SIEMENS

Function Manual

SINAMICS

HEM

Heat Exchanger Module

Edition 10/2019

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SINAMICS

Heat Exchanger Module HEM

Function Manual

Introduction 1

Safety instructions 2

Applications and characteristics 3

Installation and activation 4

Function description 5

Commissioning 6

Parameters 7

Function diagrams 8

Faults and alarms 9

Appendix A

Valid for
Technology Extension HEM Firmware Version 1.2
for
SINAMICS S120, from Version 5.1
and Cabinet Modules Liquid-Cooled

10/2019
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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

Note the following:

⚠ 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.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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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Table of contents

1 Introduction 5

1.1 The SINAMICS converter family 5

1.2 General information about SINAMICS documentation 6

2 Safety instructions 9

2.1 General safety instructions 9

2.2 Warranty and liability for application examples 10

2.3 Industrial Security 11

3 Applications and characteristics 13

3.1 Field of application 13

3.2 Features 14

4 Installation and activation 15

4.1 Installing using STARTER or SIMOTION SCOUT 15
4.1.1 Preconditions for installing using STARTER or SIMOTION SCOUT 15
4.1.2 Installing the OA Support Package in STARTER 17
4.1.3 Downloading the technology package 18
4.1.4 Activating the Technology Extension in the drive object 19
4.1.5 Commissioning the HEM Technology Extension 20

4.2 Upgrading using STARTER or SIMOTION SCOUT 21
4.2.1 Preconditions for upgrading using STARTER or SIMOTION SCOUT 21
4.2.2 Installing the OA Support Package in STARTER 22
4.2.3 Download the technology package for the new version 23
4.2.4 Additional information about upgrading 24
4.2.5 Updating HEM Technology Extension 24

4.3 Uninstalling using STARTER or SIMOTION SCOUT 25

4.4 Scripting with STARTER or SIMOTION SCOUT 26
4.4.1 Information about scripting 26
4.4.2 Scripting for Technology Extensions 27

5 Function description 29

5.1 Principle of operation of the Heat Exchanger Module 29

5.2 Monitoring functions 31
5.2.1 Overview 31
5.2.2 Temperature monitoring 31
5.2.3 Pressure monitoring 32
5.2.4 Wire-break monitoring 33
5.2.5 Maintenance interval 33
5.2.6 Detecting leaks (option W49) 33
5.2.7 Flow monitoring (option W62) 34

5.3 Control functions 35
5.3.1 Protection against condensation 35
5.3.2 Temperature control 35
5.3.3 Condensation protection 36
5.4 SINAMICS Safety Integrated 38
6 Commissioning 39
6.1 Basic commissioning using a script file 41
6.2 System-specific interconnections 42
6.3 Settings via the "Heat Exchanger Module" dialog in STARTER 44
6.4 Settings to protect the SINAMICS power units 45
7 Parameters 47
8 Function diagrams 59
9 Faults and alarms 69
A Appendix 77
A.1 List of abbreviations 77
Index 89

Introduction

1

1.1 The SINAMICS converter family

With the SINAMICS converter family, you can solve any individual drive task in the low-voltage, medium-voltage and DC voltage range. From converters to motors and controllers, all Siemens drive components are perfectly matched to each other and can be easily integrated into your existing automation system. With SINAMICS you are prepared for digitization. You benefit from highly efficient engineering with a variety of tools for the entire product development and production process. And you also save space in the control cabinet – thanks to the integrated safety technology.

You can find additional information about SINAMICS at the following address (http://www.siemens.com/sinamics).

1.2 General information about SINAMICS documentation

SINAMICS documentation

The SINAMICS documentation is organized in the following categories:

- General documentation/catalogs
- User documentation
- Manufacturer/service documentation

Standard scope

The scope of the functionality described in this document can differ from that of the drive system that is actually supplied.

- Other functions not described in this documentation might be able to be executed in the drive system. However, no claim can be made regarding the availability of these functions when the equipment is first supplied or in the event of service.
- The documentation can also contain descriptions of functions that are not available in a particular product version of the drive system. Please refer to the ordering documentation only for the functionality of the supplied drive system.
- Extensions or changes made by the machine manufacturer must be documented by the machine manufacturer.

For reasons of clarity, this documentation does not contain all of the detailed information on all of the product types, and cannot take into consideration every conceivable type of installation, operation and service/maintenance.

Target group

This documentation is intended for machine manufacturers, commissioning engineers, and service personnel who use the SINAMICS drive system.

Benefits

This manual provides all of the information, procedures and operator actions required for the particular usage phase.

Siemens MySupport/Documentation

You can find information on how to create your own individual documentation based on Siemens content and adapt it for your own machine documentation at the following address (https://support.industry.siemens.com/My/ww/en/documentation).

Additional information

You can find information on the topics below at the following address (https://support.industry.siemens.com/cs/document/108993276):

- Ordering documentation/overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals/information)

Questions relating to the technical documentation

Please send any questions about the technical documentation (e.g. suggestions for improvement, corrections) to the following email address (mailto:docu.motioncontrol@siemens.com).

FAQs

You can find Frequently Asked Questions under Product Support (https://support.industry.siemens.com/cs/de/en/ps/faq).

Training

At the following address (http://www.sitrain-learning.siemens.com), you can find information about SITRAIN (Siemens training on products, systems and solutions for automation and drives).

Technical Support

Country-specific telephone numbers for technical support are provided in the Internet at the following address (http://support.industry.siemens.com/sc/ww/en/sc/2090) in the "Contact" area.

Compliance with the General Data Protection Regulation

Siemens respects the principles of data protection, in particular the data minimization rules (privacy by design).

For this product, this means:
The product does not process neither store any person-related data, only technical function data (e.g. time stamps). If the user links these data with other data (e.g. shift plans) or if he stores person-related data on the same data medium (e.g. hard disk), thus personalizing these data, he has to ensure compliance with the applicable data protection stipulations.

Safety instructions 2

2.1 General safety instructions

⚠ WARNING

Danger to life if the safety instructions and residual risks are not observed

If the safety instructions and residual risks in the associated hardware documentation are not observed, accidents involving severe injuries or death can occur.

- Observe the safety instructions given in the hardware documentation.
- Consider the residual risks for the risk evaluation.

⚠ WARNING

Malfunction of the machine as a result of incorrect or changed parameter settings

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization (parameter assignments) against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

2.2 Warranty and liability for application examples

The application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise.

Application examples are not customer-specific solutions, but merely provide assistance with typical tasks. As user you are responsible for ensuring that the products described are operated correctly. These application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.3 Industrial Security

Note

Industrial Security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens products and solutions represent only one component of such a concept.

Customers are solely responsible for preventing unauthorized access to their plants, systems, machines, and networks. Systems, machines and components should only be connected to the company's network or the Internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' recommendations regarding appropriate security measures should be taken into account. For more information about Industrial Security, please visit:

Industrial Security (http://www.siemens.com/industrialsecurity).

Siemens products and solutions undergo continuous development to make them even more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported and failure to apply the latest updates may increase exposure to cyber threats.

To constantly be informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at:

Industrial Security (http://www.siemens.com/industrialsecurity).

⚠ WARNING

Unsafe operating states resulting from software manipulation

Software manipulation (e.g. viruses, trojans, malware or worms) can cause unsafe operating states in your plant that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a state-of-the-art, integrated Industrial Security concept for the installation or machine.
- Make sure that you include all installed products into the integrated Industrial Security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.

Applications and characteristics 3

3.1 Field of application

Introduction

The Technology Extension Heat Exchanger Module (HEM) is an extension for the TM31 Terminal Module. A Technology Extension (TEC) is also known as an "OA application".

Note

Information about the Heat Exchanger Module is provided in the following references:

- SINAMICS S120 Cabinet Modules Liquid-Cooled Equipment Manual

Heat Exchanger Module applications

The Heat Exchanger Module is used to dissipate the power loss from the converter. It comprises a deionized water circuit on the converter side and a raw water circuit on the plant/ system side.

3.2 Features

Ordering options

The Heat Exchanger Module can be ordered with various options. The following options are relevant for the HEM Technology Extension:

Table 3-1 Ordering options

Option	Description
W01	Partially redundant Heat Exchanger Module with 2 pumps. Operational reliability is increased as a result of the alternating operation of the redundant pumps.
W49	Heat Exchanger Module with leakage sensor at the base of the cabinet. The sensor is connected with a TM31 digital input.
W62	Heat Exchanger Module with integrated flow monitor and temperature sensor in the raw water circuit on the plant/system side.

System integration

The following hardware requirements apply to the HEM Technology Extension:

- Control Unit (CU310-2 or CU320-2)
- Terminal Module TM31 in the Cabinet Heat Exchanger Module

License key

You require a license key for the HEM Technology Extension.

Additional information is provided in Section "Commissioning (Page 39)".

Updating the HEM version

The hardware of the Heat Exchanger Module must be adapted prior to updating the HEM Technology Extension to version V1.2.

Additional information is provided in Section "Updating HEM Technology Extension (Page 24)".

Installation and activation

4

4.1 Installing using STARTER or SIMOTION SCOUT

4.1.1 Preconditions for installing using STARTER or SIMOTION SCOUT

Note

The subsequent description in this chapter refers to the fictitious Technology Extension "ABC_OA" with version V1.1.

The procedure described in this chapter can be correspondingly applied to any real Technology Extension.

This description for installing and commissioning a Technology Extension is applicable to the STARTER commissioning tool and to engineering software with integrated STARTER (e.g. SIMOTION SCOUT).

Generally, the term STARTER is used hereafter.

Terms

Technology Extension (TEC)

Software component that is installed as an additional technology package and that expands the functionality of the SINAMICS drive system.

A Technology Extension is also known as an OA application (OA, Open Architecture).

OA Support Package (OASP)

Installing an OA Support Package (OASP) expands the STARTER commissioning tool with the corresponding Technology Extension.

An OA Support Package is only required if the associated Technology Extension is used. Generally, it can be sourced through your local Siemens office.

Devices

This description is applicable for SINAMICS S120 (CU320-2) and SIMOTION D4x5-2 with SINAMICS Integrated.

Preconditions

1. The STARTER commissioning tool with version V4.5 or higher must be installed.
   We recommend that the latest version of STARTER is used.
2. The file for the OA Support Package "oasp_abc_oa_v1_1_1_oaif04402300.zip" must be located in a known directory.
   The file name for the OA Support Package comprises the following elements:
   - oasp = OA Support Package
   - abc_oa = name of the Technology Extension
   - v1_1_1 = version of the Technology Extension
   - oaif04402300 = OA interface version
     Version of the SINAMICS firmware from which this Technology Extension can be used (04402300 = V4.4).

Note

The following description assumes that basic commissioning of the control and the drive or drive object has been completed.

4.1.2 Installing the OA Support Package in STARTER

In the following description, the Technology Extension is installed in STARTER as a technology package.

Requirements

The following preconditions must be met before installation:

1. The STARTER commissioning tool has been opened.
2. No project is open.

Procedure

Proceed as follows for installation:

1. From the "Tools" menu, choose the "Installation of libraries and technology packages" function.
   The "Installation of libraries and technology packages" window opens.

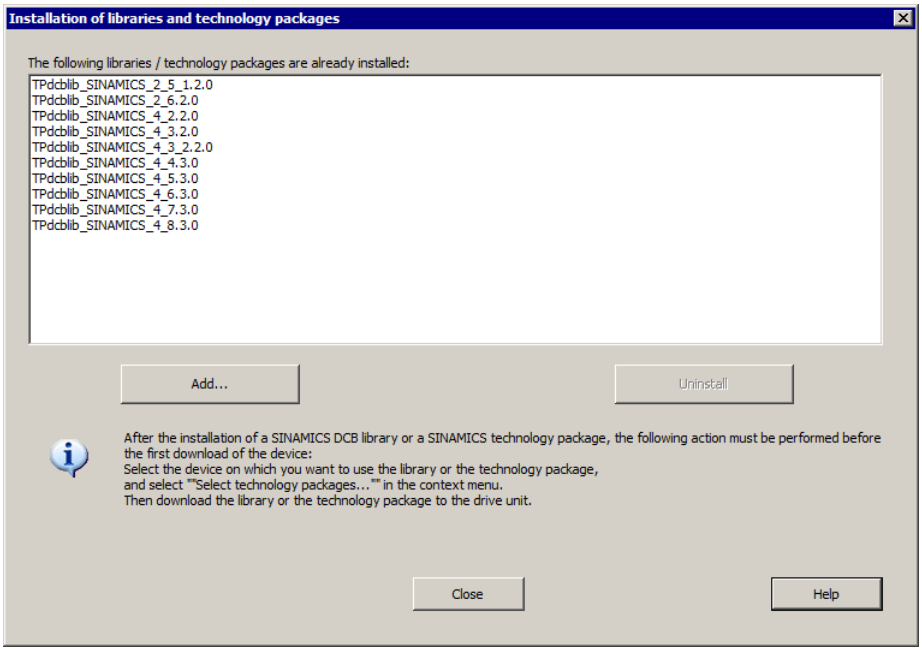


Figure 4-1 Selecting and installing the technology package

2. Click on "Add".
3. Open file "oasp_abc_oa_v1_1_1_oaif04402300.zip".
   The technology package belonging to the Technology Extension ABC_OA is added.
4. Click the "Close" button.

4.1.3 Downloading the technology package

In the following, the Technology Extension ABC_OA with version V1.1 is loaded into the device via STARTER.

Requirements

The following requirements must be met before downloading:

1. A project matching the device is open.
2. The STARTER commissioning tool is in ONLINE mode.

Procedure

To download, proceed as follows:

1. Right-click the drive unit in the project navigator.
2. Click "Select technology packages" in the shortcut menu.
   The "Select technology packages" window opens.
3. For the technology package "ABC_OA", set the action "Load to target device"

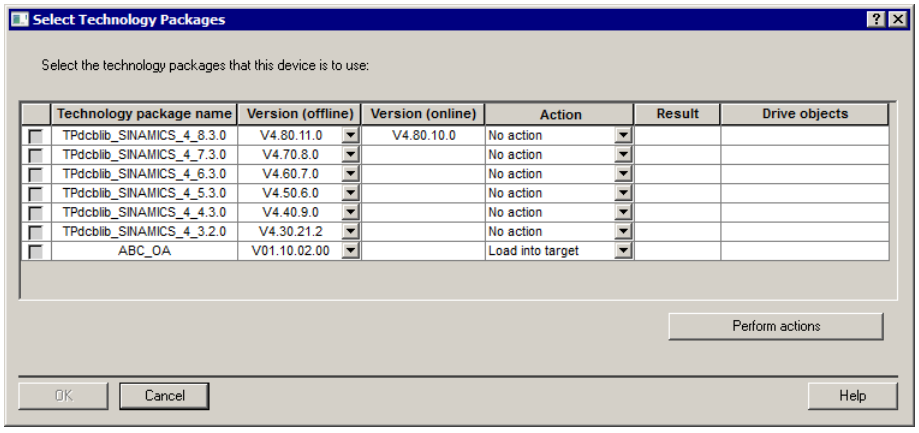


Figure 4-2 Select the technology packages

4. Click the "Perform actions" button.
   After successfully performing the action, the information "OK" is displayed for the corresponding "Result" field.
5. If necessary, switch the target device off and on again (POWER ON).

Additional information on the "Select technology package" dialog

For a technology package, the "Version (online)" column is only populated after executing "Load to target device".

The version data between the "Version (offline)" and "Version (online)" columns may differ. When you download the technology package, the version in the target device is always overwritten.

4.1.4 Activating the Technology Extension in the drive object

In the following, the Technology Extension is assigned to a drive object.

Requirements

1. A project matching the device is open.
2. The corresponding drive axes have been created in the project.
3. The STARTER commissioning tool is in the OFFLINE mode.

Procedure

To activate the Technology Extension in the drive object, proceed as follows:

1. In the project navigator, select the drive object for which the functionality is required (e.g. SERVO_03).
2. Select "Properties" in the shortcut menu.
3. To activate the Technology Extension, select check box "ABC_OA" on the "Technology packages" tab.

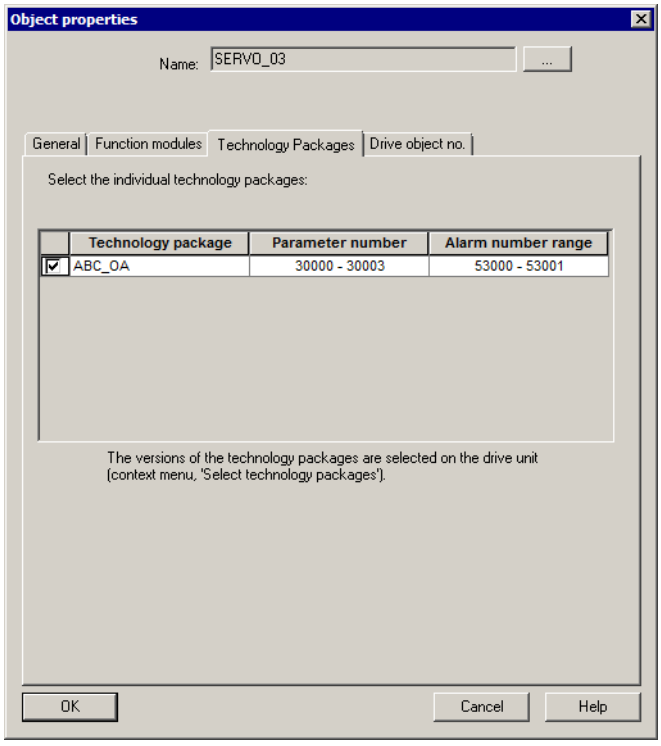


Figure 4-3 Object properties

4. Click on "OK".

Note

If multiple versions of a Technology Extension are installed in STARTER, select the required version, see "Download the technology package for the new version (Page 23)".

5. Open the expert list of the drive object.
   The additional parameters of the installed Technology Extension must now be visible in the expert list of the corresponding drive object.

	Parameter	Data set	Parameter text	Offline value SERVO_03	Unit	Modifiable to	Access level	Minimum	Maximum
	All	All	All	All	All	All	All	All	All
1215	p10203		SI Motion SBT control selection	[0] SBT via SCC (p10235)		Commissioni...	3		
1216	p10204		SI Motion SBT motor type	[0] Rotating		Commissioni...	3		
1217	p10208[0]		SI Motion SBT test torque ramp time, Brake 1	1000	ms	Commissioni...	3	20	10000
1218	p10209[0]		SI Motion SBT brake holding torque, Brake 1	10.00	Nm	Commissioni...	3	1	60000
1219	p10210[0]		SI Motion SBT test torque factor sequence 1, Brake 1	1.00		Commissioni...	3	0.3	1
1220	p10211[0]		SI Motion SBT test duration sequence 1, Brake 1	1000	ms	Commissioni...	3	20	10000
1221	p10212[0]		SI Motion SBT position tolerance sequence 1, Brake 1	1.000	mm	Commissioni...	3	0.001	360
1222	p10218		SI Motion SBT test torque sign	[0] Positive		Commissioni...	3		
1223	p10220[0]		SI Motion SBT test torque factor sequence 2, Brake 1	1.00		Commissioni...	3	0.3	1
1224	p10221[0]		SI Motion SBT test duration sequence 2, Brake 1	1000	ms	Commissioni...	3	20	10000
1225	p10222[0]		SI Motion SBT position tolerance sequence 2, Brake 1	1.000	mm	Commissioni...	3	0.001	360
1226	p10230[0]		BI: SI Motion SBT control word, Select brake test	0		Commissioni...	3		
1227	r10231		SI Motion SBT control word diagnostics	0H			3		
1228	r10234		CO/BO: SI Safety Info Channel status word S_ZSW3B	0H			3		
1229	p10235		CI: SI Safety Control Channel control word S_STW3B	0		Ready to run	3		
1230	r10240		SI Motion SBT test torque diagnostics	0.00	Nm		3		
1231	r10241		SI Motion SBT load torque diagnostics	0.00	Nm		3		
1232	p10250		CI: SI Safety Control Channel control word S_STW1B	0		Ready to run	3		
1233	r10251		CO/BO: SI Safety Control Channel control word S_STW1B diagnostics	0H			3		
1234	p30000		ABC_OA switch-on mode	[0] Reset messages		Operation	1		
1235	p30001		CI: ABC_OA P controller input signal source	0		Operation	1		
1236	r30002		CO: ABC_OA P controller output signal	0.00			1		
1237	p30003		ABC_OA P controller gain factor	1.00		Operation	1	0	1000

Figure 4-4 Expert list

6. To activate the Technology Extension for the drive object, perform the project download. Set the mode to ONLINE and select "Download Project to Target System".

4.1.5 Commissioning the HEM Technology Extension

By setting the corresponding additional parameters, the Technology Extension ABC_OA can be commissioned using the STARTER commissioning tool via the expert list.

For the HEM Technology Extension, parameters starting at p32430 are available, see "Parameters (Page 47)".

The commissioning is described in Chapter "Commissioning (Page 39)".

4.2 Upgrading using STARTER or SIMOTION SCOUT

4.2.1 Preconditions for upgrading using STARTER or SIMOTION SCOUT

Note

The description in this chapter refers to the fictitious Technology Extension "ABC_OA". This is to be upgraded from version V1.1 to V1.2.

The procedure described in this chapter can be correspondingly applied to any real Technology Extension.

This description for upgrading a Technology Extension is applicable for the STARTER commissioning tool and for engineering software with integrated STARTER (e.g. SIMOTION SCOUT).

Generally, the term STARTER is used hereafter.

Devices

This description is applicable for SINAMICS S120 (CU320-2) and SIMOTION D4x5-2 with SINAMICS Integrated.

Requirements

1. The OA Support Package "oasp_abc_oa_v1_1_1_oaif04402300.zip" has already been installed and assigned to the required drive objects, see "Installing using STARTER or SIMOTION SCOUT (Page 15)".
2. The file for the OA Support Package "oasp_abc_oa_v1_2_oaif04402300.zip" must be located in a known directory.
   The file name for the OA Support Package comprises the following elements:
   - oasp = OA Support Package
   - abc_oa = name of the Technology Extension
   - v1_2 = version of the Technology Extension
   - oaif04402300 = OA interface version
     Version of the SINAMICS firmware from which this Technology Extension can be used (04402300 = V4.4).

4.2.2 Installing the OA Support Package in STARTER

In the following, the new Technology Extension is installed in STARTER as an additional technology package.

Procedure

To install the OA Support Package "oasp_abc_oa_v1_2_oaif04402300.zip", proceed as described in Chapter "Installing the OA Support Package in STARTER (Page 17)".

After this installation, both versions of ABC_OA are visible in the window "Installation of libraries and technology packages".

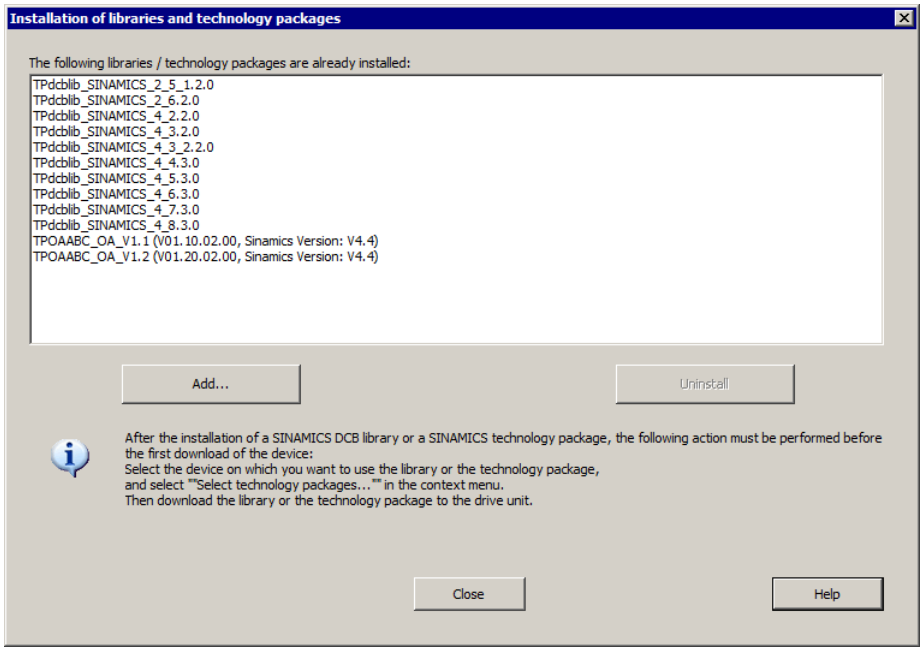


Figure 4-5 Installing the OA Support Package (technology package)

4.2.3 Download the technology package for the new version

In the following, the Technology Extension ABC_OA with version V1.2 is loaded into the device via STARTER.

Requirements

The following requirements must be met before downloading:

1. A project matching the device is open.
2. The STARTER commissioning tool is in ONLINE mode.

Procedure

To download, proceed as follows:

1. Right-click the drive unit in the project navigator.
2. Click "Select technology packages" in the shortcut menu.
   The "Select technology packages" window opens.
3. For technology package "ABC_OA", select version V01.20.02.00 under the column "Version (offline)".

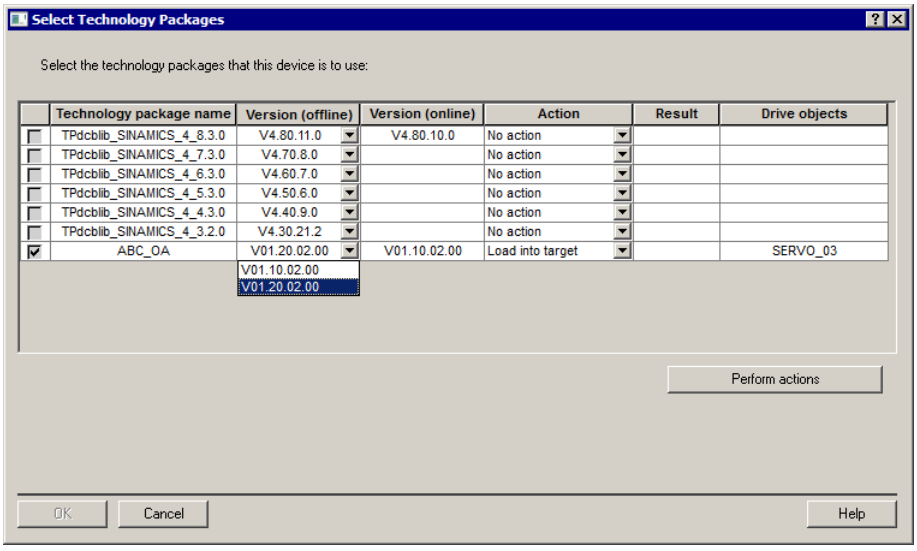


Figure 4-6 Selecting the technology package version

4. For the technology package "ABC_OA", set the action "Load to target device"
5. Click the "Perform actions" button.
6. Confirm the message that the existing technology package should be overwritten.
   After successfully performing the action, the information "OK" is displayed for the corresponding "Result" field.
   Version V01.20.02.00 is now used on the drive device.
7. To activate the Technology Extension for the drive object, perform the project download.
   Set the mode to ONLINE and select "Download Project to Target System".

4.2.4 Additional information about upgrading

Pay particular attention to the following information about upgrading:

1. The drive objects activated in the previous version of the Technology Extension remain activated.
   Procedure for activating/deactivating the Technology Extension in further drive objects, see "Activating the Technology Extension in the drive object (Page 19)".
2. The parameters set in a drive object in the previous version of the Technology Extension and their values are retained.
3. New parameters of the newly installed version of the Technology Extension are preassigned the factory settings and may have to be set.
4. The OA Support Package of the previous version of the Technology Extension can be deleted from STARTER if it can no longer be used for other projects or drive devices.
   For the procedure for deleting/uninstalling, see "Uninstalling using STARTER or SIMOTION SCOUT (Page 25)".

4.2.5 Updating HEM Technology Extension

The Heat Exchanger Module has a SAX61 actuator for valves.

The direction of action on the AZX61.1 function module of the actuator for the HEM Technology Extension V1.1 is set so that the actuating signal is reversed.

In contrast, the HEM Technology Extension V1.2 requires a direct-acting actuating signal on the actuator of the Heat Exchanger Module for the purpose of temperature control.

Requirement

The direction of action on the actuator of the Heat Exchanger Module must be adapted prior to updating the HEM Technology Extension to version V1.2.

Upgrading to HEM V1.2

Set switch 1 for the direction of action of the actuating signal on the AZX61.1 function module to the OFF switch position.

Instructions for this can be downloaded at SIOS (https://support.industry.siemens.com) under the ID **109772200**.

4.3 Uninstalling using STARTER or SIMOTION SCOUT

Procedure

To uninstall a Technology Extension using STARTER or SIMOTION SCOUT, reverse the installation sequence.

1. Deactivate the Technology Extension in the drive object, see "Activating the Technology Extension in the drive object (Page 19)".
2. Delete the technology package belonging to the Technology Extension in the drive unit, see "Downloading the technology package (Page 18)".
   - Deactivate the technology package in OFFLINE mode.
   - Save and compile the project.
   - Download the project to the target device.
   - For the technology package in ONLINE mode, select the "Delete" action and click the "Perform actions" button.
3. Uninstall the Technology Extension in STARTER.

Uninstalling the Technology Extension in STARTER

To uninstall, proceed as follows:

1. From the "Tools" menu, choose the "Installation of libraries and technology packages" function.
   The "Installation of libraries and technology packages" window opens.

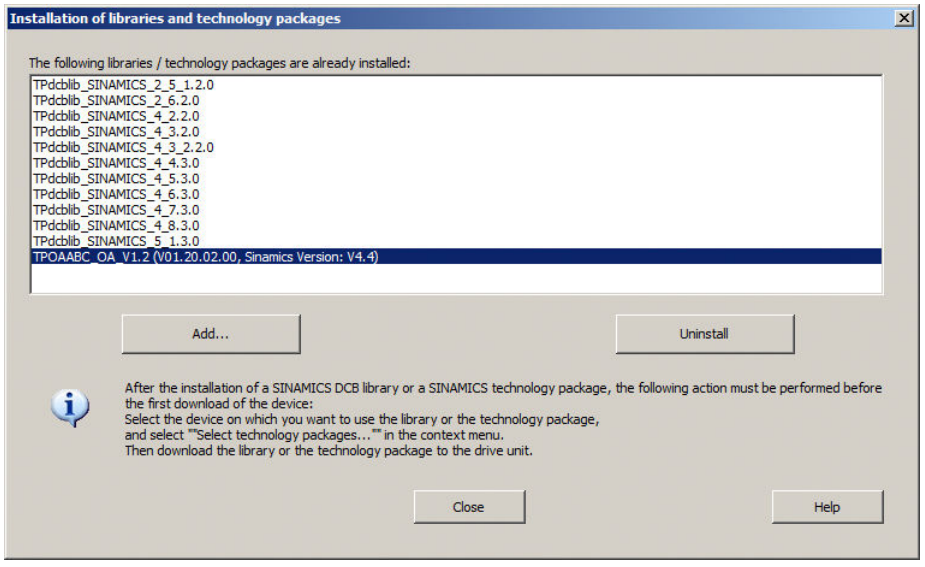


Figure 4-7 Uninstalling technology packages

2. Select the technology package belonging to the Technology Extension ABC_OA.
3. Click the "Uninstall" button.
   The technology package is deleted.
4. Click the "Close" button.

4.4 Scripting with STARTER or SIMOTION SCOUT

4.4.1 Information about scripting

This description is applicable for the STARTER commissioning tool and for engineering software with integrated STARTER (e.g. SIMOTION SCOUT). Generally, the term STARTER is used hereafter.

Using the scripting functionality assumes that you are familiar with script programming; therefore, a general introduction will not be provided here.

The implementation is based on VBScript from MICROSOFT, which has been expanded to include special objects and methods for STARTER. STARTER from version V5.1 SP1 HF2 is recommended when using SINAMICS TEC scripting functions with STARTER.

Devices

This description is applicable for SINAMICS S120 (CU320-2) and SIMOTION D4x5-2 with SINAMICS Integrated.

Working with scripting functionality

Using the scripting functionality, you can automate the configuration using an easy-to-learn script language. Drive objects (DOs), e.g. SINAMICS drives and SIMOTION technology objects (TOs), for example axes, can be configured.

Standard scripts can be adapted to specific situations during the runtime using interactive queries, which means that the scripts are executed dependent on query results. This simplifies and speeds up commissioning. Other applications include documenting settings that have been made and repeating complex settings without error, for example.

⚠ WARNING

Malfunctions as a result of incorrect scripts

Scripting provides extensive automation options that are required to be able to automate manual operator actions in STARTER, therefore optimizing the time required for the recurring configuration of projects and tasks. Incorrect configurations that are not identified in tests can result in serious injury or death! The script programmer and the script user are responsible for the operator actions implemented in the scripting.

- Run systematic tests on new and modified scripts to verify and validate them.
- Before running a script, carefully ensure it has the correct content! Verify and validate the results when running a script by performing tests on the machine.

Note

Information about scripting, tools and application examples

- Detailed documentation about VBScript is available at the following address (https://www.microsoft.com).
- Detailed notes for SIMOTION scripts are contained in SIMOTION Utilities & Applications. This information is available on DVD or in the Internet at the following address (https://support.industry.siemens.com/cs/document/26340545).
  In addition to the SIMOTION Scripting Interface Manual and a script styleguide, there is a collection of scripts that provide support when working with SIMOTION SCOUT.

Scripting variants

The following scripting variants are available in STARTER:

VBScript Internal

In the STARTER project navigator, script folders can be inserted under the project, each device and each TO/DO. You can then insert the scripts into this script folder. Scripts are edited using an internal editor. Scripts can be imported or exported in text format (ASCII) and XML.

VBScript External

Scripts can also be executed from Windows Explorer. STARTER does not have to be started for this purpose. This allows operators without system knowledge to perform configuration tasks. In this case, the script is available as a VBScript in an ASCII file "TECupdaten.vbs" in the Windows file system, for example.

External scripting

For more complex scripting applications, you can implement your own application – which provides a task-oriented user interface – and internal SIMOTION scripting, which uses the STEP7 command interface and other scripting interfaces (e.g. for databases or XML). This form of scripting is implemented using VisualBasic or Visual C#, for example.

4.4.2 Scripting for Technology Extensions

An application example, where several TEC-specific scripting methods are applied, is the automated update of Technology Extensions. The typical workflow when upgrading and the methods used are subsequently described.

Detailed information about general and TEC-specific scripting methods are provided in the STARTER online help.

Upgrading a Technology Extension using scripting methods

To update a Technology extension using scripting, the same steps must be performed as for a manual update, see "Upgrading using STARTER or SIMOTION SCOUT (Page 21)". Additional steps and queries serve especially to guarantee a safe and reliable function.

Table 4-1 Scripting methods and corresponding commissioning steps

Scripting methods	Commissioning step
GetActivatedTECs	Query, on which drive objects are Technology Extensions activated and which version is used.
GetTECParameterRanges	Query, which parameters belong to a specific, activated Technology Extension.
Parameter	Read out and save the settings of these parameters.
DeActivateTEC	Deactivate the old TEC version.
UninstallTEC	Uninstall the old TEC version.
InstallTEC	Install the new TEC version.
SelectTECVersion	Select the new TEC version to be installed.
DownloadTEC	Download the new TEC version.
ActivateTEC	Activate the new TEC version on all drive objects on which the old version was active. To do this, the drive objects read-out using "GetActivatedTECs" must now be used as target.
Parameter	Restore the parameter settings in the new TEC version.

The methods listed can be removed from the complex context and separately applied. For instance, a text file can be created using "GetActivatedTECs" that can be used for documentation purposes or as configuration example.

The steps defined using scripting can also be extended to include additional actions. For example, the results from "GetActivatedTECs" can be compared with the OASP in an installation folder. If more recent versions are saved to the installation folder, then an update can be fully automatically performed in STARTER.

Explanations and programming examples

An overview and help for scripting methods specific to Technology Extensions are provided in the STARTER help:

1. Open Help, by pressing key "F1", for example.
2. Double-click on folder "Scripts to Automated Execution".
3. Double-click on folder "Methods".
4. Double-click on folder "Technology Extensions methods".
   A detailed description with syntax, notes and programming examples is provided in this folder for all TEC-specific scripting methods.

Function description 5

5.1 Principle of operation of the Heat Exchanger Module

General

The Heat Exchanger Module is used to dissipate the power loss from the converter. It comprises a deionized water circuit on the converter side and a raw water circuit on the plant/system side.

The warm liquid (water and anti-freeze and/or inhibitors) in the deionized water circuit is pumped to the water/water plate-type heat exchanger using circulating pumps (or 2 pumps alternating for option W01). The heat exchanger is manufactured out of stainless steel and is connected to the plant-side raw water circuit.

The liquid in the deionized water circuit on the converter side is cooled by the raw water circuit on the plant side and flows back to the converter.

The HEM Technology Extension assumes the following tasks:

- System-specific setting of the Heat Exchanger Module using parameters
- Controlling the pumps
- Monitoring the motor circuit breaker, the pressure actual values and the temperature actual values
- Detecting leaks
- Controlling the intake temperature in the deionized water circuit using a control valve
- Displaying all system parameters
- Functions to avoid condensation
- Dialog in the STARTER commissioning tool for visualizing and parameterizing the Heat Exchanger Module

Note

Information about the Heat Exchanger Module is provided in the following references:

- SINAMICS S120 Cabinet Modules Liquid-Cooled Equipment Manual

Note

Observe the information in the following literature for the cooling circuit configuration of the converter-side deionized water circuit and the Heat Exchanger Module:

- SINAMICS G130, G150, S120 Chassis, S120 Cabinet Modules, S150 Configuration Manual,
  Chapter "Information about the cooling circuit and cooling circuit engineering"

Communication

The integration of the HEM Technology Extension in the drive system allows its integration into higher-level control systems to visualize signals and messages.

The actual system properties can be represented in status words. Display parameters can be transferred to higher-level control systems via PZD interconnections.

Ordering options

The HEM Technology Extension can be ordered with various options. The following order options must be activated in p32430 when required. Several options can be activated.

Option	Description	Activation
W01	Heat Exchanger Module, partially redundant with 2 pumps	p32430.0 = 1
W62	Sensors in the raw water circuit on the plant/system side	p32430.1 = 1

5.2 Monitoring functions

5.2.1 Overview

To protect the SINAMICS power units to be cooled and the Heat Exchanger Module, the HEM Technology Extension offers the following monitoring functions:

- Temperature monitoring (Page 31)
- Pressure monitoring (Page 32)
- Wire-break monitoring (Page 33)
- Maintenance interval (Page 33)
- Detecting leaks (option W49) (Page 33)
- Flow monitoring (option W62) (Page 34)

5.2.2 Temperature monitoring

Function

The HEM Technology Extension generates alarms if the set alarm thresholds of the following temperatures are exceeded:

- Temperature in the deionized water circuit
- Temperature in the cabinet
- Temperature in the raw water circuit (option W62)

The factory settings for these temperature alarm thresholds have been selected so that they respond as soon as the power loss cannot be completely dissipated at rated converter load.

The alarms help to identify potential sources of faults at an early stage, and to resolve any problems before the converter is shut down.

Note

Excessive temperatures in the deionized water circuit can damage the pumps.

When the deionized water circuit temperature exceeds 58°C, the Heat Exchanger Module is shut down for safety reasons and a fault is output.

Evaluating the temperature in the cabinet

The temperature in the cabinet is read in by linking the connector inputs p32433[1...5] with the actual temperature value "air intake" (r0037[3]) of the power units to be cooled, see "System-specific interconnections (Page 42)".

The temperature in the cabinet is required for the functions to avoid condensation.

5.2.3 Pressure monitoring

Pressure sensors are integrated in the intake as well as the return of the deionized water circuit. The thresholds for the monitored operating pressures are configured in two stages (alarm and fault thresholds).

For option W01, when a fault threshold is violated, the system first switches over to the redundant pump. If the second pump also develops a fault condition, then the Heat Exchanger Module is shut down with the appropriate fault message.

In each Heat Exchanger Module operating state, both actual pressure values are checked against minimum and maximum values. Further, after the start, and for option W01 when switching over the pump after the time entered in p32448 has expired, the differential pressure is monitored.

Differential pressure

After filling the system, a system filling pressure of 2.1 bar should be set for the switched-off pump.

If the pump is switched on, the pressure in the circuit depends on the flow rate. The difference between the intake and return flow pressure of the deionized water circuit is monitored in order to conclude that the flow rate is sufficient and not too high. The differential pressure is determined by the following factors:

- Viscosity (concentration of anti-freeze)
- Connecting hoses to the flow piping (intake and return flow)
- Available quick-release couplings on the power units
- Additionally available heat exchangers

The pressure must be adjusted via the setting tap in the intake of the deionized water circuit in such a way that a difference of approx. 1.3 bar (for minimum anti-freeze addition) or 2.5 bar (for maximum anti-freeze addition) is set between the intake and the return flow pressure.

Note

Observe the information in the following literature:

- SINAMICS G130, G150, S120 Chassis, S120 Cabinet Modules, S150 Configuration Manual,
  Chapter "Information about the cooling circuit and cooling circuit engineering"

Example

The pump power supply fails. As a consequence, the intake and return flow pressure of the deionized water circuit on the converter side equalize. When the fault limits for pressure, set in p32446, are undershot, a fault (F53558) is generated.

5.2.4 Wire-break monitoring

Alarm A53561 is output when wire break is detected for at least one temperature sensor. If the sensor in the intake of the deionized water circuit fails, then the temperature controller is held, and the last valid value at the controller output is kept as setpoint for the control valve.

5.2.5 Maintenance interval

Setting maintenance intervals

Maintenance intervals for the pump and for the Heat Exchanger Module can be set using p32456.

An appropriate alarm is output when the set operating hours are reached.

Reset maintenance intervals

Using p32457, the maintenance interval for the pumps and the Heat Exchanger Module can be reset by setting the appropriate indices = 0.

In addition, after replacing a pump, the value for the operating hours of the particular pump and Heat Exchanger Module can be reset using p32457.

5.2.6 Detecting leaks (option W49)

For option W49, in the factory, a leakage sensor is installed at the base of the Heat Exchanger Module cabinet along with an evaluation module.

Evaluating the parameter response

As soon as the sensor comes into contact with liquid, the evaluation module detects a change to the resistance value. If the digital signal is connected to the p32432[9] binector input, the Heat Exchanger Module generates an alarm.

An additional leakage sensor can be evaluated with the p32432[8] binector input. Generally, this evaluation module is located in the control cabinet accommodating the SINAMICS power unit.

Note

Depending on the particular requirement, the alarms can be reparameterized to become a fault. The Heat Exchanger Module is shut down when a fault occurs. As a consequence, individual class requirements can be addressed.

5.2.7 Flow monitoring (option W62)

Flow sensor in the raw water circuit

With option W62, a parameterizable flow sensor is installed in the raw water circuit. Furthermore, the TM150 Terminal Module is installed in the HEM.

If the flow is too low, an alarm is generated by the HEM Technology Extension via a digital output of the sensor.

Based on temperature models, the SINAMICS power units check the flow in the deionized water circuit. This means that it is not necessary to monitor the deionized water circuit using an additional flow sensor.

Example

The raw water circuit has been poorly vented or a valve is not open. As a consequence, the nominal flow is too low - and the system can no longer guarantee the full cooling power.

5.3 Control functions

5.3.1 Protection against condensation

With liquid-cooled units, warm air can condense on the cold surfaces of heat sinks, pipes and hoses. The condensation depends on the temperature difference between the ambient air and the coolant, and the humidity of the ambient air. The temperature at which water vapor contained in the air condenses into water is known as the dew point. Condensation water can cause corrosion and electrical damage, for example, flashovers/arcing in the power unit and, in the worst-case scenario, can result in irreparable equipment damage. It is therefore absolutely essential to prevent condensation inside the units.

As the SINAMICS units cannot prevent condensation if it is caused by the prevailing climatic conditions, the temperature must be controlled by appropriately parameterizing the cooling circuit. The temperature control must ensure that the coolant temperature is always held above the dew point of the ambient air.

5.3.2 Temperature control

The Heat Exchanger Module contains the following temperature control components:

- Temperature sensor in the intake of the deionized water circuit
- Continuously operating control valve

The control valve regulates the quantity of liquid that is pumped through the plate-type heat exchanger. The setpoint for the deionized water circuit entered in p32437 controls the amount of heat exchanged with the raw water circuit on the plant/system side. The dynamic response of the controller can be adapted to address the specific system requirements using the proportional gain Kp (p32438) and integral time Tn (p32439).

"Manual control valve" function (p32431.3)

When the p32431.3 = 0 function is deactivated, the temperature control is deactivated and the setpoint for the control valve is entered via p32440.

This function can be used to test the control valve.

5.3.3 Condensation protection

The HEM Technology Extension offers the following functions for condensation protection:

- Interconnectable parameters (connectors) for the actual temperature value in the cabinet (p32433[1...5])
- Condensation alarm
- Increasing the temperature setpoint
- Automatic operation for condensation prevention

Requirement

At least one connector input p32433[1...5] with an actual temperature value must be interconnected for the functions for condensation protection. For example, r0037[3] (supply air) of the power unit to be cooled can be used as the actual temperature value.

For cabinets with a closed system (degree of protection IP55), it is recommended that the "Increase temperature setpoint" (p32431.1) and "Automatic operation to avoid condensation" (p32431.2) functions are deactivated. For this degree of protection, the temperature inside the cabinet is essentially defined by the temperature of the deionized water circuit. When these functions are deactivated it is ensured that no unnecessarily high temperature setpoint is reached. Do not set setpoint p32437 for the deionized water circuit higher than 40 °C, as higher setting values result in power derating.

"Condensation alarm" function (p32431.0)

When the p32431.0 = 1 function is active, an alarm is output if the difference between the actual temperature values of the deionized water circuit and the actual temperature value inside the cabinet exceeds the threshold value set in p32435[3].

The alarm threshold must be set depending on the specific system – and on the prevailing humidity (see following table).

The table below specifies the dew point as a function of ambient temperature T and relative humidity φ for an atmospheric pressure of 100 kPa (1 bar).

Table 5-1 Dew point

Ambient temperature	Relative humidity φ										
T	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	100%
10 °C	< 0 °C	< 0 °C	< 0 °C	0.2 °C	2.7 °C	4.8 °C	6.7 °C	7.6 °C	8.4 °C	9.2 °C	10.0 °C
20 °C	< 0 °C	2.0 °C	6.0 °C	9.3 °C	12.0 °C	14.3 °C	16.4 °C	17.4 °C	18.3 °C	19.1 °C	20.0 °C
25 °C	0.6 °C	6.3 °C	10.5 °C	13.8 °C	16.7 °C	19.1 °C	21.2 °C	22.2 °C	23.2 °C	24.1 °C	24.9 °C
30 °C	4.7 °C	10.5 °C	14.9 °C	18.4 °C	21.3 °C	23.8 °C	26.1 °C	27.1 °C	28.1 °C	29.0 °C	29.9 °C
35 °C	8.7 °C	14.8 °C	19.3 °C	22.9 °C	26.0 °C	28.6 °C	30.9 °C	32.0 °C	33.0 °C	34.0 °C	34.9 °C
40 °C	12.8 °C	19.1 °C	26.7 °C	27.5 °C	30.6 °C	33.4 °C	35.8 °C	36.9 °C	37.9 °C	38.9 °C	39.9 °C
45 °C	16.8 °C	23.3 °C	28.2 °C	32.0 °C	35.3 °C	38.1 °C	40.6 °C	41.8 °C	42.9 °C	43.9 °C	44.9 °C
50 °C	20.8 °C	27.5 °C	32.6 °C	36.6 °C	40.0 °C	42.9 °C	45.5 °C	46.6 °C	47.8 °C	48.9 °C	49.9 °C

Example

At an ambient temperature of 40 °C and a relative humidity of 95%, a temperature difference of 1.1 K is obtained. This threshold value must be entered into p32435[3].

If the temperature of the deionized water circuit drops below the temperature inside the cabinet by this set value, a potential risk of condensation is signaled using alarm A53562.

"Increase temperature setpoint" function (p32431.1)

The setpoint for the deionized water circuit temperature must be adapted to the expected ambient temperature and humidity (see table "Dew point").

When the p32431.1 = 1 function is activated, the temperature setpoint is automatically held 2 K above the measured temperature inside the Heat Exchanger Module cabinet. If the temperature in the converter-side deionized water circuit exceeds the setpoint temperature entered in p32437, then status bit r32452.8 = 1 is set. Even for higher degrees of humidity, condensation is ruled out. The resulting setpoint can be increased up to a maximum of 45 °C, and is displayed in r32454.

"Automatic operation for condensation prevention" function (p32431.2)

When the p32431.2 = 1 function is activated, the Heat Exchanger Module is automatically switched on when there is a risk of condensation. If the actual temperature value in the deionized water circuit (r32451[0]) is 1 K colder than the actual temperature value inside the cabinet (r32451[1]), then the Heat Exchanger Module is started without a switch-on command. Status word r32452.9 = 1 is set if the function is active. The "Automatic operation for condensation prevention" function should only be activated together with the "Increase temperature setpoint" function.

For pure circulation in the deionized water circuit (i.e. no liquid is pumped through the plate-type heat exchanger), losses in the various loads, pumps and valves result in an increase in the deionized water temperature. As soon as the actual temperature value in the deionized water circuit (r32451[0]) is 2 K warmer than the actual temperature value inside the cabinet (r32451[1]), then the Heat Exchanger Module is shut down. If a switch-on command is issued during this time using p32432.0 = 1, then the Heat Exchanger Module remains in operation and the automatic start of the Heat Exchanger Module is reset (r32452.9 = 0).

5.4 SINAMICS Safety Integrated

The functions implemented with a Technology Extension are not part of the SINAMICS Safety Integrated Functions, nor do they influence the SINAMICS Safety Integrated Functions.

Note

Information on SINAMICS Safety Integrated can be found in the following reference:

- SINAMICS S120 Safety Integrated Function Manual.

Commissioning 6

The following description also specifies the usual commissioning sequence of the HEM Technology Extension.

Requirements

Commissioning of the HEM Technology Extension requires the following:

- The STARTER commissioning tool as of version V5.1 must be installed. We recommend using STARTER V5.3 or higher.
- The Technology Extension is installed as a technology package in STARTER.
  See "Installing the OA Support Package in STARTER (Page 17)"
- The technology package is loaded into the Control Unit.
  See "Downloading the technology package (Page 18)"
- The Technology Extension is assigned to the TM31 Terminal Module.
  See "Activating the Technology Extension in the drive object (Page 19)"

Licensing

A license key is required for the HEM Technology Extension. You can generate the appropriate license key using the WEB License Manager. To do this, you require the Certificate of License (CoL).

The order number (MLFB) for the Certificate of License (CoL) is as follows:

6SL3077-0AA05-2AB0

You can use the license for the memory cards in the following systems:

- SINAMICS S120 CU310-2 Control Unit
- SINAMICS S120 CU320-2 Control Unit

Note

Information and the procedure required for licensing can be found in the following reference:

- SINAMICS S120 Drive Functions Function Manual, Chapter "Licensing".

You can use the Technology Extension for a limited time by activating the "Trial License" function. Please see the corresponding product documentation for more information about the Trial License.

Configuration

The HEM Technology Extension is configured in three steps:

1. "Basic commissioning using a script file (Page 41)"
2. "System-specific interconnections (Page 42)"
3. "Settings to protect the SINAMICS power units (Page 45)"

6.1 Basic commissioning using a script file

Components TM31 and TM150 (for option W62) are the interfaces to the sensors, the motor circuit breakers as well as to the control modules of the Heat Exchanger Module.

We recommend running the "HEM" script file in STARTER to simply and quickly interconnect the parameters of the HEM Technology Extension with the two components.

"HEM" script file

This script preassigns the parameter settings for TM31 and TM150 (optional).

Note

The "HEM" script file and instructions on basic commissioning via the script file are contained in the scope of delivery of the Heat Exchanger Module.

Furthermore, you can downloaded this data in SIOS (https://support.industry.siemens.com) using the ID **109749739**.

Function diagrams

The necessary settings for the basic commissioning, which are executed when running the script, can be seen in the following function diagrams:

- "7390 – Signal sources (Page 60)"
- "7393 – Increasing the temperature setpoint, automatic condensation prevention (Page 63)"
- "7394 – PI controller (Page 64)"

6.2 System-specific interconnections

The settings of the TM31 signal sources to control the Heat Exchanger Module depend on the specific system, and must be manually interconnected.

p32432[0] HEM ON/OFF

Interconnect the binector input p32432[0] with the signal that corresponds to the switch-on command of the first drive object that is switched-in (e.g. Line Module).

p32432[1] acknowledge HEM fault

The HEM faults are also reset when the drive object (TM31) is acknowledged. Signal p32432[1] can also be interconnected, e.g. if only Heat Exchanger Module faults need to be acknowledged.

p32432[2] HEM immediate stop

This signal is used to immediately shut down the Heat Exchanger Module. Contrary to OFF/ON, the run-on time set in p32441 is not active. The signal p32432[2] can, for example, be interconnected with an EMERGENCY OFF for the system.

p32432[9] frequency converter leakage

For option W49, a leakage sensor is installed at the base of the control cabinet in the Heat Exchanger Module along with an evaluation module. The signal p32432[9] can be used for the leakage evaluation unit in the converter cabinet. The Heat Exchanger Module generates an alarm via a digital signal.

p32433[1...5] HEM temperature signal source, cabinet

It is recommended that the connector inputs p32433[1...5] are interconnected with the actual temperature value "air intake" (r0037[3]) of the power units to be cooled. The interconnected temperature values form the maximum and it is displayed as the actual value for the temperature in the cabinet in r32451[1]. The "HEM" script automatically performs the interconnection. If the script does not find a suitable value for the interconnection, a corresponding message is output.

If you use the Heat Exchanger Module without drive objects, the temperature values will be made accessible via the higher-level control system. Alternatively, a suitable cabinet temperature can be supplied to the Control Unit.

Note

The following functions for condensation protection must only be used with a suitable actual temperature value in the cabinet.

- Condensation alarm (p32431.0)
- Increase temperature setpoint (p32431.1)
- Automatic operation for condensation prevention (p32431.2)

If a connector input (p32433[1...5]) is not interconnected for a selected function for condensation protection, the alarm A53571 "Cabinet signal source missing" is issued.

6.3 Settings via the "Heat Exchanger Module" dialog in STARTER

Requirement

The HEM Technology Extension is installed as a technology package in STARTER.

Open the dialog box

You can open the "Heat Exchanger Module" dialog in the context menu of the TM31 Terminal Module.

The dialog provides an overview of the current operating state of the Heat Exchanger Module.

Settable functions

The following functions are adjustable via the "Heat Exchanger Module" dialog:

- Selecting ordering options
- Selecting functions for temperature control and condensation protection
- Setting temperature and pressure alarm thresholds
- Testing the three-way valve

6.4 Settings to protect the SINAMICS power units

Shutting down the modules

All active fault messages of the Heat Exchanger Module result in the Heat Exchanger Module being shut down; however, SINAMICS power units are not shut down (the fault response is set to "NONE" in the factory).

When the SINAMICS power units have a somewhat lower load level, a certain time can expire until the temperature monitoring functions respond - and the SINAMICS power units are shut down for safety reasons.

Settings

Depending on the specific application, you can optionally make the following settings:

1. Automatic restart after successful acknowledgment
   When the "Automatic restart after HEM fault" function is activated, (p32431.4 = 1), after successfully acknowledging an HEM fault, the Heat Exchanger Module is switched on, assuming that the switch-on command p32432[0] is still available.
2. Forcing the module to shut down
   In order to force a shutdown of the SINAMICS power units that are to be cooled, signal r32452.3 ("Fault active") can be interconnected with the OFF2 signal of the power unit to be shut down.

Note

You must ensure that the power units cannot be switched on while the Heat Exchanger Module is in operation via the internal BICO interconnection and the control integration. The corresponding signals are accessible in status word 1 (r32452).

To protect the power units, we recommend switching them off directly in the event of a fault trip of the HEM (variant 2).

Parameters 7

Overview

Note

An overview of the parameters, especially the explanation of the parameter list, can be found in the product-specific List Manuals, for example:

- SINAMICS S120/S150 List Manual, Chapter "Overview of parameters".

List of parameters

Note

This chapter only includes the parameters for the HEM Technology Extension.

You can find the product-dependent parameters available for SINAMICS in the online help for the particular control system or commissioning tool or, for example, in the following reference:

- SINAMICS S120/S150 List Manual, Chapter "List of parameters".

Product: drvoa_hem, Version: 1201200, Language: eng
Objects: A_INF, B_INF, R_INF, S_INF, SERVO, TM31, VECTOR

p32430 HEM ordering options / Ordering options

TM31

Can be changed: T	**Calculated:** -	**Access level:** 1
Data type: Unsigned16	**Dynamic index:** -	**Function diagram:** 7395
P-Group: All groups	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0001 bin

Description: Sets the available ordering options with software relevance.

For bit 00:

Option W01 includes two pumps installed in the converter-side fine water circuit. The alternating operation of the pumps increases the operational reliability.

For bit 01:

Option W62 includes a flowmeter and a temperature acquisition (sensory system) in the plant-side raw water circuit.

Bit field:

Bit	Signal name	1 signal	0 signal	FP
00	W01 - Heat Exchanger Module, partially redundant with two pumps	Active	Inactive	-
01	W62 - sensory system in the plant-side circuit raw water circuit	Active	Inactive	-

Dependency: See also: p32432, p32433

Note

HEM: Heat Exchanger Module

Heat Exchanger Modules dissipate the heat loss from the converter. They consist of a converter-side fine water circuit and a plant-side raw water circuit.

p32431 HEM function selection / Function selection

TM31

Can be changed: T, U	**Calculated:** -	**Access level:** 3
Data type: Unsigned16	**Dynamic index:** -	**Function diagram:** -
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0000 1011 bin

Description:

Sets the selection of the individual functions for the Heat Exchanger Module (HEM).

For bit 00:

For activated function, warning A53562 is issued when the difference between the actual temperature value in the cabinet (r32451[1]) and the actual temperature value in the fine water circuit (r32451[0]) exceeds the set value (p32435[3]).

For bit 01:

For activated function, the temperature setpoint is increased when there is risk of condensation and this is indicated in status word 1 (r32452.8). The resulting temperature setpoint (r32454) is then increased by 2 K (r32451[1] + 2 K).

For bit 02:

For activated function, the Heat Exchanger Module is switched on automatically when there is risk of condensation. The automatic operation and the resulting temperature rise in the fine water circuit (r32451[0]) reduces the risk of condensation.

For bit 03:

For activated function, the temperature in the fine water circuit is regulated to the resulting temperature setpoint (r32454) using the control valve.

For deactivated function, the set setpoint affects the control valve (p32440).

For bit 04:

For activated function, the Heat Exchanger Module is automatically switched on again after 5 seconds after acknowledgment of a fault (r32452.4 = 0) if the switch-on command is still active (p32432[0] = 1).

Bit field:

Bit	Signal name	1 signal	0 signal	FP
00	Display condensation alarm	Active	Inactive	-
01	Increase temperature setpoint to prevent condensation	Active	Inactive	7393, 7394
02	Automatic operation for condensation prevention	Active	Inactive	7393
03	Temperature control	Active	Inactive	-
04	Automatic restart after HEM fault	Active	Inactive	-

Dependency:

For bit 00 ... 02:

At least one connector input p32433[15] must be connected to a signal source for the temperature in the cabinet.

See also: p32437, p32440, r32454

See also: A53562

⚠ CAUTION

For bit 02:
For activated function, the Heat Exchanger Module starts automatically without a switch-on command (p32432[0]).

p32432[0...10] BI: HEM signal sources / Signal sources

TM31

Can be changed: T, U
Data type: Unsigned32 / Binary
P-Group: -
Not for motor type: -
Min:
-

Calculated: -
Dynamic index: -
Unit group: -
Scaling: -
Max:
-

Access level: 1
Function diagram: 7390, 7398
Unit selection: -
Expert list: 1
Factory setting:
[0] 0
[1] 0
[2] 1
[3...7] 0
[8] 1
[9] 1
[10] 1

Description:
Sets the signal sources to control the Heat Exchanger Module (HEM).
For index [0]:
Signal for activating/deactivating the Heat Exchanger Module. After switch off, the run-on time set in p32441 acts.
For index [1]:
Signal for acknowledging Heat Exchanger Module faults. Faults are also reset when the drive object is acknowledged.
For index [2]:
Signal for stopping the Heat Exchanger Module immediately.
For index [3]:
Selector switch signal to switch the operating modes MANUAL=0-signal/AUTO=1-signal.
For index [4]:
Pump 1 motor circuit-breaker feedback signal.
For index [5]:
Pump 2 motor circuit-breaker feedback signal (only for Option W01).
For index [6]:
Pump 1 contactor feedback signal.
For index [7]:
Pump 2 contactor feedback signal (only for Option W01).
For index [8]:
Signal for the leakage evaluation unit in the converter cabinet.
For index [9]:
Signal for the leakage evaluation unit in the Heat Exchanger Module (only for Option W49).
For index [10]:
Feedback signal of the flow sensor in the plant-side raw water circuit (only for Option W62).

Index:
[0] = HEM On/Off
[1] = Acknowledge HEM fault
[2] = HEM immediate stop
[3] = HEM MANUAL/AUTO
[4] = Pump 1 motor circuit-breaker
[5] = Pump 2 motor circuit-breaker
[6] = Pump 1 operation
[7] = Pump 2 operation
[8] = Frequency converter leakage
[9] = HEM leakage
[10] = Plant-side raw water circuit flow outside tolerance

Dependency:
See also: p32430

p32433[0...6] CI: HEM temperature signal source / Temp S_src

TM31

Can be changed: T	**Calculated:** -	**Access level:** 3
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7397
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0

Description: Sets the signal source for the actual temperature values.
For index [0]:
Signal source for the actual temperature value of the converter-side fine water circuit.
For index [1...5]:
Signal sources for the actual temperature values in the cabinet.
The maximum actual temperature value is displayed in r32541[1].
For index [6]:
Signal source for the actual temperature value of the plant-side raw water circuit (only for Option W62).

Index: [0] = Fine water circuit
[1] = Cabinet 1
[2] = Cabinet 2
[3] = Cabinet 3
[4] = Cabinet 4
[5] = Cabinet 5
[6] = Raw water circuit

Dependency: See also: p32430, r32451

Note
For index [1...5]:
At least one signal source must be interconnected if one of the functions p32431 bit 00 ... 02 is activated.

p32434[0...1] CI: HEM fine water circuit actual pressure value signal source / Fw p_actVal S_src

TM31

Can be changed: T	**Calculated:** -	**Access level:** 3
Data type: Unsigned32 / FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7395
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	0

Description: Sets the signal source for the actual pressure values in the converter-side fine water circuit.
For index [0]:
Signal source for the actual pressure value at the intake.
For index [1]:
Signal source for the actual pressure value in the return flow.

Index: [0] = Intake
[1] = Return flow

Dependency: See also: r32450

p32435[0...3] HEM actual temperature value alarm thresholds / T_actVal AlThrsh

TM31

Can be changed: T, U
Data type: FloatingPoint32
P-Group: -
Not for motor type: -
Min:
0.0 [°C]

Calculated: -
Dynamic index: -
Unit group: -
Scaling: -
Max:
58.0 [°C]

Access level: 3
Function diagram: 7397
Unit selection: -
Expert list: 1
Factory setting:
[0] 46.0 [°C]
[1] 50.0 [°C]
[2] 45.0 [°C]
[3] 1.0 [°C]

Description:
Sets the alarm thresholds for the actual temperature values.
For index [0]:
If the actual temperature value of the fine water circuit (r32451[0]) exceeds the selected alarm threshold, an appropriate alarm is issued.
For index [1]:
An appropriate alarm is issued if the actual temperature value in the cabinet (r32451[1]) exceeds the alarm threshold specified here.
For index [2]:
For activated Option W62 (p32430.1 = 1):
If the actual temperature value of the raw water circuit (r32451[2]) exceeds the selected alarm threshold, an appropriate alarm is issued.
For index [3]:
An appropriate alarm is issued if the difference between the actual temperature value in the cabinet (r32451[1]) and the actual temperature value in the fine water circuit (r32451[0]) exceeds the set value.

Recommendation:
For index [3]:
The value must be set appropriate for the ambient air humidity.

Index:
[0] = Fine water circuit temperature alarm threshold
[1] = Cabinet temperature alarm threshold
[2] = Raw water circuit temperature alarm threshold
[3] = Temperature difference condensation alarm

Dependency:
See also: r32451
See also: A53559, A53562

p32436[0...5] HEM fine water circuit pressure alarm thresholds / Press AlThrsh

TM31

Can be changed: T, U
Data type: FloatingPoint32
P-Group: -
Not for motor type: -
Min:
0.3 [bar]

Calculated: -
Dynamic index: -
Unit group: -
Scaling: -
Max:
6.0 [bar]

Access level: 3
Function diagram: 7395, 7396
Unit selection: -
Expert list: 1
Factory setting:
[0] 0.4 [bar]
[1] 5.5 [bar]
[2] 0.5 [bar]
[3] 4.5 [bar]
[4] 0.7 [bar]
[5] 2.5 [bar]

Description:
Sets the alarm limits for the pressure in the converter-side fine water circuit.
If the pressure exceeds or undershoots one of these pressure limits, an appropriate alarm is generated.

Index: [0] = Intake lower threshold
[1] = Intake upper threshold
[2] = Return flow lower threshold
[3] = Return flow upper threshold
[4] = Difference lower threshold
[5] = Difference upper threshold

Dependency: See also: A53556

p32437 HEM fine water circuit temperature setpoint / Temp_setp

TM31

Can be changed: T, U | **Calculated:** - | **Access level:** 3
Data type: FloatingPoint32 | **Dynamic index:** - | **Function diagram:** 7393
P-Group: - | **Unit group:** - | **Unit selection:** -
Not for motor type: - | **Scaling:** - | **Expert list:** 1

Min:	Max:	Factory setting:
10.0 [°C]	50.0 [°C]	40.0 [°C]

Description: Setpoint for the temperature in the converter-side fine water circuit.

Dependency: See also: p32431, p32438, p32439

p32438 HEM thermostat proportional gain / Temp_ctrl Kp

TM31

Can be changed: T, U | **Calculated:** - | **Access level:** 3
Data type: FloatingPoint32 | **Dynamic index:** - | **Function diagram:** 7394
P-Group: - | **Unit group:** - | **Unit selection:** -
Not for motor type: - | **Scaling:** - | **Expert list:** 1

Min:	Max:	Factory setting:
0.000	100.000	0.020

Description: Sets the proportional gain Kp of the thermostat for the 3-way valve.

p32439 HEM thermostat integral time / Temp_ctrl Tn

TM31

Can be changed: T, U | **Calculated:** - | **Access level:** 3
Data type: FloatingPoint32 | **Dynamic index:** - | **Function diagram:** 7394
P-Group: - | **Unit group:** - | **Unit selection:** -
Not for motor type: - | **Scaling:** - | **Expert list:** 1

Min:	Max:	Factory setting:
1.0 [s]	60.0 [s]	22.0 [s]

Description: Sets the integral time Tn of the thermostat for the 3-way valve.

p32440 HEM control valve setpoint / Valve setp

TM31

Can be changed: T, U | **Calculated:** - | **Access level:** 3
Data type: FloatingPoint32 | **Dynamic index:** - | **Function diagram:** 7394
P-Group: - | **Unit group:** - | **Unit selection:** -
Not for motor type: - | **Scaling:** - | **Expert list:** 1

Min:	Max:	Factory setting:
0 [%]	100 [%]	0 [%]

Description: Sets the setpoint for the control valve.
For deactivated "Temperature control" function (p32431.3 = 0), the set setpoint affects the control valve.
This function can be used to test the control valve.

Note
The following applies:
0 % corresponds to internal circulation (flow via plate heat exchanger is 0 %).
100 % corresponds to full cooling capacity (flow via plate heat exchanger is 100 %).

p32441 HEM run-on time / Run-on time

TM31

Can be changed: T, U	**Calculated:** -	**Access level:** 3
Data type: Unsigned32	**Dynamic index:** -	**Function diagram:** 7398
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0 [s]	600 [s]	60 [s]

Description: Sets the run-on time.
After deactivation via binector input p32432[0] = 0-signal, this time acts before the Heat Exchanger Module is switched off.

p32442[0...1] HEM pump run time until automatic switching / Pump t_switch

TM31

Can be changed: T, U	**Calculated:** -	**Access level:** 3
Data type: Unsigned32	**Dynamic index:** -	**Function diagram:** 7395
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
1 [h]	10000 [h]	3 [h]

Description: Sets the run times until automatic switching to the other pump.
Different run times can be selected for the pumps. The different wear on the pumps simplifies preventative maintenance.

Index: [0] = Switching time pump 1 to 2
[1] = Switching time pump 2 to 1

Dependency: Only for Option W01 (p32430.0 = 1).
See also: p32430

p32445 HEM pressure scaling / Pressure scaling

TM31

Can be changed: T	**Calculated:** -	**Access level:** 4
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7395
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0.0 [bar]	30.0 [bar]	30.0 [bar]

Description: Sets the unit scaling for actual pressure values (r32450).
100% corresponds to the set value in bar.

Dependency: See also: p32434, r32450

p32446[0...5] HEM fine water circuit pressure fault limits / Press fault limits

TM31

Can be changed: T, U
Calculated: -
Access level: 4
Data type: FloatingPoint32
Dynamic index: -
Function diagram: 7395, 7396
P-Group: -
Unit group: -
Unit selection: -
Not for motor type: -
Scaling: -
Expert list: 1
Min:
0.0 [bar]
Max:
6.0 [bar]
Factory setting:
[0] 0.1 [bar]
[1] 5.9 [bar]
[2] 0.2 [bar]
[3] 5.9 [bar]
[4] 0.3 [bar]
[5] 3.0 [bar]

Description: Sets the fault limits for the pressure in the converter-side fine water circuit.
If the pressure exceeds or undershoots one of these pressure limits, an appropriate fault is generated.

Index:
[0] = Intake lower threshold
[1] = Intake upper threshold
[2] = Return flow lower threshold
[3] = Return flow upper threshold
[4] = Difference lower threshold
[5] = Difference upper threshold

Dependency: See also: p32442
See also: A53557, F53558

Note
For activated Option W01 (p32430.0 = 1), the violation of a pressure fault threshold causes an alarm to be generated and switching to the second pump. If the second pump also reaches a fault threshold, the Heat Exchanger Module is shutdown.
The alarm is automatically withdrawn for the following cases:
- The associated pump starts without violating fault thresholds (e.g. after reaching the switching time to the redundant pump).
- The Heat Exchanger Module is switched off.

p32447 HEM fine water circuit temperature fault threshold / Temp fault thresh

TM31

Can be changed: T, U
Calculated: -
Access level: 4
Data type: FloatingPoint32
Dynamic index: -
Function diagram: 7397
P-Group: -
Unit group: -
Unit selection: -
Not for motor type: -
Scaling: -
Expert list: 1
Min:
45.0 [°C]
Max:
100.0 [°C]
Factory setting:
58.0 [°C]

Description: Sets the fault threshold for the temperature of the fine water circuit.
If the temperature of the fine water circuit exceeds the set value, an appropriate fault is issued and the Heat Exchanger Module switched off.

Dependency: See also: F53560

p32448 HEM fine water circuit pressure difference suppression time / p_diff t_suppr

TM31

Can be changed: T, U
Calculated: -
Access level: 4
Data type: Unsigned32
Dynamic index: -
Function diagram: 7396
P-Group: -
Unit group: -
Unit selection: -
Not for motor type: -
Scaling: -
Expert list: 1
Min:
0 [s]
Max:
20 [s]
Factory setting:
3 [s]

Description: Sets the suppression time for monitoring the pressure difference in the fine water circuit.
This time acts when starting and switching the pumps.

NOTICE
The monitoring of the pressure difference is deactivated during this time.

r32450[0...2] HEM fine water circuit actual pressure values / Act press values

TM31

Can be changed: -	**Calculated:** -	**Access level:** 3
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7395, 7396
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
- [bar]	- [bar]	- [bar]

Description: Display and connector output for the actual pressure values in the fine water circuit.

Index: [0] = Intake
[1] = Return flow
[2] = Difference between intake and return flow

Dependency: See also: p32445

r32451[0...2] CO: HEM actual temperature values / Temp_ActVal

TM31

Can be changed: -	**Calculated:** -	**Access level:** 3
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7393, 7394, 7397
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** p2006	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
- [°C]	- [°C]	- [°C]

Description: Display and connector output for the actual temperature values.
For index [0]:
Actual temperature value in the converter-side fine water circuit. The sensor is at the intake and is used for actual value sensing for the integrated thermostat.
For index [1]:
The sensor is located behind the control box of the Heat Exchanger Module. It is used for condensation monitoring and condensation prevention.
For index [2]:
Only for activated Option W62 (p32430.1 = 1).
Actual temperature value in the raw water circuit. The sensor is at the intake. The monitoring of the temperature in the raw water circuit reduces failure causes because temperature problems are detected early.

Index: [0] = Fine water circuit
[1] = Cabinet
[2] = Raw water circuit

Dependency: See also: p32430

r32452.0...13 CO/BO: HEM status word 1 / ZSW1

TM31

Can be changed: -	**Calculated:** -	**Access level:** 3
Data type: Unsigned32	**Dynamic index:** -	**Function diagram:** 7390, 7391
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
-	-	-

Description: Display and BICO output for status word 1 of the Heat Exchanger Module.

Bit field:	Bit	Signal name	1 signal	0 signal	FP
	00	Operation	Yes	No	7395, 7396, 7398
	01	Immediate stop active	Yes	No	7398
	02	Ready for switching on	Yes	No	7398
	03	Alarm active	No	Yes	-
	04	Fault active	No	Yes	7398
	05	Run-on time active	Yes	No	7396, 7398
	06	Pump 1 actuated	Yes	No	7396
	07	Pump 2 actuated	Yes	No	7396
	08	Increase temperature setpoint to prevent condensation active	Yes	No	7393
	09	Automatic operation for condensation prevention active	Yes	No	7393, 7398
	10	Control valve setpoint specification active	Yes	No	-
	11	MANUAL operation active	Yes	No	7398
	12	Raw water circuit flow outside tolerance	Yes	No	-
	13	Leakage detected	Yes	No	-

r32453.0...3 CO/BO: HEM status word 2 / ZSW2

TM31

Can be changed: - **Calculated:** - **Access level:** 3
Data type: Unsigned32 **Dynamic index:** - **Function diagram:** 7390, 7392
P-Group: - **Unit group:** - **Unit selection:** -
Not for motor type: - **Scaling:** - **Expert list:** 1
Min: **Max:** **Factory setting:**
- - -

Description: Display and BICO output for status word 2 of the Heat Exchanger Module.

Bit field:	Bit	Signal name	1 signal	0 signal	FP
	00	Pump 1 motor circuit-breaker	Active	Inactive	7398
	01	Pump 2 motor circuit-breaker	Active	Inactive	7398
	02	Pump 1 operation	Active	Inactive	-
	03	Pump 2 operation	Active	Inactive	-

r32454 CO: HEM resulting temperature setpoint / Temp_setp result

TM31

Can be changed: - **Calculated:** - **Access level:** 3
Data type: FloatingPoint32 **Dynamic index:** - **Function diagram:** 7393, 7394
P-Group: - **Unit group:** - **Unit selection:** -
Not for motor type: - **Scaling:** - **Expert list:** 1
Min: **Max:** **Factory setting:**
- [°C] - [°C] - [°C]

Description: Display and connector output for the resulting temperature setpoint.

The setpoint set in p32437 acts generally. For activated "Condensation prevention, increase temperature setpoint" function (p32431.1 = 1), the resulting setpoint can be increased to maximum 45° C.

Dependency: See also: p32431, p32437

r32455 CO: HEM control valve setpoint display / Valve setp disp

TM31

Can be changed: -	**Calculated:** -	**Access level:** 3
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** 7394
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
- [%]	- [%]	- [%]

Description: Display and connector output of the setpoint resulting from the temperature control for the 3-way valve.

Dependency: See also: A53561

NOTICE

The 3-way valve closes automatically to 0% if a wire break between TM31 and the valve is detected (provided the power supply is still active).
In the case of a wire break to the temperature sensor in the fine water circuit, the last active setpoint is retained and an appropriate alarm issued.

Note

The following applies:
0 % corresponds to internal circulation (flow via plate heat exchanger is 0 %).
100 % corresponds to full cooling capacity (flow via plate heat exchanger is 100 %).

p32456[0...2] HEM maintenance intervals / Maint intervals

TM31

Can be changed: T, U	**Calculated:** -	**Access level:** 3
Data type: Unsigned32	**Dynamic index:** -	**Function diagram:** -
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0 [h]	10000 [h]	[0] 0 [h] [1] 2500 [h] [2] 2500 [h]

Description: Sets the time for the individual maintenance intervals.
An appropriate alarm is issued when the times set here are reached.
Procedure when the alarm is initiated:
- Perform the appropriate maintenance.
- Set the operating hours of the associated maintenance to 0 (p32457[x]).

Index: [0] = Heat Exchanger Module
[1] = Pump 1
[2] = Pump 2

Dependency: See also: p32457
See also: A53568

Note

For value = 0, the associated function is deactivated.

p32457[0...5] CO: HEM operating hours / Operating hours

TM31

Can be changed: T, U	**Calculated:** -	**Access level:** 3
Data type: FloatingPoint32	**Dynamic index:** -	**Function diagram:** -
P-Group: -	**Unit group:** -	**Unit selection:** -
Not for motor type: -	**Scaling:** -	**Expert list:** 1
Min:	**Max:**	**Factory setting:**
0.00 [h]	340.28235E36 [h]	0.00 [h]

Description: Display and connector output for the operating hours.
The value can only be set to 0.
Total operating hours:
- Display of the total elapsed operating hours.
- The value for pump 1 or 2 must be reset to 0 after a pump replacement.
Maintenance operating hours:
- Display the elapsed operating hours since the last maintenance.
- After performing the appropriate maintenance, the value must be reset to 0.

Index: [0] = Heat Exchanger Module total
[1] = Heat Exchanger Module maintenance
[2] = Pump 1 total
[3] = Pump 1 maintenance
[4] = Pump 2 total
[5] = Pump 2 maintenance

Dependency: See also: p32456
See also: A53568

Function diagrams

8

Note

This chapter only includes the function diagrams for the HEM Technology Extension.

You can find the product-dependent function diagrams available for SINAMICS in the following reference:

- SINAMICS S120/S150 List Manual, Section "Function diagrams"

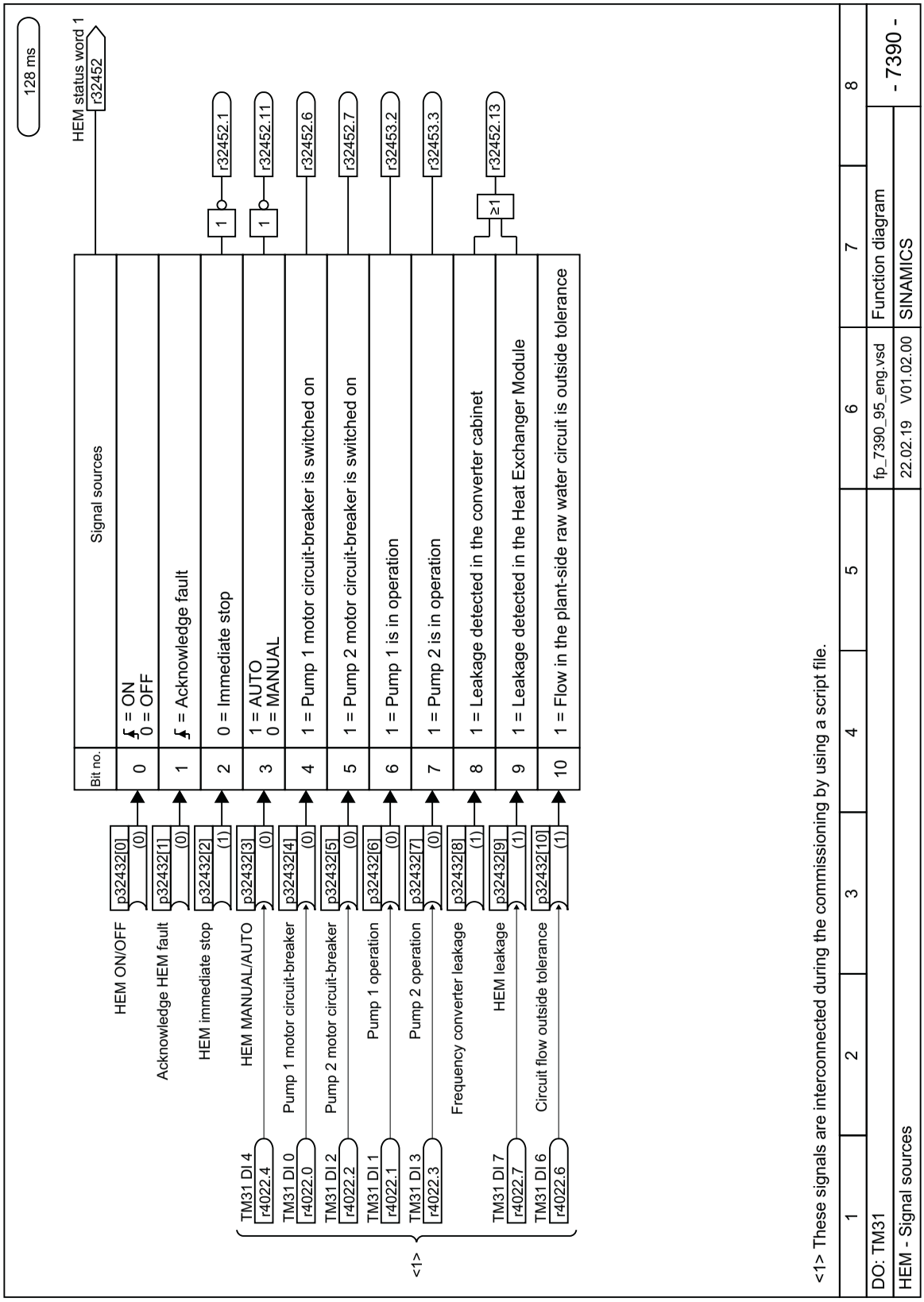


Figure 8-1 7390 - Signal sources

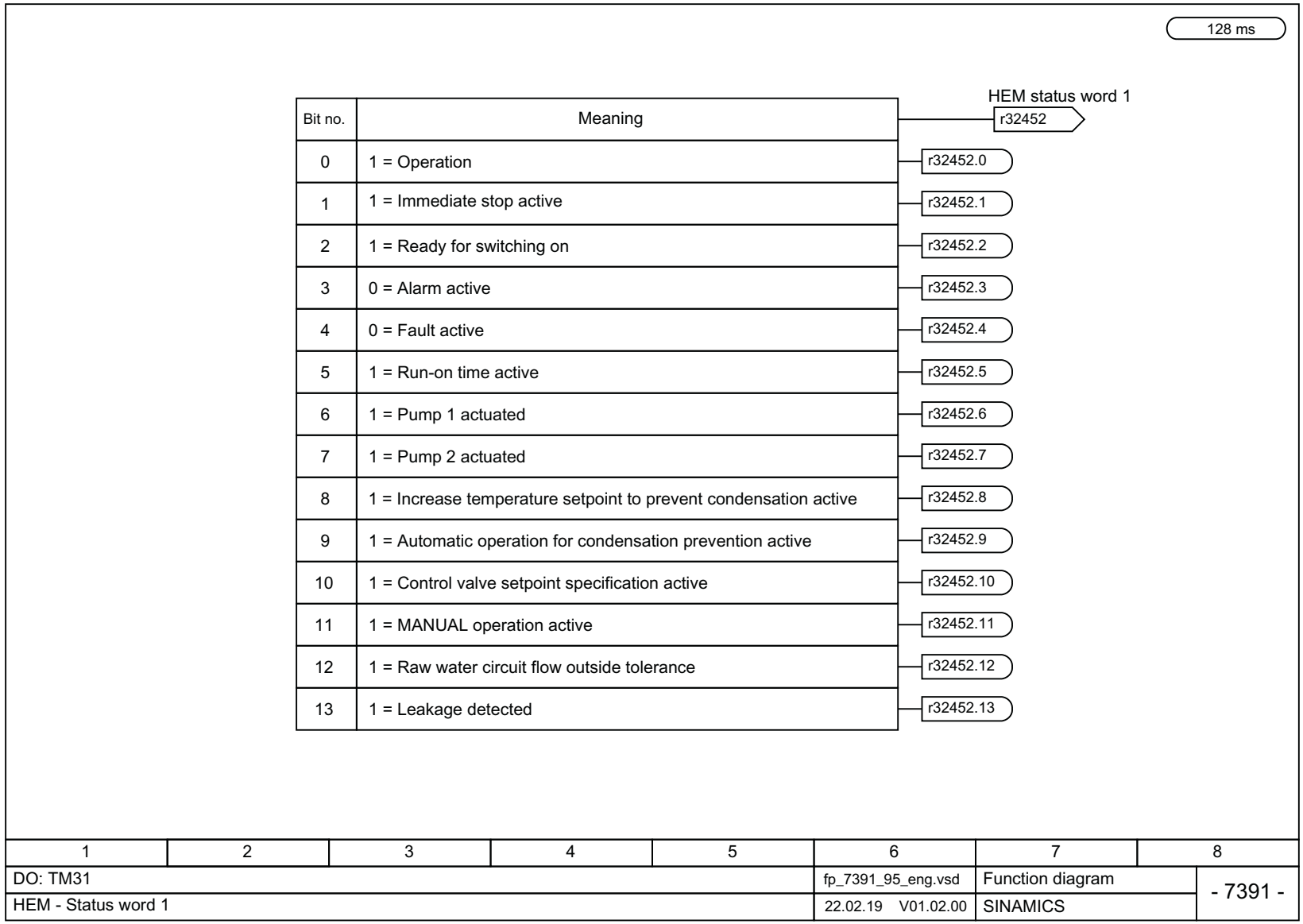


Figure 8-2 7391 – status word 1

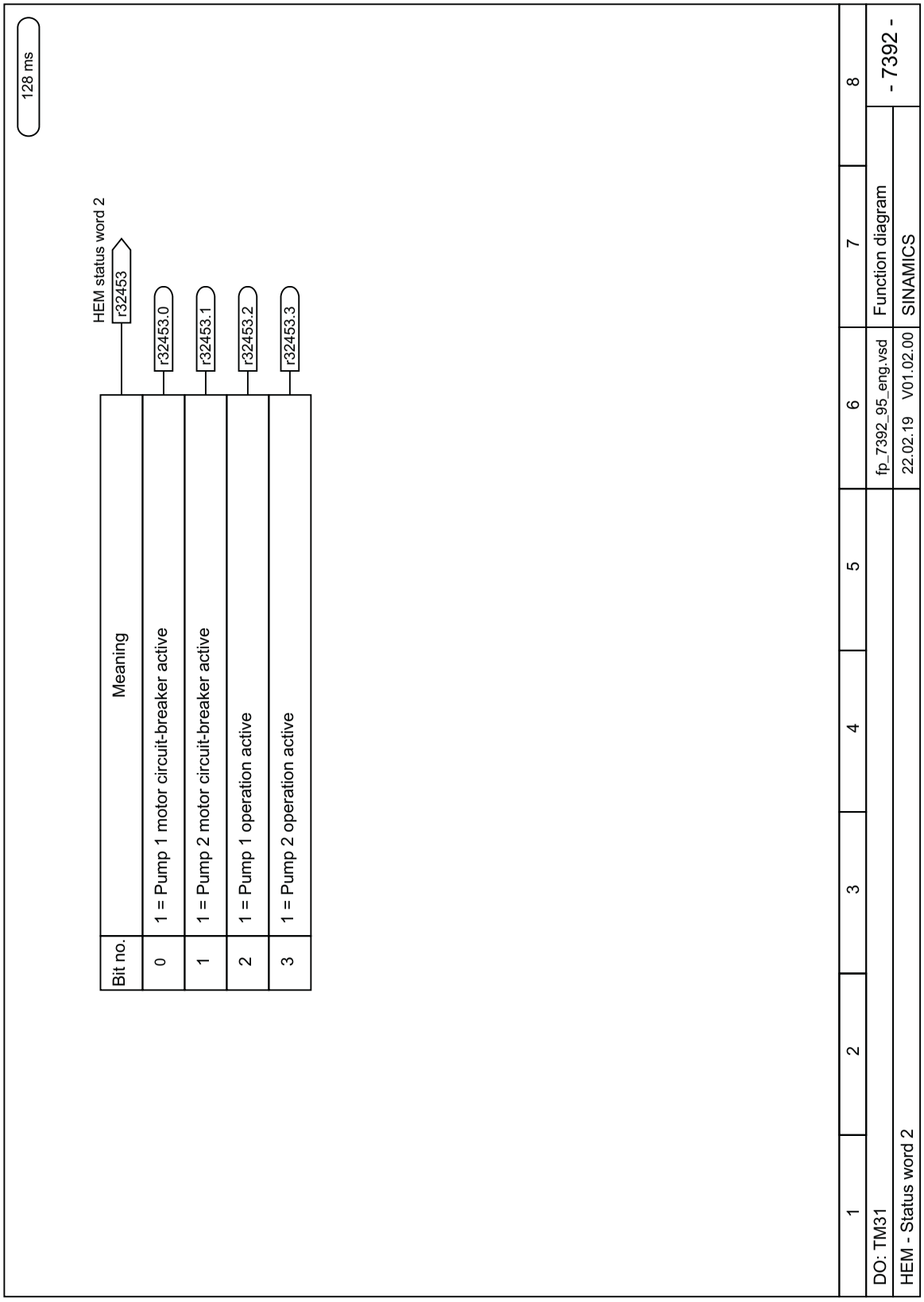


Figure 8-3 7392 - Status word 2

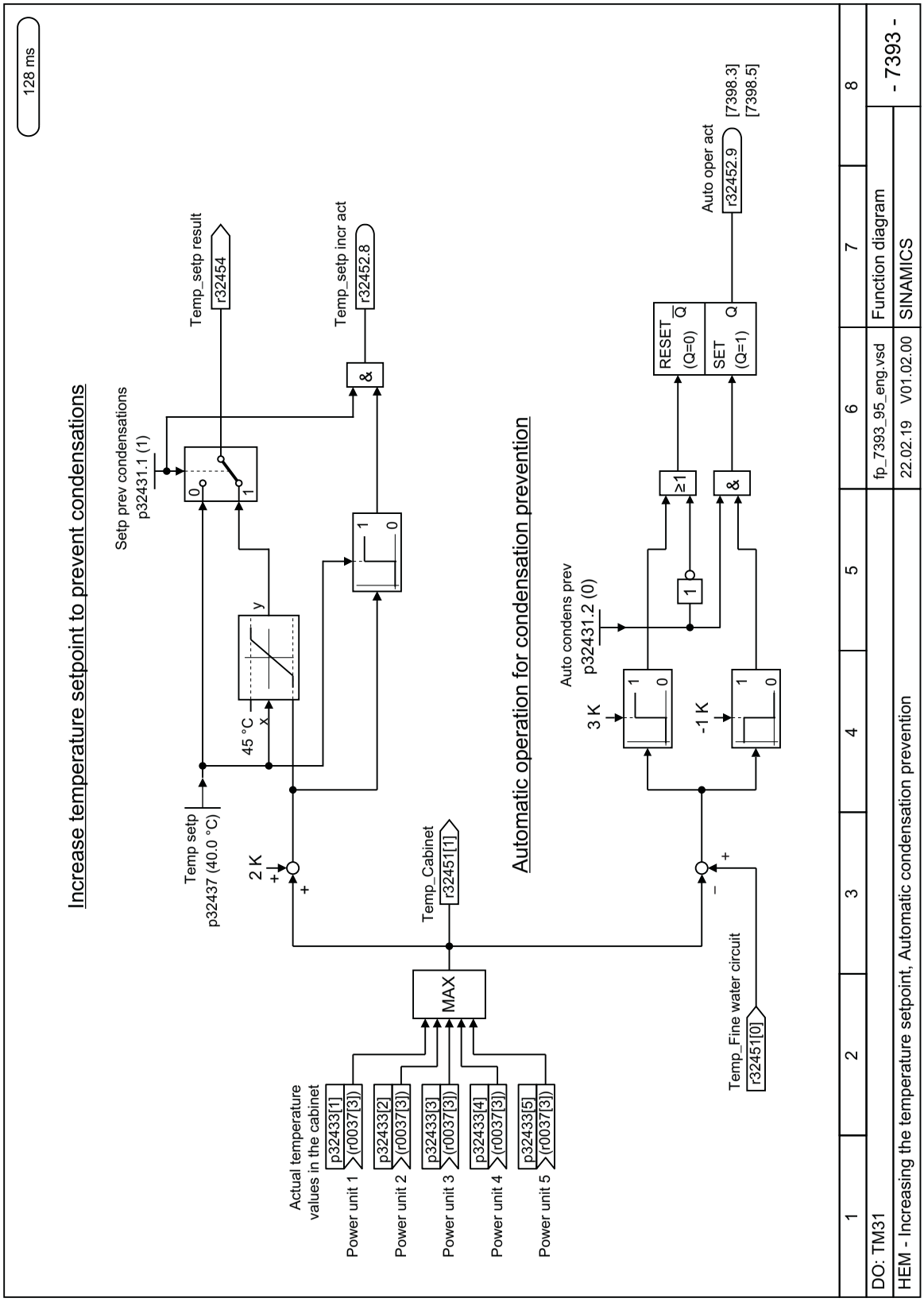


Figure 8-4 7393 - Increasing the temperature setpoint, Automatic condensation prevention.

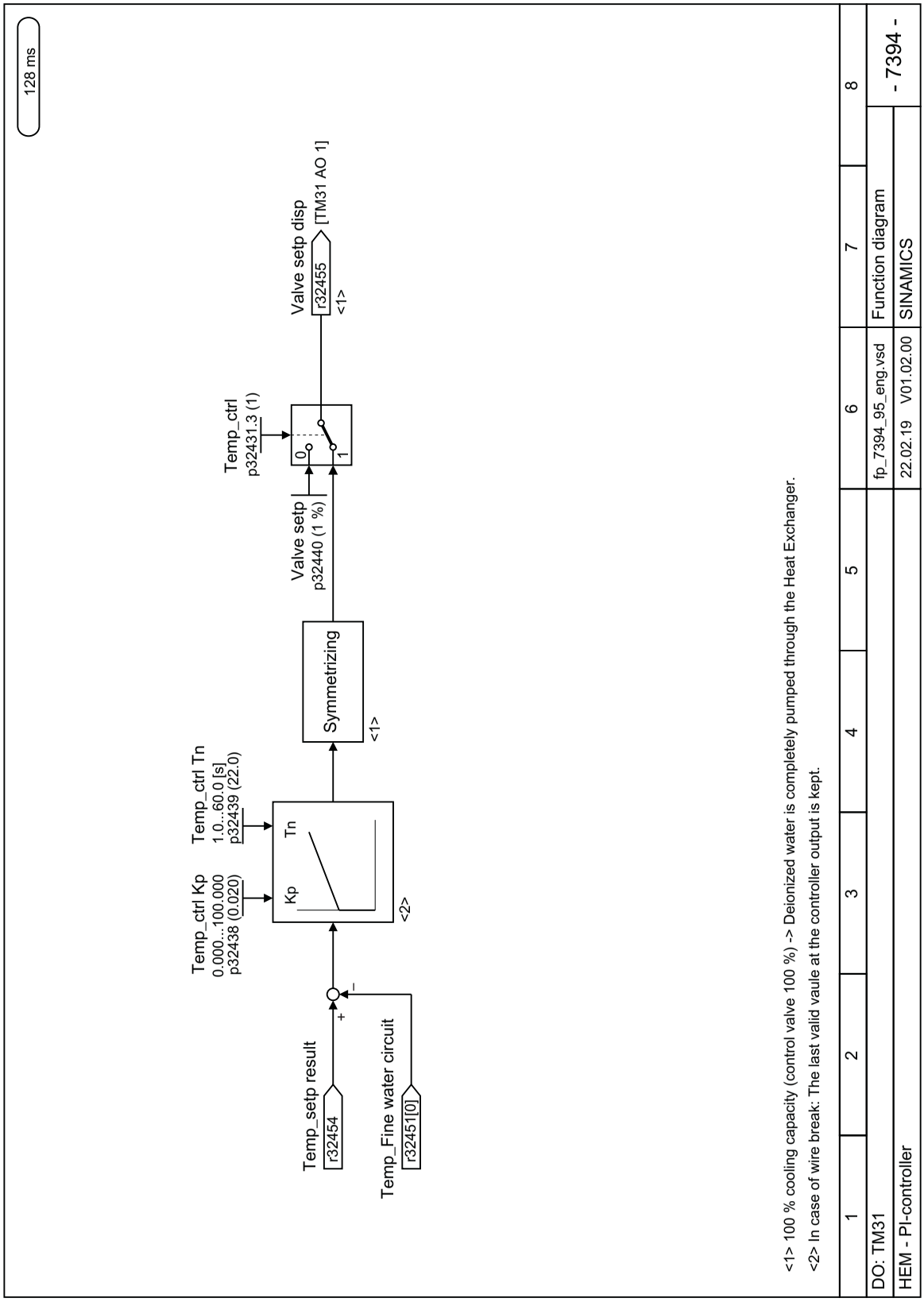
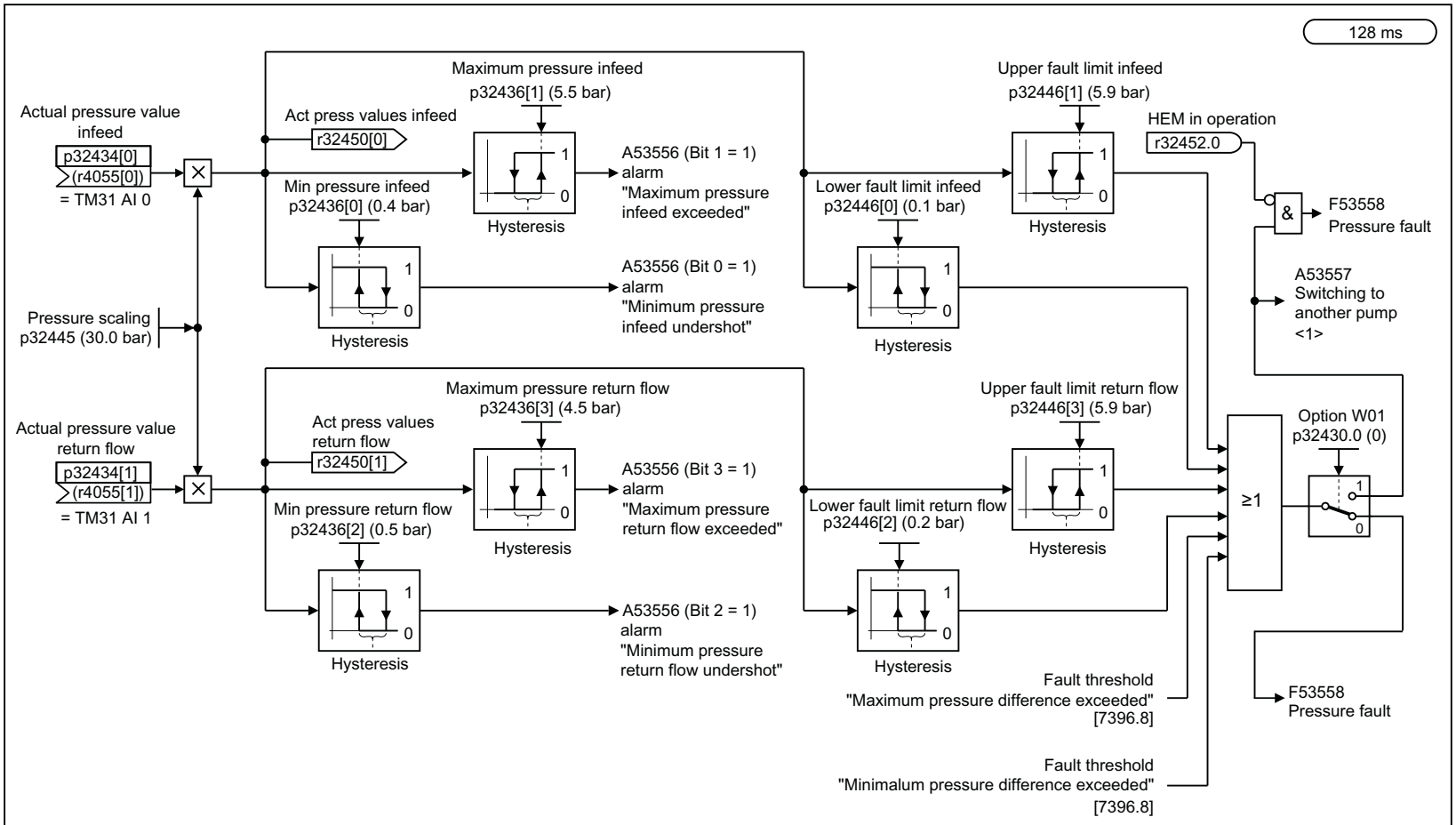


Figure 8-5 7394 - PI-controller



<1> If another pressure failure occurs on the redundant pump, the system is disconnected with F53558. The warning is automatically reset if the affected pump could be connected without a failure (e.g. in the case of a new change, after expiration of the switchover time in p32442).

1	2	3	4	5	6	7	8
DO: TM31					fp_7395_95_eng.vsd	Function diagram	- 7395 -
HEM - Pressure evaluation					22.02.19 V01.02.00	SINAMICS	

Figure 8-6 7395 - Pressure evaluation

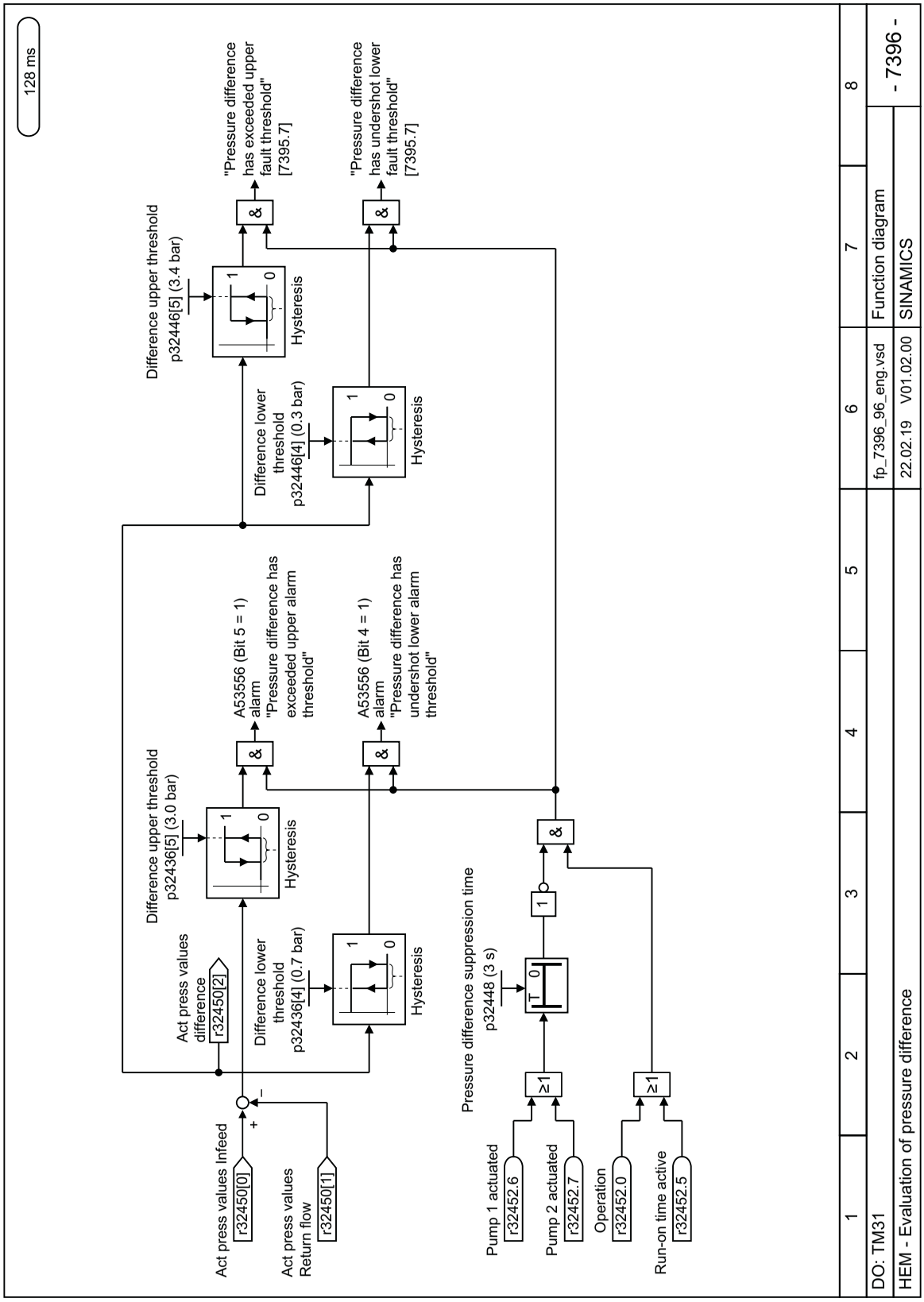
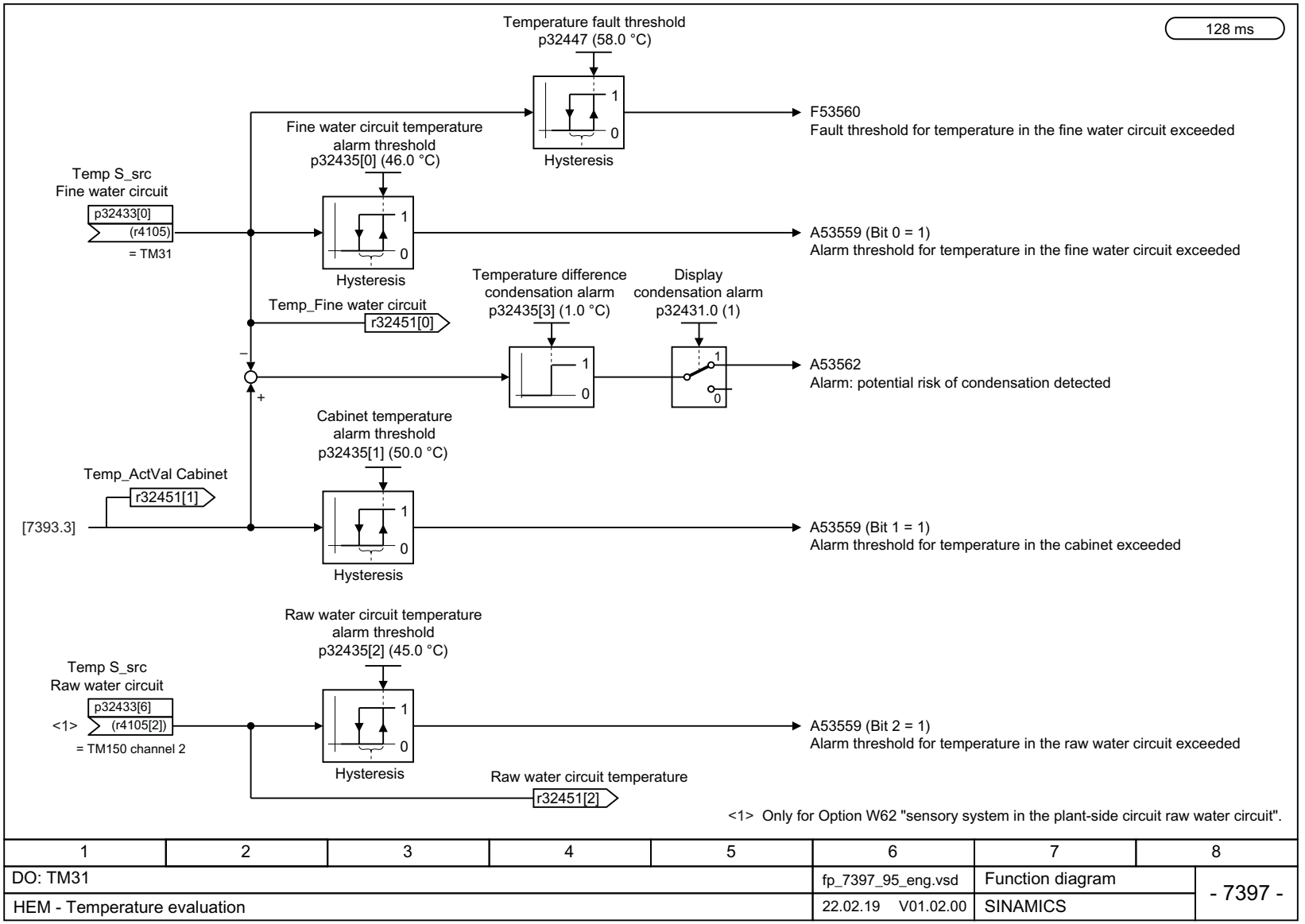


Figure 8-7 7396 - Evaluation of pressure difference



1	2	3	4	5	6	7	8
DO: TM31					fp_7397_95_eng.vsd	Function diagram	- 7397 -
HEM - Temperature evaluation					22.02.19 V01.02.00	SINAMICS	

Figure 8-8 7397 - Temperature evaluation

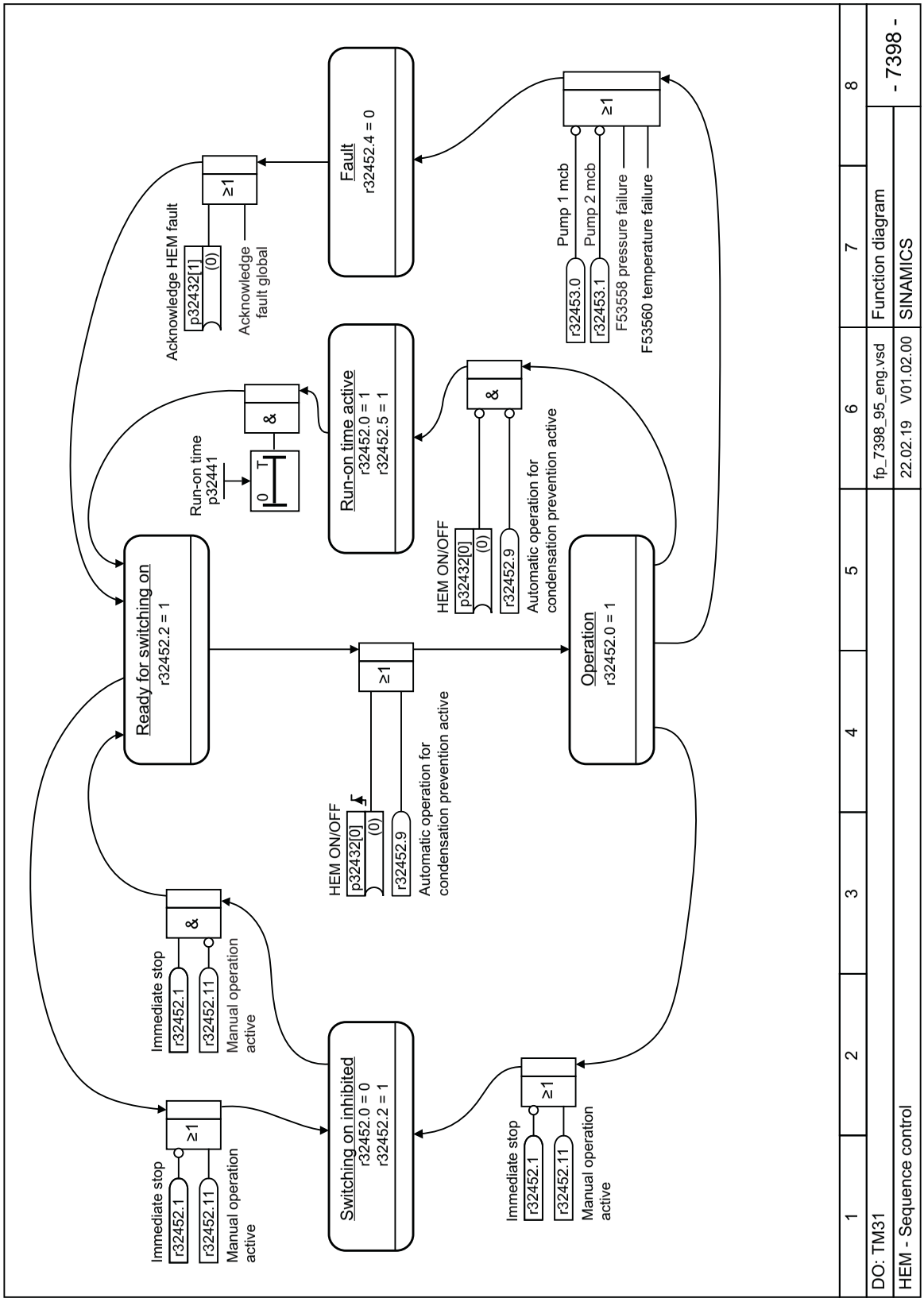


Figure 8-9 7398 - Sequence control

Faults and alarms

9

Overview

Note

An overview of the faults and alarms, especially the explanation of the faults and alarms list, is contained in the product-specific List Manuals, for example:

- SINAMICS S120/S150 List Manual, Chapter "Overview of faults and alarms"

List of faults and alarms

Note

This chapter only includes the messages for the HEM Technology Extension.

You can find information on additional messages that are output (faults, alarms) in the online help for the particular control system or commissioning tool or, for example, in the following reference:

- SINAMICS S120/S150 List Manual, Chapter "List of faults and alarms".

Product: drvoa_hem, Version: 1201200, Language: eng
Objects: A_INF, B_INF, R_INF, S_INF, SERVO, TM31, VECTOR

A53555 HEM Operating mode, MANUAL selected

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: -
Reaction: NONE
Acknowledge: NONE
Cause: The Heat Exchanger Module is in MANUAL operating mode. This is activated by the selection lever on the control box.
Note:
Activation via the HEM Technology Extension is not possible.
Deactivation is not possible when the pressure and temperature thresholds are violated.
HEM: Heat Exchanger Module
Remedy: Not necessary.
The alarm is withdrawn automatically after switching to AUTO operating mode.

A53556 HEM alarm threshold for pressure in the fine water circuit violated

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: Fault cause: %1 bin
Reaction: NONE
Acknowledge: NONE

Cause: A measured quantity in the fine water circuit has undershot or exceeded the set alarm threshold.
Fault cause:
Bit 00 = 1:
The actual pressure value at the intake of the fine water circuit has undershot the lower alarm threshold (p32436[0]).
Bit 01 = 1:
The actual pressure value at the intake of the fine water circuit has exceeded the upper alarm threshold (p32436[1]).
Bit 02 = 1:
The actual pressure value in the return flow of the fine water circuit has undershot the lower alarm threshold (p32436[2]).
Bit 03 = 1:
The actual pressure value in the return flow of the fine water circuit has exceeded the upper alarm threshold (p32436[3]).
Bit 04 = 1:
The pressure difference (intake/return flow) of the fine water circuit has undershot the lower alarm threshold (p32436[4]).
Bit 05 = 1:
The pressure difference (intake/return flow) of the fine water circuit has exceeded the upper alarm threshold (p32436[5]).
Note:
The fault cause is also displayed as alarm value (r2124).
HEM: Heat Exchanger Module
See also: p32434 (HEM fine water circuit actual pressure value signal source), p32436 (HEM fine water circuit pressure alarm thresholds)

Remedy: - Check the associated actual pressure values.
- Check the converter fine water circuit.
- If necessary, adapt the associated alarm threshold (p32436[0...5]).

A53557 HEM fault threshold for pressure violated, switching made to another pump

Drive object: All objects

Message class: Application / technological function faulted (17)

Message value: Fault cause: %1 bin

Reaction: NONE

Acknowledge: NONE

Cause: A fault threshold for the pressure was violated in the fine water circuit. Consequently, switching was made to another pump.
Fault cause:
Bit 00 = 1:
Pump 1 was switched off.
Bit 01 = 1:
Pump 2 was switched off.
Note:
The fault cause is also displayed as alarm value (r2124).
HEM: Heat Exchanger Module

Remedy: - Check the converter fine water circuit pump displayed in the alarm value.
- Check the power supply of the pump displayed in the alarm value.
- This alarm is withdrawn automatically when after the automatic switching (p32442[0...1]) no fault threshold is violated in the pump displayed in the alarm value.

F53558 HEM fault threshold for pressure in the fine water circuit violated

Drive object: All objects

Message class: Application / technological function faulted (17)

Message value: -

Reaction: NONE

Acknowledge: IMMEDIATELY

Cause: A fault threshold for the pressure was violated in the fine water circuit.
In partial-redundant operation (Option W01):
- A fault threshold for the pressure was violated at both pumps.
For operation with one pump:
- A fault threshold for the pressure was violated at pump 1.
Note:
HEM: Heat Exchanger Module
See also: p32430 (HEM ordering options), p32434 (HEM fine water circuit actual pressure value signal source), p32446 (HEM fine water circuit pressure fault limits)

Remedy:
- Check the pumps.
- Check the power supply of the pumps.
- Check the fine water circuit (e.g. leakage, valves).
- See also the alarm value for A53557.

A53559 HEM alarm threshold for temperature exceeded

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: Fault cause: %1 bin
Reaction: NONE
Acknowledge: NONE
Cause: A temperature has exceeded the set alarm threshold.
Fault cause:
Bit 00 = 1:
The temperature at the intake of the fine water circuit has exceeded the alarm threshold (p32435[0]).
Bit 01 = 1:
The internal cabinet temperature has exceeded the alarm threshold (p32435[1]).
Bit 02 = 1:
The temperature in the raw water circuit has exceeded the alarm threshold (p32435[2]).
Note:
The fault cause is also displayed as alarm value (r2124).
HEM: Heat Exchanger Module
See also: p32435 (HEM actual temperature value alarm thresholds), r32451 (HEM actual temperature values)

Remedy:
General:
- Check and correct the cause for the temperature increase (e.g. control valve, raw water circuit).
For bit 00 = 1:
- Check the "Temperature control" function selection (p32431.3).
See also: p32431 (HEM function selection)

F53560 HEM fault threshold for temperature in the fine water circuit exceeded

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: -
Reaction: NONE
Acknowledge: IMMEDIATELY
Cause: The temperature of the fine water circuit has exceeded the fault threshold of 58° C.
Operation of the Heat Exchanger Module is not possible, the pumps are switched off.
Note:
HEM: Heat Exchanger Module
See also: r32451 (HEM actual temperature values)

Remedy: - Check and correct the cause for the temperature increase (e.g. control valve, raw water circuit).
- Check the "Temperature control" function selection (p32431.3).
See also: p32431 (HEM function selection)

A53561 HEM temperature input wire break

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: Fault cause: %1 bin
Reaction: NONE
Acknowledge: NONE
Cause: A wire break in at least one temperature input was detected.
Fault cause:
Bit 00 = 1:
Fine water circuit actual temperature value (p32433[0]).
Bit 01 = 1:
Actual temperature value cabinet 1 (p32433[1]).
Bit 02 = 1:
Actual temperature value cabinet 2 (p32433[2]).
Bit 03 = 1:
Actual temperature value cabinet 3 (p32433[3]).
Bit 04 = 1:
Actual temperature value cabinet 4 (p32433[4]).
Bit 05 = 1:
Actual temperature value cabinet 5 (p32433[5]).
Note:
The fault cause is also displayed as alarm value (r2124).
HEM: Heat Exchanger Module
See also: p32433 (HEM temperature signal source)
Remedy: Check the wiring of the associated temperature sensors.

A53562 HEM potential risk of condensation detected

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: -
Reaction: NONE
Acknowledge: NONE
Cause: The difference between the actual temperature value in the cabinet (r32451[1]) and the actual temperature value in the fine water circuit (r32451[0]) exceeds the set temperature difference (p32435[3]). Consequently, plant condensation is possible.
Note:
HEM: Heat Exchanger Module
See also: p32431 (HEM function selection), r32451 (HEM actual temperature values)
Remedy: - Check the "Increase temperature setpoint to prevent condensation" function selection (p32431.1).
- Check the "Automatic operation for condensation prevention" function selection (p32431.2).
- Check the "Temperature control" function selection (p32431.3).
See also: p32431 (HEM function selection)

A53563 HEM plant-side raw water circuit flow outside the tolerance

Drive object: All objects
Message class: Application / technological function faulted (17)

Message value: -
Reaction: NONE
Acknowledge: NONE
Cause: The flow sensor signals a value outside the set range.
Note:
HEM: Heat Exchanger Module
See also: p32430 (HEM ordering options), p32432 (HEM signal sources)
Remedy: - Check the raw water flow in the plant-side circuit raw water circuit.
- Check the sensor parameterization. The nominal flow for the plant-side circuit raw water circuit is printed on the rating plate of the Heat Exchanger Module.

A53564 (F) HEM converter cabinet leakage detected

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: -
Reaction: NONE
Acknowledge: NONE
Cause: A leakage within the converter cabinet was detected.
Note:
HEM: Heat Exchanger Module
See also: p32432 (HEM signal sources)
Remedy: - Check the converter cabinet for leakage.
- Check the settings and wiring of the evaluation units.
Reaction upon F: NONE
Acknowl. upon F: IMMEDIATELY

A53565 (F) HEM Heat Exchanger Module leakage detected

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: -
Reaction: NONE
Acknowledge: NONE
Cause: A leakage was detected in the Heat Exchanger Module.
Note:
HEM: Heat Exchanger Module
See also: p32432 (HEM signal sources)
Remedy: - Check the Heat Exchanger Module for leakage.
- Check the settings and wiring of the evaluation units.
Reaction upon F: NONE
Acknowl. upon F: IMMEDIATELY

A53566 HEM feedback signal of a motor circuit-breaker missing

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: Fault cause: %1 bin
Reaction: NONE
Acknowledge: NONE

Cause: Partial-redundant operation is no longer possible.
Fault cause:
Bit 00 = 1:
Feedback signal from the motor circuit-breaker of pump 1 missing.
Bit 01 = 1:
Feedback signal from the motor circuit-breaker of pump 2 missing.
Note:
The fault cause is also displayed as alarm value (r2124).
HEM: Heat Exchanger Module
See also: p32430 (HEM ordering options), p32432 (HEM signal sources)

Remedy:
- Check the motor circuit-breaker of the associated pump.
- Check the voltage supply of the associated pump.
- Check the pump.

F53567 HEM motor circuit-breaker feedback signal missing

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: -
Reaction: NONE
Acknowledge: IMMEDIATELY
Cause: For partial-redundant operation (Option W01):
The feedback signals from the motor circuit-breaker of both pumps are missing.
For operation of a single pump:
Feedback signal from the motor circuit-breaker of pump 1 missing.
Note:
HEM: Heat Exchanger Module
See also: p32430 (HEM ordering options), p32432 (HEM signal sources)

Remedy:
- Check the motor circuit-breaker of the pumps.
- Check the power supply of the pumps.
- Check the pump.

A53568 HEM maintenance required

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: Fault cause: %1 bin
Reaction: NONE
Acknowledge: NONE

Cause: At least one maintenance interval (p32456[0...2]) has elapsed. An appropriate maintenance is required.
Fault cause:
Bit 00 = 1:
Maintenance for the Heat Exchanger Module is required.
The operating hours counter for maintenance of the Heat Exchanger Module (p32457[1]) has exceeded the set maintenance interval (p32456[0]).
Bit 01 = 1:
Maintenance for pump 1 is required.
The operating hours counter for maintenance of pump 1 (p32457[3]) has exceeded the set maintenance interval (p32456[1]).
Bit 02 = 1:
Maintenance for pump 2 is required.
The operating hours counter for maintenance of pump 2 (p32457[5]) has exceeded the set maintenance interval (p32456[2]).
Note:
The fault cause is also displayed as alarm value (r2124).
HEM: Heat Exchanger Module
See also: p32456 (HEM maintenance intervals), p32457 (HEM operating hours)

Remedy: - Perform the appropriate maintenance.
- Set the associated operating hours counter for maintenance to 0 (p32457[1, 3, 5]).
See also: p32457 (HEM operating hours)

A53569 HEM immediate stop active

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: -
Reaction: NONE
Acknowledge: NONE
Cause: The immediate stop for the Heat Exchanger Module was activated with the binector input p32432[2] = 0-signal.
Operation of the Heat Exchanger Module is not possible.
Note:
HEM: Heat Exchanger Module
See also: p32432 (HEM signal sources)
Remedy: None required.
This alarm is withdrawn automatically after deselecting the immediate stop (p32432[2] = 1-signal).

F53570 HEM feedback pump in operation missing

Drive object: All objects
Message class: Application / technological function faulted (17)
Message value: -
Reaction: NONE
Acknowledge: IMMEDIATELY
Cause: Despite controlling the motor circuit-breaker via binector input p32432[4], no feedback signal via binector input p32432[6] could be detected.
In partial-redundant operation (option W01, p32430.0 = 1), the feedback signal via binector input p32432[7] is also missing when the second pump is controlled via binector input p32432[5].
Note:
HEM: Heat Exchanger Module
See also: p32430 (HEM ordering options), p32432 (HEM signal sources)
Remedy: - Check wiring (control and feedback).
- Check the motor contactor of the pumps.

A53571 - HEM cabinet temperature signal source missing

Drive object: All objects

Message class: Application / technological function faulted (17)

Message value: -

Reaction: NONE

Acknowledge: NONE

Cause: At least one of the following functions has been selected although no actual temperature value for the cabinet is connected in p32433[1...5]:
- p32431.0: Display condensation alarm
- p32431.1: Increase temperature setpoint to prevent condensation
- p32431.2: Automatic operation for condensation prevention

Note:
HEM: Heat Exchanger Module
See also: p32431 (HEM function selection)

Remedy:
- Interconnect at least one signal source for the temperature in the cabinet in p32433[1...5].
- Deactivate the functions in p32431.

See also: p32431 (HEM function selection), p32433 (HEM temperature signal source)

A53572 HEM temperature control not in the expected range

Drive object: All objects

Message class: Application / technological function faulted (17)

Message value: -

Reaction: NONE

Acknowledge: NONE

Cause: The setpoint of the control valve r32455 has reached limit. The actual temperature value of the fine water circuit in r32451[0] has not changed as expected and deviates by over 3 K from the setpoint.

Possible causes of the fault:
- After upgrading the Technology Extension HEM from V1.1 to V1.2, the direction of action of the control valve was not adjusted.
- Control valve defective.
- Lack of circulation in the raw water circuit (flow insufficient).
- Temperature raw water circuit too warm.

Note:
HEM: Heat Exchanger Module

Remedy:
- Check the direction of action of the Heat Exchanger Module (see r32455).
- Check the parameterization of analog output 0 of Terminal Module TM31.
- Check the control valve.
- Check the raw water circuit
- Contact Technical Support.

Appendix

A

A.1 List of abbreviations

Note

The following list of abbreviations includes all abbreviations and their meanings used in the entire SINAMICS family of drives.

A

Abbreviation	Derivation of abbreviation	Meaning
A…	Alarm	Warning
AC	Alternating Current	Alternating current
ADC	Analog Digital Converter	Analog digital converter
AI	Analog Input	Analog input
AIM	Active Interface Module	Active Interface Module
ALM	Active Line Module	Active Line Module
AO	Analog Output	Analog output
AOP	Advanced Operator Panel	Advanced Operator Panel
APC	Advanced Positioning Control	Advanced Positioning Control
AR	Automatic Restart	Automatic restart
ASC	Armature Short-Circuit	Armature short-circuit
ASCII	American Standard Code for Information Interchange	American coding standard for the exchange of information
AS-i	AS-Interface (Actuator Sensor Interface)	AS-Interface (open bus system in automation technology)
ASM	Asynchronmotor	Induction motor
AVS	Active Vibration Suppression	Active load vibration damping
AWG	American Wire Gauge	American Wire Gauge (Standard for cross-sections of cables)

B

Abbreviation	Derivation of abbreviation	Meaning
BB	Betriebsbedingung	Operation condition
BERO	-	Contactless proximity switch
BI	Binector Input	Binector input
BIA	Berufsgenossenschaftliches Institut für Arbeitssicherheit	BG Institute for Occupational Safety and Health
BICO	Binector Connector Technology	Binector connector technology

Abbreviation	Derivation of abbreviation	Meaning
BLM	Basic Line Module	Basic Line Module
BO	Binector Output	Binector output
BOP	Basic Operator Panel	Basic operator panel

C

Abbreviation	Derivation of abbreviation	Meaning
C	Capacitance	Capacitance
C…	-	Safety message
CAN	Controller Area Network	Serial bus system
CBC	Communication Board CAN	Communication Board CAN
CBE	Communication Board Ethernet	PROFINET communication module (Ethernet)
CD	Compact Disc	Compact disc
CDS	Command Data Set	Command data set
CF Card	CompactFlash Card	CompactFlash card
CI	Connector Input	Connector input
CLC	Clearance Control	Clearance control
CNC	Computerized Numerical Control	Computer-supported numerical control
CO	Connector Output	Connector output
CO/BO	Connector Output/Binector Output	Connector/binector output
COB-ID	CAN Object-Identification	CAN Object Identification
CoL	Certificate of License	Certificate of License
COM	Common contact of a change-over relay	Center contact of a change-over contact
COMM	Commissioning	Commissioning
CP	Communication Processor	Communications processor
CPU	Central Processing Unit	Central processing unit
CRC	Cyclic Redundancy Check	Cyclic redundancy check
CSM	Control Supply Module	Control Supply Module
CU	Control Unit	Control Unit
CUA	Control Unit Adapter	Control Unit Adapter
CUD	Control Unit DC	Control Unit DC

D

Abbreviation	Derivation of abbreviation	Meaning
DAC	Digital Analog Converter	Digital analog converter
DC	Direct Current	Direct current
DCB	Drive Control Block	Drive Control Block
DCBRK	DC Brake	DC braking
DCC	Drive Control Chart	Drive Control Chart
DCN	Direct Current Negative	Direct current negative
DCP	Direct Current Positive	Direct current positive

Abbreviation	Derivation of abbreviation	Meaning
DDC	Dynamic Drive Control	Dynamic Drive Control
DDS	Drive Data Set	Drive Data Set
DHCP	Dynamic Host Configuration Protocol	Dynamic Host Configuration Protocol (Communication protocol)
DI	Digital Input	Digital input
DI/DO	Digital Input/Digital Output	Digital input/output, bidirectional
DIN	Deutsches Institut für Normung	Deutsches Institut für Normung (German Institute for Standardization)
DMC	DRIVE-CLiQ Hub Module Cabinet	DRIVE-CLiQ Hub Module Cabinet
DME	DRIVE-CLiQ Hub Module External	DRIVE-CLiQ Hub Module External
DMM	Double Motor Module	Double Motor Module
DO	Digital Output	Digital output
DO	Drive Object	Drive object
DP	Decentralized Peripherals	Distributed I/O
DPRAM	Dual Ported Random Access Memory	Dual-Port Random Access Memory
DQ	DRIVE-CLiQ	DRIVE-CLiQ
DRAM	Dynamic Random Access Memory	Dynamic Random Access Memory
DRIVE-CLiQ	Drive Component Link with IQ	Drive Component Link with IQ
DSC	Dynamic Servo Control	Dynamic Servo Control
DSM	Doppelsubmodul	Double submodule
DTC	Digital Time Clock	Timer

E

Abbreviation	Derivation of abbreviation	Meaning
EASC	External Armature Short-Circuit	External armature short-circuit
EDS	Encoder Data Set	Encoder data set
EEPROM	Electrically Erasable Programmable Read-Only Memory	Electrically Erasable Programmable Read-Only Memory
EGB	Elektrostatisch gefährdete Baugruppen	Electrostatic sensitive devices
EIP	EtherNet/IP	EtherNet Industrial Protocol (real-time Ethernet)
ELCB	Earth Leakage Circuit Breaker	Residual current operated circuit breaker
ELP	Earth Leakage Protection	Ground-fault monitoring
EMC	Electromagnetic Compatibility	Electromagnetic compatibility
EMF	Electromotive Force	Electromotive force
EMK	Elektromotorische Kraft	Electromotive force
EMV	Elektromagnetische Verträglichkeit	Electromagnetic compatibility
EN	Europäische Norm	European standard
EnDat	Encoder-Data-Interface	Encoder interface
EP	Enable Pulses	Pulse enable
EPOS	Einfachpositionierer	Basic positioner
ES	Engineering System	Engineering system
ESB	Ersatzschaltbild	Equivalent circuit diagram

Abbreviation	Derivation of abbreviation	Meaning
ESD	Electrostatic Sensitive Devices	Electrostatic sensitive devices
ESM	Essential Service Mode	Essential service mode
ESR	Extended Stop and Retract	Extended stop and retract

F

Abbreviation	Derivation of abbreviation	Meaning
F…	Fault	Fault
FAQ	Frequently Asked Questions	Frequently Asked Questions
FBLOCKS	Free Blocks	Free function blocks
FCC	Function Control Chart	Function control chart
FCC	Flux Current Control	Flux current control
FD	Function Diagram	Function diagram
F-DI	Failsafe Digital Input	Fail-safe digital input
F-DO	Failsafe Digital Output	Fail-safe digital output
FEPROM	Flash-EPROM	Non-volatile write and read memory
FG	Function Generator	Function generator
FI	-	Fault current
FOC	Fiber-Optic Cable	Fiber-optic cable
FP	Funktionsplan	Function diagram
FPGA	Field Programmable Gate Array	Field Programmable Gate Array
F-PLC	Fail-safe PLC	Fail-safe PLC
FW	Firmware	Firmware

G

Abbreviation	Derivation of abbreviation	Meaning
GB	Gigabyte	Gigabyte
GC	Global Control	Global control telegram (broadcast telegram)
GND	Ground	Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as M)
GSD	Gerätestammdaten	Device master data: Describe the features of a PROFIBUS slave
GSV	Gate Supply Voltage	Gate supply voltage
GUID	Globally Unique Identifier	Globally Unique Identifier

H

Abbreviation	Derivation of abbreviation	Meaning
HF	High frequency	High frequency
HFD	Hochfrequenzdrossel	Radio frequency reactor
HLA	Hydraulic Linear Actuator	Hydraulic linear actuator

Abbreviation	Derivation of abbreviation	Meaning
HLG	Hochlaufgeber	Ramp-function generator
HM	Hydraulic Module	Hydraulic Module
HMI	Human Machine Interface	Human Machine Interface
HTL	High-Threshold Logic	Logic with high interference threshold
HTTP	Hypertext Transfer Protocol	Hypertext Transfer Protocol (communication protocol)
HTTP	Hypertext Transfer Protocol Secure	Hypertext Transfer Protocol Secure (communication protocol)
HW	Hardware	Hardware

I

Abbreviation	Derivation of abbreviation	Meaning
i. V.	In Vorbereitung	Under development: This property is currently not available
I/O	Input/Output	Input/output
I2C	Inter-Integrated Circuit	Internal serial data bus
IASC	Internal Armature Short-Circuit	Internal armature short-circuit
IBN	Inbetriebnahme	Commissioning
ID	Identifier	Identification
IE	Industrial Ethernet	Industrial Ethernet
IEC	International Electrotechnical Commission	International Electrotechnical Commission
IF	Interface	Interface
IGBT	Insulated Gate Bipolar Transistor	Insulated gate bipolar transistor
IGCT	Integrated Gate-Controlled Thyristor	Semiconductor power switch with integrated control electrode
IL	Impulslöschung	Pulse suppression
IP	Internet Protocol	Internet Protocol
IPO	Interpolator	Interpolator
ISO	Internationale Organisation für Normung	International Standards Organization
IT	Isolé Terre	Non-grounded three-phase line supply
IVP	Internal Voltage Protection	Internal voltage protection

J

Abbreviation	Derivation of abbreviation	Meaning
JOG	Jogging	Jogging

K

Abbreviation	Derivation of abbreviation	Meaning
KDV	Kreuzweiser Datenvergleich	Data cross-check
KHP	Know-how protection	Know-how protection
KIP	Kinetische Pufferung	Kinetic buffering
Kp	-	Proportional gain
KTY84-130	-	Temperature sensor

L

Abbreviation	Derivation of abbreviation	Meaning
L		
L	-	Symbol for inductance
LED	Light Emitting Diode	Light emitting diode
LIN	Linearmotor	Linear motor
LR	Lageregler	Position controller
LSB	Least Significant Bit	Least significant bit
LSC	Line-Side Converter	Line-side converter
LSS	Line-Side Switch	Line-side switch
LU	Length Unit	Length unit
LWL	Lichtwellenleiter	Fiber-optic cable

M

Abbreviation	Derivation of abbreviation	Meaning
M	-	Symbol for torque
M	Masse	Reference potential for all signal and operating voltages, usually defined as 0 V (also referred to as GND)
MB	Megabyte	Megabyte
MCC	Motion Control Chart	Motion Control Chart
MDI	Manual Data Input	Manual data input
MDS	Motor Data Set	Motor data set
MLFB	Maschinenlesbare Fabrikatebezeichnung	Machine-readable product code
MM	Motor Module	Motor Module
MMC	Man-Machine Communication	Man-machine communication
MMC	Micro Memory Card	Micro memory card
MRCD	Modular Residual Current protection Device	Modular Residual Current protection Device
MSB	Most Significant Bit	Most significant bit
MSC	Motor-Side Converter	Motor-side converter
MSCY_C1	Master Slave Cycle Class 1	Cyclic communication between master (class 1) and slave

Abbreviation	Derivation of abbreviation	Meaning
MSR	Motorstromrichter	Motor-side converter
MT	Messtaster	Probe

N

Abbreviation	Derivation of abbreviation	Meaning
N. C.	Not Connected	Not connected
N…	No Report	No report or internal message
NAMUR	Interessengemeinschaft Automatisierungstechnik der Prozessindustrie	User association of automation technology in the process industry
NC	Normally Closed (contact)	NC contact
NC	Numerical Control	Numerical control
NEMA	National Electrical Manufacturers Association	Standardization association in USA (United States of America)
NM	Nullmarke	Zero mark
NO	Normally Open (contact)	NO contact
NSR	Netzstromrichter	Line-side converter
NTP	Network Time Protocol	Standard for synchronization of the time of day
NVRAM	Non-Volatile Random Access Memory	Non-volatile read/write memory

O

Abbreviation	Derivation of abbreviation	Meaning
OA	Open Architecture	Software component which provides additional functions for the SINAMICS drive system
OAIF	Open Architecture Interface	Version of the SINAMICS firmware as of which the OA application can be used
OASP	Open Architecture Support Package	Expands the commissioning tool by the corresponding OA application
OC	Operating Condition	Operation condition
OCC	One Cable Connection	One-cable technology
OEM	Original Equipment Manufacturer	Original equipment manufacturer
OLP	Optical Link Plug	Bus connector for fiber-optic cable
OMI	Option Module Interface	Option Module Interface

P

Abbreviation	Derivation of abbreviation	Meaning
p…	-	Adjustable parameters
P1	Processor 1	CPU 1
P2	Processor 2	CPU 2
PB	PROFIBUS	PROFIBUS
PcCtrl	PC Control	Master control

Abbreviation	Derivation of abbreviation	Meaning
PD	PROFIdrive	PROFIdrive
PDC	Precision Drive Control	Precision Drive Control
PDS	Power unit Data Set	Power unit data set
PDS	Power Drive System	Drive system
PE	Protective Earth	Protective ground
PELV	Protective Extra Low Voltage	Safety extra-low voltage
PFH	Probability of dangerous failure per hour	Probability of dangerous failure per hour
PG	Programmiergerät	Programming device
PI	Proportional Integral	Proportional integral
PID	Proportional Integral Differential	Proportional integral differential
PLC	Programmable Logical Controller	Programmable logic controller
PLL	Phase-Locked Loop	Phase-locked loop
PM	Power Module	Power Module
PMI	Power Module Interface	Power Module Interface
PMSM	Permanent-magnet synchronous motor	Permanent-magnet synchronous motor
PN	PROFINET	PROFINET
PNO	PROFIBUS Nutzerorganisation	PROFIBUS user organization
PPI	Point to Point Interface	Point-to-point interface
PRBS	Pseudo Random Binary Signal	White noise
PROFIBUS	Process Field Bus	Serial data bus
PS	Power Supply	Power supply
PSA	Power Stack Adapter	Power Stack Adapter
PT1000	-	Temperature sensor
PTC	Positive Temperature Coefficient	Positive temperature coefficient
PTP	Point To Point	Point-to-point
PWM	Pulse Width Modulation	Pulse width modulation
PZD	Prozessdaten	Process data

Q

Abbreviation	Derivation of abbreviation	Meaning
No entries		

R

Abbreviation	Derivation of abbreviation	Meaning
r…	-	Display parameters (read-only)
RAM	Random Access Memory	Memory for reading and writing
RCCB	Residual Current Circuit Breaker	Residual current operated circuit breaker
RCD	Residual Current Device	Residual current device
RCM	Residual Current Monitor	Residual current monitor
REL	Reluctance motor textile	Reluctance motor textile

Abbreviation	Derivation of abbreviation	Meaning
RESM	Reluctance synchronous motor	Synchronous reluctance motor
RFG	Ramp-Function Generator	Ramp-function generator
RJ45	Registered Jack 45	Term for an 8-pin socket system for data transmission with shielded or non-shielded multi-wire copper cables
RKA	Rückkühlanlage	Cooling unit
RLM	Renewable Line Module	Renewable Line Module
RO	Read Only	Read only
ROM	Read-Only Memory	Read-only memory
RPDO	Receive Process Data Object	Receive Process Data Object
RS232	Recommended Standard 232	Interface standard for cable-connected serial data transmission between a sender and receiver (also known as EIA232)
RS485	Recommended Standard 485	Interface standard for a cable-connected differential, parallel, and/or serial bus system (data transmission between a number of senders and receivers, also known as EIA485)
RTC	Real Time Clock	Real-time clock
RZA	Raumzeigerapproximation	Space-vector approximation

S

Abbreviation	Derivation of abbreviation	Meaning
S1	-	Continuous operation
S3	-	Intermittent duty
SAM	Safe Acceleration Monitor	Safe acceleration monitoring
SBC	Safe Brake Control	Safe brake control
SBH	Sicherer Betriebshalt	Safe operating stop
SBR	Safe Brake Ramp	Safe brake ramp monitoring
SBT	Safe Brake Test	Safe brake test
SCA	Safe Cam	Safe cam
SCC	Safety Control Channel	Safety Control Channel
SCSE	Single Channel Safety Encoder	Single-channel safety encoder
SD Card	SecureDigital Card	Secure digital memory card
SDC	Standard Drive Control	Standard Drive Control
SDI	Safe Direction	Safe motion direction
SE	Sicherer Software-Endschalter	Safe software limit switch
SESM	Separately-excited synchronous motor	Separately excited synchronous motor
SG	Sicher reduzierte Geschwindigkeit	Safely limited speed
SGA	Sicherheitsgerichteter Ausgang	Safety-related output
SGE	Sicherheitsgerichteter Eingang	Safety-related input
SH	Sicherer Halt	Safe stop
SI	Safety Integrated	Safety Integrated
SIC	Safety Info Channel	Safety Info Channel

Abbreviation	Derivation of abbreviation	Meaning
SIL	Safety Integrity Level	Safety Integrity Level
SITOP	-	Siemens power supply system
SLA	Safely-Limited Acceleration	Safely limited acceleration
SLM	Smart Line Module	Smart Line Module
SLP	Safely-Limited Position	Safely Limited Position
SLS	Safely-Limited Speed	Safely limited speed
SLVC	Sensorless Vector Control	Sensorless vector control
SM	Sensor Module	Sensor Module
SMC	Sensor Module Cabinet	Sensor Module Cabinet
SME	Sensor Module External	Sensor Module External
SMI	SINAMICS Sensor Module Integrated	SINAMICS Sensor Module Integrated
SMM	Single Motor Module	Single Motor Module
SN	Sicherer Software-Nocken	Safe software cam
SOS	Safe Operating Stop	Safe operating stop
SP	Service Pack	Service pack
SP	Safe Position	Safe position
SPC	Setpoint Channel	Setpoint channel
SPI	Serial Peripheral Interface	Serial peripheral interface
SPS	Speicherprogrammierbare Steuerung	Programmable logic controller
SS1	Safe Stop 1	Safe Stop 1 (time-monitored, ramp-monitored)
SS1E	Safe Stop 1 External	Safe Stop 1 with external stop
SS2	Safe Stop 2	Safe Stop 2
SS2E	Safe Stop 2 External	Safe Stop 2 with external stop
SSI	Synchronous Serial Interface	Synchronous serial interface
SSL	Secure Sockets Layer	Encryption protocol for secure data transfer (new TLS)
SSM	Safe Speed Monitor	Safe feedback from speed monitor
SSP	SINAMICS Support Package	SINAMICS support package
STO	Safe Torque Off	Safe torque off
STW	Steuerwort	Control word

T

Abbreviation	Derivation of abbreviation	Meaning
TB	Terminal Board	Terminal Board
TEC	Technology Extension	Software component which is installed as an additional technology package and which expands the functionality of SINAMICS (previously OA application)
TIA	Totally Integrated Automation	Totally Integrated Automation
TLS	Transport Layer Security	Encryption protocol for secure data transfer (previously SSL)
TM	Terminal Module	Terminal Module

Abbreviation	Derivation of abbreviation	Meaning
TN	Terre Neutre	Grounded three-phase line supply
Tn	-	Integral time
TPDO	Transmit Process Data Object	Transmit Process Data Object
TSN	Time-Sensitive Networking	Time-Sensitive Networking
TT	Terre Terre	Grounded three-phase line supply
TTL	Transistor-Transistor-Logic	Transistor-transistor logic
Tv	-	Rate time

U

Abbreviation	Derivation of abbreviation	Meaning
UL	Underwriters Laboratories Inc.	Underwriters Laboratories Inc.
UPS	Uninterruptible Power Supply	Uninterruptible power supply
USV	Unterbrechungsfreie Stromversorgung	Uninterruptible power supply
UTC	Universal Time Coordinated	Universal time coordinated

V

Abbreviation	Derivation of abbreviation	Meaning
VC	Vector Control	Vector control
Vdc	-	DC link voltage
VdcN	-	Partial DC link voltage negative
VdcP	-	Partial DC link voltage positive
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik	Association of Electrical Engineering, Electronics and Information Technology
VDI	Verein Deutscher Ingenieure	Verein Deutscher Ingenieure [Association of German Engineers]
VPM	Voltage Protection Module	Voltage Protection Module
Vpp	Volt peak to peak	Volt peak to peak
VSM	Voltage Sensing Module	Voltage Sensing Module

W

Abbreviation	Derivation of abbreviation	Meaning
WEA	Wiedereinschaltautomatik	Automatic restart
WZM	Werkzeugmaschine	Machine tool

X

Abbreviation	Derivation of abbreviation	Meaning
XML	Extensible Markup Language	Extensible markup language (standard language for Web publishing and document management)

Y

Abbreviation	Derivation of abbreviation	Meaning
No entries		

Z

Abbreviation	Derivation of abbreviation	Meaning
ZK	Zwischenkreis	DC link
ZM	Zero Mark	Zero mark
ZSW	Zustandswort	Status word

Index

7

7390
Signal sources, 60
7391
Status word 1, 61
7392
Status word 2, 62
7393
Increasing the temperature setpoint, Automatic condensation prevention, 63
7394
PI -controller, 64
7395
Pressure evaluation, 65
7396
Evaluation of pressure difference, 66
7397
Temperature evaluation, 67
7398
Sequence control, 68

A

ABC_OA
Activation using STARTER, 19
Installing using SIMOTION SCOUT, 15
Installing using STARTER, 15
Uninstalling using SIMOTION SCOUT, 25
Uninstalling using STARTER, 25
Upgrading using scripting methods, 28
Upgrading using SIMOTION SCOUT, 21
Upgrading using STARTER, 21
Alarms, 69
Application
Heat Exchanger Module, 13

B

BI: HEM signal sources
p32432[0...10], 49

C

CI: HEM fine water circuit actual pressure value signal source
p32434[0...1], 50
CI: HEM temperature signal source
p32433[0...6], 50
CO/BO: HEM status word 1
r32452.0...13, 55
CO/BO: HEM status word 2
r32453.0...3, 56
CO: HEM actual temperature values
r32451[0...2], 55
CO: HEM control valve setpoint display
r32455, 57
CO: HEM operating hours
p32457[0...5], 57
CO: HEM resulting temperature setpoint
r32454, 56
Commissioning
ABC_OA using SIMOTION SCOUT, 20
ABC_OA using STARTER, 20
Heat Exchanger Module, 20, 39
Condensation protection, 36

F

Faults, 69
Function diagrams, 61
Evaluation of pressure difference, 66
Increasing the temperature setpoint, Automatic condensation prevention, 63
PI-controller, 64
Pressure evaluation, 65
Sequence control, 68
Signal sources, 60
SINAMICS product-specific, 59
Status word 2, 62
Temperature evaluation, 67

H

Heat Exchanger Module
Application, 13
Commissioning, 20, 39
Configuration, 40
Functions, 29

List of parameters, 47
Ordering options, 14, 30
Requirements for commissioning, 39
Term, 13
HEM actual temperature value alarm thresholds
p32435[0...3], 51
HEM control valve setpoint
p32440, 52
HEM fine water circuit actual pressure values
r32450[0...2], 55
HEM fine water circuit pressure alarm thresholds
p32436[0...5], 51
HEM fine water circuit pressure difference suppression time
p32448, 54
HEM fine water circuit pressure fault limits
p32446[0...5], 54
HEM fine water circuit temperature fault threshold
p32447, 54
HEM fine water circuit temperature setpoint
p32437, 52
HEM function selection
p32431, 48
HEM maintenance intervals
p32456[0...2], 57
HEM ordering options
p32430, 47
HEM pressure scaling
p32445, 53
HEM pump run time until automatic switching
p32442[0...1], 53
HEM run-on time
p32441, 53
HEM Technology Extension
List of faults and alarms, 69
List of parameters, 47
HEM thermostat integral time
p32439, 52
HEM thermostat proportional gain
p32438, 52

I

Installing Technology Extension
using SIMOTION SCOUT, 15
using STARTER, 15
Interconnect signal sources, 42

L

License key, 14, 39
Licensing, 39
List of faults and alarms, 69

M

Monitoring
Flow in the raw water circuit, 34
Leakage, 33
Maintenance interval, 33
Pressure, 32
Temperature, 31
Wire break, 33

O

OA Support Package (OASP), 15
Ordering options
Heat Exchanger Module, 14

P

Parameters, 47
Pressure monitoring
Differential pressure, 32
Example, 32

R

Requirements
Commissioning the Heat Exchanger Module, 39

S

Safety instructions
General, 9
Industrial Security, 11
STARTER
"Heat Exchanger Module" dialog, 44
Status word 1, 61

T

Technology Extension (TEC), 15
Technology Extension ABC_OA
Activation using STARTER, 19
Commissioning, 20
Uninstalling using SIMOTION SCOUT, 25
Uninstalling using STARTER, 25
Upgrading using scripting methods, 28

Upgrading using SIMOTION SCOUT, 21
Upgrading using STARTER, 21
Temperature control, 35
Temperature monitoring, 31
Term
Heat Exchanger Module, 13

U

Updating
HEM V1.2, 24
Upgrading the Technology Extension
using scripting methods, 28

W

Wire-break monitoring, 33

Additional information

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