SIEMENS

Weighing systems

Electronic Weighing System SIWAREX WP521/WP522

Manual

04/2016

A5E36695225A

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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Note the following:

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Foreword

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1.1 Purpose of the manual

This manual contains module-specific information about the wiring, diagnostic and technical specifications of the technology module.

Information about the design and commissioning of the S7-1500 or the ET 200MP in general can be found in the system manual for S7-1500 or ET 200MP.

1.2 Conventions

Observe the notes labeled as follows:

Note

A note contains important information about the product described in the documentation, about handling the product, or about a part of the documentation to which special attention should be given.

1.3 Security messages

Siemens provides automation and drive products with industrial security functions that support the secure operation of plants or machines. They are an important component in a holistic industrial security concept. With this in mind, our products undergo continuous development. We therefore recommend that you keep yourself informed with respect to our product updates. Detailed technical information can be found at: http://support.automation.siemens.com.

To ensure the secure operation of a plant or machine it is also necessary to take suitable preventive action (e.g. cell protection concept) and to integrate the automation and drive components into a state-of-the-art holistic industrial security concept for the entire plant or machine. Products used from other manufacturers should also be taken into account here. You will find further information under: http://www.siemens.com/industrialsecurity.

1.4 Industrial Security

SIWAREX WP521/WP522 is intended for use in secure networks (closed) and is not protected against unauthorized data traffic.

Devices connected to a company network or to the Internet must be protected against unauthorized access, e.g. through application of firewalls and network segmenting. For more information about Industrial Security, visit (http://www.siemens.com/industrialsecurity)

Documentation guide

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Introduction

The documentation for the SIMATIC and SIWAREX is modular and includes topics related to your automation system.

The complete documentation for the S7-1500 and ET 200MP systems consists of the respective system manuals, function manuals and device manuals.

You are also supported by the information system from STEP 7 (TIA Portal) during the configuration and programming of your automation system.

Overview of the documentation for the SIWAREX WP 521/WP522 technology module

The following table shows documents that you need to use the SIWAREX WP521/WP522 technology module.

Table 2- 1 Documentation for the SIWAREX WP521/WP522 technology module

Topic	Documentation	Most important contents
System description	S7-1500 Automation System (https://support.industry.siemens.com/cs/document/59191792) System Manual System manual Distributed I/O System ET 200MP (http://support.automation.siemens.com/WW/view/de/45604716)	• Application planning • Assembly • Connecting • Commissioning
Designing interference-free controllers	Designing interference-free controllers (https://support.industry.siemens.com/cs/document/59193566/simatic-s7-1500-et-200mp-et-200sp-et-200al-designing-interference-free-controllers?dti=0&lc=en-WW) Function Manual	• Basics • Electromagnetic compatibility • Lightning protection
Weighing with SIWAREX WP521/WP522	SIWAREX WP521/WP522 Electronic Weighing System Device Manual	• Module design • Assembly • Connecting • Weighing functions • Communication • Technical specifications

SIMATIC manuals

All current manuals for the SIMATIC products are available for download free of charge from the Internet (https://support.industry.siemens.com).

Product overview

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3.1 Properties

Article number

SIWAREX WP521 - 7MH4 980-1AA01

SIWAREX WP522 - 7MH4 980-2AA01

View of the modules

Image 3-1 SIWAREX WP521/WP522 module

Properties

The TM SIWAREX WP521/WP522 technology module has the following features:

- Technical properties
- Width: 35 mm
- WP521 one weighing channel, WP522 two weighing channels
- Interfaces:
  - Supply voltage L+
  - Load cell connection for strain gauge load cell in 6 or 4-wire system (per channel), 1 to 4 mV/V
  - Digital input signals DI0, DI1 and DI2 (per channel)
  - Digital output signals DQ0, DQ1, DQ2, DQ3 (per channel)
  - RS485 with Modbus RTU or for connecting the remote display (per channel)
  - Ethernet interface with SIWATOOL protocol and Modbus TCP/IP (once for each channel)
- Channel-by-channel monitoring of load cells for wire breakage
- Hardware interrupts can be configured channel by channel
- Input filter for suppressing interference with programmable digital inputs
- Supported functions:
  - Scale calibration with weights or automatically
  - Signal filtering with average value filter and low-pass filter
  - 3 limits
  - Tare
  - Set to zero
  - Trace (signal recording)
  - Firmware update
  - Identification data I&M
  - Commissioning with SIWATOOL (service tool for PC)

3.2 Area of application

The electronic weighing system described here is the optimal solution everywhere signals from weighing or force sensors are to be acquired and processed. SIWAREX WP521/WP522 offers high accuracy as an electronic weighing system.

The applications for which the SIWAREX WP521/WP522 is equipped include the following:

- Non-automatic weighing to OIML R76 (not legal-for-trade)
- Level monitoring of silos and bunkers

- Platform scale
- Scales in hazardous areas (with SIWAREX IS Ex interface)

3.3 System integration in SIMATIC

The electronic weighing system described here is a technology module for the SIMATIC S7-1500. It can be freely configured within the automation solution, including the weighing application. An optimal solutions can be found for a variety of systems with the right combination of SIMATIC modules. Fast customized and industry specific solutions can be developed using the configuration package and the "Ready for use" application for SIMATIC.

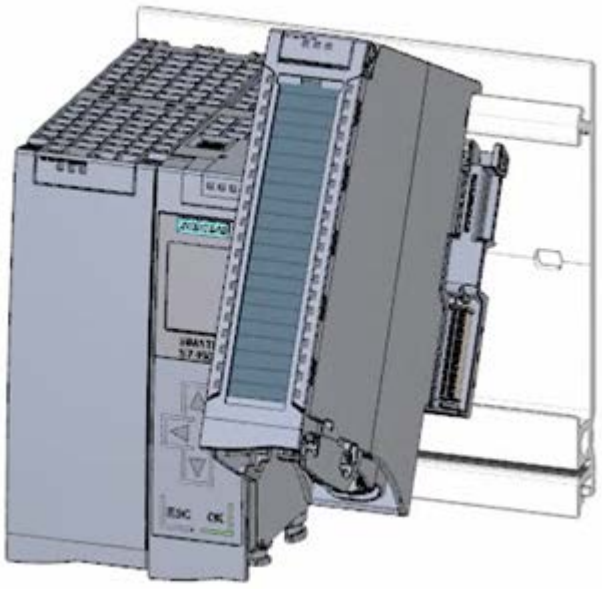

Image 3-2 Figure SIWAREX WP521/WP522 installed next to SIMATIC 1500-CPU

3.4 Customer benefits

The electronic weighing system described here features significant advantages:

- Uniform design technology and consistent communication in SIMATIC S7-1500
- Configuration via an HMI panel or PC
- Standardized configuration option in the SIMATIC TIA Portal
- Weight measurement with a resolution of 4 million parts
- High accuracy 0.05 %
- High measuring rate of 100/120 Hz (effective interference suppression)
- Monitoring of limits

- Flexible adaptation to different requirements
- Easy adjustment of the scales using the SIWATOOL program
- Automatic adjustment without calibration weights possible
- Replacement of module without renewed scale calibration
- Use in Ex Zone 2 / ATEX approval
- Intrinsically safe load cell for use in hazardous area Zone 1 (SIWAREX IS option)
- Diagnostic functions

3.5 Product package

The product package of the SIWAREX WP521/WP522 includes:

- SIWAREX WP521/WP522 module

The following components are supplied with the technology module and can also be ordered separately as spare parts:

- Shield bracket
- Shield terminal
- Power supply element
- Labeling strip
- U-connector

Other components

The following components must be ordered separately:

- Front connectors, including potential jumpers and cable ties
- Front connector 35 mm with push-in system

Note

We recommend using the SIWAREX WP521/WP522 configuration package to configure the SIWAREX WP521/WP522 electronic weighing system. The configuration package is not included in the product package of the module: → Accessories (Page 169).

3.6 Overview of the functions

The primary task of the electronic weighing system is measuring and recording the current weight value. The integration in SIMATIC provides the possibility to process the weight value directly in the PLC (**P**rogrammable **L**ogic **C**ontroller).

The SIWAREX WP521 / WP522 is calibrated ex factory. This enables both automatic adjustment of the scale without calibration weights and modules to be exchanged without having to re-adjust the scale.

The Ethernet interface enables connection of a PC for configuring the electronic weighing system or the connection of automation systems of any kind (Modbus TCP / IP).

The SIWAREX WP521/WP522 electronic weighing system can also be used in hazardous areas (Zone 2). The load cell is powered intrinsically safe for Zone 1 applications via the optional Ex interface, SIWAREX IS.

The SIWAREX WP521/WP522 can also be used independent of the automation system in stand-alone mode. This scenarios provide numerous configuration options.

The user himself can determine the HMI device. However, the HMI device must support Modbus RTU or TCP/IP. A custom operating style can be implemented.

The SIWAREX WP521/WP522 can be controlled remotely without a separate, local HMI device. An HMI device can be used for multiple scales. The configuration possibilities are almost unlimited.

3.7 Overview of configuration options

3.7.1 Configuration with the PC

The scale parameters can be quickly adjusted using the "SIWATOOL" PC configuration software, which offers Windows convenience.

The program enables you to commission the scale without knowledge of automation technology. If service is required, the processes in the scale can be analyzed and tested independent of the automation system or operator panel using the PC. Reading the diagnostic buffer from the SIWAREX module is very helpful when analyzing events.

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

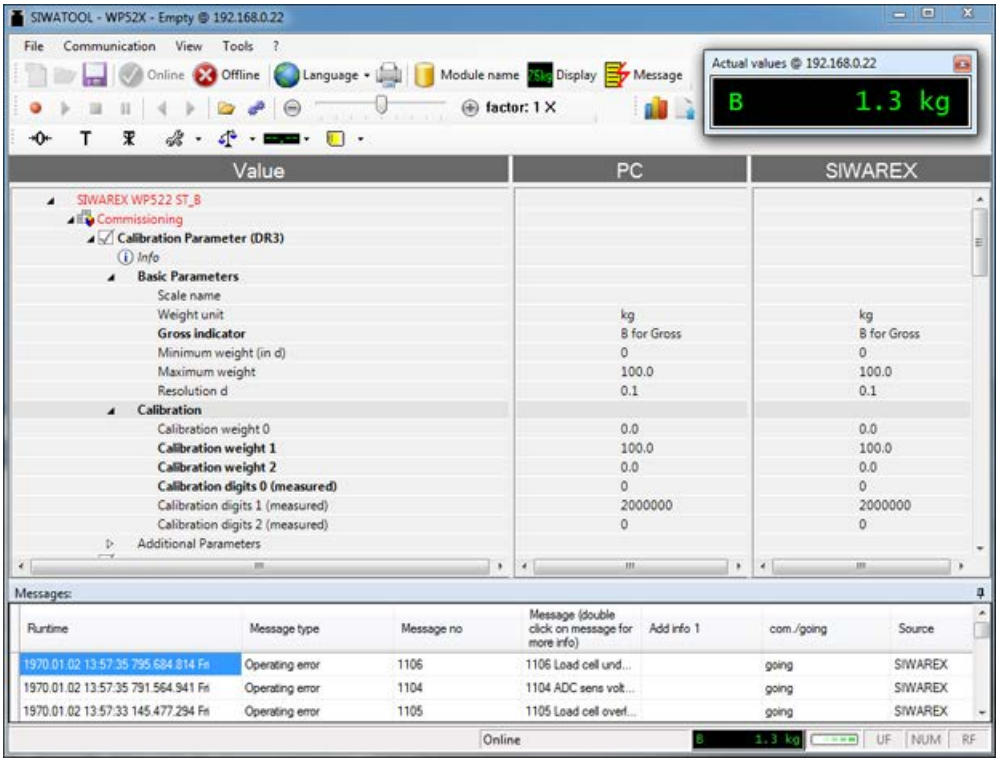

Image 3-3 Overview of the SIWATOOL WP522 program window

SIWATOOL not only provides support for adjusting the scale, but also in the analysis of the diagnostics buffer, which can be saved together with the parameters after reading the module. The display of the current scale state can be adjusted.

The program can be switched between several languages.

3.7.2 Configuration via the Modbus interface

Alternatively, the configuration can also be performed on a SIMATIC panel, which is connected directly to the SIWAREX module. In this case, the SIWAREX module behaves as a Modbus slave. The configuration software project package includes loadable HMI software for a SIMATIC Panel TP700 Comfort.

In general, all SIMATIC HMI Comfort Panels can be used for direct Modbus communication. The use of SIMATIC HMI Basic Panels is currently not possible. A direct connection between SIMATIC HMI Panels and SIWAREX WP521/WP522 via Modbus RTU is not approved.

The parameters for the SIWAREX module can also be edited on an external system, a PC for example, and transferred to the electronic weighing system via Modbus RTU or TCP/IP. You can find a detailed description of the mapping of the holding register in section → Scale parameters and functions. (Page 67)

Installation and connection

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4.1 Installation guideline

When assembling the SIMATIC components with the electronic weighing system described herein, you must adhere to the guidelines for setup, assembly and wiring the SIMATIC S7-1500 (see documentation tree).

This manual also describes the specific aspects of assembly and wiring the electronic weighing system.

4.2 Pin assignment

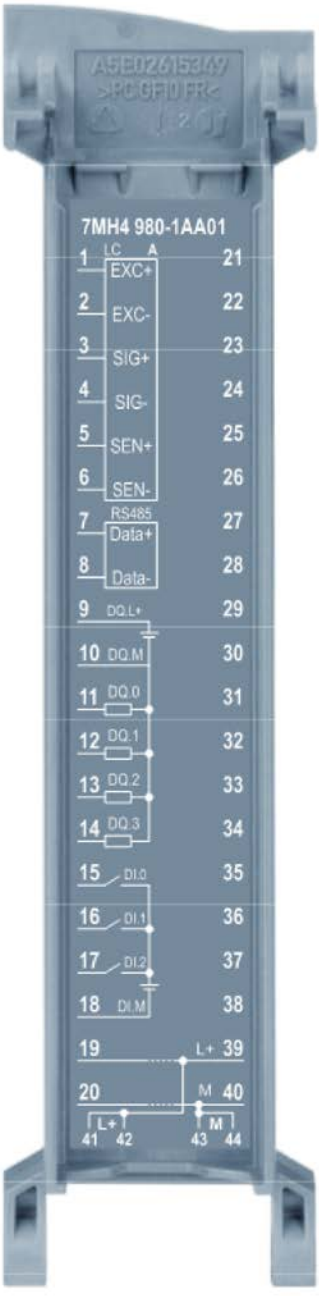
Connect the load cells, the digital input and digital output signals to the 40-pin front connector of the technology module. In addition, connect the 4-pin feed element to the supply voltage to supply the module and digital outputs.

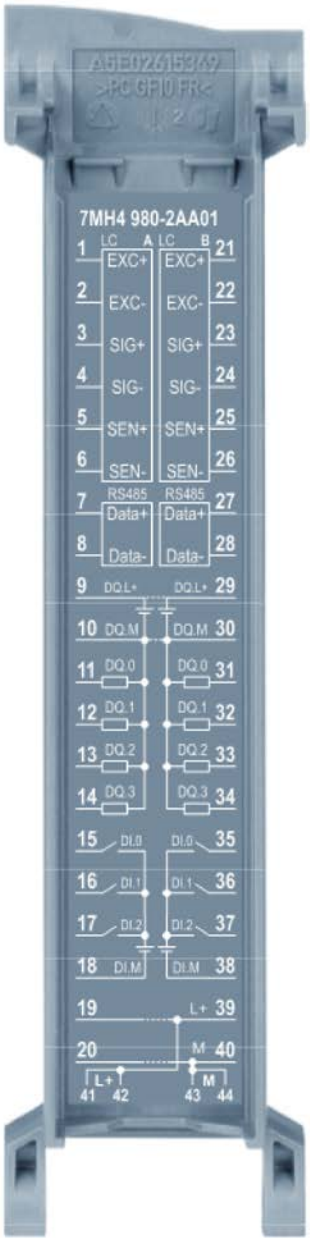
The next two sections detail the pin assignment for the front connector and the power supply element.

You can find information on wiring front connectors, creating a cable shield, etc. in the in section "Connecting" section of the Automation System S7-1500 (https://support.industry.siemens.com) system manual and Distributed I/O System ET 200MP (https://support.industry.siemens.com) system manual.

Pin assignment for the front connector

The following tables show the pin assignment of the front connector.

WP521 ST					
 Pin assignment of WP521	Load cell EXC+	1	21		
	Load cell EXC-	2	22		
	Load cell SIG+	3	23		
	Load cell SIG-	4	24		
	Load cell SEN+	5	25		
	Load cell SEN-	6	26		
	RS485, D+	7	27		
	RS485, D-	8	28		
	DQ.L+ (24V DQ)	9	29		
	DQ.M (0V DQ)	10	30		
	DQ.0	11	31	(Pins 21 ... 38 unusable)	
	DQ.1	12	32		
	DQ.2	13	33		
	DQ.3	14	34		
	DI.0	15	35		
	DI.1	16	36		
	DI.2	17	37		
	DI.M (0V DI)	18	38		
	L+ (if jumpered)	19	39	L+ (of 41, 42)	Pins 19 and 39 jumperable
	M (if jumpered)	20	40	M (of 43, 44)	Pins 20 and 40 jumperable
		41 42	43 44		
		L+	M		

WP522 ST					
	Load cell EXC+	1	21		
	Load cell EXC-	2	22		
	Load cell SIG+	3	23		
	Load cell SIG-	4	24		
	Load cell SEN+	5	25		
	Load cell SEN-	6	26		
	RS485, D+	7	27		
	RS485, D-	8	28		
	DQ.L+ (24V DQ)	9	29		Pins 9 and 29 jumperable
	DQ.M (0V DQ)	10	30		Pins 10 and 30 jumperable
	DQ.0	11	31		
	DQ.1	12	32		
	DQ.2	13	33		
	DQ.3	14	34		
	DI.0	15	35		
	DI.1	16	36		
	DI.2	17	37		
	DI.M (0V DI)	18	38		
	L+ (if jumpered)	19	39	L+ (of 41, 42)	Pins 19 and 39 jumperable
	M (if jumpered)	20	40	M (of 43, 44)	Pins 20 and 40 jumperable
		41 42	43 44		
		L+	M		

Pin assignment of WP522

Pin assignment for the power supply element

The power supply element is plugged onto the front connector and serves to supply the technology module. For this purpose, you need to connect the supply voltage to terminal 41 (L+) and terminal 44 (M). Use terminal 42 (L+) and terminal 43 (M) to loop the supply voltage to the next module.

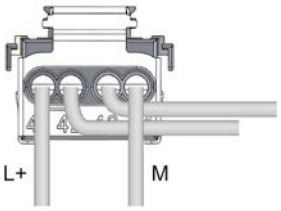


Image 4-1 Power supply element

L+	DC 24V supply voltage
M	Ground for supply voltage

4.3 Connecting the load cells

Overview

Pickups equipped with strain gauges (EMS full bridge) can be connected to the electronic weighing system SIWAREX WP521/WP522 to meet the following requirements.

- Identifier 1.... 4 mV/V
- A supply voltage of 5 V is permitted

The power supply for the load cells is 4.85 V.

To test the maximum possible number of load cells that can be connected to a WP521/WP522, the following condition must be met:

- Scale operation without Ex interface: (input resistance of load cell) / (number of load cells) > 40 Ohm
- Weighing mode with EX interface: (input resistance of load cell) / (number of load cells) > 50 Ohm

Connection with 4-wire or 6-wire system

The connection options are shown in the following two figures.

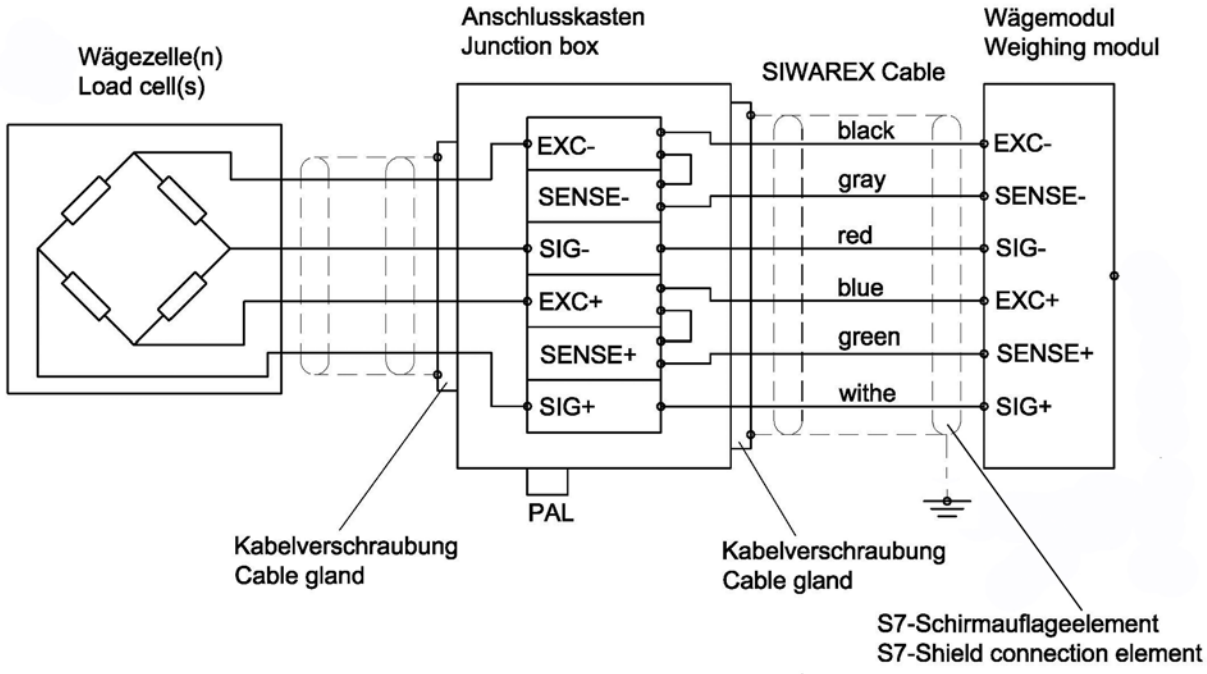


Image 4-2 Connection of strain gauge load cell with 4-wire system

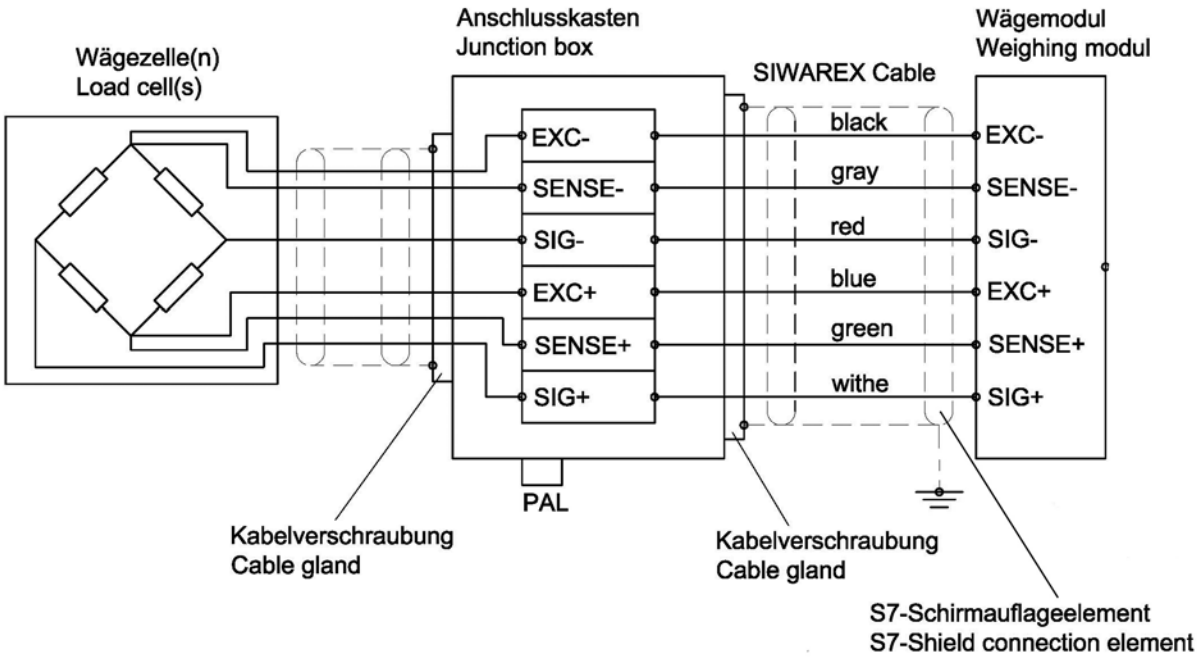


Image 4-3 Connection of load cell with 6-wire system

Rules

Observe the following rules when connecting analog (strain gauge) load cells:

1. The use of a junction box (SIWAREX JB junction box) is required when more than one load cell is connected (the load cells must be connected in parallel). If the distance of a load cell to the SIWAREX WP521/WP522 or terminal box is greater than the available length of the load cell cable, the SIWAREX EB extension box should be used.
2. The cable shield is always applied at the cable gland of the junction box (SIWAREX JB) or the extension box. If there is a risk of equipotential bonding through the cable shield, connect a equipotential equalization conductor parallel to the load cell cable.

3. Twisted wire pairs that are also shielded are required for the specified cables:
   - Sensor cable (+) and (-)
   - Measuring voltage cable (+) and (-)
   - Supply voltage cable (+) and (-)

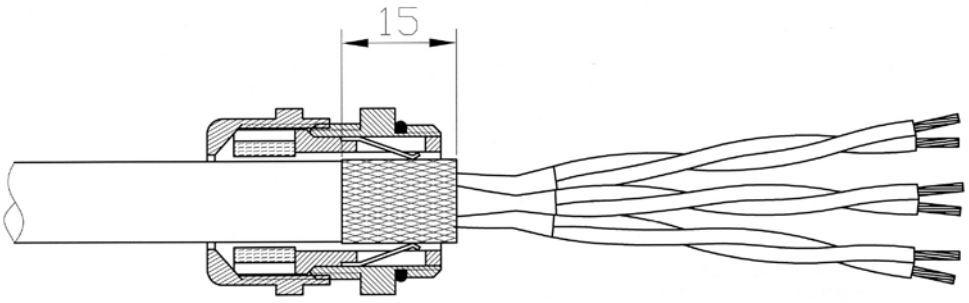


Image 4-4 Shielding in the screw gland

We recommended that you use the cables listed in chapter → Accessories (Page 169).

4. The shield must be connected to ground in the immediate vicinity of the SIWAREX WP521/WP522. The maximum distance between the SIWAREX WP521/WP522 and the load cell is applicable when the recommended cables are used.

Table 4- 1 Load cell connections on the module

Labeling	Function
Sig-	Measurement cable load cell -
Sig+	Measurement cable load cell -
Sen-	Sensor cable load cell -
Sen+	Sensor cable load cell +
Exc-	Supply load cell -
Exc+	Supply load cell +

4.4 Shield connection

You need to ground the shields of the load cell cables via the shield on the front connector (shield bracket and terminal) ground.

Ensure that the shield support for the shielded cables are correctly assembled. This is the only way to ensure the immunity of the system.

A cable is shielded to attenuate the effects of magnetic, electrical and electromagnetic interference on the cable. Interference on the cable shielding is discharged to the ground through a conductive cable shield bus. To avoid this interference from becoming a source of interference itself, ensure the connection to ground has a low impedance .

Only use cables with a braided shield (see recommended cable in the section Accessories (Page 169)). The coverage of the shield should be at least 80%.

Image 4-5 Front connector with a shielded cable and 24V connection

4.5 Supply voltage L+/M

Connect the supply voltage (24 V DC) to terminals L+ and M. An internal protection circuit protects the technology module from reverse polarity of the supply voltage. The technology module monitors whether the supply voltage is connected.

4.6 Digital inputs DI0, DI1 and DI2

There are three digital inputs per weighing channel available. The digital inputs can be assigned to scale commands per configuration.

⚠ CAUTION

Unknown assignment of digital inputs

If the assignment of the digital inputs is not known at the time of connection, This may damage parts of the system.

Do not create a connection with the digital inputs before you know the assignment.

The digital inputs are not permanently assigned to commands in the delivery state. The assignment of the digital inputs to commands is made during commissioning by setting parameters of the data record DR7.

The digital inputs of the two SIWAREX WP522 scale channels are electrically isolated from each other.

Input filter for digital inputs

The following values can be specified for the input delay:

- None
- 5 ms
- 10 ms (preset)
- 15 ms
- 20 ms
- 25 ms
- 30 ms
- 35 ms
- 40 ms

Note

If you select "No", you must use shielded cables to connect the digital inputs.

4.7 Digital outputs DQ0, DQ1, DQ2 and DQ3

There are four digital outputs available per weighing channel. The digital outputs DQ0, DQ1, DQ2, DQ3 may be assigned to the status or messages by the specified parameters. They can also be controlled directly via a SIMATIC program or via DR18.

⚠ CAUTION

Unknown assignment of digital outputs

The assignment of the digital outputs is not known at the time of connection. Digital outputs can be active immediately after turning on the power supply. This may damage parts of the system.

Do not create a connection with the digital outputs before you know the assignment of the digital outputs.

The digital outputs have no fixed assignment to process data ex factory. The assignment of the digital inputs to function and the reaction to failure is made during commissioning by setting parameters of the data record DR7.

The digital outputs of the two SIWAREX WP522 scale channels are electrically isolated from each other.

The digital outputs are 24 V sourcing with respect to M and with a nominal load current of 0.5A. They are protected against overload and short-circuit.

Note

Direct connection of relays and contactors is not possible without external wiring. You can find information about the maximum possible operating frequencies and the inductance of the inductive load on the digital outputs in the section Technical specifications (Page 157).

4.8 Connection of RS485 serial interface

The following devices can be connected to the serial interface:

- Display from the Siebert company, type S102
- Operator Panels or other HMI devices with RS485 and Modbus protocol RTU
- Communication partner with Modbus protocol RTU

Table 4- 2 Connection of RS485 serial interface

Labeling	Function
EIA-485 D+	RS485 data line + for feeding in of bus signal
EIA-485 D-	RS485 data line - for feeding in of bus signal

When a SIWAREX WP521/WP522 module forms the end of an RS485 network, the termination of the bus network can be switched per configuration.

4.9 Connection of Siebert display via RS485

A Siebert display S102 with the order no. S102-W6/14/0R-000/0B-SM can be connected to the RS485 interface of the weighing module. Connect a 24 V DC supply to the Siebert display, and connect the latter to the RS485 interface of the weighing module as shown in the following diagram.

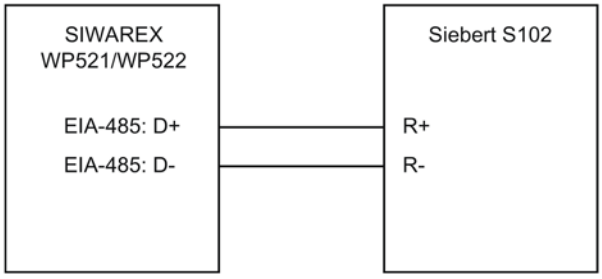


Image 4-6 Connection of Siebert display S102

The RS485 interface in DR13 is set as follows:

- RS-485 protocol: SIEBERT Display S102
- Baud rate: 9 600 bit/s
- Character parity: Even

The S102 is set as follows:

Table 4- 3 Settings of Siebert display S102

Menu item	Setting	Meaning	
1 Interface	485	RS485 interface	
9 Station address	01	Address meaning:	
		Address	**Weight value**
		01	Verifiable weight
		02	Total
		03	Net
		04	Tare
t Timeout	2	e.g. timeout after 2 seconds	
C	0.0	No decimal point	
F Segment test	----*	No segment test when switching on	
	8.8.8	Segment test when switching on	

4.10 Connection of the Ethernet interface

An RJ45 connector is used for the connection.

The following devices can be connected to the Ethernet interface:

- PC service and commissioning program SIWATOOL or Web browser
- Operator panels or other HMI devices with Ethernet and Modbus protocol TCP/IP
- Communication partner with Modbus protocol TCP/IP

To remove the plug-in connector without a tool (screwdriver), you should ensured that the cable has a plug with sufficiently long release lever, see as an example in the figure below.

Image 4-7 Connection socket for an Ethernet cable

Image 4-8 Ethernet cable connected to module

Image 4-9 Press the Ethernet cable into the socket

Ethernet socket on the bottom of the enclosure, plug with extended release lever

Image 4-10 Ethernet plug with release lever

Commissioning

5

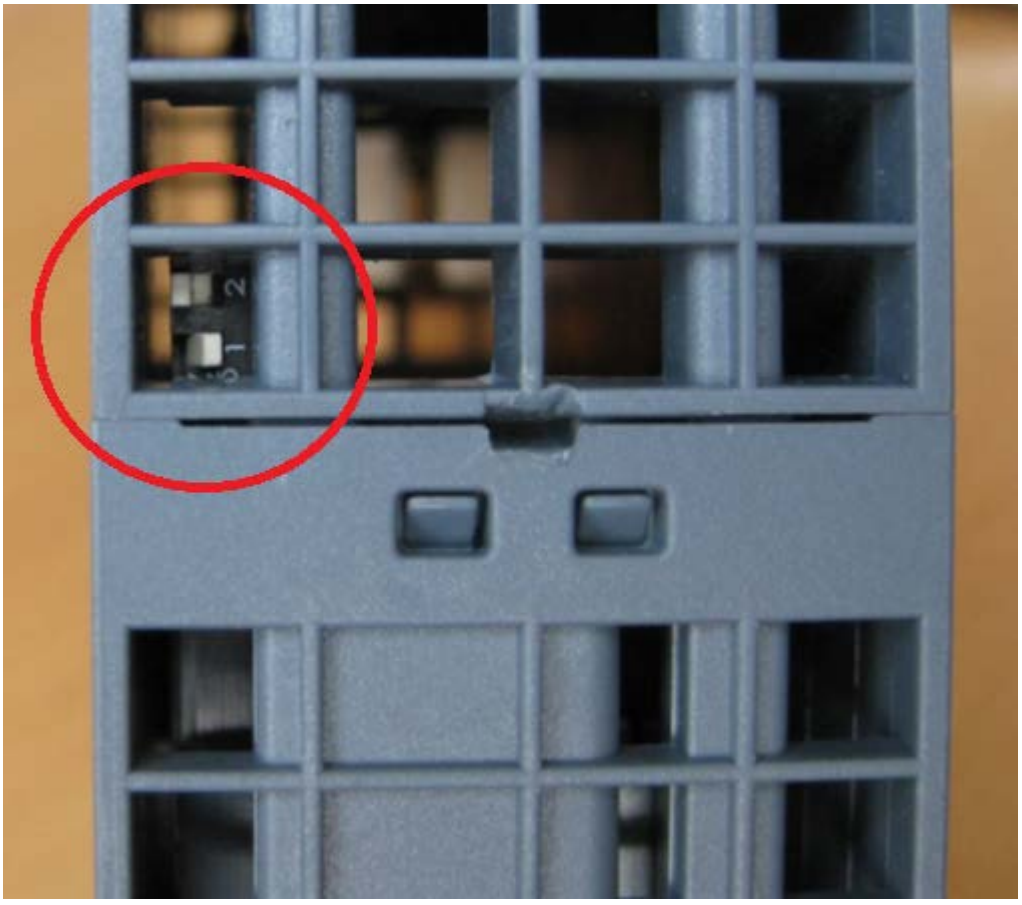
5.1 Basic tasks

Commissioning consists mainly of checking the mechanical scale structure, setting parameters, calibration, and verification of the envisaged functionality.

5.2 Ex-works settings of the operating switch

The module has two DIP switches located on the left in the upper part of the enclosure (accessible through the vent). Both switches are in the up position ex factory.

Image 5-1 Switch position in the enclosure



Switch ①: Specifies the operating environment

Switch ②: Currently no function

Image 5-2 Switch functions

Switch ①

Switch position	Operating environment
Up	Integrated in SIMATIC mode
Down	Stand-alone mode (without SIMATIC controller)

"Integrated in SIMATIC mode" set.

Connected to an S7-1500 CPU, stand-alone mode (DIP 1 in lower position) can be useful, because SIWAREX WP521/WP522 then remains fully functional even in the case of a CPU stop and can be operated (e.g. through an HMI device directly connected via Modbus, through a coupled PC or through the digital inputs)

Note

If the switch ① is set to the lower position while the SIWAREX module is operating with SIMATIC, the SIWAREX module does not perform a reset when there is a loss of power supply for the SIMATIC CPU.

5.3 Factory-set parameters

The electronic weighing system described here is provided with factory-set parameters. The parameters have been provided for a typical 100 kg scale based on three load cells. Parameters which can be entered in % or time are preset in such a way that they provide good results for most applications.

A quick start can be carried out with these default parameters (see chapter Start-up with the operator panel and the Ready-for-use software (Page 38)).

5.4 Commissioning tools

The following options are available for commissioning the electronic weighing system:

- Operator Panel
- SIWATOOL

The SIWATOOL program allows you to commission the scale without an Operator Panel and without an automation system. In the event of a fault, additional SIWATOOL diagnostics functions enable fast analysis of the cause.

5.5 Start-up with the operator panel and the Ready-for-use software

5.5.1 Restriction of access

Note

The example project "Ready-for-use" does not restrict access. If operation of the scale/system is implemented based on this configuration example, restriction of access is recommended, e.g. by using passwords with the support of the engineering tools.

5.5.2 Start

The quick start is performed in this example with a TP700 Comfort Panel connected directly to the WP521/WP522. The panel communicates directly via Modbus TCP/IP or via the SIMATIC S7-1500 CPU.

To carry out the quick start, select the "1.0 Setup" function in the main menu and then "1.2 Quick Start". You will be guided through the individual tasks for setting the most important parameters.

The remaining parameters are factory-set in such a way that they can be used in most cases without any changes.

All parameter inputs must be saved by clicking on the diskette icon.

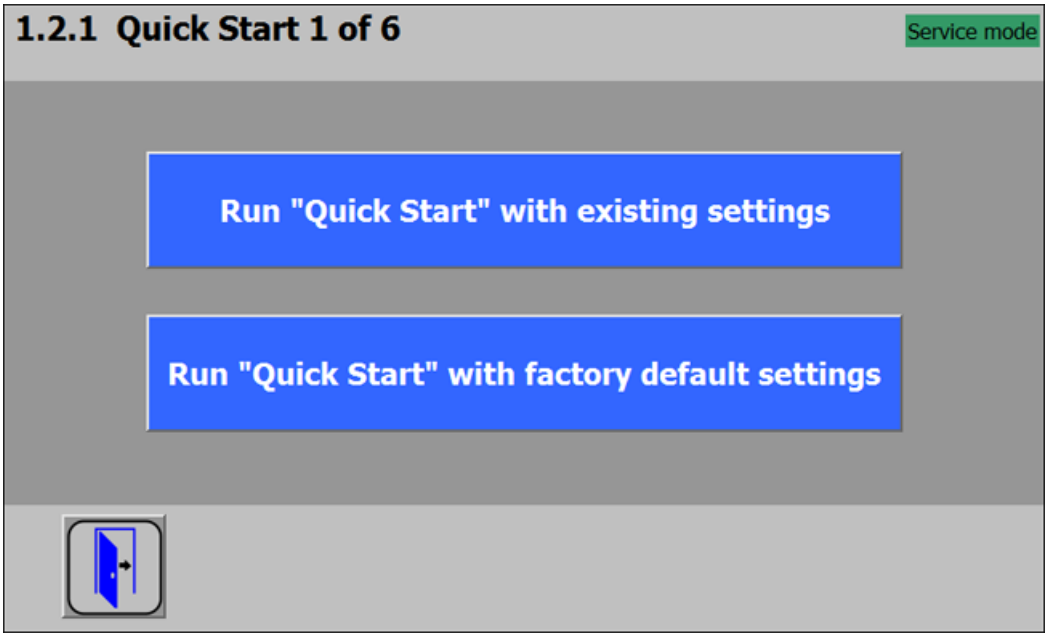


Image 5-3 Quick Start 1 of 6

5.5.3 Specification of basic values 1

The basic parameters can be entered first, e.g. the scale name, unit of weight or gross weight ID.

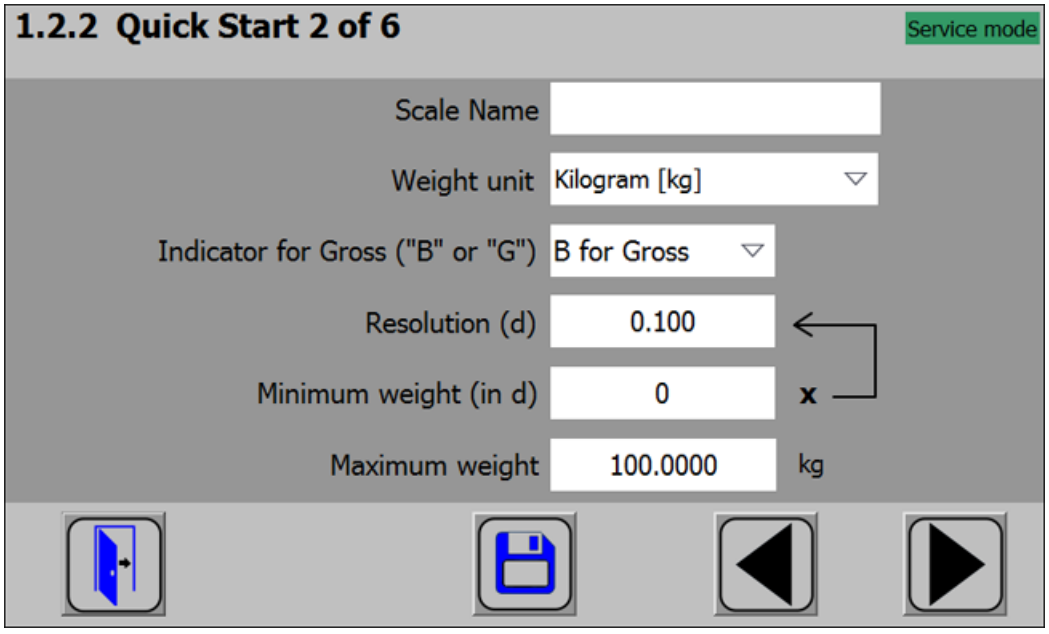


Image 5-4 Quick Start 2

5.5.4 Specification of basic values 2

The load cell parameters are entered in this step.

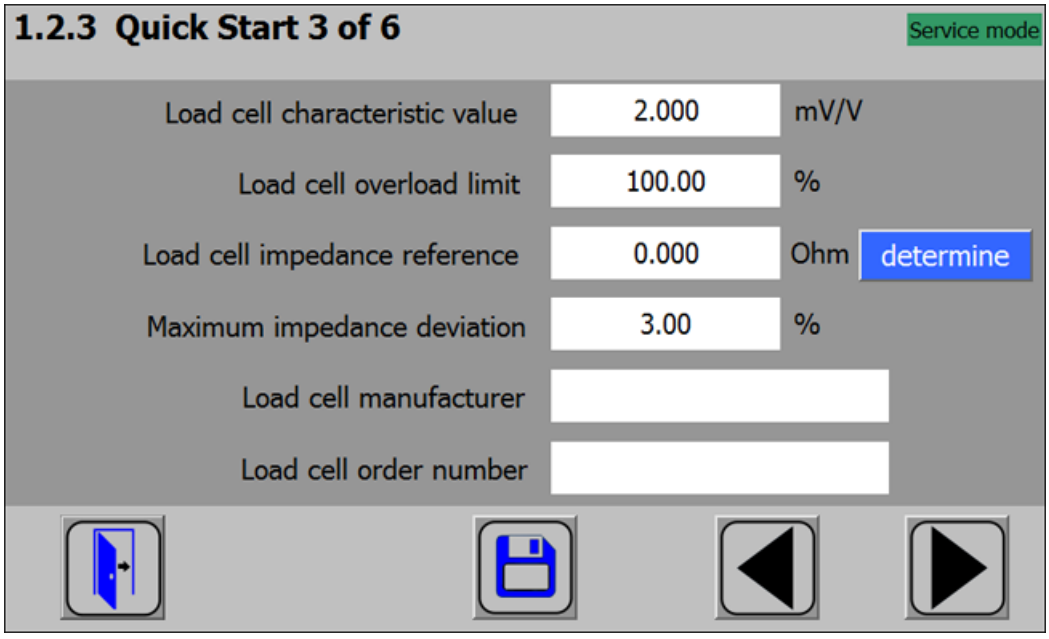


Image 5-5 Quick Start 3

5.5.5 Selecting the calibration method

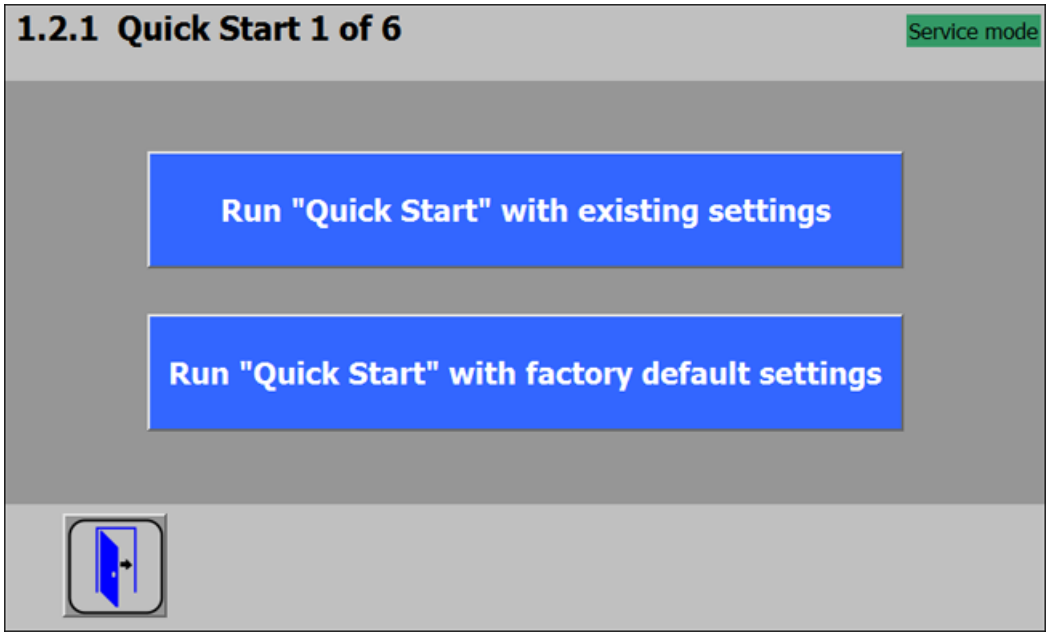


Image 5-6 Quick Start 4

The module can always be calibrated in two different ways:

- Using reference weights: in the case of a calibration with weights, mechanical influences of the scale construction are also partially taken into account.
- Without weights, using the technical specifications of the connected load cell(s): in the case of automatic calibration, the accuracy of the scale is influenced by the mechanical properties to a greater extent than with calibration using reference weights.

With both methods, make sure that the mechanical properties of the scale are flawless prior to calibration.

5.5.6 Defining the calibration weights

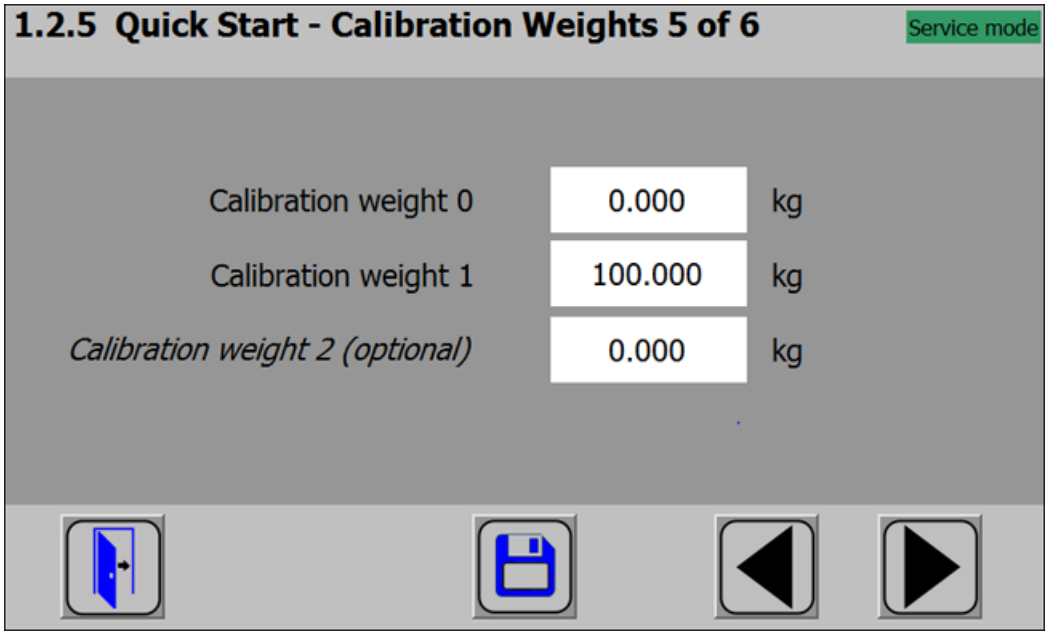


Image 5-7 Quick Start 5

In step 5 you enter the calibration weights which are to be positioned on the scale during the calibration. If the scale is not empty and the current contents are known, you can define an "Calibration weight 0" with the current contents of the scale. With an empty scale, this parameter remains as 0 kg. "Calibration weight 1" usually defines the first reference point of the scale characteristic. A further reference point ("Calibration weight 2") can also be set in addition. This is optional, and may not be necessary depending on the mechanical properties of the scale.

Note that the interval between the calibration weights must be at least 2% of the nominal load of the scale. With a 1 000 kg scale, a calibration weight of at least 20 kg must therefore be used.

5.5.7 Setting calibration points

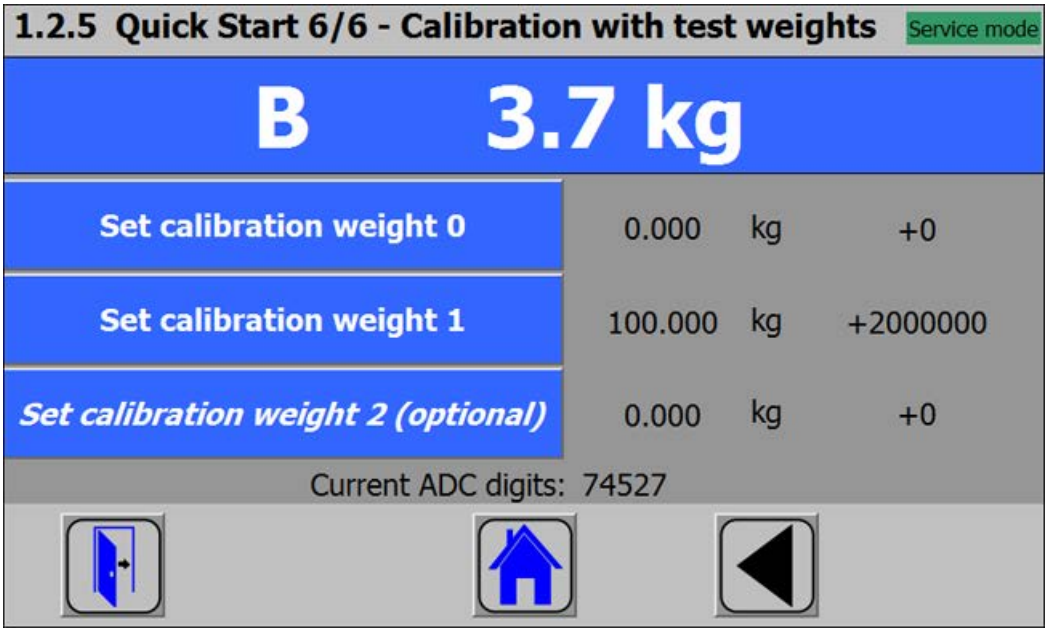


Image 5-8 Quick Start 6

Carry out the calibration commands at the end of the quick start:

1. Carry out the "Set calibration weight 0" command. The "Calibration weight 0" defined in step 5 is now visible in the display.
2. Place the "Calibration weight 1" defined in step 5 on the scale construction, and execute the "Set calibration weight 1" command.
3. If an "Calibration weight 2" was selected:
   Place the "Calibration weight 2" defined in step 5 on the scale construction, and execute the "Set calibration weight 2" command.
4. Calibration of the scale is now complete. Return to the start screen by clicking on the house icon.

5.5.8 Calibrating the scale automatically

The scale can also be calibrated without weights. To do this, it is essential to enter data specific to the load cells, and the scale must be empty.

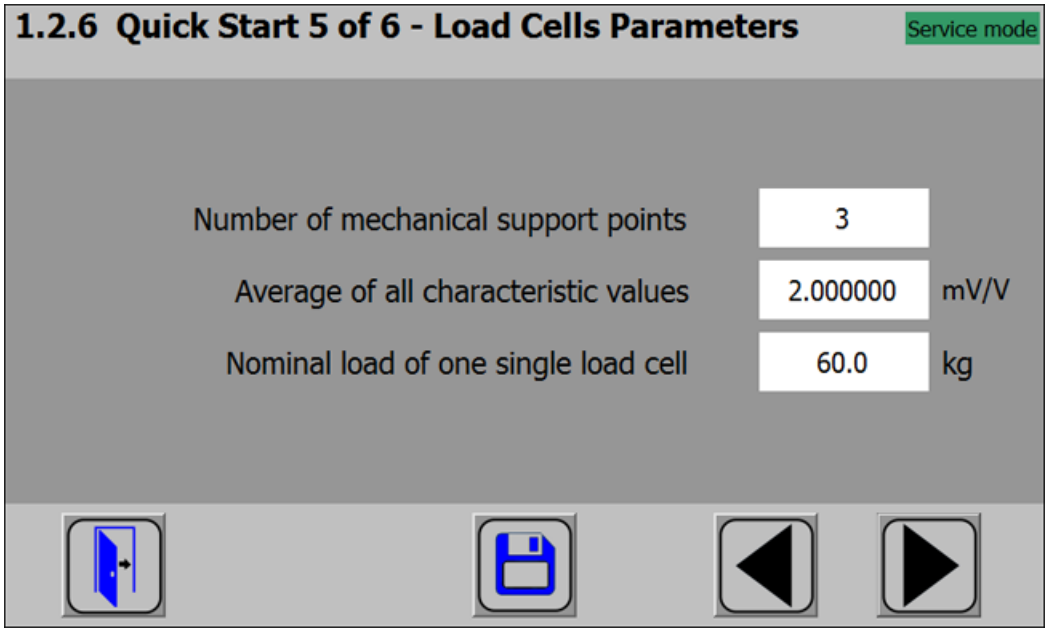


Image 5-9 Quick Start 5

The number of points of support corresponds with a silo, for example, to the number of clamps or feet of the silo. A quadratic platform scale with a load cell at each corner has 4 support points. The characteristic values of the individual load cells are required to calculate the average characteristic value of the cells.

The formula for the calculation is:
(characteristic value cell 1 + characteristic value cell 2 + ... characteristic value cell n) / n

If the exact characteristic values are unknown, it is permissible to also use rounded-off numbers (e.g. 1.0 mV/V, 2.0 mV/V). The nominal load of one single load cell (not the nominal load of the complete scale!) must subsequently be defined.

5.5.9 Performing the automatic calibration

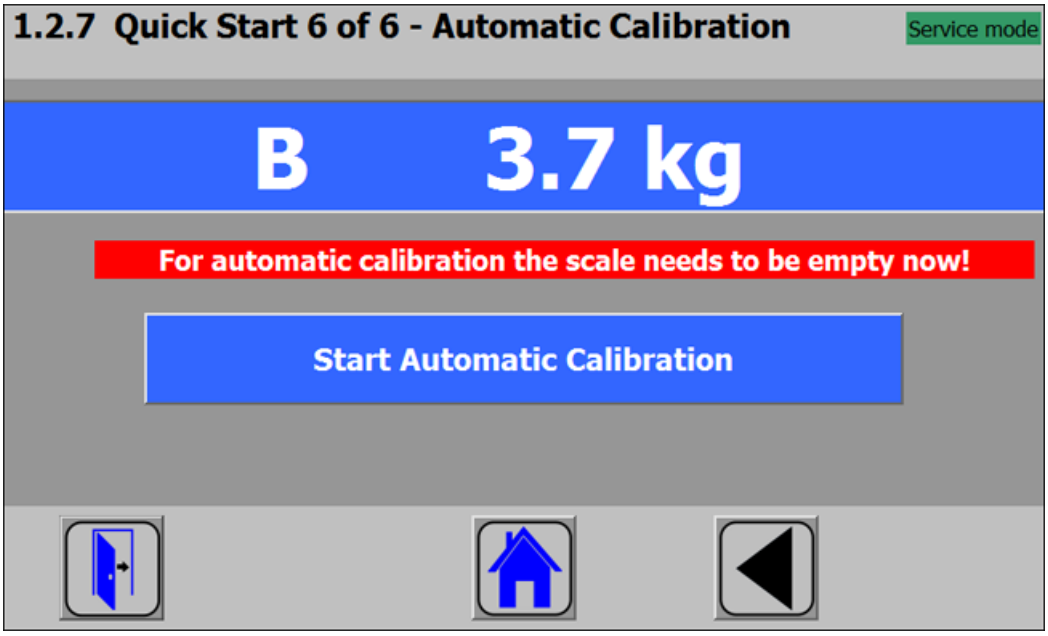


Image 5-10 Quick Start 6

Subsequently enter the "Perform automatic calibration" command with the scale empty. The scale is calibrated directly, and clicking on the house icon returns you to the start screen.

5.5.10 Checking the scale following calibration

If the scale is only used for company-internal purposes, a simple check is sufficient.

Perform the following steps:

1. The scale is unloaded and shows "0 kg".
2. Place a known reference weight on the scale.
   Check the displayed value.
3. If a second known reference weight is available, place it on the scale in addition.
   Check whether the scale displays the sum of the reference weights.
4. Remove the reference weights from the scale.
   Check that the display is "0 kg" again.

5.6 Service with the SIWATOOL program

5.6.1 General

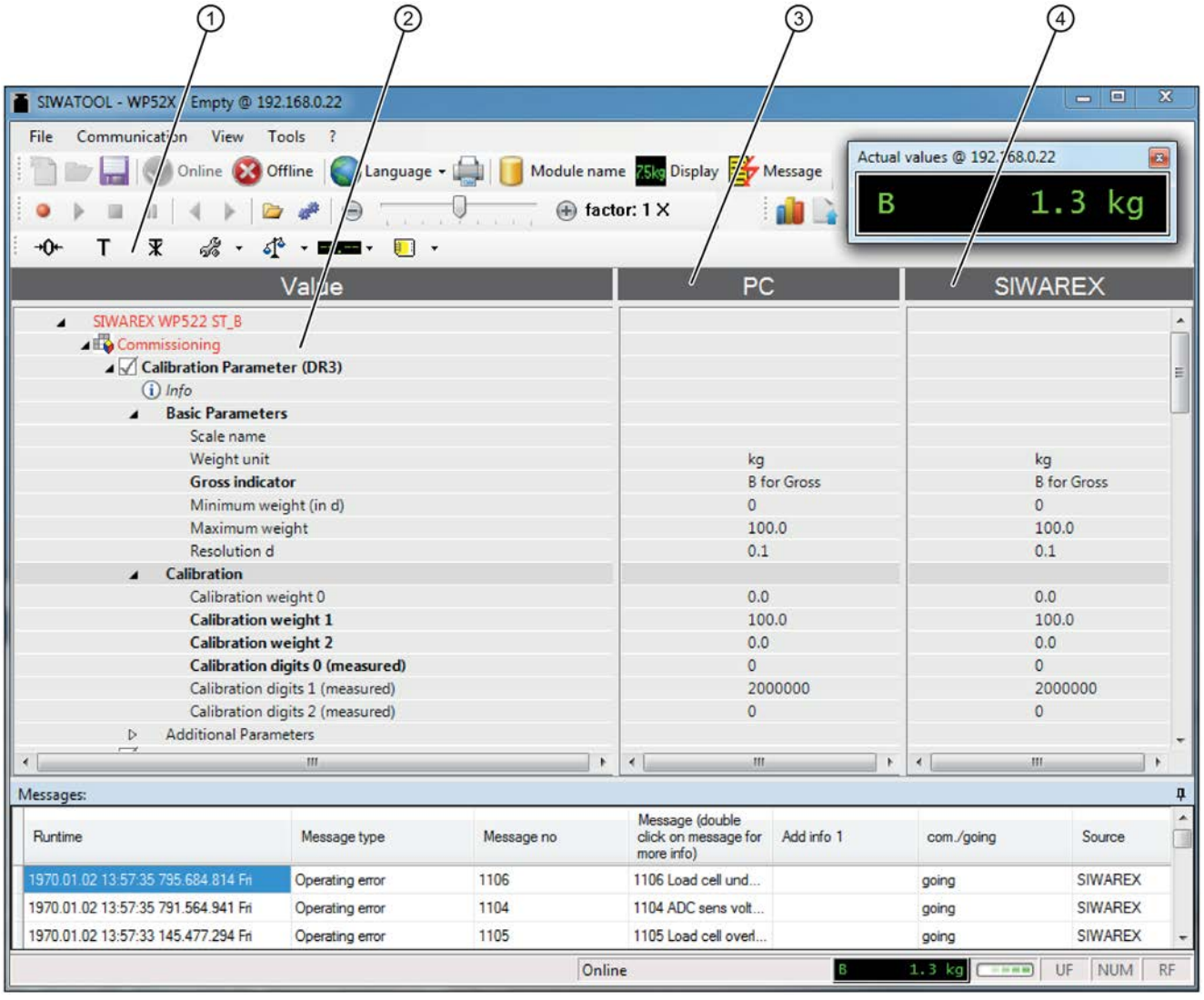
You can use the SIWATOOL program to commission the scale independently of the SIMATIC automation system.

The program is included in the configuration package.

Install the SIWATOOL program (SIWATOOL folder) on your PC for commissioning. You have 3 options when selecting the SIWAREX module:

- Selection SIWAREX WP521ST
- Selection SIWAREX WP522STA - for channel A
- Selection SIWAREX WP522STB - for channel B

5.6.2 Windows and functions of SIWATOOL



① Control elements for SIWATOOL and operation of the scale

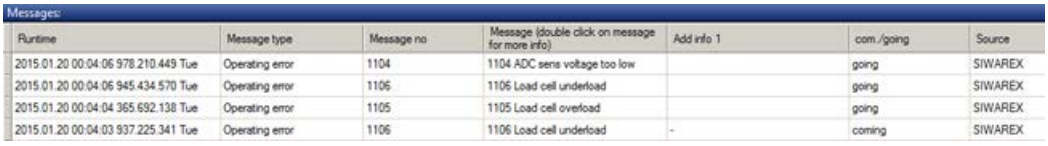
② Parameter list of the SIWATOOL module

③ Offline values of the SIWAREX module

④ Online values of the connected SIWAREX module

Image 5-11 Layout of the SIWATOOL user interface

The message window shows the current contents of the message buffer of the SIWAREX module. The most recent message is in the top line.

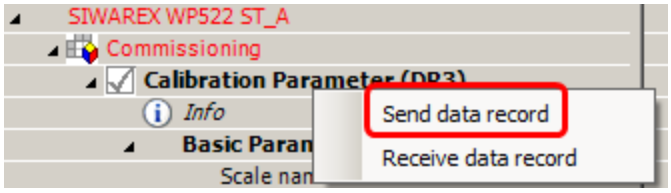


In order to archive data, all data can be exported from the SIWAREX module and saved as a file or printed.

Note

You can edit all data in the SIWAREX module in online mode. The changes are **not** automatically imported to the corresponding scale data block in the SIMATIC CPU.

Select the appropriate data record in order to send or receive it (e.g.: "Calibration parameter (DR3)") and call the command list with a right mouse click.



The data record is sent from the PC to the SIWAREX WP521/WP522 using "Send data record".

The data record is sent from the SIWAREX WP521/WP522 to the PC using "Receive data record".

The complete data record (all parameters of the data record) is always transferred, not just individual parameters!

For example, if data record 3 is to be sent, right-click on "Calibration Parameter (DR3)". The command list is then opened with the option for sending the respective data record to the weighing module or for reading it from the module. All data records can only be sent to or read from the SIWAREX as complete packets. It is not possible to read or write individual parameters within a data record.

Different parameter-settings between PC and SIWAREX are marked in red in the SIWATOOL:

Value	PC	SIWAREX
SIWAREX WP522 ST_A		
Commissioning		
Calibration Parameter (DR3)		
Info		
Basic Parameters		
Scale name	Siwarex	Siwarex
Weight unit	g	g
Gross indicator	B for Gross	B for Gross
Minimum weight (in d)	0	0
Maximum weight	15000.0	20000.0
Resolution d	0.1	0.1
Calibration		
Calibration weight 0	0.0	0.0
Calibration weight 1	100.0	2000.0
Calibration weight 2	0.0	0.0
Calibration digits 0 (measured)	21625	21625
Calibration digits 1 (measured)	215641	215641
Calibration digits 2 (measured)	0	0
Additional Parameters		
Autom. CalibrationDigits (DR4)		
Tare-Zero-Memory (DR5)		
Limits (DR6)		
Process Interfaces (DR7)		

Therefore the complete data record must initially be received for every change to parameters within it.

The desired parameter can then be edited, and the data record returned.

Note

If the data record is not received, the danger exists that different PC parameters will be sent to the scale and overwrite previously active and intentionally defined parameters.

Online parameter trends can be recorded and played back using the recorder function located at the top right-hand edge of SIWATOOL. You can use the "Configure recorder" button to select the data records to be recorded and to set the save parameters. The playback speed can be set using a slider.

5.6.3 Available help options

SIWATOOL offers various help options for operation:

- Info card

  You can select the "Info" item directly underneath the individual data records in the navigation tree. This info card explains how the data record influences the scale behavior.

- Tooltip

  If you move the mouse over a button or parameter, a corresponding help text is displayed.

- Help

  Click on the menu option "Help" to call up the SIWATOOL help. The Help can be opened separately.

5.6.4 Recording scale traces

Scale traces can be recorded and exported using SIWATOOL. The recording is started and stopped using commands, and recorded traces can also be deleted. The trace recording cycle is set in data record DR7. A dialog box appears with the "Export trace data" button. The trace is displayed in this window as a table or graphic, and the data can be exported to csv or Excel and then processed further. The commands for starting and stopping are present in the "Trace commands" group (yellow memory card icon) in SIWATOOL.

All important measured values, messages and changes in status are recorded.

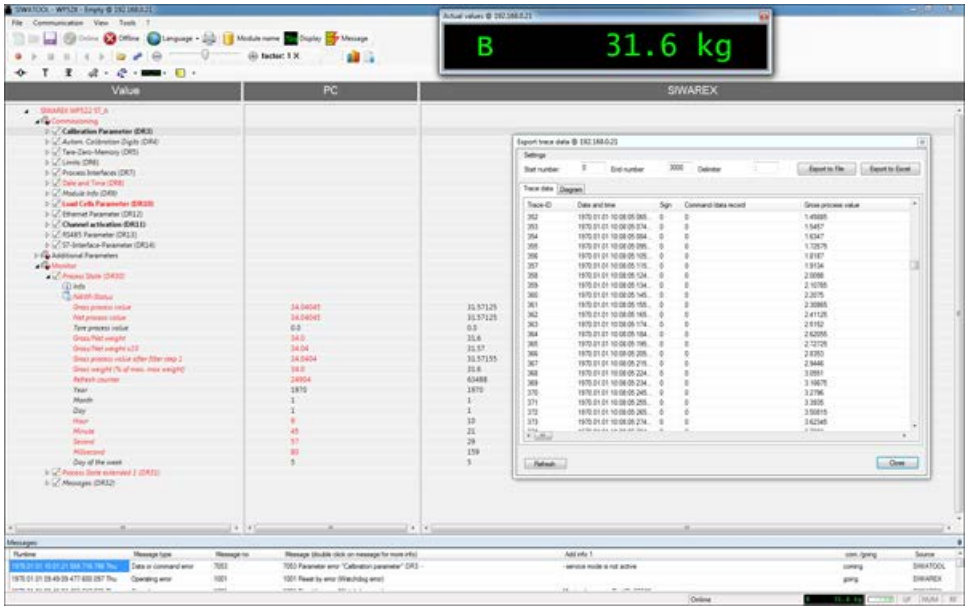


Image 5-12 Reading trace as a table

Image 5-13 Reading trace as a chart

5.6.5 Offline parameter assignment

All scale parameters can be edited and saved without an electronic weighing system.

This reduces the setup time. You can thus prepare the parameters for several scales in your office, and subsequently transfer them to the electronic weighing system during setup.

Data from one scale currently in operation can be exported and used to set up another scale.

5.7 Commissioning with SIWATOOL

5.7.1 IP address for SIWAREX

The factory-set IP address is 192.168.0.21. This address is also preset in SIWATOOL. The connection to a SIWAREX module can be established immediately. The network card used must be configured for this network.

If the connection is to be established to a specific SIWAREX module, its IP address must be set in SIWATOOL. The setting is carried out with the menu item "Communication/Set Ethernet Configuration...".

If the IP address of a SIWAREX module is unknown, it can be determined using the additional program "Primary Setup Tool". The program is included in the SIWAREX configuration package.

During the setup, a new IP address can be assigned to the module using SIWATOOL.

Note

Please also observe the Security information (Page 9).

The assignment of a new IP address to a SIWAREX module is necessary if several SIWAREX modules are present in one network.

The following ports are used by SIWAREX:

- SIWATOOL for SIWAREX WP521 port: 23006
- SIWATOOL for SIWAREX WP522 channel A: port 23006, channel B: port 23007
- Modbus TCP/IP for SIWAREX WP521: Port: 502
- Modbus TCP/IP for SIWAREX WP521/WP522: Port: 502

  or

- Modbus TCP/IP for SIWAREX WP522 channel A: port configurable, channel B: port configurable
- FTP for firmware download port: 69

5.7.2 Entering a known SIWAREX IP address

To establish a connection to a SIWAREX module, enter the IP address in SIWATOOL. Under the menu item "Communication", select "Set Ethernet Configuration...". Enter the IP address of the SIWAREX module in the following window. To activate the IP address and establish a connection to the SIWAREX module, subsequently click on "Online".

5.7.3 Determining an unknown IP address

If the IP address of a connected SIWAREX module is unknown, it can be determined using the program "Primary Setup Tool". The program is included in the configuration package (Page 169).

Install the program "Primary Setup Tool". When started, the program can determine the Siemens devices present in the network.

The MAC (Media Access Control) address can be read on the front of the SIWAREX module. Every device has an MAC address which is unique worldwide.

The IP address can be determined from the identified MAC address. The Primary Setup Tool also allows the IP address of a SIWAREX module to be set/changed.

Additional information on the Primary Setup Tool can be found in the associated manual.

5.7.4 Setting up a network

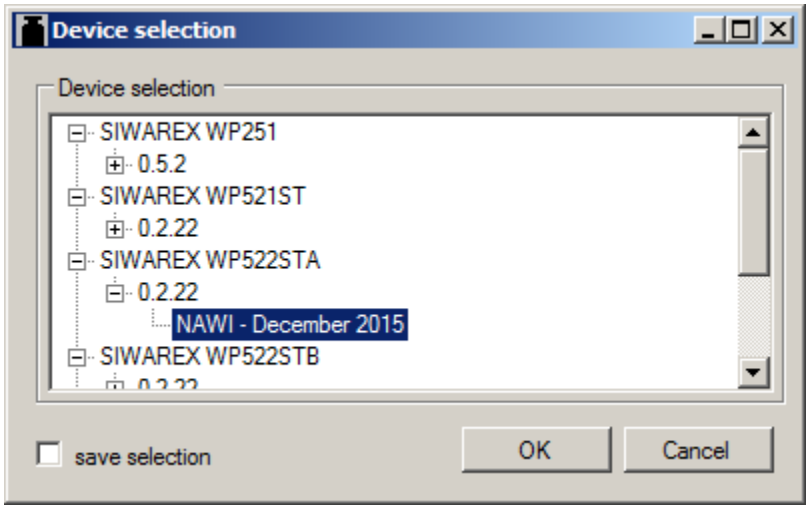
Several SIWAREX modules can be connected together in a network via a switch. Via the network, you can use SIWATOOL to assign parameters to and start the various modules or connect a common Operator Panel.

Note

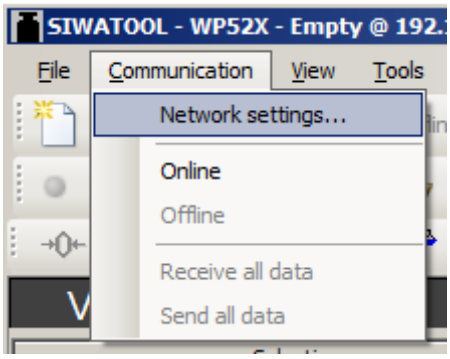
Please also observe the Security information (Page 9).

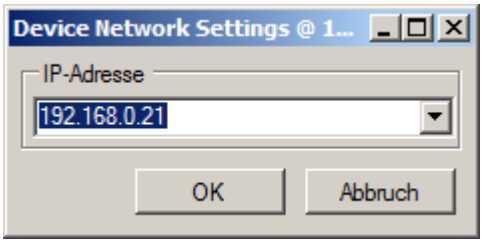
5.7.5 Start

When starting the SIWATOOL program, first select the SIWAREX WP521ST or SIWAREX WP522STA (channel A) or SIWAREX 522STB (channel B) using the "Device selection" window.

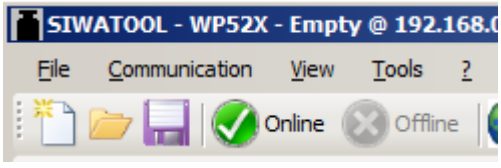


The IP address of the module can be selected in the "Communication" menu.





Click "Online" to establish communication to the SIWAREX.



See also

Service with the SIWATOOL program (Page 46)

5.7.6 Calibration method

5.7.6.1 Selecting the calibration method

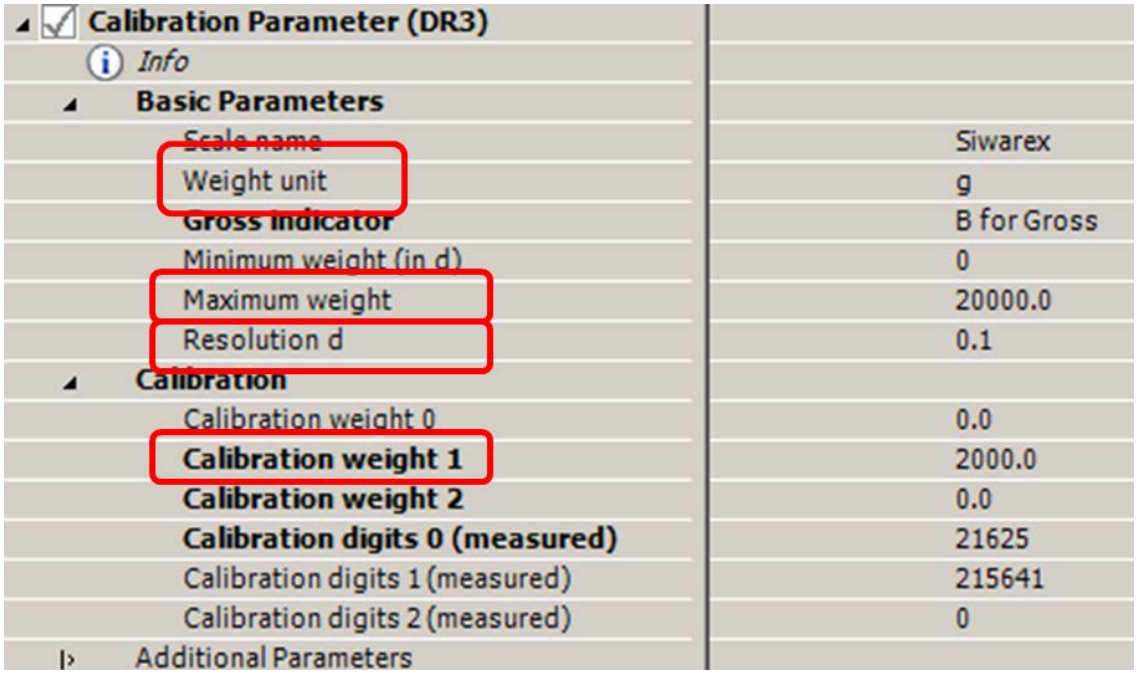
The SIWAREX module can always be calibrated in two different ways:

- Using reference weights: in the case of a calibration with weights, mechanical influences of the scale construction are also partially taken into account.
- Without weights, using the technical specifications of the connected load cell(s): in the case of automatic calibration, the accuracy of the scale is influenced by the mechanical properties to a greater extent than with calibration using reference weights.

With both methods, make sure that the mechanical properties of the scale are flawless prior to calibration.

5.7.6.2 Calibration with calibration weight

When calibrating using a calibration weight, the identified parameters in DR3 / Basic parameters are checked or entered:



Unit of weight:

The unit of weight can be selected from a list.

Maximum weighing range:

Exceeding the maximum weighing range (= the maximum material to be weighed) is indicated in DS30, status 1-2, at parameter "Max 9e".

If the maximum weighing range is exceeded, this bit is set to TRUE.

Resolution d:

The resolution d can be defined in accordance with EN 45501 (0.0001 to 50). This parameter is used for the weight display in the SIWATOOL software.

Calibration weight 1:

The calibration weight 1 and its corresponding calibration digits define the characteristic curve of the scale.

A minimum calibration weight must be used as calibration weight 1; with a load cell characteristic value of:

- 1 mV/V: 8% of the total rated load of all load cells
- 2 mV/V: 4% of the total rated load of all load cells
- 4 mV/V: 2% of the total rated load of all load cells

Example

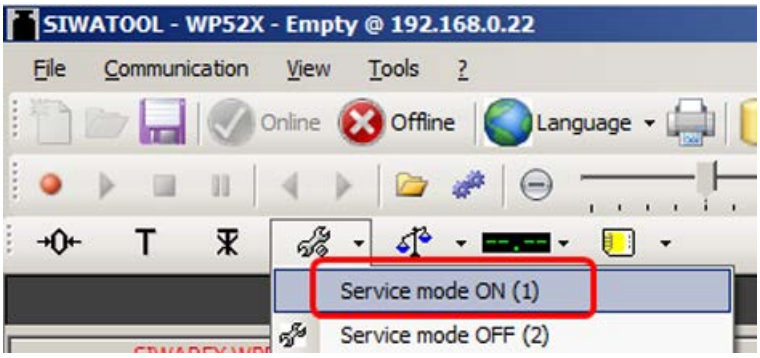
Number of load cells: 3 units

Nominal load of one single load cell: 100 kg

Load cell characteristic value: 2 mV/V

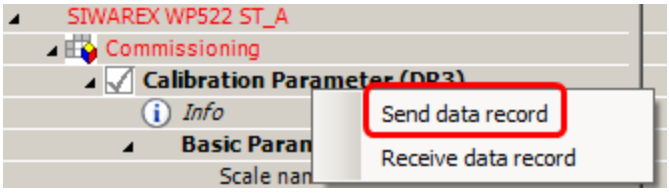
The minimum calibration weight which can be used for the calibration is: 4% x 3 x 100 kg = 12 kg

Once the above-mentioned parameters have been set in the PC, they must be sent to the SIWAREX. Service mode must be switched on first. The DR3 can only be sent and the calibration commands executed with service mode switched on.



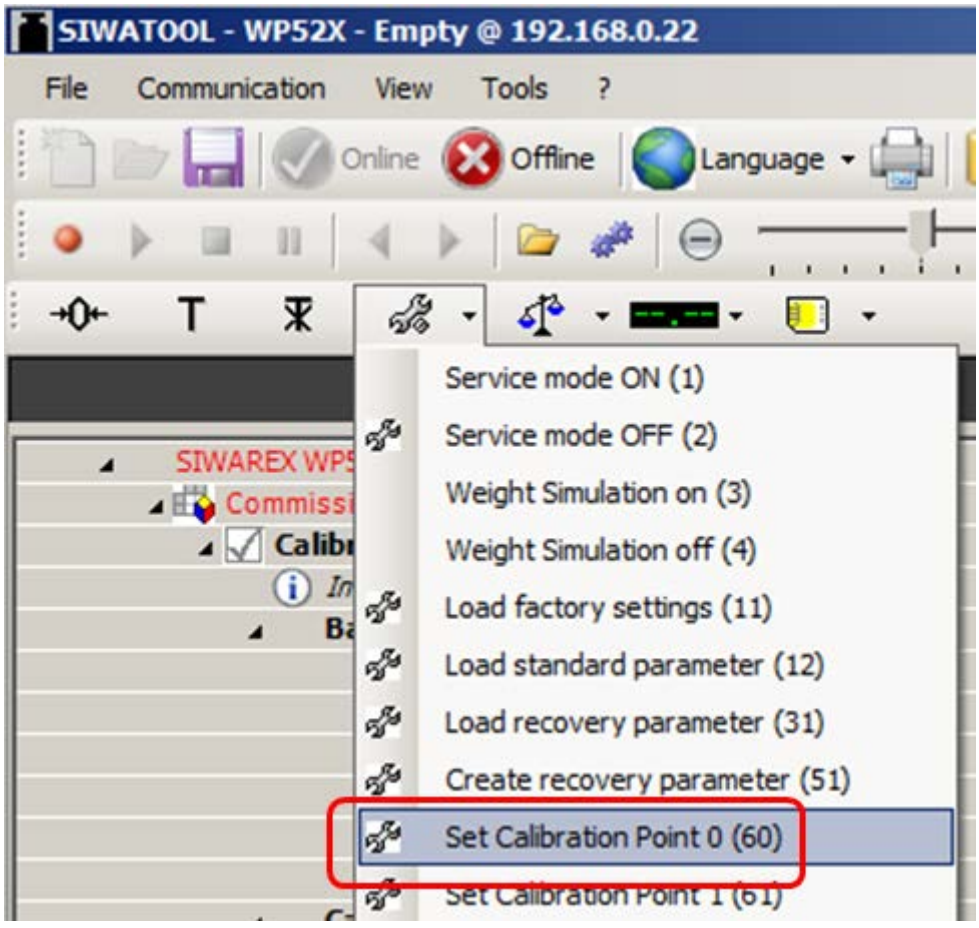
After switching on service mode, a red wrench icon is displayed in the SIWATOOL next to the weight value.

The DR3 is subsequently sent to the SIWAREX by a right-click on "Calibration parameters (DR3)" and execution of "Send data record".



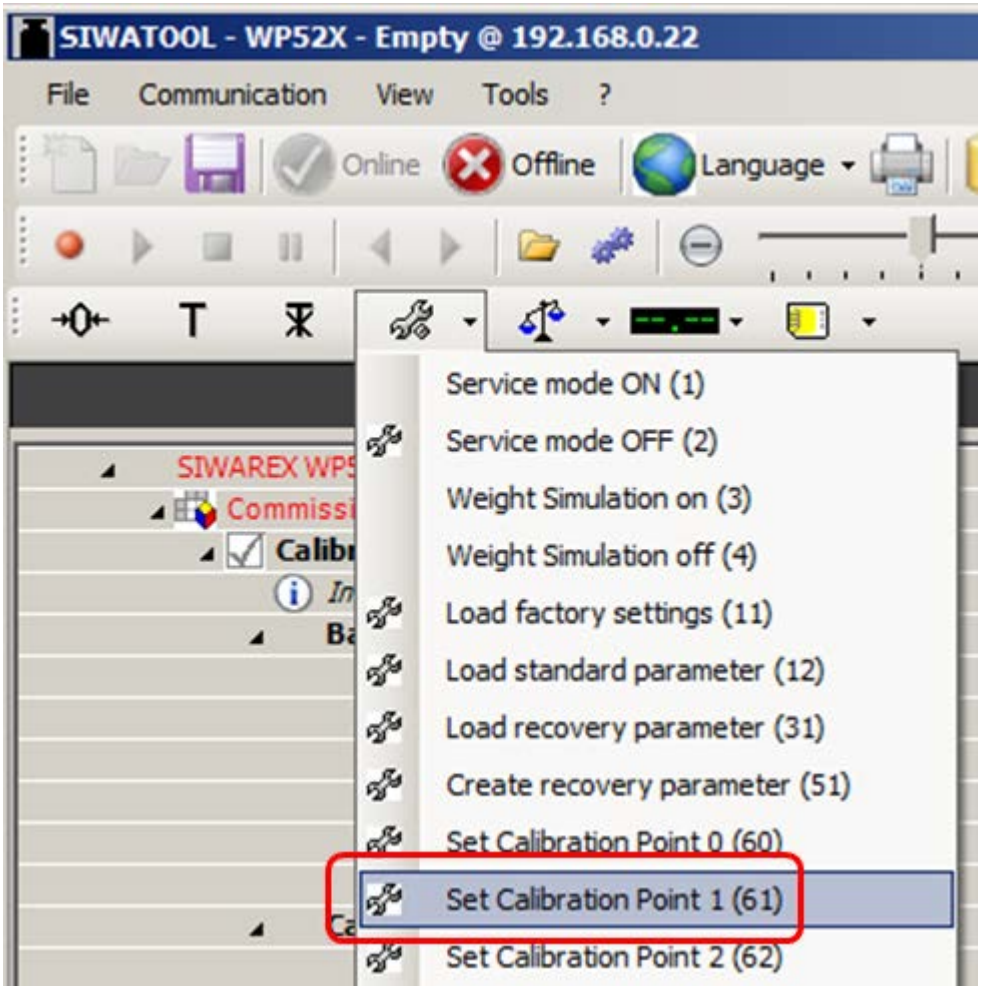
All parameter settings in DR3 are now identical again between PC and SIWAREX, and all parameters of DR3 are displayed again in black.

Following transmission of the parameters to the SIWAREX, and with a empty scale – i.e. only the mechanical dead load (e.g. empty container) bears on the load cells – the "Calibration point 0 valid" command is executed:

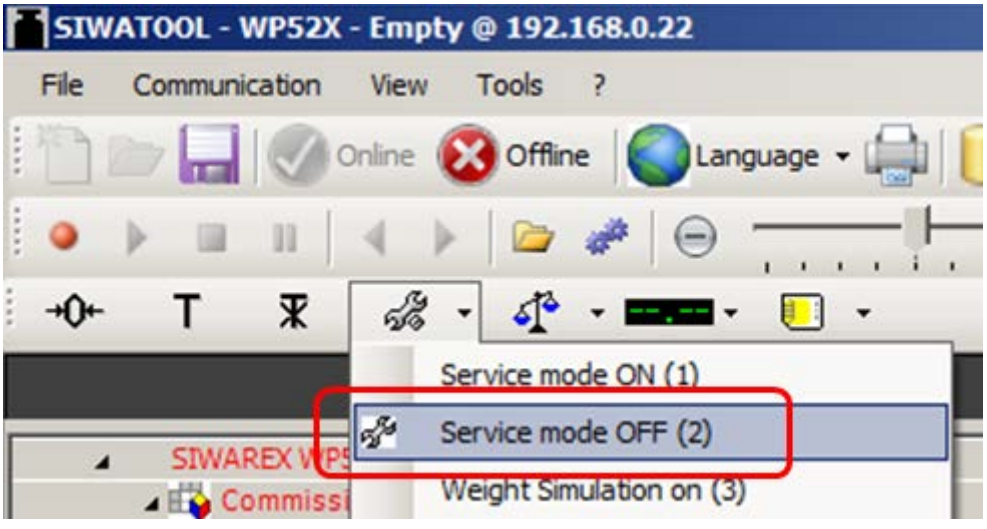


The calibration weight 1 defined in DR3 is subsequently applied to the scale.

The "Calibration point 1 valid" command is then executed:



Service mode is switched off again:



The calibration is then finished, and the correct weight value is now displayed in SIWATOOL.

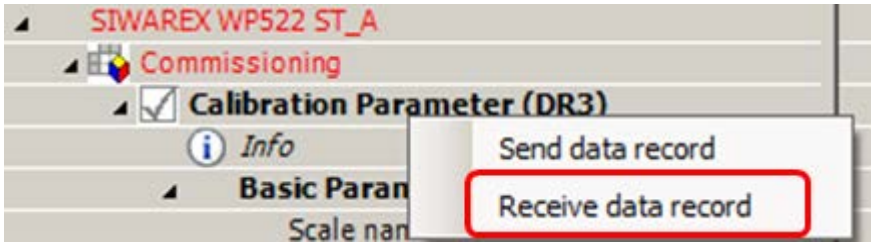
Read back DR3

During the calibration, the SIWAREX internally changes its calibration digits.

This means that obsolete parameter values are now present in SIWATOOL.

These are displayed in red, e.g.:

The DR3 must be read back in order to again achieve calibration digits in the SIWATOOL which are consistent with the SIWAREX:



Checking the scale following calibration

If the scale is only used for company-internal purposes, a simple check is sufficient.

Perform the following steps:

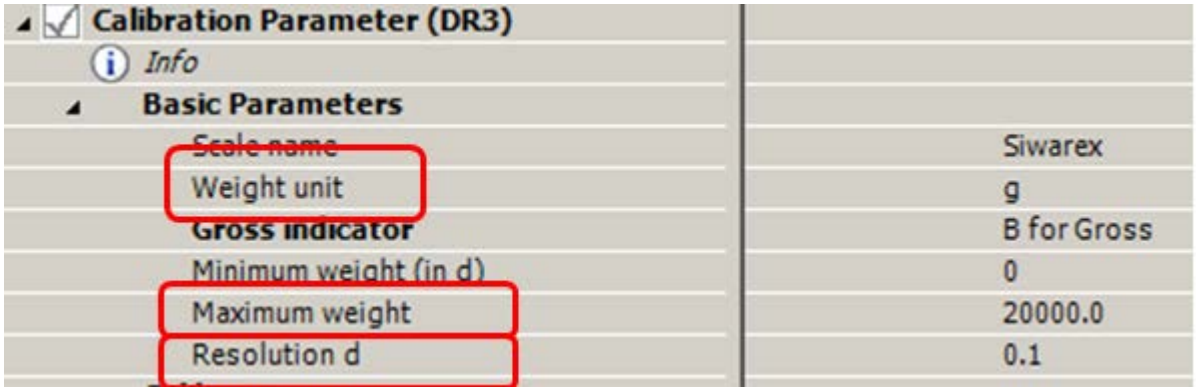
1. The scale is unloaded and shows "0 kg".
2. Place one or more known test weights on the scale (but not the calibration weight which was used during the calibration, so as to check other weight points of the scale in addition to the calibration weight). Check the displayed weight value in the SIWATOOL.
3. Remove the test weights from the scale. Check that the display is "0 kg" again.

5.7.6.3 Automatic calibration (= calibration without calibration weight)

The scale can also be calibrated without a weight. To do this, the parameters identified in bold type in DR3 / Basic parameters are checked or entered, and the data specific to the load cells specified in DR10:

In addition, it is essential that the scale is empty.

Checking or entering the parameters identified in bold type in DR3 / Basic parameters:



Unit of weight:

The unit of weight can be selected from a list.

Maximum weighing range:

Exceeding the maximum weighing range (= the maximum material to be weighed) is indicated in DR30, status 1-2, at parameter "Max 9e".

If the maximum weighing range is exceeded, this bit is set to TRUE.

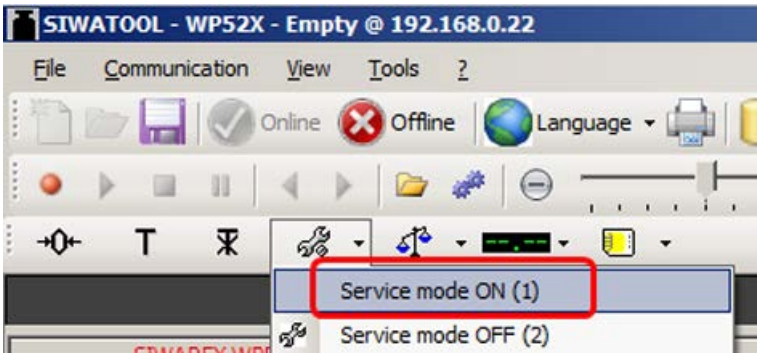
Resolution d:

The resolution d can be defined in accordance with EN 45501 (0.0001 to 50).

Once the above-mentioned parameters have been entered, the parameters modified in the PC must be sent to the SIWAREX.

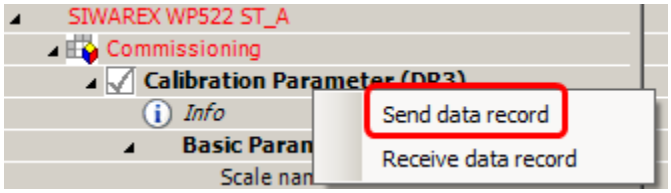
Service mode must be switched on first.

The DR3 and DR10 can only be sent and the calibration commands executed with service mode switched on:



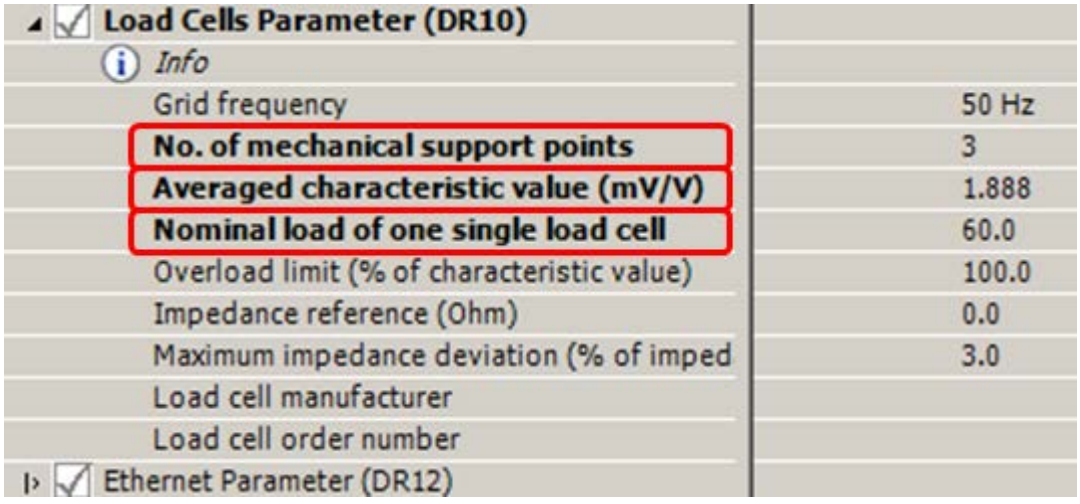
After switching on service mode, a red wrench icon is displayed in the SIWATOOL next to the weight value:

The DR3 is subsequently sent to the SIWAREX by a right-click on "Calibration parameters (DR3)" and execution of "Send data record":



All parameter settings in DR3 are now identical again between PC and SIWAREX, and all parameters of DR3 are displayed again in black.

The data specific to the load cells is subsequently specified in DR10:



Number of support points:

The number of support points corresponds with a silo, for example, to the number of clamps or feet of the silo. A quadratic platform scale with a load cell at each corner has 4 support points.

Characteristic value (mV/V):

This parameter is the mean value of the characteristic values of all connected

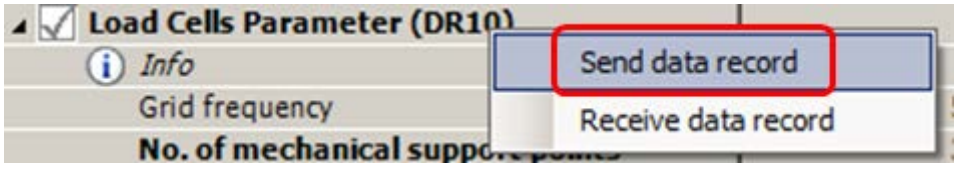
load cells (e.g.: characteristic value = 2.018 mV/V). The exact characteristic value of a load cell can be obtained from its test report or directly read off it.

If the characteristic values of the individual load cells are unknown, the value "1.0" can be assumed for 1mV/V load cells, the value "2.0" for 2mV/V load cells etc.

Nominal load of one single load cell

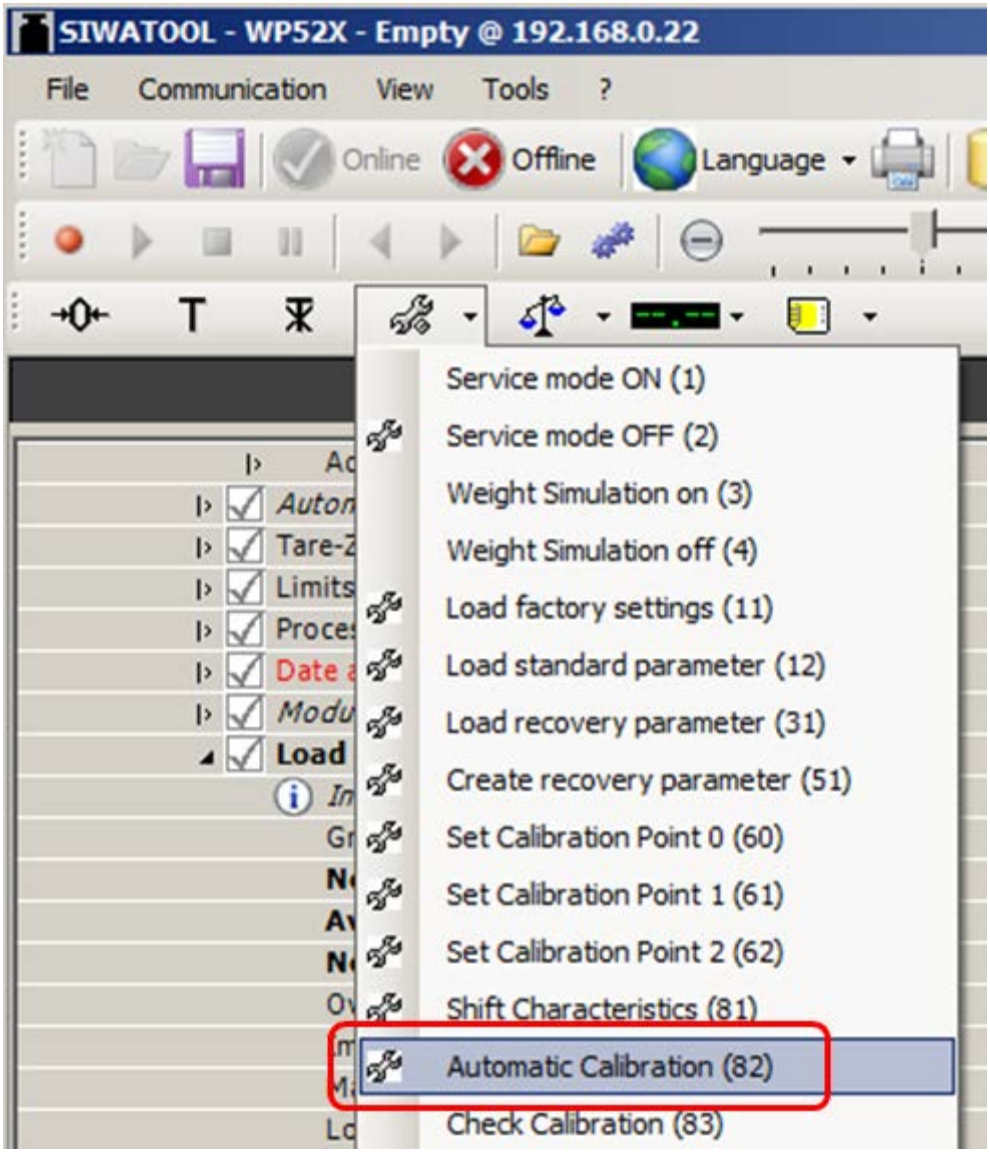
Specifying the nominal load of one single load cell

The DR10 is subsequently sent to the SIWAREX by a right-click on "Load cell parameters (DR10)" and execution of "Send data record":

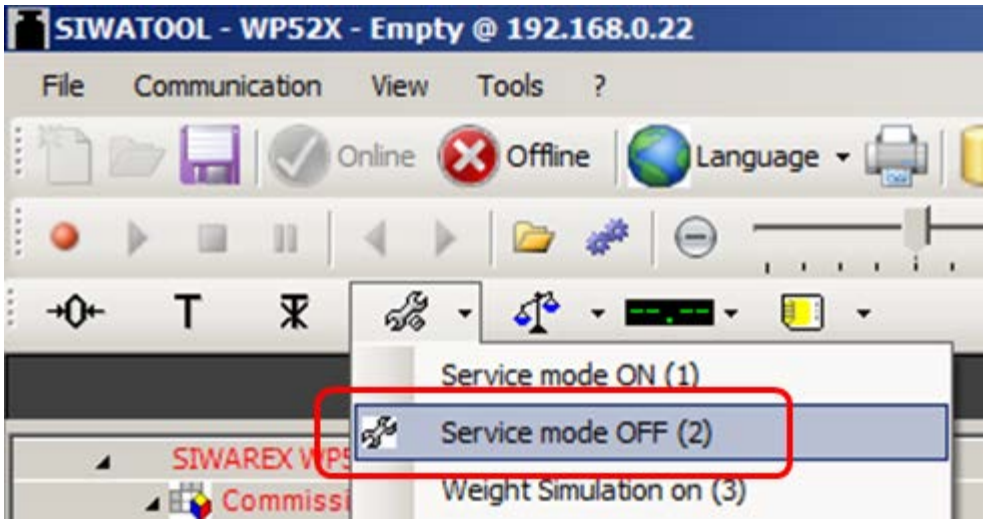


All parameter settings in DR10 are now identical again between PC and SIWAREX, and all parameters of DR10 are displayed again in black.

Following transmission of the parameters to the SIWAREX, and with a empty scale – i.e. only the mechanical dead load (e.g. empty container) bears on the load cells – the "Automatic calibration" command is executed:



Service mode is switched off again:



The calibration is then finished, and the correct weight value is now displayed in SIWATOOL.

Read back DR3

During the calibration, the SIWAREX internally changes its calibration digits and the calibration weight.

This means that obsolete parameter values are now present in SIWATOOL.

These are displayed in red, e.g.:

The DR3 must be read back in order to again achieve calibration digits and the calibration weight in the SIWATOOL which are consistent with the SIWAREX:

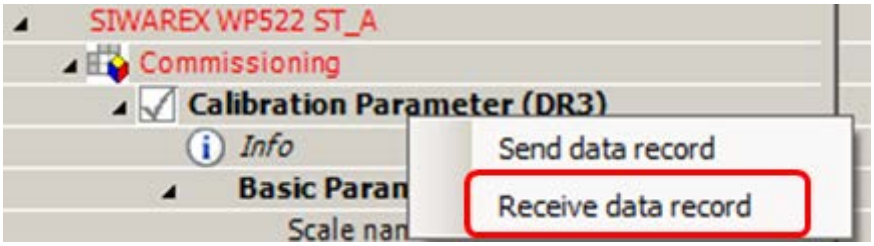


Image 5-14 Receive data record

Checking the scale following calibration

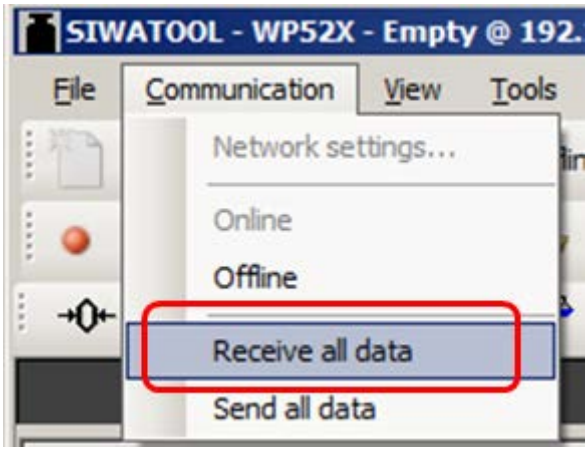
If the scale is only used for company-internal purposes, a simple check is sufficient.

Perform the following steps:

1. The scale is unloaded and shows "0 kg".
2. Place one or more known test weights on the scale. Check the displayed weight value in the SIWATOOL.
3. Remove the test weights from the scale. Check that the display is "0 kg" again.

5.7.6.4 Receive all data

Activate the "Receive all data" function in the communication menu.



All parameters can now been saved as a backup file on the hard disk. If a module is replaced, the backup file can be downloaded to the new module within a few seconds. At the time of input of the backup file, the scale is directly in the calibrated state again – without a new calibration.

5.7.7 Firmware update with SIWATOOL

New firmware versions can be transferred to the SIWAREX module using SIWATOOL. In order to transfer the firmware, the Windows firewall must be configured in such a way that SIWATOOL is registered as an approved program. The FTP protocol is used for the transfer. Firewalls or other protection software can interfere or prevent the transmission of data via the FTP protocol. In such cases, the respective protective mechanism must be temporarily deactivated for the duration of the update, or an alternative PC used.

The latest firmware version can be found under Industry Online Support (http://support.automation.siemens.com/WW/view/de/10807015/133100).

Note

The SIWAREX module parameters are preassigned with default values after the transfer of the new firmware.

You should therefore export and save the original parameter values prior to the firmware update. Following the firmware update, the saved data can be converted by SIWATOOL to the new firmware version.

Saving existing parameters

- Export the current parameters

  Select the "Receive all data records" function from the menu under "Communication". The current parameter set is then transferred to SIWATOOL.

- Save the current data record in a file.

Transferring the new firmware version to the SIWAREX module

Note

During the firmware transfer, the SIWAREX module works restricted with the old firmware version and the new firmware is loaded in the background. For this reason, you must not switch off the module during the firmware transfer.

1. Set the SIMATIC CPU to "STOP".
2. Register with SIWATOOL on the SIWAREX module.
3. Use the function button to start the firmware download.
4. Select the current firmware file under "Firmware Download"
5. Click the "Start transfer" button.

Following the transfer, the SIWAREX module must be switched off and then on again. This activates the new firmware.

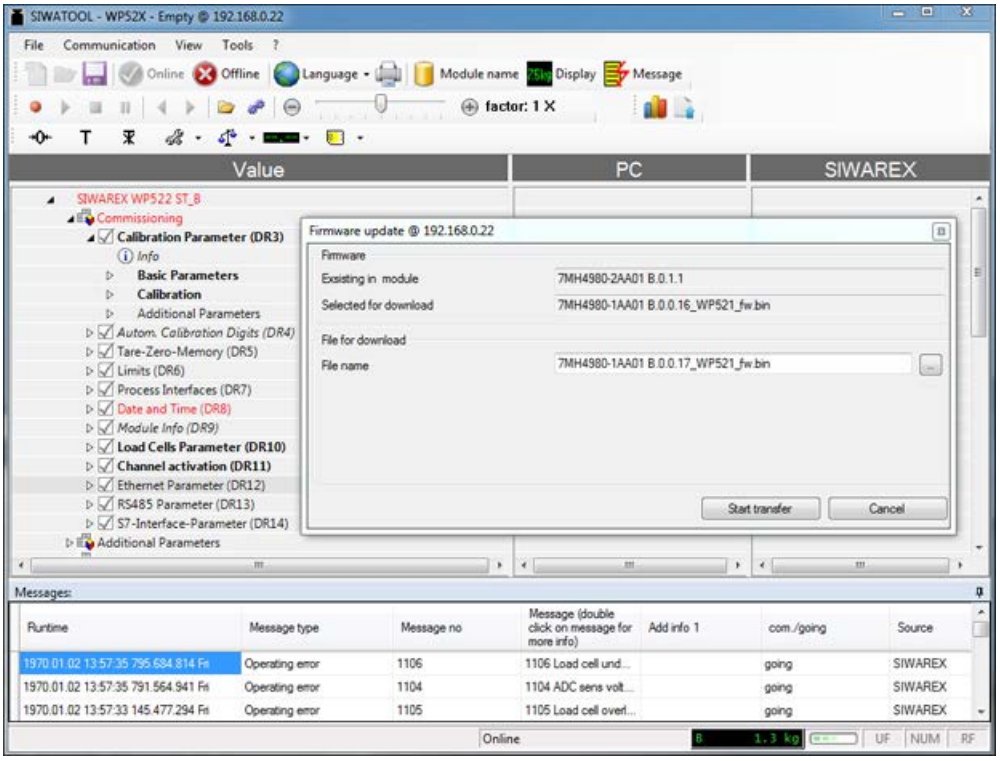


Image 5-15 Downloading the firmware with SIWATOOL

5.7.8 Firmware update with SIMATIC TIA Portal

If necessary, the SIMATIC TIA Portal can be used to perform the firmware update of the SIWAREX WP521/WP522 module.

You can update the firmware of a module using a firmware file.

To update the firmware, proceed as follows:

1. Make sure the module is not in use.
2. Open the module in the online and diagnostics view.
3. Select the "Firmware Update" group in the "Functions" folder.
4. Click on the "Browse" button in the "Firmware Loader" area to select the path to the firmware update files.
5. Select one of these files. The table then lists all modules for which an update is possible with the selected firmware file.
6. Click "Start Upgrade". If the selected file can be interpreted by the module, it is loaded into the module.
7. If the operating mode of the CPU needs to be changed, you are prompted via dialogs.

⚠ WARNING

Prohibited system states possible

An S7-1500 CPU goes immediately to STOP mode when the firmware update begins, which may affect the operation of an online process or machine. Unexpected operation of a process or machine can lead to death or serious injury and/or property damage.

Note

After performing a firmware update, you must replace the affected module by the same module with the current firmware version in the hardware configuration of your project. The configuration will then comply with the actual existing configuration again.

A station can restart after activating the firmware. This will result in the failure of all modules of the station.

If the corresponding CPU is in RUN mode, activation of the firmware can cause access errors or other impairments of the user program even including sustained CPU STOP.

Scale parameters and functions

6

6.1 Parameters and functions

The electronic weighing system used here can be used for non-automatic weighing, for examples, as a platform scale or hopper scale. They are not legal-for-trade.

All parameters are set to default values in the factory. You can restore the configuration to factory settings using the "Load factory settings" command.

The default parameters are set such that the scale is immediately ready for operation. The weight value indicates changes in weight on the load cell, but only corresponds to the actual weight following a calibration. You do not need to re-enter all parameters. The advantage of this solution is that you can decide which default values are to be retained and which parameters need to be adapted for your application.

All parameters are divided into data records (DR). The data records are organized in steps (tasks) to be implemented during commissioning or during the process.

The scale functions governed by the parameters are also described in the parameter description below.

First, the parameters of a given data record are displayed in a table. The detailed parameter description for the parameters of this data record then follows.

When it receives new parameters, the SIWAREX module runs a validation check. In the event of a parameter assignment error, the data record is not applied (not saved) by the SIWAREX module and a data/operator error is reported.

6.2 DR 2 command code

DR 2 is a special data record used to transfer commands to the SIWAREX module by SIWATOOL.

6.3 DR 3 calibration parameters

6.3.1 Overview

The calibration parameters need to be checked and if necessary modified for all scales.

The scale is basically defined by calibration parameters and calibration operation. Any changes in data record DR 3 require the service operation of the module to be activated. If service mode is not active, all parameter inputs are directly rejected with an error.

Procedure

- Check all parameters and modify them as required
- Transfer the DR 3 data record from SIWATOOL to the scales
- Adjust the scales
- Transfer the DR 3 data record from the scales to SIWATOOL

Table 6- 1 Assignment of data record 3

Variable	Note	Type	Length (bytes)	Read write Pro-tection	Write protec-tion	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	-	3	-	-	1000
Length	Data record length information	USHORT	2	r	-	116	-	-	1001
Application	Information about which application the DR belongs to	USHORT	2	r	-	141	-	-	1002
Version ID	Information about the current data record version	USHORT	2	r	-	1	1	65635	1003
Scale name header	Maximum length and actual length of string for scale name	UBYTE[2]	2	rw	r	12,12	-	-	1004
Scale name (Page 71)	Scale name specified by user	CHAR[12]	12	rw	r	" "	-	-	1005
Unit of weight (Page 71)	Unit of weight	USHORT	2	rw	r	2	0	6	1011
Gross identifier (Page 71)	Abbreviation for brutto/gross (B or G)	USHORT	2	rw	r	0	0	1	1012
Reserve	Reserve	USHORT	2	rw	-	0	-	-	1013
Reserve	Reserve	USHORT	2	rw	r	0	-	-	1014
Minimum weighing range (Page 72)[1)]	Minimum number d	USHORT	2	rw	r	20	0	65535	1015
Maximum weighing range (Page 72) [1)]	Maximum weight	FLOAT	4	rw	r	100	> weigh-ing_range _min	9.999.999	1016
	Calibration weight 0[1)] (usually the zero point)	FLOAT	4	rw	r	0	1	9.999.999	1018
	Calibration weight 1[1)]	FLOAT	4	rw	r	100	1	9.999.999	1020

Variable	Note	Type	Length (bytes)	Read write Pro-tection	Write protec-tion	Default	Min.	Max.	Modbus registers
	Calibration weight 2	FLOAT	4	rw	r	0	1	9.999.999	1022
	Calibration digits 0 determined during calibration with calibration weight 0	LONG	4	rw	r	0	0	3.999.999	1024
	Calibration digits 1 determined during calibration with calibration weight 1	LONG	4	rw	r	2000	0	3.999.999	1026
	Calibration digits 2 determined during calibration with calibration weight 2	LONG	4	rw	r	0	0	3.999.999	1028
Scale interval (Page 72) [1)]	Resolution weighing range 1 (1*10**k, 2*10**k, 5*10**k]; k: -3 … 2)	FLOAT	4	rw	r	0.1	0.0001	50	1030
Automatic zero adjustment (Page 72)	0: auto. zero adjustment off 1: auto. zero adjustment on	BIT	0	rw	r	0	0	1	1036.16
	Reserve	BIT	0	rw	r	0		1	1036.15
Currency	0: Filling 1: Emptying	BIT	0	rw	r	0	0	1	1036.14
Weight simulation (Page 72)	Weight simulation	BIT	0	rw	r	0	0	1	1036.13
		BIT	0	rw	r	0	0	1	1036.12
Bit 5	Bit 5: Reserve	BIT	0	rw	r	0	0	1	1036.11
Bit 6	Bit 6: Reserve	BIT	0	rw	r	0	0	1	1036.10
Filter sequence	0: Low-pass filter before average value filter 1: Average value filter before low-pass filter	BIT	0	rw	r	0	0	1	1036.9
Bit 8	Bit 8: Reserve	BIT	0	rw	r	0	0	1	1036.8
Bit 9	Bit 9: Reserve	BIT	0	rw	r	0	0	1	1036.7
Bit 10	Bit 10: Reserve	BIT	0	rw	r	0	0	1	1036.6
Bit 11	Bit 11: Reserve	BIT	0	rw	r	0	0	1	1036.5
Bit 12	Bit 12: Reserve	BIT	0	rw	r	0	0	1	1036.4

Variable	Note	Type	Length (bytes)	Read write Pro-tection	Write protec-tion	Default	Min.	Max.	Modbus registers
Bit 13	Bit 13: Reserve	BIT	0	rw	r	0	0	1	1036.3
Bit 14	Bit 14: Reserve	BIT	0	rw	r	0	0	1	1036.2
Bit 15	Bit 15: Reserve	BIT	2	rw	r	0	0	1	1036.1
Reserve		USHORT	2	rw	r	0	0	6	1033
Maximum tare load (Page 73)	Tare maximum [in % of WRmax]	FLOAT	4	rw	r	100	0	250	1034
Reserve		FLOAT	4	rw	r	0	0	100.0	1036
Reserve		FLOAT	4	rw	r	0	0	100.0	1038
Maximum negative zero setting limit (semi-automatically) (Page 73)	Negative range of the semi-automatic zeroing [in % of maximum weighing range WRmax]	FLOAT	4	rw	r	1	0	100.0	1040
Maximum positive zero setting limit (semi-automatically) (Page 73)	Positive range of the semi-automatic zeroing [in % of maximum weighing range WRmax]	FLOAT	4	rw	r	3.0	0	100.0	1042
Standstill range (Page 74)	Standstill range (in d)	FLOAT	4	rw	r	1	0	9.999.999	1044
Standstill time (Page 74)	Standstill time 1 in ms	TIME	4	rw	r	2000	10	10000	1046
Standstill wait-ing time (Page 74)	Waiting time until standstill. 0: standstill-dependent scale command, if there is no standstill, immediately re-jected. > 0: Maximum waiting time until command is exe-cuted	TIME	4	rw	-	0	0	10000	1048
Low-pass filter limit frequency (Page 75)	Low-pass filter 1 - cutoff frequency: 0: Filter disabled	FLOAT	4	rw	r	2	0	50	1050
Low-pass filter number (Page 75)	Filter order Low-pass filter 1	USHORT	2	rw	r	4	1	4	1052
Reserve	Reserve	USHORT	2	rw	-	0	-	-	1053

Variable	Note	Type	Length (bytes)	Read write Pro-tection	Write protec-tion	Default	Min.	Max.	Modbus registers
Reserve		FLOAT	4	rw	-	0			1054
Period the average value filter (Page 76)	Averaging period of the average value filter in ms	USHORT	2	rw	r	100	0	10000	1056

[1] Parameter for calculation of calibration points with theoretical calibration

6.3.2 Scale name

You can select any name, but it may not exceed 12 characters. You can enter any designation.

6.3.3 Unit of weight

A number is specified as the weight unit. The defined unit of weight applies to all weight specifications. Entries are not be converted if the unit of weight has changed.

Codes for weight unit:

- 0: "mg"
- 1: "g"
- 2: "kg"
- 3: "t"
- 4: "oz" (ounce)
- 5: "lb" (pound)
- 6: "T" (= short tons)
- 7: "TL" (= long tons)

6.3.4 Gross identifier

The gross identifier specifies the letter, B (for brutto) or G (for gross), to be used in the display for gross weights. The identifier is specified by a number.

Codes for brutto/gross identifier:

- 0: "B"
- 1: "G"

6.3.5 Minimum weighing range

The minimum weighing range with the unit "d" (resolution) is set during the calibration.

The factory setting is 0 d. Falling below the minimum weighing range is displayed in the status of the scale.

6.3.6 Maximum weighing range

The maximum weight is defined during commissioning.

The maximum weight depends on the number and type of load cells used.

6.3.7 Calibration weights 0, 1, 2 and calibration digits 0, 1, 2

The calibration weights and corresponding calibration digits define the characteristic curve of the scales. A detailed description can be found in section Performing calibration (Page 76).

6.3.8 Scale interval

The scale interval for the weighing range can be defined in accordance with EN 45501 (0.0001 to 50).

6.3.9 Automatic zero adjustment

If necessary, the scales can be set semi-automatically to zero by the user by means of the "Zeroing" command.

The automatic adjustment sets the scale to zero without a further command in the event of slow zero drifting. Slow drift is assumed if the OIML R76 criteria for this are met.

6.3.10 Filling/emptying mode

With filling, the net weight increases when the scale is loaded. At discharge weighing, the net weight increases when the scale is unloaded.

6.3.11 Weight simulation

For test purposes, weight simulation can be enabled instead of actual weighing. The simulated weight is specified using the DR 16 data record. Weight simulation can, in certain situations, facilitate scale testing and commissioning. The simulated weight is indicated on the main display with the word "TEST".

6.3.12 Filter sequence

The weighing signal can pass through the low-pass and average value filter. The parameter is used to determine which filter is first passed through.

6.3.13 Maximum tare load

The weighing module accepts any external tare specification which is less than the maximum tare load (percentage of maximum weighing range). Tare commands are also accepted provided that the current gross weight is less than the configured maximum tare load.

6.3.14 Maximum negative zero setting limit (semi-automatically)

Zeroing defines the current weight of the scales as zero.

You can restrict the effect of the zeroing function by defining limits. The limitation is based not on the current gross weight, but rather on the weight which the scales would display had there been no zeroing (time of scale calibration).

6.3.15 Maximum positive zero setting limit (semi-automatically)

You can restrict the effect of the zeroing function by defining limits. The limitation is based not on the current weight, but rather on the weight which the scales would display had there been no zeroing (time of scale calibration).

6.3.16 Standstill range

Standstill monitoring checks whether the scales are correctly balanced. Scale standstill is registered if the weight changes by less than a specified fluctuation in d (standstill value) over a specified time (standstill time). Standstill monitoring is used in static scale mode (commands: zeroing, taring). The diagram below illustrates how standstill monitoring works.

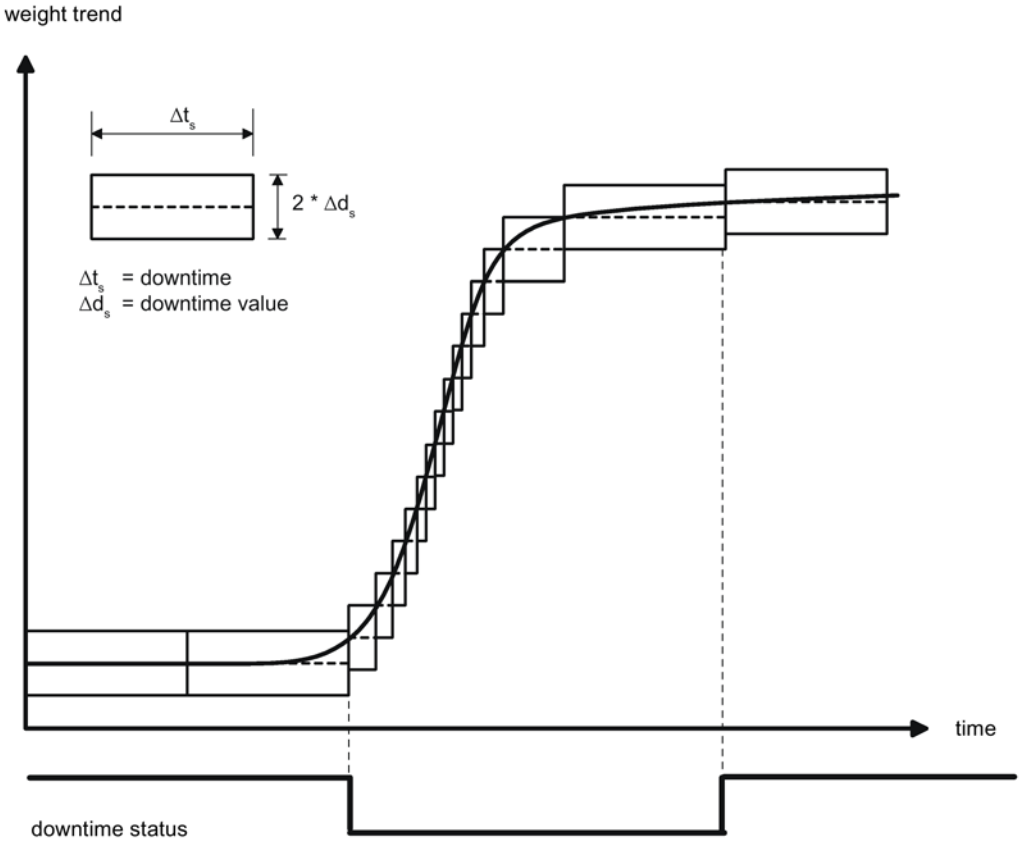


Image 6-1 Standstill monitoring

6.3.17 Standstill time

Standstill monitoring checks whether the scales are correctly balanced. Scale standstill is registered if the weight changes by less than a specified fluctuation in d (standstill value) over a specified time (standstill time). Standstill monitoring is used in static scale mode (with the following commands: zeroing, taring).

6.3.18 Standstill waiting time

Standstill waiting time is a maximum waiting time for standstill upon the execution of a command which depends on standstill (taring, zeroing, registering). A technology message is generated if the command cannot be executed during the standstill waiting time because there is no standstill.

If the standstill waiting time is equal to zero, a command requiring standstill is rejected immediately if there is no standstill.

6.3.19 Low-pass filter limit frequency

There is a critically damped low-pass filter for suppressing faults. The diagram below shows the step response of the filter (f = 2 Hz). The entry "0" means that the filter is switched off. A limit frequency of between 0.01 and 20.0 Hz can be specified.

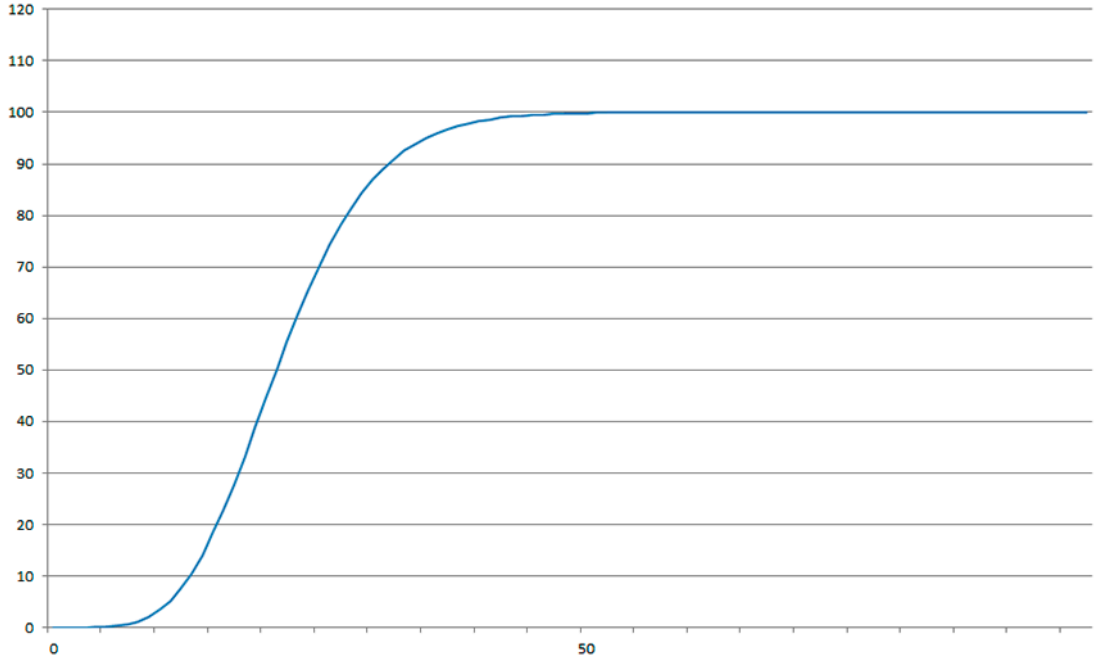


Image 6-2 Step-forced response of the digital low-pass filter when f = 2 Hz

The definition of the limit frequency is extremely important for the suppression of faults. Defining the limit frequency defines the "speed" of the scales' response to changes in the measured value.

A value of 5 Hz, for example, results in a relatively rapid response to a change in weight; a value of 0.5 Hz makes the scales "slower".

6.3.20 Low-pass filter number

The number of the filter defines the effect of damping. Values 1...4 can be specified. The higher the selected filter number, the higher the effect.

6.3.21 Period the average value filter

The average value filter is used to steady the weight against random interference. The weight value is based on average values that are incurred in the specified period.

6.4 Performing calibration

6.4.1 Calibration with calibration weights

The incoming analog measured value from the load cells is converted into a digital value in an analog-to-digital converter. A weight is calculated using this digital value. This weight is then used by all weighing module functions for messages and for determining the status.

The characteristic curve of the measuring system must be defined before the weight can be calculated from the digital value. In the simplest case, the characteristic curve is defined with points 0 and 1. The first working point (point 0) is defined by the empty scale (no load) at their own weight. The load cells return a voltage measurement to the weighing module as a result of the weight of the scales themselves. Following analog-to-digital conversion of the measured voltage, the zero point is assigned to the digital value (calibration digits for the zero point).

If the scales are loaded with a defined standard weight (e.g. 50% of the measuring range), the new digital value returned by the analog-to-digital converter is assigned the standard weight.

The characteristic curve can also be determined with a third point, which must be higher than point 1.

Make sure that the difference between two calibration weights is at least 40 000 digits, as the calibration command may otherwise be rejected.

The calibration procedure involves the following steps:

- Activation of service mode using the "Service mode on" command.
- Define the calibration weight and other parameters of the DR 3 data record.
- Transfer the DR 3 data record to the scales.
- Trigger "Adjustment weight 0 valid" for empty scales.
- Load the scale with the defined standard weight.
- Trigger "Adjustment weight 1 valid".
- Transfer data record DR 3 from the scale to SIWATOOL and save the data on a data medium.

You must follow the correct calibration sequence with increasing calibration weights.

Load cell characteristic value	Calibration digit 1 (ca.) when rated load is
1 mV/V	1 000 000
2 mV/V	2 000 000
4 mV/V	4 000 000

This defines the characteristic curve and the scale can now calculate weights for the full measuring range.

The diagram below illustrates the relationship between calibration digits and the calibration weight.

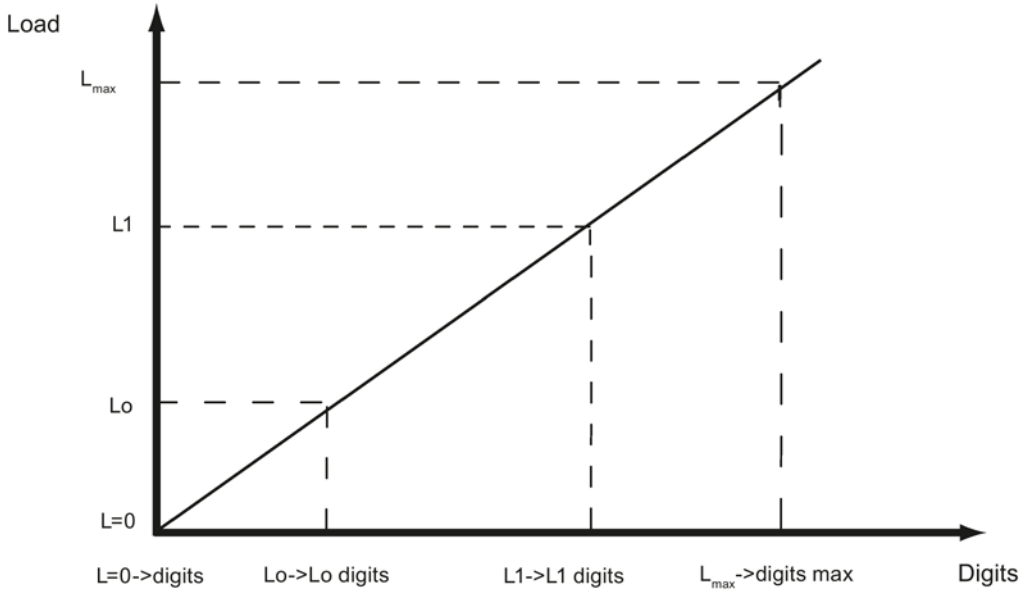


Image 6-3 Calibration digits and calibration weight

Load	Comment	Load	Digits
L=0	Load cells empty		Approx. 0
Lo	Calibration weight 0 "Zero point"	0 kg	e.g. B. 70 682 for calibration point 0
L1	Calibration weight 1	e.g. 60 kg	e.g. 308 452 for adjustment digits 1
L_{max}	Rated load of the load cell(s)	e.g. 100 kg	1 000 000
L_{max} +10 %	Rated weight + approximately 10%	e.g. approx. 110 kg	1 090 000

You do not need to perform calibration if the calibration digits and the calibration weights are known to the weighing module described here. They are simply sent to SIWAREX by data record DR 3 and the scale is ready for use immediately.

The SIWATOOL program facilitates rapid calibration.

Following commissioning and calibration, all data records must be read from the weighing module and saved as a scale file.

Identical scales can be put into operation immediately. Connect the PC to the new scale and enable the "Send all data records" function in service mode. This transfers the parameters for calibration weights and calibration digits, and the characteristic curve is determined immediately. The same applies when you change a weighing module.

Note

Two working points are usually sufficient for determining the scale's characteristic curve. An additional working point is only required for non-linear systems.

Specification of negative calibration points is not possible. However, the characteristic can also be used in the negative range down to -2 000 000 digits. To achieve this, the characteristic curve generated in the positive range is extended into the negative range.

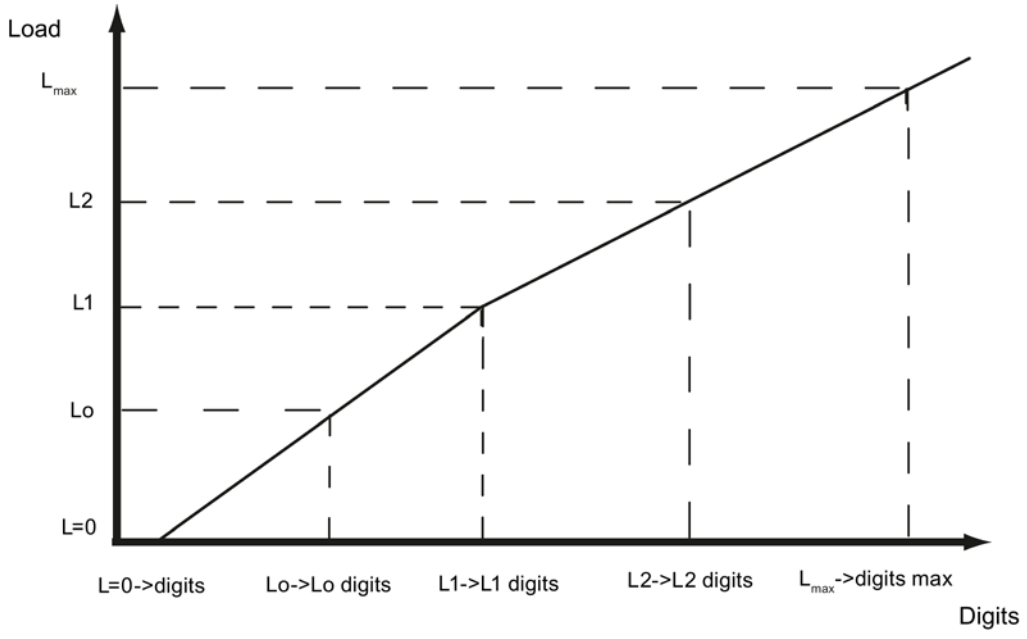


Image 6-4 Linearizing the scale's characteristic curve

Load	Comment	Load	Digits
L=0	Load cells empty		Approx. 0
Lo	Calibration weight 0 "Zero point"	0 kg	e.g. B. 76 082 for calibration point 0
L1	Calibration weight 1	e.g. 60 kg	e.g. 386 452 for adjustment digits 1
L2	Calibration weight 2	e.g. 80 kg	e.g. 451 367 for adjustment digits 2
L_{max}	Rated load of the load cell(s)	e.g. 100 kg	1 000 000
L_{max} +10 %	Rated weight + approximately 10%	e.g. approx. 110 kg	1 090 000

6.4.2 Automatic calibration

Scales can be rapidly commissioned with automatic calibration. The accuracy of the scale greatly depends on the entered parameters and the mechanical properties of the scale. However, you achieve the best level of accuracy for the scales by using calibration weights.

During initial commissioning with automatic calibration, you must reset the module using the "Load factory settings" command.

Subsequently specify the load cell parameters in data record 10. Command 82 "Perform automatic calibration" then uses this data and the currently applied dead load to calculate the characteristic curve of the scale. The characteristic curve is active immediately.

Note

The characteristic curve data in data record 3 active prior to execution of command 82 is directly overwritten.

Automatic calibration requires the following criteria:

- Correct mechanical installation of the scale
- Scale is empty (only mechanical installation (= dead load) present on the cells)
- Load cells are evenly loaded
- There are no shunt circuits

6.5 DR 4 output the calculated adjustment digits

6.5.1 Overview

Data record DR 4 outputs the digits calculated from the automatic scale calibration and the calibration check. This data record cannot be sent to the scales.

Table 6- 2 Assignment of data record 4

Variable	Note	Type	Length (bytes)	Read write	Default	Min.	Max.	Modbus Register
Data record number	Contains no. of data record	USHORT	2	r	4	-	-	1200
Length	Data record length information	USHORT	2	r	28	-	-	1201
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1202

Variable	Note	Type	Length (bytes)	Read write	Default	Min.	Max.	Modbus Register
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1203
Calibration digits 0, 1, 2 (calculated) (Page 80)	Calibration digits 0 (calculated): calibration digits calculated by 'automatic calibration'	LONG	4	r	0	0	1600000	1204
	Calibration digits 1 (calculated): calibration digits calculated by 'automatic calibration'	LONG	4	r	0	0	1600000	1206
	Calibration digits 2 (calculated): calibration digits calculated by 'automatic calibration'	LONG	4	r	0	0	1600000	1208
Reserve 1	Reserve	SHORT	2	r	0	-	-	1210
Reserve 2	Reserve	USHORT	2	r	0	-	-	1211
Reserve 3	Reserve	FLOAT	4	r	0	-	-	1212

6.5.2 Calibration digits 0, 1, 2 (calculated)

The calculation is based on the parameters from DR 10 and is executed using command no. 82 or 83.

6.6 DR 5 zeroing memory

6.6.1 Overview

Data record DR 5 displays the current values in the tare memory and the zeroing memory.

Procedure

- Check all parameters
- Transfer the data record to the scales

Table 6- 3 Assignment of data record 5

Variable	Note	Type	Length (bytes)	Read write Protec-tion	Default	Min.	Max.	Modbus Register
Data record number	Contains no. of data record	USHORT	2	r	5	-	-	1214
Length	Data record length information	USHORT	2	r	40	-	-	1215
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1216
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1217
Effective tare weight - from specification (Page 81)	Current tare weight (tare setting)	FLOAT	4	rw	0	0	-	1218
Effective tare weight (semi-automatic) (Page 81)	Current tare weight (semi-automatic)	FLOAT	4	rw	0	0	-	1220
Current zero tracking weight (Page 82)	Current zero weight (zero adjustment)	FLOAT	4	rw	0	-	-	1226
Dead load (Page 82)	Dead load calculated during automatic calibration	FLOAT	4	r	0	-	-	1228
Reserve 1	Reserve	SHORT	2	rw	0	-	-	1230
Reserve 2	Reserve	USHORT	2	rw	0	-	-	1231
Reserve 3	Reserve	FLOAT	4	rw	0	-	-	1232

6.6.2 Effective tare weight - from specification

A tare weight can be specified in data record DR 15. You can activate a pre-defined tare weight with a 1013 command. From this point on, the activated tare weight is factored into the weight calculations. The "Delete tare" command deactivates the active tare weight. This does not delete the specification in data record DR 15.

6.6.3 Effective tare weight (semi-automatic)

The corresponding command (see command 1011) applies the current gross weight as the active tare weight. From this point on, the activated tare weight is factored into the weight calculations. The "Delete tare" command deactivates the active tare weight.

6.6.4 Current zero tracking weight

The current zero tracking weight is recorded in this parameter if automatic zero tracking is activated.

6.6.5 Dead load

The characteristic curve of the scales is determined during calibration. When there is no load, the main display returns "0". The dead load is the weight of the empty scales, i.e. the weight of the scales themselves.

6.7 DR 6 limit settings

6.7.1 Overview

The switch-on and switch-off values for the limits are configured in data record DR 6.

Procedure

- Check all parameters and modify them as required
- Transfer the data record to the scales

Table 6- 4 Assignment of data record 6

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus Register
Data record number	Contains no. of data record	USHORT	2	r	6	-	-	1234
Length	Data record length information	USHORT	2	r	60	-	-	1235
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1236
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1237

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus Register
Basis of limits	"Gross/Net - based on limit 1 and 2 0: GW 1 and GW 2 are based on gross (specified as percentage, min: -200, max: 200%) 1: GW 1 and GW 2 are based on net (specified as percentage, min: -200, max: 200%) 2: GW 1 and GW 2 are absolute values and based on gross 3: GW 1 and GW 2 are absolute values and based on net Note: The blank value then functions either as a percentage or absolute value (weight), but is always based on gross."	USHORT	2	rw	0	0	3	1238
Reserve	Reserve	USHORT	2	rw	0	0	-	1239
Limit 1 ON (Page 84)	Switch-on point for limit value 1 (% of measuring range)	FLOAT	4	rw	99	9.999.999	9.999.999	1240
Reserve		LONG	4	rw	0	-	-	1242
Limit 1 OFF (Page 84)	Switch-off point for limit value 1 (% of measuring range)	FLOAT	4	rw	98	-9.999.999	-9.999.999	1244
Reserve		LONG	4	rw	0	-	-	1246
Limit 2 ON (Page 84)	Switch-on point for limit value 2 (% of measuring range)	FLOAT	4	rw	50	-9.999.999	-9.999.999	1248
Reserve								1250
Limit 2 OFF (Page 84)	Switch-off point for limit value 2 (% of measuring range)	FLOAT	4	rw	49	-9.999.999	-9.999.999	1252
Reserve		LONG	4	rw	0	0	-	1254
Limit "Empty" ON (Page 85)	Limit "Empty" ON (always based on gross) (% if measuring range)	FLOAT	4	rw	1	-9.999.999	-9.999.999	1256

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus Register
Delay time for limits (Page 85)	Uniform delay time for: • Switch ON / OFF limit 1 • Switch ON / OFF limit 2 • Switch ON blank message (OFF delay empty alarm = 0 fixed) in ms	TIME	4	rw	0	0	9999999	1258
Reserve 2	Reserve	USHORT	2	rw	0	-	-	1260
Reserve 3	Reserve	USHORT	2	rw	0	-	-	1261
Reserve 4	Reserve	FLOAT	4	rw	0	-	-	1262

6.7.2 Basis of limits

The limits can be interpreted differently, depending on the selected reference quantity.

Gross/Net - based on limit (GW) 1 and 2:

Value	Ref.
0	GW 1 and GW 2 are based on gross (specified as percentage, min: -200%, max: 200%)
1	GW 1 and GW 2 are based on net (specified as percentage, min: -200%, max: 200%)
2	GW 1 and GW 2 are absolute weight values and based on gross
3	GW 1 and GW 2 are absolute weight values and based on net

Note

The blank value then functions either as a percentage or absolute weight value, but is always based on gross.

6.7.3 Limit value 1 ON, limit value 2 ON, limit value 1 OFF, limit value 2 OFF

The switch-on and switch-off points can be specified separately for each limit value as a percentage of the measuring range. This allows both minimum and maximum value violation monitoring with hysteresis. A delay time for switch-on and switch-off can also be specified. Either the current net weight or the current gross weight can be selected as the reference value for limits 1 and 2.

Maximum value monitoring is implemented with the following specifications:

- Switch-on value > switch-off value

Minimum value monitoring is implemented with the following specification:

- Switch-on value < switch-off value

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

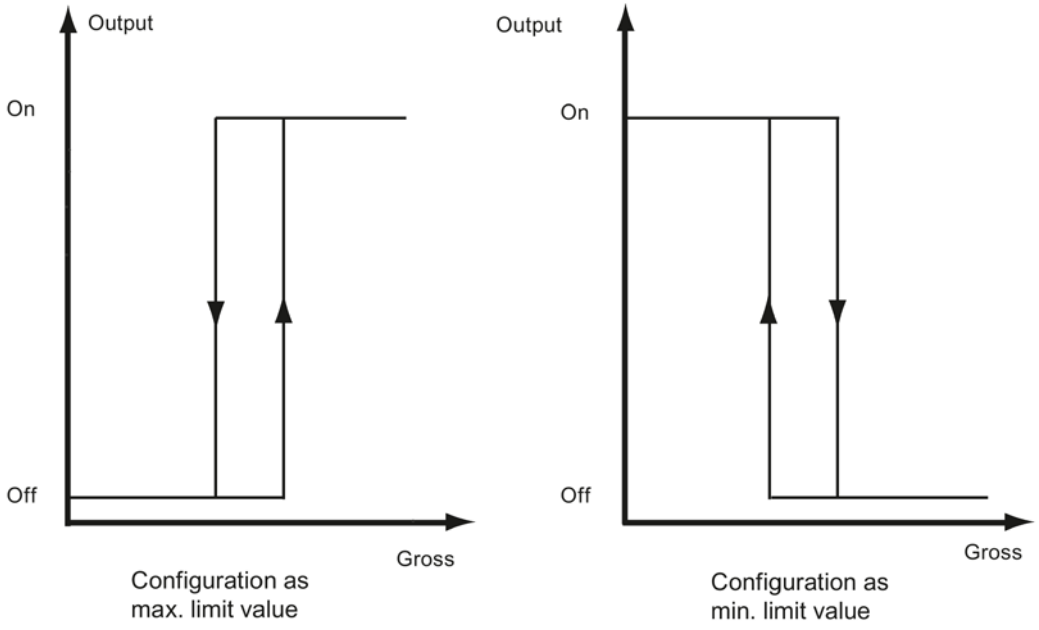


Image 6-5 Limit value configuration

6.7.4 Limit "Empty" ON

The value for the empty range is a limit value below which the weighing module registers and returns the status "empty". The values are entered as a percentage of the measuring range. The "Empty" limit always refers to the current gross weight in the scale.

6.7.5 Delay time for limits

Uniform delay time for:

- Switch ON / OFF limit 1
- Switch ON / OFF limit 2
- Switch ON blank message
  (OFF delay blank message =0 fixed)

This is specified in ms.

6.8 DR 7 interface parameters

6.8.1 Overview

Data record DR 7 contains the parameters for defining the properties of the available I/O (digital inputs, digital outputs, serial interfaces).

If a port is not used, the default values can be retained.

Procedure

- Change the parameters if necessary
- Transfer the data record to the scales

Table 6- 5 Assignment of data record 7

Variable	Note	Type	Length (bytes)	Read write	De-fault	Min.	Max.	Modbus Register
Data record number	Contains no. of data record	USHORT	2	r	7	-	-	1300
Length	Data record length information	USHORT	2	r	48	-	-	1301
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1302
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1303
Assignment for digital input 0, 1, 2 (Page 88)	Assignment for input 0: Code 0: No command assigned 1 … 32767: Command triggered by a rising edge (0→1 transition) 32769…65535 (command code + 32768): Command triggered by a falling edge (1→0 transition)	USHORT	2	rw	0	0	0x7FFF	1304
	Assignment for input 1: Encoding like input 0	USHORT	2	rw	0	0	0x7FFF	1305
	Assignment for input 2: Encoding like input 0	USHORT	2	rw	0	0	0x7FFF	1306
Reserve		USHORT	2	rw	0	0	1999	1307
Input filtering (hardware setting) (Page 88)	0: No filtering 1: 5 ms 2: 10 ms 3: 15 ms 4: 20 ms 5: 25 ms 6: 30 ms 7: 40 ms	USHORT	2	rw	2	0	8	1308

Variable	Note	Type	Length (bytes)	Read write	De-fault	Min.	Max.	Modbus Register
Assignment for digital output 0, 1, 2, 3 (Page 89)	Assignment for output 1: 0-31: Status info 33: Specified by S7 interface 34: Reserved special code for de-faults 100-131: Inverted status information 255: (Compatibility) output deac-tivated 1000-1015: Operating error 1100-1115: Inverted operating error 2000-2047: Technological error 2100-2147: Inverted technological error 3000-3047: Data or command error 3100-3147: Inverted data or com-mand error	USHORT	2	rw	0	0	0xFFFF	1309
	Assignment for output 1: (see Output 0)	USHORT	2	rw	0	0	0xFFFF	1310
	Assignment for output 2: (see Output 0)	USHORT	2	rw	0	0	0xFFFF	1311
	Assignment for output 3: (see Output 0)	USHORT	2	rw	0	0	0xFFFF	1312
Monitoring of the digital outputs	Monitoring of the digital outputs and their supply voltage 0: Monitoring of outputs inactive 1: Monitoring of outputs active	USHORT	2	rw	1	0	1	1313
Reaction of the digital outputs to fault or CPU stop (Page 89)	Reaction of the digital outputs to module fault or SIMATIC CPU stop: 0: All outputs are switched off 1: The corresponding predefined state value is applied 2: Outputs are not switched off, work continues 3: All outputs are switched on	USHORT	2	rw	0	0	2	1314
Reserve	Reserve	USHORT	2	rw	0	0	1	1315
Reserved		USHORT	2	rw	0	0	1	1316
Replacement value for DQ 0, 1, 2, 3 (Page 89)	Predefined state of digital output DQ 1 on error or SIMATIC CPU Stop	BIT	0	rw	0	0	1	1317.16
	Predefined state of digital output DQ 2 on error or SIMATIC CPU Stop	BIT	0	rw	0	0	1	1317.15
	Predefined state of digital output DQ 3 on error or SIMATIC CPU Stop	BIT	0	rw	0	0	1	1317.14
	Predefined state of digital output DQ 4 on error or SIMATIC CPU Stop	BIT	0	rw	0	0	1	1317.13

Variable	Note	Type	Length (bytes)	Read write	De-fault	Min.	Max.	Modbus Register
Trace record-ing cycle (Page 90)	Trace recording cycle. Every nth measured value is recorded. For example: n=1: 10 ms n=10: 100 ms 1 000: 10 s	USHORT	2	rw	1	1	1000	1318
Trace storage method (Page 90)	0: Trace recording runs as circular buffer 1: Trace is stopped when trace memory is full	BIT	0	rw	0	0	1	1319.16
Reserve 1	Reserve	LONG	4	rw	0	0	-	1320
Reserve 2	Reserve	FLOAT	4	rw	0	0	-	1322

6.8.2 Assignment for digital input 0, 1, 2

A command trigger can be assigned to a digital input. The assignment is made with the command number: → Command lists (Page 133).

Assignment for input 0, 1, 2, 3:

Code	Assignment
0	Not assigned
1…32767	Command triggered by a rising edge (0→1 transition)
32769…65535	(Command code + 32768): Command triggered by a falling edge (1→0 transition)

6.8.3 Input filtering (hardware setting)

To ensure that the inputs do not respond too quickly to the signal change, a minimum signal pending time can be specified. The pending signal is not processed further until this time has elapsed.

The following values can be set:

Value	Duration of signal queuing	Value	Duration of signal queuing
0	No filtering	4	20 ms
1	5 ms	5	25 ms
2	10 ms	6	30 ms
3	15 ms	7	35 ms
8	40 ms		

6.8.4 Assignment for digital output 0, 1, 2, 3

A status display can be assigned to a digital input. This is done on the basis of the bit number.

Assignment for output 0, 1, 2, 3:

Code Hex	Status display
0 … 1F	Bit no. of the status flags from byte 0 .. 3 from data record 30
21	Control of output via data record 18
22	Control of output via SIMATIC S7 I/O
Code FF	Output always disabled

6.8.5 Reaction of the digital outputs to fault or CPU stop

This parameter can be used to determine the reaction of the digital outputs to a fault in the SIWAREX module.

Value	Response
0	All outputs are switched off
1	The corresponding predefined state value is applied
2	Outputs are not switched off (continue)
3	Switch on all outputs

6.8.6 Replacement value for DQ 0, 1, 2, 3

The outputs are usually reset following a module fault (operating error) or SIMATIC CPU STOP. This response is the default setting.

If an output is to be set following a fault, this response is defined using this parameter. The "State of digital outputs on error or SIMATIC CPU Stop" parameter must also be set to "Replacement output upon operating error activated".

The replacement value definition is then valid.

NOTICE
Risk to the plant If an output is set following a fault (operating error), this can pose a risk for the plant. Ensure that the parameters are correctly set.

6.8.7 Trace recording cycle

The trace function is used for the continuous recording of measured values. The n parameter sets the recording rate.

Value	Response
n=1	Recording every 10 ms
n=10	Recording every 100 ms
n=100	Recording every second
N=1 000	Recording every 10 s

6.8.8 Trace storage method

This parameter is used to specify the response of the trace memory.

Value	Response
0	Trace recording runs as circulating memory
1	Trace is stopped when the trace memory is full

6.9 DR 8 date and time

The current date and time is specified or read using data record DR 8. The clock is not buffered and can only continue to function without power for about 30 seconds. If you are using the Modbus protocol, data record DR 48 must be used for the date and time.

Procedure

- Set the date and time
- Transfer the data record to the scales

Table 6- 6 Assignment of data record 8

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	8	-	-	1330
Length	Data record length information	USHORT	2	r	16	-	-	1331
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1332

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1333
Date and time	SIMATIC DTL format	DTL	12	rw	DTL#1970-01-01-00:00:00.0	-	-	1334

6.10 DR 9 module information

No entries can be made in data record DR 9. This data record provides information on the inner workings of the SIWAREX module. This information is used to identify the module at the manufacturer plant (e.g. in the event of repairs). The entries in the data record are of no importance to the user for operation.

Table 6- 7 Assignment of data record 9

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modus register
Data record number	Contains no. of data record	USHORT	2	r	9	-	-	1340
Length	Data record length information	USHORT	2	r	68	-	-	1341
Application	Information about which application the DR belongs to	USHORT	2	r	201	-	-	1342
Version ID	Information about the current data record version	USHORT	2	r	1	1	65 635	1343
Order number - header	Maximum and actual string length for the order number	UBYTE[2]	2	r	16,16	-	-	1344
Order number	Order number of the module 7MH ..	CHAR[16]	16	r	"7MH4980-*AA01"	-	-	1345
Serial number - header	String header	UBYTE[2]	2	r	12,12	-	-	1353
Serial number	Serial number " XXX00001"	CHAR[12]	12	r	" "	-	-	1354
Firmware type - header	String header	UBYTE[2]	2	r	2.2	-	-	1360
Firmware type	Reference V - Release B - Test etc.	CHAR[2]	2	r	'V '	-	-	1361
FW - Version - 1st digit	Version 1.	USHORT	2	r	1	-	-	1362
FW - Version - 2nd digit	Version 2.	USHORT	2	r	0	-	-	1363

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modus register
FW - Version - 3rd digit	Version 3.	USHORT	2	r	0	-	-	1364
Hardware version number	ES hardware version number (e.g. 03)	USHORT	2	r	1	-	-	1365
OS version header	String header	UBYTE[2]	2	r	2.2	-	-	1366
OS version (loader) - designation	Reference V - Release B - Test etc.	CHAR[2]	2	r	'V '	-	-	1367
OS version (loader) - designation	e.g. version n	USHORT	2	r	'V '	-	-	1368
HW device ID and HW revision ID	Read from HW and entered here Byte 0: HW device ID Byte 1: HW revision ID	USHORT	2	r	0	-	-	1369
Reserve	Reserve	USHORT	4	r	0	-	-	1370
Reserve	Reserve	USHORT	4	r	0	-	-	1371
Reserve	0	FLOAT	4	r	0	-	-	1372

6.11 DR 10 load cell parameters

6.11.1 Overview

The parameters of the analog load cells must be checked prior to the automatic calibration and modified if necessary. Only the parameters identified by bold font and asterisk (*) need be entered.

Procedure

- Check the parameters and modify them as required
- Transfer the data record to the scales
- Adjust the scales

Table 6- 8 Assignment of data record 10

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	10	-	-	1400
Length	Data record length information	USHORT	2	r	92	-	-	1401
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1402
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1403
50/60 Hz toggling (Page 94)	50/60 Hz toggling	USHORT	2	rw	0	0	1	1404
Number of support points (Page 94) [1)]	Number of support points	USHORT	2	rw	0	0	8	1405
Load cell characteristic value (Page 94) [1)]	Characteristic value of the load cell (n) [mV/V], the mean value is used if there is more than one cell.	FLOAT	4	rw	2	>0.1	10	1406
Rated load of a load cell (Page 94) [1)]	Nominal load of one single load cell	FLOAT	4	rw	60	-	-	1408
Overload limit (Page 94)	Default in % based on configured LC characteristic value as of which overload is reported.	FLOAT	2	rw	100	0	1000	1410
Impedance reference value (Page 95)	Setpoint range specification (rated value) in ohms; 0 = No impedance check	FLOAT	4	rw	0	0	-10000	1412
Permissible impedance deviation (Page 95)	Default as percentage based on impedance value (permissible range: impedance value ±x%)	FLOAT	4	rw	3	0	20	1414
Reserve	Reserve	SHORT	2	rw	0			1416
Header LC manufacturer	Header for load cell manufacturer	UBYTE[2]	2	rw	24,24			1417
Load cell manufacturer (Page 95)	Manufacturer of load cells used	CHAR[24]	24	rw				1418
Reserve	Reserve	USHORT	2	rw	0			1430
Header LC order number	Header for load cell order number	UBYTE[2]	2	rw	24,24			1431

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Load cell order number (Page 95)	Order number of load cells used	CHAR[24]	24	rw				1432
Reserve	Reserve	FLOAT	4	rw	0			1444

1) Parameter for calculation of calibration points with theoretical calibration

6.11.2 50/60 Hz toggling

To improve the suppression of faults caused by the supply network, you can specify the network frequency for signal filtering. The measuring rate is 100 Hz for the 50 Hz setting, and 120 Hz for the 60 Hz setting.

6.11.3 Number of support points

If no anchor points are used, the number of support points is equal to the number of load cells.

If anchor points are used in addition to load cells, the number of support points is equal to the total number of load cells and fixed support points.

6.11.4 Load cell characteristic value

The load cell characteristic value is required to correctly interpret the output voltage from the load cell. This specification is also necessary for determining load cell overload. The exact value can be entered if the measurement log for the load cell is available. The mean value can be entered if there is more than one load cell.

Example

Characteristic value = 2.018 mV/V

6.11.5 Rated load of a load cell

The rated load of a load cell is required for checking the maximum weighing range of the scales. The rated load is entered in the specified units of weight.

6.11.6 Overload limit

The parameter causes the weight value to be checked for exceeding the overload. The default is specified as a % value and acts on the specified characteristic value of the load cell. An operating error is reported in case of overload.

6.11.7 Impedance reference value

This parameter is used to activate the total impedance of the connected load cells. The impedance of the load cells can be monitored together with the allowable impedance deviation.

The current impedance can be entered or taken the current measurement (DR31) per command during commissioning.

Parameter specified in ohms;
0 = No impedance check

6.11.8 Permissible impedance deviation

The permissible deviation is given in % of the impedance reference value. Exceeding the value is displayed in the status area of the scale.

6.11.9 Load cell manufacturer

The commissioning engineer can enter the manufacturer of the load cell here.

6.11.10 Load cell order number

The commissioning engineer can enter the order number of the load cell here.

6.12 DR 11 channel status/channel activation

6.12.1 Overview

Data record DR 11 is used to activate and deactivate the weighing channel.

Procedure

- Enter the desired state for the weighing channel
- Transfer the data record to the scales

Table 6- 9 Allocation of data record 11

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	11	-	-	1460
Length	Data record length information	USHORT	2	r	12	-	-	1461
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1462
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1463
Channel activation	Channel activation: 0: Channel deactivated 1: Channel activated	USHORT	2	rw	1	0	1	1464
Reserve R	Reserve	USHORT	2	rw	0	0	-	1465

6.12.2 Channel status / channel activation

The factory setting is "Weighing channel activated". The user has the option of deactivating the channel, for example, to prevent operating errors because the load cells are not yet connected for this channel or because the scale should go into operation at later time.

Deactivation suppresses diagnostic errors, process data is output with 0. The module can be pre-configured in this state.

6.13 DR 12 Ethernet parameters

6.13.1 Overview

Before the SIWAREX module can be integrated into an Ethernet network, the Ethernet parameters need to be configured.

Table 6- 10 Assignment of data record 12

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	12	-	-	1500
Length	Data record length information	USHORT	2	r	100	-	-	1501
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1502
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1503
Device MAC address (Page 99)	Device MAC address 1	USHORT	2	r	0x0	0	255	1504
	Device MAC address 2	USHORT	2	r	0x30	0	255	1505
	Device MAC address 3	USHORT	2	r	0x05	0	255	1506
	Device MAC address 4	USHORT	2	r	0xD5	0	255	1507
	Device MAC address 5	USHORT	2	r	0xB0	0	255	1508
	Device MAC address 6	USHORT	2	r	0x16	0	255	1509
IP address (Page 99)	IP address x.n.n.n	USHORT	2	rw	192	0	255	1510
	IP address n.x.n.n	USHORT	2	rw	168	0	255	1511
	IP address n.n.x.n	USHORT	2	rw	0	0	255	1512
	IP address n.n.n.x	USHORT	2	rw	21	0	255	1513
Subnet mask (Page 99)	Subnet mask x.n.n.n	USHORT	2	rw	255	0	255	1514
	Subnet mask n.x.n.n	USHORT	2	rw	255	0	255	1515
	Subnet mask n.n.x.n	USHORT	2	rw	255	0	255	1516
	Subnet mask n.n.n.x	USHORT	2	rw	0	0	255	1517
Gateway (Page 100)	Gateway x.n.n.n	USHORT	2	rw	192	0	255	1518
	Gateway n.x.n.n	USHORT	2	rw	168	0	255	1519
	Gateway n.n.x.n	USHORT	2	rw	0	0	255	1520
	Gateway n.n.n.x	USHORT	2	rw	21	0	255	1521
Device name (Page 100)	Current device name header	UBYTE[2]	2	rw				1522
	Current device name	CHAR[32]	32	rw				1523
Unit identifier channel 1	Reserve	SHORT	2	rw	-1	-1	255	1539

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
TCP port channel 1	"Modbus TCP: TCP port, is addressed with channel 1 as the base channel.	USHORT	4	rw	502	1	49151	1540
TCP port channel 1	"Modbus TCP: TCP port, is addressed with channel 1 as the base channel.	USHORT	4	rw	502	1	49151	1540
Reserve	RESERVE	BIT		rw	0	0	1	1541.16
Reserve	Reserve	BIT		rw	0	0	1	1541.15
Reserve	Reserve	BIT		rw	0	0	1	1541.14
Reserve	Reserve	BIT		rw	0	0	1	1541.13
Reserve	Reserve	BIT		rw	0	0	1	1541.12
Reserve	Reserve	BIT		rw	0	0	1	1541.11
Reserve	Reserve	BIT		rw	0	0	1	1541.10
Reserve	Reserve	BIT		rw	0	0	1	1541.9
Byte swap for text fields	"0: Normal 1: The two characters in a Modbus register are transferred in the wrong order"			rw	1	0	1	1541.8
Byte swap for 16-bit values	"0: big endian (MSB first) 1: little endian (LSB first)"	BIT		rw	0	0	1	1541.7
Byte swap for the two halves of a 32-bit value (INT32/FLOAT)	"0: big endian (MSB first) 1: little endian (LSB first)"	BIT		rw	0	0	1	1541.6
Word swap for 32-bit integers (interchanging the two Modbus registers)	"0: big endian (MSW first) 1: little endian (LSW first)"	BIT		rw	1	0	1	1541.5
Reserve	Reserve	BIT		rw	0	0	1	1541.4
Reserve	Reserve	BIT		rw	0	0	1	1541.3
Reserve	Reserve	BIT		rw	0	0	1	1541.2
Reserve	Reserve	BIT		rw	0	0	1	1541.1
Unit identifier channel 2	Reserve	SHORT	2	rw	-1	-1	255	1542
TCP port channel 2	"Modbus TCP: TCP port, is addressed with channel 1 as the base channel.	USHORT		rw	502		49151	1543
Reserve	Reserve	BIT		rw			1	1544.16
Reserve	Reserve	BIT		rw			1	1544.15
Reserve	Reserve	BIT		rw			1	1544.14
Reserve	Reserve	BIT		rw			1	1544.13
Reserve	Reserve	BIT		rw			1	1544.12

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Reserve	Reserve	BIT		rw	0	0	1	1544.11
Reserve	Reserve	BIT		rw	0	0	1	1544.10
Reserve	Reserve	BIT		rw	0	0	1	1544.9
Byte swap for text fields	"0: Normal 1: The two characters in a Modbus register are transferred in the wrong order"	BIT		rw	1	0	1	1544.8
Byte swap for 16-bit values	"0: Normal 1: The two characters in a Modbus register are transferred in the wrong order"	BIT		rw	0	0	1	1544.7
Byte swap for the two halves of a 32-bit value (INT32/FLOAT)	"0: big endian (MSB first) 1: little endian (LSB first)"	BIT		rw	0	0	1	1544.6
Word swap for 32-bit integers (inter-changing the two Modbus registers)	"0: big endian (MSW first) 1: little endian (LSW first)"	BIT		rw	1	0	1	1544.5
Reserve	Reserve	BIT		rw	0	0	1	1544.4
Reserve	Reserve	BIT		rw	0	0	1	1544.3
Reserve	Reserve	BIT		rw	0	0	1	1544.2
Reserve	Reserve	BIT		rw	0	0	1	1544.1
Reserve	Reserve	SHORT		rw	0			1545
Reserve	Reserve	FLOAT		rw	0			1546
Reserve	Reserve	FLOAT		rw	0			1548

6.13.2 Device MAC address

Each SIWAREX module has a unique MAC address. This MAC address cannot be changed by the user.

6.13.3 IP address

Assign the IP address using the Primary Setup Tool, SIWATOOL, or via the SIMATIC (see chapter "Ethernet approvals (Page 143)").

6.13.4 Subnet mask

Assign the subnet mask of your network.

6.13.5 Gateway

If a gateway is used between the SIWAREX WP251/WP522 and the communication partner, you enter the address of the gateway here.

If a gateway is not present, enter the IP address of the SIWAREX module.

6.13.6 Device name

This parameter can be used to assign a name to the weighing module in the Ethernet network. The length of the name is limited to 32 characters. Empty spaces must be filled by "x".

6.13.7 Unit identifier channel 1 or channel 2

This parameter is used to create a logical connection via Modbus TCP/IP. The parameter pairs "Unit identifier" and "Port number" determines the logical connection of a channel with the Modbus master if a common IP address is used.

If there is only one IP address available for the module and the same port number is used (e.g. 502), the unit identifier must be different in order for each weighing channel to create a logically separate connection.

6.13.8 Modbus TCP port number channel 1 or channel 2

This parameter is used to create a logical connection via Modbus TCP/IP. The parameter pairs "Unit identifier" and "Port number" determines the logical connection of a channel with the Modbus master if a common IP address is used.

If there is only one IP address available for the module and the same unit identifier is used (e.g. 2), the port number must be different in order for each weighing channel to create a logically separate connection.

6.13.9 Byte swap

With these parameters, the byte order of variables in the communication via Modbus TCP/IP is determined.

6.14 DR 13 RS485 parameters

6.14.1 Overview

The parameters which define the response of the RS485 interface are specified in data record DR 13. If the interface is not used, the default values can be retained.

Procedure

- Check the parameters and modify them as required
- Transfer the data record to the scales

Table 6- 11 Assignment of data record 13

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	13	-	-	1558
Length	Data record length information	USHORT	2	r	24	-	-	1559
Application	Information about which application the data record belongs to	USHORT	2	r	141	-	-	1560
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1561
RS485 protocol (Page 102)	0: No protocol 1: MODBUS RTU 2: SIEBERT display	USHORT	2	rw	1	0	2	1562
RS485 baud rate (Page 103)	0: 9 600 bps 1: 19 200 bits/s 2: 38 400 bits/s 3: 57 600 bits/s 4: 115 000 bps	USHORT	2	rw	3	0	6	1563
RS485 character parity (Page 103)	Character parity 0: Even 1: Odd	BIT	0	rw	0	0	1	1564.16
Bit 1	Reserve	BIT	0	rw	0	0	1	1564.15
	Reserve	BIT	0	rw	0	0	1	1564.14
Bit 3	Reserve	BIT	0	rw	0	0	1	1564.13
Bit 4	Reserve	BIT	0	rw	0	0	1	1564.12
Bit 5	Reserve	BIT	0	rw	0	0	1	1564.11
Bit 6	Reserve	BIT	0	rw	0	0	1	1564.10
RS485 termination	Activation of the RS485 termination	BIT	0	rw	0	0	1	1564.9

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Byte swap for text fields	"0: Normal 1: The two characters in a Modbus register are transferred in the wrong order"	BIT	0	rw	0	0	1	1564.8
Byte swap for 16-bit values	"0: big endian (MSB first) 1: little endian (LSB first)"	BIT	0	rw	0	0	1	1564.7
Byte swap for the two halves of a 32-bit value (INT32/FLOAT)	"0: big endian (MSB first) 1: little endian (LSB first)"	BIT	0	rw	0	0	1	1564.6
Word swap for 32-bit integers (interchanging the two Modbus registers)	"0: big endian (MSW first) 1: little endian (LSW first)"	BIT	0	rw	0	0	1	1564.5
Bit 12	Reserve	BIT	0	rw	0	0	1	1564.4
Bit 13	Reserve	BIT	0	rw	0	0	1	1564.3
Bit 14	Reserve	BIT	0	rw	0	0	1	1564.2
Bit 15	Reserve	BIT	2	rw	0	0	1	1564.1
RS485 Modbus address (Page 103)	MODBUS address for Vito module	USHORT	2	rw	20	1	255	1565
Decimal place for Siebert indicator (Page 103)	Decimal place for Siebert display	SHORT	2	rw	0	-	-	1566
MODBUS RTU frame delay	Delay time for response with MODBUS RTU in ms (RS485)	USHORT	2	rw	0	-	-	1567
Reserve 3	Reserve	FLOAT	4	rw	0	-	-	1568

6.14.2 RS485 protocol

This parameter defines the protocol for communication via the RS485 interface.

Value	Protocol
0	No communication/protocol
1	Modbus RTU
2	SIEBERT display

6.14.3 RS485 baud rate

This parameter defines the baud rate for the RS485 interface.

Value	Baud rate
0	9 600 bps
1	19 200 bps
2	38 400 bps
3	57 600 bps
4	115 000 bps

6.14.4 RS485 character parity

This parameter defines the character parity for the RS485 interface.

Value	Character parity
0	Even
1	Odd

6.14.5 RS485 termination

A termination resistor is switched internally with these parameters.

6.14.6 Byte swap

The byte order of variables in the communication via Modbus RTU is determined with these parameters.

6.14.7 RS485 Modbus address

This parameter defines the Modbus address (1 to 230) for communication via the RS485 interface with the Modbus protocol.

6.14.8 Decimal place for Siebert indicator

A fixed decimal place must be specified if a Siebert indicator is used. The following values are permitted: 0 ... 4

6.14.9 Modbus RTU message frame delay

These parameters specify the delay time (in ms) expected by the module replying to a master request for data.

6.15 DR 14 SIMATIC interface parameters

6.15.1 Overview

The parameters which define the response of the SIMATIC interface are specified in data record DR 14. It is possible to define the process values to be output on the basis of the I/O area.

Procedure

- Check the parameters and modify them as required
- Transfer the data record to the scales

Table 6- 12 Assignment of data record 14

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	14	-	-	1570
Length	Data record length information	USHORT	2	r	16	-	-	1571
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1572
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1573
Selection of process value 1, 2 (Page 105)	Selection of process value 1 (S7 I/O interface): Code for selection of process variable to be updated	USHORT	2	rw	4	0	10	1574

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
	Selection of process value 2 (S7 I/O interface): Code for selection of process variable to be updated	USHORT	2	rw	10	0	10	1575
	Possible Simatic mode	SHORT	2	rw	1	1	4	1576
Reserve 2	Reserve	USHORT	2	rw	0	0	-	1577

6.15.2 Selection of process value 1, 2

The weighing module can communicate with an S7-1500 CPU in two ways: Just via the I/O or by reading out complete data records. The I/O is faster and exhibits a higher performance. Two free-definable channels are available in the S7 I/O (process value 1 and process value 2). Users can decide which scale values (see table) are to be made available cyclically at these two parameters of the PLC.

Table 6- 13 Selection table for process value 1,2

Process value	Decimal code	From DR	Format
No process selected	0	-	-
Gross process	1	30	FLOAT
Net process	2	30	FLOAT
Tare process	3	30	FLOAT
Legal trade G/N weight	4	30	FLOAT
G/N weight_x10	5	30	FLOAT
Gross-2-process-value	6	30	FLOAT
Reserve	7	30	FLOAT
Filtered digit intermediate value	8	31	LONG
Unfiltered digit value	9	31	LONG
Filtered digit value	10	31	LONG
"Array: Status DI/DQs (PW[0.1]) Refresh counter (PW[2,3])", see Table 6-18 Assignment of data record 31 (Page 114)	11	31	USHORT USHORT
Reserve	12		
Reserve	13		
Reserve	14		
Async. error bits (32-bit): bits 0..15: Operating error BTF (word 0) bits 16..31: Technology error TNF (word 2), see Table 6-19 Assignment of data record 32 (Page 116)	15	32	LONG

See also

Overview (Page 113)
DR 32 alarm display (Page 116)

6.16 DR 15 tare default values

6.16.1 Overview

Data record DR 15 is used for external specification of the tare weight.

Procedure

- Enter the tare weight
- Transfer the data record to the scales
- Activate the tare weight with a command

Table 6- 14 Assignment of data record 15

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	15	-	-	1578
Length	Data record length information	USHORT	2	r	16	-	-	1579
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1580
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1581
Default tare weight (Page 106)	Tare manual	FLOAT	4	rw	0	0	Depends on specification in DR 3	1582
Reserve R	Reserve	SHORT	2	rw	0	0	-	1584

6.16.2 Default tare weight

If a tare weight is to be used, first it must be entered in DR15 and then activated with the command "Set Tare 1 (1013)" . The tare weight must not exceed the maximum values specified in data record DR 3.

6.17 DR 16 simulation value

6.17.1 Overview

Specifying a weight value using data record DR 16 disables the measuring input of the SIWAREX module and "simulates" a weight with the specified value. The SIWAREX module must first be released for simulation mode in DR 3 and then switched to simulation mode with command no. 3.

Procedure

- Release simulation mode in DR 3
- Enter the weight to be simulated
- Transfer the data record to the SIWAREX module
- Start the simulation using command "Weight simulation on (3)"
- Stop the simulation using command "Weight simulation off (4)"

Table 6- 15 Assignment of data record 16

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	16	-	-	1598
Length	Data record length information	USHORT	2	r	16	-	-	1599
Application	Information about which application the data record belongs to	USHORT	2	r	141	-	-	1600
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1601
Weight simulation specification (Page 107)	Weight value specification (only relevant if simulation mode is enabled)	FLOAT	4	rw	0	maximum weighing range	maximum weighing range	1602
Reserve	Reserve	FLOAT	2	rw	0	0	-	1604

6.17.2 Weight simulation specification

Only use weight simulation values which are within the measuring range of the scales. The word "TEST" is displayed on the main display during simulation and a status bit is set. From the start of simulation onward, all parameterized limits, inputs and outputs etc. refer to the simulation weight.

6.18 DR 18 digital output control specifications

6.18.1 Overview

If a digital output is defined in data record DR 7 for control with data record DR 18 (see Assignment for digital output 0, 1, 2, 3 (Page 89)), you can control this output with data record DR 18. Transfer is always for all four digital outputs. Only outputs which have been configured for control via DR 18 (see DR7 interface parameters (Page 86)) are activated or deactivated according to the content of data record DR 18.

Procedure

- Check or adapt the desired parameter settings of the digital outputs in data record 7
- Define the value for digital output 0, 1, 2, 3
- Transfer the data record to the scales

Table 6- 16 Assignment of data record 18

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	18	-	-	1606
Length	Data record length information	USHORT	2	r	12	-	-	1607
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	1608
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	1609
Specification for digital output 0, 1, 2, 3 (Page 109)	Specification of digital output 0=1 -> DA0 output active (only if assignment Code 21 is assigned to the output, see DR 7)	BIT	0	rw	0	0	1	1610.16
	Specification of digital output 1=1 -> DA1 output active (only if assignment Code 21 is assigned to the output, see DR 7)	BIT	0	rw	0	0	1	1610.15
	Specification of digital output 2=1 -> DA2 output active (only if assignment Code 21 is assigned to the output, see DR 7)	BIT	0	rw	0	0	1	1610.14

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
	Specification of digital output 3=1 -> DA3 output active (only if assignment Code 21 is assigned to the output, see DR 7)	BIT	0	rw	0	0	1	1610.13
Bit 4	Reserve	BIT	0	rw	0	0	1	1610.12
Bit 5	Reserve	BIT	0	rw	0	0	1	1610.11
Bit 6	Reserve	BIT	0	rw	0	0	1	1610.10
Bit 7	Reserve	BIT	0	rw	0	0	1	1610.9
Bit 8	Reserve	BIT	0	rw	0	0	1	1610.8
Bit 9	Reserve	BIT	0	rw	0	0	1	1610.7
Bit 10	Reserve	BIT	0	rw	0	0	1	1610.6
Bit 11	Reserve	BIT	0	rw	0	0	1	1610.5
Bit 12	Reserve	BIT	0	rw	0	0	1	1610.4
Bit 13	Reserve	BIT	0	rw	0	0	1	1610.3
Bit 14	Reserve	BIT	0	rw	0	0	1	1610.2
Bit 15	Reserve	BIT	2	rw	0	0	1	1610.1
Reserve 1	Reserve	USHORT	2	rw	0	-	-	1611

6.18.2 Specification for digital output 0, 1, 2, 3

Digital outputs 0 to 3 can be controlled using data record 18 with this parameter. This function can be used for commissioning purposes, for example.

Note

The reaction of the controlled outputs in the case of SIMATIC CPU stop, failure or module fault can be determined by the user in DR 7.

6.19 DR 30 current process values

6.19.1 Overview

Current states and process values in the scales can be monitored using process values and advanced process values from data record DR 31. Monitoring selected data during commissioning is extremely useful as it helps you to optimize parameters.

Procedure

- Read data record DR 30 via a time-controlled OB
- Display/analyze the required tags

It is not always necessary to cyclically read data record DR 30. If corresponding process tags have already been selected in DR 14 (Page 104), they are sent to the scale data block over the I/O interface using the FB. In this case, you can use these tags and also all status bits without the data communication.

Table 6- 17 Assignment of data record 30

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	30	-	-	3000
Length	Data record length information	USHORT	2	r	68	-	-	3001
Application	Information about which application the data record belongs to	USHORT	2	r	141	-	-	3002
Version ID	Information about the current data record version	USHORT	2	r	1	1	255	3003
1/4d zero	Set if gross less than ± 0.25e	BIT	2	r	0	-	-	3004.16
Max 9e/-20d	Set if the weight has exceeded the gross weighing range by more than 9 display steps (d)	BIT	0	r	0	-	-	3004.15
Tared	Set if tare memory is not equal to zero	BIT	0	r	0	-	-	3004.14
Manual tare set (pT)	Set if the tare memory is assigned an external specified value 1	BIT	0	r	0	-	-	3004.13
Reserve		BIT	0	r	0	-	-	3004.12
Waiting for standstill	Set if module is waiting for standstill to execute command	BIT	0	r	0	-	-	3004.11
Standstill	Set if standstill condition is met	BIT	0	r	0	-	-	3004.10
Reserve		BIT	0	r	0	-	-	3004.9
Empty	Set if "Empty" condition is met	BIT	0	r	0	-	-	3004.8
Limit value 1	Limit value 1 has responded	BIT	0	r	0	-	-	3004.7
Limit value 2	Limit value 2 has responded	BIT	0	r	0	-	-	3004.6
Min violated	Set if min. is violated	BIT	0	r	0	-	-	3004.5

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Reserve		BIT						3004.4
Channel active	Channel is set active	BIT	0	r	0	-	-	3004.3
Channel display channel B	1= Status comes from channel B	BIT	0	r	0	-	-	3004.2
Channel display channel A	1= Status comes from channel A	BIT	0	r	0	-	-	3004.1
Reserve		BIT	0	r	0	-	-	3005.16
Reserve		BIT	0	r	0	-	-	3005.15
Reserve		BIT	0	r	0	-	-	3005.14
Reserve		BIT	0	r	0	-	-	3005.13
Impedance error	Set when leaving the setpoint range of impedance	BIT	0	r	0	-	-	3005.12
Wrong time	Wrong time due to empty buffer. Reset clock.	BIT	0	r	0	-	-	3005.11
Trace active	Set when trace is running	BIT	0	r	0	-	-	3005.10
Operator error by digital input	Set with synchronization error by command to digital input	BIT	0	r	0	-	-	3005.9
Calibration characteristic curve implausible	Points of calibration characteristic curve are not plausible or complete	BIT	0	r	0	-	-	3005.8
Service mode	Service mode is active	BIT	0	r	0	-	-	3005.7
Simulation mode	Simulations mode is active	BIT	0	r	0	-	-	3005.6
Reserve		BIT	0	r	0	-	-	3005.5
Reserve		BIT	0	r	0	-	-	3005.4
CPU stop or CPU failure	Set when switch S1 is OFF (operation with SIMATIC) and S7 CPU has failed or ODIS is active	BIT	0	r	0	-	-	3005.3
Startup	Startup has taken place, is deleted again after 5 seconds	BIT	0	r	0	-	-	3005.2
Status fault	Operating error pending	BIT	0	r	0	-	-	3005.1
Gross process weight (Page 112)	Gross weight (process value)	FLOAT	4	r	0	-	-	3006
Net process weight (Page 112)	Net weight (process value)	FLOAT	4	r	0	-	-	3008

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Tare process weight (Page 113)	Tare weight (process value)	FLOAT	4	r	0	-	-	3010
Gross / net weight (Page 113)	Gross or net weight	FLOAT	4	r	0	-	-	3012
Gross / net weight with increased resolution (x 10) (Page 113)	Legal trade Gross/Net weight x10	FLOAT	4	r	0	-	-	3014
Gross process weight 2 (Page 113)	Gross weight after first filter	FLOAT	4	r	0	-	-	3016
Percentage gross weight based on maximum capacity (DR3)	Percentage gross weight based on maximum capacity (rounded to one decimal place)	FLOAT	4	r	0	-	-	3018
Refresh counter for process values (Page 113)	Refresh counter incremented by 1 if weight values were changed	USHORT	2	r	0	-	-	3020
Date and time	SIMATIC DTL format	DTL	12	rw	DTL#1970-01-01-00:00:00.0			3021
Reserve		SHORT	2	r	0	-	-	3029
Reserve		FLOAT	4	r	0	-	-	3030
Reserve		FLOAT	4	r	0	-	-	3032

6.19.2 Gross process weight

The current gross weight. The rounding is performed according to the specifications in data record DR 3 with the parameter "Automatic zero adjustment (Page 72)".

6.19.3 Net process weight

The current net weight. The rounding is performed according to the specifications in data record DR 3 with the parameter "Automatic zero adjustment (Page 72)".

6.19.4 Tare process weight

The current tare weight. The rounding is performed according to the specifications in data record DR 3 with the parameter "Automatic zero adjustment (Page 72)".

6.19.5 Gross / net weight

The current weight for the main display. Resolution corresponds setting in data record DR 3 Scale interval (Page 72).

6.19.6 Gross / net weight with increased resolution (x 10)

The current weight for the main display in higher resolution. Resolution corresponds setting in data record DR 3 Scale interval (Page 72) x 10.

6.19.7 Gross process weight 2

The current gross weight after the first filter. Since the value was not even filtered with filter 2, it is usually filtered weaker than the gross process value.

6.19.8 Refresh counter for process values

Measured values are calculated every 10 ms in the SIWAREX module. A counter is incremented by 1 each time. Once the counter reaches the value 65536, it starts again from zero. The counter can be used as a time stamp for data record DR 30.

6.20 DR 31 advanced current process values

6.20.1 Overview

Current states and process values in the scales can be monitored using advanced process values and process values (DR 30). This data is not required for standard operation of the scales.

Monitoring selected data during trial operation is extremely useful as it helps you to optimize parameters.

Procedure

- Read data record DR 31
- Display/analyze the required tags

Table 6- 18 Assignment of data record 31

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	31	-	-	3300
Length	Data record length information	USHORT	2	r	32	-	-	3301
Application	Information about which application the data record belongs to	USHORT	2	r	101	-	-	3302
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	3303
Unfiltered digit value (Page 115)	Unfiltered digital value from the AD converter	LONG	4	r	0	-	-	3304
Filtered digit value after the first filter (Page 115)	Filtered digit intermediate value of the AD converter after the first filter	LONG	4	r	0	-	-	3306
Digits filtered (Page 115)	Filtered digit value from the AD converter after the second filter	LONG	4	r	0	-	-	3308
Load cell impedance	Currently measured impedance of the load cells in ohms	FLOAT	4	r	0	-	-	3310
Current status of input 0, 1, 2 (Page 115)	Current status of input 0	BIT	0	r	0	0	1	3312.16
	Current status of input 1	BIT	0	r	0	0	1	3312.15
	Current status of input 2	BIT	0	r	0	0	1	3312.14
	Current status of input 3	BIT	0	r	0	0	1	3312.13
Bit 4	Reserve	BIT	0	r	0	0	1	3312.12
Bit 5	Reserve	BIT	0	r	0	0	1	331211
Bit 6	Position of DIP switch 1	BIT	0	r	0	0	1	3312.10
Bit 7	Position of DIP switch 2	BIT	0	r	0	0	1	3312.9
Current status of digital output 0, 1, 2, 3 (Page 115)	Current status of output 0	BIT	0	r	0	0	1	3312.8
	Current status of output 1	BIT	0	r	0	0	1	3312.7
	Current status of output 2	BIT	0	r	0	0	1	3312.6
	Current status of output 3	BIT	0	r	0	0	1	3312.5
Reserve		BIT	0	r	0	0	1	3312.4
Reserve		BIT	0	r	0	0	1	3312.3
Reserve		BIT	0	r	0	0	1	3312.2
Reserve		BIT	2	r	0	0	1	3312.1

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Refresh counter for process values (Page 116)	Refresh counter incremented by 1 if weight values were changed	USHORT	2	r	0	-	-	3313
Current load cell signal in mV (Page 116)	Currently measured load cell signal	FLOAT	4	r	0	-	-	3314

6.20.2 Unfiltered digit value

The unfiltered digit value is the internal measured value immediately before filtering.

6.20.3 Filtered digit value after the first filter

Filtered digit value is the internal measured value immediately after the first filtering.

6.20.4 Digits filtered

Filtered digit value is the internal measured value after the filtering with the first and second filters.

6.20.5 Current status of input 0, 1, 2

This parameter allows you to check the current status of the digital inputs.

6.20.6 Current status of digital output 0, 1, 2, 3

This parameter allows you to check the current status of the digital outputs.

6.20.7 Current status of DIP switch

Switch 1:

ON - Operation without SIMATIC (stand-alone mode)

OFF - Operation in SIMATIC

Switch 2:

No meaning

6.20.8 Refresh counter for process values

Measured values are calculated every 10 ms in the SIWAREX module. A counter is incremented by 1 each time. Once the counter reaches the value 65536, it starts again from zero. The counter can used like a time stamp for the data record DR 30/31.

6.20.9 Current load cell signal in mV

Display of currently measured signal voltage of the load cell(s) in mV.

6.21 DR 32 alarm display

Data record DR 32 is used in the Modbus communication with Modbus master.

Operating errors or technology errors are reported spontaneously and the bit display is extended approximately 3 seconds so that there is enough time to register the message. The operating errors are displayed as long as the error is pending.

Data and operating errors are treated as follows.

If a function which is used to write to the holding register is completed with an error, the data or operator error reported can be read from data record DR 32. The messages are displayed for 3 seconds and do not need to be acknowledged from the SIWAREX module.

The exact cause of a parameter or operating error can be determined through additional information. The additional information is provided in the message list (section Message list (Page 124)).

At successful completion of a function for writing to the SIWAREX register, data record DR 32 does not have to be polled.

Table 6- 19 Assignment of data record 32

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	32	-	-	3500
Length	Data record length information	USHORT	2	r	28	-	-	3501
Application	Information about which application the DR belongs to	USHORT	2	r	141	-	-	3502
Version ID	Information about the current data record version	USHORT	2	r	1	1	65535	3503
1000 Operating error pending	At least one operating error has occurred (= 1 as long as an operating error is pending)	Bit_0	0	r	0	-	-	3504

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
1108 Short-circuit	Short-circuit to power supply line to the load cell	Bit_1	0	r	0	-	-	3504
1104 Undervoltage	Undervoltage at SENSE input	Bit_2	0	r	0	-	-	3504
1109 Fault digital outputs	Fault digital outputs (overtemperature, no ext. supply voltage)	Bit_3	0	r	0	-	-	3504
1105 Overload	Overload	Bit_4	0	r	0	-	-	3504
1106 Underload	Load low	Bit_5	0	r	0	-	-	3504
-	Reserve	Bit_6	0	r	0	-	-	3504
1102 ADU error	A/D converter error	Bit_7	0	r	0	-	-	3504
-	Reserve	Bit_8	0	r	0	-	-	3504
1003 Checksum error (parameter)	Checksum error with parameters	Bit_9	0	r	0	-	-	3504
-	Reserve	Bit_10	0	r	0	-	-	3504
1004 Checksum error (program)	Checksum error in program code	Bit_11	0	r	0	-	-	3504
-	Reserve	Bit_12	0	r	0	-	-	3504
1001 Watchdog	Restart after fatal error	Bit_13	0	r	0	-	-	3504
-	Reserve	Bit_14	0	r	0	-	-	3504
Unable to connect to SIMATIC	The firmware must be updated using the new TIA Portal	Bit_15	1	r	0	-	-	3504
2000 Technological error detected	At least one technology is a fault is pending (group error)	Bit_0	0	r	0	-	-	3505
2001 Timeout tare or zero	Taring or zeroing is not possible because no standstill occurred within the waiting period.	Bit_1	0	r	0	-	-	3505
2002 Trace overloaded	The configured cycle for the trace recording cannot be processed: Reading in progress or the buffer is full, data recording has stopped	Bit_2	0	r	0	-	-	3505
-	Reserve	Bit_3	0	r	0	-	-	3505
-	Reserve	Bit_4	0	r	0	-	-	3505
Cold restart	Restart after power failure or firmware update	Bit_5	0	r	0	-	-	3505
Download error	FW download aborted or rejected	Bit_6	0	r	0	-	-	3505
-	Reserve	Bit_7	1	r	0	-	-	3505
-	Reserve	Bit_8	0	r	0	-	-	3505
-	Reserve	Bit_9	0	r	0	-	-	3505
-	Reserve	Bit_10	0	r	0	-	-	3505
-	Reserve	Bit_11	0	r	0	-	-	3505

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
-	Reserve	Bit_12	0	r	0	-	-	3505
-	Reserve	Bit_13	0	r	0	-	-	3505
Default parameters loaded	Note to users about the newly loaded parameters	Bit_14	0	r	0	-	-	3505
Factory settings restored	Note to users about the newly loaded parameters	Bit_15	1	r	0	-	-	3505
-	Reserve	Bit_0-Bit_15	0	r	0	-	-	3506-3507
5000 Data or command error	Group fault	Bit_0	0		0	-	-	3508
6050 Command unknown	Issued command code unknown.	Bit_1	0		0	-	-	3508
6051 Command currently not possible	"Additional information" contains additional information	Bit_2	0	r	0	-	-	3508
6052 Error service command	"Additional information" contains additional information	Bit_3	0	r	0	-	-	3508
6053 Calibration command error	All commands for adjustment, calibration	Bit_4	0	r	0	-	-	3508
6054 Scale command error	"Additional information" contains additional information	Bit_5	0	r	0	-	-	3508
6055 Scale command error	"Additional information" contains additional information	Bit_6	0	r	0	-	-	3508
6056 Memory command error	"Additional information" contains additional information	Bit_7	1	r	0	-	-	3508
7050 Unknown data record	Requested DR unknown	Bit_8	0	r	0	-	-	3508
7051 Parameter input currently not possible	"Additional information" contains additional information	Bit_9	0	r	0	-	-	3508
7052 Parameter change not possible due to write protection	"Additional information" contains additional information	Bit_10	0	r	0	-	-	3508
7053 Error in calibration parameter DR3	"Additional information" contains additional information	Bit_11	0	r	0	-	-	3508
7054 Parameter error DR5	"Additional information" contains additional information	Bit_12	0	r	0	-	-	3508
7055 Parameter error DR6	"Additional information" contains additional information	Bit_13	0	r	0	-	-	3508
7056 Parameter error DR7	"Additional information" contains additional information	Bit_14	0	r	0	-	-	3508
7057 Parameter error DR8/DR48	"Additional information" contains additional information	Bit_15	1	r	0	-	-	3508
7058 Parameter error in DR10 or DR11	"Additional information" contains additional information	Bit_0	0	r	0	-	-	3509
7059 Error in interface parameters DR12-DR14	"Additional information" contains additional information	Bit_1	0	r	0	-	-	3509

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
7060 Error in extended parameters DR15 DR19	"Additional information" contains additional information	Bit_2	0	r	0	-	-	3509
-	Reserve	Bit_3-Bit_15	0	r	0	-	-	3509-3510
Additional information about data and operating errors	Additional information about data and operating errors (see Additional Information list)	USHORT	1	r	0	-	-	3511
Data and operating error code	Error number (see error list)	USHORT	2	r	0	-	-	3512
Reserve	Reserve	USHORT	2	r	0	-	-	3513

6.22 DR 34 ASCII main display value

6.22.1 Overview

The ASCII weight value corresponds to the value on the main display of the scale and can be used in addition to the main display for an auxiliary display / operating display.

Table 6- 20 Assignment of data record 34

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	34	-	-	4000
Length	Data record length information	USHORT	2	r	26	-	-	4001
Application	Information about which application the DR belongs to	USHORT	2	r	101	-	-	4002
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	4003
ASCII display string header	Maximum length and actual length of string	UBYTE[2]	2	r	16,2	-	-	4004
Content of main display as ASCII string (Page 120)	For display of legal-for-trade weight value, legal-for-trade resolution, etc. (see below)	CHAR[16]	16	r	" "	-	-	4005

6.22.2 Content of main display as ASCII string

The following values can be displayed in non-automatic weighing instruments (NAWI) applications:

Display content	Activation per command	Identifier
Standard display	710	B/G
Increased resolution (temporarily)	701 (only possible in "Standard display" mode)	x
Net process display	714	n
Gross process display	715	
Tare display (temporary)	705	T
same as during preset tare active	705	p
Weight simulation active	3	
Display overflow	-	B
Operator error	-	-

6.23 DR 48 date and time 2 (for Modbus)

The current date and time can be set or read via data record DR 48. The clock is not buffered and can only continue to function without power for about 30 seconds. Data record DR 8 is used for date and time when the Modbus protocol is not used.

Procedure

- Set the date and time
- Transfer the data record to the SIWAREX module

Table 6- 21 Table 8- 27 Assignment of data record 48

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	Contains no. of data record	USHORT	2	r	48	-	-	4500
Length	Data record length information	USHORT	2	r	24	-	-	4501
Application	Information about which application the data record belongs to	USHORT	2	r	141	-	-	4502
Version ID	Information about the current data record version	USHORT	2	r	1	1	65635	4503
Year	Year number	USHORT	2	rw	2015	2012		4504
Month	Month	USHORT	2	rw	1	1	12	4505
Day	Day in the month	USHORT	2	rw	1	1	31	4506

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Hour	Hour	USHORT	2	rw	0	0	23	4507
Minute	Minute	USHORT	2	rw	0	0	59	4508
Second	Second	USHORT	2	rw	0	0	59	4509
Millisec-ond	Millisecond	USHORT	2	rw	0	0	999	4510
Day of the week	Day of the week	USHORT	2	rw	1	1	7	4511

Alarm logging 7

7.1 Message types

The messages in the electronic weighing system described here are divided into three types.

Operating messages

System status messages can be generated spontaneously at any time by an unexpected event. They include internal and external hardware problems which can occur spontaneously during weighing.

Technological error

Technology errors occur spontaneously due to the weighing process.

The status bits are not messages in contrast. The status indicators describe the status of the scale in normal operation and can always be observed and evaluated.

Data and operating errors

The data and operating errors are always a response to a command due to a plausibility check.

These are data errors if a plausibility error has been detected in a data packet which was sent to the module and receipt of the packet has been rejected by the module.

These are operating errors if the module cannot execute the sent command in its current operating state.

7.2 Message paths

You can read out the messages using different paths. You define the path for forwarding and processing of messages during configuration.

The messages are processed for two basic purposes:

- For display or recording on an operator panel for the operator
- For linking in the control software to control specific reactions in the process.

The following message paths are possible:

- Output of the message buffer to the SIWATOOL program (takes place automatically)
- Output by means of function block as bit field in Scale data block
- Certain operating errors can be transmitted as diagnostic interrupts to the SIMATIC CPU and evaluated by OB82

7.3 Evaluating messages with the help of SIWATOOL

The electronic weighing system has a message buffer for each weighing channel. The buffer can contain up to 60 entries. If the number of alarms in the alarm buffer exceeds 60, the oldest entry is overwritten. The message buffer can be read out at any time with the help of SIWATOOL (menu item "Read out all data records") and saved together with the scale parameters. This facilitates the detection, analysis and correction of errors in the system.

7.4 Detecting messages with the help of FB SIWA

All messages of the SIWAREX module can be fully detected and processed in the controller using the SIWAREX WP521/WP522 function block. The messages can be evaluated directly in a signaling system by means of a bit signaling area in the scale data block. The message texts are stored in the signaling system. The message text is output when a bit becomes "1".

7.5 Message list

7.5.1 Introduction

The message list is an overview of all messages that the SIWAREX module can generate. A message can be quickly identified by the message code (number).

7.5.2 System status message list

Operator error (code 1000 to 1999)	Error code	Description and remedy
1000 Operating error pending	1000	Group message, at least one operating error exists.
1001 Watchdog	1001	Watchdog, error is displayed for at least 10 seconds. A serious error has occurred in the function of SIWAREX, e.g. program error, severe electromagnetic influence on device, etc. Contact the SIWAREX Support if the error occurs multiple times.
1003 Checksum incorrect parameter	1003	Checksum error at parameter. Critical error because the parameters are no longer safe.
1004 Checksum incorrect program	1004	Checksum error program code. Critical error because the program is no longer safe.
1008 Firmware version not compatible	1008	The firmware must be updated via the TIA Portal.
1102 ADU error	1102	AD converter error when reading in the measured value. If the error occurs again, make sure that the EMC recommendations are observed (chapter Electrical, EMC and climatic requirements (Page 161)).
1104 Undervoltage	1104	Undervoltage at sensor cables

Operator error (code 1000 to 1999)	Error code	Description and remedy
1105 Overload	1105	Overload of scale (ca. 110%)
1106 Underload	1106	Underload of scale (ca. -10%)
1108 Short-circuit	1108	Short-circuit to power supply line to the load cell
1109 Fault digital outputs	1109	Fault digital outputs (overtemperature, no ext. supply voltage)

7.5.3 Technology error message list

Technology error (code 2000 to 4999)	Error code	Description and remedy
2000 Technological error detected	2000	Group message, at least one technology error exists
2001 Taring/zeroing timeout	2001	Taring of scale or set to zero is not possible because a standstill was not reached during the standstill time. The command was discarded.
2002 Trace overloaded	2002	The configured recording rate for trace cannot be processed. Set a slower recording rate (section "Trace recording cycle (Page 90)")
2005 Restart after voltage dip	2005	Restart after power failure or firmware download.
2006 Download error	2006	A firmware download was canceled/rejected, e.g. because the transferred file is invalid.

7.5.4 Message list data and operating errors with additional information

Additional information is available for most data or command errors. The cause of the error is described in more detail using this information. If a data or command error bit is set, the additional information is filled accordingly at the same time. In this way, both the error bits as well as the additional information must be analyzed together in order to locate the cause of the error in the program.

Data and operating errors	Error code	Supple-mentary info	Description
5000 Data or command error	5000	-	Group error, at least one data or command error is pending
6050 Command unknown	6050	-	Given command code unknown. Check the command code.
6051 Command currently not possible	6051	-	The desired command could not be executed because, for example, another process is running at this time. Additional information contains more detailed information.
		4500	, because fault is pending
		4501	, because there is no standstill
		4502	, because already waiting for standstill
6052 Error service command	6052		Command from the group service commands could not be executed. Additional information contains more detailed information.
		4510	, because no service mode active
		4516	, because no service activated for other channel

Data and operating errors	Error code	Supple-mentary info	Description
6053 Calibration command error	6053		Command from the group adjustment commands failed. Additional information contains more detailed information.
		4510	, because no service mode active
		4520	, because distance of adjustment digits too low
		4521	, because order of calibration points wrong
		4522	, because calibration is not yet complete
		4523	, because adjustment digits are out of range
		4524	, because calibration weight 0
6054 Scale command error	6054		Command from the group weighing commands (zero, tare, etc.) could not be executed. Additional information contains more detailed information.
		4500	, because fault is pending
		4501	, because there is no standstill
		4502	, because already waiting for standstill
		4530	, because weight outside allowable tare range
		4531	, because weight outside allowable zero range
6056 Memory command error	6056		Trace command was rejected. Additional information contains more detailed information.
		4500	, because fault is pending
		4550	, because trace memory full
7050 Unknown data record	7050	-	Requested data record is unknown.
7051 Parameter input currently not possible	7051		Parameter input is currently not possible. Additional information contains more detailed information.
		4510	, because no service mode active
7053 Error in calibration parameter DR3	7053		Additional Information refers to the non-plausible parameter in DR3
		3323	Unit of weight
		3199	Gross identifier
		3247	Reserve 1a
		3247	Reserve 1b
		3323	Unit of weight
		3199	Gross identifier
		3086	Calibration weight 0
		3087	Calibration weight 1
		3088	Calibration weight 2
		3081	Adjustment digits 0 (measured)
		3083	Adjustment digits 1 (measured)
		3085	Adjustment digits 2 (measured)
		3248	Resolution
		3288	Maximum tare load
		3333	Negative zeroing value
		3335	Positive zeroing value

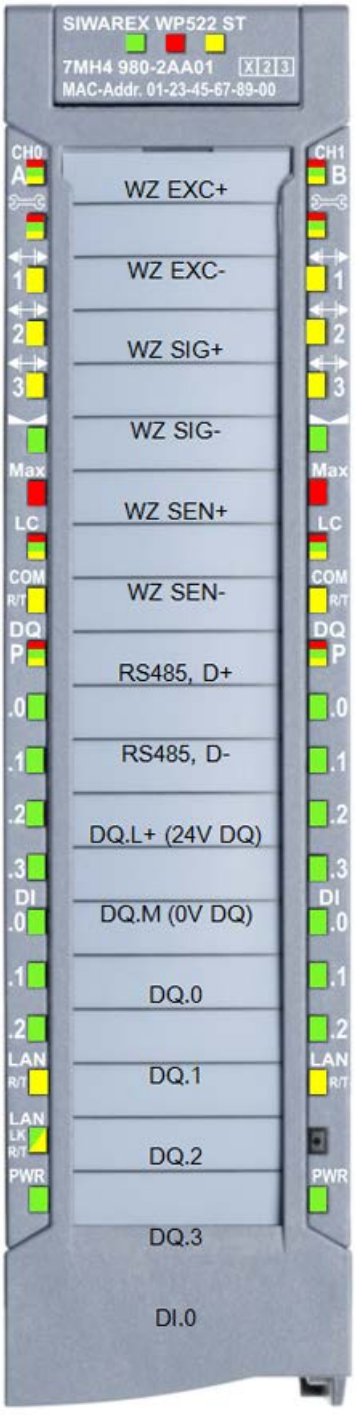
Data and operating errors	Error code	Supple-mentary info	Description
		3274	Standstill value
		3317	Standstill time
		3316	Waiting period
		3175	Cut-off frequency low-pass filter 1
		3236	Order no. low-pass filter 1
		3906	Period average value filter
		4510	, because no service mode active
		4520	, because distance of adjustment digits too low
		4521	, because order of calibration points wrong
		4524	, because calibration weight 0
		4610	, because of error in Max - Min weighing range
		4611	, because resolution not allowed
		4612	, because the cutoff frequency of the low-pass filter TP1 is too low
7054 Parameter error DR5	7054		Additional Information refers to the non-plausible parameter in DR5
		3105	Effective tare manual
		3115	Effective tare - semiautomatic
		3116	Zero value
		3118	Current zero value auto.
		3124	Dead load
		4510	, because no service mode active
		4530	, because weight outside allowable tare range
		4531	, because weight outside allowable zero range
7055 Parameter error DR6	7055		Additional Information refers to the non-plausible parameter in DR6
		3433	Basis of limits
		3203	Limit 1 on value
		3202	Limit 1 off value
		3206	Limit 2 on value
		3205	Limit 2 off value
		3150	Blank value
		2451	Uniform delay time for - Switch ON / OFF limit 1 - Switch ON / OFF limit 2 - Switch ON blank message
		4640	, because specification in percent outside the permissible range
7056 Parameter error DR7	7056		Additional Information refers to the non-plausible parameter in DR7
		3055	Assignment for digital input 0
		3056	Assignment for digital input 1
		3057	Assignment for digital input 2

Data and operating errors	Error code	Supple-mentary info	Description
		3162	Filter settings for the digital inputs
		3059	Assignment for digital output 0
		3060	Assignment for digital output 1
		3061	Assignment for digital output 2
		3062	Assignment for digital output 3
		3884	Monitoring of the digital outputs and their supply voltage
		3881	Reaction of digital outputs to errors (independent of switch)
		3882	Reaction of digital outputs at CPU stop or failure
		3312	Trace recording cycle
		4650	, because DQ.0 assignment not possible
		4651	, because DQ.1 assignment not possible
		4652	, because DQ.2 assignment not possible
		4653	, because DQ.3 assignment not possible
7057 Parameter error DR8/DR48	7057		Additional Information refers to the non-plausible parameter in DR8 / DR48
		3121	Date and time
7058 Parameter error in DR10 and DR11	7058		Additional Information refers to the non-plausible parameter in DR10
		3283	Switch 50/60Hz
		3227	Number of support points
		3180	LC parameter
		3228	Rated load
		3888	Overload limit
		1107	Impedance reference value
		3889	Permissible impedance deviation
		3324	String header
		3890	Load cell manufacturer
		3891	Load cell order number
		4510	, because no service mode active
		4660	, because input range exceeded (parameter * overload limit)
		1190	Channel status
7059 Error in interface pa-rameters DR12-DR14	7059		Additional Information refers to the non-plausible parameter in DR12 - DR14
		3138	Device MAC address 1
		3103	IP address x.n.n.n
		3102	Gateway x.n.n.n
		4107	Unit identifier channel 1
		3892	TCP port channel 1
		4108	Unit identifier channel 2
		3893	TCP port channel 2
		3253	RS485 protocol

Data and operating errors	Error code	Supple-mentary info	Description
		3250	RS485 baud rate
		3221	Modbus address RTU (RS485)
		3126	Decimal place remote display
		3895	Modbus RTU message frame delay
		3264	Selection process value 1 (S7 I/O interface)
		3265	Selection process value 2 (S7 I/O interface)
		4510	, because no service mode active
		4670	, because selection code is not defined for process values 1
		4671	, because selection code is not defined for process values 2
		4672	, because MAC address is not identical
		4673	, because IP address is invalid
		4674	, because Modbus TCP port invalid
7060 Error in extended parameters DR15 DR19	7060		Additional Information refers to the non-plausible parameter in DR15 - DR19
		3897	Tare default value
		4530	, because weight outside allowable tare range

7.5.5 Messages by LEDs on the module

The LEDs on the front of the SIWAREX module signal the following status and error messages.

LED name	Sym-bol		Sym-bol	LED name
				
Status scale A (CH 0)	A		B	Status scale B (CH 1)
Service mode				Service mode
Limit 1 triggered				Limit 1 triggered
Limit 2 triggered				Limit 2 triggered
Limit 3 triggered				Limit 3 triggered
Standstill				Standstill
Maximum weight	Max		Max	Maximum weight
Status load cell	LC		LC	Status load cell
Activate RS485 com.	COM R/T		COM R/T	Activate RS485 com.
Status digital outputs	DQ P		DQ P	Status digital outputs
Dig. Output 0 active	.0		.0	Dig. Output 0 active
Dig. Output 1 active	.1		.1	Dig. Output 1 active
Dig. Output 2 active	.2		.2	Dig. Output 2 active
Dig. Output 3 active	.3		.3	Dig. Output 3 active
Dig. Input 0 active	.0		.0	Dig. Input 0 active
Dig. Input 1 active	.1		.1	Dig. Input 1 active
Dig. Input 2 active	.2		.2	Dig. Input 2 active
LAN Rx/Tx (channel-spec.)	LAN R/T		LAN R/T	LAN Rx/Tx (channel-spec.)
LAN LINK, Rx/Tx (PHY)	LAN LK, R/T		LAN LK, R/T	*(free)*
Voltage channel A OK	PWR		PWR	Voltage channel B OK

As with all S7-1500 technology and signal modules, there are **3 LEDs** in the colors green, red and yellow located at the top of the area. The following table explains the dynamic meaning of the LEDs.

Table 7- 1 Dynamic meaning of the LEDs

LED	Status	Meaning
RUN LED	Green  2Hz	S7-end module startup
	grün	Ready for operation
SF/ERROR LED	Red  2Hz	System fault (module/channel diagnostics alarm pending, e.g. operating errors or firmware update) [red LED flashes for at least 3 seconds]
MAINT LED	gelb	Maintenance LED - without function for WP52x
	/  2Hz	
D (diagnostics)	Red  2Hz	Operating error pending (e.g. also: Stand-alone configured, but S7 communication
	gelb	Stand-alone mode active (possible to continue work without operational S7 CPU)
	grün	Ready
	Green  2Hz	Service mode active
	(off)	Normal operation
	gelb	Limit 1 responded
	gelb	Limit 2 responded
	gelb	Limit 3 triggered
	(off)	No standstill
	grün	Status standstill pending
Max	Red  2Hz	Weighing range exceeded
LC	Red  2Hz	Load cell error
	gelb	Measured LC impedance outside the configured setpoint range
	grün	Load cell status OK
COM R/T	gelb	RS485 communication active (Receive/Transmit) Pulse 0.5s for transmitting/receiving a message frame; Modbus reception: Activation independent of slave address. Permanent with "Siebert" configuration, since transmitted regularly

LED	Status	Meaning
LAN R/T	gelb	LAN communication to this channel active (only Siwatool/Modbus TCP – not with FTP, for example) Pulse 0.5s for transmitting/receiving a frame → transforms into continuous light during active Siwatool/Modbus link. WP522: This LED is channel-specific driven for communication via channel-specific TCP ports
DQ P	(off)	There is no output voltage and none of the outputs is assigned a function
	Red  2Hz	No output voltage or is at least one of the outputs DQ.x has a fault (overload)
	grün	Digital outputs ready; trigger at Simatic failure or stop, output replacement values if required
	gelb	Digital outputs ready; no monitoring of SIMATIC function (stand-alone operation)
DQ.x	grün	Digital output x active (high level)
DI.x	grün	Digital input x active (high level) (status is detected after filtering)
LAN LK R/T	grün	Link: There is an Ethernet connection to a remote station
	gelb	Receive/Transmit: Pulse when an Ethernet frame is sent or received
PWR	grün	Status of local channel 24V supply available

xxx = LED ON

 = LED flashes

Commands

8

8.1 Overview

The commands for the electronic weighing system described here can be transmitted by several interfaces:

- by the Operator Panel via the controller to the SIWAREX module
- by the Operator Panel directly to the SIWAREX module
- by SIWATOOL directly to the SIWAREX module
- by the digital inputs after corresponding assignment in data record DR 7

A data or command error is signaled if a command cannot be executed or if the sent data record is rejected.

Detailed descriptions of the commands can be found in the following command lists:

→ Table 8-1 Command 1 ... 99: Service commands (Page 133)

→ Table 8-2 Commands 450 ... 499: Trace commands (Page 134)

→ Table 8-3 Commands 700 to 899: HMI display switching (Page 134)

→ Table 8-4 Commands 1000 ... : Basic functions for weighing commands (Page 135)

→ Command groups of SIWAREX WP521/WP522 (Page 135)

8.2 Command lists

The commands for the electronic weighing system described here are summarized in the following list:

Table 8- 1 Command 1 ... 99: Service commands

Command code	Command	Description
1	Service mode On	Turn on service mode
2	Service mode Off	Turn off service mode
3	Test mode On (simulation)	Turn on test mode. The simulation value from data record 16 is used instead of the measured value for calculation of the process values.
4	Test mode Off (simulation)	Switch off test mode.
11	Load factory setting	The command resets the SIWAREX to the "ex works" status. Then: - All parameters and stored data are loaded with the default values - All message buffers (diagnostic buffer, trace memory, etc.) are reset

Command code	Command	Description
12	Load standard parameters	Like "Load factory settings" (command code 11), but interface settings for Ethernet and Modbus RTU are not reset to the factory setting.
31	Reserve	
51	Reserve	
60	Calibration point 0 valid	Calibration point 0 valid / save values for calibration point 0.
61	Calibration point 1 valid	Calibration point 1 valid / save values for calibration point 1.
62	Calibration point 2 valid	Calibration point 2 valid / save values for calibration point 2.
81	Characteristic shift	Move calibration characteristic. The command defines the current weight of the scale as the new zero point (0 kg) and shifts the complete characteristic without changing the gradient. The command can be used, for example, in order to compensate parts used for mounting calibration weights on the scale at the end of the calibration.
82	Perform automatic calibration	Calculating the scale characteristic curve with reference to the load cell from data record 10. The calculated characteristic curve is entered directly in data record 3 and 4, and thus activated immediately after executing the command. The scale must be empty when the command is executed.
83	Perform calibration check	The command calculates the theoretical digital values in•relation to the calibration weights using the load cell parameters from data record 10 and the adjustment weights 0, 1 and 2 from data record 3. The output of these theoretical digits is made in data record 4. The function can be used to check the plausibility of adjustment digits in data record 3, which have been determined in a legal-for-trade calibration.
907	Apply load cell impedance	The currently measured impedance value (DS31) is transferred to the DS 10.

Table 8- 2 Commands 450 ... 499: Trace commands

Command code	Command	Description
451	Trace RAM on	Start permanent tracing
452	Trace RAM off	Stop permanent tracing
454	Delete trace RAM	Delete tracing memory.

Table 8- 3 Commands 700 to 899: HMI display switching

Command code	Command	Description
701	Increased resolution	Increased resolution on the main display
705	Display current tare weight	Current tare weight on the main display
710	Activate standard display	Activate standard display gross/net (main display)
714	N Process value	Show net process weight on the main display

Command code	Command	Description
715	B Process value	Show gross process weight on the main display
716	B process value after first filter	Gross process weight after the first filter

Table 8- 4 Commands 1000 ... : Basic functions for weighing commands

Command code	Command	Description
1001	Set to zero	Zeroing (semi-automatic)
1011	Tare	Taring (semi-automatic)
1012	Delete tare	Delete current tare weight
1013	Valid tare	Activate default tare
1016	SIMATIC tare specification	Specified tare weight from SIMATIC I/O interface

8.3 Command groups of SIWAREX WP521/WP522

The following commands can be triggered in the scale data block DB_SCALE in the area CMD1 to CMD3:

Table 8- 5 Command groups of SIWAREX WP521/WP522

Command group	Description
1 ... 999	Commands are passed by the function module to the module via data record DR 2 (scale, weighing, display, trace commands). The meanings of the commands correspond to the command list (see → Command lists (Page 133)).
2000 + X	Reading of a data record, X corresponds to the data record number. Example: Data record 3 transmitted by SIWAREX module to SIMATIC CPU → 2000 + 3 = command code 2003
4000 + X	Writing of a data record, X corresponds to the data record number. Example: Data record 3 transmitted by SIMATIC CPU to the SIWAREX module → 4000 + 3 = command code 4003
7001	Read all data - Read all data from the SIWAREX to the CPU
7002	Write all data - Write all data from the CPU to the SIWAREX (service mode has to be turned on)

Additional information on transmission of commands from the control program by means of the SIMATIC interface is available in chapter Communication with SIMATIC S7-1500 (Page 137).

Communication with SIMATIC S7-1500

9

9.1 General information

A SIWAREX WP521 occupies 32 bytes, a SIWAREX WP522 occupies 64 bytes in the I/O area of the CPU.

The effect of the mode switch setting (see section "Ex-works settings of the operating switch (Page 36)") on the reaction to CPU failure or stop must be taken into account. If the switch is set to SIMATIC operation ex factory, the user use the parameters in DR7 to determine how the module reacts to CPU failure or stop.

The function block can be used to read the current process values of the scale (weight, status). It is also possible to set the scale parameters and issue commands (taring, zeroing, etc.). A separate call of the FB is required for each weighing channel.

The function blocks described above including HMI configurations can be downloaded as a completed example project ("ready-for-use") at: Example project "ready-for-use" (https://support.industry.siemens.com/cs/document/94109373/tia-portal-project-%E2%80%9Eready-for-use%E2%80%9C-for-siwarex-wp521/wp522?dti=0&lc=en-WW)

The latest firmware versions for the weighing modules can be downloaded at:Firmware (https://support.industry.siemens.com/cs/document/75231231/firmware-siwarex-wp231?dti=0&lc=en-WW)

9.2 System environment

The technology module can be used in the following system environments:

Possible applications	Required components	Configuration software	In the user program
Central operating in an S7-1500 system	S7-1500 automation system	STEP 7 (TIA Portal): Device configuration with the hardware configuration (HWCN)	Control by a SIWAREX FB and instance DB
Distributed operation with S7-1500 and ET200MP	Distributed I/O System ET 200MP		

9.3 Memory requirements for SIWAREX communication

The memory requirement is summarized in the following table.

Table 9- 1 Properties of the function block

FB properties	FB call per weighing channel
Read weight & status	YES
Drop commands	YES
Transfer parameters	YES
Work memory requirement in CPU	15600 bytes + n x 2 650 bytes
Load memory requirements in CPU	232000 Byte + n x 62000 Byte

n = number of weighing channels

9.4 Creating the hardware configuration

As of TIA Portal V14, SIWAREX WP521/WP522 is integrated as standard in the hardware profile as an S7-1500 technology module.

An HSP is available for integration in TIA Portal V13 at:Hardware Support Package (https://support.industry.siemens.com/cs/document/73514020/hardware-support-package-(hsp)-for-siwarex-wp231-in-tia-portal-v11-sp2-for-products%3A-7mh4960-2aa01?dti=0&lc=en-WW)

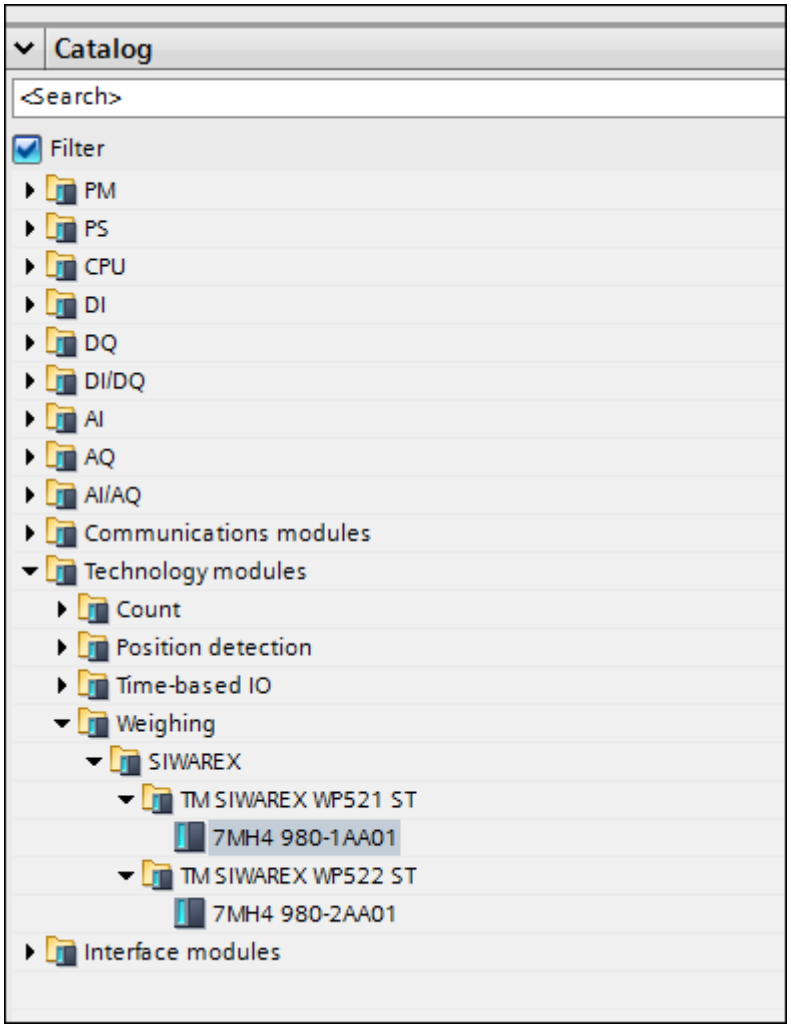


Image 9-1 Configuration in the TIA Portal

The SIWAREX WP521 or SIWAREX WP522 module can be placed directly next to the S7-1500 CPU via drag-and-drop.

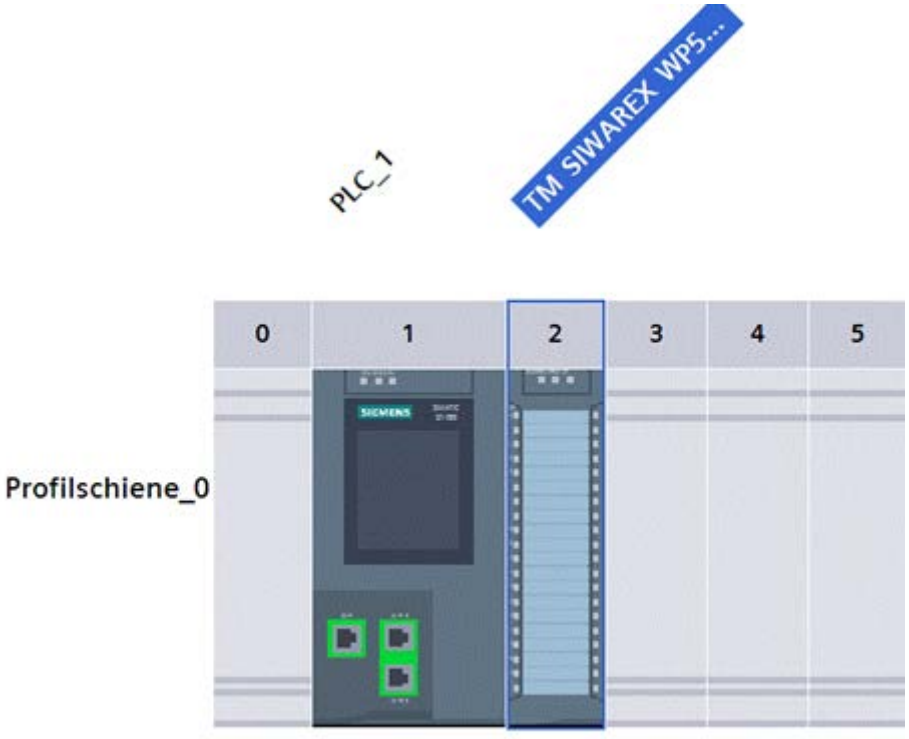


Image 9-2 Configuration with S7-1500 CPU

TIA Portal automatically assigns a separate I/O start address and a HW ID for every SIWAREX present in the project. These two parameters are relevant for calling the function block, and can be obtained from the properties of the respective module. The address range is always in the region of the I/O image of the automation system.

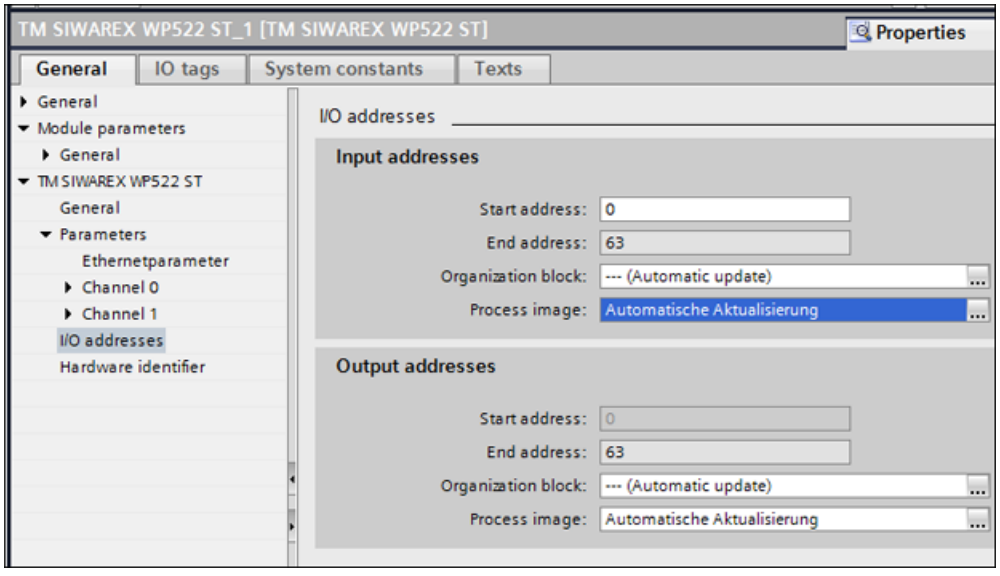


Image 9-3 Addressing of the SIWAREX WP522 module in TIA Portal

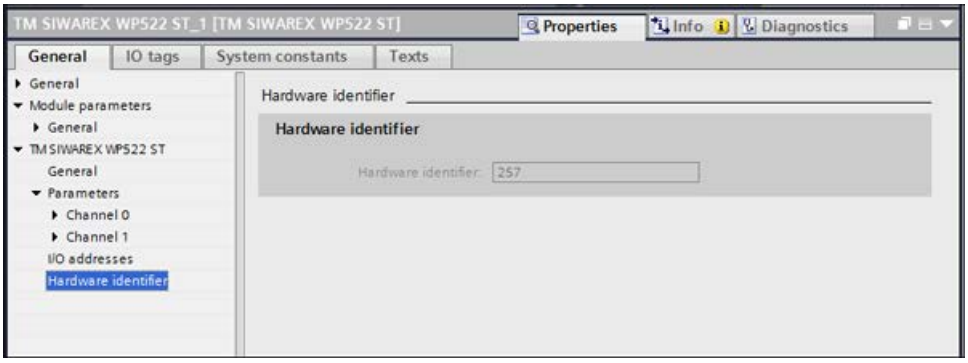


Image 9-4 HW ID of module in TIA Portal

9.5 Diagnostic messages

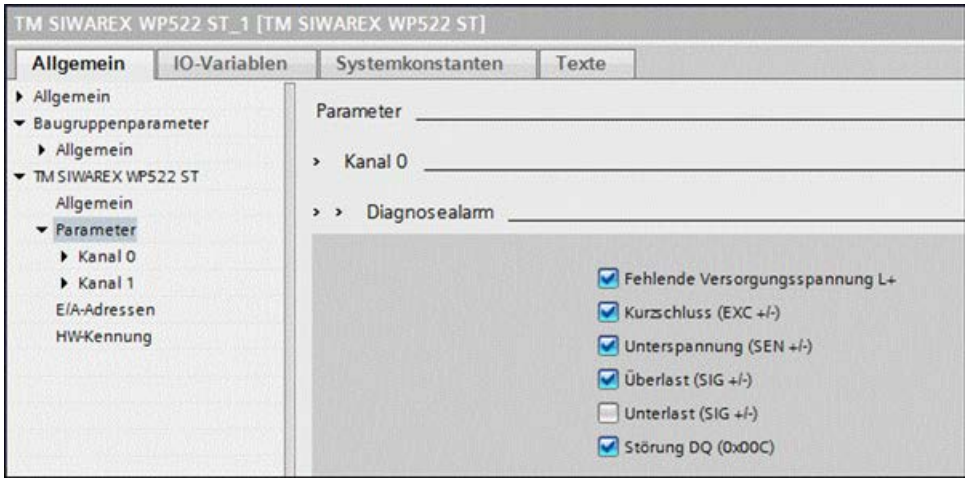
The DIAG LED flashes red if a diagnostic message is pending. Diagnostic results are displayed as plain text in STEP 7 (TIA Portal) via the online and diagnostics view. You can evaluate the error code via the OB82 user program.

The following diagnostic messages can be generated:

Table 9- 2 Diagnostic messages

Diagnostic message	Error code	Meaning	Remedy
Short-circuit	01H	Short-circuit in the load cell supply	Check line up to load cell
Under voltage	02H	Under-voltage of sense lines	Voltage drop to the load cell to high. Check cause.
Overload	07H	High limit for sensor voltage exceeded	Overload of the scale eliminated
Load low	08H	Low limit for sensor voltage undershot	Check mechanics of the scale, check the wiring of the sensor.
Error	09H	Internal module error, fault	Replace technology module
ADC error	0BH	Signal conversion by ADC faulty	EMC faults may be responsible for this error
DQ error	0CH	Fault in digital outputs	Check supply voltage for DQs, check for overload
Parameter checksum error	0DH	The checksum for the parameter integrity is incorrect	Load factory setting for parameters.
Checksum error program	0EH	The checksum for the parameter integrity is incorrect	Reload firmware, replace module
No load voltage	11H	No L+ for technology module	Check supply voltage on BaseUnit

Diagnostic message	Error code	Meaning	Remedy
Hardware interrupt lost	16H	Technology module cannot generate an interrupt, because previous alarm has not yet been processed	Change interrupt processing in the CPU, re-configure technology module.
Module temporarily unavailable	1FH	Normal operation of the module is not possible, because a firmware update is being performed, for example.	Wait until module goes into normal operation.



9.6 Triggering a hardware interrupt

You can configure which events are to trigger a hardware interrupt for the SIWAREX module.

Based on the configuration, the SIWAREX module triggers a hardware interrupt for specific events/limits. When a hardware interrupt occurs, the CPU interrupts execution of the user program and processes the associated hardware interrupt OB. The event that triggered the interrupt is entered by the CPU into the start information of the associated hardware interrupt OB.

Activation of the hardware interrupts

For the device configuration of the SIWAREX module, you can activate the hardware interrupts in the TIA Portal under "Basic parameters > Channel 0 or 1> Hardware interrupts".

Lost hardware interrupt

When an event that triggers a hardware interrupt occurs and a previous event of the same kind has not yet been processed, no further hardware interrupt is triggered. The hardware interrupt is lost. Depending on the configuration, this can result in a "Lost hardware interrupt lost" diagnostic alarm.

No hardware interrupts are activated by default.

One result of triggering a hardware interrupt is that the following two variables are entered in the start information of the associated hardware interrupt OB:

- EventType: One byte with a set bit
- IChannel: Number of the channel that triggered the hardware interrupt

Table 9- 3 Table of event bits

Hardware interrupt	EventType bit
Limit 1 OFF → ON	0
Limit 1 ON → OFF	1
Limit 2 OFF → ON	2
Limit 2 ON → OFF	3
Limit 3 OFF → ON	4
Limit 3 ON → OFF	5

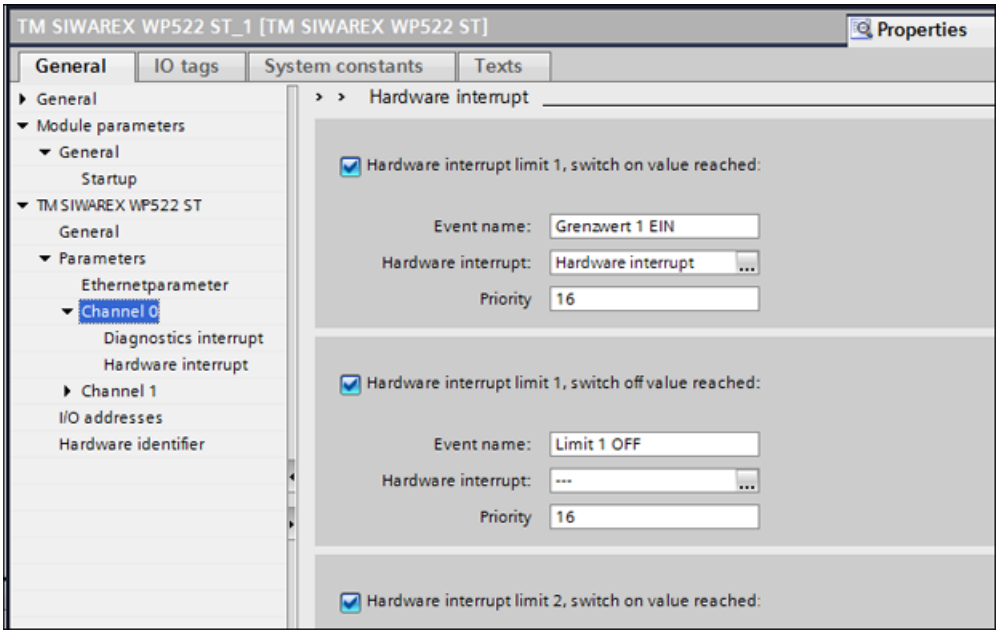


Image 9-5 Configuration of hardware interrupts

9.7 Ethernet approvals

It may be necessary to restrict the communication options via Ethernet for reasons of data security. It is recommendable to deactivate surplus interfaces.

Note

Please also observe the Security information (Page 9).

The settings in HW Config only take effect in "SIMATIC mode", see Ex-works settings of the operating switch (Page 36).

The restriction of Ethernet Modbus communication can be performed per configuration of the ports in data record DR12 (port number = 0)

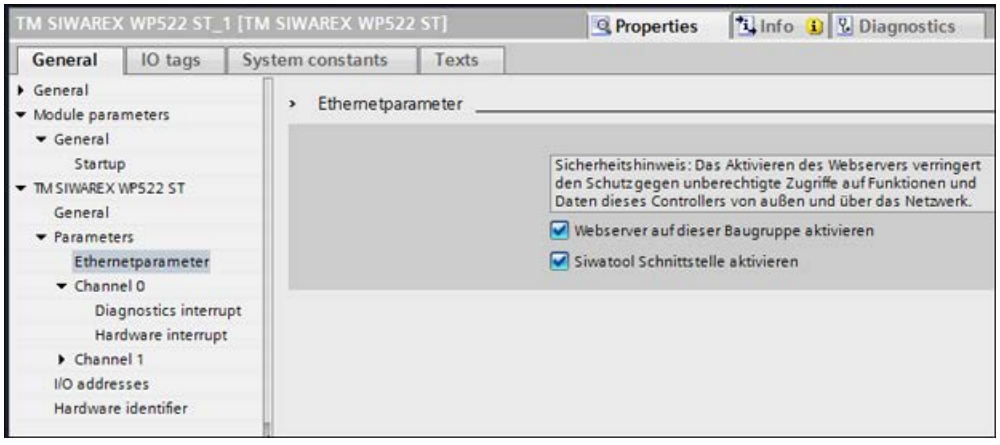


Image 9-6 Ethernet approvals

9.8 Calling of function block

This description is based on using the "SIWAREX_WP52X" block (FB1552) with data record communication and the following data:

- **Start address** SIWAREX WP521/WP522: 68 (see →
- **HW ID** SIWAREX WP521/WP522: 257 (see → Image 9-4 HW ID of module in TIA Portal (Page 141)
- **Instance data block number** of the function block: DB521

The function block can be integrated at the desired position in the user program using drag and drop. Calling of the FB must be carried out cyclically in the control program.

FB "SIWAREX WP52X" is called once in OB1 for the SIWAREX WP521 module. For the SIWAREX WP522 module, FB "SIWAREX_52X" is called once for each channel.

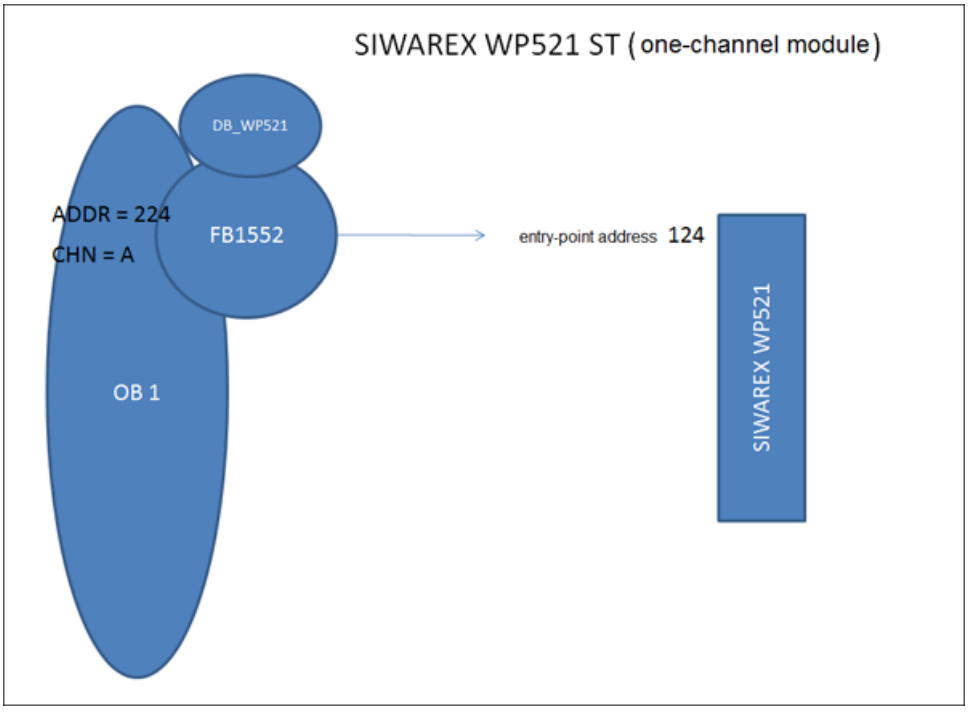


Image 9-7 Call block for SIWAREX WP521

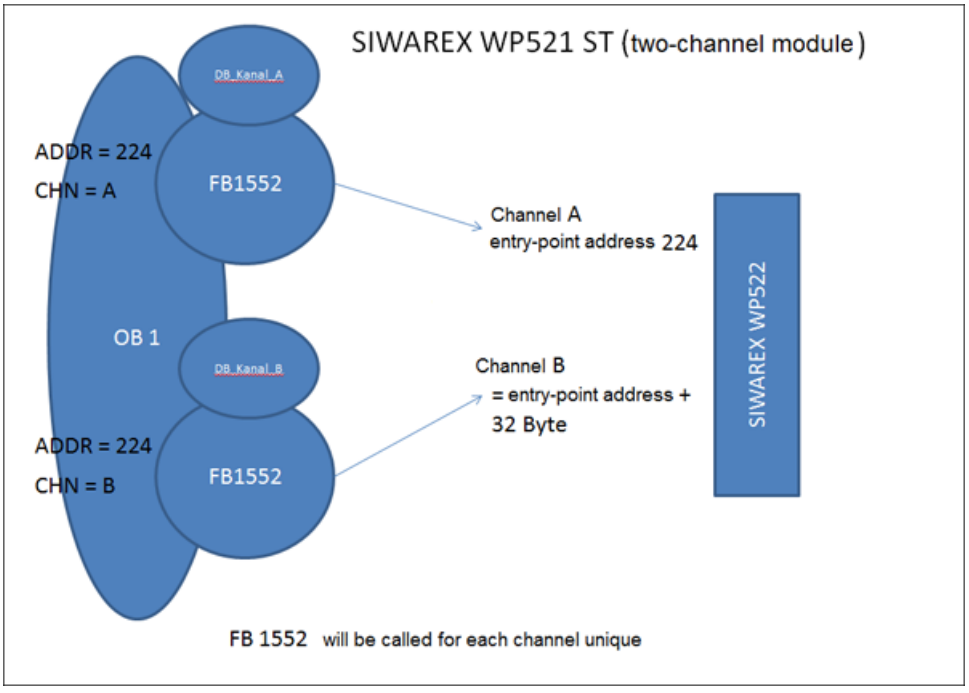


Image 9-8 Call block for SIWAREX WP522

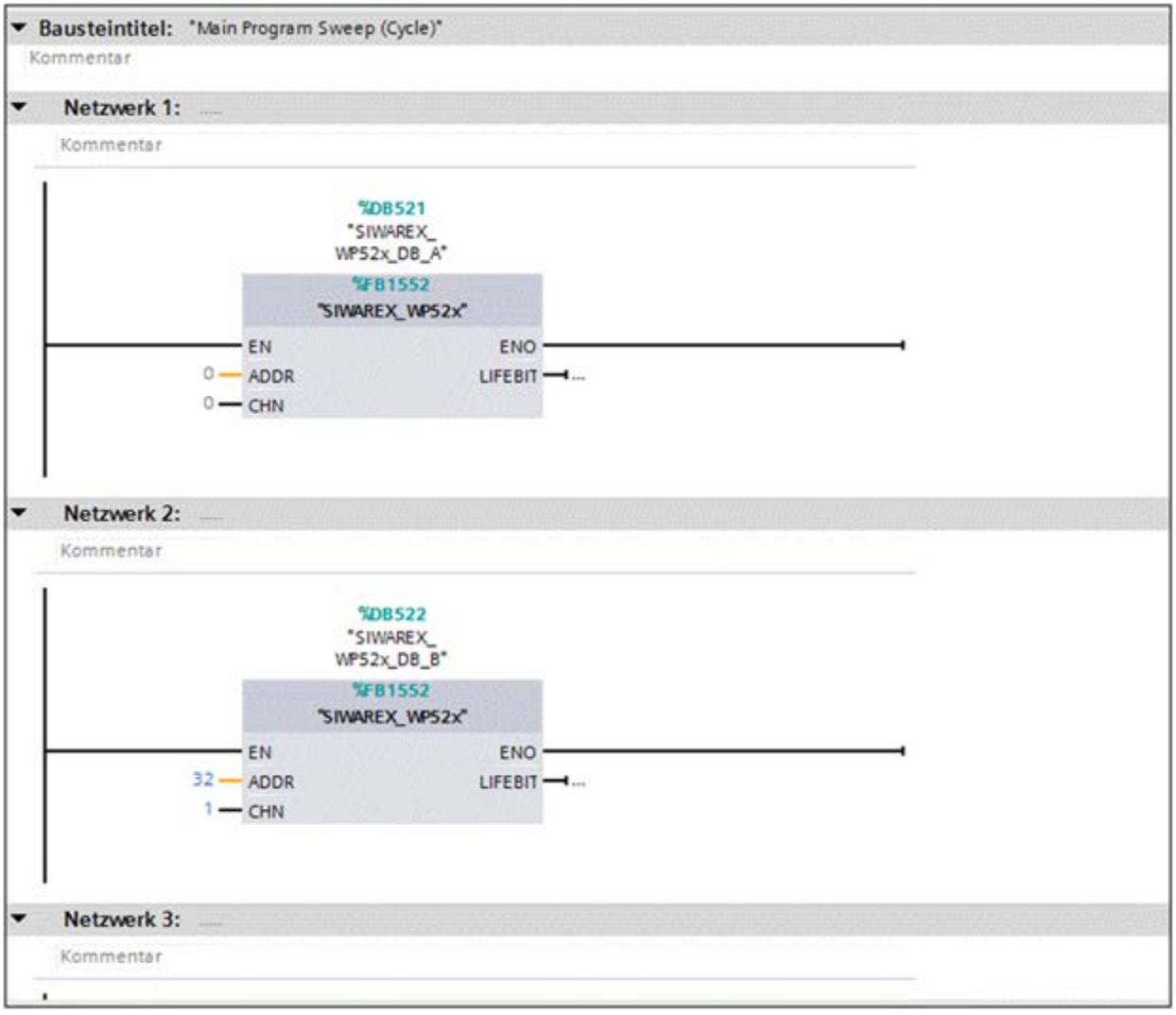


Image 9-9 Call the block for SIWAREX WP521/WP522 in the user program

Function block parameter	Description
ADDR	Start address WP521/WP522 (see → Creating the hardware configuration (Page 138))
HW_ID	HW ID WP521/WP522 (see → Creating the hardware configuration (Page 138))
DB_NO	Number of FB-internal instance DB
LIFEBIT	Optional status bit can be used to monitor communication

The generated instance DB (DB521 in this case) has multi-instance capability and includes all data records of the WP52X, as well as all the necessary parameters for data communication between the CPU and the weighing module.

A separate FB call must be made in the user program for each weighing module. In this manner, each scale receives its own instance DB (or a section of the multi-instance DB is

assigned to each scale) which provides the respective scale parameters. The input and output parameters of the FB must be adapted for each call.

9.9 Working with the function block

Data records in SIWAREX weighing modules

All parameters in SIWAREX weighing modules are structured in data records. These data records must be considered as connected packages and can only be respectively read into the CPU or written to the SIWAREX as complete packages. Reading or writing of a single parameter within a data record is not possible. You can find a description of all data records and their parameters in chapter → Scale parameters and functions (Page 67).

Reading and writing of data records is carried out using special command codes which can be sent with three command mailboxes handled according to priority within the instance DB:

11	s_CMD1	Struct	462.0	
12	i_CMD_CODE	Int	0.0	0
13	bo_CMD_TRIGGER	Bool	2.0	false
14	bo_CMD_InProgress	Bool	2.1	false
15	bo_CMD_Finished...	Bool	2.2	false
16	bo_CMD_Finished...	Bool	2.3	false
17	s_CMD2	Struct	466.0	
18	i_CMD_CODE	Int	0.0	0
19	bo_CMD_TRIGGER	Bool	2.0	false
20	bo_CMD_InProgress	Bool	2.1	false
21	bo_CMD_Finished...	Bool	2.2	false
22	bo_CMD_Finished...	Bool	2.3	false
23	s_CMD3	Struct	470.0	
24	i_CMD_CODE	Int	0.0	0
25	bo_CMD_TRIGGER	Bool	2.0	false
26	bo_CMD_InProgress	Bool	2.1	false
27	bo_CMD_Finished...	Bool	2.2	false
28	bo_CMD_Finished...	Bool	2.3	false

Image 9-10 CMD command mailboxes

As shown in the graphics, a command mailbox always consists of a command code (Int) and four bits (Bool). A command is set by entering the desired command code in the "i_CMD_CODE" parameter and setting the respective command trigger "bo_CMD_TRIGGER". The status bits "bo_CMD_InProgress" (command being processed), "bo_CMD_FinishedOk" (command finished without errors) and "bo_CMD_FinishedError" (command rejected or finished with error) can be evaluated in the user program.

In addition, the three command mailboxes are managed and processed according to priority. CMD1 has the highest priority, CMD3 has the lowest priority. If all three command mailboxes are triggered simultaneously by the user program, for example, the function block initially processes CMD1, then CMD2, and finally CMD3. Cyclic triggering of command mailbox 3 is

also interrupted by intermediate sending of a command in mailbox 2 or 1 for processing of the respective command.

Note

Cyclic triggering of the CMD1 command mailbox makes it impossible to send commands in mailbox 2 or 3.

A summary of all existing command codes can be found in chapter →Command lists (Page 133).

The following equation for generation of a corresponding command code applies to the reading of data records from the SIWAREX to the data block:

Command code = 2000 + X (X = desired data record number)

The following equation for generation of a corresponding command code applies to the writing of data records from the data block to the SIWAREX:

Command code = 4000 + X (X = desired data record number)

Example

The following example clarifies the actions with command mailboxes and data records:

"Calibration weight 1" is to be set to a value of 12.5 by the CPU. Since "Calibration weight 1" is a parameter of data record 3 (see section → Scale parameters and functions (Page 67)), service mode must be first activated. This can be done with command code "1" (see section → Command lists (Page 133)).

The variable "i_CMD_CODE" must therefore be assigned the value "1" and the associated "bo_CMD_TRIGGER" set to TRUE. Subsequently, the module is directly in service mode (DIAG LED flashes green):

i_CMD_CODE = 1

bo_CMD_TRIGGER = TRUE

Since only complete data records can be read or written, it is recommendable to now read data record 3 into the CPU. This is carried out using command code 2003 (see chapter → Command lists (Page 133)):

i_CMD_CODE = 2003

bo_CMD_TRIGGER = TRUE

All current data from data record 3 are now present in the data block. The calibration weight is then set as desired to a value of 12.5:

CALIB_WEIGHT_1 = 12.5

The modified data record 3 must now be written into the SIWAREX again. This is carried out using command code 4003 (see chapter → Command lists (Page 133)):

i_CMD_CODE = 4003

bo_CMD_TRIGGER = TRUE

The new calibration weight is now present in the SIWAREX and can be used. Service mode for the module should subsequently be switched off again using command "2".

This procedure for reading and writing data records is identical for all data records.

9.10 I/O interface of function block

The following scale parameters are available cyclically in the data block in the controller without special reading of data records or can be sent to the scale without sending of data records:

Table 9- 4 I/O data of function block

Parameter (read)	Meaning
SCALE_STATUS_1 (UINT)	Bytes 0 & 1 of the scale status (see data record 30)
SCALE_STATUS_2 (UINT)	Bytes 2 & 3 of the scale status (see data record 30)
PROCESS_VAL_1 (REAL)	Scale value in accordance with selection in data record 14
PROCESS_VAL_2 (REAL)	Scale value in accordance with selection in data record 14
OPERATION_ERRORS	Operating error according to Message list (Page 124)
TECHNOLOGICAL_ERRORS_1	Technology messages according to Message list (Page 124)
TECHNOLOGICAL_ERRORS_2	Technology messages according to Message list (Page 124)
TECHNOLOGICAL_ERRORS_3	Technology messages according to Message list (Page 124)
DATA_CMD_ERROR_1	Data command error according to Message list (Page 124)
DATA_CMD_ERROR_2	Data command error according to Message list (Page 124)
DATA_CMD_ERROR_3	Data command error according to Message list (Page 124)
ADD_INFO	Additional information data / operator errors
Parameter (write)	
TARE_VALUE (REAL)	Tare default value of S7 I/Os (activate with command 1016)
DIGIT_OUTPUT (UINT)	Default values for digital outputs, if they have assigned as an "S7 interface" function in data record 7.

9.11 Error codes of function block

States and errors of the FB.

Table 9- 5 Statuses/errors when working with the function block

Error bit	Error description
bo_AppIIDError	Address module does not match the function block
bo_AppIIDDRError	Data record does not match the inserted module
bo_SFBError	Runtime error during transmission of data record
bo_RdPerError	Reading of I/O data failed
bo_LifeBitError	SIWAREX no longer responds
bo_StartUpError	Command was sent although StartUp is still TRUE
bo_WrongFW	Data record version does not match the firmware
bo_InvalidCMD	An invalid command code was sent

Error bit	Error description
bo_DataOperationError	Synchronous data operation error has occurred
bo_StartUp	Startup synchronization of module running

Note

If execution of the function block is faulty, the variables shown do not correspond to the actual status in the module.

Communication via Modbus 10

10.1 General information

The current process values and parameters can be exchanged via the RS485 interface with Modbus RTU or the Ethernet interface with Modbus TCP/IP. It is possible to use both interfaces for the communication.

Note

Please also observe the Security information (Page 9).

The following chapters describe the specifications for handling communication. The following functions can be executed:

- Export parameters from the electronic weighing system
- Write parameters
- Export current process values
- Monitor messages

10.2 Special feature of Modbus TCP/IP connection to SIWAREX WP522

There are two ways to communicate with two scale channels via Modbus TCP/IP:

- Communication for both weighing channels vis port 502. The register numbers of the data record tables for weighing channel B can be increased by the offset value 5000.
- Communication for both channels via freely configurable ports. The register numbers indicated in the record tables apply to both weighing channels.

The assignment of a new IP address to a SIWAREX module is necessary if several SIWAREX modules are present in one network.

- Modbus TCP/IP for SIWAREX WP521: Port: 502
- Modbus TCP/IP for SIWAREX WP521/WP522: Port: 502

or

- Modbus TCP/IP for SIWAREX WP522 channel A: port configurable, channel B: port configurable

10.3 Principle of data transmission

This description is valid for communication via Modbus RTU and Modbus TCP/IP.

The standardized MODBUS protocol is used for communication. The master function is always in the connected communication partner, while the SIWAREX module is always the slave.

Data transfer is bidirectional. The master function is always in the connected module which “controls” the communication with corresponding requests to the respective SIWAREX module address. The SIWAREX module is always the slave and responds to the requests of the master, provided that the address matches, with a response frame.

Each Modbus partner has its own address. The SIWAREX module has the default address 1. This address can be changed as a parameter (e.g. in SIWATOOL). This address is without significance if the Ethernet interface is used because the connection is based on the IP address.

If the RS485 interface is used, the following character frame is valid:

Start bit	1
Number of data bits	8
Parity	Even
Stop bit	1

The following baud rates can be set:

- 9 600 bit/s
- 19 200 bit/s (default setting)
- 38 400 bit/s
- 57 600 bit/s
- 115 000 bit/s

Functions which can be used by the master are listed below. The structure and contents of the registers are shown in chapter "Scale parameters and functions (Page 67)".

Service	Function code	Usage
Read Holding Registers	03	Read one or more 16-bit parameter registers
Write Single Register	06	Write a single parameter register
Write Multiple Registers	16	Write multiple registers

If a request of the master is answered by the SIWAREX module (slave), the SIWAREX module sends a response frame with or without errors. In the case of a response without error message, the response frame contains the received function code; in the case of errors, the highest bit of the function code is set. This corresponds to the Modbus standard. Afterwards, the master requests the data record DR 32 to check which process-related data or operator errors exist.

10.4 Data record concept

The register assignment is an image of the data records. The chapter → Scale parameters and functions (Page 67) describes the data records, variables and functions, including the register addresses. The data records are always checked as complete data packets for plausibility. For this reason, you must follow a specific procedure to change individual parameters.

10.5 Command mailboxes

Corresponding command codes must be sent in order to execute commands and to read and write data records in the Modbus buffer memories. These are described in more detail in chapter → Command lists (Page 133). The following tables list the Modbus registers used to process these commands:

Table 10- 1 Command mailbox 1: Highest priority

Variable	Note	Type	Modbus registers
CMD1_CODE	Code of command to be executed	USHORT	910
CMD1_TRIGGER	Trigger for starting the command	USHORT	911
CMD1_STATUS	0=job running; 1=job finished (1 cycle)	USHORT	912
CMD1_QUIT	0=no error; <>0=error code	USHORT	913

Table 10- 2 Command mailbox 2: Average priority

Variable	Note	Type	Modbus registers
CMD2_CODE	Code of command to be executed	USHORT	920
CMD2_TRIGGER	Trigger for starting the command	USHORT	921
CMD2_STATUS	0=job running; 1=job finished (1 cycle)	USHORT	922
CMD2_QUIT	0=no error; <>0=error code	USHORT	923

Table 10- 3 Command mailbox 3: Low priority

Variable	Note	Type	Modbus registers
CMD3_CODE	Code of command to be executed	USHORT	930
CMD3_TRIGGER	Trigger for starting the command	USHORT	931
CMD3_STATUS	0=job running; 1=job finished (1 cycle)	USHORT	932
CMD3_QUIT	0=no error; <>0=error code	USHORT	933

10.6 Reading registers

The method for reading registers depends on whether they belong to the writable data records (DR 3 to DR 29) or can only be read as current values (DR 30 to DR 34).

If you wish to read the registers from the data records DR 3 to DR 29, you must first export these as a complete data record to the internal output buffer.

All Modbus registers of the individual parameters can be found in chapter → Scale parameters and functions (Page 67).

Example

A parameter is to be read from data record 3 (DR 3).

- First, write register CMD3_CODE with 2003 (2000 plus the number of the data record = read data record).
- Then write "1" for CMD3_TRIGGER. DR3 is now updated in the Modbus buffer.
- It is now possible to read one or more registers with the corresponding variable(s). The data consistency of the registers read at this time is guaranteed.

You can find all further command numbers in chapter → Command lists (Page 133).

Example

A current measured value is to be read out from DR 30.

⇒ The register can be directly requested because its contents are automatically refreshed in the SIWAREX module at the specified measuring rate of 100 Hz and are always available up-to-date.

10.7 Writing registers

If you wish to write registers from the data records DR 3 to DR 29, you must first export the corresponding data record to the internal output buffer using an appropriate command. Individual registers can then be written. The complete data record must subsequently be written internally using an appropriate command. A plausibility check of the complete data record is carried out in the process.

Example

A parameter from DR 3 is to be written.

- First, write register CMD3_CODE with 2003 (2000 plus the number of the data record).
- Then write "1" for CMD3_TRIGGER. DR 3 is now updated in the Modbus memory.
- Now you can write or make changes in one or more registers with the corresponding variable. If you want to transfer the written/changed register to the scale, you need to write the entire data record:
- First, write register CMD3_CODE with 4003 (4000 plus the number of the data record = write data record).
- Then write "1" for CMD3_TRIGGER.
- The data record is then transferred to the process memory in the SIWAREX module. All registers of the data record are checked for plausibility in the process.

If the plausibility check fails, the complete data record is not written and a message is output to the user (from the area of data/operator errors).

You can find all further command numbers in chapter → Command lists (Page 133).

A document for working with SIWAREX WP521/WP522 and Modbus is also available online →Modbus communication of the WP521/WP522 (https://support.industry.siemens.com/cs/document/77913998/how-does-the-modbus-communication-of-the-wp231-work?dti=0&lc=en-WW).

Technical specifications

11

11.1 Technical specifications

A scale can be connected to the SIWAREX WP521.

Two separate scales can be connected to the SIWAREX WP522. The weighing functionality is available 2x.

24 V power supply

Note

The 24 V DC nominal power supply, all interfaces and all I/O circuits must be powered from sources with safety extra-low voltage that fulfill the requirements SELV, PELV according to IEC 61140 or NEC Class 2 meet.

Table 11- 1 Technical specifications: Power supply 24 V DC

Rated voltage	24 V DC
Static low / high limits	19.2 / 28.8 V DC
Dynamic low / high limits	18.5 / 30.2 V DC
Non-periodic overvoltages	35 V DC for 500 ms with a recovery time of 50 s
Maximum current consumption (without digital inputs/outputs, see table)	WP521: 120 mA, WP522: 200 mA @ 24 V DC
Module power loss typical (without digital inputs/outputs, see table)	WP521: 2.4 W, WP522: 3.9 W

Power supply from SIMATIC S7 backplane bus

Table 11- 2 Technical specifications: Power supply backplane

Current consumption from SIMATIC S7-1500 backplane bus	Typical 35 mA @15 V

Load cell interface analog (with WP522 1x per weighing channel)

Table 11- 3 Technical specifications: Load cell interface

Error limit according to DIN1319-1 at 20 °C +10 K[1)]		≤ 0.05 % v.E.
Measuring accuracy to OIML R76-1:2006/EN45501:2015 (not certified)	Class	III
	Resolution	3000d
	Error percentage pi	0.4
	Step voltage	0.5 µV/e

Accuracy delivery state[2)]		typ. 0.1 % v.E.
Sampling rate		100 Hz
Input signal resolution		± 4 000 000
Measuring range		± 4 mV/V
Common mode voltage range		0.25 V to +4.75 V
strain gauge feed 3)		4.85 V DC ± 3 %
Short-circuit and overload protection		Yes
Connection		6-wire
Sensor voltage monitoring		≤ 4.0 V
Min. DMS input resistance per channel	without Ex-i interface SIWAREX IS	40 Ω
	with Ex-i interface SIWAREX IS	50 Ω @ type 7MH4710-5BA 100 Ω @ type 7MH4710-5CA
Max. DMS output resistance		4 100 Ω
Temperature coefficient range		≤ ± 5 ppm/K v. E.
Temperature coefficient zero point		≤ ± 0.015 µV/K
Linearity error		≤ 0.005 %
Measured value filtering		Low-pass and average value filter configurable (DR3)
Electrical isolation		Typ. 500 V AC
50 Hz / 60 Hz noise suppression CMRR		> 90 dB
Input resistance	Signal cable	typ. $20*10^6$ Ω
	Sensor cable	typ. $100*10^6$ Ω
Cable length[4)]	Special cable	max. 800 m

1) Relative accuracy! (Absolute accuracy can only be achieved with local calibration with calibration standards)

2) Accuracy for module exchange or theoretical calibration decisive

3) Value applies to the sensor; voltage drops on lines are compensated up to 5 volts

4) When using SIWAREX cable 7MH4702-8AG

Digital outputs DQ (for WP522 4x per weighing channel)

In case of fault or SIMATIC CPU stop, the configured value is always applied to the digital output.

A freewheeling diode is provided on the consumer for inductive loads at the digital output.

Table 11- 4 Technical specifications: Digital outputs

Number per weighing channel	4 (High Side Switch)
Supply voltage range	19.2 ... 28.8 V DC
Max. output current per output	0.5 A (ohmic load)
Max. total current for all outputs	2.0 A
Update rate (FW)	100

Switching delay	typ. 65 µs Turn-On @I_L = 500 mA typ. 110 µs Turn-Off @I_L = 100 mA
RDSON	< 0.2 Ω
Short-circuit proof	Yes
Electrical isolation	500 V AC
Cable length (meters)	Max. 500 m shielded, 150 m unshielded

Digital inputs DI (for WP522 3x per weighing channel)

Table 11- 5 Technical specifications: Digital inputs

Number of inputs	3
Rated voltage	24 V DC
Supply voltage range	max. DC 30 V
Current consumption @ 24 V DC	4 mA
Surge voltage	35 V DC for 0.5 s
Signal level logic 1 (max)	15 V DC, input current typ. 3 mA @24 V DC
Signal level logic 0 (max)	5 V DC, input current ≤ 2.0 mA
Sampling rate (FW)	10 ms
Configurable filtering (DS 7) [1)]	0 to 40 ms in intervals of 5ms
Electrical isolation	500 V AC
Type in accordance with EN 61131-2: 2007	Type 1 to 3

[1)] Signal changes shorter than the programmed time are recorded)

RS485 interface (for WP522 1x per weighing channel)

Table 11- 6 Technical specifications: RS-485

Standard	EIA-485
Baud rate	up to 115 Kbps*
Data bits	7 or 8
Parity	even | odd | none
Stop bits	1 or 2
Terminating resistors (can be activated)	390 Ω / 220 Ω / 390 Ω
Electrical isolation	500 V AC
Transfer protocol	ASCII for remote display, Siebert company and Modbus RTU
Cable length	≤ 115 Kbps max. 1 000 m (Fieldbus 2-core, shielded, e.g. 6XV1830-0EH10)

Ethernet (available only 1x)

Table 11- 7 Technical specifications: Ethernet

Standard		IEEE 802.3
Transmission speed		10/100 Mbps (automatic detection)
Electrical isolation		1 500 V AC
Transfer protocol		TCP/IP, Modbus TCP
Autonegotiation		Yes
Auto MDI-X		Yes
Cable lengths	Cable Cat 5e UTP (unshielded)	max. 50 m
	Cable Cat 5e SF/UTP (shielded)	max. 100 m

Dimensions and weight

Table 11- 8 Technical specifications: Dimensions and weight

Dimensions W x H x D (packaged)	41 x 191 x 164 mm
Dimensions W x H x D (unpackaged)	35 x 147 x 129 mm
Weight (packaged)	WP 521ST: 0.37kg WP 522ST: 0.42 kg

Mechanical requirements and data

Table 11- 9 Rated conditions in accordance with IEC 60721

Mode	IEC 60721-3-3 Class 3M3, stationary use, weather-proofed
Storage/transport	IEC 60721-3-2 Class 2M2 without precipitation

Technical specifications: Mechanical requirements and data

Testing	Standards	Test values
Vibrational load during operation	IEC 61131-2:2007 IEC 60068-2-6:2007 Test Fc	5 ... 8.4 Hz: 3.5 mm deflection 8.4 ... 150 Hz: 9.8 m/s^2 (=1G)
Shock load during operation	IEC 61131-2:2007 IEC 60068-2-27:2008 Test Ea	150 m/s^2 (approx. 15 g), half-sine Duration: 11 ms
Vibration load during transport	IEC 60068-2-6:2007 Test Fc	5 ... 8.4 Hz: 3.5 mm deflection 8.4 ...500 Hz: 9.8 m/s^2

Testing	Standards	Test values
Shock load during transport	IEC 60068-2-27:2008 Test Ea	250 m/s^2 (25G), half sine Duration: 6ms
Free fall	IEC 61131-2:2007 IEC 60068-2-31:2008 Test Ec, procedure 1	In product packaging: 300 mm drop height In shipping package: 1.0 m drop height

11.2 Electrical, EMC and climatic requirements

Electrical protection and safety requirements

Fulfilled requirement	Standards	Comments
Safety regulations	IEC 61010-1:2010 +C1:2011 + C2:2013 IEC 61010-2-201:2014 IEC 61131-2:2007 UL 508:2003 CSA C22.2 No.142:1990	
Protection class	IEC 61140:2001 + A1:2004 IEC 61131-2:2007	To maintain the safety characteristics of extra-low voltage circuits, external connections to communications ports, analog circuits, as well as all 24 V DC nominal power supplies and all I/O circuits must be powered by approved sources that fulfill the requirements according to the various standards for SELV, PELV, NEC Class 2, voltage limited or power limited. The ground connection for the DIN rail serves as a functional ground for dissipating interference currents.
IP degree of protection	IP 20 according to IEC 60529 1991 +A1:2000	IP20: • Protection against contact with standard probe • Protection against solid bodies with diameters in excess of 12.5mm • No special protection against water
Air gaps and creepage distances	IEC 60664:2007 IEC 61131-2:2007 IEC 61010-1:2010 UL 508:2003 CSA C22.2 No. 142:1990	Overvoltage category II Pollution degree 2

Fulfilled requirement	Standards	Comments
Isolation stability	IEC 61131-2:2007 CSA C22.2, No. 142:1990 UL508:2003	Ethernet port: 1 500 V AC (shield and signals) Other electrical circuits: Test voltage: 500 V AC or 707 V DC
Use in hazardous areas	IEC 60079-0:2009 IEC 60079-15:2010	When installing the modules in hazardous areas, the special operating conditions must be taken into consideration in accordance with SIWAREX Product Information – "Use of SIWAREX Modules in a Zone 2 Hazardous Area" A5E02192786A.
Electromagnetic compatibility	IEC 61000-6-2:2004 IEC 61000-6-4:2007+ A1:2011	All shielded cables must be grounded at both ends to comply with the requirements for electromagnetic compatibility. If the shielded cable is routed out of the hazardous area for explosion-proof equipment, both ends of the cable shield must be connected to the potential equalization. To comply with the requirements for lightning strikes, additional measures are required (see footnotes Table 12-11) for installation in Zone A according to IEC 61131-2: 2007.

Electromagnetic compatibility

Table 11- 10 Requirements: Emitted interference in industrial environment according to EN 61000-6-4

Comments	Standard	Limits
Emission of radio interferences (electromagnetic fields)	Class A industrial environment: • IEC/CISPR 16-2-3: 2006 • EN55016-2-3:2006	• 30 – 230MHz, 40dB(mV/m) Q • 230 – 1000MHz, 47dB(mV/m) Q • 1 GHz to 3 GHz / 76 dB(mV/m) peak, 56 dB(mV/m) average • 3 GHz to 6 GHz / 80 dB(mV/m)
Emission on 24 V power supply lines	Class A: Industrial environment: • IEC/CISPR 16-2-1: 2009 • EN 55016-2-1: 2004	Class A: Industrial environment • 0.15 ... 0.5 MHz, 79 dB (µV) Q • 0.15 ... 0.5 MHz, 66 dB (µV) M • 0.5 ... 30 MHz, 73 dB (µV) Q • 0.5 ... 30 MHz, 60 dB (µV) M
Emission on wired Ethernet	EN 61000-6-4:2007+A1:2011 IEC/CISPR 22: 2008 EN55022: 2010	0.15 ... 0.5 MHz: • 53 dB (µA) ... 43 dB (µA) Q • 40 dB (µA) – 30 dB (µA) M 0.5 ... 30 MHz: • 43 dB (µA) Q / 30 dB (µA) M

Table 11- 11 Requirements: Interference immunity in industrial environment according to EN 61000-6-2

Comments	Standard	Severity level
Burst pulses on power supply cables	EN 61000-4-4:2004 EN 45501:2015 OIML R 76:2006 NAMUR NE21:2011 EN 61326-1:2006 EN 61131-2:2007	±2.4 kV 5/50ns/5kHz ±2.4 kV 5/50ns / 100kHz
Burst pulses on data and signal cables		±2.4 kV 5/50ns/5kHz ±2.4 kV 5/50ns / 100kHz
Electrostatic discharge (ESD)	EN 61000-4-2:2009 EN 45501:2015 OIML R 76:2006 NAMUR NE21:2011 EN 61326-1:2006 EN 61131-2:2007	2, 4, 6 kV direct/indirect
Electrostatic air discharge (ESD)		2, 4, 6, 8 kV

Comments	Standard	Severity level
Surge on power supply cables	IEC 61131-2 :2007 NAMUR NE21 :2011 EN 61326-1 :2006 OIML R76 -2:2006 EN 61000-4-5 :2006 EN 45501:2015	ZONE A acc. to IEC 61131-2[2]: ±1.0 kV line to line ±2.0 kV line to earth ZONE B to IEC 61131-2: ±0.5 kV line to line ±1.0 kV line to earth
Surge on data and signal cables		ZONE A acc. to IEC 61131-2[3]: ±1.0 kV line to line ±2.0 kV line to earth ZONE B to IEC 61131-2: ±1.0 kV line to earth
Electromagnetic RF fields	IEC 61131-2 :2007 NAMUR NE21 :2011 EN 61326-1 :2006 OIML R76-2 :2006 EN 61000-4-3:2006 +A1:2008+A2:2010 EN 45501:2015	80MHz – 2.7 GHz: 20V/m
Induced conducted interference	IEC 61131-2 :2007 NAMUR NE21 :2011 EN 61326-1 :2006 OIML R76-2 :2006 EN 61000-4-6 :2009	10 kHz – 80MHz: $12V_{eff}$

[1] Not applicable for shielded cables and symmetrical ports

[2] An external fuse must be provided to comply with the requirement (e.g. Lightning conductor BVTAD24, Dehn & Söhne company)

[3] An external fuse must be provided to comply with the requirement (e.g. Lightning conductor BSPM4BE24, Dehn & Söhne company)

NOTICE

Radio interference is possible

This is a device of class A. The device may cause radio interference in residential areas. Implement appropriate measures (e.g.: use in 8MC cabinets) to prevent radio interference.

Ambient conditions

The SIWAREX WP521/WP522 is designed for use under the following conditions in SIMATIC S7-1500. Also observe the operating conditions of the S7-1500 system.

Table 11- 12 Operating conditions to IEC 60721

Mode	IEC 60721-3-3 Class 3K3, stationary use, weather-proofed
Storage/transport	IEC 60721-3-2 Class 2K4 without precipitation

Table 11- 13 Climatic requirements

Comments		Ambient conditions	Application areas
Operating temperature:	Vertical installation in S7-1500	0 to +40 °C	
	Horizontal installation in S7-1500	0 to +60 °C	
Storage and transport temperature		-40 to +70 °C	
Relative humidity		5 to 95 %	No condensation; corresponds to relative humidity (RH) stress level 2 to DIN IEC 61131-2
Pollutant concentration		SO_2: < 0.5 ppm H_2S: < 0.1 ppm;	RH < 60 % no condensation
Atmospheric pressure	Operation	IEC 60068-2-13	1080 to 795 hPa (operation) (-1 000 to + 2 000 m above sea level)
	For transport and storage	IEC 60068-2-13	1 080 to 660 hPa (storage) (-1 000 to +3 500 m above sea level)

Reliability

Mean Time Between Failure (MTBF)

The MTBF calculation results in the following values for the modules:

Table 11- 14 MTBF

Electronic Weighing System	MTBF in years
SIWAREX WP521	50 years @TA = 40°C
SIWAREX WP522	33 years @TA = 40°C

11.3 Approvals

NOTICE
Safety guidelines for applications in hazardous areas For applications in hazardous areas, the safety instructions in the document "Product Information - Use of SIWAREX Modules in a Zone 2 Hazardous Area (https://support.industry.siemens.com/cs/?lc=en-DE)" are to be observed.

Note

The latest valid approvals for SIWAREX WP521/WP522 can be found on the rating plate of the module.

CE	CE mark (https://support.industry.siemens.com/cs/document/65692972/declaration-of-conformity-ec-eu-declaration-of-conformity-manufacturer?dti=0&lc=en-WW)
cULus	cULus approval (https://support.industry.siemens.com/cs/document/74442065/general-product-approval-ul-ul?dti=0&lc=en-WW) - pending
FM APPROVED	FM approval for Zone 2 - pending
Ex	ATEX approval (https://support.industry.siemens.com/cs/document/81803667/for-use-in-hazardous-locations-manufacturer-declartion-manufacturer?dti=0&lc=en-WW) - pending For Category 3 Equipment according to EU Directive 2014/34/EU (ATEX)
IECEx	IECEx approval - pending For category 3 equipment
KC	KC mark For use in S. Korea

	RCM mark For use in Australia and New Zealand
	EAC mark pending For use in the Eurasian Customs Union
	The modules are RoHS-compliant according to EU Directive 2016/65/EU.

Accessories

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12.1 Configuration package

Ordering data	
Description	**Order number**
Configuration Package SIWAREX WP521/WP522 • SIWATOOL program for adjustment of scales during commissioning • Software "Ready for use" This contains the SIMATIC S7 blocks for operation with SIMATIC S7-1500 and a project for SIMATIC Operator Panel KTP600 • Product manuals in several languages	7MH4980-1AK01
Product Manual SIWAREX WP521/WP522 in various languages	Free download from the Internet WP521/WP522 Manuals (https://support.industry.siemens.com)
SIWAREX WP521/WP522 "Ready for Use"	Free download from the Internet "Ready for Use" (https://support.industry.siemens.com)
Front connector 35 mm with screw-type system	6ES7592-1AM00-0XB0
Front connector 35 mm with push-in system	6ES7592-1BM00-0XB0
Ethernet patch cable CAT5 For connecting the SIWAREX with a PC (SIWATOOL), a SIMATIC CPU, a panel, etc.	
Digital remote display The digital remote displays can be connected directly to the SIWAREX WP521/WP522 via the RS485 interface. Suitable remote display: S102 Siebert Industrieelektronik GmbH Postfach 1180 D-66565 Eppelborn, Germany Tel.: 06806/980-0 Fax: 06806/980-999 Internet: www.siebert.de (www.siebert.de) Detailed information can be obtained from the manufacturer.	
SIWAREX JB junction box for parallel connection of load cells	7MH4 710-1BA

Ordering data	
Description	**Order number**
SIWAREX EB extension box For extending load cell cables	7MH4 710-2AA
Ex interface, type SIWAREX IS With ATEX approval for intrinsically-safe connection of load cells, including manual, suitable for the load cell groups SIWAREX CS, U, M, FTA, and P	
• With short-circuit current < 199 mA DC	7MH4 710-5BA
• With short-circuit current < 137 mA DC	7MH4 710-5CA
Cable (optional)	
Cable Li2Y 1 x 2 x 0.75 ST + 2 x (2 x 0.34 ST) - CY • To connect SIWAREX CS, U, M, P, A, WP521/WP522 to the junction box (JB), extension box (EB) or Ex interface (Ex-I) or between two JBs, for fixed laying • Occasional bending is possible • 10.8 mm outer diameter • For ambient temperature -20 ... +70 °C	7MH4 702-8AG
Cable Li2Y 1 x 2 x 0.75 ST + 2 x (2 x 0.34 ST) - CY, blue sheath • To connect junction box (JB) or extension box (EB) in hazardous area and Ex interface (Ex-I), for fixed laying • Occasional bending is possible, blue PVC insulating sheath, approx. 10.8 mm outer diameter • For ambient temperature -20 ... +70 °C	7MH4 702-8AF

Appendix A

A.1 Technical support

Technical Support

You can contact Technical Support for weighing technology:

- E-mail (mailto:support.automation@siemens.com)
- Tel.: +49 (721) 595-2811

You can contact Technical Support for all IA and DT products:

- Via the Internet with the **Support Request:**
  Documentation
  (https://support.industry.siemens.com/cs/products?dtp=Manual&pnid=17781&lc=en-WW)
- Tel.: +49 (911) 895-7222
- Fax: +49 (911) 895-7223

You can find additional information about our technical support on the Internet at
Technical support (https://support.industry.siemens.com/cs/start?lc=en-WW)

Service & Support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base online on the Internet at:

Support request (https://support.industry.siemens.com/My/ww/en/requests)

There you will find:

- The latest product information, FAQs, downloads, tips and tricks.
- Our newsletter, providing you with the latest information about your products.
- A Knowledge Manager to find the right documents for you.
- Our bulletin board, where users and specialists share their knowledge worldwide.
- You can find your local contact partner for Industry Automation and Drives Technologies in our partner database.
- Information about on-site service, repairs, spare parts and much more is available under "Services".

Additional Support

Please contact your local Siemens representative and offices if you have any questions about the products described in this manual and do not find the right answers.

Find your contact partner at:

Partner (http://www.automation.siemens.com/aspa_app/?ci=yes&lang=en)

A signpost to the documentation of the various products and systems is available at:

Industry Online Support (https://support.industry.siemens.com/cs/?lc=en-DE)

A.2 ESD Guidelines

Definition of ESD

All electronic modules are equipped with large-scale integrated ICs or components. Due to their design, these electronic elements are highly sensitive to overvoltage, and thus to any electrostatic discharge.

The electrostatic sensitive components/modules are commonly referred to as ESD devices. This is also the international abbreviation for such devices.

ESD modules are identified by the following symbol:

NOTICE
Overvoltage on modules ESD devices can be destroyed by voltages well below the threshold of human perception. These static voltages develop when you touch a component or electrical connection of a device without having drained the static charges present on your body. The electrostatic discharge current may lead to latent failure of a module, that is, this damage may not be significant immediately, but in operation may cause malfunction.

Electrostatic charging

Anyone who is not connected to the electrical potential of their surroundings can be electrostatically charged.

The figure below shows the maximum electrostatic voltage which may build up on a person coming into contact with the materials indicated. These values correspond to IEC 801-2 specifications.

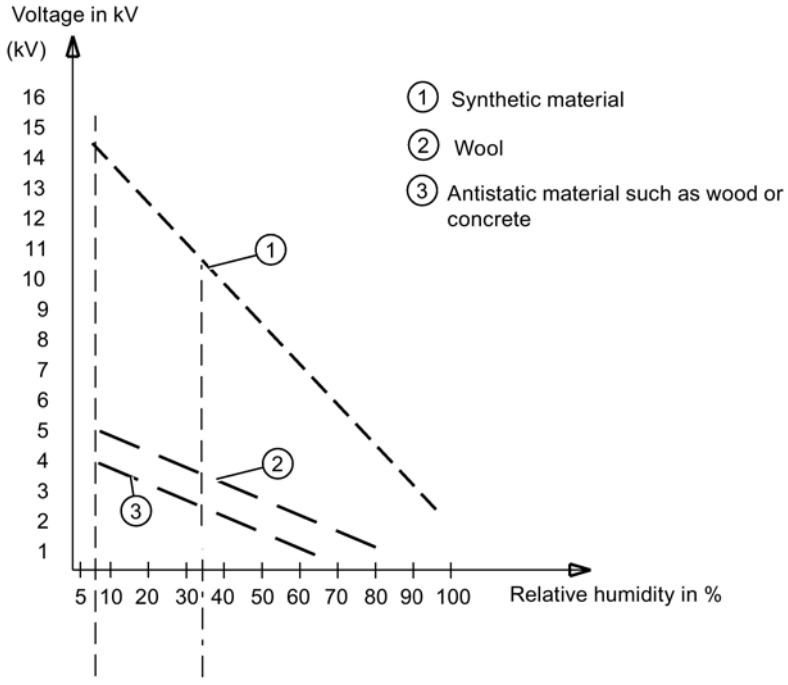

Image A-1 Electrostatic voltages which an operator can be subjected to

Basic protective measures against electrostatic discharge:

- Ensure good equipotential bonding:
  When handling electrostatic sensitive devices, ensure that your body, the workplace and packaging are grounded. This prevents electrostatic charge.
- Avoid direct contact:
  As a general rule, only touch electrostatic sensitive devices when this is unavoidable (e.g. during maintenance work). Handle the modules without touching any chip pins or PCB traces. In this way, the discharged energy can not affect the sensitive devices.

  Discharge your body before you start taking any measurements on a module. Do so by touching grounded metallic parts. Always use grounded measuring instruments.

A.3 List of abbreviations

ASCII	American Standard Code for Information Interchange
B	Gross weight
CPU	Central processor, in this case SIMATIC CPU
DB	Data block
FB	SIMATIC S7 function block
HMI	Human machine interface (e.g. SIMATIC Operator Panel)
HSP	Hardware Support Package
HW	Hardware

IM	Interface module
N	Net weight
NAWI	Non-automatic weighing instrument
NAW	Non-automatic scales
OIML	Organisation Internationale de Metrologie Legale
OP	Operator Panel (SIMATIC)
PC	Personal computer
pT	Preset tare (predefined tare weight with manual taring)
RAM	Random Access Memory (read/write memory)
PLC	Programmable logic controller
STEP 7	Programming device software for SIMATIC S7
T	Tare weight
TM	Technology module
TP	Touch Panel (SIMATIC)
UDT	Universal Data Type (S7)
WRP	Write protection
LC	Load cell(s)
NR	Numerical range

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W