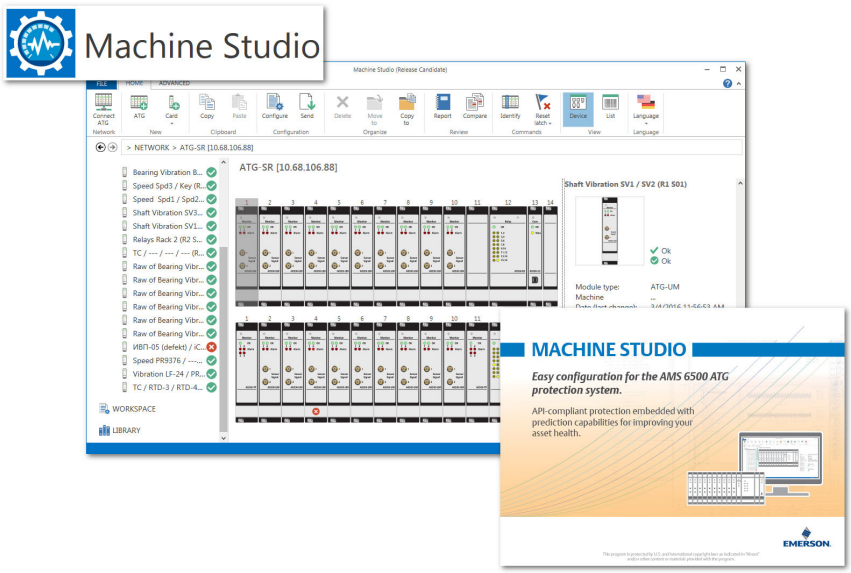
Operating Manual
MHM-97879 , Rev 5.03
April 2021

Machinery Health™ System

Machine Studio – General Functions



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Patents

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

Contents

1 General

1.1 Using this manual

This manual contains information concerning the use of the Machine Studio configuration software version 3.x.

Read the operating manual completely prior to starting installation and use of 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 1-1 shows a list of documents that are referred to in this operating manual.

Table 1-1: 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-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

1.2 Symbols

Note
This symbol marks passages that contain important information.

⚠ CAUTION

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

⚠ DANGER

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

⎓	According to IEC 61010, this symbol means that this device must be operated with DC voltage.

	Warning, electric shock hazard.

	According to IEC 61010, this symbol means that the documentation of the device must completely be read and understood before installing and commissioning of the device. Observe all safety related instructions in this document.

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 approved expressly 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 800.833.8314 (U.S. and Canada) +1.512.832.3774 (Latin America) +63.2702.1111 (Asia Pacific, Europe, and Middle East)
Email	ap-sms@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.emersonprocess.com/technicalsupport.

Note
If the equipment has been exposed to a hazardous substance, a Material Safety Data Sheet (MSDS) must be included with the returned materials. 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 the software 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 Card(s) 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 7 and Microsoft Windows 10

1.6 Software installation

Procedure

1. Download Machine Studio – if not already done.
    a) The download link is on the documentation CD **Online Protection Documentation**. Place the CD into the drive.
    The CD automatically starts and the start screen of the CD is displayed (see Figure 1-1). If the CD does not automatically start, open the CD with a file explorer, and click **index**.

Figure 1-1: Documentation CD - Start screen

b) Click **Download Configuration Software** to open the software download page on the internet.

Alternatively enter http://reliabilitymobile.com/apps/registration/Account/Login.aspx into the address bar of your internet browser.

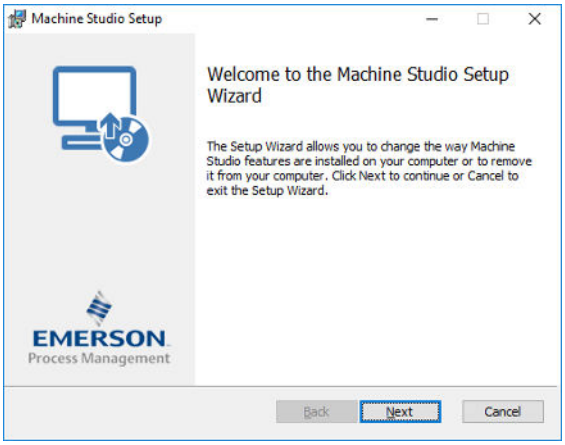
c) Log in to the download page.

Click **Register** if you do not already have an account. Follow the instructions.

d) Go to **AMS Machine Studio**, and click **AMS Machine Studio Installer Package** to download the setup file to your computer.

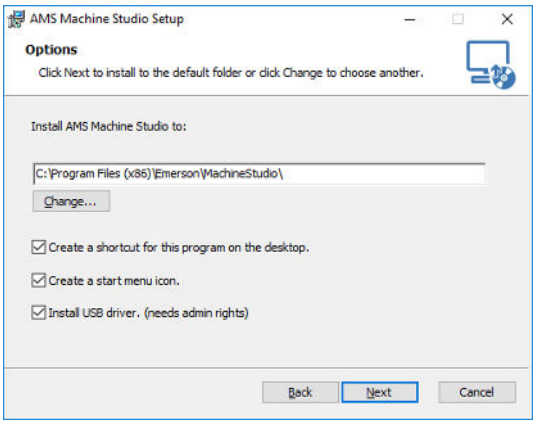
2. Unzip the file to an arbitrary location.
3. Click **Machine_Studio_Setup**, and follow the instructions (see Figure 1-2).

Figure 1-2: Setup wizard



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

Figure 1-3: USB driver



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

4. Click the Machine Studio icon to start the software from the desktop.

Figure 1-4: Desktop icon

2 Program overview

Use 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
- **EZ 1000**
  Converter for Eddy Current Sensors

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

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

This operating manual describes the general functions of 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, 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 three tabs **File**, **Home**, and **Advanced** (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. Refer to File for details.

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

Advanced includes functions for connecting and disconnecting already established communications. Refer to Advanced for details.

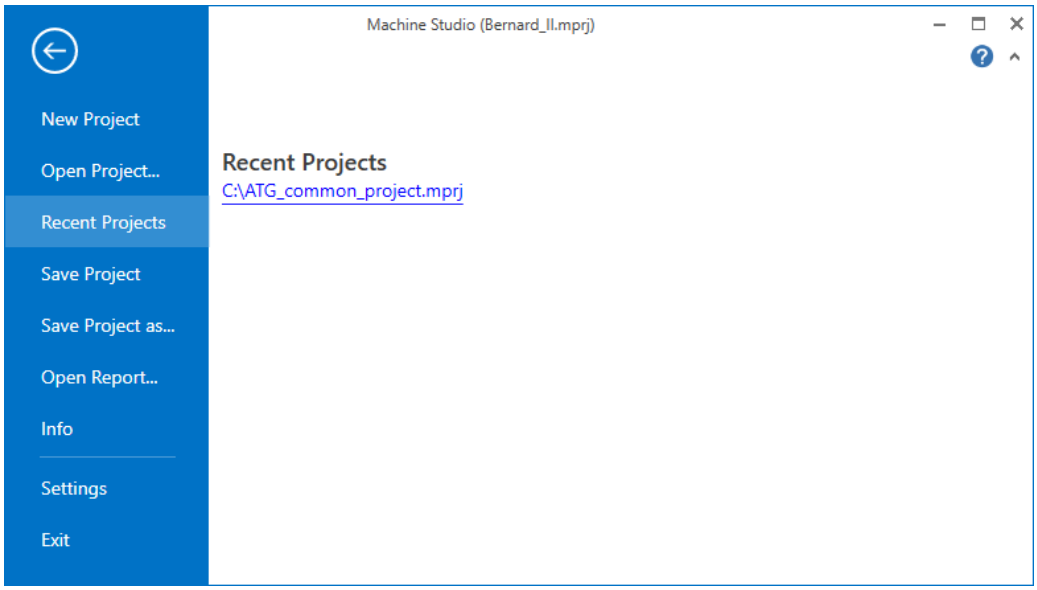
2.1 File

When you start 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

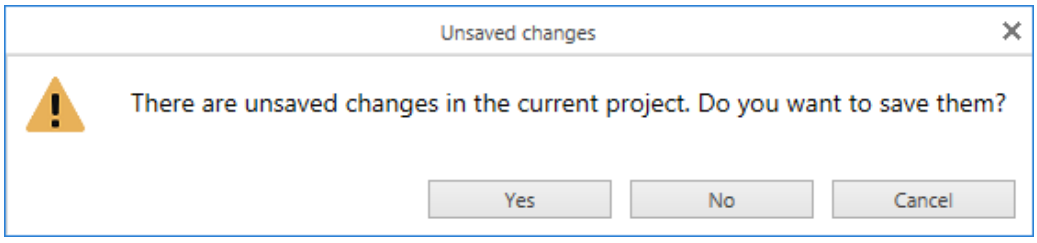
A project can contain online racks (Network) and/or offline racks (Workspace).

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

If the computer is connected to an AMS 6500 ATG system or an other compatible device, Machine Studio scans the system, detects, and displays all the devices (cards or converters).

If you select **New Project** and you are currently working in a new, unsaved project, 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**.

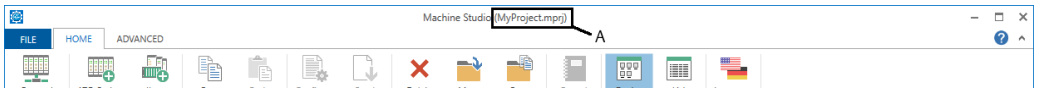
2.1.2 Open Project

Opens an existing project from hard disk.

When clicking this command, a browser window opens and displays a list of projects with 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. Structure of all systems listed below **Network**, **Workspace**, and **Library**, and the configuration of all cards of the systems are stored in the project.

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.

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, as well as permissible characters correspond to Windows conventions. Projects can be saved by using any name and are automatically given the file extension *.**mprj**.

When you have entered name and path of the current project and confirmed your input with a click on **Save**, the indication changes to main application window.

2.1.6 Open Report

Click **Open Report** to open a report generated with the Machine Studio's report function and saved with the extension *.**prnx**.

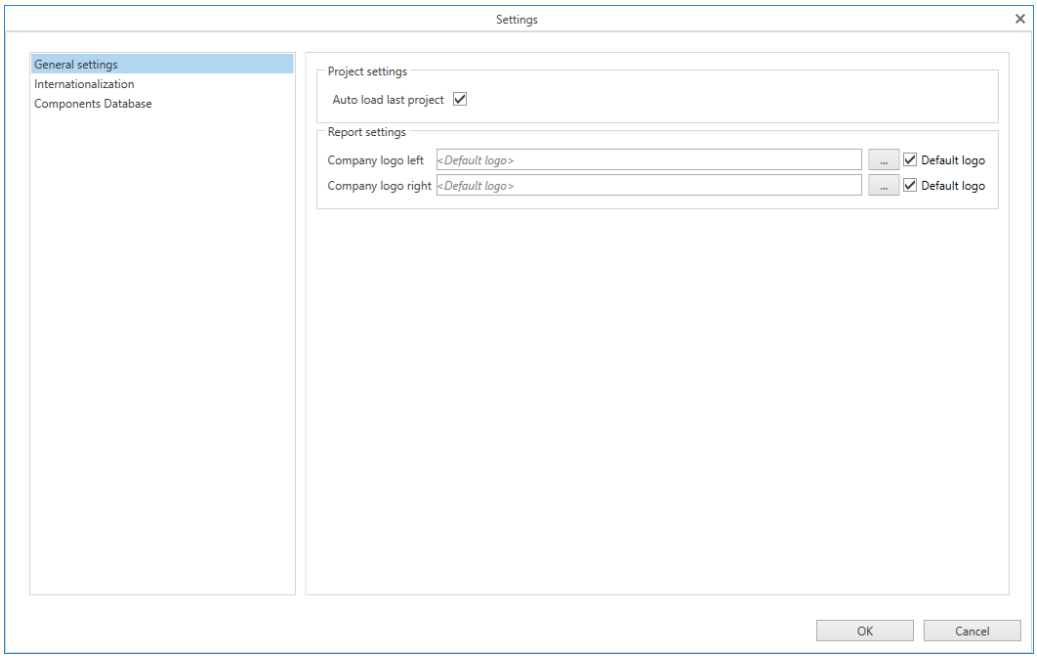
2.1.7 Info

The Info screen shows the version of the installed Machine Studio software together with names and versions of installed software plugins. If you have problems when using the software, please have the number of the current version of your configuration software and any plugins when you call the Emerson Product 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

This menu point shows a switch **Auto load last project**. Place a checkmark in the box to activate automatic loading of the last project at program start. If the checkbox has not been 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

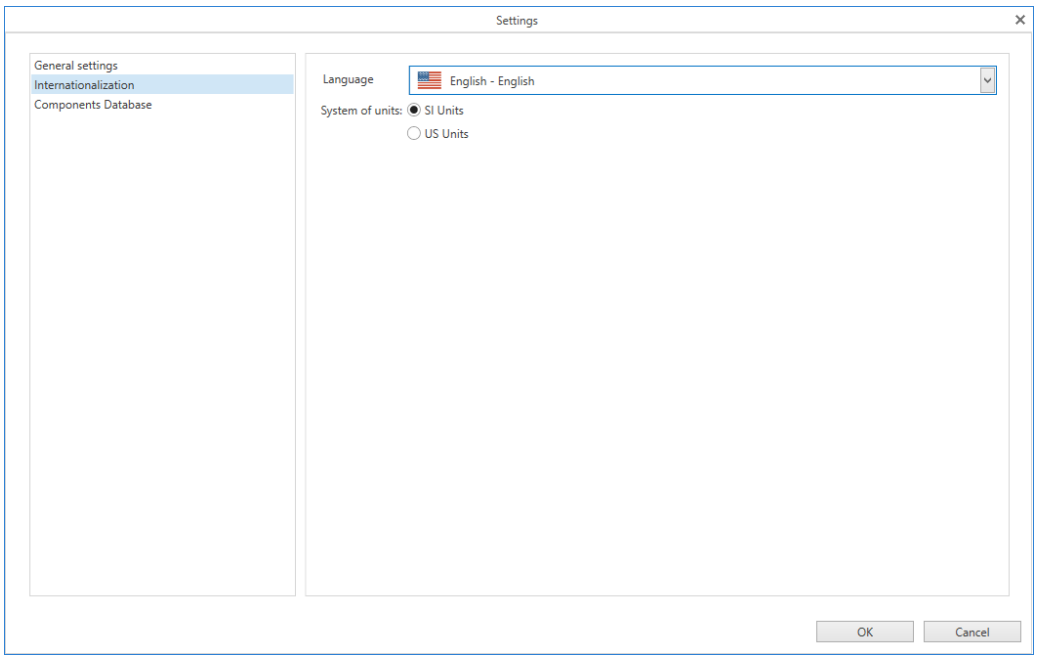
Select the language and the system of units (see Figure 2-7). The following languages are available:

- German
- English
- Chinese (Simplified)

The selected language applies for all commands and texts that appear in 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 system of units of the Modbus and OPC UA data.

Figure 2-7: Language settings and system units



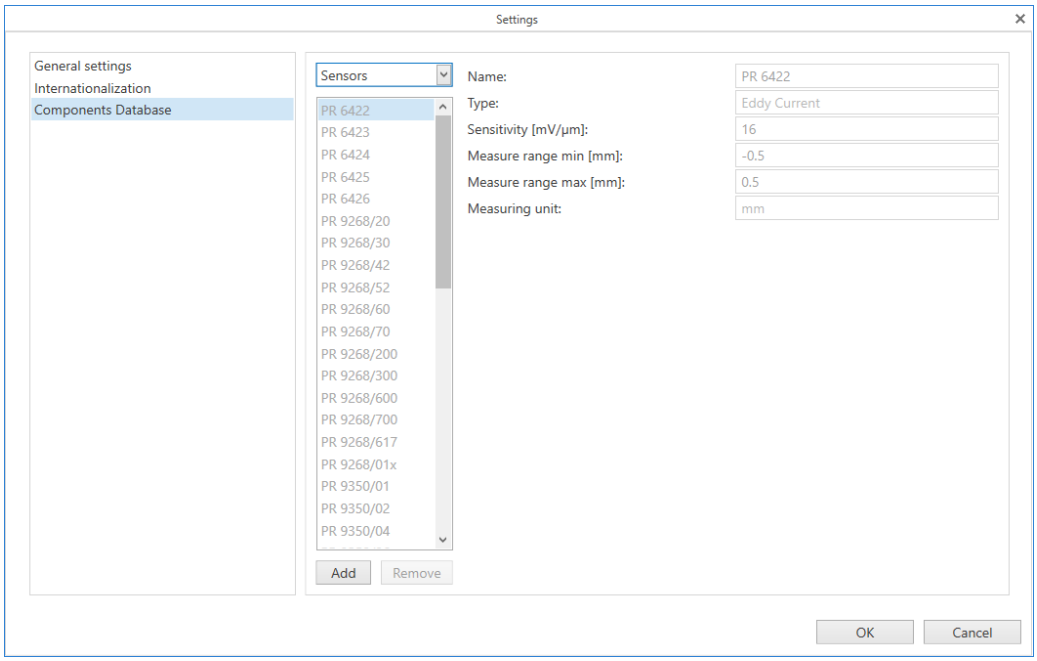
Make your choice, and confirm the selection by clicking **OK**.

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 devices shown here will be proposed for selection in menus **Configuration** → **Input** → **Sensor** → **Select component**. The target materials are selectable during the 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 **Sensor**, **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

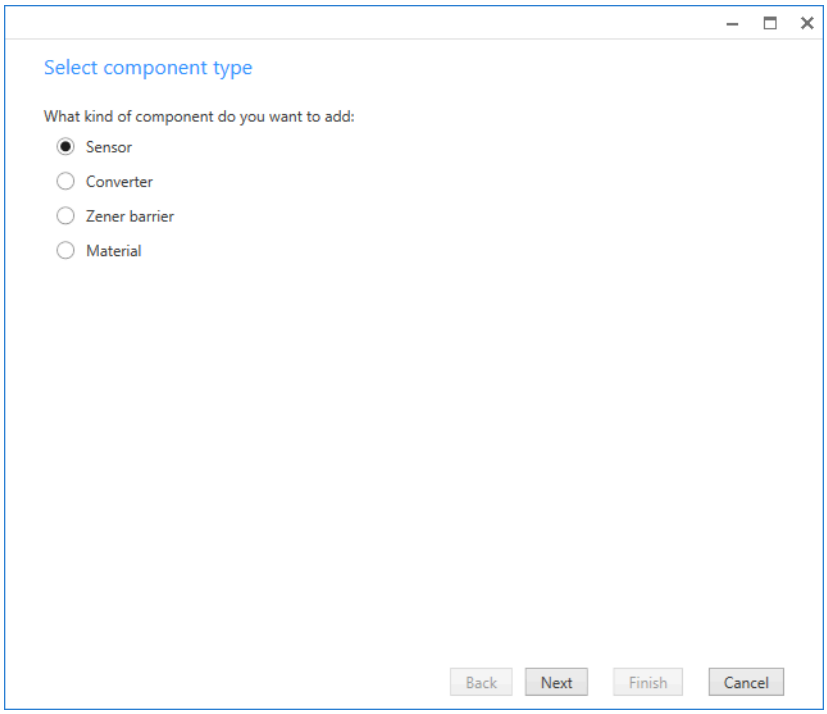
If the used sensor, converter, Zener barrier or material is not listed, add it to the database as a custom component.

Note
Ensure that the specification of the new component meets the requirements of the AMS 65000 ATG system.

Procedure

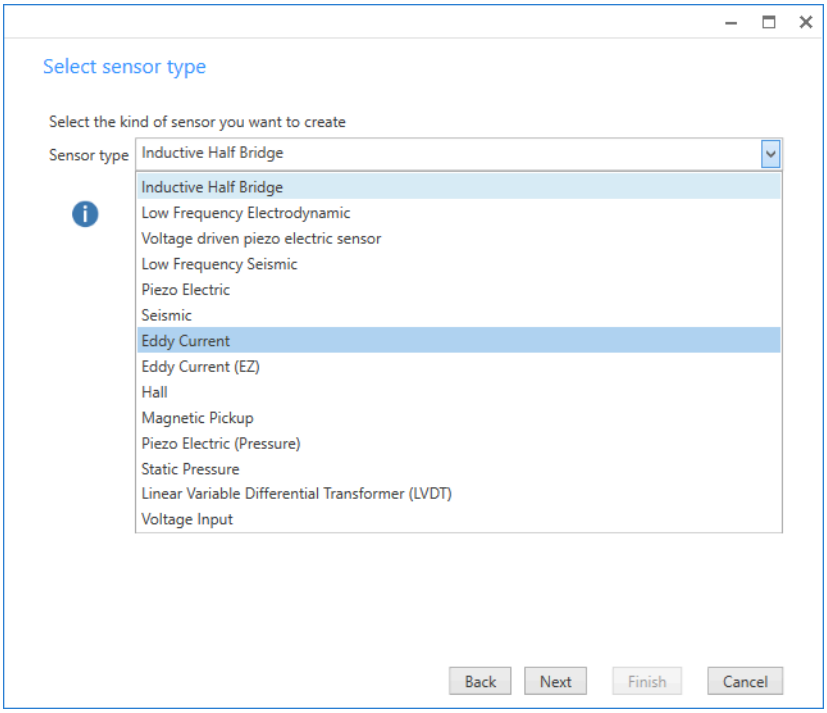
1. Click **Add** to add a new component to the list.

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

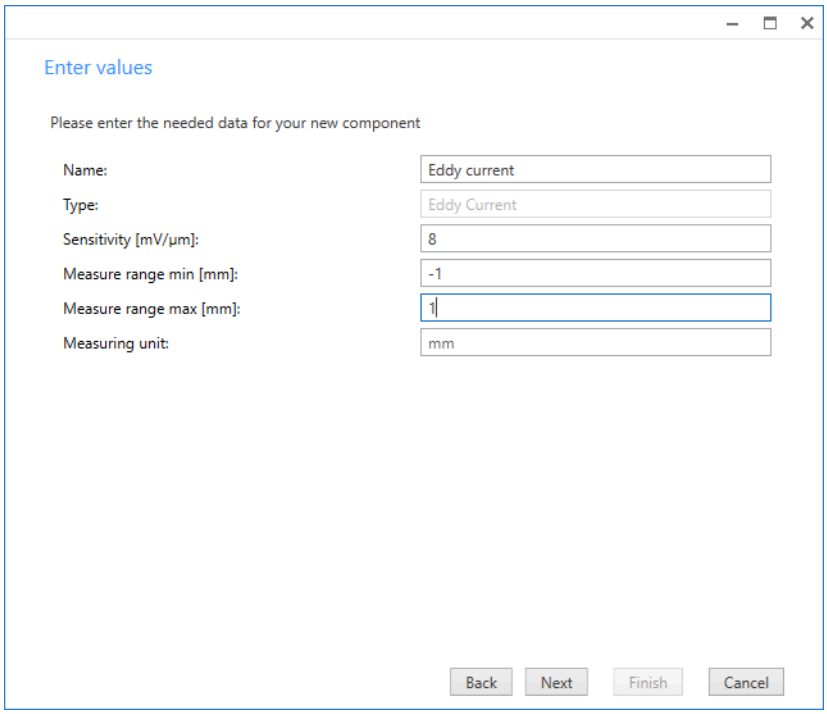


The sensor type **Voltage Input** mainly differs from the other sensor types in selectable measuring units and two supply options (positive voltage or current). Use this sensor type to connect sensors or voltage input signals that are not covered by the other sensor types.

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.

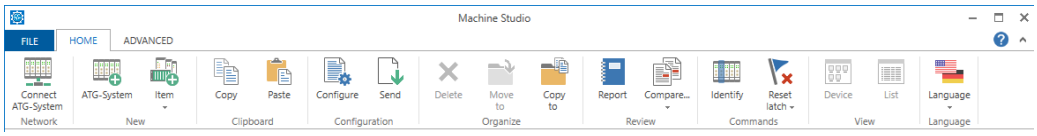
To remove a component, select the corresponding type in the component list, and click **Remove**. The selected type number disappears from the list of components.

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



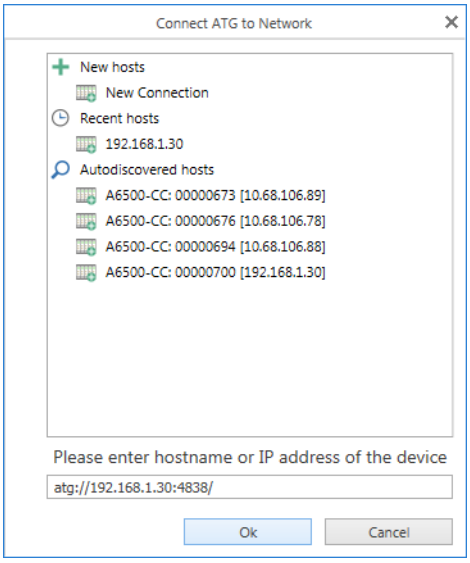
Some buttons are inactive and can only be clicked when a protection card or a converter has been selected in the device tree. The command buttons depend on the selected card and are described in the respective card manual.

2.2.1 Connect ATG-System

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

At new installations, the communication between computer and A6500-SR System Rack through the USB interface will start automatically when you switch on the supply voltage for the System Rack or when you connect a USB cable between the PC and Com Card installed in an already powered rack.

Figure 2-13: Connect ATG-System



Refer to New network connection to change communication settings.

2.2.2 ATG-System

Click **ATG-System** to insert a new ATG system to the device tree level **Workspace** for offline configurations.

Figure 2-14: ATG-System

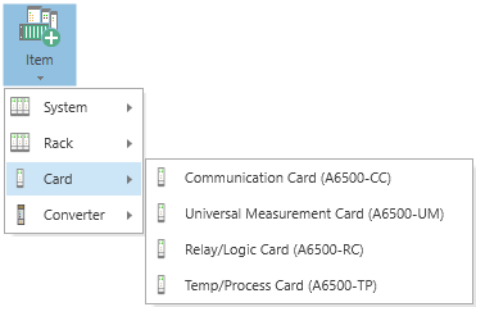
Unconfigured devices are marked with the **No config** sign . For details on offline configurations, refer to Offline configuration. To name the new ATG system, open the configuration of the A6500-CC Com Card and enter a name or description in field **Configuration → Basic → System name**. See operating manual of the Com Card for details.

2.2.3 Item

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

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

Figure 2-15: 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.

2.2.4 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 2-16: Copy

2.2.5 Paste

Click **Paste** and select a location where to paste the clipboard content. The location can be anywhere in the tree. The content to be copied depends on the selected location. See Table 2-1.

Figure 2-17: Paste

Table 2-1: 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]

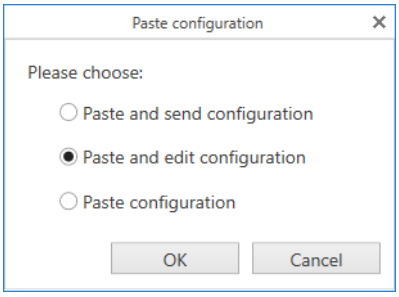
Table 2-1: Copy | Paste *(continued)*

Copied from	Paste to (selected possible location)	Copied content
	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**
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 or converter the dialog for selecting paste options opens. Select an option to continue. **Paste and send configuration** is only selectable if a card has been selected that has an online connection and is below **Network**.

Figure 2-18: Paste options dialog



2.2.6 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 **Card configuration** to enable input or modification of configuration parameters of the selected card or converter.

Figure 2-19: Configure

For more information, see Configuration of this manual.

2.2.7 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**) has been selected. The parameters of all channels of the selected card or converter will be sent to the protection card. This command requires an online connection to the card.

Figure 2-20: 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.

2.2.8 Delete

This function deletes converters, offline cards from a System Rack, or a complete System Rack from the device tree. Select a device from the device tree, or 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 2-21: Delete

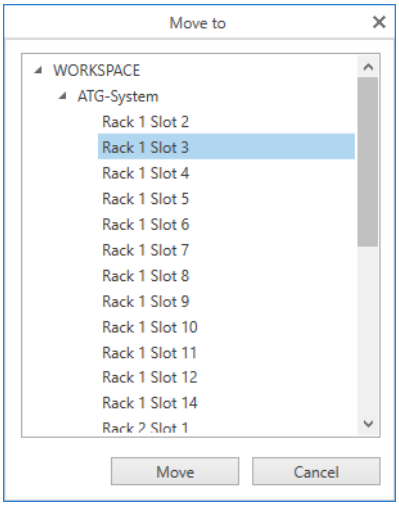
2.2.9 Move to

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 System Rack in level **Workspace** of the device tree to other slots within this rack.

Figure 2-22: Move to

The dialog **Move to** opens. Browse through the available System Racks and levels, and select a free slot or location where the card or converter may be moved to (see Figure 2-23).

Figure 2-23: Dialog Move to



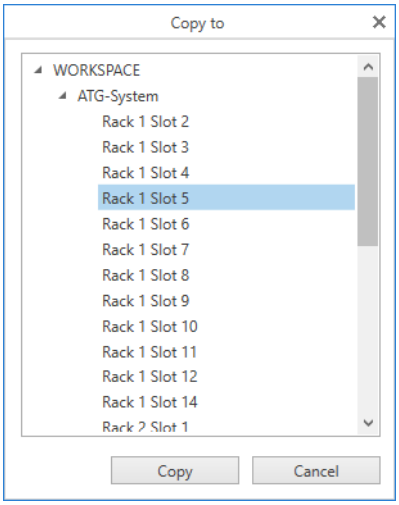
2.2.10 Copy to

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 System Racks in level **Workspace** or **Library**.

Figure 2-24: Copy to

The dialog **Copy to** opens. Browse through the available System Racks or levels, and select a location or a free slot to place the copy of the selected card or converter (see Figure 2-25).

Figure 2-25: Dialog Copy to

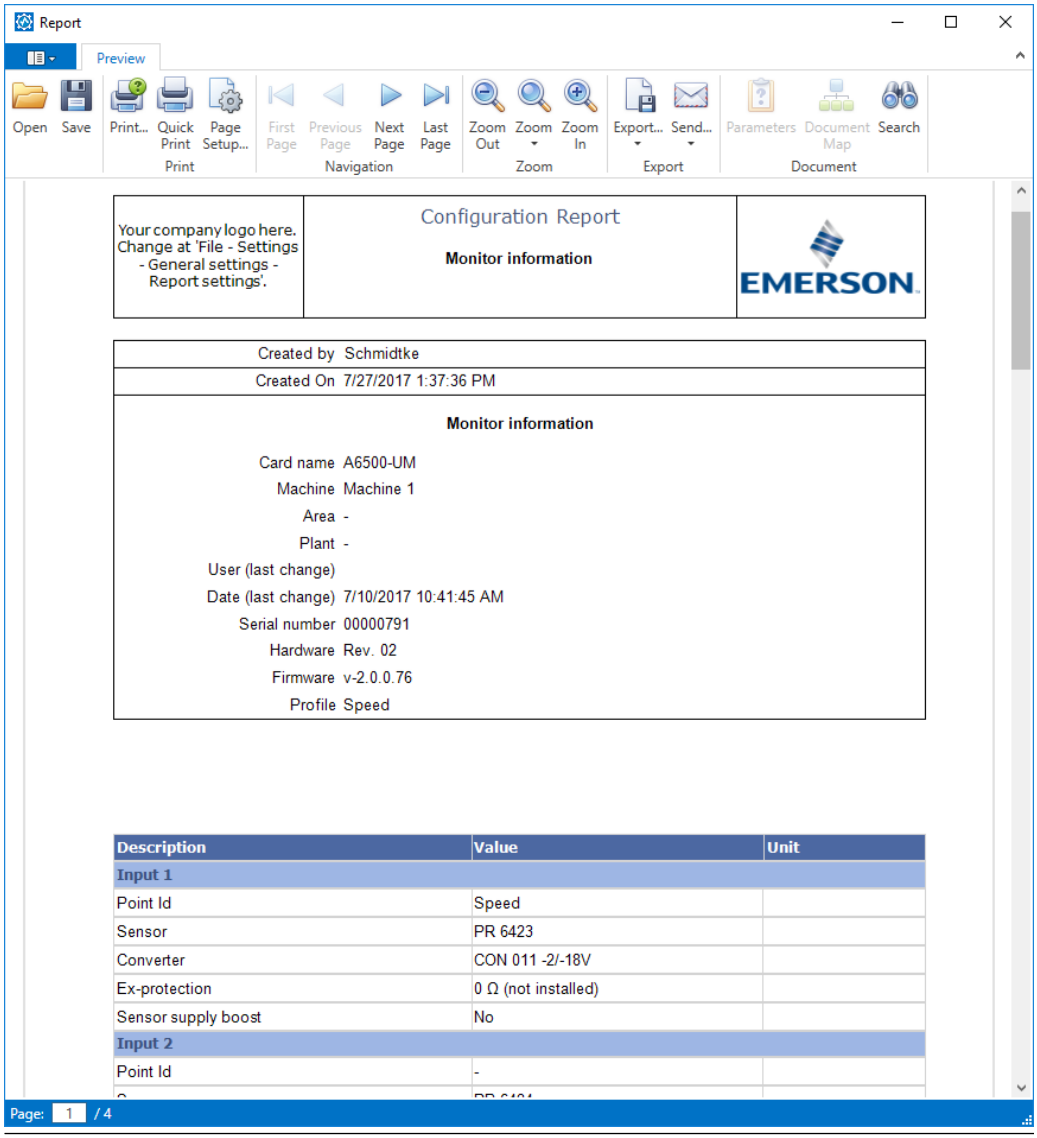


2.2.11 Report

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

Figure 2-26: Report

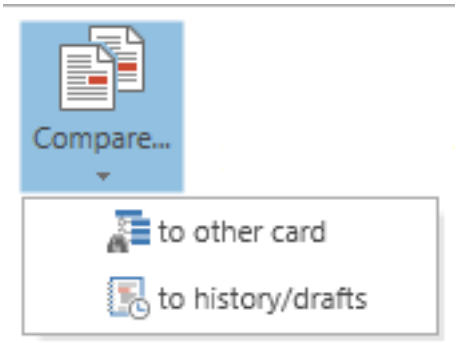
Figure 2-27: Configuration report



2.2.12 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.

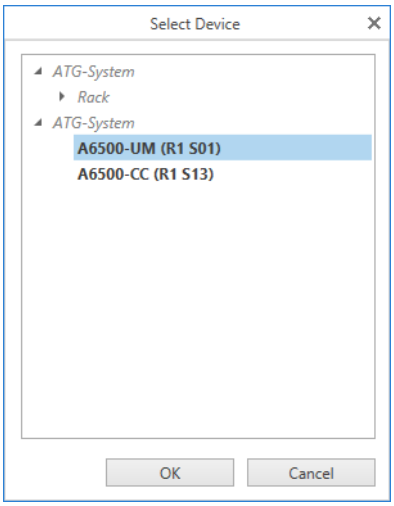
Figure 2-28: Compare



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 2-29).

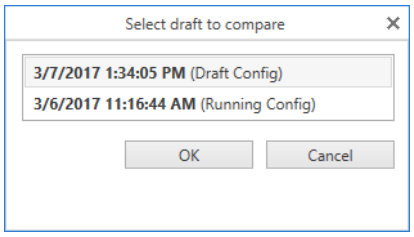
  Figure 2-29: Dialog Select Device

  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 2-30).

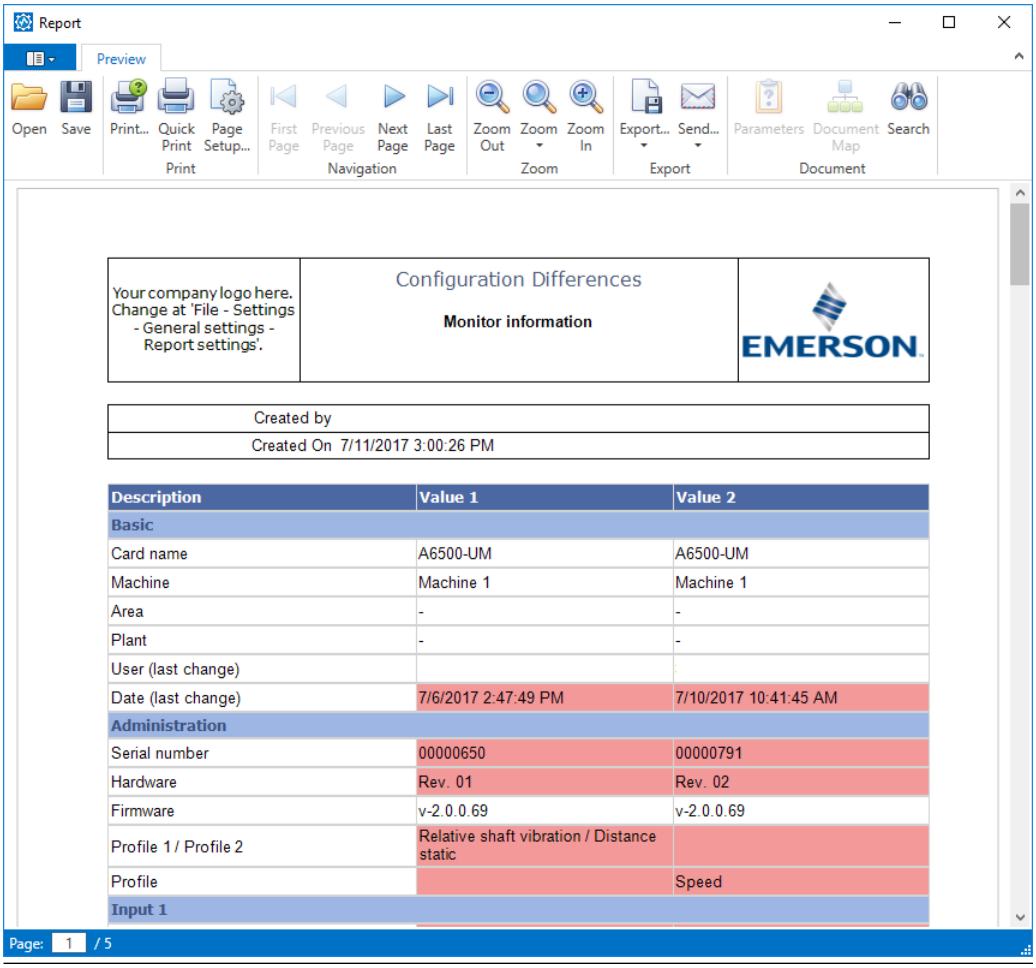
Figure 2-30: Dialog Select draft to compare



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 2-31: Function Compare, configuration differences



Description	Value 1	Value 2
Basic		
Card name	A6500-UM	A6500-UM
Machine	Machine 1	Machine 1
Area	-	-
Plant	-	-
User (last change)		
Date (last change)	7/6/2017 2:47:49 PM	7/10/2017 10:41:45 AM
Administration		
Serial number	00000650	00000791
Hardware	Rev. 01	Rev. 02
Firmware	v-2.0.0.69	v-2.0.0.69
Profile 1 / Profile 2	Relative shaft vibration / Distance static	
Profile		Speed
Input 1		

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.

2.2.13 Device

Switch to the rack view in the workspace of the **Home** window .

Figure 2-32: Device

This button is disabled if an EZ 1000 converter is connected.

2.2.14 List

Switch to the list view in the work space of the **Home** window.

Figure 2-33: List

This button is disabled if an 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 2-34: Button "Language"

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

2.3 Advanced

Use the two buttons of the **Advanced** ribbon command bar to disconnect or reconnect an already existing communication between PC and system or converter. These buttons are active when an EZ 1000 converter or an ATG system is selected in the device tree below level **Network**.

2.3.1 Connect

Click **Connect** to reestablish a communication between computer and the EZ 1000 converter or the A6500-CC Com Card. Use this command if the device has been disconnected by the command **Disconnect** (see Disconnect). This applies for USB and TCP/IP interface lines 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 System Rack via the USB interface starts automatically without any software command when you switch on the supply voltage for the System Rack or when you connect the USB cable between PC and communication card.

Figure 2-35: Connect

See Communication for further communication details.

2.3.2 Disconnect

Disconnect is active when you select an EZ 1000 converter or ATG-System in the tree.

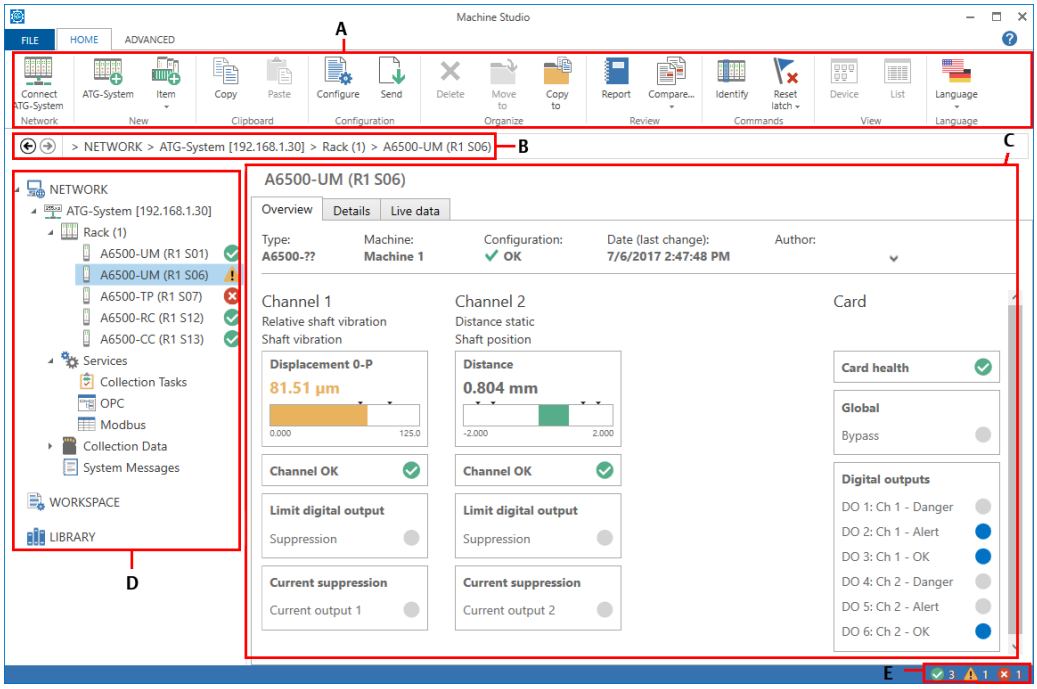
Select **Disconnect** to interrupt the communication between the PC and device.

Figure 2-36: Disconnect

2.4 Main view

The main view is the starting point for the main tasks of Machine Studio. Figure 2-37 explains this view.

Figure 2-37: Main view Machine Studio



A. Ribbon command bar
B. Navigation bar
C. Space for online view and configuration dialog
D. Device tree
E. Status information 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 ATG system

With a USB interface or TCP/IP connection to the A6500-CC Com Card in the System Rack, Machine Studio automatically reads status information from all cards installed in the rack.

The structure below **Network** depends on the Firmware of the connected system. Figure 2-38 shows an online view of an AMS 6500 ATG system without data collection function, and Figure 2-39 shows an AMS 6500 ATG system with data collection function.

Figure 2-38: Start window Machine Studio with System Rack

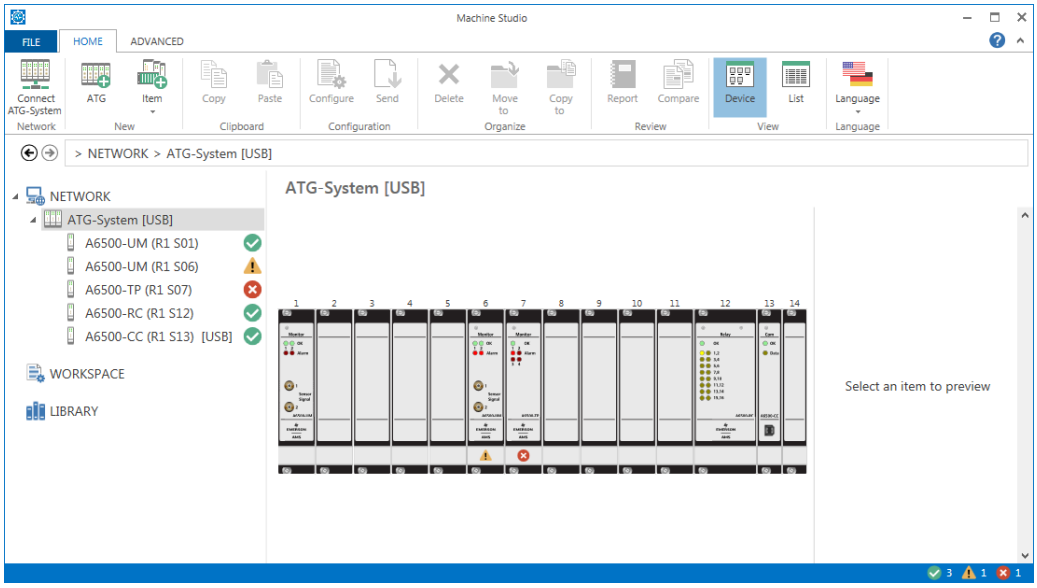
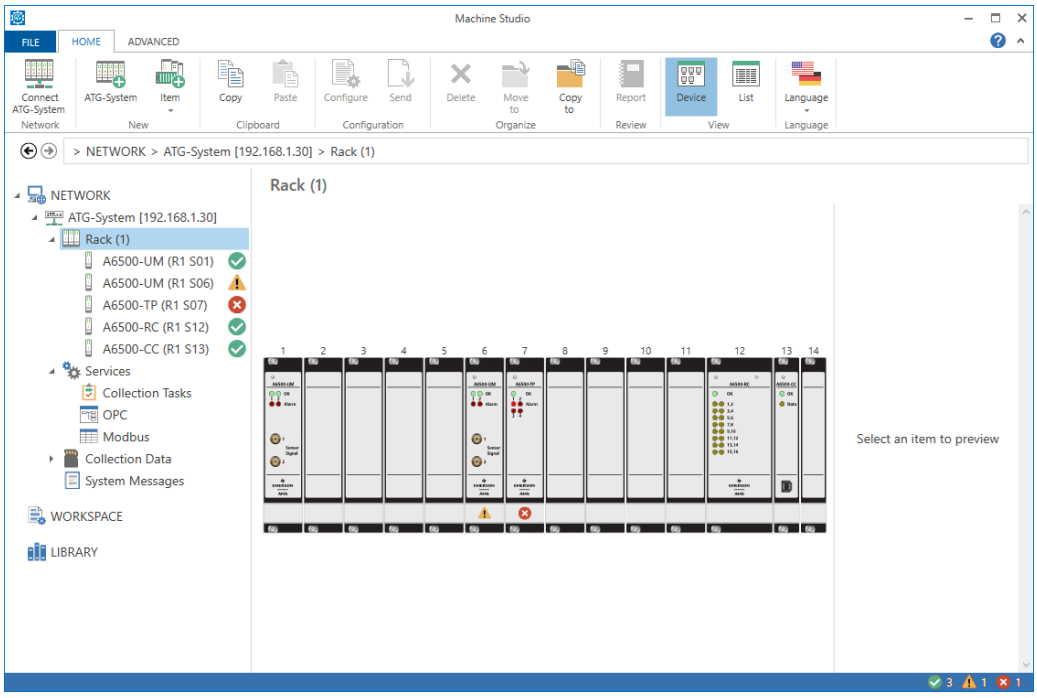


Figure 2-39: Start window Machine Studio with System Rack with data collection function



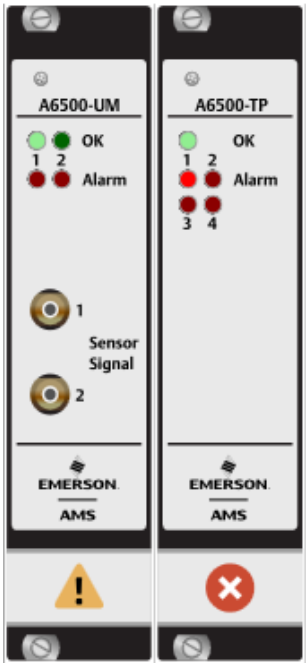
By clicking on line **Rack** in the device tree, the program shows the image of the ATG system including all detected protection cards correctly shown in place, including all actual LED indications at the card fronts. Any changes of card states will automatically be shown in this graphic. At the top of the workspace, above the System Rack, the name of the currently selected rack is shown.

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

Figure 2-40: Alert message or Channel not OK

Figure 2-41: Danger alarm

Figure 2-42: Machine Studio, status indications at the card front



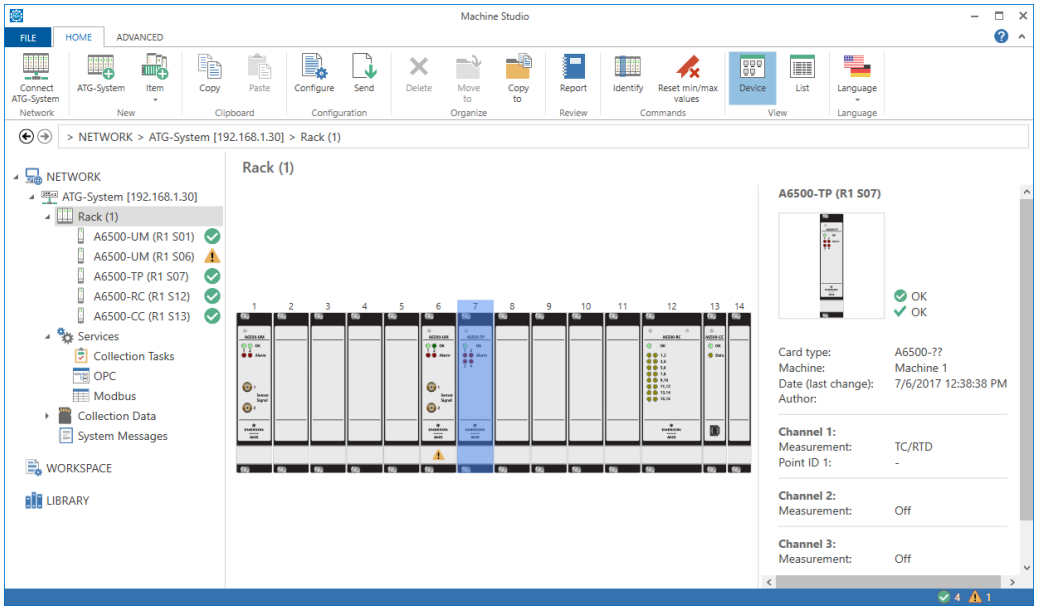
In this example, channel two of the A6500-UM Universal Measurement Card shows the status "Channel not OK" due to missing input connections. Status message "Channel OK" requires both a connected measuring chain and a signal level within permitted limits according to the defined specifications.

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.

With a click on the **Rack** level, the ribbon command bar of window **Home** shows buttons **Device** and **List**. With a click on **List**, Machine Studio shows a table with name, type number, serial number, and status information of the cards. Beside this, at the right of the screen, a table with information for measuring functions and channel descriptions of the selected card is shown. Click **Device** for the indication of a graphic of the System Rack.

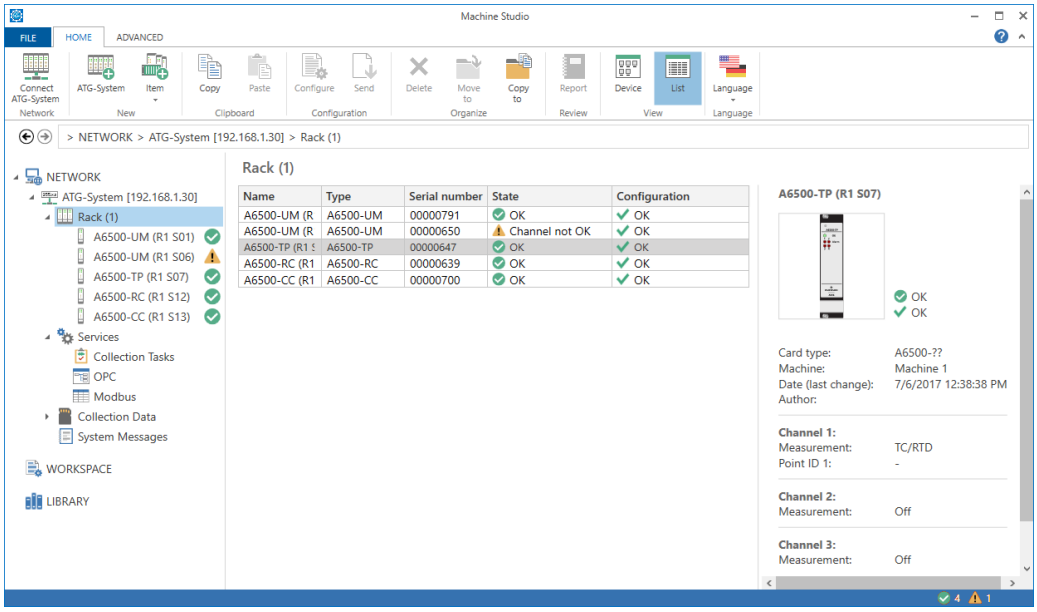
Double click the card to display the measuring results of the card.

Figure 2-43: Machine Studio, rack view with information about selected card



The screen shows the selected card with a light blue transparent mask. The right part of the workspace shows an image of this card, status information, additional information such as serial number, module type, firmware version, configuration status, date and time of the last parameter change. Below are point-IDs and channel designations of all channels.

Figure 2-44: Machine Studio, List view



2.5 Navigation bar

The navigation bar is shown below the ribbon bar. This line shows name and rack position of the currently selected physical device. The first item in this line defines the level of the device tree. In the example below, it is the Network level. The second item ATG-System [192.168.1.30] defines the System Rack where the selected protection card is installed, and the interface type in brackets. The selected card in this example is a A6500-UM and is installed in rack 1, slot 06.

The two arrows to the left of the line permit going backwards and forwards through the course.

Figure 2-45: Machine Studio, project bar

2.6 Structure of the device tree

When starting Machine Studio, all converters and cards installed in a System 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 in the **Overview** display field .

The device tree includes 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 EZ 1000 converter.

By clicking on a device in the device tree, the program shows an overview with available measuring results and status information of the channels in the right part of the screen. Clicking on **Configure** in the ribbon bar opens the **Configuration** application window to input or edit configuration data of the selected device.

Figure 2-46: Machine Studio, device tree

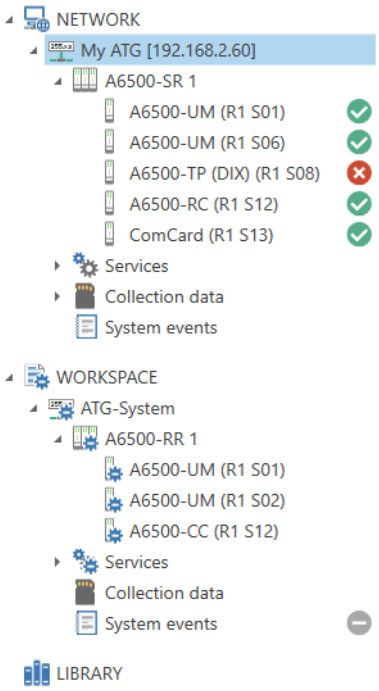


Figure 2-46 shows the structure of the device tree of an ATG system with 5 cards installed. The lines of the device tree show the type of the device together with the rack position. A green circle with a white checkmark indicates that the communication is running properly and no error or alarm has been detected. A red circle with a white "x" (for example, at the A6500-TP in slot 07 of the rack) indicates Danger alarm.

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

2.6.1 Network

This level shows physical devices (online devices) connected to the computer. Physical devices can be configured and their measuring results displayed on the screen.

By placing the cursor on one of the type numbers, the measuring results of this card are shown in the workspace to the right of the device tree. The configuration function for this device can be started with **Configure**.

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 ATG-Systems, racks, or EZ 1000 converters can be moved to the **Library** level (see Table 2-1). 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.

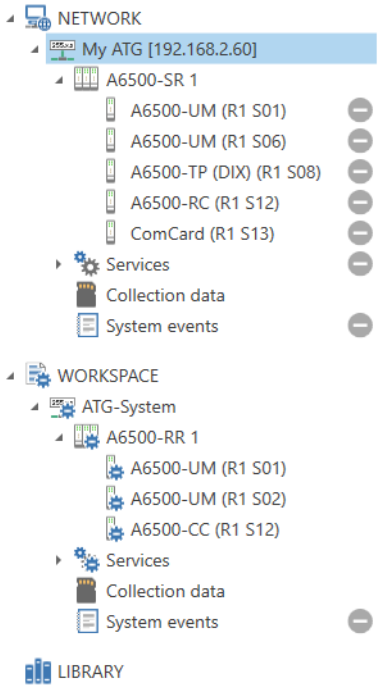
2.6.4 Status indication

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

Table 2-2: Status indication

Symbols	Meaning
	Everything OK
	Alert alarm or channel failure
	Danger alarm, services failure, failure of collected data, or micro SD card failure
	No communication between Machine Studio and device (see Figure 2-47)
	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)

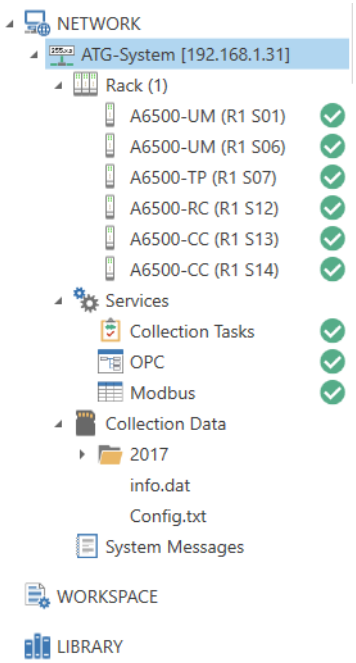
Figure 2-47: Device tree, no communication with System Rack



2.7 Structure of the device tree – AMS 6500 ATG with data collection

The structure of **Network** is different from the structure described in Structure of the device tree, if an AMS 6500 ATG system with data collection function is connected to Machine Studio.

Figure 2-48: Device tree - AMS 6500 ATG with data collection



2.7.1 Network

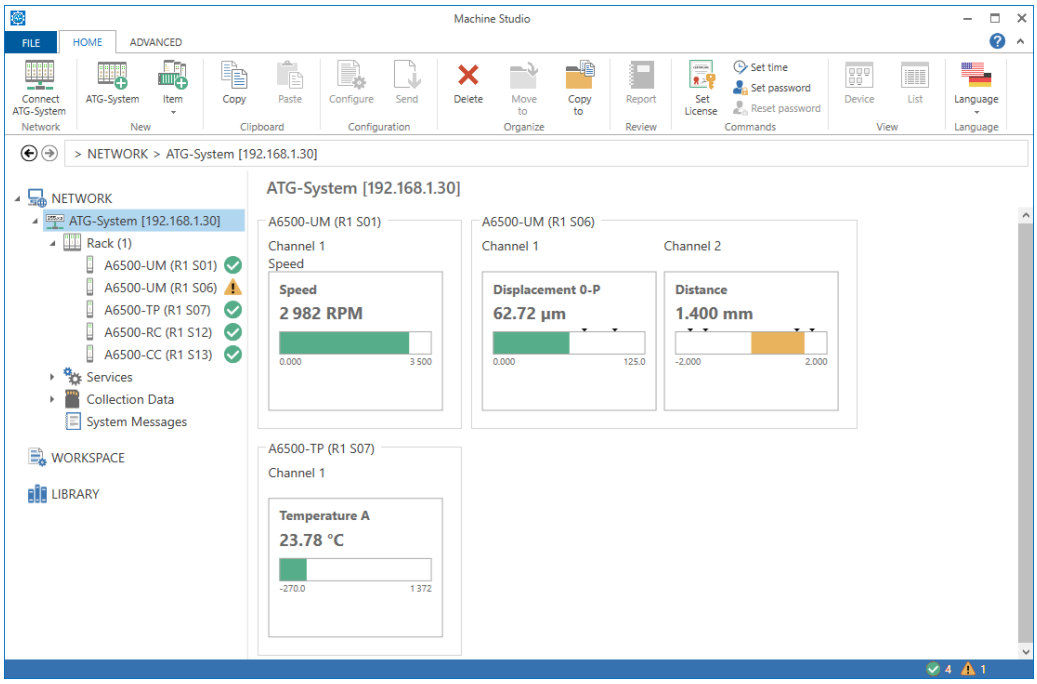
The **Network** level contains all physically connected devices, including ATG systems or EZ 1000 converters.

ATG-System

The **ATG-System** level is subdivided into **Rack**, **Services**, **Collection Data**, and **System Messages**. The active connection type is stated in brackets in this line – IP address or USB.

Click **ATG-System** to open an online view with a display object for each measurement of the connected system (see Figure 2-49).

Figure 2-49: Measurement overview

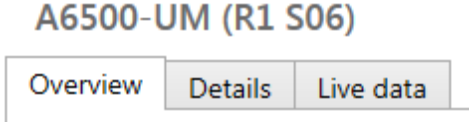


Rack	This level contains all physical devices installed in the connected A6500-xR System Rack.
Services	This level contains all functions for data collection and data interfaces (OPC and Modbus).
Collection Data	This level lists all data stored on the micro SD card.
System Messages	This level lists all messages currently produced by the system.

2.8 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 2-50: 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, No config)
Date	Date and time of the last change to the configuration.
Author	Name of the user who made the last change to the configuration. The user name of the login data of the operation system is used for this entry.
Configuration version	Version of 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**).

2.8.1 Display function **Overview**

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

Overview shows measuring results, channel states, global flags, software status, and all configured channels/ 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.

2.8.2 Display function **Details**

This function 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 on 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.

2.8.3 Display function **Live data**

Live data lets you see a graph of the measurement to see variations in the signal. The X-axis is the time axis with a period of 100 seconds. The Y-axis shows the scaled process value of this channel with indication of the entire measuring range. The diagram displays the linear trend. Measuring values are refreshed in time intervals of one second.

This display function lets you confirm measurement results. The values are not saved 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.

2.8.4 Status information

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.

Rack status

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 2-51: Rack status indication

The status in the example above shows 3 devices in OK - state, one device with an alert-alarm and 1 device with status not OK (danger alarm).

Maintenance required

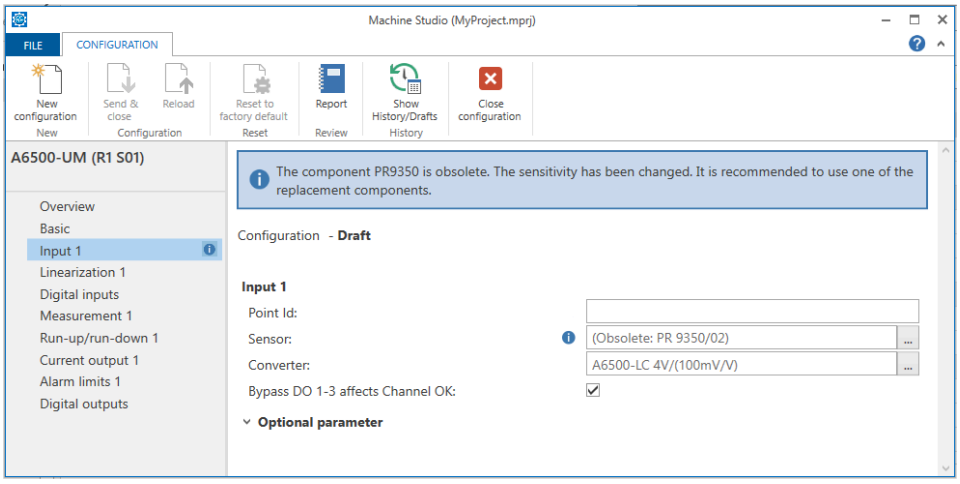
Devices whose configuration should be checked are marked with the **Maintenance required** symbol. See Figure 2-52.

Figure 2-52: 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.

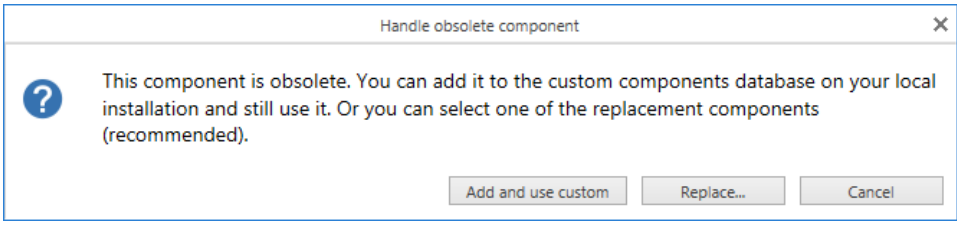
1. Select the card marked with the **Maintenance required** symbol from the device tree.
2. Click **Configure** to open the window **Configuration**.
   A message box at the top of the configuration window informs you about the change. Additionally, the configuration page and the parameter which must be checked are marked with the **Maintenance required** symbol. See Figure 2-53.

Figure 2-53: 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 2-54)

Figure 2-54: 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.

2.9 Offline configuration

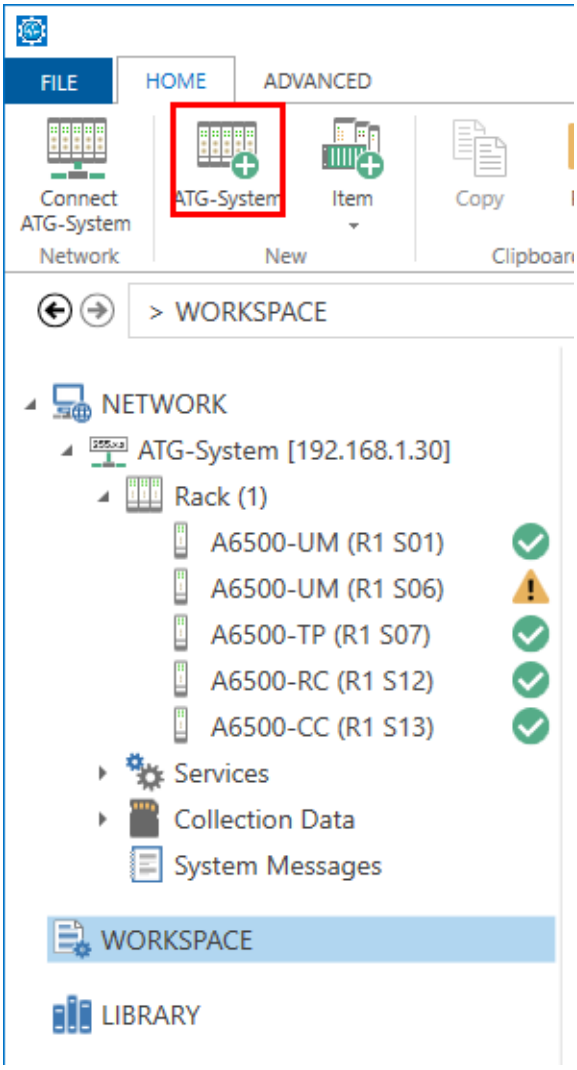
Machine Studio is a configuration software used to configure and operate protection cards of the AMS 6500 ATG system and the EZ 1000 converter. For the online configuration, the Com Card(s) of the system can be connected to the computer through USB or through a TCP/IP interface line. EZ 1000 converters can be connected through their USB interface.

Machine Studio also provides a means to create offline configurations without a connection to physical devices. This offline configuration may be performed simultaneously to the normal measuring operation. Having finished the configuration, the created configuration can be used at any time by copying the created offline system from the workspace to the physical level and establishing an interface connection to the computer.

2.9.1 Insert devices for offline configurations

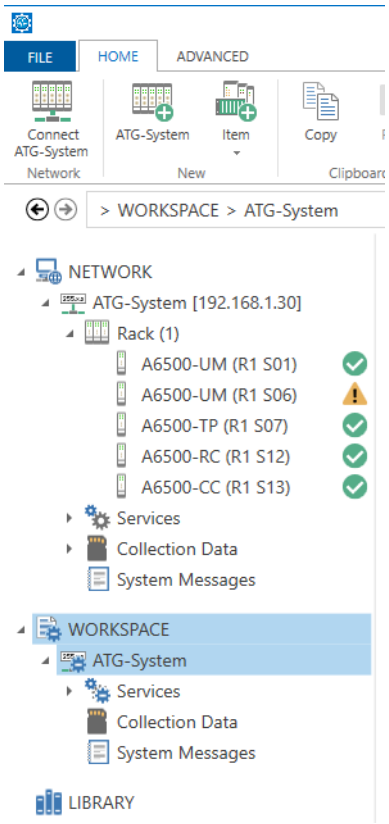
To create offline configurations, open the Machine Studio **Home** window, and click **ATG-System** in the ribbon bar. For offline configuration of an EZ 1000, see operating manual of the converter.

Figure 2-55: Offline configuration, creation of a new System Rack



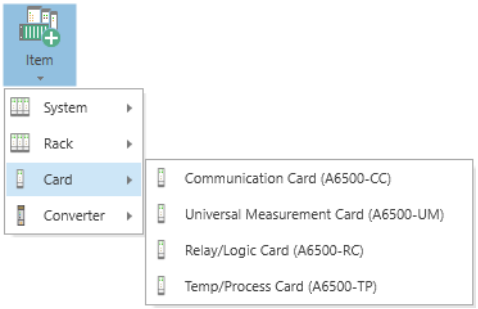
The program creates a new ATG system without a rack and places the system in level **Workspace** of the device tree.

Figure 2-56: Offline configuration, new ATG system in level "Workspace"



Click **Item** in the ribbon bar to select a rack and devices for the new configuration:

Figure 2-57: Add offline device



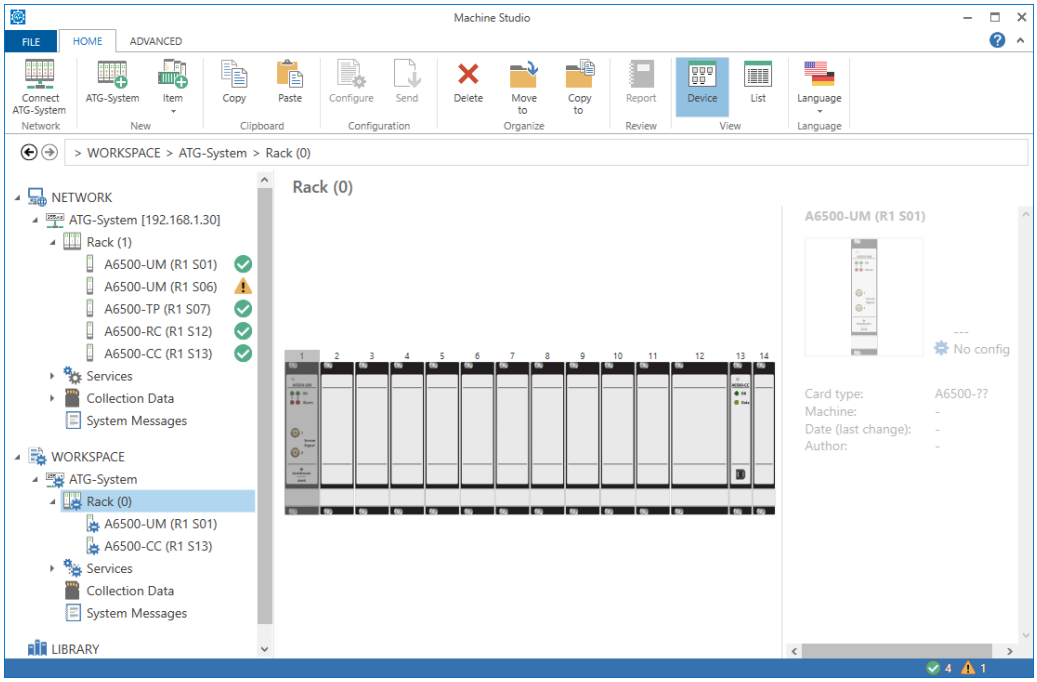
The menu shows a list with types available for the selection.

The selected rack is placed below the ATG system. The selected cards are placed in this new rack. The program inserts the first card at the top of the new rack in the device tree and in slot 1 of the System Rack. The Com Cards are inserted in the Com Card slots. Make your choice, and select a device for the new ATG system.

Protection cards may be selected in any order.

Start adding a new card by placing the cursor on the **Rack** level of the tree. When you click **Item → Card** and select one of the cards from the menu, this card is placed in the selected offline System Rack. When placing the cursor on line **Workspace → ATG-System → Rack**, a graphic of the offline system appears on the workspace of this window.

Figure 2-58: Offline configuration, selection of cards



In the same way, you can add all protection cards to your offline rack. New protection cards are inserted into the rack in the order they were selected, beginning with slot position 1.

If necessary, card positions can be changed using **Move to** or drag and drop.

2.9.2 Move / Copy devices in offline configurations

The level **Workspace → ATG-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 → ATG-System → Rack**, and click the desired card in the graphic. The card is now shown with a light blue transparent mask over the front plate. Keep the left mouse button pressed, move the card to the new position, then release the mouse button. The selected card is now placed 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).

Copies of protection cards are made including all configuration parameters and settings.

2.9.3 Transfer of prepared configurations

When you have finished designing the offline rack, enter the configuration parameters. The configuration is made in the same way as 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 is 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 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

3.1 Communication functions

This chapter describes the main communication functions of Machine Studio and the A6500-CC Com Card, necessary for configuration and operation, using the USB interface. The A6500-CC operating manual describes network communication applications. For communication to an EZ 1000 converter, see operating manual of the converter.

For configuration and operation, the cards of the AMS 6500 ATG system require communications with computers. For this reason, the A6500-xR System Racks (A6500-SR, A6500-RR, A6500-FR) contain one or two communication cards of type A6500-CC in slots 13 and 14.

Generally, one A6500-CC card is used for communication. The second communication card can be configured for redundancy. If there is a problem, communication will be taken over by the second (redundant) card.

3.2 Communication with Machine Studio through USB

Communication to Machine Studio takes place through the communication card A6500-CC in the system rack. Stationary equipment in control rooms are typically connected to the system racks through TCP/IP interface lines. 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 protection cards installed in the system 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.

The communication between Machine Studio and the system rack automatically starts as soon as Machine Studio is started, and the USB cable is connected from the computer to the front socket of the A6500-CC.

All AMS 6500 ATG protection cards installed in the A6500-xR System Rack will be detected and their type numbers, serial numbers, card states, and alarm states read out and represented in the device tree structure of Machine Studio. Click a card in the tree structure and the actual measuring values, channel states and the card state of this card are shown in the **Overview** screen.

The device tree structure shows the type number of this card and the work area of the window as well as a table with type number, serial number, and status of the new card.

3.3 New network connection

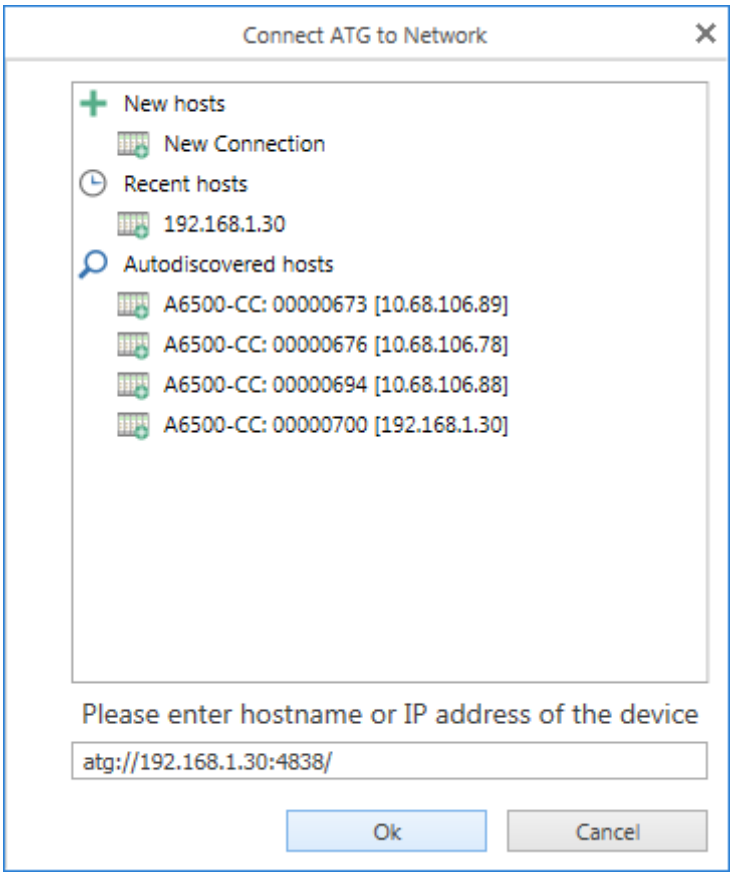
To connect Machine Studio to AMS 6500 ATG systems through a network connection, click **Connect ATG** in the ribbon bar of the **Home** window .

Figure 3-1: Connect ATG

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 **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). Machine Studio automatically detects AMS 6500 ATG host if the function **Auto discovery** is activated at the A6500-CC Com Card (refer to Com Card operating manual for details).

Figure 3-2: Connect ATG to network



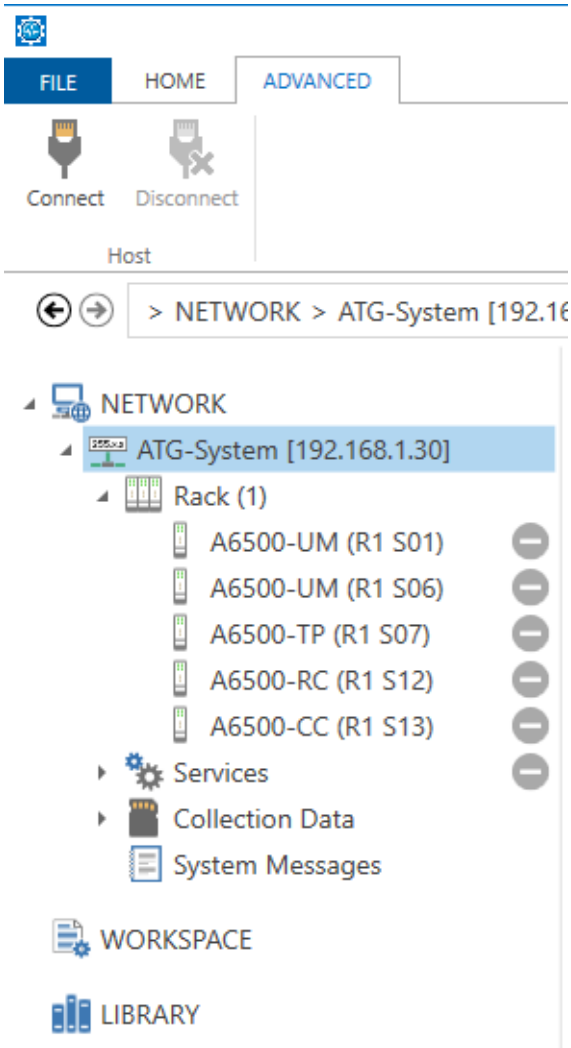
3.4 Connect and disconnect AMS 6500 ATG systems

Use **Connect** and **Disconnect** on the **Advanced** tab in the ribbon bar to start or stop the communication between computer and system rack.

Select **ATG System** in the tree to activate the **Connect** or **Disconnect** buttons. If the communication is established, **Connect** is displayed in gray and **Disconnect** is shown in color.

Click **Disconnect** to interrupt the communication. The status in the tree structure indicates no communication (see Figure 3-3).

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

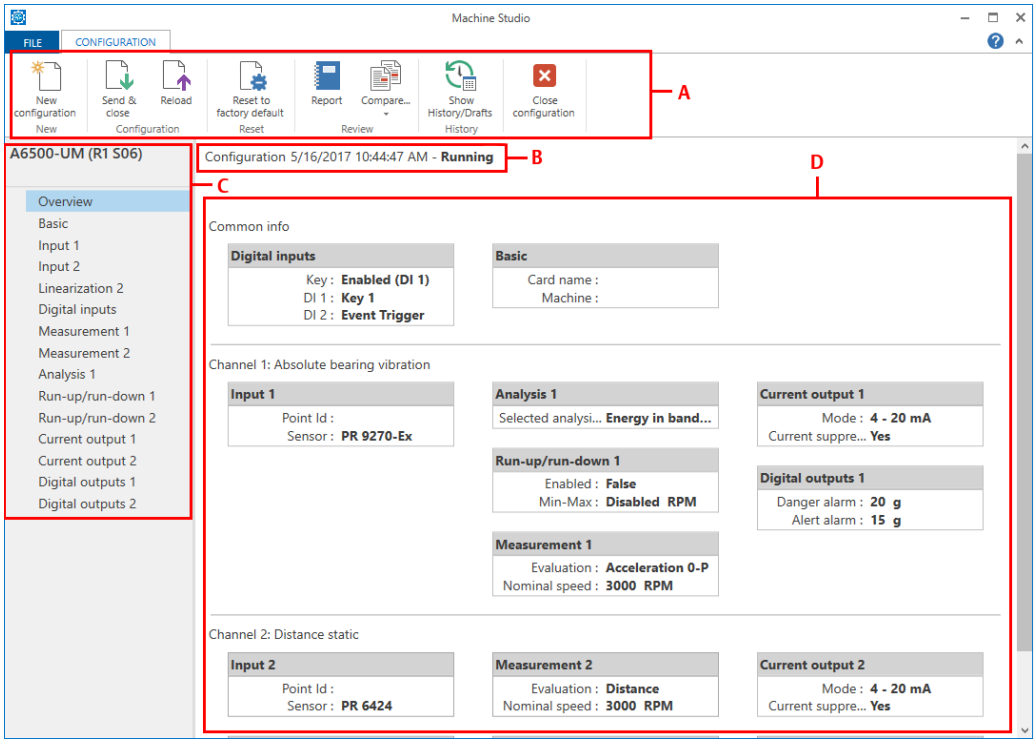


To re-establish the communication, click **Connect**.

4 Configuration

Select a card or converter from the 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 loaded 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 window with commands for configuration file management.

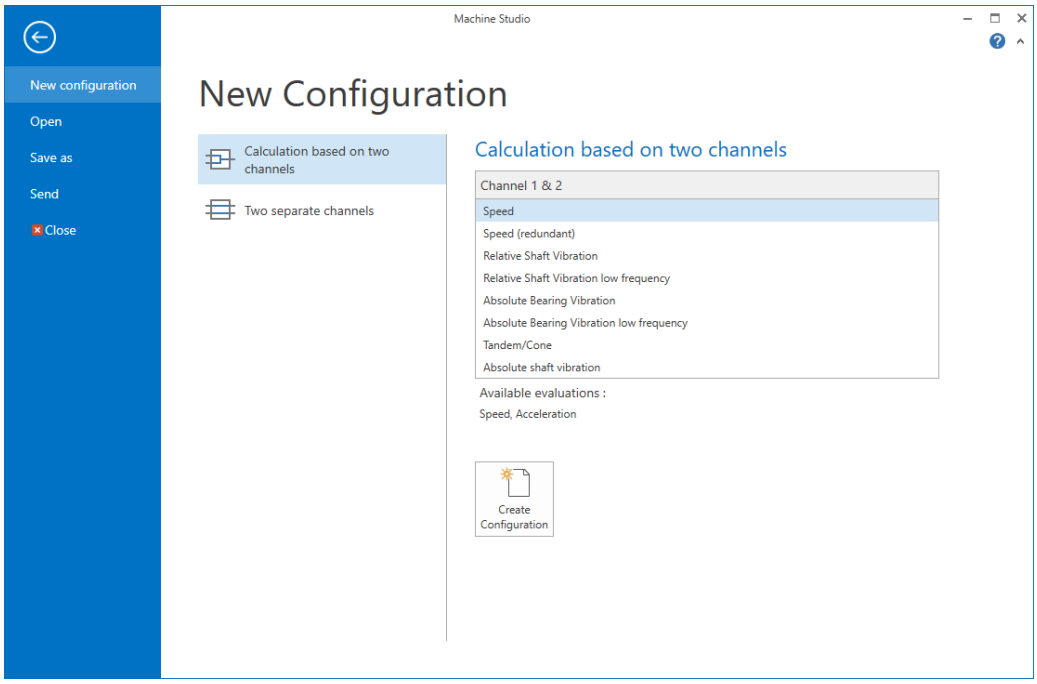
See respective device operating manuals for details.

4.1 File

This window contains commands for file management of configuration parameters. Click **File** in the top left corner of **Configuration** (see Figure 4-2) to switch to the **File** window (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 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.
- **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, or from a physically connected EZ 1000 converter 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 level **Network** of the device tree is displayed. Select the device whose configuration shall be opened, and click **Open**.

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

4.1.3 Save as

Click **Save as** to save configuration parameters currently loaded in the working memory to an arbitrary storage location. The parameters can be stored under a different name or in a different directory. A browser window opens to enter the name and to select a path for saving the data. Permissible length of the name, and permissible characters correspond to the operating system. Configuration files can be saved by using any name and will automatically be given file extension *.mcfg.

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

4.1.4 Send

⚠ CAUTION

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

After you have finished editing a configuration, click **Send** to send the configuration to the selected device. Afterwards, the program returns to the start menu and continues displaying the measuring results.

5 Data collection and Modbus/OPC configuration

5.1 General – Data collection

The AMS 6500 ATG with transient prediction is a read-only application using AMS Machine Works. AMS Machine Works is a software from Emerson uses data from predictive maintenance technologies to diagnose and communicate the health of mechanical and rotating machinery. The AMS 6500 ATG collects the signal waveform data and buffers it on the internal micro SD card. ATG systems with prediction capabilities have this micro SD card installed in the A6500-CC Com Card. The configuration of the data collection is made in Machine Studio. The collected signal waveforms are not influenced by filters, set in the A6500-UM Universal Measuring Card. There are different configurable triggers or control elements to start a data collection:

- Manual trigger
- Scheduled trigger
- Event trigger
- Ad hoc – command for spontaneous data collection

Note
The performance of the AMS 6500 ATG typically allows up to 2000 grabs[1] per day.

A license (ATG Prediction Extension License; A6500-PE) is required for the configurable data collection. Without a license, you can use a predefined data collection with fixed parameters.

AMS Machine Works

AMS Machine Works reads the collected data through the Modbus interface of the AMS 6500 ATG. AMS 6500 ATG's with firmware version 3.x are compatible with AMS Machine Works version 1.6 with AMS 6500 ATG Interface Update (NK-2000-0758).

AMS Machinery Manager

The use of AMS Machinery Manager requires the AMS 6500 ATG Service. The AMS 6500 ATG Service transfers the collected data to an AMS Machinery Manager database. AMS Machinery Manager reads this data for further processing and analysis. The AMS 6500 ATG Service is available on the Guardian Support Portal and the software download page http://reliabilitymobile.com/apps/registration/Account/Login.aspx. For installation and operation of the service see the user guide AMS 6500 ATG Service for AMS Machinery Manager.

Note
Transient prediction requires AMS Machinery Manager version 5.7 and later versions for data analysis.

1 *Single execution of a data collection.*

From version 5.71 onwards, the AMS 6500 ATG Service is part of AMS Machinery Manger. See AMS Machinery Manager Help for further details.

5.2 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** (see Configuration). The license is assigned to one specific A6500-CC Com Card.

Note
For ATG systems with redundant communication, Emerson recommends to have a license for each Com Card.

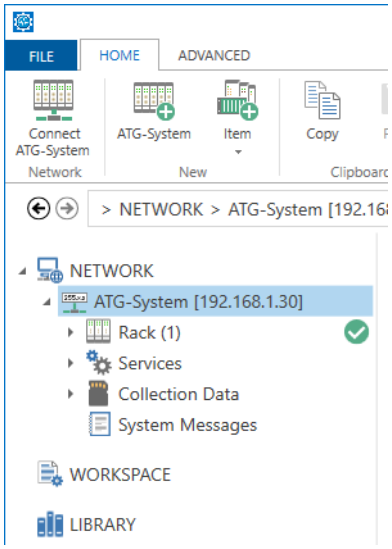
Follow the steps to add the license to enable the full configurable data collection. An online connection to the Com Card is required for this procedure.

Note
The license key is connected to a specific A6500-CC Com Card, identified by the serial number of the card, and cannot be transferred to another A6500-CC Com Card.

Procedure

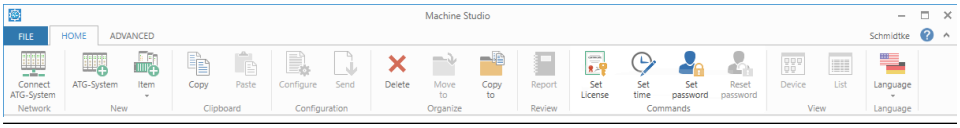
1. Choose the **ATG-System [connection type]** that contains the Com Card to be licensed from the device tree (see Figure 5-1).

Figure 5-1: Selected ATG system



The system-related commands are added to the command ribbon bar (see Figure 5-2).

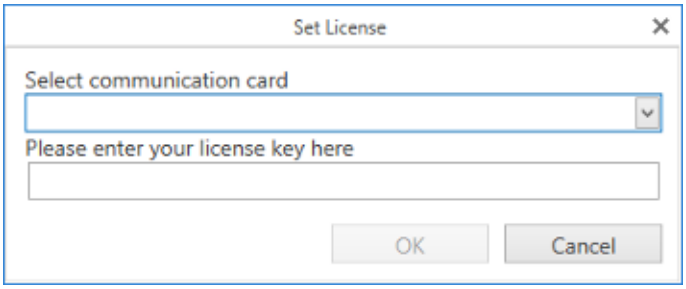
Figure 5-2: ATG system commands



2. Click **Set License** (see Figure 5-3) to open the dialog for entering the license key (Figure 5-4).

Figure 5-3: Button Set License

Figure 5-4: Dialog Set License

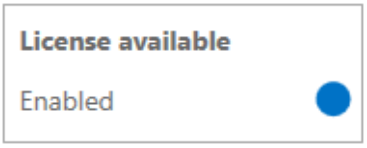


3. Select the serial number of the A6500-CC Com Card from the **Select communication card** drop down list.

   The serial number of the Com 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 Machine Studio. To check the license status, go to the online view **Overview** of the A6500-CC Com Card, and check the dialog box **License available**. An available license is indicated by a blue solid circle (see Figure 5-5).

Figure 5-5: Indication license state



5.3 Redundance

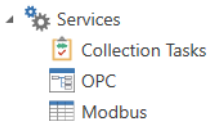
In ATG systems with redundant communication – two A6500-CC Com Cards installed – the active A6500-CC Com Card collects data and buffers the collected data on the micro SD card. The AMS 6500 ATG Service automatically checks for Com Card activity to always collect the data from the active card.

Note
For ATG systems with redundant communication, Emerson recommends to have a license for both A6500-CC Com Cards. See License entry for license details.

5.4 Services

The ATG system related services are listed below Services in the tree structure (see Figure 5-6).

Figure 5-6: Services - Tree structure



There are services for data collection and services for interfaces. Data collection services are:

- Collection Tasks (see Collection Task)

Interface services are:

- OPC UA (see OPC UA)
- Modbus (see Modbus)

5.4.1 SNTP Client

The internal time of an AMS 6500 ATG system can be synchronized with the time provided by a Simple Network Time Protocol (SNTP) server to keep the 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.

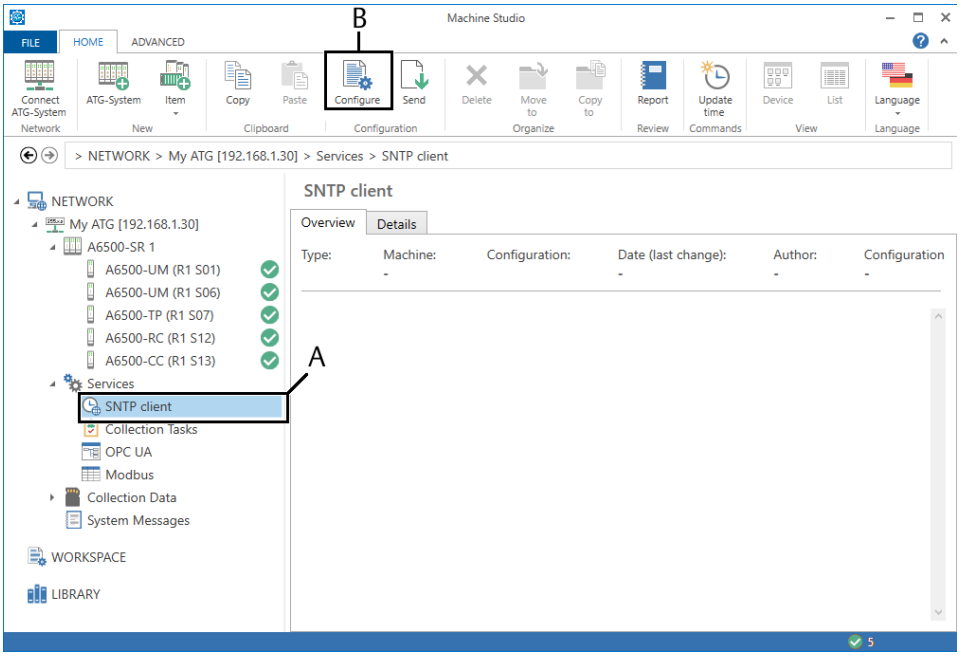
Configuration

This chapter describes the general configuration of the SNTP client.

Procedure

1. Select **Network** → **ATG System** → **SNTP Client**.

Figure 5-7: Selection SNTP Client



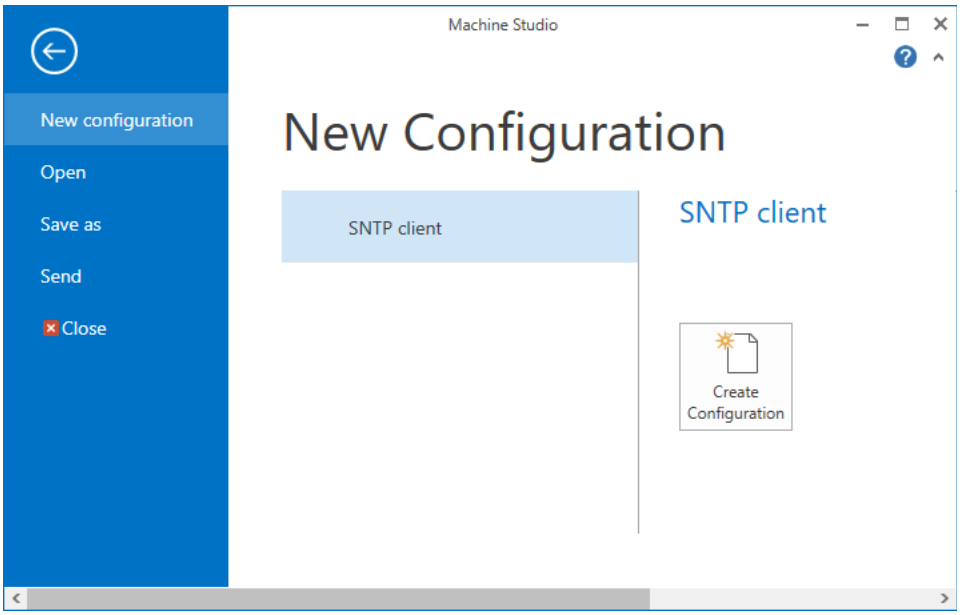
*A. Selected **SNTP Client***

*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 SNTP client, the **New Configuration** dialog appears. Click **Create Configuration** to create a new configuration.

Figure 5-8: New Configuration

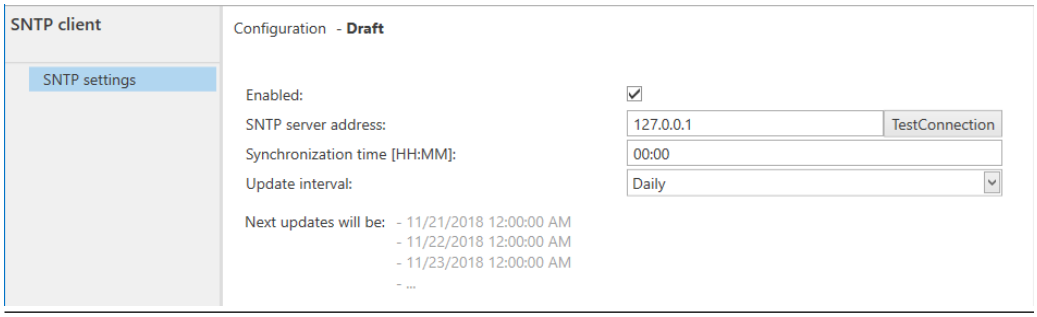


3. Enter the configuration parameter. See SNTP settings for details.
4. Click **Send & close** to send the configuration to the ATG System. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

Note
Sending a SNTP client configuration does not affect the protection function of the ATG System.

SNTP settings

Figure 5-9: SNTP settings



Enabled	Place a checkmark in 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 **TestConnection** to ensure that the IP address is correct, and the server can be connected. **Note** If the IP address is not valid, time synchronization is not activated.
Synchronization time [HH:MM]	Enter a time to synchronize the time of the 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 ATG System time is synchronized once per hour. This setting keeps the network traffic low and the synchronization frequence is sufficient to avoid a large time deviation.
Next updates will be:	The date and time of the next three time synchronizations is displayed here. This information depends on the settings for **Synchronization time [HH:MM]** and **Update interval**.

Commands

If **SNTP client** 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.

Update time

Figure 5-10: Update time

Click **Update time** to force an update of the SNTP client. Whether the time update was successful or not is indicated in the upper right corner of Machine Studio. For more details on the state of the SNTP client, see SNTP client.

5.4.2 Collection Tasks

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

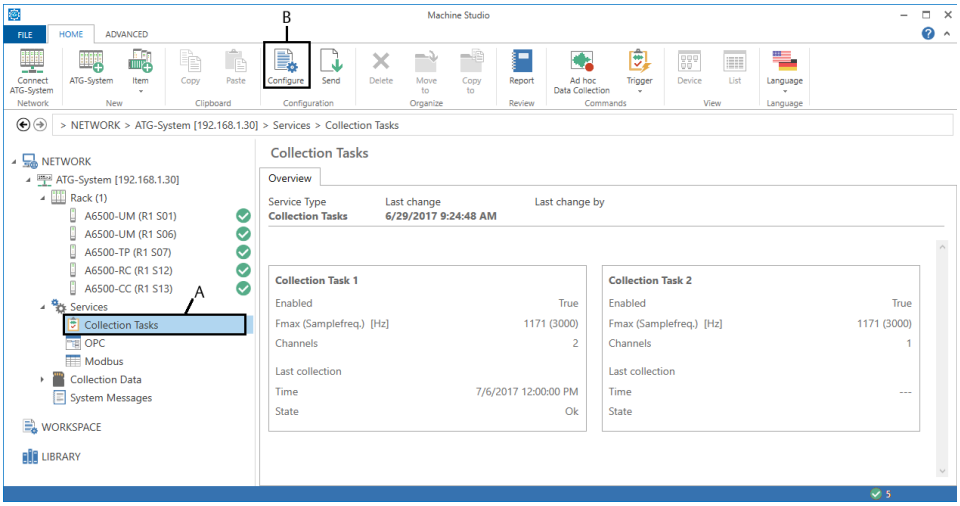
- **Schedule**
  Data is collected at a fixed time. For example: every day at 12:00.
- **Event**
  Data is collected at an event. An event could be, for example, a danger alarm of a vibration measurement.

The AMS 6500 ATG Service transfers the collected data to an AMS Machinery Manager database running on a PC connected through an Ethernet network to the A6500-CC Com Card. In parallel, the collected data is stored on the micro SD card of the A6500-CC Com Card sorted by year, month, and day. The micro SD card is used as a short-time buffer for the collected data in case of a disturbed AMS 6500 ATG Service.

Configuration

1. Select **Network** → **ATG System** → **Services** → **Collection Tasks** (see Figure 5-11).

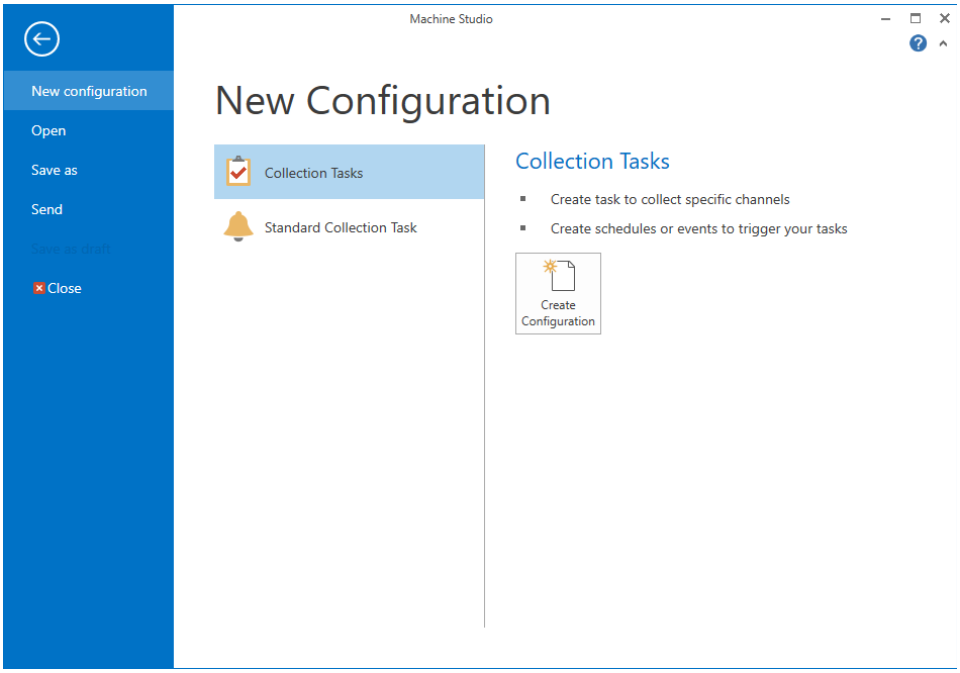
Figure 5-11: Selection of Collection Tasks



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

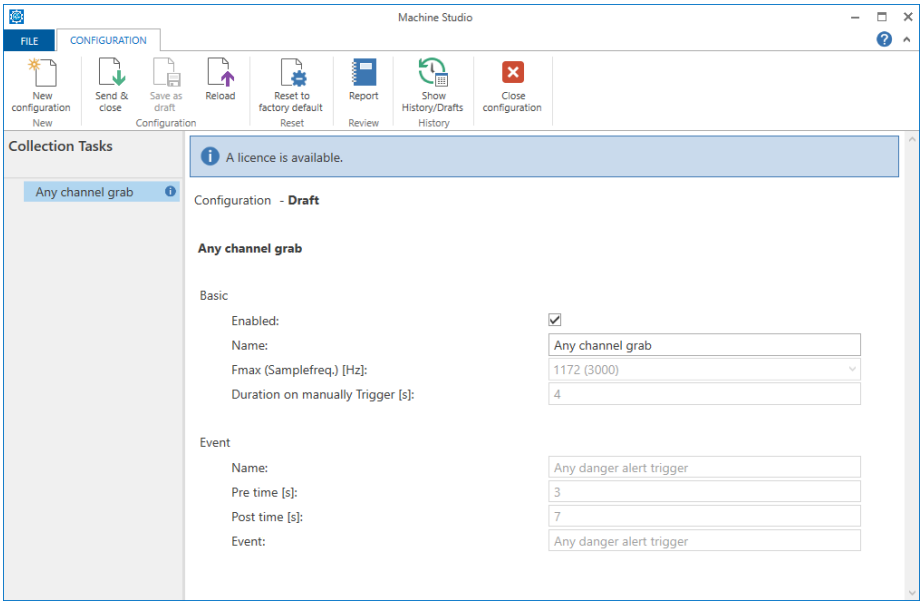
2. Click **Configure** in the ribbon command bar to open the configuration editor (see Configure).
3. During the first configuration of a **Collection Task**, the **New Configuration** dialog appears (see Figure 5-12).

Figure 5-12: 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 5-13). 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 5-13: Any channel grab



For meaning of the listed parameters see Tasks.

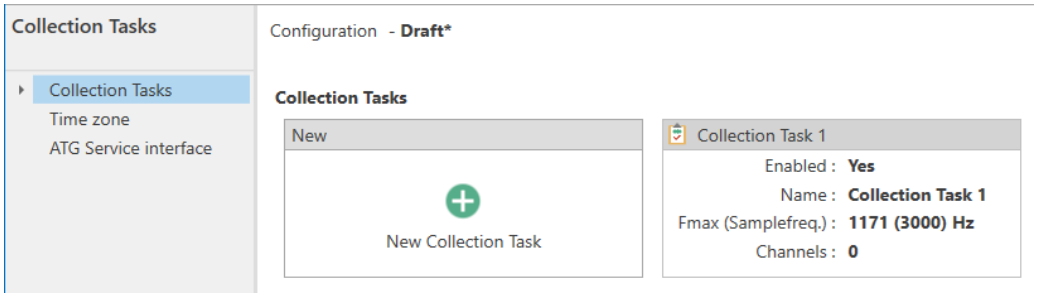
4. Enter the configuration parameters. See Collection Task, Tasks, Set the time zone for the data collection task, and Configure the ATG Service interface for details.
5. Click **Send & close** to send the configuration to the ATG System. The editor automatically closes after the successful sending of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

Note
Sending a **Collection Tasks** configuration does not affect the protection function of the ATG System.

Collection Task

Collection Tasks displays all configured data collection tasks and a button to create a new collection task (see Figure 5-14).

Figure 5-14: Collection Tasks



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

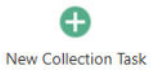
New collection task

Use tasks to configure the data collection. Define for each task the channels to be grabbed, different triggers, and 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 5-15). Up to ten tasks can be created.

Figure 5-15: 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.

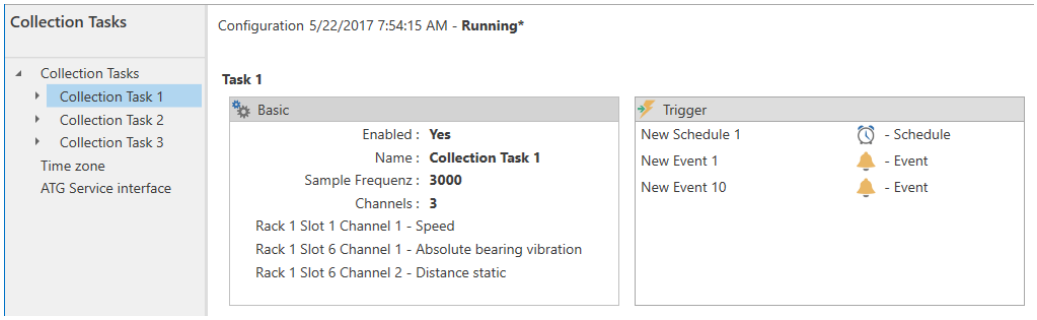
Delete a task

1. Select **Collection Tasks** from the tree (see Figure 5-14).
   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

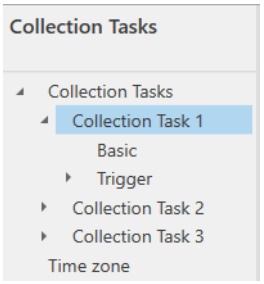
Click one of the listed tasks in the task tree. The task name depends on the configuration. The right window displays an overview about the basic configuration and trigger configuration (see Figure 5-16).

Figure 5-16: Task overview



Click the arrow in front of the task to open more configuration options for **Basic** and **Trigger** (see Figure 5-17).

Figure 5-17: Task tree

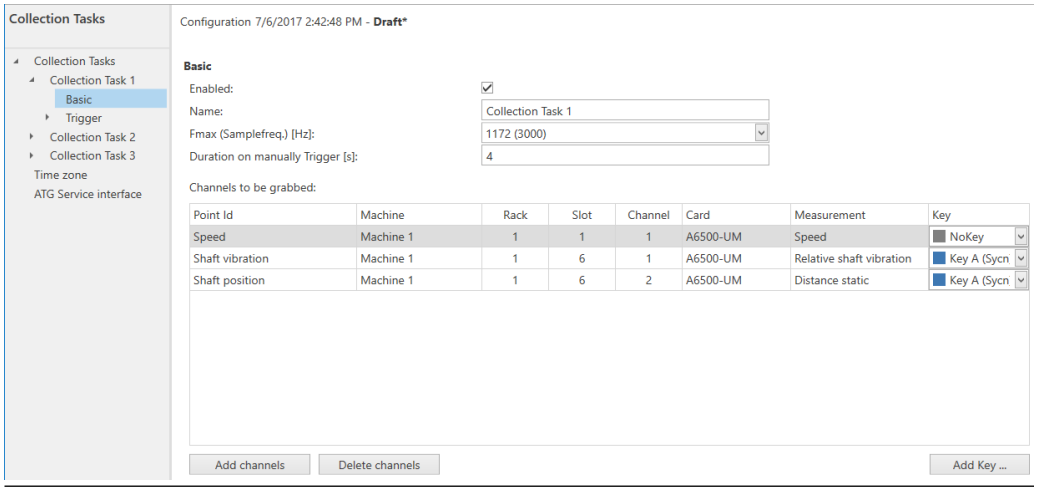


The **Basic** and **Trigger** configuration dialogs can also be opened by clicking the **Basic** or **Trigger** objects in the group overview.

Enter the basic parameters for the data collection

The basic parameters for the data collection are entered here. See Figure 5-18.

Figure 5-18: Basic



Enabled — Place a checkmark in the 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)

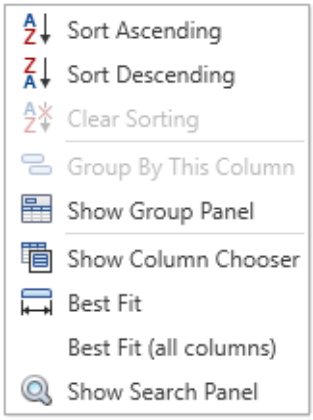
Note
A higher sampling frequency results in a higher data volume and the data collection takes a longer time.

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 grabbed. 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 5-19).

Figure 5-19: Table functions



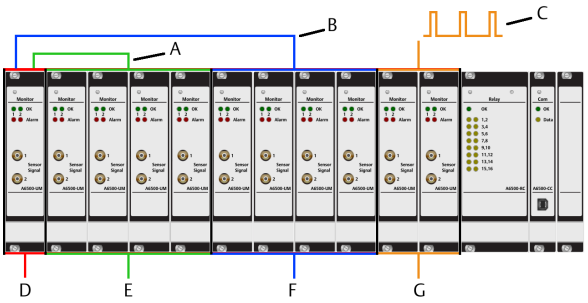
Key

Select a key group for the channels to be grabbed 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 grabbed, 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 grabbed, physically connected to the same external key signal, generated outside of the System Rack.

Figure 5-20 shows a key group example.

Figure 5-20: 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)***

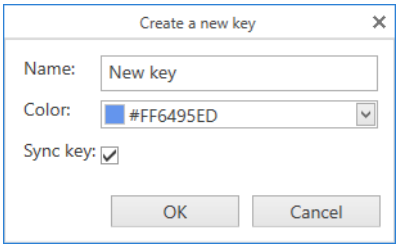
*F. Four A6500-UM cards connected through the System Rack to Key 2 generated by the A6500-UM in slot 1. Key group: **Key B (Sync)***

*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 5-21.

Figure 5-21: 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. Place a checkmark in the **Sync key** box 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.

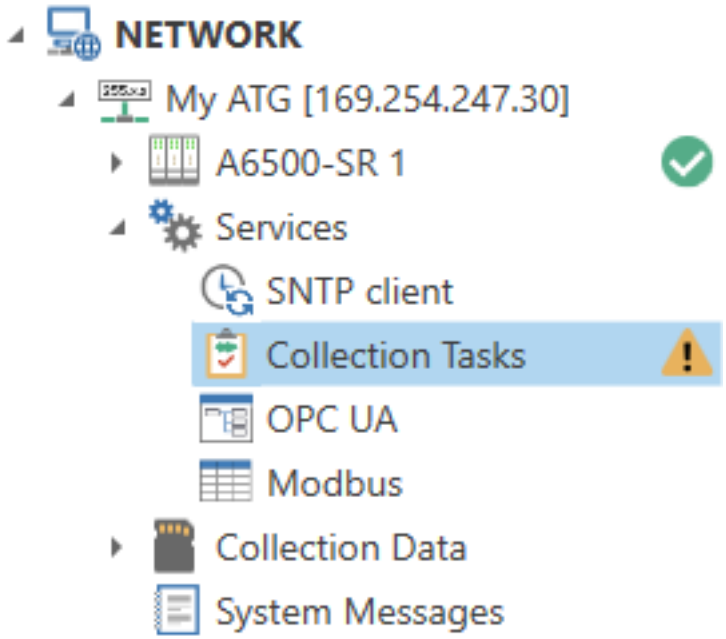
   Note
   Data collection with advance synchronization is only possible with a key signal generated by an A6500-UM card.

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 grabbed. 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 grabbed are no longer available:

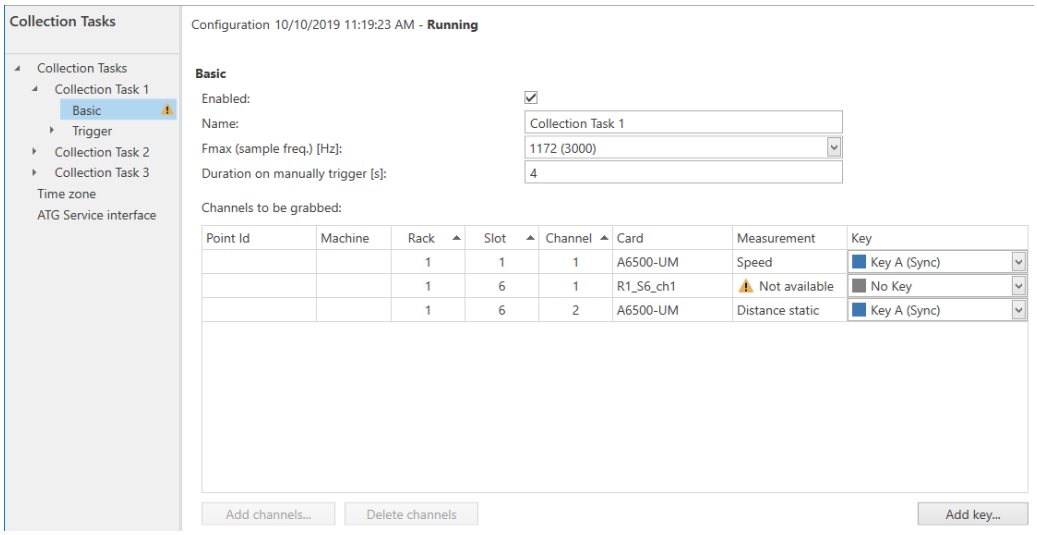
Figure 5-22: Indication of an inconsistency in the list of channels to be grabbed



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 5-23).

Figure 5-23: Indication of a missing channel



There are several possibilities to solve the inconsistency:

Table 5-1: Hints for solving inconsistencies

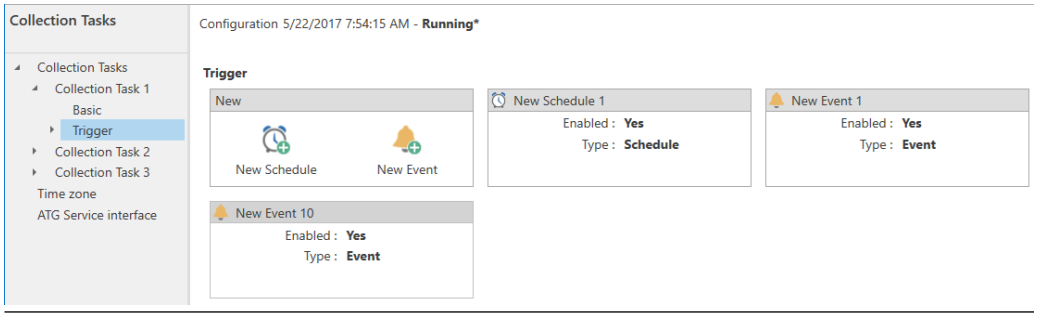
Cause	Solution
Card has been removed	Reinstall the missing card or delete the channel from the list
Configuration of the card has been changed	Update the list in accordance to the change
Card is defective	Replace the card and configure it in accordance to the defective card

Note
Collection tasks with missing channels are still processed.

Configure the triggers for the data collection

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

Figure 5-24: 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 5-25: New Schedule

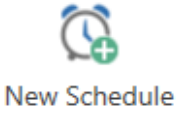
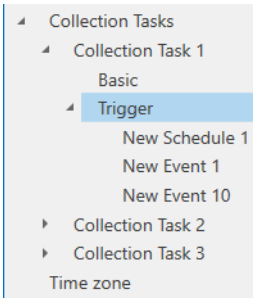


Figure 5-26: New Event

A **New Schedule** or **New Event** object is added to the trigger overview and to the task tree (see Figure 5-27).

Figure 5-27: 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.

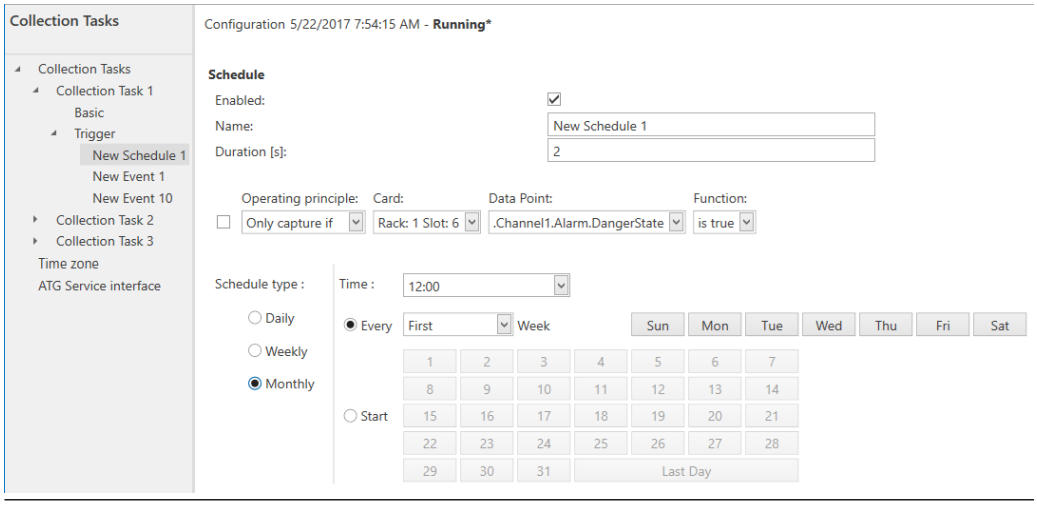
Delete a trigger

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 5-28: New Schedule - Configuration



Enabled Place a checkmark in the 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 the 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. Place a checkmark in 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

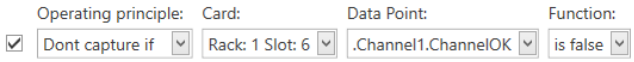
   If a data point is selected that requires a limit, for example an analog output, select between:
   - is greater than
   - is greater than or equal
   - is less than
   - is less than or equal
   - is between
   - is not between

   These conditions enable further input fields for limit entries.

Example

Figure 5-29 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 5-29: 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

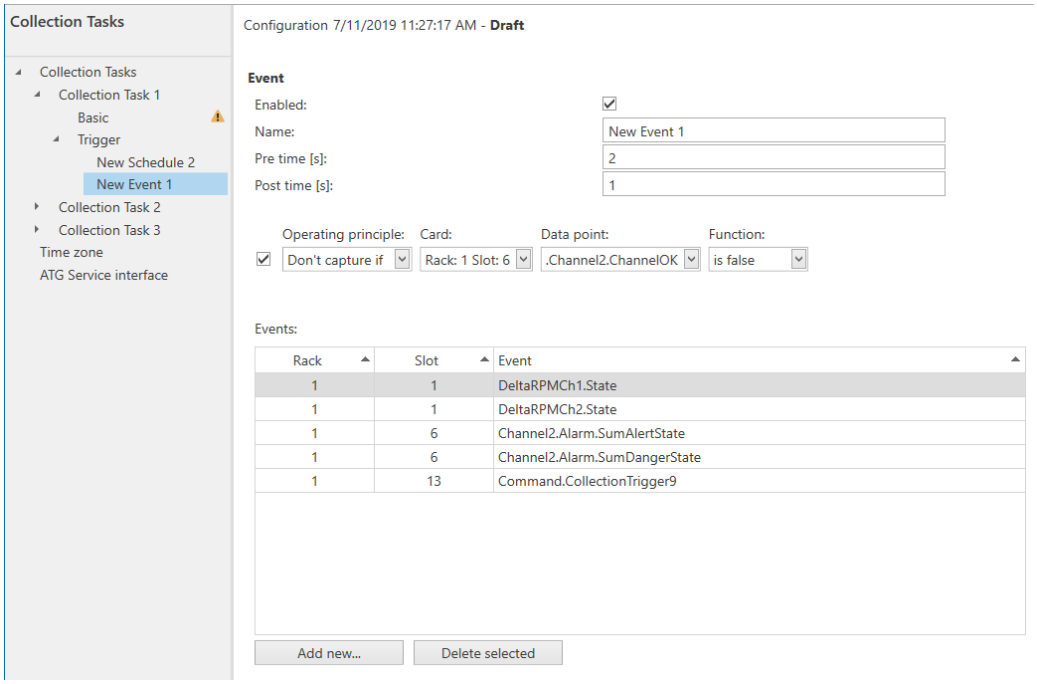
Data is not collected at days which do not belong to the current month.

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

Define events for the data collection

Configure the new event.

Figure 5-30: New Event - Configuration



Enable Place a checkmark in the box to enable the event trigger.

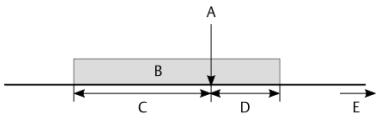
Name Enter a name for the event. This name replaces **New Event** in the task tree.

Pre time and Post time Define the length of the grabbed data block. The maximum duration for each parameter depends on the selected sampling frequency (see Enter the 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 5-31).

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 grabbed. 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 5-31: 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. Place a checkmark in 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

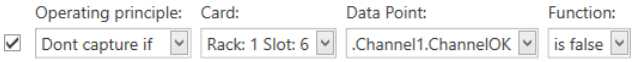
- is between
- is not between

These conditions enable further input fields for limit entries.

Example

Figure 5-32 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 5-32: Example for capture suppression

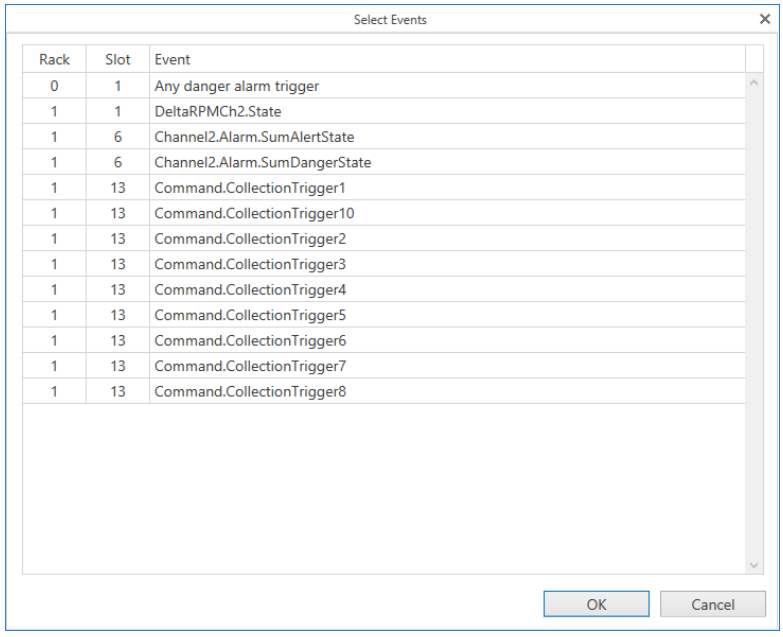


Events

Select one or more event triggers.

1. Click **Add new ...** to open a table with all available events (see Figure 5-33). 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 the basic parameters for the data collection).

Figure 5-33: 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-45 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 (A6500-CC Com Card) 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.

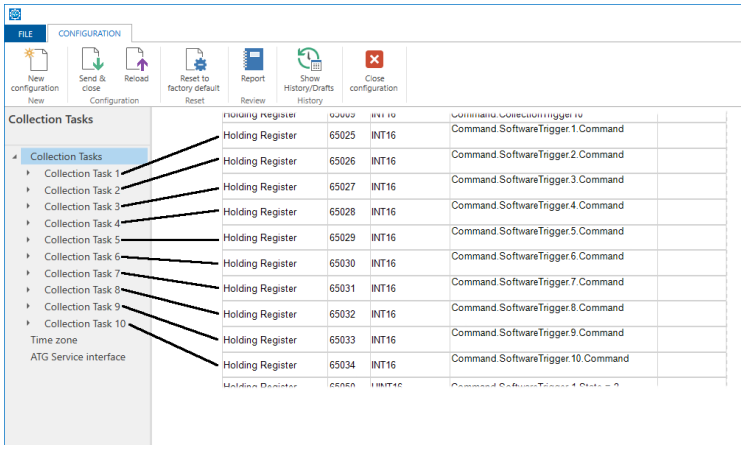
Software trigger command task 1 is assigned to collection task 1.

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

...

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

Figure 5-34: 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.

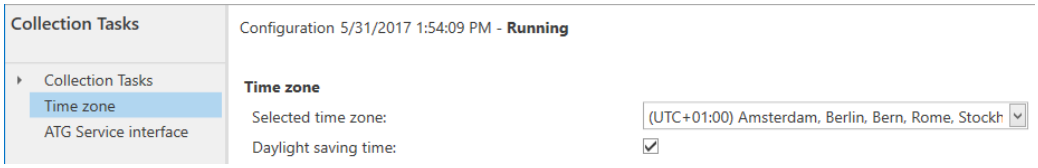
See Table B-45 for further details.

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 5-35: Time zone



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

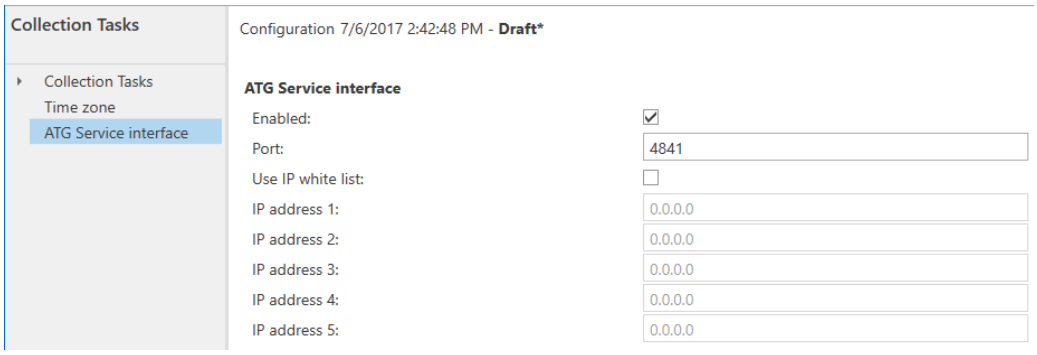
Configure the ATG Service interface

Configure the interface for the AMS 6500 ATG Service. See Figure 5-36. This service is an additional tool to transfer the collected data to a selectable AMS Machinery Manager

database. This service is part of AMS Machinery Manager. See respective manual for details.

Note
One service can connect to an A6500-CC Com Card at the same time.

Figure 5-36: AMS 6500 ATG Service interface



Enable	Place a checkmark in the box to activate the interface for the AMS 6500 ATG Service.
Port	Enter the port for the communication.
Use IP white list	Place a checkmark in 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 AMS 6500 ATG Service interface.

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 Data Collection

Use the **Ad hoc Data Collection** 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.

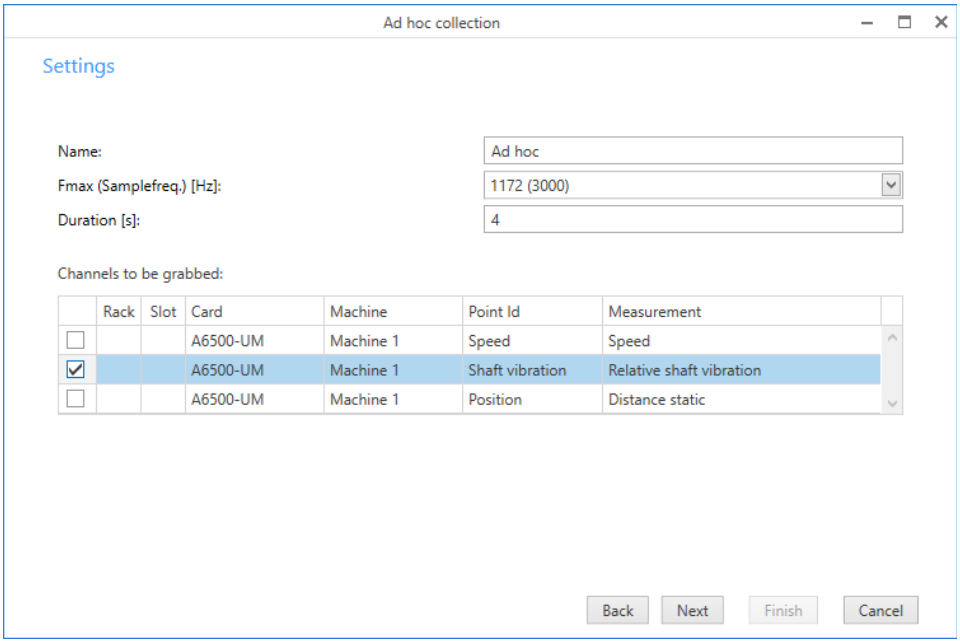
Figure 5-37: Ad hoc Data Collection

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 afterwards.

Procedure

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

Figure 5-38: Ad hoc collection settings

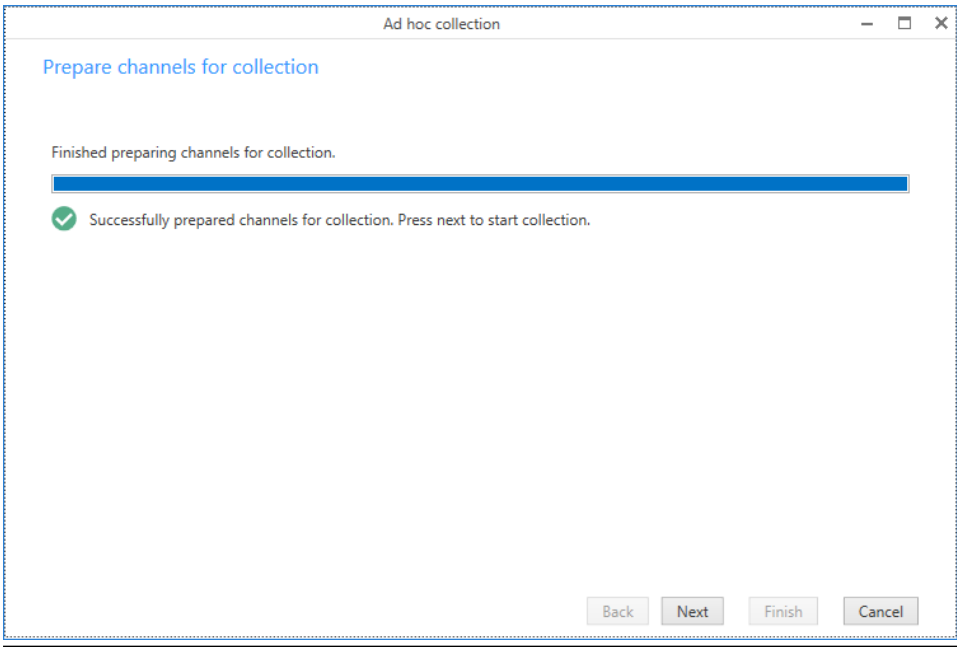


Name	Enter a name for the collected data.
Fmax (Samplefreq.) [Hz]	Select the sampling frequency from the list field. See Enter the basic parameters for the data collection for details.
Duration	Define the length of the data block. The maximum length depends on the selected sampling frequency.
Channels to be grabbed	Select the channels to be grabbed. In column **Active**, place a checkmark in 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 5-39). Click **Next** to start the data collection.

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

Figure 5-39: Channels ready for data collection



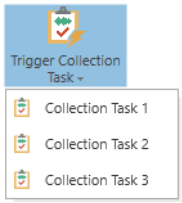
The data is collected and stored afterwards.

5. After collection, click **Finish** to close the dialog.
   After approximately 60 seconds, the system is ready for the 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 5-40: Trigger Collection Task



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

5.4.3 OPC UA

The A6500-CC Com Card is equipped with an OPC UA (OLE for Process Control Unified Architecture) server.

Connection and communication

The connection interface of the OPC UA server is the TCP/IP interface of the A6500- CC Com Card (see A6500-CC Operating Manual for details).

Up to five OPC UA clients can simultaneously connect to the OPC UA server.

An IP address and port is required for the client to connect to the OPC UA server. The OPC UA communication is not encrypted. The communication is designed for the reading of data. The sending of commands, such as the reset latch command, is not possible through the OPC UA communication.

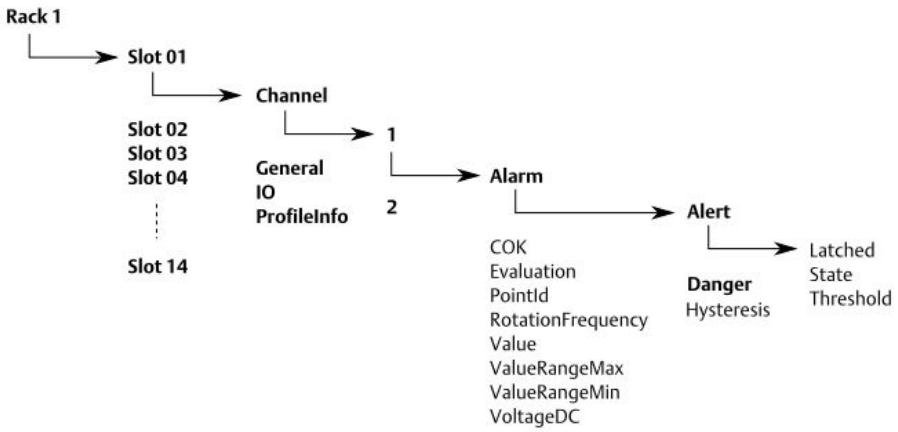
Note
OPC UA is not backwards compatible to OPC.

OPC 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 A6500-CC Com Card can be read.

The data points (nodes) of the OPC UA server are structured as shown on Figure 5-41. This structure is based on the physical structure of the System Rack and facilitates the location of the single data points.

Figure 5-41: Item structure



Bold: Groups

Not bold: data points (node)

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

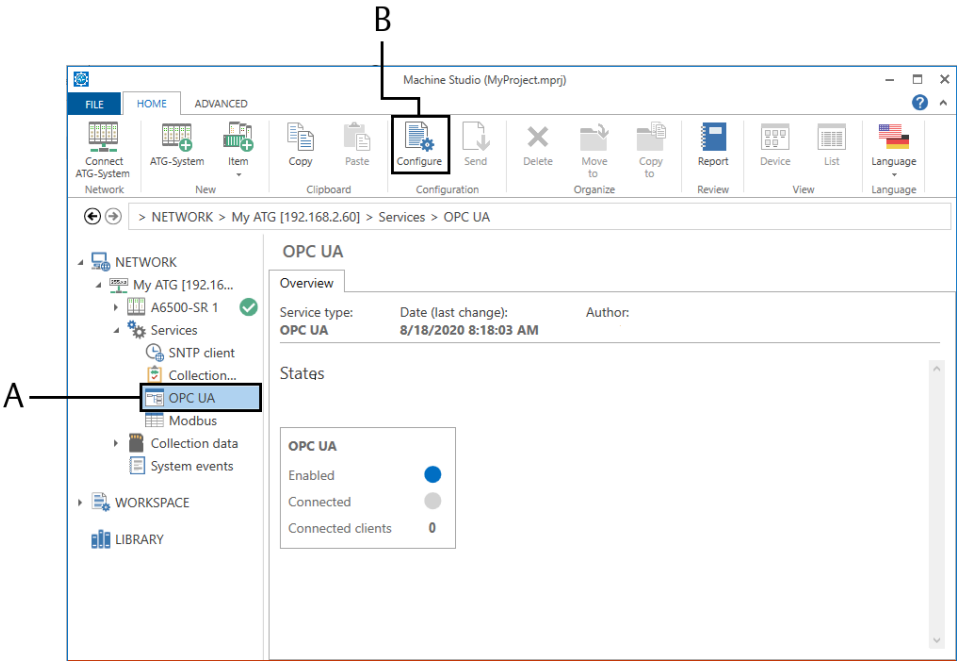
Note
To obtain waveform data, Emerson recommends a minimum cycle time of 1000 ms. OPC UA data is generally provided in SI units, independently of the selected system of units in Machine Studio (**Settings → Internationalization → System of units**).

Configuration

Procedure

1. Select **Network** → **ATG System** → **Services** → **OPC** (see Figure 5-42).

Figure 5-42: Selection OPC



*A. Selected **OPC***

*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. See OPC UA credentials and OPC UA for details.
4. Click **Send & close** to send the configuration to the ATG System. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

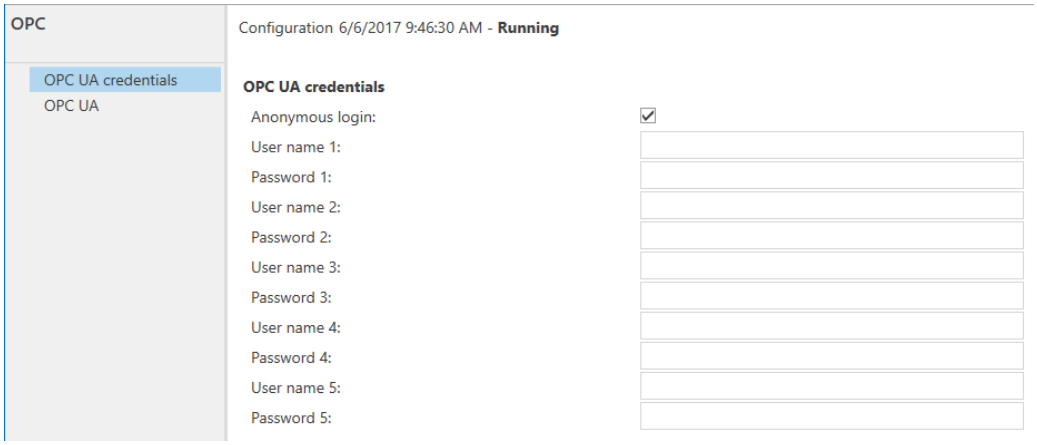
   See operating manual of your OPC UA client on how to connect to OPC UA servers.

Note
Sending an OPC UA configuration does not affect the protection function of the ATG System.

OPC UA credentials

Define the user access to the OPC UA interface (see Figure 5-43).

Figure 5-43: OPC UA credentials



Anonymous login

Check this box if no access control is required. Uncheck this box to define up to five user logins.

Note

Changing from anonymous login to password protected login requires a restart of the card.

Send the configuration to the card. The confirmation dialog with the reboot request appears. Click **Send & reboot** to send the configuration and to restart the A6500-CC Com Card afterwards.

If you prefer to restart the A6500-CC manually, remove and plug it.

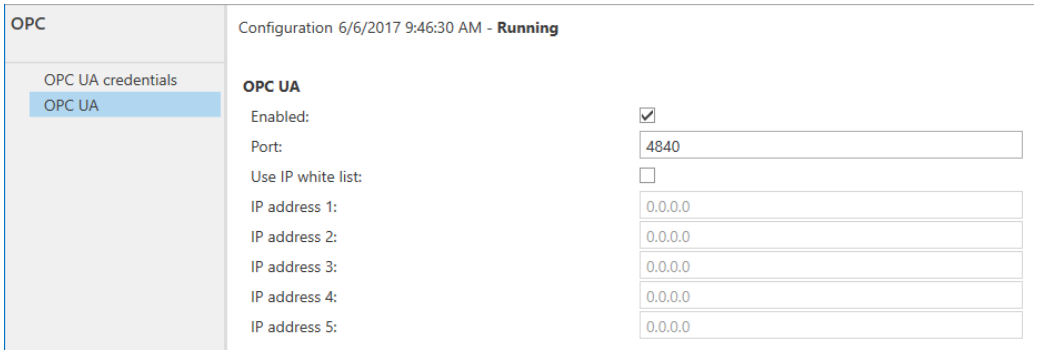
User name 1 and Password 1 to User name 5 and Password 5

Create up to five user logins. Enter user name and password.

OPC UA

Define the OPC UA interface (see Figure 5-44).

Figure 5-44: OPC UA Interface settings



Enabled Check this box to enable the OPC UA interface.

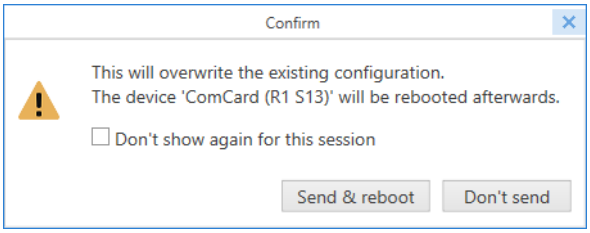
Port Enter the port for the communication.

Note
The sending of a configuration with a changed port causes a disconnection of all OPC connections. Afterwards, the connections are automatically reestablished.

Note
The changing of the port requires a restart of the card.

Send the configuration to the card. The confirmation dialog with the reboot request appears (see Figure 5-45). Click **Send & reboot** to send the configuration and to restart the A6500-CC Com Card upon completion.

Figure 5-45: Reboot request



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.

5.4.4 Modbus

Configuration

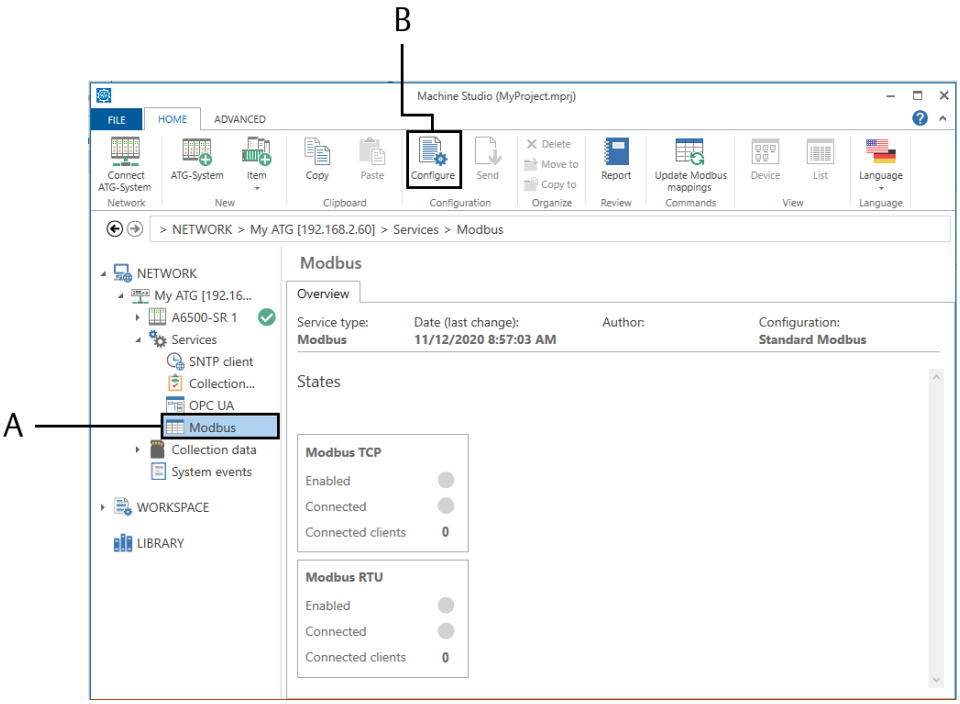
This chapter describes the general configuration of the Modbus interface of the A6500-CC Com Card. For setup and configuration of the redundant communication, see the A6500-CC operating manual.

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

Procedure

1. Select **Network** → **ATG System** → **Services** → **Modbus** (see Figure 5-46).

Figure 5-46: Selection Modbus

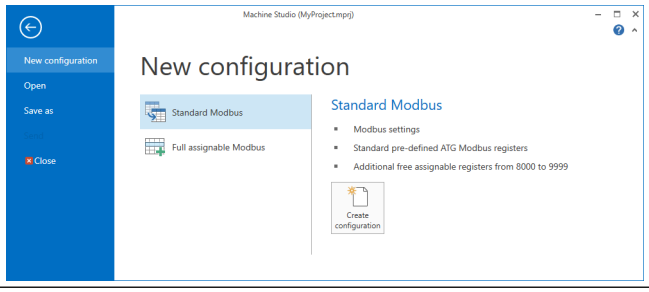


*A. Selected **Modbus***

*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 5-47: 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 Assigned registers for details.
5. Click **Send & close** to send the configuration to the ATG System. The editor automatically closes after the successful sending of the configuration. See Send a configuration.

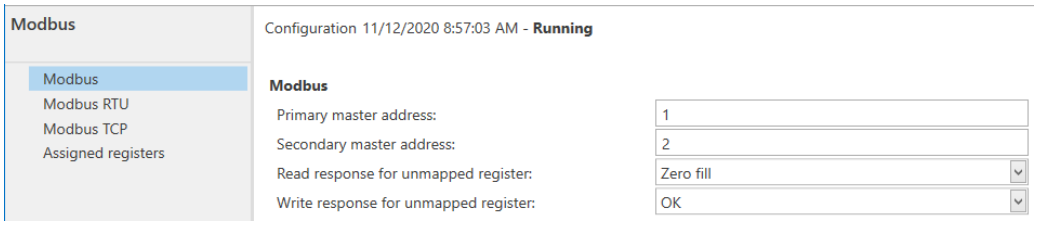
   See Modbus – Interface settings and data tables for interface settings and data tables.

Note
Sending a Modbus configuration does not affect the protection function of the ATG System.

Modbus

Configure the general Modbus communication.

Figure 5-48: Modbus settings



Primary master address
Enter the Modbus device address for the Com Card installed in the left communication card slot (CD13).

Secondary master address
Enter the Modbus device address for the Com Card installed in the right communication card slot (CD14).

Note
The device address (port address) is mainly required for the serial Modbus RTU communication. If both Com 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 Com 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

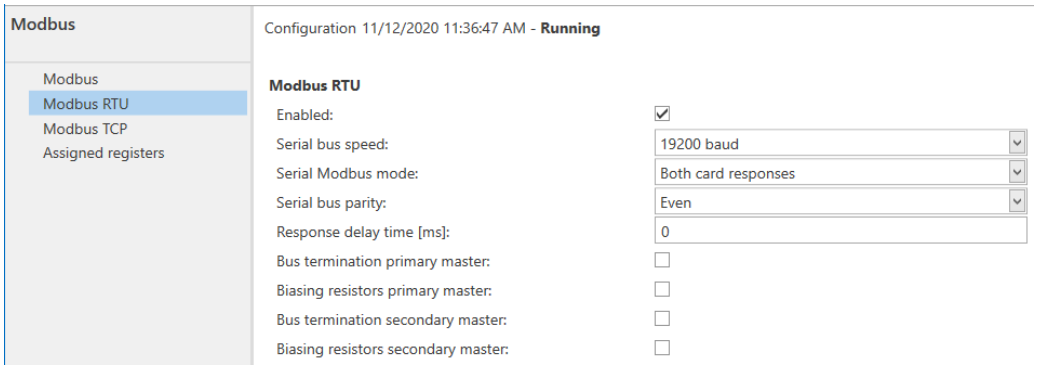
Choose the response if an unmapped register is written. The register mapping depends on the configuration of the cards connected to the Com Card.

- **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.

Figure 5-49: 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 responses and provides Modbus data.
- **Both card responses**
  Both cards response and provide Modbus data.

Serial bus parity

Choose the check bit.

- **None**
  Error detection is disabled.
- **Even**
  Even check bit.
- **Odd**

Odd check bit

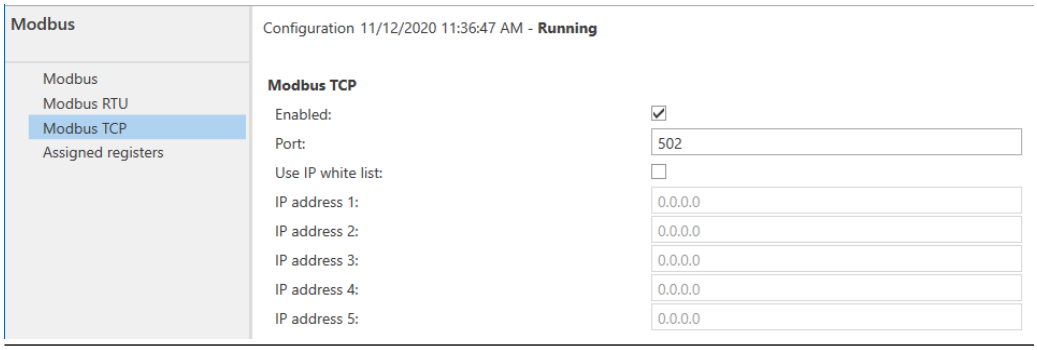
Response delay time [ms]	Enter a delay time in ms between data transmit and receive.
Bus termination primary master and Bus termination secondary master	Check this box to activate the Modbus bus termination. The Modbus RTU communication is based on a RS 485 bus. This physical bus requires a bus termination 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 A6500-CC Com Card operating manual).
	Note Ensure that the termination is only activated at one Com 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 A6500-CC Com Card operating manual).

Modbus TCP

Configure the Modbus TCP interface.

Up to 5 clients can simultaneously connect to the Modbus TCP interface.

Figure 5-50: Modbus TCP settings



Enable	Check this box to activate Modbus over TCP/IP. 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.

Note
Sending a configuration with a changed port causes Modbus communication to be disconnected and immediately reconnected using the specified port.

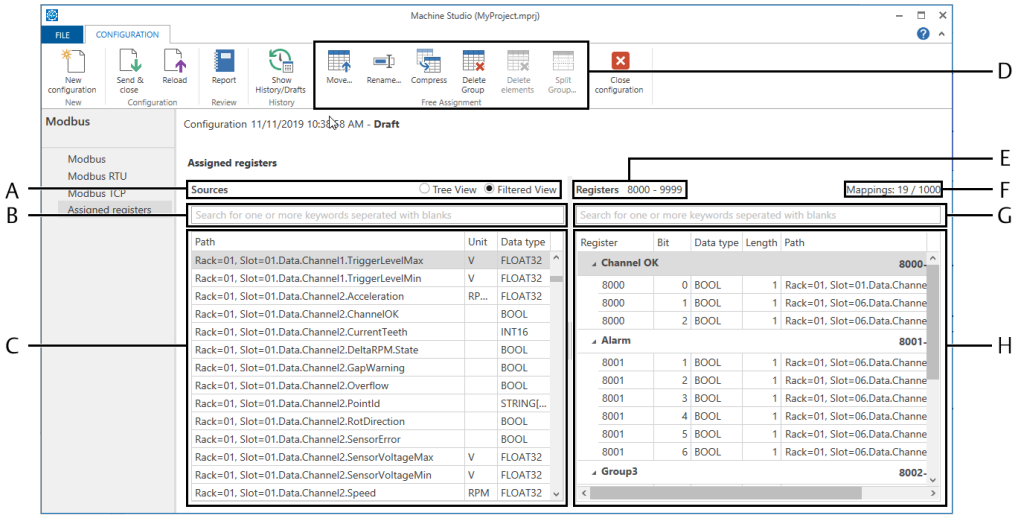
Use IP white list	Check this box to activate the device white list. This list is used to define devices allowed to communicate with the Modbus TCP interface of the Com Card.
IP address 1 to IP address 5	These fields are only available if the check box **Use IP white list** is checked. Enter up to five IP addresses of devices allowed to communicate with the Modbus TCP IP interface.

Assigned registers

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 ranging from 8000 to 9999 (**Standard Modbus**), or use the full register range of 0 to 65535 for your assignment (**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
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 5-51: 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.

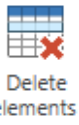
Compress

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

Delete Group

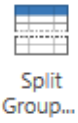
Delete a group from the list of assigned registers.

Delete elements



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

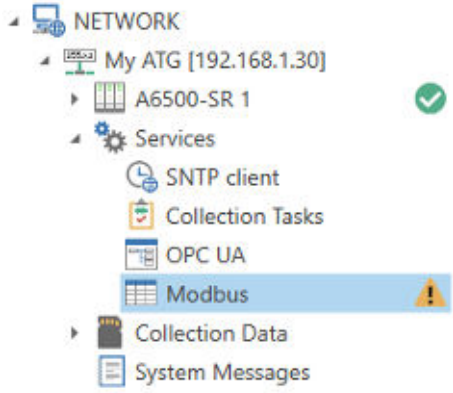
Split Group ...



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

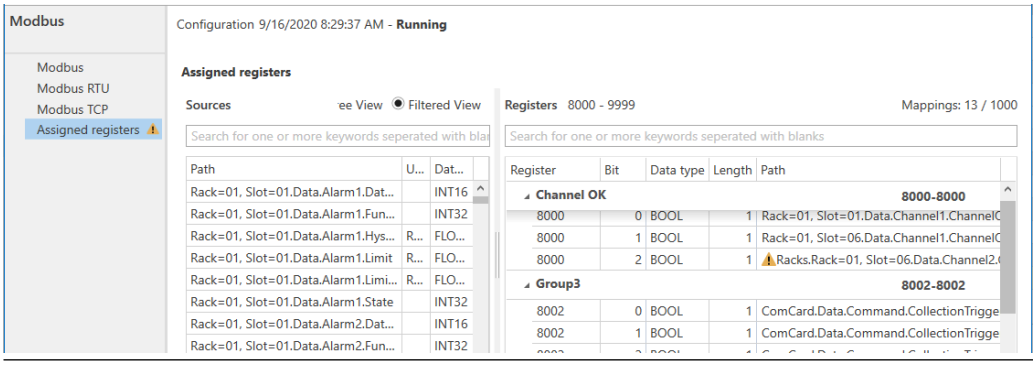
Note
Changing the card's configuration causes a change to the Modbus registers. If one or more registers in the list of assigned registers are no longer available, a yellow warning triangle appears beside the Modbus service in the device tree:

Figure 5-52: Indication – inconsistency of freely assigned Modbus of registers



In this case, open the Modbus configuration and go to **Assigned registers** 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.

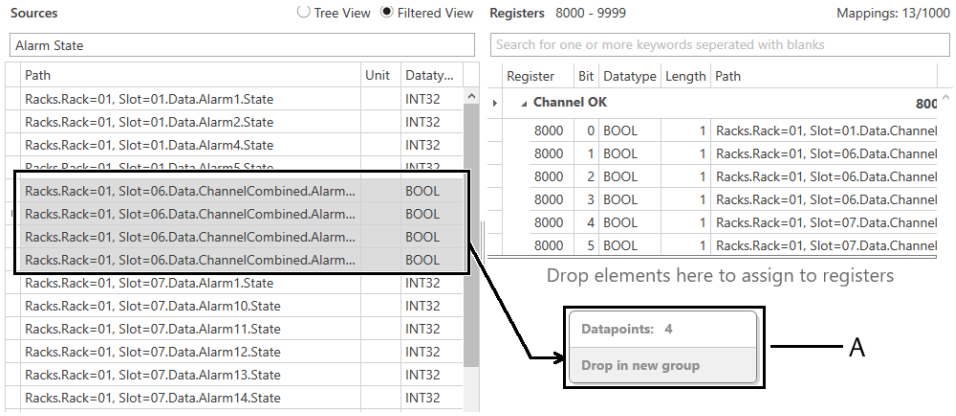
Figure 5-53: Indication in Assigned registers



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 rack data 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 rack data list to the list of assigned registers.

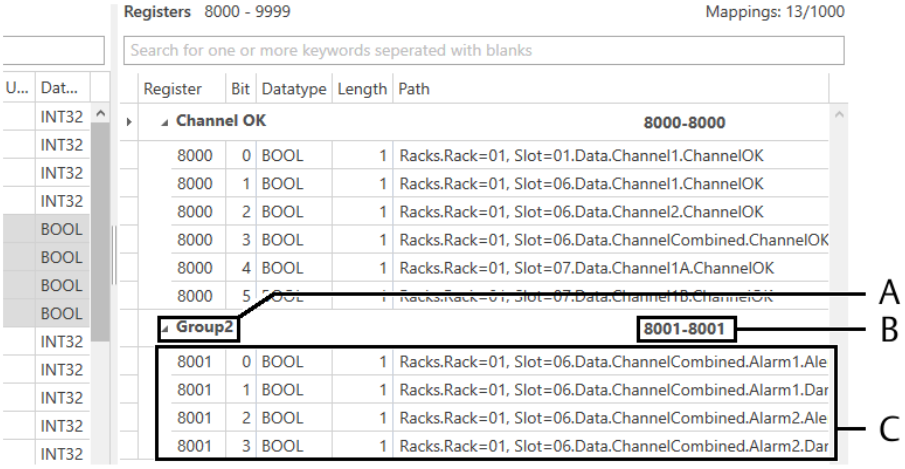
Figure 5-54: Drag and drop



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.

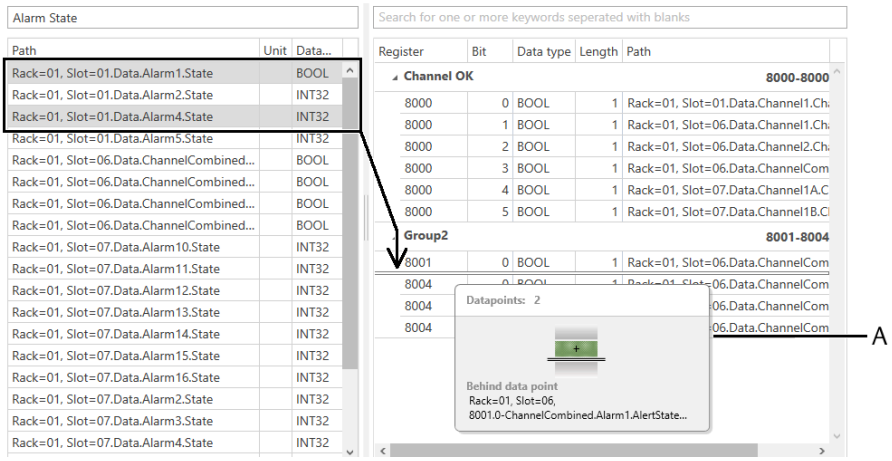
Figure 5-55: New register group



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 5-56: 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 6500) 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.

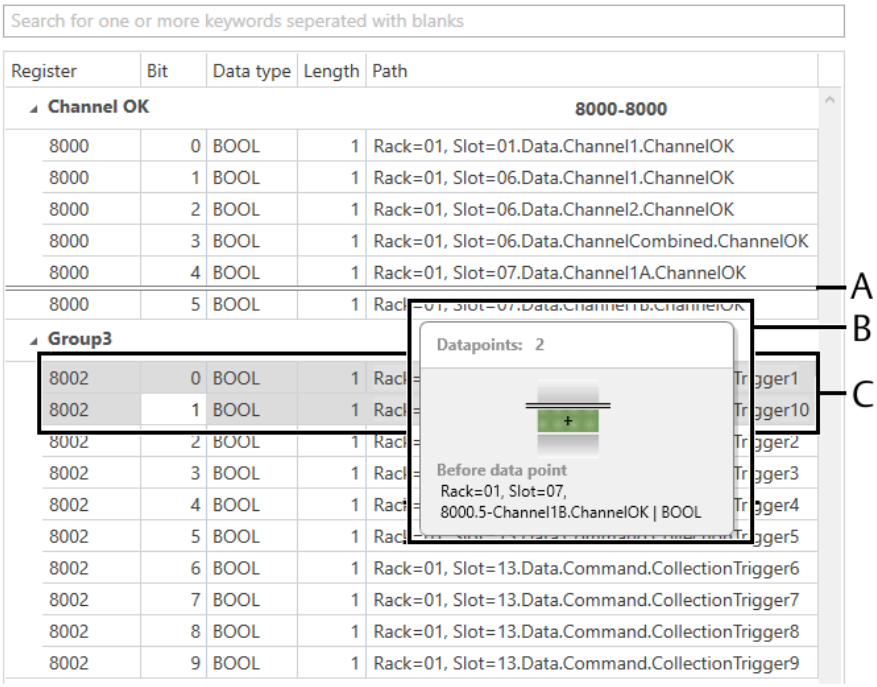
  c. Enter a name and click **OK**.
     The new group is created and contains the register selected beforehand and all following registers.

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 5-57: 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.

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

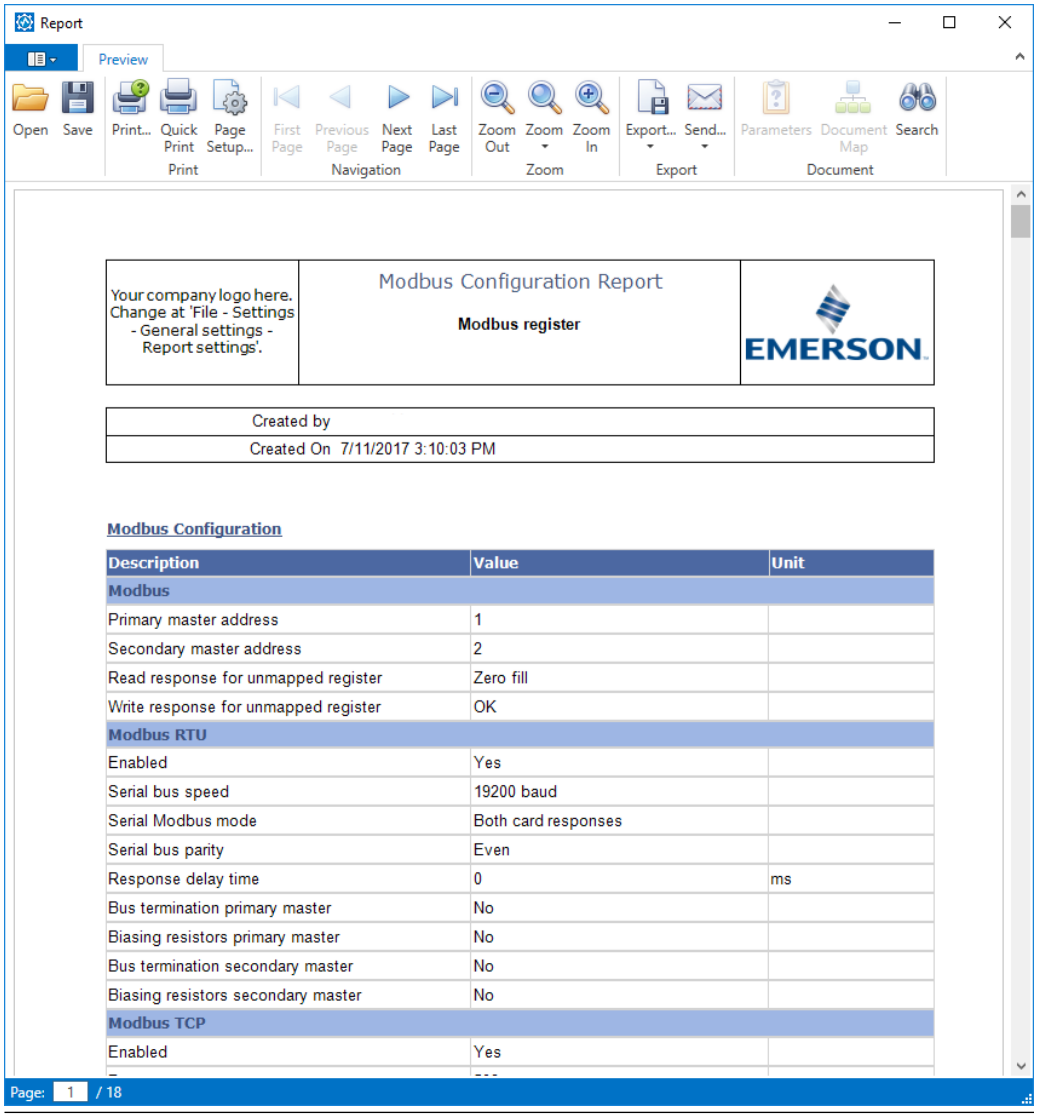
Figure 5-58: Report

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 5-59. 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 5-59: Modbus register report



Update Modbus mappings

Figure 5-60: 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 Com Card. To force an update click **Update Modbus mappings**.

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

5.5 Collection Data (micro SD Card)

See the A6500-CC Com Card manual for inserting a micro SD card into the Com Card.

Note
Emerson recommends replacing the micro SD card after five years of operation.

⚠ CAUTION

Use only micro SD cards authorized by Emerson (order number: A6500-SD).

The micro SD 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 micro SD card is indicated by an icon beside the SD card icon in the device tree of Machine Studio.

Table 5-2 lists some possible reasons for a SD card in not OK indication.

⚠ CAUTION

Any work at the system may impair machine protection.

Table 5-2: State indication - possible reasons and solutions

Reason	Icon	Solution
No micro SD card installed.	⊖	Install a micro SD card authorized by Emerson (see A6500-CC Com Card manual for details).
Wrong micro SD card type.	⊗	
Micro SD card is not properly installed	⊖	Check the proper fit of the micro SD card. (see A6500-CC Com Card manual for details)
Micro SD card has a defect.	⊖	Replace the defect micro SD card by a new one (see A6500-CC Com Card manual for details).
Micro SD card has not been detected.	⊖	Reboot the A6500-CC Com Card by removing and plugging.

The stored data is sorted by year, month, and day. To browse to a data file:

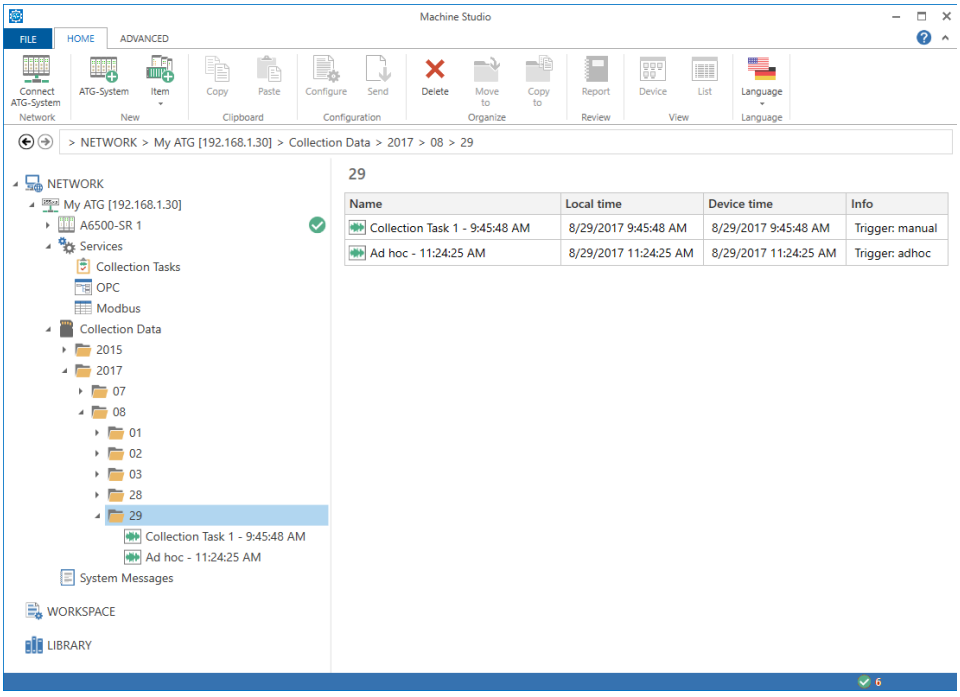
Procedure

1. Click on the small arrow in front of the micro SD card symbol in the device tree to expand the file structure of the micro SD 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 5-61). 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**.

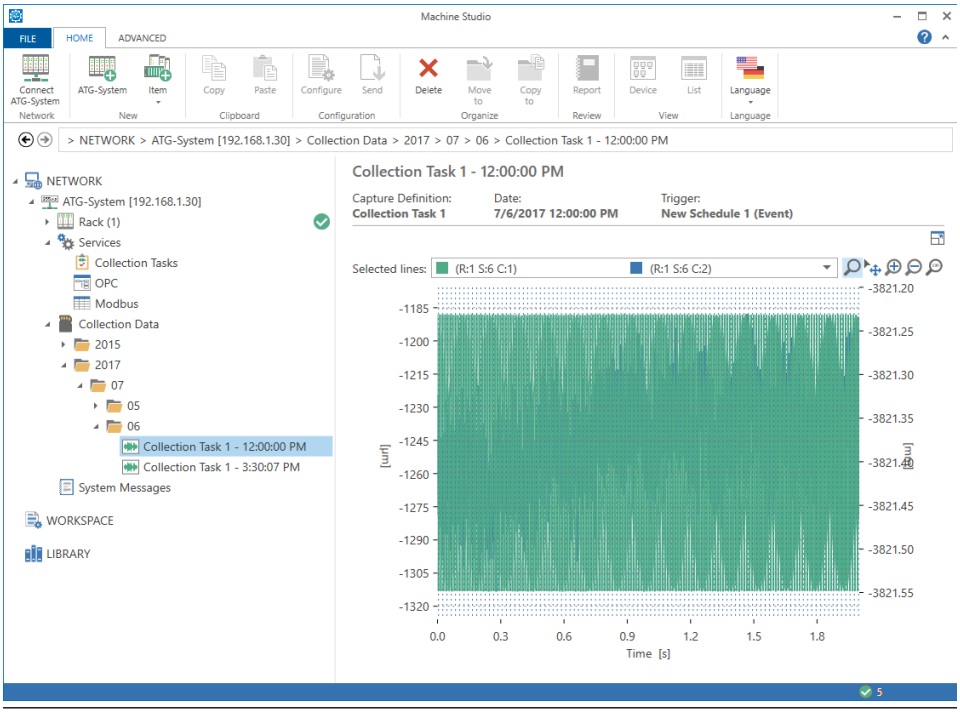
Figure 5-61: Collection data - folder structure



The day folder contains all data files written on that 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 5-62.

Figure 5-62: Display of collection data



5.5.1 Delete a folder or data file

Complete folders or single data files can be deleted from the micro SD 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.

5.6 System events

Click **System events** in the device tree to open the system events stored on the micro SD card of the A6500-CC card. Up to 10000 events with sequence number, time stamp, and message can be displayed.

The events are stored in files on the micro SD card. The oldest file is overwritten if the space on the micro SD card is occupied and a new event occurs. A system event indicates that files have been overwritten. Events are read from the micro SD card as soon as there is a connection between Machine Studio and the Com Card. If no micro SD card is installed, only events that occur during the connection between Machine Studio and the Com Card are listed.

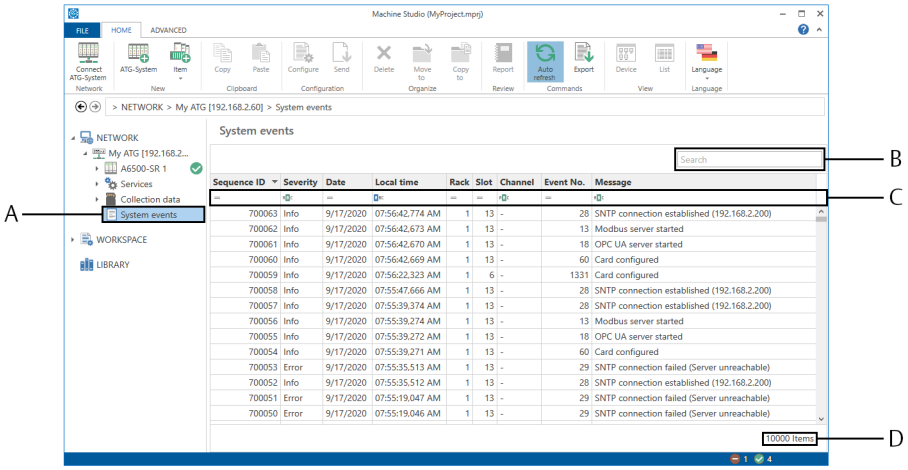
The internal event buffer of the AMS 6500 ATG cards is limited.

- 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.

Figure 5-63: System events



*A. Selected **System events***
B. Entry field of the search function
C. Filter functions
D. Number of listed events

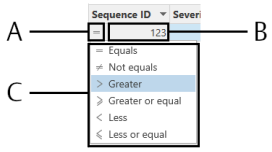
The columns contain the following information

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	Time stamp of the event. The time of the AMS 6500 ATG system is used for the time stamp.
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.

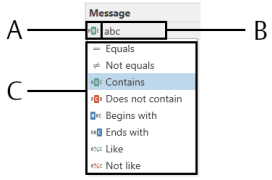
Use the search function to search the **Message** column for a certain message. The search starts while entering the condition.

Figure 5-64: Filter functions – columns with numbers



A. Icon of the selected filter function
B. Entry field for the filter condition
C. Available filter functions

Figure 5-65: 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 A6500-CC Com Cards

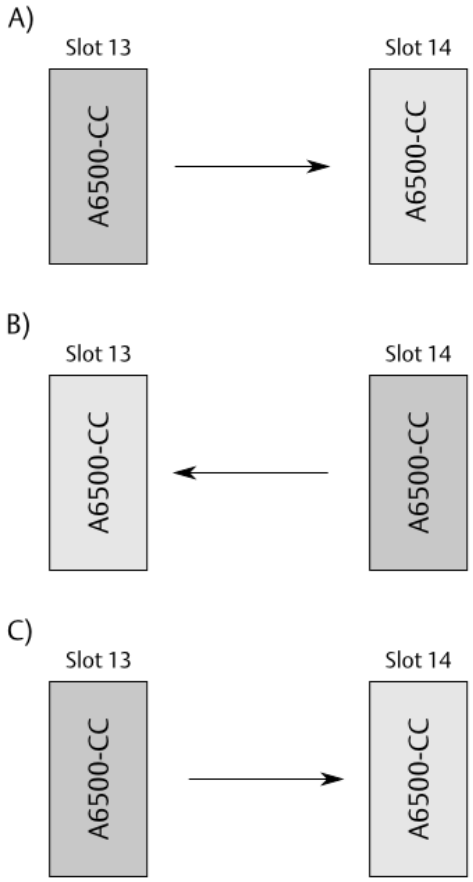
With redundant communication, the occurred events can be read from both A6500-CC Com Cards. Both Com Cards share the same events related to the system in which they are installed. The following table explains the behavior of the redundant Com Cards at different scenarios.

Scenario	Behavior
An A6500-CC is already installed (typically in slot 13) and running, and a second new (unused) A6500-CC is added to the rack.	At the first start of the newly added Com Card, all events stored on the already installed Com Card are copied to the new Com Card. This process can take several minutes. All new events are stored on both Com Cards.
An A6500-CC is already installed (typically in slot 13) and running and a second A6500-CC that has been running in another system is added to the rack.	At the first start of the added Com Card, the Com 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 Com Card are copied to the added Com Card. All new events are stored on both Com Cards.

Scenario	Behavior
An A6500-CC is already installed (typically in slot 13) and running, and a second A6500-CC that was meanwhile installed in another system is added to the rack again.	At the first start of the added Com Card, the Com Card recognizes that it was meanwhile installed in another system. The stored events of the system in which the Com Card was installed in the meantime are no longer accessible. The already installed Com Card synchronizes the events (without the events of the system where it was installed in the meantime) with the added Com Card. All new events are stored on both Com Cards.
An A6500-CC already installed in slot 14 has events stored. The power supply of the system rack is switched off. A new A6500-CC without any stored events is installed in slot 13. The power supply of the system is switched on again.	The Com Card in slot 13 starts as the primary card and becomes active. The Com Card in slot 14 is passive and the already stored events are no longer accessible. Both Com Cards starts with empty event folders. All new events are stored on both Com Cards. **Note** To avoid the loss of already stored events on the Com Card in slot 14, start the system rack only with the Com Card in slot 14 and then install the new Com Card into slot 13.

Figure 5-66 explains the copy behavior of events if one card is replaced.

Figure 5-66: Copy of events



A. *At power on, A6500-CC Com Cards installed in both slots (13 and 14): The events stored on the card in slot 13 are automatically copied to the card in slot 14, regardless of which card is new and which card has already stored events.*
B. *Already powered on system rack, A6500-CC Com Card installed in slot 14: The events stored on the card in slot 14 are automatically copied to a newly installed card in slot 13.*
C. *Already powered on system rack, A6500-CC Com Card installed in slot 13: The events stored on the card in slot 13 are automatically copied to a newly installed card in slot 14.*

5.6.1 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.

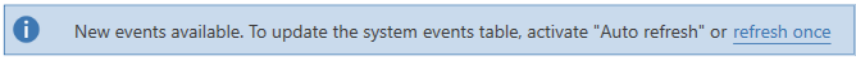
Note
These commands do not affect the protection function of the system.

Auto refresh

Figure 5-67: Auto refresh

Click **Auto refresh** to read events from the A6500-CC Com Card. The button is active (gray highlighted) by default. A message (Figure 5-68) appears if new events are available and **Auto refresh** is disabled.

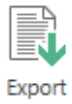
Figure 5-68: Information about new events



To read the new events, activate **Auto refresh** or click **refresh once**.

Export events

Figure 5-69: Export events

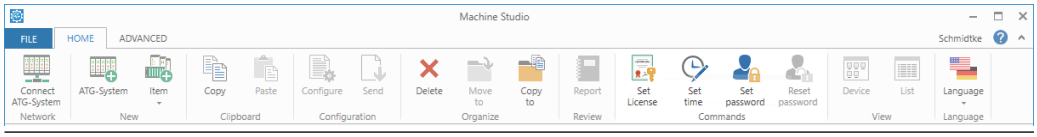


Click **Export events** to save all events stored on the micro SD card as a *.csv file to a selectable location.

5.7 ATG-System commands

Several online commands are available if an ATG system with data collection is selected in the device tree (see Figure 5-70).

Figure 5-70: ATG-System commands



5.7.1 Set License

Click Set License to open the licensing dialog. See License entry for details.

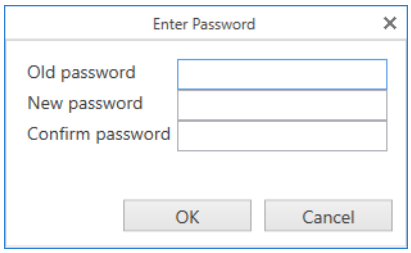
5.7.2 Set time

Click **Set time** to synchronize the A6500-CC card with the UTC time (Coordinated Universal Time) of the connected PC.

5.7.3 Set password

Click **Set password** to define a password to protect the rack configuration. The input window for entering a password opens (see Figure 5-71).

Figure 5-71: 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 rack.

Once a password has been defined, it must be entered before sending a configuration.

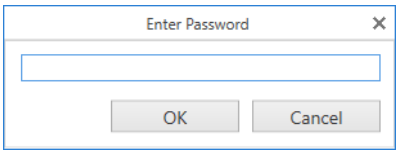
The entered password stays active until the next disconnect. After reconnecting, the password must be entered again before sending a configuration.

The password protects the system against unauthorized configuration changes through the TCP/IP communication.

5.7.4 Reset password

Click **Reset password** to open the dialog for resetting the password of the rack (see Figure 5-72).

Figure 5-72: Dialog for resetting a password



Enter the password, and click **OK**.

If the rack is connected through the USB interface, the password can be reset without entering the existing password. Password reset through the TCP connection always requires entering the existing password.

5.8 Send and reload a configuration

5.8.1 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.

Prerequisites

Ensure that there is an online connection between the Com Card and the Machine Studio software running on a PC or laptop.

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 system's A6500-CC Com Card.

Procedure

1. Click **Connect ATG** on the ribbon command bar of **Home** to establish a connection at TCP/IP connection.
2. Click **Send & close** in the ribbon command bar to send the configuration to the card. The configuration editor automatically closes after the sending process.
   A successfully sent configuration will be 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 A6500-CC Com Card is ready to use when the "Ok" LED on the card front shows a steady green light.

5.8.2 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 Machine Studio. Click **Reload** in the ribbon command bar if the card's configuration must be loaded again.

5.9 Online view

There is an online view for each service and the collected data. Click a service or **Collection Data** in the device tree to open the associated online view.

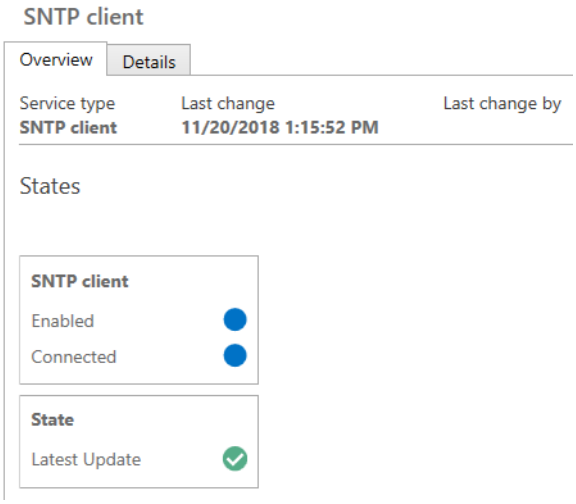
5.9.1 SNTP client

Overview and **Details** provide information about the state of the SNTP client.

Overview

Overview provides basic information about the SNTP client and time updates.

Figure 5-73: SNTP client – Overview



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.

Connected The connection state to the configured SNTP server is indicated by a colored circle. An established connection is indicated with a solid blue circle. Otherwise, the circle is gray.

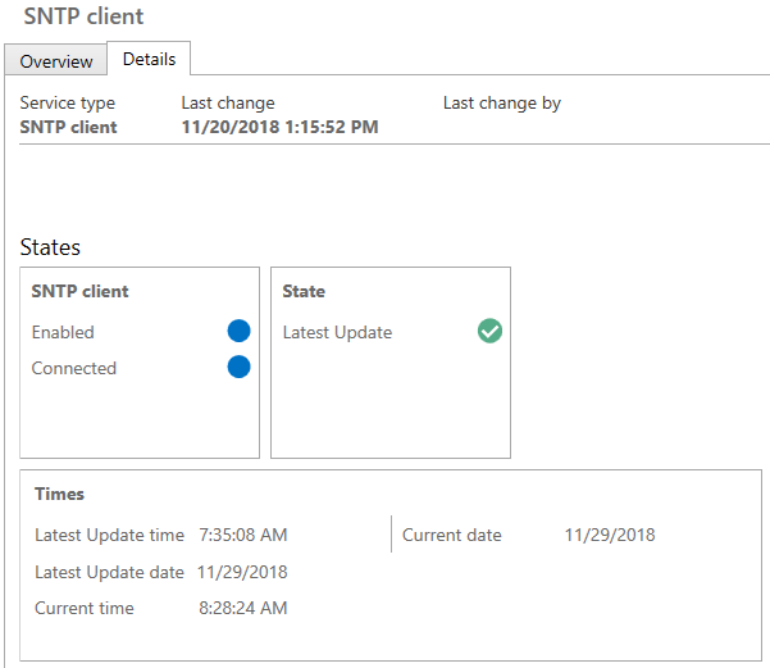
State

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.

Details

Details provides further information on the SNTP client.

Figure 5-74: SNTP client – Details



SNTP client and **State** are described in Overview.

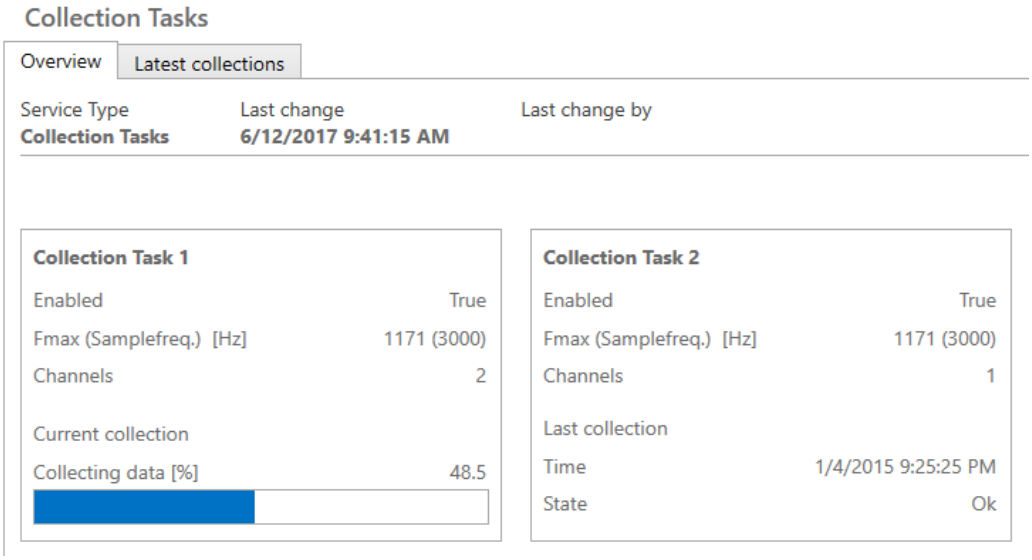
Times	
Latest Update time	Time of the last successful SNTP client update.
Latest Update date	Date of the last successful SNTP client update.
Current time	Current time of the SNTP client.
Current date	Current date of the SNTP client.

5.9.2 Collection Tasks

Overview

Figure 5-75 shows an overview of the configured collection tasks.

Figure 5-75: Collection Tasks - Overview



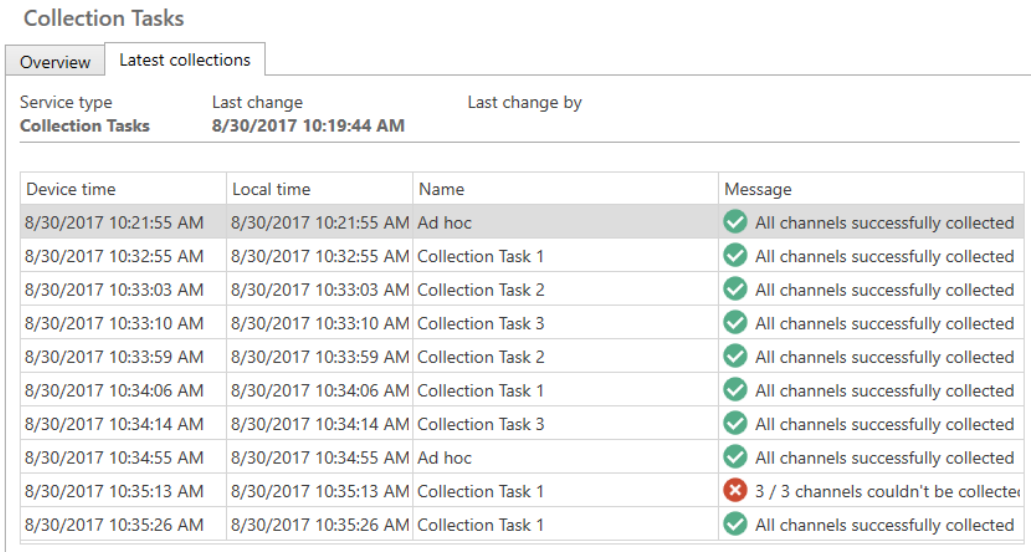
Overview contains a section with the following information for each configured collection task.

Enabled	Indicates whether the data collection of the task is activated or not.
Fmax (Samplefreq.) [Hz]	Displays the maximum signal frequency that can be grabbed and the sample frequency in parenthesis.
Channels	Displays the number of channels grabbed 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 5-76 displays information about the last ten collections.

Figure 5-76: Collection Tasks - Latest collections

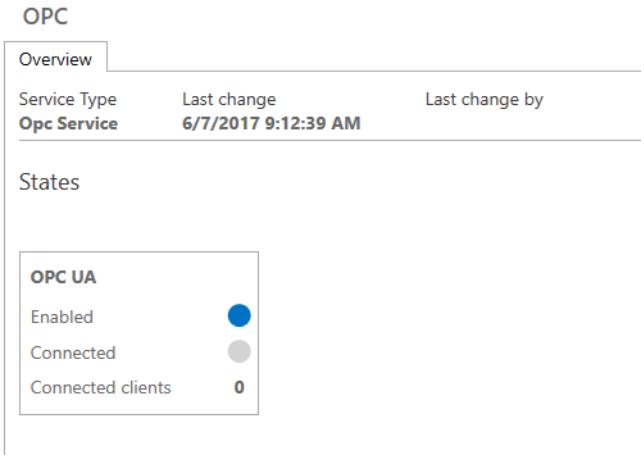


Device time	Local time	Name	Message
8/30/2017 10:21:55 AM	8/30/2017 10:21:55 AM	Ad hoc	All channels successfully collected
8/30/2017 10:32:55 AM	8/30/2017 10:32:55 AM	Collection Task 1	All channels successfully collected
8/30/2017 10:33:03 AM	8/30/2017 10:33:03 AM	Collection Task 2	All channels successfully collected
8/30/2017 10:33:10 AM	8/30/2017 10:33:10 AM	Collection Task 3	All channels successfully collected
8/30/2017 10:33:59 AM	8/30/2017 10:33:59 AM	Collection Task 2	All channels successfully collected
8/30/2017 10:34:06 AM	8/30/2017 10:34:06 AM	Collection Task 1	All channels successfully collected
8/30/2017 10:34:14 AM	8/30/2017 10:34:14 AM	Collection Task 3	All channels successfully collected
8/30/2017 10:34:55 AM	8/30/2017 10:34:55 AM	Ad hoc	All channels successfully collected
8/30/2017 10:35:13 AM	8/30/2017 10:35:13 AM	Collection Task 1	3 / 3 channels couldn't be collecte
8/30/2017 10:35:26 AM	8/30/2017 10:35:26 AM	Collection Task 1	All channels successfully collected

5.9.3 OPC

Overview displays the state of the OPC UA interface connection. See Figure 5-77.

Figure 5-77: OPC UA - Overview

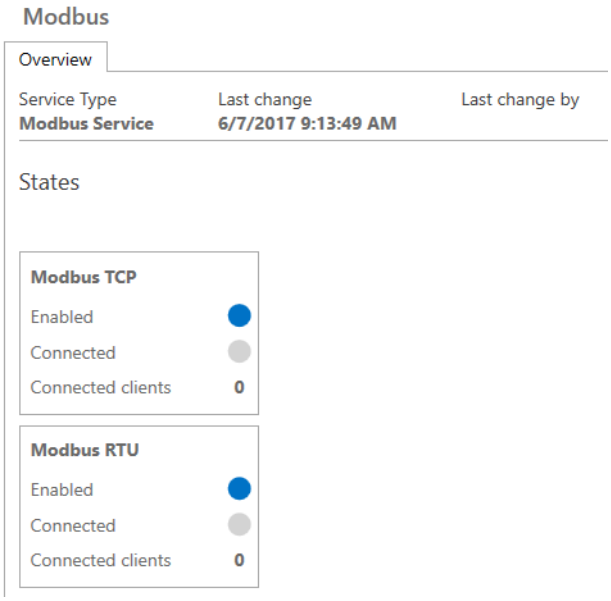


Enabled	The state of the interface is indicated by a colored circle. A solid blue circle indicates an enabled interface. The circle is gray if the interface is disabled.
Connected	Indicates a connection to the OPC UA interface by a colored circle. An established connection is indicated with a solid blue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

5.9.4 Modbus

Overview displays the state of the Modbus TCP and Modbus RTU interface connection. See Figure 5-78.

Figure 5-78: Modbus - Overview



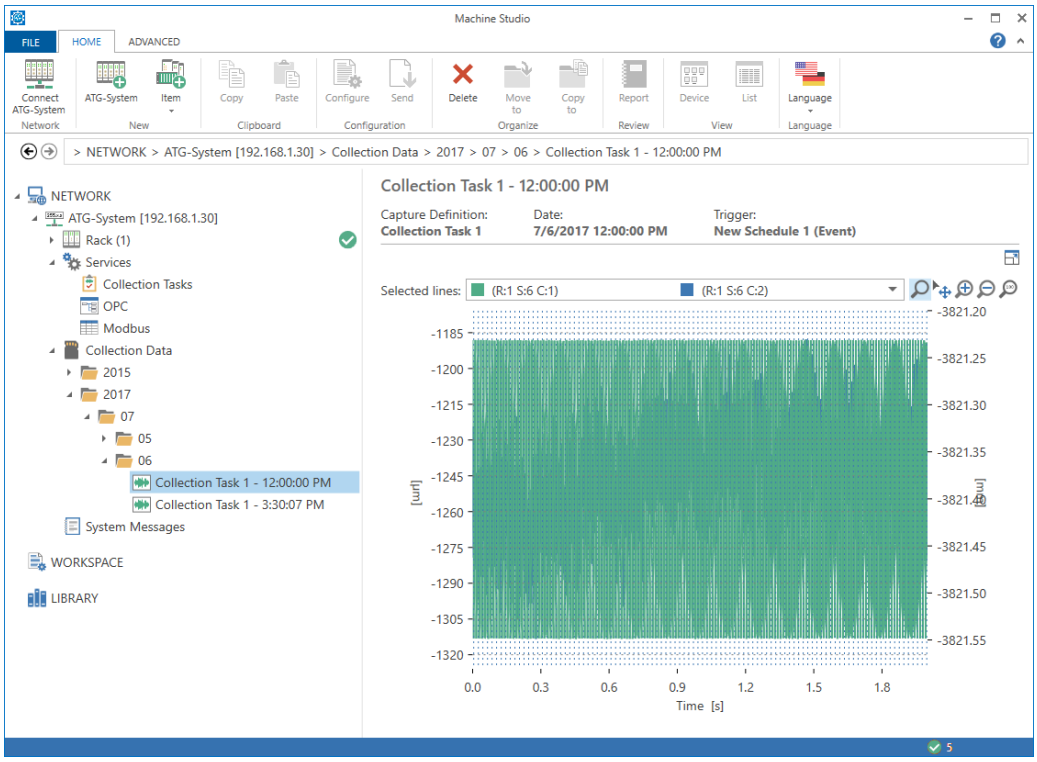
There is one display object for the Modbus TCP interface and one for the Modbus RTU interface. The objects contain the following information:

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.

5.9.5 Collection data

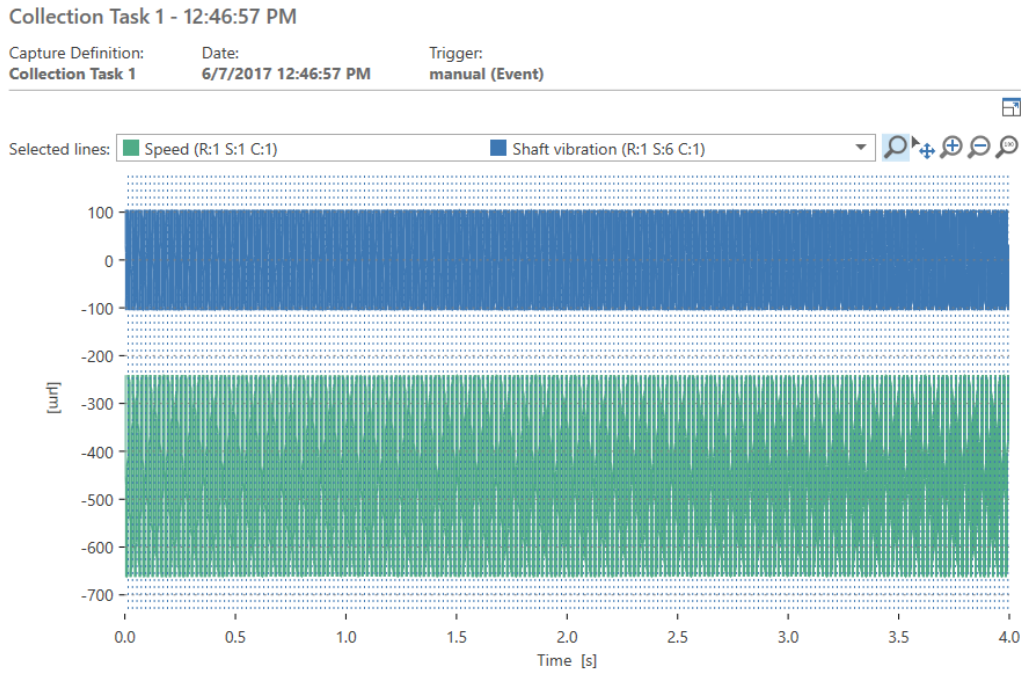
Browse through the data files on the micro SD card, and select one to display the collected data (see Collection Data (micro SD Card)).

Figure 5-79: Selected data file



By default, the online view displays two lines of the collected data (see Figure 5-80). More lines can be added, if contained in the data file (see Figure 5-82).

Figure 5-80: 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 5-81: 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 5-82). Use the list field to assign an available data line to a color. There are two parameters to change the properties of a line:

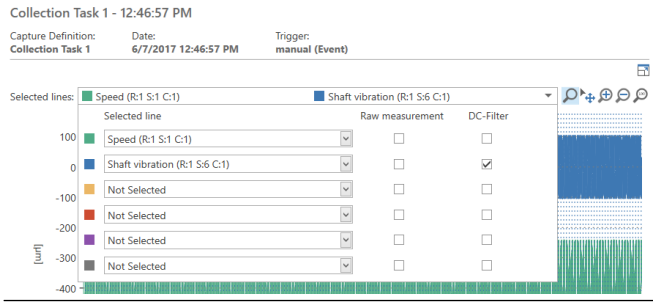
- **Raw measurement**

  Place a checkmark in 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**

  Place a checkmark in 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 5-82: Line selection



Click outside of the dialog to close it.

Region zoom

Enlarge an interesting part of the data grab. 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 grab 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 grab 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 grab 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 grab view. At every click, the grab view is enlarged.

Click **zoom to fit**, or right-click to reset the view.

Zoom out

Stepwise reduce the grab 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 grab view. At every click, the grab view is reduced.

Click **zoom to fit**, or right-click on the diagram to reset the view.

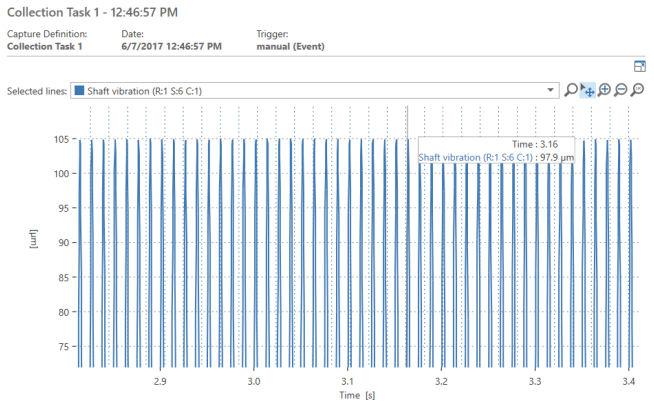
Zoom to fit

Click the **zoom to fit** icon to reset the view.

Cursor

Use the cursor to display single values of the selected lines (see Figure 5-83).

Figure 5-83: 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

5.10 Technical data - data collection

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	
Micro SD 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 grab on micro SD card**
96000	37500	10

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

6 Firmware and maintenance

⚠ CAUTION

Any work at the system may impair machine protection.

Machine studio has a functions for updating and downgrading the firmware of AMS 6500 ATG cards. You can update the firmware of all cards within an AMS 6500 ATG system at once. An AMS 6500 ATG system can consists 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.

For the firmware update of the EZ 1000 converter see the EZ 1000 operating manual.

Note
Emerson recommends to save the configuration of the cards before starting the update process. See Save as.

Follow this procedure to connect the ATG system and to open the maintenance mode of Machine Studio. See System update for updating the firmware.

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.

Appropriate firmware files for a card downgrade are already integrated in Machine Studio.

Emerson recommends to disconnect all clients used for data exchange such as OPC UA clients before updating or downgrading the firmware.

Procedure

1. Start Machine Studio.
2. Connect the AMS 6500 ATG system through the Ethernet interface to the PC.
   Click **Connect ATG-System** to establish the connection to the ATG system (see New network connection).
3. Go to the **Advanced** tab. See Program overview.
4. Press **Ctrl+Alt+M** to enable the maintenance mode.
   The buttons **System Inventory**, **Update firmware (all)**, **Downgrade firmware**, **Erase eprom**, and **Export maintenance system info** appear.

   Continue with System update to update the firmware of a whole ATG system. To downgrade a single card continue with Firmware downgrade.

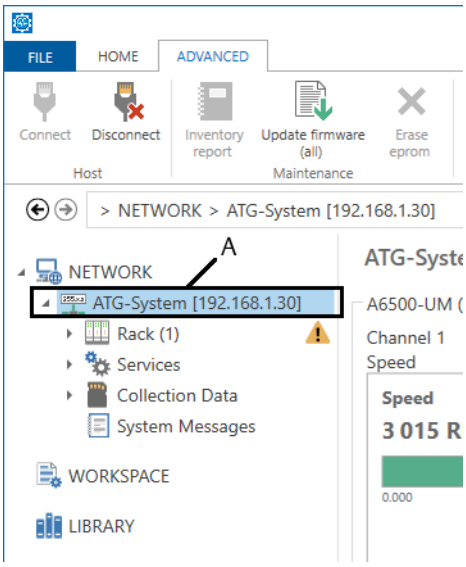
6.1 System update

Use this procedure to update the firmware of all cards within an AMS 6500 ATG system at once or to upgrade an AMS 6500 ATG system to an AMS 6500 ATG system with data collection capability.

Procedure

1. Select the system to be updated from the device tree.
   - Click **ATG-System** in the device tree, if the firmware of an AMS 6500 ATG with data collection capability must be updated. See Figure 6-1.

Figure 6-1: Select an ATG system with data collection capability

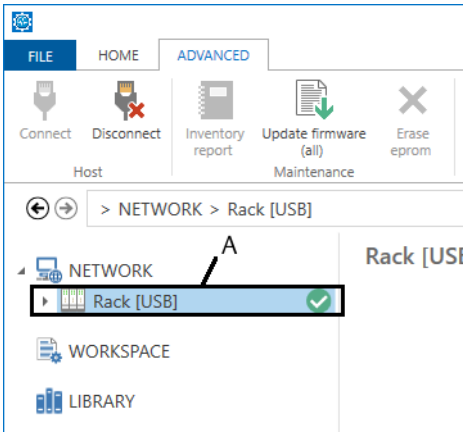


A. Selected ATG system rack.

   - Click **Rack** in the device tree, if the firmware of an AMS 6500 ATG without data collection capability must be updated. See Figure 6-2.

Note
See AMS 6500 ATG Upgrade Guide for details.

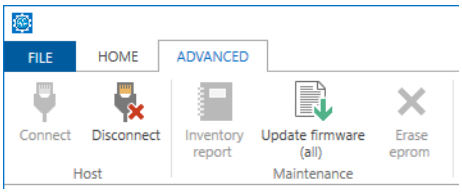
Figure 6-2: Select an ATG system without data collection capability



A. Selected ATG system rack.

The button **Update firmware (all)** is activated (colored).

Figure 6-3: Update firmware (all)

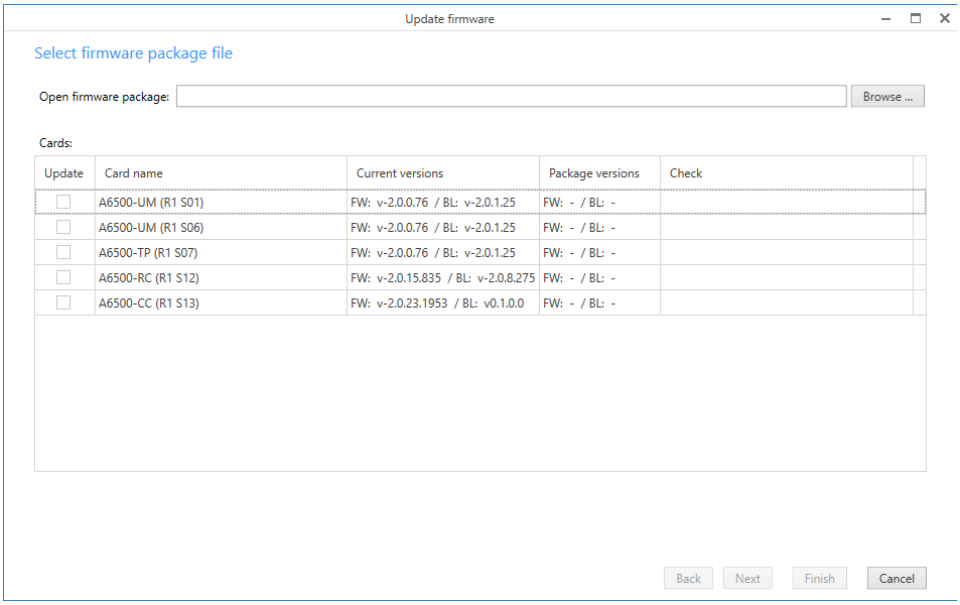


2. Click **Update firmware (all)**. The function checks the prerequisites for the update. If all prerequisites are fulfilled, the update dialog opens (see Figure 6-4).

   Prerequisites for the update:

   - System is connected through the Ethernet interface.
   - System is connected through the active Com Card. See overview of the Com Card for card state (**A6500-CC → Overview → RedundancyActive card**)
   - Configuration of all cards are valid.

Figure 6-4: Update dialog



3. 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.

Note
There are three firmware files for upgrading an AMS 6500 ATG system (firmware version up to 1.x) to an AMS 6500 ATG system with data collection capability (firmware version ≥ 2.x). For identification, the files are numbered. Install the upgrade files one after another.

4. 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.

5. 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 or disconnect the system rack 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 cards list to open the details.

6. Click **Finish** to close the update dialog.

Postrequisites

Finally, check the configuration of the updated cards. If necessary load the configuration saved beforehand to the cards (see File).

6.2 Firmware downgrade

⚠ CAUTION

Any work on the system may impair machine protection.

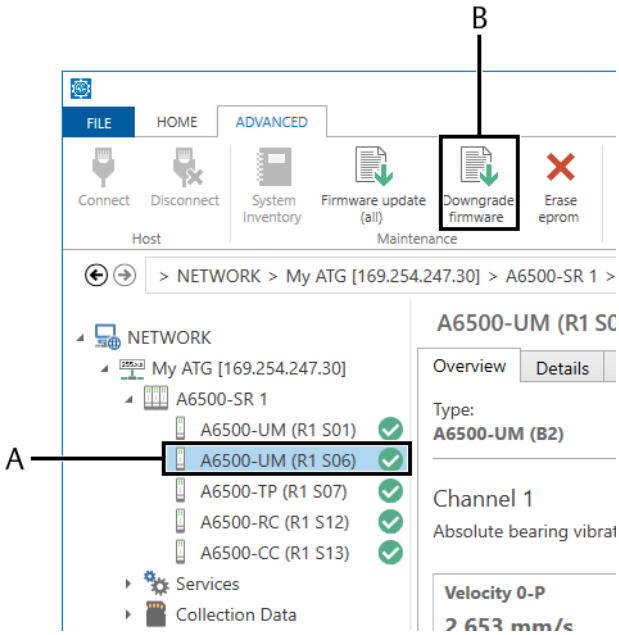
Use this procedure to downgrade the firmware of the selected card to an older firmware version or to a SIL certified firmware version. The following cards of the AMS 6500 ATG can be downgraded:

- A6500-UM
- A6500-TP
- A6500-RC
- A6500-CC

Procedure

1. Select the card to be downgraded from the device tree.

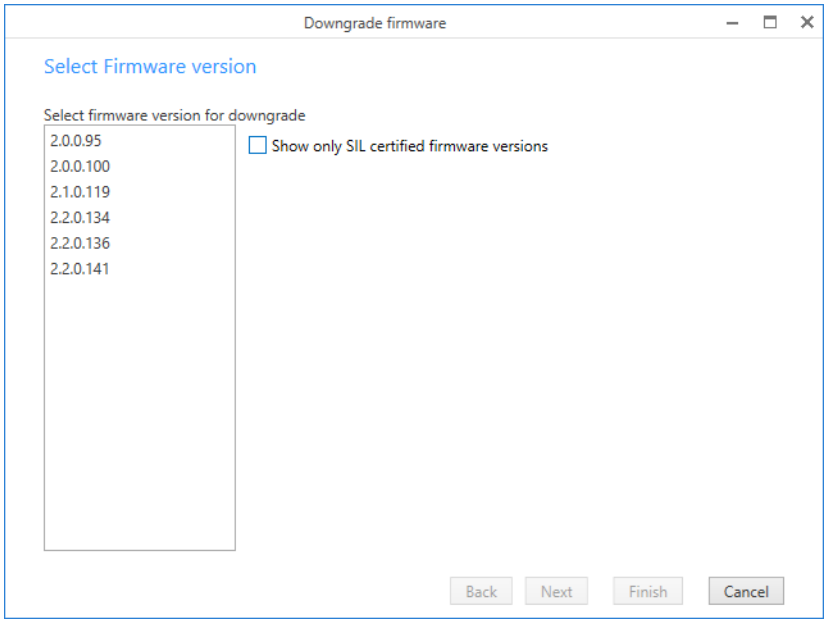
Figure 6-5: Select the card to be downgraded



A. Selected card
B. Downgrade button

2. Click **Downgrade firmware** to open the downgrade dialog.

Figure 6-6: Downgrade dialog



3. Select the firmware file to be installed on the card from the list.

Place a checkmark in the **Show only SIL certified firmware versions** box to list only SIL certified firmware versions.

4. Click **Next** to start the downgrade.

⚠ CAUTION

Do not remove the card form the system rack or disconnect the system rack during the downgrade process.

5. Click **Next** to finish the downgrade process.
6. Click **Finish** to close the downgrade dialog.
7. Erase the remaining configuration from the card as described in Erase eprom.
8. Create a new configuration for the cards.

6.3 Erase eprom

Use this command to erase the complete configuration from the card. The firmware is not affected by this command.

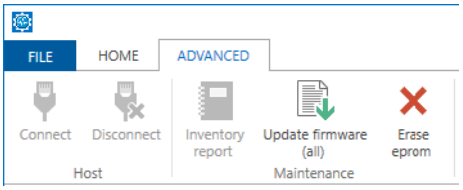
Prerequisites

Establish a connection between the ATG system and Machine Studio, and activate the maintenance mode. See Firmware and maintenance.

Procedure

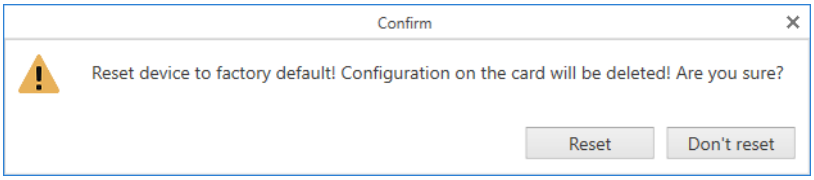
1. Select a card from the device tree.
   The button **Erase eprom** is activated (colored). See Figure 6-7.

Figure 6-7: Erase eprom



2. Click **Erase eprom**, and confirm the safety request (see Figure 6-8) to start the process.

Figure 6-8: Erase eprom – Safety request



A window displaying the progress opens.

The successful erasing of the eprom is indicated by flashing of the OK LED (A6500-UM: alternated flashing of the OK LEDs).

3. Create a new configuration for the card.

6.4 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
- Operation time
- Up time
- Highest temperature, measured by the card internal temperature sensor.

Note
Before contacting the technical support, create an inventory report to help ease troubleshooting.

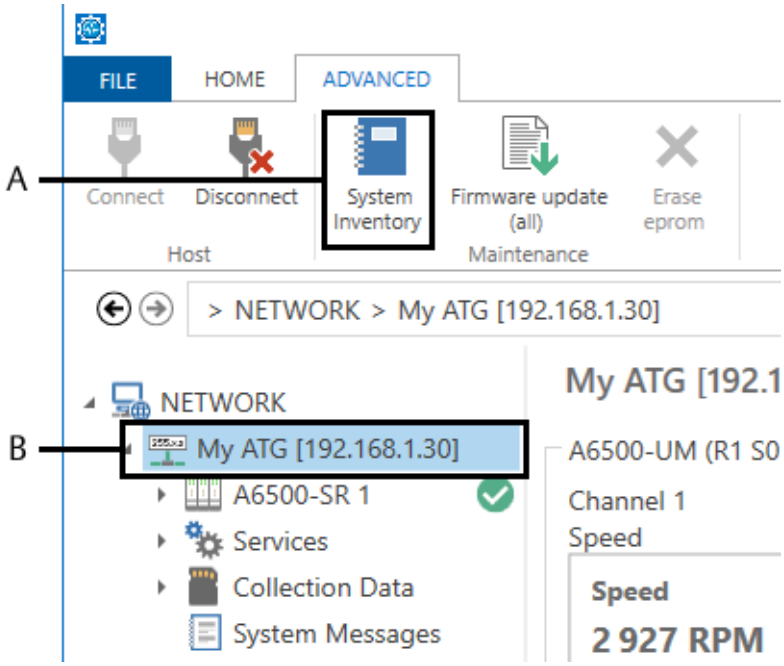
Prerequisites

Establish a connection between the ATG system, you want to generate the inventory report for, and Machine Studio. Activate the maintenance mode (see Firmware and maintenance).

Procedure

1. Select the ATG system from the device tree.
   The button **System Inventory** is activated (colored).

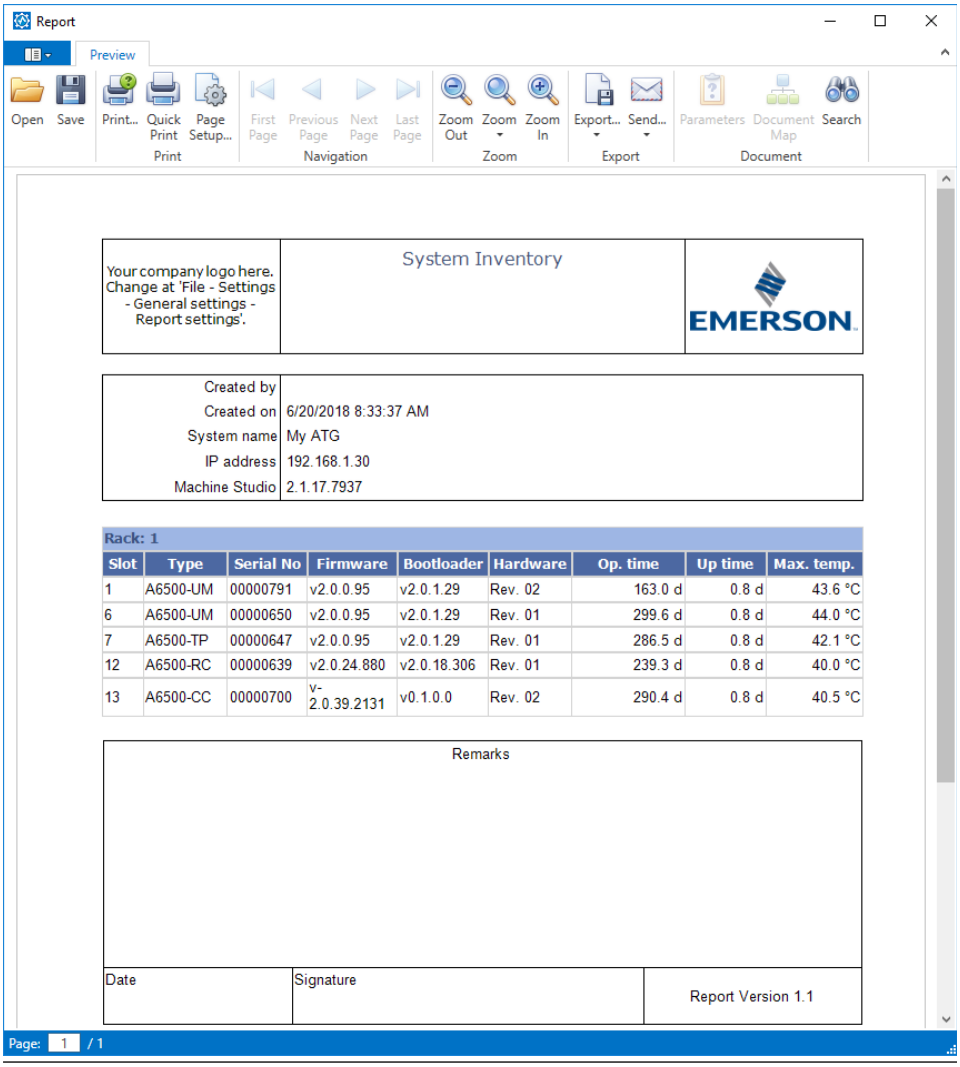
Figure 6-9: Selected system for the inventory report



*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 6-10: System inventory report



3. Use the control elements of the report viewer to print, export, or store the report.

6.5 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.

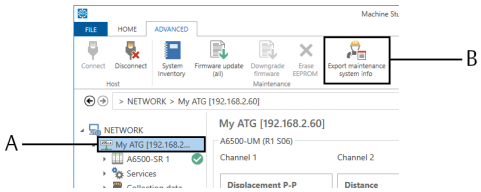
Prerequisites

Establish an Ethernet or USB connection between the ATG system, you want to generate the file for, and Machine Studio. 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 6-11: 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 Machine Studio.

Procedure

1. Contact technical support to check the firmware version of the suspicious card and the version of Machine Studio in use.

   Always use the latest version of firmware and Machine Studio.
2. Update 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 Machine Studio for the firmware update.
4. Use the updated version of 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
Firmware and maintenance
System update
Firmware downgrade
Erase eprom
System inventory
Export maintenance system info

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 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 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 A6500-CC Com Card manual for details.
Subnet Mask	Example: 255.255.248.0 See A6500-CC Com 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.

Table B-2: Interface details Modbus RTU

Parameter	Detail
Baud rate	Example: 19200 baud see Modbus RTU
Data bits	8

Table B-2: Interface details Modbus RTU *(continued)*

Parameter	Detail
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 Com Cards are used, define a unique address for each Com 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).

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 removed from the system, 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 Assigned registers.
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	
	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.

Table B-6: Register partition

Group		Card	Number of reserved registers	Table
General		A6500-UM A6500-TP A6500-RC A6500-CC	30	Table B-7
A6500-UM	Inputs / Outputs	A6500-UM	30	Table B-8
A6500-TP		A6500-TP	30	Table B-9
A6500-RC		A6500-RC	50	Table B-10
A6500-CC		A6500-CC	50	Table B-11
Speed	Measurement	A6500-UM	90	Table B-12
Combined channels – dynamic			40	Table B-13
Combined channels – static			50	Table B-14
Combined channels – cylinder pressure			53	Table B-15
Single channel – dynamic			20	Table B-16
Single channel – static			20	Table B-17
Single channel – eccentricity			20	Table B-18
Single channel – cylinder pressure			33	Structure of group "Single channel – Cylinder pressure – Measurement"
Order analysis			100	Table B-20
Band analysis and Energy in and analysis			100	Table B-21

Table B-6: Register partition *(continued)*

Group		Card	Number of reserved registers	Table
PeakVue			100	Table B-22
Not 1st order Analysis			15	Table B-23
Temperature Process		A6500-TP	240	Table B-24

Structure of the group "General"

The 30 registers of the group "General" are occupied as shown in Table B-7.

Table B-7: Structure of group "General"

Register	Length (number of registers)	Type	Name	Description
0	1	16 Bit Integer (unsigned)	Card type	0x40 : A6500-CC 0x41 : A6500-RC 0x42 : A6500-UM 0x43 : A6500-TP
1	1	16 Bit Integer (unsigned)	Rack	Number of rack where the card is installed: 1 2
2	1	16 Bit Integer (unsigned)	Slot	Number of the slot where the card is installed: 1 to 14
3	1	16 Bit Integer (unsigned)	Online state	0: Offline 1: Online
4	1	16 Bit Integer (unsigned)	Card state	State of the card: 0: OK Low byte ≠ 0: warning High byte ≠ 0: danger
5	2	Float	Card temperature	Current temperature of the card, measured by the internal sensor.
7	1	16 Bit Integer (unsigned)	Number of configurations	Number of configuration of the card
8	11	String [22]	Serial number	Serial number of the card.
19	1	16 Bit Integer (singed)	Major	First part of the firmware version **X**.x.x.xxx

Table B-7: Structure of group "General" *(continued)*

Register	Length (number of registers)	Type	Name	Description
20	1	16 Bit Integer (unsigned)	Minor	Second part of the firmware version x.**X**.x.xxx
21	1	16 Bit Integer (unsigned)	Patch	Third part of the firmware version x.x.**X**.xxx
22	1	16 Bit Integer (unsigned)	Revision	Fourth part of the firmware version x.x.x.**XXX**
23	1	16 Bit Integer (unsigned)	Year	Real time clock
24	1	16 Bit Integer (unsigned)	Month	Real time clock
25	1	16 Bit Integer (unsigned)	Day	Real time clock
26	1	16 Bit Integer (unsigned)	Hour	Real time clock
27	1	16 Bit Integer (unsigned)	Minute	Real time clock
28	1	16 Bit Integer (unsigned)	Second	Real time clock
29	1		not used	Reserve
30	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-8.

Table B-8: Structure of group "A6500-UM Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	1	16 Bit Integer (unsigned)	Application main group CH1	Main group of the selected application: 0: Disabled 1: Dynamic measurement 2: Static measurement 3: Eccentricity 4: Cylinder pressure 5: Rod position 100: Combined channels: Speed [1] 101: Combined channels: Dynamic [1] 102: Combined channels: Static[1] 103: Combined channels: Cylinder pressure[1] 104: Combined channels: Rod position[1]
1	1	16 Bit Integer (unsigned)	Application main group CH2	Main group of the selected application: 0: Disabled 1: Dynamic measurement 2: Static measurement 3: Eccentricity 4: Cylinder pressure
2	1	16 Bit Integer (unsigned)	Analysis type CH1	Selected analysis type: 0: Disabled 1: Order analysis 2: Band analysis 3: PeakVue
3	1	16 Bit Integer (unsigned)	Analysis type CH2	Selected analysis type: 0: Disabled 1: Order analysis 2: Band analysis 3: PeakVue
4	2	Float	Current out1 value	Current value of the current output 1. Unit: mA Range: 0 to 20 mA or 4 to 20 mA

Table B-8: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
6	2	Float	Current out2 value	Current value of the current output 2. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
8	1	Bool, Bit 0	Digital out 1	State of the digital output 1 ≠0: active 0: not active
		Bool, Bit 1	Digital out 2	State of the digital output 2 ≠0: active 0: not active
		Bool, Bit 2	Digital out 3	State of the digital output 3 ≠0: active 0: not active
		Bool, Bit 3	Digital out 4	State of the digital output 4 ≠0: active 0: not active
		Bool, Bit 4	Digital out 5	State of the digital output 5 ≠0: active 0: not active
		Bool, Bit 5	Digital out 6	State of the digital output 6 ≠0: active 0: not active
9	1	Bool, Bit 0	Digital in 1	State of the digital input 1 0: low [2] 1: high [3]
		Bool, Bit 1	Digital in 2	State of the digital input 2 0: low[2] 1: high[3]
		Bool, Bit 2	Digital in 3	State of the digital input 3 0: low[2] 1: high[3]
		Bool, Bit 3	Digital in 4	State of the digital input 4 0: low[2] 1: high[3]
		Bool, Bit 4	Digital in 5	State of the digital input 5 0: low[2] 1: high[3]

Table B-8: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
10	1	16 Bit Integer (unsigned)	Digital in 1 - mode	Mode of the digital input 1 0: key signal 1: digital in
11	1	16 Bit Integer (unsigned)	Digital in 2 - mode	Mode of the digital input 2 0: key signal 1: digital in
12	2	Float	Sample frequency CH1	Sample frequency of channel 1 Unit: Hz
14	2	Float	Sample frequency CH2	Sample frequency of channel 2 Unit: Hz
16	1	Bool, Bit 0	Bypass DO 1-2	State of the bypass digital outputs 1 and 2 ≠0: active 0: not active
		Bool, Bit 1	Bypass DO 4-5	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)	Configuration version – Major	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)	Configuration version – Minor	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)	Configuration version – Build	Machine Studio version used to configure the card – Build part of the version number x.xx.**XX** Revision xxxx
21	1	16 Bit Integer (unsigned)	Configuration version – Revision	Machine Studio version used to configure the card – Revision part of the version number x.xx.xx Revision **XXXX**

Table B-8: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
22	1	Bool, Bit 0	Simulation CH1	State of the channel 1 simulation ≠0: active 0: not active
		Bool, Bit 1	Simulation CH2	State of the channel 2 simulation ≠0: active 0: not active
		Bool, Bit 2	Simulation Combined	State of the combined channel simulation ≠0: active 0: not active
		Bool, Bit 3	Simulation Combined Value 2	State of the Max evaluation of application Tandem/Cone – Min/Max ≠0: active 0: not active
		Bool, Bit 4	Simulation CH1 Value 2	State of the second channel 1 simulation[4] ≠0: active 0: not active
		Bool, Bit 5	Simulation CH2 Value 2	State of the second channel 2 simulation[5] ≠0: active 0: not active
23	1	Bool, Bit 0	Simulation DI1	State of the digital input 1 simulation ≠0: active 0: not active
		Bool, Bit 1	Simulation DI2	State of the digital input 2 simulation ≠0: active 0: not active
		Bool, Bit 2	Simulation DI3	State of the digital input 3 simulation ≠0: active 0: not active
		Bool, Bit 3	Simulation DI4	State of the digital input 4 simulation ≠0: active 0: not active

Table B-8: Structure of group "A6500-UM Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 4	Simulation DI5	State of the digital input 5 simulation ≠0: active 0: not active
24	1	Bool, Bit 0	Simulation Operation Mode	State of the operation mode simulation ≠0: active 0: not active
25	1	16 Bit Integer (unsigned)	Current Operation Mode	Currently active operation mode: 0: none 1 to 4: Operation mode 1-4
26	1	Bool, Bit 0	Limit Multiplier State	State of the limit multiplier ≠0: active 0: not active
27 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-9.

Table B-9: Structure of group "A6500-TP Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Current out1 value	Current value of the current output 1. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
2	2	Float	Current out2 value	Current value of the current output 2. Unit: mA Range: 0 to 20 mA or 4 to 20 mA

Table B-9: Structure of group "A6500-TP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
4	2	Float	Current out3 value	Current value of the current output 3. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
6	2	Float	Current out4 value	Current value of the current output 4. Unit: mA Range: 0 to 20 mA or 4 to 20 mA
8	1	Bool, Bit 0	Digital out 1	State of the digital output 1 ≠0: active 0: not active
		Bool, Bit 1	Digital out 2	State of the digital output 2 ≠0: active 0: not active
		Bool, Bit 2	Digital out 3	State of the digital output 3 ≠0: active 0: not active
		Bool, Bit 3	Digital out 4	State of the digital output 4 ≠0: active 0: not active
		Bool, Bit 4	Digital out 5	State of the digital output 5 ≠0: active 0: not active
		Bool, Bit 5	Digital out 6	State of the digital output 6 ≠0: active 0: not active
9	1	Bool, Bit 0	Digital in 1	State of the digital input 1 0: low [1] 1: high[2]
		Bool, Bit 1	Digital in 2	State of the digital input 2 0: low[1] 1: high[2]
10	1	Bool, Bit 0	Bypass CH 1a	State of the bypass channel 1a ≠0: active 0: not active

Table B-9: Structure of group "A6500-TP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	Bypass CH 1b	State of the bypass channel 1b ≠0: active 0: not active
		Bool, Bit 2	Bypass CH 2a	State of the bypass channel 2a ≠0: active 0: not active
		Bool, Bit 3	Bypass CH 2b	State of the bypass channel 2b ≠0: active 0: not active
		Bool, Bit 4	Bypass CH 3a	State of the bypass channel 3a ≠0: active 0: not active
		Bool, Bit 5	Bypass CH 3b	State of the bypass channel 3b ≠0: active 0: not active
		Bool, Bit 6	Bypass CH 4a	State of the bypass channel 4a ≠0: active 0: not active
		Bool, Bit 7	Bypass CH 4b	State of the bypass channel 4b ≠0: active 0: not active
11	1		not used	Reserve
12	1	16 Bit Integer (unsigned)	Configuration version – Major	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)	Configuration version – Minor	Machine Studio version used to configure the card – Minor part of the version number x.**XX**.xx Revision xxxx

Table B-9: Structure of group "A6500-TP Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
14	1	16 Bit Integer (unsigned)	Configuration version – Build	Machine Studio version used to configure the card – Build part of the version number x.xx.**XX** Revision xxxx
15	1	16 Bit Integer (unsigned)	Configuration version – Revision	Machine Studio version used to configure the card – Revision 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-10.

Table B-10: Structure of group "A6500-RC Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	DI1	State of digital input 1 ≠0: active 0: not active
		Bool, Bit 1	DI2	State of digital input 2 ≠0: active 0: not active
		Bool, Bit 2	DI3	State of digital input 3 ≠0: active 0: not active
		Bool, Bit 3	DI4	State of digital input 4 ≠0: active 0: not active
		Bool, Bit 4	DI5	State of digital input 5 ≠0: active 0: not active
		Bool, Bit 5	DI6	State of digital input 6 ≠0: active 0: not active
		Bool, Bit 6	DI7	State of digital input 7 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 7	DI8	State of digital input 8 ≠0: active 0: not active
		Bool, Bit 8	DI9	State of digital input 9 ≠0: active 0: not active
		Bool, Bit 9	DI10	State of digital input 10 ≠0: active 0: not active
		Bool, Bit 10	DI11	State of digital input 11 ≠0: active 0: not active
		Bool, Bit 11	DI12	State of digital input 12 ≠0: active 0: not active
		Bool, Bit 12	DI13	State of digital input 13 ≠0: active 0: not active
		Bool, Bit 13	DI14	State of digital input 14 ≠0: active 0: not active
		Bool, Bit 14	DI15	State of digital input 15 ≠0: active 0: not active
		Bool, Bit 15	DI16	State of digital input 16 ≠0: active 0: not active
1	1	Bool, Bit 0	DI17	State of digital input 17 ≠0: active 0: not active
		Bool, Bit 1	DI18	State of digital input 18 ≠0: active 0: not active
		Bool, Bit 2	DI19	State of digital input 19 ≠0: active 0: not active
		Bool, Bit 3	DI20	State of digital input 20 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 4	DI21	State of digital input 21 ≠0: active 0: not active
		Bool, Bit 5	DI22	State of digital input 22 ≠0: active 0: not active
		Bool, Bit 6	DI23	State of digital input 23 ≠0: active 0: not active
		Bool, Bit 7	DI24	State of digital input 24 ≠0: active 0: not active
		Bool, Bit 8	DI25	State of digital input 25 ≠0: active 0: not active
		Bool, Bit 9	DI26	State of digital input 26 ≠0: active 0: not active
		Bool, Bit 10	DI27	State of digital input 27 ≠0: active 0: not active
		Bool, Bit 11	DI28	State of digital input 28 ≠0: active 0: not active
		Bool, Bit 12	DI29	State of digital input 29 ≠0: active 0: not active
		Bool, Bit 13	DI30	State of digital input 30 ≠0: active 0: not active
		Bool, Bit 14	DI31	State of digital input 31 ≠0: active 0: not active
		Bool, Bit 15	DI32	State of digital input 32 ≠0: active 0: not active
2	1	Bool, Bit 0	DI33	State of digital input 33 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	DI34	State of digital input 34 ≠0: active 0: not active
		Bool, Bit 2	DI35	State of digital input 35 ≠0: active 0: not active
		Bool, Bit 3	DI36	State of digital input 36 ≠0: active 0: not active
		Bool, Bit 4	DI37	State of digital input 37 ≠0: active 0: not active
		Bool, Bit 5	DI38	State of digital input 38 ≠0: active 0: not active
		Bool, Bit 6	DI39	State of digital input 39 ≠0: active 0: not active
		Bool, Bit 7	DI40	State of digital input 40 ≠0: active 0: not active
		Bool, Bit 8	DI41	State of digital input 41 ≠0: active 0: not active
		Bool, Bit 9	DI42	State of digital input 42 ≠0: active 0: not active
		Bool, Bit 10	DI43	State of digital input 43 ≠0: active 0: not active
		Bool, Bit 11	DI44	State of digital input 44 ≠0: active 0: not active
		Bool, Bit 12	DI45	State of digital input 45 ≠0: active 0: not active
		Bool, Bit 13	DI46	State of digital input 46 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 14	DI47	State of digital input 47 ≠0: active 0: not active
		Bool, Bit 15	DI48	State of digital input 48 ≠0: active 0: not active
3	1	Bool, Bit 0	DI49	State of digital input 49 ≠0: active 0: not active
		Bool, Bit 1	DI50	State of digital input 50 ≠0: active 0: not active
		Bool, Bit 2	DI51	State of digital input 51 ≠0: active 0: not active
		Bool, Bit 3	DI52	State of digital input 52 ≠0: active 0: not active
		Bool, Bit 4	DI53	State of digital input 53 ≠0: active 0: not active
		Bool, Bit 5	DI54	State of digital input 54 ≠0: active 0: not active
		Bool, Bit 6	DI55	State of digital input 55 ≠0: active 0: not active
		Bool, Bit 7	DI56	State of digital input 56 ≠0: active 0: not active
		Bool, Bit 8	DI57	State of digital input 57 ≠0: active 0: not active
		Bool, Bit 9	DI58	State of digital input 58 ≠0: active 0: not active
		Bool, Bit 10	DI59	State of digital input 59 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 11	DI60	State of digital input 60 ≠0: active 0: not active
		Bool, Bit 12	DI61	State of digital input 61 ≠0: active 0: not active
		Bool, Bit 13	DI62	State of digital input 62 ≠0: active 0: not active
		Bool, Bit 14	DI63	State of digital input 63 ≠0: active 0: not active
		Bool, Bit 15	DI64	State of digital input 64 ≠0: active 0: not active
4	1	Bool, Bit 0	DI65	State of digital input 65 ≠0: active 0: not active
		Bool, Bit 1	DI66	State of digital input 66 ≠0: active 0: not active
5	1	Bool, Bit 0	DO1	State of digital output (relay) 1 ≠0: active 0: not active
		Bool, Bit 1	DO2	State of digital output (relay) 2 ≠0: active 0: not active
		Bool, Bit 2	DO3	State of digital output (relay) 3 ≠0: active 0: not active
		Bool, Bit 3	DO4	State of digital output (relay) 4 ≠0: active 0: not active
		Bool, Bit 4	DO5	State of digital output (relay) 5 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 5	DO6	State of digital output (relay) 6 ≠0: active 0: not active
		Bool, Bit 6	DO7	State of digital output (relay) 7 ≠0: active 0: not active
		Bool, Bit 7	DO8	State of digital output (relay) 8 ≠0: active 0: not active
		Bool, Bit 8	DO9	State of digital output (relay) 9 ≠0: active 0: not active
		Bool, Bit 9	DO10	State of digital output (relay) 10 ≠0: active 0: not active
		Bool, Bit 10	DO11	State of digital output (relay) 11 ≠0: active 0: not active
		Bool, Bit 11	DO12	State of digital output (relay) 12 ≠0: active 0: not active
		Bool, Bit 12	DO13	State of digital output (relay) 13 ≠0: active 0: not active
		Bool, Bit 13	DO14	State of digital output (relay) 14 ≠0: active 0: not active
		Bool, Bit 14	DO15	State of digital output (relay) 15 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 15	DO16	State of digital output (relay) 16 ≠0: active 0: not active
6	1	16 Bit Integer (unsigned)	Configuration version – Major	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)	Configuration version – Minor	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)	Configuration version – Build	Machine Studio version used to configure the card – Build part of the version number x.xx.**XX** Revision xxxx
9	1	16 Bit Integer (unsigned)	Configuration version – Revision	Machine Studio version used to configure the card – Revision part of the version number x.xx.xx Revision **XXXX**
10	1	Bool, Bit 0	Marker 1	State of marker 1 ≠0: active 0: not active
		Bool, Bit 1	Marker 2	State of marker 2 ≠0: active 0: not active
		Bool, Bit 2	Marker 3	State of marker 3 ≠0: active 0: not active
		Bool, Bit 3	Marker 4	State of marker 4 ≠0: active 0: not active
		Bool, Bit 4	Marker 5	State of marker 5 ≠0: active 0: not active
		Bool, Bit 5	Marker 6	State of marker 6 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 6	Marker 7	State of marker 7 ≠0: active 0: not active
		Bool, Bit 7	Marker 8	State of marker 8 ≠0: active 0: not active
		Bool, Bit 8	Marker 9	State of marker 9 ≠0: active 0: not active
		Bool, Bit 9	Marker 10	State of marker 10 ≠0: active 0: not active
		Bool, Bit 10	Marker 11	State of marker 11 ≠0: active 0: not active
		Bool, Bit 11	Marker 12	State of marker 12 ≠0: active 0: not active
		Bool, Bit 12	Marker 13	State of marker 13 ≠0: active 0: not active
		Bool, Bit 13	Marker 14	State of marker 14 ≠0: active 0: not active
		Bool, Bit 14	Marker 15	State of marker 15 ≠0: active 0: not active
		Bool, Bit 15	Marker 16	State of marker 16 ≠0: active 0: not active
11	1	Bool, Bit 0	Marker 17	State of marker 17 ≠0: active 0: not active
		Bool, Bit 1	Marker 18	State of marker 18 ≠0: active 0: not active
		Bool, Bit 2	Marker 19	State of marker 19 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 3	Marker 20	State of marker 20 ≠0: active 0: not active
		Bool, Bit 4	Marker 21	State of marker 21 ≠0: active 0: not active
		Bool, Bit 5	Marker 22	State of marker 22 ≠0: active 0: not active
		Bool, Bit 6	Marker 23	State of marker 23 ≠0: active 0: not active
		Bool, Bit 7	Marker 24	State of marker 24 ≠0: active 0: not active
		Bool, Bit 8	Marker 25	State of marker 25 ≠0: active 0: not active
		Bool, Bit 9	Marker 26	State of marker 26 ≠0: active 0: not active
		Bool, Bit 10	Marker 27	State of marker 27 ≠0: active 0: not active
		Bool, Bit 11	Marker 28	State of marker 28 ≠0: active 0: not active
		Bool, Bit 12	Marker 29	State of marker 29 ≠0: active 0: not active
		Bool, Bit 13	Marker 30	State of marker 30 ≠0: active 0: not active
		Bool, Bit 14	Marker 31	State of marker 31 ≠0: active 0: not active
		Bool, Bit 15	Marker 32	State of marker 32 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
12	1	Bool, Bit 0	Marker 33	State of marker 33 ≠0: active 0: not active
		Bool, Bit 1	Marker 34	State of marker 34 ≠0: active 0: not active
		Bool, Bit 2	Marker 35	State of marker 35 ≠0: active 0: not active
		Bool, Bit 3	Marker 36	State of marker 36 ≠0: active 0: not active
		Bool, Bit 4	Marker 37	State of marker 37 ≠0: active 0: not active
		Bool, Bit 5	Marker 38	State of marker 38 ≠0: active 0: not active
		Bool, Bit 6	Marker 39	State of marker 39 ≠0: active 0: not active
		Bool, Bit 7	Marker 40	State of marker 40 ≠0: active 0: not active
		Bool, Bit 8	Marker 41	State of marker 41 ≠0: active 0: not active
		Bool, Bit 9	Marker 42	State of marker 42 ≠0: active 0: not active
		Bool, Bit 10	Marker 43	State of marker 43 ≠0: active 0: not active
		Bool, Bit 11	Marker 44	State of marker 44 ≠0: active 0: not active
		Bool, Bit 12	Marker 45	State of marker 45 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 13	Marker 46	State of marker 46 ≠0: active 0: not active
		Bool, Bit 14	Marker 47	State of marker 47 ≠0: active 0: not active
		Bool, Bit 15	Marker 48	State of marker 48 ≠0: active 0: not active
13	1	Bool, Bit 0	Marker 49	State of marker 49 ≠0: active 0: not active
		Bool, Bit 1	Marker 50	State of marker 50 ≠0: active 0: not active
		Bool, Bit 2	Marker 51	State of marker 51 ≠0: active 0: not active
		Bool, Bit 3	Marker 52	State of marker 52 ≠0: active 0: not active
		Bool, Bit 4	Marker 53	State of marker 53 ≠0: active 0: not active
		Bool, Bit 5	Marker 54	State of marker 54 ≠0: active 0: not active
		Bool, Bit 6	Marker 55	State of marker 55 ≠0: active 0: not active
		Bool, Bit 7	Marker 56	State of marker 56 ≠0: active 0: not active
		Bool, Bit 8	Marker 57	State of marker 57 ≠0: active 0: not active
		Bool, Bit 9	Marker 58	State of marker 58 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 10	Marker 59	State of marker 59 ≠0: active 0: not active
		Bool, Bit 11	Marker 60	State of marker 60 ≠0: active 0: not active
		Bool, Bit 12	Marker 61	State of marker 61 ≠0: active 0: not active
		Bool, Bit 13	Marker 62	State of marker 62 ≠0: active 0: not active
		Bool, Bit 14	Marker 63	State of marker 63 ≠0: active 0: not active
		Bool, Bit 15	Marker 64	State of marker 64 ≠0: active 0: not active
14	1	Bool, Bit 0	SWI1	State of software input 1 ≠0: active 0: not active
		Bool, Bit 1	SWI2	State of software input 2 ≠0: active 0: not active
		Bool, Bit 2	SWI3	State of software input 3 ≠0: active 0: not active
		Bool, Bit 3	SWI4	State of software input 4 ≠0: active 0: not active
		Bool, Bit 4	SWI5	State of software input 5 ≠0: active 0: not active
		Bool, Bit 5	SWI6	State of software input 6 ≠0: active 0: not active
		Bool, Bit 6	SWI7	State of software input 7 ≠0: active 0: not active

Table B-10: Structure of group "A6500-RC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 7	SWI8	State of software input 8 ≠0: active 0: not active
		Bool, Bit 8	SWI9	State of software input 9 ≠0: active 0: not active
		Bool, Bit 9	SWI10	State of software input 10 ≠0: active 0: not active
		Bool, Bit 10	SWI11	State of software input 11 ≠0: active 0: not active
		Bool, Bit 11	SWI12	State of software input 12 ≠0: active 0: not active
		Bool, Bit 12	SWI13	State of software input 13 ≠0: active 0: not active
		Bool, Bit 13	SWI14	State of software input 14 ≠0: active 0: not active
		Bool, Bit 14	SWI15	State of software input 15 ≠0: active 0: not active
		Bool, Bit 15	SWI16	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-11.

Table B-11: Structure of group "A6500-CC Inputs/Outputs"

Register	Length (number of registers)	Type	Name	Description
0	1	16 Bit Integer (unsigned)	CPU Load	Load of the internal CPU Unit: % Range: 0 to 100

Table B-11: Structure of group "A6500-CC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
1	1	16 Bit Integer (unsigned)	Maximal cycle time	Maximal cycle time of the data collection from all connected cards. Unit: ms
2	1	16 Bit Integer (unsigned)	Memory usage	Usage of the internal memory Unit: % Range: 0 to 100
3	1		not used	Reserve
4	1	16 Bit Integer (signed)	Current temperature	Current temperature, measured by the card internal sensor. Unit: 0.1°C
5	1	Bool, Bit 0	Ethernet connected	0: Not connected 1: Connected
		Bool, Bit 1	USB connected	0: Not connected 1: Connected
		Bool, Bit 2	Status master	0: Passive/inactive 1: Active
		Bool, Bit 3	Redundancy state	0: No redundancy 1: Redundancy active
6	1	16 Bit Integer (unsigned)	Channel OK	Card status. Always active in non-redundancy mode. 0: Not OK 1: OK
7	1	Bool, Bit 0	Machine Studio active	0: Not active 1: Active Always active in non-redundancy mode.
		Bool, Bit 1	Machine Studio connected	0: Not connected 1: Connected
8	1	16 Bit Integer (unsigned)	Machine Studio connections	Number of connected Machine Studios Range: 0 to 8
9	1	Bool, Bit 0	Mobile App active	0: Not active 1: Active
		Bool, Bit 1	Mobile App connected	0: Not connected 1: Connected

Table B-11: Structure of group "A6500-CC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
10		16 Bit Integer (unsigned)	Mobile App connections	Number of connected Mobile Apps Range: 0 to 5
11	1	Bool, Bit 0	OPC UA active	0: Not active 1: Active
		Bool, Bit 1	OPC UA connected	0: Not connected 1: Connected
12	1	16 Bit Integer (unsigned)	OPC UA connections	Number of connected OPC UA clients Range: 0 to 5
13	1	Bool, Bit 0	Modbus TCP active	0: Not active 1: Active
		Bool, Bit 1	Modbus TCP connected	0: Not connected 1: Connected
14	1	16 Bit Integer (unsigned)	Modbus TCP connections	Number of connected Modbus clients Range: 0 to 5
15	1	Bool, Bit 0	Modbus RTU active	0: Not active 1: Active
		Bool, Bit 1	Modbus RTU connected	0: Not connected 1: Connected
16	1	16 Bit Integer (unsigned)	Modbus RTU connections	Number of connected serial Modbus clients Range: 0 to 1
17	1	Bool, Bit 0	Discovery active	0: Not active 1: Active
		Bool, Bit 1	not used	
18	1	Bool, Bit 0	License state	Licensing ATG Prediction Extension 0: No license 1 License
19	1	Bool, Bit 0	SNTP active	0: Not active 1: Active
		Bool, Bit 1	SNTP connected	0: Not connected 1: Connected
20	1	16 Bit Integer (unsigned)	SNTP Update Time Year	Year of the latest SNTP update

Table B-11: Structure of group "A6500-CC Inputs/Outputs" *(continued)*

Register	Length (number of registers)	Type	Name	Description
21	1	16 Bit Integer (unsigned)	SNTP Update Time Month	Month of the latest SNTP update
22	1	16 Bit Integer (unsigned)	SNTP Update Time Day	Day of the latest SNTP update
23	1	16 Bit Integer (unsigned)	SNTP Update Time Hour	Hour of the latest SNTP update
24	1	16 Bit Integer (unsigned)	SNTP Update Time Minute	Minute of the latest SNTP update
25	1	16 Bit Integer (unsigned)	SNTP Update Time Second	Second of the latest SNTP
26	1	16 Bit Integer (unsigned)	Configuration version – Major	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)	Configuration version – Minor	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)	Configuration version – Build	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)	Configuration version – Revision	Machine Studio version used to configure the card – Revision part of the version number x.xx.xx Revision **XXXX**
30 to 49	1		not used	Reserve

Structure of the group "Speed Measurement"

The 90 registers of the group "Speed Measurement" are occupied as shown in Table B-12.

Table B-12: Structure of group "Speed Measurement"

Register		Type	Name	Description
0	2	Float	CH1 Speed	Speed value channel 1 Unit: RPM
2	2	Float	CH1 MinSpeed	Minimum speed value channel 1 Unit: RPM

Table B-12: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
4	2	Float	CH1 MaxSpeed	Maximum speed value channel 1 Unit: RPM
6	2	Float	CH1 DiffSpeed	Difference speed channel 1 Unit: RPM
8	2	Float	CH1 Acceleration	Acceleration value channel 1 Unit: RPM/s
10	2	Float	CH1 SensMin	Minimum sensor voltage channel 1 Unit: V
12	2	Float	CH1 SensMax	Maximum sensor voltage channel 1 Unit: V
14	2	Float	CH1 TriggerLevelMin	Minimum trigger level channel 1 Unit: V
16	2	Float	CH1 TriggerLevelMax	Maximum trigger level channel 1 Unit: V
18	2	Float	CH1 Current teeth	Number of currently detected teeth channel 1
20	2	Float	CH1 SpeedRangeMax	Maximum speed range channel 1 Unit: RPM
22	1	Bool, Bit 0	CH1 Overflow	0: No overflow ≠0: Overflow
		Bool, Bit 1	CH1 Standstill	0: No standstill ≠0: Standstill
		Bool, Bit 2	CH1 SensorError	0: No sensor error ≠0: Sensor error
		Bool, Bit 3	CH1 GapWarning	0: No gap warning ≠0: Gap warning
		Bool, Bit 4	CH1 RotDirection	Rotational direction 0: Normal direction ≠0: Inverse direction
		Bool, Bit 5	CH1 COK	Channel 1 OK 0: Not OK ≠0: OK
23	2	Float	CH2 Speed	Speed value channel 2 Unit: RPM

Table B-12: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
25	2	Float	CH2 MinSpeed	Minimum speed value channel 2 Unit: RPM
27	2	Float	CH2 MaxSpeed	Maximum speed value channel 2 Unit: RPM
29	2	Float	CH2 DiffSpeed	Difference speed channel 2 Unit: RPM
31	2	Float	CH2 Acceleration	Acceleration value channel 2 Unit: RPM/s
33	2	Float	CH2 SensMin	Minimum sensor voltage channel 2 Unit: V
35	2	Float	CH2 SensMax	Maximum sensor voltage channel 2 Unit: V
37	2	Float	CH2 TriggerLevelMin	Minimum trigger level channel 2 Unit: V
39	2	Float	CH2 TriggerLevelMax	Maximum trigger level channel 2 Unit: V
41	2	Float	CH2 Current teeth	Number of currently detected teeth channel 2
43	2	Float	CH2 SpeedRangeMax	Maximum speed range channel 2 Unit: RPM
45	1	Bool, Bit 0	CH2 Overflow	0: No overflow ≠0: Overflow
		Bool, Bit 1	CH2 Standstill	0: No standstill ≠0: Standstill
		Bool, Bit 2	CH2 SensorError	0: No sensor error ≠0: Sensor error
		Bool, Bit 3	CH2 GapWarning	0: No gap warning ≠0: Gap warning
		Bool, Bit 4	CH2 RotDirection	Rotational direction 0: Normal direction ≠0: Inverse direction

Table B-12: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
		Bool, Bit 5	CH2 COK	Channel 2 OK 0: Not OK ≠0: OK
46	1	16 Bit Integer (unsigned)	Alarm1 Source	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
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

Table B-12: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
52	1	Bool	Alarm1 State	0: No alarm ≠0: Alarm
53	1	16 Bit Integer (unsigned)	Alarm2 Source	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
57	2	Float	Alarm2 Hysteresis	Defined alarm 2 hysteresis
59	1	Bool	Alarm2 State	0: No alarm ≠0: Alarm

Table B-12: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
60	1	16 Bit Integer (unsigned)	Alarm4 Source	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
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

Table B-12: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
67	1	16 Bit Integer (unsigned)	Alarm5 Source	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
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
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 Limit 2	Alarm 1: defined second limit for alarm window
76	2	Float	Alarm2 Limit 2	Alarm 2: defined second limit for alarm window
78	2	Float	Alarm4 Limit 2	Alarm 4: defined second limit for alarm window

Table B-12: Structure of group "Speed Measurement" *(continued)*

Register		Type	Name	Description
80	2	Float	Alarm5 Limit 2	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-13.

Table B-13: Structure of group "Combined channels – dynamic – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	COK Combined	Channel Combined OK 0: Not OK ≠0: OK
		Bool, Bit 1	COK Channel 1	Channel 1 OK 0: Not OK ≠0: OK
		Bool, Bit 2	COK Channel 2	Channel 2 OK 0: Not OK ≠0: OK
1	2	Float	Value	Measurement value
3	2	Float	CH1 VoltageDC	DC voltage of channel 1 (Gap voltage) Unit: V
5	2	Float	CH1 Value 0-P	0-to-Peak value of channel 1
7	2	Float	CH2 VoltageDC	DC voltage of channel 2 (Gap voltage) Unit: V
9	2	Float	CH2 Value 0-P	0-to-Peak value of channel 2
11	2	Float	Speed	Unit: RPM
13	1	Bool, Bit 0	State DangerAlarm1	State of the danger alarm channel 1 ≠0: active 0: not active
		Bool, Bit 1	State AlertAlarm1	State of the alert alarm channel 1 ≠0: active 0: not active

Table B-13: Structure of group "Combined channels – dynamic – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
14	1	Bool, Bit 0	State DangerAlarm2	State of the danger alarm channel 2 ≠0: active 0: not active
		Bool, Bit 1	State AlertAlarm2	State of the alert alarm channel 2 ≠0: active 0: not active
15	2	Float	ValueRangeMin	Combined value minimum measuring range
17	2	Float	ValueRangeMax	Combined value maximum measuring range
19	2	Float	CH1 ValueRangeMin	Channel 1 minimum value measuring range
21	2	Float	CH1 ValueRangeMax	Channel 1 maximum value measuring range
23	2	Float	CH2 ValueRangeMin	Channel 2 minimum value measuring range
25	2	Float	CH2 ValueRangeMax	Channel 2 maximum value measuring range
27	2	Float	TV DangerAlarm1	Limit value danger alarm 1
29	2	Float	TV AlertAlarm1	Limit value alert alarm 1
31	2	Float	TV DangerAlarm2	Limit value danger alarm 2
33	2	Float	TV AlertAlarm2	Limit value alert alarm 2
35	1	16 Bit Integer (unsigned)	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 15: Absolute shaft vibration 54: Voltage input - Smax 55: Voltage input - SmaxPP

Table B-13: Structure of group "Combined channels – dynamic – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
36	1	Bool, Bit 0	Alarm enabled 1	State of limit supervision for combined channels – dynamic – measurement ≠0: active 0: not active
		Bool, Bit 1	Alarm enabled 2	
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-14.

Table B-14: Structure of group "Combined channels – static – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	COK Combined	Channel Combined OK 0: Not OK ≠0: OK
		Bool, Bit 1	COK Channel 1	Channel 1 OK 0: Not OK ≠0: OK
		Bool, Bit 2	COK Channel 2	Channel 2 OK 0: Not OK ≠0: OK
1	2	Float	Value	Measurement value
3	2	Float	CH1 VoltageDC	DC voltage of channel 1 (Gap voltage) Unit: V
5	2	Float	CH2 VoltageDC	DC voltage of channel 2 (Gap voltage) Unit: V
7	2	Float	Speed	Unit: RPM
9	1	Bool, Bit 0	Upper State DangerAlarm1	Upper state of the danger alarm channel 1 ≠0: active 0: not active

Table B-14: Structure of group "Combined channels – static – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	Upper State AlertAlarm1	Upper state of the alert alarm channel 1 ≠0: active 0: not active
10	1	Bool, Bit 0	Lower State DangerAlarm1	Lower state of the danger alarm channel 1 ≠0: active 0: not active
		Bool, Bit 1	Lower State AlertAlarm1	Lower state of the alert alarm channel 1 ≠0: active 0: not active
11	1	Bool, Bit 0	Upper State DangerAlarm2	Upper state of the danger alarm channel 2 ≠0: active 0: not active
		Bool, Bit 1	Upper State AlertAlarm2	Upper state of the alert alarm channel 2 ≠0: active 0: not active
12	1	Bool, Bit 0	Lower State DangerAlarm2	Lower state of the danger alarm channel 2 ≠0: active 0: not active
		Bool, Bit 1	Lower State AlertAlarm2	Lower state of the alert alarm channel 2 ≠0: active 0: not active
13	2	Float	ValueRangeMin	Combined value minimum measuring range
15	2	Float	ValueRangeMax	Combined value maximum measuring range
17	2	Float	Upper TV DangerAlarm1	Upper limit value danger alarm 1
19	2	Float	Upper TV AlertAlarm1	Upper limit value alert alarm 1
21	2	Float	Lower TV DangerAlarm1	Lower limit value danger alarm 1
23	2	Float	Lower TV AlertAlarm1	Lower limit value alert alarm 1

Table B-14: Structure of group "Combined channels – static – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
25	2	Float	Upper TV DangerAlarm2	Upper limit value danger alarm 2
27	2	Float	Upper TV AlertAlarm2	Upper limit value alert alarm 2
29	2	Float	Lower TV DangerAlarm2	Lower limit value danger alarm 2
31	2	Float	Lower TV AlertAlarm2	Lower limit value alert alarm 2
33	1	16 Bit Integer (unsigned)	Evaluation	19: Relative shaft position - Minimum/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	Alarm enabled 1	State of limit supervision for combined channels – static – measurement ≠0: active 0: not active
		Bool, Bit 1	Alarm enabled 2	
35	2	Float	Value 2	Max value of application Tandem/Cone "Min/Max"
37 to 49	1		not used	Reserve

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-15.

Table B-15: Structure of the group "Combined channels – Cylinder pressure"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	COK Combined	Channel Combined OK 0: Not OK ≠0: OK
		Bool, Bit 1	COK Channel 1	Channel 1 OK 0: Not OK ≠0: OK
		Bool, Bit 2	COK Channel 2	Channel 2 OK 0: Not OK ≠0: OK
1	2	Float	Speed	Speed value Unit: RPM
3	2	Float	Discharge pressure chamber 1	Measurement value Unit: kPa
5	2	Float	Discharge pressure chamber 2	Measurement value Unit: kPa
7	2	Float	Suction pressure chamber 1	Measurement value Unit: kPa
9	2	Float	Suction pressure chamber 2	Measurement value Unit: kPa
11	2	Float	Maximum pressure chamber 1	Measurement value Unit: kPa
13	2	Float	Maximum pressure chamber 2	Measurement value Unit: kPa
15	2	Float	Maximum pressure angle chamber 1	Measurement value Unit: °
17	2	Float	Maximum pressure angle chamber 2	Measurement value Unit: °
19	2	Float	Minimum pressure chamber 1	Measurement value Unit: kPa
21	2	Float	Minimum pressure chamber 2	Measurement value Unit: kPa
23	2	Float	Minimum pressure angle chamber 1	Measurement value Unit: °
25	2	Float	Minimum pressure angle chamber 2	Measurement value Unit: °
27	2	Float	Compression ratio chamber 1	Measurement value Unit: kPa
29	2	Float	Compression ratio chamber 2	Measurement value Unit: kPa

Table B-15: Structure of the group "Combined channels – Cylinder pressure" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
31	2	Float	Peak rod compression	Measurement value Unit: kN
33	2	Float	Peak rod compression angle	Measurement value Unit: °
35	2	Float	Peak rod tension	Measurement value Unit: kN
37	2	Float	Peak rod tension angle	Measurement value Unit: °
39	2	Float	Degree of rod reversal	Measurement value 0 to 180°
41	1	Bool, Bit 0	Upper State AlertAlarm 1	Upper state of the alert alarm 1 ≠0: active 0: not active
		Bool, Bit 1	Upper State DangerAlarm 1	Upper state of the danger alarm 1 ≠0: active 0: not active
42	1	Bool, Bit 0	Lower State AlertAlarm 1	Lower state of the alert alarm 1 ≠0: active 0: not active
		Bool, Bit 1	Lower State DangerAlarm 1	Lower state of the danger alarm 1 ≠0: active 0: not active
43	1	Bool, Bit 0	Upper State AlertAlarm 2	Upper state of the alert alarm 2 ≠0: active 0: not active
		Bool, Bit 1	Upper State DangerAlarm 2	Upper state of the danger alarm 2 ≠0: active 0: not active
44	1	Bool, Bit 0	Lower State AlertAlarm Discharge Pressure Chamber 2	Lower state of the alert alarm 2 ≠0: active 0: not active

Table B-15: Structure of the group "Combined channels – Cylinder pressure" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	Lower State DangerAlarm 2	Lower state of the danger alarm 2 ≠0: active 0: not active
45	2	Float	Measuring range	Measuring range
47	2	Float	Upper TV DangerAlarm 1	Upper limit value danger alarm 1
49	2	Float	Upper TV AlertAlarm 1	Upper limit value alert alarm 1
51	2	Float	Lower TV DangerAlarm 1	Lower limit value danger alarm 1
53	2	Float	Lower TV AlertAlarm 1	Lower limit value alert alarm 1
55	2	Float	Upper TV DangerAlarm 2	Upper limit value danger alarm 2
57	2	Float	Upper TV AlertAlarm 2	Upper limit value alert alarm 2
59	2	Float	Lower TV DangerAlarm 2	Lower limit value danger alarm 2
61	2	Float	Lower TV AlertAlarm 2	Lower limit value alert alarm 2

Table B-15: Structure of the group "Combined channels – Cylinder pressure" *(continued)*

Register	Length (number of registers)	Type	Name	Description
63	1	16 Bit Integer (unsigned)	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	Alarm enabled 1	Alarm limits 1 ≠0: enabled 0: not enabled
		Bool, Bit 1	Alarm enabled 2	Alarm limits 2 ≠0: enabled 0: not enabled
65	1	Bool, Bit 0	Measured result valid	Measured result ≠0: Not valid 0: Valid

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-16.

Table B-16: Structure of group "Single channel – dynamic – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool	COK	ChannelOK 0: Not OK ≠0: OK
1	2	Float	Value	Measurement value
3	2	Float	Speed	Unit: RPM
5	2	Float	VoltageDC	DC voltage (Gap voltage) Unit: V
7	1	Bool, Bit 0	State DangerAlarm	State of the danger alarm ≠0: active 0: not active
		Bool, Bit 1	State AlertAlarm	State of the alert alarm ≠0: active 0: not active
8	2	Float	ValueRangeMin	Value minimum measuring range
10	2	Float	ValueRangeMax	Value maximum measuring range
12	2	Float	TV DangerAlarm	Limit value danger alarm
14	2	Float	TV AlertAlarm	Limit value alert alarm

Table B-16: Structure of group "Single channel – dynamic – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
16	1	16 Bit Integer (unsigned)	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
17	1	Bool, Bit 0	Alarm enabled	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-17.

Table B-17: Structure of group "Single channel - static - Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool	COK	Channel OK 0: Not OK ≠0: OK
1	2	Float	Value	Measurement value
3	2	Float	VoltageDC	DC voltage of (Gap voltage) Unit: V
5	1	Bool, Bit 0	Upper State DangerAlarm	Upper state of the danger alarm ≠0: active 0: not active
		Bool, Bit 1	Upper State AlertAlarm	Upper state of the alert alarm ≠0: active 0: not active
		Bool, Bit 2	Upper alarm enabled	State of limit supervision for single channel – static – measurement ≠0: active 0: not active
6	1	Bool, Bit 0	Lower State DangerAlarm	Lower state of the danger alarm ≠0: active 0: not active
		Bool, Bit 1	Lower State AlertAlram	Lower state of the alert alarm ≠0: active 0: not active
		Bool, Bit 2	Lower alarm enabled	State of limit supervision for single channel – static – measurement ≠0: active 0: not active
7	2	Float	ValueRangeMin	Value minimum measuring range
9	2	Float	ValueRangeMax	Value maximum measuring range

Table B-17: Structure of group "Single channel - static - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
11	2	Float	Upper TV DangerAlarm	Upper limit value danger alarm
13	2	Float	Upper TV AlertAlarm	Upper limit value alert alarm
15	2	Float	Lower TV DangerAlarm	Lower limit value danger alarm
17	2	Float	Lower TV AlertAlarm	Lower limit value alert alarm
19	1	16 Bit Integer (unsigned)	Evaluation	16: Distance 17: Rod Drop Average Mode 18: Rod Gap 29: Rod Drop Triggered Mode 50: Voltage input - static value

Structure of group "Single channel – eccentricity – Measurement"

The 20 registers of the group "Single channel – eccentricity – Measurement" are occupied as shown in Table B-18.

Table B-18: Structure of group "Single channel – eccentricity – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool	COK	Channel OK 0: Not OK ≠0: OK
1	2	Float	Value	Measurement value
3	2	Float	Speed	Unit: RPM
5	2	Float	VoltageDC	DC voltage of (Gap voltage) Unit: V
7	1	Bool, Bit 0	State DangerAlarm	State of the danger alarm ≠0: active 0: not active
		Bool, Bit 1	State AlertAlarm	State of the alert alarm ≠0: active 0: not active
8	2	Float	ValueRangeMin	Value minimum measuring range
10	2	Float	ValueRangeMax	Value maximum measuring range

Table B-18: Structure of group "Single channel – eccentricity – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
12	2	Float	TV DangerAlarm	Limit value danger alarm
14	2	Float	TV AlertAlarm	Limit value alert alarm
16	1	16 Bit Integer (unsigned)	Evaluation	0: Peak-to-Peak 19: Minimum 20: Maximum
17	1	Bool, Bit 0	Alarm enabled	State of limit supervision for single channel – eccentricity – measurement ≠0: active 0: not active
18	1		not used	Reserve
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-15.

Table B-19: Structure of the group "Single channel – Cylinder pressure"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	COK	Channel OK 0: Not OK ≠0: OK
1	2	Float	Speed	Speed value Unit: RPM
3	2	Float	Discharge pressure	Measurement value Unit: kPa
5	2	Float	Suction pressure	Measurement value Unit: kPa
7	2	Float	Maximum pressure	Measurement value Unit: kPa
9	2	Float	Maximum pressure angle	Measurement value Unit: °
11	2	Float	Minimum pressure	Measurement value Unit: kPa
13	2	Float	Minimum pressure angle	Measurement value Unit: °
15	2	Float	Compression ratio	Measurement value

Table B-19: Structure of the group "Single channel – Cylinder pressure" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
17	2	Float	Peak rod compression	Measurement value Unit: kN
19	2	Float	Peak rod compression angle	Measurement value Unit: °
21	2	Float	Peak rod tension	Measurement value Unit: kN
23	2	Float	Peak rod tension angle	Measurement value Unit: °
25	2	Float	Degree of rod reversal	Measurement value 0 to 180°
27	1	Bool, Bit 0	Upper State DangerAlarm	Upper state of the danger alarm ≠0: active 0: not active
		Bool, Bit 1	Upper State AlertAlarm	Upper state of the alert alarm ≠0: active 0: not active
28	1	Bool, Bit 0	Lower State DangerAlarm	Lower state of the danger alarm ≠0: active 0: not active
		Bool, Bit 1	Lower State AlertAlarm	Lower state of the alert alarm ≠0: active 0: not active
29	2	Float	Upper TV DangerAlarm	Upper limit value danger alarm
31	2	Float	Upper TV AlertAlarm	Upper limit value alert alarm
33	2	Float	Lower TV DangerAlarm	Lower limit value danger alarm
35	2	Float	Lower TV AlertAlarm	Lower limit value alert alarm
37	2	Float	Measuring range	Measuring range

Table B-19: Structure of the group "Single channel – Cylinder pressure" *(continued)*

Register	Length (number of registers)	Type	Name	Description
39	1	16 Bit Integer (unsigned)	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
40	1	Bool, Bit 0	Alarm enabled	Alarm limits ≠0: enabled 0: not enabled
41	1	Bool, Bit 0	Measured result valid	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-20.

Table B-20: Structure of group "Order analysis – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Phase Na	Phase harmonic Na
2	2	Float	Peak Na	Amplitude harmonic Na
4	2	Float	Phase Nb	Phase harmonic Nb
6	2	Float	Peak Nb	Amplitude harmonic Nb

Table B-20: Structure of group "Order analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
8	2	Float	Phase Nc	Phase harmonic Nc
10	2	Float	Peak Nc	Amplitude harmonic Nc
12	2	Float	Phase Nd	Phase harmonic Nd
14	2	Float	Peak Nd	Amplitude harmonic Nd
16	2	Float	Phase Ne	Phase harmonic Ne
18	2	Float	Peak Ne	Amplitude harmonic Ne
20	2	Float	Phase Na Dif	Difference phase harmonic Na
22	2	Float	Peak Na Dif	Difference peak harmonic Na
24	2	Float	Phase Nb Dif	Difference phase harmonic Nb
26	2	Float	Peak Nb Dif	Difference peak harmonic Nb
28	2	Float	Phase Nc Dif	Difference phase harmonic Nc
30	2	Float	Peak Nc Dif	Difference peak harmonic Nc
32	2	Float	Phase Nd Dif	Difference phase harmonic Nd
34	2	Float	Peak Nd Dif	Difference peak harmonic Nd
36	2	Float	Phase Ne Dif	Difference phase harmonic Ne
38	2	Float	Peak Ne Dif	Difference peak harmonic Ne
40	1	Bool, Bit 0	Peak Nx AlertAlarm State	State peak alert alarm of the selected harmonic Nx [1] ≠0: active 0: not active
		Bool, Bit 1	Phase Nx AlertAlarm State	State phase alert alarm of the selected harmonic Nx [1] ≠0: active 0: not active
		Bool, Bit 2	Peak Nx DangerAlarm State	State peak danger alarm of the selected harmonic Nx [1] ≠0: active 0: not active

Table B-20: Structure of group "Order analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 3	Phase Nx DangerAlarm State	State phase danger alarm of the selected harmonic Nx [1] ≠0: active 0: not active
41	1	Bool, Bit 0	Peak Ny AlertAlarm State	State peak alert alarm of the selected harmonic Ny [1] ≠0: active 0: not active
		Bool, Bit 1	Phase Ny AlertAlarm State	State phase alert alarm of the selected harmonic Ny [1] ≠0: active 0: not active
		Bool, Bit 2	Peak Ny DangerAlarm State	State peak danger alarm of the selected harmonic Ny [1] ≠0: active 0: not active
		Bool, Bit 3	Phase Ny DangerAlarm State	State phase danger alarm of the selected harmonic Ny [1] ≠0: active 0: not active
42	1	Bool, Bit 0	Runs at nominal speed State	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	Order valid state	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)	Nx	Selected harmonic Nx
45	2	Float	TV Phase Nx AlertAlarm	Limit phase alert alarm of selected harmonic Nx
47	2	Float	TV Phase Nx DangerAlarm	Limit phase danger alarm of selected harmonic Nx

Table B-20: Structure of group "Order analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
49	2	Float	TV Peak Nx AlertAlarm	Limit peak alert alarm of selected harmonic Nx
51	2	Float	TV Peak Nx DangerAlarm	Limit peak danger alarm of selected harmonic Nx
53	2	Float	Phase Nx Baseline	Phase baseline of the selected harmonic Nx
55	1	16 Bit Integer (unsigned)	Ny	Selected harmonic Ny
56	2	Float	TV Phase Ny AlertAlarm	Limit phase alert alarm of selected harmonic Ny
58	2	Float	TV Phase Ny DangerAlarm	Limit phase danger alarm of selected harmonic Ny
60	2	Float	TV Peak Ny AlertAlarm	Limit peak alert alarm of selected harmonic Ny
62	2	Float	TV Peak Ny DangerAlarm	Limit peak danger alarm of selected harmonic Ny
64	2	Float	Phase Ny Baseline	Phase baseline of the selected harmonic Ny
66	1	16 Bit Integer (signed)	Order-Na	-1: 1/2. Order 1: 1. Order to 10: 10. Order
67	1	16 Bit Integer (signed)	Order-Nb	
68	1	16 Bit Integer (signed)	Order-Nc	
69	1	16 Bit Integer (signed)	Order-Nd	
70	1	16 Bit Integer (signed)	Order-Ne	
71	1	Bool, Bit 0	Alarm enabled	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 energy in band analysis – Measurement"

The 100 registers of the group "Band analysis and energy in band analysis - Measurement" are occupied as shown in Table B-21. Both analysis functions – **Band analysis** and **Energy in band analysis**) – occupy the same Modbus registers. See parameter **A6500-UM card** → **Configuration** → **Analysis** → **Select analysis** for selected analysis function. The unit of the analysis functions are different, for example **g** if **Band analysis** has been selected or **g²/Hz** if **Energy in band analysis** has been selected.

Table B-21: Structure of group "Band analysis and energy in band analysis – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Band1 Value	Measurement value of band 1
2	2	Float	Band2 Value	Measurement value of band 2
4	2	Float	Band3 Value	Measurement value of band 3
6	2	Float	Band4 Value	Measurement value of band 4
8	2	Float	Band5 Value	Measurement value of band 5
10	2	Float	Band6 Value	Measurement value of band 6
12	2	Float	Band7 Value	Measurement value of band 7
14	2	Float	Band8 Value	Measurement value of band 8
16	1	Bool, Bit 0	Band1 state AA	State of the band 1 alert alarm ≠0: active 0: not active
		Bool, Bit 1	Band1 state DA	State of the band 1 danger alarm ≠0: active 0: not active
		Bool, Bit 2	Band2 state AA	State of the band 2 alert alarm ≠0: active 0: not active
		Bool, Bit 3	Band2 state DA	State of the band 2 danger alarm ≠0: active 0: not active
		Bool, Bit 4	Band3 state AA	State of the band 3 alert alarm ≠0: active 0: not active
		Bool, Bit 5	Band3 state DA	State of the band 3 danger alarm ≠0: active 0: not active

Table B-21: Structure of group "Band analysis and energy in band analysis – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 6	Band4 state AA	State of the band 4 alert alarm ≠0: active 0: not active
		Bool, Bit 7	Band4 state DA	State of the band 4 danger alarm ≠0: active 0: not active
		Bool, Bit 8	Band5 state AA	State of the band 5 alert alarm ≠0: active 0: not active
		Bool, Bit 9	Band5 state DA	State of the band 5 danger alarm ≠0: active 0: not active
		Bool, Bit 10	Band6 state AA	State of the band 6 alert alarm ≠0: active 0: not active
		Bool, Bit 11	Band6 state DA	State of the band 6 danger alarm ≠0: active 0: not active
		Bool, Bit 12	Band7 state AA	State of the band 7 alert alarm ≠0: active 0: not active
		Bool, Bit 13	Band7 state DA	State of the band 7 danger alarm ≠0: active 0: not active
		Bool, Bit 14	Band8 state AA	State of the band 8 alert alarm ≠0: active 0: not active
		Bool, Bit 15	Band8 state DA	State of the band 8 danger alarm ≠0: active 0: not active
17	2	Float	Band1 FreqRangeMin	Band 1 frequency range minimum

Table B-21: Structure of group "Band analysis and energy in band analysis – Measurement" ***(continued)***

Register	Length (number of registers)	Type	Name	Description
19	2	Float	Band1 FreqRangeMax	Band 1 frequency range maximum
21	2	Float	Band1 TV AA	Limit value alert alarm band 1
23	2	Float	Band1 TV DA	Limit valuer danger alarm band 1
25	2	Float	Band2 FreqRangeMin	Band 2 frequency range minimum
27	2	Float	Band2 FreqRangeMax	Band 2 frequency range maximum
29	2	Float	Band2 TV AA	Limit value alert alarm band 2
31	2	Float	Band2 TV DA	Limit valuer danger alarm band 2
33	2	Float	Band3 FreqRangeMin	Band 3 frequency range minimum
35	2	Float	Band3 FreqRangeMax	Band 3 frequency range maximum
37	2	Float	Band3 TV AA	Limit value alert alarm band 3
39	2	Float	Band3 TV DA	Limit valuer danger alarm band 3
41	2	Float	Band4 FreqRangeMin	Band 4 frequency range minimum
43	2	Float	Band4 FreqRangeMax	Band 4 frequency range maximum
45	2	Float	Band4 TV AA	Limit value alert alarm band 4
47	2	Float	Band4 TV DA	Limit valuer danger alarm band 4
49	2	Float	Band5 FreqRangeMin	Band 5 frequency range minimum
51	2	Float	Band5 FreqRangeMax	Band 5 frequency range maximum
53	2	Float	Band5 TV AA	Limit value alert alarm band 5
55	2	Float	Band5 TV DA	Limit valuer danger alarm band 5
57	2	Float	Band6 FreqRangeMin	Band 6 frequency range minimum

Table B-21: Structure of group "Band analysis and energy in band analysis – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
59	2	Float	Band6 FreqRangeMax	Band 6 frequency range maximum
61	2	Float	Band6 TV AA	Limit value alert alarm band 6
63	2	Float	Band6 TV DA	Limit valuer danger alarm band 6
65	2	Float	Band7 FreqRangeMin	Band 7 frequency range minimum
67	2	Float	Band7 FreqRangeMax	Band 7 frequency range maximum
69	2	Float	Band7 TV AA	Limit value alert alarm band 7
71	2	Float	Band7 TV DA	Limit valuer danger alarm band 7
73	2	Float	Band8 FreqRangeMin	Band 8 frequency range minimum
75	2	Float	Band8 FreqRangeMax	Band 8 frequency range maximum
77	2	Float	Band8 TV AA	Limit value alert alarm band 8
79	2	Float	Band8 TV DA	Limit valuer danger alarm band 8
81	1	Bool, Bit 0	Alarm enabled	State of limit supervision for band analysis and energy in band analysis – measurement ≠0: active 0: not active
82 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-22.

Table B-22: Structure of group "PeakVue – Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Float	PeakVue value	PeakVue Measurement value

Table B-22: Structure of group "PeakVue – Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
2	1	Bool, Bit 0	PeakVue AA State	State of the PeaKVue Alert Alarm ≠0: active 0: not active
		Bool, Bit 1	PeakVue DA State	State of the PeaKVue Danger Alarm ≠0: active 0: not active
3	2	Float	PeakVue TV AA	Limit value alert alarm
5	2	Float	PeakVue TV DA	Limit value danger alarm
7	1	16 Bit Integer (unsigned)	PeakVue WaveFormEnabled	PeakVue waveform display 0: not enabled ≠0: enabled
8	2	Float	Filter band lower limit	Lower limit value of the filter band
10	2	Float	Filter band upper limit	Upper limit value of the filter band
12	1	Bool, Bit 0	Alarm enabled	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-23.

Table B-23: Structure of group "Not 1st order Analysis"

Register	Length (number of registers)	Type	Name	Description
0	2	Float	Value	Not 1st order analysis value
2		Bool, Bit 0	Measure result valid	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	Alert Alarm State	State of the Not 1st order analysis Alert Alarm ≠0: active 0: not active

Table B-23: Structure of group "Not 1st order Analysis" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 1	Danger Alarm State	State of the Not 1st order analysis Danger Alarm ≠0: active 0: not active
4	1	16 Bit Integer (unsigned)	Evaluation	0: 0-to-Peak 1: Peak-to-Peak 2: RMS
5	1	16 Bit Integer (unsigned)	Acceleration mode	0: High 1: Low
6	2	Float	Value range min	Minimum value of the measuring range
8	2	Float	Value range max	Maximum value of the measuring range
10	1	Bool, Bit 0	Alarm enable	≠0: active 0: not active
11	2	Float	TV Danger alarm	Threshold (limit) value of the danger alarm
13	2	Float	TV Alert alarm	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-24.

Table B-24: Structure of group "Temperature Process - Measurement"

Register	Length (number of registers)	Type	Name	Description
0	1	Bool, Bit 0	CH1a-COK	Channel OK - Channel 1a 0: Not OK ≠0: OK
		Bool, Bit 1	CH1b-COK	Channel OK - Channel 1b 0: Not OK ≠0: OK
		Bool, Bit 2	CH2a-COK	Channel OK - Channel 2a 0: Not OK ≠0: OK
		Bool, Bit 3	CH2b-COK	Channel OK - Channel 2b 0: Not OK ≠0: OK

Table B-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 4	CH3a-COK	Channel OK - Channel 3a 0: Not OK ≠0: OK
		Bool, Bit 5	CH3b-COK	Channel OK - Channel 3b 0: Not OK ≠0: OK
		Bool, Bit 6	CH4a-COK	Channel OK - Channel 4a 0: Not OK ≠0: OK
		Bool, Bit 7	CH4b-COK	Channel OK - Channel 4b 0: Not OK ≠0: OK
1	2	Float	CH1a Value	Measurement value channel 1a Unit: °C, V, or mA
3	2	Float	CH1a Value Min	Minimum measurement value channel 1a Unit: °C, V, or mA
5	2	Float	CH1a Value Max	Maximum measurement value channel 1a Unit: °C, V, or mA
7	2	Float	CH1b Value	Measurement value channel 1b Unit: °C, V, or mA
9	2	Float	CH1b Value Min	Minimum measurement value channel 1b Unit: °C, V, or mA
11	2	Float	CH1b Value Max	Maximum measurement value channel 1b Unit: °C, V, or mA
13	2	Float	CH2a Value	Measurement value channel 2a Unit: °C, V, or mA
15	2	Float	CH2a Value Min	Minimum measurement value channel 2a Unit: °C, V, or mA
17	2	Float	CH2a Value Max	Maximum measurement value channel 2a Unit: °C, V, or mA

Table B-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
19	2	Float	CH2b Value	Measurement value channel 2b Unit: °C, V, or mA
21	2	Float	CH2b Value Min	Minimum measurement value channel 2b Unit: °C, V, or mA
23	2	Float	CH2b Value Max	Maximum measurement value channel 2b Unit: °C, V, or mA
25	2	Float	CH3a Value	Measurement value channel 3a Unit: °C, V, or mA
27	2	Float	CH3a Value Min	Minimum measurement value channel 3a Unit: °C, V, or mA
29	2	Float	CH3a Value Max	Maximum measurement value channel 3a Unit: °C, V, or mA
31	2	Float	CH3b Value	Measurement value channel 3b Unit: °C, V, or mA
33	2	Float	CH3b Value Min	Minimum measurement value channel 3b Unit: °C, V, or mA
35	2	Float	CH3b Value Max	Maximum measurement value channel 3b Unit: °C, V, or mA
37	2	Float	CH4a Value	Measurement value channel 4a Unit: °C, V, or mA
39	2	Float	CH4a Value Min	Minimum measurement value channel 4a Unit: °C, V, or mA
41	2	Float	CH4a Value Max	Maximum measurement value channel 4a Unit: °C, V, or mA
43	2	Float	CH4b Value	Measurement value channel 4b Unit: °C, V, or mA

Table B-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
45	2	Float	CH4b Value Min	Minimum measurement value channel 4b Unit: °C, V, or mA
47	2	Float	CH4b Value Max	Maximum measurement value channel 4b Unit: °C, V, or mA
49	2	Float	CH1a ValueRangeMin	Minimum value measuring range channel 1a
51	2	Float	CH1a ValueRangeMax	Maximum value measuring range channel 1a
53	2	Float	CH1b ValueRangeMin	Minimum value measuring range channel 1b
55	2	Float	CH1b ValueRangeMax	Maximum value measuring range channel 1b
57	2	Float	CH2a ValueRangeMin	Minimum value measuring range channel 2a
59	2	Float	CH2a ValueRangeMax	Maximum value measuring range channel 2a
61	2	Float	CH2b ValueRangeMin	Minimum value measuring range channel 2b
63	2	Float	CH2b ValueRangeMax	Maximum value measuring range channel 2b
65	2	Float	CH3a ValueRangeMin	Minimum value measuring range channel 3a
67	2	Float	CH3a ValueRangeMax	Maximum value measuring range channel 3a
69	2	Float	CH3b ValueRangeMin	Minimum value measuring range channel 3b
71	2	Float	CH3b ValueRangeMax	Maximum value measuring range channel 3b
73	2	Float	CH4a ValueRangeMin	Minimum value measuring range channel 4a
75	2	Float	CH4a ValueRangeMax	Maximum value measuring range channel 4a
77	2	Float	CH4b ValueRangeMin	Minimum value measuring range channel 4b
79	2	Float	CH4b ValueRangeMax	Maximum value measuring range channel 4b

Table B-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
81	1	16 Bit Integer Low Byte (unsigned)	CH1a Evaluation	Signal evaluation channel 1a 0: Off 1: Temperature
		16 Bit Integer High Byte (unsigned)	CH1b Evaluation	Signal evaluation channel 1b 0: Off 1: Temperature 2: Voltage 3: Current
82	1	16 Bit Integer Low Byte (unsigned)	CH2a Evaluation	Signal evaluation channel 2a 0: Off 1: Temperature
		16 Bit Integer High Byte (unsigned)	CH2b Evaluation	Signal evaluation channel 2b 0: Off 1: Temperature 2: Voltage 3: Current
83	1	16 Bit Integer Low Byte (unsigned)	CH3a Evaluation	Signal evaluation channel 3a 0: Off 1: Temperature
		16 Bit Integer High Byte (unsigned)	CH3b Evaluation	Signal evaluation channel 3b 0: Off 1: Temperature 2: Voltage 3: Current
84	1	16 Bit Integer Low Byte (unsigned)	CH4a Evaluation	Signal evaluation channel 4a 0: Off 1: Temperature
		16 Bit Integer High Byte (unsigned)	CH4b Evaluation	Signal evaluation channel 4b 0: Off 1: Temperature 2: Voltage 3: Current

Table B-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
85	1	16 Bit Integer (unsigned)	Alarm1 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
94	1	16 Bit Integer (unsigned)	Alarm2 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
103	1	16 Bit Integer (unsigned)	Alarm3 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
112	1	16 Bit Integer (unsigned)	Alarm4 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
121	1	16 Bit Integer (unsigned)	Alarm5 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
130	1	16 Bit Integer (unsigned)	Alarm6 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
139	1	16 Bit Integer (unsigned)	Alarm7 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
148	1	16 Bit Integer (unsigned)	Alarm8 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
157	1	16 Bit Integer (unsigned)	Alarm9 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
166	1	16 Bit Integer (unsigned)	Alarm10 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
175	1	16 Bit Integer (unsigned)	Alarm11 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
184	1	16 Bit Integer (unsigned)	Alarm12 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
193	1	16 Bit Integer (unsigned)	Alarm13 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
202	1	16 Bit Integer (unsigned)	Alarm14 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
211	1	16 Bit Integer (unsigned)	Alarm15 Source	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-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
220	1	16 Bit Integer (unsigned)	Alarm16 Source	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
229	1	4 Bit Integer (unsigned)	Composite 1 Mode	Calculation 1 mode: 0: None 1: Average 2: Differential 3: Maximum deviation
		4 Bit Integer (unsigned)	Composite 1 Difference channel	Calculation 1 difference channel: 0: Off 1: Channel 1A 2: Channel 1B ... 8: Channel 4B

Table B-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 0	Composite 1 Average Channel 1A	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	Composite 1 Average Channel 1B	
		Bool, Bit 2	Composite 1 Average Channel 2A	
		Bool, Bit 3	Composite 1 Average Channel 2B	
		Bool, Bit 4	Composite 1 Average Channel 3A	
		Bool, Bit 5	Composite 1 Average Channel 3B	
		Bool, Bit 6	Composite 1 Average Channel 4A	
		Bool, Bit 7	Composite 1 Average Channel 4B	
230	2	Float	Composite 1 Value	Result calculation 1
232	1	4 Bit Integer (unsigned)	Composite 2 Mode	Calculation 2 difference channel: 0: Off 1: Channel 1A 2: Channel 1B ... 8: Channel 4B
		4 Bit Integer (unsigned)	Composite 2 Difference channel	Calculation 2 difference channel: 0: Off 1: Channel 1A 2: Channel 1B ... 8: Channel 4B
		Bool, Bit 0	Composite 2 Average Channel 1A	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	Composite 2 Average Channel 1B	
		Bool, Bit 2	Composite 2 Average Channel 2A	
		Bool, Bit 3	Composite 2 Average Channel 2B	

Table B-24: Structure of group "Temperature Process - Measurement" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bool, Bit 4	Composite 2 Average Channel 3A	
		Bool, Bit 5	Composite 2 Average Channel 3B	
		Bool, Bit 6	Composite 2 Average Channel 4A	
		Bool, Bit 7	Composite 2 Average Channel 4B	
233	2	Float	Composite 2 Value	Result calculation 2
235 to 240	1		not used	Reserve

Structure of registers "Description"

The 340 registers for the channel description are occupied as shown in Table B-25. 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-25: Structure of registers "Description"

Register	Length (number of registers)	Type	Name	Description
0	15	Char[30]	Card name	see Table B-26
15	15	Char[30]	Machine name	
30	15	Char[30]	Area	
45	15	Char[30]	Plant	
60	15	Char[30]	Point ID 1	
75	20	Char[40]	Description 1[1]	
95	15	Char[30]	Point ID 2	
110	20	Char[40]	Description 2[1]	
130	15	Char[30]	Point ID 3	
145	20	Char[40]	Description 3[1]	
165	15	Char[30]	Point ID 4	
180	20	Char[40]	Description 4[1]	
200	15	Char[30]	Point ID 5	
215	20	Char[40]	Description 5[1]	
235	15	Char[30]	Point ID 6	
250	20	Char[40]	Description 6[1]	

Table B-25: Structure of registers "Description" *(continued)*

Register	Length (number of registers)	Type	Name	Description
270	15	Char[30]	Point ID 7	
285	20	Char[40]	Description 7[1]	
305	15	Char[30]	Point ID 8	
320	20	Char[40]	Description 8[1]	
319 to 340	1		not used	Reserve

1 *For future use.*

Table B-26: Usage of the Point IDs depending on the different cards and applications

Register	A6500-TP	A6500-RC	A6500-CC	A6500-UM		
				Single channel	Combined channels	Speed
0	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
30	Area	Area	Area	Area	Area	Area
45	Plant	Plant	Plant	Plant	Plant	Plant
60	Point ID Input 1A	Not in use	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
95	Point ID Input 1B	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
130	Point ID Input 2A	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
165	Point ID Input 2B	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
200	Point Id Input 3A	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
235	Point ID Input 3B	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
270	Point ID Input 4A	Not in use	Not in use	Not in use	Not in use	Not in use

Table B-26: Usage of the Point IDs depending on the different cards and applications *(continued)*

Register	A6500-TP	A6500-RC	A6500-CC	A6500-UM		
				Single channel	Combined channels	Speed
285	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
320	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-27.

Table B-27: 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)
...				
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

Table B-27: Structure of group register "A6500-UM Main Values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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-28.

Table B-28: 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

Table B-28: Structure of group register "A6500-TP Main Values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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	
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	

Table B-28: Structure of group register "A6500-TP Main Values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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-29.

Table B-29: 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])
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	

Table B-29: Structure of group register "Alarm states" *(continued)*

Register	Length (number of registers)	Type	Name	Description
43247			not used	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 **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-30.

Table B-30: 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
		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])	

Table B-30: Structure of group register "Channel OK states" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		Bit array	Channel OK state card 1 / Ch 2 (Rack 2[1])	0: Channel Not OK; 1: Channel OK
...				
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, and A6500-CC) occupies one register within the group register range as shown in Table B-31.

Table B-31: 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-32: Register "Modbus mapping version"

Register	Length (number of registers)	Type	Name	Description
43499	1	16 Bit Integer (unsigned)	Modbus mapping version number	**Version:** 0: Machine Studio Version 2.81.46 and before 1: Machine Studio Version 2.81.46 to 2.82.12 2: Machine Studio Version 2.90.x

Card configuration number

The number of configuration changes of each installed card (A6500-UM, A6500-TP, A6500-RC, and A6500-CC) occupies one register within the group register range as shown in Table B-33.

Table B-33: 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-34.

Table B-34: 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
...				

Table B-34: Register "A6500-UM Card – Speed per channel" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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-35.

Table B-35: 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-36.

Table B-36: 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

Table B-36: Register "A6500-UM Card – Special value" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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-37.

Table B-37: 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

Table B-37: Register "A6500-UM Card – Analytic values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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
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

Table B-37: Register "A6500-UM Card – Analytic values" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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
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

B.2.2 Data table "Holding register"

The holding card registers are allocated continuously to the racks and slots. Table B-39 shows the allocation of the racks and slots to the registers. The general holding register ranges are shown in Table B-38.

For every card connected to the Com Card, 4140 registers are reserved for its time data. The register numbers are allocated continuously:

Table B-38: 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 65009	Trigger for data capturing	ATG System
65100 to 65105	Current UTC time	ATG System

Table B-39: Register allocation – Time data

System Rack	Slot	Register "Time data"	Register "Settings"
Rack 1	Card 1	0 to 2069	64000 to 64105
	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	22770 to 24839	
	Card 2	24840 to 26909	
	Card 3	26910 to 28979	
	Card 4	28980 to 31049	
	Card 5	31050 to 33119	
	Card 6	33120 to 35189	
	Card 7	35190 to 37259	
	Card 8	37260 to 39329	
	Card 9	39330 to 41399	
	Card 10	41400 to 43469	
	Card 11	43470 to 45539	

1 *Only if a second A6500-SR is connected to the Com Card*

Table B-40: 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	
	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-41. 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.

Table B-41: 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	8 Bit Integer (unsigned)	Time value 1	1. value of the time data (Channel 1)
11	1	8 Bit Integer (unsigned)	Time value 2	2. value of the time data (Channel 1)
12	1	8 Bit Integer (unsigned)	Time value 3	3. value of the time data (Channel 1)
...	...	...	...	...
1033	1	8 Bit Integer (unsigned)	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)
1037	2	32 Bit Integer (unsigned)	Current time	Unix time of the current data set (Channel 2)[1]

Table B-41: Structure of registers "Time data" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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	8 Bit Integer (unsigned)	Time value 1	1. value of the time data (Channel 2)
1046	1	8 Bit Integer (unsigned)	Time value 2	2. value of the time data (Channel 2)
1047	1	8 Bit Integer (unsigned)	Time value 3	3. value of the time data (Channel 2)
...	...	...	...	...
2068	1	8 Bit Integer (unsigned)	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-42. These registers are writable and readable.

Table B-42: Structure of registers "Software inputs"

Register offset[1]	Length (number of registers)	Type	Name	Description
0	1	Bool	SWI1	Use these registers to switch the software inputs of the A6500-RC Relay Card.
1	1	Bool	SWI2	

Table B-42: Structure of registers "Software inputs" *(continued)*

Register offset[1]	Length (number of registers)	Type	Name	Description
2	1	Bool	SWI3	0: Off 1: On These registers are writable and readable.
3	1	Bool	SWI4	
4	1	Bool	SWI5	
5	1	Bool	SWI6	
6	1	Bool	SWI7	
7	1	Bool	SWI8	
8	1	Bool	SWI9	
9	1	Bool	SWI10	
10	1	Bool	SWI11	
11	1	Bool	SWI12	
12	1	Bool	SWI13	
13	1	Bool	SWI14	
14	1	Bool	SWI15	
15	1	Bool	SWI16	
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"

The 50 holding registers to switch the software inputs of A6500-UM Universal Measurements Cards are occupied as shown in Table B-43. These registers are writable and readable.

Table B-43: Structure of registers "Software switches"

Register offset[1]	Length (number of registers)	Type	Name	Description
0	1	Bool	Limit multiplier	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	Bypass	
2	1	Bool	Bypass DO 1-2	
3	1	Bool	Bypass DO 4-5	

Table B-43: Structure of registers "Software switches" *(continued)*

Register offset[1]	Length (number of registers)	Type	Name	Description
4	1	16 Bit Integer (unsigned)	Operation mode	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 "Settings"

The 105 holding registers are general registers for the complete system and occupied as shown in Table B-44. 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-44: 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

Table B-44: Structure of registers "Settings" *(continued)*

Register	Length (number of registers)	Type	Name	Description
64001	1	16 Bit Integer	Reset latch	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)
64002	1	16 Bit Integer	Reset Max Input Channel Temp	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 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)

Table B-44: Structure of registers "Settings" *(continued)*

Register	Length (number of registers)	Type	Name	Description
		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)
		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)

Table B-44: Structure of registers "Settings" *(continued)*

Register	Length (number of registers)	Type	Name	Description
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)
...				
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"

The 85 holding registers are registers for triggering data collection tasks and occupied as shown in Table B-45.

Table B-45: Structure of registers "Trigger"

Register	Length (number of registers)	Type	Name	Description
65000	1	16 Bit Integer (signed)	Command Collection Trigger 1	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 Collection Trigger 2	
65002	1	16 Bit Integer (signed)	Command Collection Trigger 3	
65003	1	16 Bit Integer (signed)	Command Collection Trigger 4	
65004	1	16 Bit Integer (signed)	Command Collection Trigger 5	
65005	1	16 Bit Integer (signed)	Command Collection Trigger 6	
65006	1	16 Bit Integer (signed)	Command Collection Trigger 7	
65007	1	16 Bit Integer (signed)	Command Collection Trigger 8	
65008	1	16 Bit Integer (signed)	Command Collection Trigger 9	
65009	1	16 Bit Integer (signed)	Command Collection Trigger 10	
65010 to 65024	1		not used	Reserve
65025	1	16 Bit Integer (signed)	Software trigger command task 1	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
65026	1	16 Bit Integer (signed)	Software trigger command task 2	
65027	1	16 Bit Integer (signed)	Software trigger command task 3	
65028	1	16 Bit Integer (signed)	Software trigger command task 4	
65029	1	16 Bit Integer (signed)	Software trigger command task 5	
65030	1	16 Bit Integer (signed)	Software trigger command task 6	
65031	1	16 Bit Integer (signed)	Software trigger command task 7	
65032	1	16 Bit Integer (signed)	Software trigger command task 8	
65033	1	16 Bit Integer (signed)	Software trigger command task 9	

Table B-45: Structure of registers "Trigger" *(continued)*

Register	Length (number of registers)	Type	Name	Description
65034	1	16 Bit Integer (signed)	Software trigger command task 10	These registers are writable and readable.
65035 to 65049	1		not used	Reserve
65050	1	16 Bit Integer (unsigned)	Software trigger state task 1	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)	Software trigger state task 2	
65052	1	16 Bit Integer (unsigned)	Software trigger state task 3	
65053	1	16 Bit Integer (unsigned)	Software trigger state task 4	
65054	1	16 Bit Integer (unsigned)	Software trigger state task 5	
65055	1	16 Bit Integer (unsigned)	Software trigger state task 6	
65056	1	16 Bit Integer (unsigned)	Software trigger state task 7	
65057	1	16 Bit Integer (unsigned)	Software trigger state task 8	
65058	1	16 Bit Integer (unsigned)	Software trigger state task 9	
65059	1	16 Bit Integer (unsigned)	Software trigger state task 10	
65060 to 65061	1		not used	Reserve
65062	1	16 Bit Integer (unsigned)	Software trigger state task 1	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)	Software trigger state task 2	
65064	1	16 Bit Integer (unsigned)	Software trigger state task 3	
65065	1	16 Bit Integer (unsigned)	Software trigger state task 4	
65066	1	16 Bit Integer (unsigned)	Software trigger state task 5	
65067	1	16 Bit Integer (unsigned)	Software trigger state task 6	
65068	1	16 Bit Integer (unsigned)	Software trigger state task 7	
65069	1	16 Bit Integer (unsigned)	Software trigger state task 8	
65070	1	16 Bit Integer (unsigned)	Software trigger state task 9	
65071	1	16 Bit Integer (unsigned)	Software trigger state task 10	
65072 to 65074	1		not used	Reserve
65075	1	16 Bit Integer (unsigned)	Software trigger pre time task 1	Only available if the Com Card in the left-most communication card slot is active. Minimal available pre time of all channels to be
65076	1	16 Bit Integer (unsigned)	Software trigger pre time task 2	
65077	1	16 Bit Integer (unsigned)	Software trigger pre time task 3	

Table B-45: Structure of registers "Trigger" *(continued)*

Register	Length (number of registers)	Type	Name	Description
65078	1	16 Bit Integer (unsigned)	Software trigger pre time task 4	grabbed assigned to a collection task. Unit: seconds
65079	1	16 Bit Integer (unsigned)	Software trigger pre time task 5	
65080	1	16 Bit Integer (unsigned)	Software trigger pre time task 6	
65081	1	16 Bit Integer (unsigned)	Software trigger pre time task 7	
65082	1	16 Bit Integer (unsigned)	Software trigger pre time task 8	
65083	1	16 Bit Integer (unsigned)	Software trigger pre time task 9	
65084	1	16 Bit Integer (unsigned)	Software trigger pre time task 10	
65085 to 65086	1		not used	Reserve
65087	1	16 Bit Integer (unsigned)	Software trigger pre time task 1	Only available if the Com Card in the right communication card slot is active. Minimal available pre time of all channels to be grabbed assigned to a collection task. Unit: seconds
65088	1	16 Bit Integer (unsigned)	Software trigger pre time task 2	
65089	1	16 Bit Integer (unsigned)	Software trigger pre time task 3	
65090	1	16 Bit Integer (unsigned)	Software trigger pre time task 4	
65091	1	16 Bit Integer (unsigned)	Software trigger pre time task 5	
65092	1	16 Bit Integer (unsigned)	Software trigger pre time task 6	
65093	1	16 Bit Integer (unsigned)	Software trigger pre time task 7	
65094	1	16 Bit Integer (unsigned)	Software trigger pre time task 8	
65095	1	16 Bit Integer (unsigned)	Software trigger pre time task 9	
65096	1	16 Bit Integer (unsigned)	Software trigger pre time task 10	
65097 to 65099	1		not used	Reserve

Structure of the registers "Current time"

The six holding registers are registers for the current UTC time and occupied as shown in Table B-46.

Note
In systems with redundant communication, check which card is active before setting the device time. The time can be only set at active A6500-CC Com Cards.

Table B-46: Structure of registers "Current time"

Register	Length (number of registers)	Type	Name	Description
65100	1	16 Bit Integer	Current time - 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	Current time - Month	
65102	1	16 Bit Integer	Current time - Day	
65103	1	16 Bit Integer	Current time - Hour	
65104	1	16 Bit Integer	Current time - Minute	
65105	1	16 Bit Integer	Current time - Second	
65106	1	16 Bit Integer	Active	Indication whether the Com Card in the left-most communication card slot is active. 1: active 0: passive
65110	1	16 Bit Integer	Current time - 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	Current time - Month	
65112	1	16 Bit Integer	Current time - Day	
65113	1	16 Bit Integer	Current time - Hour	
65114	1	16 Bit Integer	Current time - Minute	
65115	1	16 Bit Integer	Current time - Second	
65116	1	16 Bit Integer	Active	Indication whether the Com Card in the right communication card slot is active. 1: active 0: passive

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