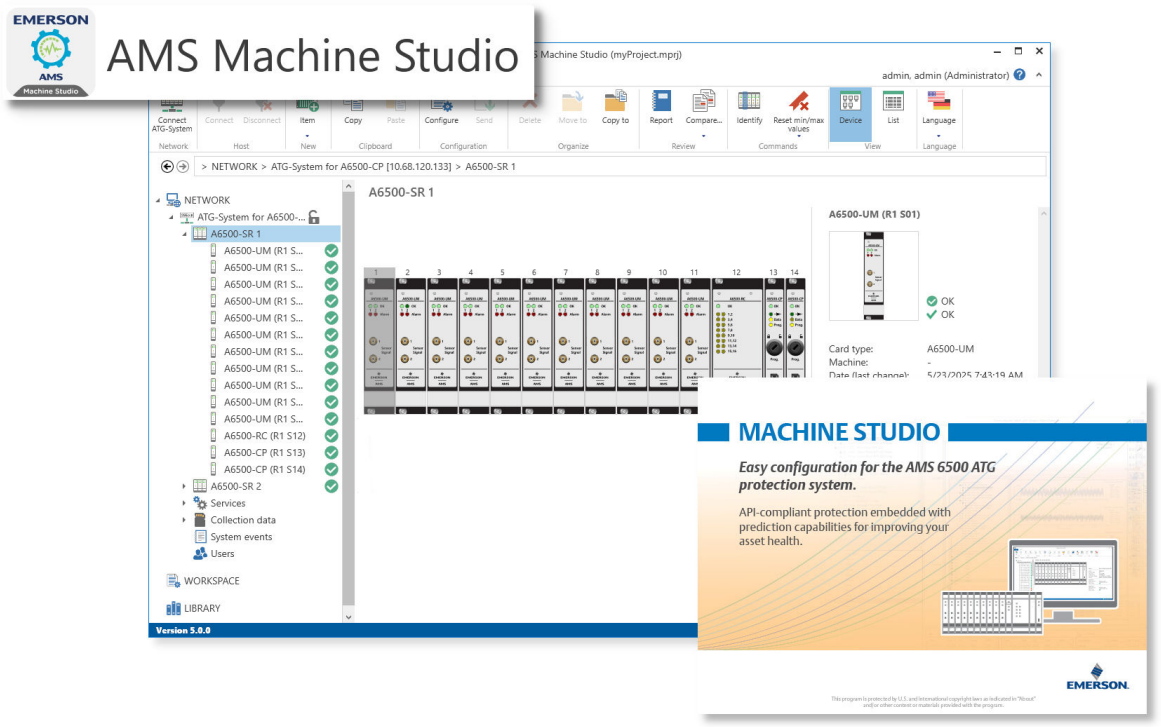
Operating Manual
MHM-97879 , Rev 7.00
August 2026

AMS Machine Studio

General Functions



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The product(s) described in this manual are covered under existing and pending patents.

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1 General

1.1 Using this manual

This operating manual applies for the AMS Machine Studio configuration software version 5.x and the communication cards listed in Table 1-1.

Table 1-1: Communication cards

Communication card	Firmware version
A6500-CC	3.x
A6500-CP	1.x and 5.x

Note
The appearance of AMS Machine Studio and the available functions depend on the communication card used and its firmware version.

Read the operating manual completely before installing and using the software. Comply with all safety instructions.

Include the operating manual when transferring the software to third parties.

Note
When requesting technical support, please indicate type and serial number from the type plate.

Table 1-2 shows a list of documents that are referred to in this operating manual.

Table 1-2: Referenced documents

MHM-97873	Operating Manual A6500-UM Universal Measurement Card
MHM-97874	Operating Manual A6500-TP Temperature Process Card
MHM-97876	Operating Manual A6500-RC Relay Card
MHM-97891	Operating Manual A6500-CP Com Card Pro
MHM-97875	Operating Manual A6500-CC Com Card
MHM-97878	Operating Manual A6500-LC LVDT Converter
MHM-97877	Operating Manual A6500-xR System Racks
MHM-97917	User Guide AMS 6500 ATG Service for AMS Machinery Manager
MHM-97918	AMS 6500 ATG Upgrade Guide
MHM-97884	Operating Manual EZ 1000 Converter for Eddy Current Sensors
MHM-97892	Operating Manual AMS 6500 ATG Dashboard

1.2 Symbols

Note
This symbol marks passages that contain important information.

⚠ CAUTION

This symbol marks operations that can lead to malfunctions, faulty measurements, or data loss, but will not damage the device.

⚠ DANGER

A danger indicates actions that can lead to property damage or personal injury.

1.3 Liability and guarantee

Emerson is not liable for damages that occur due to improper use. Proper use also includes the knowledge of, and compliance with, this document.

Customer changes to the device that have not been expressly approved by Emerson will result in the loss of guarantee.

Due to continuous research and further development, Emerson reserves the right to change technical specifications without notice.

1.4 Technical support

You may need to ship this product for return, replacement, or repair to an Emerson Product Service Center. Before shipping this product, contact Emerson Product Support to obtain a Return Materials Authorization (RMA) number and receive additional instructions.

Product Support

Emerson provides a variety of ways to reach your Product Support team to get the answers you need when you need them:

Phone	Toll free 1 800 833 8314 (U.S. and Canada) +1 512 832 3774 (Latin America) +63 2 8702 1111 (Asia Pacific, Europe, and Middle East)
Email	Guardian.GSC@Emerson.com
Web	http://www.emerson.com/en-us/contact-us

To search for documentation, visit http://www.emerson.com.

To view toll free numbers for specific countries, visit

http://www.emerson.com/technicalsupport.

Note
If the equipment has been exposed to a hazardous substance, a Material Safety Data Sheet (MSDS) must be included with the materials returned. An MSDS is required by law to be available to people exposed to specific hazardous substances.

1.5 Minimum operating requirements

When delivered, the cards of the AMS 6500 ATG system are not configured. Use AMS Machine Studio to configure the cards.

The PC or laptop must meet the following minimum requirements to operate the configuration software and to establish communication to A6500-CC Com Cards or A6500-CP Com Cards Pro installed in an A6500-xR System Rack or to EZ 1000 converters:

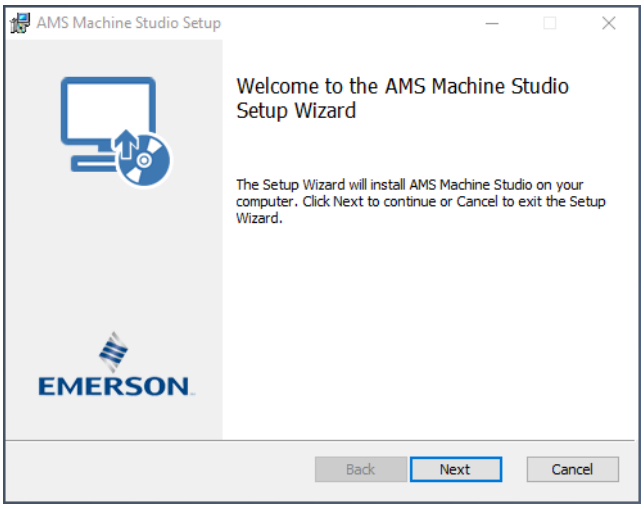
- Standard Business/Office PC
- Communication interface: USB or TCP
- Free space on hard disk: minimum 1 GB
- RAM: minimum 4 GB
- Minimum resolution of 1366 x 768 pixel with text scaling of 100%
- Operating system: any variants of Microsoft Windows 10 and Microsoft Windows 11
- Microsoft Visual C++ 2019 Redistributable (or newer)
- .NET 10.0 (or newer)

1.6 Software installation

Procedure

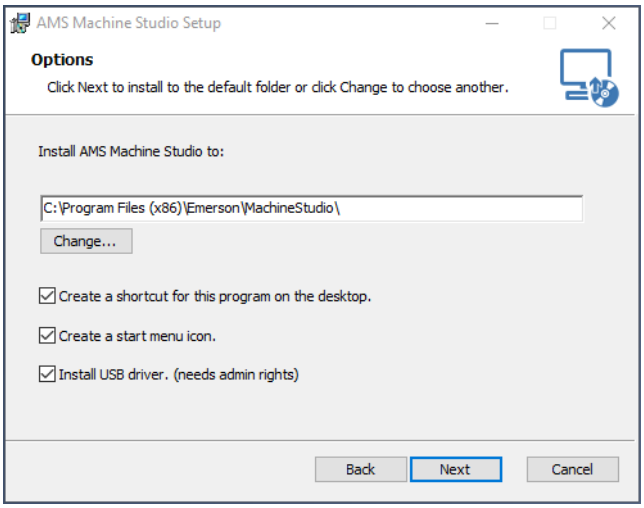
1. Download AMS Machine Studio – if not already done.
   a) Enter http://reliabilitymobile.com/apps/registration/amsms.aspx into the address bar of your internet browser to open the software download portal.
   b) Go to **AMS Machine Studio**, and click **AMS Machine Studio Installer Package** to download the setup file to your computer.
2. Ensure that you are logged on to the computer as an administrator.
3. Unzip the file to an arbitrary location.
4. Click **Machine_Studio_Setup**, and follow the instructions (see Figure 1-1).

Figure 1-1: Setup wizard



Ensure that the option **Install USB drive, (needs admin rights)** is selected in the options dialog:

Figure 1-2: USB driver



The setup installs AMS Machine Studio with all necessary program and data files and places a link on the desktop.

5. Click the AMS Machine Studio icon to start the software from the desktop.

Figure 1-3: Desktop icon



Note
AMS Machine Studio verifies the signature of files loaded during the start up process. There are two types of possible verification errors:

- **Critical verification errors**
  Critical errors prevent the start of AMS Machine Studio.
- **Skippable verification errors**
  Skippable errors are indicated by an error dialog with the possibility to continue the start up process of AMS Machine Studio.

In both cases, Emerson recommends contacting product support. See Technical support.

1.6.1 Third-party software components

This product does not include automated update mechanisms for third-party components. Customers are advised to establish a regular review and patching process to ensure continued security and compliance, as further described in the AMS Product Security Documentation. The below compatibility overview is for informational purposes only and does not indicate active support of such components.

AMS Machine Studio requires Microsoft .NET to operate. During installation, the setup will notify you if .NET is not detected. Install the following version before continuing with the installation process:

- Microsoft .NET 10.0

2 Program overview

Use AMS Machine Studio to configure and operate the AMS 6500 ATG and the EZ 1000 converter. The following devices can be operated with this software:

- **A6500-UM** (component of the AMS 6500 ATG system)
  Universal Measurement Card
- **A6500-TP** (component of the AMS 6500 ATG system)
  Temperature Process Card
- **A6500-RC** (component of the AMS 6500 ATG system)
  Relay Card
- **A6500-CC** (component of the AMS 6500 ATG system)
  Communication Card
- **A6500-CP** (component of the AMS 6500 ATG system)
  Communication Card Pro
- **AMS EZ 1000 Converter**
  Converter for Eddy Current Sensors

All cards (A6500-UM, A6500-TP, A6500-RC, A6500-CC, and A6500-CP) can be operated in the A6500-xR racks – A6500-SR, A6500-RR, or A6500-FR[1]. The computer connects to the protection cards using a USB 2.0 or TCP/IP connection to an A6500-CC Com Card or to an A6500-CP Com Card Pro installed in one of the rightmost slots of the rack.

The AMS EZ 1000 Converter is equipped with an USB 2.0 interface for connecting to a computer.

This operating manual describes the general functions of AMS Machine Studio necessary for the configuration of the devices. The installation and configuration procedure and all necessary information how to operate the devices can be found in the respective operating manuals.

When starting the software, AMS Machine Studio shows the screen of the **Network** level, the ribbon command bar for the selection of functions, and the device tree with all devices connected to the computer. The top left corner of the screen shows the tabs **File** and **Home** (see Figure 2-1) with different commands.

Figure 2-1: Main tabs



File switches to the application window for file and project management and to make general settings. See File for details.

1 *Not all functions of an A6500-CP are available when used in an A6500-FR.*

Home contains several commands to configure the system for measurement functions. See Home for details.

The additional tab **Advanced** includes functions for maintenance such as firmware update and is not visible by default. See Advanced for details.

2.1 File

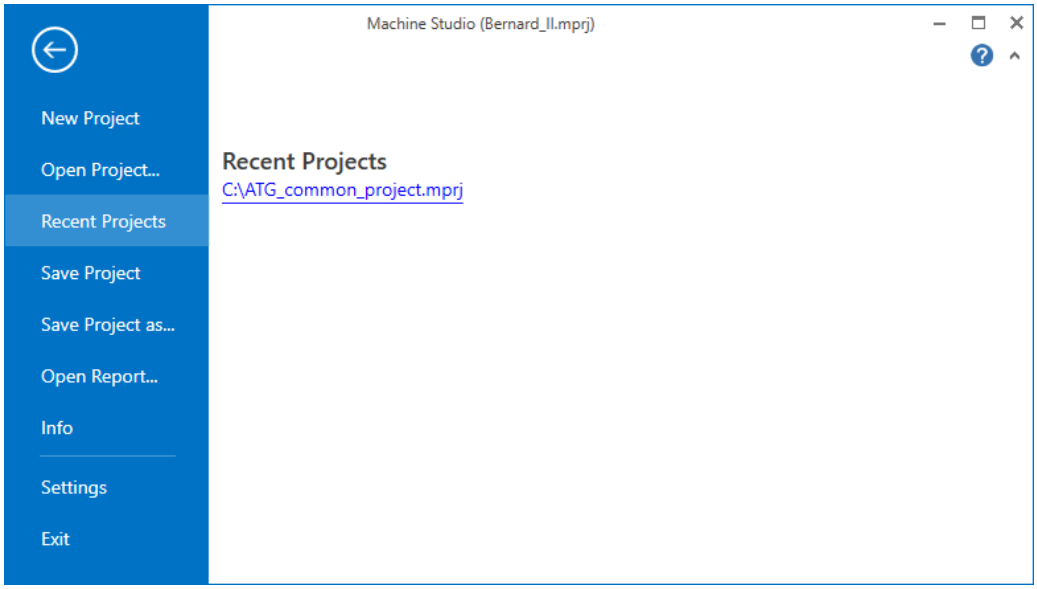
When you start AMS Machine Studio, the program displays the ribbon command bar **Home**. Click **File** in the top left corner of the screen (see Figure 2-2) to display all commands and functions for file and project management, settings, and general information about the software.

Figure 2-2: File



The command list, shown in Figure 2-3, appears at the left side of the screen.

Figure 2-3: File – command list



2.1.1 New Project

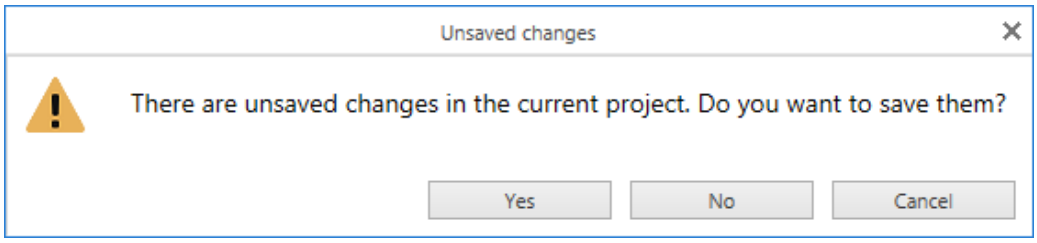
A project can contain online racks (Network) and/or offline racks (Workspace).

To create a new project, select **File > New Project**.

Note
Ensure that a project contains only one AMS 6500 ATG system (one project per communication card, two communication cards in redundant systems) to avoid performance issues in AMS Machine Studio.

If you select **New Project** and you are currently working in a new, unsaved project, AMS Machine Studio prompts you to save your project (see Figure 2-4).

Figure 2-4: Message for saving the currently loaded parameter set



Click **Yes** to save your project. In the browser window, enter a name for your project.

To choose a different directory, browse to a new location. The default location for the file is the **Documents** folder.

Click **Store**. The project is automatically saved with the file extension ***.mprj**.

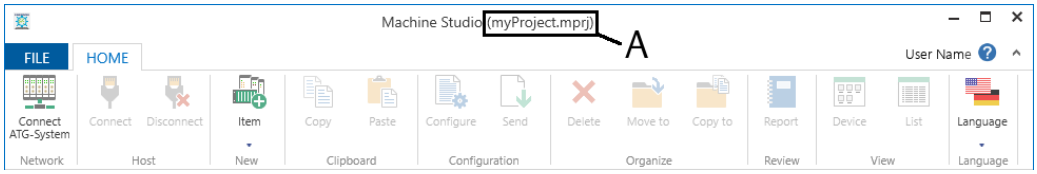
2.1.2 Open Project ...

Opens an existing project from hard disk.

Click **Open Project ...** to open a browser window with a list of available projects. Projects have the file extension ***.mprj**.

Enter the path or navigate to the location of your project. Click the project name and click **Open**. The project is indicated by the project name in the window title (see Figure 2-5).

Figure 2-5: Project name



A. Name of the current project

2.1.3 Recent Projects

The recent project list shows recently stored or edited projects. Click one of the projects to open it.

2.1.4 Save Project

Click **Save Project** to save the current project. The structure of all systems listed under **Network** and **Workspace**, and the configuration of all cards of the systems are stored in the project. The items and systems listed under **Library** are stored per AMS Machine Studio installation and are available for all projects. The configuration of the dashboard running on the A6500-CP card is not stored.

Note
Use projects to back-up your AMS 6500 ATG systems and other devices.

If the project has been saved before, the project is saved.

If the project has not been saved yet, specify the name and path of the project when prompted.

Note
Ensure that a project contains only one AMS 6500 ATG system (one project per communication card, two communication cards in redundant systems) to avoid performance issues in AMS Machine Studio.

2.1.5 Save Project as ...

Save a copy of the current project on hard disk under a different name or in a different directory. A browser window opens to input name and path for saving the project, showing the path of the subdirectory that was previously used to save a project. The permissible length of the name and the permissible characters correspond to the Microsoft Windows conventions. Projects can be saved by using any name and with the file extension *.**mprj**.

Note
Ensure that a project contains only one AMS 6500 ATG system (one project per communication card, two communication cards in redundant systems) to avoid performance issues in AMS Machine Studio.

Enter name and path of the current project and click **Save** to confirmed your input. The display changes to the main application window.

2.1.6 Open Report ...

Click **Open Report ...** to open a report generated with the AMS Machine Studio's report function and saved with the extension *.**prnx**. Files with the extension *.**prnx** could be generated with AMS Machine Studio up to version 2.81.46. From version 2.81.46, files with the extension *.**prnx** could no longer be generated with AMS Machine Studio.

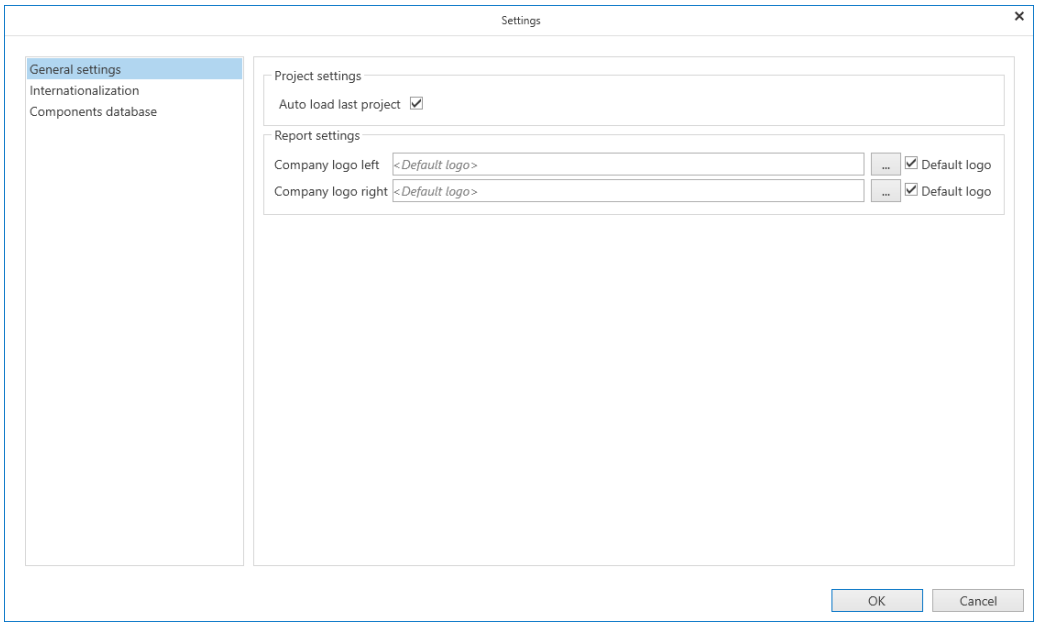
2.1.7 Info

The Info screen shows the version of the installed AMS Machine Studio. Click the blue colored links to open text files with further version and license information. In case of problems with AMS Machine Studio call Emerson Product support and have the number of the installed AMS Machine Studio version ready. See Technical support.

2.1.8 Settings

Click **Settings** to open the dialog for general software settings, internationalization, and for the components database maintenance (see Figure 2-6). After changing the settings, click **OK** to accept the changes and close the dialog. Click **Cancel** to discard changes and close the dialog.

Figure 2-6: Settings



General settings

Project settings

Check the box **Auto load last project** to activate the automatic loading of the last project at program start. If the checkbox is not checked, the program will start in default condition.

Report settings

This field permits placing your company logo on the reports. By default, the headline of the reports contains the default logo, both checkboxes are set.

By removing the checkmarks and clicking on the selection button ... you can select your company logo to place it in the left or right corner of the headline.

For a report without any logo, uncheck both boxes and leave the entry fields empty.

When you have selected your logo, click **OK**. The program returns to the **Home** screen.

Internationalization

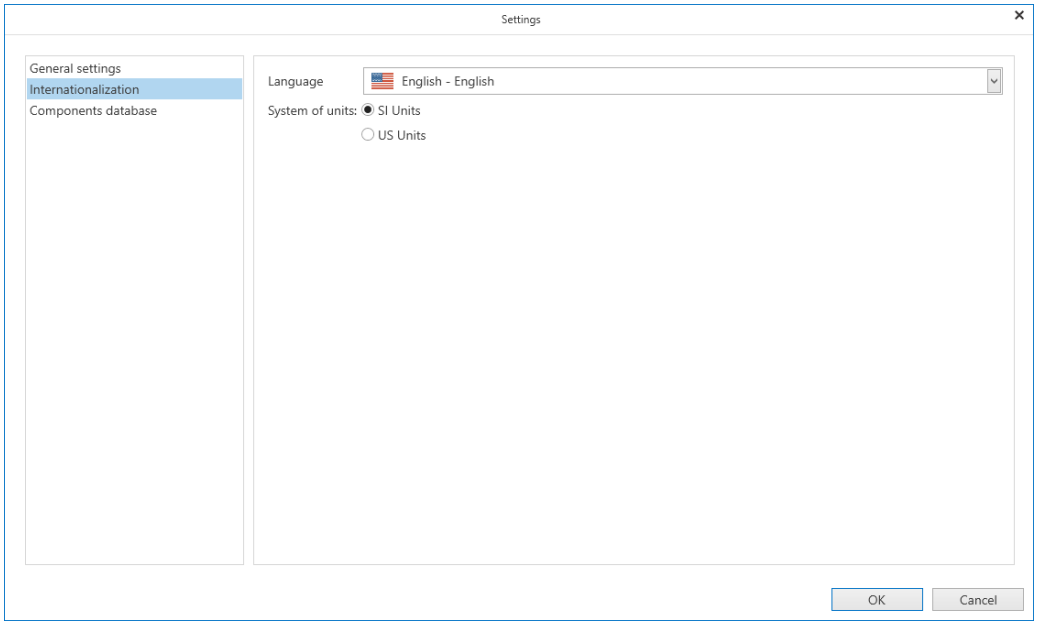
Select the language and the system of units (see Figure 2-7). The following languages are available:

- German
- English
- Chinese (Simplified)
- Russian

The selected language applies for all commands and texts that appear in AMS Machine Studio.

For measuring units, you may select between the International Metric System of units (SI units) and the Anglo-American system of units (US units). This selection does not change the unit system of the Modbus and OPC UA data, it is always in SI units.

Figure 2-7: Language settings and system units



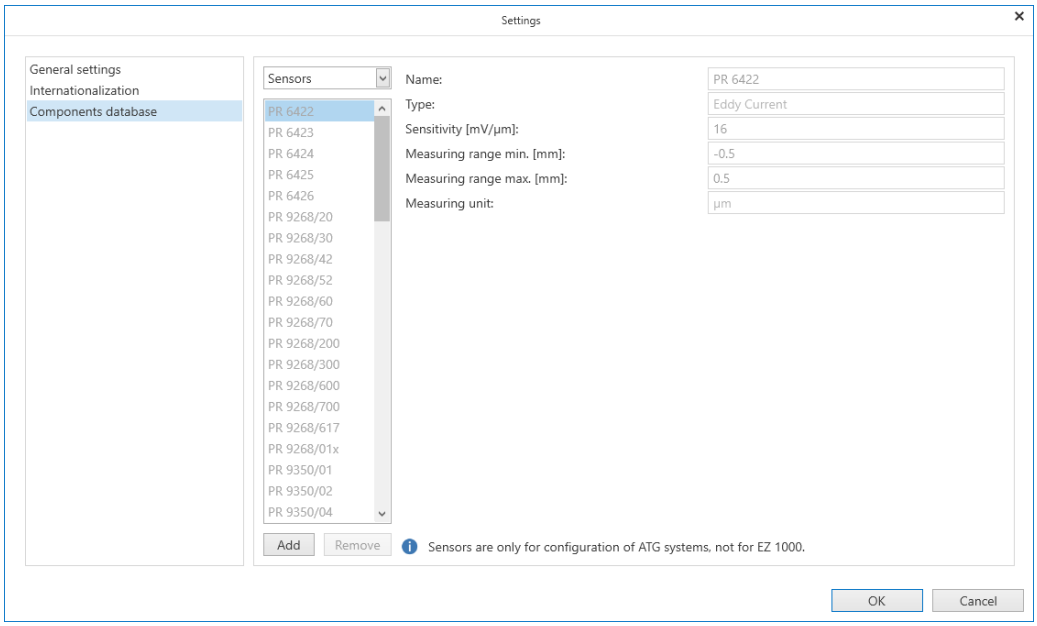
Make your choice, and confirm the selection by clicking **OK**.

Components database

You can add or remove components from the internal database. The database includes sensors, signal converters, Zener barriers, and target materials used for the configuration of the measurement functions. All components shown here will be proposed for selection in menu **Configuration** → **Input** → **Sensor** → **Select component**, depending on the measuring task. The target materials are selectable during the AMS EZ 1000 Converter configuration.

Select a group (**Sensors**, **Converters**, **Zener barriers**, or **Material**) from the drop-down list to show all element of this group in the field below.

Figure 2-8: Components data base



The groups **Sensors** and **Converters** contain all types of sensors and converters required for configuring the AMS 6500 ATG system such as:

- Hall effect sensors
- Inductive half bridge sensors
- Low frequency seismic sensors
- Piezoelectric sensors
- LVDTs and differential transformers
- Seismic sensors
- VR sensors, also known as magnetic pickups (MPUs)
- Eddy current sensors and signal converters

Add a new component

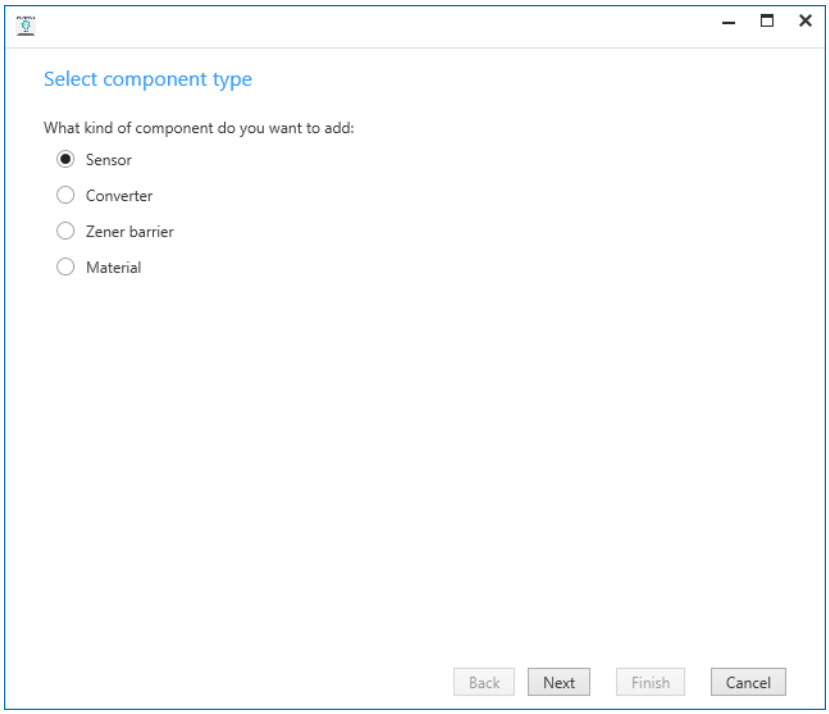
If the used sensor, converter, Zener barrier or material is not listed, add it to the database as a custom component.

Note
Ensure that the specification of the new component meets the requirements of the AMS 6500 ATG system.

Procedure

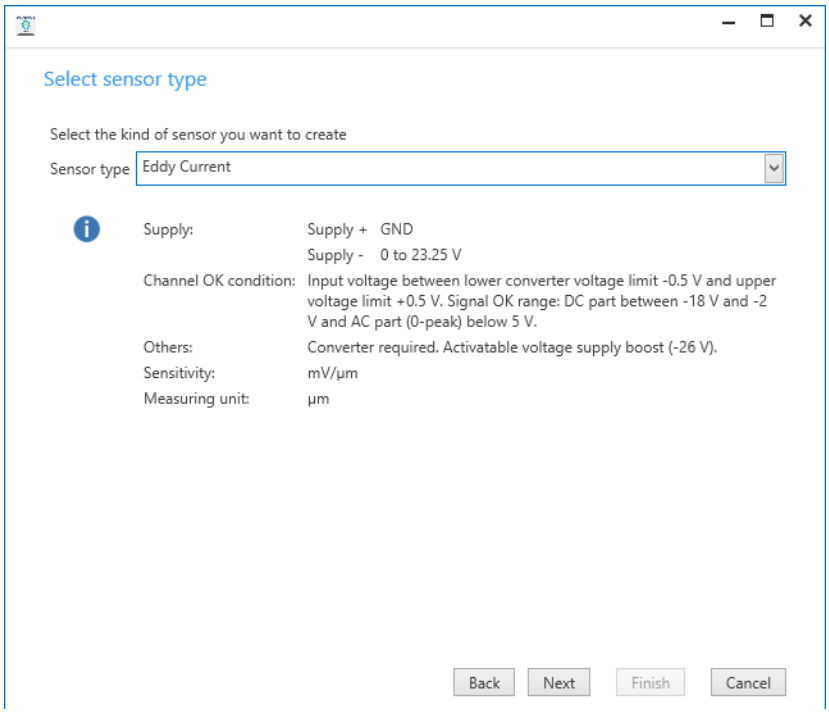
1. Click **Add** to add a new component to the list.

Figure 2-9: Select a component type



2. Select a component type, and click **Next**.
3. If **Sensor** has been selected, select a sensor type from the drop down list, and click **Next**. Otherwise continue with Step 4.

Figure 2-10: Select a sensor type



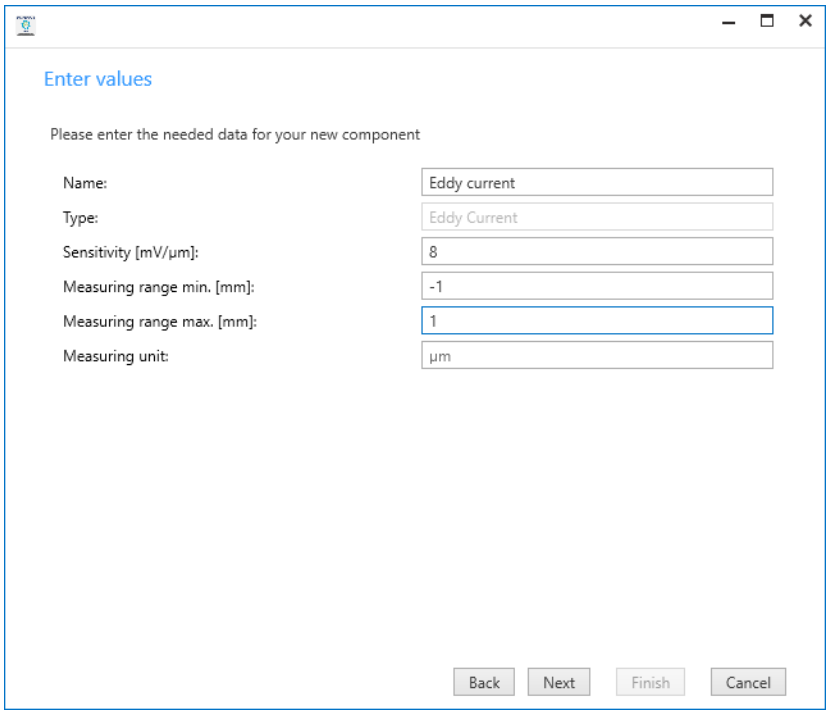
The sensor type **Voltage Input** mainly differs from the other sensor types in selectable measuring units and two supply options (positive voltage or current). Use this sensor type to connect sensors or voltage input signals that are not covered by the other sensor types.

Note
Select **Eddy Current (EZ)** if adding an eddy current sensor other than an AMS EZ 1000 Sensor to be used with an AMS EZ 1000 Converter.

4. Enter the values for the selected component, and click **Next**.

   The available parameters depend on the selected component.

Figure 2-11: Example – dialog for entering values



5. Click **Next**, check the entered data, and place a checkmark in the box **Data is correct** to confirm the input. Click **Finish** to add the new component to the database.

⚠ CAUTION

When adding new sensors, ensure that correct data is entered. The sensor data is the basis for a proper measurement function.

Entering incorrect data may cause measuring errors and as a consequence unwanted shutdowns or unrecognized dangerous situations. To avoid this, closely verify the technical specifications from the data sheet of the new device.

Note
Once the new component is added to the database it is not possible to change the entered values.

The new component can be used for the configuration of your protection functions.

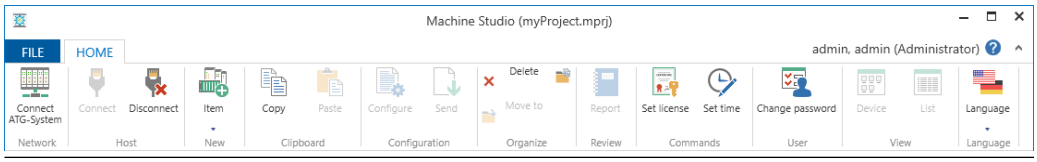
To remove a component, select the corresponding type in the component list, and click **Remove**. The selected type number disappears from the list of components.

Note
Only the custom components, shown in black, can be removed. The default components, shown in gray, can neither be removed nor changed.

2.2 Home

This ribbon contains buttons for direct access to frequently used functions. The commands are described in the following chapters.

Figure 2-12: Home

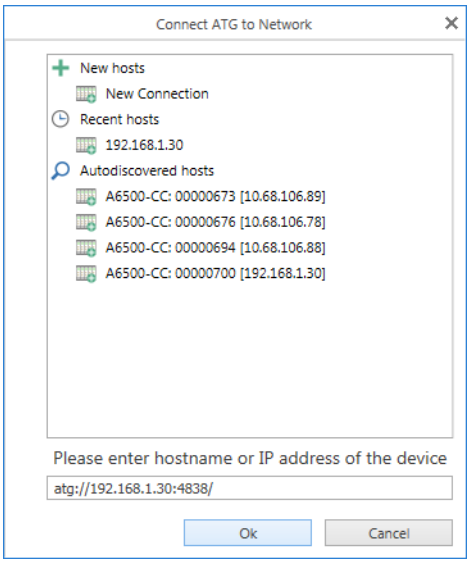


Some buttons are inactive and can only be clicked when a card or a converter is selected in the device tree. The command buttons depend on the selected card and are described in the respective card manual.

2.2.1 Connect ATG-System

Communication starts automatically when there is a USB connection between PC and A6500-CC Com Card or A6500-CP Com Card Pro. Click **Connect ATG-System** to connect to AMS 6500 ATG systems connected to a TCP/IP network.

Figure 2-13: Dialog Connect ATG-System

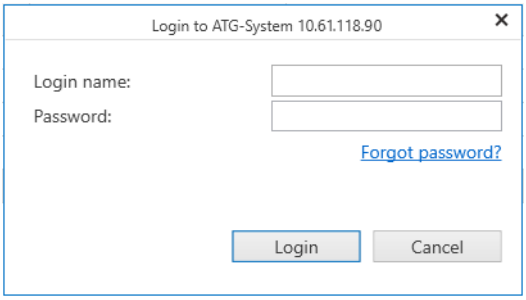


Note

At new installations, the communication between computer and AMS 6500 ATG through the USB interface will start automatically when you switch on the supply voltage for the AMS 6500 ATG or when you connect a USB cable between the PC and communication card installed in an already powered rack.

The connection to an AMS 6500 ATG system via an A6500-CP Com Card Pro is protected. The login dialog appears if a connection to an A6500-CP card is detected. Enter your login credentials to get access to the connected AMS 6500 ATG system.

Figure 2-14: Login dialog



By default, an administration account with the following login data is available:

Table 2-1: Default administration account – login data

Login name	Password
admin	admin

Note
The change of the standard password of the default administration account is required at the first login.

For more information about the user management see A6500-CP Com Card Pro – User management.

Refer to New network connection to change communication settings.

2.2.2 Connect

Click **Connect** to reestablish a communication between computer and the A6500-CC Com Card or the A6500-CP Com Card Pro. Use this command if the device has been disconnected by the command **Disconnect** (see Disconnect). This applies to TCP/IP interfaces of the communication card. For how to establish a new connection to an AMS 6500 ATG through the TCP interface see New network connection.

At new installations, the communication between computer and rack via the USB interface starts automatically without any software command when you switch on the supply voltage for the rack or when you connect the USB cable between PC and communication card.

Figure 2-15: Connect



The dialog for entering login data opens when connecting to an A6500-CP card.

See Communication for further communication details.

2.2.3 Disconnect

Disconnect is active when you select a connected AMS EZ 1000 Converter or a connected AMS 6500 ATG in the device tree.

Click **Disconnect** to interrupt the communication between computer and device, and to log out the current user.

Figure 2-16: Disconnect



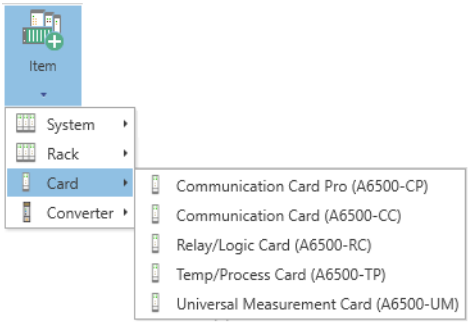
2.2.4 Item

Click **Item** to add new systems, racks, cards, or converters for offline configuration to **Workspace** in the device tree. A menu opens and shows a list of devices available for selection.

New devices are arranged in the same order as they are added below **Workspace**. To add a new card to an already added rack, select this rack before adding the new card.

Note
The offline configuration options of added items are always based on their latest firmware version.

Figure 2-17: Card



Unconfigured devices are marked with the **No config** sign . For details on the offline configuration, refer to Offline configuration. For item details see respective operating manual.

Select **Systems** to add an ATG system depending on the used communication card including services below **Workspace**. The following options are available:

ATG-System for A6500-CC	ATG system with A6500-CC Com Card(s). The system includes the following services: • Collection tasks • Modbus • OPC UA • SNTP client
ATG-System for A6500-CP	ATG system with A6500-CP Com Card(s) Pro and firmware version 5.x (FW 5.x). The system includes the following services: • Data collections • AMS Machine Works • Modbus • OPC UA • Web server • Date and time • Audit log

Select the added ATG system to add racks and cards. The number of cards that can be added depends on the added rack types. The use of different types of communication cards within an ATG system is not possible.

To name the new AMS 6500 ATG system, open the configuration of the A6500-CC Com Card or the A6500-CP Com Card Pro and enter a name or description in field **Configuration → Basic → System name**. See operating manual of the communication cards for details.

2.2.5 Copy

Click **Copy** to copy the selected converters, cards, or whole racks including configuration to the clipboard. The copy function can be used for systems, racks, cards, and converters. Copying of devices could be useful when you want to install several cards of the same type in one rack or to copy complete racks.

Figure 2-18: Copy



2.2.6 Paste

Select a location where to paste the clipboard content and click **Paste**. The location can be anywhere in the tree. The content to be copied depends on the selected location. See Table 2-2.

Figure 2-19: Paste



Table 2-2: Copy / Paste

Copied from	Paste to (selected possible location)	Copied content
Device[1] below **Network**	Same device type below **Network**	Configuration is copied to the selected device[2]
	Workspace	Device including configuration is added below **Workspace**
	Same device type below **Workspace**	Configuration is copied to the selected device[2]
	Rack below **Workspace**[3]	Card including configuration is added to the rack
	Library	Device including configuration is added below **Library**
	Same device type below **Library**	Configuration is copied to the selected device[2]
	Rack below **Library**[3]	Card including configuration is added to the rack
Device[1] below **Workspace**	**Workspace**	Device including configuration is added below **Workspace**
	Same device type below **Workspace**	Configuration is copied to the selected device[2]
	Rack below[3] **Workspace**	Card including configuration is added to the rack
	Same device type below **Network**	Configuration is copied to the selected device[2]
	Library	Device including configuration is added below **Library**
	Same device type below **Library**	Configuration is copied to the selected device[2]
	Rack below **Library**[3]	Card including configuration is added to the rack
Device[1] below **Library**	See "Device below **Workspace**"	
Rack or ATG-System below **Network**	**Workspace**	Rack including cards and configuration is added below **Workspace**
	Library	Rack including cards and configuration is added below **Library**

Table 2-2: Copy | Paste *(continued)*

Copied from	Paste to (selected possible location)	Copied content
Rack or ATG-System below **Workspace**	**Library**	Rack including cards and configuration is added below **Library**
Rack or ATG-System below **Library**	See "Rack or ATG-System below **Workspace**"	

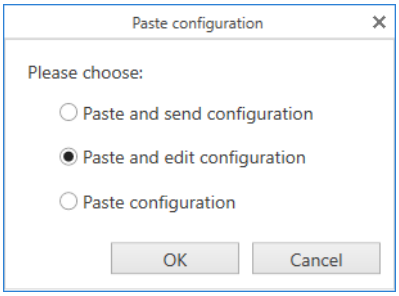
1 Card of the AMS 6500 ATG or EZ 1000 Converter
2 Dialog for selecting paste options opens.
3 Only if a card is selected.

If the configuration is copied to a card, service, or converter the dialog for selecting paste options opens. Select an option to continue. **Paste and send configuration** is selectable if a card or service is selected below **Network** that has an online connection.

Only A6500-CP: **Paste and send configuration** is selectable if:

- A card or service is selected below **Network** that has an online connection.
- User is logged in as an **Operator** or an **Administrator**.
- The key-switch is in the unlocked position. See Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.

Figure 2-20: Paste options dialog



2.2.7 Configure

Editing of configuration parameters. This button is shown in gray unless one of the devices in the device tree has been selected or a device has been selected from the rack picture.

Click **Configure** to open the window **Configuration** to enable input or modification of configuration parameters of the selected card or converter.

Figure 2-21: Configure



For more information, see Configuration of this manual.

2.2.8 Send

Click **Send** to load configuration parameters into the selected card. This button is shown in gray unless one of the physical devices in the device tree (level **Network**) with a changed configuration has been selected. The parameters of the selected card or converter will be sent to the card. This command requires an online connection to the card.

Note
Sending of a configuration is protected when an A6500-CP card is used. To enable sending of a configuration:

1. Log in with an operator or an administrator account.
2. Switch the key-switch to the unlocked position. See Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.

Figure 2-22: Send



When this action is finished, the program continues indicating measuring values.

⚠ CAUTION

The machine protection function of the card or converter is disabled during sending of configurations with major changes because of a reboot of the card. See card manuals for details.

2.2.9 Delete

This function deletes converters, offline cards from a rack, or a complete rack from the device tree. Select a device from the device tree, place the cursor on the corresponding front plate in the rack graphic, or on the line of the list view. Click **Delete** to delete the selected converter, card, or rack.

Figure 2-23: Delete



2.2.10 Move to

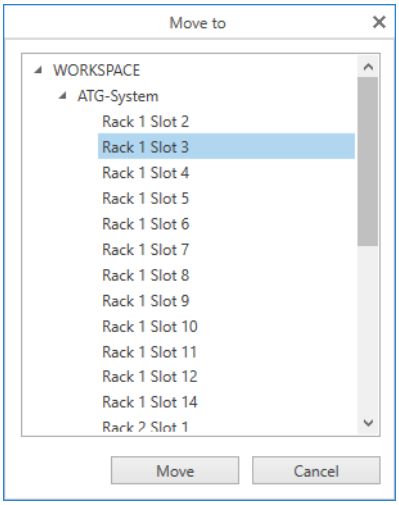
This function can only be used for offline devices. Click **Move to** to move devices between the levels **Workspace** and **Library** or to move cards in the virtual rack in level **Workspace** of the device tree to other slots within this rack.

Figure 2-24: Move to



The dialog **Move to** opens. Browse through the available racks and levels, and select a free slot or location where the card or converter may be moved to (see Figure 2-25).

Figure 2-25: Dialog Move to



2.2.11 Copy to

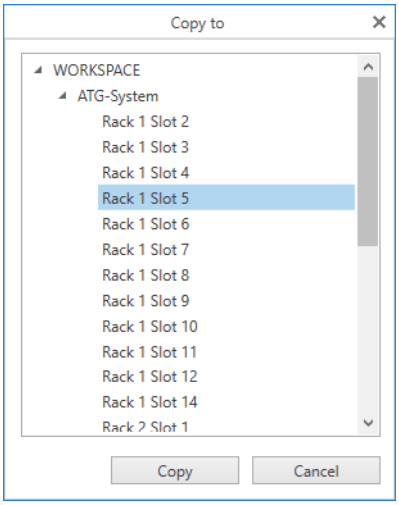
Click **Copy to** to copy selected converters or cards within the same level or to another level (except **Network**), or cards to a free slot within a racks in level **Workspace** or **Library**.

Figure 2-26: Copy to



The dialog **Copy to** opens. Browse through the available racks or levels, and select a location or a free slot to place the copy of the selected card or converter (see Figure 2-27).

Figure 2-27: Dialog Copy to



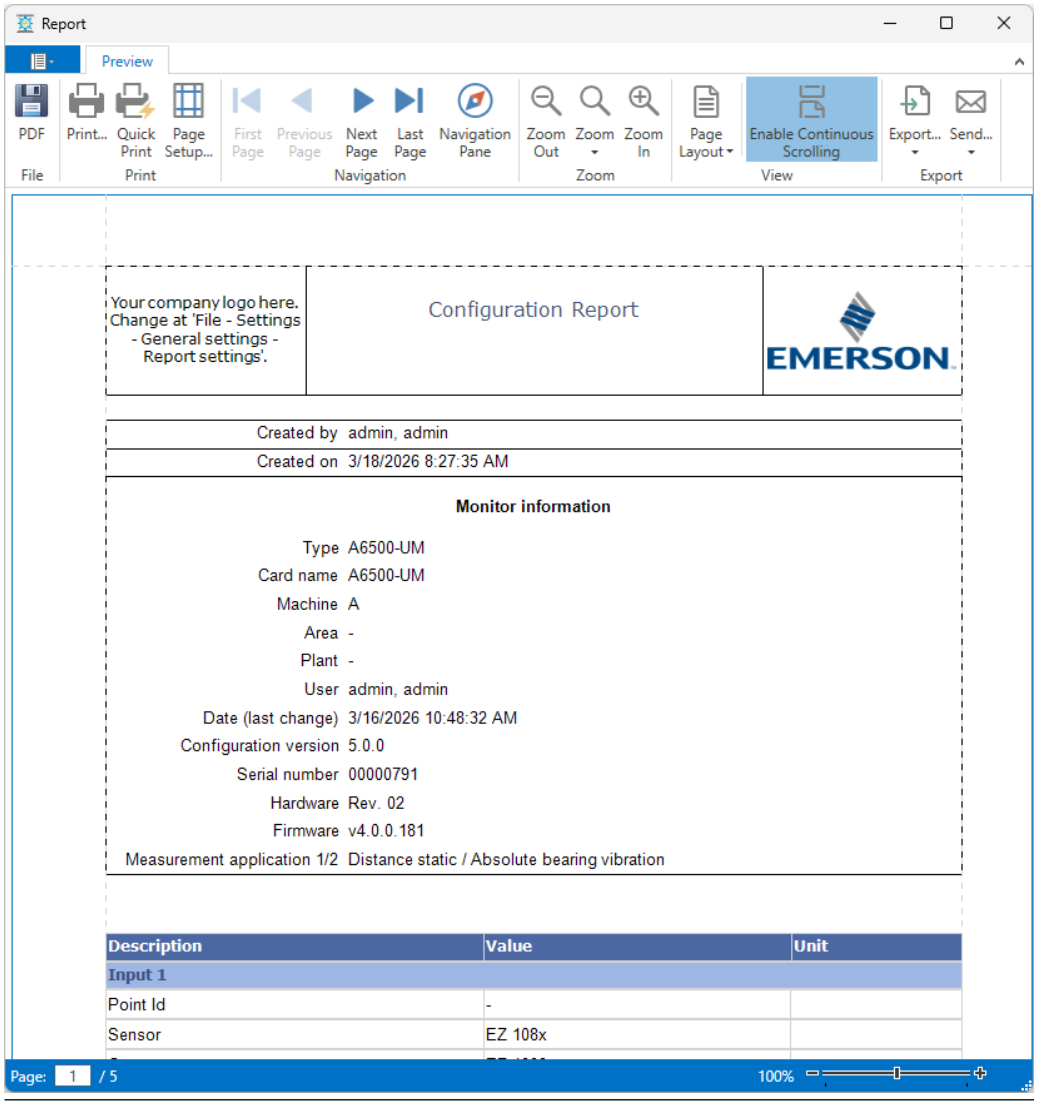
2.2.12 Report

Click **Report** to open a report window with the configuration parameters of the selected card or converter. Use the control elements of the report viewer to save, print, or export the report.

Figure 2-28: Report



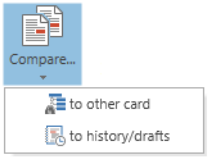
Figure 2-29: Configuration report



2.2.13 Compare

Select a card or converter, and click **Compare** to compare the current configuration parameters with parameters of another sources such as other devices, histories, or drafts.

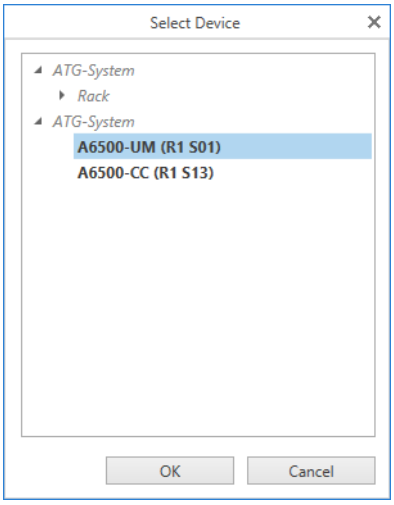
Figure 2-30: Compare



There are two options for **Compare**:

- **to other card**
  Select **to other card** to compare the selected card to another card or the selected converter to another converter. The dialog for selecting the second device for the comparison opens (see Figure 2-31).

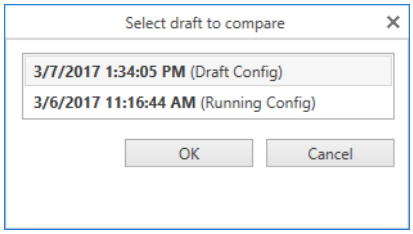
Figure 2-31: Dialog Select Device



Browse through the available converters or System Racks, and select a card or converter for the comparison. Click **OK** to start the comparison.

- **to history/drafts**
  Select **to history/drafts** to compare the selected card or converter with a draft or history configuration. The dialog for selecting the card or converter for the comparison opens (see Figure 2-32).

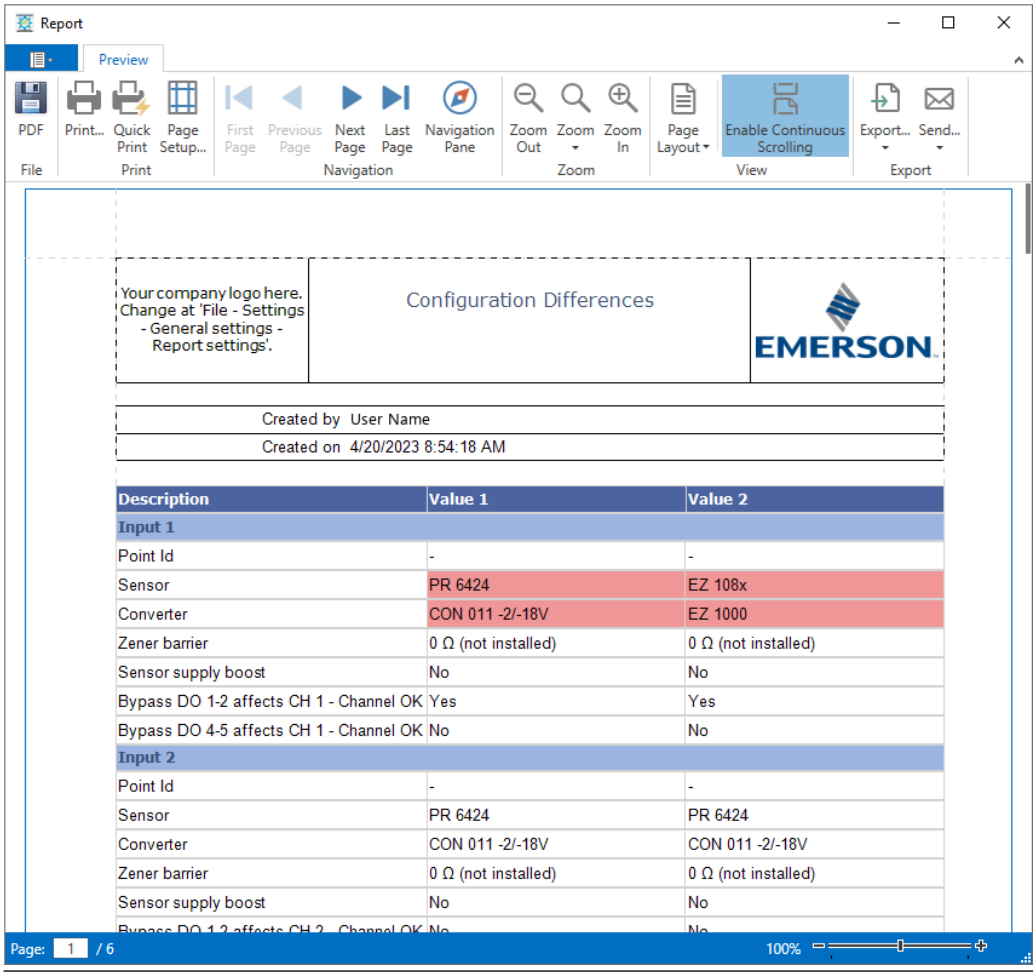
Figure 2-32: Dialog Select draft to compare



Select a draft or history configuration, and click **OK** to start the comparison.

The program opens the **Configuration Differences** report with the detected differences in the configuration parameters.

Figure 2-33: Function Compare, configuration differences



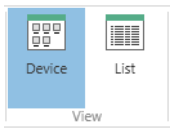
Description	Value 1	Value 2
Input 1		
Point Id	-	-
Sensor	PR 6424	EZ 108x
Converter	CON 011 -2/-18V	EZ 1000
Zener barrier	0 Ω (not installed)	0 Ω (not installed)
Sensor supply boost	No	No
Bypass DO 1-2 affects CH 1 - Channel OK	Yes	Yes
Bypass DO 4-5 affects CH 1 - Channel OK	No	No
Input 2		
Point Id	-	-
Sensor	PR 6424	PR 6424
Converter	CON 011 -2/-18V	CON 011 -2/-18V
Zener barrier	0 Ω (not installed)	0 Ω (not installed)
Sensor supply boost	No	No

The red columns in the report indicate differences in the configuration. Column *Value 1* represents the parameters of the card clicked first, and *Value 2* represents the parameters of the comparison card. Comparison of configuration parameters is possible with all online and offline converters and cards in the levels **Network**, **Workspace**, and **Library** of the device tree.

2.2.14 Device and List

Use **Device** and **List** to toggle between the rack view (**Device**) and the list view (**List**) in the workspace of the **Home** window. The button of the selected view is highlighted.

Figure 2-34: Device



These buttons are disabled if an AMS EZ 1000 Converter is connected.

2.2.15 Language

This button in the ribbon command bar permits the selection of a language for this software.

Figure 2-35: Button "Language"



Use **Language** to change the language of AMS Machine Studio. For details on settings and localization, refer to Settings.

2.3 Advanced

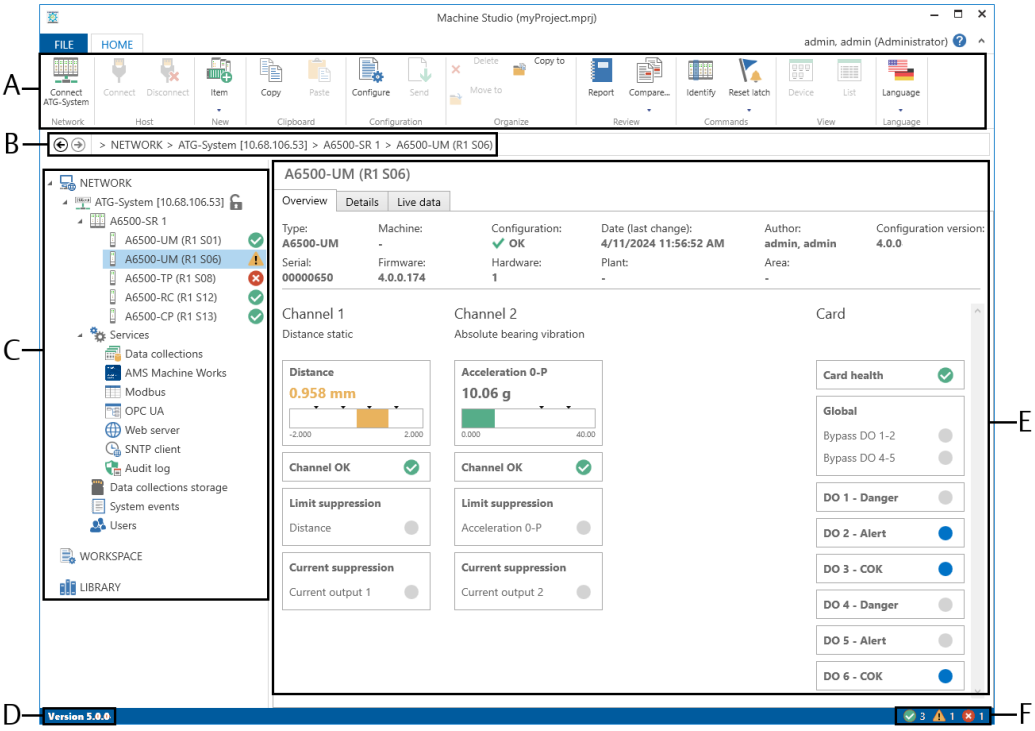
Advanced contains the buttons listed below for system maintenance purposes and is not visible by default. On the **Home** tab press **Ctrl+Alt+M** to enable the **Advanced** tab. The **Advanced** tab appears.

- **System Inventory**, see System inventory
- **Update firmware (all)**, see Firmware update (all)
- **Downgrade firmware**, see Firmware downgrade
- **Reset to factory default**, see Reset to factory default
- **Export maintenance system info**, see Export maintenance system info

2.4 Main view

The main view is the starting point for the main tasks of AMS Machine Studio. Figure 2-36 explains this view.

Figure 2-36: Main view AMS Machine Studio



A. Ribbon command bar
B. Navigation bar
C. Device tree
D. Version of AMS Machine Studio
E. Space for online view and configuration dialog
F. Status information of the AMS 6500 ATG system

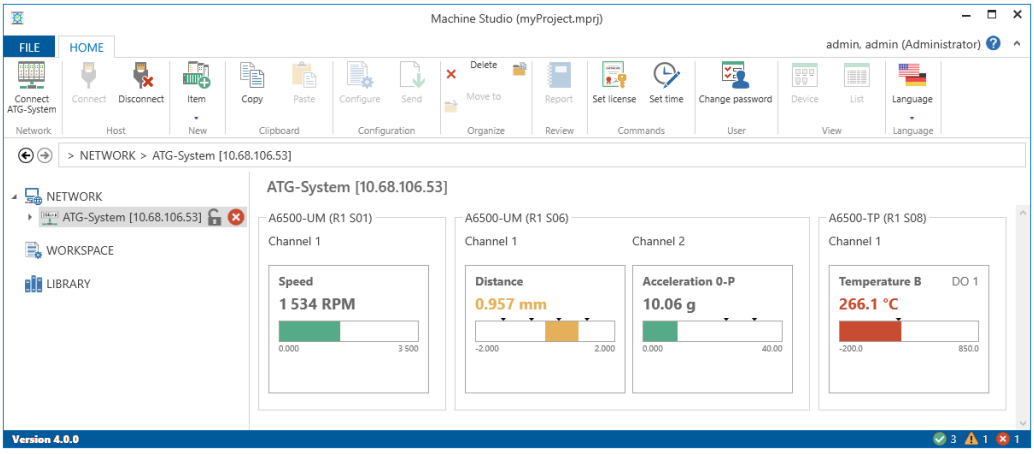
The space on the right of the screen shows online displays with current measuring values and status information of the element selected from the tree. It also shows module type, machine name, date of the last parameter change, and name of the user who last made changes. Click the arrow to show serial number, firmware version, hardware version, plant name, and area.

2.4.1 Start window

With a USB interface or TCP/IP connection to an A6500-CC Com Card or an A6500-CP Com Card Pro[2] in the rack, AMS Machine Studio automatically reads status information and measurement data from all cards installed in the rack. Figure 2-37 shows the view after an established connection to an AMS 6500 ATG system.

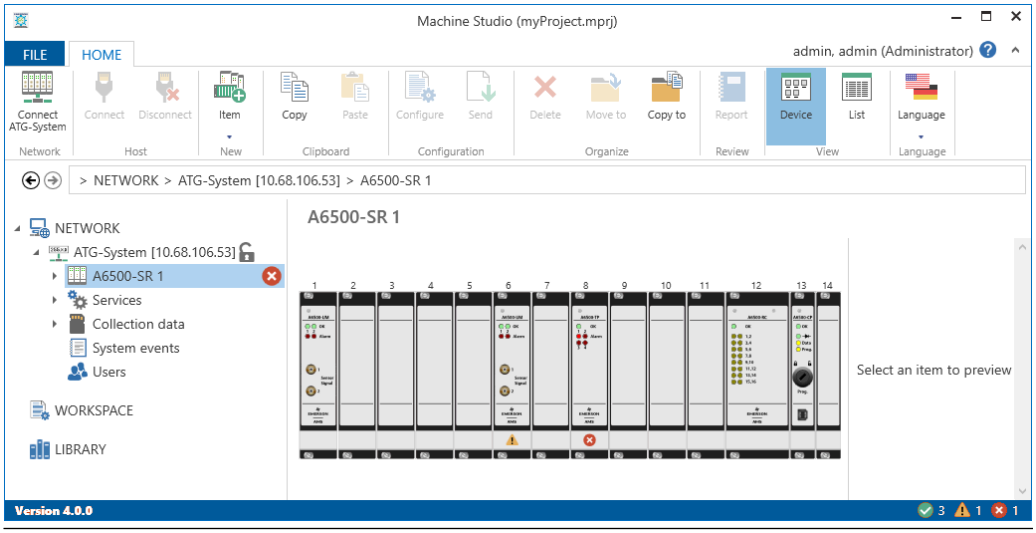
2 *Visibility of data requires a log in.*

Figure 2-37: Start window



Expand the device tree and select the connected System Rack to open the System Rack overview. This view includes all detected cards, shown in place, including all current LED indications at the card fronts. Any changes of card states are automatically shown in this graphic. Above the System Rack, the name of the currently selected rack is shown.

Figure 2-38: System Rack overview



The handle of the cards in the rack shows information about the card state.

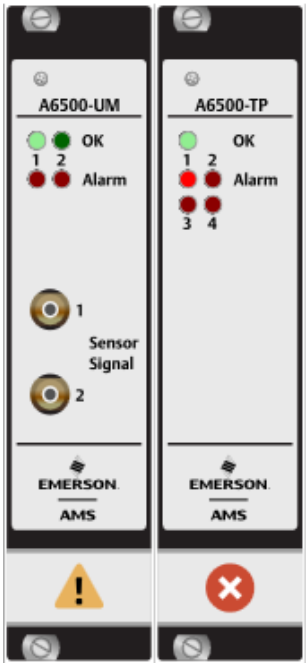
Figure 2-39: Alert message or Channel not OK



Figure 2-40: Danger alarm



Figure 2-41: AMS Machine Studio, status indications at the card front



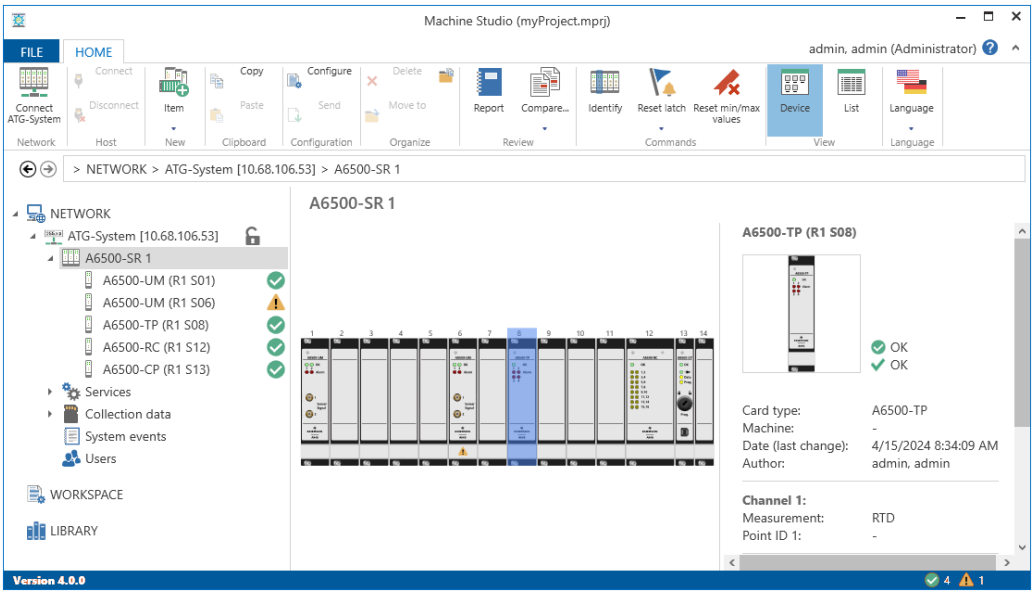
In this example, channel two of the A6500-UM Universal Measurement Card shows the status **Channel not OK** due to missing input connections. Status message **Channel OK** requires both a connected measuring chain and a signal level within permitted limits according to the defined specifications.

The A6500-TP Temperature Process Card indicates an Alert message, which means that the channel function is OK but one of the alarm limits was exceeded.

When a rack is selected, the buttons **Device** and **List** appears in the ribbon command bar. Click **List** to see a table with name, type number, serial number, and status information of the cards. To the right of the list, an overview is shown with information about configured measuring functions and channel descriptions of the card selected in the list. Click **Device** to see the graphic view of the rack.

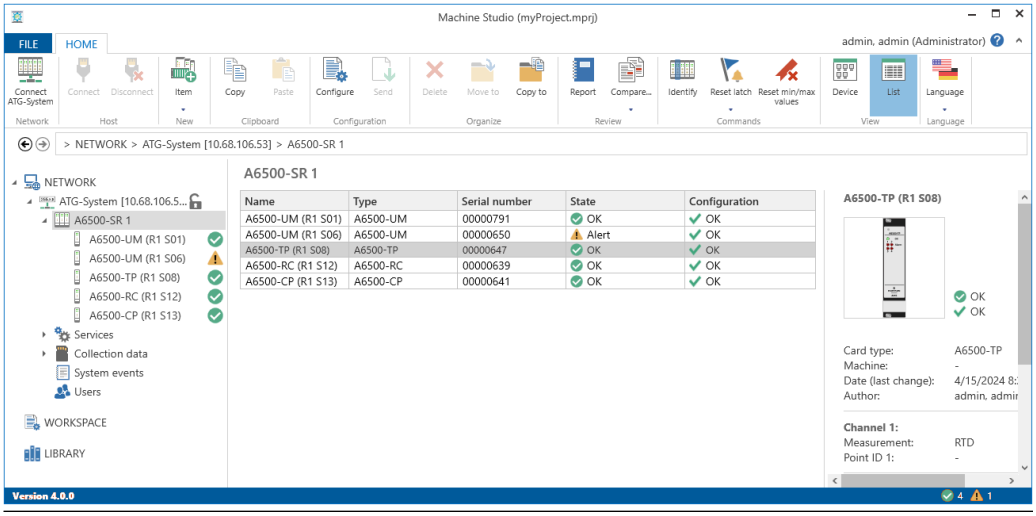
Double click a card to switch to the online view of the card.

Figure 2-42: AMS Machine Studio – System Rack view with information about a selected card



A selected card is highlighted in light blue. Next to the rack illustration, an overview of the selected card with status and configuration information is shown.

Figure 2-43: AMS Machine Studio – List view



A selected card is highlighted in light gray. Next to the list, an overview of the selected card with status and configuration information is shown.

2.5 Navigation bar

The navigation bar below the ribbon command bar indicates the currently selected element from the device tree. This can be, for example, a physically card from a rack or an

item below **Workspace**. The first item in this navigation bar defines the level of the device tree. In the example below, it is the **Network** level. The second item **My ATG [IP address]**[3] defines the AMS 6500 ATG system where the rack and the selected card belongs to, and the interface type in brackets. The third item **A6500-SR 1** shows the rack. The selected card in this example is an A6500-UM card, installed in rack 1, slot 06.

Use the two arrows to the left of the navigation bar to go backwards and forwards through the recently selected elements of the device tree.

Figure 2-44: Navigation bar



2.6 Structure of the device tree

When starting AMS Machine Studio, all converters and cards installed in a rack (A6500-SR, A6500-RR, or A6500-FR) including their type numbers, serial numbers, card states, and alarm states are represented in the device tree. By clicking on one of the cards or converters in the device tree, the actual measuring values, channel states, and the card state of this devices are shown on the **Overview** display field.

The device tree includes the three levels **Network**, **Workspace**, and **Library**. Physical devices from this tree structure can be configured online through the connection to the communication card or through the connection to the AMS EZ 1000 Converter.

Click a device in the device tree to open an overview with available measuring results and status information of the channels in the right part of the screen. Click **Configure** in the command ribbon bar to open the **Configuration** window to edit configuration data of the selected device.

3 *The configured name of the AMS 6500 ATG is displayed (**Communication card (A6500-CC or A6500-CP)** → **Configuration** → **Basic** → **System name**).*

Figure 2-45: Device tree

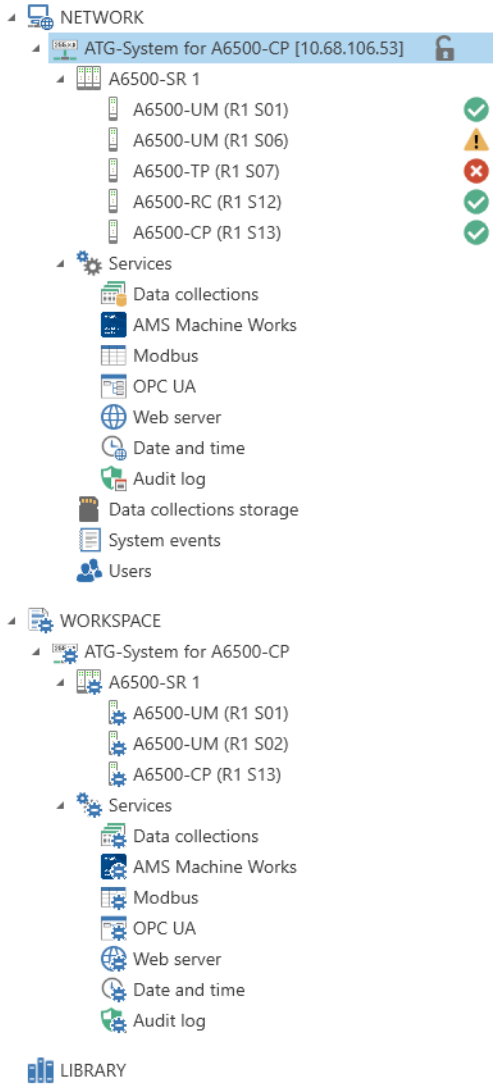


Figure 2-45 shows the structure of the device tree of an AMS 6500 ATG system with five cards installed. The lines of the device tree show the type of the device together with the position in the rack. A green circle with a white checkmark indicates that the communication is running properly and no error or alarm has been detected. A red circle with a white "x" (for example, at the A6500-TP in slot 08 of the rack) indicates a danger alarm.

The designation in parentheses shows the address of the AMS 6500 ATG and the card position in this rack (for example, communication card A6500-CP is installed in rack 1, slot 13).

2.6.1 Network

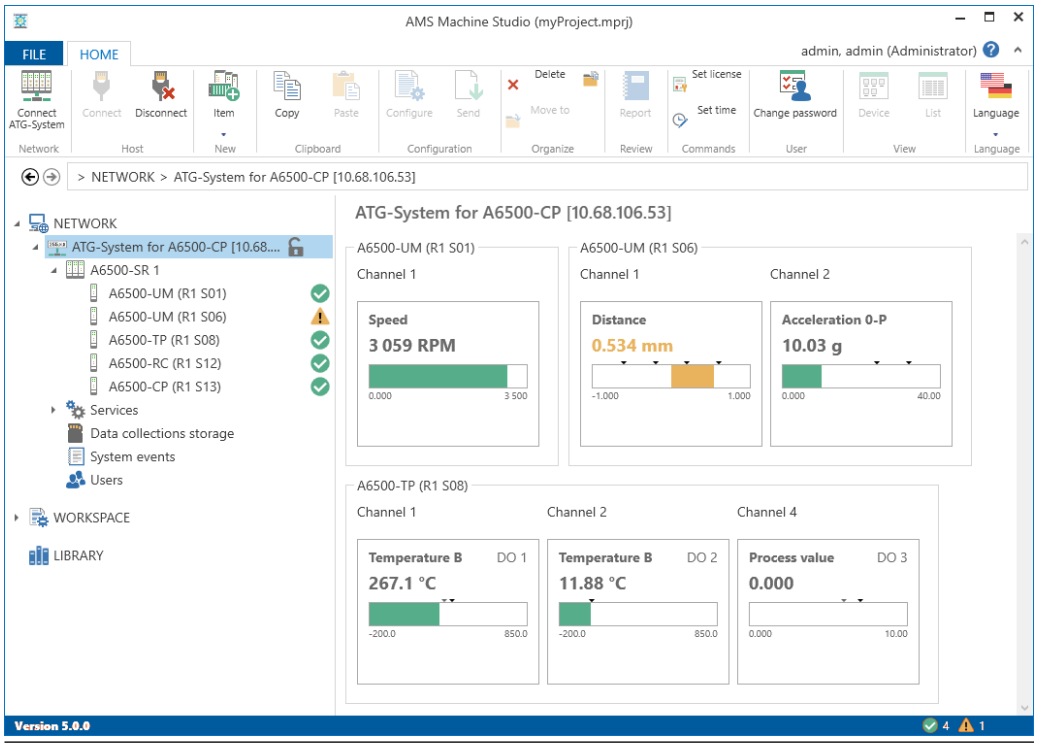
The **Network** level contains all physically connected devices, including AMS EZ 1000 Converters.

AMS 6500 ATG system level

The AMS 6500 ATG system level is subdivided into **Rack**[4], **Services**, **Data collections storage** or **Collection data** if using an A6500-CC or A6500-CP with FW 1.x, **System events**, and **Users**[5]. The active connection type is stated in brackets behind the rack – IP address or USB.

Click the AMS 6500 ATG level to open an online view with a display object for each measurement of the connected system (see Figure 2-46).

Figure 2-46: Measurement overview



Rack[4]	This level contains all physical devices installed in the connected A6500-xR rack.
Services	This level contains all functions for data collection, data interfaces (OPC and Modbus), time synchronization, and the Audit log.
Data collections storage	This level lists all alarm-triggered data collections stored on the microSD card of the communication card.

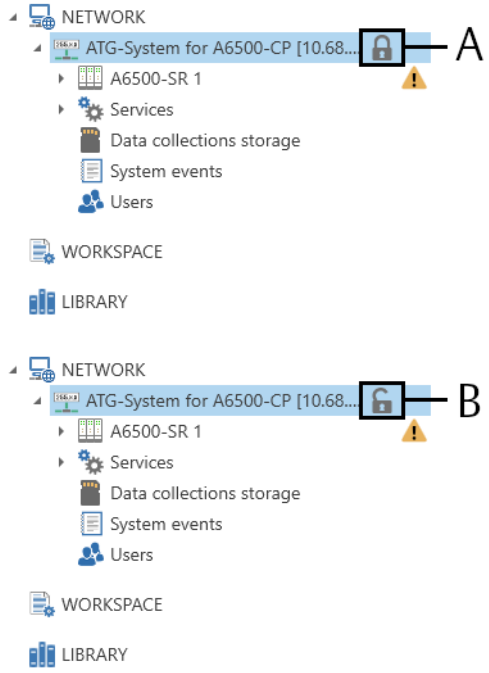
4 *The type of the configured rack, A6500-SR, A6500-RR, or A6500-FR, and the number of the rack (1 or 2) is displayed.*
5 *Requires an A6500-CP Com Card Pro.*

System events	This level lists all system events stored on the microSD card of the communication card.
Users	**Users** is available when an A6500-CP Com Card is installed in the AMS 6500 ATG system. This level lists all user accounts created for the selected AMS 6500 ATG system.

A6500-CP Com Card Pro

Whether the system programming is enabled or not is shown in the line of the AMS 6500 ATG system, if an A6500-CP card is installed. See Figure 2-47 .

Figure 2-47: Indication of the key-switch position



A. System programming is not enabled (locked).
B. System programming is enabled (unlocked).

2.6.2 Workspace

This level of the device tree is intended to create and configure offline devices. The configuration of offline devices can be copied with drag and drop or **Copy** and **Paste** to devices of the same type below the **Network** level for immediate use or to the **Library** level for later use. Complete AMS 6500 ATG systems, systems racks, or AMS EZ 1000 Converters can be moved to the **Library** level (see Table 2-2). The **Move to** button allows card positions in the virtual system rack to be moved to other places within the rack.

2.6.3 Library

Directory to store offline devices. Projects stored in this directory can be edited and copied to other places in the device tree.

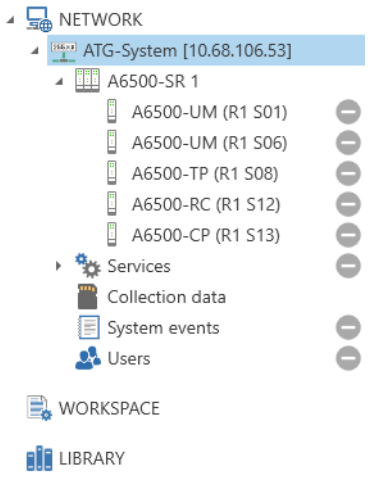
2.6.4 Status indication

Table 2-3 lists symbols displayed for the status indication in the device tree. For further details see operating manual of the cards.

Table 2-3: Status indication

Symbols	Meaning
	Everything OK
	Alert alarm or channel failure
	Danger alarm, services failure, failure of collected data, or microSD card failure
	No communication between AMS Machine Studio and device (see Figure 2-48)
	Maintenance required (icon on device symbol, see Maintenance required)
	Device (card or converter) not in sync (icon on device symbol)
	Device (card or converter) not configured (icon on device symbol)
	System programming is not enabled (locked)
	System programming is enabled (unlocked)

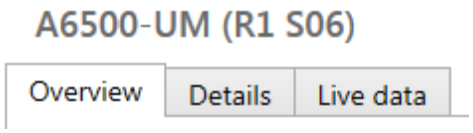
Figure 2-48: Device tree, no communication with System Rack



2.7 Display functions

In this part of the screen, the measuring results of the selected device are displayed. Three tabs at the top of the online view permit switching between different views.

Figure 2-49: AMS Machine Studio, switchover between display functions



Common card information is shown at the top of each online view.

Always visible information

Type	Type of the device selected from the device tree.
Machine	Designation for the machine entered in the configuration (**Basic → Machine).**
Configuration	Indicates the state of the configuration (OK, Not in sync, or No config)
Date (last change)	Date and time of the last change to the configuration.
User	Name of the user who made the last change to the configuration. For offline configurations, the user name from the operation system login data is used for this entry.
Configuration version	Version of AMS Machine Studio used for the last change to the configuration.

Hidden information, click the arrow beside the visible information to show them

Serial	Serial number of the device selected from the device tree.

Firmware	Firmware version of the device selected from the device tree.
Hardware	Hardware revision of the device selected from the device tree.
Plant	Designation for the plant entered in the configuration (**Basic** → **Plant**).
Area	Designation for the area entered in the configuration (**Basic** → **Area**).

2.7.1 Display function **Overview**

This display provides an overview of measuring results and channel states together with information about the card status or converter status. **Overview** is the default view once the software is running.

Overview shows measuring results, channel states, global flags, software status, and all configured channels and subchannels. Deactivated channels with no measuring function will not be displayed here. This display field also shows converter state, card state, and states of alarm outputs.

For further details, see the respective operating manual of the card or the converter.

2.7.2 Display function **Details**

This display provides additional details of measuring results and status information necessary for further studies of the measuring results.

Details offers information on:

- Software status, hardware status, temperature of the selected card or converter
- Global flags, alarm bypass active or inactive; bypass active means, the alarm output is disabled. In this case, the circle is blue.
- Measuring values of all configured channels and subchannels in numerical form and as a bar diagram. Only configured channels are displayed.
- Channel related status information, Sensor OK, Card health OK.
- Status values of all channels, including detected minimum and maximum values, since program start or last reset of min/max values.
- Analog output values of current outputs as numerical values and bar diagrams.

For further details, see respective operating manual of the card or the converter.

2.7.3 Display function **Live data**

Live data provides a graphical visualization of the measurement to see, for example, variations in the signal. The X-axis is the time axis with a period of 100 seconds. The Y-axis shows the scaled measuring value of this channel with indication of the entire measuring range. The diagram displays the trend. Measuring values are refreshed in time intervals of one second.

This display function lets you confirm measurement results. The values are not stored on a hard disk and cannot be printed. If it is necessary to store measuring results for further

processing, transmit the data to another system through Modbus RTU, Modbus TCP/IP, or OPC UA.

For further details, see respective operating manual of the card or the converter.

2.7.4 Status information

AMS Machine Studio provides several status information. Two types of status information are describes below. For more details and device specific status information see the respective operating manuals.

Status of connected devices

This indication in the bottom right corner of the screen shows the number of connected devices (cards and converters) with their current states OK, Alert, Danger, or no communication.

Figure 2-50: Device status indication



The status in the example above shows three devices in OK state, one device with an alert alarm and one device with status not OK (danger alarm).

Maintenance required

Devices whose configuration should be checked are marked with the **Maintenance required** symbol. See Figure 2-51.

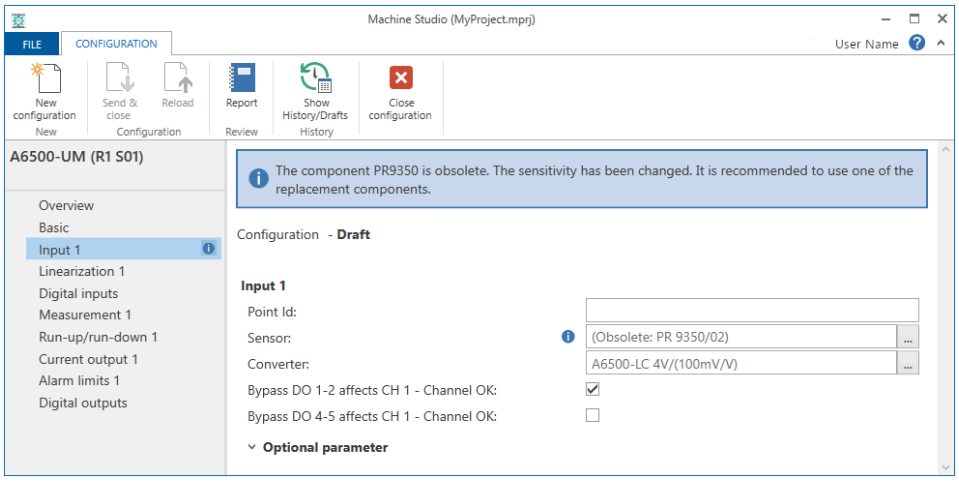
Figure 2-51: Symbol – Maintenance required



A cause for the indication is, for example, a change of the technical specification of the selected sensor because of an update of the components database. Check the configuration to find the cause for the indication.

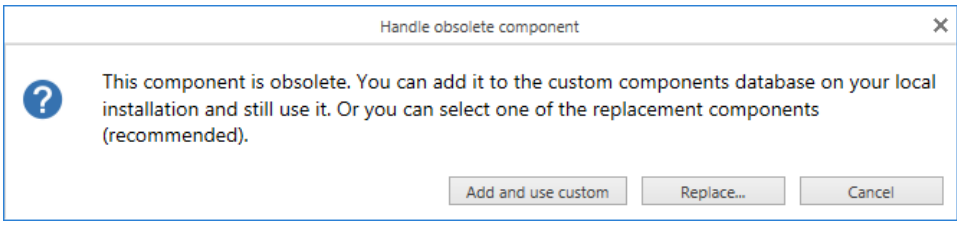
1. Select the card marked with the **Maintenance required** symbol from the device tree.
2. Click **Configure** to open the configuration.
   A message box at the top of the configuration window informs you about the change. Additionally, the configuration page and the parameter which must be checked are marked with the **Maintenance required** symbol. See Figure 2-52.

Figure 2-52: Configuration page with Maintenance required indication



3. Click the parameter and follow the instructions.
   For example, click the sensor selection button. A message box with options appears (see Figure 2-53)

Figure 2-53: Message box example



   Click **Add and use custom** to keep the sensor. Click **Replace...** to replace the sensor by the updated type.

4. Send the updated configuration to the card.

2.8 Offline configuration

AMS Machine Studio is a configuration software used to configure and operate cards of the AMS 6500 ATG system and the AMS EZ 1000 Converter. For the online configuration, the communication card(s) of the system can be connected to the computer through USB or through a TCP/IP interface. AMS EZ 1000 Converters can be connected through their USB interface.

AMS Machine Studio also provides the ability to create offline configurations without connection to physical devices. This offline configuration may be performed simultaneously to the normal measuring operation. Once the configuration is complete, the created configuration can be used at any time by copying the configuration from **Workspace** to **Network** (physical level) and establishing an interface connection between

AMS 6500 ATG and computer. See card manuals for how to create an offline configuration.

2.8.1 Move / Copy devices in offline configurations

The level **Workspace → AMS 6500 ATG system → System rack** of the device tree shows all cards. By selecting a card, it can be configured and prepared in the same way as cards in the online rack.

To move cards within the rack, place the cursor on **Workspace → AMS 6500 ATG system → System rack**, and click the desired card in the graphic. The card is highlighted in light blue. Keep the left mouse button pressed, move the card to the new position, then release the mouse button to placed the card at the new position.

Another way to move cards within the rack or to another rack, is to use the **Move to** button in the ribbon command bar (see Move to).

If a certain type is used several times in the rack, it can be copied by proceeding as described before, but use **Copy to** instead of **Move to**. With this action, the selected card is copied (see Copy to).

Cards are copied including all configuration parameters and settings.

2.8.2 Transfer of prepared configurations

After creating the offline rack, enter the configuration parameters. The configuration is made in the same way as for the online racks.

Use **Copy** and **Paste** or drag and drop to copy the configuration from the new offline rack to a connected system below **Network** (see Copy and Paste).

Another way to save and open the configuration of the cards:

Place the cursor on the card in the device tree, and open the configuration function. Enter the measurement parameters and save them on the hard disk, **Configuration → File → Save as**.

Later, the configuration can be loaded to the card by selecting the online card in the device tree, opening the saved file from the offline card (**Configuration → File → Open**), and sending the data with **Send & close**.

3 Communication

This chapter describes the main communication functions of AMS Machine Studio and the communication cards A6500-CC Com Card and A6500-CP Com Card Pro. The communication cards are necessary for configuration and data exchange, using the TCP/IP interface or the USB interface. The operating manuals of the communication cards describe network communication applications. For communication to an AMS EZ 1000 Converter, see operating manual of the converter.

For configuration and data exchange, the cards of the AMS 6500 ATG system require communications with a computer. For this, the A6500-xR racks (A6500-SR, A6500-RR, and A6500-FR) contain one or two communication cards of type A6500-CC or A6500-CP in one of the most right slots.

Generally, one A6500-CC or one A6500-CP card is used for communication. Use a second communication card to establish communication redundancy. If there is a problem, communication will be taken over by the second (redundant) communication card. Always use communication cards of the same type and firmware version when building a redundant communication system.

3.1 Communication with AMS Machine Studio through USB

Communication to AMS Machine Studio takes place through the communication card A6500-CC or A6500-CP in the rack. Stationary equipment in control rooms are typically connected to the racks through the TCP/IP interface. The USB interface at the card front is generally used for service and commissioning purposes. Both interfaces can be used to configure the communication card(s) and cards installed in the rack. Measuring data can also be transmitted to the configuration computer.

Note
Time data cannot be read through the USB interface. That means time waveforms and frequency spectrums of the A6500-UM cards cannot be displayed if the card is connected through the USB interface.

Communication between AMS Machine Studio and the rack begins automatically when AMS Machine Studio is started, and the USB cable is connected from the computer to the front socket of the A6500-CC or A6500-CP.

All AMS 6500 ATG cards installed in the A6500-xR rack are detected and their type, serial number, card states, and alarm states read out and represented in the device tree structure of AMS Machine Studio. Click a card in the tree structure and the current measuring values, channel states and the card state of this card are shown in **Overview**.

Note
The connection to an AMS 6500 ATG system with an A6500-CP Com Card Pro is password protected. This is regardless of the interface used, USB or Ethernet. See A6500-CP Com Card Pro operating manual and A6500-CP Com Card Pro – User management for details.

Disconnect USB connection

Unplug the USB cable to disconnect from the AMS 6500 ATG system. **Connect** and **Disconnect** in the ribbon command bar are disabled while connected through the USB interface.

3.2 New network connection

To connect AMS Machine Studio to AMS 6500 ATG systems through a network connection, click **Connect ATG-System** in the ribbon commend bar of **Home**.

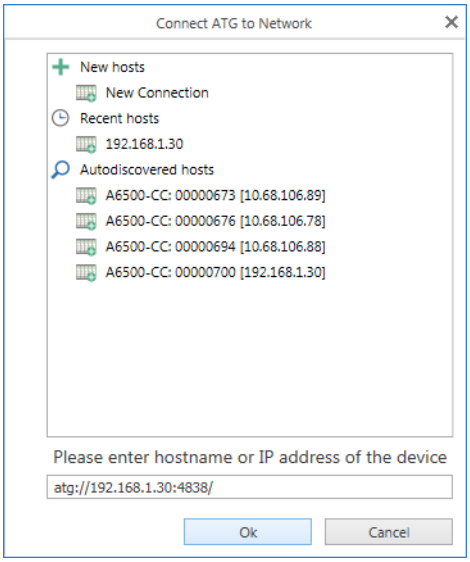
Figure 3-1: Connect ATG-System



Note
During the first configuration of an AMS 6500 ATG system, use the USB interface to set the IP address for the network connection. The default IP address of a new communication card (A6500-CC or A6500-CP) is **192.168.1.100** if installed in the left communication card slot and **192.168.1.101** for a new communication card installed in the right communication card slot.

The **Connect ATG to Network** dialog appears. Enter the IP address of the new device, if known. Otherwise, automatically establish the connection by clicking on one of the listed IP addresses (see Figure 3-2). AMS Machine Studio automatically detects AMS 6500 ATG hosts when the **Auto discovery** function is enabled on the communication card (see the communication card's operating manual for details).

Figure 3-2: Connect ATG to network

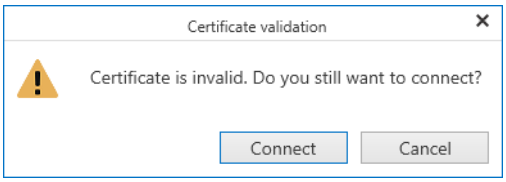


Note
The connection to an AMS 6500 ATG system with an A6500-CP Com Card Pro is password protected. See A6500-CP Com Card Pro operating manual and A6500-CP Com Card Pro – User management for details.

⚠ CAUTION

The connection to an AMS 6500 ATG system with an A6500-CP Com Card Pro is secured with a certificate. The following message appears if the certificate validation fails.

Figure 3-3: Failed certificate validation



Do not click **Connect** if the cause for the failed validation is unknown. In this case, contact the product support (see Technical support).

Note
The communication cards (A6500-CC and A6500-CP) automatically disconnect the network connection to an AMS Machine Studio client after 30 seconds of inactivity.

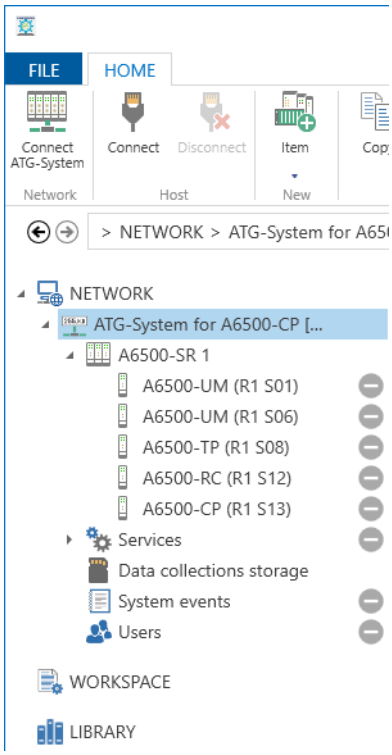
3.3 Connect and disconnect AMS 6500 ATG systems

Use **Connect** and **Disconnect** on the **Home** tab in the ribbon command bar to start or stop the communication between computer and AMS 6500 ATG.

Select the AMS 6500 ATG system in the device tree to activate the **Connect** or **Disconnect** buttons. If the communication is established, **Connect** is grayed out and **Disconnect** is active.

Click **Disconnect** to interrupt the communication and to log out the user in AMS 6500 ATG systems with an A6500-CP Com Card Pro. The status in the device tree structure indicates no communication (see Figure 3-4).

Figure 3-4: Device tree structure, indication of communication error



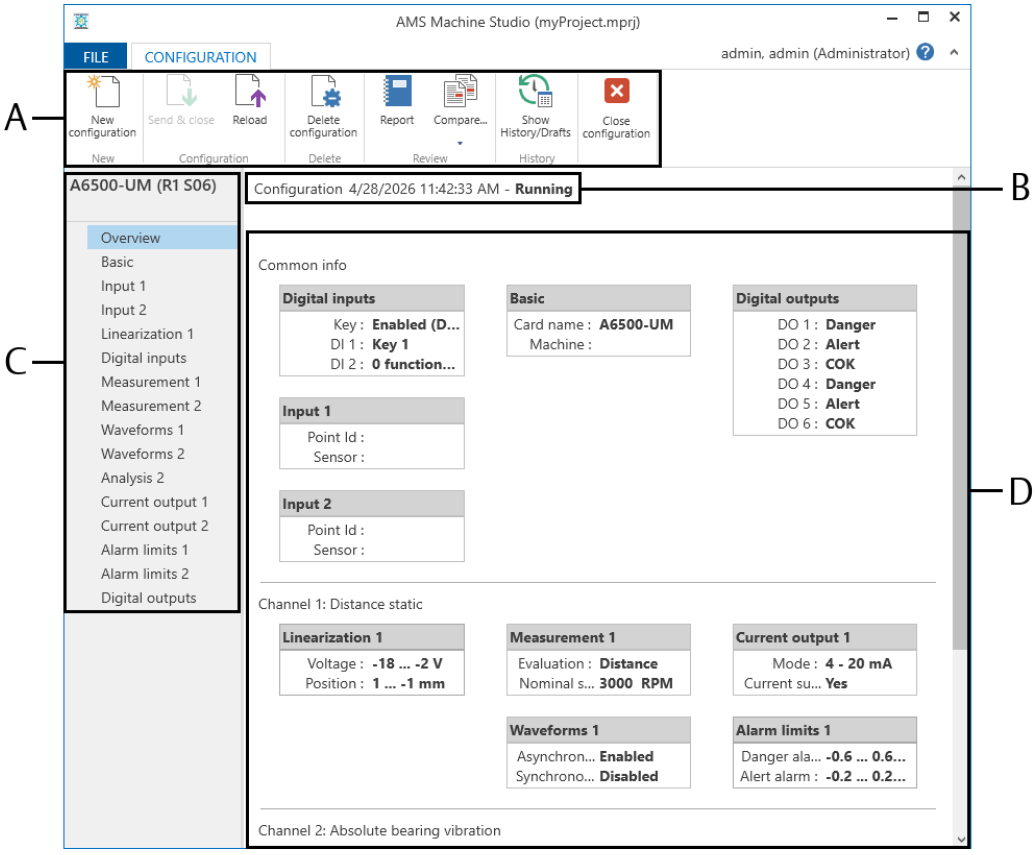
Users is available if an AMS 6500 ATG system with an A6500-CP Com Card Pro is selected.

To re-establish the communication, click **Connect**.

4 Configuration

Select a card or converter from the device tree, and click **Configure** to open the **Configuration** editor. This editor contains all functions for the configuration of measuring functions and the management of configuration data (see Figure 4-1).

Figure 4-1: Configuration, Overview



A. Ribbon command bar with icons for quick access to configuration functions.
B. Date and time when the current parameter set was changed and functional status of the device.
C. List of parameters for adjustment of measuring functions.
D. Workspace for parameter entry.

The top left corner of the screen shows the tab **File**, which opens another dialog with commands for configuration file management.

See respective device operating manuals for details.

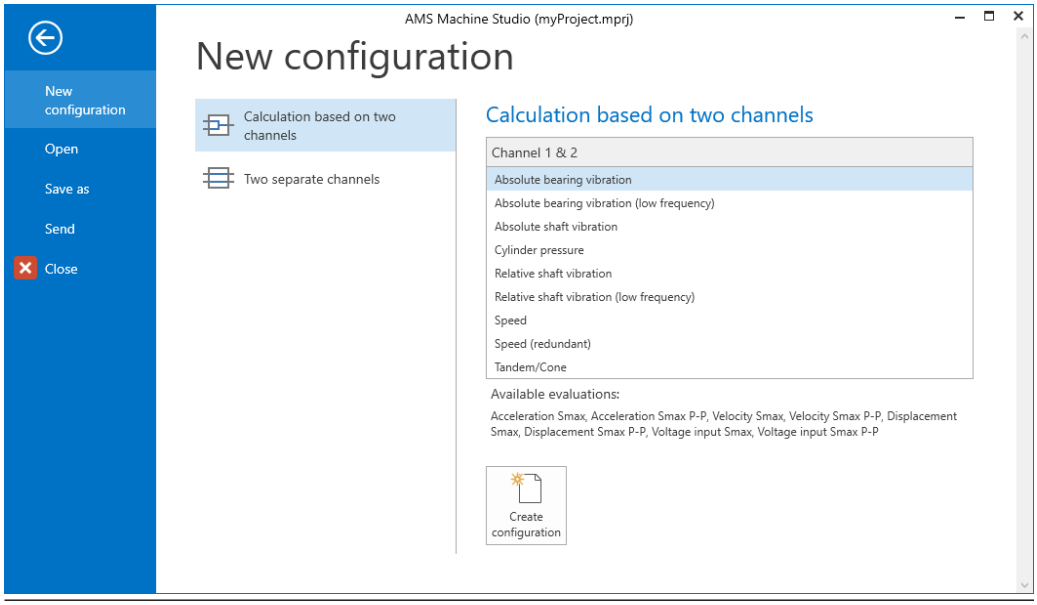
4.1 File

File contains commands for file management of configuration parameters. Click **File** in the top left corner of **Configuration** (see Figure 4-2) to switch to **File** (see Figure 4-3).

Figure 4-2: Tab File



Figure 4-3: File



The following command list appears in the left part of the screen.

New configuration	Click **New configuration** to start a new configuration.
Open	Click **Open** to open an existing configuration file from an arbitrary storage location, from a physically connected AMS 6500 ATG card, or from a physically connected AMS EZ 1000 Converter.
Save as	Click **Save as** to save an open configuration file with a new name.
Send	Click **Send** to send the configuration to a card or to a converter. **Send** is enabled when the configuration contains changes that can be sent to the selected card.
Close	Click **Close** to close the configuration editor. Configuration changes are saved as a draft. Draft files can be opened by the history function of the configuration editor. See operating manual of the devices for details.

4.1.1 New configuration

Create a new configuration for the selected device (card or converter). The program initiates the default state of the device. Before you click this command, it is appropriate to ensure that currently loaded parameters are saved to a hard drive.

Refer to the respective device operating manuals for details.

4.1.2 Open

Click **Open** to load an existing configuration from an arbitrary storage location, from a physically connected AMS 6500 ATG card, from a physically connected AMS EZ 1000 Converter, or from a project into the computer memory. This configuration can be edited and sent to the same or another device.

Click **Open** and select the file source:

- Select **Computer** and click **Browse** to browse for configuration files with file extension *.mcfg.
- Select **Current Project**. The levels **Network**, **Workspace**, and **Library** of the device tree are displayed. Expand the structure below **Network** or **Workspace**. Select the device or service whose configuration shall be opened, and click **Open**.

  Note
  Only configurations compatible with the selected device or service can be opened.

The **Configuration** dialog opens with all parameters for further editing.

4.1.3 Save as

Click **Save as** to save the current configuration to an arbitrary storage location. The configuration can be stored with a different name or in a different directory. A browser window opens to enter the name and to select a storage location. Permissible length of the name, and permissible characters correspond to the operating system. Configuration files get automatically the file extension *.mcfg.

After entering name and path, click **Save**. The view returns to the **Configuration** dialog.

4.1.4 Send

⚠ CAUTION

The machine protection function of the device is disabled during sending of configurations.

Click **Send** to send the completed configuration to the selected device. Afterward, AMS Machine Studio returns to the start menu and continues displaying the measuring results.

If an A6500-CP card is installed in the AMS 6500 ATG system, log in as an **Operator** or an **Administrator** and switch the key-switch to the unlocked position, see Enable system

programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.

Enable system programming with A6500-CP communication card

Set the key-switch of the A6500-CP Com Card Pro to unlock to enable programming of the AMS 6500 ATG system. See Figure 4-4 for the position of key-switch and **Prog. LED** on the front plate.

The enabled system programming is indicated by:

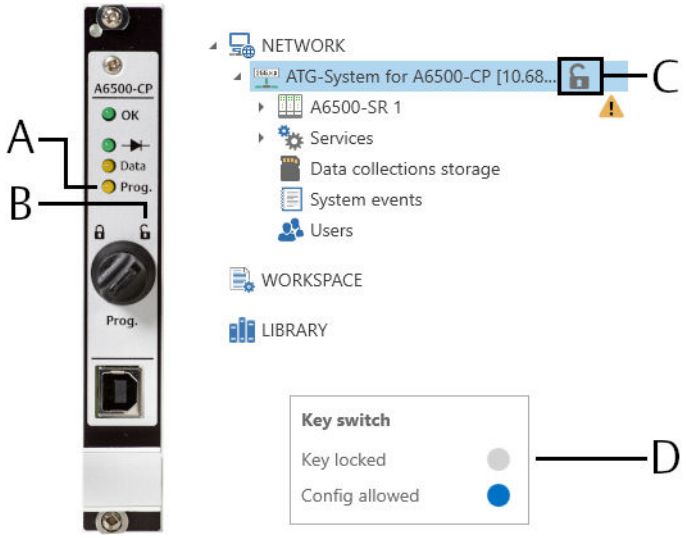
- A switched on **Prog. LED**
- An unlock symbol in the device tree behind the related AMS 6500 ATG system
- A status information in the online view
- Modbus register and OPC UA data point

Table 4-1: Status indication through Modbus and OPC UA

Function	Modbus register	OPC UA data point
Key switch state	KeySwitchState	KeySwitchState
System program state	SystemProgramState	SystemProgramState

The system program status shows whether sending of configurations to the AMS 6500 ATG system or firmware updates are allowed or not.

Figure 4-4: Key-switch in unlocked position



A. Program LED (Prog. LED)
B. Key-switch in unlocked position
C. Indication in AMS Machine Studio
D. Online view of the A6500-CP card

Enable system programming with redundant A6500-CP communication cards

Set the key-switch of both A6500-CP Com Cards Pro to unlock to enable programming of the AMS 6500 ATG system. Table 4-2 explains the behavior of the communication cards with key-switches in different positions.

Table 4-2: Key-switch position to enable system programming in a redundant system

A6500-CP left slot		A6500-CP right slot		System programming
Key-switch	**Prog. LED**	**Key-switch**	**Prog. LED**	
Locked	Off	Locked	Off	Disabled
Unlocked	Off	Locked	Off	Disabled
Locked	Off	Unlocked	Off	Disabled
Unlocked	On	Unlocked	On	Enabled

See Figure 4-5 for the position of key-switch and **Prog. LED** on the front plate.

An enabled system programming is indicted by:

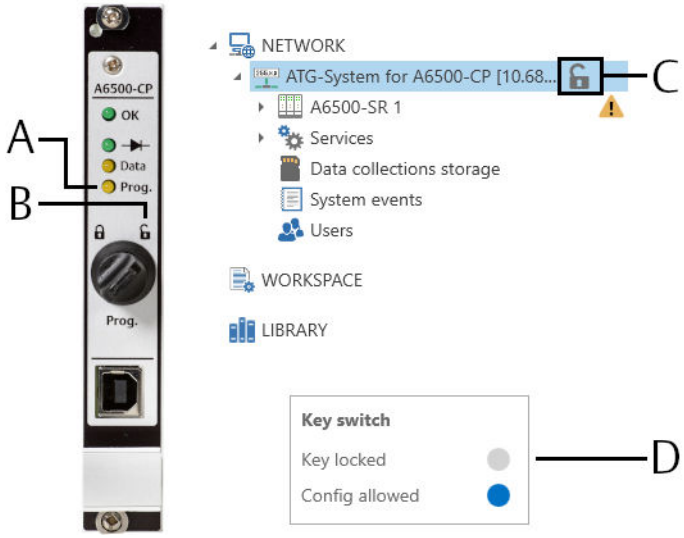
- A switched on **Prog. LED**
- An unlock symbol in the device tree behind the related AMS 6500 ATG system
- A status information in the online view
- Modbus register and OPC UA data point

Table 4-3: Status indication through Modbus and OPC UA

Function	Modbus register	OPC UA data point
Key switch state	KeySwitchState	KeySwitchState
System program state	SystemProgramState	SystemProgramState

The system program status shows whether sending of configurations to the AMS 6500 ATG system or firmware updates are allowed or not.

Figure 4-5: Key-switch in unlocked position



A. Program LED (Prog. LED)
B. Key-switch in unlocked position
C. Indication in AMS Machine Studio
D. Online view of the A6500-CP cards

5 Services and data storage

The AMS 6500 ATG system related services are listed below **Services** in the tree structure. The available services depend on the communication card and firmware versions used. See Figure 5-1 to Figure 5-3.

Figure 5-1: Services – Tree structure A6500-CC

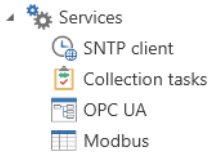


Figure 5-2: Services – Tree structure A6500-CP (FW 1.x)

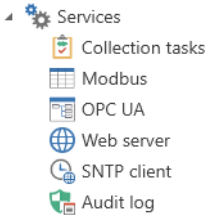
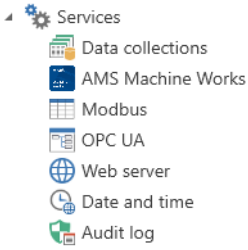


Figure 5-3: Services – Tree structure A6500-CP (FW 5.x)



There are services for data collection, for interfaces, and for the system.

Data collection services:

- Collection tasks (see Collection task), requires an A6500-CC or A6500-CP (FW 1.x)
- Data collections (see Data collections), requires an A6500-CP (FW 5.x)

The storage of the collected data on the internal microSD card, if using an A6500-CP (FW 5.x), is described in Data collections storage and for the A6500-CC or A6500-CP (FW 1.x) in Collection data.

Interface services:

- OPC UA (see OPC UA)
- Modbus (see Modbus)
- Web server (see Web server), requires an A6500-CP (FW 1.x or FW 5.x)

- AMS Machine Works (see AMS Machine Works), requires A6500-CP (FW 5.x)

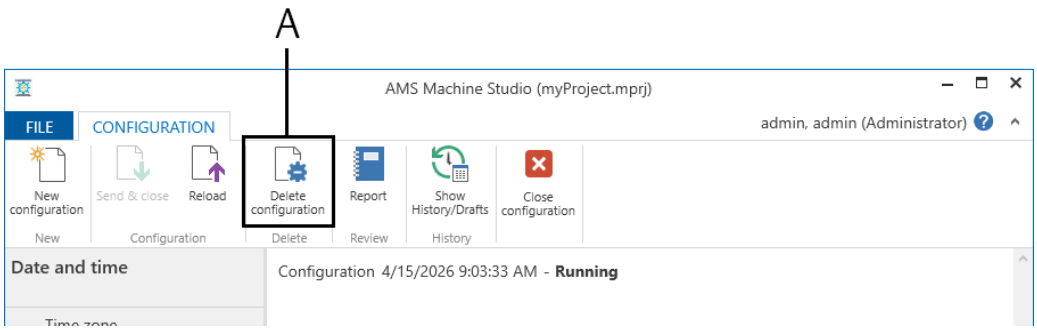
System services:

- Date and time (see Date and time)
- Audit log (see Audit log), requires A6500-CP (FW 1.x or FW 5.x) and administrative rights for some functions

Delete a service configuration

Delete configuration in the configuration editor deletes the configuration of the selected service. The configuration of the communication card is not affected by this command.

Figure 5-4: Services – Delete configuration



*A. Button **Delete configuration***

5.1 General – data acquisition services

The AMS 6500 ATG with data acquisition functionality is an application used by Emerson´s AMS Machine Works or the predecessor application, AMS Machinery Manager[6]. The predictive maintenance technologies in AMS Machine Works use data from monitoring devices to diagnose and communicate the health of rotating machinery.

AMS 6500 ATG systems with data collection capabilities collect data and send it to AMS Machine Works and/or buffer the data on an internal microSD card, depending on the communication card used and its firmware version.

In AMS 6500 ATG systems with an A6500-CP Com Card Pro with firmware version 5.0 or higher collected data can be streamed as live data to AMS Machine Works. Live data is streamed through the AMS Machine Works interface service.

Data collection for the AMS 6500 ATG, including several collection trigger options, is configured in AMS Machine Studio. An ATG Prediction Extension License (A6500-PE) is required to enable the configuration of data collection. Without this license, only the predefined data collection of the A6500-CC card or of the A6500-CP (FW 1.x) card with fixed parameters can be used.

Note
The collected signal waveforms are not influenced by filters set in the A6500-UM Universal Measuring Card.

6 *Requires an A6500-CC card.*

AMS Machine Works

AMS Machine Works reads the collected data of the AMS 6500 ATG system. AMS 6500 ATG cards with the following firmware versions are compatible with the listed AMS Machine Works versions.

Note
All cards of an AMS 6500 ATG system intended for connection to AMS Machine Works must be configured at least once using the latest version of AMS Machine Studio to ensure proper communication.

Table 5-1: Compatible firmware versions

AMS 6500 ATG card	Firmware version of the AMS 6500 ATG card	AMS Machine Works version
A6500-CC	3.3	1.8 to 2.3
A6500-CP	1.x	2.1 to 2.3
	5.x	2.4 or higher
A6500-UM	3.x	1.8 to 2.3
	5.x	2.4 or higher
A6500-TP	3.x	1.8 to 2.3
	5.x	2.4 or higher

Note
A6500-CP: Modbus via LAN 2 does not contain any time data. Use LAN 1 for the communication with AMS Machine Works.

Note
When an A6500-CP with firmware version 1.x is used, the Modbus mappings must be synchronized to ensure proper communication between the AMS 6500 ATG system and AMS Machine Works. See Update Modbus mappings.

AMS Machinery Manager

The use of AMS Machinery Manager requires the ATG Service and an A6500-CC Com Card. AMS Machinery Manager is not compatible with the A6500-CP Com Card Pro. The ATG Service transfers the collected data to an AMS Machinery Manager database. AMS Machinery Manager reads this data for further processing and analysis.

Note
Transient prediction requires AMS Machinery Manager version 5.7 and later versions for data analysis.
From version 5.71 onwards, the ATG Service is part of AMS Machinery Manager. See AMS Machinery Manager Help for further details.

Data acquisition services

There are two different services for the data acquisition:

- Data collections (see Data collections)
- Collection tasks (see Collection Tasks)

The availability of the data collection services depends on the communication card and firmware used. Table 5-2 provides an overview of the different requirements and the usable machinery management software.

Note
When updating an A6500-CP card from firmware version 1.x to 5.x, the **Collection tasks** configuration from version 1.x cannot be migrated to the **Data collection** configuration in version 5.x and must be reconfigured manually.

Table 5-2: Requirements

Service	Communication card	Interface	Machinery management software
Collection tasks	A6500-CC	ATG service and Modbus	AMS Machinery Manager 5.7 or later and AMS Machine Works 1.8 to 2.3
	A6500-CP with firmware version 1.x	ATG service and Modbus	AMS Machine Works 1.8 to 2.3
Data collections	A6500-CP with firmware version 5.x	AMS Machine Works	AMS Machine Works 2.4

Note
The ATG Service is automatically installed when you install the Data Import server of AMS Machinery Manager or AMS Machine Works version 1.8 to 2.3.

5.1.1 License entry

A license (ATG Prediction Extension License; A6500-PE) is required for the configurable data collection. Without a license, you can use the **Standard Collection Task** available with the A6500-CC card and the A6500-CP (FW 1.x) card (see Configuration). The license is assigned to one specific communication card (A6500-CC or A6500-CP).

Note
For ATG systems with redundant communication, Emerson recommends having a license for each communication card. Redundant license: A6500-PER

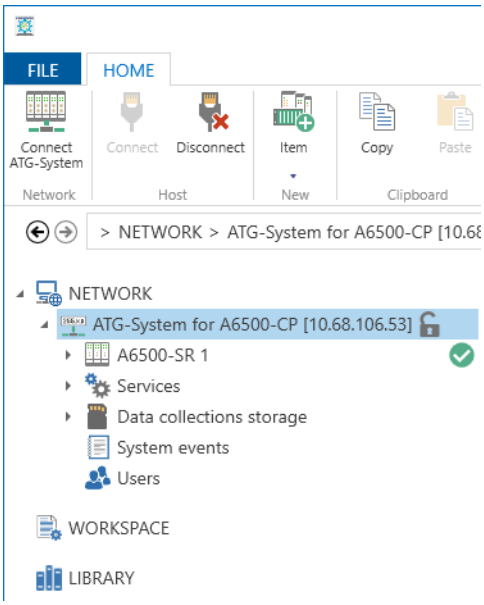
Follow the steps to add the license to enable the full configurable data collection. An online connection to the communication card is required for this procedure.

Note
The license key is connected to a specific communication card (A6500-CC or A6500-CP), identified by the serial number of the card, and cannot be transferred to another communication card.
Keep the license document in the case the license key must be reentered. This could be necessary after a reset of the A6500-CP card to factory default.

Procedure

1. Select the **AMS 6500 ATG system** from the device tree that contains the communication card to be licensed (see Figure 5-5).

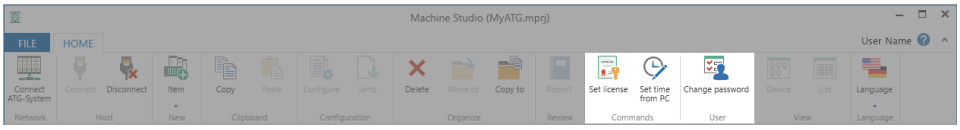
Figure 5-5: Selected AMS 6500 ATG system



Note
It is not necessary to switch the A6500-CP card into the program-state to activate a license. License activation is always possible.

The system-related commands are added to the command ribbon bar (see Figure 5-6).

Figure 5-6: AMS 6500 ATG system commands

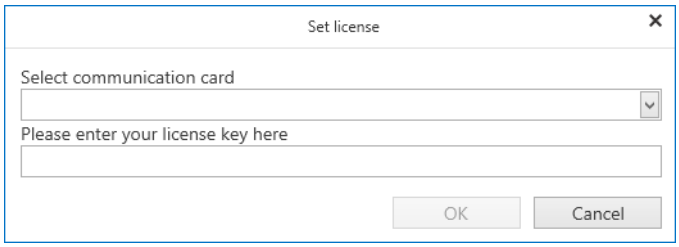


2. Click **Set License** (see Figure 5-7) to open the dialog for entering the license key (Figure 5-8).

Figure 5-7: Button Set License



Figure 5-8: Dialog Set License

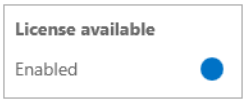


3. Select the serial number of the communication card from the **Select communication card** drop down list.

   The serial number of the communication card must be identical to the serial number on the license document.

4. Enter the license key, shown on the license document, into the field **Please enter your license key here**.
5. Click **OK** to complete the licensing process.
   A successful licensing is indicated by a message in the upper right corner of AMS Machine Studio. To check the license status, go to the online view **Overview** of the communication card, and check the dialog box **License available**. An available license is indicated by a blue solid circle (see Figure 5-9).

Figure 5-9: Indication license state



5.1.2 Redundancy

In AMS 6500 ATG systems with redundant communication (two communication cards installed), the active communication card collects data and buffers the collected data on its microSD card. If an A6500-CP (FW 5.x) card is installed, only alarm-triggered data is stored on the microSD card.

Note
For AMS 6500 ATG systems with redundant communication, Emerson recommends having a license for both communication cards. See License entry for license details.

5.2 Data collections

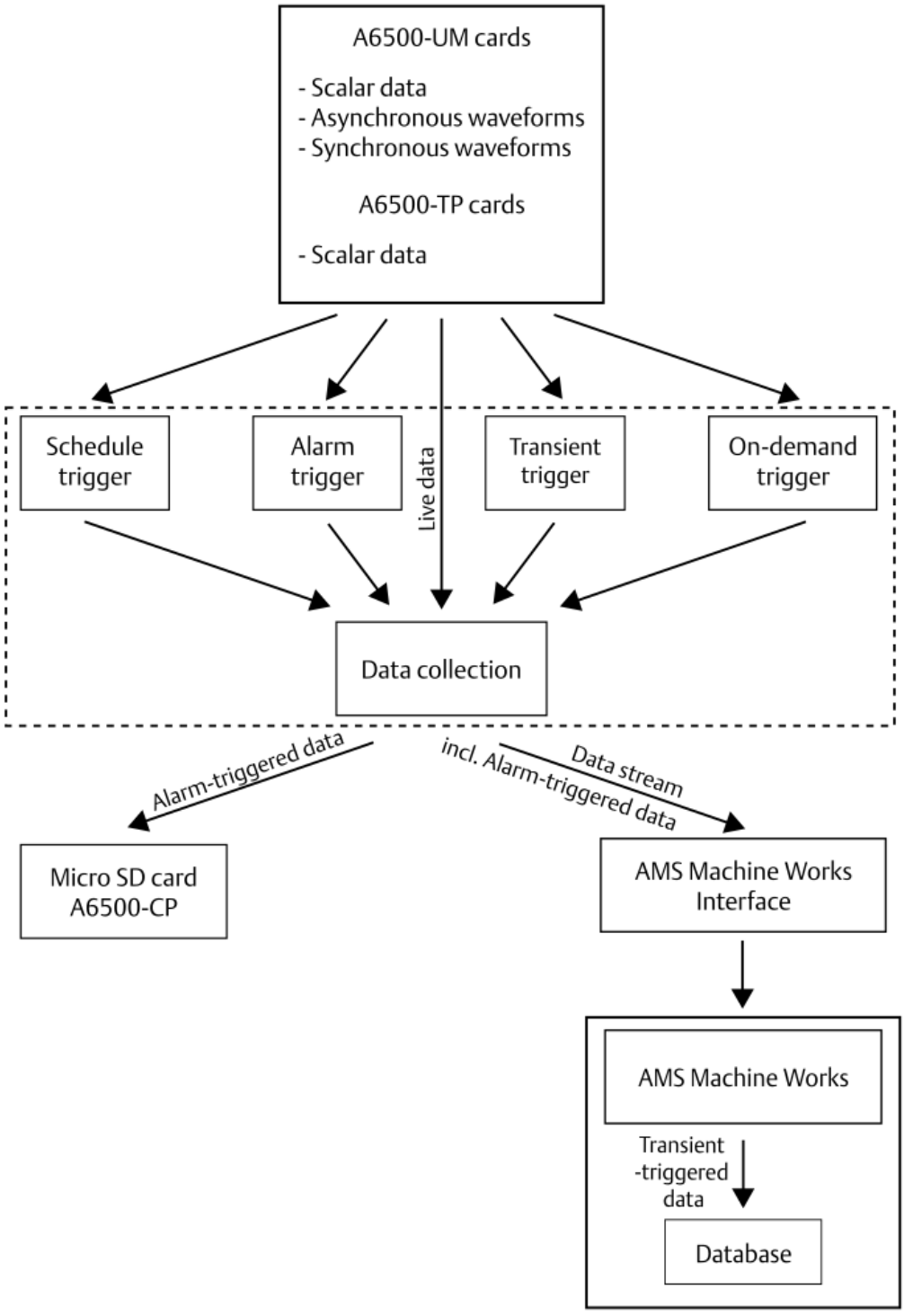
The data collection functionality described in this chapter is available when using an A6500-CP card with firmware version 5.x. This service enables the streaming and acquisition of both scalar data and waveform data, supporting a variety of collection triggers to suit different monitoring and diagnostic needs.

Data measured by the A6500-UM and A6500-TP cards of the AMS 6500 ATG system can be collected based on the following configurable triggers:

- Schedule
- Alarm
- Transient
- On-demand

Collected data is streamed to AMS Machine Works. Alarm-triggered data is additionally stored on the internal microSD card of the A6500-CP card. Transient-triggered data is streamed to AMS Machine Works and stored in the AMS Machine Works database. Enabled live scalar and waveform data are continuously streamed through the AMS Machine Works interface. See Figure 5-10.

Figure 5-10: Data collections overview



See Data sent to AMS Machine Works for a general overview of the data transmitted to AMS Machine Works.

Data types and triggers

The following types of data can be collected:

Scalar values Scalar values are single numerical values such as overall measurement values, analysis values, or gap values.

Asynchronous waveforms An asynchronous waveform is a data block with a defined length that is collected by the A6500-UM card. The collected data block is not synchronized with the machine rotation.
Asynchronous waveforms are configured on the A6500-UM card channel that has the measuring point connected, which provides the needed waveform signal. See A6500-UM card Operating Manual for details.

Synchronous waveforms A synchronous waveform is a data block collected with a defined length that is collected rotationally synchronous by the A6500-UM card. The collection starts with the beginning of the next rotation.

Note
Synchronous waveforms collection requires a key signal from an A6500-UM card in key mode. Emerson recommends activating **Advanced synchronization** to obtain a key signal that includes a time stamp for synchronizing data collection across all A6500-UM cards connected to this key signal.

Synchronous waveforms are configured on the A6500-UM card channel that has the measuring point connected, which provides the needed waveform signal. See A6500-UM card Operating Manual for details.

Available collection triggers:

Scheduled Scalar data and waveforms (asynchronous and synchronous) are collected on a configurable schedule. The collected data is directly sent to AMS Machine Works and not buffered on the microSD card of the A6500-CP card.

Transient Scalar data and waveforms (asynchronous and synchronous) are collected based on configurable events such as delta RPM or delta Time. A collection predicate must be met before data can be collected. The collected data is directly sent to AMS Machine Works and not buffered on the microSD card of the A6500-CP card.

Waveforms are transmitted from AMS 6500 ATG to AMS Machine Works typically within less than 5 seconds after collection. The update rate for waveform data typically ranges between 2 and 8 seconds, depending on the configured lines of resolution (LOR) and Fmax settings. Waveform transmission is continuous but it may be temporarily slowed down or interrupted if an alarm condition occurs. In such cases, the system prioritizes the transmission of alarm data to AMS Machine Works to ensure timely response and processing. Once the alarm has been successfully communicated, waveform transmission resumes automatically.

Alarm Scalar data and waveforms (asynchronous and synchronous) are collected based on fulfilled alarm conditions. The collected data is buffered on the microSD card of the A6500-CP card and sent to AMS Machine Works.

On-demand On-demand refers to a manual, user-initiated action that triggers an immediate data collection process. Unlike scheduled or condition-based data collection, on-demand data is collected only when explicitly requested by the user. This function allows operators to obtain current machine condition information at any time, independent of predefined monitoring intervals.

An on-demand trigger records:

- One scalar (measuring value), maximum 15 values (signal evaluations, analysis, ...)
- Configured number of waveforms (see Number of waveforms for on-demand trigger)

The on-demand trigger mechanism is accessible via AMS Machine Studio and through the Modbus, OPC UA, or AMS Machine Works interfaces, and is currently supported on LAN 1.

Live data The Live data trigger enables continuous data collection to provide a real-time data stream. Live data can be selectively enabled for scalar data and waveform data (including synchronous waveform data) on **Basic** (see Basic). Live data can be enabled or disabled from AMS Machine Works through the AMS Machine Works interface, provided that live data is enabled in the AMS 6500 ATG system.

This trigger mode is intended for applications that require up-to-date machine condition information during operation.

Time synchronization between A6500-CP and A6500-UM cards

A6500-UM cards are normally synchronized via the advanced key synchronization pulse (see A6500-UM Card Operation Manual). This ensures that all A6500-UM cards using the same key signal share a common time reference defined by the A6500-UM card operating in speed mode.

If an A6500-UM card does not receive a key synchronization pulse for a defined period, it automatically synchronizes its time with the A6500-CP card.

The same behavior applies to the A6500-UM card operating in speed mode. If the card does not receive a key synchronization pulse, it synchronizes its time with the A6500-CP card. As a result, all A6500-UM cards synchronized with the A6500-UM card in speed mode remain aligned with the A6500-CP card time.

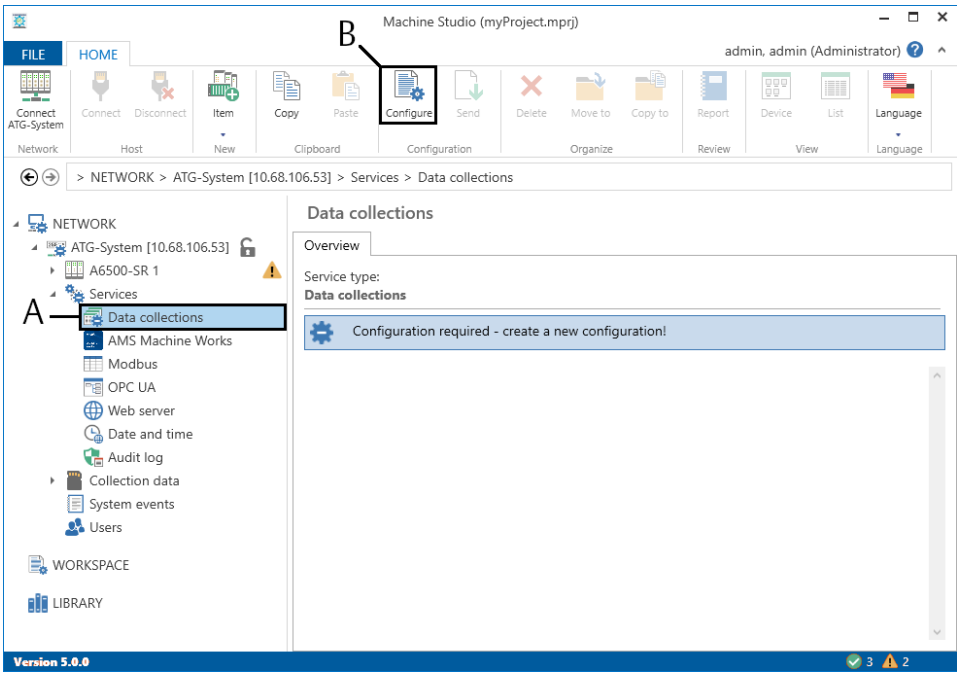
Time synchronization is implemented in a way that minimizes the impact of time jitter. For example, if the system time is adjusted backwards by several seconds, this does not cause significant delays in data recording or processing.

5.2.1 Configuration

Procedure

1. Select **Network → AMS 6500 ATG System → Services → Data collections** (see Figure 5-11).

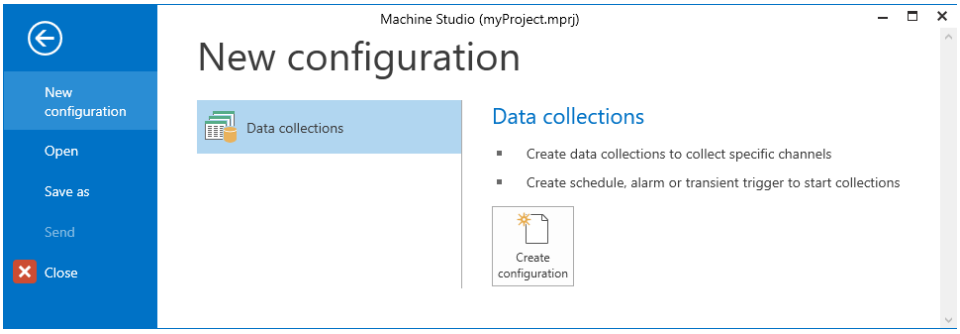
Figure 5-11: Data collections selection



*A. Selected **Data collections***
*B. **Configure** to open the configuration editor*

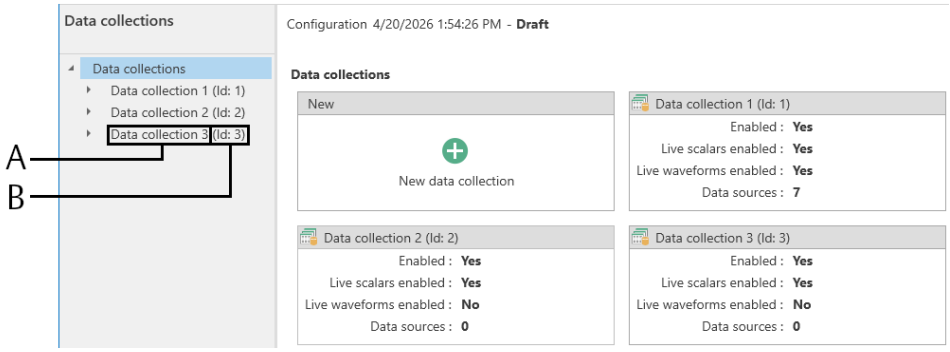
2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).
   During the first configuration of the data collections, the **New configuration** dialog appears. Click **Create configuration** to create a new configuration.

Figure 5-12: New configuration



3. Create a data collection. **Data collections** contains all configured data collections and a button to add a new data collection.

Figure 5-13: Data collections



A. Configurable name of the data collection
B. Sequence Number of the data collection

Here you can add new data collections, open data collection details, or delete data collections. Click a data collection to open its configuration.

Add a new data collection

Use **Data collections** to configure how data is gathered. For each data collection, define the data sources to be collected, set triggers to control data collection, and specify the collection settings.

Note
A channel can only be assigned to one data collection.

Click **New data collection** (see Figure 5-13) to add a new data collection. Up to ten data collections can be added.

The new data collection is added to the tree on the left side of the configuration editor, and the editor automatically switches to it. Each data collection entry in the device tree consists of the name (entered on the **Basic** tab) and a sequence number (Id: x), see Figure 5-13.

Delete a data collection

a. Select **Data collections** from the tree on the left
   All available data collections are shown in the right part of the configuration editor.

b. In the right part of the configuration editor, move the cursor on the data collection to be deleted.
   The frame of the data collection is highlighted and a trash bin symbol appears.

c. Click the trash bin symbol to delete the data collection.
   The data collection is immediately removed from the configuration.

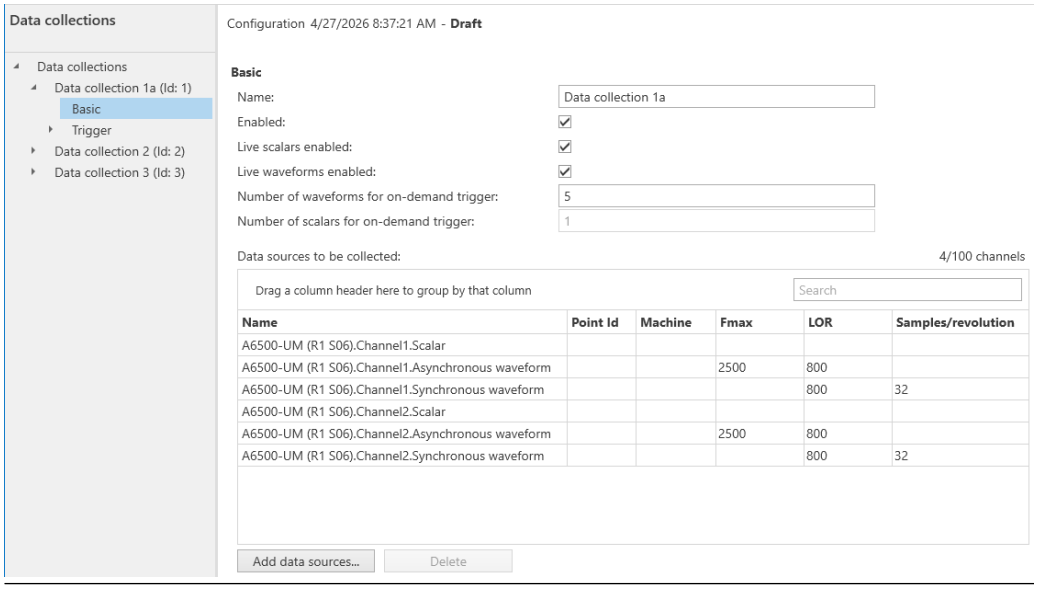
4. Enter the configuration parameters. See Basic and Trigger for details.
5. Click **Send & close** to send the configuration to the AMS 6500 ATG system. The editor closes automatically after a successful sending of the configuration. See Send a configuration.

Note
Sending a data collections configuration does not affect the protection function of the AMS 6500 ATG system.

Basic

Enter basic parameters for the data collection. The data collection with the defined sources can be started by different trigger options. Enabled live scalar and waveform data are continuously streamed through the AMS Machine Works interface.

Figure 5-14: Basic



Name — Enter a name for the data collection. This name will also be displayed together with the collection number in the tree.

Enabled — Check this box to enable the data collection.

Live scalars enabled — Check this box to enable transmission of scalar values to AMS Machine Works.

One scalar value of each scalar type[7] is sent out every second.

Note
A maximum of 15 scalar values per channel can be requested per live data set.

Live waveforms enabled — Check this box to enable transmission of waveform data to AMS Machine Works. Depending on the configuration of the A6500-UM cards asynchronous waveforms, synchronous waveforms, or both types can be transmitted.

The update rate depends on the lines of resolution configured in the A6500-UM card (**Waveforms → LOR**):

7 *Scalar values are single numerical values such as overall measurement values, gap values, or analysis values.*

- 400 LOR: ≤ 2 seconds
- 800 LOR: ≤ 4 seconds
- 1600 LOR: ≤ 8 seconds

Number of waveforms for on-demand trigger

Define the number of waveforms to be collected upon an on-demand trigger event. When an on-demand trigger event occurs, all waveforms in the data sources table are collected as often as specified in this field. On-demand data collections can be initiated via AMS Machine Studio, the Modbus or OPC UA interface, or by AMS Machine Works users through the AMS Machine Works interface of the AMS 6500 ATG system.

Number of scalars for on-demand trigger

Indicates the number of scalars collected when an on-demand trigger event occurs. This entry is for informational purposes only and cannot be changed. When an on-demand trigger event occurs, all scalars in the data sources table are collected once. On-demand data collections can be initiated via AMS Machine Studio, the Modbus or OPC UA interface, or by AMS Machine Works users through the AMS Machine Works interface of the AMS 6500 ATG system.

Data sources to be collected

Click **Add data sources...** to open a selection dialog containing a table with all available data sources. Click a row to select the data source for the collection. To select more data sources, press **Ctrl** and left-click further rows. Selected rows are highlighted in blue. **Add data sources...** is disabled when no further data sources can be added.

Click **OK** to add the selected data sources to the table of sources to be collected. Click **Cancel** to discard the selections.

Note
Up to 100 channels can be added per data collection. A channel may include multiple data sources, such as scalar values and waveforms. **Add data sources...** is disabled once the limit is reached or no further data sources are available. The counter in the upper right of the data sources table shows how many channels have already been added. A counter showing how many channels can still be added is also available in the **Add data sources** selection dialog.

To remove a data source from the table, left-click the row of the data source to be deleted and click **Delete**.
To delete multiple data sources from the list, press **Ctrl** and click each data source you want to delete, or press **Shift** and click the first and last data source of a block to select them. Then click **Delete**.

The data sources are removed from the table immediately.

⚠ CAUTION

Changing the waveform collection configuration in the A6500-UM card automatically also changes the data collection.

The data sources table contains the following information:

Name	This column contains the following information: • The name of the card, taken from the card configuration. • The physical location of the measurement point (rack, slot, and channel). • The format of the collected data, such as asynchronous waveform, synchronous waveform, or scalars.
Point Id	The identifier of the measurement point, taken from the card configuration.
Machine	The name of the machine associated with the measurement point, taken from the card configuration.
Fmax	The maximum frequency for the measurement. Available for asynchronous waveforms.
LOR	The lines of resolution used in the data collection process. Available for synchronous and asynchronous waveforms.
Samples per revolution	Samples per revolution used in the data collection process. Available for synchronous waveforms.

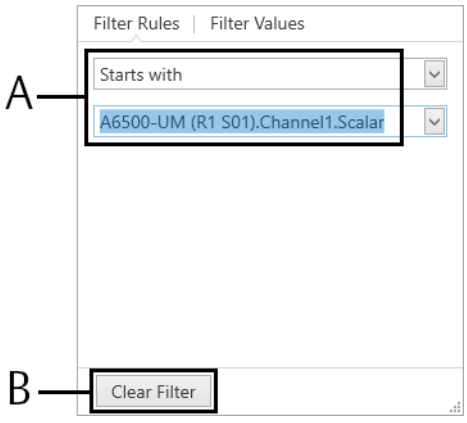
Table filter functions

Several filter functions and grouping possibilities are available for the data sources table.

Filter the content of a column:

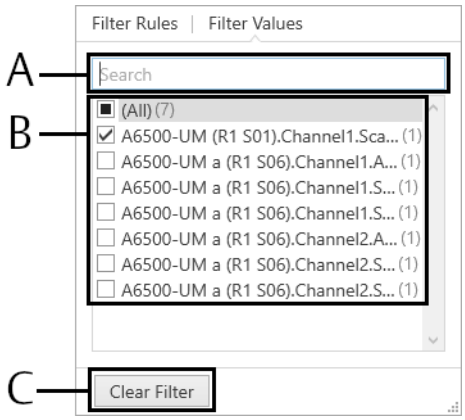
1. Move the courser over the header of the column with the content to be filtered. The filter icon appears.
2. Click the filter icon to open a dialog with selection options.

Figure 5-15: Selection options – filter rules



A. Filter options
B. Button to clear the filter

Figure 5-16: Selection options – filter values



A. Search field
B. Selectable options
C. Button to clear the filter

3. Enter filter values or define filter rules.
   The filter conditions are applied immediately. Click **Clear filter** to reset all defined filter for the column.
4. Click somewhere outside the filter dialog to close it.
   A column with an active filter is indicated with the filer icon in the column header. Columns without an active filter do not show the icon. If filter settings need to be changed or deleted click the filter icon to open the filter dialog again.

Group the content of a column based on the column header:

The filter functions can also be applied to grouped columns.

1. Click and hold the header of column to be grouped.
2. Move the header into the field below **Data sources to be collected** and release the mouse button. Or right-click the header and click **Group By This Column** in the pop-up menu.
   The content of the column is grouped based on the column header. Click the arrow in front of the group name to see the content of the group.

To undo the grouping, click and hold the header in the field below **Data sources to be collected** and move it back to the table header. The column header can be replaced at arbitrary positions within the table header. Release the mouse button at the desired position.

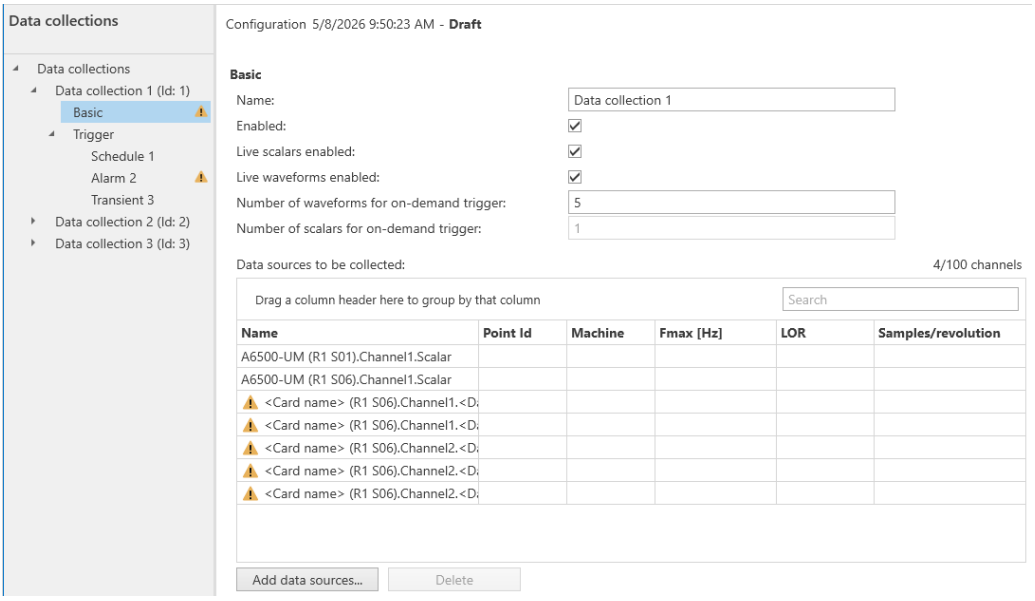
Indication of missing channels

Removing a card or changing a configuration of a card causes an inconsistency in the list of sources to be collected. If one or more channels in the data source table become unavailable, a yellow warning triangle appears next to the **Data collection** service in the device tree.

When the tree is fully collapsed, the warning triangle is also shown at the top level. This allows the warning to be traced down through the tree to its source.

In this case, open the **Data collection** configuration, and follow the warning triangle to the cause of this inconsistency. Sources that are no longer available are marked with a warning triangle (see Figure 5-17)

Figure 5-17: Indication of a missing source



There are several possibilities to solve an inconsistency:

Table 5-3: Hints for solving inconsistencies

Cause	Solution
Card has been removed	Reinstall the missing card or delete the source from the list.
Configuration of the card has been changed	Update the list to reflect the change.
Card is defective	Replace the card and configure it based on the settings of the defective card.

Note
Data collections are processed even if some channels are missing.

Trigger

Data collection in the AMS 6500 ATG system can be initiated based on various types of triggers:

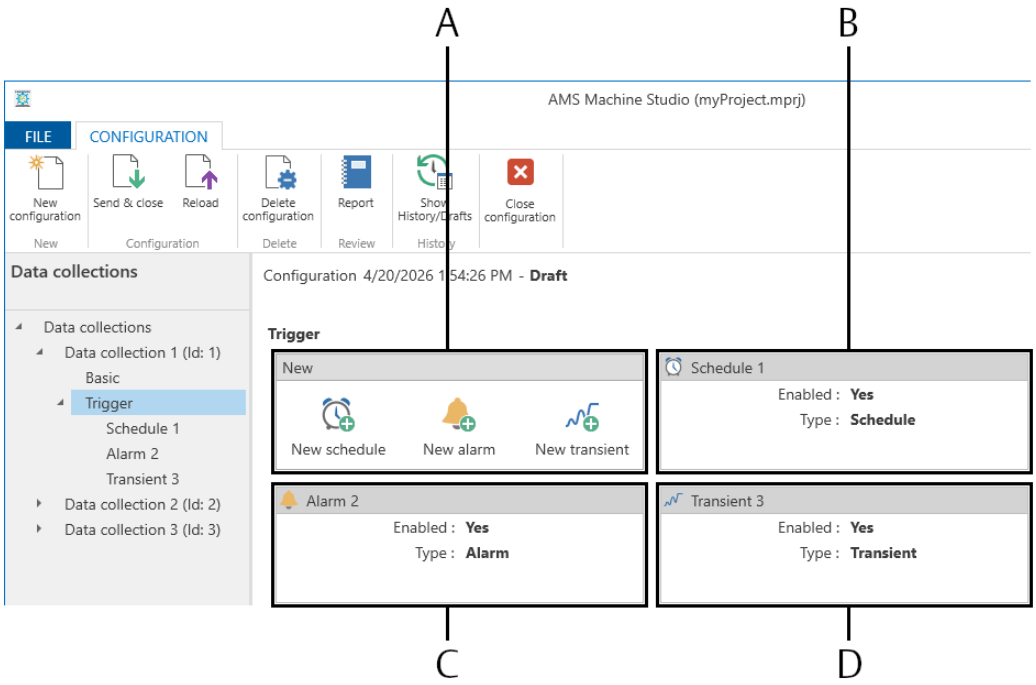
- **Schedule**: Automatically start data collection at predefined times or intervals. See Schedule.
- **Alarm**: Initiate data collection when specific alarm conditions are met. See Alarm.

- **Transient**: Capture data during transitional machine states such as startup or shutdown. See Transient
- **Live**: Continuous data collection. See Basic.
- **On-demand**: On-demand refers to a manual, user-initiated action that triggers an immediate data collection process. See Number of waveforms for on-demand trigger.

Each data collection can include up to six triggers consisting of the types schedule, alarm, and transient, plus one live trigger and one on-demand trigger.

When different configured triggers start a data collection at the same time, all data collections run in parallel. The only exception is alarm-triggered data collections: in this case, the first alarm trigger initiates the data collection.

Figure 5-18: Trigger configuration



A. Buttons to add a new trigger
B. Schedule trigger configuration
C. Alarm trigger configuration
D. Transient trigger configuration

Here you can add new triggers for the data collection, open existing trigger configurations, or delete triggers. Click a trigger to open its configuration.

Add a new trigger

Click one of the different trigger buttons **New schedule**, **New alarm**, or **New transient** (see Figure 5-18) to add a new schedule, alarm, or transient trigger to the data collection. Up to six triggers can be added across all trigger types.

The new trigger is added to the tree on the left side of the configuration editor, and the editor automatically opens the trigger configuration.

Delete a trigger

1. Select **Trigger** from the tree on the left.
   All available triggers are shown in the right part of the configuration editor.
2. In the right part of the configuration editor, place the cursor on the trigger to be deleted.
   The frame of the trigger is highlighted and a trash bin symbol appears.
3. Click the trash bin symbol to delete the trigger.
   The trigger is immediately removed from the configuration.

Software trigger

There are ten additional Modbus registers and corresponding OPC UA items for directly triggering data collections. The available OPC UA items are identical with the available Modbus registers. These software triggers are assigned to the data collections in numeric order:

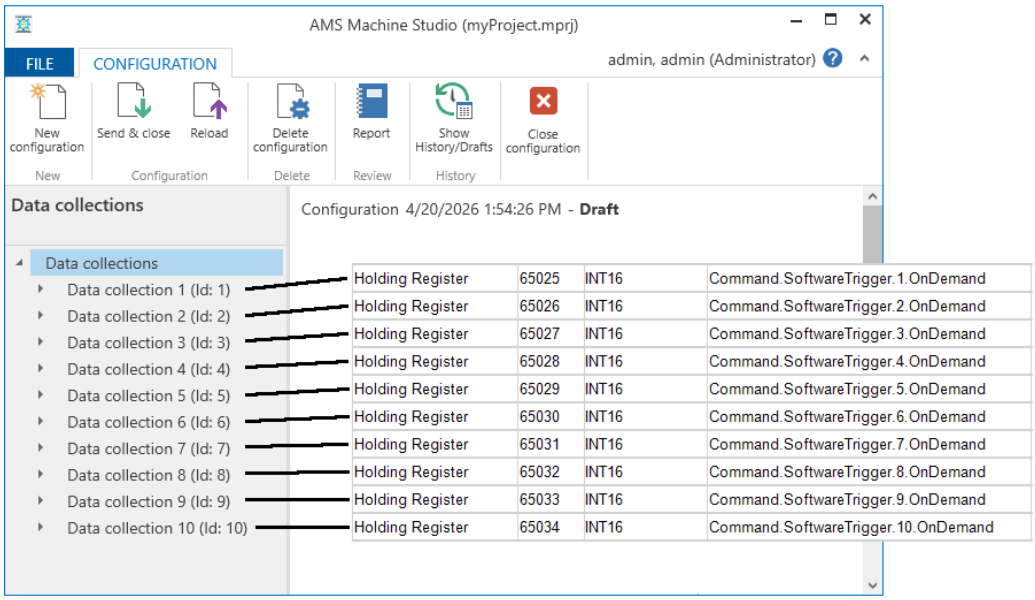
Command.SoftwareTrigger.1.OnDemand is assigned to data collection 1 (Id: 1).

Command.SoftwareTrigger.2.OnDemand is assigned to data collection 2 (Id: 2).

...

Command.SoftwareTrigger.10.OnDemand is assigned to data collection 10 (Id: 10).

Figure 5-19: Assignment of the software triggers to the data collections



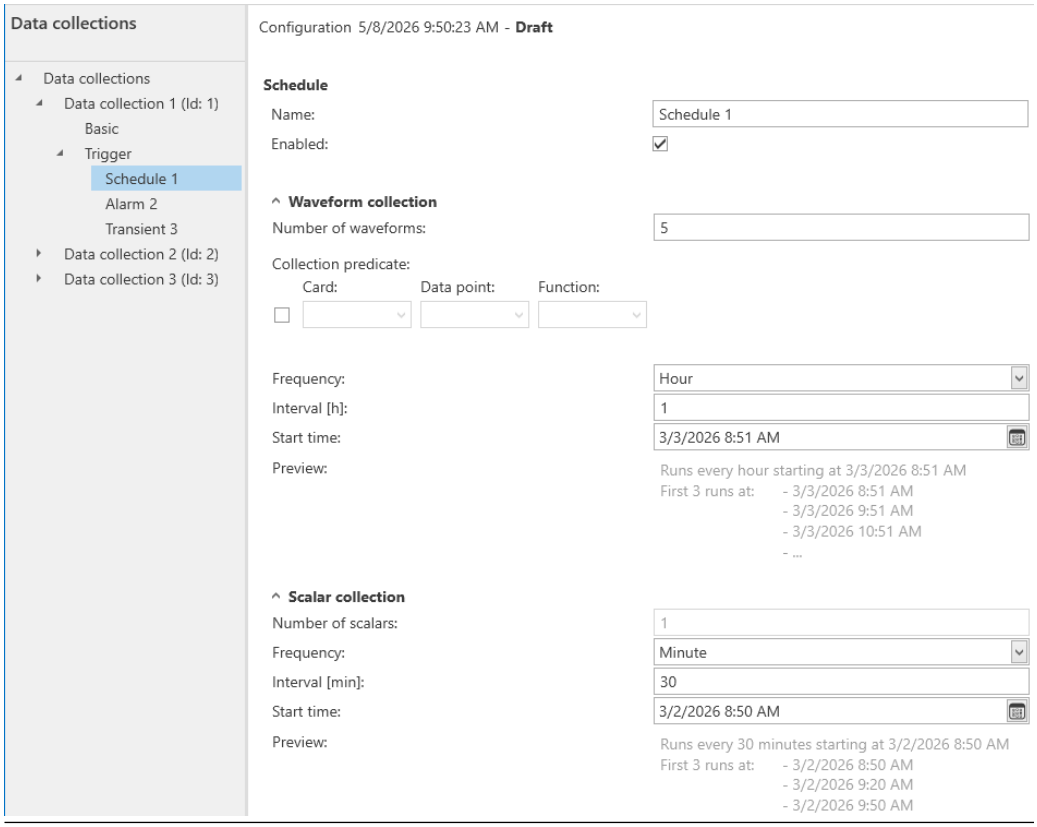
The name of the data collection may differ in your configuration, as it is configurable (see Name).

To trigger a data collection, use an OPC UA client to set the value of the appropriate trigger item to **1**. The value is **-1** while the OPC UA server is waiting for the command. See Table B-64 for more details on using the Modbus registers.

Schedule

Set up schedules for the data collection.

Figure 5-20: Schedule



Name Add a unique name for the schedule. The schedule with this name is available in the device tree.

Enabled Check this box to enable the schedule.

Waveform collection

Click the down arrow in front of **Waveform collection** to open parameters for the waveform collection.

Number of waveforms The number specifies how often the waveforms in the data sources table under **Basic** are collected. When a scheduled trigger occurs, all waveforms in the data sources table are collected as often as specified in this field.

The time required to collect the specified number of waveforms depends on the waveform acquisition settings of the A6500-UM card and can range from a few seconds to several minutes. Example: Collecting 5 synchronous waveforms with 800 LOR and 32 samples per revolution at 3000 rpm takes approximately 10 seconds.

Collection predicate

Define the condition under which waveform data is collected when the scheduled trigger occurs.

The predicate acts as a logical rule. When the scheduled trigger occurs, the system checks this rule to decide if waveform data should be collected.

Waveform data is collected when the scheduled trigger occurs and the predicate evaluates to true.

Procedure:

1. Check the box to enable the condition. If unchecked, waveform data is collected whenever an event occurs. Waveform data is not collected, when the scheduled trigger occurs but the predicate evaluates to false.
2. Select a card from the drop-down list.
   The available cards depend on the cards installed in the connected AMS 6500 ATG system.
3. Depending on the selected card, additional selection and entry fields for defining the condition appear, see Table 5-4.

Table 5-4: Selection and entry fields

Data point type	Function	Level/Limit
Binary value	• is true • is false	-/-
Measurement value	• is greater than • is greater than or equal • is less than • is less than or equal • is between • is not between	Entry field for limit value, two entry fields for conditions **is between** and **is not between**

4. Enter a limit value if a source is selected that provides a limit value entry field. Two entry fields are available if **is between** or **is not between** is selected for the limit condition.

Frequency

Define the execution time interval for data collection. Depending on the selection further entry or selection fields appear.

- **Never**
  No scheduled waveform collection.
- **Hour**
  Waveforms are collected at a definable hourly interval.

Interval

Enter a number to define the hourly interval.

Start time Define a start time for the waveform collection schedule. The date and time format depends on the language setting of AMS Machine Studio (see Language).

- Enter date and time in the entry field. Click a single element of the date and time format to select it. The selected element is highlighted in blue. Type in the value.
- Click the calendar icon to open the dialog for selecting time and date. Choose a date and time, then click **OK**.

Preview Displays a summary of the defined schedule.

Scalar collection

Click the down arrow in front of **Scalar collection** to open parameters for the scalar collection.

Number of scalars Indicates how often the scalars in the data sources table under the **Basic** tab are collected. This entry is for informational purposes only and cannot be changed. When a scheduled trigger occurs, all scalars in the data sources table are collected once.

Frequency Define the execution time interval for data collection. Depending on the selection further entry or selection fields appear.

- **Never**
  No scheduled scalar collection.
- **Second**
  Scalars are collected at a configurable interval in seconds.
- **Minute**
  Scalars are collected at a configurable interval in minutes.

Interval Enter a number to define the interval in seconds or minutes, depending on the selected frequency.

Start time Define a start time for the scalar data collection schedule. The date and time format depends on the language setting of AMS Machine Studio (see Language).

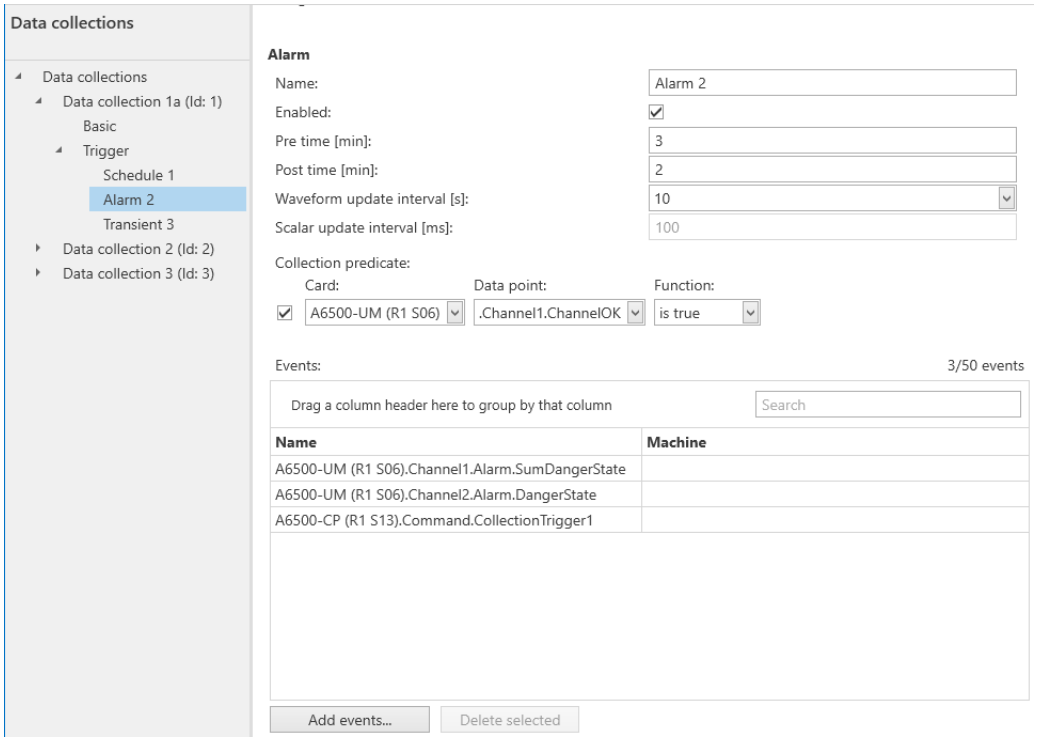
- Enter date and time in the entry field. Click a single element of the date and time format to select it. The selected element is highlighted in blue. Type in the value.
- Click the calendar icon to open the dialog for selecting time and date. Choose a date and time, then click **OK**.

Preview Displays a summary of the defined schedule.

Alarm

Configure alarm triggers in AMS Machine Studio with customizable timing, update rates, and event conditions.

Figure 5-21: Alarm trigger



Name Enter a unique name for the trigger.

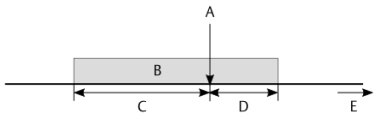
Enabled Check this box to enable the trigger.

Pre time and post time Define the length of the data block to be collected.

Pre time specifies how much data is collected before the event occurs. **Post time** specifies how much data is collected after the event. The maximum duration from **Pre time** to **Post time** is 14 minutes.

Example: The event is the danger alarm of a shaft vibration measurement. **Pre time** is 3 minutes and **Post time** is 2 minutes. Once the event occurs, a block with data of 3 minutes before the alarm event plus data of 2 minutes after the event is collected. The total length of the data block is 5 minutes.

Figure 5-22: Diagram pre and post time



A. Event
B. Data block
C. Pre time
D. Post time
E. Time

Waveform update interval

Select an update interval for the waveform within the defined data block.

The waveform update interval defines how often waveform data is recorded during an alarm event. Shorter intervals, for example 5 s, provide higher temporal resolution and more waveforms, while longer intervals, for example 20 s, reduce data volume. For a 5-minute (300 seconds) data block, approximately 60, 30, or 15 waveforms are collected with update intervals of 5 s, 10 s, or 20 s, respectively.

Note
The collection of certain waveforms, such as those with 1600 LOR (Lines of Resolution), can take longer than the selected update interval. For example, if the update rate is set to 5 seconds and the waveform collection requires 8 seconds, the second scheduled update will be ignored because the first waveform is still in progress.

Scalar update interval

Indicates the interval at which scalars are collected when an alarm trigger event occurs. This entry is for informational purposes only and cannot be changed. When an alarm trigger event occurs, all scalars in the data sources table are collected every 100 ms within the defined data block.

Collection predicate

Define the condition under which scalar and waveform data is collected when an event occurs.

The predicate acts as a logical rule. When an event occurs, the system checks this rule to decide if scalar and waveform data should be collected.

- Scalar and waveform data is collected when the event occurs and the predicate evaluates to true.
- Scalar and waveform data is not collected when the event occurs but the predicate evaluates to false.

Procedure:

1. Check the box to enable the condition. If unchecked, scalar and waveform data is collected whenever an event occurs.
2. Select a card from the drop-down list.
   The available cards depend on the cards installed in the connected AMS 6500 ATG system.

3. Depending on the selected card, additional selection and entry fields for defining the condition appear, see Table 5-5.

Table 5-5: Selection and entry fields

Data point type	Function	Level/Limit
Binary value	• is true • is false	-/-
Measurement value	• is greater than • is greater than or equal • is less than • is less than or equal • is between • is not between	Entry field for limit value, two entry fields for conditions **is between** and **is not between**

4. Enter a limit value if a source is selected that provides a limit value entry field. Two entry fields are available if **is between** or **is not between** is selected for the limit condition.

Events

Click **Add event ...** to open a selection dialog containing a table with all available events. Click a row to select the event for the collection. To select more events, press **Ctrl** and left-click further rows. Selected rows are highlighted in blue.

Note
Up to 50 events can be added per data collection. **Add events...** is disabled once the limit is reached or no further events are available. The counter in the upper right of the events table shows how many events have already been added. A counter showing how many events can still be added is also available in the **Select Events** dialog.

Select collection trigger commands to trigger the data collection through the OPC UA or Modbus interface.

- **Modbus**
  See Table B-64 for details.
- **OPC UA**
  The available OPC UA items are identical with the available Modbus registers for collection triggering of data collections.
  Command.CollectionTrigger1 to **Command.CollectionTrigger10**
  To trigger a data collection, use an OPC UA client to set the value of the appropriate trigger item to **1**. The value is **-1** while the OPC UA server is waiting for the command.

Click **OK** to add the selected events to the table of events. Click **Cancel** to discard the selections.

To remove an event from the table, left-click the row of the event to be deleted and click **Delete selected**.
To delete multiple events from the list, press **Ctrl** and click each event you want to delete, or press **Shift** and click the first and last event of a block to select them. Then click **Delete selected**.

The events are removed from the table immediately.

The events table contains the following information:

Name This column contains the following information:
- The name of the card, taken from the card configuration.
- The physical location (rack, slot, and channel).
- The event such as an alarm state used to trigger data collection.

Machine The name of the machine associated with the event, taken from the card configuration.

See Table filter functions for a description of the table filter functions.

Transient

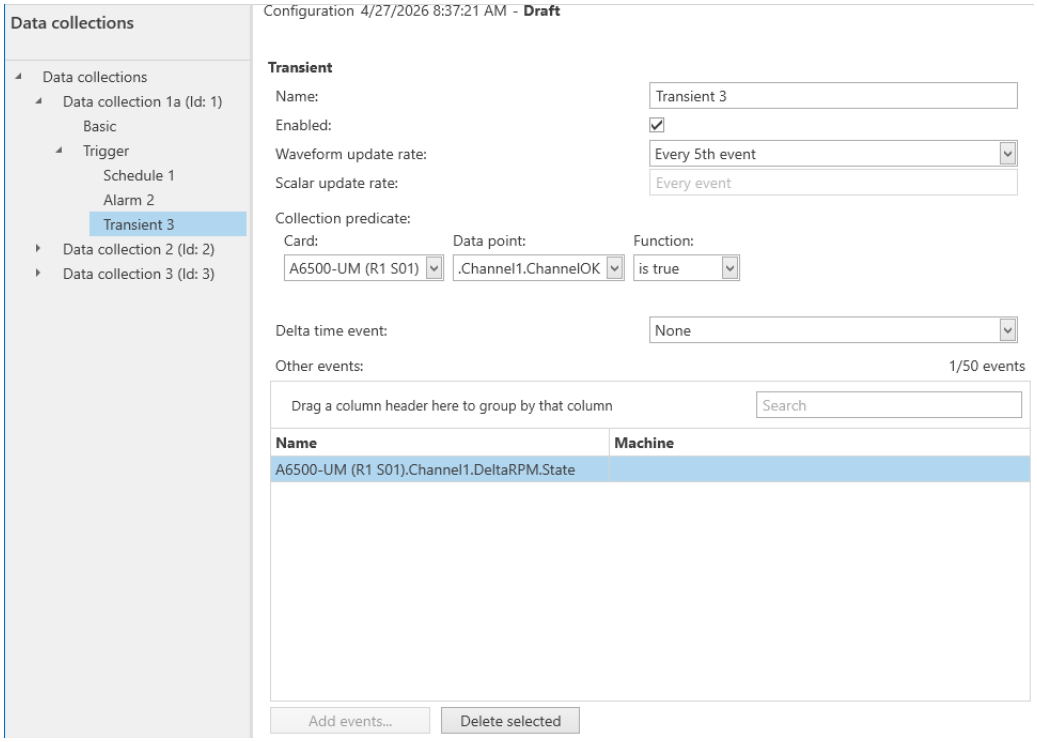
Transient data collection enables users to capture machine behavior during critical transition periods such as startup (run-up) and shutdown (run-down). This functionality is essential for diagnosing performance issues and understanding dynamic machine conditions.

Configure transient triggers to initiate data collection during these transitional states. These triggers allow the system to record relevant data precisely when the machine enters or exits a transient condition.

AMS Machine Works can receive scalar and waveform data from the AMS 6500 ATG system during configured transient events. This data is transmitted to AMS Machine Works for in-depth analysis and is stored for future reference, enabling comprehensive evaluation of machine performance during startup and shutdown phases.

- Update rate: Up to 10 updates per event, with a maximum of 15 values (evaluations and analyses, depending on UM card configuration) per added channel, at 100 ms intervals provided the predicate is fulfilled.
- Asynchronous and synchronous waveform data is sent to AMS Machine Works at a configurable event interval provided the predicate is fulfilled.

Figure 5-23: Transient



Name — Add a unique name for the transient trigger. The transient trigger with this name is available in the device tree.

Enabled — Check this box to enable the transient trigger.

Waveform update rate — Specifies how often waveform data is collected during transient events. Select the number of events after which data is recorded.

> **Note**
> The transient trigger is ignored if a waveform collection is already in progress.

Scalar update rate — Indicates the update rate at which scalars are collected when transient trigger events occur. This entry is for informational purposes only and cannot be changed. When transient trigger events occur, all scalars in the data sources table are collected at every event.

Collection predicate — Define the condition under which data is collected when the transient trigger occurs.

The predicate acts as a logical rule. When the transient trigger occurs, the system checks this rule to decide if data should be collected.

- Data is collected when the transient trigger occurs and the predicate evaluates to true.
- Data is not collected, when the transient trigger occurs but the predicate evaluates to false.

Procedure:

1. Select a card from the drop-down list.
   The available cards depend on the cards installed in the connected AMS 6500 ATG system.
2. Depending on the selected card, additional selection and entry fields for defining the condition appear, see Table 5-6.

Table 5-6: Selection and entry fields

Data point type	Function	Level/Limit
Binary value	• is true • is false	-/-
Measurement value	• is greater than • is greater than or equal • is less than • is less than or equal • is between • is not between	Entry field for limit value, two entry fields for conditions **is between** and **is not between**

3. Enter a limit value if a source is selected that provides a limit value entry field. Two entry fields are available if **is between** or **is not between** is selected for the limit condition.

Delta time event

Select a time-based trigger from the dropdown list. The selected delta time defines the interval at which a delta time event is raised. Delta time events are disabled if **None** is selected.

Note
The delta time event is not coupled to the start of the **Transient** data collection. The delta time timer runs independently on the A6500-CP card.

Other events

Click **Add event ...** to open a selection dialog containing a table with all available events. Click a row to select the event for the collection. To select more events, press **Ctrl** and left-click further rows. Selected rows are highlighted in blue.

Note
Only **delta RPM** and **delta Time** events are supported for triggering a transient data collection. Up to 50 events can be added per data collection. **Add events...** is disabled once the limit is reached or no further events are available. The counter in the upper right of the events table shows how many events have already been added. A counter showing

how many events can still be added is also available in the **Select Events** dialog.

Click **OK** to add the selected events to the table of events. Click **Cancel** to discard the selections.

To remove an event from the table, left-click the row of the event to be deleted and click **Delete**. The event is deleted from the table immediately.

The transient trigger table contains the following information:

Name This column contains the following information:
- The name of the card, taken from the card configuration.
- The physical location (rack, slot, and channel).
- The event such as a **delta RPM** event used to trigger transient data collection.

Machine The name of the machine associated with the event, taken from the card configuration.

5.2.2 Commands

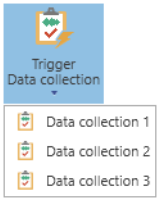
If **Data collections** is selected in the device tree, the associated commands are enabled in the command ribbon bar. An online connection is required to execute these commands.

Note
These commands do not affect the protection function of the system.

Trigger Data collection

Click **Trigger Data collection** to open a list of all configured data collections. Click a data collection to start it manually. The number of waveforms and scalars collected during this on-demand collection is defined on the **Basic** tab.

Figure 5-24: Trigger Data collection



The data collections can also be triggered through the OPC UA or Modbus interface. See Software trigger.

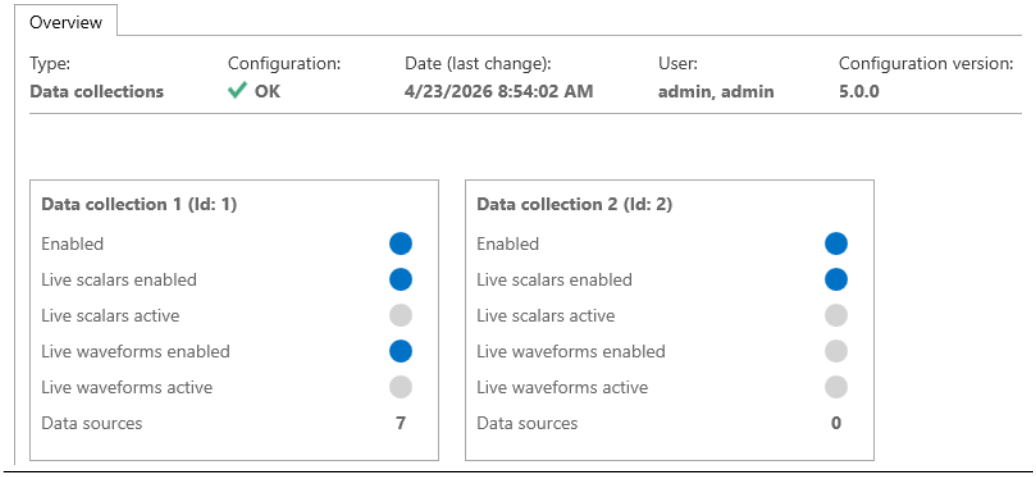
5.2.3 Online view

The online view provides an overview of the data collection process and information about the most recently collected data. Click **Data collections** in the device tree to open the online view.

Overview

Figure 5-25 provides an overview of each configured data collection.

Figure 5-25: Data collections – overview



Enabled	A solid blue circle indicates an enabled data collection. The circle is gray if the data collection is disabled.
Live scalars enabled	A solid blue circle indicates an enabled scalar data collection. The circle is gray if the scalar data collection is disabled.
Live scalars active	The state of the live scalar transmission is displayed. A solid blue circle indicates an active transmission controlled by AMS Machine Works. The circle is gray if no scalar transmission is active.
Live waveforms enabled	A solid blue circle indicates an enabled waveform collection. The circle is gray if the waveform collection is disabled.
Live waveforms active	The state of the live waveform transmission is displayed. A solid blue circle indicates an active transmission controlled by AMS Machine Works. The circle is gray if no waveform transmission is active.
Data sources	Displays the number of configured data sources.

5.3 Collection Tasks

This service is available with an A6500-CC card and an A6500-CP card with firmware version 1.x.

The **Collection Task** service collects data based on two types of configurable triggers:

- **Schedule**
  Data is collected at a fixed time. For example: every day at 12:00.
- **Event**
  Data is collected at an event. An event could be, for example, a danger alarm of a vibration measurement.

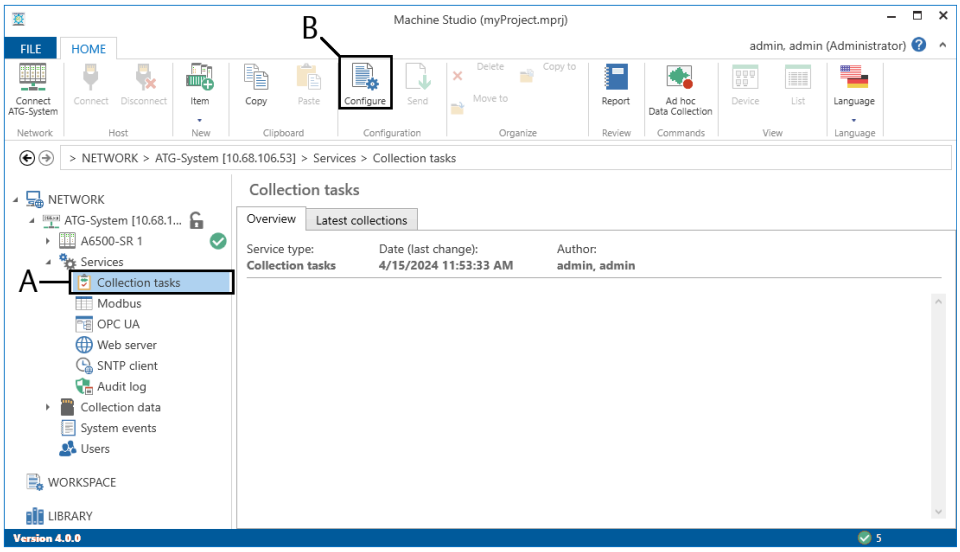
Use AMS Machine Works or AMS Machinery Manager to store the data collected by AMS 6500 ATG in a database and to analyze the data. See General – data acquisition services. The collected data is also stored on the microSD card of the communication card sorted by year, month, and day. The microSD card is used as a short-time buffer for the collected data in case of a disturbed communication to the machinery management software.

Note
The performance of the AMS 6500 ATG typically allows up to 2000 collections[8] per day.

5.3.1 Configuration

1. Select **Network** → **AMS 6500 ATG System** → **Services** → **Collection tasks** (see Figure 5-26).

Figure 5-26: Collection tasks selection

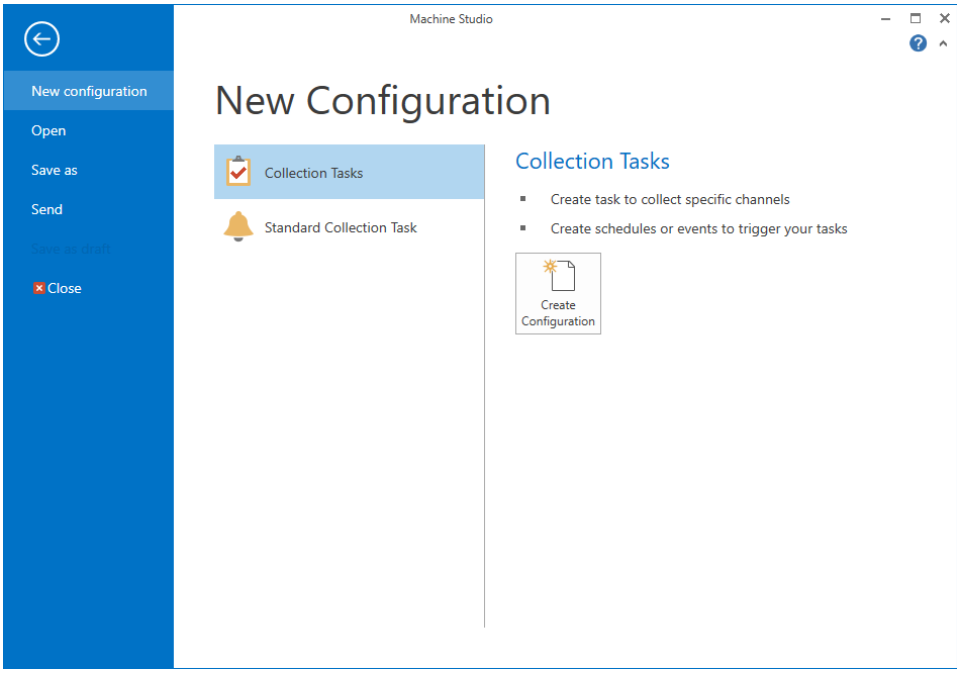


*A. Selected **Collection tasks***
*B. **Configure** to open the configuration editor.*

2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).
3. During the first configuration of a **Collection task**, the **New configuration** dialog appears (see Figure 5-27).

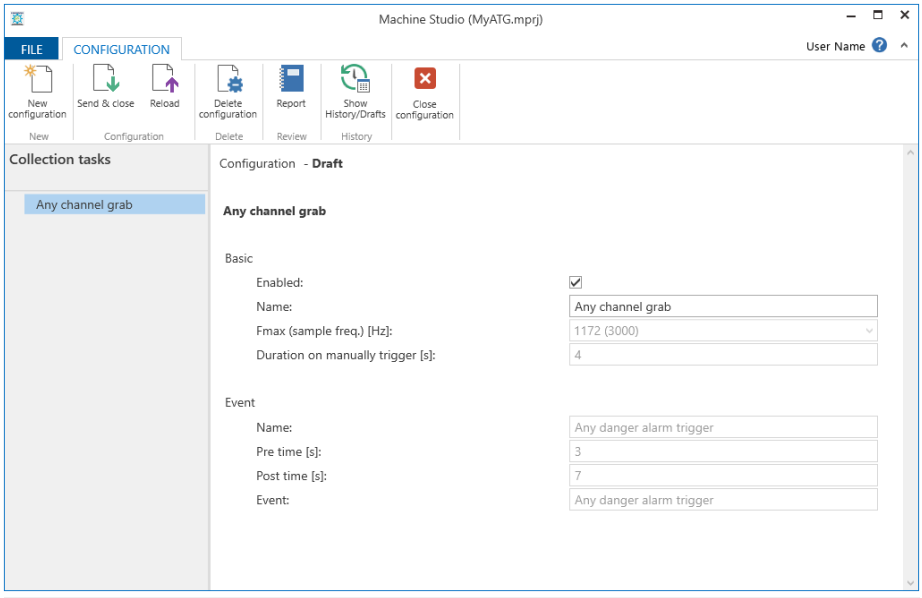
8 *Single execution of a data collection.*

Figure 5-27: New configuration



- Select **Collection tasks** to configure tasks for the data collection. Click **Create configuration** to create a new configuration. This selection requires a license (see License entry).
- Select **Standard collection task** to use the predefined data collection. Click **Create configuration** to open the configuration. The parameters of this license-free configuration can not be changed, except of parameter **Name** and enabling or disabling of the task (see Figure 5-28). Data of all channels is collected if a danger alarm of an arbitrary channel appears – assuming the channels are configured for danger alarm supervision (see digital output configuration of the respective cards).

Figure 5-28: Any channel grab



For meaning of the listed parameters, see Tasks.

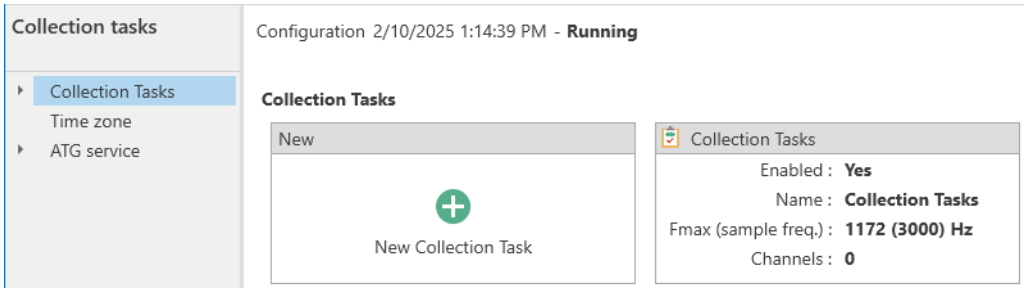
4. Enter the configuration parameters. See Collection task, Tasks, Set the time zone for the data collection task, and Configure the ATG service for details.
5. Click **Send & close** to send the configuration to the AMS 6500 ATG system. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

Note
Sending a **Collection tasks** configuration does not affect the protection function of the AMS 6500 ATG system.

Collection task

Collection tasks displays all configured data collection tasks and a button to create a new collection task (see Figure 5-29).

Figure 5-29: Collection Tasks



Here you can create new collection tasks, open task details, and delete tasks. Click a task to switch to the task configuration.

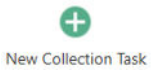
New collection task

Use tasks to configure how data is gathered. For each task, define the channels to be collected, set triggers to control data collection, and specify the collection settings.

Note
A channel can only be assigned to one collection task.

Click **New Collection Task** in the object **New** to create a new task for the data collection (see Figure 5-30). Up to ten tasks can be created.

Figure 5-30: New Collection Task



The configuration editor switches to the newly created task. The new task is added to the task tree on the left part of the configuration editor.

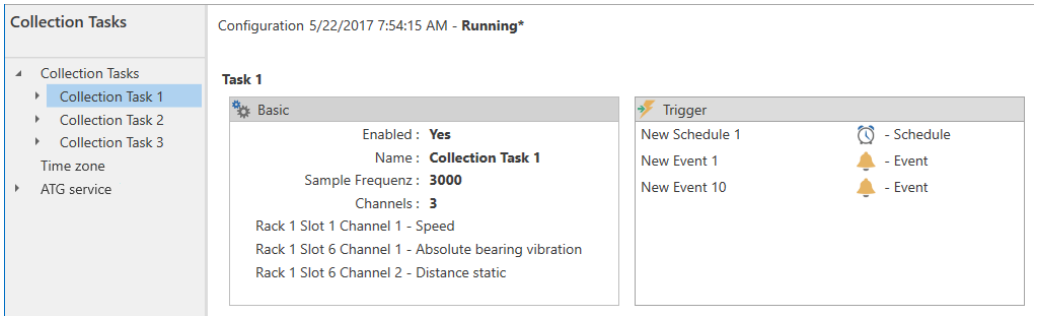
Delete a task

1. Select **Collection Tasks** from the tree (see Figure 5-29).
   All available collection tasks are displayed in the right part of the configuration editor.
2. In the right part of the configuration editor, move the cursor on the task to be deleted.
   The frame of the task changes color to blue, and a trash bin symbol appears.
3. Click the trash bin to delete the task.
   The task is immediately removed from the configuration.

Tasks

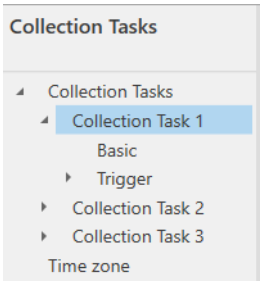
Click one of the listed tasks in the task tree. The task name depends on the configuration. The right window displays an overview about the basic configuration and trigger configuration (see Figure 5-31).

Figure 5-31: Task overview



Click the arrow in front of the task to open more configuration options for **Basic** and **Trigger** (see Figure 5-32).

Figure 5-32: Task tree

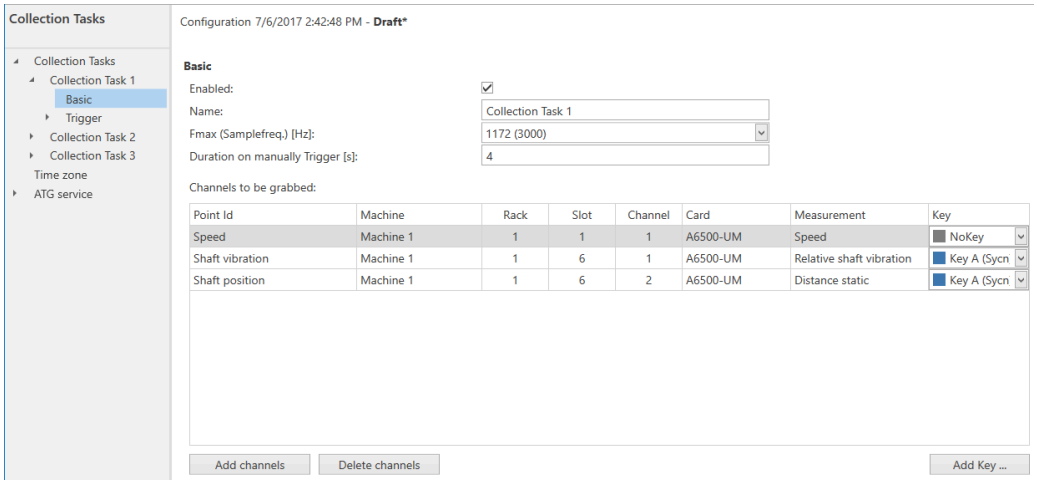


The **Basic** and **Trigger** configuration dialogs can also be opened by clicking the **Basic** or **Trigger** objects in the group overview.

Enter basic parameters for the data collection

The basic parameters for the data collection are entered here. See Figure 5-33.

Figure 5-33: Basic



Enabled — Check this box to enable the task for data collection.

Name — Enter a name for the task. This name is also shown together with the task number in the task tree.

Fmax (Samplefreq.) [Hz] — Select the maximum of the expected signal frequency from the drop down list.
The sampling frequency depends on this selection and is stated behind the maximum frequency:

- 1172 Hz (sample frequency 3000 Hz)
- 2344 Hz (sample frequency 6000 Hz)
- 4688 Hz (sample frequency 12000 Hz)
- 9375 Hz (sample frequency 24000 Hz)
- 18750 Hz (sample frequency 48000 Hz)
- 37500 Hz (sample frequency 96000 Hz)

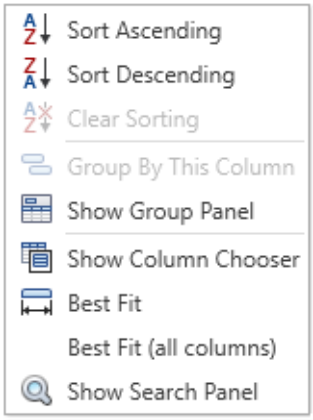
Note
A higher sampling frequency results in a higher data volume and the data collection takes a longer time.

Duration on manually Trigger [s] — Define the length of the data block for manually triggered tasks. The maximum length depends on the selected sampling frequency.
The data collection can be manually triggered by a button in the command ribbon bar (see Commands). The data collection starts with clicking **Trigger Collection Task**.

Channels to be grabbed — Click **Add channels** to open a list with all available channels. Click a row to select the channel for the data collection. To select more channels, press **Ctrl** and left-click more rows. Selected rows are blue

colored. Click **OK** to add the selected channels to the table of channels to be collected. To delete a channel from the table, left-click the row of the channel to be deleted, and click **Delete channels**. Some functions, such as sorting, searching, and alignment, are available for the table. Right-click the first cell of a column (heading) to open the pop-up menu with the table functions (see Figure 5-34).

Figure 5-34: Table functions



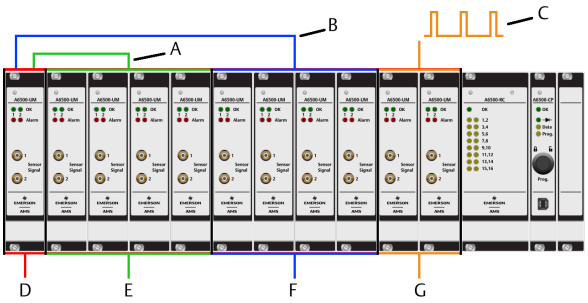
Key

Select a key group for the channels to be collected from the column **Key** to synchronize the data collection of the channels assigned to this key group. Key groups depend on the key signal physically connected to the measuring channels. A6500-UM Universal Measurement Cards can provide key signals with an extended pulse for the advanced synchronization. The synchronization of the data collection with activated advanced synchronization is much more precise than the standard synchronization. See the A6500-UM card manual for key signal details and the A6500-xR System Rack manual for the connection of key signals. Create your own key groups or select between predefined groups:

- **No Key**
  No key connected to that channel.
- **[Key group name] (Sync)**
  Key group for all channels to be collected, physically connected to the same key signal, generated within the System Rack. The data collection of all channels in this group is synchronized based on the key signal.
- **Ext Key**
  Key group for all channels to be collected, physically connected to the same external key signal, generated outside of the System Rack.

Figure 5-35 shows a key group example.

Figure 5-35: Key group example



A. Key 1 – generated by the A6500-UM card in slot 1.

B. Key 2 – generated by the A6500-UM card in slot 1.

C. External key signal

D. A6500-UM card in slot 1 - both channels configured for key generation (Key 1 and Key 2).

*E. Four A6500-UM cards connected through the System Rack to Key 1 generated by the A6500-UM in slot 1. Key group: **Key A (Sync)***

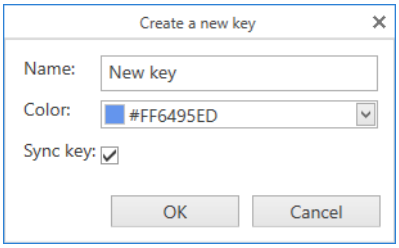
*F. Four A6500-UM cards connected through the System Rack to Key 2 generated by the A6500-UM in slot 1. Key group: **Key B (Sync)***

*G. Two A6500-UM connected to an external key. Key group: **Ext Key***

Create a new key group

1. Click **Add Key ...** below the channel list to open the dialog for creating new key groups. See Figure 5-36.

Figure 5-36: Create a new key



2. Enter a key group name into the **Name** field.
3. Select a color for the group from the drop down list.

4. Check the box **Sync key** to enable the advanced synchronization of the data collection based on the key signal with extended pulses.
   The advanced synchronization requires an A6500-UM card configured for generation of key signals with extended pulses (see A6500-UM operating manual). The name of the key group gets the addition **(Sync)** if the advanced synchronization is enabled. With activated advanced synchronization, the synchronization of the collected data of the channels assigned to this key group is more precise than the standard synchronization.

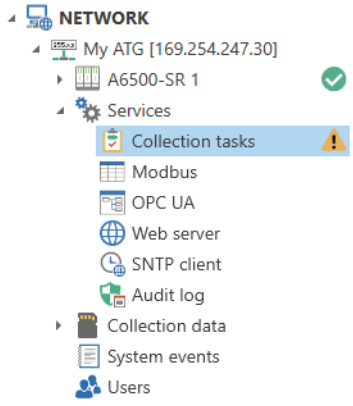
   Note
   Data collection with advance synchronization is only possible with a key signal generated by an A6500-UM card.

5. Click **OK** to create the new key group. Otherwise, click **Cancel**.
   The dialog closes, and the new key group can be used in the channel selection list.

Indication of missing channels

Removing a card or changing a card's configuration causes an inconsistency in the list of channels to be collected. A yellow warning triangle appears beside the **Collection Tasks** service in the device tree if one or more channels in the list of channels to be collected are no longer available:

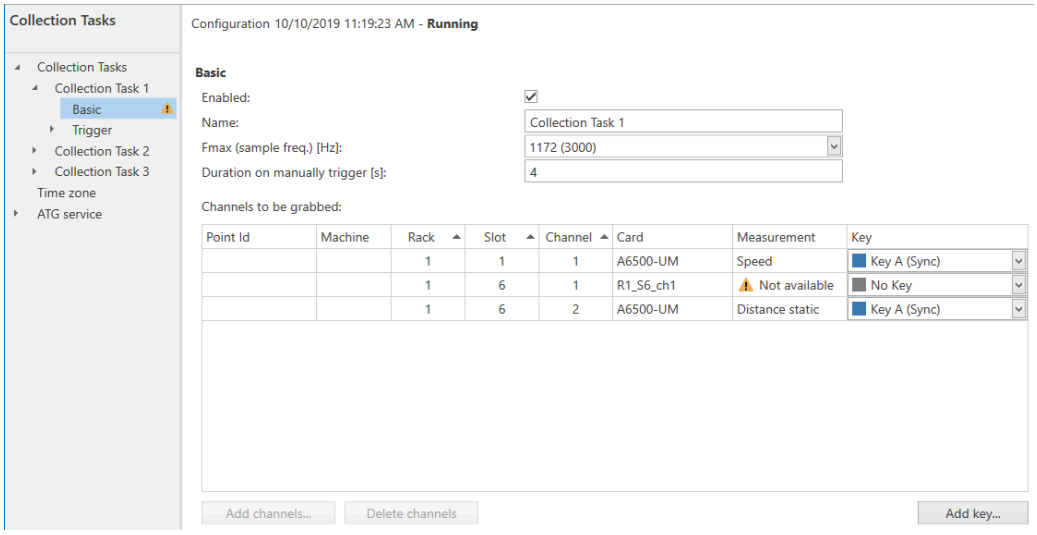
Figure 5-37: Indication of an inconsistency in the list of channels to be collected



With a completely collapsed tree the warning triangle is also displayed at the upper level, so the warning triangle can be followed down through the tree to the cause.

In this case, open the **Collection Task** configuration, and follow the yellow triangle to the cause of this inconsistency. Channels that are no longer available are marked with a yellow warning triangle (see Figure 5-38).

Figure 5-38: Indication of a missing channel



There are several possibilities to solve the inconsistency:

Table 5-7: Hints for solving inconsistencies

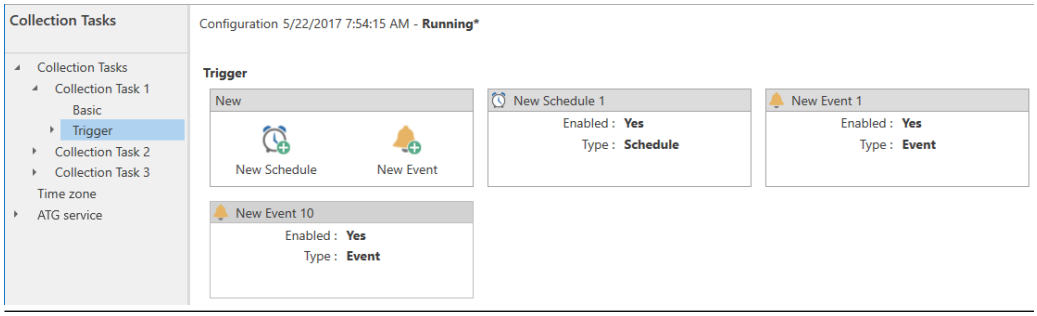
Cause	Solution
Card has been removed	Reinstall the missing card or delete the channel from the list
Configuration of the card has been changed	Update the list in accordance to the change
Card is defective	Replace the card and configure it in accordance to the defective card

Note
Collection tasks with missing channels are still processed.

Configure triggers for the data collection

Trigger displays all configured triggers – scheduled triggers and event triggers.

Figure 5-39: Trigger



The object **New** contains the buttons **New Schedule** and **New Event**.

1. Click **New Schedule** or **New Event** to create a new trigger for the data collection.

Figure 5-40: New Schedule

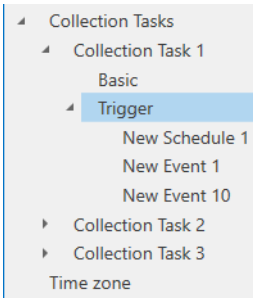


Figure 5-41: New Event



A **New Schedule** or **New Event** object is added to the trigger overview and to the task tree (see Figure 5-42).

Figure 5-42: New Schedule or New Event



2. Click the **New Schedule** or **New Event** object in the overview or **New Schedule** or **New Event** in the task tree to open the configuration.
   The configuration view opens (see Define scheduled data collection or Define events for the data collection).
3. Enter the parameters for the scheduled trigger.

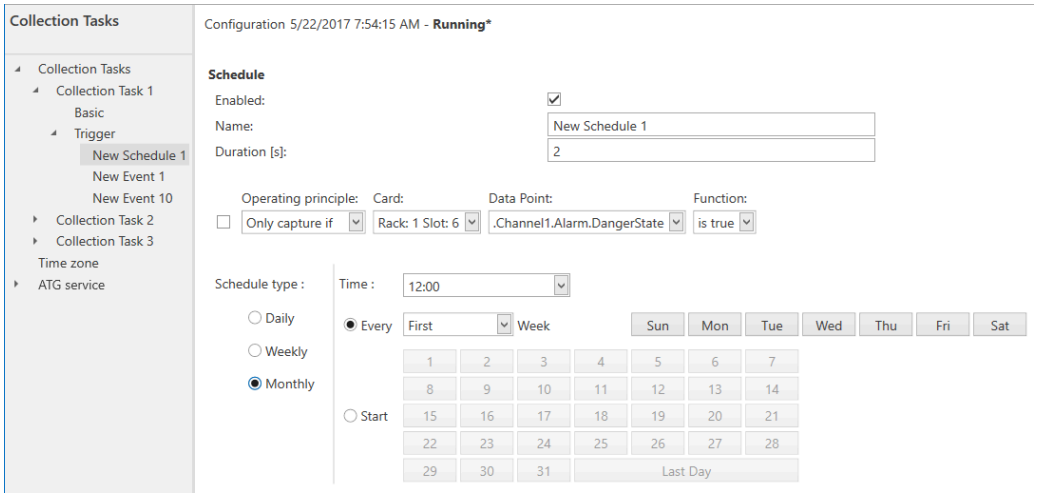
Delete a trigger

1. Move the cursor on the trigger (schedule or event) to be deleted.
   The frame of the selected trigger changes color to blue, and a trash bin symbol appears.
2. Click the trash bin to delete the trigger.
   The trigger is immediately removed from the configuration.

Define scheduled data collection

Configure the new schedule.

Figure 5-43: New Schedule - Configuration



Enabled Check this box to enable the schedule.

Name Enter a name for the schedule. This name replaces **New Schedule** in the task tree.

Duration Define the length of the collected data block. The maximum duration depends on the selected sampling frequency (see Enter basic parameters for the data collection).

Capture restriction Add an additional condition to the trigger. The data collection can be suppressed or enabled based on a configurable logic.

Note
The configured restriction has no effect if the collection task is manually triggered (see Trigger Collection Task).

1. Check the box to activate the restriction.
2. Select the main condition from the first drop down list.
   - **Only capture if**
   - **Don't capture if**
3. Select rack and slot from the second drop down list.
4. Select a data point. The available data points depend on the card installed in the slot selected beforehand. Data points are:
   - Digital inputs
   - Digital output
   - Card states (for example: Channel OK state)
   - Alarm states (for example: Danger Alarm state)
   - Analog output values

5. Select the condition for the defined logic.
   - is true
   - is false

   If a data point is selected that requires a limit, for example an analog output, select between:
   - is greater than
   - is greater than or equal
   - is less than
   - is less than or equal
   - is between
   - is not between

   These conditions enable further input fields for limit entries.

Example

Figure 5-44 shows an example condition for suppressing data collection, if Channel OK of channel 1 of the card installed in slot 6 of rack 1 is switched off.

Figure 5-44: Example for capture suppression



Schedule type

Define the time base for the data capturing.

Daily

Data is collected daily at a fixed time. Enter a time at which the data collection starts.

To collect data at a defined interval over a day, select the desired interval from the **Repeat** list. The entered time defines the start time of the interval.

Weekly

Data is collected at a fixed time on one or more days a week. Enter a time, and click the days. Selected days are colored blue. To unselect a day, click it again.

Monthly

Data is collected at a fixed time, selectable days, and weeks of a month.

Enter a time.

Click **Every** to enable the selection field for the week of a month and the days.

1. Enter a time.
2. Select the number of the week of a month.
3. Click one day or more days.
   Selected days are colored blue. To unselect a day, click it again.

Click **Start** to enable the selection fields for the days of a month.

1. Enter a time.
2. Click one or more days. Click **Last Day** if data is always collected at the last day of a month.
   Selected days are colored blue. To unselect a day, click it again.

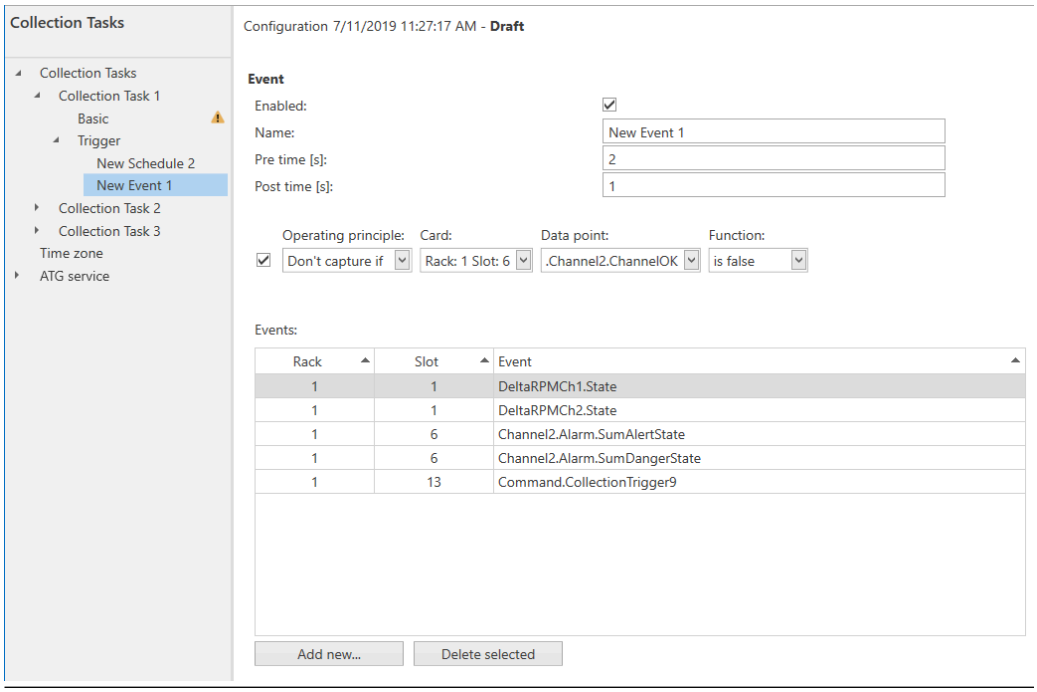
Note
Data is not collected at days which do not belong to the current month.

Example: Day 31 is ignored at all month with less than 31 days.

Define events for the data collection

Configure the new event.

Figure 5-45: New Event - **Configuration**

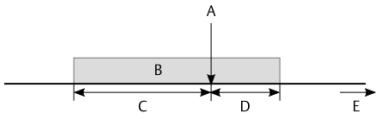


Enable	Check this box to enable the event trigger.
Name	Enter a name for the event. This name replaces **New Event** in the task tree.
Pre time and Post time	Define the length of the collected data block. The maximum duration for each parameter depends on the selected sampling frequency (see Enter basic parameters for the data collection). With parameter **Pre time**, the length of the data block before the event is defined. **Post time** defines the length of the data block after the event (see Figure 5-46). Example: The event is the danger alarm of a shaft vibration measurement, **Pre time** is two seconds and **Post time** is one second. Once the event

occurs, a data block with the data of two seconds before the alarm event plus the data of one second after the event is collected. The total data block length is three seconds. So data before and after the event are available for analysis.

The total block length is the addition of **Pre time** and **Post time**.

Figure 5-46: Diagram pre- and post time



A. Event
B. Data block
C. Pre time
D. Post time
E. Time

Collection restriction

Add an additional condition to the trigger. The data collection can be suppressed or enabled based on a configurable logic.

Note
The configured restriction has no effect if the collection task is manually triggered (see Trigger Collection Task).

1. Check the box to activate the restriction.
2. Select the main condition from the first drop down list.
   - **Only capture if**
   - **Don't capture if**
3. Select rack and slot from the second drop down list.
4. Select a data point. The available data points depend on the card installed in the slot selected beforehand. Data points are:
   - Digital inputs
   - Digital output
   - Card states (for example: Channel OK state)
   - Alarm states (for example: Danger Alarm state)
   - Analog output values
5. Select the condition for the defined logic.
   - is true
   - is false

   If a data point is selected that requires a limit, for example an analog output, select between:

- is greater than
- is greater than or equal
- is less than
- is less than or equal
- is between
- is not between

These conditions enable further input fields for limit entries.

Example

Figure 5-47 shows an example condition for suppressing data collection, if Channel OK of channel 1 of the card installed in slot 6 of rack 1 is switched off.

Figure 5-47: Example for capture suppression

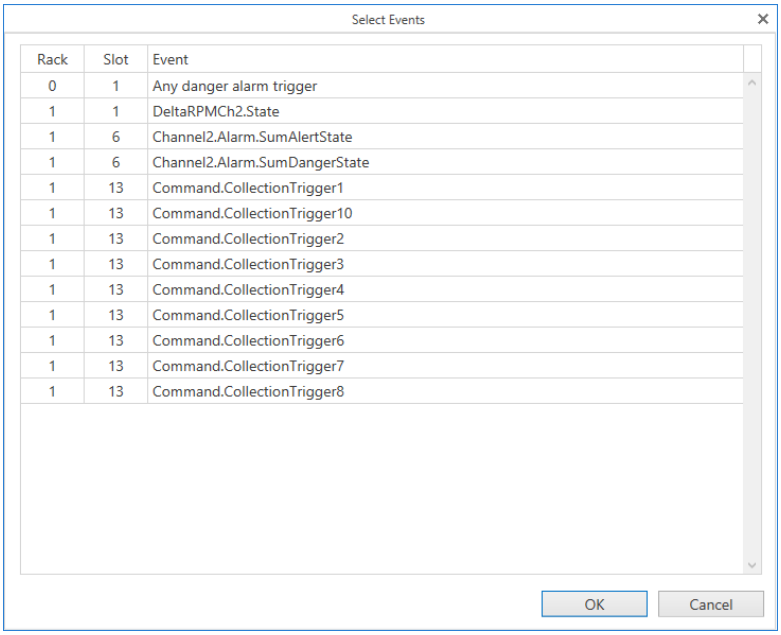


Events

Select one or more event triggers.

1. Click **Add new ...** to open a table with all available events (see Figure 5-48). An event can be, for example, the danger alarm state of one card channel. The pop-up menu with table functions can be opened with a right-click on the column heading (see Enter basic parameters for the data collection).

Figure 5-48: Event table



The following events can be used for triggering, if they are configured for the channel:

- Alarm states (alert alarm and danger alarm).
- Digital inputs configured as event trigger. See A6500-UM operating manual for details.
- Delta RPM – A definable speed difference is used to trigger collection tasks. Configure the differential speed trigger in the A6500-UM card (**Speed application** → **Speed diff. trigger 1** or **Speed diff. trigger 2**.
- Software trigger through the OPC UA or Modbus interface.

  Modbus

  See Table B-63 for details.

  OPC UA

  The available OPC UA items are identical with the available Modbus registers for software triggering of collection tasks.

  CollectionTrigger1 to **CollectionTrigger10**

  To trigger a data collection, use an OPC UA client to set the value of the appropriate trigger item to **1**. The value is **-1** while the OPC UA server (communication card A6500-CC or A6500-CP) is waiting for the command.

  Note

  There are ten additional Modbus registers to directly trigger the collection tasks. These registers are assigned to the collection tasks in numeric order.

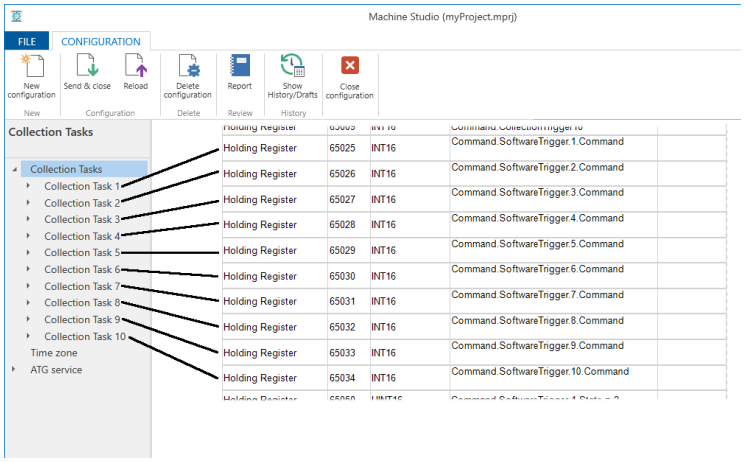
  Software trigger command task 1 is assigned to collection task 1.

  Software trigger command task 2 is assigned to collection task 2.

  ...

  Software trigger command task 10 is assigned to collection task 10.

Figure 5-49: Assignment of the software triggers to the tasks



The name of the collection tasks **Collection Task ...** might be different in your configuration as the name is configurable.

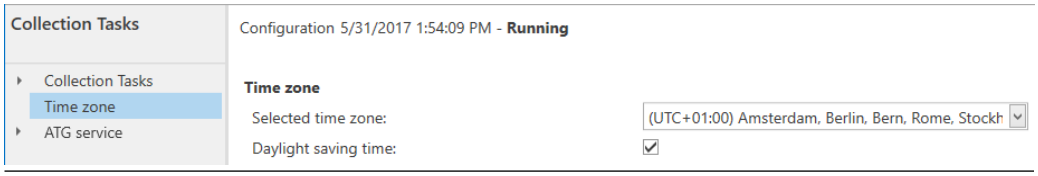
See Table B-63 for further details.

2. Click a row to select an event as a trigger for the data collection.
3. Click **OK** to add the selected events to the table of the configuration.
   To delete an event from the table, click the row of the event to be deleted to select it. Click **Delete selected**.

Set the time zone for the data collection task

Configure the time zone in which the system is located. These settings are used for the timestamp of the collected data.

Figure 5-50: Time zone



Selected time zone	Select the time zone in which the system is located from the drop down list.
Daylight saving time	Check this box to activate the automatic changeover of the daylight saving time for the selected time zone.

Configure the ATG service

The use of AMS Machine Works requires the ATG service and an A6500-CC Com Card or an A6500-CP Com Card Pro with firmware version 1.x (see Table 5-2). The use of AMS Machinery Manager also requires the ATG service and an A6500-CC Com Card. AMS Machinery Manager is not compatible with the A6500-CP Com Card Pro. Configure the interface for the ATG service. See Figure 5-52. The task of this service is to transfer the collected data to a database and is part of AMS Machine Works and AMS Machinery Manager. See respective manuals for details.

Note
One service can connect to a communication card at the same time.

Note
The ATG service does not work properly if Holding registers are swapped (see Holding register). Use the default register allocation (registers not swapped) when using the ATG service . Swapped Holding registers are indicated by a notification:

Figure 5-51: Swapped Holding registers notification

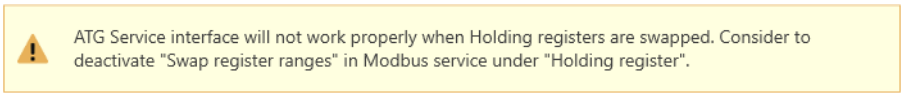
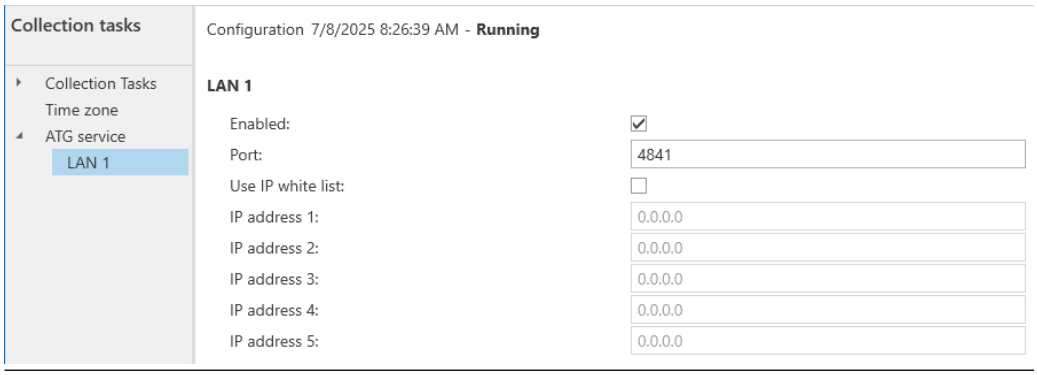


Figure 5-52: ATG service – A6500-CP (FW 1.x)



Enable	Check the box to activate the interface for the ATG service.
Port	Enter the port for the communication.
Use IP white list	Check the box to enable the IP white list.
IP address 1 to IP address 5	Enter up to five IP addresses of devices which are allowed to communicate with the ATG service.

5.3.2 Commands

If **Collection Tasks** is selected in the device tree, the associated commands are enabled in the command ribbon bar. An online connection is required to execute the commands.

Note
These commands do not affect the protection function of the system.

Ad hoc Collection task

Use the **Ad hoc Collection task** function to capture data of arbitrary channels without changing the **Collection tasks** configuration. This function provides the ability to immediately capture data of selected channels during an unexpected machine behavior.

Figure 5-53: Ad hoc Collection task

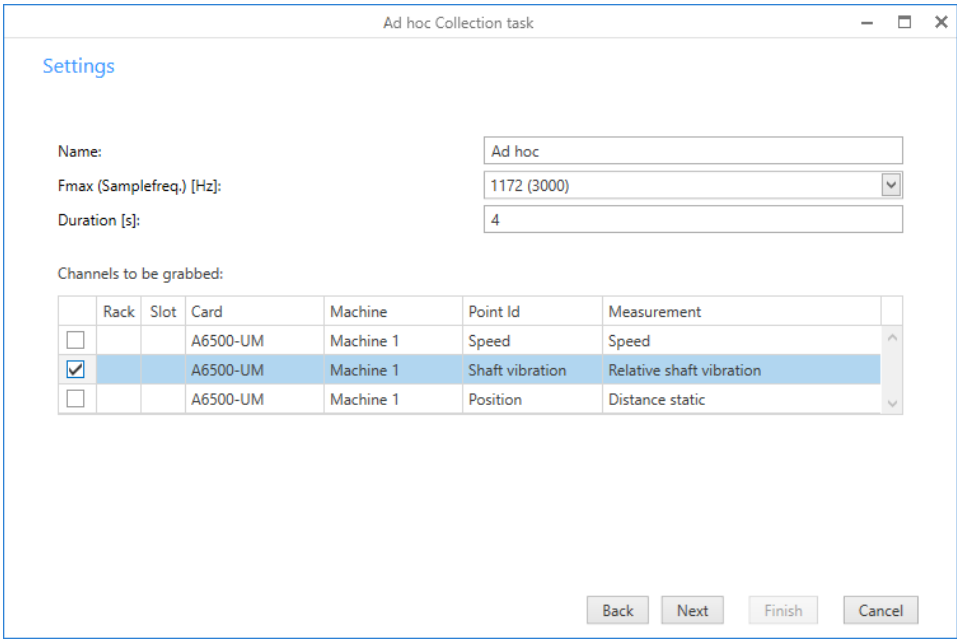


Note
Channels selected for **Ad hoc** collection are not available for scheduled and event triggered data collection configured in Collection tasks if the function is active and up to 60 seconds afterward.

Procedure

1. Click **Ad hoc Collection task** to open the dialog for the direct collection of data.
2. Confirm the warning, and click **Next**.
3. Configure the data collection.

Figure 5-54: Ad hoc Collection task settings



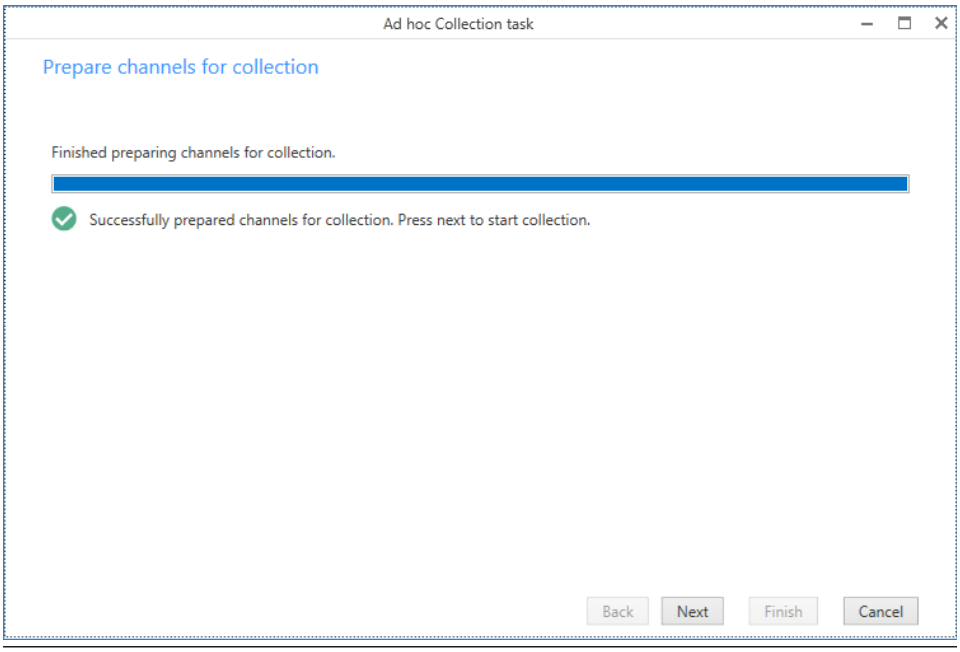
Name Enter a name for the collected data.

Fmax (Samplefreq.) [Hz]	Select the sampling frequency from the list field. See Enter basic parameters for the data collection for details.
Duration	Define the length of the data block. The maximum length depends on the selected sampling frequency.
Channels to be grabbed	Select the channels to be collected. In column **Active**, check the box in the row assigned to the channel. Click **Next**.

4. Ad hoc prepares the channel for data collection. The green OK sign indicates the readiness for data collection (see Figure 5-55). Click **Next** to start the data collection.

Note
The ad hoc collection is enabled if the selected channels are prepared and no other data collection task is running.

Figure 5-55: Channels ready for data collection



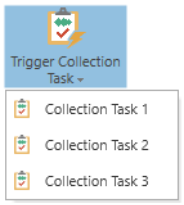
The data is collected and stored afterward.

5. After the data collection, click **Finish** to close the dialog.
After approximately 60 seconds, the system is ready for the Collection task based data collection again.

Trigger Collection Task

Click **Trigger Collection Task** to open a list of all configured tasks for the data collection. Click a task to manually start the data collection.

Figure 5-56: Trigger Collection Task



For the collection progress, see online view of the **Collection Tasks** (see Online view).

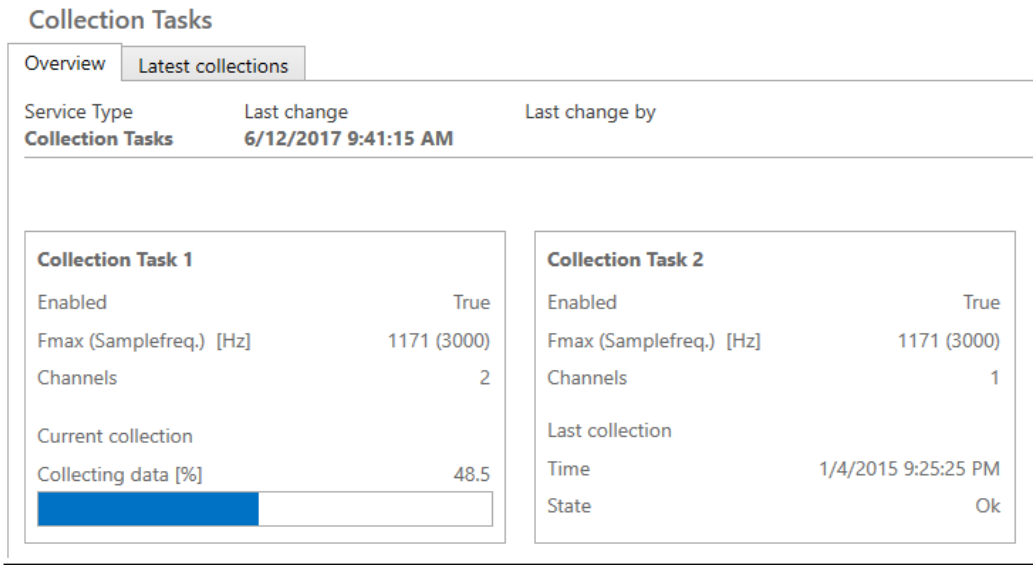
5.3.3 Online view

There is an online view for the data collections service. Click **Data collections** in the device tree to open the associated online view.

Overview

Figure 5-57 shows an overview of the configured collection tasks.

Figure 5-57: Collection Tasks - Overview



Overview contains a section with the following information for each configured collection task.

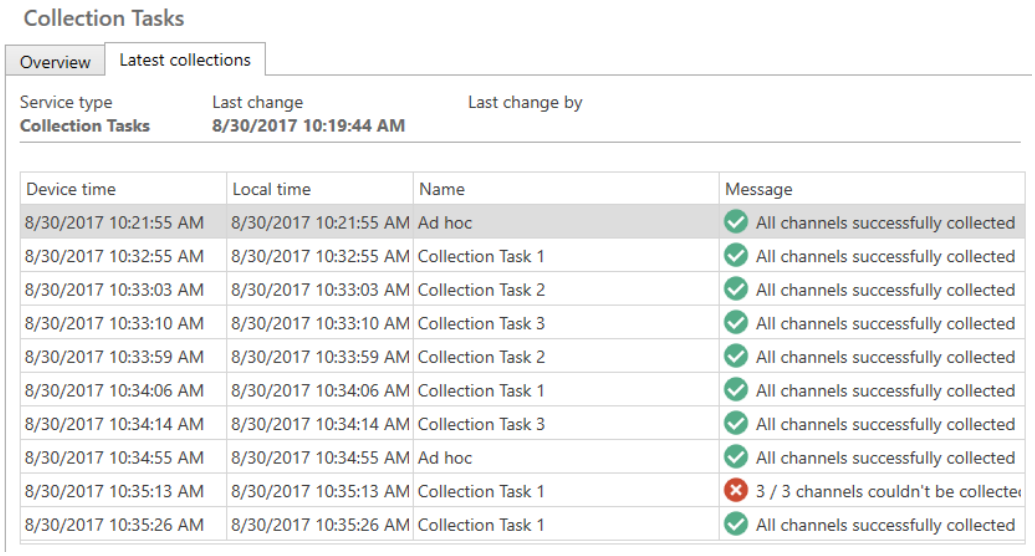
Enabled	Indicates whether the data collection of the task is activated or not.
Fmax (Samplefreq.) [Hz]	Displays the maximum signal frequency that can be collected and the sample frequency in parenthesis.
Channels	Displays the number of channels collected with this task.
Current collection and Last collection	During data collection, the lower part of the task object displays the collection progress. If no data collection is in progress, the

lower part of the object displays time, and state of the last collection.

Latest collections

Figure 5-58 displays information about the last ten collections.

Figure 5-58: Collection Tasks - Latest collections



5.3.4 Technical data

Only specifications with indicated tolerances or limit values are binding. Data without tolerances or without error limits is informative data and not guaranteed. Technical modification, especially of the software, is subject to change without notice. If not otherwise specified, all data is referred to an environmental temperature of +25°C.

General		
Maximum time for one data capture	320 s at F_{max} = 1172 Hz 160 s at F_{max} = 2344 Hz 80 s at F_{max} = 4688 Hz 40 s at F_{max} = 9375 Hz 20 s at F_{max} = 18750 Hz 10 s at F_{max} = 37500 Hz	
Resolution	0.1 Hz	
MicroSD Card type	A6500-SD	Use only the specified type.
The collected signal waveforms are not influenced by filters, set in the A6500-UM Universal Measuring Card.		

Sample frequency [Hz]	F_{max} [Hz]	Maximum capture time [sec] for one collection on microSD card
96000	37500	10
48000	18750	20
24000	9375	40
12000	4688	80
6000	2344	160
3000	1172	320

5.4 AMS Machine Works

The AMS Machine Works interface service is required for data exchange between AMS 6500 ATG systems equipped with an A6500-CP Com Card Pro (FW 5.x) and AMS Machine Works. See Table 5-2. Configure the LAN interface and install certificates to secure communication.

Note
Using the AMS Machine Works interface requires a valid license on the A6500-CP card, see License entry.

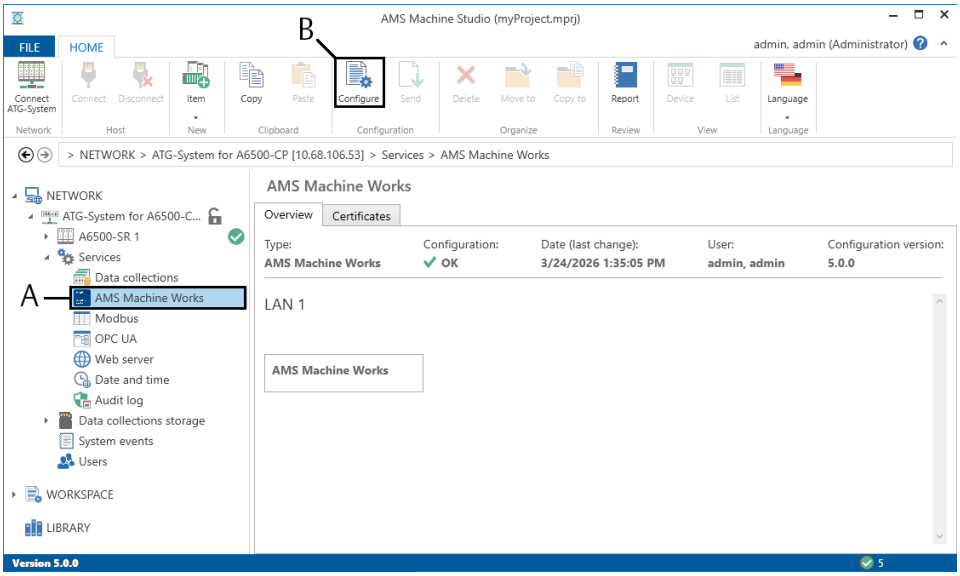
5.4.1 Configuration

This chapter describes the configuration of the AMS Machine Works interface service.

Procedure

1. Select **Network** → **AMS 6500 ATG System** → **Services** → **AMS Machine Works**.

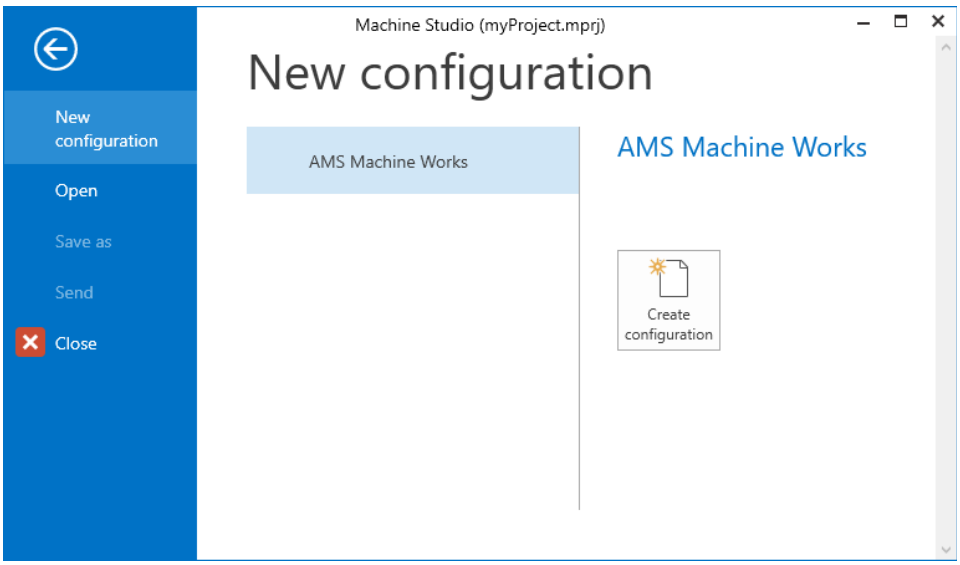
Figure 5-59: AMS Machine Works service selection



*A. Selected **AMS Machine Works** service*
*B. **Configure** opens the configuration editor*

2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).
   During the first configuration of the AMS Machine Works interface service, the **New configuration** dialog appears. Click **Create configuration** to open the new configuration.

Figure 5-60: New configuration



3. Enter the configuration parameters. See LAN 1 and Certificates for details.

4. Click **Send & close** to send the configuration to the AMS 6500 ATG system. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

Note
Sending an AMS Machine Works interface service configuration does not affect the protection function of the AMS 6500 ATG system.

LAN 1

The interface for the AMS Machine Works service is the upper Ethernet port (LAN 1) of the card.

Figure 5-61: AMS Machine Works service settings



Enabled	Check this box to enable the AMS Machine Works interface.
Port	Enter the port for the communication. Ensure that the port entered is unique and not used by another AMS 6500 ATG interface connected through the same Ethernet port. **Note** The sending of a configuration with a changed port causes a disconnection of the AMS Machine Works interface. Reconnect it using the specified port.
Use IP white list	Check this box to enable the IP white list.
IP address 1 to IP address 5	Enter up to five IP addresses of devices which are allowed to communicate with the AMS Machine Works interface.

Certificates

Upload a client TLS certificate for the communication with AMS Machine Works to the A6500-CP card. Up to two certificates can be uploaded. The establishment of any connection between AMS Machine Works and an AMS 6500 ATG system with an A6500-CP card without a valid certificate is not possible. The validity of the certificate is checked during the connection establishment phase. Existing connections are not terminated if a certificate expires or is deleted.

Figure 5-62: Certificates

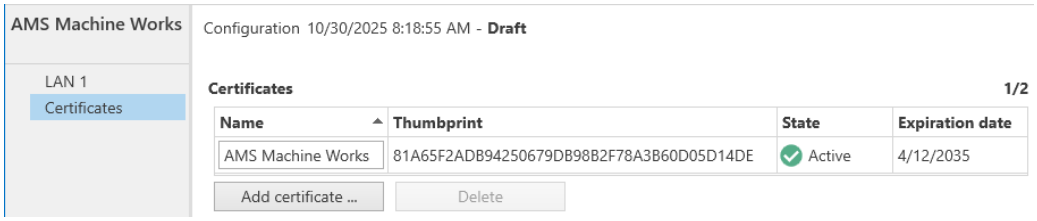


Table details

Name	This column displays the name from the certificate by default. Edit the name directly within the table.
Thumbprint	Unique identifier of the certificate.
State	A visual indicator of the certificate's status. An active certificate is marked with a white checkmark within a green solid circle, while an expired one shows the yellow warning triangle.
Expiration date	The date on which the certificate expires.

Add a certificate

1. Click **Add certificate ...** to open a dialog for selecting a certification file.
   Certification files with the extension *.cer, *.crt, *.der, and *.pem can be added. The dialog provides feedback if an invalid file is uploaded.
2. Select a certificate and click **OK**.
   The certificate is added to the table.
3. Repeat 1 and 2 to add a second certificate.
   Installing two certificates on the communication card offers advantages, such as increased stability during certificate transitions. If a certificate is about to expire or is being replaced by a new one:
   - Both certificates can be installed in parallel.
   - Clients that already recognize the new certificate will use it.
   - Other clients can continue using the old one until the transition is complete.
4. Click **Send & close** to send the AMS Machine Works interface configuration, including the certificate(s), to the A6500-CP card. The editor automatically closes after the successful sending of the configuration.

   Note
   Sending a configuration does not affect the protection function of the AMS 6500 ATG system.

Add Certificate ... is disabled once the table contains two certificates.

Remove a certificate

1. Click the row with the certificate to be deleted to select it.

The selected row is highlighted.

2. Click **Delete** to remove the selected certificate from the table.
3. Click **Send & close** to send the configuration, including the removed certificate, to the A6500-CP card. The editor automatically closes after the successful sending of the configuration.

Note
Sending a configuration does not affect the protection function of the AMS 6500 ATG system.

Certificates in AMS 6500 ATG systems with redundant A6500-CP cards.

In systems with redundant A6500-CP communication cards, the certificate is sent to both cards. If two certificates are listed in the table, both certificates are installed on each communication card in a redundant system.

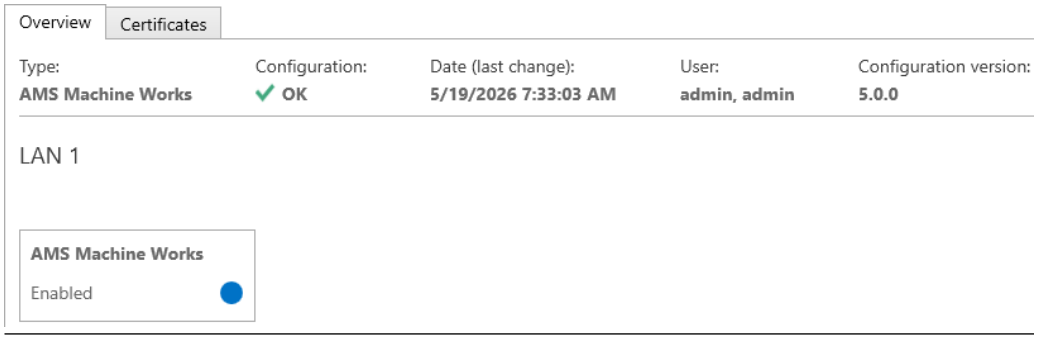
5.4.2 Online view

There is an online view for the AMS Machine Works interface. Click **AMS Machine Works** in the device tree to open the associated online view.

Overview

Overview provides Information about the state of the AMS Machine Works interface. See Figure 5-63.

Figure 5-63: AMS Machine Works – Overview

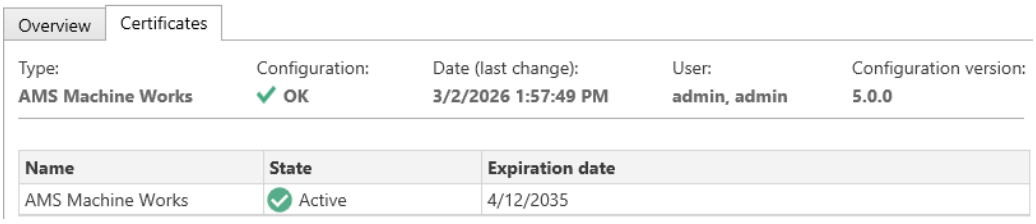


Enabled The state of the AMS Machine Works interface is indicated by a colored circle. A solid blue circle indicates an enabled AMS Machine Works interface. The circle is gray if the interface is disabled.

Certificates

Certificates displays state and details of the certificates stored on the A6500-CP card.

Figure 5-64: Certificates

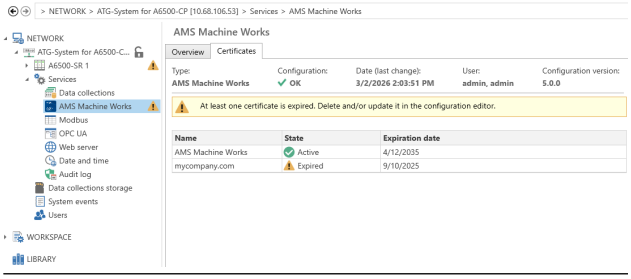


Description of the table content:

Name This column displays the name of the certificate.

State A visual indicator of the certificate's status. An active certificate is marked with a white checkmark within a green solid circle, while an expired one shows the yellow warning triangle. An expired certificate is also indicated with the yellow warning triangle in the device tree. See Figure 5-65.

Figure 5-65: Indication of an expired certificate



Expiration date The date on which the certificate expires.

5.5 Modbus

5.5.1 Configuration

This chapter describes the general configuration of the Modbus interface of the A6500-CC Com Card or the A6500-CP Com Card Pro. Modbus TCP is available via both LAN interfaces when using the A6500-CP card. For setup and configuration of the redundant communication, see operating manual of the communication card.

Note
A6500-CP (FW 1.x): Time data is not available through LAN 2. If time data is required, use LAN 1.

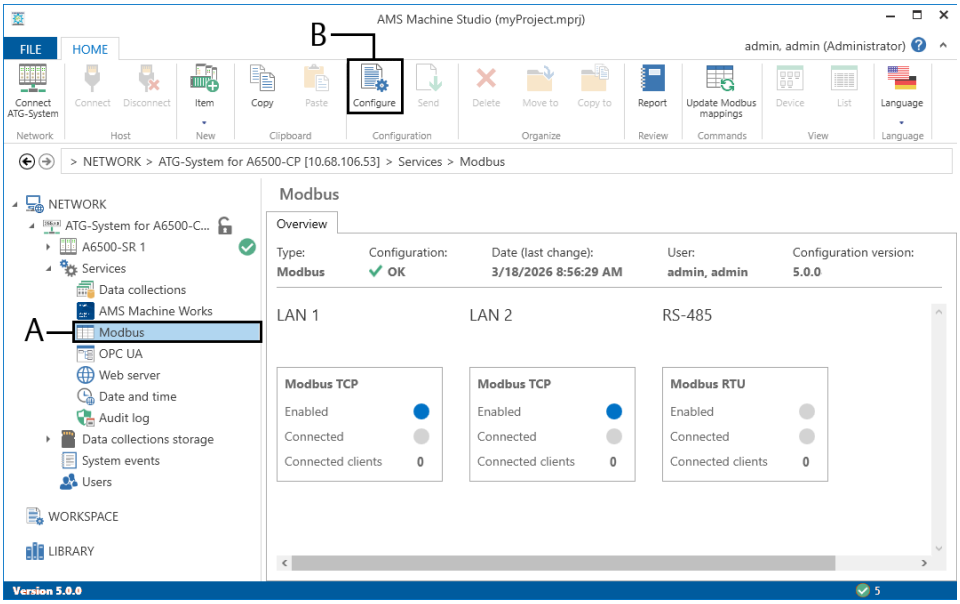
Note
Time data is not supported on A6500-CP cards running firmware version 5.x.

Note
Modbus data is generally provided in SI units, independently of the selected system of units in AMS Machine Studio (**Settings → Internationalization → System of units**).

Procedure

1. Select **Network → AMS 6500 ATG System → Services → Modbus** (see Figure 5-66).

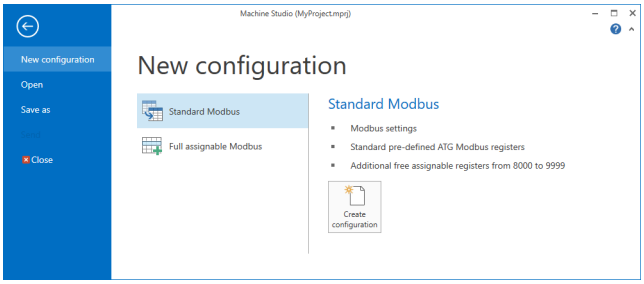
Figure 5-66: Modbus selection



*A. Selected **Modbus***
*B. **Configure** to open the configuration editor.*

2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).
3. During the first configuration of the Modbus interface, the **New configuration** dialog appears.

Figure 5-67: New configuration



- Select **Standard Modbus** to use a predefined Modbus data table (see Data tables) with additional free assignable Modbus registers from 8000 to 9999. Click **Create configuration** to open the configuration.
- Select **Full assignable Modbus** to create your own Modbus data table with a full range of assignable **Input** registers from 0 to 65535. Click **Create configuration** to open the configuration.

4. Enter the configuration parameter. See Modbus, Modbus RTU, Modbus TCP, and Input register for details.
5. Click **Send & close** to send the configuration to the AMS 6500 ATG system. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

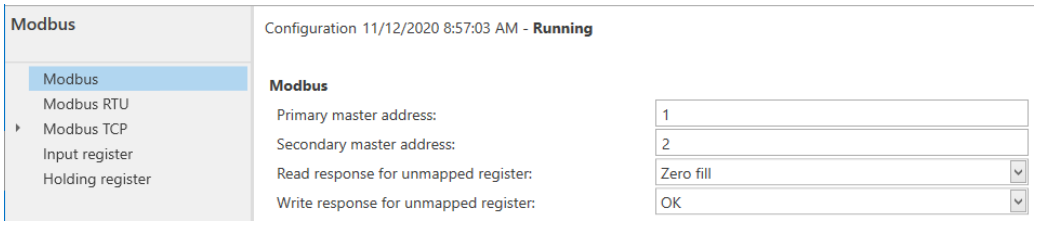
   See Modbus – Interface settings and data tables for interface settings and data tables.

Note
Sending a Modbus configuration does not affect the protection function of the AMS 6500 ATG system.

Modbus

Configure the general Modbus communication.

Figure 5-68: Modbus settings



Primary master address
Enter the Modbus device address for the communication card installed in the left communication card slot.

Secondary master address
Enter the Modbus device address for the communication card installed in the right communication card slot.

Note
The device address (port address) is mainly required for the serial Modbus RTU communication. If both communication cards have the same master address, ensure that **Only active card responses** is selected for parameter **Modbus RTU → Serial Modbus mode**.

Read response for unmapped register
Choose the response if an unmapped register is read. The register mapping depends on the configuration of the cards connected to the communication card.

- **Zero fill**
  If an unmapped register is read, the card responses with "0".

- **Illegal data address**
  If an unmapped register is read, the card responses with "Illegal data address" (recommended setting).
  Exception code: 02

Write response for unmapped register

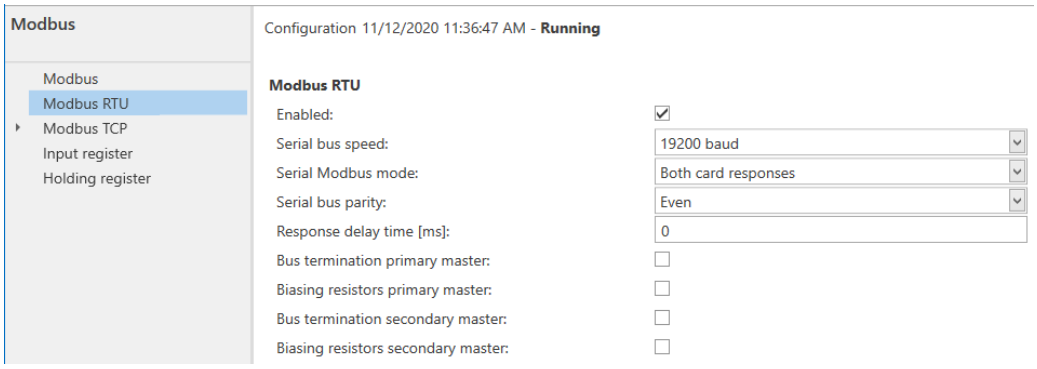
Choose the response if an unmapped register is written. The register mapping depends on the configuration of the cards connected to the communication card.

- **OK**
  If an unmapped register is written, the card responses with "OK".
- **Illegal data address**
  If an unmapped register is written, the card responses with "illegal data address".
  Exception code: 02

Modbus RTU

Configure the Modbus RTU interface. The Modbus RTU interface works as a slave interface.

Figure 5-69: Modbus RTU settings



Enable

Check this box to activate the Modbus RTU interface.

Serial bus speed

Choose the Mobus RTU bus speed.

- 9600 Baud
- 19200 Baud
- 38400 Baud

Serial Modbus mode

Choose the response mode.

- **Only active card responses**
  Only the active card responds and provides Modbus data.
- **Both card responses**
  Both cards respond and provide Modbus data.

Serial bus parity

Choose the check bit.

- **None**

Error detection is disabled.

- **Even**
  Even check bit.
- **Odd**
  Odd check bit

Response delay time [ms]
Enter a delay time in ms between data transmit and receive.

Bus termination primary master and Bus termination secondary master
Check this box to activate the Modbus bus termination. The Modbus RTU communication is based on a RS 485 bus. This physical bus requires a bus termination at the first and the last device on the bus. Whether the termination must be activated at the primary master, the secondary master, or at both cards depends on the application (see operating manual of the communication card).

Note
Ensure that the termination is only activated at one communication card if the RTU interface of both cards is connected to the same bus.

Biasing resistors primary master and Biasing resistors secondary master
Check this box to activate the bias setting. The RS 485 bus requires a connection of bus line A to +5 V and of bus line B to ground (bias connection). This is required at one device on the bus. Whether the bias must be activated at the primary master, at the secondary master, at both cards, or at another card connected to the bus depends on the application (see operating manual of the communication card).

Modbus TCP

Configure the Modbus TCP interface.

A6500-CP card: **Modbus TCP** contains the configuration pages for the configuration of the LAN 1 and LAN 2 interfaces. Click on the little arrow in front of **Modbus TCP** to get access to the LAN 1 and LAN 2 configuration pages. Both configuration pages contain the same parameters.

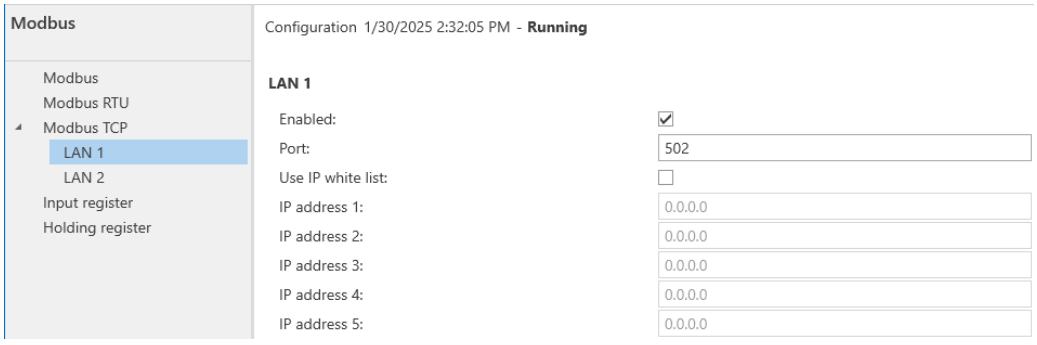
Note
To use Modbus TCP on LAN 2, ensure that LAN 2 is enabled in the configuration of the A6500-CP card.

Note
A6500-CP: Ensure that the data diode is deactivated for the Modbus over TCP/IP communication through the lower Ethernet port (LAN 2). See A6500-CP Com Card Pro operating manual for details.

Up to five clients can simultaneously connect to the Modbus TCP interface. When using an A6500-CP card, up to five clients can simultaneously connect to each Modbus TCP interface (LAN 1 and LAN 2).

Note
The communication cards (A6500-CC and A6500-CP) automatically disconnect the Modbus TCP connection from a client after 120 seconds of inactivity.

Figure 5-70: Modbus TCP settings – LAN 1 and LAN 2 – A6500-CP



Enable Check this box to activate Modbus over TCP/IP for the LAN interface. By activating this function, additional parameters are enabled.

Port Enter the TCP port for the Modbus over TCP/IP communication. Standard port for Modbus is 502. Ensure that the port entered is unique and not used by another AMS 6500 ATG interface using this LAN interface.

Note
Sending a configuration with a changed port disconnects Modbus communication. Reconnect it using the specified port.

Use IP white list Check this box to activate the device white list. This list is used to define devices allowed to communicate with the Modbus TCP interface of the communication card.

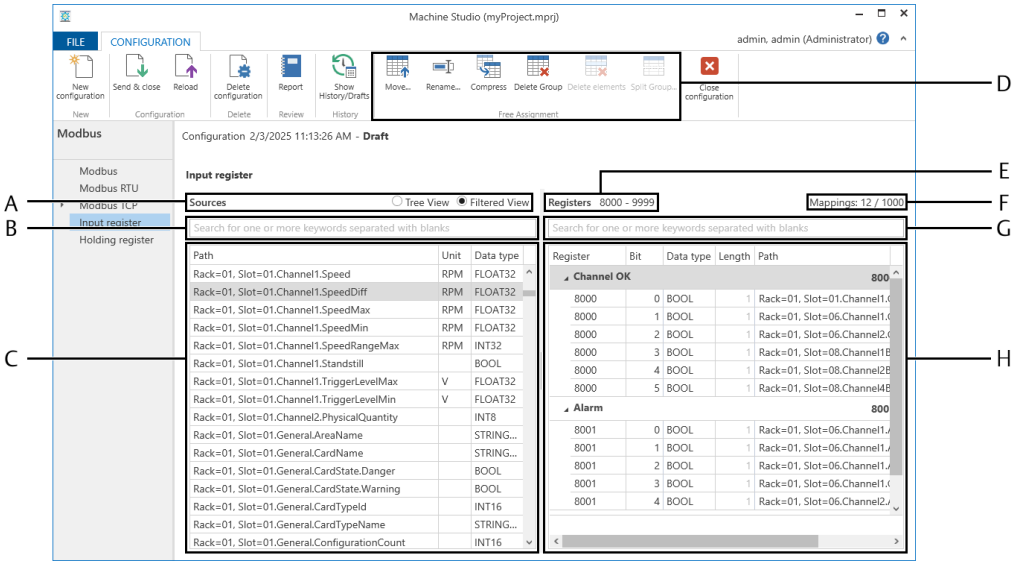
IP address 1 to IP address 5 These fields are only available if the check box **Use IP white list** is checked. Enter up to five IP addresses of devices allowed to communicate with the Modbus TCP IP interface over this LAN interface.

Input register

Depending on your selection at the beginning of the configuration (see Configuration), up to 2000 registers of the available Modbus rack data can be assigned to user-definable registers in the range 8000 to 9999 (**Standard Modbus**), or across the full register range from 0 to 65535 (**Full assignable Modbus**). The available number of registers for the assignment depends on the data type (Integer, Float, or Bool) of the selected registers and can be less than 2000 registers or 65535 registers. The assignable registers are of type **Input register** and can be grouped for a better overview.

Note
A6500-CP with FW 1.x: AMS Machine Works reads Modbus data from the fixed assigned registers as described in Data tables. Free assigned registers cannot be read by AMS Machine Works.

Figure 5-71: Free assignment of registers



A. Selection of rack data view
*B. Search input field (if **Filtered View** is selected)*
C. Rack data, available registers depend on the AMS 6500 ATG configuration
D. Command buttons
E. Register range for the assignment
F. Number of already mapped registers of the maximum number of registers available for the mapping
G. Search input field for assigned registers
H. List of defined register groups and assigned registers

Command Buttons

The command buttons are allocated to the list of assigned registers. These buttons become active depending on the selection from the list of assigned registers.

Move ...



Move a group to another register range within the reserved range.

Rename



Change the name of the selected group. Provide a new name when prompted.

Compress



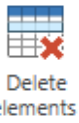
Remove blank registers from the selected group. Remaining registers are numbered sequentially.

Delete Group

Delete a group from the list of assigned registers.

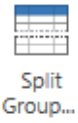


Delete elements



Delete one or more selected registers from the list of assigned registers.

Split Group ...

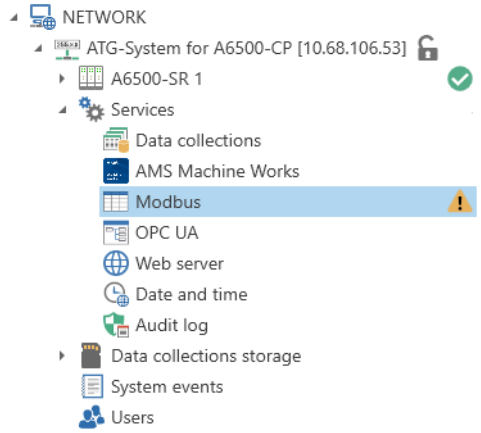


Split a group starting at the selected register. Enter a name for the group when prompted.

Note

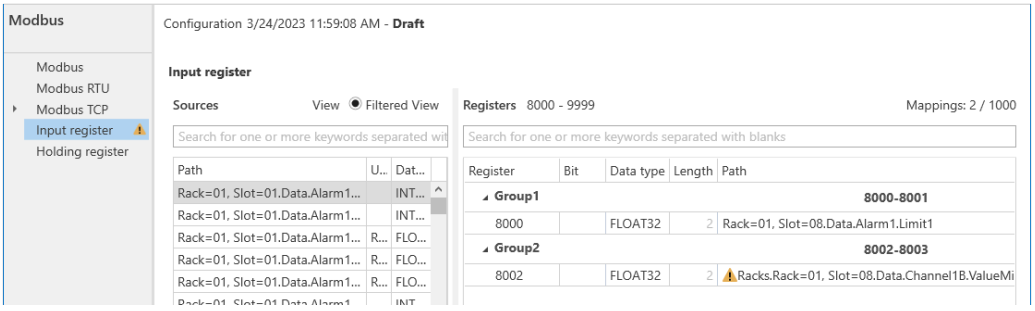
Changing the card's configuration causes a change to the Modbus registers. If one or more registers in the list of assigned registers are no longer available, a yellow warning triangle appears beside the Modbus service in the device tree:

Figure 5-72: Indication – inconsistency of freely assigned Modbus registers



In this case, open the Modbus configuration and go to **Input register** to check the list of assigned registers. The registers that are no longer available are marked with a yellow warning triangle. Replace or remove the registers that are no longer available.

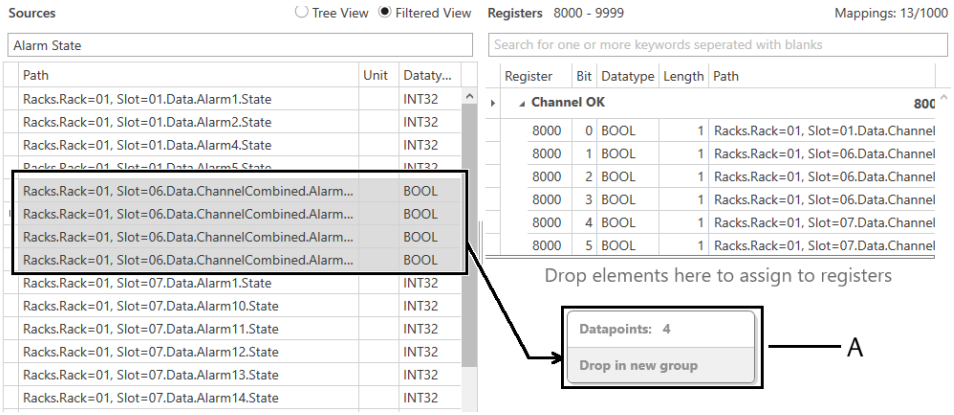
Figure 5-73: Indication in Input register



Procedure

1. Ensure that the Modbus registers are current.
   - For an offline system, ensure that all cards of the system are configured.
   - For an already configured and running system open the configuration.
2. Select the registers to be assigned from the **Sources** list.
   - In **Tree View**, click a register to select it.
   - In **Filtered View**, select one or more registers. Click a single register, or press **Ctrl** or **Shift** while clicking to select multiple registers.
3. Drag and drop the selected registers from the **Sources** list to the list of assigned registers.

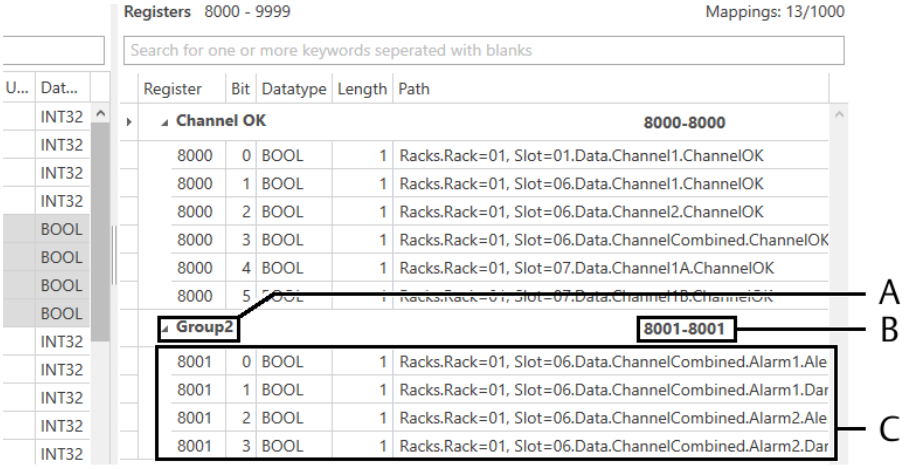
Figure 5-74: Drag and drop



A. Information box with number of data points to be moved and the location where to move.

A register group is automatically created for each register dropped into a free area below the already assigned registers.

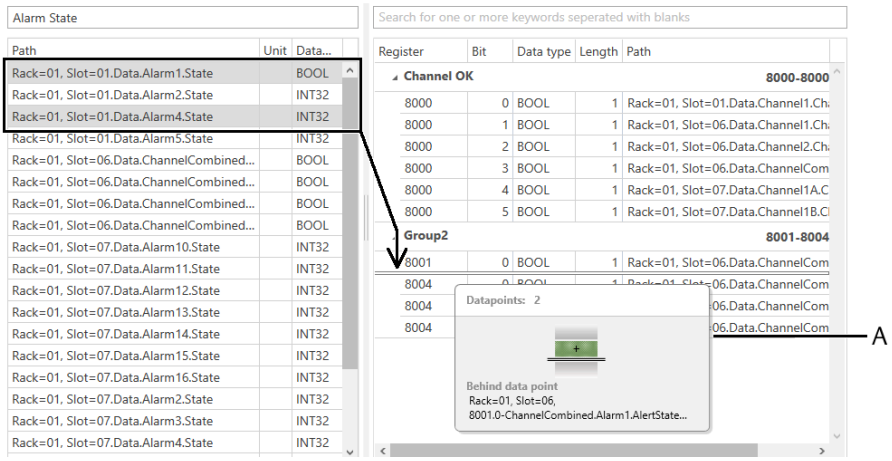
Figure 5-75: New register group



A. Automatically created group
B. Occupied register range
C. Assigned registers

To add one or more registers to an existing group, drag and drop them into the desired group.

Figure 5-76: Move register(s) to an existing group



A. Information box with number of data points (registers) to be moved and the location where to move.

- *If the mouse cursor is above the double line, then the selected registers are placed behind the row above the double line. The numbering of the register is assigned accordingly.*
- *If the mouse cursors is below the double line, then the selected registers are placed above the row below the double line. The numbering of the register is assigned accordingly.*

Continue moving registers.

4. Use the command buttons to arrange the registers and register groups as desired.
   - Move a group.
     a. Select the group to be moved.
        Click the desired group (the row with the group name) in the list of assigned registers. The selected row is highlighted.
     b. Click **Move ...** in the ribbon bar.
        The dialog for entering the register number for the start register of the group opens.
     c. Enter a register number within the available range (**Standard Modbus**: 8000 to 9999 or **Full assignable Modbus**: 0 to 65535) and click **OK**.

        Note
        The entered register number must be outside of the already assigned registers.

        The group is moved to the new range. The first register of the group is moved to this register. All other registers of the group are moved subsequently.
   - Rename a group.
     a. Select the group to be renamed.
        Click the desired group (the row with the group name) in the list of assigned registers. The selected row is highlighted.
     b. Click **Rename** in the ribbon bar.
        The dialog for changing the group name opens.
     c. Enter the new name for the group and click **OK**.
        The name is changed immediately.
   - Remove blank registers.
     a. Select the row of the group name to be compressed from the list of assigned registers.
        The selected row is highlighted.
     b. Click **Compress** in the ribbon bar.
        All unused registers in the selected group are removed, and the remaining registers are numbered sequentially.
   - Delete a group.
     a. Select the group to be deleted.
        Click the desired group (the row with the group name) in the list of assigned registers. The selected row is highlighted.
     b. Click **Delete Group** in the ribbon bar.
        The selected group and the assigned registers are immediately removed from the list of assigned registers.
   - Delete registers.

a. Select the register to be deleted.
   Click the desired register (the row with the register) in the list of assigned registers. The selected row is highlighted.
   To select a number of registers, press **Ctrl** and click several registers. Press **Shift** and click two registers to select these registers and all registers in between.

b. Click **Delete elements** in the ribbon bar.
   The selected registers are immediately removed from the list of assigned registers.

- Split a group.
  a. Select a register in the group to define the beginning of the new group.
     The selected row is highlighted.

  b. Click **Split Group ...** in the ribbon bar.
     The dialog for entering the name for the new group opens.

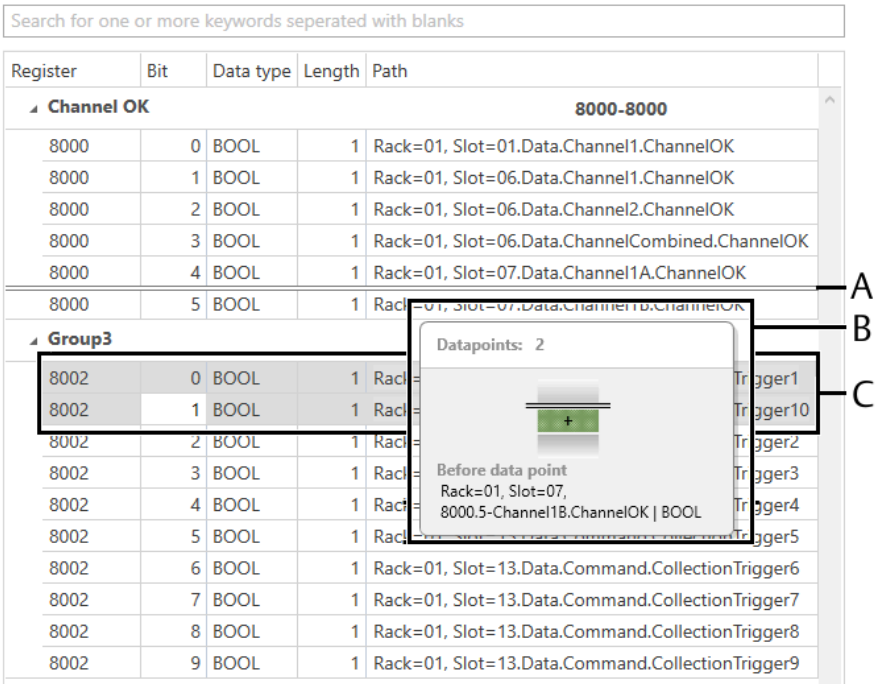
  c. Enter a name and click **OK**.
     The new group is created and contains the register selected beforehand and all following registers.

Registers can be moved within its group or to other groups.

a. Select a register to be moved to another location within the list of assigned registers.
   Click the desired register (the row with the register) in the list of assigned registers. The selected row is highlighted.
   To move a number of registers at once, press **Ctrl** and click several registers to select discontiguous registers, or press **Shift** and click two registers to select these registers and all registers in between.

b. Click and drag the selected register to the new location.
   The location where the registers are moved to is marked with a line.

Figure 5-77: Move registers



A. Line to mark the location where the registers are moved to.

B. Information box with number of data points to be moved and the location where to move.

- *If the mouse cursor is above the double line, then the selected registers are placed behind the row above the double line. The numbering of the register is assigned accordingly.*
- *If the mouse cursors is below the double line, then the selected registers are placed above the row below the double line. The numbering of the register is assigned accordingly.*

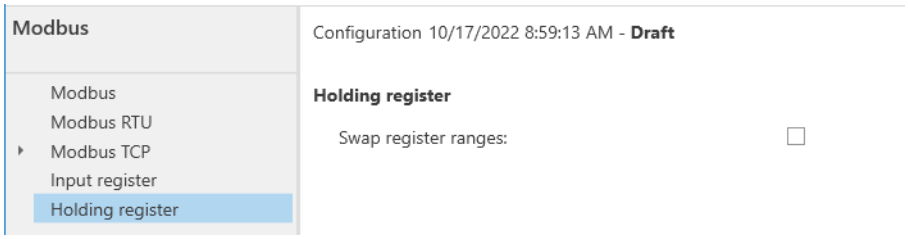
C. Selected registers.

c. Release the mouse button to place the registers at the desired location.
The register numbering is readjusted.

Holding register

Some systems solely work with a Holding register range of 0 to 9999. Use this function to select whether time data or software switches, settings, trigger for data capturing, and the current UTC time are available in this register range.

Figure 5-78: Holding register



Swap register ranges

Check this box to swap registers containing software switches, settings, trigger for data capturing, and the current UTC time with registers containing time data.

- Register allocation with box not checked (see also Data table "Holding register"):

  Table 5-8: Register range – not swapped

Register range	Content
0 to 53820	Time data
62000 to 63300	Software switches and software inputs
64000 to 64105	Settings
65000 to 65099	Trigger for data capturing
65100 to 65105	Current UTC time

- Register allocation with box checked:

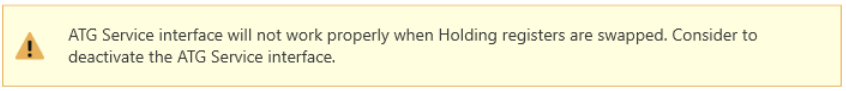
  Table 5-9: Register range – swapped

Register range	Content
0 to 1300	Software switches and software inputs
2000 to 2105	Settings
3000 to 3099	Trigger for data capturing
3100 to 3105	Current UTC time
10000 to 63820	Time data

Swapped Holding registers are indicated by the Modbus register **Swap Holding register ranges**, see Table B-23.

Note
The ATG Service interface does not work properly if Holding registers are swapped (see Configure the ATG service). Use the default register allocation (registers not swapped) when using the ATG Service interface. Swapped Holding registers are indicated by a notification:

Figure 5-79: Swapped Holding registers notification



5.5.2 Commands

If **Modbus** is selected in the device tree, the associated commands are enabled in the command ribbon bar. An online connection is required to execute the commands.

Note
These commands do not affect the protection function of the system.

Modbus report

Figure 5-80: Report

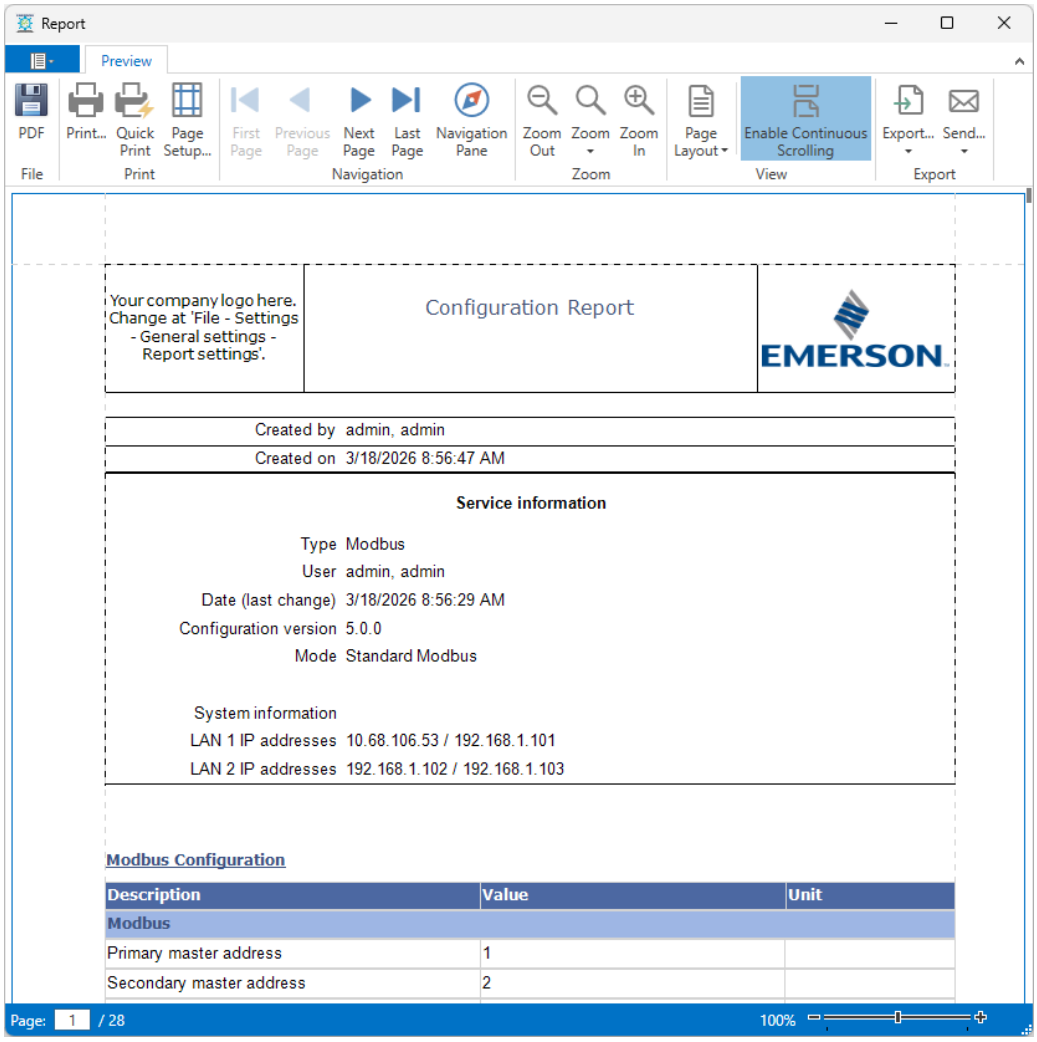


Click **Report** to open the report about the Modbus registers.

The report lists the Modbus registers which are occupied by the installed cards. See Figure 5-81. The report is useful for setting up Modbus communication with, for example, a control system.

The report window includes an export function for different file formats. Select a file format from the **Export** drop down list to export the report.

Figure 5-81: Modbus register report



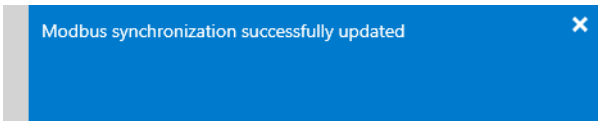
Update Modbus mappings

Figure 5-82: Update Modbus mappings



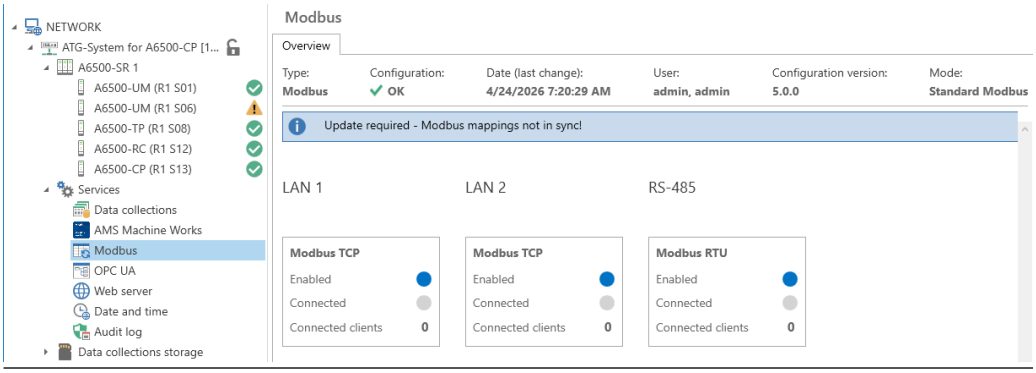
Use **Update Modbus mappings** to manually update the Modbus registers. The registers are generally updated automatically, for example after the change of the configuration of a card connected to the communication card. To force an update click **Update Modbus mappings**.

Note
Do not close AMS Machine Studio during Modbus synchronization. AMS Machine Studio can be closed when the message "Modbus synchronization successfully updated" appears.



A failed or missing update of Modbus mappings is indicated by a slow flashing OK LED and a notification in AMS Machine Studio (see Figure 5-83).

Figure 5-83: Indication of missing Modbus mappings



If using an A6500-CP card for communication, enable system programming to use this command. See Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.

Note
Modbus requests are answered with **Server Device Busy (0x06)** when updating the Modbus mapping.

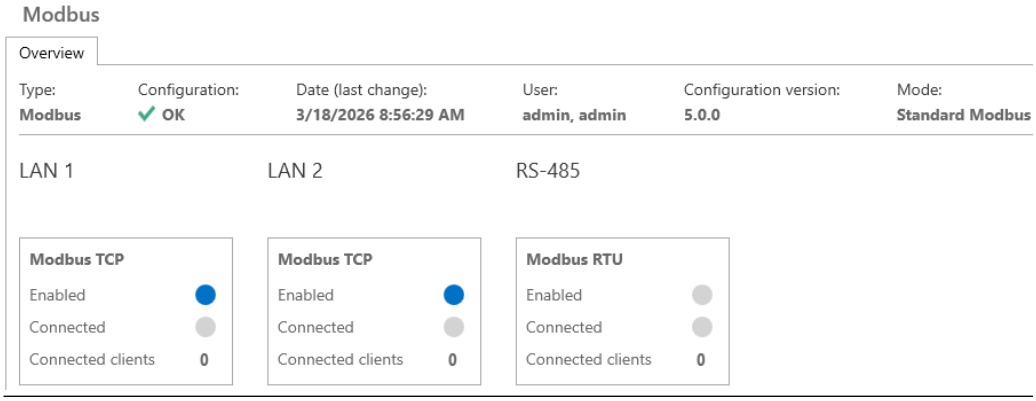
5.5.3 Online view

There is an online view for the Modbus service. Click **Modbus** in the device tree to open the associated online view.

Overview

Overview displays the state of the Modbus TCP and Modbus RTU interface connection. See Figure 5-84.

Figure 5-84: Modbus - Overview



There is a display object for each LAN interface and one for the Modbus RTU interface. The objects contain the following information:

Enabled	The state of the interface is indicated by a colored circle. A solid blue circle indicates an enabled interface. The circle is gray if the interface is disabled.
Connected	Indicates a connection to the Modbus interface by a colored circle. An established connection is indicated with a solid blue circle. Otherwise, the circle is gray.
Connected clients	Displays the number of interface clients connected to the service. In redundant systems the shown number of connections is the number of connected active communication cards.

5.6 OPC UA

The communication cards A6500-CC and A6500-CP are equipped with an OPC UA (OLE for Process Control Unified Architecture) server. An OPC UA server is available for both LAN interfaces when using the A6500-CP Com Card Pro.

5.6.1 Connection and communication

The connection interface of the OPC UA server is the TCP/IP interface of the communication cards (see A6500-CC or A6500-CP operating manual for details).

Up to five OPC UA clients can simultaneously connect to one OPC UA server. When using an A6500-CP card, up to five clients can simultaneously connect to each OPC UA server (LAN 1 and LAN 2).

Note
A6500-CP (FW 1.x): Time data is not available through LAN 2. If time data is required, use LAN 1.

Note
Time data is not supported on A6500-CP cards running firmware version 5.x.

Note
Ensure that the data diode is deactivated for the OPC UA communication through the lower Ethernet port (LAN 2). See A6500-CP Com Card Pro operating manual for details.

An IP address and port is required for the client to connect to the OPC UA server. When using the A6500-CP card, OPC UA communication can be encrypted, see OPC UA security policies.

Note
OPC UA is not backwards compatible to OPC.

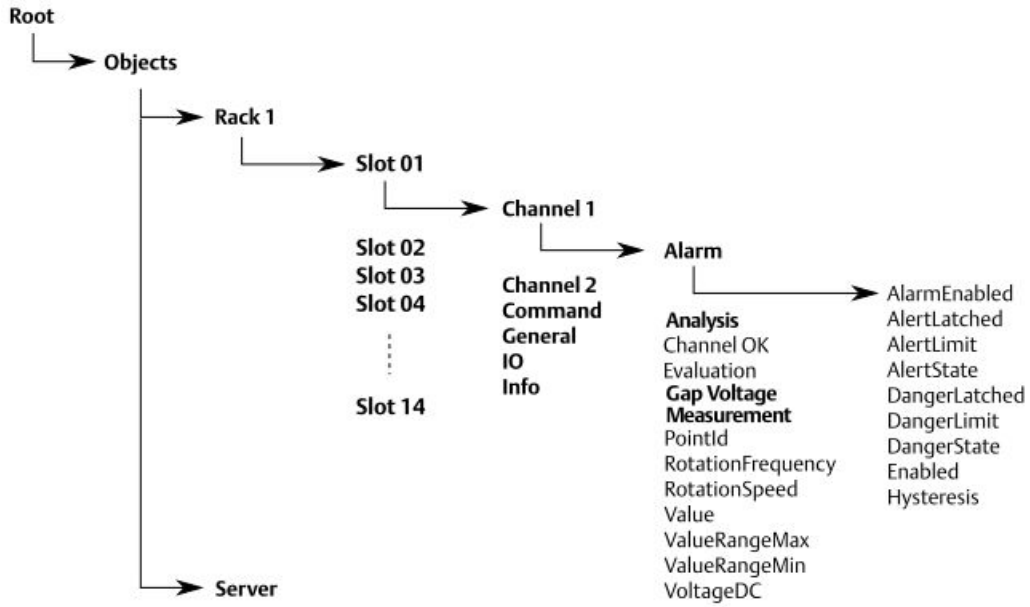
Note
The communication cards (A6500-CC and A6500-CP) automatically disconnect the OPC UA connection from a client after 30 seconds of inactivity.

5.6.2 OPC UA data points and cycle time

The available data points are identical to the Modbus data registers (see Data tables). A maximum of 1000 OPC items (data points) per OPC UA server (A6500-CC one server or A6500-CP two servers accessible through LAN 1 and LAN 2) can be read.

The structure and availability of data points (nodes) of the OPC UA server depends on the physical structure of the rack and the configuration of the single cards. Figure 5-85 shows a structure example for an A6500-UM card in slot 1 of a System Rack.

Figure 5-85: Item structure



Bold: Groups

Not bold: data points (node)

Note
The name of the analysis function **Energy in band analysis** has been changed to **Interval band by frequency analysis**. The new name are used for OPC UA configurations send with AMS Machine Studio version 3.6 and higher. Check your existing OPC UA client configuration for possible inconsistencies in the OPC UA data point names.

The minimum OPC UA server cycle time is 500 ms. Use the OPC UA client to change its cycle time.

Note
To obtain waveform data, Emerson recommends a minimum cycle time of 1000 ms. OPC UA data is generally provided in SI units, independently of the selected system of units in AMS Machine Studio (**Settings** → **Internationalization** → **System of units**).

Alarms and conditions

System events that occur during an already established OPC UA connection are available through the OPC UA servers of an A6500-CP card. Current events are transmitted, historic events are not available. The system events are contained in the **Server** object, see Figure 5-85. A transmitted event contains the following information:

- Time stamp, time of the AMS 6500 ATG system
- Severity level:
  - 250: Info
  - 500: Warning
  - 750: Error
  - 1000: Fatal
- Event source (rack, slot, and channel[9])
- Message
  Messages are generally provided in English, independently of the selected language in AMS Machine Studio (**Settings** → **Internationalization** → **Language**).

  Note
  Configure the A6500-CP card at least once to make event definitions available on the OPC UA server. A6500-CP cards with the default configuration cannot provide event definitions.

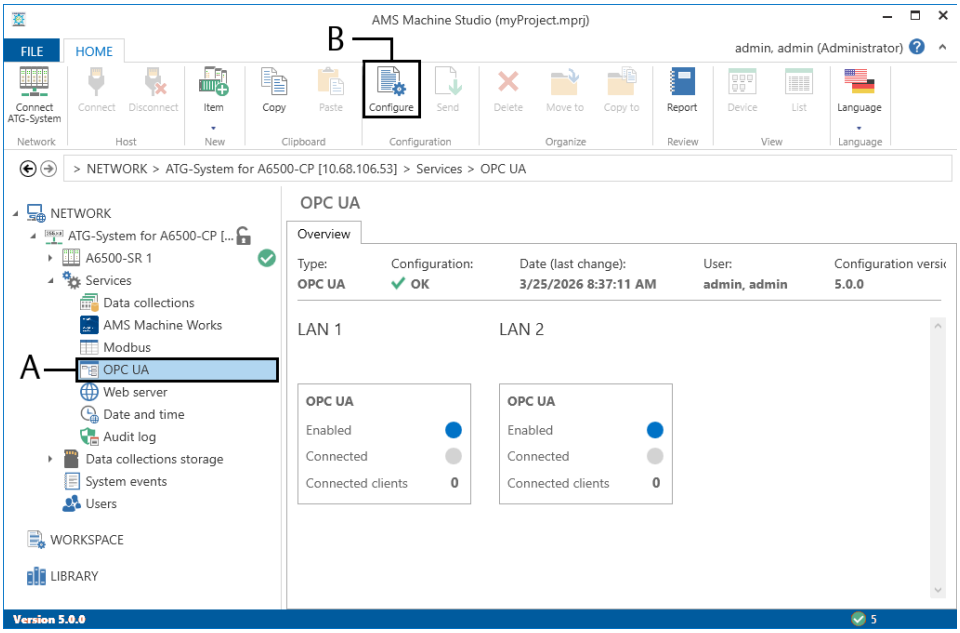
5.6.3 Configuration

Procedure

1. Select **Network** → **AMS 6500 ATG System** → **Services** → **OPC UA** (see Figure 5-86).

9 *If available for the event.*

Figure 5-86: OPC UA selection



*A. Selected **OPC UA***

*B. **Configure** to open the configuration editor.*

2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).
3. Enter the configuration parameter. The configuration depends on the used communication card. See OPC UA LAN 1 and LAN 2 – A6500-CP if an A6500-CP is used. See OPC UA credentials – A6500-CC and OPC UA – A6500-CC if an A6500-CC is used.

   Only A6500-CP: Create an OPC UA user in the user management if a password protected communication through the OPC UA interface is required. An OPC UA user is shared between both OPC UA server (LAN 1 and LAN 2). So it is not necessary to create an OPC UA user for each OPC UA server. See A6500-CP Com Card Pro – User management.
4. Click **Send & close** to send the configuration to the AMS 6500 ATG system. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

   See operating manual of your OPC UA client on how to connect to OPC UA servers.

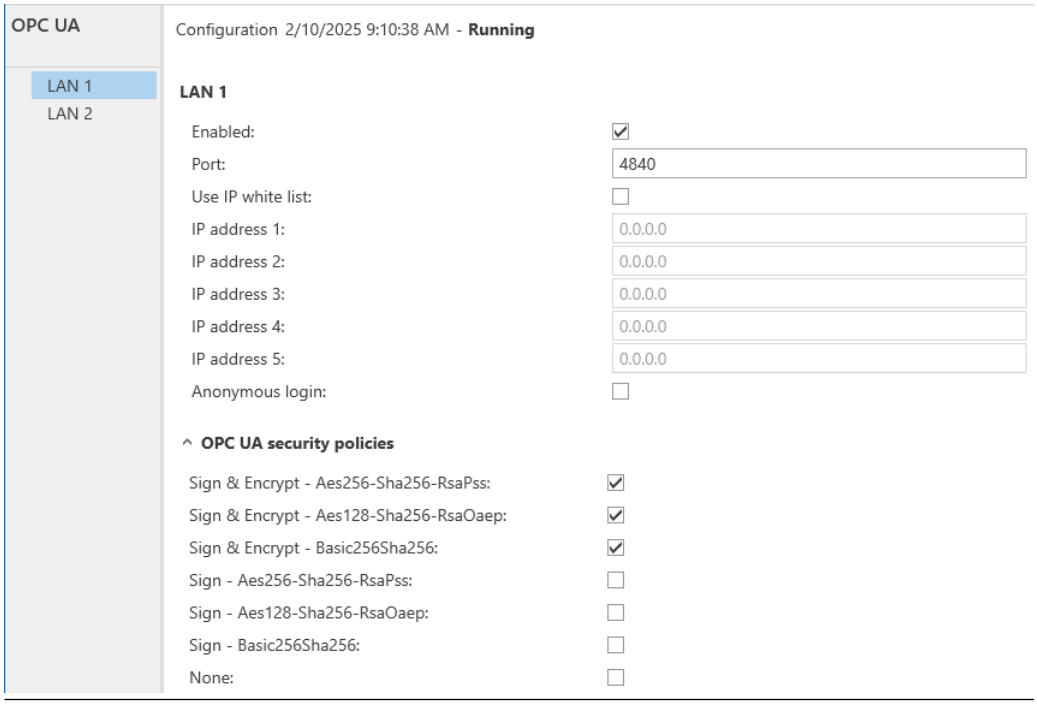
Note
Sending an OPC UA configuration does not affect the protection function of the AMS 6500 ATG system.

OPC UA LAN 1 and LAN 2 – A6500-CP

OPC UA interface configuration if an A6500-CP card is used. Both configuration pages **LAN 1** and **LAN 2** contain the same parameters.

Note
To use OPC UA on LAN 2, ensure that LAN 2 is enabled in the configuration of the A6500-CP card.

Figure 5-87: OPC UA Interface settings



Enabled
Check this box to enable the OPC UA interface.

Note
An A6500-CP running a firmware version earlier than 5.0 requires a reboot after a configuration with a changed enable selection is sent.

Port
Enter the port for the communication. Ensure that the port entered is unique and not used by another AMS 6500 ATG interface connected through the same Ethernet port.

Note
Sending a configuration with a changed port disconnects of all OPC connections. An A6500-CP running a firmware version earlier than 5.0 requires a reboot after a configuration with a changed port is sent.

Use IP white list
Check this box to enable the IP white list.

IP address 1 to IP address 5
Enter up to five IP addresses of devices which are allowed to communicate with the OPC UA interface.

Anonymous login
Only A6500-CP: Check this box if no access control is required. Already defined OPC UA users (see A6500-CP Com Card Pro – User management) are overridden when anonymous login is enabled.

OPC UA security policies

Click the down arrow in front of **OPC UA security policies** to open the available security policies.

Select one or more policies to protect the communication between OPC UA client and OPC UA server. Select **None** to operate the OPC UA communication without any protection.

Ensure that all existing OPC UA clients the server needs to communicate with supports the selected policy. Try to find the strongest common policy all clients are compatible with.

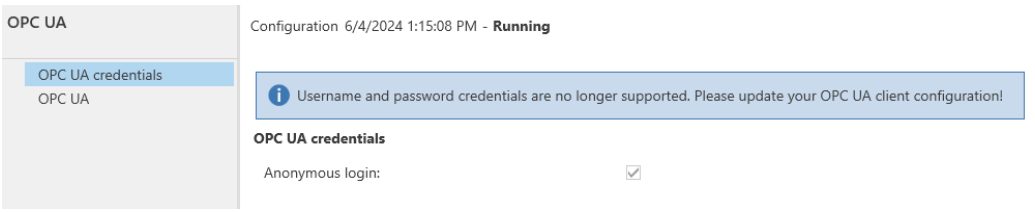
Note
Only security policies with **Encrypt** in their name provide encryption of the communication.

Note
An A6500-CP running a firmware version earlier than 5.0 requires a reboot after a configuration with a changed OPC UA security policy is sent.

OPC UA credentials – A6500-CC

OPC UA credentials is only available if an A6500-CC card is used.

Figure 5-88: OPC UA credentials



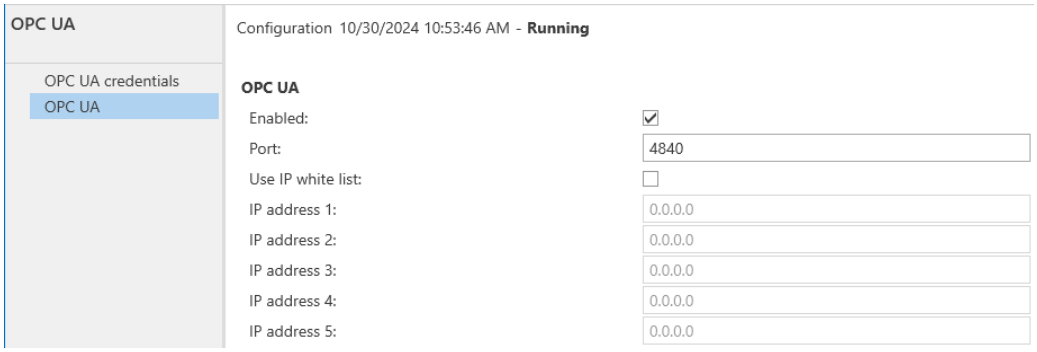
User name and password credentials are not supported in AMS Machine Studio version 4.1 together with A6500-CC with firmware version 3.3. Change your OPC UA client authentication settings to **Anonymous login**. The OPC UA interface rejects login attempts with user name and password.

Anonymous login is always activated for the OPC UA services of the AMS 6500 ATG when using an A6500-CC Com Card.

OPC UA – A6500-CC

OPC UA interface configuration if an A6500-CC card is used.

Figure 5-89: OPC UA



Enabled	Check this box to enable the OPC UA interface.
Port	Enter the port for the communication. Ensure that the port entered is unique and not used by another AMS 6500 ATG interface.

Note
Sending a configuration with a changed port disconnects all OPC connections and requires a reboot of the A6500-CC card.

Use IP white list	Check this box to enable the IP white list.
IP address 1 to IP address 5	Enter up to five IP addresses of devices which are allowed to communicate with the OPC UA interface.

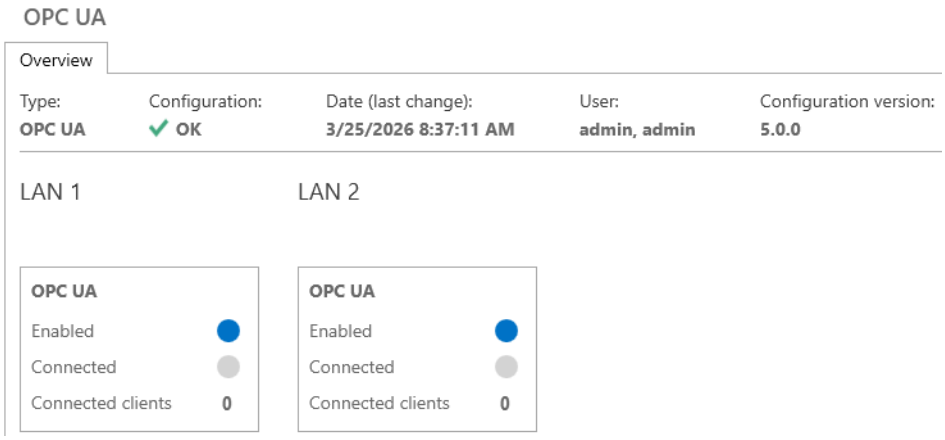
5.6.4 Online view

There is an online view for the OPC UA service. Click **OPC UA** in the device tree to open the associated online view

Overview

Overview displays the state of the OPC UA interface connections. See Figure 5-90.

Figure 5-90: OPC UA - Overview



There is a display object for each LAN interface. The objects contain the following information:

Enabled	The state of the interface is indicated by a colored circle. A solid blue circle indicates an enabled interface. The circle is gray if the interface is disabled.
Connected	Indicates a connection to the OPC UA interface by a colored circle. An established connection is indicated with a solid blue circle. Otherwise, the circle is gray.
Connected clients	Displays the number of interface clients connected to the service. In redundant systems the shown number of connections is the number of connected active communication cards.

5.7 Web server

The A6500-CP Com Card Pro is equipped with an internal web server. The web server provides a user-definable dashboard with measurement values and status information of the connected AMS 6500 ATG system and is available on the upper Ethernet port (LAN 1) of the A6500-CP card. See A6500-CP card operating manual for the location of the Ethernet port. The connection to the web server is secured with a certificate. For setup, use, and further details of the dashboard see operating manual AMS 6500 ATG Dashboard.

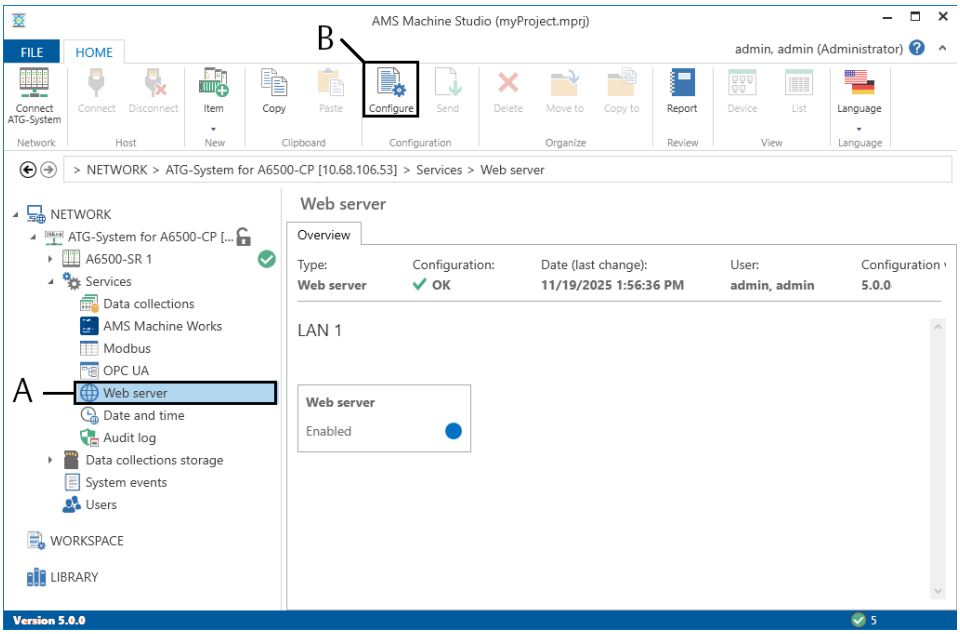
5.7.1 Configuration

This chapter describes the configuration of the web server.

Procedure

1. Select **Network** → **AMS 6500 ATG System** → **Services** → **Web server**.

Figure 5-91: Web server selection



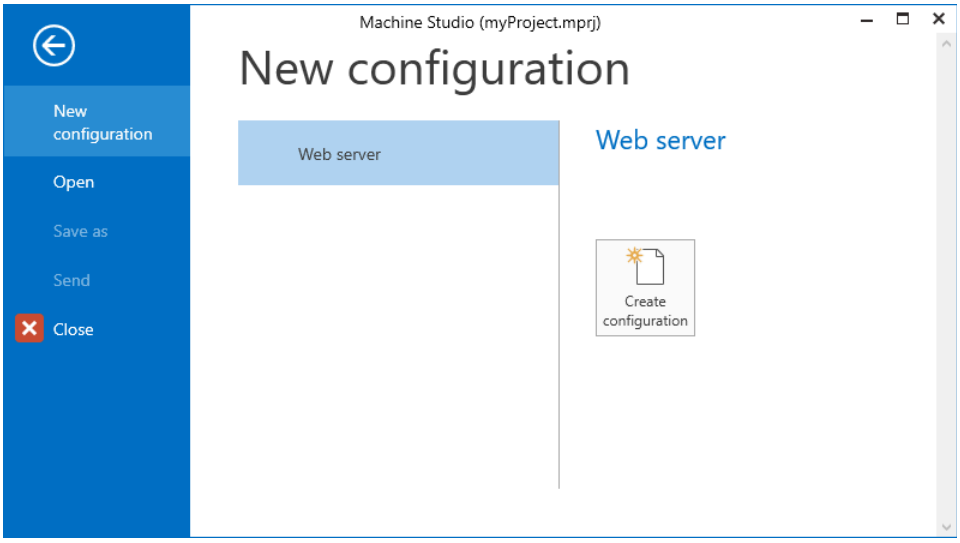
*A. Selected **Web server***

*B. **Configure** opens the configuration editor*

2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).

   During the first configuration of the web server, the **New configuration** dialog appears. Click **Create configuration** to create a new configuration.

Figure 5-92: New configuration



3. Enter the configuration parameter. See Web server for details.

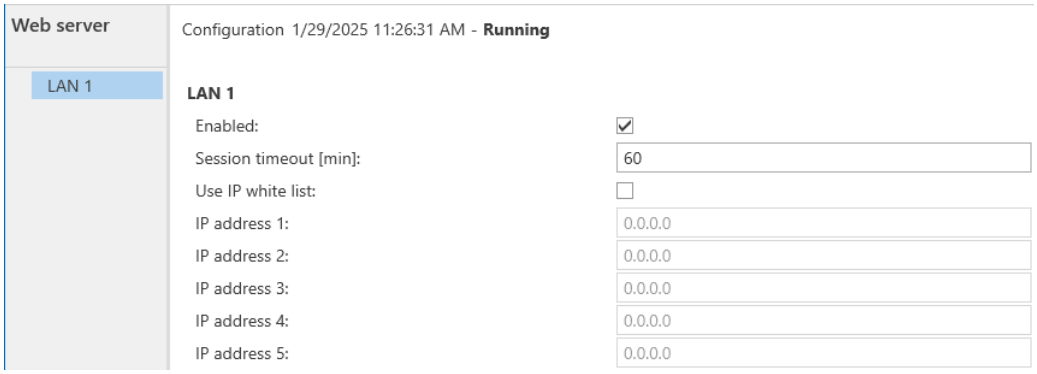
4. Click **Send & close** to send the configuration to the AMS 6500 ATG system. The editor automatically closes after a successful sending of the configuration. See Send a configuration.

Note
Sending a web server configuration does not affect the protection function of the AMS 6500 ATG system.

Web server

Configure the communication with the web server located on the A6500-CP communication card.

Figure 5-93: Web server



Enable	Check this box to enable the web server of the A6500-CP card.
Session timeout	Enter a time for the session timeout. Once the entered time has expired, the user logged into the dashboard running on the web server is automatically logged out. The timer starts to run if no user action is detected. A new user action such as a mouse click resets the timer.
Use IP white list	Check this box to enable the IP white list.
IP address 1 to IP address 5	Enter up to five IP addresses of devices which are allowed to connect to the web server.

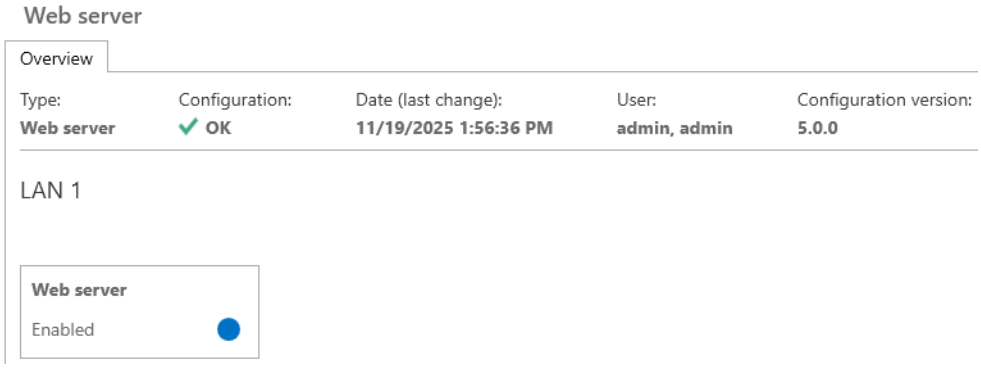
5.7.2 Online view

There is an online view for the web server service. Click **Web server** in the device tree to open the associated online view.

Overview

Overview provides information about the state of the web server. See Figure 5-94.

Figure 5-94: Web server – Overview



Enabled The state of the web server is indicated by a colored circle. A solid blue circle indicates an enabled web server. The circle is gray if the web server is disabled.

5.8 Date and time

The internal time of an AMS 6500 ATG system can be synchronized with the UTC time (Coordinated Universal Time) provided by a Simple Network Time Protocol (SNTP) server to keep the AMS 6500 ATG system time current. This function requires a permanent connection to a SNTP server.

Note
The SNTP client can also receive time data from Network Time Protocol (NTP) servers.

Note
The displayed time is the device time using the configured time zone and is also used as the timestamp on the microSD card.

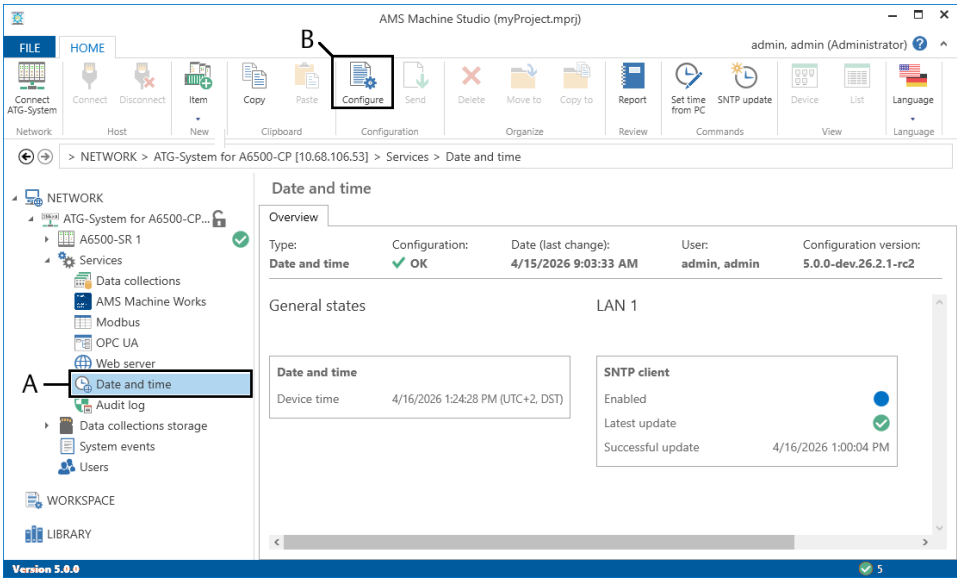
5.8.1 Configuration

This chapter describes the general configuration settings for date and time, including the SNTP client.

Procedure

1. Select **Network** → **AMS 6500 ATG System** → **Date and time**.

Figure 5-95: Date and time selection



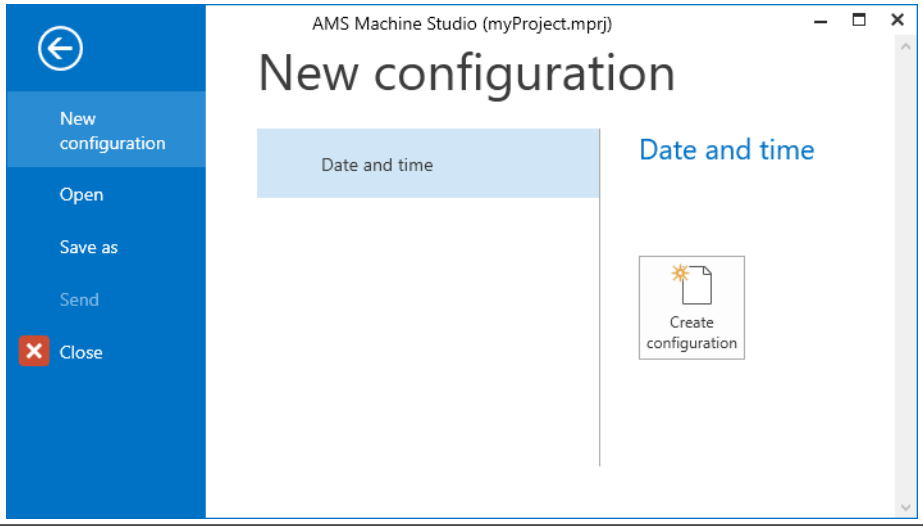
*A. Selected **Date and time***

*B. **Configure** opens the configuration editor.*

2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).

   During the first configuration of the date and time, the **New Configuration** dialog appears. Click **Create Configuration** to create a new configuration.

Figure 5-96: New Configuration



3. Enter the configuration parameter. See Time zone and SNTP client for details.

4. Click **Send & close** to send the configuration to the AMS 6500 ATG system. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

Note
Sending a date and time configuration does not affect the protection function of the AMS 6500 ATG system.

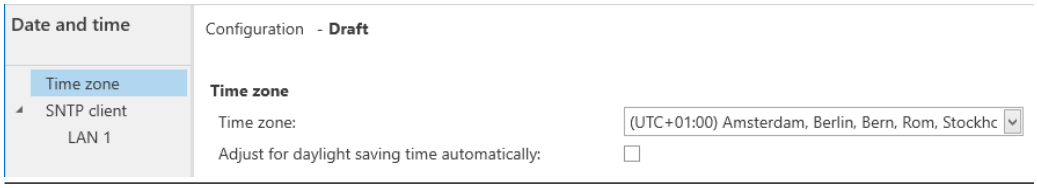
Note
If **Adjust for daylight saving time automatically** is selected, the daylight saving time settings are stored on the A6500-CP card when the configuration is saved and remain valid for the next 20 years. If the **Date and time** service configuration is not saved again within this period, the daylight saving time function will no longer work.

Time zone

These settings are available when using an A6500-CP card with firmware version 5.x. Configure the time zone in which the system is located.

The AMS 6500 ATG system operates with UTC as its internal time base. When configured, the A6500-CP card obtains a 20-year table of daylight saving time rules for all time zones from AMS Machine Studio and uses this information to calculate the time for the data collection triggering based on the user's configured local time zone.

Figure 5-97: Time zone

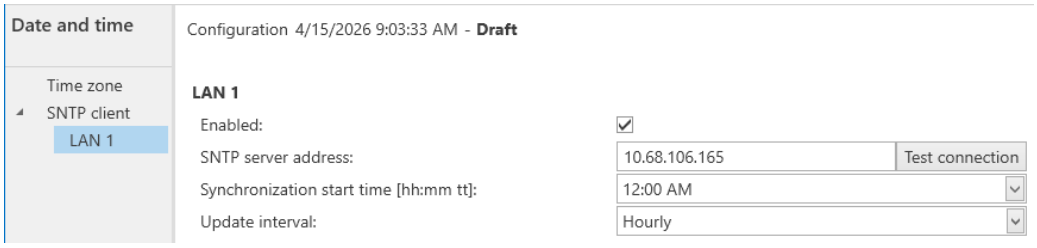


Time zone	Select the time zone in which the AMS 6500 ATG system is located from the drop down list.
Adjust for daylight saving time automatically	Check this box to activate the automatic daylight saving time changeover for the selected time zone.

SNTP client

A6500-CP card: The interface for the SNTP client is the upper Ethernet port (LAN 1) of the card.

Figure 5-98: SNTP settings – A6500-CP



Enabled	Check this box to enable SNTP time synchronization.
SNTP server address	Enter the IP address of the SNTP server used for the time synchronization. It is not necessary to enter a port number. The standard port number **123** for NTP (Network Time Protocol) servers is already set. Click **Test Connection** to ensure that the IP address is correct, and the server can be connected. **Note** Time synchronization fails when the entered IP address does not correspond to a time server.
Synchronization time [HH:MM]	Enter a time to synchronize the time of the AMS 6500 ATG system. The entered time is the start time for the selected update interval.
Update interval	Select an update interval for the time synchronization. Emerson recommends an hourly update interval, so the AMS 6500 ATG system time is synchronized once per hour. This setting keeps the network traffic low and the synchronization frequency is sufficient to avoid a large time deviation.

5.8.2 Commands

If **Date and time** is selected in the device tree, the associated commands are enabled in the command ribbon bar. An online connection is required to execute the commands.

Note
These commands do not affect the protection function of the system.

Set time from PC

Figure 5-99: Set time from PC



Click **Set time from PC** to synchronize the connected AMS 6500 ATG system with the UTC time (Coordinated Universal Time) of the connected computer.

Note
The times shown in AMS Machine Studio rely on the local time settings of the user's computer.

SNTP update

Figure 5-100: SNTP update



Click **SNTP update** to force an update of the SNTP client. Whether the time update was successful or not is indicated in the upper right corner of AMS Machine Studio. For more details on the state of the SNTP client, see Online view.

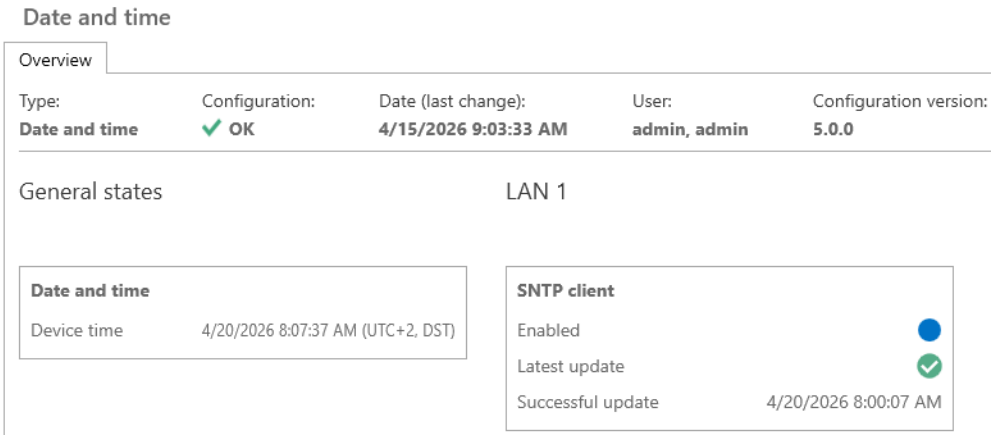
5.8.3 Online view

There is an online view for the date and time service. Click **Date and time** in the device tree to open the associated online view.

Overview

Overview provides information about the SNTP client and time updates.

Figure 5-101: SNTP client – Overview



Date and time

Device time The current date and time of the connected AMS 6500 ATG, including time zone information and daylight saving time status. If daylight saving time is active, it is indicated by **DST** in brackets.

SNTP client

Enabled The state of the SNTP client is indicated by a colored circle. A solid blue circle indicates an enabled client. The circle is gray if the client is disabled.

SNTP client	
Latest update	The state of the latest update attempt is indicated with a symbol. A white checkmark in a green circle indicates that the last update of the SNTP client was successful. The yellow warning triangle indicates that the last update has been failed.
Successful update	Date and time of the last successful SNTP client update.

5.9 Audit log

The audit log is available for AMS 6500 ATG systems with an A6500-CP Com Card Pro installed. It is accessible through the upper Ethernet port (LAN 1) of the A6500-CP card. Cybersecurity related events such as login attempts can be automatically sent from the A6500-CP card through an Ethernet connection to a syslog server for further investigation. Cybersecurity events are stored as audit log records. At least 2000 audit log records, typically up to 4000 audit log records, can be buffered in the internal memory of the A6500-CP card. The maximum number of records depends on the text length of the single record. The oldest record is overwritten if the maximum number of audit log records is reached. See Audit log records for a list of possible records.

Audit log records with redundant communication cards

- The active A6500-CP card sends the audit log records to the syslog server.
- Both A6500-CP cards store the same audit log records if they are available when the cybersecurity event occurs. Records are not synchronized between the A6500-CP cards.
- The sequence of the audit log records is not always in chronological order. But each record gets a time stamp[10].

5.9.1 Configuration

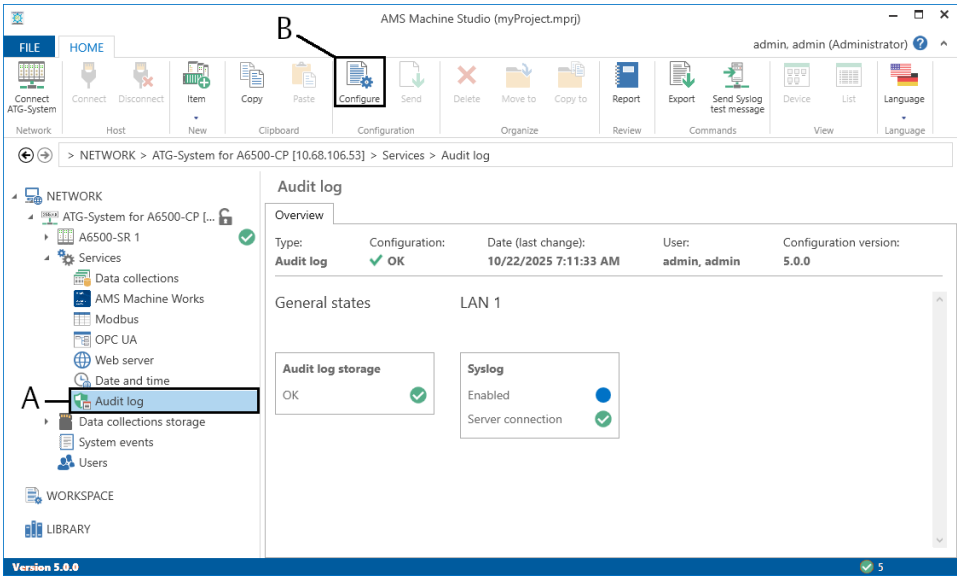
This chapter describes the configuration of the audit log service. A user with administrative rights can configure the audit log.

Procedure

1. Select **Network** → **AMS 6500 ATG System** → **Services** → **Audit log**.

10 *UTC time of the A6500-CP card.*

Figure 5-102: Audit log selection



*A. Selected **Audit log***

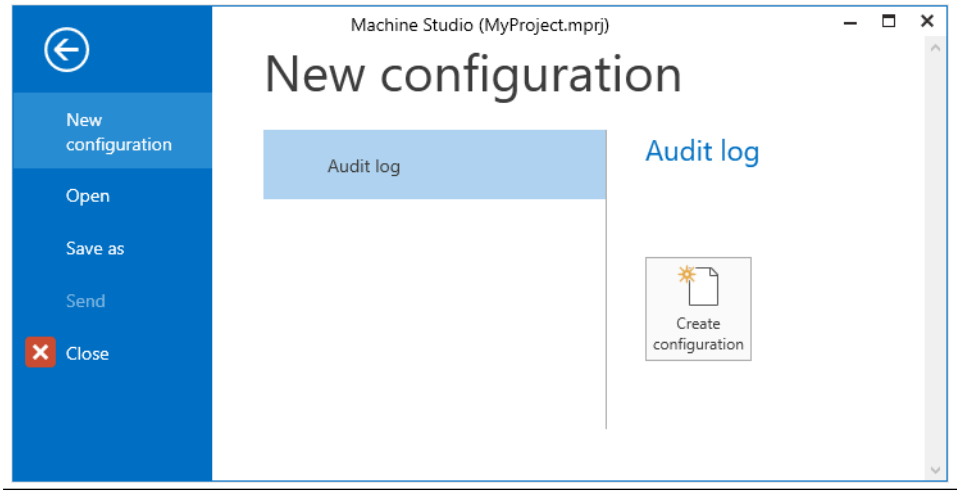
*B. **Configure** opens the configuration editor*

2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).

   Configure is available for users with administrative rights.

   During the first configuration of the audit log, the **New configuration** dialog appears. Click **Create configuration** to create a new configuration.

Figure 5-103: New configuration



3. Enter the configuration parameter. See Audit log for details.

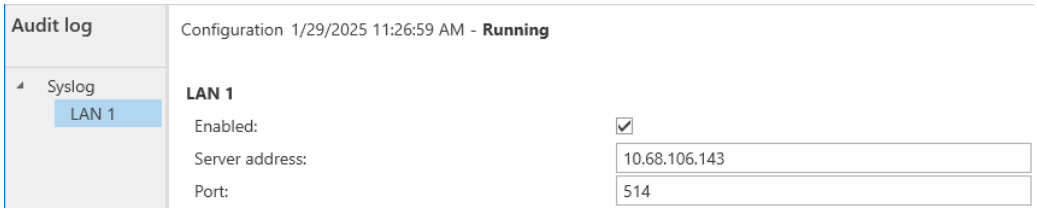
4. Click **Send & close** to send the configuration to the AMS 6500 ATG system. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

Note
Sending an audit log configuration does not affect the protection function of the AMS 6500 ATG system.

Audit log

Configure the communication with the syslog server to be used to collect the audit log records of the AMS 6500 ATG system.

Figure 5-104: Syslog settings



Enable	Check this box to enable sending of audit log records to a syslog server.
Server address	Enter the IP address of the syslog server.
Port	Enter a port for the communication with the syslog server.

5.9.2 Commands

If **Audit log** is selected in the device tree and a user with administration rights is logged in, the associated commands are enabled in the command ribbon bar. An online connection is required to execute the commands.

Note
These commands do not affect the protection function of the system.

Export

Figure 5-105: Export



1. Click **Export** to generate a ZIP-file containing all available audit log records.
   The ZIP-file contains one or two txt-files with the records. There are two files, one for each A6500-CP card, if an AMS 6500 ATG with redundant communication is used. The name of the txt-file contains a time stamp[11], rack number, and the slot number of the A6500-CP card which has provided the records.

11 *UTC time of the A6500-CP card.*

The default file name of the ZIP-file is **audit_logs_YYYY-MM-DD_hh-mm-ss.zip** (Y, M, D, h, m, and s are placeholders for the current year, month, day, hour, minute, and second).
The dialog for selecting a download location opens.

2. Use the default name of the ZIP-file or enter a new name for the file. Select a storage location.
3. Click **Save** to save the ZIP-file.

Send Syslog test message

Figure 5-106: Send Syslog test message



Click **Send Syslog test message** to send a test message to the configured syslog server (see Audit log).

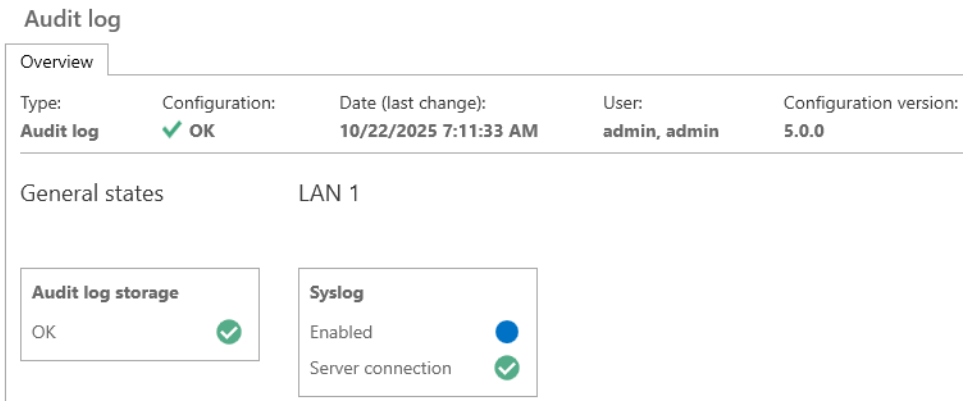
Content of the test message: This is a test message created by user *[User Name]*.

A successfully transmitted test message is indicated in the upper right corner of AMS Machine Studio. The **Send Syslog test message** button is grayed-out if **LAN 1 → Enabled** is not checked.

5.9.3 Online view

There is an online view for the Audit log service. Click **Audit log** in the device tree to open the associated online view. **Overview** provides information about the state of the Audit log. See Figure 5-107. In systems with redundant communication cards, the displayed status is aggregated from the Audit log status of both communication cards.

Figure 5-107: Audit log – Overview



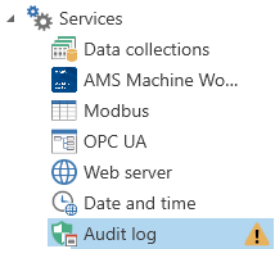
Audit log storage

OK The state of the local storage is indicated by a symbol:

- A working storage is indicated with a white checkmark in a green circle.
- The yellow warning triangle indicates a storage error.

An error is also indicated with a yellow warning triangle behind **Audit log** in the device tree and a corresponding message in **Overview**.

Figure 5-108: Error indication



Syslog

Enabled	The state of the Syslog client is indicated by a colored circle. • A solid blue circle indicates an enabled client. • The circle is gray if the client is disabled. The Syslog client is required to send Audit log entries to a Syslog server.
Server connection	The Ethernet connection state is indicated by a symbol: • An established connection to the network is indicated with a white checkmark in a green circle. • The yellow warning triangle indicates a disturbed connection to the network. • The gray circle symbol indicates a disabled client.

5.10 Transfer of the services configuration to an AMS 6500 ATG system with an A6500-CP card

The services configuration of an AMS 6500 ATG system with an A6500-CC Com Card with firmware 2.x or 3.x can be transferred to an AMS 6500 ATG system with an A6500-CP Com Card Pro. The following services configuration can be transferred:

- OPC UA
- Modbus
  - Full assignable Modbus
  - Standard
- SNTP client

There are several ways to transfer the configurations from an AMS 6500 ATG system with an A6500-CC card to a system with an A6500-CP card:

- Transfer via configuration file, see AMS 6500 ATG system with A6500-CC – configurations transfer via file.
- Transfer via drag and drop or copy and paste from **Workspace** or **Library**, see AMS 6500 ATG system with A6500-CC – configuration transfer via Workspace.

Note
The described procedures are also valid for AMS 6500 ATG systems with redundant communication cards. Ensure that you connect to the active communication card when transferring configurations.

5.10.1 AMS 6500 ATG system with A6500-CC – configurations transfer via file

Follow these steps to transfer the services configurations via configuration files to an AMS 6500 ATG system with an A6500-CP Com Card Pro. If the configuration files already exist start with Step 4.

Procedure

1. Connect to the AMS 6500 ATG system with the configurations to be transferred. See Communication.
2. Save the configuration of the single services.
   a) Select the service in the device tree.
   b) Click **Configure** to open the configuration editor.
   c) Go to **File** → **Save as**.
      The dialog for saving the configuration opens.
   d) Select a storage location, enter a file name, and click **Save**.
   e) Click **Close configuration** to close the configuration editor.
   f) Repeat the steps for the other services.
3. Disconnect from the AMS 6500 ATG system with the A6500-CC Com Card.
4. Connect to the AMS 6500 ATG system with the A6500-CP Com Card Pro to which the configurations needs to be transferred. See Communication.
   Log in as an **Operator** or an **Administrator**.
5. Open a file with a service configuration.
   a) Select a service in the device tree.
   b) Click **Configure** to open the configuration editor.
   c) Got to **File** → **Open** → **Computer** and click **Browse...**.
      The dialog for selecting a file opens.
   d) Select the file with the corresponding service configuration and click **Open**.
      Confirm the prompt.
6. Check the configuration settings and adjust them if necessary.

7. Click **Send & close** to send the configuration to the system.

   See Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.

8. Repeat the steps for the other services, starting with Step 5 .

5.10.2 AMS 6500 ATG system with A6500-CC – configuration transfer via **Workspace**

Follow these steps to transfer the services configuration via **Workspace** to an AMS 6500 ATG system with an A6500-CP Com Card Pro.

Note

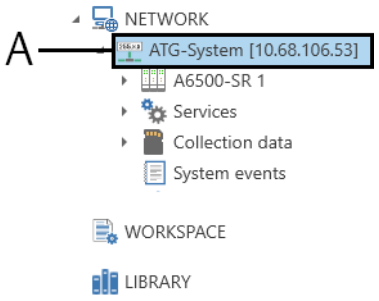
This process is also possible via **Library**.

Drag and drop can also be used instead of copy and paste.

Procedure

1. Connect to the AMS 6500 ATG system with the configurations to be transferred. See Communication.
2. Select the AMS 6500 ATG system in the device tree.

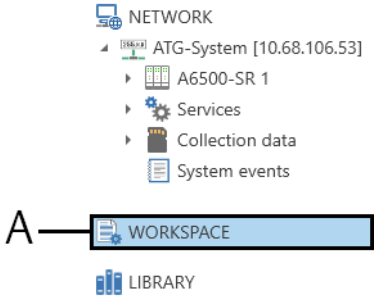
Figure 5-109: Selected AMS 6500 ATG system



A. Selected AMS 6500 ATG system

3. Click **Copy** to copy the whole selected AMS 6500 ATG system with all configurations.
4. Select **Workspace** in the device tree.

Figure 5-110: Selected Workspace



A. Selected Workspace

5. Click **Paste** to paste the copied AMS 6500 ATG system below **Workspace**.
6. Save the **Workspace**. Go to **File → Save Project as...** to open the dialog for saving the project which also contains the **Workspace** including configurations.
7. Select a storage location, enter a file name, and click **Save**.
8. Disconnect from the AMS 6500 ATG system with the A6500-CC Com Card.
9. Connect to the AMS 6500 ATG system with the A6500-CP Com Card Pro to which the configurations need to be transferred. See Communication. Log in as an **Operator** or an **Administrator**.
10. Select a service with the configuration to be transferred below **Workspace**.
11. Click **Copy** to copy the configuration of the selected service.
12. Select the corresponding service below **Network**.
13. Click **Paste** to paste the copied configuration to the selected service.

    The dialog to select a paste option opens.
14. Select **Paste and edit configuration**. Click **OK**.
15. Check the configuration settings and adjust them if necessary.
16. Click **Send & close** to send the configuration to the system.

    See Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.
17. Repeat the steps for the other services, starting with Step 10.

5.11 Data collections storage

Data collections storage is available with an A6500-CP Com Card Pro with firmware version 5.x. Alarm-triggered collected data (see Alarm) is stored in a ring buffer on the microSD card. The maximum number of data collections is 1000. When this limit is reached, the oldest 50 data collections on the microSD card are overwritten by newer data. The data stored in the ring buffer is derived from the configured data sources (see Basic).

Note
Data collection storage with the A6500-CP Com Card Pro running firmware version 5.x differs from that of the A6500-CP with firmware version 1.x. In version 5.x, data is buffered in a ring buffer on the internal microSD card. Data previously buffered on the microSD card under firmware 1.x is no longer accessible after upgrading to firmware 5.x and is automatically deleted. The A6500-CP card continuously checks the contents of the microSD card and deletes files that were not written by the A6500-CP card with firmware version 5.x.

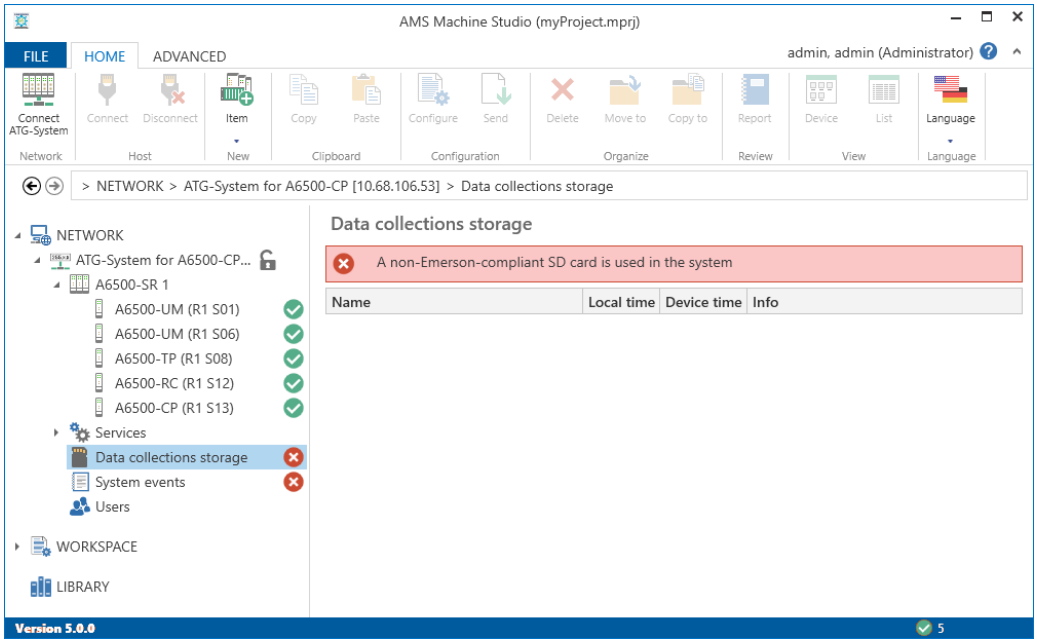
See the A6500-CP card manual for inserting a microSD card into the communication card.

Note
Emerson recommends replacing the microSD card after five years of operation.

⚠ CAUTION

Use only microSD cards authorized by Emerson (order number: A6500-SD). Figure 5-111 shows an indication that a microSD card installed in the A6500-CP is not authorized by Emerson.

Figure 5-111: Non-Emerson-compliant microSD card installed



The state of the microSD card is indicated by an icon beside the microSD card icon in the device tree of AMS Machine Studio.

Table 5-10 lists some possible reasons for a microSD card in not OK condition.

⚠ CAUTION

Any work at the system may impair machine protection.

Table 5-10: State indication – possible reasons and solutions

Reason	Icon	Solution
No microSD card installed.		Install a microSD card authorized by Emerson (see communication card manual for details).
Wrong microSD card type.		
MicroSD card is not properly installed		Check the proper fit of the microSD card (see communication card manual for details).
MicroSD card has a defect.		Replace the defect microSD card by a new one (see communication card manual for details).
MicroSD card has not been detected.		Reboot the communication card by removing and plugging.

The stored data is organized in the device tree by year, month, day, and hour. Date and time associated with that structure depend on the local time settings.

Note
The collected data cannot be displayed in AMS Machine Studio. Since the data is also streamed to AMS Machine Works, view it there. Data stored on the microSD card is automatically retransmitted to AMS Machine Works if data is missing.

To see which data collections are stored on the microSD card:

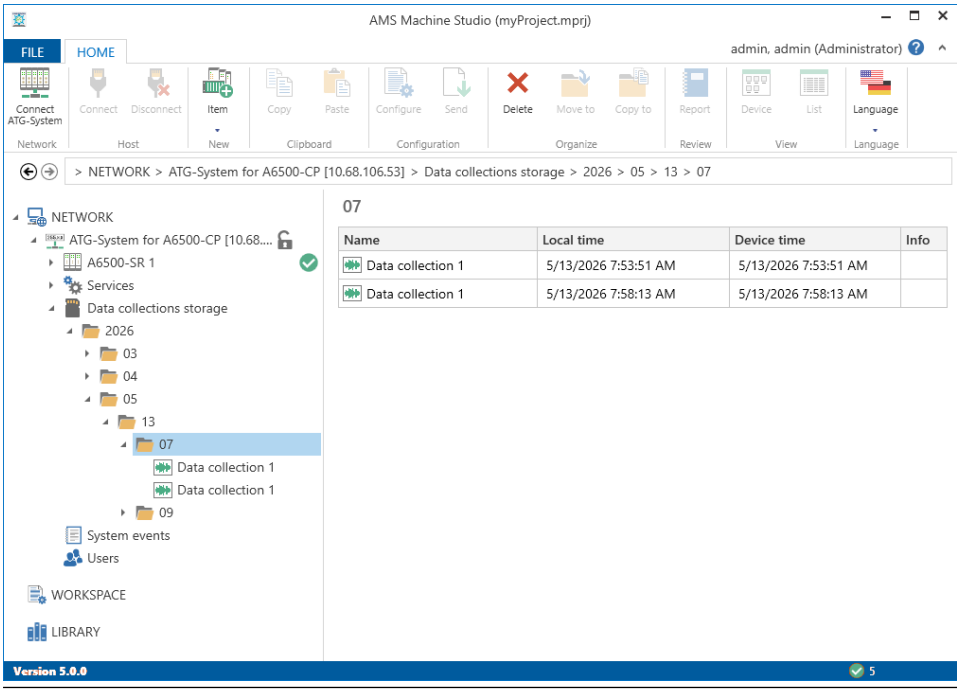
Procedure

1. Click on the small arrow in front of the microSD card symbol in the device tree to expand the file structure of the microSD card.
2. Click on the small arrow in front of the year folder to open the folder content. Open the appropriate month, day, and hour folder in the same way.

   Click on a folder to display the content as a list in the main window (see Figure 5-112).

   The hour folder contains all data files written during this hour.

Figure 5-112: Data collection storage



5.11.1 Delete a folder or data file

Complete folders or single data files can be deleted from the microSD card.

Procedure

1. Click the folder or file to be deleted in the device tree or in the list to select it.
2. Click **Delete** in the command ribbon bar and confirm the safety prompt.

   The selected folder or file is deleted.

5.12 Collection data

Collection data is available with an A6500-CC card or with an A6500-CP with firmware version 1.x.

See the communication card manual for inserting a microSD card into the communication card.

Note
Emerson recommends replacing the microSD card after five years of operation.

⚠ CAUTION

Use only microSD cards authorized by Emerson (order number: A6500-SD).

The microSD card is used as a temporary buffer for the collected data. The buffer works as a ring buffer. The oldest data on the card is overwritten by the newer data.

The state of the microSD card is indicated by an icon beside the microSD card icon in the device tree of AMS Machine Studio.

Table 5-11 lists some possible reasons for a microSD card in not OK condition.

⚠ CAUTION

Any work at the system may impair machine protection.

Table 5-11: State indication – possible reasons and solutions

Reason	Icon	Solution
No microSD card installed.	⊖	Install a microSD card authorized by Emerson (see communication card manual for details).
Wrong microSD card type.	⊗	
MicroSD card is not properly installed	⊖	Check the proper fit of the microSD card (see communication card manual for details).
MicroSD card has a defect.	⊖	Replace the defect microSD card by a new one (see communication card manual for details).
MicroSD card has not been detected.	⊖	Reboot the communication card by removing and plugging.

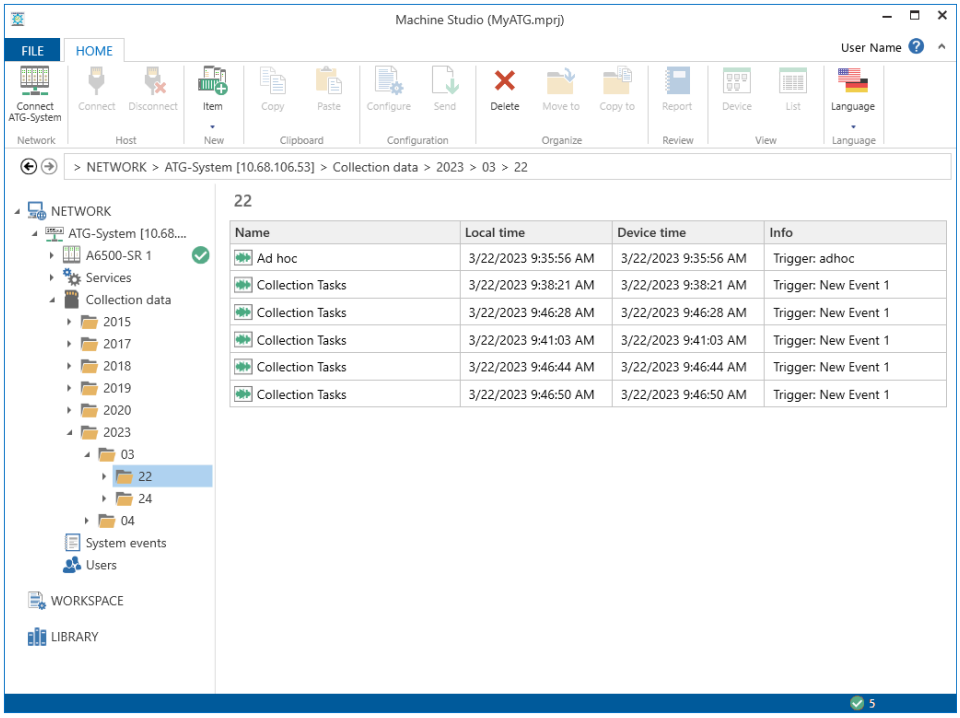
The stored data is sorted by year, month, and day. To browse to a data file:

Procedure

1. Click on the small arrow in front of the microSD card symbol in the device tree to expand the file structure of the microSD card.
2. Click on the small arrow in front of the year folder to open the folder content. Open the appropriate month and day folder in the same way.

   Click on a folder to display the content as a list in the main window (see Figure 5-113). Incorrect data files are marked with ⊗. A cause for an incorrect data file indication is a **Channel not OK** state of a channel configured for the collection task during the collection. Data from a channel with a detected fault (**Channel not OK**) are not collected. See respective card operating manuals for details on **Channel OK**.

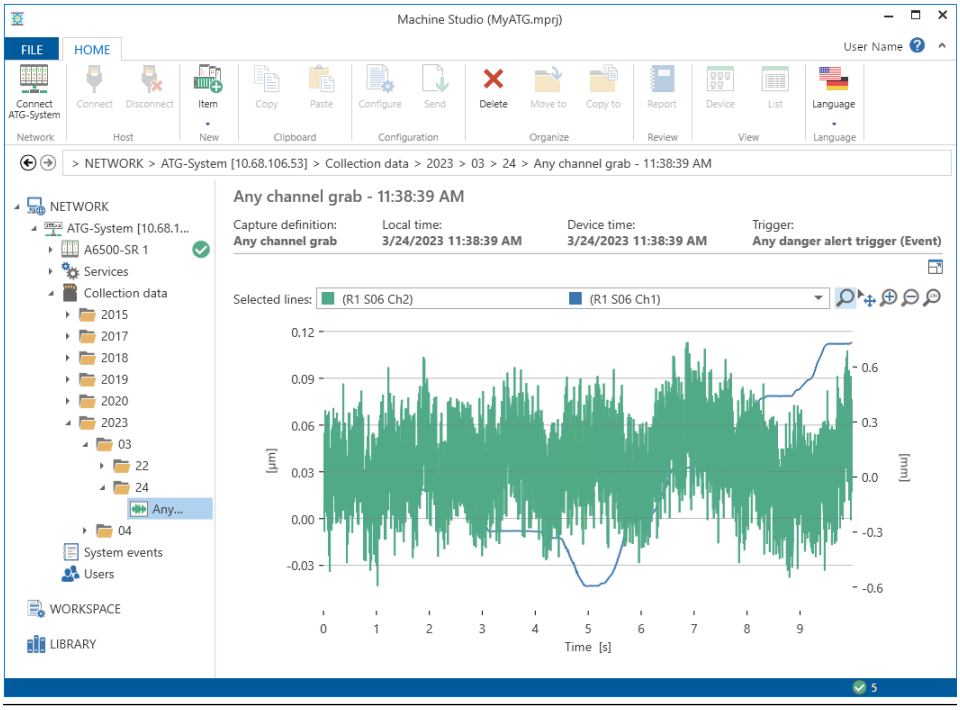
Figure 5-113: Collection data – folder structure



The day folder contains all data files written on this day.

3. Click on the data file to display the collected data. To open a data file from the list, double click it. See Figure 5-114.

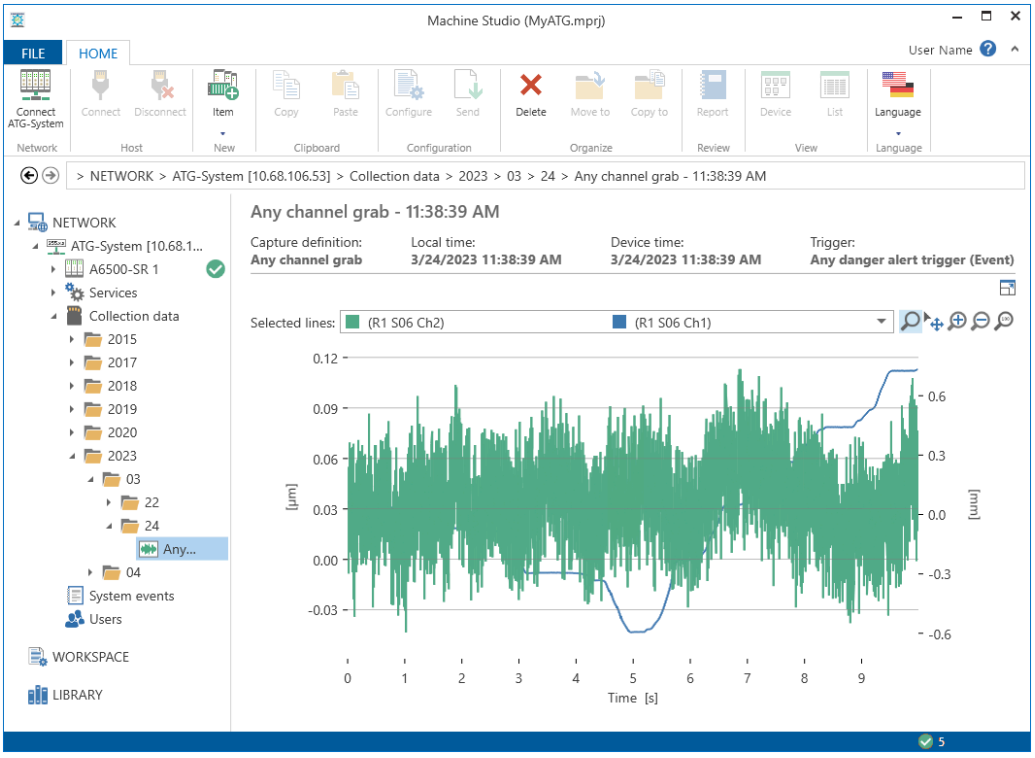
Figure 5-114: Display of collection data



5.12.1 Online view

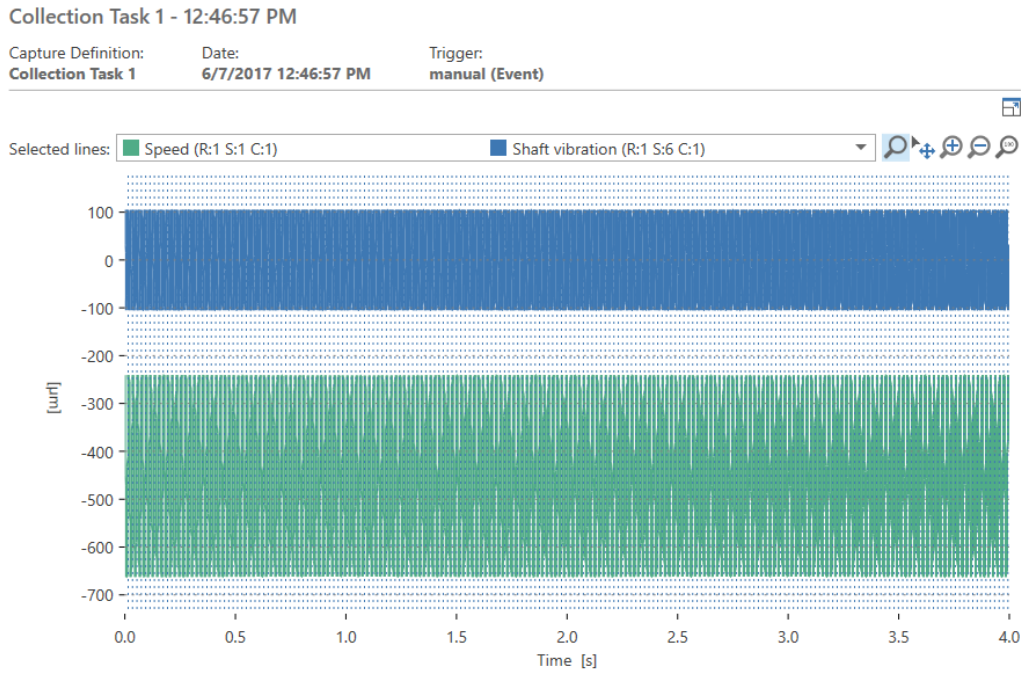
Browse through the data files on the microSD card, and select one to display the collected data (see Collection data).

Figure 5-115: Selected data file



By default, the online view displays two lines of the collected data (see Figure 5-116). More lines can be added, if contained in the data file (see Figure 5-118).

Figure 5-116: Online view of selected lines



The data view contains several buttons for adapting the view to your needs:

Full screen



Click the full screen button to enlarge the view.
Click the minimize screen button to close the enlarged view.

Figure 5-117: Minimize screen



Line selection

Select up to six different colored lines to display at once. Click the selection button to open the selection dialog (see Figure 5-118). Use the list field to assign an available data line to a color. There are two parameters to change the properties of a line:

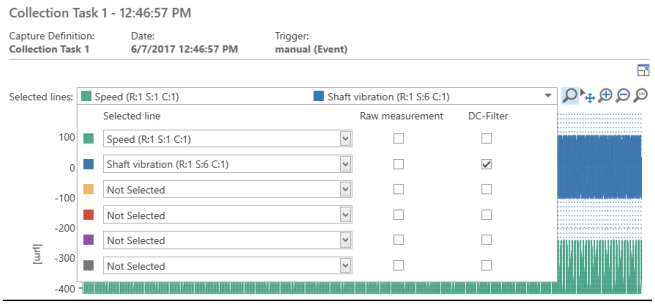
- **Raw measurement**

  Check the box to enable raw measurement for that line. With enabled raw measurement, the amplitude of the signal is displayed in voltage instead of the associated unit.

- **DC-Filter**

  Check the box to enable DC filtering for that line. This function filters out the DC part of the sensor signal – only the AC part is displayed.

Figure 5-118: Line selection



Click outside of the dialog to close it.

Region zoom



Enlarge an interesting part of the data collection. Click the **region zoom** icon to activate the **region zoom** function. The button is colored light blue if **region zoom** is activated, otherwise the button is gray.
Place the mouse cursor close to the area of interest, click and hold. Move the mouse to frame the area of interest. Release the mouse button to enlarge the selected area.

Click **zoom to fit**, or right-click on the diagram to reset the view.

Move



Move the entire collection view. Click the **move** icon to activate the function. The button is colored light blue if **move** is activated, otherwise, the button is gray.
Click an arbitrary point in the collection and hold. Move the view to the desired position, and release the mouse button to place the view at that point.

Click **zoom to fit**, or right-click on the diagram to reset the view.

Zoom in



Stepwise enlarge the collection view at mouse position. Click the **zoom in** icon to activate the function. The button is colored light blue if **zoom in** is activated, otherwise the button is gray.
Click an arbitrary point in the collection view. At every click, the collection view is enlarged.

Click **zoom to fit**, or right-click to reset the view.

Zoom out



Stepwise reduce the collection view at mouse position. Click the **zoom out** icon to activate the function. The button is colored light blue if **zoom out** is activated, otherwise the button is gray.
Click an arbitrary point in the collection view. At every click, the collection view is reduced.

Click **zoom to fit**, or right-click on the diagram to reset the view.

Zoom to fit

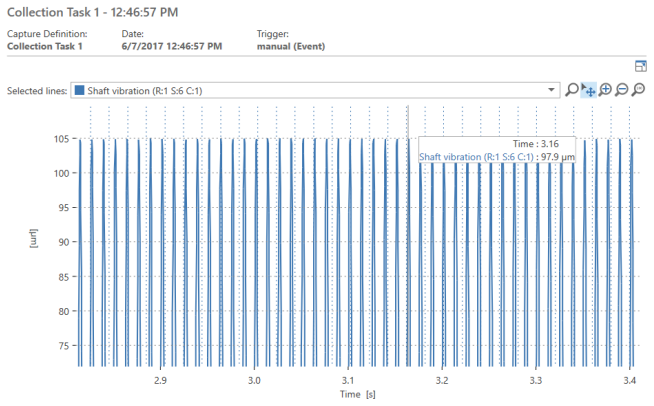


Click the **zoom to fit** icon to reset the view.

Cursor

Use the cursor to display single values of the selected lines (see Figure 5-119).

Figure 5-119: Cursor



The cursor function is active as soon as the mouse cursor is within the data view.

Diagram shortcuts

Zoom in/out	Ctrl + Mouse wheel
Horizontal movement	Shift + Mouse wheel
Vertical movement	Alt + Mouse wheel

5.12.2 Delete a folder or data file

Complete folders or single data files can be deleted from the microSD card.

Procedure

1. Click the folder or file to be deleted in the device tree or in the list to select it.
2. Click **Delete** in the command ribbon bar.
   The selected folder or file is immediately deleted.

5.13 Send and reload a configuration

5.13.1 Send a configuration

⚠ CAUTION

Connections to external devices such as Modbus clients may be interrupted during sending of configurations.

Note
After sending a configuration, data collection is not possible for approximately 10 seconds while the filters settle.

Note
Modbus requests are answered with **Server Device Busy (0x06)** when sending a configuration.

Procedure

1. Ensure that there is an online connection between the communication card and AMS Machine Studio running on a computer.

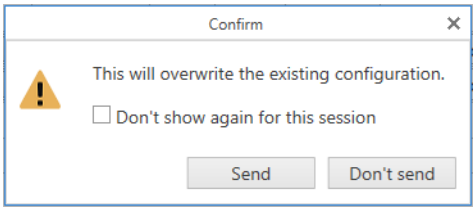
   AMS Machine Studio will automatically establish an online connection to the cards of the AMS 6500 ATG system as soon as there is a physical connection through the USB port of the A6500-CC Com Card or A6500-CP Com Card Pro of the system. At a TCP/IP connection click **Connect ATG-System** on the ribbon command bar of page **Home** to establish a connection.

   Only A6500-CP: Log in as an **Operator** or an **Administrator**, and ensure that the key-switch is in the unlocked position. See Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.

2. Click **Send & close** in the ribbon command bar to send the configuration to the system.

   A confirmation dialog opens in accordance to the boot requirement:.

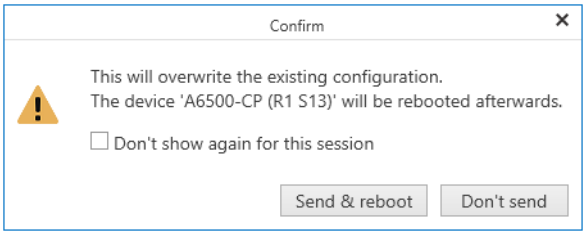
Figure 5-120: Confirmation – overwrite configuration without reboot.



Check the box **Don't show again for this session** to send further configurations without confirming the dialog. This selection is reset when AMS Machine Studio is closed.

Click **Send** to overwrite the existing configuration without rebooting the communication card.

Figure 5-121: Confirmation – overwrite configuration and reboot required



Check the box **Don't show again for this session** to send further configurations without confirming the dialog. This selection is reset when AMS Machine Studio is closed.

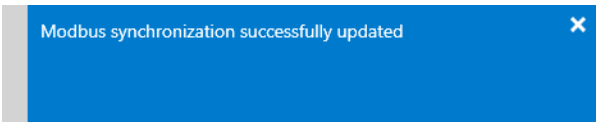
Click **Send & reboot** to overwrite the existing configuration and to reboot the communication card afterward.

The configuration editor automatically closes afterward.

A successfully sent configuration is indicated by a message in the upper right corner of the software window. This message window will automatically disappear, or close it by clicking on the cross.

The Modbus registers are automatically updated according to the sent configuration. The successful update is also indicated by a message in the upper right corner.

Note
Do not close AMS Machine Studio during Modbus synchronization. AMS Machine Studio can be closed when the message "Modbus synchronization successfully updated" appears.



Note
The Modbus registers are not automatically updated if an A6500-CC card is installed in the AMS 6500 ATG system that is protected by a password. In this case go to **Services** → **Modbus** and click **Update Modbus mappings** in the ribbon command bar to update the Modbus registers.

The communication card is ready to use when the **OK** LED on the card front shows a steady green light.

Note
Emerson recommends updating the time of the AMS 6500 ATG system after sending a configuration. This ensures that time stamps used for system events are up-to-date and therefore easier to assign. Select the AMS 6500 ATG system in the device tree and click **Set time** in the ribbon command bar. This is not necessary if the time is automatically synchronized with an SNTP server.

3. Only A6500-CP: Switch back the key-switch to the locked position to protect the AMS 6500 ATG system against unauthorized changes.

5.13.2 Reload a configuration

Once an online connection has been established, the configuration of all cards of an AMS 6500 ATG system are automatically loaded to AMS Machine Studio. Click **Reload** in the ribbon command bar if the card's configuration must be loaded again.

6 System events

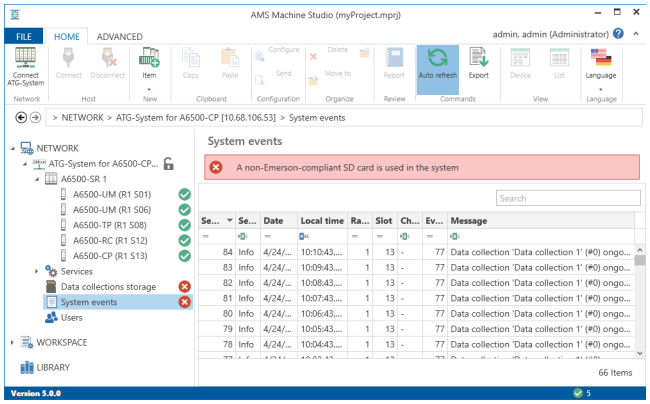
Click **System events** in the device tree to open the system events stored on the microSD card of the A6500-CC or A6500-CP card. Up to 10000 events with sequence number, time stamp[12], and message can be displayed. See operating manuals for A6500-UM, A6500-TP, A6500-RC, A6500-CC, and A6500-CP for a list of card related events and references. Table D-1 lists the events for which you can find more information in this operating manual.

The events are stored in files on the microSD card. The oldest file is overwritten if the space on the microSD card is occupied and a new event occurs. A system event indicates that files have been overwritten. Events are read from the microSD card as soon as there is a connection between AMS Machine Studio and the communication card. If no microSD card is installed, only events that occur during the connection between AMS Machine Studio and the communication card are listed.

⚠ CAUTION

Use only microSD cards authorized by Emerson (order number: A6500-SD). Figure 6-1 shows an indication that a microSD card installed in the A6500-CP is not authorized by Emerson.

Figure 6-1: Non-Emerson-compliant microSD card installed



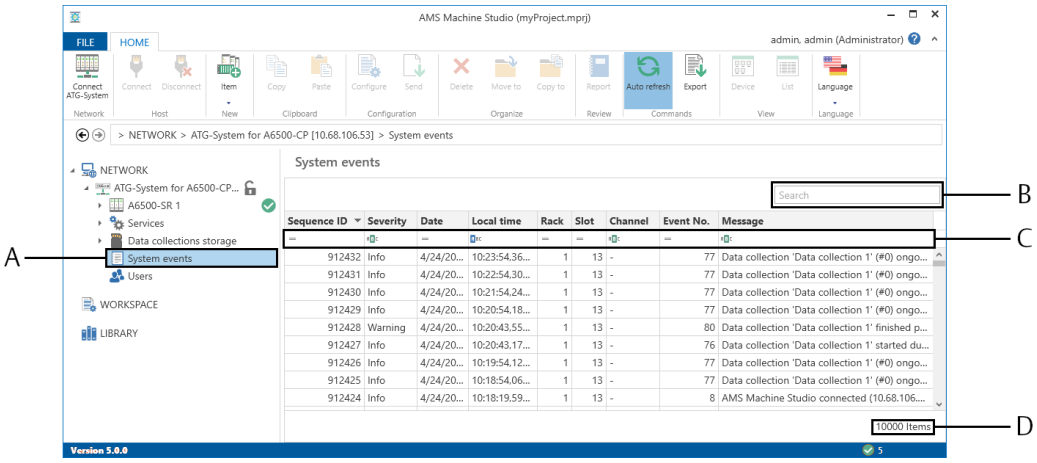
The internal event buffer of the AMS 6500 ATG cards is limited:

- A6500-UM Card and A6500-TP Card: maximum of 256 events
- A6500-RC Card: maximum of 32 events

Lost events due to the event buffer limitation are indicated by a corresponding system event.

12 *UTC time of the communication card.*

Figure 6-2: System events



*A. Selected **System events***
B. Entry field of the search function
C. Filter functions
D. Number of listed events

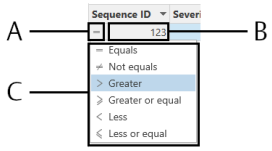
The columns contain the following information

Sequence ID	A sequential Id is assigned to each event.
Severity	The events are classified into different levels of severity: **Info**, **Warning**, **Error**, and **Fatal**.
Date	Date on which the event appeared.
Local time	The time stamp of the event is displayed according to the local time settings of the user's computer. The time stamp for the event relies on the AMS 6500 ATG system time (UTC) at the moment the event occurs.
Rack	Number of the Rack.
Slot	Number of the slot where the card is installed that has issued the event.
Channel	Channel of the card that has issued the event.
Event No.	Internal number of the event.
Message	Detailed description of the event.

Each column of the list has filter functions. The available functions depend on the content of the column. Click the icon of the currently selected filter to open the menu of all filter functions available for that column. Click a filter function to select it. Enter the filter condition into the assigned entry field. The filtering starts while entering the condition. Deleting the entry resets the filter.

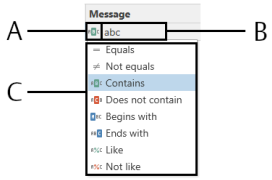
Use the search function to search the **Message** column for a certain message. The search starts while entering the condition.

Figure 6-3: Filter functions – columns with numbers



A. Icon of the selected filter function
B. Entry field for the filter condition
C. Available filter functions

Figure 6-4: Filter functions – columns with text



A. Icon of the selected filter function
B. Entry field for the filter condition
C. Available filter functions

System events with redundant communication cards

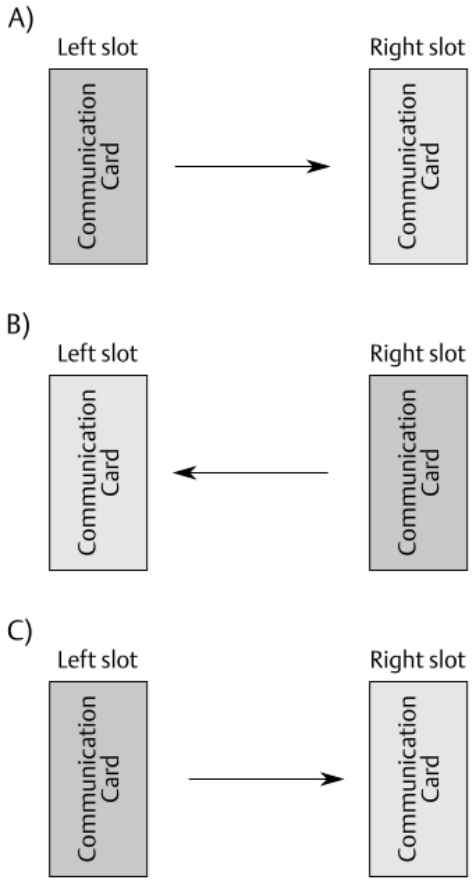
With redundant communication, the occurred events can be read from both communication cards. Both communication cards share the same events related to the system in which they are installed. The following table explains the behavior of the redundant communication cards at different scenarios.

Scenario	Behavior
A communication card already installed (typically in the left slot) and running, and a second new (unused) communication card is added to the rack.	At the first start of the newly added communication card, all events stored on the already installed communication card are copied to the new communication card. This process can take several minutes. All new events are stored on both communication cards.

Scenario	Behavior
A communication card already installed (typically in the left slot) and running and a second communication card that has been running in another system is added to the rack.	At the first start of the added communication card, the communication card recognizes that it is installed in another system. The already stored events of the other system are no longer accessible. All events stored on the already installed communication card are copied to the added communication card. All new events are stored on both communication cards.
A communication card is already installed (typically in the left slot) and running, and a second communication card that was meanwhile installed in another system is added to the rack again.	At the first start of the added communication card, the communication card recognizes that it was meanwhile installed in another system. The stored events of the system in which the communication card was installed in the meantime are no longer accessible. The already installed communication card synchronizes the events (without the events of the system where it was installed in the meantime) with the added communication card. All new events are stored on both communication cards.
A communication card already installed in the right slot has events stored. The power supply of the system rack is switched off. A new communication card without any stored events is installed into the left slot. The power supply of the system is switched on again.	The communication card in the left slot starts as the primary card and becomes active. The communication card in the right slot is passive and the already stored events are no longer accessible. Both communication cards starts with empty event folders. All new events are stored on both communication cards. **Note** To avoid the loss of already stored events on the communication card in the right slot, start the system rack only with the communication card in the right slot and then install the new communication card into the left slot.

Figure 6-5 explains the copy behavior of events if one card is replaced.

Figure 6-5: Copy of events



A. *At power on, communication cards installed in both slots (left and right): The events stored on the card in the left slot are automatically copied to the card in the right slot, regardless of which card is new and which card has already stored events.*
B. *Already powered on system rack, communication card installed in the right slot: The events stored on the card in the right slot are automatically copied to a newly installed card in the left slot.*
C. *Already powered on system rack, communication card installed in the left slot: The events stored on the card in the left slot are automatically copied to a newly installed card in the right slot.*

6.1 Commands

If **System events** is selected in the device tree, the associated commands are enabled in the command ribbon bar. An online connection is required to execute the commands.

Note
These commands do not affect the protection function of the system.

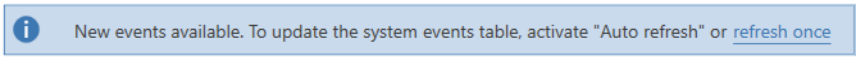
Auto refresh

Figure 6-6: Auto refresh



Click **Auto refresh** to read events from the communication card. The button is active (gray highlighted) by default. A message (Figure 6-7) appears if new events are available and **Auto refresh** is disabled.

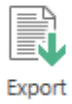
Figure 6-7: Information about new events



To read the new events, activate **Auto refresh** or click **refresh once**.

Export events

Figure 6-8: Export events



Click **Export events** to save all events stored on the microSD card as a *.csv file to a selectable location.

7 A6500-CP Com Card Pro – User management

The A6500-CP Com Card Pro is equipped with a user management to limit access to connected AMS 6500 ATG systems. When establishing an online connection to an AMS 6500 ATG system through an A6500-CP Com Card Pro, the user is required to enter login data. By default, an administration account with the following login data is available:

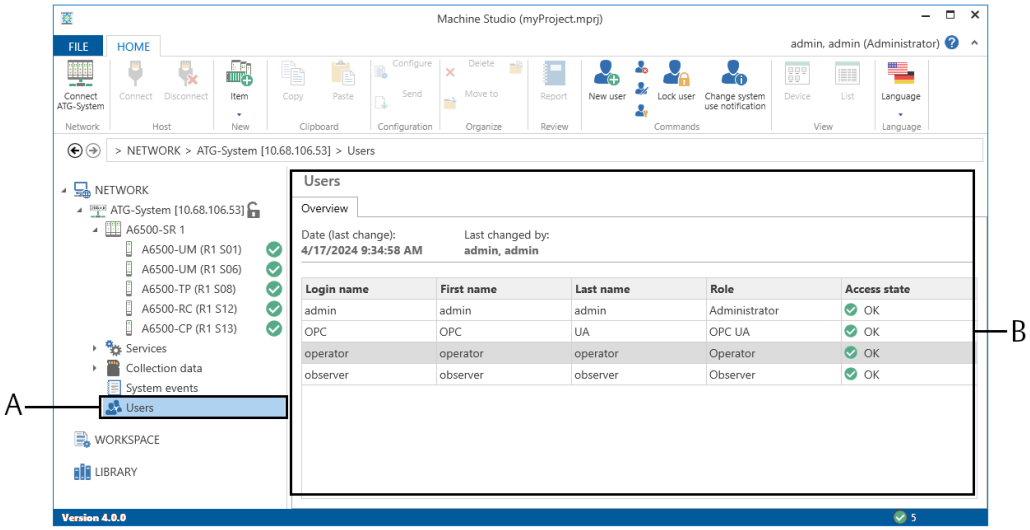
Table 7-1: Default administration account – login data

Login name	Password
admin	admin

Note
The change of the standard password of the default administration account is required at the first login.

After log in to an A6500-CP as a user with administrative rights click **Users** in the device tree to open an overview of all existing users accounts.

Figure 7-1: List of users



*A. Selected **Users***
B. List of users

Date and time of the last change and the name of the user who made the last changes are displayed at the top of the list. The columns contain the following information.

Login name User name to log in to the A6500-CP Com Card Pro.

First name First name of the user.

Last name Last name of the user.

Role	Role assigned to the user.
Access state	Indicates whether the account is enabled (OK), disabled in the user dialog (**Modify user** → **Disable account**), or locked.

Each column of the list has a sort function. Click the header of the column to toggle the sorting between descending and ascending order. The direction is indicated by triangles pointing in the active sorting direction.

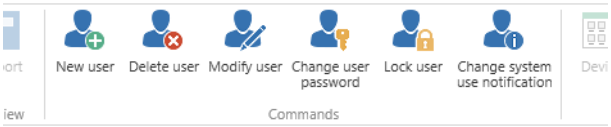
User management in redundant systems

In redundant systems with two A6500-CP cards installed, the user configuration is automatically stored on both communication cards. So the user logs in regardless of which communication card is currently active.

User administration

Use the user commands **New user** (see Create a new user), **Modify user** (see Modify a user), **Delete user** (see Delete a user), **Lock user** (see Lock a user), and **Change system use notification** (Change system use notification) to manage users. The commands are available if a user with administrative rights is logged in, the key-switch is in the unlocked position[13] (see Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards), and **Users** is selected in the device tree. See Figure 7-2

Figure 7-2: User commands



7.1 Create a new user

Add a new user account.

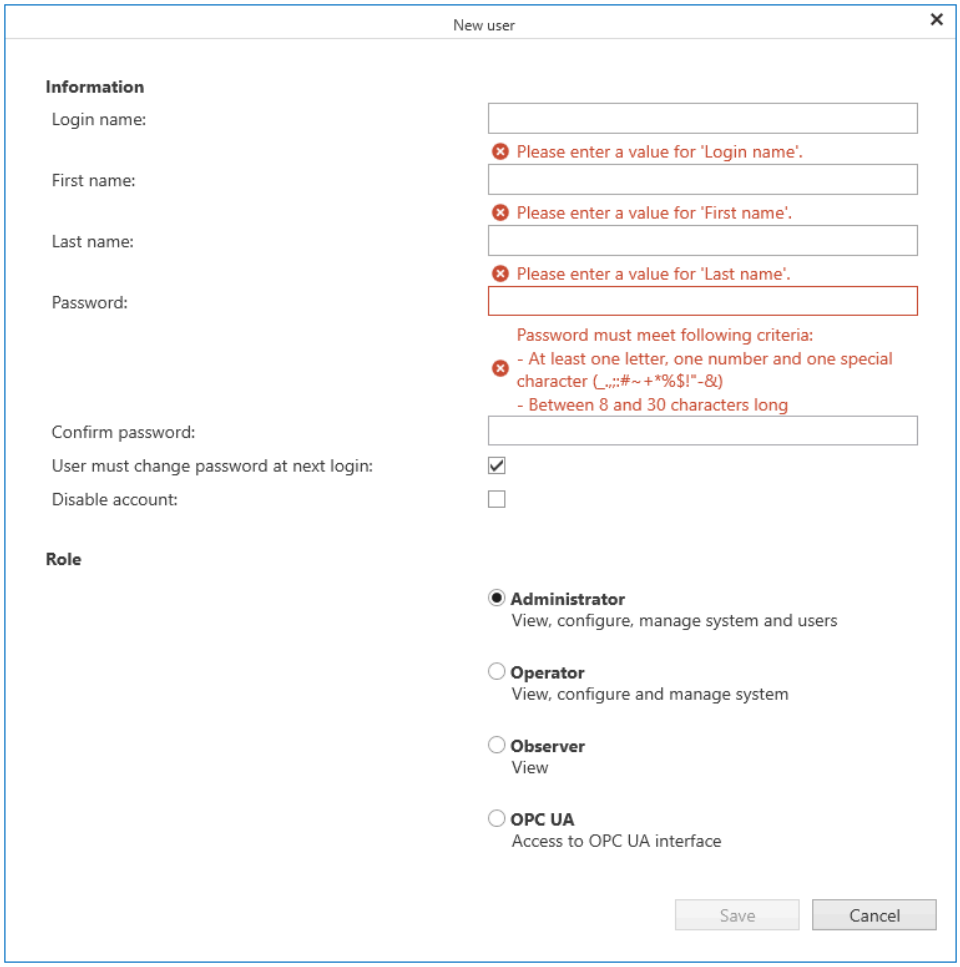
Procedure

1. Click **New user** in the ribbon command bar to open the dialog for creating a new user account.

   The dialog for entering user settings opens (see Figure 7-3). Up to 35 users with different roles can be created. The **New user** button is disabled if 35 users have already been added.

13 *Not necessary for **Change user password** and **Lock user**.*

Figure 7-3: New user dialog



Information

Login name Enter a login name used for the login.

First name Enter the first name of the user.

Last name Enter the last name of the user.

Password Define a password that meets the following requirements:

- Minimum 8 characters
- Maximum 30 characters
- The password must consists of at least one letter, one number, and one special character (_.,;:#~+*%$!"-&).

Confirm password Re-enter the previously defined password to confirm it.

Information	
User must change password at next login	Check this box to force the user to change the password at the next log in. The box is automatically cleared after the user password is changed. Check this box again if the user must change the password again. This function is not available for the role **OPC UA**.
Disable account	Check this box to disable the user account. This does not delete the user account. For how to delete a user account, see Delete a user. A disabled account is marked with the information symbol and **Disabled** in the **Access** column.

Click one of the listed roles to select it. Select between the following options:

Role	
Administrator	The user has all rights and can read all information, create and modify configurations, manage the AMS 6500 ATG system, and administrate users.
Operator	The user can read all information, is allowed to create and modify configurations, and manage the AMS 6500 ATG system. The user is not allowed to administrate other users.
Observer	The user is allowed to read all information including configurations and reports but cannot send commands, and create or modify configurations.
OPC UA	The user has the right to read data through the OPC UA interface. The defined credentials are necessary to get access to the OPC UA interface. The OPC UA user cannot log in to AMS Machine Studio. An activated **Anonymous login** for the OPC UA interface (see OPC UA LAN 1 and LAN 2 – A6500-CP) overrides the OPC UA account. Entry of log in credentials is not necessary with **Anonymous login** activated.

2. Complete the dialog. See Step 1 for a detailed description of the parameters.
3. Click **Save** to create the user or click **Cancel** to discard the entries.

   The next time a login is required, the newly created login credentials can be used.

7.2 Delete a user

Delete a user account.

Note
All user accounts can be deleted except the last user account with administrative rights.

Procedure

1. To select a user, click in the list of users (see Figure 7-1) the row with the user to be deleted.

   The selected row is highlighted.

2. Click **Delete user** in the ribbon command.

   A confirmation prompt opens.

3. Click **OK** to delete the selected user account.
4. The user account is deleted immediately.

7.3 Modify a user

Modify an existing user. Each user in the list can be modified.

Procedure

1. To select a user, click in the list of users (see Figure 7-1) the row with the user to be changed.

   The selected row is highlighted.

2. Click **Modify user** in the ribbon command bar to open the dialog with the user account details.
3. Change the user details in accordance with your needs.

   See Information and Rolle for a detailed description of the parameters. The user password cannot be changed in this dialog. See Change user password for how to change the password.

4. Click **Save** to save the changes or click **Cancel** to discard the entries.

   The next time a login is required, the changed user details take effect.

7.4 Change user password

Change the password of a user. The password of each user in the list can be changed.

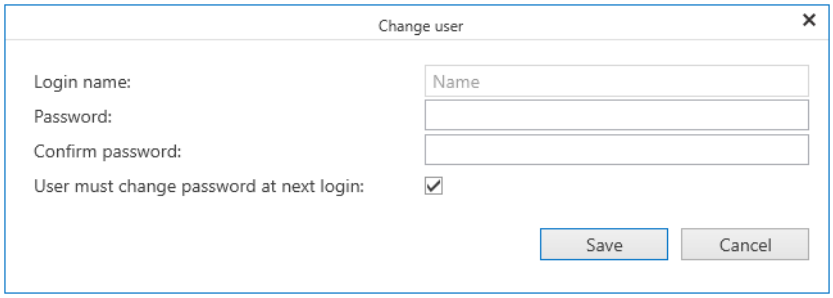
Procedure

1. To select a user, click in the list of users (see Figure 7-1) the row with the user to be changed.

   The selected row is highlighted.

2. Click **Change user password** in the command ribbon bar to open the dialog for changing the password.

Figure 7-4: Change user password



3. Enter the new password in the **Password** field and again in the **Confirm password** field.
4. Check the box **User must change password at next login** to force the user to change the password at the next login.
5. Click **Save** to save the changed password or click **Cancel** to discard the entries.

7.5 Lock a user

Lock or unlock a user. Each user in the list can be locked or unlocked. Use this command to unlock users who are locked after five consecutive invalid login attempts. A locked user is marked with the warning symbol ⚠ in the list of users.

Lock a user

1. Select the user to be locked. Click in the list of users (see Figure 7-1) the row with the user to be locked.
   The selected row is highlighted.
2. Click **Lock user** in the ribbon command bar to lock the user.
   The locked user is marked with the warning symbol ⚠ and **Locked** in the **Access state** column in the list of users and the **Lock user** button stays highlighted as long as the locked user is selected in the list of users.

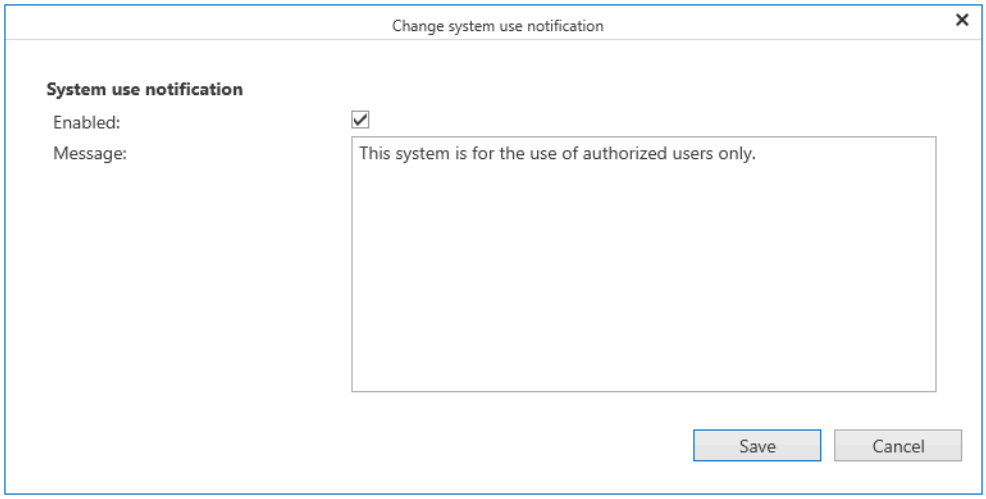
Unlock a user

1. Select the user to be unlocked. Click in the list of users (see Figure 7-1) the row with the user to be unlocked.
   The selected row and the **Lock user** button is highlighted.
2. Click the highlighted **Lock user** button in the ribbon command bar to unlock the user.
   The state changes from **Locked** to **OK** and is also marked with the OK symbol ✔ in the **Access state** column. The **Lock user** button is no longer highlighted as long as the user is selected in the list of users.

7.6 Change system use notification

Create or change a system usage notification shown to the user at the first login.

Figure 7-5: Dialog for entering the notification text



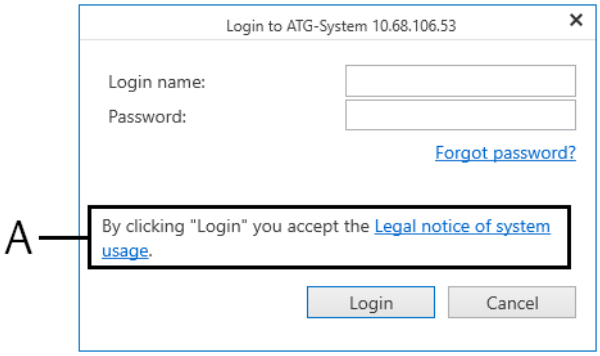
Enable Check this box to enable displaying the notification text.

Message Entry field for the notification text. The text can consists of 2500 characters.

Procedure

1. Click **Change system use notification** in the ribbon command bar to open the dialog for entering the notification text.
2. Check the box **Enable** to show a link to open the notification text on the log-in dialog.

Figure 7-6: Log-in dialog with link to open notification text



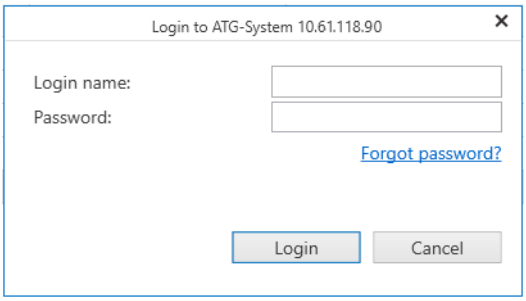
A. Link to open the notification text

3. Enter the notification text.
4. Click **Save** to save the notification text or click **Cancel** to discard the entries.

7.7 Log in

The login dialog appears when a connection to an AMS 6500 ATG system is being established (see Connect ATG-System and Connect). The login dialog also appears when the network connection between AMS Machine Studio and the A6500-CP card was interrupted and after a reboot of the A6500-CP card caused, for example, by a firmware update or change of port settings.

Figure 7-7: Login dialog



Enter your login credentials and click **Login**.

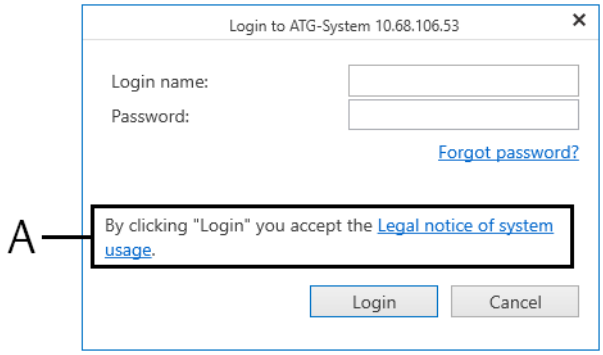
The name of the user entered in the configuration (parameter **User**) is send to AMS 6500 ATG cards during the user is logged in. Locally stored configuration files, and configuration files below **WORKSPACE** and **LIBRARY** contain the user name of the login data of the operation system.

Note
A user is locked after five consecutive invalid login attempts. A locked account can be unlocked by a user with administrator rights.
A user with administrator rights can always log in through the USB interface by using the account's credentials even if the administrator account has previously been locked.

System use notification

If information about the use of the AMS 6500 ATG system is defined by a user with administrator rights, the login dialog contains a link to open these information. See Figure 7-8.

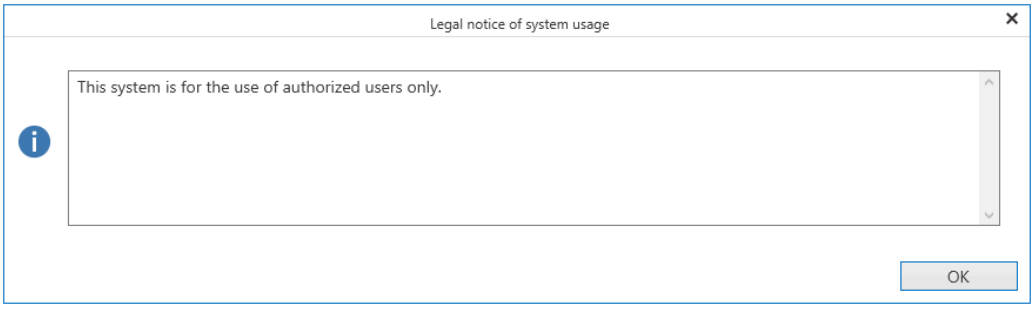
Figure 7-8: Login dialog with link to system use notification



A. Link to open the notification text

Click **Legal notice of system usage** to open the system use notification. See Figure 7-9.

Figure 7-9: System use notification



Read the information and confirm it by clicking **OK**.

Forgotten password

What to do when you have forgotten your password depends on the type of connection – through USB or through TCP.

USB Contact a user with administrator rights to reset your password.

1. If you are the last user with administrator rights and you have forgotten your password, click **Forgot password?**. The dialog to reset the A6500-CP Com Card Pro opens.
2. Click **Reset to factory default**.

   The A6500-CP Com Card Pro is set to factory default. In redundant systems, both A6500-CP cards are set to factory default. The reset card reboots afterward.

⚠ CAUTION

The present configuration on the A6500-CP card, on both cards in redundant systems, is deleted and replaced by the default configuration. This includes the configuration of the services (Collection tasks, Modbus, OPC UA, Web server, SNTP client, and Audit log).

3. Log in with the default credentials (see Table 7-1).
4. Crate a new configuration for the A6500-CP card and the services.

TCP Contact a user with administrator rights to reset your password.

If you are the last user with administrator rights and you have forgotten your password, connect through USB to the system and reset the communication card to factory default. See steps below USB.

⚠ CAUTION

The present configuration on the A6500-CP card, on both cards in redundant systems, is deleted and replaced by the default configuration. This includes the configuration of the services (Collection tasks, Modbus, OPC UA, Web server, SNTP client, and Audit log).

7.8 Log out

To log out a user, disconnect the AMS 6500 ATG system where the user is logged in. Select the AMS 6500 ATG in the device tree and click **Disconnect**. See Disconnect. A user disconnect can also be caused by the following situations:

- Reboot of the A6500-CP Com Card Pro
- Network issues
- Unplugged USB cable[14]
- Deletion of the AMS 6500 ATG system from the device tree
- Closing AMS Machine Studio

7.9 User management with redundant communication cards

With redundant communication, the available users can be read from both A6500-CP Com Cards Pro. Both communication cards share the same users related to the system in which they are installed. Table 7-2 explains the behavior of the redundant communication cards at different scenarios. The following states and information of users are exchanged between the communication cards regardless of the system programming status (see Enable system programming with redundant A6500-CP communication cards):

14 *Default for logging out if connected through the USB interface.*

- Password changes by user
- The access state: Locked
- Requirement: User must change password at next login

Table 7-2: Behavior of the communication cards in redundant systems

Scenario	Behavior
A communication card already installed (typically in the left slot) and running, and a second new (unused) communication card is added to the rack.	At the first start of the newly added communication card, all users on the already installed communication card are copied to the new communication card. This process can take several minutes. All new users and changes to existing users are stored on both communication cards.
A communication card already installed (typically in the left slot) and running and a second communication card that has been running in another system is added to the rack.	At the first start of the added communication card, the communication card recognizes that it is installed in another system. The already stored users of the other system are no longer accessible. All users stored on the already installed communication card are copied to the added communication card. All new users and changes to existing users are stored on both communication cards.
A communication card is already installed (typically in the left slot) and running, and a second communication card that was meanwhile installed in another system is added to the rack again.	At the first start of the added communication card, the communication card recognizes that it was meanwhile installed in another system. The stored users of the system in which the communication card was installed in the meantime are no longer accessible. The already installed communication card synchronizes the users (without the users of the system where it was installed in the meantime) with the added communication card. All new users and changes to existing users are stored on both communication cards.
A communication card already installed in the right slot has users stored. The power supply of the system rack is switched off. A new communication card without any stored users is installed in the left slot. The power supply of the system is switched on again.	The communication card in the left slot starts as the primary card and becomes active. The communication card in the right slot is passive and the already stored users are no longer accessible. Both communication cards starts without any users. All new users are stored on both communication cards. **Note** To avoid the loss of already existing users on the communication card in the right slot, start the system rack only with the communication card in the right slot and then install the new communication card into the left slot.

8 AMS 6500 ATG system commands

Several online commands are available if an AMS 6500 ATG system with data collection is selected in the device tree. The availability of password related commands such as **Change password**, **Set password**, or **Reset password** depends on the installed communication card. Figure 8-1 shows commands for a system with an A6500-CP card and Figure 8-2 for a system with an A6500-CC card.

Figure 8-1: A6500-CP – AMS 6500 ATG system commands

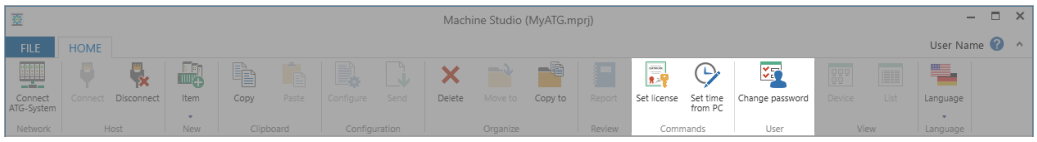
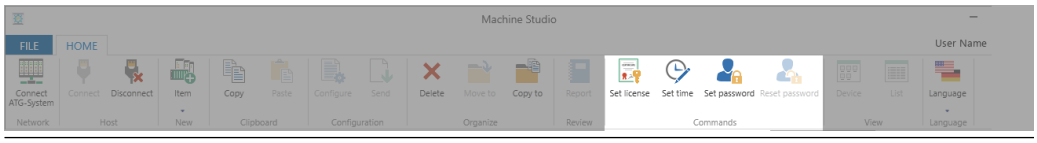


Figure 8-2: A6500-CC – AMS 6500 ATG system commands



8.1 Set license

Click **Set license** to open the licensing dialog. See License entry for details.

8.2 Set time from PC

Figure 8-3: Set time from PC



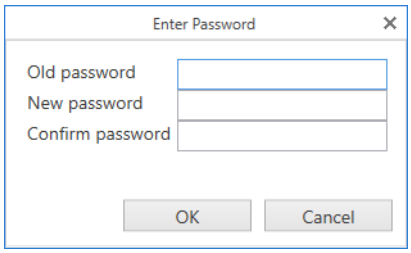
Click **Set time from PC** to synchronize the connected AMS 6500 ATG system with the UTC time (Coordinated Universal Time) of the connected computer.

Note
The times shown in AMS Machine Studio rely on the local time settings of the user's computer.

8.3 A6500-CC – Set password

Click **Set password** to define a password to protect the configuration of the AMS 6500 ATG system. The dialog for entering a password opens (see Figure 8-4).

Figure 8-4: Dialog for entering a password



If a password is not already set, enter the new password in the **New password** field, and repeat the entry in the **Confirm password** field. Click **OK** to set the password for the rack.

If a password is already set for the rack and it must be changed, enter the active password in the **Old password** field, then enter the new password in the **New password** and the **Confirm password** fields. Click **OK** to set the new password for the AMS 6500 ATG system.

Once a password has been defined, it must be entered before sending a configuration.

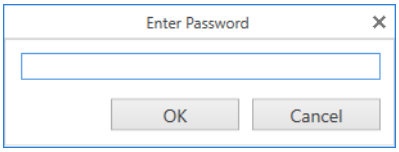
The entered password stays active until the next disconnect. After reconnecting, the password must be entered again before sending a configuration.

The password protects the system against unauthorized configuration changes through the TCP/IP communication of A6500-CC cards.

8.4 A6500-CC – Reset password

Click **Reset password** to open the dialog for resetting the password of the rack with A6500-CC card(s) (see Figure 8-5).

Figure 8-5: Dialog for resetting a password



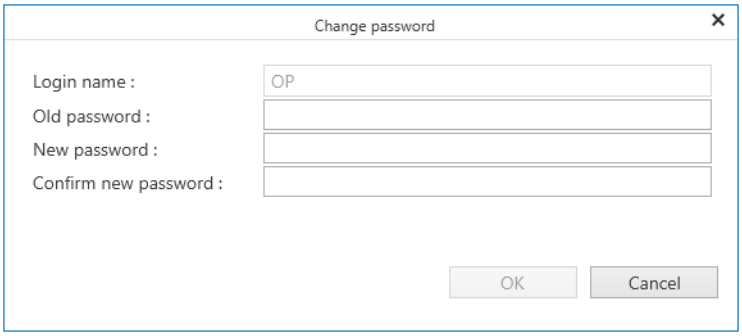
Enter the password, and click **OK**.

If the rack is connected through the USB interface of the A6500-CC card, the password can be reset without entering the existing password. Password reset through the TCP connection of the A6500-CC card always requires entering the existing password.

8.5 A6500-CP – Change password

Click **Change password** to change the password of the currently logged in user. The dialog for changing the password opens (see Figure 8-6).

Figure 8-6: Dialog for changing the password



To change the password of the currently logged in user, enter the active password in the **Old password** field, then enter the new password in the **New password** and the **Confirm password** fields. Click **OK** to set the new password.

9 Firmware and maintenance

⚠ CAUTION

Any work at the system may impair machine protection.

AMS Machine Studio has functions for updating and downgrading the firmware of AMS 6500 ATG cards, and further maintenance functions. You can update the firmware of all cards within an AMS 6500 ATG system at once. An AMS 6500 ATG system can consist of one or two A6500-SR or A6500-RR System Racks or one A6500-FR System Rack. The firmware of single cards can be downgraded.

Note
When updating an AMS 6500 ATG system with two system racks, Emerson recommends updating the cards rack by rack. First all cards in the first rack and then the cards in the second rack.

For the firmware update of the AMS EZ 1000 Converter see the AMS EZ 1000 Converter operating manual.

Follow this procedure to connect the AMS 6500 ATG system and to open the maintenance mode of AMS Machine Studio.

Procedure

1. Start AMS Machine Studio.
2. Connect the AMS 6500 ATG system through the Ethernet interface to the computer.

   Click **Connect ATG-System** to establish the connection to the AMS 6500 ATG system (see New network connection).

   Note
   For a firmware downgrade of an A6500-CC or A6500-CP card, connect through the USB interface, as the communication card configuration, including the IP addresses, is reset to factory default during the downgrade process.

   Note
   For resetting an A6500-CC or A6500-CP to factory default connect through the USB interface.
3. Only A6500-CP: Log in with an **Operator** or an **Administrator** account. Log in with an **Administrator** account for resetting the card to factory default.
4. On the **Home** tab press **Ctrl+Alt+M** to enable the **Advanced** tab.
5. Got to the **Advanced** tab.

   The **Advanced** tab contains the buttons **System Inventory**, **Firmware update (all)**, **Downgrade firmware**, **Reset to factory default**, and **Export maintenance system info**:

   - See System inventory for how to create a system inventory report.

- See Firmware update (all) for how to update the firmware.
- See Firmware downgrade for how to downgrade the firmware.
- See Reset to factory default for how to reset a card to factory default.
- See Export maintenance system info for how to export maintenance and system information.

9.1 Firmware update (all)

Use this procedure to update the firmware of all cards within an AMS 6500 ATG system at once.

Note
Emerson recommends saving the configuration of the cards before starting the update process. See Save as.

Prerequisites

Before you start the update, you need the common firmware package. A common firmware package contains the firmware for all AMS 6500 ATG cards.

Note
For A6500-UM cards and A6500-TP cards with hardware revision 12 or higher, use the common firmware package stated in the knowledge base article NK-1600-0371.

Emerson recommends disconnecting all clients used for data exchange such as OPC UA clients before updating or downgrading the firmware.

Note
Ensure that the A6500-UM, the A6500-TP, and the A6500-RC cards have firmware version 5.x or higher installed to be compatible with A6500-CP cards running firmware version 5.x or higher. If a card with firmware version 5.x is used as a spare part in an AMS 6500 ATG system that contains an A6500-CC card, downgrade the spare card's firmware as described in Firmware downgrade. Before downgrading the spare card, ensure that the A6500-CC card is running the latest firmware version.

The use of an A6500-CC with firmware version 3.x or an A6500-CP with firmware version 1.x requires an A6500-UM, A6500-TP, and A6500-RC with firmware version 3.x. See also Table 9-1.

Table 9-1: AMS Machine Studio and firmware compatibility

AMS Machine Studio version	Firmware versions		Behavior
	A6500-CP	A6500-UM, A6500-TP, and A6500-RC	
4.x	1.x	3.x	Compatible
4.x	1.x	5.x	Not compatible, A6500-UM, A6500-TP, and A6500-RC cards cannot be configured and operated

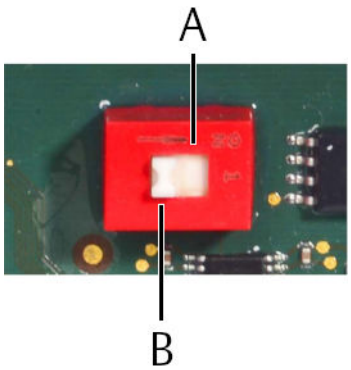
Table 9-1: AMS Machine Studio and firmware compatibility *(continued)*

AMS Machine Studio version	Firmware versions		Behavior
	A6500-CP	A6500-UM, A6500-TP, and A6500-RC	
4.x	5.x	3.x	Connection to A6500-CP is not possible
4.x	5.x	5.x	
5.x	1.x	3.x	Compatible
5.x	1.x	5.x	Not compatible, A6500-UM, A6500-TP, and A6500-RC cannot be configured and operated, the data collections service cannot collect data
5.x	5.x	3.x	
5.x	5.x	5.x	Compatible

Procedure

1. Only A6500-CP card:
   - Ensure that the key-switch is in the unlocked position. See Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.
   - Ensure that the data diode is deactivated – slide switch is in the data diode not active position

   Figure 9-1: Data diode slide switch

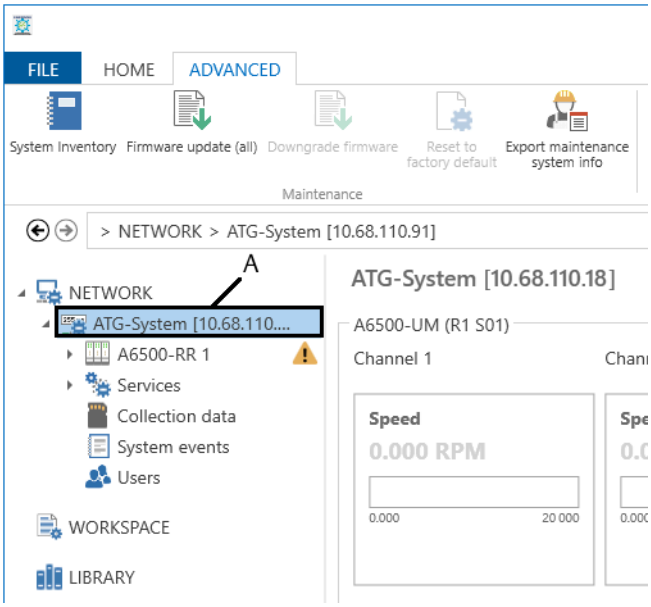
   

   A. Switch position: Data diode active
   B. Switch position: Data diode not active

   The data diode must be deactivated to permit the update of the data diode controller.

2. Select the AMS 6500 ATG system to be updated from the device tree. See Figure 9-2.

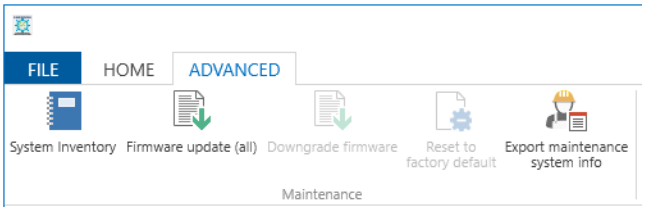
Figure 9-2: Select an AMS 6500 ATG system



A. Selected AMS 6500 ATG system rack.

The button **Firmware update (all)** is activated (colored).

Figure 9-3: Firmware update (all)



⚠ CAUTION

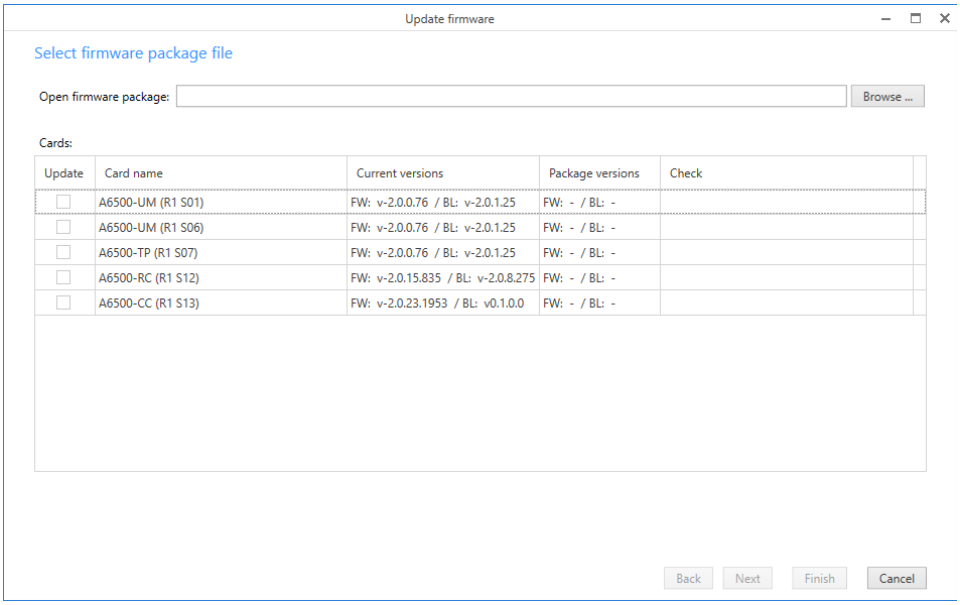
Only A6500-CP card: Do not switch the key-switch back to the locked position during the firmware update. This causes the firmware update to fail.

3. Click **Firmware update (all)**. The function checks the prerequisites for the update. If all prerequisites are fulfilled, the update dialog opens (see Figure 9-4).

   Prerequisites for the update:

   - System is connected through the Ethernet interface.
   - System is connected through the active communication card. See overview of the communication card for card state (**A6500-CC or A6500-CP → Overview → RedundancyActive card**)
   - Configuration of all cards are valid.

Figure 9-4: Update dialog



4. Click **Browse ...** to browse to the storage location of the common firmware package file.

   A firmware package contains the firmware for all AMS 6500 ATG cards.

5. Select the firmware file, and click **OK**.
   The update program checks the firmware package and compares the firmware versions on the cards with the version of the package.

Note
Major firmware version updates (when the first number of the firmware version increases) may introduce breaking changes. Before proceeding, carefully review the AMS Machine Studio release notes to fully understand all modifications and their impact. This note, along with a list of all affected cards, is displayed in the update dialog when a firmware version with breaking changes is selected.

Note
Do not use A6500-UM firmware versions 3.5.0.158 or 3.5.1.161. For more information, see Knowledge Base Article NK-2500-0488.

6. **Note**
   When updating an AMS 6500 ATG system with two system racks, Emerson recommends updating the cards rack by rack. First all cards in the first rack and then the cards in the second rack.

   Click **Next** to start the update process.

   The update program tries to back up the configuration of the cards. The progress of the whole process is displayed.

Note
Do not remove the card from the system rack, disconnect the system rack, or switch the key-switch of the A6500-CP card back to the locked position during the update process.

After the successful firmware update, the card starts up and the OK LED(s) flashes green. The card is ready for operation when the OK LED(s) switches to a steady green light – provided that the card has a suitable configuration and proper sensors are connected. For additional information about the update process, click **View detailed information** below the list of cards to open the details.

7. Click **Finish** to close the update dialog.
8. Only A6500-CP card: Switch back the key-switch to the locked position to protect the AMS 6500 ATG system against unauthorized changes.

Postrequisites

Finally, check the configuration of the updated cards. If necessary, load the configuration saved beforehand to the cards (see File).

9.2 Firmware downgrade

⚠ CAUTION

Any work on the system may impair machine protection.

Use this procedure to downgrade the firmware of the selected card to an older firmware version or to a SIL certified firmware version. The following cards of the AMS 6500 ATG can be downgraded:

- A6500-UM
- A6500-TP
- A6500-RC
- A6500-CC
- A6500-CP

Appropriate firmware files for a card downgrade are already integrated in AMS Machine Studio.

Prerequisites

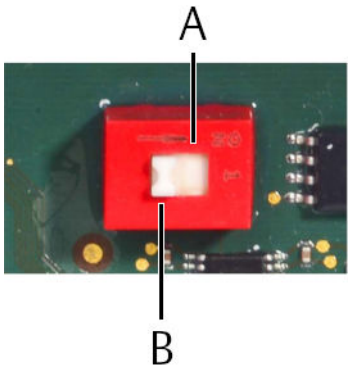
Emerson recommends disconnecting all clients used for data exchange such as OPC UA clients before updating or downgrading the firmware.

Procedure

1. Only A6500-CP card:
   - Ensure that the key-switch is in the unlocked position. See Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards.

- When downgrading the firmware of the A6500-CP card, ensure that the data diode is deactivated – slide switch is in the data diode not active position.

Figure 9-5: Data diode slide switch



A. Switch position: Data diode active
B. Switch position: Data diode not active

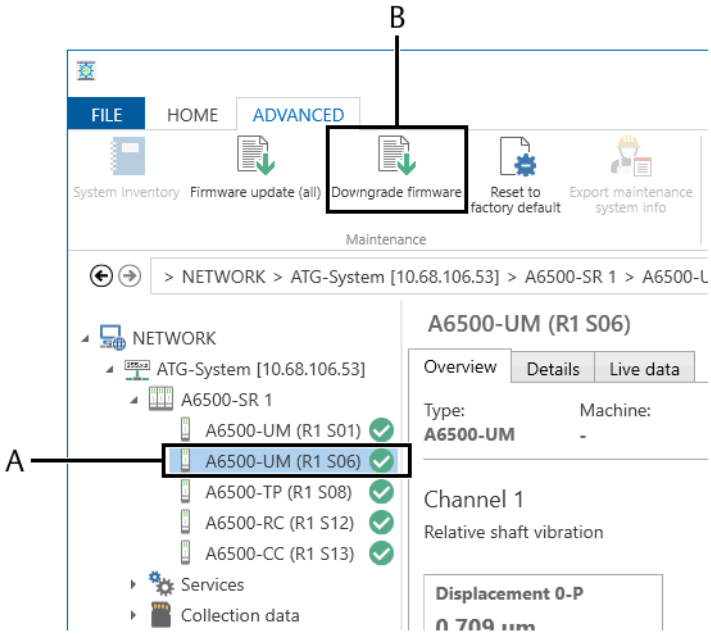
The data diode must be deactivated to permit the downgrade of the data diode controller.

⚠ CAUTION

Only A6500-CP card: Do not switch the key-switch back to the locked position during the firmware downgrade. This causes the firmware downgrade to fail.

2. Select the card to be downgraded from the device tree.

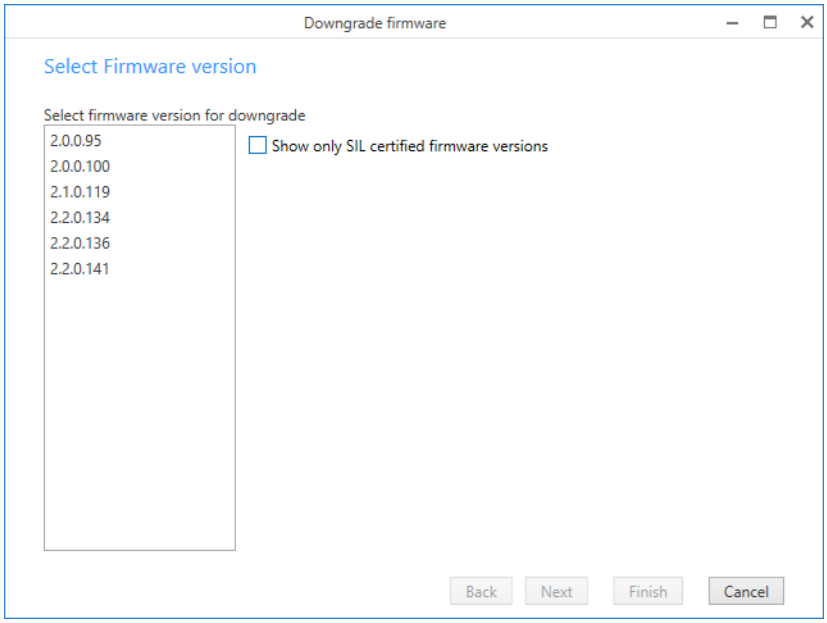
Figure 9-6: Select the card to be downgraded



A. Selected card
B. Downgrade button

3. Click **Downgrade firmware** to open the downgrade dialog.

Figure 9-7: Downgrade dialog



4. Select the firmware file to be installed on the card from the list.

Check the box **Show only SIL certified firmware versions** to list only SIL certified firmware versions. Use SIL certified firmware versions marked with **Spare** for downgrades of cards to be installed in existing SIL installations.

5. Click **Next** to start the downgrade.

⚠ CAUTION

Do not remove the card form the system rack, disconnect the system rack, or switch the key-switch of the A6500-CP card back to the locked position during the downgrade process.

6. Click **Next** to finish the downgrade process.
7. Click **Finish** to close the downgrade dialog.
8. Create a new configuration for the card.
9. Only A6500-CP card: Switch back the key-switch to the locked position to protect the AMS 6500 ATG system against unauthorized changes.

9.3 Reset to factory default

Use this command to reset the complete configuration of the selected card. The following items are not affected by this command:

- Firmware
- Service data (online view **Details**) except **Up time**

Select the card to be reset in the device tree. The procedure depends on the selected card.

- See A6500-CC and A6500-CP to reset an A6500-CC card or an A6500-CP card to factory default.
- See A6500-UM, A6500-TP, or A6500-RC to reset an A6500-UM, A6500-TP, or A6500-RC to factory default.

9.3.1 A6500-CC and A6500-CP

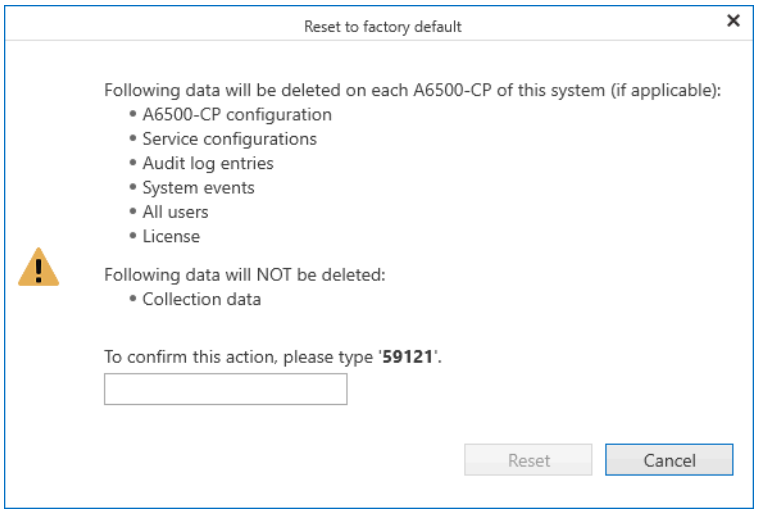
Procedure

1. Ensure that the connection to the A6500-CC card or A6500-CP card is made through the USB interface.

   Only A6500-CP: Ensure that you are locked into AMS Machine Studio as an administrator.

2. Only A6500-CP: Switch the key-switch to the unlocked position (see Enable system programming with A6500-CP communication card or Enable system programming with redundant A6500-CP communication cards)
   The **Reset to factory default** button is activated (colored).
3. Click **Reset to factory default** to open the reset dialog.

Figure 9-8: Reset to factory default – dialog A6500-CP



⚠ CAUTION

In AMS 6500 ATG systems with redundant communication cards, both communication cards are reset to factory default, regardless of which communication card is selected in the device tree.

Note

The following data is deleted, if applicable:

- Communication card configuration (Configuration of both A6500-CC cards or of both A6500-CP cards in redundant AMS 6500 ATG systems)
- Services configuration
- Audit log entries (only A6500-CP)
- System events (only A6500-CP)
- All users (only A6500-CP)
- License (only A6500-CP)

  Note

  Ensure that you still have the license document before resetting an A6500-CP card.

Data stored on the microSD card is not affected by this command.

4. Enter the shown confirmation number and click **Reset**.

   The selected communication card (both communication cards in redundant AMS 6500 ATG systems) is reset to factory default. A reset card is marked with the "No configuration" icon in the online view (see Figure 9-9).

Figure 9-9: No configuration icon

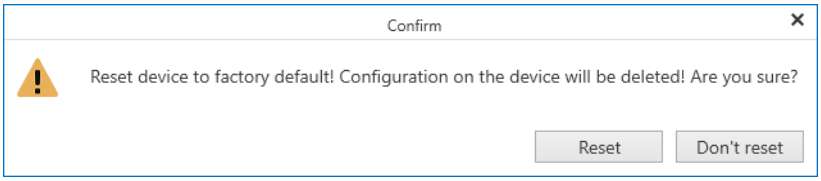


9.3.2 A6500-UM, A6500-TP, or A6500-RC

Procedure

1. Click **Reset to factory default** to reset the selected card to factory default.
   The following confirmation prompt appears.

Figure 9-10: Reset to factory default – confirmation prompt



⚠ CAUTION

The present configuration on the card will be deleted.

2. Click **Reset** to reset the card. Otherwise click **Don't reset**.
   After a successful reset the **OK** LED is flashing. Both **OK** LEDs flash alternately on the A6500-UM. Now the card is in the delivery state again. A reset card is marked with the "No configuration" sign in the online view (see Figure 9-11).

Figure 9-11: No configuration icon



9.4 System inventory

Use this command to generate a report about all cards installed within an AMS 6500 ATG system. The report contains the following information of each card:

- Slot number
- Type of the card
- Serial number
- Firmware version
- Boot loader version
- Hardware revision

- Up time
- Operation time
- Highest temperature, measured with the card internal temperature sensor.
- AMS Machine Studio version used to configure the card.

Note
Before contacting the technical support, create an inventory report to help ease troubleshooting.

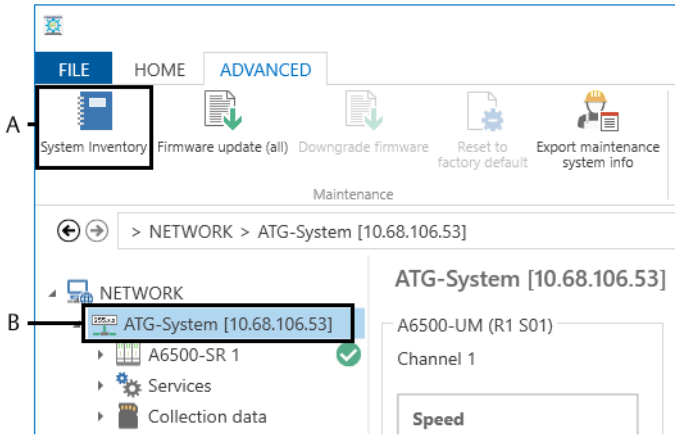
Prerequisites

Establish a connection between the AMS 6500 ATG system, you want to generate the inventory report for, and AMS Machine Studio. Activate the maintenance mode (see Firmware and maintenance).

Procedure

1. Select the AMS 6500 ATG system from the device tree.
   The button **System Inventory** is activated (colored).

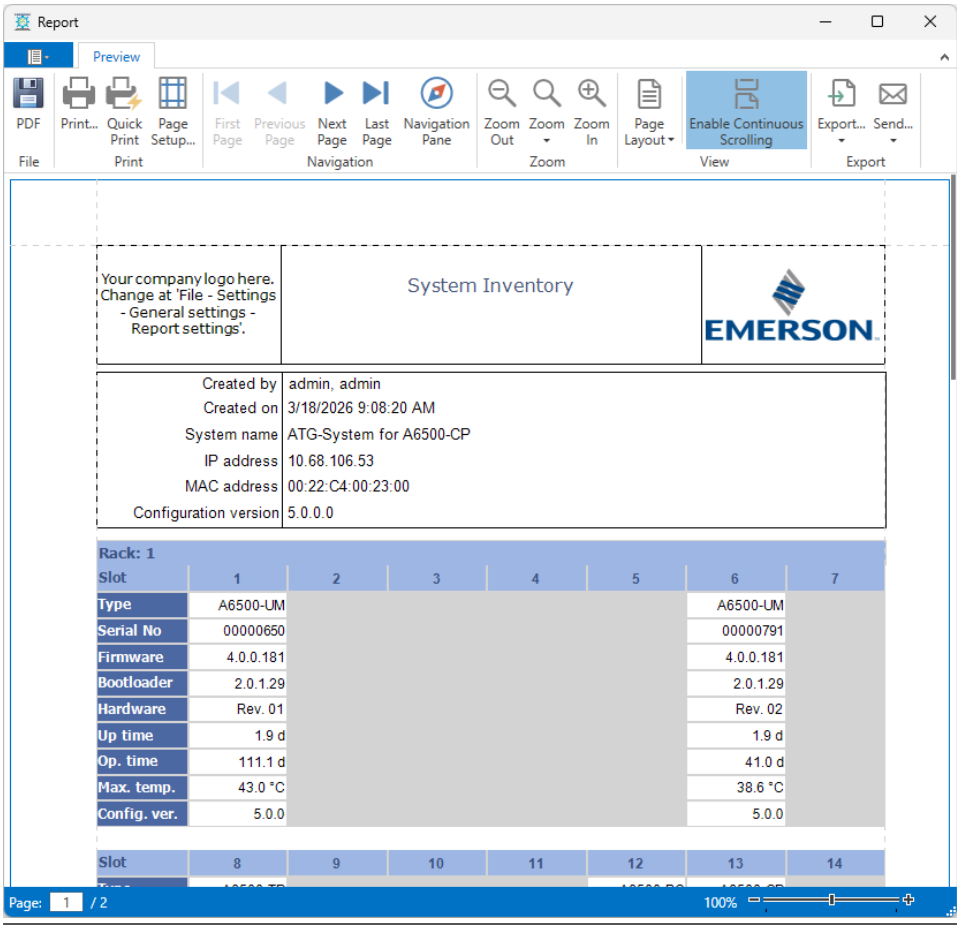
Figure 9-12: Selected system for the inventory report



*A. Button **System Inventory***
B. Selected AMS 6500 ATG system

2. Click **System Inventory** to generate the inventory report.
   The report viewer with the collected system inventory information opens.

Figure 9-13: System inventory report



3. Use the control elements of the report viewer to print, export, or store the report.

9.5 Export maintenance system info

Use this command to generate a file on request from an Emerson support engineer. The file contains all system information including the system inventory information (see System inventory) for advanced troubleshooting.

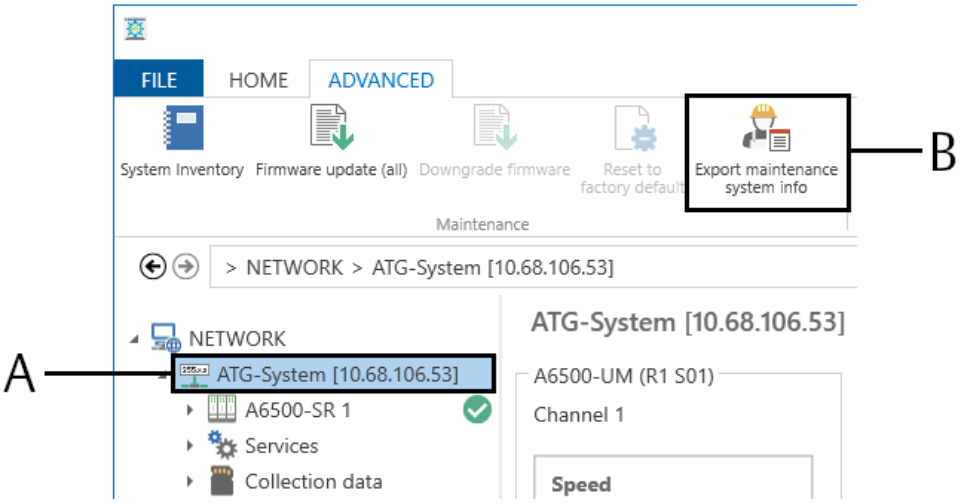
Prerequisites

Establish an Ethernet or USB connection between AMS Machine Studio and the AMS 6500 ATG system for which you want to generate the file. Activate the maintenance mode (see Firmware and maintenance).

Procedure

1. Select the AMS 6500 ATG system from the device tree.
   The button **Export maintenance system info** is activated (colored).

Figure 9-14: Select system for maintenance system information export



A. Selected AMS 6500 ATG system
*B. Button **Export maintenance system info***

2. Click **Export maintenance system info** to generate the maintenance system information file.
   The file is generated and a file browser opens.
3. Select a storage location and save the file.
4. Send the file to the support engineer.

A Troubleshooting – first steps

In case of an unexpected behavior of an AMS 6500 ATG card.

Prerequisites

The card has an online connection in AMS Machine Studio.

Procedure

1. Contact technical support to check the firmware version of the suspicious card and the version of AMS Machine Studio in use.

   Always use the latest version of firmware and AMS Machine Studio.
2. Update AMS Machine Studio if a newer version is available.
3. Update the firmware of the suspicious card if a newer version is available.

   Always use the latest version of AMS Machine Studio for the firmware update.
4. Use the updated version of AMS Machine Studio to receive the configuration from the card and send it back again.

   See operating manual of the card for how to connect a card, and how to receive and send a configuration.
5. Check if the unexpected behavior of the card is still present.
   Continue troubleshooting with the assistance of the technical support if the card is still not working as expected.

Related information

Technical support

B Modbus – Interface settings and data tables

Note
The Modbus protocol only allows 125 registers to be read at once.
Modbus data is generally provided in SI units, independently of the selected system of units in AMS Machine Studio (**Settings** → **Internationalization** → **System of units**).

B.1 Modbus interface settings

This chapter describes the interface details for Modbus over TCP and Modbus RTU communication. These interface details are necessary to allow other systems to communicate with the Com Card.

B.1.1 Interface details Modbus over TCP/IP

Modbus over TCP/IP permits the reading of general card data, measurement data, and analysis data. The writing of commands, such as "Reset Latch", is also possible. You can find the required IP address and subnet mask in the configuration window **LAN** of AMS Machine Studio. Table B-1 lists the necessary details for the communication interface setting.

Table B-1: Interface details Modbus over TCP/IP

Parameter	Detail
TCP / IP Address	Example: 172.16.201.28 See communication card manual for details.
Subnet Mask	Example: 255.255.248.0 See communication card manual for details.
Port	502 (Modbus over TCP/IP standard) see Modbus TCP
Unit	see Modbus

B.1.2 Interface details Modbus RTU

Modbus RTU only permits reading of general card data, measurement data, and analysis data. Table B-2 lists the necessary details for the communication interface setting.

The Modbus RTU interface works as a slave interface.

Table B-2: Interface details Modbus RTU

Parameter	Detail
Baud rate	Example: 19200 baud see Modbus RTU

Table B-2: Interface details Modbus RTU *(continued)*

Parameter	Detail
Data bits	8
Parity	Example: Even see Modbus RTU
Stop bit	1
Port address	see Modbus

Note
The device address (port address) is required for the serial Modbus RTU communication. The address is defined on configuration page **Modbus** (see Modbus). If two communication cards are used, define a unique address for each communication card.

B.2 Data tables

The data of the protection cards is divided up in two categories "card data" and "time data". Card data is stored as **Modbus Input** register (Hex 0x04) and time data as **Modbus Holding** register (Hex 0x03). Most of the system and card depending commands are also available as **Coils** (Hex 0x01). **Coils** are available with A6500-CP Com Card Pro and A6500-CC Com Card with firmware version 3.2 and later and AMS Machine Studio version 3.2 and later. After a firmware update of the A6500-CC Com Card to 3.2 on a password protected AMS 6500 ATG (see A6500-CC – Set password) click **Update Modbus mappings** (see Update Modbus mappings) to get valid **Coil** values. The Modbus mappings are updated automatically if the AMS 6500 ATG is not password protected.

Card data includes measuring values, measuring ranges, limit values, and card status data. The time function registers contain settings and signal waveform information.

Note
If a card is not responding, removed from the system, or defective, all Modbus registers of that card are set to 0 (zero).

Some card data, such as measuring values, occupy two 16 bit Modbus registers. See Table B-3 for bit arrangement of these registers.

Table B-3: Two-register values (data type: float, 32 bit integer)

First register		Second register	
Register low (bit 15 to bit 0)		Register high (bit 31 to bit 16)	
High byte	Low byte	High byte	Low byte

B.2.1 Data table "Input register"

Table B-4 lists the available register ranges of the input register.

The input card registers are allocated continuously to the racks and slots. Table B-5 shows the allocation of the racks and slots to the registers. The general input register ranges are shown in Table B-4.

Table B-4: Input register range

Register range	Content	Registers per card / slot
0 to 7800	Basic card data	300
8000 to 9999	User definable registers	See Input register.
20000 to 28840	Card and channel description	340
42000 to 52000	Grouped information	---

Table B-5: Register allocation

System Rack	Slot	Register "Basic card data"	Register "Description"	Register "Grouped information"
Rack 1	Card 1	0 to 299	20000 to 20339	42000 to 52000
	Card 2	300 to 599	20340 to 20679	
	Card 3	600 to 899	20680 to 21019	
	Card 4	900 to 1199	21020 to 21359	
	Card 5	1200 to 1499	21360 to 21699	
	Card 6	1500 to 1799	21700 to 22039	
	Card 7 (Relay Card [1])	1800 to 2099	22040 to 22379	
	Card 8 (Com Card[1])	2100 to 2399	22380 to 22719	
	Card 9	2400 to 2699	22720 to 23059	
	Card 10 (Relay Card[2])	2700 to 2999	23060 to 23399	
	Card 11 (Relay Card[2])	3000 to 3299	23400 to 23739	
	Card 12 (Relay Card[3] or Com Card 1[2])	3300 to 3599	23740 to 23739	
	Card 13 (Com Card 1[3] or Com Card 2[2])	3600 to 3899	24080 to 24079	
	Card 14 (Com Card 2[3])	3900 to 4199	24420 to 24759	
Rack 2 [4]	Card 1	4200 to 4499	24760 to 25099	
	Card 2	4500 to 4799	25100 to 25439	
	Card 3	4800 to 5099	25440 to 25779	
	Card 4	5100 to 5399	25780 to 26119	
	Card 5	5400 to 5699	26120 to 26459	
	Card 6	5700 to 5999	26460 to 26799	
	Card 7	6000 to 6299	26800 to 27139	
	Card 8	6300 to 6599	27140 to 27479	
	Card 9	6600 to 2899	27480 to 27819	
	Card 10 (Relay Card[2])	6900 to 7199	27820 to 28159	
	Card 11 (Relay Card[2])	7200 to 7499	28160 to 28499	

Table B-5: Register allocation *(continued)*

System Rack	Slot	Register "Basic card data"	Register "Description"	Register "Grouped information"
	Card 12 (Relay Card[3])	7500 to 7799	28500 to 28840	

1 *A6500-FR*
2 *A6500-RR*
3 *A6500-SR*
4 *Only if a second A6500-SR or A6500-RR is connected to the Com Card*

The 300 basic card data input registers are split into several groups as shown in Table B-6.

Note
The available Modbus data depends on the card configuration.

For example: An A6500-UM card configured for "Combined channels - dynamic" only provides Modbus data in the registers reserved for "Combined channels - dynamic". All other measurement related registers such as the registers "Combined channels - static", "Single channel dynamic", "Single channel - static", "Single channel - eccentricity", and "Speed" are empty. The same applies to the analysis registers "Order analysis", "Band analysis", and "PeakVue". Only the registers related to the configured analysis function contain Modbus data. See Table B-10 to Table B-17 for further examples.

Table B-6: Register partition

Group		Card	Number of reserved registers	Table
General		A6500-UM A6500-TP A6500-RC A6500-CC A6500-CP	30	Table B-19
A6500-UM	Inputs / Outputs	A6500-UM	30	Table B-20
A6500-TP		A6500-TP	30	Table B-21
A6500-RC		A6500-RC	50	Table B-22
A6500-CC		A6500-CC	50	Table B-23
A6500-CP		A6500-CP	50	Table B-24
Speed	Measurement	A6500-UM	90	Table B-25
Combined channels – dynamic			40	Table B-26
Combined channels – static			50	Table B-27
Combined channels – cylinder pressure			100	Table B-28
Single channel – dynamic			20	Table B-29

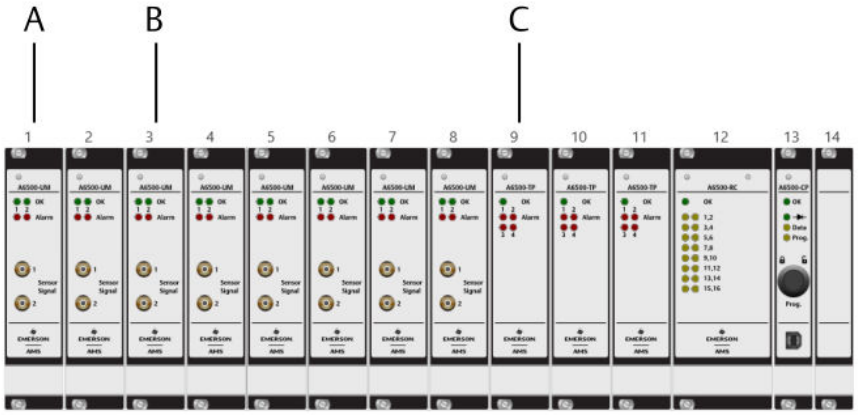
Table B-6: Register partition *(continued)*

Group		Card	Number of reserved registers	Table
Single channel – static			20	Table B-30
Single channel – eccentricity			20	Table B-31
Single channel – cylinder pressure			100	Structure of group "Single channel – Cylinder pressure – Measurement"
Order analysis			100	Table B-33
Band analysis and Interval band by frequency analysis			100	Table B-34
Interval band by orders analysis			100	Table B-35
PeakVue			100	Table B-36
Not 1st order analysis			15	Table B-37
Temperature Process		A6500-TP	240	Table B-38

Example Input register combination

The available Modbus data registers within the basic card data range (see Table B-5) depend on the configured measuring application. Table B-10 to Table B-17 show some examples to explain the register combination based on the configured measuring application. The listed start addresses are not the absolute start addresses. The absolute start address depends on the position of the card within the rack, see Table B-5 and Figure B-1. Add the basic card data range start (for example 600 for slot 3) as an offset to the start addresses listed in Table B-10 to Table B-17.

Figure B-1: Start address example



A. *Slot 1/Card 1: Basic card data range: 0 to 299*

Table B-7: Start address example slot 1 with A6500-UM card

Register group	***Start address***
General	*0*
A6500-UM	*30*
Single channel – eccentricity	*60*
Order analysis	*80*
Single channel – dynamic	*180*
Band analysis	*200*

B. *Slot 3/Card 3: Basic card data range: 600 to 899*

Table B-8: Start address example range slot 3 with A6500-UM card

Register group	***Start address***
General	*600*
A6500-UM	*630*
Single channel – eccentricity	*660*
Order analysis	*680*
Single channel – dynamic	*780*
Band analysis	*800*

C. *Slot 9/Card 9: Basic card data range: 2400 to 2699*

Table B-9: Start address example range slot 9 with A6500-TP card

Register group	***Start address***
General	*2400*
A6500-TP	*2430*

Table B-9: Start address example range slot 9 with A6500-TP card (continued)

Register group	*Start address*
Temperature Process	*2460*

Table B-10: Register combination within the basic card data range – A6500-UM Speed application

Register group	Start address	Number of reserved registers
General	0	30
A6500-UM	30	30
Speed	60	90

Table B-11: Register combination within the basic card data range – A6500-UM, two separate channels, static applications

Register group	Start address	Number of reserved registers
General	0	30
A6500-UM	30	30
Single channel – static	60	20
Analysis[1]	80	100 (Empty registers)
Single channel – static	180	20
Analysis[1]	200	100 (Empty registers)

1 *Order analysis including Peak Phase, Band analysis, Interval band analysis, PeakVue analysis, or Not 1st order analysis*

Table B-12: Register combination within the basic card data range – A6500-UM, two separate channels, dynamic applications

Register group	Start address	Number of reserved registers
General	0	30
A6500-UM	30	30
Single channel – dynamic	60	20
Band analysis	80	100
Single channel – dynamic	180	20
Band analysis	200	100

Table B-13: Register combination within the basic card data range – A6500-UM, two separate channels, mixed applications

Register group	Start address	Number of reserved registers
General	0	30
A6500-UM	30	30

Table B-13: Register combination within the basic card data range – A6500-UM, two separate channels, mixed applications *(continued)*

Register group	Start address	Number of reserved registers
Single channel – dynamic	60	20
PeakVue analysis	80	100
Single channel – static	180	20
Analysis[1]	200	100 (Empty registers)

1 *Order analysis including Peak Phase, Band analysis, Interval band analysis, PeakVue analysis, or Not 1st order analysis*

Table B-14: Register combination within the basic card data range – A6500-UM, calculation based on two channels, Smax application

Register group	Start address	Number of reserved registers
General	0	30
A6500-UM	30	30
Combined channels – dynamic	60	40
Order analysis including Peak Phase	100	100
Band analysis	200	100

Table B-15: Register combination within the basic card data range – A6500-RC

Register group	Start address	Number of reserved registers
General	0	30
A6500-RC	30	50

Table B-16: Register combination within the basic card data range – A6500-TP

Register group	Start address	Number of reserved registers
General	0	30
A6500-TP	30	30
Temperature Process	60	240

Table B-17: Register combination within the basic card data range – A6500-CC

Register group	Start address	Number of reserved registers
General	0	30
A6500-CC	30	50

Table B-18: Register combination within the basic card data range – A6500-CP

Register group	Start address	Number of reserved registers
General	0	30
A6500-CP	30	50

Structure of the group "General"

The 30 registers of the group "General" are occupied as shown in Table B-19.

Table B-19: Structure of group "General"

Register	Length (number of registers)	Type	Name	Description
0	1	16 Bit Integer (unsigned)	General.CardTypeId	0x40 : A6500-CC 0x41 : A6500-RC 0x42 : A6500-UM 0x43 : A6500-TP 0x60: A6500-CP
1	1	16 Bit Integer (unsigned)	General.Rack	Number of rack where the card is installed: 1 2
2	1	16 Bit Integer (unsigned)	General.Slot	Number of the slot where the card is installed: 1 to 14
3	1	16 Bit Integer (unsigned)	General.OnlineState	0: Offline 1: Online
4	1	Bool, Bit 0	General.CardState.Warning	State of the card: 0: OK 1: Warning
		Bool, Bit 8	General.CardState.Danger	State of the card: 0: OK 1: Danger
5	2	Float	General.Temperature	Current temperature of the card, measured with the internal sensor.
7	1	16 Bit Integer (unsigned)	General.ConfigurationCount	Number of configurations for the card
8	11	String [22]	General.SerialNo	Serial number of the card.

Table B-19: Structure of group "General" *(continued)*

Register	Length (number of registers)	Type	Name	Description
19	1	16 Bit Integer (singed)	General.Firmware.Major	First part of the firmware version **X**.x.x.xxx
20	1	16 Bit Integer (unsigned)	General.Firmware.Minor	Second part of the firmware version x.**X**.x.xxx
21	1	16 Bit Integer (unsigned)	General.Firmware.Patch	Third part of the firmware version x.x.**X**.xxx
22	1	16 Bit Integer (unsigned)	General.Firmware.Revision	Fourth part of the firmware version x.x.x.**XXX**
23	1	16 Bit Integer (unsigned)	General.LastDataChange.Year	Real time clock
24	1	16 Bit Integer (unsigned)	General.LastDataChange.Month	Real time clock
25	1	16 Bit Integer (unsigned)	General.LastDataChange.Day	Real time clock
26	1	16 Bit Integer (unsigned)	General.LastDataChange.Hour	Real time clock
27	1	16 Bit Integer (unsigned)	General.LastDataChange.Minute	Real time clock
28	1	16 Bit Integer (unsigned)	General.LastDataChange.Second	Real time clock
29	1		not used	Reserve

Structure of the group "A6500-UM Inputs/Outputs" Universal Measurement Card

The 30 registers of the group "A6500-UM Inputs/Outputs" are occupied as shown in Table B-20.

Table B-20: Structure of group "A6500-UM Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	1	16 Bit Integer (unsigned)	General.ProfileId1	Main group of the selected application (channel 1): 0: Disabled 1: Dynamic measurement 2: Static measurement 3: Eccentricity 4: Cylinder pressure 100: Combined channels: Speed [1] 101: Combined channels: Dynamic [1] 102: Combined channels: Static[1] 103: Combined channels: Cylinder pressure[1]
1	1	16 Bit Integer (unsigned)	General.ProfileId2	Main group of the selected application (channel 2): 0: Disabled 1: Dynamic measurement 2: Static measurement 3: Eccentricity 4: Cylinder pressure

Table B-20: Structure of group "A6500-UM Inputs/Outputs" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
2	1	16 Bit Integer (unsigned)	Channel1.Analysis.AnalysisId	Selected analysis type channel 1: 0: Disabled 1: Order analysis 2: Band analysis 3: PeakVue 4: Energy in band 11: Oder analysis (combined channel) 12: Band analysis (combined channel) 13: PeakVue (combined channel) 14: Interval band by frequency (combined channel) 15: Not first order (single channel) 16: Energy in band by orders (combined channel) 17: Energy in band by orders (single channel)

Table B-20: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
3	1	16 Bit Integer (unsigned)	Channel2.Analysis.AnalysisId	Selected analysis type channel 2: 0: Disabled 1: Order analysis 2: Band analysis 3: PeakVue 11: Oder analysis (combined channel) 12: Band analysis (combined channel) 13: PeakVue (combined channel) 14: Interval band by frequency (combined channel) 15: Not first order (single channel) 16: Energy in band by orders (combined channel) 17: Energy in band by orders (single channel)
4	2	Float	IO.AnalogOut1	Current value of the current output 1. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
6	2	Float	IO.AnalogOut2	Current value of the current output 2. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
8	1	Bool, Bit 0	IO.DigitalOut1	State of the digital output 1 ≠0: active 0: not active
		Bool, Bit 1	IO.DigitalOut2	State of the digital output 2 ≠0: active 0: not active

Table B-20: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 2	IO.DigitalOut3	State of the digital output 3 ≠0: active 0: not active
		Bool, Bit 3	IO.DigitalOut4	State of the digital output 4 ≠0: active 0: not active
		Bool, Bit 4	IO.DigitalOut5	State of the digital output 5 ≠0: active 0: not active
		Bool, Bit 5	IO.DigitalOut6	State of the digital output 6 ≠0: active 0: not active
9	1	Bool, Bit 0	IO.DigitalIn1	State of the digital input 1 0: low [2] 1: high [3]
		Bool, Bit 1	IO.DigitalIn2	State of the digital input 2 0: low[2] 1: high[3]
		Bool, Bit 2	IO.DigitalIn3	State of the digital input 3 0: low[2] 1: high[3]
		Bool, Bit 3	IO.DigitalIn4	State of the digital input 4 0: low[2] 1: high[3]
		Bool, Bit 4	IO.DigitalIn5	State of the digital input 5 0: low[2] 1: high[3]
10	1	16 Bit Integer (unsigned)	IO.DigitalIn1Mode	Mode of the digital input 1 0: key signal 1: digital in

Table B-20: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
11	1	16 Bit Integer (unsigned)	IO.DigitalIn2Mode	Mode of the digital input 2 0: key signal 1: digital in
12	2	Float	IO.SampleFrequencyCH1	Sample frequency of channel 1 Unit: Hz
14	2	Float	IO.SampleFrequencyCH2	Sample frequency of channel 2 Unit: Hz
16	1	Bool, Bit 0	IO.BypassCH1	State of the bypass digital outputs 1 and 2 ≠0: active 0: not active
		Bool, Bit 1	IO.BypassCH2	State of the bypass digital outputs 4 and 5 ≠0: active 0: not active
17	1		not used	Reserve
18	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Major	AMS Machine Studio version used to configure the card – Major part of the version number **X**.xx.xx Revision xxxx
19	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Minor	AMS Machine Studio version used to configure the card – Minor part of the version number x.**XX**.xx Revision xxxx
20	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Build	AMS Machine Studio version used to configure the card – Build part of the version number x.xx.**XX** Revision xxxx
22	1	Bool, Bit 0	IO.SimulationCH1	State of the channel 1 simulation ≠0: active 0: not active

Table B-20: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	IO.SimulationCH2	State of the channel 2 simulation ≠0: active 0: not active
		Bool, Bit 2	IO.Simulation.Combined	State of the combined channel simulation ≠0: active 0: not active
		Bool, Bit 3	IO.Simulation.CombinedValue2	State of the Max evaluation of application Tandem/Cone – Min/Max ≠0: active 0: not active
		Bool, Bit 4	IO.SimulationCH1Value2	State of the second channel 1 simulation[4] ≠0: active 0: not active
		Bool, Bit 5	IO.SimulationCH2Value2	State of the second channel 2 simulation[5] ≠0: active 0: not active
23	1	Bool, Bit 0	IO.SimulationDI1	State of the digital input 1 simulation ≠0: active 0: not active
		Bool, Bit 1	IO.SimulationDI2	State of the digital input 2 simulation ≠0: active 0: not active
		Bool, Bit 2	IO.SimulationDI3	State of the digital input 3 simulation ≠0: active 0: not active
		Bool, Bit 3	IO.SimulationDI4	State of the digital input 4 simulation ≠0: active 0: not active

Table B-20: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 4	IO.SimulationDI5	State of the digital input 5 simulation ≠0: active 0: not active
24	1	Bool, Bit 0	IO.SimulationOperationMode	State of the operation mode simulation ≠0: active 0: not active
25	1	16 Bit Integer (unsigned)	IO.CurrentOperationMode	Currently active operation mode: 0: none 1 to 4: Operation mode 1-4
26	1	Bool, Bit 0	IO.LimitMultiplierState	State of the limit multiplier ≠0: active 0: not active

Table B-20: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
27	1	16 Bit Integer (unsigned)	Channel1.PhysicalQuantity	Physical quantity of channel 1 (8 Bit Integer (unsigned)): 0: Unspecified 1: Displacement 2: Velocity 3: Acceleration 4: Time 5: Mass 6: Electric current 7: Temperature 8: Electrical resistance 9: Frequency 10: Electrical potential 11: Capacitance 12: Inductance 13: Power 14: Luminous flux 15: Illuminance 16: Work 17: Pressure 18: Force 19: Electric charge 20: Plane angle 21: Ratio 22: Angular speed 23: Angular acceleration 24: Area

Table B-20: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
			Channel2.PhysicalQuantity	Physical quantity of channel 2 (8 Bit Integer (unsigned)): 0: Unspecified 1: Displacement 2: Velocity 3: Acceleration 4: Time 5: Mass 6: Electric current 7: Temperature 8: Electrical resistance 9: Frequency 10: Electrical potential 11: Capacitance 12: Inductance 13: Power 14: Luminous flux 15: Illuminance 16: Work 17: Pressure 18: Force 19: Electric charge 20: Plane angle 21: Ratio 22: Angular speed 23: Angular acceleration 24: Area
28 to 29	1		not used	Reserve

1 *If "Application main group CH1" is a combined measurement, "Application main group CH2" is always = 0 (Disabled)*
2 *Input terminal **Open** or >13 V*
3 *GND at input terminal*
4 *In case of a combined application and both current outputs assigned to channel 1.*
5 *In case of a combined application and both current outputs assigned to channel 2.*

Structure of the group "A6500-TP Inputs/Outputs" Temperature Process Card

The 30 registers of the group "A6500-TP Inputs/Outputs" are occupied as shown in Table B-21.

Table B-21: Structure of group "A6500-TP Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	IO.AnalogOut1	Current value of the current output 1. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
2	2	Float	IO.AnalogOut2	Current value of the current output 2. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
4	2	Float	IO.AnalogOut3	Current value of the current output 3. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
6	2	Float	IO.AnalogOut4	Current value of the current output 4. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
8	1	Bool, Bit 0	IO.DigitalOut1	State of the digital output 1 ≠0: active 0: not active
		Bool, Bit 1	IO.DigitalOut2	State of the digital output 2 ≠0: active 0: not active
		Bool, Bit 2	IO.DigitalOut3	State of the digital output 3 ≠0: active 0: not active
		Bool, Bit 3	IO.DigitalOut4	State of the digital output 4 ≠0: active 0: not active
		Bool, Bit 4	IO.DigitalOut5	State of the digital output 5 ≠0: active 0: not active

Table B-21: Structure of group "A6500-TP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 5	IO.DigitalOut6	State of the digital output 6 ≠0: active 0: not active
9	1	Bool, Bit 0	IO.DigitalIn1	State of the digital input 1 0: low [1] 1: high[2]
		Bool, Bit 1	IO.DigitalIn2	State of the digital input 2 0: low[1] 1: high[2]
10	1	Bool, Bit 0	IO.BypassCH1a	State of the bypass channel 1a ≠0: active 0: not active
		Bool, Bit 1	IO.BypassCH1b	State of the bypass channel 1b ≠0: active 0: not active
		Bool, Bit 2	IO.BypassCH2a	State of the bypass channel 2a ≠0: active 0: not active
		Bool, Bit 3	IO.BypassCH2b	State of the bypass channel 2b ≠0: active 0: not active
		Bool, Bit 4	IO.BypassCH3a	State of the bypass channel 3a ≠0: active 0: not active
		Bool, Bit 5	IO.BypassCH3b	State of the bypass channel 3b ≠0: active 0: not active
		Bool, Bit 6	IO.BypassCH4a	State of the bypass channel 4a ≠0: active 0: not active

Table B-21: Structure of group "A6500-TP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 7	IO.BypassCH4b	State of the bypass channel 4b ≠0: active 0: not active
11	1		not used	Reserve
12	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Major	AMS Machine Studio version used to configure the card – Major part of the version number **X**.xx.xx Revision xxxx
13	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Minor	AMS Machine Studio version used to configure the card – Minor part of the version number x.**XX**.xx Revision xxxx
14	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Build	AMS Machine Studio version used to configure the card – Build part of the version number x.xx.**XX** Revision xxxx
16 to 29	1		not used	Reserve

*1 Input terminal **Open** or >13 V*
2 GND at input terminal

Structure of the group "A6500-RC Inputs/Outputs" Relay Card

The 50 registers of the group "A6500-RC Inputs/Outputs" are occupied as shown in Table B-22.

Table B-22: Structure of group "A6500-RC Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	IO.DigitalIn1	State of digital input 1 ≠0: active 0: not active
		Bool, Bit 1	IO.DigitalIn2	State of digital input 2 ≠0: active 0: not active
		Bool, Bit 2	IO.DigitalIn3	State of digital input 3 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 3	IO.DigitalIn4	State of digital input 4 ≠0: active 0: not active
		Bool, Bit 4	IO.DigitalIn5	State of digital input 5 ≠0: active 0: not active
		Bool, Bit 5	IO.DigitalIn6	State of digital input 6 ≠0: active 0: not active
		Bool, Bit 6	IO.DigitalIn7	State of digital input 7 ≠0: active 0: not active
		Bool, Bit 7	IO.DigitalIn8	State of digital input 8 ≠0: active 0: not active
		Bool, Bit 8	IO.DigitalIn9	State of digital input 9 ≠0: active 0: not active
		Bool, Bit 9	IO.DigitalIn10	State of digital input 10 ≠0: active 0: not active
		Bool, Bit 10	IO.DigitalIn11	State of digital input 11 ≠0: active 0: not active
		Bool, Bit 11	IO.DigitalIn12	State of digital input 12 ≠0: active 0: not active
		Bool, Bit 12	IO.DigitalIn13	State of digital input 13 ≠0: active 0: not active
		Bool, Bit 13	IO.DigitalIn14	State of digital input 14 ≠0: active 0: not active
		Bool, Bit 14	IO.DigitalIn15	State of digital input 15 ≠0: active 0: not active
		Bool, Bit 15	IO.DigitalIn16	State of digital input 16 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
1	1	Bool, Bit 0	IO.DigitalIn17	State of digital input 17 ≠0: active 0: not active
		Bool, Bit 1	IO.DigitalIn18	State of digital input 18 ≠0: active 0: not active
		Bool, Bit 2	IO.DigitalIn19	State of digital input 19 ≠0: active 0: not active
		Bool, Bit 3	IO.DigitalIn20	State of digital input 20 ≠0: active 0: not active
		Bool, Bit 4	IO.DigitalIn21	State of digital input 21 ≠0: active 0: not active
		Bool, Bit 5	IO.DigitalIn22	State of digital input 22 ≠0: active 0: not active
		Bool, Bit 6	IO.DigitalIn23	State of digital input 23 ≠0: active 0: not active
		Bool, Bit 7	IO.DigitalIn24	State of digital input 24 ≠0: active 0: not active
		Bool, Bit 8	IO.DigitalIn25	State of digital input 25 ≠0: active 0: not active
		Bool, Bit 9	IO.DigitalIn26	State of digital input 26 ≠0: active 0: not active
		Bool, Bit 10	IO.DigitalIn27	State of digital input 27 ≠0: active 0: not active
		Bool, Bit 11	IO.DigitalIn28	State of digital input 28 ≠0: active 0: not active
		Bool, Bit 12	IO.DigitalIn29	State of digital input 29 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 13	IO.DigitalIn30	State of digital input 30 ≠0: active 0: not active
		Bool, Bit 14	IO.DigitalIn31	State of digital input 31 ≠0: active 0: not active
		Bool, Bit 15	IO.DigitalIn32	State of digital input 32 ≠0: active 0: not active
2	1	Bool, Bit 0	IO.DigitalIn33	State of digital input 33 ≠0: active 0: not active
		Bool, Bit 1	IO.DigitalIn34	State of digital input 34 ≠0: active 0: not active
		Bool, Bit 2	IO.DigitalIn35	State of digital input 35 ≠0: active 0: not active
		Bool, Bit 3	IO.DigitalIn36	State of digital input 36 ≠0: active 0: not active
		Bool, Bit 4	IO.DigitalIn37	State of digital input 37 ≠0: active 0: not active
		Bool, Bit 5	IO.DigitalIn38	State of digital input 38 ≠0: active 0: not active
		Bool, Bit 6	IO.DigitalIn39	State of digital input 39 ≠0: active 0: not active
		Bool, Bit 7	IO.DigitalIn40	State of digital input 40 ≠0: active 0: not active
		Bool, Bit 8	IO.DigitalIn41	State of digital input 41 ≠0: active 0: not active
		Bool, Bit 9	IO.DigitalIn42	State of digital input 42 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 10	IO.DigitalIn43	State of digital input 43 ≠0: active 0: not active
		Bool, Bit 11	IO.DigitalIn44	State of digital input 44 ≠0: active 0: not active
		Bool, Bit 12	IO.DigitalIn45	State of digital input 45 ≠0: active 0: not active
		Bool, Bit 13	IO.DigitalIn46	State of digital input 46 ≠0: active 0: not active
		Bool, Bit 14	IO.DigitalIn47	State of digital input 47 ≠0: active 0: not active
		Bool, Bit 15	IO.DigitalIn48	State of digital input 48 ≠0: active 0: not active
3	1	Bool, Bit 0	IO.DigitalIn49	State of digital input 49 ≠0: active 0: not active
		Bool, Bit 1	IO.DigitalIn50	State of digital input 50 ≠0: active 0: not active
		Bool, Bit 2	IO.DigitalIn51	State of digital input 51 ≠0: active 0: not active
		Bool, Bit 3	IO.DigitalIn52	State of digital input 52 ≠0: active 0: not active
		Bool, Bit 4	IO.DigitalIn53	State of digital input 53 ≠0: active 0: not active
		Bool, Bit 5	IO.DigitalIn54	State of digital input 54 ≠0: active 0: not active
		Bool, Bit 6	IO.DigitalIn55	State of digital input 55 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 7	IO.DigitalIn56	State of digital input 56 ≠0: active 0: not active
		Bool, Bit 8	IO.DigitalIn57	State of digital input 57 ≠0: active 0: not active
		Bool, Bit 9	IO.DigitalIn58	State of digital input 58 ≠0: active 0: not active
		Bool, Bit 10	IO.DigitalIn59	State of digital input 59 ≠0: active 0: not active
		Bool, Bit 11	IO.DigitalIn60	State of digital input 60 ≠0: active 0: not active
		Bool, Bit 12	IO.DigitalIn61	State of digital input 61 ≠0: active 0: not active
		Bool, Bit 13	IO.DigitalIn62	State of digital input 62 ≠0: active 0: not active
		Bool, Bit 14	IO.DigitalIn63	State of digital input 63 ≠0: active 0: not active
		Bool, Bit 15	IO.DigitalIn64	State of digital input 64 ≠0: active 0: not active
4	1	Bool, Bit 0	IO.DigitalIn65	State of digital input 65 ≠0: active 0: not active
		Bool, Bit 1	IO.DigitalIn66	State of digital input 66 ≠0: active 0: not active
5	1	Bool, Bit 0	IO.DigitalOut1	State of digital output (relay) 1 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	IO.DigitalOut2	State of digital output (relay) 2 ≠0: active 0: not active
		Bool, Bit 2	IO.DigitalOut3	State of digital output (relay) 3 ≠0: active 0: not active
		Bool, Bit 3	IO.DigitalOut4	State of digital output (relay) 4 ≠0: active 0: not active
		Bool, Bit 4	IO.DigitalOut5	State of digital output (relay) 5 ≠0: active 0: not active
		Bool, Bit 5	IO.DigitalOut6	State of digital output (relay) 6 ≠0: active 0: not active
		Bool, Bit 6	IO.DigitalOut7	State of digital output (relay) 7 ≠0: active 0: not active
		Bool, Bit 7	IO.DigitalOut8	State of digital output (relay) 8 ≠0: active 0: not active
		Bool, Bit 8	IO.DigitalOut9	State of digital output (relay) 9 ≠0: active 0: not active
		Bool, Bit 9	IO.DigitalOut10	State of digital output (relay) 10 ≠0: active 0: not active
		Bool, Bit 10	IO.DigitalOut11	State of digital output (relay) 11 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 11	IO.DigitalOut12	State of digital output (relay) 12 ≠0: active 0: not active
		Bool, Bit 12	IO.DigitalOut13	State of digital output (relay) 13 ≠0: active 0: not active
		Bool, Bit 13	IO.DigitalOut14	State of digital output (relay) 14 ≠0: active 0: not active
		Bool, Bit 14	IO.DigitalOut15	State of digital output (relay) 15 ≠0: active 0: not active
		Bool, Bit 15	IO.DigitalOut16	State of digital output (relay) 16 ≠0: active 0: not active
6	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Major	AMS Machine Studio version used to configure the card – Major part of the version number **X**.xx.xx Revision xxxx
7	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Minor	AMS Machine Studio version used to configure the card – Minor part of the version number x.**XX**.xx Revision xxxx
8	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Build	AMS Machine Studio version used to configure the card – Build part of the version number x.xx.**XX** Revision xxxx
10	1	Bool, Bit 0	IO.Marker1	State of marker 1 ≠0: active 0: not active
		Bool, Bit 1	IO.Marker2	State of marker 2 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 2	IO.Marker3	State of marker 3 ≠0: active 0: not active
		Bool, Bit 3	IO.Marker4	State of marker 4 ≠0: active 0: not active
		Bool, Bit 4	IO.Marker5	State of marker 5 ≠0: active 0: not active
		Bool, Bit 5	IO.Marker6	State of marker 6 ≠0: active 0: not active
		Bool, Bit 6	IO.Marker7	State of marker 7 ≠0: active 0: not active
		Bool, Bit 7	IO.Marker8	State of marker 8 ≠0: active 0: not active
		Bool, Bit 8	IO.Marker9	State of marker 9 ≠0: active 0: not active
		Bool, Bit 9	IO.Marker10	State of marker 10 ≠0: active 0: not active
		Bool, Bit 10	IO.Marker11	State of marker 11 ≠0: active 0: not active
		Bool, Bit 11	IO.Marker12	State of marker 12 ≠0: active 0: not active
		Bool, Bit 12	IO.Marker13	State of marker 13 ≠0: active 0: not active
		Bool, Bit 13	IO.Marker14	State of marker 14 ≠0: active 0: not active
		Bool, Bit 14	IO.Marker15	State of marker 15 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 15	IO.Marker16	State of marker 16 ≠0: active 0: not active
11	1	Bool, Bit 0	IO.Marker17	State of marker 17 ≠0: active 0: not active
		Bool, Bit 1	IO.Marker18	State of marker 18 ≠0: active 0: not active
		Bool, Bit 2	IO.Marker19	State of marker 19 ≠0: active 0: not active
		Bool, Bit 3	IO.Marker20	State of marker 20 ≠0: active 0: not active
		Bool, Bit 4	IO.Marker21	State of marker 21 ≠0: active 0: not active
		Bool, Bit 5	IO.Marker22	State of marker 22 ≠0: active 0: not active
		Bool, Bit 6	IO.Marker23	State of marker 23 ≠0: active 0: not active
		Bool, Bit 7	IO.Marker24	State of marker 24 ≠0: active 0: not active
		Bool, Bit 8	IO.Marker25	State of marker 25 ≠0: active 0: not active
		Bool, Bit 9	IO.Marker26	State of marker 26 ≠0: active 0: not active
		Bool, Bit 10	IO.Marker27	State of marker 27 ≠0: active 0: not active
		Bool, Bit 11	IO.Marker28	State of marker 28 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 12	IO.Marker29	State of marker 29 ≠0: active 0: not active
		Bool, Bit 13	IO.Marker30	State of marker 30 ≠0: active 0: not active
		Bool, Bit 14	IO.Marker31	State of marker 31 ≠0: active 0: not active
		Bool, Bit 15	IO.Marker32	State of marker 32 ≠0: active 0: not active
12	1	Bool, Bit 0	IO.Marker33	State of marker 33 ≠0: active 0: not active
		Bool, Bit 1	IO.Marker34	State of marker 34 ≠0: active 0: not active
		Bool, Bit 2	IO.Marker35	State of marker 35 ≠0: active 0: not active
		Bool, Bit 3	IO.Marker36	State of marker 36 ≠0: active 0: not active
		Bool, Bit 4	IO.Marker37	State of marker 37 ≠0: active 0: not active
		Bool, Bit 5	IO.Marker38	State of marker 38 ≠0: active 0: not active
		Bool, Bit 6	IO.Marker39	State of marker 39 ≠0: active 0: not active
		Bool, Bit 7	IO.Marker40	State of marker 40 ≠0: active 0: not active
		Bool, Bit 8	IO.Marker41	State of marker 41 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 9	IO.Marker42	State of marker 42 ≠0: active 0: not active
		Bool, Bit 10	IO.Marker43	State of marker 43 ≠0: active 0: not active
		Bool, Bit 11	IO.Marker44	State of marker 44 ≠0: active 0: not active
		Bool, Bit 12	IO.Marker45	State of marker 45 ≠0: active 0: not active
		Bool, Bit 13	IO.Marker46	State of marker 46 ≠0: active 0: not active
		Bool, Bit 14	IO.Marker47	State of marker 47 ≠0: active 0: not active
		Bool, Bit 15	IO.Marker48	State of marker 48 ≠0: active 0: not active
13	1	Bool, Bit 0	IO.Marker49	State of marker 49 ≠0: active 0: not active
		Bool, Bit 1	IO.Marker50	State of marker 50 ≠0: active 0: not active
		Bool, Bit 2	IO.Marker51	State of marker 51 ≠0: active 0: not active
		Bool, Bit 3	IO.Marker52	State of marker 52 ≠0: active 0: not active
		Bool, Bit 4	IO.Marker53	State of marker 53 ≠0: active 0: not active
		Bool, Bit 5	IO.Marker54	State of marker 54 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 6	IO.Marker55	State of marker 55 ≠0: active 0: not active
		Bool, Bit 7	IO.Marker56	State of marker 56 ≠0: active 0: not active
		Bool, Bit 8	IO.Marker57	State of marker 57 ≠0: active 0: not active
		Bool, Bit 9	IO.Marker58	State of marker 58 ≠0: active 0: not active
		Bool, Bit 10	IO.Marker59	State of marker 59 ≠0: active 0: not active
		Bool, Bit 11	IO.Marker60	State of marker 60 ≠0: active 0: not active
		Bool, Bit 12	IO.Marker61	State of marker 61 ≠0: active 0: not active
		Bool, Bit 13	IO.Marker62	State of marker 62 ≠0: active 0: not active
		Bool, Bit 14	IO.Marker63	State of marker 63 ≠0: active 0: not active
		Bool, Bit 15	IO.Marker64	State of marker 64 ≠0: active 0: not active
14	1	Bool, Bit 0	IO.SoftwareInputState1	State of software input 1 ≠0: active 0: not active
		Bool, Bit 1	IO.SoftwareInputState2	State of software input 2 ≠0: active 0: not active
		Bool, Bit 2	IO.SoftwareInputState3	State of software input 3 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 3	IO.SoftwareInputState4	State of software input 4 ≠0: active 0: not active
		Bool, Bit 4	IO.SoftwareInputState5	State of software input 5 ≠0: active 0: not active
		Bool, Bit 5	IO.SoftwareInputState6	State of software input 6 ≠0: active 0: not active
		Bool, Bit 6	IO.SoftwareInputState7	State of software input 7 ≠0: active 0: not active
		Bool, Bit 7	IO.SoftwareInputState8	State of software input 8 ≠0: active 0: not active
		Bool, Bit 8	IO.SoftwareInputState9	State of software input 9 ≠0: active 0: not active
		Bool, Bit 9	IO.SoftwareInputState10	State of software input 10 ≠0: active 0: not active
		Bool, Bit 10	IO.SoftwareInputState11	State of software input 11 ≠0: active 0: not active
		Bool, Bit 11	IO.SoftwareInputState12	State of software input 12 ≠0: active 0: not active
		Bool, Bit 12	IO.SoftwareInputState13	State of software input 13 ≠0: active 0: not active
		Bool, Bit 13	IO.SoftwareInputState14	State of software input 14 ≠0: active 0: not active

Table B-22: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 14	IO.SoftwareInputState15	State of software input 15 ≠0: active 0: not active
		Bool, Bit 15	IO.SoftwareInputStatel16	State of software input 16 ≠0: active 0: not active
15 to 49	1		not used	Reserve

Structure of the group "A6500-CC Inputs/Outputs" Com Card

The 50 registers of the group "A6500-CC Inputs/Outputs" are occupied as shown in Table B-23.

Table B-23: Structure of group "A6500-CC Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	1	16 Bit Integer (unsigned)	Info.CPULoad	Load of the internal CPU Unit: % Range: 0 to 100
1	1	16 Bit Integer (unsigned)	Info.MaxCycleTime	Maximal cycle time of the data collection from all connected cards. Unit: ms
2	1	16 Bit Integer (unsigned)	Info.MemoryUsage	Usage of the internal memory Unit: % Range: 0 to 100
3	1		not used	Reserve
4	1	16 Bit Integer (signed)	General.Temperature	Current temperature, measured with the card internal sensor. Unit: 0.1°C
5	1	Bool, Bit 0	Info.EthernetConnected	0: Not connected 1: Connected
		Bool, Bit 1	Info.USBConnected	0: Not connected 1: Connected

Table B-23: Structure of group "A6500-CC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 2	Info.RS485Active	0: Passive/inactive 1: Active
		Bool, Bit 3	Info.RedundancyState	0: No redundancy 1: Redundancy active
6	1	16 Bit Integer (unsigned)	General.ChannelOk	Card status. 0: Not OK 1: OK
7	1	Bool, Bit 0	Info.MachineStudioEnabled	0: Not active 1: Active
		Bool, Bit 1	Info.MachineStudioConnected	0: Not connected 1: Connected
8	1	16 Bit Integer (unsigned)	Info.MachineStudioConnectedClients	Number of connected AMS Machine Studios Range: 0 to 8
9	1	Bool, Bit 0	Info.MobileAppEnabled	0: Not active 1: Active
		Bool, Bit 1	Info.MobileAppConnected	0: Not connected 1: Connected
10		16 Bit Integer (unsigned)	Info.MobileAppConnectedClients	Number of connected Mobile Apps Range: 0 to 5
11	1	Bool, Bit 0	Info.OpcUaEnabled	0: Not active 1: Active
		Bool, Bit 1	Info.OpcUaConnected	0: Not connected 1: Connected
12	1	16 Bit Integer (unsigned)	Info.OpcUaConnectedClients	Number of connected OPC UA clients Range: 0 to 5
13	1	Bool, Bit 0	Info.ModbusTCPEnabled	0: Not active 1: Active
		Bool, Bit 1	Info.ModbusTCPConnected	0: Not connected 1: Connected
14	1	16 Bit Integer (unsigned)	Info.ModbusTCPConnectedClients	Number of connected Modbus clients Range: 0 to 5
15	1	Bool, Bit 0	Info.ModbusRTUEnabled	0: Not active 1: Active

Table B-23: Structure of group "A6500-CC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	Info.ModbusRTUConnected	0: Not connected 1: Connected
16	1	16 Bit Integer (unsigned)	Info.ModbusRTUConnectedClients	Number of connected serial Modbus clients Range: 0 to 1
17	1	Bool, Bit 0	Info.AutoDiscoveryEnabled	0: Not active 1: Active
		Bool, Bit 1	not used	
18	1	Bool, Bit 0	Info.LicenseState	Licensing ATG Prediction Extension 0: No license 1 License
19	1	Bool, Bit 0	Info.SNTPActive	0: Not active 1: Active
		Bool, Bit 1	Info.SNTPConnected	0: Not connected 1: Connected
20	1	16 Bit Integer (unsigned)	Info.SNTPUpdateTime.Year	Year of the latest SNTP update
21	1	16 Bit Integer (unsigned)	Info.SNTPUpdateTime.Month	Month of the latest SNTP update
22	1	16 Bit Integer (unsigned)	Info.SNTPUpdateTime.Day	Day of the latest SNTP update
23	1	16 Bit Integer (unsigned)	Info.SNTPUpdateTime.Hour	Hour of the latest SNTP update
24	1	16 Bit Integer (unsigned)	Info.SNTPUpdateTime.Minute	Minute of the latest SNTP update
25	1	16 Bit Integer (unsigned)	Info.SNTPUpdateTime.Second	Second of the latest SNTP
26	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Major	AMS Machine Studio version used to configure the card – Major part of the version number **X**.xx.xx Revision xxxx

Table B-23: Structure of group "A6500-CC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
27	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Minor	AMS Machine Studio version used to configure the card – Minor part of the version number x.**XX**.xx Revision xxxx
28	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Build	AMS Machine Studio version used to configure the card – Build part of the version number x.xx.**XX** Revision xxxx
29	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Informational	AMS Machine Studio version used to configure the card – Revision part of the version number x.xx.xx Revision **XXXX**
30	1	Bool, Bit 0	Info.SwapHoldingRegisterRanges	0: Swap is disabled 1: Swap is enabled
31	1	16 Bit Integer (unsigned)	Info.ModbusStructVersMajor	Version of the used Modbus structure definition – Major part (8 Bit Integer (unsigned))
			Info.ModbusStructVersMinor	Version of the used Modbus structure definition – Minor part (8 Bit Integer (unsigned))
32 to 49			not used	Reserve

Structure of the group "A6500-CP Inputs/Outputs" Com Card Pro

The 50 registers of the group "A6500-CP Inputs/Outputs" are occupied as shown in Table B-23.

Table B-24: Structure of group "A6500-CP Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	1	16 Bit Integer (unsigned)	Info.CPU1.CPULoad	Load of the first internal CPU Unit: % Range: 0 to 100
1	1		not used	Reserve

Table B-24: Structure of group "A6500-CP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
2	1	16 Bit Integer (unsigned)	Info.CPU1.MemoryUsage	Usage of the internal memory assigned to CPU 1 Unit: % Range: 0 to 100
3	1		not used	Reserve
4	1	16 Bit Integer (signed)	General.Temperature	Current temperature, measured with the card internal sensor. Unit: 0.1°C
5	1	Bool, Bit 0	Info.LAN1.Connected	0: Not connected 1: Connected
		Bool, Bit 1	Info.USB.Connected	0: Not connected 1: Connected
		Bool, Bit 2	Info.IsActiveCard	0: Passive/inactive 1: Active
		Bool, Bit 3	Info.RedundancyState	0: No redundancy 1: Redundancy active
		Bool, Bit 4	Info.LAN2.Connected	0: Not connected 1: Connected
6	1	16 Bit Integer (unsigned)	Info.ChannelOK	Card status. 0: Not OK 1: OK
7	1	Bool, Bit 0	Info.MachineStudio.LAN1.Enabled	0: Not active 1: Active
		Bool, Bit 1	Info.MachineStudio.LAN1.Connected	0: Not connected 1: Connected
8	1	16 Bit Integer (unsigned)	Info.MachineStudio.LAN1.ConnectedClients	Number of connected AMS Machine Studios Range: 0 to 3
9	1		not used	Reserve
10	1		not used	Reserve
11	1	Bool, Bit 0	Info.OpcUa.LAN1.Enabled	0: Not active 1: Active
		Bool, Bit 1	Info.OpcUa.LAN1.Connected	0: Not connected 1: Connected

Table B-24: Structure of group "A6500-CP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
12	1	16 Bit Integer (unsigned)	Info.OpcUa.LAN1.ConnectedClients	Number of OPC UA clients connected to LAN 1 Range: 0 to 5
13	1	Bool, Bit 0	Info.Modbus.TCP.LAN1.Enabled	0: Not active 1: Active
		Bool, Bit 1	Info.Modbus.TCP.LAN1.Connected	0: Not connected 1: Connected
14	1	16 Bit Integer (unsigned)	Info.Modbus.TCP.LAN1.ConnectedClients	Number of Modbus clients connected to LAN 1 Range: 0 to 5
15	1	Bool, Bit 0	Info.Modbus.RTU.Enabled	0: Not active 1: Active
		Bool, Bit 1	Info.Modbus.RTU.Connected	0: Not connected 1: Connected
16	1	16 Bit Integer (unsigned)	Info.Modbus.RTU.ConnectedClients	Number of connected serial Modbus clients Range: 0 to 1
17	1	Bool, Bit 0	Info.LAN1.AutoDiscoveryEnabled	0: Not active 1: Active
18	1	Bool, Bit 0	Info.LicenseState	Licensing ATG Prediction Extension 0: No license 1: License
19	1	Bool, Bit 0	Info.SNTP.LAN1.Enabled	0: Not active 1: Active
20	1	16 Bit Integer (unsigned)	Info.SNTP.LAN1.SNTPUpdateTime.Year	Year of the latest SNTP update
21	1	16 Bit Integer (unsigned)	Info.SNTP.LAN1.SNTPUpdateTime.Month	Month of the latest SNTP update
22	1	16 Bit Integer (unsigned)	Info.SNTP.LAN1.SNTPUpdateTime.Day	Day of the latest SNTP update
23	1	16 Bit Integer (unsigned)	Info.SNTP.LAN1.SNTPUpdateTime.Hour	Hour of the latest SNTP update

Table B-24: Structure of group "A6500-CP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
24	1	16 Bit Integer (unsigned)	Info.SNTP.LAN1.SNTPUpdateTime.Minute	Minute of the latest SNTP update
25	1	16 Bit Integer (unsigned)	Info.SNTP.LAN1.SNTPUpdateTime.Second	Second of the latest SNTP update
26	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Major	AMS Machine Studio version used to configure the card – Major part of the version number **X**.xx.xx Revision xxxx
27	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Minor	AMS Machine Studio version used to configure the card – Minor part of the version number x.**XX**.xx Revision xxxx
28	1	16 Bit Integer (unsigned)	Info.ConfigurationVersion.Build	AMS Machine Studio version used to configure the card – Build part of the version number x.xx.**XX** Revision xxxx
29	1		not used	Reserve
30	1	Bool, Bit 0	Info.Modbus.SwapHoldingRegisterRanges	0: Swap is disabled 1: Swap is enabled
31	1	16 Bit Integer (unsigned)	Info.Modbus.StructVersMajor	Version of the used Modbus structure definition – Major part (8 Bit Integer (unsigned))
			Info.Modbus.StructVersMinor	Version of the used Modbus structure definition – Minor part (8 Bit Integer (unsigned))
32	1	Bool, Bit 0	Info.KeySwitchState	0: Locked 1: Unlocked
		Bool, Bit 1	Info.SystemProgramState	0: System programming disabled 1: System programming enabled
33	1	Bool, Bit 0	Info.DataDiodeEnabled	0: Not active 1: Active
34	1	Bool, Bit 0	Info.AuditLog.Syslog.LAN1.Enabled	0: Not active 1: Active

Table B-24: Structure of group "A6500-CP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	Info.AuditLog.Syslog.LAN1.ConnectionOK	0: Not OK 1: OK
		Bool, Bit 2	Info.AuditLog.Storage.Enabled	0: Not active 1: Active
		Bool, Bit 3	Info.AuditLog.Storage.OK	0: Not OK 1: OK
35	2	Float	Info.SupplyVoltage.Value	Supply voltage Unit: V
37	1	Bool, Bit 0	Info.SupplyVoltage.Warning	0: OK 1: Warning
38	1	16 Bit Integer (unsigned)	Info.CPU2.CPULoad	Load of the second internal CPU Unit: % Range: 0 to 100
39	1	16 Bit Integer (unsigned)	Info.CPU2.MemoryUsage	Usage of the internal memory assigned to CPU 2 Unit: % Range: 0 to 100
40	1	Bool, Bit 0	Info.OpcUa.LAN2.Enabled	0: Not active 1: Active
		Bool, Bit 1	Info.OpcUa.LAN2.Connected	0: Not connected 1: Connected
41	1	16 Bit Integer (unsigned)	Info.OpcUa.LAN2.ConnectedClients	Number of OPC UA clients connected to LAN 2 Range: 0 to 5
42	1	Bool, Bit 0	Info.Modbus.TCP.LAN2.Enabled	0: Not active 1: Active
		Bool, Bit 1	Info.Modbus.TCP.LAN2.Connected	0: Not connected 1: Connected
43		16 Bit Integer (unsigned)	Info.Modbus.TCP.LAN2.ConnectedClients	Number of Modbus TCP clients connected to LAN 2 Range: 0 to 5
44 to 49			not used	Reserve

Structure of the group "Speed Measurement"

The 90 registers of the group "Speed Measurement" are occupied as shown in Table B-25.

Table B-25: Structure of group "Speed Measurement"

Register		Type	Name	Description
0	2	Float	Channel1.Speed	Speed value channel 1 Unit: RPM
2	2	Float	Channel1.SpeedMin	Minimum speed value channel 1 Unit: RPM
4	2	Float	Channel1.SpeedMax	Maximum speed value channel 1 Unit: RPM
6	2	Float	Channel1.SpeedDiff	Difference speed channel 1 Unit: RPM
8	2	Float	Channel1.Acceleration	Acceleration value channel 1 Unit: RPM/s
10	2	Float	Channel1.SensorVoltageMin	Minimum sensor voltage channel 1 Unit: V
12	2	Float	Channel1.SensorVoltageMax	Maximum sensor voltage channel 1 Unit: V
14	2	Float	Channel1.TriggerLevelMin	Minimum trigger level channel 1 Unit: V
16	2	Float	Channel1.TriggerLevelMax	Maximum trigger level channel 1 Unit: V
18	2	Float	Channel1.CurrentTeeth	Number of currently detected teeth channel 1
20	2	Float	Channel1.SpeedRangeMax	Maximum speed range channel 1 Unit: RPM
22	1	Bool, Bit 0	Channel1.Overflow	0: No overflow ≠0: Overflow
		Bool, Bit 1	Channel1.Standstill	0: No standstill ≠0: Standstill
		Bool, Bit 2	Channel1.SensorError	0: No sensor error ≠0: Sensor error

Table B-25: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
		Bool, Bit 3	Channel1.GapWarning	0: No gap warning ≠0: Gap warning
		Bool, Bit 4	Channel1.RotDirection	Rotational direction 0: Normal direction ≠0: Inverse direction
		Bool, Bit 5	Channel1.ChannelOK	Channel 1 OK 0: Not OK ≠0: OK
23	2	Float	Channel2.Speed	Speed value channel 2 Unit: RPM
25	2	Float	Channel2.SpeedMin	Minimum speed value channel 2 Unit: RPM
27	2	Float	Channel2.SpeedMax	Maximum speed value channel 2 Unit: RPM
29	2	Float	Channel2.SpeedDiff	Difference speed channel 2 Unit: RPM
31	2	Float	Channel2.Acceleration	Acceleration value channel 2 Unit: RPM/s
33	2	Float	Channel2.SensorVoltageMin	Minimum sensor voltage channel 2 Unit: V
35	2	Float	Channel2.SensorVoltageMax	Maximum sensor voltage channel 2 Unit: V
37	2	Float	Channel2.TriggerLevelMin	Minimum trigger level channel 2 Unit: V
39	2	Float	Channel2.TriggerLevelMax	Maximum trigger level channel 2 Unit: V
41	2	Float	Channel2.CurrentTeeth	Number of currently detected teeth channel 2
43	2	Float	Channel2.SpeedRangeMax	Maximum speed range channel 2 Unit: RPM
45	1	Bool, Bit 0	Channel2.Overflow	0: No overflow ≠0: Overflow

Table B-25: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
		Bool, Bit 1	Channel2.Standstill	0: No standstill ≠0: Standstill
		Bool, Bit 2	Channel2.SensorError	0: No sensor error ≠0: Sensor error
		Bool, Bit 3	Channel2.GapWarning	0: No gap warning ≠0: Gap warning
		Bool, Bit 4	Channel2.RotDirection	Rotational direction 0: Normal direction ≠0: Inverse direction
		Bool, Bit 5	Channel2.ChannelOK	Channel 2 OK 0: Not OK ≠0: OK
46	1	16 Bit Integer (unsigned)	Alarm1.DataSource	Alarm source: 0: Disabled 1: Channel 1 speed 2: Channel 1 acceleration 3: Channel 1 standstill 4: Channel 1 gap warning 5: Channel 2 speed 6: Channel 2 acceleration 7: Channel 2 standstill 8: Channel 2 gap warning 9: Speed difference Channel 1/2 10: Redundancy rotational direction Channel 1/2 11: Redundancy speed 12: Redundancy acceleration 13: Redundancy standstill 14: Redundancy gap warning 15: Channel 1: Rotational direction 16: Channel 2: Rotational direction

Table B-25: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
47	1	16 Bit Integer (unsigned)	Alarm1.Function	Alarm function: 0: Disabled 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window inside 6: Window inside (Latch) 7: <= Limit and No standstill 8: Normal 9: Invert 10: Window outside 11: Window outside (Latch)
48	2	Float	Alarm1.Limit	Defined alarm 1 limit
50	2	Float	Alarm1.Hysteresis	Defined alarm 1 hysteresis
52	1	Bool	Alarm1.State	0: No alarm ≠0: Alarm

Table B-25: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
53	1	16 Bit Integer (unsigned)	Alarm2.DataSource	Alarm source: 0: Disabled 1: Channel 1 speed 2: Channel 1 acceleration 3: Channel 1 standstill 4: Channel 1 gap warning 5: Channel 2 speed 6: Channel 2 acceleration 7: Channel 2 standstill 8: Channel 2 gap warning 9: Speed difference Channel 1/2 10: Redundancy rotational direction Channel 1/2 11: Redundancy speed 12: Redundancy acceleration 13: Redundancy standstill 14: Redundancy gap warning 15: Channel 1: Rotational direction 16: Channel 2: Rotational direction
54	1	16 Bit Integer (unsigned)	Alarm2.Function	Alarm function: 0: Disabled 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window inside 6: Window inside (Latch) 7: <= Limit and No standstill 8: Normal 9: Invert 10: Window outside 11: Window outside (Latch)
55	2	Float	Alarm2.Limit	Defined alarm 2 limit

Table B-25: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
57	2	Float	Alarm2.Hysteresis	Defined alarm 2 hysteresis
59	1	Bool	Alarm2.State	0: No alarm ≠0: Alarm
60	1	16 Bit Integer (unsigned)	Alarm4.DataSource	Alarm source: 0: Disabled 1: Channel 1 speed 2: Channel 1 acceleration 3: Channel 1 standstill 4: Channel 1 gap warning 5: Channel 2 speed 6: Channel 2 acceleration 7: Channel 2 standstill 8: Channel 2 gap warning 9: Speed difference Channel 1/2 10: Redundancy rotational direction Channel 1/2 11: Redundancy speed 12: Redundancy acceleration 13: Redundancy standstill 14: Redundancy gap warning 15: Channel 1: Rotational direction 16: Channel 2: Rotational direction
61	1	16 Bit Integer (unsigned)	Alarm4.Function	Alarm function: 0: Disabled 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 7: <= Limit and No standstill 8: Normal 9: Invert 10: Window outside 11: Window outside (Latch)

Table B-25: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
62	2	Float	Alarm4.Limit	Defined alarm 3 limit
64	2	Float	Alarm4.Hysteresis	Defined alarm 3 hysteresis
66	1	Bool	Alarm4.State	0: No alarm ≠0: Alarm
67	1	16 Bit Integer (unsigned)	Alarm5.DataSource	Alarm source: 0: Disabled 1: Channel 1 speed 2: Channel 1 acceleration 3: Channel 1 standstill 4: Channel 1 gap warning 5: Channel 2 speed 6: Channel 2 acceleration 7: Channel 2 standstill 8: Channel 2 gap warning 9: Speed difference Channel 1/2 10: Redundancy rotational direction Channel 1/2 11: Redundancy speed 12: Redundancy acceleration 13: Redundancy standstill 14: Redundancy gap warning 15: Channel 1: Rotational direction 16: Channel 2: Rotational direction

Table B-25: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
68	1	16 Bit Integer (unsigned)	Alarm5.Function	Alarm function: 0: Disabled 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 7: <= Limit and No standstill 8: Normal 9: Invert 10: Window outside 11: Window outside (Latch)
69	2	Float	Alarm5.Limit	Defined alarm 4 limit
71	2	Float	Alarm5.Hysteresis	Defined alarm 4 hysteresis
73	1	Bool	Alarm5.State	0: No alarm ≠0: Alarm
74	2	Float	Alarm1.Limit2	Alarm 1: defined second limit for alarm window
76	2	Float	Alarm2.Limit2	Alarm 2: defined second limit for alarm window
78	2	Float	Alarm4.Limit2	Alarm 4: defined second limit for alarm window
80	2	Float	Alarm5.Limit2	Alarm 5: defined second limit for alarm window
81 to 89	1		not used	Reserve

Structure of the group "Combined channels – dynamic – Measurement"

The 40 registers of the group "Combined channels – dynamic – Measurement" – are occupied as shown in Table B-26.

Table B-26: Structure of group "Combined channels – dynamic – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	ChannelCombined.ChannelOK	Channel Combined OK 0: Not OK ≠0: OK

Table B-26: Structure of group "Combined channels – dynamic – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	Channel1.ChannelOK	Channel 1 OK 0: Not OK ≠0: OK
		Bool, Bit 2	Channel2.ChannelOK	Channel 2 OK 0: Not OK ≠0: OK
1	2	Float	ChannelCombined.Value	Measurement value
3	2	Float	Channel1.VoltageDC	DC voltage of channel 1 (Gap voltage) Unit: V
5	2	Float	Channel1.Value0P	0-to-Peak value of channel 1
7	2	Float	Channel2.VoltageDC	DC voltage of channel 2 (Gap voltage) Unit: V
9	2	Float	Channel2.Value0P	0-to-Peak value of channel 2
11	2	Float	ChannelCombined.RotationSpeed	Unit: RPM
13	1	Bool, Bit 0	ChannelCombined.Alarm1.AlertState	State of the alert alarm channel 1 ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm1.DangerState	State of the danger alarm channel 1 ≠0: active 0: not active
14	1	Bool, Bit 0	ChannelCombined.Alarm2.AlertState	State of the alert alarm channel 2 ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm2.DangerState	State of the danger alarm channel 2 ≠0: active 0: not active
15	2	Float	ChannelCombined.ValueRangeMin	Combined value minimum measuring range

Table B-26: Structure of group "Combined channels – dynamic – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
17	2	Float	ChannelCombined.ValueRangeMax	Combined value maximum measuring range
19	2	Float	Channel1.ValueRangeMin	Channel 1 minimum value measuring range
21	2	Float	Channel1.ValueRangeMax	Channel 1 maximum value measuring range
23	2	Float	Channel2.ValueRangeMin	Channel 2 minimum value measuring range
25	2	Float	Channel2.ValueRangeMax	Channel 2 maximum value measuring range
27	2	Float	ChannelCombined.Alarm1.DangerLimit	Limit value danger alarm 1
29	2	Float	ChannelCombined.Alarm1.AlertLimit	Limit value alert alarm 1
31	2	Float	ChannelCombined.Alarm2.DangerLimit	Limit value danger alarm 2
33	2	Float	ChannelCombined.Alarm2.AlertLimit	Limit value alert alarm 2
35	1	16 Bit Integer (unsigned)	ChannelCombined.Evaluation	3: Relative shaft vibration Smax 4: Relative shaft vibration SmaxPP 8: Absolute bearing vibration - velocity Smax 9: Absolute bearing vibration - velocity SmaxPP 13: Absolute bearing vibration - acceleration Smax 14: Absolute bearing vibration - acceleration SmaxPP 54: Voltage input - Smax 55: Voltage input - SmaxPP 56: Absolute shaft vibration Peak-to-Peak 57: Absolute shaft vibration RMS

Table B-26: Structure of group "Combined channels – dynamic – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
36	1	Bool, Bit 0	ChannelCombined.Alarm1.AlarmEnabled	State of limit supervision for combined channels – dynamic – measurement ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm2.AlarmEnabled	
37			not used	Reserve
38			not used	Reserve
39			not used	Reserve

Structure of the group "Combined channels – static – Measurement"

The 50 registers of the group "Combined channels – static – Measurement" are occupied as shown in Table B-27.

Table B-27: Structure of group "Combined channels – static – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	ChannelCombined.ChannelOK	Channel Combined OK 0: Not OK ≠0: OK
		Bool, Bit 1	Channel1.ChannelOK	Channel 1 OK 0: Not OK ≠0: OK
		Bool, Bit 2	Channel2.ChannelOK	Channel 2 OK 0: Not OK ≠0: OK
1	2	Float	ChannelCombined.Value	Measurement value
3	2	Float	Channel1.VoltageDC	DC voltage of channel 1 (Gap voltage) Unit: V
5	2	Float	Channel2.VoltageDC	DC voltage of channel 2 (Gap voltage) Unit: V
7	2	Float	ChannelCombined.RotationSpeed	Unit: RPM
9	1	Bool, Bit 0	ChannelCombined.Alarm1.PosAlertState	Upper state of the alert alarm channel 1[1] ≠0: active 0: not active

Table B-27: Structure of group "Combined channels – static – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	ChannelCombined.Alarm1.PosDangerState	Upper state of the danger alarm channel 1[1] ≠0: active 0: not active
10	1	Bool, Bit 0	ChannelCombined.Alarm1.NegAlertState	Lower state of the alert alarm channel 1[1] ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm1.NegDangerState	Lower state of the danger alarm channel 1[1] ≠0: active 0: not active
11	1	Bool, Bit 0	ChannelCombined.Alarm2.PosAlertState	Upper state of the alert alarm channel 2[1] ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm2.PosDangerState	Upper state of the danger alarm channel 2 ≠0: active 0: not active
12	1	Bool, Bit 0	ChannelCombined.Alarm2.NegAlertState	Lower state of the alert alarm channel 2 [1] ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm2.NegDangerState	Lower state of the danger alarm channel 2[1] ≠0: active 0: not active
13	2	Float	ChannelCombined.ValueRangeMin	Combined value minimum measuring range
15	2	Float	ChannelCombined.ValueRangeMax	Combined value maximum measuring range
17	2	Float	ChannelCombined.Alarm1.PosDangerLimit	Upper limit value danger alarm 1 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.

Table B-27: Structure of group "Combined channels – static – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
19	2	Float	ChannelCombined.Alarm1.PosAlertLimit	Upper limit value alert alarm 1 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
21	2	Float	ChannelCombined.Alarm1.NegDangerLimit	Lower limit value danger alarm 1 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
23	2	Float	ChannelCombined.Alarm1.NegAlertLimit	Lower limit value alert alarm 1 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
25	2	Float	ChannelCombined.Alarm2.PosDangerLimit	Upper limit value danger alarm 2 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
27	2	Float	ChannelCombined.Alarm2.PosAlertLimit	Upper limit value alert alarm 2 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
29	2	Float	ChannelCombined.Alarm2.NegDangerLimit	Lower limit value danger alarm 2 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
31	2	Float	ChannelCombined.Alarm2.NegAlertLimit	Lower limit value alert alarm 2 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.

Table B-27: Structure of group "Combined channels – static – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
33	1	16 Bit Integer (unsigned)	ChannelCombined.Evaluation	19: Relative shaft position - Minimum 20: Relative shaft position - Maximum 21: Relative shaft position - Tandem 22: Relative shaft position - Cone 1 23: Relative shaft position - Cone 2 24: Relative shaft position - Double Cone 1 25: Relative shaft position - Double Cone 2 26: Absolute housing expansion - Addition 27: Absolute housing expansion - Subtraction 28: Absolute shaft position 49: Tandem II
34	1	Bool, Bit 0	ChannelCombined.Alarm1.AlarmEnabled	State of limit supervision for combined channels – static – measurement ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm2.AlarmEnabled	
35	2	Float	ChannelCombined.Value2	Max value of application Tandem/Cone "Min/Max"
37 to 49	1		not used	Reserve

1 *When the alarm is deactivated using the **Limit function** parameter, the register is permanently set to **0** (not active).*
2 *Not a Number*

Structure of the group "Combined channels – Cylinder pressure"

The 65 registers of the group "Combined channels – Cylinder pressure" are occupied as shown in Table B-28.

Table B-28: Structure of the group "Combined channels – Cylinder pressure"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	ChannelCombined.ChannelOK	Channel Combined OK 0: Not OK ≠0: OK
		Bool, Bit 1	Channel1.ChannelOK	Channel 1 OK 0: Not OK ≠0: OK
		Bool, Bit 2	Channel2.ChannelOK	Channel 2 OK 0: Not OK ≠0: OK
1	2	Float	ChannelCombined.Speed	Speed value Unit: RPM
3	2	Float	ChannelCombined.Chamber1.DischargePressure	Measurement value Unit: kPa
5	2	Float	ChannelCombined.Chamber2.DischargePressure	Measurement value Unit: kPa
7	2	Float	ChannelCombined.Chamber1.SuctionPressure	Measurement value Unit: kPa
9	2	Float	ChannelCombined.Chamber2.SuctionPressure	Measurement value Unit: kPa
11	2	Float	ChannelCombined.Chamber1.MaximumPressure	Measurement value Unit: kPa
13	2	Float	ChannelCombined.Chamber2.MaximumPressure	Measurement value Unit: kPa
15	2	Float	ChannelCombined.Chamber1.MaximumPressureAngle	Measurement value Unit: °
17	2	Float	ChannelCombined.Chamber2.MaximumPressureAngle	Measurement value Unit: °
19	2	Float	ChannelCombined.Chamber1.MinimumPressure	Measurement value Unit: kPa
21	2	Float	ChannelCombined.Chamber2.MinimumPressure	Measurement value Unit: kPa
23	2	Float	ChannelCombined.Chamber1.MinimumPressureAngle	Measurement value Unit: °
25	2	Float	ChannelCombined.Chamber2.MinimumPressureAngle	Measurement value Unit: °
27	2	Float	ChannelCombined.Chamber1.CompressionRatio	Measurement value
29	2	Float	ChannelCombined.Chamber2.CompressionRatio	Measurement value

Table B-28: Structure of the group "Combined channels – Cylinder pressure" *(continued)*

Register	Length (number of registers)	Type	Name	Description
31	2	Float	ChannelCombined.PeakRodCompression	Measurement value Unit: kN
33	2	Float	ChannelCombined.PeakRodCompressionAngle	Measurement value Unit: °
35	2	Float	ChannelCombined.PeakRodTension	Measurement value Unit: kN
37	2	Float	ChannelCombined.PeakRodTensionAngle	Measurement value Unit: °
39	2	Float	ChannelCombined.DegreesOfRodReversal	Measurement value 0 to 180°
41	1	Bool, Bit 0	ChannelCombined.Alarm1.PosAlertState	Upper state of the alert alarm 1[1] ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm1.PosDangerState	Upper state of the danger alarm 1[1] ≠0: active 0: not active
42	1	Bool, Bit 0	ChannelCombined.Alarm1.NegAlertState	Lower state of the alert alarm 1[1] ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm1.NegDangerState	Lower state of the danger alarm 1[1] ≠0: active 0: not active
43	1	Bool, Bit 0	ChannelCombined.Alarm2.PosAlertState	Upper state of the alert alarm 2[1] ≠0: active 0: not active
		Bool, Bit 1	ChannelCombined.Alarm2.PosDangerState	Upper state of the danger alarm 2[1] ≠0: active 0: not active
44	1	Bool, Bit 0	ChannelCombined.Alarm2.NegAlertState	Lower state of the alert alarm 2[1] ≠0: active 0: not active

Table B-28: Structure of the group "Combined channels – Cylinder pressure" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	ChannelCombined.Alarm2.NegDangerState	Lower state of the danger alarm 2[1] ≠0: active 0: not active
45	2	Float	ChannelCombined.MeasuringRange	Measuring range
47	2	Float	ChannelCombined.Alarm1.PosDangerLimit	Upper limit value danger alarm 1 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
49	2	Float	ChannelCombined.Alarm1.PosAlertLimit	Upper limit value alert alarm 1 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
51	2	Float	ChannelCombined.Alarm1.NegDangerLimit	Lower limit value danger alarm 1 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
53	2	Float	ChannelCombined.Alarm1.NegAlertLimit	Lower limit value alert alarm 1 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
55	2	Float	ChannelCombined.Alarm2.PosDangerLimit	Upper limit value danger alarm 2 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
57	2	Float	ChannelCombined.Alarm2.PosAlertLimit	Upper limit value alert alarm 2 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.

Table B-28: Structure of the group "Combined channels – Cylinder pressure" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
59	2	Float	ChannelCombined.Alarm2.NegDangerLimit	Lower limit value danger alarm 2 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
61	2	Float	ChannelCombined.Alarm2.NegAlertLimit	Lower limit value alert alarm 2 Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
63	1	16 Bit Integer (unsigned)	ChannelCombined.Evaluation	36: Discharge pressure chamber 1 37: Suction pressure chamber 1 38: Maximum pressure chamber 1 39: Minimum pressure chamber 1 40: Compression ratio chamber 1 41: Discharge pressure chamber 2 42: Suction pressure chamber 2 43:Maximum pressure chamber 2 44: Minimum pressure chamber 2 45: Compression ratio chamber 2 46: Peak rod compression 47: Peak rod tension 48: Degree of rod reversal
64	1	Bool, Bit 0	ChannelCombined.Alarm1.AlarmEnabled	Alarm limits 1 ≠0: enabled 0: not enabled
		Bool, Bit 1	ChannelCombined.Alarm2.AlarmEnabled	Alarm limits 2 ≠0: enabled 0: not enabled

Table B-28: Structure of the group "Combined channels – Cylinder pressure" *(continued)*

Register	Length (number of registers)	Type	Name	Description
65	1	Bool, Bit 0	ChannelCombined.MeasureResultValid	Measured result ≠0: Not valid 0: Valid
66	1	8 Bit Integer (unsigned)	ChannelCombined.ChamberInput1	Chamber number assigned to input 1
		8 Bit Integer (unsigned)	ChannelCombined.ChamberInput2	Chamber number assigned to input 2

*1 When the alarm is deactivated using the **Limit function** parameter, the register is permanently set to **0** (not active).*

Structure of the group "Single channel – dynamic – Measurement"

The 20 registers of the group "Single channel – dynamic – Measurement" are occupied as shown in Table B-29.

x: place holder for channel number (1 or 2)

Table B-29: Structure of group "Single channel – dynamic – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool	Channelx.ChannelOK	ChannelOK 0: Not OK ≠0: OK
1	2	Float	Channelx.Value	Measurement value
3	2	Float	Channelx.RotationSpeed	Unit: RPM
5	2	Float	Channelx.VoltageDC	DC voltage (Gap voltage) Unit: V
7	1	Bool, Bit 0	Channelx.Alarm.AlertState	State of the alert alarm ≠0: active 0: not active
		Bool, Bit 1	Channelx.Alarm.DangerState	State of the danger alarm ≠0: active 0: not active
8	2	Float	Channelx.ValueRangeMin	Value minimum measuring range
10	2	Float	Channelx.ValueRangeMax	Value maximum measuring range

Table B-29: Structure of group "Single channel – dynamic – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
12	2	Float	Channelx.Alarm.DangerLimit	Limit value danger alarm
14	2	Float	Channelx.Alarm.AlertLimit	Limit value alert alarm
16	1	16 Bit Integer (unsigned)	Channelx.Evaluation	0: Relative shaft vibration - Peak-to-Peak 1: Relative shaft vibration - 0-to-Peak 2: Relative shaft vibration - RMS 5: Absolute bearing vibration - Velocity Peak-to-Peak 6: Absolute bearing vibration - Velocity 0-to-Peak 7: Absolute bearing vibration - Velocity RMS 10: Absolute bearing vibration - Acceleration Peak-to-Peak 11: Absolute bearing vibration - Acceleration 0-to-Peak 12: Absolute bearing vibration - Acceleration RMS 30: Vibration (low freq.)/w Order analysis 0-to-peak 31: Vibration (low freq.)/w Order analysis peak-to-peak 32: Vibration (low freq.)/w Order analysis RMS 33: Dynamic pressure 0-to-peak 34: Dynamic pressure peak-to-peak 35: Dynamic pressure RMS 51: Voltage input 0-to-peak 52: Voltage input peak-to-peak 53: Voltage input RMS

Table B-29: Structure of group "Single channel – dynamic – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
17	1	Bool, Bit 0	Channelx.Alarm.AlarmEnabled	State of limit supervision for combined channels – dynamic – measurement ≠0: active 0: not active
18 to 19	1		not used	Reserve

Structure of the group "Single channel - static - Measurement"

The 20 registers of the group "Single channel - static - Measurement" are occupied as shown in Table B-30.

x: place holder for channel number (1 or 2)

Table B-30: Structure of group "Single channel - static - Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool	Channelx.ChannelOK	Channel OK 0: Not OK ≠0: OK
1	2	Float	Channelx.Value	Measurement value
3	2	Float	Channelx.VoltageDC	DC voltage of (Gap voltage) Unit: V
5	1	Bool, Bit 0	Channelx.Alarm.PosAlertState	Upper state of the alert alarm[1] ≠0: active 0: not active
		Bool, Bit 1	Channelx.Alarm.PosDangerState	Upper state of the danger alarm[1] ≠0: active 0: not active
		Bool, Bit 2	Channelx.Alarm.AlarmEnabled	State of limit supervision for single channel – static – measurement ≠0: active 0: not active

Table B-30: Structure of group "Single channel - static - Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
6	1	Bool, Bit 0	Channelx.Alarm.NegAlertState	Lower state of the alert alarm[1] ≠0: active 0: not active
		Bool, Bit 1	Channelx.Alarm.NegDangerState	Lower state of the danger alarm[1] ≠0: active 0: not active
		Bool, Bit 2	Channelx.Alarm.AlarmEnabled	State of limit supervision for single channel – static – measurement ≠0: active 0: not active
7	2	Float	Channelx.ValueRangeMin	Value minimum measuring range
9	2	Float	Channelx.ValueRangeMax	Value maximum measuring range
11	2	Float	Channelx.Alarm.PosDangerLimit	Upper limit value danger alarm Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
13	2	Float	Channelx.Alarm.PosAlertLimit	Upper limit value alert alarm Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
15	2	Float	Channelx.Alarm.NegDangerLimit	Lower limit value danger alarm Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
17	2	Float	Channelx.Alarm.NegAlertLimit	Lower limit value alert alarm Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.

Table B-30: Structure of group "Single channel - static - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
19	1	16 Bit Integer (unsigned)	Channelx.Evaluation	16: Distance 17: Rod Drop Average Mode 18: Rod Gap 29: Rod Drop Triggered Mode 50: Voltage input - static value

*1 When the alarm is deactivated using the **Limit function** parameter, the register is permanently set to **0** (not active).*

Structure of group "Single channel – eccentricity – Measurement"

The 20 registers of the group "Single channel – eccentricity – Measurement" are occupied as shown in Table B-31.

x: place holder for channel number (1 or 2)

Table B-31: Structure of group "Single channel – eccentricity – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool	Channelx.ChannelOK	Channel OK 0: Not OK ≠0: OK
1	2	Float	Channelx.Value	Measurement value
3	2	Float	Channelx.RotationSpeed	Unit: RPM
5	2	Float	Channelx.VoltageDC	DC voltage of (Gap voltage) Unit: V
7	1	Bool, Bit 0	Channelx.Alarm.AlertState	State of the alert alarm ≠0: active 0: not active
		Bool, Bit 1	Channelx.Alarm.DangerState	State of the danger alarm ≠0: active 0: not active
8	2	Float	Channelx.ValueRangeMin	Value minimum measuring range
10	2	Float	Channelx.ValueRangeMax	Value maximum measuring range

Table B-31: Structure of group "Single channel – eccentricity – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
12	2	Float	Channelx.Alarm.DangerLimit	Limit value danger alarm
14	2	Float	Channelx.Alarm.AlertLimit	Limit value alert alarm
16	1	16 Bit Integer (unsigned)	Channelx.Evaluation	0: Peak-to-Peak 19: Minimum 20: Maximum
17	1	Bool, Bit 0	Channelx.Alarm.AlarmEnabled	State of limit supervision for single channel – eccentricity – measurement ≠0: active 0: not active
18	1	Bool, Bit 0	Channelx.OutOfSpeedRange	State of the speed 0: In range 1: Out of range
19	1		not used	Reserve

Structure of group "Single channel – Cylinder pressure – Measurement"

The 41 registers of the group "Single channel – Cylinder pressure" are occupied as shown in Table B-28.

x: place holder for channel number (1 or 2)

Table B-32: Structure of the group "Single channel – Cylinder pressure"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	Channelx.ChannelOK	Channel OK 0: Not OK ≠0: OK
1	2	Float	Channelx.Speed	Speed value Unit: RPM
3	2	Float	Channelx.DischargePressure	Measurement value Unit: kPa
5	2	Float	Channelx.SuctionPressure	Measurement value Unit: kPa
7	2	Float	Channelx.MaximumPressure	Measurement value Unit: kPa
9	2	Float	Channelx.MaximumPressureAngle	Measurement value Unit: °

Table B-32: Structure of the group "Single channel – Cylinder pressure" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
11	2	Float	Channelx.MinimumPressure	Measurement value Unit: kPa
13	2	Float	Channelx.MinimumPressureAngle	Measurement value Unit: °
15	2	Float	Channelx.CompressionRatio	Measurement value
17	2	Float	Channelx.PeakRodCompression	Measurement value Unit: kN
19	2	Float	Channelx.PeakRodCompressionAngle	Measurement value Unit: °
21	2	Float	Channelx.PeakRodTension	Measurement value Unit: kN
23	2	Float	Channelx.PeakRodTensionAngle	Measurement value Unit: °
25	2	Float	Channelx.DegreesOfRodReversal	Measurement value 0 to 180°
27	1	Bool, Bit 0	Channelx.Alarm.PosAlertState	Upper state of the alert alarm ≠0: active 0: not active
		Bool, Bit 1	Channelx.Alarm.PosDangerState	Upper state of the danger alarm ≠0: active 0: not active
28	1	Bool, Bit 0	Channelx.Alarm.NegAlertState	Lower state of the alert alarm ≠0: active 0: not active
		Bool, Bit 1	Channelx.Alarm.NegDangerState	Lower state of the danger alarm ≠0: active 0: not active
29	2	Float	Channelx.Alarm.PosDangerLimit	Upper limit value danger alarm Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.

Table B-32: Structure of the group "Single channel – Cylinder pressure" *(continued)*

Register	Length (number of registers)	Type	Name	Description
31	2	Float	Channelx.Alarm.PosAlertLimit	Upper limit value alert alarm Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
33	2	Float	Channelx.Alarm.NegDangerLimit	Lower limit value danger alarm Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
35	2	Float	Channelx.Alarm.NegAlertLimit	Lower limit value alert alarm Returns "NaN[2]" if the alarm is deactivated with the **Limit function** parameter.
37	2	Float	Channelx.MeasuringRange	Measuring range
39	1	16 Bit Integer (unsigned)	Channelx.Evaluation	36: Discharge pressure chamber 1 37: Suction pressure chamber 1 38: Maximum pressure chamber 1 39: Minimum pressure chamber 1 40: Compression ratio chamber 1 41: Discharge pressure chamber 2 42: Suction pressure chamber 2 43:Maximum pressure chamber 2 44: Minimum pressure chamber 2 45: Compression ratio chamber 2 46: Peak rod compression 47: Peak rod tension 48: Degree of rod reversal

Table B-32: Structure of the group "Single channel – Cylinder pressure" *(continued)*

Register	Length (number of registers)	Type	Name	Description
40	1	Bool, Bit 0	Channelx.Alarm.AlarmEnabled	Alarm limits ≠0: enabled 0: not enabled
41	1	Bool, Bit 0	Channelx.MeasureResultValid	Measured result ≠0: Not valid 0: Valid

Structure of group "Order analysis – Measurement"

The 100 registers of the group "Order analysis - Measurement" are occupied as shown in Table B-33.

x: place holder for channel number (1 or 2)

Table B-33: Structure of group "Order analysis – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Channelx.Analysis.Order.Na.Phase	Phase harmonic Na
2	2	Float	Channelx.Analysis.Order.Na.Peak	Amplitude harmonic Na
4	2	Float	Channelx.Analysis.Order.Nb.Phase	Phase harmonic Nb
6	2	Float	Channelx.Analysis.Order.Nb.Peak	Amplitude harmonic Nb
8	2	Float	Channelx.Analysis.Order.Nc.Phase	Phase harmonic Nc
10	2	Float	Channelx.Analysis.Order.Nc.Peak	Amplitude harmonic Nc
12	2	Float	Channelx.Analysis.Order.Nd.Phase	Phase harmonic Nd
14	2	Float	Channelx.Analysis.Order.Nd.Peak	Amplitude harmonic Nd
16	2	Float	Channelx.Analysis.Order.Ne.Phase	Phase harmonic Ne
18	2	Float	Channelx.Analysis.Order.Ne.Peak	Amplitude harmonic Ne
20	2	Float	Channelx.Analysis.Order.Na.PhaseDif	Difference phase harmonic Na
22	2	Float	Channelx.Analysis.Order.Na.PeakDif	Difference peak harmonic Na
24	2	Float	Channelx.Analysis.Order.Nb.PhaseDif	Difference phase harmonic Nb
26	2	Float	Channelx.Analysis.Order.Nb.PeakDif	Difference peak harmonic Nb
28	2	Float	Channelx.Analysis.Order.Nc.PhaseDif	Difference phase harmonic Nc

Table B-33: Structure of group "Order analysis – Measurement" ***(continued)***

30	2	Float	Channelx.Analysis.Order.Nc.PeakDif	Difference peak harmonic Nc
32	2	Float	Channelx.Analysis.Order.Nd.PhaseDif	Difference phase harmonic Nd
34	2	Float	Channelx.Analysis.Order.Nd.PeakDif	Difference peak harmonic Nd
36	2	Float	Channelx.Analysis.Order.Ne.PhaseDif	Difference phase harmonic Ne
38	2	Float	Channelx.Analysis.Order.Ne.PeakDif	Difference peak harmonic Ne
40	1	Bool, Bit 0	Channelx.Analysis.Order.Alarm1.PeakAlertState	State peak alert alarm of the selected harmonic Nx [1] ≠0: active 0: not active
		Bool, Bit 1	Channelx.Analysis.Order.Alarm1.PhaseAlertState	State phase alert alarm of the selected harmonic Nx [1] ≠0: active 0: not active
		Bool, Bit 2	Channelx.Analysis.Order.Alarm1.PeakDangerState	State peak danger alarm of the selected harmonic Nx [1] ≠0: active 0: not active
		Bool, Bit 3	Channelx.Analysis.Order.Alarm1.PhaseDangerState	State phase danger alarm of the selected harmonic Nx [1] ≠0: active 0: not active
41	1	Bool, Bit 0	Channelx.Analysis.Order.Alarm2.PeakAlertState	State peak alert alarm of the selected harmonic Ny [1] ≠0: active 0: not active
		Bool, Bit 1	Channelx.Analysis.Order.Alarm2.PhaseAlertState	State phase alert alarm of the selected harmonic Ny [1] ≠0: active 0: not active
		Bool, Bit 2	Channelx.Analysis.Order.Alarm2.PeakDangerState	State peak danger alarm of the selected harmonic Ny [1] ≠0: active 0: not active

Table B-33: Structure of group "Order analysis – Measurement" ***(continued)***

		Bool, Bit 3	Channelx.Analysis.Order.Alarm2.PhaseDangerState	State phase danger alarm of the selected harmonic Ny [1] ≠0: active 0: not active
42	1	Bool, Bit 0	Channelx.Analysis.Order.RunsAtNominalSpeed	0: invalid (peak and phase alarms are invalid, current speed is not around nominal speed) ≠0: valid (peak and phase alarms are valid, current speed around nominal speed)
43	1	Bool, Bit 0	Channelx.Analysis.Order.OrderValid	0: invalid (invalid order measurement, current speed is not around nominal speed) ≠0: valid (valid order measurement, current speed is around nominal speed)
44	1	16 Bit Integer (unsigned)	Channelx.Analysis.Order.Alarm1.SelectedOrderId	Selected harmonic Nx
45	2	Float	Channelx.Analysis.Order.Alarm1.PhaseAlertLimit	Limit phase alert alarm of selected harmonic Nx
47	2	Float	Channelx.Analysis.Order.Alarm1.PhaseDangerLimit	Limit phase danger alarm of selected harmonic Nx
49	2	Float	Channelx.Analysis.Order.Alarm1.PeakAlertLimit	Limit peak alert alarm of selected harmonic Nx
51	2	Float	Channelx.Analysis.Order.Alarm1.PeakDangerLimit	Limit peak danger alarm of selected harmonic Nx
53	2	Float	Channelx.Analysis.Order.Alarm1.PhaseBaseline	Phase baseline of the selected harmonic Nx
55	1	16 Bit Integer (unsigned)	Channelx.Analysis.Order.Alarm2.SelectedOrderId	Selected harmonic Ny
56	2	Float	Channelx.Analysis.Order.Alarm2.PhaseAlertLimit	Limit phase alert alarm of selected harmonic Ny
58	2	Float	Channelx.Analysis.Order.Alarm2.PhaseDangerLimit	Limit phase danger alarm of selected harmonic Ny
60	2	Float	Channelx.Analysis.Order.Alarm2.PeakAlertLimit	Limit peak alert alarm of selected harmonic Ny
62	2	Float	Channelx.Analysis.Order.Alarm2.PeakDangerLimit	Limit peak danger alarm of selected harmonic Ny

Table B-33: Structure of group "Order analysis – Measurement" ***(continued)***

64	2	Float	Channelx.Analysis.Order.Alarm2.PhaseBaseline	Phase baseline of the selected harmonic Ny
66	1	16 Bit Integer (signed)	Channelx.Analysis.Order.Order.Na	-1: 1/2. Order 1: 1. Order to 10: 10. Order
67	1	16 Bit Integer (signed)	Channelx.Analysis.Order.Order.Nb	
68	1	16 Bit Integer (signed)	Channelx.Analysis.Order.Order.Nc	
69	1	16 Bit Integer (signed)	Channelx.Analysis.Order.Order.Nd	
70	1	16 Bit Integer (signed)	Channelx.Analysis.Order.Order.Ne	
71	1	Bool, Bit 0	Channelx.Analysis.Order.AlarmEnabled	State of limit supervision for order analysis measurement ≠0: active 0: not active
72 to 99	1		not used	Reserve

1 *An active alarm stays active if "Order Valid State" becomes invalid (0).*

Structure of the group "Band analysis and Interval band analysis – Measurement"

The 100 registers of the group "Band analysis and Interval band analysis - Measurement" are occupied as shown in Table B-34. Both analysis functions – **Band analysis** and **Interval band analysis**) – occupy the same Modbus registers. See parameter **A6500-UM card** → **Configuration** → **Analysis** → **Select analysis** for selected analysis function.

x: place holder for channel number (1 or 2)

Table B-34: Structure of group "Band analysis and Interval band by frequency analysis – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Channelx.Analysis.IntervalBand1.Value	Measurement value of band 1
2	2	Float	Channelx.Analysis.IntervalBand2.Value	Measurement value of band 2
4	2	Float	Channelx.Analysis.IntervalBand3.Value	Measurement value of band 3

Table B-34: Structure of group "Band analysis and Interval band by frequency analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
6	2	Float	Channelx.Analysis.IntervalBand4.Value	Measurement value of band 4
8	2	Float	Channelx.Analysis.IntervalBand5.Value	Measurement value of band 5
10	2	Float	Channelx.Analysis.IntervalBand6.Value	Measurement value of band 6
12	2	Float	Channelx.Analysis.IntervalBand7.Value	Measurement value of band 7
14	2	Float	Channelx.Analysis.IntervalBand8.Value	Measurement value of band 8
16	1	Bool, Bit 0	Channelx.Analysis.IntervalBand1.AlertState	State of the band 1 alert alarm ≠0: active 0: not active
		Bool, Bit 1	Channelx.Analysis.IntervalBand1.DangerState	State of the band 1 danger alarm ≠0: active 0: not active
		Bool, Bit 2	Channelx.Analysis.IntervalBand2.AlertState	State of the band 2 alert alarm ≠0: active 0: not active
		Bool, Bit 3	Channelx.Analysis.IntervalBand2.DangerState	State of the band 2 danger alarm ≠0: active 0: not active
		Bool, Bit 4	Channelx.Analysis.IntervalBand3.AlertState	State of the band 3 alert alarm ≠0: active 0: not active
		Bool, Bit 5	Channelx.Analysis.IntervalBand3.DangerState	State of the band 3 danger alarm ≠0: active 0: not active
		Bool, Bit 6	Channelx.Analysis.IntervalBand4.AlertState	State of the band 4 alert alarm ≠0: active 0: not active

Table B-34: Structure of group "Band analysis and Interval band by frequency analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 7	Channelx.Analysis.IntervalBand4.DangerState	State of the band 4 danger alarm ≠0: active 0: not active
		Bool, Bit 8	Channelx.Analysis.IntervalBand5.AlertState	State of the band 5 alert alarm ≠0: active 0: not active
		Bool, Bit 9	Channelx.Analysis.IntervalBand5.DangerState	State of the band 5 danger alarm ≠0: active 0: not active
		Bool, Bit 10	Channelx.Analysis.IntervalBand6.AlertState	State of the band 6 alert alarm ≠0: active 0: not active
		Bool, Bit 11	Channelx.Analysis.IntervalBand6.DangerState	State of the band 6 danger alarm ≠0: active 0: not active
		Bool, Bit 12	Channelx.Analysis.IntervalBand7.AlertState	State of the band 7 alert alarm ≠0: active 0: not active
		Bool, Bit 13	Channelx.Analysis.IntervalBand7.DangerState	State of the band 7 danger alarm ≠0: active 0: not active
		Bool, Bit 14	Channelx.Analysis.IntervalBand8.AlertState	State of the band 8 alert alarm ≠0: active 0: not active
		Bool, Bit 15	Channelx.Analysis.IntervalBand8.DangerState	State of the band 8 danger alarm ≠0: active 0: not active
17	2	Float	Channelx.Analysis.IntervalBand1.FrequencyRangeMin	Band 1 frequency range minimum
19	2	Float	Channelx.Analysis.IntervalBand1.FrequencyRangeMax	Band 1 frequency range maximum

Table B-34: Structure of group "Band analysis and Interval band by frequency analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
21	2	Float	Channelx.Analysis.IntervalBand1.AlertLimit	Limit value alert alarm band 1
23	2	Float	Channelx.Analysis.IntervalBand1.DangerLimit	Limit valuer danger alarm band 1
25	2	Float	Channelx.Analysis.IntervalBand2.FrequencyRangeMin	Band 2 frequency range minimum
27	2	Float	Channelx.Analysis.IntervalBand2.FrequencyRangeMax	Band 2 frequency range maximum
29	2	Float	Channelx.Analysis.IntervalBand2.AlertLimit	Limit value alert alarm band 2
31	2	Float	Channelx.Analysis.IntervalBand2.DangerLimit	Limit valuer danger alarm band 2
33	2	Float	Channelx.Analysis.IntervalBand3.FrequencyRangeMin	Band 3 frequency range minimum
35	2	Float	Channelx.Analysis.IntervalBand3.FrequencyRangeMax	Band 3 frequency range maximum
37	2	Float	Channelx.Analysis.IntervalBand3.AlertLimit	Limit value alert alarm band 3
39	2	Float	Channelx.Analysis.IntervalBand3.DangerLimit	Limit valuer danger alarm band 3
41	2	Float	Channelx.Analysis.IntervalBand4.FrequencyRangeMin	Band 4 frequency range minimum
43	2	Float	Channelx.Analysis.IntervalBand4.FrequencyRangeMax	Band 4 frequency range maximum
45	2	Float	Channelx.Analysis.IntervalBand4.AlertLimit	Limit value alert alarm band 4
47	2	Float	Channelx.Analysis.IntervalBand4.DangerLimit	Limit valuer danger alarm band 4
49	2	Float	Channelx.Analysis.IntervalBand5.FrequencyRangeMin	Band 5 frequency range minimum
51	2	Float	Channelx.Analysis.IntervalBand5.FrequencyRangeMax	Band 5 frequency range maximum
53	2	Float	Channelx.Analysis.IntervalBand5.AlertLimit	Limit value alert alarm band 5
55	2	Float	Channelx.Analysis.IntervalBand5.DangerLimit	Limit valuer danger alarm band 5
57	2	Float	Channelx.Analysis.IntervalBand6.FrequencyRangeMin	Band 6 frequency range minimum

Table B-34: Structure of group "Band analysis and Interval band by frequency analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
59	2	Float	Channelx.Analysis.IntervalBand6.FrequencyRangeMax	Band 6 frequency range maximum
61	2	Float	Channelx.Analysis.IntervalBand6.AlertLimit	Limit value alert alarm band 6
63	2	Float	Channelx.Analysis.IntervalBand6.DangerLimit	Limit valuer danger alarm band 6
65	2	Float	Channelx.Analysis.IntervalBand7.FrequencyRangeMin	Band 7 frequency range minimum
67	2	Float	Channelx.Analysis.IntervalBand7.FrequencyRangeMax	Band 7 frequency range maximum
69	2	Float	Channelx.Analysis.IntervalBand7.AlertLimit	Limit value alert alarm band 7
71	2	Float	Channelx.Analysis.IntervalBand7.DangerLimit	Limit valuer danger alarm band 7
73	2	Float	Channelx.Analysis.IntervalBand8.FrequencyRangeMin	Band 8 frequency range minimum
75	2	Float	Channelx.Analysis.IntervalBand8.FrequencyRangeMax	Band 8 frequency range maximum
77	2	Float	Channelx.Analysis.IntervalBand8.AlertLimit	Limit value alert alarm band 8
79	2	Float	Channelx.Analysis.IntervalBand8.DangerLimit	Limit valuer danger alarm band 8
81	1	Bool, Bit 0	Channelx.Analysis.AlarmEnabled	State of limit supervision for band analysis and Interval band analysis – measurement ≠0: active 0: not active
82 to 99	1		not used	Reserve

Structure of the group "Interval band by orders analysis – Measurement"

The 100 registers of the group "Interval band by orders analysis - Measurement" are occupied as shown in Table B-35.

x: place holder for channel number (1 or 2)

Table B-35: Structure of group "Interval band by orders analysis – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Channelx.Analysis.IntervalBand1.Value	Measurement value of band 1
2	2	Float	Channelx.Analysis.IntervalBand2	Measurement value of band 2
4	2	Float	Channelx.Analysis.IntervalBand3	Measurement value of band 3
6	2	Float	Channelx.Analysis.IntervalBand4	Measurement value of band 4
8	2	Float	Channelx.Analysis.IntervalBand5	Measurement value of band 5
10	2	Float	Channelx.Analysis.IntervalBand6	Measurement value of band 6
12	2	Float	Channelx.Analysis.IntervalBand7	Measurement value of band 7
14	2	Float	Channelx.Analysis.IntervalBand8	Measurement value of band 8
16	1	Bool, Bit 0	Channelx.Analysis.IntervalBand1.AlertState	State of the band 1 alert alarm ≠0: active 0: not active
		Bool, Bit 1	Channelx.Analysis.IntervalBand1.DangerState	State of the band 1 danger alarm ≠0: active 0: not active
		Bool, Bit 2	Channelx.Analysis.IntervalBand2.AlertState	State of the band 2 alert alarm ≠0: active 0: not active
		Bool, Bit 3	Channelx.Analysis.IntervalBand2.DangerState	State of the band 2 danger alarm ≠0: active 0: not active
		Bool, Bit 4	Channelx.Analysis.IntervalBand3.AlertState	State of the band 3 alert alarm ≠0: active 0: not active
		Bool, Bit 5	Channelx.Analysis.IntervalBand3.DangerState	State of the band 3 danger alarm ≠0: active 0: not active

Table B-35: Structure of group "Interval band by orders analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 6	Channelx.Analysis.IntervalBand4.AlertState	State of the band 4 alert alarm ≠0: active 0: not active
		Bool, Bit 7	Channelx.Analysis.IntervalBand4.DangerState	State of the band 4 danger alarm ≠0: active 0: not active
		Bool, Bit 8	Channelx.Analysis.IntervalBand5.AlertState	State of the band 5 alert alarm ≠0: active 0: not active
		Bool, Bit 9	Channelx.Analysis.IntervalBand5.DangerState	State of the band 5 danger alarm ≠0: active 0: not active
		Bool, Bit 10	Channelx.Analysis.IntervalBand6.AlertState	State of the band 6 alert alarm ≠0: active 0: not active
		Bool, Bit 11	Channelx.Analysis.IntervalBand6.DangerState	State of the band 6 danger alarm ≠0: active 0: not active
		Bool, Bit 12	Channelx.Analysis.IntervalBand7.AlertState	State of the band 7 alert alarm ≠0: active 0: not active
		Bool, Bit 13	Channelx.Analysis.IntervalBand7.DangerState	State of the band 7 danger alarm ≠0: active 0: not active
		Bool, Bit 14	Channelx.Analysis.IntervalBand8.AlertState	State of the band 8 alert alarm ≠0: active 0: not active
		Bool, Bit 15	Channelx.Analysis.IntervalBand8.DangerState	State of the band 8 danger alarm ≠0: active 0: not active

Table B-35: Structure of group "Interval band by orders analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
17	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand1.OrderRangeMin	Band 1 order range minimum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
18	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand1.OrderRangeMax	Band 1 order range maximum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
19	2	Float	Channelx.Analysis.IntervalBand1.AlertLimit	Limit value alert alarm band 1
21	2	Float	Channelx.Analysis.IntervalBand1.DangerLimit	Limit valuer danger alarm band 1
23	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand2.OrderRangeMin	Band 2 order range minimum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
24	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand2.OrderRangeMax	Band 2 order range maximum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
25	2	Float	Channelx.Analysis.IntervalBand2.AlertLimit	Limit value alert alarm band 2
27	2	Float	Channelx.Analysis.IntervalBand2.DangerLimit	Limit valuer danger alarm band 2

Table B-35: Structure of group "Interval band by orders analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
29	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand3.OrderRangeMin	Band 3 order range minimum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
30	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand3.OrderRangeMax	Band 3 order range maximum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
31	2	Float	Channelx.Analysis.IntervalBand3.AlertLimit	Limit value alert alarm band 3
33	2	Float	Channelx.Analysis.IntervalBand3.DangerLimit	Limit valuer danger alarm band 3
35	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand4.OrderRangeMin	Band 4 order range minimum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
36	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand4.OrderRangeMax	Band 4 order range maximum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
37	2	Float	Channelx.Analysis.IntervalBand4.AlertLimit	Limit value alert alarm band 4
39	2	Float	Channelx.Analysis.IntervalBand4.DangerLimit	Limit valuer danger alarm band 4

Table B-35: Structure of group "Interval band by orders analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
41	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand5.OrderRangeMin	Band 5 Order range minimum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
42	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand5.OrderRangeMax	Band 5 order range maximum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
43	2	Float	Channelx.Analysis.IntervalBand5.AlertLimit	Limit value alert alarm band 5
45	2	Float	Channelx.Analysis.IntervalBand5.DangerLimit	Limit valuer danger alarm band 5
47	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand6.OrderRangeMin	Band 6 order range minimum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
48	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand6.OrderRangeMax	Band 6 order range maximum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
49	2	Float	Channelx.Analysis.IntervalBand6.AlertLimit	Limit value alert alarm band 6
51	2	Float	Channelx.Analysis.IntervalBand6.DangerLimit	Limit valuer danger alarm band 6

Table B-35: Structure of group "Interval band by orders analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
53	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand7.OrderRangeMin	Band 7 order range minimum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
54	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand7.OrderRangeMax	Band 7 order range maximum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
55	2	Float	Channelx.Analysis.IntervalBand7.AlertLimit	Limit value alert alarm band 7
57	2	Float	Channelx.Analysis.IntervalBand7.DangerLimit	Limit valuer danger alarm band 7
59	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand8.OrderRangeMin	Band 8 order range minimum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
60	1	16 Bit Integer (signed)	Channelx.Analysis.IntervalBand8.OrderRangeMax	Band 8 order range maximum -2: 1/3. Order -1: 1/2. Order 1: 1. Order ... 20: 20. Order
61	2	Float	Channelx.Analysis.IntervalBand8.AlertLimit	Limit value alert alarm band 8
63	2	Float	Channelx.Analysis.IntervalBand8.DangerLimit	Limit valuer danger alarm band 8
65	1	Bool, Bit 0	Channelx.Analysis.AlarmEnabled	State of limit supervision ≠0: active 0: not active

Table B-35: Structure of group "Interval band by orders analysis – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
66	2	16 Bit Integer (unsigned)	Channelx.Analysis.SpeedRangeMin	Speed range minimum
68	2	16 Bit Integer (unsigned)	Channelx.Analysis.SpeedRangeMax	Speed range maximum
70	1	Bool, Bit 0	Channelx.Analysis.IsValid	State of analysis calculation 0: Analysis values are invalid 1: Speed is within speed range and speed deviation is <2%
71 to 99	1		not used	Reserve

Structure of group "PeakVue – Measurement"

The 100 registers of the group "PeakVue – Measurement" are occupied as shown in Table B-36.

x: place holder for channel number (1 or 2)

Table B-36: Structure of group "PeakVue – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Float	Channelx.Analysis.PeakVue.Value	PeakVue Measurement value
2	1	Bool, Bit 0	Channelx.Analysis.PeakVue.AlertState	State of the PeaKVue Alert Alarm ≠0: active 0: not active
		Bool, Bit 1	Channelx.Analysis.PeakVue.DangerState	State of the PeaKVue Danger Alarm ≠0: active 0: not active
3	2	Float	Channelx.Analysis.PeakVue.AlertLimit	Limit value alert alarm
5	2	Float	Channelx.Analysis.PeakVue.DangerLimit	Limit value danger alarm

Table B-36: Structure of group "PeakVue – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
7	1	16 Bit Integer (unsigned)	Channelx.TimeDataId	PeakVue waveform display in AMS Machine Studio 0: not enabled ≠0: enabled
8	2	Float	Channelx.Analysis.PeakVue.LowerFilterLimit	Lower limit value of the filter band
10	2	Float	Channelx.Analysis.PeakVue.UpperFilterLimit	Upper limit value of the filter band
12	1	Bool, Bit 0	Channelx.Analysis.PeakVue.AlarmEnabled	State of limit supervision for PeakVue measurement ≠0: active 0: not active
13 to 99	1		not used	Reserve

Structure of the group "Not 1st order Analysis"

The 14 registers of the group "Not 1st order Analysis" are occupied as shown in Table B-37.

x: place holder for channel number (1 or 2)

Table B-37: Structure of group "Not 1st order Analysis"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Channelx.Analysis.NotFirstOrder.Value	Not 1st order analysis value
2		Bool, Bit 0	Channelx.Analysis.NotFirstOrder.MeasureResult	State of the measurement result ≠0: Current speed is within the permissible speed range 0: Current speed is out of the permissible speed range
3	1	Bool, Bit 0	Channelx.Analysis.NotFirstOrder.AlertState	State of the Not 1st order analysis Alert Alarm ≠0: active 0: not active

Table B-37: Structure of group "Not 1st order Analysis" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	Channelx.Analysis.NotFirstOrder.Danger	State of the Not 1st order analysis Danger Alarm ≠0: active 0: not active
4	1	16 Bit Integer (unsigned)	Channelx.Analysis.NotFirstOrder.Evaluation	0: 0-to-Peak 1: Peak-to-Peak 2: RMS
5	1	16 Bit Integer (unsigned)	Channelx.Analysis.NotFirstOrder.AccelerationMode	0: High 1: Low
6	2	Float	Channelx.Analysis.NotFirstOrder.ValueRangeMin	Minimum value of the measuring range
8	2	Float	Channelx.Analysis.NotFirstOrder.ValueRangeMax	Maximum value of the measuring range
10	1	Bool, Bit 0	Channelx.Analysis.NotFirstOrder.AlarmEnabled	≠0: active 0: not active
11	2	Float	Channelx.Analysis.NotFirstOrder.AlertLimit	Threshold (limit) value of the danger alarm
13	2	Float	Channelx.Analysis.NotFirstOrder.DangerLimit	Threshold (limit) value of the alert alarm

Structure of the group "Temperature Process - Measurement"

The 240 registers of the group "Temperature Process - Measurement" are occupied as shown in Table B-38.

Table B-38: Structure of group "Temperature Process - Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	Channel1A.ChannelOK	Channel OK - Channel 1a 0: Not OK ≠0: OK
		Bool, Bit 1	Channel1B.ChannelOK	Channel OK - Channel 1b 0: Not OK ≠0: OK
		Bool, Bit 2	Channel2A.ChannelOK	Channel OK - Channel 2a 0: Not OK ≠0: OK

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 3	Channel2B.ChannelOK	Channel OK - Channel 2b 0: Not OK ≠0: OK
		Bool, Bit 4	Channel3A.ChannelOK	Channel OK - Channel 3a 0: Not OK ≠0: OK
		Bool, Bit 5	Channel3B.ChannelOK	Channel OK - Channel 3b 0: Not OK ≠0: OK
		Bool, Bit 6	Channel4A.ChannelOK	Channel OK - Channel 4a 0: Not OK ≠0: OK
		Bool, Bit 7	Channel4B.ChannelOK	Channel OK - Channel 4b 0: Not OK ≠0: OK
1	2	Float	Channel1A.Value	Measurement value channel 1a Unit: °C, V, or mA
3	2	Float	Channel1A.ValueMin	Minimum measurement value channel 1a Unit: °C, V, or mA
5	2	Float	Channel1A.ValueMax	Maximum measurement value channel 1a Unit: °C, V, or mA
7	2	Float	Channel1B.Value	Measurement value channel 1b Unit: °C, V, or mA
9	2	Float	Channel1B.ValueMin	Minimum measurement value channel 1b Unit: °C, V, or mA
11	2	Float	Channel1B.ValueMax	Maximum measurement value channel 1b Unit: °C, V, or mA
13	2	Float	Channel2A.Value	Measurement value channel 2a Unit: °C, V, or mA

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
15	2	Float	Channel2A.ValueMin	Minimum measurement value channel 2a Unit: °C, V, or mA
17	2	Float	Channel2A.ValueMax	Maximum measurement value channel 2a Unit: °C, V, or mA
19	2	Float	Channel2B.Value	Measurement value channel 2b Unit: °C, V, or mA
21	2	Float	Channel2B.ValueMin	Minimum measurement value channel 2b Unit: °C, V, or mA
23	2	Float	Channel2B.ValueMax	Maximum measurement value channel 2b Unit: °C, V, or mA
25	2	Float	Channel3A.Value	Measurement value channel 3a Unit: °C, V, or mA
27	2	Float	Channel3A.ValueMin	Minimum measurement value channel 3a Unit: °C, V, or mA
29	2	Float	Channel3A.ValueMax	Maximum measurement value channel 3a Unit: °C, V, or mA
31	2	Float	Channel3B.Value	Measurement value channel 3b Unit: °C, V, or mA
33	2	Float	Channel3B.ValueMin	Minimum measurement value channel 3b Unit: °C, V, or mA
35	2	Float	Channel3B.ValueMax	Maximum measurement value channel 3b Unit: °C, V, or mA
37	2	Float	Channel4A.Value	Measurement value channel 4a Unit: °C, V, or mA
39	2	Float	Channel4A.ValueMin	Minimum measurement value channel 4a Unit: °C, V, or mA

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
41	2	Float	Channel4A.ValueMax	Maximum measurement value channel 4a Unit: °C, V, or mA
43	2	Float	Channel4B.Value	Measurement value channel 4b Unit: °C, V, or mA
45	2	Float	Channel4B.ValueMin	Minimum measurement value channel 4b Unit: °C, V, or mA
47	2	Float	Channel4B.ValueMax	Maximum measurement value channel 4b Unit: °C, V, or mA
49	2	Float	Channel1A.ValueRangeMin	Minimum value measuring range channel 1a
51	2	Float	Channel1A.ValueRangeMax	Maximum value measuring range channel 1a
53	2	Float	Channel1B.ValueRangeMin	Minimum value measuring range channel 1b
55	2	Float	Channel1B.ValueRangeMax	Maximum value measuring range channel 1b
57	2	Float	Channel2A.ValueRangeMin	Minimum value measuring range channel 2a
59	2	Float	Channel2A.ValueRangeMax	Maximum value measuring range channel 2a
61	2	Float	Channel2B.ValueRangeMin	Minimum value measuring range channel 2b
63	2	Float	Channel2B.ValueRangeMax	Maximum value measuring range channel 2b
65	2	Float	Channel3A.ValueRangeMin	Minimum value measuring range channel 3a

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
67	2	Float	Channel3A.ValueRangeMax	Maximum value measuring range channel 3a
69	2	Float	Channel3B.ValueRangeMin	Minimum value measuring range channel 3b
71	2	Float	Channel3B.ValueRangeMax	Maximum value measuring range channel 3b
73	2	Float	Channel4A.ValueRangeMin	Minimum value measuring range channel 4a
75	2	Float	Channel4A.ValueRangeMax	Maximum value measuring range channel 4a
77	2	Float	Channel4B.ValueRangeMin	Minimum value measuring range channel 4b
79	2	Float	Channel4B.ValueRangeMax	Maximum value measuring range channel 4b
81	1	16 Bit Integer Low Byte (unsigned)	Channel1A.Evaluation	Signal evaluation channel 1a 0: Off 1: Temperature
		16 Bit Integer High Byte (unsigned)	Channel1B.Evaluation	Signal evaluation channel 1b 0: Off 1: Temperature 2: Voltage 3: Current
82	1	16 Bit Integer Low Byte (unsigned)	Channel2A.Evaluation	Signal evaluation channel 2a 0: Off 1: Temperature
		16 Bit Integer High Byte (unsigned)	Channel2B.Evaluation	Signal evaluation channel 2b 0: Off 1: Temperature 2: Voltage 3: Current

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
83	1	16 Bit Integer Low Byte (unsigned)	Channel3A.Evaluation	Signal evaluation channel 3a 0: Off 1: Temperature
		16 Bit Integer High Byte (unsigned)	Channel3B.Evaluation	Signal evaluation channel 3b 0: Off 1: Temperature 2: Voltage 3: Current
84	1	16 Bit Integer Low Byte (unsigned)	Channel4A.Evaluation	Signal evaluation channel 4a 0: Off 1: Temperature
		16 Bit Integer High Byte (unsigned)	Channel4B.Evaluation	Signal evaluation channel 4b 0: Off 1: Temperature 2: Voltage 3: Current

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
85	1	16 Bit Integer (unsigned)	Alarm1.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
86	1	16 Bit Integer (unsigned)	Alarm1.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
87	2	Float	Alarm1.Limit1	Defined alarm 1 limit 1
89	2	Float	Alarm1.Limit2	Defined alarm 1 limit 2
91	2	Float	Alarm1.Hysteresis	Defined alarm 1 hysteresis
93	1	Bool	Alarm1.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
94	1	16 Bit Integer (unsigned)	Alarm2.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
95	1	16 Bit Integer (unsigned)	Alarm2.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
96	2	Float	Alarm2.Limit1	Defined alarm 2 limit 1
98	2	Float	Alarm2.Limit2	Defined alarm 2 limit 2
100	2	Float	Alarm2.Hysteresis	Defined alarm 2 hysteresis
102	1	Bool	Alarm2.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
103	1	16 Bit Integer (unsigned)	Alarm3.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
104	1	16 Bit Integer (unsigned)	Alarm3.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
105	2	Float	Alarm3.Limit1	Defined alarm 3 limit 1
107	2	Float	Alarm3.Limit2	Defined alarm 3 limit 2
109	2	Float	Alarm3.Hysteresis	Defined alarm 3 hysteresis
111	1	Bool	Alarm3.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
112	1	16 Bit Integer (unsigned)	Alarm4.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
113	1	16 Bit Integer (unsigned)	Alarm4.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
114	2	Float	Alarm4.Limit1	Defined alarm 4 limit 1
116	2	Float	Alarm4.Limit2	Defined alarm 4 limit 2
118	2	Float	Alarm4.Hysteresis	Defined alarm 4 hysteresis
120	1	Bool	Alarm4.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
121	1	16 Bit Integer (unsigned)	Alarm5.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
122	1	16 Bit Integer (unsigned)	Alarm5.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
123	2	Float	Alarm5.Limit1	Defined alarm 5 limit 1
125	2	Float	Alarm5.Limit2	Defined alarm 5 limit 2
127	2	Float	Alarm5.Hysteresis	Defined alarm 5 hysteresis
129	1	Bool	Alarm5.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
130	1	16 Bit Integer (unsigned)	Alarm6.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
131	1	16 Bit Integer (unsigned)	Alarm6.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
132	2	Float	Alarm6.Limit1	Defined alarm 6 limit 1
134	2	Float	Alarm6.Limit2	Defined alarm 6 limit 2
136	2	Float	Alarm6.Hysteresis	Defined alarm 6 hysteresis
138	1	Bool	Alarm6.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
139	1	16 Bit Integer (unsigned)	Alarm7.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
140	1	16 Bit Integer (unsigned)	Alarm7.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
141	2	Float	Alarm7.Limit1	Defined alarm 7 limit 1
143	2	Float	Alarm7.Limit2	Defined alarm 7 limit 2
145	2	Float	Alarm7.Hysteresis	Defined alarm 7 hysteresis
147	1	Bool	Alarm7.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
148	1	16 Bit Integer (unsigned)	Alarm8.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
149	1	16 Bit Integer (unsigned)	Alarm8.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
150	2	Float	Alarm8.Limit1	Defined alarm 8 limit 1
152	2	Float	Alarm8.Limit2	Defined alarm 8 limit 2
154	2	Float	Alarm8.Hysteresis	Defined alarm 8 hysteresis
156	1	Bool	Alarm8.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
157	1	16 Bit Integer (unsigned)	Alarm9.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
158	1	16 Bit Integer (unsigned)	Alarm9.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
159	2	Float	Alarm9.Limit1	Defined alarm 9 limit 1
161	2	Float	Alarm9.Limit2	Defined alarm 9 limit 2
163	2	Float	Alarm9.Hysteresis	Defined alarm 9 hysteresis
165	1	Bool	Alarm9.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
166	1	16 Bit Integer (unsigned)	Alarm10.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
167	1	16 Bit Integer (unsigned)	Alarm10.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
168	2	Float	Alarm10.Limit1	Defined alarm 10 limit 1
170	2	Float	Alarm10.Limit2	Defined alarm 10 limit 2
172	2	Float	Alarm10.Hysteresis	Defined alarm 10 hysteresis
174	1	Bool	Alarm10.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
175	1	16 Bit Integer (unsigned)	Alarm11.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
176	1	16 Bit Integer (unsigned)	Alarm11.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
177	2	Float	Alarm11.Limit1	Defined alarm 11 limit 1
179	2	Float	Alarm11.Limit2	Defined alarm 11 limit 2
181	2	Float	Alarm11.Hysteresis	Defined alarm 11 hysteresis
183	1	Bool	Alarm11.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
184	1	16 Bit Integer (unsigned)	Alarm12.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
185	1	16 Bit Integer (unsigned)	Alarm12.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
186	2	Float	Alarm12.Limit1	Defined alarm 12 limit 1
188	2	Float	Alarm12.Limit2	Defined alarm 12 limit 2
190	2	Float	Alarm12.Hysteresis	Defined alarm 12 hysteresis
192	1	Bool	Alarm12.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
193	1	16 Bit Integer (unsigned)	Alarm13.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
194	1	16 Bit Integer (unsigned)	Alarm13.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
195	2	Float	Alarm13.Limit1	Defined alarm 13 limit 1
197	2	Float	Alarm13.Limit2	Defined alarm 13 limit 2
199	2	Float	Alarm13.Hysteresis	Defined alarm 13 hysteresis
201	1	Bool	Alarm13.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
202	1	16 Bit Integer (unsigned)	Alarm14.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
203	1	16 Bit Integer (unsigned)	Alarm14.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
204	2	Float	Alarm14.Limit1	Defined alarm 14 limit 1
206	2	Float	Alarm14.Limit2	Defined alarm 14 limit 2
208	2	Float	Alarm14.Hysteresis	Defined alarm 14 hysteresis
210	1	Bool	Alarm14.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
211	1	16 Bit Integer (unsigned)	Alarm15.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
212	1	16 Bit Integer (unsigned)	Alarm15.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
213	2	Float	Alarm15.Limit1	Defined alarm 15 limit 1
215	2	Float	Alarm15.Limit2	Defined alarm 15 limit 2
217	2	Float	Alarm15.Hysteresis	Defined alarm 15 hysteresis
219	1	Bool	Alarm15.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
220	1	16 Bit Integer (unsigned)	Alarm16.DataSource	Alarm source: 0: Disabled 1: Channel 1 temperature a 2: Channel 1 temperature b 3: Channel 1 process value 4: Channel 2 temperature a 5: Channel 2 temperature b 6: Channel 2 process value 7: Channel 3 temperature a 8: Channel 3 temperature b 9: Channel 3 process value 10: Channel 4 temperature a 11: Channel 4 temperature b 12: Channel 4 process value
221	1	16 Bit Integer (unsigned)	Alarm16.Function	Alarm function: 1: >= Limit 2: >= Limit (Latch) 3: <= Limit 4: <= Limit (Latch) 5: Window 6: Window (Latch)
222	2	Float	Alarm16.Limit1	Defined alarm 16 limit 1
224	2	Float	Alarm16.Limit2	Defined alarm 16 limit 2
226	2	Float	Alarm16.Hysteresis	Defined alarm 16 hysteresis
228	1	Bool	Alarm16.State	0: No alarm ≠0: Alarm

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
229	1	4 Bit Integer (unsigned)	Calculation1._Mode	Calculation 1 mode: 0: None 1: Average 2: Differential 3: Maximum deviation
		4 Bit Integer (unsigned)	Calculation1._DifferenceChannel	Calculation 1 difference channel: 0: Off 1: Channel 1A 2: Channel 1B ... 8: Channel 4B
		Bool, Bit 0	Calculation1.AverageChannel.CH1_A	Channel selected for averaging: 0: Not selected ≠0: Selected If a channel is configured for process value, 3-wire RTD, or 4-wire RTD read the register of the B channel.
		Bool, Bit 1	Calculation1.AverageChannel.CH1_B	
		Bool, Bit 2	Calculation1.AverageChannel.CH2_A	
		Bool, Bit 3	Calculation1.AverageChannel.CH2_B	
		Bool, Bit 4	Calculation1.AverageChannel.CH3_A	
		Bool, Bit 5	Calculation1.AverageChannel.CH3_B	
		Bool, Bit 6	Calculation1.AverageChannel.CH4_A	
		Bool, Bit 7	Calculation1.AverageChannel.CH4_B	
230	2	Float	Calculation1.Value	Result calculation 1
232	1	4 Bit Integer (unsigned)	Calculation2._Mode	Calculation 2 difference channel: 0: Off 1: Channel 1A 2: Channel 1B ... 8: Channel 4B
		4 Bit Integer (unsigned)	Calculation2._DifferenceChannel	Calculation 2 difference channel: 0: Off 1: Channel 1A 2: Channel 1B ... 8: Channel 4B

Table B-38: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 0	Calculation2.AverageChannel.CH1_A	Channel selected for averaging: 0: Not selected ≠0: Selected If a channel is configured for process value, 3-wire RTD, or 4-wire RTD read the register of the B channel.
		Bool, Bit 1	Calculation2.AverageChannel.CH1_B	
		Bool, Bit 2	Calculation2.AverageChannel.CH2_A	
		Bool, Bit 3	Calculation2.AverageChannel.CH2_B	
		Bool, Bit 4	Calculation2.AverageChannel.CH3_A	
		Bool, Bit 5	Calculation2.AverageChannel.CH3_B	
		Bool, Bit 6	Calculation2.AverageChannel.CH4_A	
		Bool, Bit 7	Calculation2.AverageChannel.CH4_B	
233	2	Float	Calculation2.Value	Result calculation 2
235 to 239	1		not used	Reserve

Structure of registers "Description"

The 340 registers for the channel description are occupied as shown in Table B-39. All strings are zero terminated, if their maximum length is not used. If the maximum length is reached, longer text strings are truncated and the last character may be wrong.

Table B-39: Structure of registers "Description"

Register	Length (number of registers)	Type	Name	Description
0	15	String[30]	General.CardName	see Table B-40
15	15	String[30]	General.MachineName	
30	15	String[30]	General.AreaName	
45	15	String[30]	General.PlantName	
60	15	String[30]	Channel1.PointId	
75	20	String[40]	Channel1.Description[1]	
95	15	String[30]	Channel2.PointId	
110	20	String[40]	Channel2.Description[1]	
130	15	String[30]	Channel3.PointId	
145	20	String[40]	Channel3.Description[1]	
165	15	String[30]	Channel4.PointId4	
180	20	String[40]	Channel4.Description[1]	
200	15	String[30]	Channel5.PointId	

Table B-39: Structure of registers "Description" *(continued)*

Register	Length (number of registers)	Type	Name	Description
215	20	String[40]	Channel5.Description [1]	
235	15	String[30]	Channel6.PointId	
250	20	String[40]	Channel6.Description[1]	
270	15	String[30]	Channel7.PointId	
285	20	String[40]	Channel7.Description[1]	
305	15	String[30]	Channel8.PointId	
320	20	String[40]	Channel8.Description[1]	
319 to 340	1		not used	Reserve

1 *For future use.*

Table B-40: Usage of the Point IDs depending on the different cards and applications

Register	A6500-TP	A6500-RC	A6500-CC	A6500-CP	A6500-UM		
					Single channel	Combined channels	Speed
0	Card name	Card name	Card name	Card name	Card name	Card name	Card name
15	Machine name	Machine name	Machine name	Machine name	Machine name	Machine name	Machine name
30	Area	Area	Area	Area	Area	Area	Area
45	Plant	Plant	Area	Area	Plant	Plant	Plant
60	Point ID Input 1A	Not in use	System name	System name	Point ID Input 1	Point ID Input 1	Point ID Input 1
75	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
95	Point ID Input 1B	Not in use	Not in use	Not in use	Point ID Input 2	Point Id Input 2	Point ID Input 2
110	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
130	Point ID Input 2A	Not in use	Not in use	Not in use	Not in use	Point ID Combined	Not in use
145	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
165	Point ID Input 2B	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
180	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
200	Point Id Input 3A	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
215	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use

Table B-40: Usage of the Point IDs depending on the different cards and applications *(continued)*

Register	A6500-TP	A6500-RC	A6500-CC	A6500-CP	A6500-UM		
					Single channel	Combined channels	Speed
235	Point ID Input 3B	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
250	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
270	Point ID Input 4A	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
285	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
305	Point ID Input 4B	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use
320	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use	Not in use

Grouped data registers

The most important registers of the input data tables, such as measuring values, channel Ok states, and alarm states of all cards connected to the Com Card, are combined in register blocks from register 42000. The data type for this register blocks is **Input** register.

A6500-UM Universal Measurement Card Main Values

The main values of each installed Universal Measurement Card occupy four registers within the group register range as shown in Table B-41.

Table B-41: Structure of group register "A6500-UM Main Values"

Register	Length (number of registers)	Type	Name	Description
42000	2	Float	Value card 1 / Ch1 (Rack 1)	Measurement value card 1 / channel 1 / Rack 1 or combined value if both channel are combined
42002	2	Float	Value card 1 / Ch2 (Rack 1)	Measurement value card 1 / channel 2 / Rack 1 (zero at combined channels)
42004	2	Float	Value card 2 / Ch1 (Rack 1)	Measurement value card 2 / channel 1 / Rack 1 or combined value if both channel are combined
42006	2	Float	Value card 2 / Ch2 (Rack 1)	Measurement value card 2 / channel 2 / Rack 1 (zero at combined channels)
...				

Table B-41: Structure of group register "A6500-UM Main Values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
42040	2	Float	Value card 11 / Ch1 (Rack 1)	Measurement value card 11 / channel 1 / Rack 1 or combined value if both channel are combined
42042	2	Float	Value card 11 / Ch2 (Rack 1)	Measurement value card 11 / channel 2 / Rack 1 (zero at combined channels)
42044 to 42046	2		not used	Reserve
42048	2	Float	Value card 1 / Ch1 (Rack 2[1])	Measurement value card 1 / channel 1 / Rack 2 or combined value if both channel are combined
42050	2	Float	Value card 1 / Ch1 (Rack 2[1])	Measurement value card 1 / channel 2 / Rack 2 (zero at combined channels)
...				
42088	2	Float	Value card 11 / Ch 1 (Rack 2[1])	Measurement value card 11 / channel 1 / Rack 2 or combined value if both channel are combined
42090	2	Float	Value card 11 / Ch 2 (Rack 2[1])	Measurement value card 11 / channel 2 / Rack 2 (zero at combined channels)
42092 to 42094	2		not used	Reserve

1 *Only if a second A6500-SR is connected to the Com Card*

A6500-TP Temperature Process Card Main Values

The main values of each installed Temperature Process Card occupy 16 registers within the group register range as shown in Table B-42.

Table B-42: Structure of group register "A6500-TP Main Values"

Register	Length (number of registers)	Type	Name	Description
42240	2	Float	Value card 1 / Ch1a (Rack 1)	Measurement value card 1 / channel 1a / Rack 1 (only used with thermocouple)
42242	2	Float	Value card 1 / Ch1b (Rack 1)	Measurement value card 1 / channel 1b / Rack 1
42244	2	Float	Value card 1 / Ch 2a (Rack 1)	Measurement value card 1 / channel 2a/ Rack 1 (only used with thermocouple)
42246	2	Float	Value card 1 / Ch 2b (Rack 1)	Measurement value card 1/ channel 2b / Rack 1
42248	2	Float	Value card 1 / Ch 3a (Rack 1)	Measurement value card 1/ channel 3a / Rack 1 (only used with thermocouple)
42250	2	Float	Value card 1 / Ch 3b (Rack 1)	Measurement value card 1 / channel 3b / Rack 1
42252	2	Float	Value card 1 / Ch 4a (Rack 1)	Measurement value card 1 / channel 4a / Rack 1 (only used with thermocouple)
42254	2	Float	Value card 1 / Ch 4b (Rack 1)	Measurement value card 1 / channel 4b / Rack 1
...				
42412	2	Float	Value card 11 / Ch 4a (Rack 1)	Measurement value card 1 / channel 4a / Rack 1 (only used with thermocouple)
42414	2	Float	Value card 11 / Ch 4b (Rack 1)	Measurement value card 1 / channel 4b / Rack 1
42416	2		not used	
42418	2		not used	
42420	2		not used	
42422	2		not used	
42424	2		not used	
42426	2		not used	
42428	2		not used	
42430	2		not used	

Table B-42: Structure of group register "A6500-TP Main Values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
42432	2	Float	Value card 1 / Ch 1a (Rack 2[1])	Measurement value card 1 / channel 1a / Rack 2 (only used with thermocouple)
42434	2	Float	Value card 1 / Ch1b (Rack 2[1])	Measurement value card 1 / channel 1b / Rack 2
...				
42604	2	Float	Value card 11 / Ch 4a (Rack 2[1])	Measurement value card 11 / channel 4a / Rack 2 (only used with thermocouple)
42606	2	Float	Value card 11 / Ch 4b (Rack 2[1])	Measurement value card 11 / channel 4b / Rack 2
42608	2		not used	
42610	2		not used	
42612	2		not used	
42614	2		not used	
42616	2		not used	
42618	2		not used	
42620	2		not used	
42622	2		not used	

1 *Only if a second A6500-SR is connected to the Com Card*

Alarm states

The alarm states of each installed card (A6500-UM or A6500-TP) occupy one register within the group register range as shown in Table B-43.

Table B-43: Structure of group register "Alarm states"

Register	Length (number of registers)	Type	Name	Description
43200	1	Bit array	Alarm state card 1 / Ch 1 (Rack 1)	**A6500-UM Card — dynamic/static** Bit 0: Positive Alert Alarm or Alert Alarm Bit 1: Positive Danger Alarm or Danger Alarm Bit 2: Negative Alert Alarm Bit 3: Negative Danger Alarm **A6500-UM Card — speed** Bit 0: Alarm state 1 (Alarm function 1) Bit 1: Alarm state 2 (Alarm function 2) Bit 2: Alarm state 3 (Alarm function 3) Bit 3: Alarm state 4 (Alarm function 4) **A6500-TP** Bit 0: Alarm function 1(linked to DO1[1]) Bit 1: Alarm function 2 (linked to DO2[1]) Bit 2: Alarm function 3 (linked to DO3[1]) Bit 3: Alarm function 4 (linked to DO4[1]) Bit 4: Alarm function 5 (linked to DO5[1]) Bit 5: Alarm function 6 (linked to DO6[1]) Bit 6: Alarm function 7 Bit 7: Alarm function 8 Bit 8: Alarm function 9 Bit 9: Alarm function 10 Bit 10: Alarm function 11 Bit 11: Alarm function 12 Bit 12: Alarm function 13 Bit 13: Alarm function 14 Bit 14: Alarm function 15 Bit 15: Alarm function 16
43201	1	Bit array	Alarm state card 1 / Ch 2 (Rack 1)	
43202	1	Bit array	Alarm state card 2 / Ch 1 (Rack 1)	
43203	1	Bit array	Alarm state card 2 / Ch 2 (Rack 1)	
...				
43220	1	Bit array	Alarm state card 11 / Ch 1 (Rack 1)	
43221	1	Bit array	Alarm state card 11 / Ch 2 (Rack 1)	
43222	1		not used	
43223	1		not used	
43224	1	Bit array	Alarm state card 1 / Ch 1 (Rack 2[2])	
43225	1	Bit array	Alarm state card 1 / Ch 2 (Rack 2[2])	
...				
43244	1	Bit array	Alarm state card 11 / Ch 1 (Rack 2[2])	
43245	1	Bit array	Alarm state card 11 / Ch 2 (Rack 2[2])	
43246			not used	
43247			not used	

Register	Length (number of registers)	Type	Name	Description
				Bit state: 0: No alarm 1: Alarm

1 *DO = Digital output*
2 *Only if a second A6500-SR is connected to the Com Card*

Channel OK states

The channel OK states of each installed card (A6500-UM, or A6500-TP, and A6500-RC) occupy one register within the group register range as shown in Table B-44.

Table B-44: Structure of group register "Channel OK states"

Register	Length (number of registers)	Type	Name	Description
43320	1	Bit array	Channel OK state card 1 / Ch 1 (Rack 1)	**A6500-UM Card — dynamic/static** Bit 0: Channel 1 OK Bit 8: Channel 2 OK **A6500-UM Card — speed** Bit 0: Channel 1 OK Bit 8: Channel 2 OK **A6500-TP** Bit 0: Channel 1A OK Bit 1: Channel 1B OK Bit 2: Channel 2A OK Bit 3: Channel 2B OK Bit 4: Channel 3A OK Bit 5: Channel 3B OK Bit 6: Channel 4A OK Bit 7: Channel 4B OK 0: Channel Not OK; 1: Channel OK
		Bit array	Channel OK state card 1 / Ch 2 (Rack 1)	
43321	1	Bit array	Channel OK state card 2 / Ch 1 (Rack 1)	
		Bit array	Channel OK state card 2 / Ch 2 (Rack 1)	
...				
43331	1	Bit array	Channel OK state card 12 / Ch 1 (Rack 1)	
		Bit array	Channel OK state card 12 / Ch 2 (Rack 1)	
43332	1	Bit array	Channel OK state card 1 / Ch 1 (Rack 2[1])	
		Bit array	Channel OK state card 1 / Ch 2 (Rack 2[1])	
...				
43343	1	Bit array	Channel OK state card 24 / Ch 1 (Rack 2[1])	
		Bit array	Channel OK state card 24 / Ch 2 (Rack 2[1])	

1 *Only if a second A6500-SR is connected to the Com Card*

Online states

The online state of each installed card (A6500-UM, A6500-TP, A6500-RC, A6500-CC, and A6500-CP) occupies one register within the group register range as shown in Table B-45.

Table B-45: Structure of group register "Online states"

Register	Length (number of registers)	Type	Name	Description
43380	1	Bool	Online state card 1 (Rack 1)	**State:** 0: Offline 1: Online
43381	1	Bool	Online state card 2 (Rack 1)	
43382	1	Bool	Online state card 3 (Rack 1)	
43383	1	Bool	Online state card 4 (Rack 1)	
...				
43393	1	Bool	Online state card 14 (Rack 1)	
43394	1	Bool	Online state card 1 (Rack 2[1])	
...				
43406	1	Bool	Online state card 13 (Rack 2[1])	
43407	1	Bool	Online state card 14 (Rack 2[1])	

1 *Only if a second A6500-SR is connected to the Com Card*

Modbus mapping version

This register contains the used Modbus mapping version. The Modbus mapping version indicates changes of the register structure. A change could be the adding of new registers.

Table B-46: Register "Modbus mapping version"

Register	Length (number of registers)	Type	Name	Description
43499	1	16 Bit Integer (unsigned)	Modbus mapping version number	**Version:** 0: AMS Machine Studio Version 2.81.46 and before 1: AMS Machine Studio Version 2.81.46 to 2.82.12 2: AMS Machine Studio Version 2.90.x

Card configuration number

The number of configuration changes of each installed card (A6500-UM, A6500-TP, A6500-RC, A6500-CC, and A6500-CP) occupies one register within the group register range as shown in Table B-47.

Table B-47: Register "Card configuration number"

Register	Length (number of registers)	Type	Name	Description
43500	1	16 Bit Integer (unsigned)	Card 1 No. of config. changes	Number of configuration changes card 1
43501		16 Bit Integer (unsigned)	Card 2 No. of config. changes	Number of configuration changes card 2
...				
43524		16 Bit Integer (unsigned)	Card 25 No. of config. changes	Number of configuration changes card 25
43525		16 Bit Integer (unsigned)	Card 26 No. of config. changes	Number of configuration changes card 26

A6500-UM Universal Measurement Card – Speed per channel

The speed value of each channel of the installed A6500-UM cards occupies two registers within the group register range as shown in Table B-48.

Table B-48: Register "A6500-UM Card – Speed per channel"

Register	Length (number of registers)	Type	Name	Description
43600	2	Float	Value Card 1 / Ch1	Speed value of channel 1 of card 1
43602	2	Float	Value Card 1 / Ch2	Speed value of channel 2 of card 1
...				
43692	2	Float	Value Card 24 / Ch1	Speed value of channel 1 of card 24
43694	2	Float	Value Card 24 / Ch2	Speed value of channel 2 of card 24

A6500-UM Universal Measurement Card – DC value of eddy current measuring chains per channel

The DC value of a connected eddy current measuring chain of each channel of the installed A6500-UM cards occupies two registers within the group register range as shown in Table B-49.

Table B-49: Register "A6500-UM Card – DC value of eddy current measuring chains per channel"

Register	Length (number of registers)	Type	Name	Description
44000	2	Float	Card 1 / Ch1 DC voltage	DC voltage of channel 1 of card 1
44002	2	Float	Card 1 / Ch2 DC voltage	DC voltage of channel 2 of card 1
44004	2	Float	Card 2 / Ch1 DC voltage	DC voltage of channel 1 of card 2
44006	2	Float	Card 2 / Ch2 DC voltage	DC voltage of channel 2 of card 2
...				
44092	2	Float	Card 24 / Ch1 DC voltage	DC voltage of channel 1 of card 24
44094	2	Float	Card 24 / Ch2 DC voltage	DC voltage of channel 2 of card 24

A6500-UM Universal Measurement Card – Special value

The 0-P value[1] or value 2[2] (channel 1) of each installed A6500-UM cards occupies two registers within the group register range as shown in Table B-50.

Table B-50: Register "A6500-UM Card – Special value"

Register	Length (number of registers)	Type	Name	Description
44200	2	Float	Card 1 / Ch1 value 0-P[1] or value 2[2]	0-P value or value 2 of channel 1 of card 1
44202	2	Float	Card 1 / Ch2 value 0-P	0-P value of channel 2 of card 1
44204	2	Float	Card 2 / Ch1 value 0-P or value 2	0-P value or value 2 of channel 1 of card 2
44206	2	Float	Card 2 / Ch2 value 0-P	0-P value of channel 2 of card 2
...				
44292	2	Float	Card 24 / Ch1 value 0-P or value 2	0-P value or value 2 of channel 1 of card 24
44294	2	Float	Card 24 / Ch2 value 0-P	0-P value of channel 2 of card 24

1 *0-P value of the dynamic measurement value,regardless of the selected evaluation for the single channel application or the application with calculation based on two channels*
2 *Maximum value of the applications **Tandem**, **Cone**, or **Min/Max***

A6500-UM Universal Measurement Card – Analytic values

The analytic values of each channel of the installed A6500-UM cards occupies two registers within the group register range as shown in Table B-51.

Table B-51: Register "A6500-UM Card – Analytic values"

Register	Length (number of registers)	Type	Name	Description
44500	2	Float	Card 1 / Ch1 Na Phase, Band 1, or PeakVue	Na phase, band 1, or PeakVue of channel 1 of card 1
44502	2	Float	Card 1 / Ch2 Na Phase, Band 1, or PeakVue	Na phase, band 1, or PeakVue of channel 2 of card 1
44504	2	Float	Card 1 / Ch1 Na Peak or Band 2	Na peak or band 2 of channel 1 of card 1
44506	2	Float	Card 1 / Ch2 Na Peak or Band 2	Na peak or band 2 of channel 2 of card 1
44508	2	Float	Card 1 / Ch1 Nb Phase or Band 3	Nb phase or band 3 of channel 1 of card 1
44510	2	Float	Card 1 / Ch2 Nb Phase or Band 3	Nb phase or band 3, of channel 2 of card 1
44512	2	Float	Card 1 / Ch1 Nb Peak or Band 4	Nb peak or band 4 of channel 1 of card 1
44514	2	Float	Card 1 / Ch2 Nb Peak or Band 4	Nb peak or band 4 of channel 2 of card 1
44516	2	Float	Card 1 / Ch1 Nc Phase or Band 5	Nc phase or band 5 of channel 1 of card 1
44518	2	Float	Card 1 / Ch2 Nc Phase or Band 5	Nc phase or band 5, of channel 2 of card 1
44520	2	Float	Card 1 / Ch1 Nc Peak or Band 6	Nc peak or band 6 of channel 1 of card 1
44522	2	Float	Card 1 / Ch2 Nc Peak or Band 6	Nc peak or band 6 of channel 2 of card 1
44524	2	Float	Card 1 / Ch1 Nd Phase or Band 7	Nd phase or band 7 of channel 1 of card 1
44526	2	Float	Card 1 / Ch2 Nd Phase or Band 7	Nd phase or band 7, of channel 2 of card 1
44528	2	Float	Card 1 / Ch1 Nd Peak or Band 8	Nd peak or band 8 of channel 1 of card 1
44530	2	Float	Card 1 / Ch2 Nd Peak or Band 8	Nd peak or band 8 of channel 2 of card 1
44532	2	Float	Card 1 / Ch1 Ne Phase	Ne phase of channel 1 of card 1

Table B-51: Register "A6500-UM Card – Analytic values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
44534	2	Float	Card 1 / Ch2 Ne Phase	Ne phase of channel 2 of card 1
44536	2	Float	Card 1 / Ch1 Ne Peak	Ne peak of channel 1 of card 1
44538	2	Float	Card 1 / Ch2 Ne Peak	Ne peak of channel 2 of card 1
44540	2	Float	Card 2 / Ch1 Na Phase, Band 1, or PeakVue	Na phase, band 1, or PeakVue of channel 1 of card 2
44542	2	Float	Card 2 / Ch2 Na Phase, Band 1, or PeakVue	Na phase, band 1, or PeakVue of channel 2 of card 2
44544	2	Float	Card 2 / Ch1 Na Peak or Band 2	Na peak or band 2 of channel 1 of card 2
44546	2	Float	Card 2 / Ch2 Na Peak or Band 2	Na peak or band 2 of channel 2 of card 2
44548	2	Float	Card 2 / Ch1 Nb Phase or Band 3	Nb phase or band 3 of channel 1 of card 2
44550	2	Float	Card 2 / Ch2 Nb Phase or Band 3	Nb phase or band 3, of channel 2 of card 2
44552	2	Float	Card 2 / Ch1 Nb Peak or Band 4	Nb peak or band 4 of channel 1 of card 2
44554	2	Float	Card 2 / Ch2 Nb Peak or Band 4	Nb peak or band 4 of channel 2 of card 2
44556	2	Float	Card 2 / Ch1 Nc Phase or Band 5	Nc phase or band 5 of channel 1 of card 2
44558	2	Float	Card 2 / Ch2 Nc Phase or Band 5	Nc phase or band 5, of channel 2 of card 2
44560	2	Float	Card 2 / Ch1 Nc Peak or Band 6	Nc peak or band 6 of channel 1 of card 2
44562	2	Float	Card 2 / Ch2 Nc Peak or Band 6	Nc peak or band 6 of channel 2 of card 2
44564	2	Float	Card 2 / Ch1 Nd Phase or Band 7	Nd phase or band 7 of channel 1 of card 2
44566	2	Float	Card 2 / Ch2 Nd Phase or Band 7	Nd phase or band 7, of channel 2 of card 2
44568	2	Float	Card 2 / Ch1 Nd Peak or Band 8	Nd peak or band 8 of channel 1 of card 2

Table B-51: Register "A6500-UM Card – Analytic values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
44570	2	Float	Card 2 / Ch2 Nd Peak or Band 8	Nd peak or band 8 of channel 2 of card 2
44572	2	Float	Card 2 / Ch1 Ne Phase	Ne phase of channel 1 of card 2
44574	2	Float	Card 2 / Ch2 Ne Phase	Ne phase of channel 2 of card 2
44576	2	Float	Card 2 / Ch1 Ne Peak	Ne peak of channel 1 of card 2
44578	2	Float	Card 2 / Ch2 Ne Peak	Ne peak of channel 2 of card 2
...				
45452	2	Float	Card 24 / Ch1 Ne Phase	Ne phase of channel 1 of card 24
45454	2	Float	Card 24 / Ch2 Ne Phase	Ne phase of channel 2 of card 24
45456	2	Float	Card 24 / Ch1 Ne Peak	Ne peak of channel 1 of card 24
45458	2	Float	Card 24 / Ch2 Ne Peak	Ne peak of channel 2 of card 24

A6500-UM Universal Measurement Card – Physical quantity

The physical quantity of each channel of the installed A6500-UM cards occupies a half register (8 Bit) within the group register range as shown in Table B-53.

Table B-52 shows the meaning of the 8 Bit Integer (unsigned) value.

Table B-52: Physical quantity legend

Value	Meaning		Value	Meaning
0	Unspecified		13	Power
1	Displacement		14	Luminous flux
2	Velocity		15	Illuminance
3	Acceleration		16	Work
4	Time		17	Pressure
5	Mass		18	Force
6	Electric current		19	Electric charge
7	Temperature		20	Plane angle
8	Electrical resistance		21	Ratio

Table B-52: Physical quantity legend *(continued)*

Value	Meaning		Value	Meaning
9	Frequency		22	Angular speed
10	Electrical potential		23	Angular acceleration
11	Capacitance		24	Area
12	Inductance			

Table B-53: Register "A6500-UM Card – Physical quantity"

Register	Length (number of registers)	Type	Name	Description
45700	1	16 Bit Integer (unsigned)	Physical quantity measurement card 1 CH 1	Physical quantity of measurement card 1, channel 1 or calculated value for applications with calculation based on two channels. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
			Physical quantity measurement card 1 CH 2	Physical quantity of measurement card 1, channel 2 or 0 for applications with calculation based on two channels. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
45701	1	16 Bit Integer	Physical quantity measurement card 2 CH 1	Physical quantity of measurement card 2, channel 1 or calculated value for applications with calculation based on two channels. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
			Physical quantity measurement card 2 CH 2	Physical quantity of measurement card 2, channel 2 or 0 for applications with calculation based on two channels. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
...				

Table B-53: Register "A6500-UM Card – Physical quantity" *(continued)*

Register	Length (number of registers)	Type	Name	Description
45723	1	16 Bit Integer (unsigned)	Physical quantity measurement card 24 CH 1	Physical quantity of measurement card 24, channel 1 or calculated value for applications with calculation based on two channels. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
			Physical quantity measurement card 24 CH 2	Physical quantity of measurement card 24, channel 2 or 0 for applications with calculation based on two channels. For meaning of the 8 Bit Integer (unsigned) value see Table B-52

A6500-UM Universal Measurement Card – Analysis physical quantity

The analysis physical quantity of each channel of the installed A6500-UM cards occupies a half register (8 Bit) within the group register range as shown in Table B-54.

Table B-52 shows the meaning of the 8 Bit Integer (unsigned) value.

Table B-54: Register "A6500-UM Card – Analysis physical quantity"

Register	Length (number of registers)	Type	Name	Description
45750	1	16 Bit Integer (unsigned)	Physical quantity analysis card 1 CH 1	Physical quantity of analysis card 1, channel 1. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
			Physical quantity analysis card 1 CH 2	Physical quantity of analysis card 1, channel 2. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
45751	1	16 Bit Integer	Physical quantity analysis card 2 CH 1	Physical quantity of analysis card 2, channel 1. For meaning of the 8 Bit Integer (unsigned) value see Table B-52

Table B-54: Register "A6500-UM Card – Analysis physical quantity ***(continued)***

Register	Length (number of registers)	Type	Name	Description
			Physical quantity analysis card 2 CH 2	Physical quantity of analysis card 2, channel 2. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
...				
45773	1	16 Bit Integer (unsigned)	Physical quantity analysis card 24 CH 1	Physical analysis of measurement card 24, channel 1. For meaning of the 8 Bit Integer (unsigned) value see Table B-52
			Physical quantity analysis card 24 CH 2	Physical quantity of analysis card 24, channel 2. For meaning of the 8 Bit Integer (unsigned) value see Table B-52

B.2.2 Data table "Holding register"

The holding card registers are allocated continuously to the racks and slots. Table B-56 shows the allocation of the racks and slots to the registers. The general holding register ranges are shown in Table B-55.

For every card connected to the communication card, 2070 registers are reserved for its time data. The register numbers are allocated continuously:

Note
Time data is not supported on A6500-CP cards running firmware version 5.x.

Table B-55: Holding register range

Register range	Content	Registers per card / slot
0 to 53820	Time data	2070 (1035 per channel)
62000 to 63300	Software switches and software inputs	50 per card
64000 to 64105	Settings	for all cards
65000 to 65099	Trigger for data capturing	ATG System
65100 to 65105	Current UTC time	ATG System

Table B-56: Register allocation – Time data

System Rack	Slot	Register "Time data"	Register "Settings"
Rack 1	Card 1	0 to 2069	64000 to 64105

Table B-56: Register allocation – Time data *(continued)*

System Rack	Slot	Register "Time data"	Register "Settings"
	Card 2	2070 to 4139	
	Card 3	4140 to 6209	
	Card 4	6210 to 8279	
	Card 5	8280 to 10349	
	Card 6	10350 to 12419	
	Card 7	12420 to 14489	
	Card 8	14490 to 16559	
	Card 9	16560 to 18629	
	Card 10	18630 to 20699	
	Card 11	20700 to 22769	
Rack 2 [1]	Card 1	28980 to 31049	
	Card 2	31050 to 33119	
	Card 3	33120 to 35189	
	Card 4	35190 to 37259	
	Card 5	37260 to 39329	
	Card 6	39330 to 41399	
	Card 7	41400 to 43469	
	Card 8	43470 to 45539	
	Card 9	45540 to 47609	
	Card 10	47610 to 49679	
	Card 11	49680 to 51749	

1 *Only if a second A6500-SR is connected to the Com Card*

Table B-57: Register allocation – Software switches and software inputs

System rack	Slot	Register "Software switches" A6500-UM Card	Register "Software inputs" A6500-RC Relay Card depending on System Rack type
Rack 1	Card 1	62000	
	Card 2	62050	
	Card 3	62100	
	Card 4	62150	
	Card 5	62200	
	Card 6	62250	

Table B-57: Register allocation – Software switches and software inputs *(continued)*

System rack	Slot	Register "Software switches" A6500-UM Card	Register "Software inputs" A6500-RC Relay Card depending on System Rack type
	Card 7	62300	62300 to 62349[1]
	Card 8	62350	
	Card 9	62400	
	Card 10	62450	62450 to 62499[2]
	Card 11	62500	62500 to 62549[2]
	Card 12	62550	62550 to 62599[3]
	Card 13	62600	
	Card 14	62650	
Rack 2[4]	Card 1	62700	
	Card 2	62750	
	Card 3	62800	
	Card 4	62850	
	Card 5	62900	
	Card 6	62950	
	Card 7	63000	
	Card 8	63050	
	Card 9	63100	
	Card 10	63150	63150 to 63199[2]
	Card 11	63200	63200 to 63249[2]
	Card 12	63250	63250 to 63299[3]

1 *Relay Card slot A6500-FR*
2 *Relay Card slot A6500-RR*
3 *Relay Card slot A6500-SR*
4 *Only if a second A6500-SR or A6500-RR is connected to the Com Card*

Structure of the registers "Time data"

The 2070 registers for the time data are occupied as shown in Table B-58. The general time waveform data are replaced by the PeakVue time waveform data if **Show PeakVue Live Data** (**A6500-UM → Configuration → Analysis → Show PeakVue Live Data**) is activated in the respective A6500-UM card.

Note
Time data is not supported on A6500-CP cards running firmware version 5.x.

Table B-58: Structure of registers "Time data"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Sample frequency	Unit: Hz (Channel 1)
2	2	32 Bit Integer (unsigned)	Current time	Unix time of the current data set (Channel 1)[1]
4	2	32 Bit Integer (unsigned)	Number of Samples	Data block length (Channel 1)
6	2	Float	Scale	Factor for scaling the time value. Multiply the time data register with this factor to get the correct value. (Channel 1)
8	2	32 Bit Integer (unsigned)	Resolution	Resolution of the time data (Channel 1) 1: 8 Bit Integer (signed) 2: 8 Bit Integer (unsigned) **3: 16 Bit Integer (signed) - Default** 4: 16 Bit Integer (unsigned) 5: 32 Bit Integer (signed) 6: 32 Bit Integer (unsigned)
10	1	16 Bit Integer (signed)	Time value 1	1. value of the time data (Channel 1)
11	1	16 Bit Integer (signed)	Time value 2	2. value of the time data (Channel 1)
12	1	16 Bit Integer (signed)	Time value 3	3. value of the time data (Channel 1)
...	...	...	...	...
1033	1	16 Bit Integer (signed)	Time value 1024	1024. value of the time data (Channel 1)
1034	1	16 Bit Integer (unsigned)	Data mode	Data mode of channel 1 0: Raw (time data) 1: PeakVue data
1035	2	Float	Sample frequency	Unit: Hz (Channel 2)

Table B-58: Structure of registers "Time data" *(continued)*

Register	Length (number of registers)	Type	Name	Description
1037	2	32 Bit Integer (unsigned)	Current time	Unix time of the current data set (Channel 2)[1]
1039	2	32 Bit Integer (unsigned)	Number of Samples	Data block length (Channel 2)
1041	2	Float	Scale	Factor for scaling the time value. Multiply the time data register with this factor to get the correct value. (Channel 2)
1043	2	32 Bit Integer (unsigned)	Resolution	Resolution of the time data (Channel 2) 1: 8 Bit Integer (signed) 2: 8 Bit Integer (unsigned) **3: 16 Bit Integer (signed) - Default** 4: 16 Bit Integer (unsigned) 5: 32 Bit Integer (signed) 6: 32 Bit Integer (unsigned)
1045	1	16 Bit Integer (signed)	Time value 1	1. value of the time data (Channel 2)
1046	1	16 Bit Integer (signed)	Time value 2	2. value of the time data (Channel 2)
1047	1	16 Bit Integer (signed)	Time value 3	3. value of the time data (Channel 2)
...	...	...	...	...
2068	1	16 Bit Integer (signed)	Time value 1024	1024. value of the time data (Channel 2)
2069	1	16 Bit Integer (unsigned)	Data mode	Data mode of channel 2 0: Raw (time data) 1: PeakVue data

1 *Number of seconds elapsed since 1/1/1970.*

Structure of the registers "Software inputs"

The 50 holding registers to switch the software inputs of A6500-RC Relay Cards are occupied as shown in Table B-59. These registers are writable and readable.

Table B-59: Structure of registers "Software inputs"

Register offset[1]	Length (number of registers)	Type	Name	Description
0	1	Bool	IO.SoftwareInput1	Use these registers to switch the software inputs of the A6500-RC Relay Card. 0: Off 1: On These registers are writable and readable.
1	1	Bool	IO.SoftwareInput2	
2	1	Bool	IO.SoftwareInput3	
3	1	Bool	IO.SoftwareInput4	
4	1	Bool	IO.SoftwareInput5	
5	1	Bool	IO.SoftwareInput6	
6	1	Bool	IO.SoftwareInput7	
7	1	Bool	IO.SoftwareInput8	
8	1	Bool	IO.SoftwareInput9	
9	1	Bool	IO.SoftwareInput10	
10	1	Bool	IO.SoftwareInput11	
11	1	Bool	IO.SoftwareInput12	
12	1	Bool	IO.SoftwareInput13	
13	1	Bool	IO.SoftwareInput14	
14	1	Bool	IO.SoftwareInput15	
15	1	Bool	IO.SoftwareInput16	
16 to 49	1		not used	Reserve

1 *Example for the second software input of an A6500-RC installed in an A6500-SR: Register 62550 + 1 = 62551*

Structure of the registers "Software switches" – A6500-UM

The 50 holding registers to switch the software inputs of A6500-UM Universal Measurements Cards are occupied as shown in Table B-60. These registers are writable and readable.

Table B-60: Structure of registers "Software switches" – A6500-UM

Register offset[1]	Length (number of registers)	Type	Name	Description
0	1	Bool	Command.LimitMultiplier	Use these registers to switch the software inputs of the A6500-UM Universal Measurement Card. 0: Off 1: On These registers are writable and readable.
1	1	Bool	Command.Bypass	
2	1	Bool	Command.BypassDO1To2	
3	1	Bool	Command.BypassDO4To5	
4	1	16 Bit Integer (unsigned)	Command.OperationMode	Use this register to activate the configured alarm limit sets. 0: None 1: Operation Mode 1 2: Operation Mode 2 3: Operation Mode 3 4: Operation Mode 4 These registers are writable and readable.
5 to 49	1		not used	Reserve

1 *Example for the third software switch (Bypass DO 1-2) of an A6500-UM installed in slot 2 of an A6500-SR: Register 62050 + 2 = 62052*

Structure of the registers "Software switches" – A6500-TP

The 50 holding registers to switch the software inputs of A6500-TP Temperature Process Cards are occupied as shown in Table B-61. These registers are writable and readable.

Table B-61: Structure of registers "Software switches" – A6500-TP

Register offset[1]	Length (number of registers)	Type	Name	Description
0	1	Bool	Command.BypassCh1	Use these registers to switch the software inputs of the A6500-TP Temperature Process Card. 0: Off 1: On These registers are writable and readable.
1	1	Bool	Command.BypassCh2	
2	1	Bool	Command.BypassCh3	
3	1	Bool	Command.BypassCh4	

Table B-61: Structure of registers "Software switches" – A6500-TP *(continued)*

Register offset[1]	Length (number of registers)	Type	Name	Description
4 to 49	1		not used	Reserve

1 *Example for the third software switch (Bypass CH 3) of an A6500-TP installed in slot 2 of an A6500-SR: Register 62050 + 2 = 62052*

Structure of the registers "Settings"

The 105 holding registers are general registers for the complete system and occupied as shown in Table B-62. Most of these registers are writable and readable, for example "Reset Latch", "Freeze Time data", and so on.

Note
Write the command registers, such as **Reset Latch**, and **Reset Max Input Channel Temp**, one by one. The writing of all registers at once can cause communication problems on the Modbus.

Note
The registers 64010 to 64037 for the activating of time data providing are calculated for two racks with 14 cards (slots) for each rack.

The second rack always starts with card 15.

Table B-62: Structure of registers "Settings"

Register	Length (number of registers)	Type	Name	Description
64000	1	16 Bit Integer (unsigned)	Unit selection	Selected system of units: 0: SI units 1: US units
64001	1	16 Bit Integer	Command.ResetLatch	Use this register to send a reset latch command to all cards connected to the Com Card. -1: Waiting for command 0: Busy 1: Send reset latch (writable and readable)

Table B-62: Structure of registers "Settings" *(continued)*

Register	Length (number of registers)	Type	Name	Description
64002	1	16 Bit Integer	Command.ResetMinMaxValues	Use this register to send a command to reset the stored maximum temperature of all A6500-TP cards connected to the Com Card. -1: Waiting for command 0: Busy 1: Send reset latch (writable and readable)
64003	1	16 Bit Integer (unsigned)	Freeze Time data	Use this register to freeze the time data before reading the time data registers, so the data can be read at once. Otherwise, the data could has different time stamps. This command will be sent to all cards connected to the Com Card. 1 0: No freeze 1: Freeze (writable and readable)
64004	1	16 Bit Integer	Reboot Com Card left	Use this register to send a command to reboot the A6500-CC or A6500-CP in the left communication card slot. -1: Waiting for command 0: Busy 1: Send reboot (writable and readable)

Table B-62: Structure of registers "Settings" *(continued)*

Register	Length (number of registers)	Type	Name	Description
64005	1	16 Bit Integer	Reboot Com Card right	Use this register to send a command to reboot the A6500-CC or A6500-CP in the right communication card slot. -1: Waiting for command 0: Busy 1: Send reboot (writable and readable)
64006 to 64009	1		not used	Reserve
64010	1	16 Bit Integer Low Byte (signed)	Time data Card1 Channel1 active	Use this register to activate the providing of time data of card 1, channel 1. -1: Busy 0: No active 1: active (writable and readable)
		16 Bit Integer High Byte (signed)	Time data Card1 Channel2 active	Use this register to activate the providing of time data of card 1, channel 2. -1: Busy 0: No active 1: active (writable and readable)
64011	1	16 Bit Integer Low Byte (signed)	Time data Card2 Channel1 active	Use this register to activate the providing of time data of card 2, channel 1. -1: Busy 0: No active 1: active (writable and readable)

Table B-62: Structure of registers "Settings" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		16 Bit Integer High Byte (signed)	Time data Card2 Channel2 active	Use this register to activate the providing of time data of card 2, channel 2. -1: Busy 0: No active 1: active (writable and readable)
...				
64023	1	16 Bit Integer Low Byte (signed)	Time data Card14 Channel1 active	Use this register to activate the providing of time data of card 14, channel 1. -1: Busy 0: No active 1: active (writable and readable)
		16 Bit Integer High Byte (signed)	Time data Card14 Channel2 active	Use this register to activate the providing of time data of card 14, channel 2. -1: Busy 0: No active 1: active (writable and readable)
64024	1	16 Bit Integer Low Byte (signed)	Time data Card15 Channel1 active[2]	Use this register to activate the providing of time data of card 15, channel 1. -1: Busy 0: No active 1: active (writable and readable)
		16 Bit Integer High Byte (signed)	Time data Card15 Channel2 active[2]	Use this register to activate the providing of time data of card 15, channel 2. -1: Busy 0: No active 1: active (writable and readable)
...				

Table B-62: Structure of registers "Settings" *(continued)*

Register	Length (number of registers)	Type	Name	Description
64037	1	16 Bit Integer Low Byte (signed)	Time data Card28 Channel1 active	Use this register to activate the providing of time data of card 28, channel 1. -1: Busy 0: No active 1: active (writable and readable)
		16 Bit Integer High Byte (signed)	Time data Card28 Channel2 active	Use this register to activate the providing of time data of card 28, channel 2. -1: Busy 0: No active 1: active (writable and readable)
64038 to 64105	1		not used	Reserve

1 *This command will only freeze the time data Modbus registers and does not affect any other registers or functions of the whole system.*
2 *Second rack starts with card 15.*

Structure of the registers "Trigger" – A6500-CC and A6500-CP with firmware version 1.x

The 85 holding registers are used to trigger data collection tasks when using an A6500-CC or an A6500-CP with firmware version 1.x. The registers are occupied as shown in Table B-63.

Table B-63: Structure of registers "Trigger" – A6500-CC and A6500-CP with firmware version 1.x

Register	Length (number of registers)	Type	Name	Description
65000	1	16 Bit Integer (signed)	Command.CollectionTrigger1	Use these registers to send trigger commands to the ATG System to trigger configured collection tasks. These triggers can be freely assigned to arbitrary collection tasks. -1: Waiting for command 0: Busy 1: Send trigger These registers are writable and readable.
65001	1	16 Bit Integer (signed)	Command.CollectionTrigger2	
65002	1	16 Bit Integer (signed)	Command.CollectionTrigger3	
65003	1	16 Bit Integer (signed)	Command.CollectionTrigger4	
65004	1	16 Bit Integer (signed)	Command.CollectionTrigger5	
65005	1	16 Bit Integer (signed)	Command.CollectionTrigger6	
65006	1	16 Bit Integer (signed)	Command.CollectionTrigger7	
65007	1	16 Bit Integer (signed)	Command.CollectionTrigger8	
65008	1	16 Bit Integer (signed)	Command.CollectionTrigger9	
65009	1	16 Bit Integer (signed)	Command.CollectionTrigger10	
65010 to 65024	1		not used	Reserve

Table B-63: Structure of registers "Trigger" – A6500-CC and A6500-CP with firmware version 1.x *(continued)*

Register	Length (number of registers)	Type	Name	Description
65025	1	16 Bit Integer (signed)	Command.SoftwareTrigger.1.Command	Use these registers to send trigger commands to trigger collection tasks. These registers are assigned to the collection tasks in numeric order. This assignment cannot be changed. **Software trigger command task 1** is assigned to collection task 1. **Software trigger command task 2** is assigned to collection task 2. ... **Software trigger command task 10** is assigned to collection task 10. -1: Waiting for command 0: Busy 1: Send trigger These registers are writable and readable.
65026	1	16 Bit Integer (signed)	Command.SoftwareTrigger.2.Command	
65027	1	16 Bit Integer (signed)	Command.SoftwareTrigger.3.Command	
65028	1	16 Bit Integer (signed)	Command.SoftwareTrigger.4.Command	
65029	1	16 Bit Integer (signed)	Command.SoftwareTrigger.5.Command	
65030	1	16 Bit Integer (signed)	Command.SoftwareTrigger.6.Command	
65031	1	16 Bit Integer (signed)	Command.SoftwareTrigger.7.Command	
65032	1	16 Bit Integer (signed)	Command.SoftwareTrigger.8.Command	
65033	1	16 Bit Integer (signed)	Command.SoftwareTrigger.9.Command	
65034	1	16 Bit Integer (signed)	Command.SoftwareTrigger.10.Command	
65035 to 65049	1		not used	Reserve

Table B-63: Structure of registers "Trigger" – A6500-CC and A6500-CP with firmware version 1.x *(continued)*

Register	Length (number of registers)	Type	Name	Description
65050	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.1.State	Only available if the Com Card in the left-most communication card slot is active. State of the collection task: 0: Waiting 1: Prepare filter 2: Idle 3: Capture 4: Prepare SD card 5: Transfer data 6: Finish task
65051	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.2.State	
65052	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.3.State	
65053	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.4.State	
65054	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.5.State	
65055	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.6.State	
65056	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.7.State	
65057	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.8.State	
65058	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.9.State	
65059	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.10.State	
65060 to 65061	1		not used	Reserve

Table B-63: Structure of registers "Trigger" – A6500-CC and A6500-CP with firmware version 1.x *(continued)*

Register	Length (number of registers)	Type	Name	Description
65062	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.1.State	Only available if the Com Card in the right communication card slot is active. State of the collection task: 0: Waiting 1: Prepare filter 2: Idle 3: Capture 4: Prepare SD card 5: Transfer data 6: Finish task
65063	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.2.State	
65064	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.3.State	
65065	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.4.State	
65066	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.5.State	
65067	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.6.State	
65068	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.7.State	
65069	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.8.State	
65070	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.9.State	
65071	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.10.State	
65072 to 65074	1		not used	Reserve
65075	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.1.PreTime	Only available if the Com Card in the left-most communication card slot is active. Minimal available pre time of all channels to be collected assigned to a collection task. Unit: seconds
65076	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.2.PreTime	
65077	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.3.PreTime	

Table B-63: Structure of registers "Trigger" – A6500-CC and A6500-CP with firmware version 1.x *(continued)*

Register	Length (number of registers)	Type	Name	Description
65078	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.4.PreTime	
65079	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.5.PreTime	
65080	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.6.PreTime	
65081	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.7.PreTime	
65082	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.8.PreTime	
65083	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.9.PreTime	
65084	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.10.PreTime	
65085 to 65086	1		not used	Reserve
65087	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.1.PreTime	Only available if the Com Card in the right communication card slot is active. Minimal available pre time of all channels to be collected assigned to a collection task. Unit: seconds
65088	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.2.PreTime	
65089	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.3.PreTime	
65090	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.4.PreTime	
65091	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.5.PreTime	
65092	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.6.PreTime	

Table B-63: Structure of registers "Trigger" – A6500-CC and A6500-CP with firmware version 1.x *(continued)*

Register	Length (number of registers)	Type	Name	Description
65093	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.7.PreTime	
65094	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.8.PreTime	
65095	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.9.PreTime	
65096	1	16 Bit Integer (unsigned)	Command.SoftwareTrigger.10.PreTime	
65097 to 65099	1		not used	Reserve

Structure of registers "Triggers" – A6500-CP with firmware version 5.x

The 35 holding registers are used to trigger data collections when using an A6500-CP with firmware version 5.x. The registers are occupied as shown in Table B-64.

Table B-64: Structure of registers "Trigger" – A6500-CP with firmware version 5.x

Register	Length (number of registers)	Type	Name	Description
65000	1	16 Bit Integer (signed)	Command.CollectionTrigger1	Use these registers to send trigger commands to the ATG System to trigger configured data collections. These triggers can be freely assigned to arbitrary data collections. -1: Waiting for command 0: Busy 1: Send trigger These registers are writable and readable.
65001	1	16 Bit Integer (signed)	Command.CollectionTrigger2	
65002	1	16 Bit Integer (signed)	Command.CollectionTrigger3	
65003	1	16 Bit Integer (signed)	Command.CollectionTrigger4	
65004	1	16 Bit Integer (signed)	Command.CollectionTrigger5	

Table B-64: Structure of registers "Trigger" – A6500-CP with firmware version 5.x *(continued)*

Register	Length (number of registers)	Type	Name	Description
65005	1	16 Bit Integer (signed)	Command.CollectionTrigger6	
65006	1	16 Bit Integer (signed)	Command.CollectionTrigger7	
65007	1	16 Bit Integer (signed)	Command.CollectionTrigger8	
65008	1	16 Bit Integer (signed)	Command.CollectionTrigger9	
65009	1	16 Bit Integer (signed)	Command.CollectionTrigger10	
65010 to 65024	1		not used	Reserve
65025	1	16 Bit Integer (signed)	Command.SoftwareTrigger.1.OnDemand	Use these registers to send trigger commands to trigger configured data collections. These registers are assigned to the data collections in numeric order. This assignment cannot be changed. **Command.SoftwareTrigger.1. OnDemand** is assigned to data collection 1. **Command.SoftwareTrigger.2. OnDemand** is assigned to data collection 2. ... **Command.SoftwareTrigger.10. OnDemand** is assigned to data collection 10. -1: Waiting for command 0: Busy 1: Send trigger These registers are writable and readable.
65026	1	16 Bit Integer (signed)	Command.SoftwareTrigger.2.OnDemand	
65027	1	16 Bit Integer (signed)	Command.SoftwareTrigger.3.OnDemand	
65028	1	16 Bit Integer (signed)	Command.SoftwareTrigger.4.OnDemand	
65029	1	16 Bit Integer (signed)	Command.SoftwareTrigger.5.OnDemand	
65030	1	16 Bit Integer (signed)	Command.SoftwareTrigger.6.OnDemand	
65031	1	16 Bit Integer (signed)	Command.SoftwareTrigger.7.OnDemand	
65032	1	16 Bit Integer (signed)	Command.SoftwareTrigger.8.OnDemand	

Table B-64: Structure of registers "Trigger" – A6500-CP with firmware version 5.x *(continued)*

Register	Length (number of registers)	Type	Name	Description
65033	1	16 Bit Integer (signed)	Command.SoftwareTrigger.9.OnDemand	
65034	1	16 Bit Integer (signed)	Command.SoftwareTrigger.10.OnDemand	

Structure of the registers "Current time"

The six holding registers are registers for the current UTC time and occupied as shown in Table B-65.

Note
In systems with redundant communication, check which card is active before setting the device time. The time can be only set at the active communication card.

Table B-65: Structure of registers "Current time"

Register	Length (number of registers)	Type	Name	Description
65100	1	16 Bit Integer	Info.CurrentTime.Year	Time of the Com Card in the left-most communication card slot. UTC (Coordinated Universal Time); writable and readable registers
65101	1	16 Bit Integer	Info.CurrentTime.Month	
65102	1	16 Bit Integer	Info.CurrentTime.Day	
65103	1	16 Bit Integer	Info.CurrentTime.Hour	
65104	1	16 Bit Integer	Info.CurrentTime.Minute	
65105	1	16 Bit Integer	Info.CurrentTime.Second	
65106	1	16 Bit Integer	Info.IsActiveCard	Indication whether the Com Card in the left-most communication card slot is active. 1: active 0: passive

Table B-65: Structure of registers "Current time" *(continued)*

Register	Length (number of registers)	Type	Name	Description
65110	1	16 Bit Integer	Info.CurrentTime.Year	Time of the Com Card in the right communication card slot. UTC (Coordinated Universal Time); writable and readable registers
65111	1	16 Bit Integer	Info.CurrentTime.Month	
65112	1	16 Bit Integer	Info.CurrentTime.Day	
65113	1	16 Bit Integer	Info.CurrentTime.Hour	
65114	1	16 Bit Integer	Info.CurrentTime.Minute	
65115	1	16 Bit Integer	Info.CurrentTime.Second	
65116	1	16 Bit Integer	Info.IsActiveCard	Indication whether the Com Card in the right communication card slot is active. 1: active 0: passive

B.2.3 Data table "Coils"

The Coils are allocated continuously to the racks and slots. See Table B-67. Table B-66 shows the general Coil ranges.

Use these writable and readable Coils to switch system commands and card commands (A6500-UM and A6500-TP).

- 0: Off
- 1: On

Table B-66: Coils range

Range	Content	Coils per card/slot
0 to 99	System commands	100
100 to 2699	Card depending commands	100

Table B-67: Coils allocation

System Rack	Slot	Coils "Card commands"	Coils "System commands"
Rack 1	Card 1	100 to 199	0 to 99
	Card 2	200 to 299	

Table B-67: Coils allocation *(continued)*

System Rack	Slot	Coils "Card commands"	Coils "System commands"
	Card 3	300 to 399	
	Card 4	400 to 499	
	Card 5	500 to 599	
	Card 6	600 to 699	
	Card 7	700 to 799	
	Card 8	800 to 899	
	Card 9	900 to 999	
	Card 10	1000 to 1099	
	Card 11	1100 to 1199	
	Reserve	1200 to 1499	
Rack 2 [1]	Card 1	1500 to 1599	
	Card 2	1600 to 1699	
	Card 3	1700 to 1799	
	Card 4	1800 to 1899	
	Card 5	1900 to 1999	
	Card 6	2000 to 2099	
	Card 7	2100 to 2199	
	Card 8	2200 to 2299	
	Card 9	2300 to 2399	
	Card 10	2400 to 2499	
	Card 11	2500 to 2599	
	Reserve	2600 to 2699	

1 *Only if a second A6500-SR is connected to the Com Card*

Structure of the Coils "Card commands" – A6500-UM

The 100 Coils for the card commands are occupied as shown in Table B-68.

Table B-68: Structure of the A6500-UM command Coils

Coil	Type	Name	Description
0	Bool	Command.LimitMultiplier	Limit Multiplier
1	Bool	Command.Bypass	Card bypass
2	Bool	Command.BypassDO1To2	Bypass digital outputs 1 and 2
3	Bool	Command.BypassDO4To5	Bypass digital outputs 4 and 5

Table B-68: Structure of the A6500-UM command Coils *(continued)*

Coil	Type	Name	Description
4	Bool	Command.OperationMode	Use these registers to activate the configured alarm limit sets. See Table B-69.
5	Bool	Command.OperationMode	
6	Bool	Command.OperationMode	
7 to 99	Bool	Reserve	

Table B-69: Bit pattern to activate the required operating mode

Operation Mode	Coil 6	Coil 5	Coil 4
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0

Structure of the Coils "Card commands" – A6500-TP

The 100 Coils for the card commands are occupied as shown in Table B-70.

Table B-70: Structure of the A6500-TP command Coils

Coil	Type	Name	Description
0	Bool	Command.BypassCh1	Bypass Channel 1
1	Bool	Command.BypassCh2	Bypass Channel 2
2	Bool	Command.BypassCh3	Bypass Channel 3
3	Bool	Command.BypassCh4	Bypass Channel 4
4 to 99	Bool	Reserve	

Structure of the Coils "System commands"

The 100 Coils for the system commands are occupied as shown in Table B-71.

Table B-71: Structure of the system command Coils

Coil	Type	Name	Description
0	Bool	Command.ResetLatch	Use this register to send a reset latch command to all cards connected to the Com Card.
1 to 99	Bool	Reserve	

C Data sent to AMS Machine Works

Table C-1 provides an overview of all data categories transmitted from the AMS 6500 ATG system to AMS Machine Works.

Table C-1: Overview of data transmitted the AMS Machine Works

Category	Data sent to AMS Machine Works
Configuration	System configuration, rack configuration, card configuration, system component meta data, data tree definitions, units, physical quantities, alarm configuration, and trigger definitions. Sent by the AMS 6500 ATG.
Scalars	Live, scheduled, transient, on-demand, and alarm-related scalar measurement values, including timestamps and quality/status flags. Sent by A6500-UM and A6500-TP cards.
Waveforms	Asynchronous and synchronous waveform data, including sampling parameters, scaling information, and optional speed or synchronization keys. Sent by A6500-UM cards.
Alarm data	Alarm scalar data, alarm waveform data, and pre-trigger and post-trigger measurement data. Sent by A6500-UM cards.
Triggers	Collection trigger information for live, scheduled, transient, alarm-based, and on-demand data collection. Sent by the AMS 6500 ATG.
Status	Health and status information for system, rack, card, and system components, including aggregated state indicators. Sent by the AMS 6500 ATG.
Stored data	Automatic resending of data stored on the microSD card in case of missing data in AMS Machine Works.

D System events

The possible system events related to the services (Date and time, Data collections, Collection tasks, OPC UA, and Modbus) and the firmware update are listed in Table D-1. See column **Cross reference / Note** for further event related information. See System events for a general description of the system events.

Table D-1: System events

Event	Cross reference / Note
System time set by SNTP	Date and time, Online view
SNTP connection established	
SNTP connection failed x	x: 1 or 2 1: Server unreachable 2: Internal error
User authenticated	A6500-CP Com Card Pro – User management
Firmware updated	Firmware update (all)
Firmware update failed x	x: 1 to 4 1: Error "CRC Checksum Bootloader" 2: Error "CRC Checksum F427 Controller" 3: Error "CRC Checksum F401 Controller" 4: Error "CRC Checksum F427 Controller"
Firmware mismatch	Ensure that all cards have the same firmware main version such as 3.x. Update the cards that still have an outdated firmware installed.
Configuration reset to factory default	Reset to factory default
SD card detected	Collection data
Card reboot planned	Reboot will be performed, example: OPC UA credentials, see **Anonymous login**, OPC UA LAN 1 and LAN 2 – A6500-CP, see **Port**
License available	License entry
License not available	
Password enabled	A6500-CP – Change password
Password disabled	A6500-CC – Reset password
Modbus server started	Modbus, Online view
Modbus server stopped	

Table D-1: System events *(continued)*

Event	Cross reference / Note
Modbus client connected	
Modbus client disconnected	
Modbus mappings not in sync	Update Modbus mappings
OPC UA server started	OPC UA, Online view
OPC UA server stopped	
OPC UA connected	
OPC UA disconnected	
OPC UA Login Attempt	Detected connection attempt using credentials from OPC UA client, see OPC UA
File error	Delete a folder or data file
Event storage error	
Collection task [Group number] [Group name] started via AMS Machine Studio	Commands
Collection task [Group number] [Group name] started via software trigger	Configure triggers for the data collection
Collection task [Group number] [Group name] started due to the schedule [Trigger name]	
Collection task [Group number] [Group name] started due to event [Trigger name] [Event name]	
Collection task [Group number] '[Group name]' finished successfully	-/-
Collection task [Group number] '[Group name]' failed with error code	Contact support and submit the error code, see Technical support
Collection task [Group number] '[Group name]' partially successful ([number of the failed channel] of [total number of channels] channel failed)	-/-
Data collection [Data collection name {DCN}] started due to [Trigger type {TT} (Schedule, Transient, On Demand, Alarm)] [Trigger name {TN}] [Schedule sub type (0: None, 1: waveform, 2: scalars)] [Collection sequence ID{CSID[1]}]	Data collections
Data collection [Data collection name {DCN}] [Collection sequence ID {CSID[1]}] ongoing: [Data source recording failed {DSF}] / [Data source recordings total {DST}] data source recordings have failed	-/-
Data collection [Data collection name {DCN}] finished successfully [Collection sequence ID{CSID[1]}]	-/-
Data collection [Data collection name {DCN}] failed [Collection sequence ID{CSID[1]}]	-/-

Table D-1: System events *(continued)*

Event	Cross reference / Note
Data collection [Data collection name {DCN}] finished partially successful (Collection sequence ID {CSID[1]}] [Data source recordings failed {DSF}] of [Data source recordings total {DST}] data source recordings failed)	-/-

1 *The CSID is the trigger event count per data collection. For each schedule trigger, on-demand trigger, or transient trigger that occurs within a data collection, the CSID is increased by 1.*

E Audit log records

The audit log is available for AMS 6500 ATG systems with an A6500-CP Com Card Pro installed. Table E-1 lists all possible audit log records including the severity. The time stamp of the record is the UTC time of the A6500-CP card.

Table E-1: Audit log records

Message ID	Record	Severity
Access control records		
10001	TCP connection established to <ServiceName> service on A6500-CP card in slot <Y> on <Ethernet Interface> from IP <XXX>, port <Port>.	Informational
10002	TCP connection to <ServiceName> service on A6500-CP card in slot <Y> on <Ethernet Interface> from IP <XXX>, port <XXX> closed by client (<XXX> bytes received, <XXX> bytes sent).	Informational
10003	TCP connection to <ServiceName> service on A6500-CP card in slot <Y> on <Ethernet Interface> from IP <XXX>, port <XXX> closed by server (<XXX> bytes received, <XXX> bytes sent, reason <XXX>).	Informational
10004	User <Username> successfully authenticated to <ServiceName> service on A6500-CP card in slot <Y> on <Ethernet Interface> from <IP> / via USB as <role>.	Informational
10005	Unsuccessful login attempt to <ServiceName> service on A6500-CP card in slot <Y> on <Ethernet Interface> from <IP> / USB (login name: <loginname>): Invalid login name / User locked / User disabled / Invalid password / Incompatible user role .	Warning
10006	Maximum number login attempts of user <Username> exceeded. User locked.	Warning
10007	Anonymous user successfully logged to <ServiceName> service on A6500-CP card in slot <Y> from <IP> on <Ethernet Interface>.	Informational
10008	<ServiceName> session closed by <Username> from IP <IP> on <Ethernet Interface>.	Informational
10009	<ServiceName> session of user <Username> on A6500-CP card in slot<Y> on <Ethernet Interface> from <IP> timed out.	Informational
Request error records		
11002	Unauthorized access try to <ServiceName> service on <CardType> card in rack <X>, slot <Y> on <Ethernet Interface> from <IP> / via USB by <Username>.	Warning
11003	<ServiceName> service on A6500-CP card in slot<Y> on <Ethernet Interface> from <IP> delivers HTTP-Status code <ErrorCode>: <ErrorMessage>.	Warning

Table E-1: Audit log records *(continued)*

Message ID	Record	Severity
Control system records		
12003	Time updated via <Source> from <Ethernet Interface> to <NewTime>, diff <DiffInMs> ms.	Informational
12004	<CardType> card in rack <X>, slot <Y>, serial <Serialnumber> lost.	Warning
12005	<CardType> card detected in rack <X>, slot <Y>, serial <Serialnumber>, firmware X.Y.Z.	Informational
	<CardType> card detected in rack <X>, slot <Y>, serial <Serialnumber>, firmware X.Y.Z (in Bootloader).	Informational
12006	Unexpected reboot of <CPUType> of A6500-CP card in rack <X>, slot <Y>, serial <Serialnumber> (reason <Watchdog, etc.>).	Error
12007	Active network connection to A6500-CP card in slot <Y> on <Ethernet Interface> detected.	Informational
12008	Inactive network connection to A6500-CP card in slot <Y> on <Ethernet Interface> detected.	Warning
12009	USB connection to A6500-CP card in slot <Y> in established	Informational
12010	USB connection to A6500-CP card in slot <Y> disconnected	Informational
12011	This is a test message created by user <Username>	Informational
12012	Key switch of A6500-CP card in slot <Y> switched to unlocked position.	Notice
12013	Key switch of A6500-CP card in slot <Y> switched to locked position.	Informational
12014	System program state changed into unlocked state.	Notice
12015	System program state changed into locked state.	Informational
12016	<ServiceName> service on A6500-CP card in slot <Y> on <Ethernet Interface> started.	Informational
12017	<ServiceName> service on A6500-CP card in slot <Y> on <Ethernet Interface> stopped.	Warning
12018	<ServiceName> service on A6500-CP card in slot <Y> on <Ethernet Interface> could not start (reason <Reason>).	Error
12019	A6500-CP card in slot <Y> established redundancy communication.	Informational
12020	A6500-CP card in slot <Y> lost redundant communication.	Warning
12021	Incompatible firmware versions of the two A6500-CP cards (Own <Version>; Other <Version>)	Error
12022	A6500-CP card in slot <Y> entered active mode.	Informational
12023	A6500-CP card in slot <Y> entered passive mode.	Informational

Table E-1: Audit log records *(continued)*

Message ID	Record	Severity
12025	<Type> configuration integrity check failed on <CardType> card in rack <X>, slot <Y>. Configuration reset to factory default.	Error
12026	Input validation failed. Invalid data received from <IP> by <Username> to <CardType> card in rack <X>, slot <Y>.	Error
12027	System default time used as RTC time is invalid	Informational
12028	System reset to factory default via USB by user <Username>.	Informational
12029	Update of A6500-CP card in slot <Y> failed because of wrong data diode status.	Error
12030	Reboot of <CardType> card in rack <X>, slot <Y>, serial <Serialnumber>, reason <Reason>	Informational
12031	Internal error: <InfoText>	Error
12032	The supply voltage of the A6500-CP card in slot <Y> is within valid range.	Informational
12033	The supply voltage of the A6500-CP card in slot <Y> is outside the valid range of 19 to 32 V (<AdditionalTexts>).	Warning
12034	Reboot loop detected. Configuration was reset for A6500-CP card in slot <X>.	Error
12035	Modbus function code <FunctionCode> sent from IP <IP address> to <Ethernet Interface> /sent to Modbus RTU of A6500-CP card in slot <SlotNumber> is not supported (01 ILLEGAL FUNCTION).	Error
12036	Access to modbus <RegisterType> register <StartRegister> (len <Length>) sent from IP <IP address> to <Ethernet Interface>/ to Modbus RTU of A6500-CP card in slot <SlotNumber> is not allowed (02 ILLEGAL DATA ADDRESS).	Error
12037	Modbus request with function code <FunctionCode> register <Register number> (len <Length>) sent from IP <IP address> to <Ethernet Interface> of A6500-CP card in slot <SlotNumber> is illegal (03 ILLEGAL DATA VALUE).	Error
12038	Firmware of <CardType> card updated from <OldVersion> to <NewVersion> by <Username> through <IP> / through USB.	Informational
Backup and restore records		
13003	User <Username> downloaded the audit log messages.	Informational
Configuration changes and user management records		
14001	User <Username> changed <ServiceName> configuration of <CardType> card in rack <X>, slot <X>.	Informational
14002	User <Username> set configuration of <CardType> card in rack <X>, slot <X> to factory default.	Informational
14100	User <NewUsername> created by <AdminName>.	Informational
14101	User <Username> deleted by <AdminName>.	Informational

Table E-1: Audit log records *(continued)*

Message ID	Record	Severity
14102	User <Username> modified by <AdminName>.	Informational
14103	Password of user <Username> changed by <AdminName>.	Informational
14104	User <Username> locked by user <AdminName>	Informational
14105	User <Username> unlocked by user <AdminName>	Informational
14106	User <Username> changed own password.	Informational
14107	System Use Notification modified by user <Username>	Informational
14008	User <Username> <action> dashboard <id> of <ServiceName> service on A6500-CP card in slot<Y> on <Ethernet Interface> from <IP>.	Informational
Audit log records		
15001	Syslog server <Server-IP> not reachable from A6500-CP card in slot <Y> .	Critical
15002	Syslog server <Server-IP> is reachable again (<X> messages lost) from A6500-CP card in slot <Y> .	Notice
15003	<NumberOfLostMessages> Audit log messages lost due to too many events.	Warning

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