SIEMENS

Weighing systems

Electronic Weighing System SIWAREX WP251

Manual

12/2015

A5E37203357A

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.

Proper use of Siemens products

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⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

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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Introduction 1

1.1 Purpose of the manual

This manual contains all the information required for assembling installing, wiring and commissioning the SIWAREX WP251 electronic weighing system.

1.2 Basic knowledge required

This manual requires basic knowledge of weighing technology. When used in the SIMATIC S7-1200, basic knowledge of the SIMATIC S7-1200 automation system and the TIA Portal are required.

1.3 Manual - range of validity

This manual is valid for:

Type designation	Order No.	as of version	
SIWAREX WP251	7MH4960-6AA01	HW: FS 3	FW: V.1.0.0

Note

This manual contains a description of all electronic weighing systems available at the date of publication. We reserve the right to include a Product Information with the latest information on the module.

1.4 Technical support

Technical Support

You can contact Technical Support for weighing technology:

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

You can contact Technical Support for S7-1200 products:

- Via the Internet using the **Support Request:**
  E-mail Weighing Technology (mailto:hotline.siwarex@siemens.com)
- By phone: +49 (911) 895-7222
- By fax: +49 (911) 895-7223

Additional information about our technical support is available on the Internet at Support request (http://www.siemens.de/automation/support-request)

Service & Support on the Internet

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

Technical support (http://www.siemens.de/automation/csi/service)

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 field service, repairs, spare parts and lots more 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/partner)

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

Documentation
(https://support.industry.siemens.com/cs/products?dtp=Manual&pnid=17781&lc=en-WW)

Safety notes

2

2.1 General safety instructions

⚠ WARNING

Handling of the device/system by persons other than qualified personnel or ignoring the warning instructions can result in severe injuries or damages. This means only qualified personnel are permitted to handle this device/system.

⚠ WARNING

Commissioning is absolutely prohibited until it has been ensured that the machine in which the component described here is to be installed fulfills the regulations/specifications of Machinery Directive 89/392/EEC.

Note

The specifications of the manual for the SIMATIC S7-1200 system apply for configuration, installation and commissioning in the SIMATIC environment. This section provides additional information on hardware configuration, installation and preparation for operation of the SIWAREX WP251.

The safety notes must be observed.

Note

The device was developed, manufactured, tested and documented in compliance with the relevant safety standards. The device does usually not pose any risks of material damage or personal injury.

2.2 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://www.siemens.de/automation/).

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.de/industrialsecurity).

Description

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3.1 Product overview

SIWAREX WP251 is a versatile and flexible weighing module that can be used for operation as a non-automatic weighing instrument.

The electronic weighing system can be used in SIMATIC S7-1200 and uses all features of a modern automation system, such as integrated communication, operator control and monitoring, the diagnostic system as well as the configuration tools in the TIA Portal.

3.2 Area of application

SIWAREX WP251 is the optimum solution wherever fast and precise dosing and filling are required. The typical applications of SIWAREX WP251 are:

- Automatic catchweighing instruments
- Gravimetric filling instruments (AWI)
- Non-automatic weighing instrument (NAWI)
- Weighing instruments in hazardous areas (with Ex interface SIWAREX IS)

3.3 System integration in SIMATIC

The electronic weighing system described here is a technology module for SIMATIC S7-1200. The system, including the weighing application, can be configured as desired in the automation solution. You can create optimal solutions for small and medium-sized plants by combining the suitable SIMATIC modules. You can create customized or industry-specific solutions in no time with the help of the configuration package available under the "Ready for use" application for SIMATIC.

Note

The direct use of SIWAREX WP251 with fail-safe SIMATIC S7-1200 controllers is not yet supported.

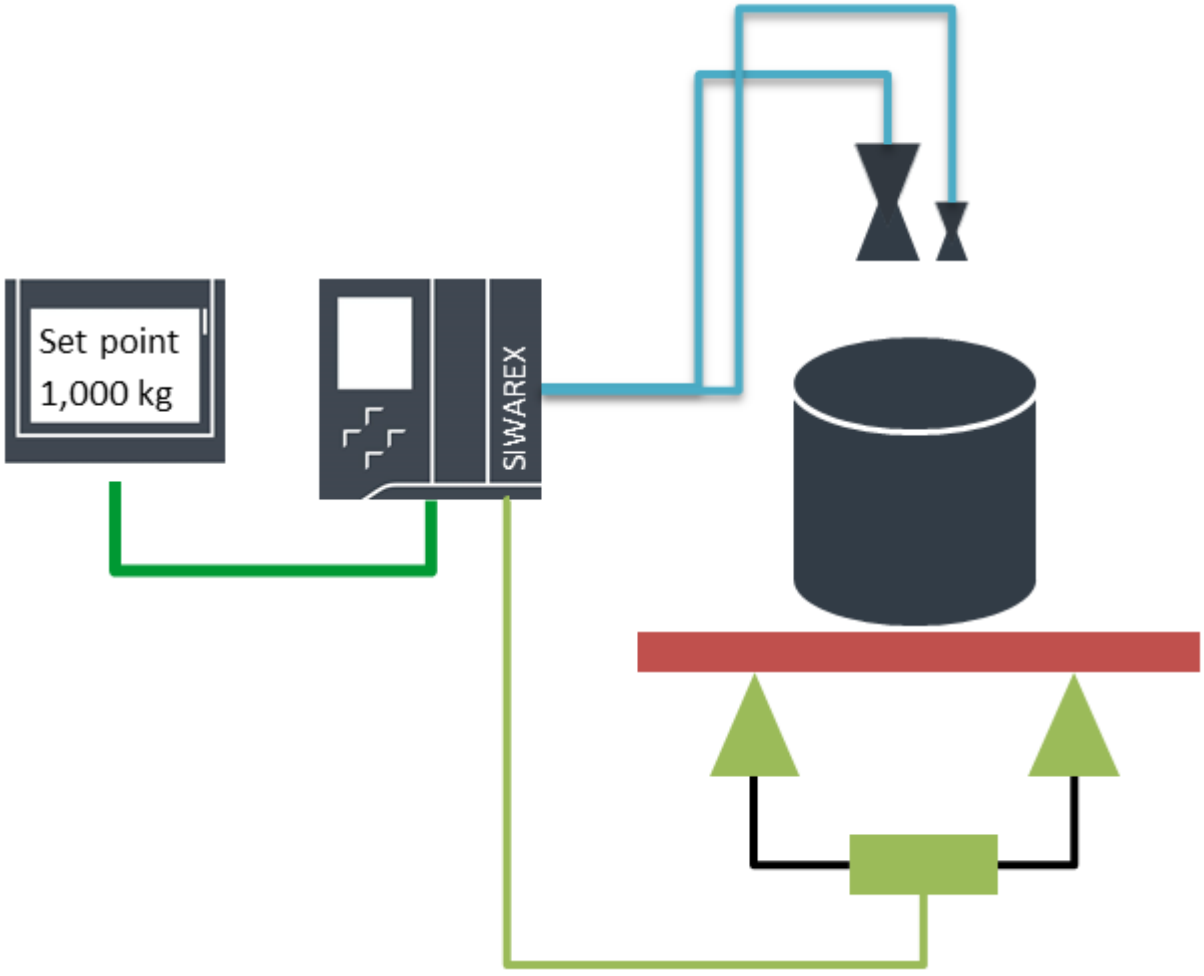

Image 3-1 System overview

3.4 Scope of delivery

The product package consists only of the SIWAREX WP251 weighing module.

Note

We recommend that you use the SIWAREX WP251 configuration package for configuring the SIWAREX WP251 electronic weighing system. The configuration package is not included in the product package of the module.

Application planning

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4.1 Functions

SIWAREX WP251 controls complex dosing and filling processes completely autonomously. The four digital outputs of the module can be used to directly control the dosing elements (coarse and fine flow). Maximum accuracy is achieved since the weighing process is fully independent of the CPU and its cycle time. The CPU can be used to manage recipes and material parameters. These parameters and the desired set point are then transferred to WP251 via a function block, and the dosing process is started. SIWAREX WP251 automatically optimizes the shut-off points, generates statistics, and logs every dosing operation in the internal log memory, which is also accessible from the CPU and can be read by the CPU. Various options are available for commissioning. The WP251 function block enables full access to all parameters of the WP251. The free, downloadable example application "Ready-for-use" enables complete commissioning, calibration and operation of the scale from the touch panel - without any programming needed.

Furthermore, commissioning can be carried out with SIWATOOL V7, the PC service software that communicates with the SIWAREX module via Ethernet. This enables access via W-LAN when a WIFI access point is used. Remote access via the Internet is also possible problem-free. Centralized access to all scales from a single location is possible for servicing purposes – worldwide.

In addition, there is full access to all parameters and commands, both via the RS485 port (Modbus RTU) and via the Ethernet interface (Modbus TCP/IP), meaning that full commissioning and operation can also take place via these channels.

Stand-alone operation allows the module to be operated autonomously even without a SIMATIC CPU. For this purpose, an HMI device can be connected directly to the Ethernet or RS485 port of the WP251. The HMI device then communicates with the weighing module via Modbus TCP/IP or RTU. This setup can also be selected to increase plant availability. If WP251 is being operated with a SIMATIC S7-1200 and stand-alone operation is additionally activated, WP251 can also continue operating (filling and dosing) without restrictions if the CPU stops because a directly connected HMI device provides access to the module in this situation.

The SIWAREX WP251 electronic weighing system can also be used in hazardous areas (Zone 2). The load cells are supplied intrinsically safe in Zone 1 applications when you use the optional Ex interface SIWAREX IS.

4.2 Parameter assignment options

4.2.1 Parameter assignment with the PC

The scale parameters can be quickly assigned with the convenience of a Windows program using the "SIWATOOL V7" PC parameter assignment software.

You can use the program for commissioning the scale without any knowledge of automation technology. When servicing is required, you can analyze and test the processes in the scale independently of the automation system or Operator Panel with the help of the PC. Reading the diagnostic buffer from the SIWAREX module is very helpful in analyzing events since the last 100 error and operating messages with time stamp are saved in non-volatile memory.

The internal log memory can also be conveniently and easily read in .csv format using SIWATOOL.

In addition, the tool can be used to create backup files, which can be re-imported into a new module after module replacement in just a few a seconds – without the need for any knowledge of the CPU program or automation environment.

SIWATOOL uses its own communication protocol, meaning that a connection to WP251 can be established in parallel with the Modbus TCP/IP operation with SIWATOOL.

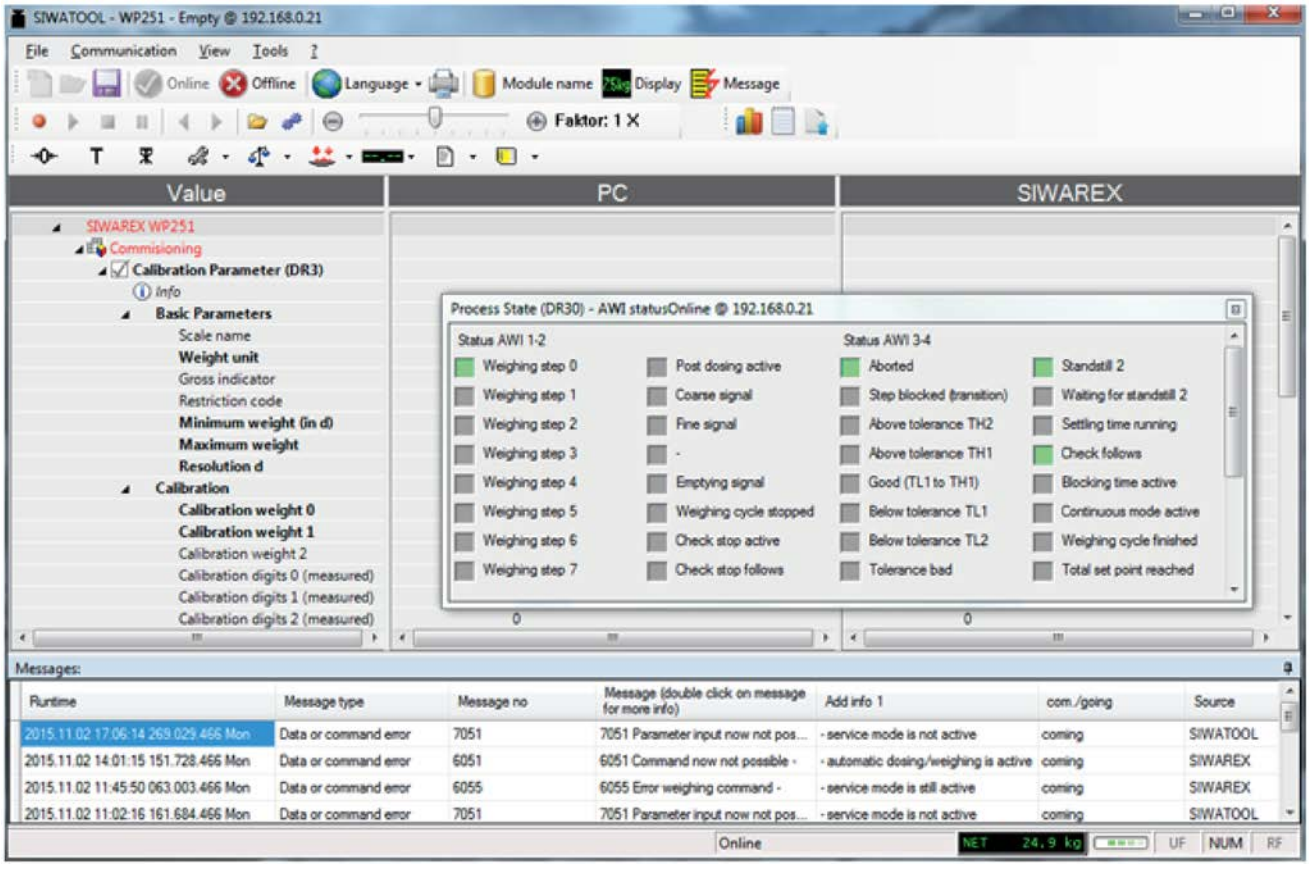

Image 4-1 SIWATOOL overview

4.2.2 Parameter assignment with a SIMATIC Panel

All module parameters can be assigned and the module put into operation using a SIMATIC HMI Panel connected to the S7-1200 CPU and the SIWAREX WP251 function and data blocks.

The "Ready-for-Use" example application is included in the scope of delivery of the configuration package and is also available from Siemens Online Support. In addition to the function block, it contains a complete TIA HMI project for operation and commissioning of scales, which the user can edit in TIA. Further information on integration in the TIA Portal can be found in section Integration in SIMATIC S7-1200 (Page 185)

4.2.3 Parameter assignment by means of the Modbus interface

You have the option to assign the parameters with a SIMATIC panel which is connected directly to the SIWAREX module. The SIWAREX module behaves like a Modbus slave in this case. Loadable HMI software for a SIMATIC Panel TP700 Comfort is provided in the scope of delivery of the configuration package.

All SIMATIC HMI Comfort Panels can be used for direct Modbus communication. The use of SIMATIC HMI Basic Panels is not possible at the moment. A direct connection between a SIMATIC HMI Panel and SIWAREX WP251 via Modbus RTU has not been approved.

The parameters for the SIWAREX module can also be prepared in a third-party system and transmitted to the electronic weighing system by means of Modbus RTU or TCP/IP.

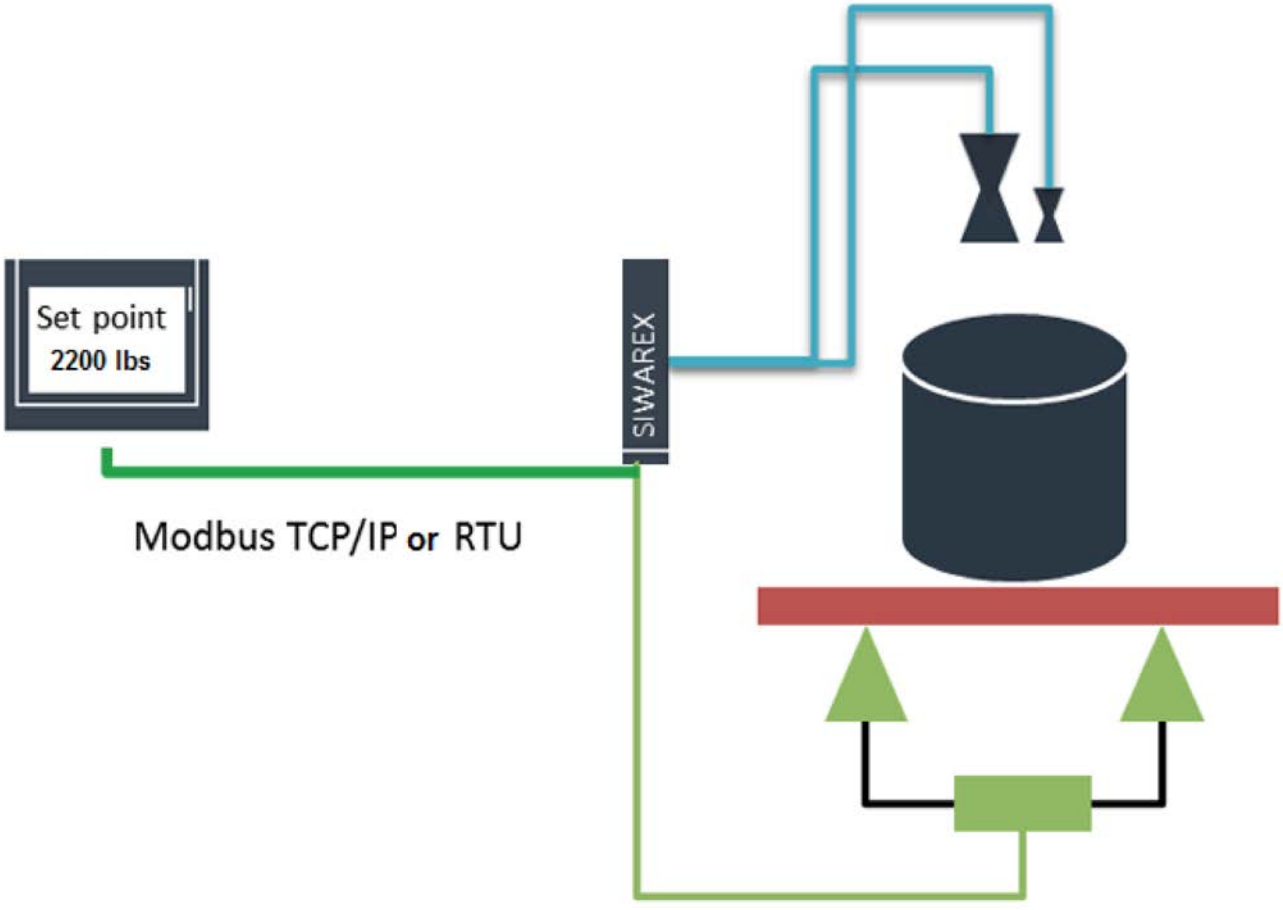

Image 4-2 SIWAREX WP251 in stand-alone operation

A detailed description of the assignment of the holding registers can be found in section
→ Scale parameters and functions (Page 57).

Mounting 5

5.1 Installation guideline

When installing the SIMATIC components together with the electronic weighing system described here, the setup, installation and wiring guidelines for the SIMATIC S7-1200 must be observed (see system manual "SIMATIC S7 S7-1200 automation system", order no.: A5E02486681).

This manual describes additional installation and wiring aspects specific to the electronic weighing system.

5.2 EMC-compliant installation

5.2.1 Introduction

Overview

The electronic weighing system described here was developed for use in industrial environments and complies with high EMC requirements. Nevertheless, before installing your devices you should prepare an EMC plan and identify and take into consideration possible interference sources.

EMC

EMC (electromagnetic compatibility) describes the capability of electrical equipment to operate without errors in a given electromagnetic environment, without being subject to external influence and without influencing external devices in any way.

5.2.2 Possible effects of interference

Electromagnetic interferences can influence the electronic weighing system described here in various ways:

- Electromagnetic fields having a direct influence on the system
- Interferences transported by communication cables
- Interferences having an effect via process cables
- Interferences entering the system via the power supply and/or protective ground

Interferences can impair the fault-free functioning of the electronic weighing system.

5.2.3 Coupling mechanisms

Depending on the propagation medium (conducted or non-conducted) and the distance between the interference source and the device, interferences can enter the faulty device through four different coupling mechanisms:

- Electrical coupling
- Capacitive coupling
- Inductive coupling
- Radiation coupling

5.2.4 Five basic rules for securing EMC

Observe these five basic rules to secure EMC.

Rule 1: Large area grounding contact

- When installing the devices, make sure that the surfaces of inactive metal parts are properly bonded to chassis ground (see following sections).
- Bond all inactive metal parts to chassis ground, ensuring large area and low-impedance contact (large cross-sections).
- When using screw connections on varnished or anodized metal parts, support contact with special contact washers or remove the protective insulating finish on the points of contact.
- Wherever possible, avoid the use of aluminum parts for ground bonding. Aluminum oxidizes very easily and is therefore less suitable for ground bonding.
- Provide a central connection between chassis ground and the ground/protective conductor system.

Rule 2: Proper cable routing

- Organize your wiring system into cable groups (high-voltage/power supply/signal/measurement/data cables).
- Always route high-voltage and data cables in separate ducts or in separate bundles.
- Install the measurement cables as close as possible to grounded surfaces (e.g. supporting beans, metal rails, steel cabinet walls).

Rule 3: Fixing the cable shielding

- Ensure proper fixation of the cable shielding.
- Always use shielded data cables. Always connect both ends of the data cable shielding to ground on a large area.
- Keep unshielded cable ends as short as possible.
- Always use metal/metalized connector housings only for shielded data cables.

Rule 4: Special EMC measures

- All inductors that are to be controlled should be connected with suppressors.
- For cabinet or enclosure lighting in the immediate range of your controller, use incandescent lamps or interference suppressed fluorescent lamps.

Rule 5: Homogeneous reference potential

- Create a homogeneous reference potential and ground all electrical equipment.
- Use sufficiently dimensioned equipotential bonding conductors if potential differences exist or are expected between your system components. Equipotential bonding is absolutely mandatory for applications in hazardous areas.

5.3 Mounting on the SIMATIC S7-1200

The electronic weighing system described here is a SIMATIC S7-1200 module and can be directly connected to the automation system's bus system. The 70 mm wide module has very low installation and cabling requirements.

The module is fitted on a mounting rail, and the bus connection made using the slide switch.

The load cells, power supply and serial interfaces are connected via the screw-type connectors.

Use of the WP251 in the SIMATIC TIA Portal is described in detail in section 11 of this manual: → Integration in SIMATIC S7-1200 (Page 185)

Connection

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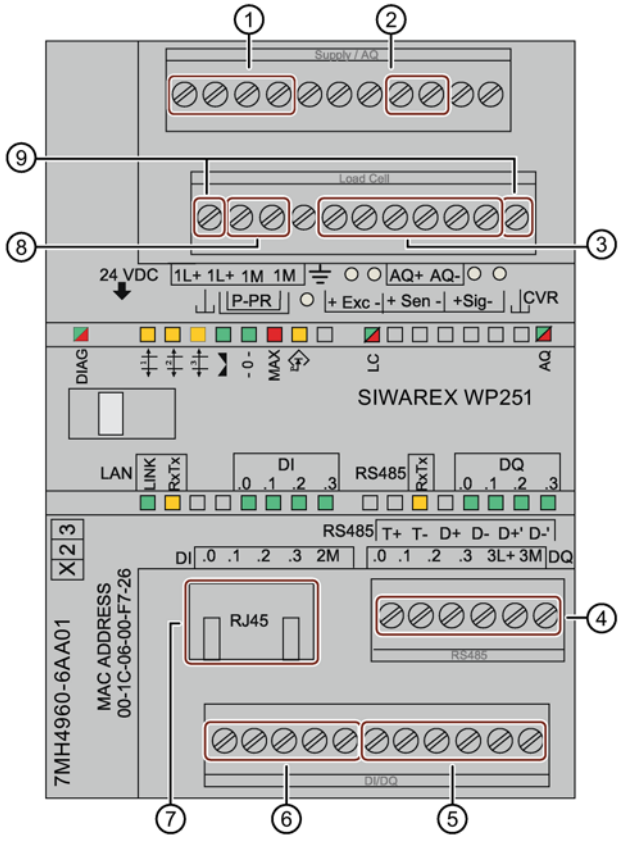
6.1 Overview

All external connections (with the exception of the Ethernet interface) are made by means of the screw connectors (terminal block 1 to 4).



① 24 V connection
② Analog output connection
③ Load cell connection
④ RS485 interface connection
⑤ Digital output connection
⑥ Digital input connection
⑦ Ethernet interface connection
⑧ Calibration bridge connection
⑨ Mounting terminals for the calibration protection plate

Image 6-1 SIWAREX WP251 connection areas

6.2 24 V connection

The 24 V DC supply voltage is connected to the electronic weighing system via the corresponding terminals.

Table 6- 1 Connection of the 24 V supply

Labeling	Function
L +	+24 V voltage supply
M	Ground voltage supply

6.3 Connecting the load cells

Overview

Sensors equipped with strain gauges (DMS full bridge) can be connected to the SIWAREX WP251 electronic weighing system. These sensors meet the following requirements.

- Characteristic value 1.... 4 mV/V
- The power supply for the load cells is 4.85 V.
- To check the maximum possible number of load cells that can be connected to a WP251, the following condition must be met:
  - Scale operation without Ex interface: (input resistance of load cell) / (number of load cells) > 40 Ohm
  - Scale operation without Ex interface: (input resistance of load cell) / (number of load cells) > 50 Ohm

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 WP251 or the junction box is greater than the available length of the load cell connection cable, use the SIWAREX EB extension box.
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 (-)

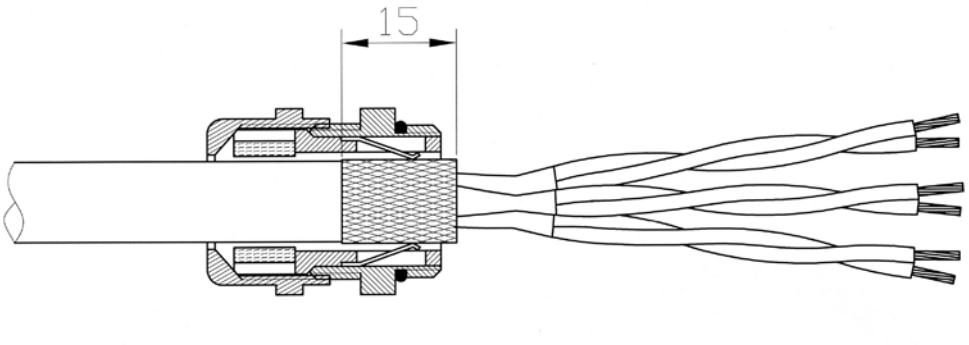


Image 6-2 Shielding in the screw gland

We recommended that you use the cables listed in chapter → Accessory (Page 213).

4. The shield must be connected to ground directly in the vicinity of the SIWAREX WP251. The maximum distance between the SIWAREX WP251 and the load cell applies when using the recommended cables.

Table 6- 2 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 +

6.4 Shield connection

Make sure you observe the correct design of the shield support for the shielded cables. It is the only way to ensure immunity of the system.

A cable is shielded to attenuate the effects of magnetic, electrical and electromagnetic interference on the cable. Interference currents on cable shielding are diverted to ground by conductive isolation rails. To avoid interference as a result of these currents, it is imperative to provide a low-impedance connection to the ground.

Use only cables with protective braided shield (see recommended cables of digital load cells in chapter Accessory (Page 213)). Shielding density must be at least 80%.

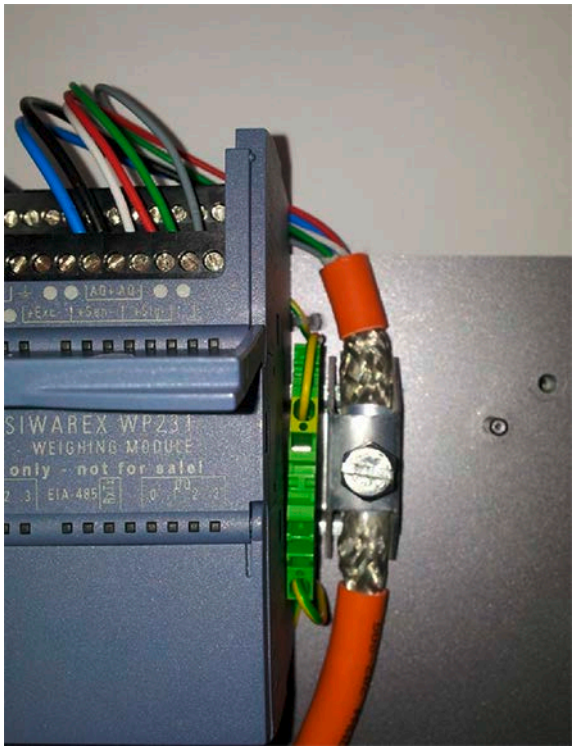


Image 6-3 Installation of the shield connection element (example)

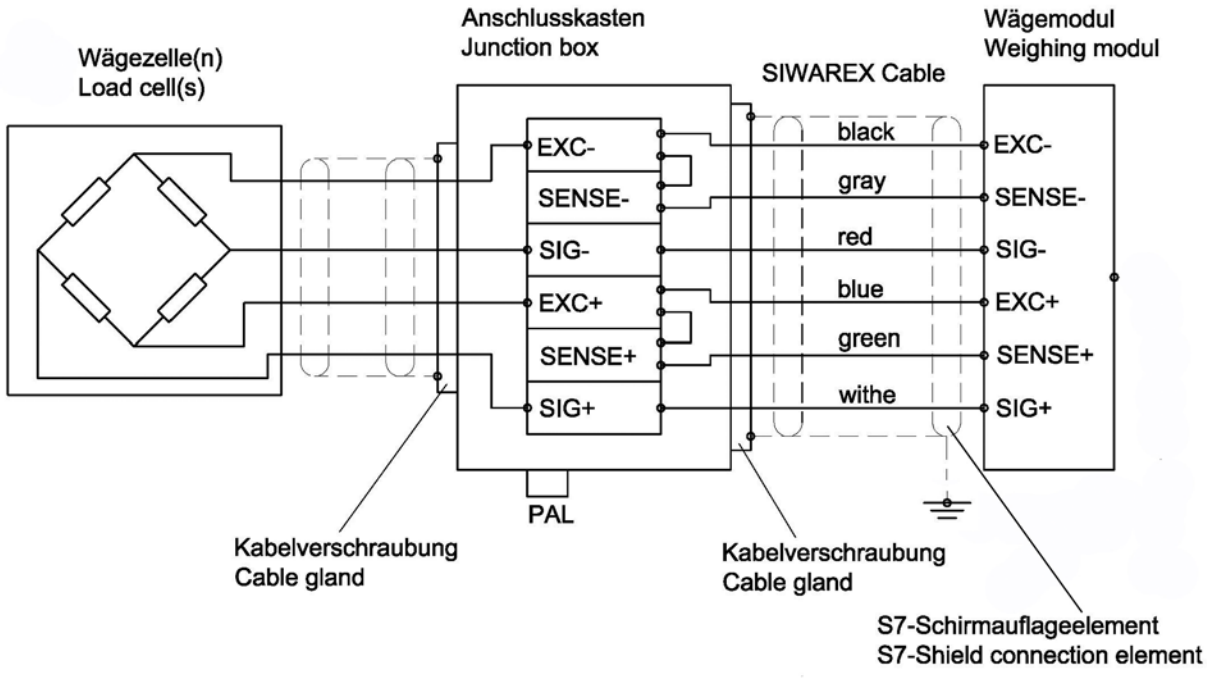


Image 6-4 Connection of strain gauge load cell with 4-wire system

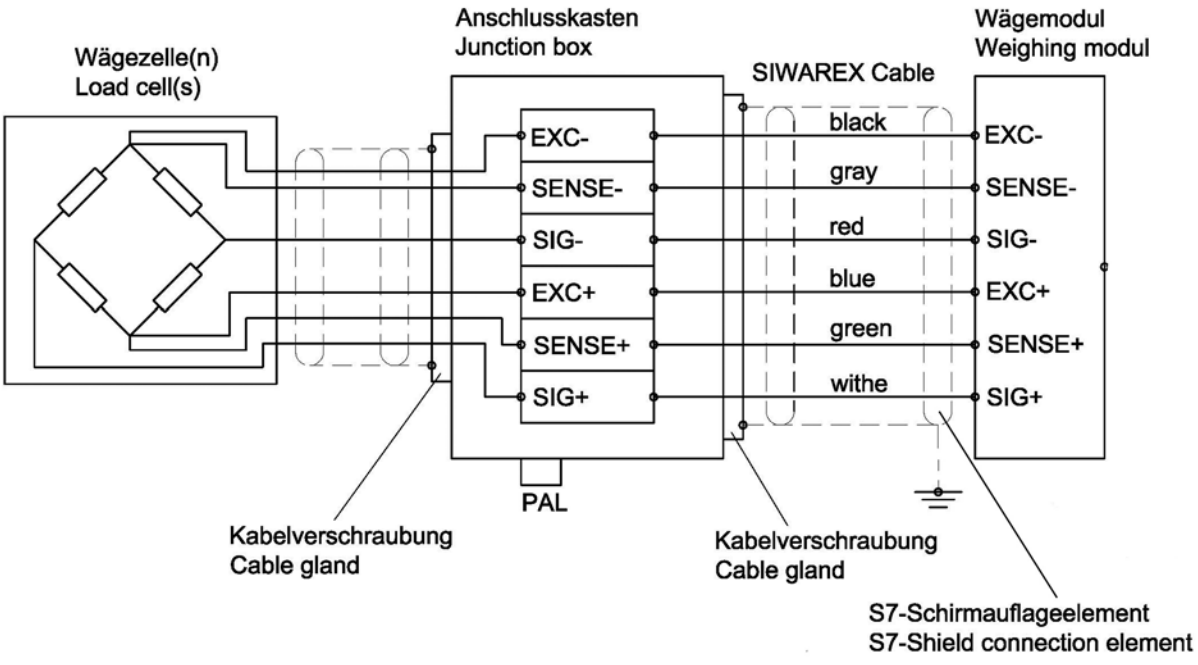


Image 6-5 Connection of strain gauge load cell with 6-wire system

6.5 Connection of digital outputs (4 x DQ)

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 electronic weighing system described here has four isolated, short-circuit proof digital outputs. They are not permanently assigned to process values or functions in the delivery state. The assignment of the digital outputs to functions and the response to errors takes place during commissioning by assigning parameters of data record 7. The 24 V power supply of the digital outputs is provided via terminals 3L+ and 3M with electrical isolation.

Table 6- 3 Connection of the digital outputs

Labeling	Function
DQ.0	Digital output 0
DQ.1	Digital output 1
DQ.2	Digital output 2
DQ.3	Digital output 3
DQ.3L+	+24 V DC power supply for digital outputs
DQ.3M	Ground of power supply for digital outputs

6.6 Connection of digital inputs (4 x DI)

⚠ 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 electronic weighing system described here has four isolated digital inputs. The digital inputs are not permanently assigned to commands in the delivery state. The assignment of the digital inputs to commands takes place during commissioning by assigning parameters of data record 7. The external 24 V switching signal is connected electrically isolated to the desired input, and the associated ground is connected to terminal 2M.

Table 6- 4 **Connection of the digital inputs**

Labeling	Function
DI.0	Digital input 0
DI.1	Digital input 1
DI.2	Digital input 2
DI.3	Digital input 3
DI.2M	Reference ground potential of the digital inputs

6.7 Connection of the analog output (1 x AQ)

CAUTION
Unknown assignment of the analog outputs The assignment of the analog output is not known at the time of connection. The analog output can be active immediately after turning on the power supply. This may damage parts of the system. Do not create a connection with the analog output before you know the assignment.

The analog output is not permanently assigned to a process value in the delivery state. The assignment of the analog output to a process value and its response to errors is carried out during commissioning in data record 7. If a wire break occurs, the LED labeled "AQ" flashes red. The output can be assigned as a 0-20 mA or 4-20 mA output.

Table 6- 5 Connection of analog output

Labeling	Function
AQ+	Analog output +
AQ-	Analog output -

6.8 Connection of RS485 serial interface

The following devices can be connected to the serial interface:

- Siebert display type S102 (connections: see chapter Connection of Siebert display via RS485 (Page 37))
- Operator Panels or other HMI devices with RS485 and Modbus protocol RTU
- Communication partner with Modbus protocol RTU

Table 6- 6 Connection of RS485 serial interface

Labeling	Function
EIA-485 T+	RS485 termination +
EIA-485 T-	RS485 termination -
EIA-485 D+‘	RS485 data line +‘ for looping through of bus signal
EIA-485 D-‘	RS485 data line -‘ for looping through of bus signal
EIA-485 D+	RS485 data line + for feeding in of bus signal
EIA-485 D-	RS485 data line - for feeding in of bus signal

If a SIWAREX WP251 module forms the termination of an RS485 network, insert a wire jumper between the D+‘ and T+ terminals and between the D-‘ and T- terminals for termination of the bus network.

6.9 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.

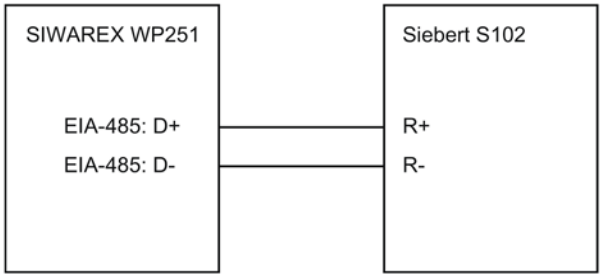


Image 6-6 Connection of Siebert display S102

The RS485 interface in DR 13 of the SIWAREX WP251 is set as follows:

- Baud rate: 9 600 bit/s
- Character parity: Even
- Number of data bits: 8
- Number of stop bits: 1

The S102 is set as follows:

Table 6- 7 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	

6.10 Connection of the Ethernet interface

An RJ45 connector is used for the connection.

The following devices can be connected to the Ethernet interface:

- PC with SIWATOOL V7 service and commissioning program
- Operator panels or other HMI devices with Ethernet and Modbus protocol TCP/IP

6.11 Activation of write protection

If a wire jumper is set between the module terminals P and PR, the parameter write protection will be activated. With a few exceptions, when write protection is active the parameters from data record 3 can no longer be edited and various service and calibration commands can no longer be executed.

Table 6- 8 Activation of write protection

Labeling	Function
P	P terminal for activation of write protection
PR	PR terminal for activation of write protection

6.12 Attachment of calibration protection plate

To operate SIWAREX WP251 as a calibratable electronic weighing system, the load cell connections must be protected against manipulation. To achieve this, mount the calibration protection plate included in the calibration set as shown in the following figure. Then attach the calibration protection plate to the associated terminals (see Overview (Page 29)).

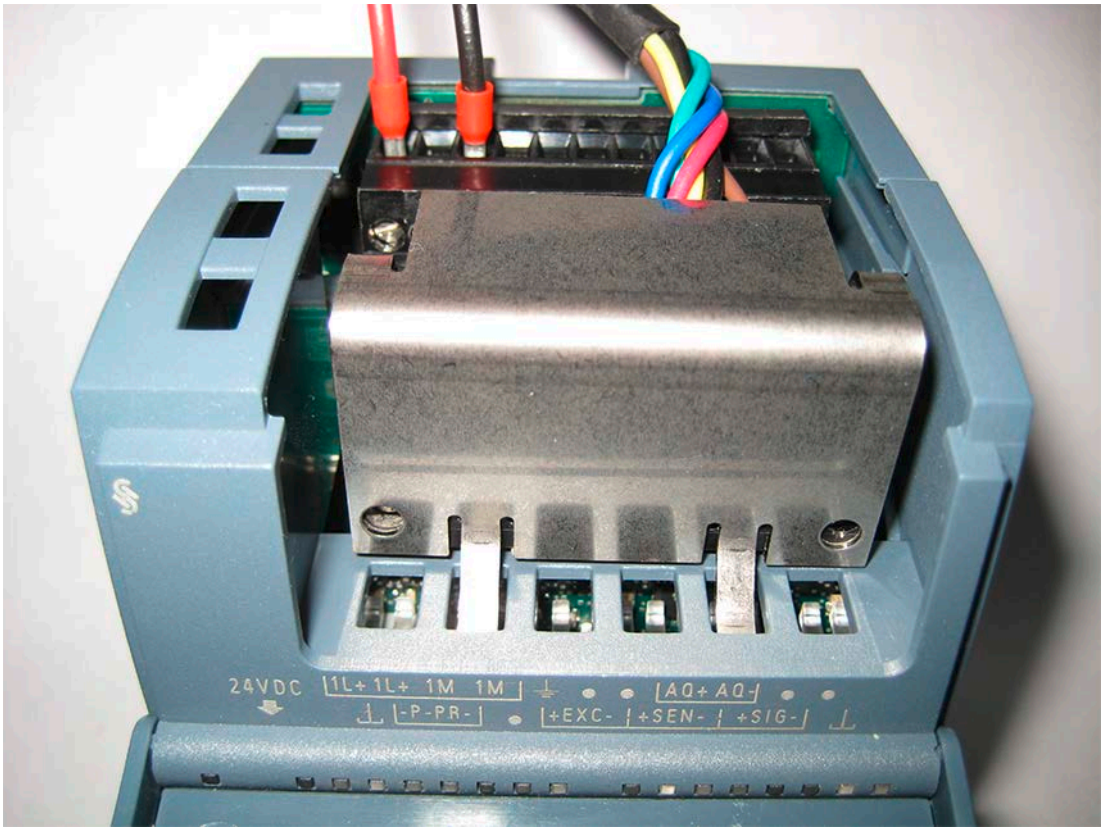


Image 6-7 Attachment of the calibration protection plates

Commissioning 7

7.1 Introduction

Commissioning consists mainly of checking the mechanical setup of the scale, assignment of parameters, performing the calibration and checking the intended functionality. SIWAREX WP251 provides a variety of commissioning options: using the "SIWATOOL" PC software, using the WP251 function block via the S7-1200 CPU or touch panel or using the Modbus TCP/IP/Modbus RTU interface. "SIWATOOL" is a component of the WP251 configuration package (see Accessories). The function block and the "Ready-for-use" example application can be downloaded for free from Siemens Online Support.

7.2 Factory setting of the mode selector

The module contains two DIP switches to the left of the Ethernet connector (accessible through the ventilation opening). Both switches are at the top position ex factory.

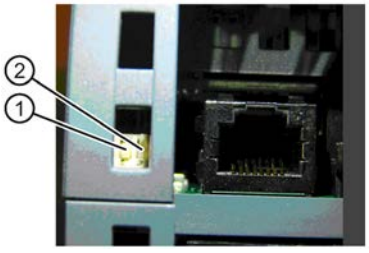


Image 7-1 Mode switch

The left-hand switch ① currently has no function. The right-hand switch ② defines the operating environment.

Switch position	Operating environment
Up	Operation integrated in SIMATIC
Down	"Stand-alone" operation (without SIMATIC controller)

The factory setting is "Operation integrated in SIMATIC".

"Stand-alone" operation (DIP 2 at bottom position) can be useful even when the module is connected to an S7-1200 CPU because SIWAREX WP251 then remains fully functional and can continue dosing and filling if the CPU stops. In other words, it can continue to be operated, for example, via a directly connected HMI device using a Modbus connection, a connected PC or the digital inputs.

Note

If the switch is set to the down position while the SIWAREX module is in operation with SIMATIC, the SIWAREX module will not carry out a reset upon loss of power supply to the SIMATIC CPU.

7.3 Automatic quick calibration with SIWATOOL

7.3.1 Overview

General information on using the SIWATOOL V7 program can be found in section "Service with the SIWATOOL program (Page 48)".

In order to perform the automatic quick calibration, the parameters marked in bold font in data records DR 3 and DR 10 must first be defined. The procedure is described below. The procedure is described below. Quick commissioning is based on an automatic calibration without the use of calibration weights. With this process, the accuracy of the scale is strongly dependent on the mechanical setup and should therefore be verified with reference weights.

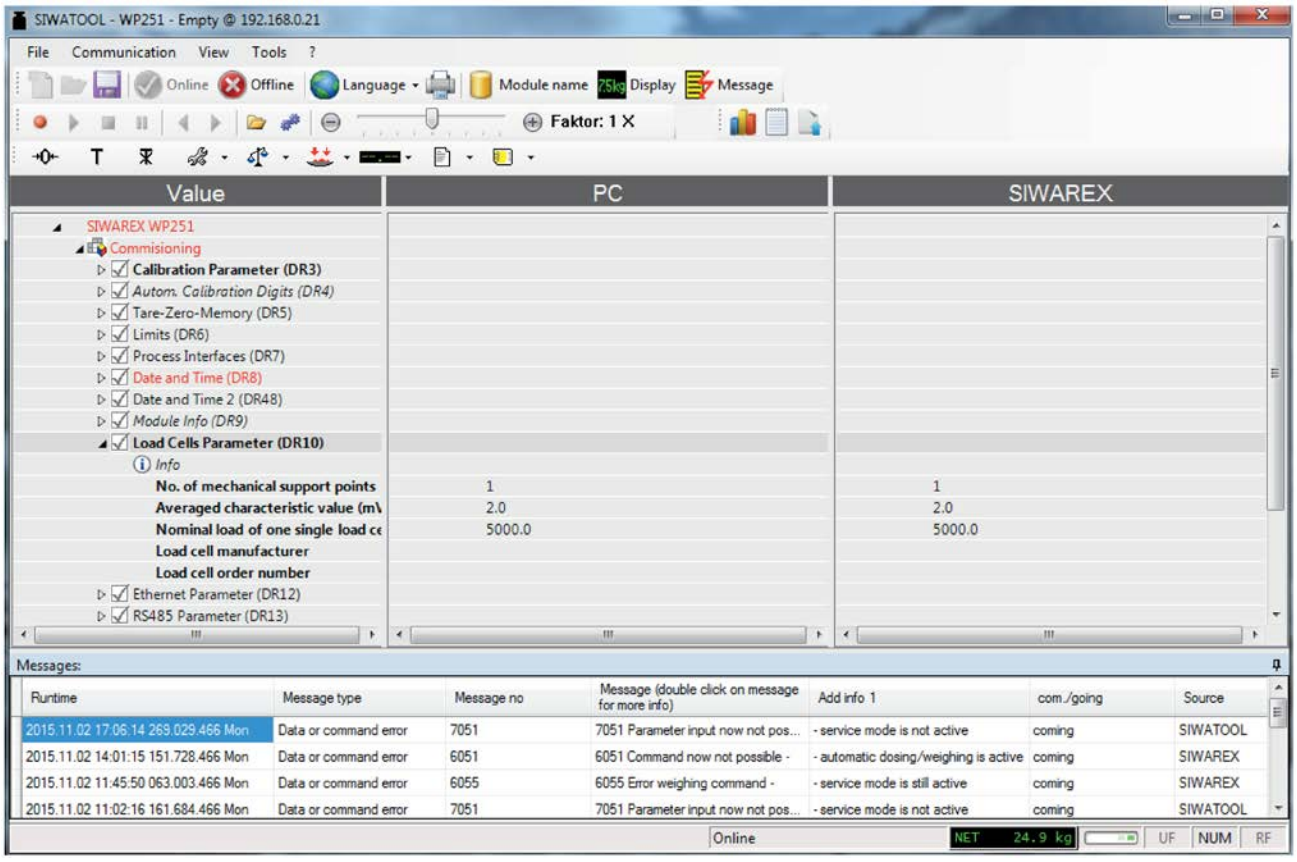


Image 7-2 Quick calibration with marked parameters

7.3.2 Activate service mode

Service mode must be activated in order to change the calibration parameters. You can find the command in the "Service Commands" group (spanner icon).

7.3.3 Load standard parameters

The quick setup is based on the standard settings of the weighing module. Therefore, the standard parameter settings must be reset prior to the quick setup. Firstly, service mode is activated; the standard parameters are subsequently loaded using the "Load standard parameters (12)" command.

The parameters must then be read from the SIWAREX in SIWATOOL using "Communication → Receive all data".

7.3.4 Input of required parameters

For commissioning, you must enter the following parameters in data record DR 3 and send these to the module:

- Unit of weight
- Required maximum weighing range of the scale
- Scale interval

The description of the parameters can be obtained from the description of data record DR 3.

Sending/receiving a data record is always carried out by right-clicking on the data record name in the "Value" column in the tree structure.

For example, if data record 3 is to be sent, right-click on "Calibration parameter (DR3)". A submenu 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 as complete packets to the SIWAREX or read from it. It is not possible to read or write individual parameters within a data record. 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. If the data record is not received, the danger exists that different offline parameters will be sent to the scale and overwrite previously active and intentionally defined parameters.

You must subsequently enter the required parameters in data record DR 10 and send these to the module.

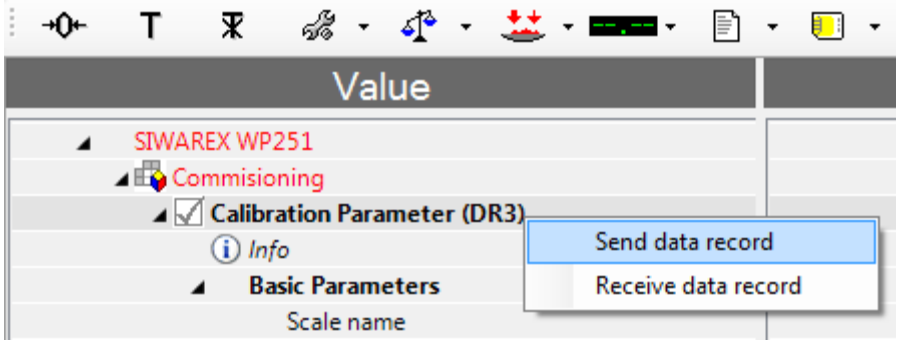


Image 7-3 Sending/receiving a data record / in SIWATOOL V7

- No. of mechanical support points
  If WP251 is connected, for example, to a platform weighing machine in which the platform is mounted on four load cells, the number of mechanical support points if 4.
  If it is connected to a tank that is mounted on one load cell and two fixed point mountings, there are 3 mechanical support points.
- Characteristic value of a load cell in mV/V, or the mean value of the characteristic values if there is more than one load cell
- Rated load of a load cell

- Load cell manufacturer
  The manufacturer of the installed load cells can be quickly and easily identified in a service case.
- Load cell order number
  The order number of the installed load cells can be quickly and easily identified in a service case.

7.3.5 Complete automatic calibration

- The scale must be empty (only mechanical dead load).
- Activate the "Automatic Calibration (82)" command.

7.3.6 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.

7.3.7 Checking the scale after calibration

Perform the following steps:

1. 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 additionally.
   → Check whether the scale displays the sum of the reference weights.
4. Remove the reference weight from the scale.
   → Check that the display is "0 kg" again.

Should these steps not yield the expected results, the electrical connection of the load cells and the scale mechanics must be checked.

7.4 Quick calibration with calibration weights and SIWATOOL

7.4.1 Introduction

In order to perform the quick calibration with calibration weights, the parameters marked in bold font in data records DR 3 and DR 10 must first be defined. The procedure is described below.

7.4.2 Activate service mode

Service mode must be activated in order to change the calibration parameters. You can find the command in the "Service Commands" group (spanner icon).

7.4.3 Load standard parameters

The quick setup is based on the standard settings of the weighing module. Therefore, the standard parameter settings must be reset prior to the quick setup. Firstly, service mode is activated; the standard parameters are subsequently loaded using the "Load standard parameters (12)" command.

The parameters must then be read from the SIWAREX in SIWATOOL using "Communication → Receive all data".

7.4.4 Input of required parameters

For commissioning, you must enter the following parameters in data record DR 3 and send these to the module:

- Unit of weight
- Required maximum weighing range of the scale
- Scale interval
- Calibration weight 0, 1 and optionally 2

The description of the parameters can be obtained from the description of data record DR 3.

Sending/receiving a data record is always carried out by right-clicking on the data record name in the "Value" column in the tree structure.

For example, if data record 3 is to be sent, right-click on "Calibration parameter (DR3)". A submenu 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 as complete packets to the SIWAREX or read from it. It is not possible to read or write individual parameters within a data record. 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. If the data record is not received, the danger exists that

different offline parameters will be sent to the scale and overwrite previously active and intentionally defined parameters.

You must subsequently enter the required parameters in data record DR 10 and send these to the module.

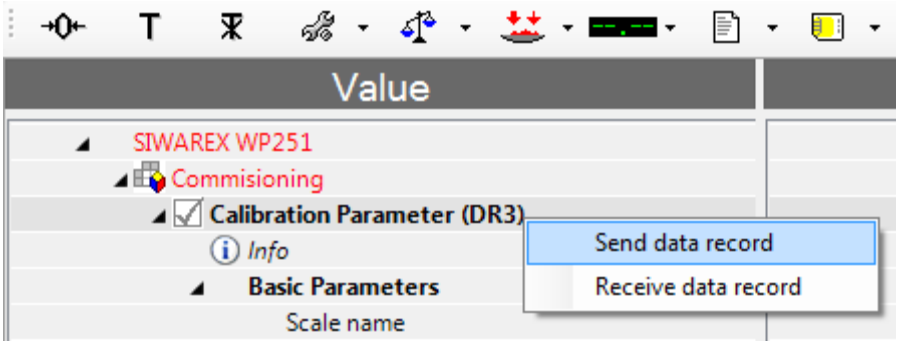


Image 7-4 Sending/receiving a data record / in SIWATOOL V7

- No. of mechanical support points
  If WP251 is connected, for example, to a platform weighing machine in which the platform is mounted on four load cells, the number of mechanical support points if 4.
  If it is connected to a tank that is mounted on one load cell and two fixed point mountings, there are 3 mechanical support points.
- Characteristic value of a load cell in mV/V, or the mean value of the characteristic values if there is more than one load cell
- Rated load of a load cell
- Load cell manufacturer
  The manufacturer of the installed load cells can be quickly and easily identified in a service case.
- Load cell order number
  The order number of the installed load cells can be quickly and easily identified in a service case.

7.4.5 Calibration

- Provided that the calibration weight 0 was specified with 0 (typical case), the scale must now be empty (only mechanical dead load).
- Activate the "Set Calibration Point 0" (60) command.
  →The weight display should now indicate 0.
- Place the previously defined "Calibration weight 1" on the scale
- Activate the "Set Calibration Point 1" (61) command.
  → The calibration weight 1 should be displayed in the weight display.
- Optional: Place the previously defined "Calibration weight 2" on the scale
- Activate the "Set Calibration Point 2" (62) command.
  → The calibration weight 2 should be displayed in the weight display.

7.4.6 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.

7.4.7 Checking the scale following calibration

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 additionally.
   → Check whether the scale displays the sum of the reference weights.
4. Remove the reference weight from the scale.
   → Check that the display is "0 kg" again.

7.5 Service with the SIWATOOL program

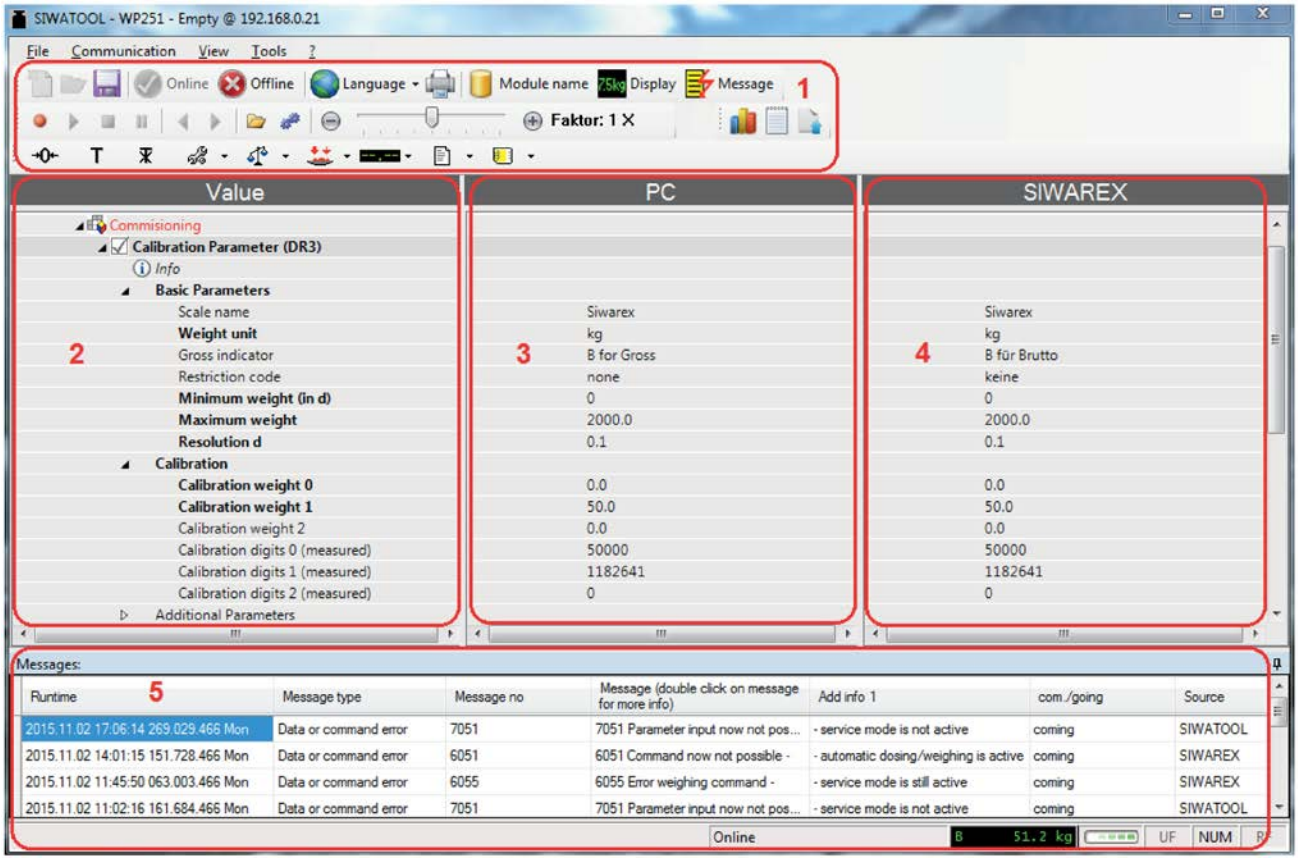
7.5.1 General

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

The program is included in the scope of delivery of the configuration package (see Accessories).

Install the SIWATOOL program on your PC for commissioning.

7.5.2 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
⑤ Error message buffer with time stamp

Image 7-5 Layout of the SIWATOOL user interface

Sending/receiving a data record is always carried out by right-clicking on the data record name in the "Value" column in the tree structure.

For example, if data record 3 is to be sent, right-click on "Calibration parameter (DR3)". A submenu is then opened with the option to send the respective data record to the weighing module or read 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. 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. If the data record is not received, the danger exists that different offline parameters will be sent to the scale and overwrite previously active and intentionally defined parameters.

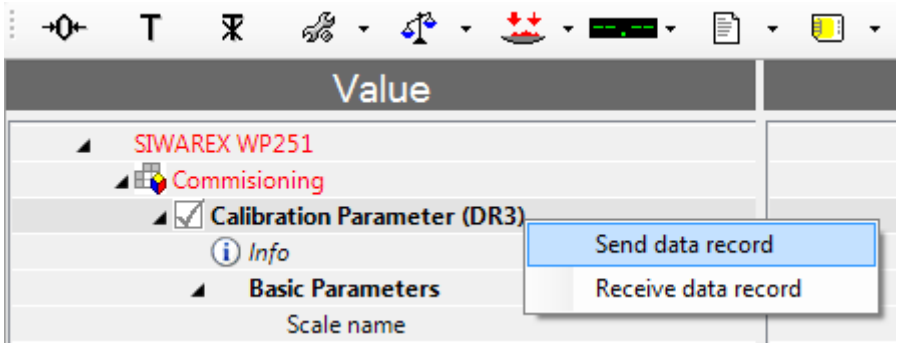


Image 7-6 Sending/receiving a data record in SIWATOOL V7

7.5.3 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.

7.5.4 IP address for SIWAREX

7.5.4.1 Introduction

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 made in menu item "Communication/Define Network Settings...".

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.

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 port: 23006
- MODBUS TCP/IP port: 502
- TFTP for firmware download port: 69

7.5.4.2 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".

7.5.4.3 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 213).

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.

7.5.4.4 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.

7.5.5 Online parameter assignment

To switch to online mode, connect the PC to the SIWAREX module using an Ethernet cable. Set the IP address of the SIWAREX module in the communication menu.

You can change all parameters in the SIWAREX module in online mode. The message window shows the current contents of the message buffer of the SIWAREX module. The current process values are displayed in the "Online" column.

For test purposes, you can send various commands to the SIWAREX module. Differences between the online/offline data are marked in red by SIWATOOL. This affects both the associated data record and the individual parameter.

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 into the corresponding scale data block in the SIMATIC CPU. This data synchronization must then be started in the CPU using the corresponding command

To download the data to the SIWAREX module, select the data record with a right mouse click and send it explicitly to the SIWAREX module.

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.

7.5.6 Entering parameters with SIWATOOL

There is a defined procedure for handling parameters. The current parameters in the SIWAREX module are displayed in the right-hand window, while the parameter values on the PC are displayed in the left-hand window. The new parameter value is entered first in the left-hand window. If several parameters of the data record are to be changed, they are entered consecutively. The data record is subsequently selected in the tree view and sent to the SIWAREX modules using the right mouse button.

Parameters are always changed as complete data records, rather than individually.

7.5.7 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. The "Export trace data" button opens a dialog window. 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.

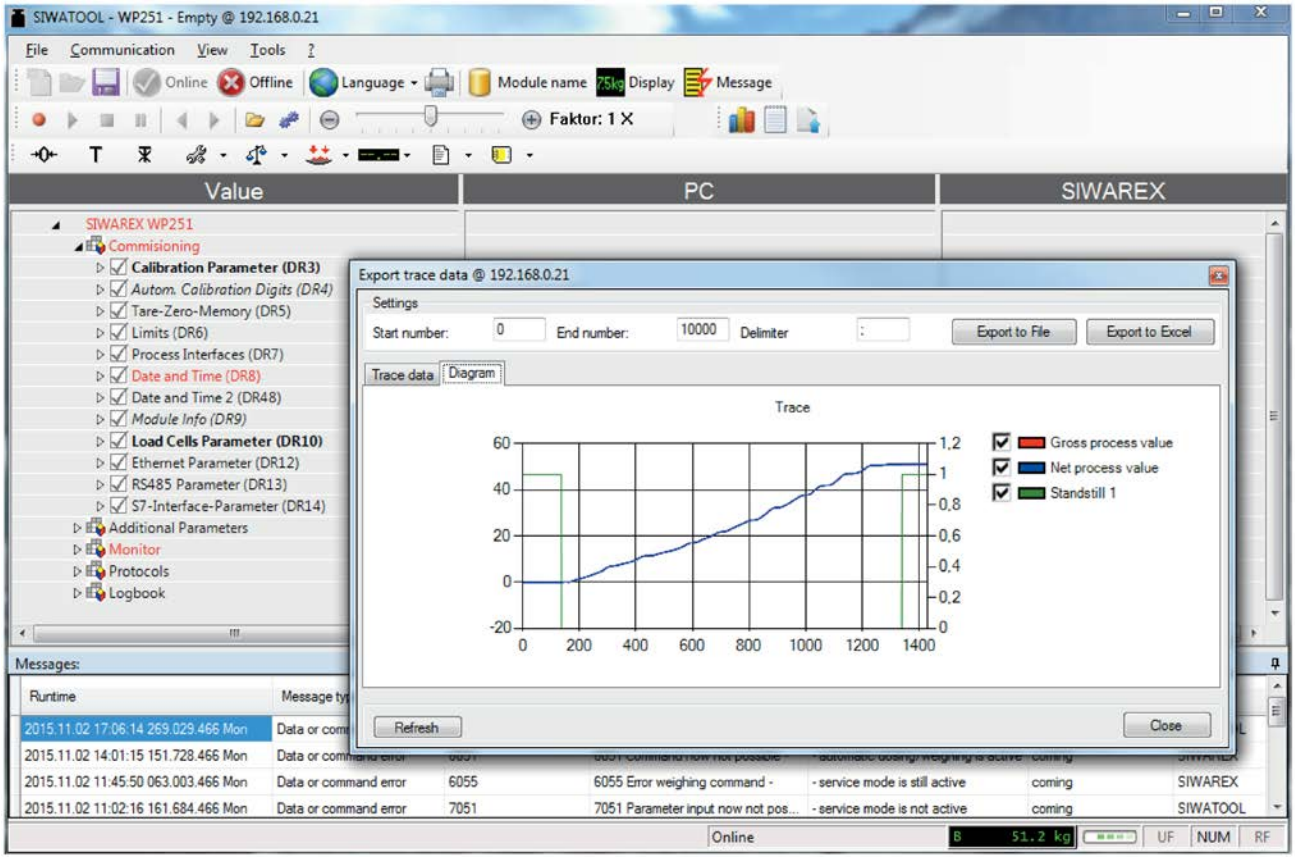


Image 7-7 Trace export

7.5.8 Firmware update

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 TFTP protocol is used for the transfer. Firewalls or other protection software may interfere with or prevent the transfer of data per TFTP 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 at Siemens Industry Online Support (https://support.industry.siemens.com/cs/document/109476228).

Note

After transfer of the new firmware, the parameters of the SIWAREX module are assigned with default values

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 to a limited extent with the old firmware version, and the new firmware is flashed 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. Call the firmware download using the function key 
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.

If the firmware file was not successfully uploaded, the following FAQ will assist you with troubleshooting: (https://support.industry.siemens.com/cs/document/109476228)

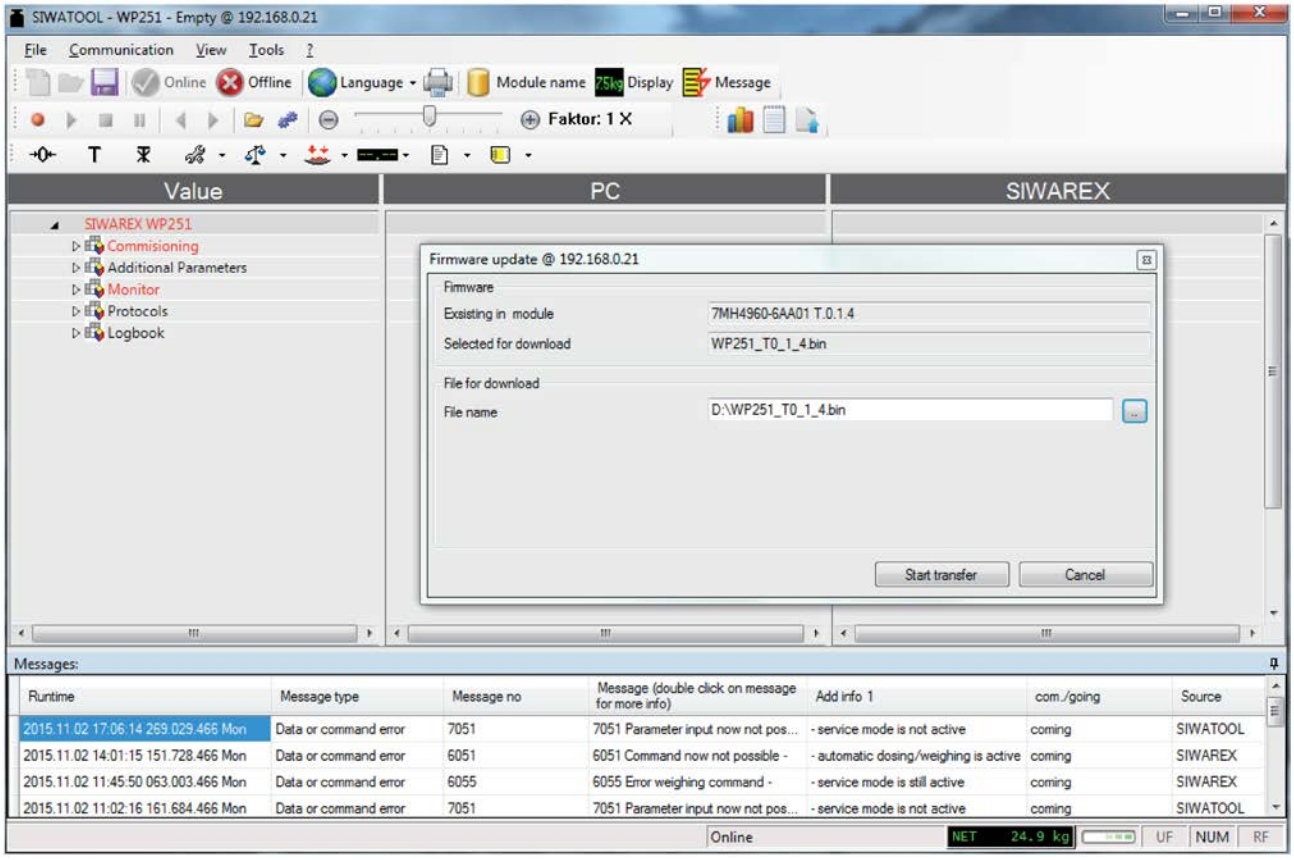


Image 7-8 Downloading the firmware with SIWATOOL

7.5.9 Reading out the saved scale logs

The scale logs are saved powerfail-proof in the internal memory of the SIWAREX.

You can read the logs with SIWATOOL using the "Logs" button .

A new window is opened, and all logs present in the weighing module are read out using "Refresh". You can subsequently save these in EXCEL or .csv format.

Scale parameters and functions

8

8.1 Parameters and functions

SIWAREX WP251 can be used as a non-automatic weighing instrument (NAWI), an gravimetric filling instrument or an automatic catchweighing instrument. The appropriate operating mode must be selected based on the requirements for the scale. For systems requiring official calibration, contact with the responsible weights and measures office at an early stage is recommended in order to define the correct operating mode and thus to correctly assign all parameters in advance.

The differences between the individual operating modes arise for the most part due to legal requirements related to calibration, which is why the operating mode (factory setting) can be used for dosing and mixing of individual components with scales that cannot be calibrated.

In this operating mode, the PLC sends a set point to SIWAREX and starts the dosing via a command. WP251 then switches the coarse and fine signal and doses the desired quantity to the scale or removes it from the scale (filling or removal mode). SIWAREX WP251 can also empty the scale, if required. An emptying signal is then switched. This signal is either switched based on a fixed time (emptying time) or when Limit 3 (emptying limit) is fallen below. After emptying, the next dosing is started directly (continuous mode) or WP251 waits for the next start command. Emptying can optionally be switched on or off for each operating mode.

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. All data records are always read or written as complete packets, and therefore it is not possible to read or write individual parameters within a data record.

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.

8.2 Weighing steps

8.2.1 Introduction

Dosing is always executed in steps. These steps involve the same task in each operating mode and are presented below. The step the scale is currently performing is indicated in the AWI Status (DR 30 or SIMATIC function block).

Weighing step	Function
0	Scale waits for command
1	Taring/Zero setting (based on weighing start options from DR 25)
2	Coarse/Fine phase (based on settings from DR 23)
3	Post-dosing (based on settings from DR 22)
4	Checking (based on settings from DR 22)
5	Emptying (based on settings from DR 25)

8.2.2 Operating mode NAWI (non-automatic weighing instrument) - Filling

This operating mode always requires an intervention by the operator, who has to start the logging of the current weight via a command. This can occur from the HMI touch panel, for example. The material to be weighed is dosed into or onto the scale.

The material to be weighed is placed on a platform weighing machine, for example, and an entry is made in the log memory of the WP251 by an operator command.

In NAWI mode, WP251 also allows a set point to be set, which the dosing functionality of the module then automatically doses. Logging of the dosed weight must be initiated by an operator command and is not an integral component of the automatic weighing cycle.

The dosing signals "Coarse flow/Fine flow" can be used to directly control the corresponding dosing elements. After the set point is reached, WP251 jumps to "stopped" state in weighing step 4, and the operator must confirm the dosed weight using the "Continue weighing" (1141) command. As a result of this, the dosed weight is logged and the weighing operation ends or WP251 advances to step 5 for emptying.

In practice, the execution of dosing in NAWI - Filling mode can be as follows:

1. PLC sends set point (DR 20) and material parameters (DR 23) to WP251
2. PLC sends "Start" command (e.g. 1101) to WP251
3. WP251 performs zero setting or tares (based on settings in DR 25)
4. Coarse/fine dosing phase starts
5. If configured and necessary, post-dosing occurs (DR 22)
6. WP251 jumps to "Stopped" state and waits for "Continue" command (1141) by the operator

7. If the "Continue" command is issued, the dosed weight is written in the log memory and the final tolerance check is performed.
8. WP251 jumps to weighing step 0 and waits for further commands.

8.2.3 Operating mode NAWI (non-automatic weighing instrument) - Removal

This operating mode always requires an intervention by the operator, who has to start the logging of the current weight via a command. This can occur from the HMI touch panel, for example.

"Removal" means that the product to be weighed is dosed from the scale (for example, a silo on load cells with discharge valves). In this case, the full scale is tared and the net weight increases with decreasing gross weight.

In NAWI mode, WP251 also allows a set point to be set, which is then dosed automatically by the dosing functionality of the module.

The dosing signals "Coarse flow/Fine flow" can be used to directly control the corresponding dosing elements. After the set point is reached, WP251 jumps to "stopped" state, and the operator must confirm the dosed weight using the "Continue weighing" command. As a result of this, the dosed weight is logged and the weighing operation is concluded.

In practice, the execution of dosing in NAWI - Removal mode can be as follows:

1. Scale is filled with sufficient material.
2. PLC sends set point (DR 20) and material parameters (DR 23) to WP251
3. PLC sends "Start" command (e.g. 1101) to WP251
4. WP251 tares (based on setting in DR 25)
5. Coarse/fine dosing phase starts
6. If configured and necessary, post-dosing occurs (DR 22)
7. WP251 jumps to "Stopped" state and waits for "Continue" command (1141) by the operator
8. If the "Continue" command is issued, the dosed weight is written in the log memory and the final tolerance check is performed.
9. Emptying signal is set, if necessary (based on setting in DR 25) (weighing step 5)
10. WP251 jumps to weighing step 0 and waits for further commands.

8.2.4 Operating mode AWI (gravimetric filling instrument)

In gravimetric filling mode, WP251 allows a set point to be set, which is then dosed automatically by the dosing functionality of the module.

The dosing signals "Coarse flow/Fine flow" can be used to directly control the corresponding dosing elements (e.g. valves). After the set point is reached, WP251 automatically logs the dosed weight in the log memory, performs a tolerance check (only in checked cycles), corrects the shut-off points of the dosing signals if necessary (only in checked cycles) and

completes the weighing operation autonomously. Optionally, WP251 can also empty the scale.

In this operating mode, the dosing is controlled by WP251 in a fully-automatic operation. In contrast to a NAWI scale, logging of the individual dosings by an operator command is not required (WP251 logs every weighing nevertheless). The scale is therefore tested during verification to see if the set point setting is always within the legally prescribed limits.

Typically, AWI scales dose continuously in continuous operation, which WP251 also supports. In this operating mode, the option also exists to define cycles that are not zeroed/tared and not checked. This increases the throughput of the scale because the operations that require a standstill do not occur in every cycle.

In practice, the execution of dosing in AWI mode can be as follows:

1. PLC sends set point (DR 20) and material parameters (DR 23) to WP251
2. PLC sends "Start" command (e.g. 1101) to WP251
3. WP251 performs zero setting or tares (based on setting in DR 25) (weighing step 1)
4. Coarse/fine dosing phase starts (weighing step 2)
5. If configured and necessary, post-dosing occurs (DR 22) (weighing step 3)
6. Dosing result is automatically checked and logged (weighing step 4)
7. Scale is emptied, if necessary (based on setting in DR 25) (weighing step 5)
8. WP251 jumps to weighing step 0 and waits for further commands or jumps directly back to step 1 (continuous operation).

8.2.5 Operating mode AWI (automatic catchweighing instrument) - Filling

In ACI mode, WP251 allows a set point to be set, which is then dosed automatically by the dosing functionality of the module.

The dosing signals "Coarse flow/Fine flow" can be used to directly control the corresponding dosing elements (e.g. valves). After the set point is reached, WP251 automatically logs the dosed weight in the log memory, performs a tolerance check, corrects the shut-off points of the dosing signals if necessary and completes the weighing operation autonomously. Optionally, WP251 can also empty the scale.

In contrast to NAWI mode, the logging of the dosed single weight is written automatically to the log memory without an operator intervention.

Dosing in continuous operation is possible.

Here is the basic sequence of dosing in ACI Filling mode:

1. PLC sends set point (DR 20) and material parameters (DR 23) to WP251
2. PLC sends "Start" command (e.g. 1101) to WP251
3. WP251 performs zero setting or tares (based on setting in DR 25) (weighing step 1)
4. Coarse/fine dosing phase starts (weighing step 2)
5. If configured and necessary, post-dosing occurs (DR 22) (weighing step 3)
6. Dosing result is automatically checked and logged (weighing step 4)

7. Scale is emptied, if necessary (based on setting in DR 25) (weighing step 5)
8. WP251 jumps to weighing step 0 and waits for further commands or jumps directly back to step 1 (continuous operation).

8.2.6 Operating mode AWI (automatic catchweighing instrument) - Removal

In ACI mode, WP251 allows a set point to be set, which is then dosed automatically by the dosing functionality of the module.

The dosing signals "Coarse flow/Fine flow" can be used to directly control the corresponding dosing elements (e.g. valves). After the set point is reached, WP251 automatically logs the dosed weight in the log memory and completes the weighing operation autonomously.

In contrast to NAWI mode, the logging of the dosed single weight is written automatically to the log memory without an operator intervention.

"Removal" means that the product to be weighed is dosed from the scale (for example, a silo on load cells with discharge valves). In this case, the full scale is tared and the net weight increases with decreasing gross weight. The "Dosing start" parameter in DR 25 should be set to "Tare" for correct operation.

Dosing in continuous operation is possible.

Here is the basic sequence of dosing in ACI - Removal mode:

1. Scale is filled with sufficient material.
2. PLC sends set point (DR 20) and material parameters (DR 23) to WP251
3. PLC sends "Start" command (e.g. 1101) to WP251
4. WP251 tares (based on setting in DR 25) (weighing step 1)
5. Coarse/fine dosing phase starts (weighing step 2)
6. If configured and necessary, post-dosing occurs (DR 22) (weighing step 3)
7. Dosing result is automatically checked and logged (weighing step 4)
8. Emptying signal is set, if necessary (based on setting in DR 25) (weighing step 5)
9. WP251 jumps to weighing step 0 and waits for further commands or jumps directly back to step 1 (continuous operation).

8.3 DR 3 Calibration parameters

8.3.1 Overview

The calibration parameters (DR 3) must be checked and changed, if necessary, for each scale.

Basic calibration of the scale is accomplished through the calibration parameters and calibration procedure (assignment of zero point and reference point). With a wire jumper on the "P" and "PR" terminals (parameter protection), most of DR 3 parameters can no longer be changed (write-protected). This provision is relevant for applications requiring official calibration. All changes in data record 3 require service mode to be switched on for the module. If service mode is not active, all parameter inputs are directly rejected with an error.

Procedure

- Read DR 3 from SIWAREX (in SIWATOOL, SIMATIC DB or ModbusMaster)
- Check all parameters and change them for the specific application
- Transfer data record DR 3 to SIWAREX (from SIWATOOL, SIMATIC DB or Modbus Master)
- Perform the calibration of the scale (zero point and calibration point 1 – optionally calibration point 2)
- Read DR 3 from SIWAREX (in SIWATOOL, SIMATIC DB or ModbusMaster)

Table 8- 1 Assignment of data record 3

Parameter	Description	Format	Length [bytes]	De-fault	Min	Max	Write protec-tion	Modbus holding register
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*3*	*-*	*-*	*-*	*1000*
Length	*Data record length information*	*USHORT*	*2*	*172*	*-*	*-*	*-*	*1001*
Application	*Information on appli-cation to which DR belongs*	*USHORT*	*2*	*105*	*-*	*-*	*-*	*1002*
Version identifier	*Current data record version information*	*USHORT*	*2*	*1*	*1*	*65535*	*-*	*1003*
Scale name header	Maximum length and actual length of string for scale name	UBYTE	2	12, 12	-	-	x	1004
Scale name (Page 66)	Freely selectable scale name	CHAR	12	" "	-	-	x	1005
Unit of weight (Page 66)	0: "mg" 1: "g" 2: "kg" 3: "t" 4: "oz" (ounce) 5: "lb" (pound) 6: "T" (=short tons) 7: "TL" (= long tons)	USHORT	2	2	0	6	x	1011
Gross identifier (Page 66)	0: "B" 1: "G"	USHORT	2	0	0	1	x	1012
Code for regulations (Page 67)	0: None 1: OIML	USHORT	2	0	-	-	-	1013
Reserve	Reserve	USHORT	2	0	-	-	-	1014

Parameter	Description	Format	Length [bytes]	De-fault	Min	Max	Write protec-tion	Modbus holding register
Minimum weighing range (Page 67)	Minimum weight, specification in numer-ical increments	USHORT	2	0	0	65,535	x	1015
Maximum weighing range (Page 67)	Maximum weight, specification in weight unit	FLOAT	4	100	> (wr_min * num_in cr)	9,999,9 99	x	1016
Calibration weights 0, 1, 2 and calibration digits 0, 1, 2 (Page 67)	Calibration weight 0	FLOAT	4	0	0	9,999,9 99	x	1018
Calibration weights 0, 1, 2 and calibration digits 0, 1, 2 (Page 67)	Calibration weight 1	FLOAT	4	100	0	9,999,9 99	x	1020
Calibration weights 0, 1, 2 and calibration digits 0, 1, 2 (Page 67)	Calibration weight 2	FLOAT	4	0	0	9,999,9 99	x	1022
Calibration digits 0 (measured)	Calibration digits 0 determined during calibration with cali-bration weight 0	LONG	4	0	- 3,999,9 99	3,999,9 99	x	1024
Calibration digits 1 (measured)	Calibration digits 1 determined during calibration with cali-bration weight 1	LONG	4	2,000 ,000	0	3,999,9 99	x	1026
Calibration digits 2 (measured)	Calibration digits 2 determined during calibration with cali-bration weight 2	LONG	4	0	0	3,999,9 99	x	1028
Scale interval (Page 68)	Resolution of weighing range1 (1*10**k, 2*10**k, 5*10**k]; k: -4 … 1)	FLOAT	4	0.1	0.0001	50.0	x	1030
Zero by power-on (Page 68)	0: Deactivated 1: Activated	BOOL	0	0	0	1	x	1032
Zero by power-on when tare ≠ 0 (Page 68)	0: No initial zeroing when tare weight ≠ 0 1: Initial zeroing when tare weight ≠ 0	BOOL	0	0	0	1	x	1032
Automatic zero adjust-ment (Page 68)	0: Deactivated 1: Activated	BOOL	0	0	0	1	x	1032
Subtractive / additive tare device (Page 69)	0: Subtractive 1: Additive	BOOL	0	0	0	1	x	1032
Weight simulation allowed (Page 69)	0: Not enabled 1: Enabled	BOOL	0	0	0	1	x	1032

Parameter	Description	Format	Length [bytes]	De-fault	Min	Max	Write protec-tion	Modbus holding register
Automatic zero tracking (Page 69)	0: Only outside the dosing cycle 1: Also inside the dosing cycle	BOOL	0	0	0	1	x	1032
Reserve	Bit 6: Reserve	BOOL	0	0	0	1	x	1032
Reserve	Bit 7: Reserve	BOOL	1	0	0	1	x	1032
Reserve	Bit 8: Reserve	BOOL	0	0	0	1	x	1032
Reserve	Bit 9: Reserve	BOOL	0	0	0	1	x	1032
Reserve	Bit 10: Reserve	BOOL	0	0	0	1	x	1032
Reserve	Bit 11: Reserve	BOOL	0	0	0	1	x	1032
Reserve	Bit 12: Reserve	BOOL	0	0	0	1	x	1032
Reserve	Bit 13: Reserve	BOOL	0	0	0	1	x	1032
Reserve	Bit 14: Reserve	BOOL	0	0	0	1	x	1032
Reserve	Bit 15: Reserve	BOOL	1	0	0	1	x	1032
Reserve	Reserve	USHORT	2	0	0	6	x	1033
Maximum tare load (Page 70)	Range of subtractive, semi-automatic taring [in % of maximum weighing range]	FLOAT	4	100	0	250	x	1034
Maximum negative zero setting limit (power-on) (Page 70)	Negative range of semi-automatic zero setting [in % of maxi-mum weighing range]	FLOAT	4	0	0	100	x	1036
Maximum positive zero setting limit (power-on) (Page 70)	Positive range of semi-automatic zero setting [in % of maxi-mum weighing range]	FLOAT	4	0	0	100	-	1038
Maximum negative zero setting limit (semi-automatically) (Page 70)	Negative range of zero setting (initial zeroing) [in % of maximum weighing range]	FLOAT	4	1	0	100	x	1040
Maximum positive zero setting limit (semi-automatically) (Page 71)	Positive range of zero setting (initial zeroing) [in % of maximum weighing range]	FLOAT	4	3	0	100	x	1042
Standstill 1 - range (Page 72)	Standstill range 1, specification in numer-ical increments	FLOAT	4	1	0	9,999,999	x	1044
Standstill 1 - time (Page 72)	Standstill time 1 (ms)	TIME	4	1000	10	10,000	x	1046

Parameter	Description	Format	Length [bytes]	De-fault	Min	Max	Write protec-tion	Modbus holding register
Max. waiting time for standstill 1 (Page 72)	Max. waiting time until standstill 1. 0: Standstill-dependent scale command is rejected immediately if no standstill. >0: Maximum waiting time until a technology message is issued.	TIME	4	0	0	10,000	-	1048
Standstill 2 - range (Page 73)	Standstill range 2, specification in numer-ical increments	FLOAT	4	1	0	0	x	1050
Standstill 2 - time (Page 73)	Standstill time 2 (ms)	TIME	4	1000	10	10,000	x	1052
Setting time before standstill 2 (Page 73)	Settling time before standstill 2 is evaluat-ed (ms)	TIME	4	0	0	10,000	-	1054
Frequency low pass filter 1 (Page 74)	Low-pass filter limit frequency: 0: Filter disabled	FLOAT	4	2	0	50	x	1056
Order no. low pass filter 1 (Page 74)	Filter order number 1 to 10	USHORT	2	4	1	4	x	1058
Depth average filter (Page 74)	Depth of first average filter (0=inactive)	USHORT	2	20	0	250	x	1059
Reserve	Reserve	USHORT	2	20	0	20	-	1060
Weighing operating mode (Page 75)	0: NAWI – Filling 1: NAWI – Removal 10: Gravimetric-Filling 20: Catchweighing – F. 21: Catchweighing-R.	USHORT	2	20	0	20	x	1061
Resolution of master totalizer	Resolution of sums (1*10**k, 2*10**k, 5*10**k]; k: -4 … 1)	FLOAT	4	0.1	-	-	-	1062
Reserve	Reserve	FLOAT	4	0	-	-	-	1064
SecureDisplay including weighing range data (Page 75)	Display weighing range data in Se-cureDisplay 0: No 1: Yes	USHORT	2	0	-	-	-	1066
SecureDisplay interface (Page 75)	0: SecureDisplay directly at WP251 Ethernet port 1: SecureDisplay at S7-1200 Ethernet port	USHORT	2	0	-	-	-	1067
String header version SecureDisplay	String header version SecureDisplay	UBYTE	2	12, 12	-	-	-	1068

Parameter	Description	Format	Length [bytes]	De-fault	Min	Max	Write protec-tion	Modbus holding register
SecureDisplay version (Page 75)	SecureDisplay version	UBYTE	12	"V3.0 0.10 "	-	-	-	1069
Smallest zoom factor of SecureDisplay (Page 75)	Minimum zoom factor of SecureDisplay (%)	USHORT	2	0	-	-	-	1075
Reserve	Reserve	FLOAT	4	0	-	-	-	1076
Reserve	Reserve	FLOAT	4	0	-	-	-	1078
Reserve	Reserve	FLOAT	4	0	-	-	-	1080
Reserve	Reserve	USHORT	2	0	-	-	-	1082
Reserve	Reserve	USHORT	2	0	-	-	-	1083
Reserve	Reserve	USHORT	2	0	0	1	-	1084
Grid frequency (Page 75)	Switchover of line frequency 50/60 Hz 0: 50 Hz 1: 60 Hz	USHORT	2	0	0	1	-	1085

8.3.2 Scale name

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

Note

The scale name cannot be changed after official verification.

8.3.3 Unit of weight

The following weight units are available for selection: milligram, gram, kilogram, metric ton, ounce, pound, short ton, and long ton The weight unit selection has no effect on the internal weight calculation. It involves only ASCII characters. Thus, all parameters with weight must be specified with appropriate conversion when there is a change of weight unit.

8.3.4 Gross identifier

The gross identifier specifies the letter, B (for brutto) or G (for gross) to be used in the display for a gross weight value.

8.3.5 Code for regulations

If the parameter is set to "OIML", WP251 performs a check to determine whether the entered parameters conform to the requirements of the OIML Recommendation. For scales not requiring official calibration, the parameter can be left deactivated (no check).

8.3.6 Minimum weighing range

For scales requiring official calibration, logging is not permitted below the minimum weighing range. The minimum weighing range is specified in the unit "d" (numerical increments) for verification.

The setting ex factory is 0 d and can thus be left for a scale not requiring official calibration. For scales requiring official calibration, "20" is generally entered.

8.3.7 Maximum weighing range

For scales requiring official calibration, further logging is not permitted above the maximum weighing range (+9d). The maximum weighing range is specified in weight unit for calibration acceptance.

The maximum weighing range depends on the number and type of load cells used, and for scales requiring official calibration additionally on the scale interval and the resulting resolution of the scale.

For scales not requiring official calibration, the maximum weighing range corresponds to the nominal load of all load cells (number of cells multiplied by the nominal load of one cell) minus the dead load (mechanical setup).

The correct parameter assignment is important because various zero setting and taring limits are specified as a percentage of it.

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

The calibration weights with the associated calibration digits define the scale characteristic. A detailed description of this can be found in section "Calibration procedure" (page 73).

The calibration weights must be specified in ascending order. Normally, it is sufficient to calibrate the scale with two calibration points (0 and 1). The setting of a third interpolation point (calibration weight 2) is thus optional.

Typically, calibration weight 0 = 0, because the calibration point 0 is normally set with the scale empty.

If a scale has been modified and the current content is known, this value can be entered and set as the calibration weight. A larger calibration weight 1 is then specified and set.

The calibration weights must be at least 5% of the nominal load of the scale and must differ from one another by an amount of at least 5% of the nominal load.

- Calibration weight 0 = 0 kg
- Calibration weight 1 = at least 5% of the nominal load of the scale
- Calibration weight 2 = at least 10% of the nominal load of the scale

The calibration digits are determined automatically by the calibration commands and assigned to the respective calibration weights. Therefore, the digits do not have to specified!

8.3.9 Scale interval

The numerical increment for the weighing range can be specified in accordance with EN 45501 (0.0001 to 50). It defines the smallest indicated weight change and conforms to the accuracy of the overall system for scales requiring official calibration.

8.3.10 Zero by power-on

The scales can automatically be set to zero when the supply voltage is switched on (in legal trade operation, this is at the end of the startup waiting time). A weight of ±10 % of the maximum measuring range can be set to zero by power-on for legal trade scales.

NOTICE
If the scales are not being used in legal trade operation (no OIML restrictions), fully loaded scales can also be set to zero once this function is enabled. The function can, however, be limited by setting a maximum and minimum weight for zero by power-on. See the section on maximum and minimum weights for zero by power-on.

8.3.11 Zero by power-on when tare ≠ 0

The scale can be automatically set to zero when the supply voltage is switched on. If the Initial zeroing (Page 68) function is enabled, this still does not specify whether the initial zeroing is also to be performed when the tare weight in the tare memory is not equal to zero.

If the "Initial zeroing if tared" parameter is set, the tare weight is also be cleared upon initial zeroing; if the parameter is not set, the scale is not set to zero.

8.3.12 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.

Note

If the scales are not being used in legal trade operation (no OIML restrictions) and this function is enabled, the scales may eventually read zero after a slow drift even if they are fully loaded. The function can, however, be limited by setting a maximum and minimum weight for zeroing.

8.3.13 Subtractive / additive tare device

If necessary, the scale can be tared using the "Tare" command.

The display value is hidden when a subtractive tare is enabled if the gross value exceeds the maximum weighing range by more than 9e.

When an additive tare is enabled, the display value is not hidden until the net weight exceeds the maximum weighing range. In the case of subtractive tare, the maximum tare weight is limited to 100% of the maximum weighing range. In the case of additive tare, the maximum tare weight is limited to 250% of the maximum weighing range.

The current tare value is deleted if you switch between additive and subtractive taring.

Note

There is no automatic evaluation of whether there is sufficient load cell measuring range capacity for an additive tare. The plant constructor is responsible for this evaluation.

8.3.14 Weight simulation allowed

For test purposes, weight simulation can be enabled instead of the actual weight determination on the basis of the load cell signal. The simulated weight value is specified using data record DR 16 and controlled with the "Weight Simulation on (3)" and "Weight Simulation off (4)" commands. Weight simulation can, in certain situations, facilitate scale testing and commissioning. The simulated weight is indicated on the main display with the word "TEST".

8.3.15 Automatic zero tracking

The parameter defines whether the zero tracking (if activated) is to be active only outside the automatic dosing cycle (only in weighing step 0) or also inside the dosing cycle.

8.3.16 Maximum tare load

The parameter is specified as a percentage of the "Maximum weight" parameter. All tare values (semi-automatic, automatic, or preset tare) are checked for this limit and rejected if the limit is exceeded.

8.3.17 Maximum negative zero setting limit (power-on)

Initial zeroing means the scale is automatically set to zero when the supply voltage is switched on.

If initial zeroing (zero setting at switch-on of the supply voltage) has been activated, the effect of the function can be limited with this parameter. The parameter is specified as a percentage of the "Maximum weight" parameter.

Example:
Maximum weight = 100 kg
Negative zeroing limit (initial zeroing) = 10%
→ Up to -10 kg (10% of 100 kg) can be zeroed by the initial zeroing function.

8.3.18 Maximum positive zero setting limit (power-on)

Initial zeroing means the scale is automatically set to zero when the supply voltage is switched on.

If initial zeroing (zero setting at switch-on of the supply voltage) has been activated, the effect of the function can be limited with this parameter. The parameter is specified as a percentage of the "Maximum weight" parameter.

Example:
Maximum weight = 100 kg
Positive zeroing limit (initial zeroing) = 10%
→ Up to 10 kg (10% of 100 kg) can be zeroed by the initial zeroing function.

8.3.19 Maximum negative zero setting limit (semi-automatically)

Zero setting defines the current weight of the scale as zero weight.

For the zero setting (semi-automatic, automatic and tracking), the effect of the function can be limited by specifying limits. The reference point for the effect of the limitation is not the current gross weight but rather the weight that the scale would have displayed had it not been set to zero beforehand (zero point at time of scale calibration).

For scales in operation where official calibration is required, the limitation between the negative and positive weight for the zeroing is 4% of the weighing range.

Example:
Maximum weight = 100 kg
Negative zeroing limit (semi-automatic) = 3%
→ Up to 3 kg (3% of 100 kg) can be set to zero by the zero setting function.

8.3.20 Maximum positive zero setting limit (semi-automatically)

Zero setting defines the current weight of the scale as zero weight.

For the zero setting (semi-automatic, automatic and tracking), the effect of the function can be limited by specifying limits. The reference point for the effect of the limitation is not the current weight but rather the weight that the scale would have displayed had it not been set to zero beforehand (zero point at time of scale calibration).

For scales in operation where official calibration is required, the limitation between the negative and positive weight for the zeroing is 4% of the maximum weighing range.

Example:

Maximum weight = 100 kg
Negative zeroing limit (semi-automatic) = 1%
→ Up to 1 kg (1% of 100 kg) can be set to zero by the zero setting function.

8.3.21 Standstill monitoring

Standstill monitoring is used to recognize when the scale is at steady state. Scale standstill is established when the weight value changes by less than a specified weight range (standstill range) within a specified time (standstill time).

WP251 has two independently formed standstill criteria (Standstill 1 and Standstill 2), which are queried at various points inside or outside the dosing cycle.

In the following situations, Standstill 1 must be present in order to perform the corresponding action: Tare, Zero setting

In the following situations, Standstill 2 must be present in order to perform the corresponding action: Tolerance check, Logging

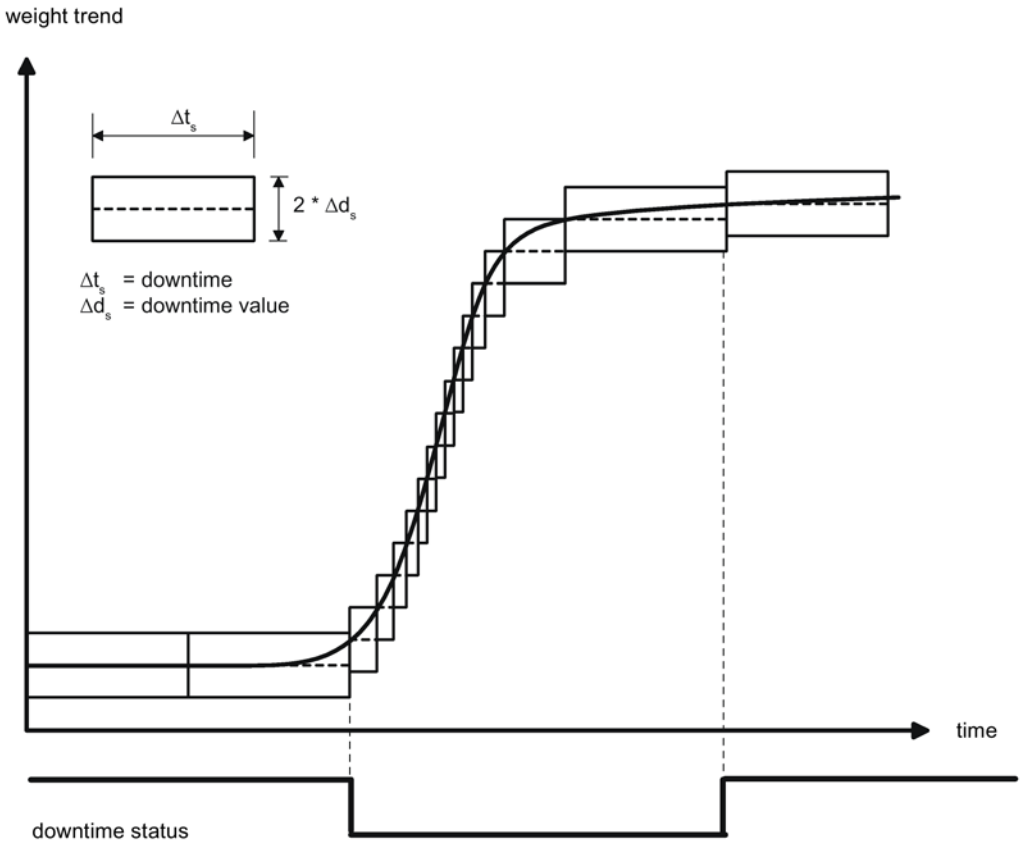


Image 8-1 Standstill monitoring

8.3.22 Standstill 1 - range

This parameter defines the weight range (+/- around the current weight) by which the weight may fluctuate within Standstill time 1, in order to determine that standstill has occurred. The setting is made in numerical increments (d).

8.3.23 Standstill 1 - time

This parameter defines the time window in which the weight value may fluctuate within Standstill range 1 only, in order to determine that standstill has occurred. The setting is made in milliseconds (ms).

8.3.24 Max. waiting time for standstill 1

The maximum waiting time for standstill 1 applies when a command is performed that is dependent on the occurrence of standstill 1. A technology message is generated if the command could not be executed during the waiting time because there is no standstill.

If the standstill waiting time is equal to zero, a command requiring standstill is rejected immediately if standstill is not achieved at the time the command is issued.

If the standstill waiting time is active, this is indicated in the NAWI Status of the scale by a corresponding bit.

8.3.25 Standstill 2 - range

This parameter defines the weight range (+/- around the current weight) by which the weight may fluctuate within Standstill time 2, in order to determine that standstill has occurred. The setting is made in numerical increments (d).

8.3.26 Standstill 2 - time

This parameter defines the time window in which the weight value may fluctuate within Standstill range 2 only, in order to determine that standstill has occurred. The setting is made in milliseconds (ms).

8.3.27 Settling time before standstill 2

The parameter defines a time in milliseconds (ms) that is allowed to elapse before a check is made for standstill 2. Because standstill 2 is needed after an automatic dosing for logging or for the tolerance check, the filled scale, which may not yet be at steady state, can settle before the check for standstill 2 is made. If the settling time is active, this is indicated in the AWI Status of the scale by a corresponding bit.

8.3.28 Frequency low pass filter 1

There is a critically damped low-pass filter for suppression of disturbances. 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.

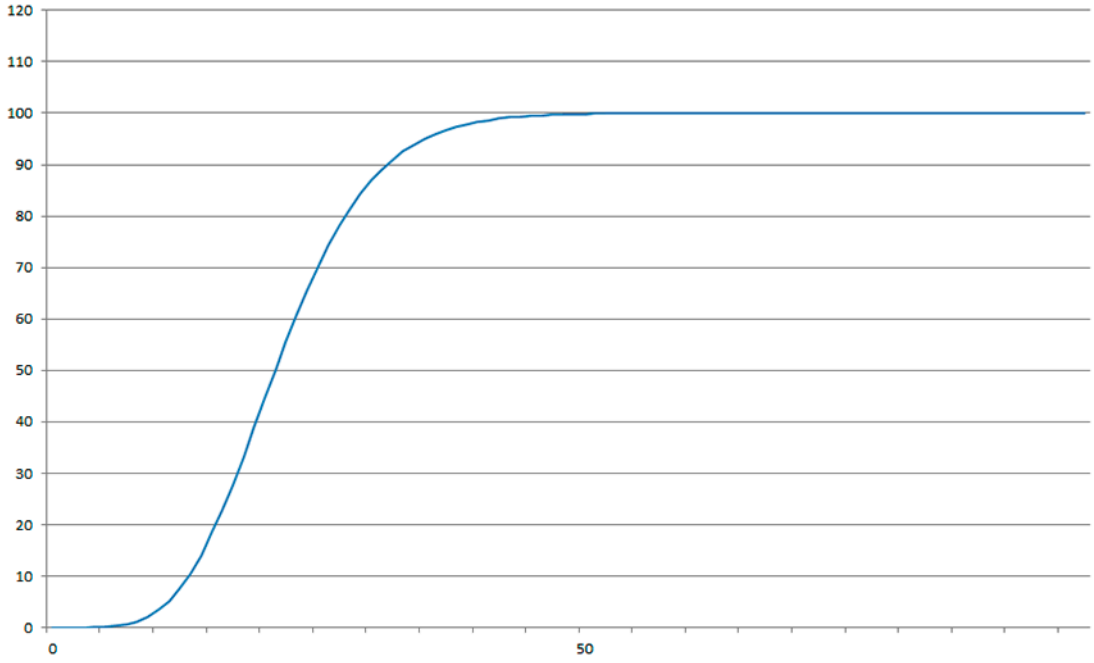


Image 8-2 Step response of digital low pass filter at f = 2 Hz

The definition of the limit frequency is extremely important for the suppression of disturbances. Defining the limit frequency defines the "speed" of the scale's 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 scale "slower".

8.3.29 Order no. low pass filter 1

The number of the filter defines the effect of damping. The values 2, 4, 6, 8, and 10 can be set. The higher the selected filter number, the higher the effect.

8.3.30 Depth average filter

Depth average filter 1 is used to settle the weight value from periodic disturbances. The weight value is calculated from the average of the n (n = max. 250) most recent weight values calculated by the weighing module every 10 ms. When n = 10, for example, 10 values are used to calculate the average. Every 10 ms, the oldest value is omitted from the calculation and the newest value is included in the calculation (running average).

8.3.31 Weighing operating mode

The parameter defines the operating mode of the scale.

The following operating modes are available:

0: Non-automatic weighing instrument (NAWI) – Filling
1: Non-automatic weighing instrument (NAWI) – Removal
10: Automatic gravimetric instrument – Filling
20: Automatic catchweighing instrument - Filling
21: Automatic catchweighing instrument - Removal

8.3.32 SecureDisplay including weighing range data

In legal trade operation, the software version of the HMI device must be recorded so that it can be checked by an official verification officer.

8.3.33 SecureDisplay interface

For applications requiring official calibration, the "SecureDisplay" software is used to display the calibratable weight value. The parameter defines whether "SecureDisplay" communicates directly via the Ethernet port of the WP251 or via the Ethernet port of the SIMATIC S7-1200 CPU.

8.3.34 SecureDisplay version

For applications requiring official calibration, the "SecureDisplay" software is used to display the calibratable weight value. The parameter defines the version of the "SecureDisplay" software that is running in the HMI device. If the version is not entered correctly, a weight value will not be output in "SecureDisplay", and the display stays in the "Start Up" step.

8.3.35 Smallest zoom factor of SecureDisplay

The minimum display size defines the smallest zoom factor for the "SecureDisplay" calibratable display. If the parameter does not match the smallest zoom factor in the .xml file in the HMI device, "SecureDisplay" remains in the "StartUp "step and no weight value is output.

8.3.36 Grid frequency

The parameter defines the line frequency of the power supply grid. A selection between 50 Hz and 60 Hz can be made. By making the correct setting, interferences caused by the power supply grid can be better suppressed.

8.4 Calibration

8.4.1 Calibration with calibration weights

The incoming analog millivolt signal from the load cells is converted to a digital value (digit) 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 by interpolation points 0 (calibration weight 0 and calibration digit 0) and 1 (calibration weight 1 and calibration digit 1). The first working point (point 0) is defined by the unloaded scale (empty) with its self-weight. Based on the weight of the scale's own construction, the load cells return a measuring voltage to the weighing module Following analog-to-digital conversion of the measuring voltage, the zero point is assigned to the digital value (calibration digits for the zero point).

If the scale is loaded with a defined calibration weight (e.g. 50% of the measuring range), the calibration weight will be assigned to the new digital value from the analog-to-digital converter.

In addition, the characteristic curve can be defined by a third interpolation point, which must lie above 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. This corresponds to approximately 2% of the nominal load of all load cells (2% of (number of load cells x nominal load of one single load cell)).

The calibration procedure involves the following steps:

- Specify the calibration weight and other parameters in data record DR 3.
- Transfer the DR 3 data record to the scale.
- Trigger the "Set Calibration Point 0" when scale is empty.
- Load the scale with the specified calibration weight.
- Trigger the "Set Calibration Point 1" command.
- Transfer data record DR 3 from the scale to SIWATOOL/SIMATIC DB/Modbus-Master and save the data as a backup, if necessary.

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

Load cell characteristic value	Digits (approx.) at nominal load
1 mV/V	1 000 000
2 mV/V	2 000 000
4 mV/V	4 000 000

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

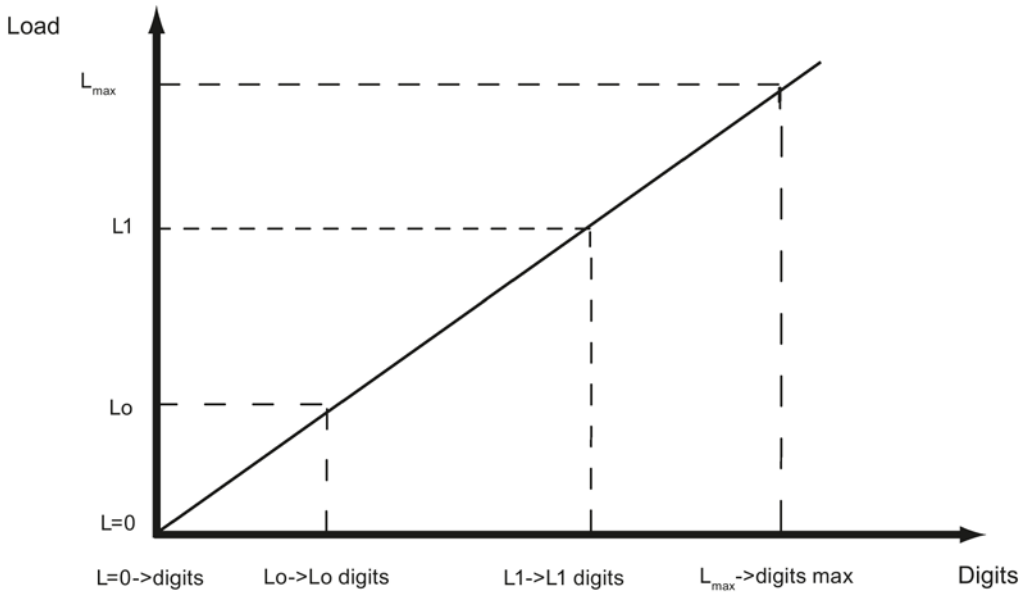


Image 8-3 Calibration digits and calibration weight

Load	Comment	Load	Digits
L=0	100 kg load cell (2 mV/V) not loaded		Approx. 0
L0	Mechanical installation on load cell (dead load)	25 kg	Approx. 500 000
L1	Calibration weight 1 placed onto scale	e.g. 60 kg	Approx. 1 200 000
L_{max}	Nominal weight of load cell	100 kg	2 000 000
L_{max} +10%	Rated weight + approx. 10 %	Approx. 110 kg	2 200 000

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 scales are 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 scales and enable the "Send all data records" function. This transfers the parameters for calibration weights and calibration digits, and the characteristic curve are determined immediately. The same applies when you change a weighing module.

Note

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

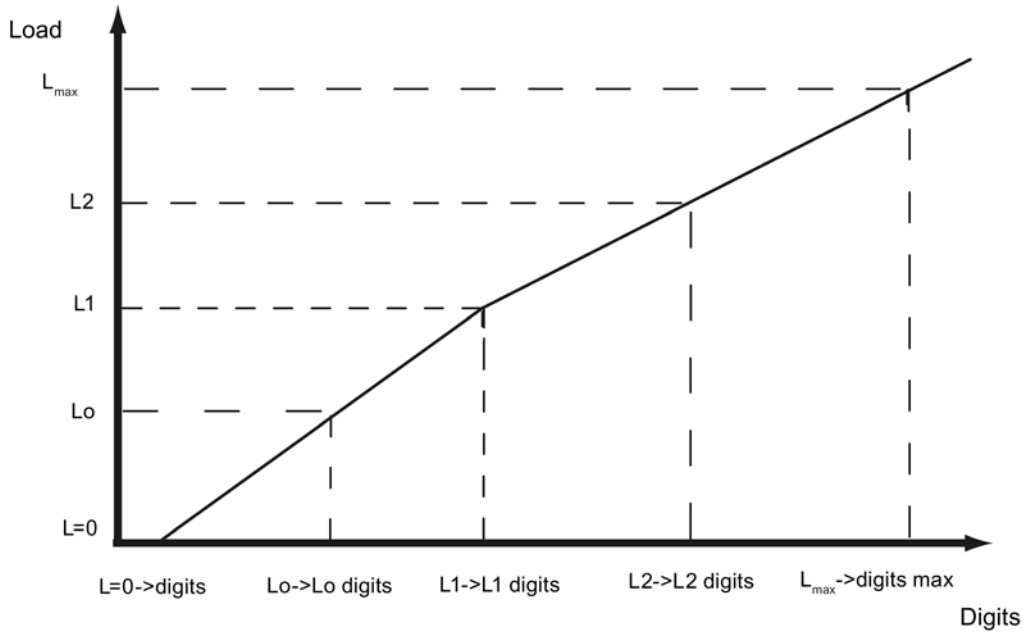


Image 8-4 Linearizing the scales' characteristic curve

Load	Comment	Load	Digits
L=0	100 kg load cell (2 mV/V) not loaded		Approx. 0
L0	Mechanical installation on load cell (dead load)	e.g. 25 kg	Approx. 500 000
L1	Calibration weight 1 placed onto scale	e.g. 60 kg	Approx. 1 200 000
L2	Calibration weight 2 placed onto scale	e.g. 80 kg	Approx. 1 650 000
L_{max}	Nominal weight of load cell	100 kg	Approx. 2 000 000
L_{max} +10 %	Rated weight + approx. 10 %	Approx. 110 kg	Approx. 2 200 000

8.4.2 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. The best level of accuracy for the scale can be achieved by calibrating with calibration weights.

During initial commissioning with automatic calibration, the module must be reset using the "Load factory settings" or "Load standard parameters" command.

The load cell parameters must subsequently be defined 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)
- Installed load cells are evenly loaded
- There are no shunt circuits

8.5 DR 4 Output of calculated calibration digits

8.5.1 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 8- 2 Assignment of data record 4

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus Register
Data record number	*Contains no. of the 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*	*105*	*-*	*-*	*1202*
Version identifier	*Current data record version information*	*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	200000	0	1600000	1204

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus Register
	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

8.5.2 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.

8.6 DR 5 Tare / zero memory

8.6.1 Overview

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

In legal trade operation, the data record is not write-protected.

Table 8- 3 Assignment of data record 5

Variable	Note	Type	Length (bytes)	Read/ write protection	Default	Min.	Max.	Modbus Register
Data record number	*Contains no. of the 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*	*105*	*-*	*-*	*1216*

Variable	Note	Type	Length (bytes)	Read/ write protec-tion	Default	Min.	Max.	Modbus Register
Version identi-fier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1217*
Effective tare weight - from specification 1, 2 or 3 (Page 81)	Current tare weight (tare setting)	FLOAT	4	rwP	0	0	Depends on speci-fication in DR 3	1218
Effective tare weight (semi-automatic) (Page 81)	Current tare weight (semi-automatic)	FLOAT	4	rwP	0	0	Depends on speci-fication in DR 3	1220
Zero by power-on (value when switching on) (Page 82)	Current zeroing weight (affected by switch-on)	FLOAT	4	rwP	0	Depends on speci-fication in DR 3	Depends on speci-fication in DR 3	1222
Zero weight (semi-automatic) (Page 82)	Current zero setting weight (semi-automatic)	FLOAT	4	rwP	0	Depends on speci-fication in DR 3	Depends on speci-fication in DR 3	1224
Current zero tracking weight (Page 82)	Current zero setting weight (zero tracking)	FLOAT	4	rwP	0	Depends on speci-fication in DR 3	Depends on speci-fication in DR 3	1226
Dead load (Page 82)	Dead load calculat-ed during automatic calibration	FLOAT	4	r	0	Depends on speci-fication in DR 3	Depends on speci-fication in DR 3	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

8.6.2 Effective tare weight - from specification 1, 2 or 3

A preset tare weight can be specified in data record DR 15. It is activated with command (1013). The "Delete Tare" command deactivates the preset tare weight. This does not delete the specification in data record DR 15.

8.6.3 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.

8.6.4 Zero by power-on (value when switching on)

If the automatic zero by power-on is configured, the scale is automatically set to "Zero" when the power supply is switched on provided the gross weight is within the defined zero setting limits. The current gross weight is saved as the zero by power-on weight. The zero by power-on weight must be within the specified range (usually ± 10 %).

8.6.5 Zero weight (semi-automatic)

The zero weight command (see command 1001) entered by the user sets the current gross weight to "Zero" provided it is within the defined zero setting limits. The current gross weight is saved as the zero weight. The zeroing weight must be within the specified range (usually +3 / -1 % of the set zero point).

8.6.6 Current zero tracking weight

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

8.6.7 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.

8.7 DR 6 Limits

8.7.1 Overview

The switch-on and switch-off values for Limits 1, 2 and 3 are configured in data record DR 6.

In legal trade operation, the data record is not write-protected.

Table 8- 4 Assignment of data record 6

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus Register
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*6*	*-*	*-*	*1234*
Length	*Data record length information*	*USHORT*	*2*	*r*	*60*	*-*	*-*	*1235*

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus Register
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	-	-	*1236*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1237*
Limit reference (limits 1 and 2)	Gross / net reference of limit 1 and 2 0: Limit 1 and Limit 2 reference the gross weight (specification in % of max. weight from DR 3) 1: Limit 1 and Limit 2 reference the net weight (specification in % of max. weight from DR 3) 2: Limit 1 and Limit 2 reference the gross weight (specification as absolute weight value) 3: Limit 1 and Limit 2 reference the net weight (specification as absolute weight value)	USHORT	2	rw	0	0	1	1238
Reserve 1	Reserve	USHORT	2	rw	0	0	-	1239
Limit value 1 ON, limit value 2 ON, limit value 1 OFF, limit value 2 OFF (Page 84)	Switch-on point for Limit 1	FLOAT	4	rw	0	maximum number range	maximum number range	1240
Reserve	Reserve	DINT	4	rw	0	0	maximum number range+	1242
Limit value 1 ON, limit value 2 ON, limit value 1 OFF, limit value 2 OFF (Page 84)	Switch-off point for Limit 1	FLOAT	4	rw	0	maximum number range	maximum number range	1244

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus Register
Reserve	Reserve	DINT	4	rw	0	0	maximum number range+	1246
Limit value 1 ON, limit value 2 ON, limit value 1 OFF, limit value 2 OFF (Page 84)	Switch-on point for Limit 2	FLOAT	4	rw	0	maximum number range	maximum number range	1248
Reserve	Reserve	DINT	4	rw	0	0	maximum number range+	1250
Limit value 1 ON, limit value 2 ON, limit value 1 OFF, limit value 2 OFF (Page 84)	Switch-off point for Limit 2	FLOAT	4	rw	0	maximum number range	maximum number range	1252
Switch-on delay limit 3 (empty)	Switch-on delay Limit 3 (ms)	TIME	4	rw	0	0	maximum number range+	1254
Limit 3 - empty (Page 85)	Limit "empty" ON (always references the gross weight). Unit is dependent on "Limit reference".	FLOAT	4	rw	0	maximum number range	maximum number range	1256
Switch-on/off delay limit 1 & 2	Switch-on and switch-off delay for limit 1 and 2 (ms)	TIME	4	rw	0	0	maximum number range+	1258
Reserve	Reserve	FLOAT	4	rw	0	-	-	1260
Reserve	Reserve	USHORT	2	rw	0	-	-	1262
Reserve	Reserve	USHORT	4	rw	0	-	-	1263

8.7.2 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 as a percentage of the measuring range or as absolutely values (based on "Limit reference" parameter setting). 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.

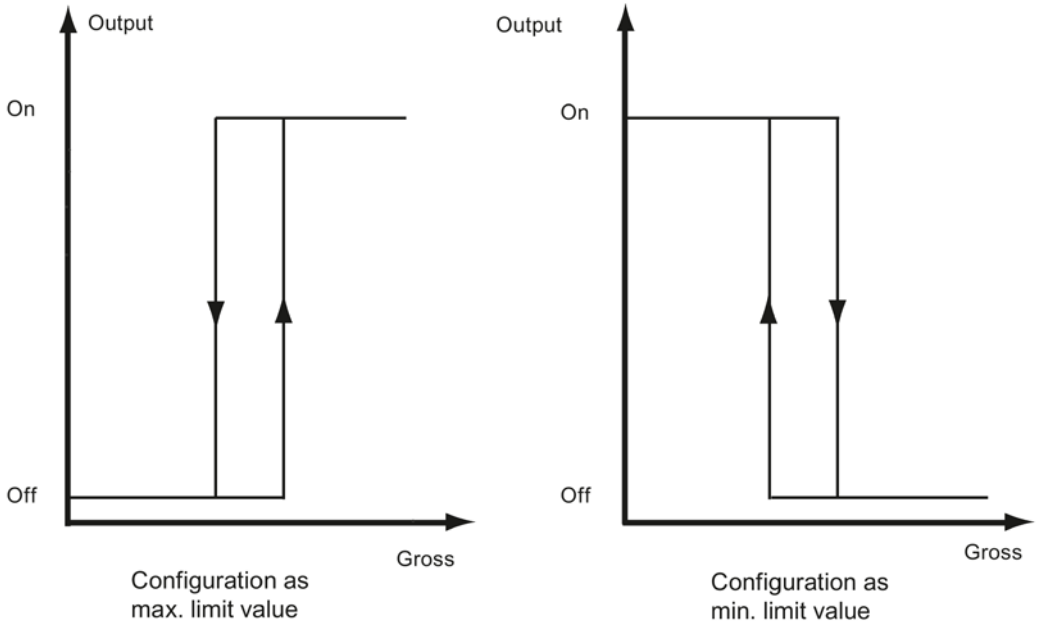


Image 8-5 Limit value configuration

8.7.3 Switch-on delay limit 3 (empty)

Switch-on of Limit 3 (empty) can be deliberately delayed by a delay time (ms). This is helpful, for example, if the weight is undershot at the moment of opening when the scale is being emptied, which would cause Limit 3 to be fallen below already.

8.7.4 Limit 3 - empty

This parameter defines the time starting from which the scale is empty. The unit is expressed either as a percentage of the maximum weight or in the weight unit depending on the "Limit reference" setting Unlike Limit 1 and Limit 2, Limit 3 always references the gross weight of the scale.

8.8 DR 7 Process interfaces

8.8.1 Overview

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

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

Table 8- 5 Assignment of data record 7

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus Register
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*7*	*-*	*-*	*1300*
Length	*Data record length information*	*USHORT*	*2*	*r*	*60*	*-*	*-*	*1301*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1302*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1303*
Assignment of digital input DI.0, DI.1, DI.2, DI.3 (Page 90)	Code 0: No command assigned 1....32759 Command is triggered at a positive edge 32760...32767: Transition for steps 0 to 7 (positive edge) 32769 … 65527 Command (command code+32768) is triggered at a negative edge 65528...65535: Transition for steps 0 to 7 (negative edge)	USHORT	2	rw	0	0	1999	1304

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus Register
	Code 0: No command assigned 1....32759 Command is triggered at a positive edge 32760...32767: Transition for steps 0 to 7 (positive edge) 32769 … 65527 Command (command code+32768) is triggered at a negative edge 65528...65535: Transition for steps 0 to 7 (negative edge)	USHORT	2	rw	0	0	1999	1305
	Code 0: No command assigned 1....32759 Command is triggered at a positive edge 32760...32767: Transition for steps 0 to 7 (positive edge) 32769 … 65527 Command (command code+32768) is triggered at a negative edge 65528...65535: Transition for steps 0 to 7 (negative edge)	USHORT	2	rw	0	0	1999	1306
	Code 0: No command assigned 1....32759 Command is triggered at a positive edge 32760...32767: Transition for steps 0 to 7 (positive edge) 32769 … 65527 Command (command code+32768) is triggered at a negative edge 65528...65535: Transition for steps 0 to 7 (negative edge)	USHORT	2	rw	0	0	1999	1307

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus Register
Input filtering (hardware setting) (Page 91)	0: 0.2 ms 1: 0.2 ms 2: 0.4 ms 3: 0.8 ms 4: 1.6 ms 5: 3.2 ms 6: 6.4 ms 7: 12.8 ms	USHORT	2	rw	5	0	7	1308
Assignment of digital output DQ.0, DQ.1, DQ.2, DQ.3 (Page 91)	Assignment for output 0: Code 0 … 0x1F hex: Bit no. of the status flags from byte 0 to 3 (DR 30) Code 0x21 hex: Data record 18 Code 0x22 hex: S7 I/O modules Code 0xFF hex: Output always disabled	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
Response of digital outputs to faults or SIMATIC STOP (Page 92)	Response of digital outputs following module fault or CPU STOP: 0: Outputs are switched off 1: Outputs are not switched off, continue 2: The relevant substitute value is activated 3: The outputs are switched on	USHORT	2	rw	0	0	0	1313
Substitute value for DQ 0, 1, 2, 3 following fault or SIMATIC STOP (Page 92)	Substitute value for DQ 0 following fault or SIMATIC CPU STOP	BIT	0	rw	0	0	1	1314.16
	Substitute value for DQ 1 following fault or SIMATIC CPU STOP	BIT	0	rw	0	0	1	1314.15
	Substitute value for DQ 2 following fault or SIMATIC CPU STOP	BIT	0	rw	0	0	1	1314.14
	Substitute value for DQ 3 following fault or SIMATIC CPU STOP	BIT	0	rw	0	0	1	1314.13
Bit 4	Reserve	BIT	0	rw	0	0	1	1314.12
Bit 5	Reserve	BIT	0	rw	0	0	1	1314.11

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus Register
Bit 6	Reserve	BIT	0	rw	0	0	1	1314.10
Bit 7	Reserve	BIT	0	rw	0	0	1	1314.9
Bit 8	Reserve	BIT	0	rw	0	0	1	1314.8
Bit 9	Reserve	BIT	0	rw	0	0	1	1314.7
Bit 10	Reserve	BIT	0	rw	0	0	1	1314.6
Bit 11	Reserve	BIT	0	rw	0	0	1	1314.5
Bit 12	Reserve	BIT	0	rw	0	0	1	1314.4
Bit 13	Reserve	BIT	0	rw	0	0	1	1314.3
Bit 14	Reserve	BIT	0	rw	0	0	1	1314.2
Bit 15	Reserve	BIT	2	rw	0	0	1	1314.1
Analog output range (Page 93)	0: 0 … 20 mA 1: 4 … 20 mA	USHORT	2	rw	0	0	1	1315
Analog output source (Page 93)	Basis of analog value output: 0 = G/N value 1 = Gross 2 = Net 3 = Ext. specification, DR 17 4 = Ext. specification, S7 interface	USHORT	2	rw	2	0	3	1316
Response of analog output to faults or SIMATIC STOP (Page 93)	0: Switch off 1: Continue 2: Output configured output value 3: Output maximum value (24 mA, NAMUR)	USHORT	2	rw	0	0	3	1317
Start value for the analog output (Page 93)	Value at which 0 …4 mA is to be output	FLOAT	4	rw	0	maximum weighing range	maximum weighing range	1318
End value for the analog output (Page 93)	Value at which 20 mA is to be output	FLOAT	4	rw	0	maximum weighing range	maximum weighing range	1320
Output value following fault or SIMATIC STOP (Page 94)	Value to be output when the OutDis signal is enabled (in mA)	FLOAT	4	rw	0	0	24	1322
Trace recording cycle (Page 94)	1: 10 ms 10: 100 ms 100: 1 s 1 000: 10 s	USHORT	2	rw	1	1	1000	1324

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus Register
Trace storage method (Page 94)	0: Trace recording runs as a circular buffer 1: Trace is stopped when the trace memory is full	BIT	0	rw	0	0	1	1325.16
Bit 1	Reserve	BIT	0	rw	0	0	1	1325.15
Bit 2	Reserve	BIT	0	rw	0	0	1	1325.14
Bit 3	Reserve	BIT	0	rw	0	0	1	1325.13
Bit 4	Reserve	BIT	0	rw	0	0	1	1325.12
Bit 5	Reserve	BIT	0	rw	0	0	1	1325.11
Bit 6	Reserve	BIT	0	rw	0	0	1	1325.10
Bit 7	Reserve	BIT	1	rw	0	0	1	1325.9
Bit 8	Reserve	BIT	0	rw	0	0	1	1325.8
Bit 9	Reserve	BIT	0	rw	0	0	1	1325.7
Bit 10	Reserve	BIT	0	rw	0	0	1	1325.6
Bit 11	Reserve	BIT	0	rw	0	0	1	1325.5
Bit 12	Reserve	BIT	0	rw	0	0	1	1325.4
Bit 13	Reserve	BIT	0	rw	0	0	1	1325.3
Bit 14	Reserve	BIT	0	rw	0	0	1	1325.2
Bit 15	Reserve	BIT	1	rw	0	0	1	1325.1
Reserve 1	Reserve	LONG	4	rw	0	0	-	1326
Reserve 2	Reserve	FLOAT	4	rw	0	0	-	1328

8.8.2 Assignment of digital input DI.0, DI.1, DI.2, DI.3

A command trigger can be assigned to a digital input. The assignment is made using the corresponding command code: → Command lists (Page 179).

Function assignment of input DI.0, DI.1, DI.2, DI.3:

Function code (decimal)	Assignment
0	Not assigned
1 … 32759	Command code is triggered at a positive edge (0 → 1 transition)
32760...32767	Transition for steps 0 to 7 (positive edge)
32769…65527	Command code +32768: Command is triggered at a negative edge (1 → 0 transition)
65528...65535	Transition for steps 0 to 7 (negative edge)

8.8.3 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	Signal pending period	Value	Signal pending period
0	0.2 ms	4	1.6 ms
1	0.2 ms	5	3.2 ms
2	0.4 ms	6	6.4 ms
3	0.8 ms	7	12.8 ms

8.8.4 Assignment of digital output DQ.0, DQ.1, DQ.2, DQ.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:

Function code (decimal)	Status display
0 … 63	0-63 Status bits of NAWI + AWI Status (see DR 30)
64	Control of output via data record 18
65	Control of output via SIMATIC S7 I/O
100 …163	0-63 Status bits of NAWI + AWI Status (inverted) (see DR 30)
255 (default)	Output deactivated
1000-1015	Operating error – output is set for 3 seconds
1100-1115	Operating error (inverted) – output is reset for 3 seconds
2000-2031	Technology error – output is set for 3 seconds
2100-2131	Technology error (inverted) – output is reset for 3 seconds
3000-3031	Data/command error – output is set for 3 seconds

For a single component scale, three of the outputs are typically linked directly to the "Coarse signal" (function code 41), "Fine signal" (function code 42), and "Empty" (function code 43) status bits in order to directly control the corresponding dosing elements or the associated relays of SIWAREX WP251.

See also

Errors and messages (Page 163)

8.8.5 Response of digital outputs to faults or SIMATIC STOP

This parameter allows you to define the response of the digital outputs following a fault of the SIWAREX module or SIMATIC STOP.

Function code	Response
0 (default)	Outputs are switched off
1	Outputs are not switched off (continue)
2	The relevant substitute value is activated
3	Outputs are switched on

8.8.6 Substitute value for DQ 0, 1, 2, 3 following fault or SIMATIC STOP

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 "Response of digital outputs to fault or SIMATIC STOP" parameter must also be set to "Output substitute value".

Examples

Table 8- 6 Bit 0 defines digital output 0 (DQ 0)

Value of bit 0	Value of DQ 0 following fault
0 (default)	0
1	1

Table 8- 7 Bit 1 defines digital output 2 (DQ 2)

Value of bit 2	Value of DQ 2 following fault
0 (default)	0
1	1

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.

8.8.7 Analog output range

This parameter is used to define the output current range.

Function code	Output current
0	0 … 20 mA
1 (default)	4 … 20 mA

8.8.8 Analog output source

The analog output can be used for a range of purposes. This parameter defines the tag that controls the analog output.

Function code	Basis for the analog output
0	Gross weight (rounded according to DR 3)
1 (default)	Net weight (rounded according to DR 3)
2	Tare weight (rounded according to DR 3)
3	Coarse/fine signal (specified percentage from DR 25)
4	Control using data record DR 17
5	Control using S7-I/O ("s_I_O_DATA.AQ_CONTROL")

8.8.9 Response of analog output to faults or SIMATIC STOP

This parameter defines the response of the analog output following a fault of the SIWAREX module or SIMATIC STOP.

Function code	Response
0 (default)	Switch off
1	Retain function
2	Output configured substitute value (e.g. 3.5 mA)
3	Output maximum value (24 mA)

8.8.10 Start value for the analog output

This parameter defines the start value of the scaling of the analog output and thus corresponds to 0 mA or 4 mA, depending on the setting. The value can be greater or less than the end value.

8.8.11 End value for the analog output

This parameter defines the end value of the scaling of the analog output and thus corresponds to 20 mA.

8.8.12 Output value following fault or SIMATIC STOP

With the default settings, the analog output is switched off following a module fault (operating error) or at a SIMATIC S7-1200 CPU STOP.

If the analog output is, for example, to be set to 3.5 mA following a fault, this is defined using this parameter. The current value to be output is entered in mA.

NOTICE
System can be switched to unsafe state If the analog output is to be set to a given value following a fault (operating error), you must ensure that this poses no danger.

8.8.13 Trace recording cycle

The trace function is used for the continuous recording of measured values. The recording rate is defined with the parameter.

Function code	Response
1	Recording every 10 ms
10	Recording every100 ms
100	Recording every 1000 ms
1000	Recording every 10000 ms

8.8.14 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 recording is stopped when memory is full and a technology message is output.

8.9 DR 8 date and time

The weighing module has its own hardware clock. The current date and time are specified by or read from data record DR 8. The clock is buffered with a capacitor and can continue operating for up to approximately 70 hours without supply voltage.

If you are using the Modbus protocol, data record DR 48 must be used for the date and time because the SIMATIC DTL format is not supported by Modbus.

Table 8- 8 Assignment of data record 8

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*8*	*-*	*-*	*1334*
Length	*Data record length information*	*USHORT*	*2*	*r*	*16*	*-*	*-*	*1335*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1336*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1337*
Date and time	SIMATIC DTL format	DTL	12	rw	DTL#1970-01-01-00:00:00.0	-	-	1338

8.10 DR 9 module information

No inputs can be made in data record DR 9. The data record contains information about the firmware and hardware versions of the module.

Table 8- 9 Assignment of data record 9

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*9*	*-*	*-*	*1344*
Length	*Data record length information*	*USHORT*	*2*	*r*	*68*	*-*	*-*	*1345*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1346*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1347*
Order No. - header	Maximum and current string length for the order number	UBYTE[2]	2	r	16,16	-	-	1348
Order No.	Order number of the module 7MH ..	CHAR[16]	16	r	"7MH4960-6AA01"	-	-	1349

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Serial number - header	String header	UBYTE[2]	2	r	12,12	-	-	1357
Serial number	Serial number	CHAR[12]	12	r	" "	-	-	1358
Firmware type - header	String header	UBYTE[2]	2	r	2,2	-	-	1364
Firmware type	Firmware type	CHAR[2]	2	r	'V'	-	-	1365
FW version 1st position	Version 1.	USHORT	2	r	0	-	-	1366
FW version 2nd position	Version 2.	USHORT	2	r	0	-	-	1367
FW version 3rd position	Version 3.	USHORT	2	r	0	-	-	1368
Hardware version number	HW version	USHORT	2	r	1	-	-	1369
OS version header	String header	UBYTE[2]	2	r	1,1	-	-	1370
OS version (loader) - designation	Operating system version	CHAR[2]	2	r	'V'	-	-	1371
OS version (loader) - designation	e.g. version n	USHORT	2	r	'V'	-	-	1372
Reserve	Reserve	USHORT	2	r	0	-	-	1373
Reserve	Reserve	USHORT	2	r	0	-	-	1374
Reserve	Reserve	USHORT	2	r	0	-	-	1375
Reserve	Reserve	FLOAT	4	r	0	-	-	1376

8.11 DR 10 Load cell parameters

8.11.1 Overview

The load cell parameters must be assigned before the automatic calibration or calibration check. The load cell manufacturer and the order number should always be specified so that the information is available in a service case.

Table 8- 10 Assignment of data record 10

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*10*	*-*	*-*	*1400*
Length	*Data record length information*	*USHORT*	*2*	*r*	*44*	*-*	*-*	*1401*

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1402*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1403*
Reserve	Reserve	USHORT	2	rw	1	-	-	1404
Reserve	Reserve	USHORT	2	rw	0	-	-	1405
Number of support points (Page 97)	Number of support points	USHORT	2	rw	0	0	8	1406
Reserve	Reserve	USHORT	2	rw	0	-	-	1407
Load cell characteristic value (Page 98) [1]	Characteristic value of the connected load cell(s). The mean value (mV) is used if there is more than one cell.	FLOAT	4	rw	2	> 0.1	10	1408
Reserve	Reserve	FLOAT	4	rw	0	-	-	1410
Rated load of a load cell (Page 98) [1]	Nominal load of one load cell	FLOAT	4	rw	60	0	Specifi-cation from DR 3	1412
Reserve	Reserve	FLOAT	4	rw	0	-	-	1414
Reserve	Reserve	FLOAT	4	rw	0	-	-	1416
Reserve 2	Reserve	SHORT	2	rw	0	-	-	1418
Reserve 3	Reserve	USHORT	2	rw	0	-	-	1419
Reserve 4	Reserve	FLOAT	4	rw	0	-	-	1420
Load cell manufacturer string header	String header	UBYTE[2]	2	rw	24,24			1422
Load cell manufacturer	Load cell manufacturer	CHAR[24]	24	rw	0.0			1423
Load cell order number String header	String header	UBYTE[2]	2	rw	24,24			1435
Load cell order number	Load cell order number	CHAR[24]	24	rw				1436

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

8.11.2 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.

Example

A tank is mounted on three load cells → Number of mechanical support points = 3

8.11.3 Load cell characteristic value

The load cell characteristic value is required to correctly interpret the output voltage from the load cell. When Siemens WL series load cells are used, the exact characteristic value can be read from label on the cell. If the exact characteristic value of the utilized cell(s) is not available, a rounded value can also be specified. For scales with multiple load cells, the average of all load cells must be calculated and entered.

Example

Characteristic value according to load cell label = 2.018 mV/V
→ Characteristic value = 2.018 mV/V

If this exact value is not known, 2.0 mV/V could also be entered.

8.11.4 Rated load of a load cell

The nominal load is entered in the specified weight units The parameter is required for automatic calculation of the scale characteristic curve (command 82).

8.12 DR 12 Ethernet parameters

8.12.1 Overview

Before the SIWAREX module can be integrated into an Ethernet network, the Ethernet parameters must be adapted, if necessary. The IP address, subnet, gateway and device name can be changed or adapted in DR 12.

Table 8- 11 Assignment of data record 12

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*12*	*-*	*-*	*1500*
Length	*Data record length information*	*USHORT*	*2*	*r*	*116*	*-*	*-*	*1501*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1502*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1503*
Device MAC address (Page 99)	Device MAC address 1	USHORT	2	r		0	255	1504
	Device MAC address 2	USHORT	2	r		0	255	1505
	Device MAC address 3	USHORT	2	r		0	255	1506
	Device MAC address 4	USHORT	2	r		0	255	1507
	Device MAC address 5	USHORT	2	r		0	255	1508

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
	Device MAC address 6	USHORT	2	r		0	255	1509
Port MAC address (Page 99)	Port MAC address 1	USHORT	2	r		0	255	1510
	Port MAC address 2	USHORT	2	r		0	255	1511
	Port MAC address 3	USHORT	2	r		0	255	1512
	Port MAC address 4	USHORT	2	r		0	255	1513
	Port MAC address 5	USHORT	2	r		0	255	1514
	Port MAC address 6	USHORT	2	r		0	255	1515
IP address (Page 99)	IP address x.n.n.n	USHORT	2	rw	192	0	255	1516
	IP address n.x.n.n	USHORT	2	rw	168	0	255	1517
	IP address n.n.x.n	USHORT	2	rw	0	0	255	1518
	IP address n.n.n.x	USHORT	2	rw	21	0	255	1519
Subnet mask (Page 100)	Subnet mask x.n.n.n	USHORT	2	rw	255	0	255	1520
	Subnet mask n.x.n.n	USHORT	2	rw	255	0	255	1521
	Subnet mask n.n.x.n	USHORT	2	rw	255	0	255	1522
	Subnet mask n.n.n.x	USHORT	2	rw	0	0	255	1523
Gateway (Page 100)	Gateway x.n.n.n	USHORT	2	rw	192	0	255	1524
	Gateway n.x.n.n	USHORT	2	rw	168	0	255	1525
	Gateway n.n.x.n	USHORT	2	rw	0	0	255	1526
	Gateway n.n.n.x	USHORT	2	rw	21	0	255	1527
Device name (Page 100)	Current device name header	UBYTE[2]	2	rw	32,32			1528
	Current device name	CHAR[32]	32	rw				1529
Reserve 1	Reserve	SHORT	2	r				1545

8.12.2 Device MAC address

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

8.12.3 Port MAC address

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

8.12.4 IP address

The IP address can be changed using the Primary Setup Tool, SIWATOOL or the SIMATIC function block (see section "IP address for SIWAREX (page 52)").
The factory state IP address is 192.168.0.21.

8.12.5 Subnet mask

Assign the subnet mask of your network.

8.12.6 Gateway

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

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

8.12.7 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".

8.13 DR 13 RS485 parameters

8.13.1 Overview

The parameter assignment of the RS485 interface occurs in data record DR 13. If the interface is not used, the default values can be retained.

Table 8- 12 Assignment of data record 13

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the 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*	*105*	*-*	*-*	*1560*
Version identifier	*Current data record version information*	*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

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
RS485 baud rate (Page 102)	0: 1 200 bps 1: 2 400 bps 2: 9 600 bps 3: 19 200 bps 4: 38 400 bps 5: 57 600 bps 6:115 000 bps	USHORT	2	rw	2	0	6	1563
RS485 character parity (Page 102)	Character parity 0: Even 1: Odd	BIT	0	rw	0	0	1	1564.16
RS485 number of data bits (Page 102)	Number of data bits per character 0: 7 data bits 1: 8 data bits	BIT	0	rw	0	0	1	1564.15
RS485 number of stop bits (Page 103)	Number of stop bits 0: 1 stop bit 1: 2 stop bits	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
Bit 7	Reserve	BIT	0	rw	0	0	1	1564.9
Bit 8	Reserve	BIT	0	rw	0	0	1	1564.8
Bit 9	Reserve	BIT	0	rw	0	0	1	1564.7
Bit 10	Reserve	BIT	0	rw	0	0	1	1564.6
Bit 11	Reserve	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

8.13.2 RS485 protocol

This parameter defines the protocol to be used for communication via the RS485 interface.

Function code	Protocol
0 (default)	No communication/protocol
1	Modbus RTU
2	SIEBERT display

8.13.3 RS485 baud rate

This parameter defines the baud rate for the RS485 interface.

Function code	Baud rate
0	1 200 bps
1	2 400 bps
2	9 600 bps
3 (default)	19 200 bps
4	38 400 bps
5	57 600 bps
6	115 000 bps

8.13.4 RS485 character parity

This parameter defines the character parity for the RS485 interface.

Value	Character parity
0 (default)	Even
1	Odd

8.13.5 RS485 number of data bits

This parameter defines the number of data bits for the RS485 interface.

Value	Data bits
0	7
1 (default)	8

8.13.6 RS485 number of stop bits

This parameter defines the number of stop bits for the RS485 interface.

Value	Stop bits
0 (default)	1
1	2

8.13.7 RS485 Modbus address

This parameter defines the Modbus address (1 to 255) for communication via the RS485 interface with the Modbus protocol.

8.13.8 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

8.14 DR 14 Selection process value 1, 2

The weighing module can communicate with an S7-1200 CPU in two ways: Via the I/O only or by reading/writing complete data records. The I/O is faster in this case and exhibits a higher performance because the data is made available to the S7-1200 or SIWAREX automatically in each PLC cycle. Using two user-definable channels in the S7-I/O (process value 1 and process value 2), the user can decide which scale values (see table) are to be made available cyclically to the PLC in these two parameters.

Table 8- 13 Selection table for process value 1,2

Process value	Function code	From DR	Format
No value selected	0	-	-
Gross weight	1	30	FLOAT
Gross/net weight (default)	2	30	FLOAT
Tare weight	3	30	FLOAT
Gross process weight	4	30	FLOAT
Gross/net process weight	5	30	FLOAT
Tare process weight	6	30	FLOAT
Net weight x10	7	30	FLOAT
Status of analog output, digital outputs and inputs (see table)	8	31	LONG
NAWI Status bits (default)	9	30	USHORT
Refresh counter	10	31	UINT

Table 8- 14 Structure of status of analog output, digital outputs, and digital inputs

Byte 0 of dw_ProcessValue1/2	Byte 1 of dw_ProcessValue1/2	Byte 2 of dw_ProcessValue1/2	Byte 3 of dw_ProcessValue1/2
Analog output digits HIGH	Analog output digits LOW	Status of digital outputs	Status of digital inputs
WORD		Bit 0 = status DQ 0	Bit 0 = status DI 0
		Bit 1 = status DQ 1	Bit 1 = status DI 1
		Bit 2 = status DQ 2	Bit 2 = status DI 2
		Bit 3 = status DQ 3	Bit 3 = status DI 3

8.15 DR 15 Preset tare

8.15.1 Overview

This data record can be used for an external tare specification.

Procedure

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

Table 8- 15 Assignment of data record 15

Variable	Note	Type	Length (bytes)	Rw	De-fault	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*15*	*-*	*-*	*1578*
Length	*Data record length information*	*USHORT*	*2*	*r*	*28*	*-*	*-*	*1579*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1580*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1581*
Preset tare weight 1 (Page 105)	Tare preset 1	FLOAT	4	rw	0	0	Depends on specifi-cation in DR 3	1582

8.15.2 Preset tare weight 1

Up to three tare weights can be entered. If a tare weight is to be applied, it must be enabled with the corresponding command. The tare weights may not exceed the maximum values specified in data record DR 3.

8.16 DR 16 Weight simulation

8.16.1 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 enabled for simulation mode in DR 3 and then switched to simulation mode with command 3 ("Weight Simulation on"). Command 4 ("Weight Simulation off") switches the module back to normal mode. In DR 30 Process State, a "Simulation mode" bit is available that indicates whether or not the module is currently in simulation mode.

Procedure

- Enable simulation mode in DR 3
- Enter a weight value to be simulated in DR 16.
- Transfer DR 16 to the SIWAREX module
- Start the simulation using command "Weight simulation on (3)"
- Stop the simulation using command "Weight simulation off (4)"

Table 8- 16 Assignment of data record 16

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the 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*	*105*	*-*	*-*	*1600*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1601*
Weight simulation specification (Page 106)	Weight value specification (only relevant if simulation mode is enabled)	FLOAT	4	rw	0	-	Max. weighing range	1602

8.16.2 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.

8.17 DR 17 Control analogue output

8.17.1 Overview

If data record DR 17 is configured as the source for the analog output (see Analog output source (Page 93)), specifying a control output sends a corresponding output current at the analog output. The set value is not saved in non-volatile memory.

Procedure

- In data record DR 7, check that "Control by DR17" has been configured as the source for the analog output
- Check the parameter assignment of the analog output
- Enter a value in data record DR 17
- Transfer the data record to the scales

Table 8- 17 Assignment of data record 17

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*17*	-	-	*1606*
Length	*Data record length information*	*USHORT*	*2*	*r*	*16*	-	-	*1607*
Application	*Information about which application the data record belongs to*	*USHORT*	*2*	*r*	*105*	-	-	*1608*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1609*
Analog output specification (Page 106)	Value to be output/simulated	FLOAT	4	rw	0	-	-	1610

8.17.2 Analog output specification

The set value must be within the range of the analog output scaling in DR 7: Start value for the analog output (Page 93) < Set value < End value for the analog output (Page 93).

8.18 DR18 Control digital outputs

8.18.1 Overview

If one or more digital outputs were defined in data record DR 7 for controlling using data record DR 18 (see Assignment of digital output DQ.0, DQ.1, DQ.2, DQ.3 (Page 91)), this output can be controlled using data record DR 18. Only outputs that were configured for controlling using DR 18 (see Overview (Page 86)) are controlled based on the content of data record DR 18. The set values are not saved in non-volatile memory!

In addition, transitions for the individual weighing steps 0 to 7 can be set in DR 18. With a set (=TRUE) transition, the respective weighing step is not executed until the corresponding transition is reset from TRUE to FALSE. The transitions are not saved in non-volatile memory!

Procedure

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

Table 8- 18 Assignment of data record 18

Variable	Note	Type	Length (bytes)	Rw	De-fault	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*18*	*-*	*-*	*1616*
Length	*Data record length information*	*USHORT*	*2*	*r*	*12*	*-*	*-*	*1617*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1618*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1619*
Specification for digital outputs DQ.0, DQ.1, DQ.2, DQ.3 (Page 108)	Specification for digital output 0=1 → DQ.0 output active (only applies if output is assigned function code 64, see DR 7)	BIT	0	rw	0	0	1	1620.16
	Specification for digital output 1=1 → DQ.1 output active (only applies if output is assigned function code 64, see DR 7)	BIT	0	rw	0	0	1	1620.15
	Specification for digital output 2=1 → DQ.2 output active (only applies if output is assigned function code 64, see DR 7)	BIT	0	rw	0	0	1	1620.14
	Specification for digital output 3=1 → DQ.3 output active (only applies if output is assigned function code 64, see DR 7)	BIT	0	rw	0	0	1	1620.13
Reserve	Reserve	BIT	0	rw	0	0	1	1620.12

Variable	Note	Type	Length (bytes)	Rw	De-fault	Min.	Max.	Modbus registers
Reserve	Reserve	BIT	0	rw	0	0	1	1620.11
Reserve	Reserve	BIT	0	rw	0	0	1	1620.10
Reserve	Reserve	BIT	0	rw	0	0	1	1620.9
Transition 0	Transition for weighing step 0	BIT	0	rw	0	0	1	1620.8
Transition 1	Transition for weighing step 1	BIT	0	rw	0	0	1	1620.7
Transition 2	Transition for weighing step 2	BIT	0	rw	0	0	1	1620.6
Transition 3	Transition for weighing step 3	BIT	0	rw	0	0	1	1620.5
Transition 4	Transition for weighing step 4	BIT	0	rw	0	0	1	1620.4
Transition 5	Transition for weighing step 5	BIT	0	rw	0	0	1	1620.3
Transition 6	Transition for weighing step 6	BIT	0	rw	0	0	1	1620.2
Transition 7	Transition for weighing step 7	BIT	2	rw	0	0	1	1620.1
Reserve 1	Reserve	USHORT	2	rw	0	-	-	1621

8.18.2 Specification for digital outputs DQ.0, DQ.1, DQ.2, DQ.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.

8.18.3 Transitions for weighing steps 0 to 7

A set transition allows the execution of an individual weighing step to be prevented.

Example:

The transition for weighing step 2 is set. Once dosing starts, weighing step 1 is performed. WP251 then jumps to weighing step 2 but does not execute it. Status bit "Step blocked" is output in DR 30. Only when the "Transition for weighing step 2" bit is reset is step 2 performed (coarse and fine signal switching)

When the module is operated with an S7-1200 CPU, transitions should not be set using DR 18 because another transition WORD with identical function is available in the Simatic I/O of the function block. The advantage of this WORD is that it transmits cyclically to WP251 and thus does not require a data record transfer. The transition WORD in the I/O is explained in more detail in section "Integration in SIMATIC".

As an alternative to setting transitions via software, the digital inputs of WP251 can also be configured with transitions for the individual weighing steps. Thus, a 24 V DC signal can be used to disable or enable individual weighing steps.

8.19 DR 20 Single set point

8.19.1 Overview

The set point amount to be dosed is specified in the data record.

Procedure

- Specify the desired set point
- Transfer DR 20 to SIWAREX WP251

Table 8- 19 Assignment of data record 20

Variable	Note	Type	Length (bytes)	Rw	De-fault	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*20*	-	-	*1624*
Length	*Data record length information*	*USHORT*	*2*	*r*	*20*	-	-	*1625*
Application	*Information about which application the data record belongs to*	*USHORT*	*2*	*r*	*105*	-	-	*1626*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1627*
Single set point (Page 109)	Set point for a single dosing	FLOAT	4	rw	50.0	0	Limited in DR 25	1628
Reserve	Reserve	FLOAT	4	rw	-	-	-	1630
Reserve	Reserve	USHORT	2	rw	-	-	-	1632
Reserve	Reserve	USHORT	2	rw	-	-	-	1633

8.19.2 Single set point

The set point defines the weight to be dosed for a single dosing. It is specified based on the weight unit set in DR 3 and must not exceed the maximum permissible set point from DR 25.

8.20 DR 21 Total set point

8.20.1 Overview

The total set point is interpreted in AWI modes as the number of containers to be dosed in continuous operation.

Table 8- 20 Assignment of data record 21

Variable	Remark	Type	Length (bytes)	Rw	De-fault	Min.	Max.	Modbus register
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*20*	*-*	*-*	*1634*
Length	*Data record length information*	*USHORT*	*2*	*r*	*20*	*-*	*-*	*1635*
Application	*Information about which application the data record belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1636*
Version identi-fier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*1637*
Total set point (Page 110)	Total set point for continuous operation	FLOAT	4	rw	0	0	-	1638
Reserve	Reserve	FLOAT	4	rw	-	-	-	1640
Reserve	Reserve	USHORT	2	rw	-	-	-	1642
Reserve	Reserve	USHORT	2	rw	-	-	-	1643

8.20.2 Total set point

The total set point is interpreted in AWI modes as the number of containers to be dosed in continuous operation. For example, if a total set point of 20 is specified and continuous operation is started, WP251 doses 20 containers in succession. Continuous operation is ended after the 20th container, and DR 30 sets the status bit "Total set point reached". If continuous operation is switched off in the interim or an active dosing is aborted, the counter is restarted.

8.21 DR 22 Tolerance parameters

8.21.1 Overview

The tolerance limits that are to be used in a tolerance check by WP251 are defined in the data record. Two tolerance bands are defined around the set point. The result of the tolerance check is available in AWI Status.

The tolerance limits around the set point are as follows:

- TH 2
- TH 1
- SINGLE SET POINT (DS 20)
- TL 1
- TL 2

For example, if TH2 & TL2 are defined with 2 kg and TH1 & TL2 with 1 kg, a dosing will be rated as "Good" (AWI Status) if the weight was dosed with an accuracy of +/- 1 kg around the specified set point. If the final weight differs more than +/- 2 kg from the specified set point, the tolerance check returns "Bad" (AWI Status).

The reaction of the scale to a tolerance error is also defined in DR 22.

Table 8- 21 Assignment of data record 22

Variable	Note	Data type	Length (bytes)	RW	De-fault	Min	Max	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*22*	*-*	*-*	*1644*
Length	*Data record length information*	*USHORT*	*2*	*r*	*56*	*-*	*-*	*1645*
Application	*Information on application to which DR belongs*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1646*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65535*	*1647*

Variable	Note	Data type	Length (bytes)	RW	De-fault	Min	Max	Modbus registers
Parameter relation (Page 115)	0: Tolerance specifications are to be interpreted as percentages (referencing the set point in DS 20) (default) 1: Tolerance specifications are to be interpreted as absolute (as weight value) 2: Tolerance limits are derived from OIML table "Limits of error on verification Class X1" (for AWI mode) 3: Tolerance limits are derived from OIML table "Maximum permissible errors in service Class X1" (for AWI mode)	USHORT	2	rw	0	0	0	1648
Reserve	Reserve	USHORT	2	rw	0	0	0	1649
Tolerance limit TH2 (Page 116)	High limit tolerance band 2 (outer)	FLOAT	4	rw	2	0	0	1650
Tolerance limit TH1 (Page 116)	High limit tolerance band 1 (inner)	FLOAT	4	rw	1	0	0	1652
Tolerance limit TL1 (Page 116)	Low limit tolerance band 1 (inner)	FLOAT	4	rw	1	0	0	1654
Tolerance limit TL2 (Page 116)	Low limit tolerance band 2 (outer)	FLOAT	4	rw	2	0	0	1656
Reserve	Reserve	USHORT	2	rw	0	0	0	1658

Variable	Note	Data type	Length (bytes)	RW	De-fault	Min	Max	Modbus registers
Behavior in case of TH1 error (Page 116)	0: Weighing cycle is not stopped and is completed with "Dosing completed" 1: Weighing cycle is stopped. User can use the "Continue" command to check the tolerance again and the cycle is then completed with "Dosing completed" in any case. 2: Weighing cycle is stopped. User can use the "Continue" command to check the tolerance again. If there is still a tol-erance error, the scale goes to Stop state again. This is repeated until the tolerance error is eliminated (e.g. by manually adding or removing material).	USHORT	2	rw	0	0	0	1659

Variable	Note	Data type	Length (bytes)	RW	De-fault	Min	Max	Modbus registers
Behavior in case of TL1 error (Page 116)	0: Weighing cycle is not stopped and is completed with "Dosing completed" 1: Weighing cycle is stopped. User can use the "Continue" command to check the tolerance again, and the cycle is then completed with "Dosing completed" in any case. 2: Weighing cycle is stopped. User can use the "Continue" command to check the tolerance again. If there is still a tolerance error, the scale goes to Stop state again. This is repeated until the tolerance error is eliminated (e.g. by manually adding or removing material). 3: Post-dosing with continuous fine signal 4: Post-dosing with pulsing	USHORT	2	rw	0	0	0	1660
Reserve	Reserve	USHORT	2	rw	0	0	0	1661
Pulse duration for pulse post dosing (Page 116)	Fine signal ON duration when "Post-dosing with pulsing" is selected	TIME	4	rw	0	0	0	1662
Number of not controlled weighings (Page 117)	Number of cycles during which WP251 does not perform a tolerance check in AWI continuous operation (active only when the previous dosing was completed with 'GOOD' tolerance).	USHORT	2	rw	0	0	0	1664

Variable	Note	Data type	Length (bytes)	RW	De-fault	Min	Max	Modbus registers
Capture of weighings into statistics (Page 117)	0: All dosings (with tolerance check) are included following "Dosing completed" in the calculated statistics 1: Only dosings (with tolerance check) of "GOOD" class are included following "Dosing completed" in the calculated statistics 2: Only dosings (with tolerance check) of "BAD" class are not includ-ed following "Dosing completed" in the calculated statistics	USHORT	2	rw	0	0	0	1665
Reserve	Reserve	FLOAT	4	rw	0	0	0	1666
Reserve	Reserve	FLOAT	4	rw	0	0	0	1668
Reserve	Reserve	SHORT	2	rw	0	0	0	1670
Reserve	Reserve	SHORT	2	rw	0	0	-	1671

8.21.2 Parameter relation

The parameters are used to define how the specified tolerance limits TH2, TH1, TL1 and TL2 are to be interpreted. The following options are available:

Function code	Meaning
0 (default)	The tolerance limits are interpreted as percentages of the set point in DS 20
1	The tolerance limits are interpreted as absolute weight values
2	The tolerance limits are calculated based on OIML R61 "Limits of error on verifica-tion Class X1".
3	The tolerance limits are calculated based on OIML R61 "Maximum permissible errors in service Class X1".

In general, the currently valid tolerance limits in data record 31 are output in the weight unit. When function codes 2 and 3 are selected, the entered tolerance limits TH2, TH1, TL1 and TL2 are ignored because the limits are calculated automatically based on the OIML Recommendation.

8.21.3 Tolerance limit TH2

This parameter defines the limit of the second tolerance band above the set point. The setting conforms to the selected tolerance reference (percentage or absolute) and must be greater than or equal to tolerance limit TH1.

8.21.4 Tolerance limit TH1

This parameter defines the limit of the first tolerance band above the set point. The setting conforms to the selected tolerance reference (percentage or absolute) and must be less than or equal to tolerance limit TH2.

8.21.5 Tolerance limit TL1

This parameter defines the limit of the first tolerance band below the set point. The setting conforms to the selected tolerance reference (percentage or absolute) and must be less than or equal to tolerance limit TL2 as a positive value.

8.21.6 Tolerance limit TL2

This parameter defines the limit of the first tolerance band below the set point. The setting conforms to the selected tolerance reference (percentage or absolute) and must be greater than or equal to tolerance limit TL1 as a positive value.

8.21.7 Behavior in case of TH1 error

This parameter defines the limit of the first tolerance band below the set point. The setting conforms to the selected tolerance reference (percentage or absolute) and must be greater than or equal to tolerance limit TL1 as a positive value.

8.21.8 Behavior in case of TL1 error

This parameter defines the limit of the first tolerance band below the set point. The setting conforms to the selected tolerance reference (percentage or absolute) and must be greater than or equal to tolerance limit TL1 as a positive value.

8.21.9 Pulse duration for pulse post dosing

This parameter defines how long (ms) the fine signal is switched on when post-dosing in pulsing mode was set as the response to a TL1 violation in the tolerance check (function code 4). The pause time of pulsing mode corresponds to the settling time before standstill 2 (DR 3).

8.21.10 Number of not controlled weighings

This parameter defines how many cycles will not be checked for tolerance during continuous operation in AWI mode. The first dosing cycle of the continuous operation is always checked for tolerance, however. The discontinuation of the check(s) starts only after a dosing with "Good" tolerance has been determined. Dosings that are not checked for tolerance are classified as "GOOD" in the statistics (DR 39).

Note

Dosing cycles that cannot be checked

In unchecked cycles, there is no adjustment of the shut-off points by the proportional controller.

Every dosing that is not checked is classified as "Good" in the statistics and the specified set point (DS 20) is used in calculating the statistics.

8.21.11 Capture of weighings into statistics

This parameter defines, based on the tolerance evaluation, which dosing results are to be included in the statistics calculation and which are not. The following options are available for selection:

Function code	Meaning
0 (default)	All dosings (with tolerance check) are included following "Dosing completed" in the calculated statistics.
1	Dosings (with tolerance check) of "GOOD" class are included following "Dosing completed" in the calculated statistics.
2	Dosings (with tolerance check) of "BAD" class are not included following "Dosing completed" in the calculated statistics.

8.22 DR 23 Material parameters

8.22.1 Overview

Material-specific parameters are specified in the data record.

Table 8- 22 Assignment of data record 23

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*R*	*20*	*-*	*-*	*1672*
Length	*Data record length information*	*USHORT*	*2*	*R*	*20*	*-*	*-*	*1673*
Application	*Information about which application the data record belongs to*	*USHORT*	*2*	*R*	*105*	*-*	*-*	*1674*
Version identifier	*Current data record version information*	*USHORT*	*2*	*R*	*1*	*1*	*65635*	*1675*
Parameter relation (Page 119)	0: Trailing/fine weight is interpreted as % of set point (DR 20) (default) 1: Trailing/fine weight is interpreted as absolute weight value	USHORT	2	RW	0	0	1	1676
Reserve	Reserve	USHORT	2	RW	-	-	-	1677
Fine weight (Page 119)	Material quantity that is to be dosed in fine flow	FLOAT	4	RW	20	0	-	1678
Trailing weight (Page 119)	Material quantity that still runs after shut-off of the fine flow	FLOAT	2	RW	5	0	-	1680
Blocking time coarse signal (Page 120)	Blocking time after switch-off of coarse signal	TIME	4	RW	0	0		1682
Blocking time fine signal (Page 120)	Blocking time after switch-off of fine signal	TIME	4	RW	0	0		1684
Shut-off correction weight (Page 121)	Shut-off correction value for compensation of influences such as overpressure or underpressure when dosing	FLOAT	4	RW	0	0	-	1686
Reserve	Reserve	FLOAT	4	RW	-	-	-	1688
Reserve	Reserve	FLOAT	4	RW	-	-	-	1690
Reserve	Reserve	USHORT	2	RW	-	-	-	1692
Reserve	Reserve	USHORT	2	RW	-	-	-	1693

8.22.2 Parameter relation

The parameter defines how the specifications for the fine weight and trailing weight are to be interpreted. The following options are available for selection:

Function code	Meaning
0 (default)	Fine and trailing weights are interpreted as specified percentages of the set point (DS 20).
1	Fine and trailing weights are interpreted as absolute weights in the weight unit.

8.22.3 Fine weight

This parameter defines how much material is to be dosed with fine signal only. Depending on the selected unit reference (DR 23), the value must be interpreted as a percentage of the set point (DR 20) or as an absolute weight value.

Example:

Set point (DR 20) = 100 kg

Function code for parameter relation (DR 23) = 0

Fine value (DR 23) = 20

→ As a result of this setting, 20 kg (20% of 100 kg) is dosed with fine flow only.

8.22.4 Trailing weight

The parameter defines how much material still flows onto the scale after the fine signal is shut off. Depending on the selected unit reference (DR 23), the value must be interpreted as a percentage of the set point (DR 20) or as an absolute weight value.

Example

Set point (DR 20) = 100 kg

Function code for parameter relation (DR 23) = 0

Fine weight (DR 23) = 5

Trailing weight (DR 23) = 2

→ With this setting it is assumed during dosing that 2 kg (2% of 100 kg) still flows onto the scale after the fine signal is shut off.

In the example, this means specifically that the coarse and final signal are switched at the start of the dosing. When 93 kg is reached, the coarse signal is shut off. When 98 kg is reached, the fine signal is shut off. The following graphic explains the relationship.

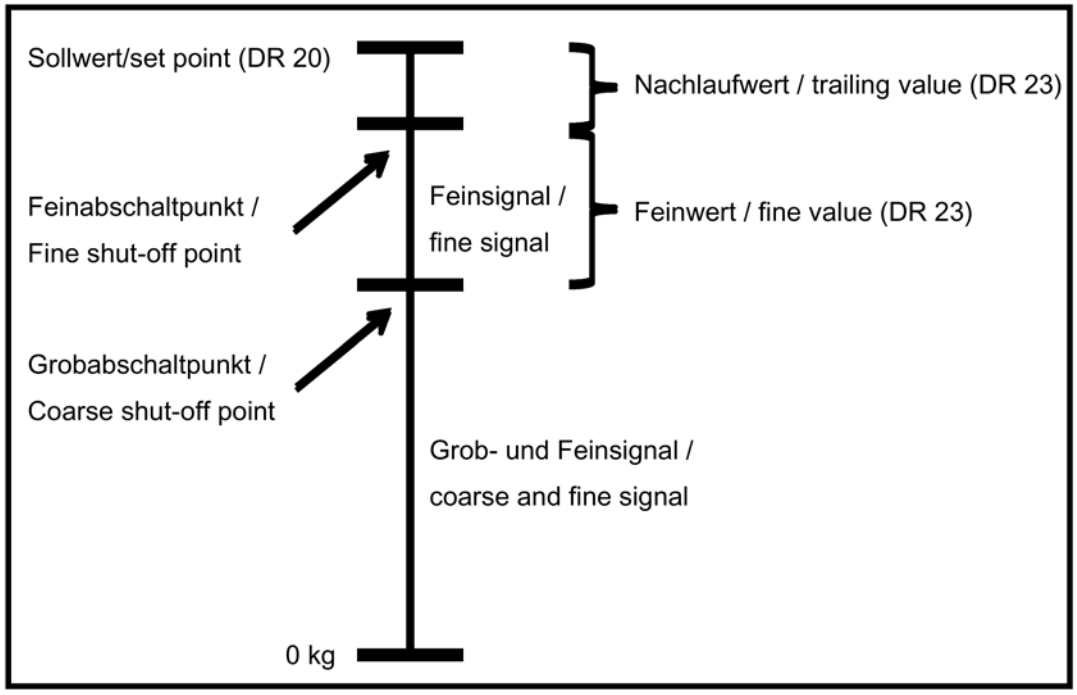


Image 8-6 Trailing weight

The shut-off points for the fine and coarse signals are corrected or optimized automatically during operation when the controller is activated (DR 24). The fine and trailing weights currently used by WP251 can be seen in DR 31 (always expressed in DR 31 in the weight unit).

8.22.5 Blocking time coarse signal

This parameter defines a timer that starts when the coarse signal is switched. As long as the timer is active, WP251 does not perform a check to determine whether the coarse shut-off point has been reached.

At the start of dosing, the "coarse" and "fine" dosing signals are usually set simultaneously. The material may strike the scale hard, producing an overshoot that is higher than the coarse shut-off point, which would cause the coarse signal to be shut off too early. To prevent this premature shut-off, the "Blocking time coarse signal" can be defined in milliseconds (ms).

8.22.6 Blocking time fine signal

This parameter defines a timer that starts when the coarse signal is shut off. As long as the timer is active, WP251 does not perform a check to determine whether the fine shut-off point has been reached.

When the coarse signal is shut off, this may produce an overshoot that can be higher than the fine shut-off point, which would cause the fine signal to be shut off too early. To prevent this premature shut-off, the "Blocking time fine signal" can be defined in milliseconds (ms).

8.22.7 Shut-off correction weight

This parameter enables influences that occur during dosing (e.g. overpressure or underpressure) to be taken into account in determining when the set point weight is reached. The setting conforms to the "Parameter relation" setting and can thus be an absolute weight or a percentage of the set point. The shut-off correction weight currently in effect is always output in data record 31 in the weight unit.

8.23 DR 24 Controller and filter parameters

8.23.1 Overview

The parameters of the proportional controller and other filter parameters are defined in this data record.

Table 8- 23 Assignment of data record 24

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*24*	*-*	*-*	*1694*
Length	*Data record length information*	*USHORT*	*2*	*r*	*56*	*-*	*-*	*1695*
Application	*Information on application to which DR belongs*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1696*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65535*	*1697*
Parameter relation (Page 123)	0: Maximum corrective action and controller deadband in % of set point in DS 20 1: Specification as absolute values	USHORT	2	rw	0	0	0	1698
Type of controller (Page 123)	0: No controller 1: Proportional controller	USHORT	2	rw	1	0	0	1699
Control factor of proportional controller (Page 123) (%) for proportional controller	Control factor of proportional controller	FLOAT	4	rw	30	> 0	0	1700
Reserve	Reserve	FLOAT	4	rw	0	0	0	1702

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Maximum corrective action (Page 123)	Maximum corrective action in weight unit	FLOAT	4	rw	5	> 0	0	1704
Controller deadband - upper limit (Page 124)	Upper limit of controller deadband (if the dosed weight is within the controller deadband, no further control occurs)	FLOAT	4	rw	0	0	0	1706
Controller deadband - lower limit (Page 124)	Lower limit of controller deadband (if the dosed weight is within the controller deadband, no further control occurs)	FLOAT	4	rw	0	0	0	1708
Reaction when max. corrective action is exceeded (Page 124)	0: Discontinue control 1: Control up to maximum corrective action	USHORT	2	rw	1	0	0	1710
Selection for dosing filter (Page 124)	0: Process values and dosing according to filter F1 1: Process values according to Filter 1, dosing according to Filter 2	USHORT	2	rw	0	0	0	1711
Frequency low pass filter 2 (Page 125)	Limit frequency for low pass filter 2	FLOAT	4	rw	2	-	-	1712
Order no. low pass filter 2 (Page 125)	Order number for low pass filter 2	USHORT	2	rw	4	-	-	1714
DepthDepth average filter (Page 126)	Depth of average filter 2 (0 = inactive)	USHORT	2	rw	10	0	250	1715
Reserve	Reserve	FLOAT	4	rw	0	0	0	1716
Adopt corrected fine/trailing value to DR 23 automatically (Page 126)	0= The fine/trailing weight corrected by the controller is output only in DR 31 (read-only). 1= The fine/trailing weight corrected by the controller is output in DR 31 and simultaneously adopted automatically in DR 23 Thus DR 23 is always updated with the currently adjusted shut-off points.	USHORT	2	rw	0	0	1	1718
Reserve	Reserve	USHORT	2	rw	0	0	0	1719
Reserve	Reserve	USHORT	2	rw	0	0	0	1720
Reserve	Reserve	USHORT	2	rw	0	0	-	1721

8.23.2 Parameter relation

This parameter defines the unit in which the "Maximum corrective action" and "Controller deadband - upper/lower limit" parameters (DR 24) must be interpreted. The following options are available:

Function code	Meaning
0 (default)	"Maximum corrective action" and "Controller deadband - upper/lower limit" are interpreted as a percentage of the set point (DS 20).
1	"Maximum corrective action" and "Controller deadband - upper/lower limit" are interpreted in the weight unit.

8.23.3 Type of controller

A proportional controller is available for optimization of the shut-off points.

Function code	Meaning
0	No controller
1 (default)	Proportional controller is activated

Note

Stop weighing cycle

If a weighing cycle has been stopped by a Stop command in the meantime, there is no corrective action by the controller for this dosing! The controller becomes active only for completed and checked cycles.

8.23.4 Control factor of proportional controller

When proportional controller is activated, its control factor can be defined. The parameter is specified as a percent.

8.23.5 Maximum corrective action

When proportional controller is activated, the maximum possible correction of the shut-off points by the controller can be defined. Depending on the "Parameter relation" setting (DR 24), the value must be specified and interpreted as a percentage of the set point (DR 20) or as an absolute weight value.

8.23.6 Controller deadband - upper limit

When proportional controller is activated, a deadband for the controller can be defined. If the achieved final weight of a dosing (with check) is below the upper limit of the deadband, the controller does not correct the shut-off points. If both limits are at zero, the controller corrects after each checked dosing.

8.23.7 Controller deadband - lower limit

When proportional controller is activated, a deadband for the controller can be defined. If the achieved final weight of a dosing (with check) is above the lower limit of the deadband, the controller does not correct the shut-off points. If both limits are at zero, the controller corrects after each checked dosing.

8.23.8 Reaction when max. corrective action is exceeded

This parameter defines the controller behavior when the maximum corrective action (DR 24) is exceeded in a cycle. The following options are available:

Function code	Meaning
0	Control is discontinued for this cycle.
1 (default)	The controller controls with the maximum corrective action (DR 24)

8.23.9 Selection for dosing filter

For shut-off of the "coarse" and "fine" dosing signals, a separate signal branch with its own filter settings can be specified. The following options are available:

Function code	Meaning
0	The dosing signals are shut off based on net process value 1 (with filter from DR 3)
1 (default)	The dosing signals are shut off according to net process value 2 (with filter from DR 24)

Note

Standstill 1 and 2 always reference the gross process value 1 with filter settings from DR 3.

8.23.10 Frequency low pass filter 2

There is a critically damped low-pass filter for suppression of disturbances. 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.

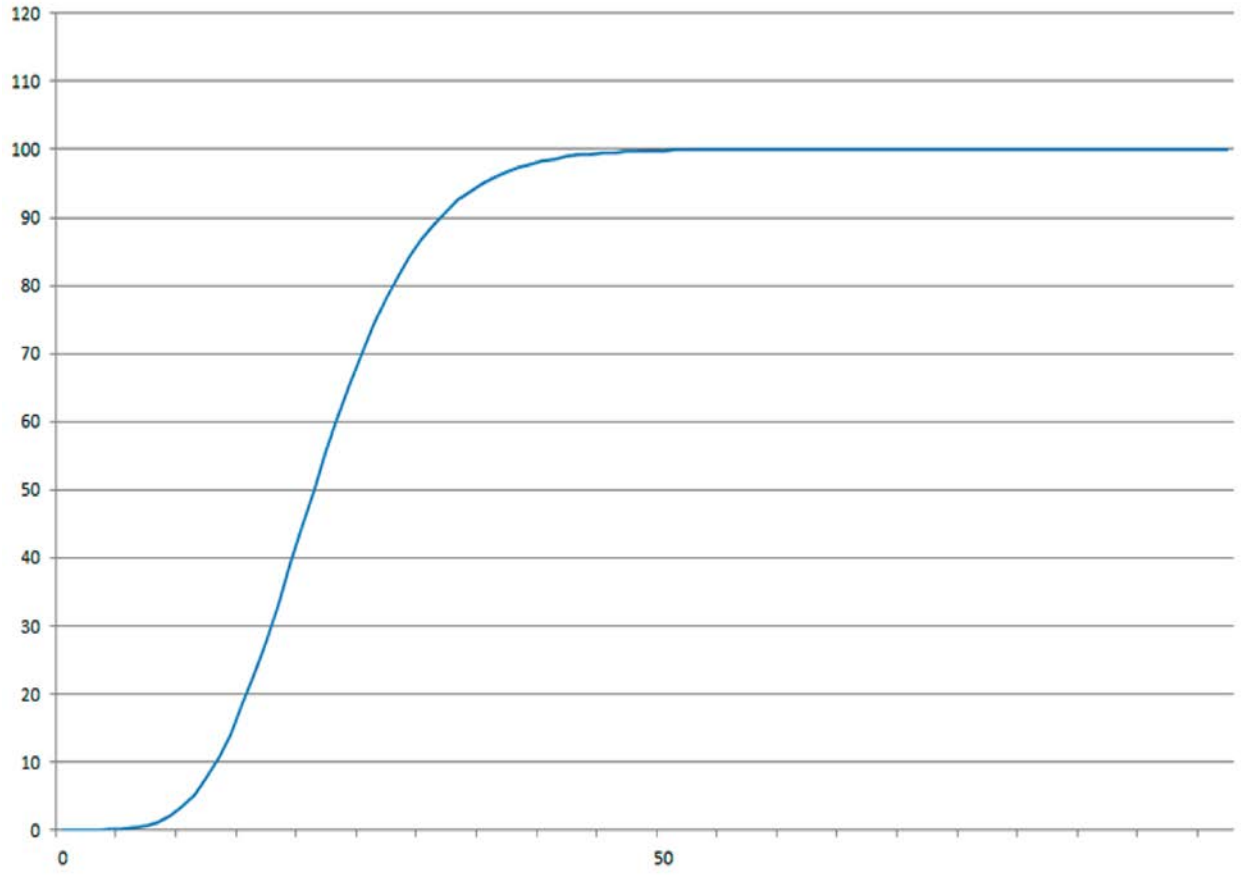


Image 8-7 Step response of digital low pass filter at f = 2 Hz

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

For example, a value of 5 Hz results in a relatively rapid response of the scale to a change in weight while a value of 0.5 Hz makes the scale "slower".

8.23.11 Order no. low pass filter 2

The order number of the filter defines the effect of damping. The values 2, 4, 6, 8 and 10 can be specified. The higher the selected order number, the stronger the filter acts.

8.23.12 Depth average filter

Depth average filter 2 is used to damp the weight value against periodic disturbances. The weight value is calculated from the average of the n (n = max. 250) most recent weight values calculated by the weighing module every 10 ms. When n = 10, for example, 10 values are used to calculate the average. Every 10 ms, the oldest value is omitted from the calculation and the newest value is included in the calculation (running average).

8.23.13 Adopt corrected fine/trailing value to DR 23 automatically

At the initial start of a dosing with "Material A", WP251 calculates the shut-off points for the coarse/fine signal according to settings from DR 23 (fine/trailing weight).

If the P-controller is active, the fine/trailing weight of "Material A" internally (DR 31) is corrected or optimized by the controller during operation if necessary.

If there is now a change to "Material B" that entails different parameters, the corrected fine/trailing weight of "Material" would have to be read from DR 31 and copied to DR 23 before the change so that at the next loading of "Material A" the optimized values are used directly at the start.

To automate this copying, the "Adopt corrected fine/trailing value to DR 23 automatically" parameter can be set to "YES" or "1".

8.24 DR 25 Dosing device parameters

8.24.1 Overview

This data record provides parameters that relate to the scale (dosing system) and are independent of the material.

Table 8- 24 Assignment of data record 25

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*25*	*-*	*-*	*1722*
Length	*Data record length information*	*USHORT*	*2*	*r*	*92*	*-*	*-*	*1723*
Application	*Information on application to which DR belongs*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1724*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65535*	*1725*
Maximum single set point (Page 128)	Specification in weight unit	FLOAT	4	rw	100	0	0	1726
"Coarse" set value for analogue output (Page 128)	% value referenced to 0/4-20 mA	FLOAT	4	rw	80	> Fine signal value	100	1728

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
"Fine" set value for analogue output (Page 129)	% value referenced to 0/4-20 mA	FLOAT	4	rw	20	0	< Coarse signal value	1730
Minimum automatic tare weight (Page 129)	Taring occurs at dosing start only if gross>minimum tare weight 0: No monitoring (specification in % referenced to "Max. weight DS 3")	FLOAT	4	rw	0	0	< Maxi-mum tare weight DR 3	1732
Maximum automatic tare weight (Page 129)	Taring occurs at dosing start only if gross<maximum tare weight 0: No monitoring (specification in % referenced to "Max. weight DS 3")	FLOAT	4	rw	0	0	≤ Maxi-mum tare weight DR 3	1734
Maximum weighing time (Page 129)	Monitoring of the dosing time. Once this time has elapsed, a technology message is output (0: no message)	TIME	4	rw	0	0	0	1736
Reserve	Reserve	USHORT	2	rw	0	0	0	1738
Weighing start options (Page 130)	0: No zero setting/taring 1: With zero setting 2: With taring 3: With preset tare weight from DR 15 4: With preset tare weight from SIMATIC I/O	USHORT	2	rw	2	0	0	1739
Cycle time for automatic zero setting (Page 130) (only relevant for AWI)	Time after which the next dosing must be set to zero.	TIME	4	rw	0	0	0	1740
Number of weighings without automatic taring/zero setting (Page 130)	Number of dosing cycles that are not tared/zeroed	USHORT	2	rw	0	0	65,535	1742
Check stop (Page 130) points	Bit 0: - Bit 1: Dosing goes to check stop after step 1, if test stop command was received Bit 2: Dosing goes to check stop after step 2, … Bit n: Dosing goes to check stop after step n, …	USHORT	2	rw	0	0	0	1743
Reserve	Reserve	ULONG	4	rw	0	0	0	1744
Reserve	Reserve	USHORT	2	rw	0	0	0	1746

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Automatic emptying (Page 131)	0: No emptying in the dosing cycle 1: Yes - until limit 3 is fallen below 2: Yes - based on time ("Emptying time")	USHORT	2	rw	1	0	0	1747
Emptying time (Page 131)	Duration of emptying signal (with automatic emptying) (only relevant for time-based emptying)	TIME	4	rw	0	0	0	1748
Maximum emptying time (Page 131)	Emptying monitoring time Only relevant for emptying option 1	TIME	4	rw	0	0	0	1750
Reserve	Reserve	FLOAT	4	rw	0	0	0	1752
Reserve	Reserve	FLOAT	4	rw	0	0	0	1754
Reserve	Reserve	FLOAT	4	rw	0	0	0	1756
Reserve	Reserve	FLOAT	4	rw	0	0	0	1758
Reserve	Reserve	USHORT	2	rw	0	0	0	1760
Reserve	Reserve	USHORT	2	rw	0	0	0	1761
Reserve	Reserve	USHORT	2	rw	0	0	0	1762
Reserve	Reserve	USHORT	2	rw	0	0	0	1763
Reserve	Reserve	TIME	4	rw	0	0	0	1764
Reserve	Reserve	TIME	4	rw	0	0	-	1766

8.24.2 Maximum single set point

This parameter limits the set point in DR 20 and thus defines the maximum capacity of the scale. The setting must be less than or equal to the maximum weight (DR 3).

8.24.3 "Coarse" set value for analogue output

The analog output of WP251 can be used for direct activation of a dosing element (e.g. vibratory pan, pump, etc.).

The parameter "Coarse set value for analogue output" is specified as a percentage (0…100%) and references the range of the analog output set in DR 7 (0/4-20 mA).

As soon as WP251 activates the "Coarse signal" in weighing step 2, the configured value is output as the analog output signal.

Example

"Coarse" set value for analogue output (DR 25) = 75%

Range analog output (DR 7) = 0-20 mA

→ When the "Coarse signal" is activated, 15 mA is output at the analog output.

8.24.4 "Fine" set value for analogue output

The analog output of WP251 can be used for direct activation of a dosing element (e.g. vibratory pan, pump, etc.).

The parameter "Fine set value for analogue output" is specified as a percentage (0…100%) and references the range of the analog output set in DR 7 (0/4-20 mA).

As soon as WP251 shuts off the "Coarse signal" in weighing step 2 leaving only the "Fine signal" active, the configured value is output as the analog output signal.

Example

"Fine" set value for analogue output (DR 25) = 30%

Range analog output (DR 7) = 0-20 mA

→ When only the "Fine signal" is still activated, 6 mA is output at the analog output.

8.24.5 Minimum automatic tare weight

This parameter defines a minimum weight that must be tared at the start of dosing. It applies only when a dosing start with taring is set in DR 25.

The parameter can be used to prevent dosing from being started even though, for example, no empty container is on the scale. In this case, the minimum tare weight should correspond to the empty weight of the container to be filled.

8.24.6 Maximum automatic tare weight

This parameter defines a maximum weight that may be tared at the start of dosing. It applies only when a dosing start with taring is set in DR 25.

The parameter can be used to prevent overfilling an already prefilled container.

8.24.7 Maximum weighing time

This parameter represents a timer that is started at the start of an automatic dosing cycle. The setting is made in milliseconds (ms). If the dosing cycle has not yet finished after expiration of the timer, WP251 outputs a corresponding technology message that has no further effect on the running dosing cycle. The message serves only as information for the operator.

8.24.8 Weighing start options

This parameter defines the first action of an automatic dosing cycle to be executed (weighing step 1). The following options are available:

Function code	Meaning
0	The dosing starts directly without zero setting or taring
1	WP251 sets the scale to zero and then starts the dosing operation
2 (default)	WP251 tares the scale and then starts the dosing operation
3	WP251 tares the scale using the preset tare weight from DR 15 and then starts the dosing operation
4	WP251 tares the scale using the preset tare weight from the SIMATIC I/O and then starts the dosing operation

8.24.9 Cycle time for automatic zero setting

This parameter can be used to define a time after which zero setting or taring must have occurred. The setting is made in milliseconds (ms). When "OIML" is set in DR 3, a zero setting/taring occurs at the latest as defined in the regulations. Dependent on the maximum time setting

8.24.10 Number of weighings without automatic taring/zero setting

This parameter defines a number of dosing cycles that are not zeroed or tared. It applies only during continuous operation. The first cycle of the continuous operation is always zeroed or tared (if configured for "Dosing start").

8.24.11 Check stop

This parameter enables, in contrast to transitions, the dosing cycle to be stopped after each individual weighing step. By setting bits 0 … 7, corresponding check stops are set for weighing steps 0 … 7. In addition, the "Activate check stop (1122)" command must be issued in order to stop the cycle at the first set check stop point.

Example:

- The check stop bits are set for weighing steps 1 and 2 and DR 25 is transmitted to WP251.

  The "Activate check stop (1122)" command is issued.
  → The "Check stop follows" bit is set in the AWI Status.

- Dosing is started (single dosing or continuous operation)
  → After weighing step 1 is complete, WP251 jumps to "Stopped" state. The "Check stop active" bit is set in the AWI Status, and the "Check stop follows" bit is reset.

- The "Activate check stop (1122)" command notifies WP251 to stop again at the next check stop point.
  → The "Check stop follows" bit is set again in the AWI Status.
- The "Continue weighing (1141)" command continues the dosing cycle.
  → After weighing step 2 is complete, WP251 jumps to "Stopped" state. The "Check stop active" bit is set in the AWI Status, and the "Check stop follows" bit is reset.
- Because no other check stop points were defined, the dosing cycle is performed after "Continue weighing (1141)" to the end.

8.24.12 Automatic emptying

This parameter defines whether and in which form the scale is to be emptied by WP251 at the end of an automatic weighing cycle. The following options are available:

Function code	Meaning
0 (default)	No emptying. After a tolerance check (if cycle is checked), WP251 completes the dosing cycle and jumps to weighing step 0.
1	Empty until limit 3 is fallen below. WP251 sets the "Emptying" bit (which can be placed directly on one of the digital outputs) until the gross weight falls below limit 3 (defined in DR 6) and then resets the bit.
2	Empty according to specified time. WP251 sets the "Emptying" bit (which can be placed directly on one of the digital outputs) based on the emptying time specified in DR 25 and then resets the bit automatically – regardless of whether or not the scale was completely emptied during the time!

8.24.13 Emptying time

The parameter defines a fixed time during which the emptying signal is activated in the emptying step. It applies only when function code 2 (Emptying according to specified time) is selected as the emptying option in DR 25. The setting is made in milliseconds (ms).

8.24.14 Maximum emptying time

This parameter defines a monitoring time for emptying option 1 in DR 25 (Emptying until limit 3 is fallen below). The time starts together with the emptying signal. If limit 3 has not yet been fallen below after expiration of the time, a corresponding technology message is issued that has no further effect on the weighing cycle or emptying. The message is purely informative. The parameter setting is made in milliseconds (ms).

8.25 DR 28 Additional strings for log

8.25.1 Overview

Data record 28 provides the option of defining four user-definable text strings with 16 characters each. A selection code is used to define which of the four text strings are to be written in the log. For example, four material names can be predefined and the appropriate material name for a batch can be selected and logged.

Table 8- 25 Assignment of data record 28

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*28*	*-*	*-*	*1768*
Length	*Data record length information*	*USHORT*	*2*	*r*	*88*	*-*	*-*	*1769*
Application	*Information on application to which DR belongs*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1770*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65535*	*1771*
String 1 string header	Maximum length and actual length of string	UBYTE	2	rw	16,16	0	0	1772
String 1	String 1 for logging	CHAR	16	rw	0	0	0	1773
String 2 string header	Maximum length and actual length of string	UBYTE	2	rw	16,16	0	0	1781
String 2	String 2 for logging	CHAR	16	rw	0	0	0	1782
String 3 string header	Maximum length and actual length of string	UBYTE	2	rw	16,16	0	0	1790
String 3	String 3 for logging	CHAR	16	rw	0	0	0	1791
String 4 string header	Maximum length and actual length of string	UBYTE	2	rw	16,16	0	0	1799
String 4	String 4 for logging	CHAR	16	rw	0	0	0	1800
Sting selection for automatic logging (Page 133)	String selection for logging 0: No string 1: String 1 2: String 2 3: String 3 4 String 4	USHORT	2	rw	0	0	0	1808
Reserve	Reserve	USHORT	2	rw	0	0	0	1809
Reserve	Reserve	FLOAT	4	rw	0	0	-	1810

8.25.2 Strings 1, 2, 3 and 4

Four user-definable text strings with 16 characters each are available.

8.25.3 Sting selection for automatic logging

This parameter defines whether and, if so, which string is to be printed in the log. The following options are available:

Function code	Meaning
0 (default)	Log print without string
1	Log print with String 1
2	Log print with String 2
3	Log print with String 3
4	Log print with String 4

8.26 DR 29 Configuration of technology messages

The data record provides the option of selectively suppressing the technology messages of WP251 (see section "Messages"). To suppress a message, the associated bit in DR 29 must be reset.

Table 8- 26 Assignment of data record 29

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*29*	*-*	*-*	*1812*
Length	*Data record length information*	*USHORT*	*2*	*r*	*16*	*-*	*-*	*1813*
Application	*Information on application to which DR belongs*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*1814*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65535*	*1815*
2000 Technological error	At least one technology error exists (group error)	B16_0	0	rw	1	0	1	1816
2001 Timeout tare or zero setting	Taring or zero setting is not possible because a standstill was not reached during the standstill waiting time	B16_1	0	rw	1	0	1	1816
2002 Trace error	The configured cycle for the trace recording cannot be processed: Reading is active or buffer is full; recording is stopped	B16_2	0	rw	1	0	1	1816
2003 Initial zero setting on not possible	The weight at switch-on is outside the permissible initial zeroing range	B16_3	0	rw	1	0	1	1816
2004 Trace memory full	Cyclic trace recording canceled because memory is full	B16_4	0	rw	1	0	1	1816
-	-	B16_5	0	rw	1	0	1	1816

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
-	-	B16_6	0	rw	1	0	1	1816
-	-	B16_7	1	rw	1	0	1	1816
2101 Risk of overfilling	Current configuration would lead to overfilling during dosing (is checked at multiple points during dosing (e.g. after taring))	B16_8	0	rw	1	0	1	1816
2102 Coarse shut-off point already exceed-ed	The coarse shut-off point is already exceeded before switching on the coarse signal	B16_9	0	rw	1	0	1	1816
2103 No standstill	A required standstill did not occur somewhere during dosing	B16_10	0	rw	1	0	1	1816
2104 CPU in "STOP"	No stand-alone operation and no CPU or CPU is not running	B16_11	0	rw	1	0	1	1816
2105 Set point too small	The set point for the dosing is too small in the current configu-ration	B16_12	0	rw	1	0	1	1816
2106 Error fine weight	Trailing weight, shut-off correc-tion value and set point are not compatible	B16_13	0	rw	1	0	1	1816
2107 Stop after toler-ance error	Weighing cycle stopped after tolerance error based on pa-rameter assignment	B16_14	0	rw	1	0	1	1816
Reserved	-	B16_15	1	rw	1	0	1	1816
2109 Blocking time "coarse" error	Blocking time coarse signal After expiration of the blocking time coarse signal, the coarse shut-off point was already ex-ceeded.	B17_0	0	rw	1	0	1	1817
2110 Blocking time "fine" error	Blocking time fine signal viola-tion After expiration of the blocking time fine signal, the fine shut-off point was already exceeded.	B17_1	0	rw	1	0	1	1817
2111 Maximum weigh-ing time exceeded	Maximum dosing time was exceeded	B17_2	0	rw	1	0	1	1817
2112 Logging not possible - no standstill	Logging conditions (standstill 2 and/or SecureDisplay not shown) are not met, automatic logging cannot be performed	B17_3	0	rw	1	0	1	1817
2113 Maximum empty-ing time exceeded	Emptying monitoring time ex-pired without achieving empty state	B17_4	0	rw	1	0	1	1817
2114 Maximum correc-tive action exceeded	Maximum corrective action (defined in DR 24) was ex-ceeded	B17_5	0	rw	1	0	1	1817
2115 Log error	Error while reading a log entry (refresh DS 46 with Request ID = 0)	B17_6	0	rw	1	0	1	1817

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
2116 Set point too large	In removal mode there is not enough material in the container at the start of dosing (gross < set point) Dosing can still be started in this case with the "Continue weighing" command and ended using "Rest emptying" as soon as no more material can be removed from the scale.	B17_7	1	rw	1	0	1	1817
-	-	B17_8	0	rw	1	0	1	1817
-	-	B17_9	0	rw	1	0	1	1817
-	-	B17_10	0	rw	1	0	1	1817
-	-	B17_11	0	rw	1	0	1	1817
2096 Restore point set	Recovery point has been successfully set	B17_12	0	rw	1	0	1	1817
2097 Restore point loaded	Recovery point (or default values, if no recovery point) has been successfully loaded	B17_13	0	rw	1	0	1	1817
2098 Standard parameters loaded	Note for the user that the standard parameters were loaded	B17_14	0	rw	1	0	1	1817
2099 Factory settings loaded	Note for the user that the factory settings were loaded	B17_15	1	rw	1	0	1	1817
Reserve	Reserve	FLOAT	4	rw	0	0	-	1818

8.27 DR 30 Process state

8.27.1 Overview

This data record contains all weight values and related status information of WP251. All values are read-only.

Note

Data record DR 30 does not have to be read into the PLC via a command! In data record DR 14 (page 101), the user can select two process variables that will be transmitted automatically via the S7-I/O to the CPU and be available there. In addition, the AWI ((**A**utomatic **W**eighing **I**nstrument) Status is available cyclically in the I/O (see section "Integration in SIMATIC") and can thus be directly used in the PLC program. At the Modbus end, the parameters and status information from DR 30 is always current and the registers can therefore be read immediately.

Table 8- 27 Assignment of data record 30

	Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus regis-ters
	Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*30*	*-*	*-*	*3000*
	Length	*Data record length infor-mation*	*USHORT*	*2*	*r*	*112*	*-*	*-*	*3001*
	Application	*Information on application to which DR belongs*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*3002*
	Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65535*	*3003*
NAWI Status	1/4d zero	Set if gross is less than ± 0.25 d	B16_0	0	r	0	-	-	3004
	Out of weighing range	Set if the gross weighing range is exceeded more than 9 display increments or is fallen below more than -20 display increments	B16_1	0	r	0	-	-	3004
	Tared	Set when tare weight is active	B16_2	0	r	0	-	-	3004
	Preset tare active	Set when preset tare weight is active	B16_3	0	r	0	-	-	3004
	Reserve	*Reserve*	*B16_4*	*0*	*r*	*0*	*-*	*-*	*3004*
	Waiting for standstill 1	Set when module is waiting for standstill to execute command	B16_5	0	r	0	-	-	3004
	Standstill 1	Set when standstill condi-tion 1 is met	B16_6	0	r	0	-	-	3004
	Reserve	*Reserve*	*B16_7*	*1*	*r*	*0*	*-*	*-*	*3004*
	Empty	Limit 3 (status empty)	B16_8	0	r	0	-	-	3004
	Limit 1	Limit value 1 has responded	B16_9	0	r	0	-	-	3004
	Limit 2	Limit value 2 has responded	B16_10	0	r	0	-	-	3004
	< Minimum weight	Minimum weighing range fallen below	B16_11	0	r	0	-	-	3004
	Reserve	*Reserve*	*B16_12*	*0*	*r*	*0*	*-*	*-*	*3004*
	Reserve	*Reserve*	*B16_13*	*0*	*r*	*0*	*-*	*-*	*3004*
	Reserve	*Reserve*	*B16_14*	*0*	*r*	*0*	*-*	*-*	*3004*
	Reserve	*Reserve*	*B16_15*	*1*	*r*	*0*	*-*	*-*	*3004*
	Reserve	*Reserve*	*B16_0*	*0*	*r*	*0*	*-*	*-*	*3005*
	Reserve	*Reserve*	*B16_1*	*0*	*r*	*0*	*-*	*-*	*3005*
	Reserve	*Reserve*	*B16_2*	*0*	*r*	*0*	*-*	*-*	*3005*
	Reserve	*Reserve*	*B16_3*	*0*	*r*	*0*	*-*	*-*	*3005*
	Reserve	*Reserve*	*B16_4*	*0*	*r*	*0*	*-*	*-*	*3005*

	Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus regis-ters
	Error Clock	Set when buffering of the time has failed. Is cleared after the time is set.	B16_5	0	r	0	-	-	3005
	Trace active	Set when trace is running	B16_6	0	r	0	-	-	3005
	Cmd error at digital input	Set when error occurs re-sulting from command at digital input	B16_7	1	r	0	-	-	3005
	Calibration curve not	Points of the calibration curve are not plausible or are incomplete	B16_8	0	r	0	-	-	3005
	Service mode	Service mode is activated	B16_9	0	r	0	-	-	3005
	Simulation mode	Simulation mode is activat-ed	B16_10	0	r	0	-	-	3005
	Write protection	Write protection is active (jumper set)	B16_11	0	r	0	-	-	3005
	Analog output error	Analog output error	B16_12	0	r	0	-	-	3005
	Stand-alone opera-tion	Set when stand-alone oper-ation is selected at DIP switch	B16_13	0	r	0	-	-	3005
	Start up	Startup has taken place or factory settings have been loaded (is deleted again after 5 seconds)	B16_14	0	r	0	-	-	3005
	Error	Error is present (operating error)	B16_15	1	r	0	-	-	3005
AWI Status	Weighing step 0	Dosing is in step 0	B16_0	0	r	0	-	-	3006
	Weighing step 1	Dosing is in step 1	B16_1	0	r	0	-	-	3006
	Weighing step 2	Dosing is in step 2	B16_2	0	r	0	-	-	3006
	Weighing step 3	Dosing is in step 3	B16_3	0	r	0	-	-	3006
	Weighing step 4	Dosing is in step 4	B16_4	0	r	0	-	-	3006
	Weighing step 5	Dosing is in step 5	B16_5	0	r	0	-	-	3006
	Weighing step 6	Dosing is in step 6	B16_6	0	r	0	-	-	3006
	Weighing step 7	Dosing is in step 7	B16_7	1	r	0	-	-	3006
	Post dosing active	Automatic post-dosing is active	B16_8	0	r	0	-	-	3006
	Coarse signal	Coarse signal is active	B16_9	0	r	0	-	-	3006
	Fine signal	Fine signal is active	B16_10	0	r	0	-	-	3006
	Reserve	*Reserve*	*B16_11*	*0*	*r*	*0*	-	-	*3006*
	Emptying signal	Emptying signal is active	B16_12	0	r	0	-	-	3006
	Weighing cycle stopped	Dosing has been stopped	B16_13	0	r	0	-	-	3006
	Check stop active	Dosing in check stop	B16_14	0	r	0	-	-	3006
	Check stop follows	Check stop command is-sued, check stop will occur at next check stop point	B16_15	1	r	0	-	-	3006

	Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus regis-ters
	Aborted	Dosing has been aborted	B16_0	0	r	0	-	-	3007
	Step blocked (transi-tion)	Dosing blocked by step blocking at digital input or via S7	B16_1	0	r	0	-	-	3007
	Above tolerance TH2	Dosed weight above high tolerance limit TH2 (="Bad")	B16_2	0	r	0	-	-	3007
	Above tolerance TH1	Dosed weight between high tolerance limits TH1 and TH2	B16_3	0	r	0	-	-	3007
	Good (TL1 to TH1)	Dosed weight greater than TL1 and less than TH1	B16_4	0	r	0	-	-	3007
	Below tolerance TL1	Dosed weight between low tolerance limits TL1 and TL2	B16_5	0	r	0	-	-	3007
	Below tolerance TL2	Dosed weight below low tolerance limit TL2 (="Bad")	B16_6	0	r	0	-	-	3007
	Tolerance bad	Dosing is bad / incorrect weight	B16_7	1	r	0	-	-	3007
	Standstill 2	Set when scale is within standstill range 2	B16_8	0	r	0	-	-	3007
	Waiting for standstill 2	Waiting for standstill 2 for check	B16_9	0	r	0	-	-	3007
	Settling time running before standstill 2	Settling time running before standstill 2	B16_10	0	r	0	-	-	3007
	Check follows	Current dosing will be checked	B16_11	0	r	0	-	-	3007
	Blocking time active	Blocking set point/actual value comparison is running (no shut-off of dosing sig-nals occurs during the time)	B16_12	0	r	0	-	-	3007
	Continuous mode active	Continuous start is activated	B16_13	0	r	0	-	-	3007
	Weighing cycle fin-ished	Cycle has finished	B16_14	0	r	0	-	-	3007
	Total set point reached	Total set point (DR 21) has been reached	B16_15	1	r	0	-	-	3007
	Gross, net and tare process values (Page 140)	Gross weight (process val-ue)	FLOAT	4	r	0	-	-	3008
	Gross, net and tare process values (Page 140)	Net weight (process value)	FLOAT	4	r	0	-	-	3010
	Gross, net and tare process values (Page 140)	Tare weight (process value)	FLOAT	4	r	0	-	-	3012
	Gross, net and tare weights (Page 140)	Gross/Net weight rounded according to DR 3	FLOAT	4	r	0	-	-	3014

	Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus regis-ters
	Gross/Net weight x10 (Page 140)	Gross/Net weight with ten-fold resolution	FLOAT	4	r	0	-	-	3016
	Gross, net and tare weights (Page 140)	Gross weight rounded ac-cording to DR 3	FLOAT	4	r	0	-	-	3018
	Gross, net and tare weights (Page 140)	Tare weight rounded ac-cording to DR 3	FLOAT	4	r	0	-	-	3020
	Gross/Net process weight 2 (Page 140)	Gross weight after Filter 2	FLOAT	4	r	0	-	-	3022
	Gross/Net process weight 2 (Page 140)	Net weight after Filter 2	FLOAT	4	r	0	-	-	3024
	Reserve	*Reserve*	*FLOAT*	*4*	*r*	*0*	-	-	*3026*
	Actual weight of last dosing (Page 140)	Actual weight of last dosing	FLOAT	4	r	0	-	-	3028
	Totalizer 1 and Total-izer 2 (Page 140)	Sum 1	DOUBLE	8	r	0	-	-	3030
	Totalizer 1 and Total-izer 2 (Page 140)	Sum 2	FLOAT	4	r	0	-	-	3034
	Youngest protocol-ID (Page 141)	Newest protocol ID	ULONG	4	r	0	-	-	3036
	Refresh counter (Page 140)	Refresh counter increment-ed by 1 when weight values were changed	USHORT	2	r	0	-	-	3038
	Date & time (Page 141)	Year count	USHORT	2	rw	1	-	-	3039
	Date & time (Page 141)	Month	USHORT	2	rw	1	1	12	3040
	Date & time (Page 141)	Day in month	USHORT	2	rw	1	1	31	3041
	Date & time (Page 141)	Hour	USHORT	2	rw	0	0	23	3042
	Date & time (Page 141)	Minute	USHORT	2	rw	0	0	59	3043
	Date & time (Page 141)	Second	USHORT	2	rw	0	0	59	3044
	Date & time (Page 141)	Millisecond	USHORT	2	rw	0	0	999	3045
	Date & time (Page 141)	Day of the week (Sunday = 1)	USHORT	2	rw	1	1	7	3046
	Current weighing step (Page 141)	Dosing step the WP251 is currently in	USHORT	2	r	0	-	-	3047
	Reserve	*Reserve*	*LONG*	*4*	*r*	*0*	-	-	*3048*
	Reserve	*Reserve*	*USHORT*	*2*	*r*	*0*	-	-	*3050*
	Reserve	*Reserve*	*USHORT*	*2*	*r*	*0*	-	-	*3051*
	Reserve	*Reserve*	*LONG*	*4*	*r*	*0*	-	-	*3052*
	Reserve	*Reserve*	*FLOAT*	*4*	*r*	*0*	-	-	*3054*

8.27.2 Gross, net and tare process values

These are the gross, net and tare weights in high-resolution process form.

8.27.3 Gross, net and tare weights

These are the gross, net and tare weights after rounding and filtering defined in data record 3.

8.27.4 Gross/Net weight x10

This is the gross/net weight after rounding according to settings in data record 3 and a resolution raised by a factor of 10.

8.27.5 Gross/Net process weight 2

These are the high-resolution, internal process values of the gross and net weight after filtering according to the settings in data record 24.

8.27.6 Refresh counter

Measured values are re-calculated every 10 ms in the SIWAREX module. The refresh counter is also incremented by 1 each time. When the counter reaches the value 65536, it is reset. The counter can be used as a time stamp for data record DR 30.

8.27.7 Actual weight of last dosing

This parameter shows the last dosed (net) weight.

8.27.8 Totalizer 1 and Totalizer 2

These are two sum memories that can be reset separately via a command (Reset totalizer 1 (651), Reset totalizer 2 (652)). In NAWI and catchweigher modes, the dosed weight is added to the sums after the tolerance check. In gravimetric filling mode, the actual weight determined by the tolerance check in checked cycles is summed. For cycles without tolerance check, the set point set in DR 20 is included in the calculated sums.

8.27.9 Youngest protocol-ID

After a successful logging, the "Youngest protocol-ID" parameter is incremented and represents the last protocol ID to be created.

8.27.10 Date & time

The Year, Month, Day, Hour, Minute, Second, Millisecond, and Day of the week parameters represent the current date and time set WP251. The date and time from an S7-1200 controller is set by sending DR 8 (SIMATIC DTL format) or alternatively DR 48 in a Modbus-compatible format.

8.27.11 Current weighing step

This parameter provides information on the dosing step the scale is currently in. A list of the steps is available in section Weighing steps (Page 58).

8.28 DR 31 Process state extended

8.28.1 Overview

Current states and process values of the scale can be monitored using the extended process states. This data is not required for standard operation of the scale.

The monitoring of selected data during trial operation is extremely useful as it helps you to optimize parameters and locate errors.

Table 8- 28 Assignment of data record 31

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*31*	*-*	*-*	*3300*
Length	*Data record length information*	*USHORT*	*2*	*r*	*88*	*-*	*-*	*3301*
Application	*Information on application to which DR belongs*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*3302*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65535*	*3303*
Unfiltered digit value (Page 143)	Unfiltered digit value	LONG	4	r	0	-	-	3304
Digits filtered by F1 (Page 143)	Filtered value after filter 1 (DR 3)	LONG	4	r	0	-	-	3306

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Filtered digit value 2 (Page 143)	Filtered value after filter 2 (DR 24)	LONG	4	r	0	-	-	3308
Current analog output (mA) (Page 144)	Currently output analog output value in mA	FLOAT	4	r	0	0	10000	3310
Current analog output (digits) (Page 144)	Currently output analog output value in digits	USHORT	2	r	0	0	10000	3312
Reserve	*Reserve*	*USHORT*	*2*	*r*	*0*	*0*	*10000*	*3313*
Current status digital input DI.0, DI.1, DI.2 and DI.3 (Page 144)	Current status of input 0	B16_0	0	r	0	-	-	3314
Current status digital input DI.0, DI.1, DI.2 and DI.3 (Page 144)	Current status of input 1	B16_1	0	r	0	-	-	3314
Current status digital input DI.0, DI.1, DI.2 and DI.3 (Page 144)	Current status of input 2	B16_2	0	r	0	-	-	3314
Current status digital input DI.0, DI.1, DI.2 and DI.3 (Page 144)	Current status of input 3	B16_3	0	r	0	-	-	3314
Reserve	*Reserve*	*B16_4*	*0*	*r*	*0*	*-*	*-*	*3314*
Reserve	*Reserve*	*B16_5*	*0*	*r*	*0*	*-*	*-*	*3314*
DIP switch 1 and 2 (Page 144)	Set when switch 1 is closed	B16_6	0	r	0	-	-	3314
DIP switch 1 and 2 (Page 144)	Set when switch 2 is closed	B16_7	1	r	0	-	-	3314
Current status digital output DQ.0, DQ.1, DQ.2 and DQ.3 (Page 144)	Current status of output 0	B16_8	0	r	0	-	-	3314
Current status digital output DQ.0, DQ.1, DQ.2 and DQ.3 (Page 144)	Current status of output 1	B16_9	0	r	0	-	-	3314
Current status digital output DQ.0, DQ.1, DQ.2 and DQ.3 (Page 144)	Current status of output 2	B16_10	0	r	0	-	-	3314
Current status digital output DQ.0, DQ.1, DQ.2 and DQ.3 (Page 144)	Current status of output 3	B16_11	0	r	0	-	-	3314
Reserve	*Reserve*	*B16_12*	*0*	*r*	*0*	*-*	*-*	*3314*
Reserve	*Reserve*	*B16_13*	*0*	*r*	*0*	*-*	*-*	*3314*
Reserve	*Reserve*	*B16_14*	*0*	*r*	*0*	*-*	*-*	*3314*
Reserve	*Reserve*	*B16_15*	*1*	*r*	*0*	*-*	*-*	*3314*
Refresh counter (Page 144)	Refresh counter	USHORT	2	r	0	0x0000	0xFFFF	3315

Variable	Note	Type	Length (bytes)	RW	De-fault	Min.	Max.	Modbus registers
Current load cell signal in mV (Page 145)	Voltage signal at load cell input in mV	FLOAT	4	r	0	-	-	3316
Current fine weight (Page 145)	Current fine weight (adjusted by the controller)	FLOAT	4	r	0	0	65535	3318
Current trailing weight (Page 145)	Current trailing weight (adjusted by the controller)	FLOAT	4	r	0	0	65535	3320
Reserve	*Reserve*	*FLOAT*	*4*	*r*	*0*	*0*	*65535*	*3322*
Reserve	*Reserve*	*FLOAT*	*4*	*r*	*0*	*0*	*65535*	*3324*
Reserve	*Reserve*	*FLOAT*	*4*	*r*	*0*	*0*	*65535*	*3326*
Reserve	*Reserve*	*FLOAT*	*4*	*r*	*0*	*0*	*65535*	*3328*
Tolerance limits TH2, TH1, TL1 and TL2 (Page 145)	High limit tolerance band 2 (absolute weight value)	FLOAT	4	r	0	0	65535	3330
Tolerance limits TH2, TH1, TL1 and TL2 (Page 145)	High limit tolerance band 1 (absolute weight value)	FLOAT	4	r	0	0	65535	3332
Tolerance limits TH2, TH1, TL1 and TL2 (Page 145)	Low limit tolerance band 1 (absolute weight value)	FLOAT	4	r	0	0	65535	3334
Tolerance limits TH2, TH1, TL1 and TL2 (Page 145)	Low limit tolerance band 2 (absolute weight value)	FLOAT	4	r	0	0	65535	3336
Reserve	*Reserve*	*USHORT*	*2*	*r*	*0*	*0*	*65535*	*3338*
Reserve	*Reserve*	*USHORT*	*2*	*r*	*0*	*0*	*65535*	*3339*
Reserve	*Reserve*	*FLOAT*	*4*	*r*	*0*	*-*	*-*	*3340*
Reserve	*Reserve*	*FLOAT*	*4*	*r*	*0*	*-*	*-*	*3342*

8.28.2 Unfiltered digit value

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

8.28.3 Digits filtered by F1

The filtered digit value is the internal measured value after filtering with filters defined in DR 3.

8.28.4 Filtered digit value 2

The filtered digit value is the internal measured value after filtering with filters defined in DR 24.

8.28.5 Current analog output (mA)

Currently output current at analog output in mA.

8.28.6 Current analog output (digits)

Currently output current at analog output with 16-bit resolution.

Note

This parameter can also be set in DR 14 as process value in the SIMATIC I/O so that cyclic reading of DR 31 is not necessary!

8.28.7 Current status digital input DI.0, DI.1, DI.2 and DI.3

Current status of digital inputs DI.0 to DI.3.

Note

This parameter can also be set in DR 14 as process value in the SIMATIC I/O so that cyclic reading of DR 31 is not necessary!

8.28.8 DIP switch 1 and 2

Current status of DIP switch 1 (without function) and 2 (stand-alone operation). The DIP switches are located inside the housing next to the Ethernet port of WP251.

8.28.9 Current status digital output DQ.0, DQ.1, DQ.2 and DQ.3

Current status of digital outputs DQ.0 to DQ.3.

Note

This parameter can also be set in DR 14 as process value in the SIMATIC I/O so that cyclic reading of DR 31 is not necessary!

8.28.10 Refresh counter

Measured values are re-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.

8.28.11 Current load cell signal in mV

Display of currently measured signal voltage of the load cell(s) between the SIG+ and SIG- terminals in millivolts (mV).

8.28.12 Current fine weight

This parameter indicates the calculated fine weight currently used by WP251. The value can differ from the specification in DR 23 because it may have been adjusted by the proportional controller.

8.28.13 Current trailing weight

This parameter indicates the calculated trailing weight currently used by WP251. The value can differ from the specification in DR 23 because it may have been adjusted by the proportional controller.

8.28.14 Tolerance limits TH2, TH1, TL1 and TL2

The tolerance limits specified in DR 22 are always output in DR 31 in the weight unit because different options are available in DR 22 for specifying the tolerance limits (absolute values, relative values or according to OIML R-61).

8.29 DR 32 Error messages

8.29.1 Overview

Data record DR 32 is used for Modbus communication with a Modbus master in order to identify or evaluate an error message from WP251. The individual message bits are set to TRUE state for three seconds in the event of an error and do not have to be acknowledged to the SIWAREX module.

All Modbus registers in DR 32 are automatically updated and do not have to be requested by a read command.

For operation with a SIMATIC CPU, the use of DR 32 is unnecessary because the error information is made available to the CPU or HMI automatically in the data block via the I/O area of the WP251.

The individual error messages are presented and explained in detail in section "Messages" (see Errors and messages (Page 163)). The following table is used only for breaking down the individual messages into their message bits.

Table 8- 29 Assignment of data record 32

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*32*	*-*	*-*	*3500*
Length	*Data record length information*	*USHORT*	*2*	*r*	*32*	*-*	*-*	*3501*
Application	*Information on application to which DR belongs*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*3502*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65535*	*3503*
1000 Operating error	There is at least one operating error (=1 as long as an operating error is present)	Bit_0	0	r	0	-	-	3504
1001 Watchdog	Watchdog activated	Bit_1	0	r	0	-	-	3504
Reserve	Reserve	Bit_2	0	r	0	-	-	3504
1003 Checksum error (parameters)	Checksum error in parameters	Bit_3	0	r	0	-	-	3504
1004 Checksum error (program)	Checksum error in program code	Bit_4	0	r	0	-	-	3504
Reserve	Reserve	Bit_5	0	r	0	-	-	3504
1006 Log book	Log book is full or defective	Bit_6	0	r	0	-	-	3504
1007 Application error	Wrong application loaded	Bit_7	1	r	0	-	-	3504
1102 ADC error	Analog-to-digital converter error	Bit_8	0	r	0	-	-	3504
Reserve	Reserve	Bit_9	0	r	0	-	-	3504
1104 Undervoltage	Undervoltage at SENSE input	Bit_10	0	r	0	-	-	3504
1105 Overload	Overload	Bit_11	0	r	0	-	-	3504
1106 Underload	Underload	Bit_12	0	r	0	-	-	3504
1107 SecureDisplay failure	Connection to SecureDisplay has been interrupted	Bit_13	0	r	0	-	-	3504
Reserve	Reserve	Bit_14	0	r	0	-	-	3504
Reserve	Reserve	Bit_15	1	r	0	-	-	3504
2000 Technological error	At least one technology error exists (group error)	Bit_0	0	r	0	-	-	3505
2001 Timeout tare or zero setting	Taring or zero setting is not possible because a standstill was not reached during the standstill waiting time	Bit_1	0	r	0	-	-	3505
2002 Trace error	The configured cycle for the trace recording cannot be processed: Reading is active or buffer is full; recording is stopped	Bit_2	0	r	0	-	-	3505

Variable	Note	Type	Length (bytes)	RW	De-fault	Mi n.	Max.	Mod-bus regis-ters
2003 Initial zero setting on not possible	The weight at switch-on is outside the permissible initial zeroing range	Bit_3	0	r	0	-	-	3505
2004 Trace memory full	Cyclic trace recording aborted because memory is full	Bit_4	0	r	0	-	-	3505
Reserve	Reserve	Bit_5	0	r	0	-	-	3505
Reserve	Reserve	Bit_6	0	r	0	-	-	3505
Reserve	Reserve	Bit_7	1	r	0	-	-	3505
2101 Risk of overfilling	Current configuration would lead to overfilling during dosing	Bit_8	0	r	0	-	-	3505
2102 Coarse shut-off point already exceeded	The coarse shut-off point is already exceeded before switching on the coarse signal	Bit_9	0	r	0	-	-	3505
2103 No standstill	Required standstill did not occur during the dosing operation	Bit_10	0	r	0	-	-	3505
2104 CPU in "STOP"	No stand-alone operation activated and no CPU or CPU is in "STOP" state	Bit_11	0	r	0	-	-	3505
2105 Set point too small	The set point for the dosing is too small in the current configuration	Bit_12	0	r	0	-	-	3505
2106 Error fine weight	Trailing weight, shut-off correction value and set point are not compatible	Bit_13	0	r	0	-	-	3505
2107 Stop after tolerance error	Weighing cycle stopped after tolerance error based on parameter assignment	Bit_14	0	r	0	-	-	3505
Reserve	Reserve	Bit_15	1	r	0	-	-	3505
2109 Blocking time "coarse" error	Blocking time coarse signal After expiration of the blocking time coarse signal, the coarse shut-off point was already exceeded.	Bit_0	0		0	-	-	3506
2110 Blocking time "fine" error	Blocking time fine signal violation After expiration of the blocking time fine signal, the fine shut-off point was already exceeded.	Bit_1	0	r	0	-	-	3506
2111 Maximum weighing time exceeded	Maximum dosing time was exceeded	Bit_2	0	r	0	-	-	3506
2112 Logging not possible - no standstill	Logging conditions are not met, automatic logging cannot be performed	Bit_3	0	r	0	-	-	3506
2113 Maximum emptying time exceeded	Emptying monitoring time expired	Bit_4	0	r	0	-	-	3506
2114 Maximum corrective action exceeded	Maximum corrective action was exceeded	Bit_5	0	r	0	-	-	3506
2115 Log error	Error while reading a log entry	Bit_6	0	r	0	-	-	3506

Variable	Note	Type	Length (bytes)	RW	Default	Min.	Max.	Modbus registers
2116 Set point too large	In removal mode there is not enough material in the container at the start of dosing (gross < set point)	Bit_7	1	r	0	-	-	3506
Reserve	Reserve	Bit_8	0	r	0	-	-	3506
Reserve	Reserve	Bit_9	0	r	0	-	-	3506
Reserve	Reserve	Bit_10	0	r	0	-	-	3506
Reserve	Reserve	Bit_11	0	r	0	-	-	3506
2096 Restore point set	Recovery point has been successfully set	Bit_12	0	r	0	-	-	3506
2097 Restore point loaded	Recovery point (or default parameters, if no recovery point) has been successfully loaded	Bit_13	0	r	0	-	-	3506
2098 Standard parameters loaded	Note for the user that the standard parameters were loaded	Bit_14	0	r	0	-	-	3506
2099 Factory settings loaded	Note for the user that the factory settings were loaded	Bit_15	1	r	0	-	-	3506
5000 Data/command errors	Group error	Bit_0	0		0	-	-	3507
6050 Unknown command	Issued command code is unknown	Bit_1	0		0	-	-	3507
6051 Command not possible now	See "Additional information" for more information	Bit_2	0	r	0	-	-	3507
6052 Service command error	See "Additional information" for more information	Bit_3	0	r	0	-	-	3507
6053 Calibration command error	All calibration commands	Bit_4	0	r	0	-	-	3507
6054 Scale command error	See "Additional information" for more information	Bit_5	0	r	0	-	-	3507
6055 Weighing command error	See "Additional information" for more information	Bit_6	0	r	0	-	-	3507
6056 Memory command error	Trace, log and log book commands	Bit_7	1	r	0	-	-	3507
7050 Unknown data record	Requested DR is unknown	Bit_8	0	r	0	-	-	3507
7051 Parameter input not possible now	See "Additional information" for more information	Bit_9	0	r	0	-	-	3507
7052 Parameter is write protected and cannot be changed	See "Additional information" for more information	Bit_10	0	r	0	-	-	3507
7053 Error in calibration parameter DR 3	See "Additional information" for more information	Bit_11	0	r	0	-	-	3507
7054 Parameter error DR 5	See "Additional information" for more information	Bit_12	0	r	0	-	-	3507
7055 Parameter error DR 6	See "Additional information" for more information	Bit_13	0	r	0	-	-	3507

Variable	Note	Type	Length (bytes)	RW	De-fault	Mi n.	Max.	Mod-bus regis-ters
7056 Parameter error DR 7	See "Additional information" for more information	Bit_14	0	r	0	-	-	3507
7057 Parameter error DR 8/DR 48	See "Additional information" for more information	Bit_15	1	r	0	-	-	3507
7058 Parameter error in DR 10	See "Additional information" for more information	Bit_0	0	r	0	-	-	3508
7059 Error in interface parameters DR 12 - DR 14	See "Additional information" for more information	Bit_1	0	r	0	-	-	3508
7060 Error in extended parameters DR 15 - DR 19	See "Additional information" for more information	Bit_2	0	r	0	-	-	3508
7061 Error set point DR20 or DR21	See "Additional information" for more information	Bit_3	0	r	0	-	-	3508
7062 Error in dosing sys-tem parameters DR 22/DR 23	See "Additional information" for more information	Bit_4	0	r	0	-	-	3508
7063 Parameter error DR 24	See "Additional information" for more information	Bit_5	0	r	0	-	-	3508
7064 Parameter error DR 25	See "Additional information" for more information	Bit_6	0	r	0	-	-	3508
Reserve	Reserve	Bit_7	1	r	0	-	-	3508
Reserve	Reserve	Bit_8	0	r	0	-	-	3508
7067 Parameter error DR 28	See "Additional information" for more information	Bit_9	0	r	0	-	-	3508
Reserve	Reserve	Bit_10	0	r	0	-	-	3508
Reserve	Reserve	Bit_11	0	r	0	-	-	3508
Reserve	Reserve	Bit_12	0	r	0	-	-	3508
Reserve	Reserve	Bit_13	0	r	0	-	-	3508
7072 Parameter error DR 45	Error in log request	Bit_14	0	r	0	-	-	3508
Reserve	Reserve	Bit_15	1	r	0	-	-	3508
Additional information on data and command errors	Additional information on data and command errors	USHORT	2	r	0	-	-	3509
Reserve	Reserve	USHORT	2	r	0	-	-	3510
Reserve	Reserve	USHORT	2	r	0	-	-	3511
Reserve	Reserve	USHORT	2	r	0	-	-	3512
Reserve	Reserve	USHORT	2	r	0	-	-	3513
Reserve	Reserve	USHORT	2	r	0	-	-	3514
Reserve	Reserve	USHORT	2	r	0	-	-	3515

8.29.2 Operating errors, technology messages, data/command errors

All available message bits are presented in the table above. For data/command errors, there is also "Additional information" available, which is described in more detail in section "Messages" (see Errors and messages (Page 163)).

8.30 DR 34 ASCII weight display

8.30.1 Overview

DR 34 provides an ASCII string with 16 characters, that can be used as a weight display. The string contains both the current gross/net weight after rounding according to DR 3 as well as the weight unit. In addition additional parameters and weight values can be (temporarily) displayed or hidden via a command.

For applications requiring official calibration, DR 34 cannot be used as a main display. In this case, the "SecureDisplay" software must be used in order to represent the weight and additional information in a calibratable manner.

The corresponding registers are always currently available at the Modbus end. For operation with a SIMATIC CPU, DR 34 must be read or requested by WP251 via a command.

Table 8- 30 Assignment of data record 34

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the 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*	*105*	-	-	*4002*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*4003*
ASCII string header	Maximum length and actual length of string	UBYTE[2]	2	r	16,16	-	-	4004
ASCII string (page 119)	Weight display string	CHAR[16]	16	r	" "	-	-	4005

8.30.2 Content of the display string

The following values can be displayed:

Standard display (gross/net weight) (via command 710)	From DR 30
High-resolution gross/net weight (via command 701 for 5 seconds)	From DR 30

Tare weight (via command 705 for 5 seconds)	From DR 30
Restriction code (via command 801 for 5 seconds)	From DR 3
Set point (via command 721 for 5 seconds)	From DR 20
Total set point (via command 722 for 5 seconds)	From DR 21
Totalizer 1 (via command 771 for 5 seconds)	From DR 30
Totalizer 2 (via command 772 for 5 seconds)	From DR 30
Serial number of WP251 (via command 871 for 5 seconds)	From DR 9
Firmware version of WP251 (via command 875 for 5 seconds)	From DR 9
SecureDisplay version (via command 876 for 5 seconds)	From DR 3

8.31 DR 35 SecureDisplay data

For a scale requiring official calibration in which "SecureDisplay" communicates with WP251 via the CPU, data record 35 provides the coded weight value. In this case it must be ensured that the data record is read from SIWAREX to the CPU in a fixed time grid (OB 35) using command code 2035. If this is not the case, "SecureDisplay" remains in "StartUp" state. For applications not requiring official calibration, DR 35 is not relevant to the operation of the scale.

Table 8- 31 Assignment of data record 35

Variable	Remark	Type	Length (bytes)	Rw	Default	Min.	Max.
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*35*	-	-
Length	*Data record length information*	*USHORT*	*2*	*r*	*40*	-	-
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	-	-
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*
SecureDisplayData		UBYTE[32]	32	r	0	-	-

8.32 DR 38 Min/max pointer

Data record 38 provides a non-volatile min/max pointer of the gross weight (filtered by filter F1) that indicates the maximum weight that has occurred since commissioning or since a reset of the min/max pointer. A time stamp is stored in parallel with the weight value. The min/max pointer can be reset by the following commands: "Load factory settings (11)", "Load standard parameter (12)" and "Reset min/max pointer (443)".

Table 8- 32 Assignment of data record 38

Variable	Note	Type	Length (bytes)	Rw	De-fault	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*38*	*-*	*-*	*4051*
Length	*Data record length information*	*USHORT*	*2*	*r*	*36*	*-*	*-*	*4052*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*4053*
Version identifi-er	*Current data rec-ord version infor-mation*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*4054*
Min/max pointer	Gross weight min/max pointer	FLOAT	4	r	0	-	-	4055
Date and time	Date and time	DTL	12	r	-	-	-	4057
Reserve	Reserve	USHORT	2	r	-	-	-	4063
Reserve	Reserve	USHORT	2	r	-	-	-	4064
Reserve	Reserve	FLOAT	4	r	-	-	-	4065
Reserve	Reserve	FLOAT	4	r	-	-	-	4067

8.33 DR 39 Statistics

Data record 39 provides a variety of statistical data. The statistics can be reset at any time with the "Reset statistics (442)" command.

Table 8- 33 Assignment of data record 39

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*39*	*-*	*-*	*4069*
Length	*Data record length information*	*USHORT*	*2*	*r*	*108*	*-*	*-*	*4070*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*4071*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*4072*

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
No. of weighings	Total number of all weighings	ULONG	4	r	0	0	-	4073
No. of checked weighings	Number of checked weighings	ULONG	4	r	0	0	-	4075
No. of checks class TH2 (absolute)	Number of checked weighings above TH2	ULONG	4	r	0	0	-	4077
No. of checks class TH1 (absolute)	Number of checked weighings above TH1	ULONG	4	r	0	0	-	4079
No. of checks class "good" (absolute)	Number of weighings within tolerance band 1	ULONG	4	r	0	0	-	4081
No. of checks class TL1 (absolute)	Number of checked weighings below TL1	ULONG	4	r	0	0	-	4083
No. of checks class TL2 (absolute)	Number of checked weighings below TL2	ULONG	4	r	0	0	-	4085
No. of checks class "bad" (absolute)	Number of checked weighings outside tolerance band 2	ULONG	4	r	0	0	-	4087
No. of checks class TH2 (% of no. of weighings)	Number of checked weighings above TH2 as a percentage of the total number of weighings	FLOAT	4	r	0	0	100	4089
No. of checks class TH1 (% of no. of weighings)	Number of checked weighings above TH1 as a percentage of the total number of weighings	FLOAT	4	r	0	0	100	4091
No. of checks class "good" (% of no. of weighings)	Number of checked weighings within tolerance band 1 as a percentage of the total number of weighings	FLOAT	4	r	0	0	100	4093
No. of checks class TL1 (% of no. of weighings)	Number of checked weighings below TL1 as a percentage of the total number of weighings	FLOAT	4	r	0	0	100	4095
No. of checks class TL2 (% of no. of weighings)	Number of checked weighings below TL2 as a percentage of the total number of weighings	FLOAT	4	r	0	0	100	4097

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
No. of checks class "bad" (% of no. of weighings)	Number of checked weighings outside tolerance band 2 as a percentage of the total number of weighings	FLOAT	4	r	0	0	100	4099
Smallest weight below TU2	Lowest measured weight below TL2	FLOAT	4	r	0	-	-	4101
Highest weight above TH2	Highest measured weight above TH2	FLOAT	4	r	0	-	-	4103
Single set point	Set point rounded as defined in DS 3	FLOAT	4	r	0	-	-	4105
Net weight average value	Average value of all checked weighings	FLOAT	4	r	0	-	-	4107
Standard deviation	Standard deviation of all checked weighings	FLOAT	4	r	0	-	-	4109
Performance per hour	Performance referenced to last dosing (weight unit/hour)	FLOAT	4	r	0	-	-	4111
No. of weighings per hour	Dosings per hour based on duration of last dosing	USHORT	2	r	0	-	-	4113
Reserve	Reserve	USHORT	2	r	0	-	-	4114
Reserve	Reserve	FLOAT	4	r	0	-	-	4115
Reserve	Reserve	FLOAT	4	r	0	-	-	4117
Reserve	Reserve	FLOAT	4	r	0	-	-	4119
Reserve	Reserve	FLOAT	4	r	0	-	-	4121

8.34 DR 41/42 Data memory

Data records 41 and 42 each provide 64 bytes of data that can be used as needed. For example, they can be used to implement connections between the Modbus interfaces and a SIMATIC S7-1200.

Table 8- 34 Assignment of data record 41

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*41*	-	-	*4123*
Length	*Data record length information*	*USHORT*	*2*	*r*	*72*	-	-	*4124*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	-	-	*4125*

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*4126*
Data area	Freely available data area	UBYTE[64]	64	r	0	-	-	4127

Table 8- 35 Assignment of data record 42

Variable	Remark	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus register
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*42*	*-*	*-*	*4200*
Length	*Data record length information*	*USHORT*	*2*	*r*	*72*	*-*	*-*	*4201*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*	*-*	*-*	*4202*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*4203*
Data area	Freely available data area	UBYTE[64]	64	r	0	-	-	4204

8.35 DR 45 Protocol request

8.35.1 Overview

A total of 550,000 weighing logs can be saved (in a calibratable manner) in the internal memory of the SIWAREX. If necessary, a log can be read in a calibratable manner using the calibratable "SecureDisplay" display software and its contents checked.

Data records DR 45/DR 46 can be used to read any log to SIMATIC S7 (not calibratable, only as an operating display). The user enters the protocol ID for the desired log in DR 45 and then sends DR 45 to the SIWAREX. The log is then made available in DR 46 for reading. Command 891 is used for the calibratable display of logs by the calibratable "SecureDisplay" software.

Table 8- 36 Assignment of data record 45

Variable	Remark	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus register
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*45*			*4300*
Length	*Data record length information*	*USHORT*	*2*	*r*	*32*			*4301*

Variable	Remark	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus register
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*			*4302*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*4303*
String header for memory ID to be read	String header	UBYTE[2]	2	rw	12,12			4304
Protocol ID to be read	ID of requested log entry	CHAR[12]	12	rw	" "	-	-	4305
Reserve	Reserve	USHORT	2	rw	0			4311
Protocol ID to be read (Page 156), decimal	ID of the requested log entry as decimal value	ULONG	4	rw	0	1		4312
Reserve	Reserve	USHORT	2	rw	0			4314

8.35.2 Protocol ID to be read

The protocol ID of the log to be displayed in data record 46 is entered here.

The protocol ID to be read is also used for the calibratable reading of the log via SecureDisplay. For example, if ID 129 is to be displayed, the value 129 must be entered in DR45 and sent to SIWAREX. The log with ID 129 can then be read from DR 46 and displayed in a calibratable manner in SecureDisplay using command 891.

If the protocol ID to be read in DR 45 is 0, data record DR 46 is automatically written with the last created log. Thus, after a dosing, DR 46 can be read directly into the PLC for further processing without having to request the last log beforehand.

8.36 DR 46 Protocol content

8.36.1 Overview

Log data is provided in data record DR 46.

Table 8- 37 Assignment of data record 46

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*46*			*4316*
Length	*Data record length information*	*USHORT*	*2*	*r*	*152*			*4317*
Application	*Information about which application the DR belongs to*	*USHORT*	*2*	*r*	*105*			*4318*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*4319*
Oldest report ID (Page 158)	Oldest protocol ID, 0: No entry available	ULONG	4	r	0	1	4,294,967,295	4320
Newest report ID (Page 158)	ID of last saved protocol entry, 0: No entry available	ULONG	4	r	0	1	4,294,967,295	4322
Selected protocol-ID (Page 158)	ID of subsequent log entry, 0: No entry available	ULONG	4	r	0	1	4,294,967,295	4324
Reserve	Reserve	UBYTE[2]	2	r	12,12			4326
Reserve	Reserve	CHAR[12]	12	r	" 0"	" 1"	"4294967295"	4327
Reserve	Reserve	UBYTE[2]	2	r	12,12			4333
Reserve	Reserve	CHAR[12]	12	r	" 0"	" 1"	"4294967295"	4334
Reserve	Reserve	UBYTE[2]	2	r	12,12			4340
Reserve	Reserve	CHAR[12]	12	r	" 0"	" 1"	" 4294967295"	4341
String header for protocol ID currently selected	String header	UBYTE[2]	2	r	28,28			4347
Protocol (Page 158)	Log content	CHAR[46]	46	r	" "			4348
String header for checksum	String header for checksum	UBYTE[2]	2	r	4,4			4371
Checksum	Checksum of selected log	CHAR[4]	4	r	"0000"			4372
String header for date	String header for date	UBYTE[2]	2	r	10,10			4374
Date, time (Page 159)	Date	CHAR[10]	10	r	"2012-03-31"			4375

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus regis-ters
String header for time	String header for time	UBYTE[2]	2	r	8,8			4380
Date, time (Page 159)	Time	CHAR[8]	8	r	"23:59:59"			4381
String header for additional string	String header for addi-tional string	UBYTE[2]	2	r	2,2			4385
Additional string	Currently not used	CHAR[4]	4	r	" "			4386
Reserve	Reserve	USHORT	2	r	0			4388
Reserve	Reserve	FLOAT	4	r	0			4390

8.36.2 Oldest report ID

The ID of the first saved log is displayed here.

8.36.3 Newest report ID

The ID of the last saved log is displayed here.

8.36.4 Selected protocol-ID

The ID of the log requested in data record 45 and shown in data record 46 is displayed here.

8.36.5 Protocol

The 46 bytes of the log have the following structure:

Designation	Data type	Length
Gross/Net	UBYTE	2
SEMICOLON	UBYTE	1
G/N weight calibratable	UBYTE	8
SEMICOLON	UBYTE	1
Weight unit	UBYTE	4
SEMICOLON	UBYTE	1
Tare sign	UBYTE	2
SEMICOLON	UBYTE	1
Tare	UBYTE	8
SEMICOLON	UBYTE	1

Designation	Data type	Length
Additional string	UBYTE	16
SEMICOLON	UBYTE	1

8.36.6 Date, time

The date and time of the selected log are displayed here.

8.37 DR 47 Logbook

The changes in the SecureDisplay software versions are recorded in the logbook. If the SIWAREX has established communication with the SecureDisplay, SIWAREX checks whether the software version of the SecureDisplay has changed. Changes are recorded in the logbook. In this way, a more recent version of the SecureDisplay can also be used during operation requiring calibration without the calibration being violated.

The logbook entries are in data record 47. Scrolling in the logbook is possible using commands 881 to 883: → Command list (page 135). Calibratable reading of the logbook is carried out using the SecureDisplay.

Table 8- 38 Assignment of data record 47

Tag	Comments	Type	Length (bytes)	Rw	De-fault	Min.	Max.	Modbus register
Data record number	*Contains no. of the data record*	*USHORT*	*2*	*r*	*47*			4392
Length	*Data record length information*	*USHORT*	*2*	*r*	*72*			4393
Application	*Information about which application the data record belongs to*	*USHORT*	*2*	*r*	*105*			4394
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	4395
String header for oldest log book ID	String header	UBYTE[2]	2	r	8,8			4396
Oldest log book ID	ID of first logbook entry	CHAR[8]	8	r	"0"	1	99999999	4397
String header of youngest logbook ID	String header	UBYTE[2]	2	r	8,8			4401
Youngest logbook-ID	ID of last logbook entry	CHAR[8]	8	r	"0"	1	99999999	4402
String header for selected logbook ID	String header	UBYTE[2]	2	r	8,8			4406
ID of the selected logbook entry	ID of the selected logbook entry	CHAR[8]	8	r	"0"	1	99999999	4407
String header for device	String header	UBYTE[2]	2	r	4,4			4411

Tag	Comments	Type	Length (bytes)	Rw	De-fault	Min.	Max.	Modbus register
Device	Currently only logbook for SecureDisplay SW changes, corresponds to entry "HMI"	CHAR[4]	4	r	" "			4412
String header for FW version old	String header	UBYTE[2]	2	r	10,10			4414
FW version old	Old FW version, e.g. V1.01.03	CHAR[10]	10	r	" "			4415
String header for FW version new	String header	UBYTE[2]	2	r	10,10			4420
FW version new	New FW version, e.g. V1.01.04	CHAR[10]	10	r	" "			4421
Checksum	Checksum of logbook entry	USHORT	2	r	0			4426
Reserve	Reserve	USHORT	2	r	0			4427

8.38 DR 48 date and time 2 (for Modbus)

The SIWAREX module has its own hardware clock. The current date and the time can be set and read using data record DR 48. The clock is buffered with a capacitor and can continue operating for up to approximately 70 hours without supply voltage. If you are not using the Modbus protocol, data record DR 8 is used for the date and time because it has the SIMATIC DTL format directly.

Table 8- 39 Assignment of data record 48

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Data record number	*Contains no. of the 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*	*105*	-	-	*4502*
Version identifier	*Current data record version information*	*USHORT*	*2*	*r*	*1*	*1*	*65635*	*4503*
Year	Year	USHORT	2	rw	2012	2012	2010	4504
Month	Month	USHORT	2	rw	1	1	12	4505
Day	Day in month	USHORT	2	rw	1	1	31	4506
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

Variable	Note	Type	Length (bytes)	Rw	Default	Min.	Max.	Modbus registers
Millisecond	Millisecond	USHORT	2	rw	0	0	999	4510
Day of the week	Day of the week	USHORT	2	rw	1	1	7	4511

Errors and messages

9

9.1 Message and error types

Three types are distinguished:

Operating errors

Operating errors can occur spontaneously at any time due to an unforeseen event. They include internal and external hardware problems which can occur spontaneously during weighing, e.g. wire break of the load cell cable.

Data and operating errors

Data and command errors arise always as response to a command or a data record transfer.

A data error occurs when a plausibility error is identified in a data record sent to the module, causing the module to refuse acceptance of the data record.

A command error occurs when the module cannot execute the issued command in its current operating state.

For most data/command errors, SIWAREX WP251 outputs additional information for the error. This includes further details about the error and is described in detail in the error list in this section.

Technology messages

Technology messages occur spontaneously due to the process flow of a weighing/dosing. Messages provide information to the operator and have no further effect on the dosing operation.

9.2 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 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 via the WP251 function block (see Communication with SIMATIC S7-1200 (Page 185))
- Output via data record DR 32 in case of communication with a Modbus master

9.3 Evaluating errors/messages with the help of SIWATOOL

The electronic weighing system has a message buffer that stores the last 80 entries including time stamp in non-volatile memory. If the number of messages in the message buffer exceeds 80, 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. The only way to completely clear the message buffer is with the "Load factory settings" command.

9.4 Evaluating errors/messages with the help of the function block

The electronic weighing system has a message buffer that stores the last 80 entries including time stamp in non-volatile memory. If the number of messages in the message buffer exceeds 80, 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. The only way to completely clear the message buffer is with the "Load factory settings" command.

9.5 Evaluating errors/messages using Modbus

Data record DR 32 is available for detecting and evaluating errors/messages using Modbus (see DR 32 Error messages (Page 145)). This is updated automatically by SIWAREX and contains a bit for each message that is set for 3 seconds when an error occurs. Thus, the registers can be read directly by a Modbus master and the individual bits can be monitored. In addition to the error bits, there is additional information with further details on the cause of the error.

9.6 Operating errors

9.6.1 Operating errors

Operating errors	Error code	Description and remedy
1000 operating error exists	1000	Group message, there is at least one operating error.
1001 Watchdog	1001	Watchdog error. A critical error has occurred in the function of the module. Contact SIWAREX Support if the error recurs.
Reserve	Reserve	Reserve
1003 Checksum error (parameters)	1003	The checksum of the parameters no longer matches. Remedy: Load factory settings. Contact SIWAREX Support if the error recurs.

Operating errors	Error code	Description and remedy
1004 Checksum error	1004	The checksum of the WP251 FW no longer matches. Remedy: Load factory settings. Contact SIWAREX Support if the error recurs.
Reserve	Reserve	Reserve
1006 Logbook error	1006	Error when writing/clearing the logbook. Remedy: Load factory settings. Contact SIWAREX Support if the error recurs.
1007 Application error	1007	Incompatible FW was loaded. Remedy: Load only WP251-compatible FW on the module.
1102 ADC error	1102	AD converter error when reading in the measured value. Remedy: Check and follow recommendations for installation meeting EMC requirements (section EMC-compliant installation (Page 25)).
Reserve	Reserve	Reserve
1104 Undervoltage at SENSE	1104	Undervoltage on the SENSE cables. A voltage between 4.85 V DC and X.XX V DC must be present between SEN+ and SEN-. If necessary, check the wiring of the load cells or, in the case of 4-wire load cells, the jumpers between EXC+&SEN+ and EXC-&SEN- in the junction box.
1105 Overload at SIG	1105	The maximum SIG input signal of the AD converter is exceeded by more than 10% (corresponds to +21.34 mV). Check the wiring of the load cell(s). If wiring is correct, check the input and output resistance of the cells and identify any defective cells.
1106 Underload at SIG	1106	The minimum SIG input signal of the AD converter is fallen below by more than 10% (corresponds to -21.34 mV). Check the wiring of the load cell(s). If wiring is correct, check the input and output resistance of the cells and identify any defective cells.
1107 Communication with SecureDisplay failed	1107	The calibratable "SecureDisplay" weight display no longer communicates with WP251. Check the cabling between the HMI and CPU or SIWAREX, the SIMATIC S7 program and the IP addresses of the networked components.
Reserve	Reserve	Reserve
Reserve	Reserve	Reserve

9.6.2 Technology messages

Table 9- 1 Technology messages

Technology errors	Error code	Description and remedy
2000 Technological error	2000	Group message, at least one technology message is present
2001 Timeout tare or zero setting	2001	Taring or zero setting is not possible because a standstill was not reached during the standstill waiting time Check the standstill criteria and the standstill waiting time in DR 3 and adjust the parameters as necessary. Check the scale mechanics for strong fluctuations / disturbances that prevent standstill.
2002 Trace error	2002	The set recording rate for trace function cannot be processed. Set a slower recording rate (section "Trace recording cycle (page 91)")

Technology errors	Error code	Description and remedy
2003 Initial zero setting on not possible	2003	The weight at switch-on is outside the configured value range in data record DR 3 defined by the maximum positive and negative weight for initial zero setting.
2004 Trace memory full	2004	The trace recording has been aborted because the internal trace memory is full.
Reserve	Reserve	Reserve
Reserve	Reserve	Reserve
Reserve	Reserve	Reserve
2101 Risk of overfilling	2101	Current parameter assignment would lead to overfilling of the scale during dosing. Check the specified set point in DR 20 or the limits for taring / zero setting in DR 3 and DR 25.
2102 Coarse shut-off point already exceeded	2102	The current weight is already above the coarse shut-off point. Remedy: Adjust set point or empty scale.
Reserve	Reserve	Reserve
2104 CPU in "STOP"	2104	WP251 is not in stand-alone operation, the SIMATIC CPU is in STOP state and a dosing command has been issued. Remedy: Put the SIMATIC CPU in RUN state or activate stand-alone operation of WP251. **NOTICE:** Ensure the safety of the system before activating stand-alone operation because WP251 activates dosing elements if necessary despite the stopped SIMATIC CPU.
2105 Set point too small	2105	The currently specified set point is too small. Remedy: Check the set point setting in DR 20.
2106 Error fine weight	2106	Trailing weight (DR 23) and set point (DR 20) are incompatible. Check the two entries.
2107 Stop after tolerance error	2107	The weighing cycle was stopped due to a tolerance error according to the parameter assignment in DR 22.
Reserve	Reserve	Reserve
2109 Blocking time "coarse" error	2109	After expiration of the blocking time coarse signal (DR 23), the coarse shut-off point has already been exceeded. Remedy: Decrease the blocking time coarse signal in DR 23.
2110 Blocking time "coarse" error	2110	After expiration of the blocking time fine signal (DR 23), the fine shut-off point has already been exceeded. Remedy: Decrease the blocking time fine signal in DR 23.
2111 Maximum weighing time exceeded	2111	The maximum weighing time specified in DR 25 was exceeded.
2112 Logging not possible - no standstill	2112	The conditions required for automatic logging (e.g. standstill 2) were not present at the time of the log print. Remedy: Check the standstill 2 criteria in DR 3 and adapt it as necessary.
2113 Maximum emptying time exceeded	2113	The maximum emptying time configured in DR 25 was exceeded during emptying. Remedy: Check the scale mechanics (for possible soiling). Adjust the maximum emptying time in DR 25, if necessary.

Technology errors	Error code	Description and remedy
2114 Maximum corrective action exceeded	2114	The corrective active of the controller was greater than the maximum corrective action configured in DR 24.
2115 Log error	2115	Error while reading a log in DR 46.
2116 Set point too large	2116	The set point specified in DR 20 is greater than the residual quantity on the scale (removal mode). Weighing can still be carried out using the "Continue weighing" and subsequent "Rest emptying" commands!
Reserve	Reserve	Reserve
Reserve	Reserve	Reserve
Reserve	Reserve	Reserve
Reserve	Reserve	Reserve
2096 Restore point set	2096	A recovery point was successfully set
2097 Restore point loaded	2097	A recovery point was successfully loaded
2098 Standard parameters loaded	2098	The standard parameters were successfully loaded
2099 Factory settings loaded	2099	The factory settings were successfully loaded

9.6.3 Data and command errors

Table 9- 2 Data and command errors

Data and command errors	Error code	Additional string	Description
5000 Data/command errors	5000	-	Group error, at least one data/operating error present
6050 Unknown command	6050	-	Issued command code is unknown. Check the command code.
6051 Command not possible now	6051	-	The desired command could not be executed because, for example, another process is already active at this time. Additional information contains details.
		4500	, because a fault is present
		4501	, because no standstill occurred
		4502	, because module is already waiting for standstill
		4507	, because dosing active
		4514	, because CPU is missing or not ready
		4541	, because emptying active
		4680	, because SecureDisplay is missing or not visible
		4681	, because display command does not match the current display content
6052 Service command error	6052		Commands from the Service commands group could not be executed. Additional information contains details.
		4510	, because service mode is not active
		4511	, because write protection active
		4507	, because dosing active
		4512	, because enable missing

Data and command errors	Error code	Additional string	Description
		4519	, because no test operation (only relevant in test field)
		4522	, because calibration not yet complete
6053 Calibration command error	6053		Command from the Calibration commands group could not be executed. Additional information contains details.
		4510	, because service mode is not active
		4511	, because write protection active
		4520	, because increment between calibration digits is too small
		4521	, because order of calibration points is incorrect
		4522	, because calibration not yet complete
		4523	, because calibration digits not in the permissible range
		4524	, because calibration weight 0
		4527	, because command is not permitted in simulation mode
6054 Scale command error	6054		Command from the Scale commands group (Zero, Tare, etc.) could not be executed. Additional information contains details.
		4500	, because a fault is present
		4501	, because no standstill occurred
		4502	, because module is already waiting for standstill
		4530	, because weight is outside the permissible tare weight range
		4531	, because weight is outside the permissible zero setting range
6055 Weighing command error	6055		Command from the Weighing commands group (Start single weighing, Start continuous mode, etc.) could not be executed. Additional information contains details.
		4500	, because a fault is present
		4501	, because no standstill occurred
		4502	, because module is already waiting for standstill
		4508	, because dosing is not active
		4509	, because timing within dosing step sequence is impermissible
		4513	, because service mode is activated
		4515	, because not possible in this operating mode
		4540	, because weight above fine shut-off point
		4542	, because set point too small
		4543	, because set point too large
		4544	, because tolerance limits implausible
		4545	, because fine weight, trailing weight and set point are incompatible
		4546	, because dosing would cause overfilling
		4547	, because configured emptying implausible
		4548	, because no check stop points defined
		4549	, because scale is already empty

Data and command errors	Error code	Additional string	Description
6056 Memory command error	6056		Trace, logging or logbook command was rejected. Additional information contains details.
		4500	, because a fault is present
		4501	, because no standstill occurred
		4502	, because module is already waiting for standstill
		4511	, because write protection active
		4532	, because weight is outside the permissible weighing range
		4550	, because trace memory full
		4551	, because log memory full
		4552	, because memory task busy
7050 Unknown data record	7050	-	Requested data record is unknown.
7051 Parameter input not possible now	7051		A parameter input is currently not possible. Additional information contains details.
		4507	, because dosing active
		4510	, because service mode is not active
		4511	, because write protection active
		3519	, because password incorrect
7052 Parameter is write protected and cannot be changed	7052		A parameter input is currently not possible due to active write protection. Additional information contains details about the parameter involved.
		Parameter ID	Parameter ID of the parameter involved
7053 Error in calibration parameter DR 3	7053		Additional information indicates an implausible parameter in DR 3
		Parameter ID	Parameter ID of the affected parameter in DR 3
		4510	, because service mode is not active
		4520	, because increment between calibration digits is too small
		4521	, because order of calibration points is incorrect
		4524	, because calibration weight 0
		4525	, because falling characteristic curve not allowed by OIML
		4526	, because mixed characteristic curve not allowed
		4610	, because weighing range max - min error
		4611	, because resolution not permitted
		4613	, because OIML and 3000d requirements violated
7054 Parameter error DR 5	7054		Additional information indicates an implausible parameter in DR 5
		Parameter ID	Parameter ID of the affected parameter in DR 5

Data and command errors	Error code	Additional string	Description
		4510	, because service mode is not active
		4530	, because weight is outside the permissible tare weight range
		4531	, because weight is outside the permissible zero setting range
7055 Parameter error DR 6	7055		Additional information indicates an implausible parameter in DR 6
		Parameter ID	Parameter ID of the affected parameter in DR 6
7056 Parameter error DR 7	7056		Additional information indicates an implausible parameter in DR 7
		Parameter ID	Parameter ID of the affected parameter in DR 7
		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 DR 8/DR 48	7057		Additional information indicates an implausible parameter in DR 8 / DR 48
		Parameter ID	Parameter ID of the affected parameter in DR 8/DR 48
7058 Parameter error in DR 10	7058		Additional information indicates an implausible parameter in DR 10
		Parameter ID	Parameter ID of the affected parameter in DR 10
		4510	, because service mode is not active
7059 Error in interface parameters DR 12 - DR 14	7059		Additional information indicates an implausible parameter in DR 12 - DR 14
		Parameter ID	Parameter ID of the affected parameter in DR 12-14
		4510	, because service mode is not active
		4670	, because selection code for process values 1 not defined
		4671	, because selection code for process values 2 not defined
		4672	, because MAC address not identical
		4673	, because IP address invalid
7060 Error in extended parameters DR 15 - DR 19	7060		Additional information indicates an implausible parameter in DR 15 - DR 19
		Parameter ID	Parameter ID of the affected parameter in DR 15-19
		4530	, because weight is outside the permissible tare weight range

Data and command errors	Error code	Additional string	Description
7061 Error set point DR 20 or DR 21	7061		Additional information indicates an implausible parameter in DR 20 / DR 21
		Parameter ID	Parameter ID of the affected parameter in DR 20/DR 21
7062 Error in dosing system parameters DR 22/DR 23	7062		Additional information indicates an implausible parameter in DR 22 / DR 23
		Parameter ID	Parameter ID of the affected parameter in DR 22/DR 23
7063 Parameter error DR 24	7063		Additional information indicates an implausible parameter in DR 24
		Parameter ID	Parameter ID of the affected parameter in DR 24
7064 Parameter error DR 25	7064		Additional information indicates an implausible parameter in DR 25
		Parameter ID	Parameter ID of the affected parameter in DR 25
		4507	, because dosing active
Reserve			
Reserve			
7067 Parameter error DR 28	7067		Additional information indicates an implausible parameter in DR 28
		Parameter ID	Parameter ID of the affected parameter in DR 28
Reserve			
Reserve			
Reserve			
Reserve			
7072 Parameter error DR 45	7072		Additional information indicates an implausible parameter in DR 45
		Parameter ID	Parameter ID of the affected parameter in DR 45
Reserve			

9.6.4 Data and command errors - Additional information

Additional information is available for most data/command errors. The cause of the error is described in detail with this information. If a data/command error bit is set, the additional information is also filled accordingly. Thus, the error bits and the additional information must be evaluated together in the program to identify the exact cause of the error.

If additional information not listed above appears for a data/operating error bit, it is a parameter ID. This defines the exact parameter that caused the error.

The following table presents the association between the parameter and parameter ID.

Parameter	Data record	Parameter ID
Standstill 1 - range	3	2153
Standstill 2 - range	3	2154
Standstill 1 - time	3	2158
Standstill 2 - time	3	2159
Weighing operating mode	3	2503
Automatic zero tracking	3	3063
Calibration digits 0 (measured)	3	3081
Calibration digits 1 (measured)	3	3083
Calibration digits 2 (measured)	3	3085
Calibration weight 0	3	3086
Calibration weight 1	3	3087
Calibration weight 2	3	3088
Depth average filter	3	3137
Frequency low pass filter 1	3	3175
SecureDisplay version	3	3178
SecureDisplay interface	3	3197
Gross indicator	3	3199
Maximum weight	3	3217
Minimum weight	3	3219
Order no. low pass filter 1	3	3236
Automatic zero tracking in dosing cycle	3	3247
Resolution	3	3248
Restriction code	3	3249
Scale name	3	3256
Additive tare	3	3282
Grid frequency	3	3283
Tare maximum	3	3288
Max. waiting time for standstill 1	3	3316
Weight simulation allowed	3	3322
Weight unit	3	3323
Initial zeroing	3	3329
Initial zeroing if tared	3	3330
Negative zeroing limit (initial zeroing)	3	3332

Parameter	Data record	Parameter ID
Negative zeroing limit (semi-automatic)	3	3333
Negative zeroing limit (initial zeroing)	3	3334
Positive zeroing value (semi-automatic)	3	3335
Resolution of master totalizer	3	3533
Smallest zoom factor of SecureDisplay	3	3728
SecureDisplay including weighing range data	3	3749
Settling time before standstill 2	3	3915
Current tare weight (preset tare)	5	3105
Current tare weight (semi-automatic)	5	3115
Current zeroing weight (semi-automatic)	5	3116
Current zeroing weight (initial zeroing)	5	3117
Current zeroing weight (zero tracking)	5	3118
Dead load (calculated)	5	3124
Switch-on/off delay limit 1 & 2	6	2451
Switch-on delay limit 3 (empty)	6	3134
Limit 3 - empty	6	3150
Limit 1 OFF value	6	3202
Limit 1 ON value	6	3203
Limit 2 OFF value	6	3205
Limit 2 ON value	6	3206
Limit reference	6	3433
Value for analog output on error or CPU-Stop	7	3049
Assignment digital Input DI.0	7	3055
Assignment digital Input DI.1	7	3056
Assignment digital Input DI.2	7	3057
Assignment digital Input DI.3	7	3058
Assignment digital output DQ.0	7	3059
Assignment digital output DQ.1	7	3060
Assignment digital output DQ.2	7	3061
Assignment digital output DQ.3	7	3062
State of digital output DQ.0 on error or CPU-Stop	7	3140
State of digital output DQ.1 on error or CPU-Stop	7	3141
State of digital output DQ.2 on error or CPU-Stop	7	3142
State of digital output DQ.3 on error or CPU-Stop	7	3143
State of digital outputs on error or CPU-Stop	7	3144
State of analog output on error or CPU-Stop	7	3144
End value analog output	7	3152
Filter digital input	7	3162
Range analog output	7	3245
Source for analog output	7	3272

Parameter	Data record	Parameter ID
Start value analog output	7	3276
Trace memory type	7	3311
Trace rate	7	3312
Date and time	8	3121
Averaged characteristic value	10	3180
No. of mechanical support points	10	3227
Nominal load of one single load cell	10	3228
Load cell manufacturer	10	3890
Load cell order number	10	3891
Gateway	12	3102
IP address	12	3103
Sub net mask	12	3114
Device MAC address	12	3138
Device name	12	3139
Port MAC address	12	3241
Decimal point remote display	13	3126
Modbus address RTU (RS485)	13	3221
RS485 baud rate	13	3250
RS485 data bits	13	3251
RS485 parity	13	3252
RS485 protocol	13	3253
RS485 stop bits	13	3254
RS-485 delay	13	3895
Selection process value 1 for SIMATIC interface	14	3264
Selection process value 2 for SIMATIC interface	14	3265
Preset tare	15	3897
Preset weight	16	3808
Preset analog output	17	3127
Preset DQ.0	18	3128
Preset DQ.1	18	3129
Preset DQ.2	18	3130
Preset DQ.3	18	3131
Transition Step 0	18	3978
Transition Step 1	18	3979
Transition Step 2	18	3980
Transition Step 3	18	3981
Transition Step 4	18	3982
Transition Step 5	18	3983
Transition Step 6	18	3984
Transition Step 7	18	3985
Single set point	20	2012
Total set point	21	3914

Parameter	Data record	Parameter ID
Number of not controlled cycles	22	230
Pulse duration for pulse post dosing	22	1775
Tolerance limit TH1	22	2340
Tolerance limit TH2	22	2341
Tolerance limit TL1	22	2342
Tolerance limit TL2	22	2343
Parameter relation	22	3970
Behavior in case of TH1 error	22	3993
Behavior in case of TL1 error	22	3994
Capture of weighings into statistics	22	4019
Fine weight	23	914
Trailing weight	23	1515
Blocking time fine signal	23	2048
Blocking time coarse signal	23	2050
Parameter relation	23	3986
Type of controller	24	284
Control factor of proportional controller (%)	24	1809
Controller deadband - lower limit	24	1813
Controller deadband - upper limit	24	1814
Maximum corrective action	24	1819
Controller behaviour in case of exceeding max. corrective action	24	1824
Depth average filter	24	3137
Frequency low pass filter 2	24	3176
Order no. low pass filter 2	24	3237
Selection for dosing filter	24	3916
Parameter relation	24	4071
Check stop points	25	524
Automatic emptying	25	757
Emptying time	25	761
Maximum single set point	25	1341
Maximum emptying time	25	1354
Cycle time for automatic zero setting	25	2259
Weighing start options	25	4098
Minimum automatic tare weight	25	2281
"Fine" set value for analogue output	25	2461
"Coarse" set value for analogue output	25	2462
Maximum weighing time	25	2518
Number of weighings without automatic taring/zero setting	25	2763
Maximum automatic tare weight	25	3917
String 1	28	422

Parameter	Data record	Parameter ID
String 2	28	424
String 3	28	426
String 4	28	428
Sting selection for automatic logging	28	2306

9.6.5 Messages by LEDs on the module

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

Item	Color	Labeling	Function
Line 1			
LED 0	Red	**DIAG**	System fault
	Green		Ready
	Green Flashing		Service mode is switched on
LED 1	Yellow		Limit 1 responded
LED 23	Yellow		Limit 2 responded
LED 3	Yellow		Limit 3 responded (empty limit)
LED 4	Green		Standstill status
LED 5	Green Flashing		Automatic weighing active
LED 6	Red		Outside of weighing range
LED 7	Yellow		Parameter input blocked (write protection)
LED 8			Not used
LED 19	Green	**LC**	Load cell(s) OK
	Red		Load cell(s) faulty
LED 10			Not used
LED 11			Not used
LED 12			Not used
LED 13			Not used
LED 14			Not used
LED 15			Not used
LED 16	Green	**AQ**	Analog output active
	Red Flashing		Analog output faulty
Line 2			
LED 1	Green	**LINK**	LAN connection exists

Item	Color	Labeling	Function
LED 2	Yellow	**Rx/Tx**	LAN communication active
LED 3			Not used
LED 4			Not used
LED 5	Green	**DI.0**	Digital input 0 active
LED 6	Green	**DI.1**	Digital input 1 active
LED 7	Green	**DI.2**	Digital input 2 active
LED 8	Green	**DI.3**	Digital input 3 active
LED 9			Not used
LED 10			Not used
LED 11	Yellow	**Rx/Tx**	RS485 communication active
LED 12			Not used
LED 13	Green	**DQ.0**	Digital output 0 active
LED 14	Green	**DQ.1**	Digital output 1 active
LED 15	Green	**DQ.2**	Digital output 2 active
LED 16	Green	**DQ.3**	Digital output 3 active

Command lists 10

10.1 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 via Modbus
- by SIWATOOL directly to the SIWAREX module
- by the digital inputs after corresponding assignment in data record DR 7

If an issued command is not accepted by SIWAREX, the cause of the rejection is always substantiated with a corresponding data/operating error.

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

→ Table 10-1 Table 10-1 Service commands (Page 180)

→ Table 10-2 Table 10-2 Protocol commands, statistics, logbook (Page 181)

→ Table 10-3 Table 10-3 Trace commands (Page 181)

→ Table 10-4 Table 10-4 Display changeover for DR 34 and SecureDisplay (Page 181)

→ Table 10-5 Table 10-5 Scale commands (Page 183)

→ Table 10-6 Table 10-6 Scale commands (Page 183)

See also

Command lists (Page 179)

10.2 Command lists

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.

Table 10- 1 Service commands

Command code	Command	Description	Protected
1	Service mode ON	Turn on service mode	
2	Service mode OFF	Turn off service mode	
3	Weight Simulation on	Turn on test mode. The simulation value from data record 16 is used instead of the measured value for calculation of the process values. Simulation mode must be enabled generally in DR 3 beforehand.	
4	Weight Simulation off	Switch off test mode.	
11	Load factory settings	The command resets the SIWAREX to the "ex works" status. During this process: • All parameters and saved data (including log memory, logbook, IP addresses and Modbus addresses) • All message buffers (diagnostic buffer, trace memory, etc.) are reset • A configured recovery point, if any, is overwritten with default settings.	P
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.	P
31	Load recovery parameter	The last recovery point created with command 51 is loaded.	P
51	Create recovery parameter	Backs up all scale parameters as a recovery point that can then be loaded when needed using command 31.	P
60	Set Calibration Point 0	Calibration point 0 valid / save values for calibration point 0. The current load cell signal or the currently measured digits are assigned to calibration weight 0 from DR 3 and entered as "Calibration digit 0" in DR 3.	P
61	Set Calibration Point 1	Calibration point 1 valid / save values for calibration point 1. The current load cell signal or the currently measured digits are assigned to calibration weight 1 from DR 3 and entered as "Calibration digit 1" in DR 3.	P
62	Set Calibration Point 2	Calibration point 2 valid / save values for calibration point 2. The current load cell signal or the currently measured digits are assigned to calibration weight 2 from DR 3 and entered as "Calibration digit 2" in DR 3.	P
81	Shift Characteristics	Move calibration characteristic. The command defines the current weight of the scale as the new zero point (0 kg) and shifts the entire characteristic curve without changing the slope. 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.	P
82	Automatic calibration	Calculation of scale characteristic using the load cell parameters from data record 10. The calculated characteristic is entered directly in data records 3 and 4 and is thus immediately active following execution of the command. The scale must be empty when the command is executed. The accuracy of a scale that is automatically calibrated depends heavily on the mechanical setup!	P

Command code	Command	Description	Protected
83	Check Calibration	The command calculates the theoretical digit values in relation to the calibration weights using the load cell parameters from data record 10 and the calibration weights 0, 1 and 2 from data record 3. These theoretical digits are output in data record 4. The function can be used to compare the calibration digits in data record 3 that were determined during a calibration with calibration weights (commands 60, 61, 62) with the theoretically expected digits.	
443	Reset min/max pointer	Resets the weight min/max pointer in DR 38	P

Table 10- 2 Protocol commands, statistics, logbook

Command code	Command	Description	Protected
401	Generate protocol	Log current parameters relevant to the calibration	
405	Erase protocols	Delete all logs	P
440	Erase log book	Delete the logbook. Only permitted in non-calibrated state.	P

Table 10- 3 Trace commands

Command code	Command	Description	Protected
451	Trace ON	Start trace recording	
452	Trace OFF	Stop trace recording	
453	Single Trace Element	Create single trace (current state)	
454	Reset Trace Memory	Delete trace memory	

Table 10- 4 Display changeover for DR 34 and SecureDisplay

Command code	Command	Description	Protected
701	High resolution on	Activate high resolution (factor 10) of the weight value on the main display (DR 34) and the SecureDisplay for 5 s.	
705	Display Tare Process	Display current tare weight on the main display (DR 34) and the SecureDisplay.	
710	Display standard weight	Display standard gross/net weight display on the main display (DR 34) and the SecureDisplay.	
721	Display single set point	Display currently set point setting from DR 20 on the main display (DR 34) and the SecureDisplay for 5 seconds.	

Command code	Command	Description	Protected
722	Display total set point	Display currently total set point setting from DR 21 on the main display (DR 34) and the SecureDisplay for 5 seconds.	
771	Display Totalizer 1	Display Totalizer 1 from DR 30	
772	Display Totalizer 2	Display Totalizer 2 from DR 30	
801	Display Current Restriction Code	Display restriction code set in DR 3 on the main display (DR 34) and the SecureDisplay for 5 seconds (command only relevant for scales requiring official calibration).	
802	Display weighing range data	Show weighing range data (Min, Max, Resolution) in SecureDisplay for 10 seconds (command only relevant for scales requiring official calibration).	
860	Hide SecureDisplay	Places SecureDisplay in the background of the HMI (command only relevant for scales requiring official calibration).	
861	SecureDisplay position 1	Shows the SecureDisplay on the HMI in position 1 (see DisplayCali.xml).	
862	SecureDisplay position 2	Shows the SecureDisplay on the HMI in position 2 (see DisplayCali.xml).	
863	SecureDisplay position 3	Shows the SecureDisplay on the HMI in position 3 (see DisplayCali.xml).	
864	SecureDisplay position 4	Shows the SecureDisplay on the HMI in position 4 (see DisplayCali.xml).	
865	SecureDisplay position 5	Shows the SecureDisplay on the HMI in position 5 (see DisplayCali.xml).	
870	Smallest SecureDisplay	Shows the SecureDisplay on the HMI with the smallest zoom factor (see DisplayCali.xml).	
871	Display serial number	Display serial number of SIWAREX WP251 in the main display and the SecureDisplay for 5 seconds.	
875	Display Firmware Version	Display firmware version and checksums of SIWAREX WP251 in the main display (serial number only) and the SecureDisplay for 5 seconds.	
876	Display SecureDisplay Software Version	Display version of SecureDisplay in the main display and the SecureDisplay for 5 seconds.	
881	Show first log book entry	Shows the first log book entry in SecureDisplay (command only relevant for scales requiring official calibration).	
882	Display last log book entry	Shows the last log book entry in SecureDisplay (command only relevant for scales requiring official calibration).	
883	Previous log book entry	Show the previous log book entry in SecureDisplay (command only relevant for scales requiring official calibration).	
884	Next log book entry	Show the next log book entry in SecureDisplay (command only relevant for scales requiring official calibration).	
891	Display protocol	Displays the last requested log in a calibratable manner in SecureDisplay.	

Table 10- 5 Scale commands

Command code	Command	Description	Protected
1001	Zero	Set to zero (semi-automatic)	
1011	Tare	Taring (semi-automatic)	
1012	Delete Tare	Delete current tare weight	
1013	Activate Preset Tare 1	Preset tare weight value from DR 15 is transferred	
1016	Activate Preset Tare S7	Preset tare weight value from SIMATIC I/O interface (see section I/O interface of function block (Page 191)) is transferred.	

Table 10- 6 Scale commands

Command code	Command	Description	Protected
1101	Start single weighing	Starts an individual dosing cycle.	
1103	Start continuous mode	Starts n dosing cycles in continuous succession Continuous operation ends automatically if a total set point (DR 21) was specified and reached or alternatively using the "Stop continuous mode (1123)" command. If a dosing cycle is still active, it is completed. The "Abort weighing (1124)" command also ends continuous operation but does not terminate an active dosing cycle. The "Continuous mode active" bit in the AWI Status (DR 30) indicates whether or not WP251 is operating in continuous mode.	
1121	Stop weighing	Current dosing cycle is stopped and the "Weighing cycle stopped" bit is set in the AWI Status (DR 30). The "Continue weighing (1141)" command can be used to continue and thus complete the cycle from this status.	
1122	Activate check stop	If check stop points have been defined (see section I/O interface of function block (Page 191)), these are activated by "Activate check stop" and the dosing cycle stops at the predefined points.	
1123	Stop continuous mode	Continuous operation is stopped. If the command is issued within a dosing cycle, this dosing cycle is first finished and WP251 then waits in weighing step 0. The "Continuous mode active" bit in the AWI Status (DR 30) is reset.	
1124	Abort weighing	The current dosing cycle is directly aborted and WP251 jumps immediately to weighing step 0.	
1125	Rest weighing	The command can be issued within the dosing cycle or outside of it (=weighing step 0). Any active coarse or fine signal is directly reset, a tolerance check is performed, a log print is created and – if configured in DR 25 –the scale is emptied. WP251 then waits in weighing step 0.	
1126	Manual emptying ON	The command can be issued only in weighing step 0. The "Emptying signal" bit is then set to TRUE and a linked digital output, if any, is set. The command is used to clean the scale or to open it manually for service.	

1127	Manual emptying OFF	The command can be issued only in weighing step 0. The "Emptying signal" bit is then set to FALSE and a linked digital output, if any, is reset. The command is used to clean the scale or to close it manually after service.	
1128	Rest emptying	The command can only be accepted if an emptying option (emptying based on Limit 3 or time) is configured in DR 25. Within a weighing cycle, the command causes the coarse and fine signal to be shut off immediately and the scale jumps directly to the emptying step. A log is not created and a tolerance check is not performed. If the command is issued outside the dosing cycle (in weighing step 0), the emptying signal is set for the specified time – if time-based emptying was configured in DR 25. If "Emptying based on Limit 3" is configured, the emptying signal is switched until Limit 3 is fallen below.	
1141	Continue weighing	If a dosing cycle is in the "stopped" state (for example, before creation of a log in NAWI mode), the dosing cycle can be continued using this command.	

10.3 Command groups of the SIWAREX WP251

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

Table 10- 7 Command groups of the SIWAREX WP251

Command code	Description
1 ... 1999	The meanings of the commands correspond to the command list (see → Command lists (Page 179)).
2000 + X	Reading of a data record, X corresponds to the data record number. Example: Transfer data record 3 from the SIWAREX module to the SIMATIC CPU → 2000 + 3 = command code 2003
4000 + X	Writing of a data record, X corresponds to the data record number. Example: Transfer data record 3 from the 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 Integration in SIMATIC S7-1200 (Page 185).

Communication with SIMATIC S7-1200 11

11.1 Integration in SIMATIC S7-1200

11.1.1 General information

A SIWAREX WP251 occupies 32 bytes each in the input and output I/O areas of the CPU. The maximum number of SIWAREX WP251 weighing modules is defined as follows:

- S7-1212 CPU → Up to a maximum of two WP251 weighing modules
- S7-1214 CPU → Up to a maximum of eight WP251 weighing modules
- S7-1215 CPU → Up to a maximum of eight WP251 weighing modules
- S7-1217 CPU → Up to a maximum of eight WP251 weighing modules

Additionally read the memory requirement for the function block call.

Note

The direct use of SIWAREX WP251 with fail-safe SIMATIC S7-1200 controllers is not yet supported.

Table 11- 1 Memory requirements of the function block

	FB with DS communication (FB251 "WP251PR")
Read weight and status	YES
Send commands	YES
Send parameters	YES
Main memory requirements in CPU	15 600 bytes + n x 2 650 bytes
Load memory requirements in CPU	232 000 bytes + n x 62 000 bytes

n = number of WP251 modules

The function block described above including HMI configuring can be downloaded as a ready-made example project (https://support.industry.siemens.com/cs/ww/de/ps/17796) ("Ready-for-use") from the Siemens Industry Online Support.

The latest firmware version for the weighing modules can be downloaded at: Firmware update (https://support.industry.siemens.com/cs/ww/de/ps/17796)

11.1.2 Creating the hardware configuration

Starting with TIA Portal V14, the SIWAREX WP251 is integrated in the standard hardware profile as an S7-1200 technology module.

For TIA Portal V13 SP1, an HSP can be downloaded for the integration.

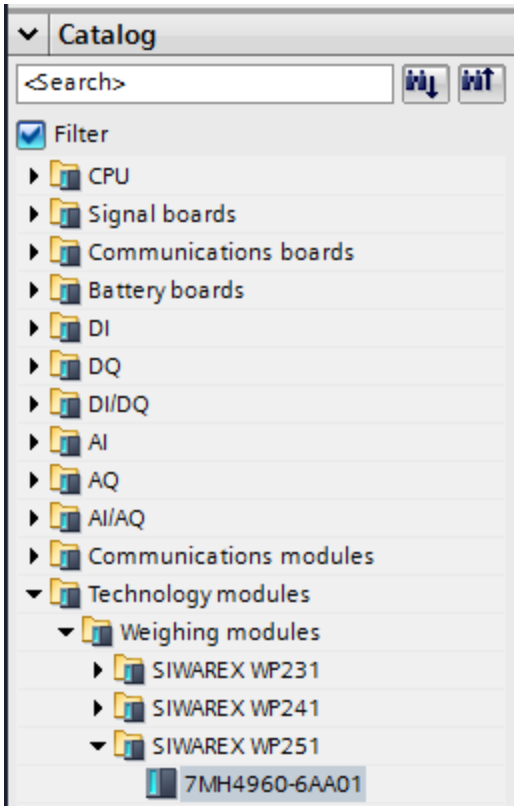


Image 11-1 Configuring in the TIA Portal

The module can be positioned directly next to the S7-1200 CPU using drag and drop.

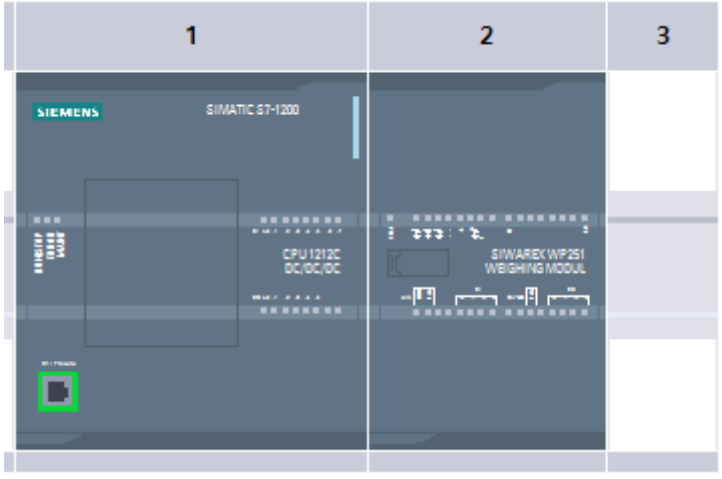


Image 11-2 Configuring with S7

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.

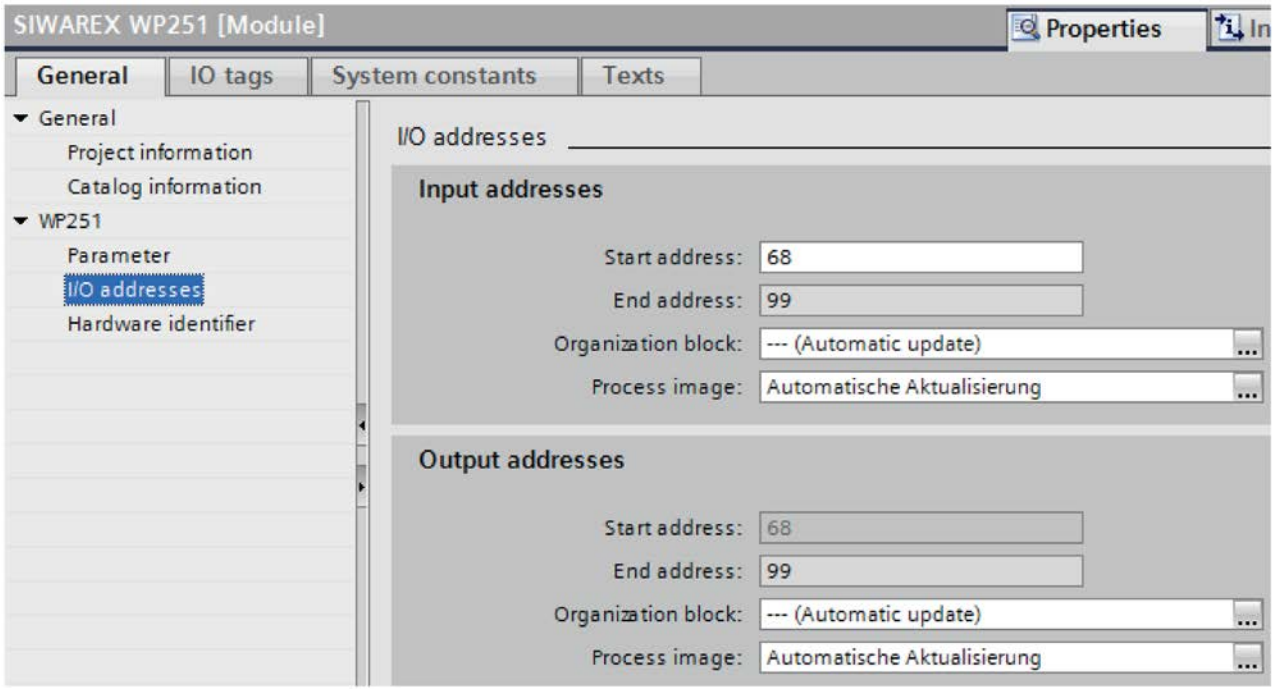


Image 11-3 Start address of the module

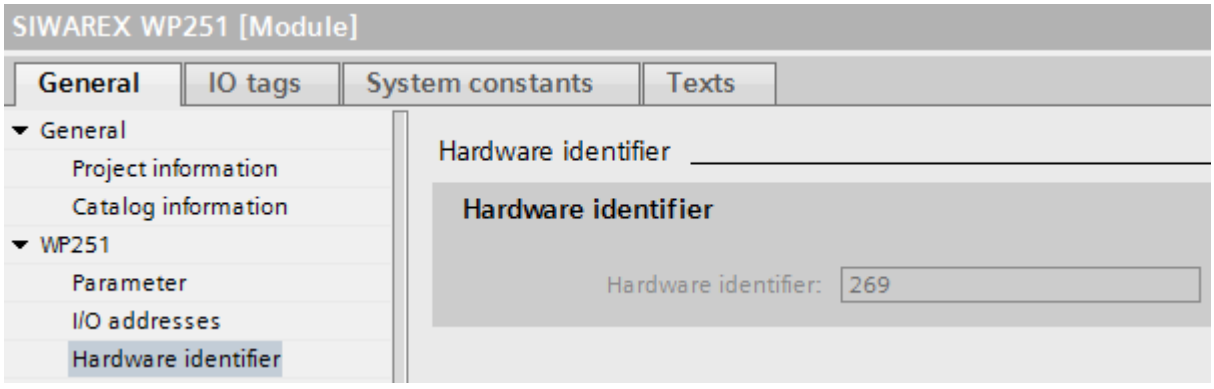


Image 11-4 Hardware identifier

Diagnostic interrupts can be optionally enabled or deactivated in the module properties.

11.1.3 Calling of function block

This description is based on use of the "WP251" block with data record communication and the following data:

- **Start address** SIWAREX WP251: 68 (see → Creating the hardware configuration (Page 186))
- **HW ID** SIWAREX WP251: 271 (see → Creating the hardware configuration (Page 186))
- **Instance data block number** of SIWAREX WP251 function block: DB 251

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.

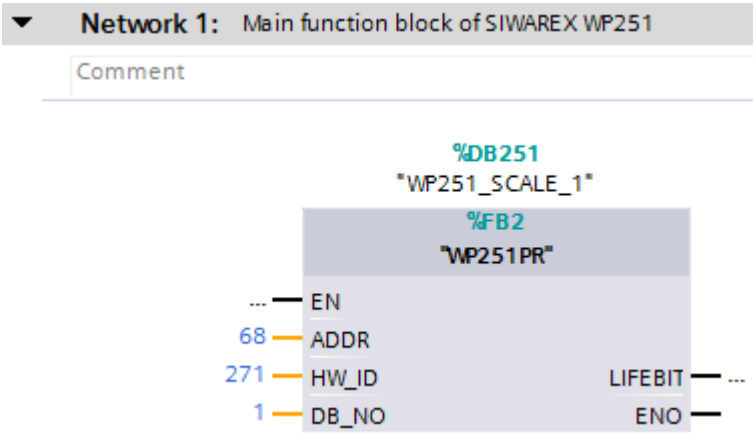


Image 11-5 Block WP251PR

Function block parameter	Description
ADDR	Start address WP251 (see → Creating the hardware configuration (Page 186))
HW_ID	HW ID WP251 (see → Creating the hardware configuration (Page 186))
DB_NO	Number of FB-internal instance DB
LIFEBIT	Optional status bit can be used to monitor communication

The generated instance DB (DB251 in this case) contains all data records of the WP251 as well as all parameters required to exchange data between the CPU and 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 which provides the respective scale parameters. The input and output parameters of the FB must be matched to the respective WP251 for each call.

11.1.4 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 57).

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	456.0	
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_FinishedOK	Bool	2.2	false
16	bo_CMD_FinishedError	Bool	2.3	false
17	s_CMD2	Struct	460.0	
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_FinishedOK	Bool	2.2	false
22	bo_CMD_FinishedError	Bool	2.3	false
23	s_CMD3	Struct	464.0	
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_FinishedOK	Bool	2.2	false
28	bo_CMD_FinishedError	Bool	2.3	false

Image 11-6 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 179).

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 from the CPU. Since "Calibration weight 1" is a parameter of data record 3 (see section → Scale parameters and functions (Page 57)), service mode must first be activated. This is possible using command code "1" (see section → Command lists (Page 179)).

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 179)):

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 179)):

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.

11.1.5 I/O interface of function block

The instance data block of the function block provides the "s_IO_DATA" structure. All parameters in this structure are updated cyclically by WP251 to SIMATIC. Thus, all values within the structure can be used directly – without reading or writing data records! The following parameters are available for use within "s_IO_DATA" on the factory side.

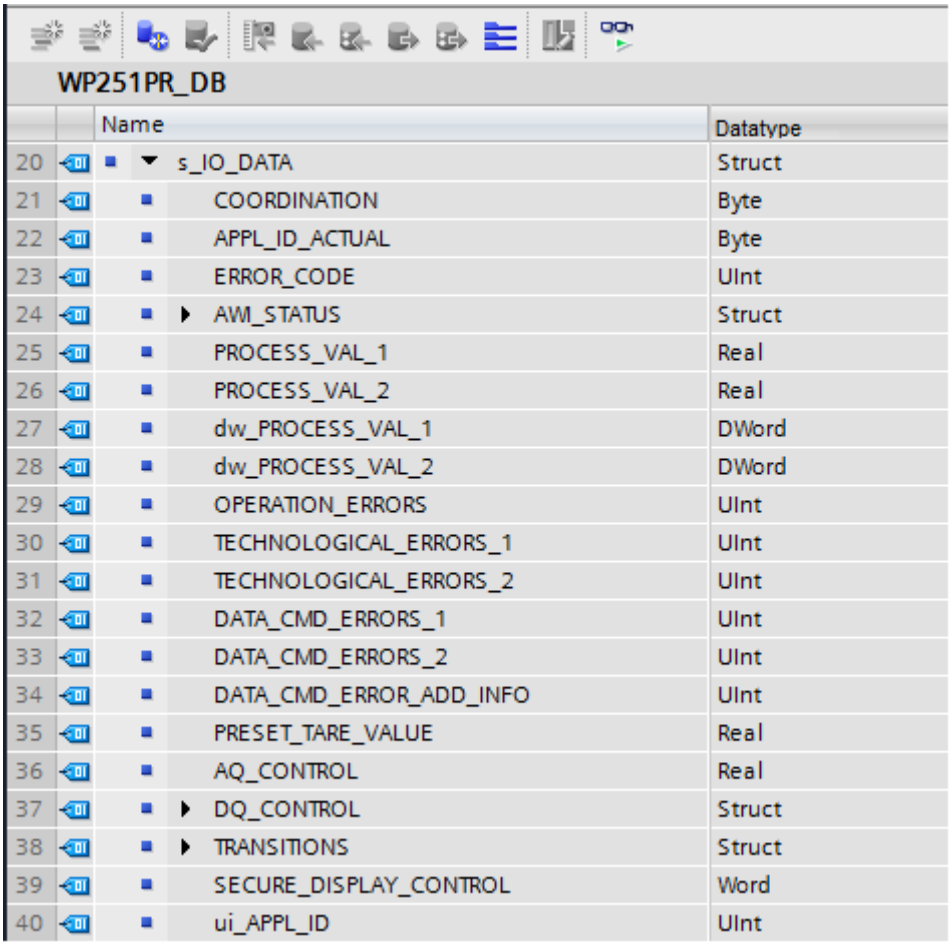


Image 11-7 s_IO_DATA

Parameter (read)	Meaning
AWI Status	AWI Status bits according to data record 30
PROCESS_VAL_1	Process value according to setting in data record 14 in REAL format (default=gross/net weight)
PROCESS_VAL_2	Process value according to setting in data record 14 in REAL format (default=NAWI Status bits according to data record 30)
dw_PROCESS_VAL_1	Process value according to setting in data record 14 in DWORD format (default=gross/net weight)
dw_PROCESS_VAL_2	Process value according to setting in data record 14 in DWORD format (default=NAWI Status bits according to data record 30)
AWI Status	AWI Status bits according to data record 30
OPERATION_ERRORS	Operating errors according to the "Messages" section

Parameter (read)	Meaning
TECHNOLOGICAL_ERRORS_1	Technology error word 1 according to the "Messages" section
TECHNOLOGICAL_ERRORS_2	Technology error word 2 according to the "Messages" section
DATA_CMD_ERRORS_1	Data/command error word 1 according to the "Messages" section
DATA_CMD_ERRORS_2	Data/command error word 2 according to the "Messages" section
DATA_CMD_ERROR_ADD_INFO	Additional information for data/command errors according to the "Messages" section
Parameter (write)	**Meaning**
PRESET_TARE_VALUE	Preset tare value (can be used via command 1016 or with corresponding "Dosing start option" (DR 25) for taring)
AQ_CONTROL	Control value for the analog output (the output must be configured accordingly for this in DR 7)
DQ_CONTROL	Control bits for the four digital outputs (the outputs must be configured accordingly for this in DR 7)
TRANSITIONS	Blocking conditions for weighing steps 0-7. For example, if the "TRANSITION_STEP_2" bit is set and a weighing is started, WP251 stops the weighing cycle after performing weighing step 1 and sets the "Step blocked (transition)" bit in the AWI Status. The weighing or weighing step 2 is not continued until the "TRANSITION_STEP_2" bit is reset.
SECURE_DISPLAY_CONTROL	Parameter for communication of the calibratable "SecureDisplay" display with the SIWAREX WP251 module. The "SecureDisplay" communication block is interconnected with this parameter for scales requiring official calibration.

11.1.6 Error codes of function block

Table 11- 2 Statuses/errors when working with the function block

Error bit	Error description
bo_ApplIDError	Address module does not match the function block
bo_ApplIDDRError	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
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.

11.2 Communication via Modbus

11.2.1 Introduction

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

The SIWAREX WP251 is intended for operation in secure (closed) networks and does not have any protection against unauthorized data traffic.

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

11.2.2 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 57)".

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 find out which process-related data or command errors exist.

11.2.3 Data record concept

The register assignment is an image of the data records. The chapter → Scale parameters and functions (Page 57) 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.

11.2.4 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 179). The following tables list the Modbus registers used to process these commands:

Table 11- 3 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 11- 4 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 11- 5 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

11.2.5 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 39).

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 57).

Example

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

- First, write register CMD3_CODE with 2003 (2000 plus the number of the data record = read data record).
- Then write CMD3_TRIGGER with "1". The DR 3 is then updated in the Modbus buffer memory.
- 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 179).

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.

11.2.6 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 CMD3_TRIGGER with "1". The DR 3 is then updated in the Modbus memory.
- It is now possible to write or modify one or more registers with the corresponding variable. If you wish to transfer the written/changed registers to the scale, it is necessary to write the complete data record:
- First, write register CMD3_CODE with 4003 (4000 plus the number of the data record = write data record).
- Then write CMD3_TRIGGER with "1".
- 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 179).

In addition, an online document is available for working with SIWAREX WP251 and Modbus → Modbus communication of WP251 (http://support.automation.siemens.com).

Operation requiring official calibration 12

12.1 Preparing for calibration

12.1.1 Calibration set

The calibration set (available as Accessory (Page 213)) with the following contents is available for operation requiring verification:

- SecureDisplay software for legal trade display of weight
- Ready-to-use project for TIA portal and TP 700 Comfort operator panel
- Manual
- Information on use of the module in operation requiring verification
- EC construction license for the module
- Test certificates for the displays
- Calibration plate for covering the connection terminals
- Templates for ID labels
- Tags for ID labels
- Self-adhesive markers "M" (green and red)

You can prepare the scale verification using the calibration set.

12.1.2 Scale design

If you wish to use the scale in operation requiring verification, the design must correspond to the conditions specified in the construction license. Therefore you should already take the specifications of the construction license into account when configuring and designing the scale. In the case of calibrated scales, the responsible weights and measures office should be contacted in advance in order to clarify the type of scale and other matters.

12.1.3 Installation and parameter assignment of the calibratable SecureDisplay main display in the HMI

The SIWAREX SecureDisplay software serves as the legal trade main display of the scale. The software must be installed on the HMI prior to the verification.

You can find a complete description of the software installation in the "SIWAREX SecureDisplay" information in Siemens Industry Online Support at (https://support.industry.siemens.com/cs/ww/de/view/109477602).

12.1.4 Parameterization of the scale

The scale is parameterized prior to the verification in accordance with the envisaged use. The scale is checked and sealed during the verification. The parameters relevant to the verification cannot be changed after the verification. These are mainly the parameters in the data record DR 3. These read/write parameters are identified by "rwP" (read/write protected) in the parameter tables in section "Scale parameters and functions". Certain commands cannot be used after the verification either. These are identified in the command table by "P".

12.1.5 Adjustment and preliminary checking of the scale

During commissioning, the scale adjustment (detailed description → Calibration (Page 76)) is carried out following input of the scale parameters.

Depending on the type and the area of use, the scope of operations for checking the measuring properties of the scale prior to the verification may be different. A preliminary check with various calibration weights should always be carried out.

12.1.6 Calibration label

The calibration labels are edited based on the templates from the calibration set, and subsequently printed. The fields in the calibration labels can already be provided with the corresponding values prior to the verification. The protective foil is attached during the verification.

12.2 Verification

12.2.1 Checking of parameters relevant to the verification

The scale parameters are set/checked using the SIMATIC HMI operator panel.

1. Call up the main menu (function key with the open-end wrench).
2. Select the "Setup" submenu in the main menu. Select the "Advanced scale parameters" function key in the "Setup" menu.
3. The currently effective calibration parameters are shown in the display "Advanced scale parameters 1 of 4" and on the following 4 pages. If the write protection of the calibration parameters is activated (jumper between the connection points P-PR), a "lock symbol" is displayed next to each protected parameter.

You can use the "Calibration check" submenu during the verification.

In turn, the "Calibration check" submenu branches into three submenus with the contents as shown in the following table.

"Version and variables check" submenu	
Switch over the representation of the SecureDisplay	Display or hide the SecureDisplay using command buttons
	Switch over between 5 possible displays of variables using buttons 1 to 5
	Show smallest possible display using command button. In the area of the calibration data (display "Advanced scale parameters 4 of 4), the smallest zoom factor is applied which still results in a readily readable display size. Following the verification, users can only select larger windows for the calibration display.
Switch over contents of the SecureDisplay, the display switches back automatically to the weight display	Display SecureDisplay version
	Display calibration regulation
	Display scale data
	Display SIWAREX serial number
	Display SIWAREX firmware release
"Scale check" submenu	
Switch over contents of the SecureDisplay	x 10 increased resolution (5 s)
	Display current tare (5 s)
Scale commands	Set to zero
	Tare setting (current weight or default values)
	Delete tare
	Logging
Tare specification	Using the tare specification button you can access the form for entering various specific tare values
"Logbook check" submenu	
Display logbook entries Only the software downloads for the legal trade display SecureDisplay are retained in the logbook. It is not possible to download the firmware following verification of the scale with the jumper for write protection inserted.	Display first logbook entry
	Display last logbook entry
	Display previous logbook entry
	Display next logbook entry

12.2.2 Checking of parameters relevant to the device

The following parameters relevant to the device are checked during the verification:

1. Checking of the software ID of the SecureDisplay

   The software ID of the DisplayCali.exe function must agree with the requirements in the SIWAREX SecureDisplay test certificate (EC). The currently valid version can be called on the SecureDisplay.

   – Call up the main menu in the main display (function key with the open-end wrench). Select the "Calibration check" submenu in the main menu.

   – Select the "Version and variables check" submenu in the "Calibration check" submenu.

   – Activate the "Display SecureDisplay version" command.

   – The version of the SecureDisplay is then shown on the display.

2. Check of the firmware ID of the SIWAREX WP251 evaluation electronics

   The firmware ID of the SIWAREX WP251 evaluation electronics must agree with the requirements in the EC type approval. The currently valid version can be called on the SecureDisplay.

   – Call up the main menu in the main display (function key with the open-end wrench). Select the "Calibration check" submenu in the main menu.

   – Select the "Version and variables check" submenu in the "Calibration check" submenu.

   – Activate the "Display SIWAREX firmware release" command.

   – The current SIWAREX firmware release is then shown on the display.

3. Checking of the smallest zoom factor for the SecureDisplay display software

   The zoom factor entered in DR3 for the alternative display size must comply with the minimum readability and font requirements of EN 45501, Chapter 4.2.1.
   The main display with the minimum zoom size can be checked for readability.

   – Call up the main menu in the main display (function key with the open-end wrench). Select the "Calibration check" submenu in the main menu.

   – Select the "Version and variables check" submenu in the "Calibration check" submenu.

   – Activate the "Display smallest SecureDisplay" command.

   – The smallest main display is then output and can be checked for readability.

4. Check of the logbook entries

   Only the software downloads for the legal trade display SecureDisplay are retained in the logbook. It is no longer possible to download the firmware for the SIWAREX WP251 evaluation electronics following verification of the scale with the jumper for write protection inserted.

   – Call up the main menu in the main display (function key with the open-end wrench). Select the "Calibration check" submenu in the main menu.
   – Select the "Logbook check" submenu in the "Calibration check" submenu.
   – Navigate in the logbook entries using 4 commands:
   – Display first logbook entry
   – Display last logbook entry
   – Display previous logbook entry
   – Display next logbook entry

5. Checking of the ID labels

   Checking is carried out in accordance with the specifications in the EC construction license.

6. Checking of the serial number of the evaluation electronics

   The serial number of the evaluation electronics used (shown at top right in the SecureDisplay) must agree with the ID label. The serial number of the evaluation electronics used can also be called on the SecureDisplay.

   – Call up the main menu in the main display (function key with the open-end wrench). Select the "Calibration check" submenu in the main menu.
   – Select the "Version and variables check" submenu in the "Calibration check" submenu.
   – Activate the "Display SIWAREX serial number" command.
   – The current serial number is then shown on the display.

7. Checking of the regulation code

   Check whether the regulation code "OIML" is set in the scale parameters. The code can be called on the SecureDisplay.

   – Call up the main menu in the main display (function key with the open-end wrench). Select the "Calibration check" submenu in the main menu.
   – Select the "Version and variables check" submenu in the "Calibration check" submenu.
   – Activate the "Display calibration regulation" command.
   – The currently set code is then shown on the display.

8. Checking of the additive tare range

   When using the additive tare compensation unit, you must check the complete weighing range (up to maximum load + additive maximum tare load). To do this, you must check up to the maximum load, and repeat this following taring. Repeat these steps until the upper limit of the range of the additive tare compensation unit has been reached.

   – Call up the main menu in the main display (function key with the open-end wrench). Select the "Calibration check" submenu in the main menu.
   – Select the "Scale check" submenu in the "Calibration check" submenu.
   – Check with the "Tare setting" or "Delete tare" command.

9. Checking of the parameter disabling/calibration bridge

   The calibration bridge must be inserted on the weighing module. You can check the calibration bridge using the specific symbol  at the bottom right in the main display (symbol displayed = calibration bridge inserted).

10. When using the second display S102 - checking of set telegram address

    The telegram address (No. 01) must be set on the Siebert display S102. Checking is carried out in accordance with the specifications in the Instruction Manual "Siebert series S102 - digital displays for Siemens Siwarex".

Technical specifications 13

13.1 Technical specifications

24 V power supply

Note

A protective extra-low voltage (to EN 60204-1) is to be ensured by system power supply.

Table 13- 1 Technical specifications: 24 V power supply

Rated voltage	24 V DC
Static low / high limits	19.2 V DC / 28.8 V DC
Dynamic low / high limits	18.5 V DC / 30.2 V DC
Non-periodic overvoltages	35 V DC for 500 ms with a recovery time of 50 s
Maximum current consumption	200 mA with 24 V DC
Typical power loss of the module	4.5 W

Power supply from SIMATIC S7 backplane bus

Table 13- 2 Technical specifications: Power supply from SIMATIC S7 backplane bus

Current consumption from S7-1200 backplane bus	Typically 3 mA

Analog load cell interface connection

Table 13- 3 Technical specifications: Analog load cell interface connection

Error limit to DIN1319-1 at 20 °C +10 K		≤ 0.05% v.E.[1)]
Accuracy according to EN45501 / OIML R76	• Class	III (and IV 1000d)
	• Resolution (d=e)	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

Maximum cable length between junction box and WP251		1000 m (3280 ft)
Common mode voltage range		0 V to 5 V
DMS supply[3)]		4.85 V DC +2/-3 %
Short-circuit and overload protection		Yes
Connection		6-wire
Sensor voltage monitoring		≤ 0.3 V
Min. DMS input resistance	• without Ex-i interface SIWAREX IS	40 Ω
	• with Ex-i interface SIWAREX IS	50 Ω
min. DMS output resistance		4 100 Ω
Temperature coefficient range		≤ ± 5 ppm/K v. E.
Temperature coefficient zero point		≤ ± 0.1 µV/K
Linearity error		≤ 0.002%
Measured value filtering		Low pass
Electrical isolation		500 V AC
50 Hz / 60 Hz noise suppression CMRR		> 80 dB
Input resistance	• Signal cable	typ. $5*10^6$ Ω
	• Sensor cable	typ. $60*10^6$ Ω

[1)] Relative accuracy! (Absolute accuracy is only reached by calibration on-site with calibration standard)

[2)] Accuracy for module replacement or theoretical calibration decisive

[3)]Value valid at sensor; voltage drops on cables are compensated up to 5 V

Analog output

The set replacement value is output in case of a fault or SIMATIC CPU stop.

Table 13- 4 Technical specifications:

Error limit according to DIN 1319-1 of full-scale value at 20 °C +10 K	0 ... 20 mA: ≤ 0.5% 4 ... 20 mA: ≤ 0.3%
Refresh rate	≤ 100 ms
Resolution	14 bit
Measuring ranges	0 mA to 20 mA 4 mA to 20 mA
Max. output current	24 mA
Error signal (if configured (FW))	22 mA
Max. load	600 Ω
Temperature coefficient range	≤ ± 25 ppm/K v. E.
Temperature coefficient zero point	typ. ± 0.3 µA/K
Linearity error	≤ 0.05%

Electrical isolation	500 V AC
Cable length	max. 100 m, twisted and shielded

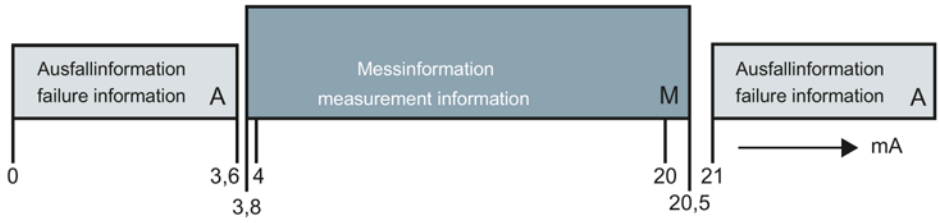


Image 13-1 Current ranges for signal level according to Namur recommendation NE43

Digital outputs (DQ)

The set value is output at the digital output in case of a fault or SIMATIC CPU stop.

A freewheeling diode has to be installed at the consumer with inductive loads at the digital output.

Table 13- 5 Technical specifications: Digital outputs

Quantity	4 (high-side switch)
Supply voltage range	19.2 V DC to 28.8 V DC
Max. output current per output	0.5 A (ohmic load)
Max. total current for all outputs	2.0 A
Refresh rate (FW)	100
Switching delay	typ. 25 µs turn on typ. 150 µs turn off
RDSON	< 0.25 Ω
Short-circuit proof	Yes
Electrical isolation	500 V AC
Cable length (meter)	Max. 500 m shielded, 150 m unshielded

Digital inputs (DI)

Table 13- 6 Technical specifications: Digital inputs

Number of inputs	4
Rated voltage	24 V DC
Supply voltage range	max. 30 V DC
Power consumption at 24 V DC	4 mA
Voltage surge	35 V DC for 0.5 s
Logical signal level 1 (min)	15 V DC at 2.5 mA
Logical signal level 0 (max)	5 V DC at 1.0 mA
Sampling rate (FW)	10 ms
Filtering	0.2, 0.4, 0.8, 1.6, 3.2, 6.4 and 12.8 ms
Electrical isolation	500 V DC

Real-time clock

Table 13- 7 Technical specifications: Real-time clock

Accuracy at 25 °C	± 60 s/month
Buffered period	typ. 10 days at 25 °C min. 6 days @40 °C

RS485 interface

Table 13- 8 Technical specifications: RS485 interface

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 from Siebert and Modbus RTU)
Cable length	≤ 115 kbps max. 1 000 m (fieldbus cable 2-wire, shielded, e.g. 6XV1830-0EH10)

Ethernet

Table 13- 9 Technical specifications: Ethernet

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

Dimensions and weights

Table 13- 10 Technical specifications:

Dimensions W x H x D	70 x 100 x 75 mm
Weight	300 g

Mechanical requirements and data

Table 13- 11 Technical specifications: Mechanical requirements and data

Testing	Standards	Test values
Vibrational load during operation	IEC 61131-2 IEC 60068-2-6 Test Fc	5 to 8.4 Hz: 3.5 mm out. 8.4 to 150 Hz: 9.8 m/s^2 (=1G) 0 cycles per axis 1 octave / min.
Shock load during operation	IEC 61131-2 IEC 60068-2-27 Test Ea	150 m/s^2 (approx. 15 g), half sine Duration: 11 ms Quantity: 3 each per axis in negative and positive direction
Vibration load during transport	IEC 60068-2-6 Test Fc	5 to 8.4 Hz: 3.5 mm out. 8.4 Hz ... 500 Hz: 9.8 m/s^2 10 cycles per axis 1 octave / min.
Shock load during transport	IEC 60068-2-27: Test Ea	• 250 m/s^2 (25G), half sine • Duration: 6ms • Quantity: 1 000 each per axis • in negative and positive direction
Free fall	IEC 61131-2 IEC 60068-2-31: Test Ec, procedure 1	• For devices < 10 kg: • In product packaging: 300 mm drop height • In shipping package: 1.0 m drop height • per 5 attempts

13.2 Electrical, EMC and climatic requirements

Electrical protection and safety requirements

Table 13- 12 Requirements: Electrical protection and safety requirements

Met requirement	Standards	Comments
Safety regulations	IEC 61010-1 IEC 61131-2; UL 508 CSA C22.2 No.142	
Protection class	IEC 61140	Module is operated with protective extra-low voltage. The protective conductor connection serves only a functional earth to dissipate interference currents

Met requirement	Standards	Comments
IP degree of protection	IP 20 to IEC 60529	• 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 IEC 61131-2 IEC 61010-1 UL 508 CSA C22.2 No. 145 EN 50156-1	Overvoltage category II Pollution degree 2 PCB material IIIa Conductor path distance 0.5 mm
Isolation stability	IEC 61131-2 CSA C22.2, No. 142 UL508	Ethernet Port: 1 500 V AC (shield and signals) Additional electrical circuits: Test voltage: 500 V AC or 707 V DC Test duration: ≥ 1 minute Short-circuit current: ≥ 5 mA

Electromagnetic compatibility

Table 13- 13 Requirements: Interference emission in industrial area in accordance with EN 61000-6-4

Comments	Standard	Limits
Emission of radio interferences (electromagnetic fields)	Class A industrial environment: EN 61000-6-4 IEC/CISPR 16-2-3: 2008	• 30 ... 230 MHz, 40 dB (µV/m) Q • 230 ... 1 000 MHz, 47 dB (µV/m) Q
Emission on power supply cables 24 V	Class A: Industrial environment: EN 61000-6-4 IEC/CISPR 16-2-1: 2010; EN 55016-2-1: 2009	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 conducted Ethernet	EN 61000-6-4	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) / 30 dB (µA) M

Table 13- 14 Requirements: Interference immunity in industrial area in accordance with EN 61000-6-2

Comments	Standard	Severity class
Burst pulses on power supply cables	EN45501 OIML R 76	1 kV
Burst pulses on data and signal cables	EN 61000-4-4 NAMUR NE21 EN 61326	2 kV
Electrostatic discharge (ESD)	EN 61000-4-2 NAMUR NE21 EN 61326 EN 45501 OIML R 76	6 kV direct/indirect
Electrostatic air discharge (ESD)	EN 61000-4-2 NAMUR NE21 EN 61326 EN 45501 OIML R 76	8 kV
Surge on power supply cables	EN 61000-4-5 IEC 61131-2 NAMUR NE21 EN 61326	• 1 kV symmetrical • 2 kV asymmetrical
Surge on data and signal cables	EN 61000-4-5 IEC 61131-2 NAMUR NE21 EN 61326	• 1 kV symmetrical[1)] • 2 kV asymmetrical
HF irradiation amplitude modulated	IEC61000-4-3 NAMUR NE21 OIML R76 EN 45501*3	• 80 to 2 000 MHz: 12 V/m • Mod.: 80% AM with 1 kHz Note: In the ranges 87 ... 108 MHz, 174 ... 230 MHz and 470 ... 790 MHz: 3 V/m
HF irradiation, cell phone frequencies	IEC 61000-4-3	• 900 MHz (± 5 MHz) • 1.89 Ghz (± 10 MHz) • 10 V/m
HF voltage on data, signal and power supply cables 0.15 to 80 MHz	IEC 61000-4-6 NAMUR NE21 EN 61326 OIML R 76	• 10 kHz to 80 MHz: 10 Veff • Mod.: 80% AM with 1 kHz

1) Not applicable for shielded cables and symmetrical ports

* An external protection element has to be installed to meet the requirement (e.g.: Blitzductor VT AD24V, Dehn&Söhne)

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 use of SIWAREX WP251 is intended under the following conditions in SIMATIC S7-1200. Additionally observe the operating conditions of the S7-1200 system.

Table 13- 15 Operating conditions in accordance with IEC 60721

Mode	IEC60721-3-3 • Class 3M3, 3K3, stationary use, weather-proofed
Storage/transport	IEC 60721-3-2 class 2K4 without precipitation

Table 13- 16 Climatic requirements

Comments		Ambient conditions	Application areas
Operating temperature:	vertical installation in S7-1200	-10 … +60 ℃	
	horizontal installation in S7-1200	-10 … +40 ℃	
	Operation with verification capability	-10 … +40 ℃	
Storage and transport temperature		-40 ... +70 °C	
Relative humidity		5 … 95%	No condensation; corresponds to relative humidity (RH) stress level 2 to DIN IEC 61131-2
Contaminant concentration		SO_2: < 0.5 ppm H_2S: < 0.1 ppm	RH < 60%, no condensation
Atmospheric pressure	Operation	IEC 60068-2-13	1 080 ... 795 hPa (operation) (-1 000 ... +2 000 m above sea level)
	Transport and storage	IEC 60068-2-13	1 080 ... 660 hPa (storage) (-1 000 ... +3 500 m above sea level)

13.3 Approvals

NOTICE
Safety information for applications in hazardous areas For applications in hazardous areas, read the safety information in the document "Product information "Use of SIWAREX modules in a Zone 2 Hazardous Area". (https://support.industry.siemens.com/cs/?lc=en-DE)"!

Note

The current approvals for SIWAREX WP251 can be found on the module rating plate.

	→ CE approvals
	→ cULus approval
	→ Ex approval Manufacturer declaration in accordance with 2004/108/EC ATEX product guideline
	→ KCC approval
	→ EAC approval
 RCM approval	→ RCM approval

The approvals are available online at (https://support.industry.siemens.com/cs/ww/de/ps/7MH4960-6AA01).

Accessory

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Ordering data	
Description	**Order number**
SIWAREX WP251 configuration package • SIWATOOL program for setting and commissioning the scale • "Ready for use" software example This contains the SIMATIC S7 block for operation with SIMATIC S7-1200 and a project for a KTP 700 Basic Key Touch Panel. • Manuals in several languages	7MH4960-6AK01
SIWAREX WP251 manual in various languages	Free download from the Internet at: SIWAREX WP251 manuals (http://support.automation.siemens.com)
SIWAREX WP251 "Ready for use"	Free download from the Internet at: Ready for use (http://support.automation.siemens.com)
Ethernet patch cable CAT5 To connect the SIWAREX to a PC (SIWATOOL), SIMATIC CPU, panel, etc.	
Digital remote display The digital remote displays can be connected directly to the SIWAREX WP251 through the RS485 interface. Suitable remote display: S102 (RS485) Siebert Industrieelektronik GmbH PO Box 1180 D-66565 Eppelborn, Germany Tel.: +49 (0)6806/980-0 Fax: +49 (0)6806/980-999 Internet: Siebert Industrieelektronik GmbH (www.siebert.de) Detailed information can be obtained from the manufacturer.	
SIWAREX JB junction box For parallel connection of load cells	7MH4 710-1BA
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

Ordering data	
Description	**Order number**
• 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, WP251 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 to +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 to +70 °C	7MH4 702-8AF
DIN rail grounding terminals for load cell cable	6ES5728-8MA11

ESD guidelines

A

A.1 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
Electrostatic voltages 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.

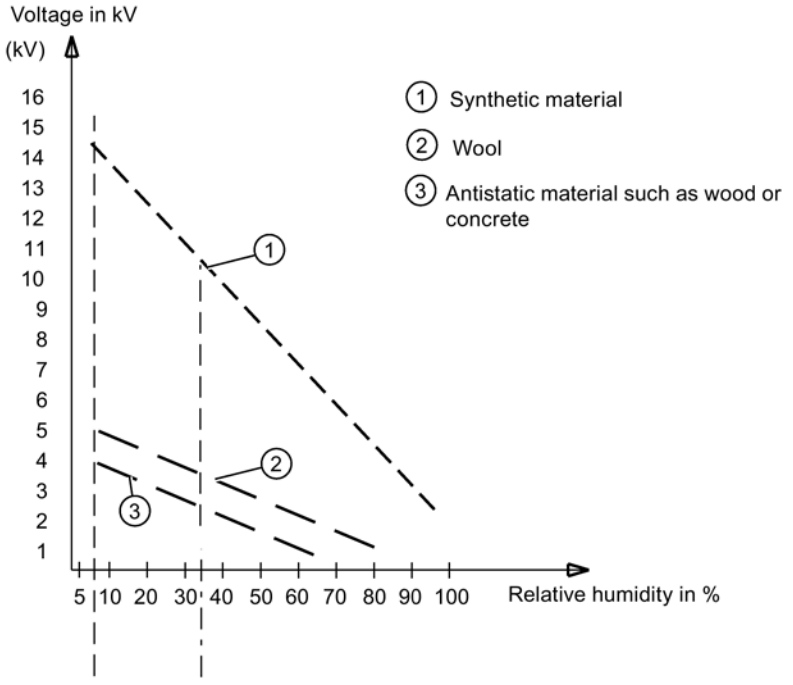

Image A-1 Electrostatic voltages which an operator can be subjected to

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.

List of abbreviations

B

B.1 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
NAWI	Non-automatic weighing instrument
NSW	nicht selbsttätige Waage
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
PLC	Programmable logic controller
STEP 7	Programming device software for SIMATIC S7
AWI	Automatic weighing instrument
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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T