

Technical Information

MEAC300 Add-ons

Auxiliary components for MEAC300



Document identification

Product name: MEAC300
Product version: 4.1
Add-ons: MEx
MEAC Redundancy package
MEAC UniversalModbus
MEAC-ERT
MEAC-DAU
WAGO Field Module
MEAC Emission PC

Manufacturer

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Original document

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Contents

1	About this document.....	7
1.1	Function of this document.....	7
1.2	Scope.....	7
1.3	Target groups	7
2	MEx	8
2.1	Purpose, functional principle.....	8
2.2	Installing MEx Client and MEx Service	10
2.2.1	System requirements	10
2.2.2	Execute the installation program	10
2.2.3	Program folder	10
2.3	Using the MEx Client	11
2.3.1	Controlling and configuring reports with the MEx Client.....	11
2.3.2	Creating data containers with selected data.....	13
2.3.3	Control functions in the MEx Client	14
2.3.4	Log functions in the MEx Client	15
2.4	Installing the MEx Configurator	16
2.4.1	Executing the installation program	16
2.4.2	Stopping/starting the MEx Service manually	16
2.5	Configuring report projects with the MEx Configurator	16
2.5.1	Basic functions in the MEx Configurator (overview).....	16
2.5.2	Necessary steps for a new report project (overview)	16
2.5.3	Creating an “Excel” document template	17
2.5.4	Starting the MEx Configurator	18
2.5.5	Creating/selecting a report project.....	18
2.5.6	Configuring the control of the report project.....	19
2.5.7	Determining basic settings for the report project	20
2.5.8	General functions for report projects	21
2.5.9	Configuring the contents of reports	22
2.5.10	Configuring a representation type individually	28
2.5.11	Help functions for editing	34
2.5.12	List of representation types (with explanation)	35
2.5.13	List of representation options (with explanation).....	39

3	MEAC-UniversalModbus.....	40
3.1	Guideline for program module “MEAC-UniversalModbus”	40
3.2	Short information on the Modbus protocol	41
3.3	Information on MEAC-UniversalModbus.....	42
3.3.1	General functions.....	42
3.3.2	System requirements.....	42
3.3.3	Restrictions to Modbus standard	43
3.3.4	Extensions to Modbus standard	43
3.3.5	Implementation of Guideline VDI 4201, Sheet 3	43
3.3.6	Modbus transfer functions supported.....	44
3.3.6.1	Function Codes supported	44
3.3.6.2	Exception Codes supported	44
3.3.6.3	Modbus messages supported	45
3.3.7	Linking the MEAC system with MEAC-UniversalModbus	46
3.4	Installing hardware interfaces	47
3.5	Adapting the MEAC evaluation configuration for Modbus	47
3.5.1	Adding a MEAC interface for Modbus.....	47
3.5.2	Configuring the Modbus interface	48
3.5.3	Configuring MEAC components for MEAC-UniversalModbus	49
3.5.4	Configuring the internal statuses for MEAC-UniversalModbus ..	49
3.6	Configuring the Modbus functions	50
3.6.1	Exporting/importing Modbus configurations	50
3.6.2	Configuring Modbus Slaves	51
3.6.3	Configuring Modbus messages	52
3.6.4	Configuring Modbus inputs.....	53
3.6.4.1	Configuring digital Modbus inputs	53
3.6.4.2	Configuring numeric Modbus inputs.....	54
3.6.5	Configuring Modbus outputs	56
3.6.5.1	Configuring digital Modbus outputs.....	56
3.6.5.2	Configuring numeric Modbus outputs	57
3.6.6	Configuring hardware outputs for Modbus	58
3.7	Activating MEAC-UniversalModbus	58
3.8	Modbus operating functions	59
3.8.1	Modbus program window: Operating functions	59
3.8.2	Modbus program window: Modbus Status.....	60
3.9	Special functions for Guideline VDI 4201	61
3.9.1	Brief information on guideline VDI 4201	61
3.9.2	Functions supported for guideline VDI 4201.....	61
3.9.3	VDI 4201: Create prerequisites (overview)	61
3.9.4	VDI 4201: Using the special functions	62
3.9.5	VDI 4201: Using reference materials	63
3.9.6	VDI 4201: Viewing the label	64

4	MEAC-Redundanzpaket	65
4.1	General information on the MEAC-Redundanzpaket	65
4.1.1	Purpose of the MEAC-Redundanzpaket.....	65
4.1.2	Terms and functions in MEAC-Redundanzpaket.....	67
4.1.3	Interaction of the redundant Emission PCs.....	68
4.1.4	Redundancy upgrade for MEAC2000 EU (overview).....	68
4.2	Installing hardware for redundant operation	69
4.2.1	Installing redundancy in emission measurement (note)	69
4.2.2	Preparing redundant Emission PCs	69
4.2.3	Connecting MEAC data acquisition units (when required)	69
4.3	Installing software for redundant operation	69
4.3.1	Application options of the installation program	69
4.3.2	Installing the MEAC-Redundanzpaket	70
4.4	Customizing the evaluation configuration	71
4.4.1	Customizing components	71
4.4.2	Configuring status output of redundancy functions (if required) ...	72
4.5	Operating with redundancy functions	72
4.5.1	Starting redundant operation	72
4.5.2	Checking/controlling status of redundancy functions	73
4.5.3	Influencing automatic Master/Standby switching	74
4.5.4	Viewing SyncService status.....	75
4.5.5	Viewing Watchdog status	75
5	Emission data remote transfer (MEAC-EFÜ)	76
5.1	Introduction to Emission data remote transfer	76
5.1.1	Purpose of MEAC-EFÜ functions	76
5.1.2	Terms	76
5.1.3	Sequence of a data transmission	76
5.1.4	Data transfer security.....	77
5.2	MEAC-EFÜ-Functions (overview).....	77
5.3	Configuring ERT functions	78
5.3.1	MEAC internal preparations	78
5.3.2	Configuring a plant for MEAC-EFÜ.....	78
5.3.3	Configuring components for ERT	79
5.3.4	Information on calculating emission values.....	80
5.3.4.1	Basis of the emission quantity calculation	80
5.3.4.2	Information and standardization in the EU Protocol ...	80
5.3.5	Configuring the MEAC-EFÜ	82
5.3.6	Configuring an ERT connection via modem	83
5.3.7	Configuring the ERT connection via Internet	84

5.4	Initiating the first modem connection to the G system.....	85
5.5	Displaying ERT information	86
5.5.1	Viewing ERT data models.....	86
5.5.2	Viewing ERT measured values.....	87
5.6	Messages via ERT.....	88
5.6.1	Processing and releasing messages	88
5.6.2	Composing messages	89
5.6.3	Displaying transmitted messages	89
5.7	Error conditions and behavior	90
6	Hardware information.....	92
6.1	PC specifications	92
6.1.1	Emission PC	92
6.1.2	Workplace PC	92
6.2	Connecting the data acquisition unit and Emission PC.....	93
6.2.1	Checking/connecting inputs and outputs.....	93
6.2.2	Connection options	93
6.3	Information on MEAC data acquisition units.....	94
6.3.1	Pin assignment: Analog input board	94
6.3.2	Pin assignment:Status input board	95
6.3.3	Pin assignment: Analog output board	96
6.3.4	Pin assignment: Status output board	97
6.3.5	Specifications for plug-in boards.....	98
6.4	Connections via field module (general)	99
6.4.1	Field module properties	99
6.4.2	Modbus data transfer with field modules	99
6.5	Information on WAGO field modules.....	100
6.5.1	Hardware components of a WAGO field module.....	100
6.5.2	Available IO modules.....	100
6.5.3	Example configuration of a WAGO field module	100
6.5.4	Configuring a WAGO field module (DIP switch).....	101

1 About this document

1.1 Function of this document

This document describes several software options for Auxiliary components for MEAC300.

Which software options are included in each scope of delivery is specified in the information supplied with the individual MEAC system.

1.2 Scope

This document is an addendum to “Operating Instructions Auxiliary components for MEAC300” and “Technical Information Auxiliary components for MEAC300”. It supplements these two documents with information on software options and hardware.

- Observe the supplied “Operating Instructions Auxiliary components for MEAC300” and “Technical Information Auxiliary components for MEAC300”.



The “MEAC300 Add-ons” Operating Instructions also specify all further documents belonging to the individual MEAC system.



NOTE:

- Pay primary attention to any individual information provided.
-

1.3 Target groups

This document is intended for trained MEAC users.

2 MEx

2.1 Purpose, functional principle

Summary of selected data

MEx can filter data out of a MEAC system and summarize these in reports.

MEx collects the desired data from the saved emission data of an Emission PC. The type of data and time of collection configured in report projects.

MEx saves the collected data in a single file. These data containers can remain permanently saved.

Configurable reports

MEx creates a report by converting the content of a data container into “Excel” format (example see “Example of a MEx report in “Excel” format (extract)”, page 9). Form and content of these reports are configurable. Finished reports can be printed automatically.

Evaluation functions

MEx provides own evaluation functions for reports which supplement the MEAC program in a useful way. Example: Subsequent counting of certain events or states.

Program modules

Program module	Status	Function
MEx Service	Windows service	Collecting data from the Emission PC
MEx Client	Application program	- Monitoring MEx Service - Controlling/starting reports
MEx Configurator	Application program	- Configuring MEx Service - Configuring reports

Table 1: MEx program modules

Fig. 1: MEx functional principle

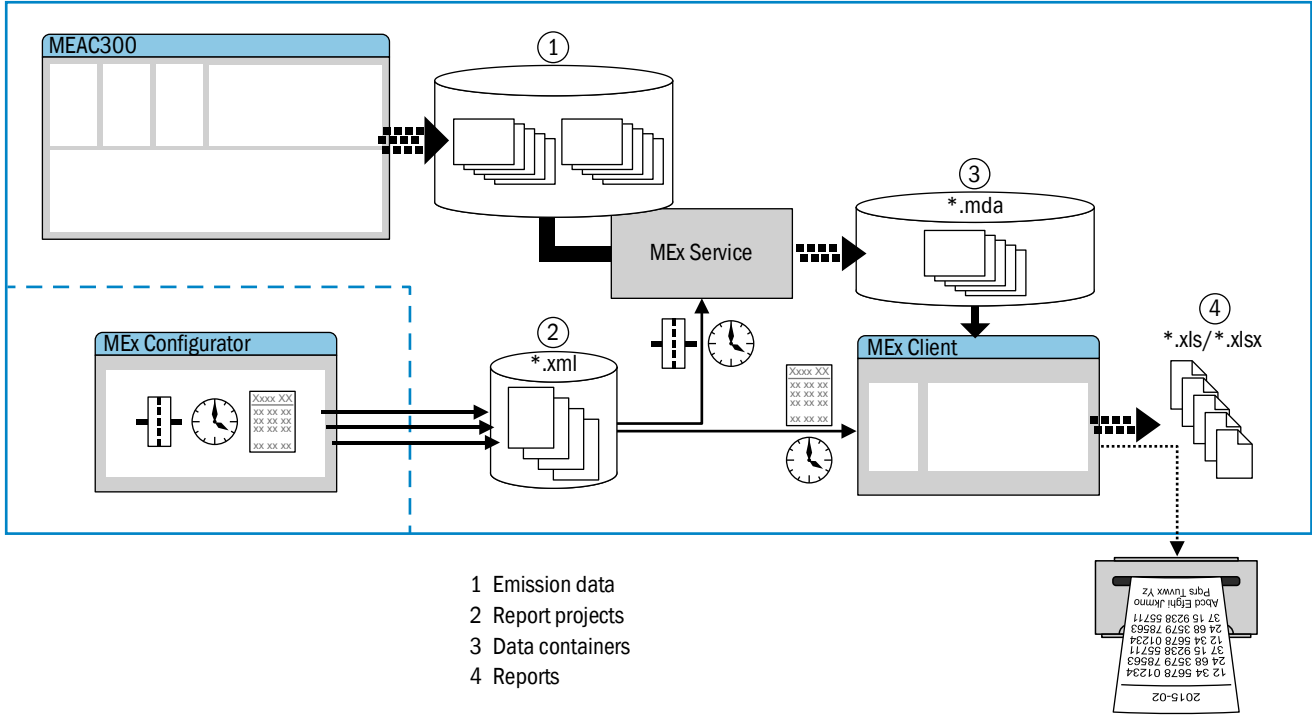


Fig. 2: Example of a MEx report in "Excel" format (extract)

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2.2 Installing MEx Client and MEx Service

- Execute this procedure on each Emission PC for which collected data is required.

2.2.1 System requirements

- Emission PC with MEAC software
- Free memory for data containers

2.2.2 Execute the installation program

- 1 Connect delivered data medium and Emission PC (e.g. insert the DVD in the DVD drive). Search for the installation program on the data medium.
 - 2 Start the installation program with administrator rights.
 - 3 Select the installation component “MEx Service”.
- » MEx Service is automatically established as Windows service (MEx300Svc.exe).



After installation, the file MEx300Svc.Install.bat can be found in the selected program folder. If required, the MEx Service can be installed exclusively with this file (without MEx Client and MEx Configurator; execute with administrator rights).

2.2.3 Program folder

Folder	Contents
\Config	Configuration data of the MEx Configurator: • Basic settings (*.ini) • Representation types (Itm.xml) • Representation options (opt.xml) • Global options (glb.xml)
\Log	• Log files of the MEx Service
\Programm	• MEx program modules • Batch files for the MEx Service (*.bat)
\Project	• Configuration files of the MEx projects (*.xml)
\Sprache	• Files for the display language (*.sil)
\System [1]	• Data containers • MEAC configuration, adapted for MEx
\Transfer	• Reports (*.xls/*xlsx)[2]
\Vorlage	• Document template for “Excel” files

Table 2: MEx program folder

[1] One subfolder for each configured report project (folder name = name of the report project, however, without spaces and special characters).

[2] Determine the standard format see “Configuring report projects with the MEx Client (with example data)”, page 12.

2.3 Using the MEx Client



The application program “MEx Client” starts automatically when the MEAC program starts. The program window is permanently visible (if it is not covered by other program windows) and can only be closed with a password (see “Control functions in the MEx Client”, page 14).

► To start MEx Client manually: Execute MEx300C1t.exe.

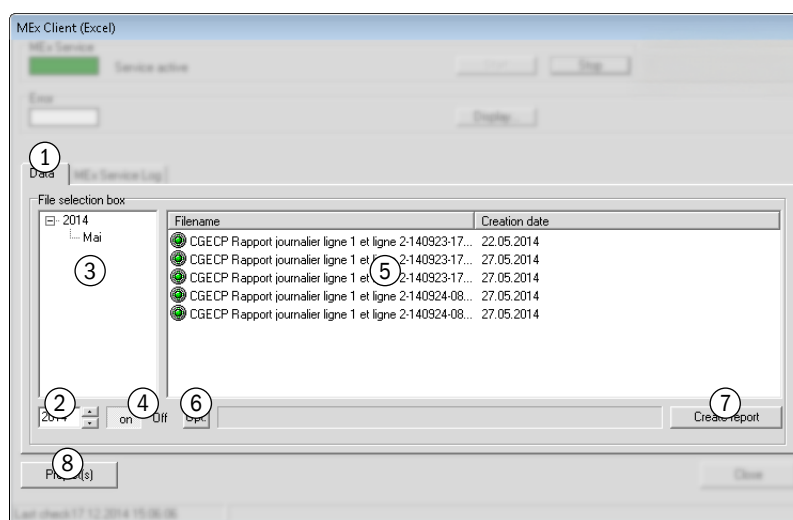


The language of the user interface is used automatically by the MEAC program.

2.3.1 Controlling and configuring reports with the MEx Client

- 1 Activate the program window of the MEx Client (click).
- 2 Select the data functions (see Fig. 3).

Fig. 3: Data functions in the MEx Client



1	Data functions
2	► Select the desired year.
3	► Mark the desired report period (click). [1]
4	► Activate/deactivate reports. [2]
5	List of saved data containers (*.mda) for the selected report period. ► To select data containers: Mark the relevant line (click).
6	► Update the list of data containers. [3]
7	► Generate reports from the selected data container (“Excel” files).
8	► Adapting the control of reports (see “Configuring report projects with the MEx Client (with example data)”, page 12).

[1] The list shows the periods of the selected year in which MEx executed report projects.

[2] In the activated state, a report (“Excel” file) is automatically created from each new data container.

[3] Usage: When MDA files were manually added or deleted in the relevant folder.

Fig. 4: Configuring report projects with the MEx Client (with example data)

1	List of saved report projects ► To select a report project: Mark the desired report project (click).
2	File name of the data containers [1]
3	► Select/change the document template for reports ("Excel" format).
4	► Select/change the folder in which the reports are saved ("Excel" files).
5	► Select the time control for regular, automatic creation of data containers. [2]
6	Path to the folder of the MEAC program
7	► Execute the displayed report project automatically (as configured).
8	► Send created reports automatically to the standard printer of the Emission PC. [3]
9	► Select whether the data containers are to be deleted automatically.
10	► Enter a comment on the displayed report project.
11	► Save settings.
12	see "Creating data containers with selected data", page 13

[1] The file name extension is added automatically. Also applies to "Excel" files created therefrom.

[2] The data originate from the last complete report period. (When an interval control is activated: The first report period starts after the current 10-minute interval).

[3] Only the contents of the report "activated" in the document template are printed (see "Creating an "Excel" document template", page 17).

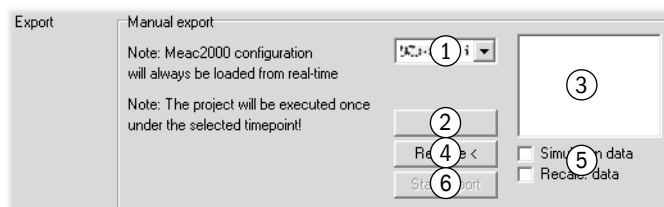


Configuring the contents of the reports, see "Configuring report projects with the MEx Configurator", page 16.

2.3.2 Creating data containers with selected data

- 1 Activate the program window of the MEx Client (see “Controlling and configuring reports with the MEx Client”, page 11).
- 2 Call up the report projects (see “Data functions in the MEx Client”, page 11).
- 3 Select a report project (see “Configuring report projects with the MEx Client (with example data)”, page 12).
- 4 Select the desired functions (see Fig. 5).

Fig. 5: Creating data containers with selected data



1	► Select the desired report period. [1]
2	► Add the selected report period to the list of report jobs.
3	List of selected report jobs
4	► Delete the marked report job.
5	► Collect simulated data[2] or only reprocessed data instead of real-time data.
6	► Create the data containers with these data. [3]

[1] The selection options originate from the configuration of the report project.

[2] Uses the emission values from the simulation mode of the MEAC program (virtual values). All other values for the report originate from the current evaluation configuration of the MEAC program (e.g. configured limit values).

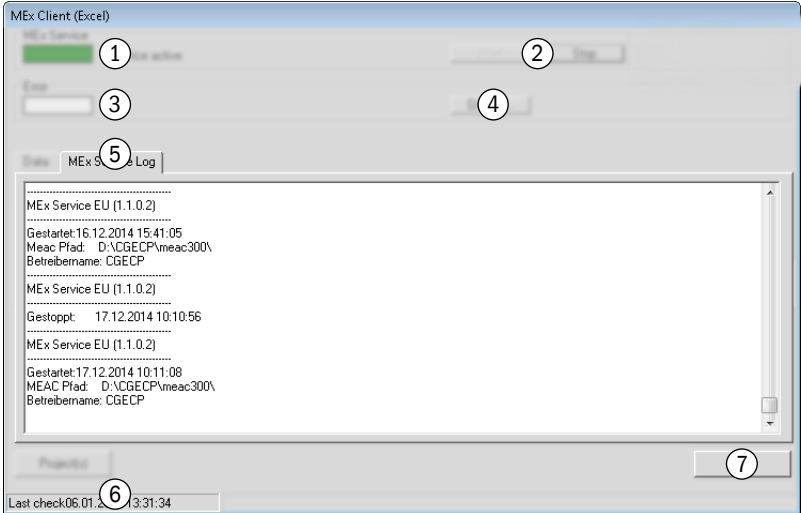
[3] Creates the data containers which contain the desired data.

2.3.3 Control functions in the MEx Client

+i The control functions are for service purposes and skilled personnel only. These functions are not needed during normal, trouble-free operation.

- 1 Activate the program window of the MEx Client (click).
- 2 Select the control functions (see Fig. 6).

Fig. 6: MEx Client: Control functions



1	Operating display for MEx Service
2	► Stop/start MEx Service.
3	Malfunction indication for MEx Service
4	► Call up the Log functions (see “Log functions in the MEx Client”, page 15).
5	Current content of the Log file of the MEx Service.
6	Timepoint when the MEx Service was last active
7	► Terminating the MEx Client: 1 Click the button. Confirm the safety prompt. 2 Enter the password for the MEAC program.

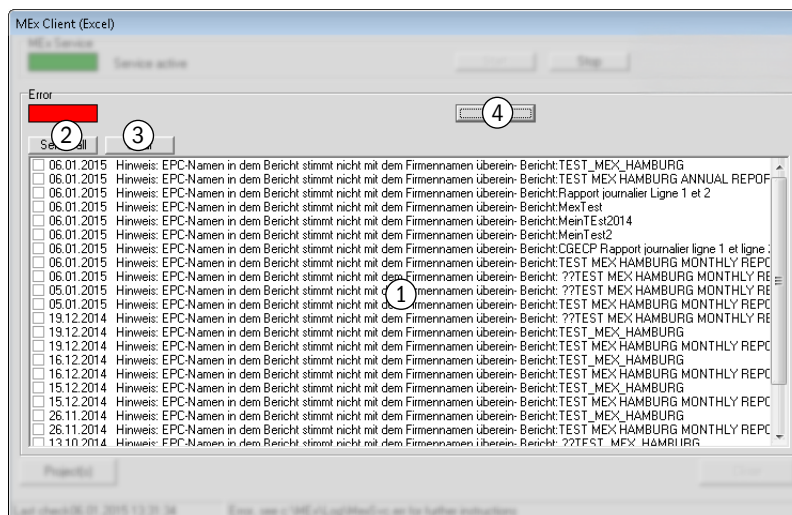
2.3.4 Log functions in the MEx Client



The Log functions are for skilled personnel only.

- 1 Activate the program window of the MEx Client (click).
- 2 Call up the Log functions (see “MEx Client: Control functions”, page 14).

Fig. 7: MEx Client: Log functions



1	Saved Log entries of the MEx Client ^[1] ► To mark individual Log entries: Click the checkbox.
2	► Mark all Log entries.
3	► Delete the marked Log entries.
4	► Go back to the control functions (see “Control functions in the MEx Client”, page 14).

[1] Current content of file “MexSvc.err”.

2.4 Installing the MEx Configurator

- Execute this procedure on the PC on which the automatic data collection and data output are to be configured.



- The MEx Configurator does not need to be installed when suitable report projects were delivered by the manufacturer.
- The MEx Configurator only needs to be installed on one PC when report projects are to be created for several connected Emission PCs.

2.4.1 Executing the installation program

- 1 Connect delivered data medium and Emission PC (e.g. insert the DVD in the DVD drive).
- 2 Search for and start the installation program on the data medium.
- 3 Select the installation component "MEx Configurator".
- 4 Follow the instructions of the installation program.

2.4.2 Stopping/starting the MEx Service manually



The installation program ensures that the MEx Service starts automatically with the operating system.

- *To stop the MEx Service:* Execute MEX300Svc.stop.bat with administrator rights.
 ► *To start the MEx Service:* Execute MEX300Svc.start.bat with administrator rights.

2.5 Configuring report projects with the MEx Configurator

2.5.1 Basic functions in the MEx Configurator (overview)

- Select the data to appear in the reports.
- Determine the organization of the data in the reports.
- Configure the automatic time control for reports.

2.5.2 Necessary steps for a new report project (overview)

Step 1:	► <i>If required:</i> Create an individual document template for the reports ("Excel" format).	see "Creating an "Excel" document template", page 17
Step 2:	► Create a new report project or select an existing report project for editing.	see "Creating/selecting a report project", page 18
Step 3:	► Configure the report project.	see "Configuring the control of the report project", page 19
Step 4:	► Determine the data the report should contain.	see "Configuring the contents of reports", page 22

2.5.3 Creating an “Excel” document template

Content of a document template for MEx

- Number and names of Table sheets of the report
- Frames and colors
- *If required:* Calculation functions and graphic representation functions
- *If required:* Embedded graphs (e.g. logo)

These elements are used in all reports configured with the relevant document template.

Creating a document template

- 1 Use “Microsoft Excel”.
- 2 *To create a new document template:* Create a new “Excel” file.
To change an existing document template: Open the relevant document template (*.xlt/*.xltx).
- 3 Create the desired number of Table sheets.
- 4 Determine the names of the Table sheets.
- 5 Position the texts and objects which should appear in the data outputs on the Table sheets.
- 6 Save the completed file as “Excel” document template (*.xlt/*.xltx) in the folder for MEx document templates (see “Program folder”, page 10).

Enabling automatic printing

- “Activate” all Table sheets in the document template whose contents should appear in the automatically printed reports (see “Controlling and configuring reports with the MEx Client”, page 11/see “Configuring report projects with the MEx Client (with example data)”, page 12).



When MEx sends reports automatically to the standard printer of the Emission PC (see “Controlling and configuring reports with the MEx Client”, page 11/see “Configuring report projects with the MEx Client (with example data)”, page 12), only those Table sheets of the report “activated” in the document template are printed.



To activate a Table sheet in “Excel”: Press and hold down the [Ctrl] button and click the name of the Table sheet. ^[1]

[1] Applies for “Excel” versions known to the manufacturer.

2.5.4 Starting the MEx Configurator

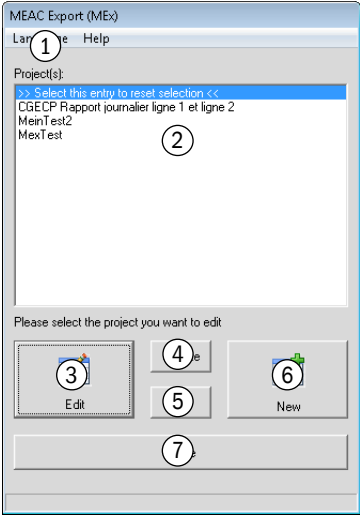
- Execute MEx300Config.exe.



The display language can be individually selected in the MEx Configurator.

2.5.5 Creating/selecting a report project

Fig. 8: Creating/managing report projects with the MEx Configurator (with example data)



1	► Select the display language for the MEx Configurator.
2	► Select a saved report project. [1]
3	► Edit the marked report project (see “Configuring the control of the report project”, page 19).
4	► Update the list of saved report projects. [2]
5	► Delete the selected report project. [3]
6	► Create a new report project. [4]
7	► Terminate the MEx Configurator.

[1] *To edit the report project:* Doubleclick on the name of the desired report project. Or mark the desired project (click with the mouse), then select [3].
[2] *Usage:* When project files were added or deleted in the relevant folder.
[3] Deletes the relevant project file (data containers and reports remain).
[4] The function allows starting with a copy of the marked project.

2.5.6 Configuring the control of the report project

Fig. 9: Configuring the report project with the MEx Configurator: Data control, time control

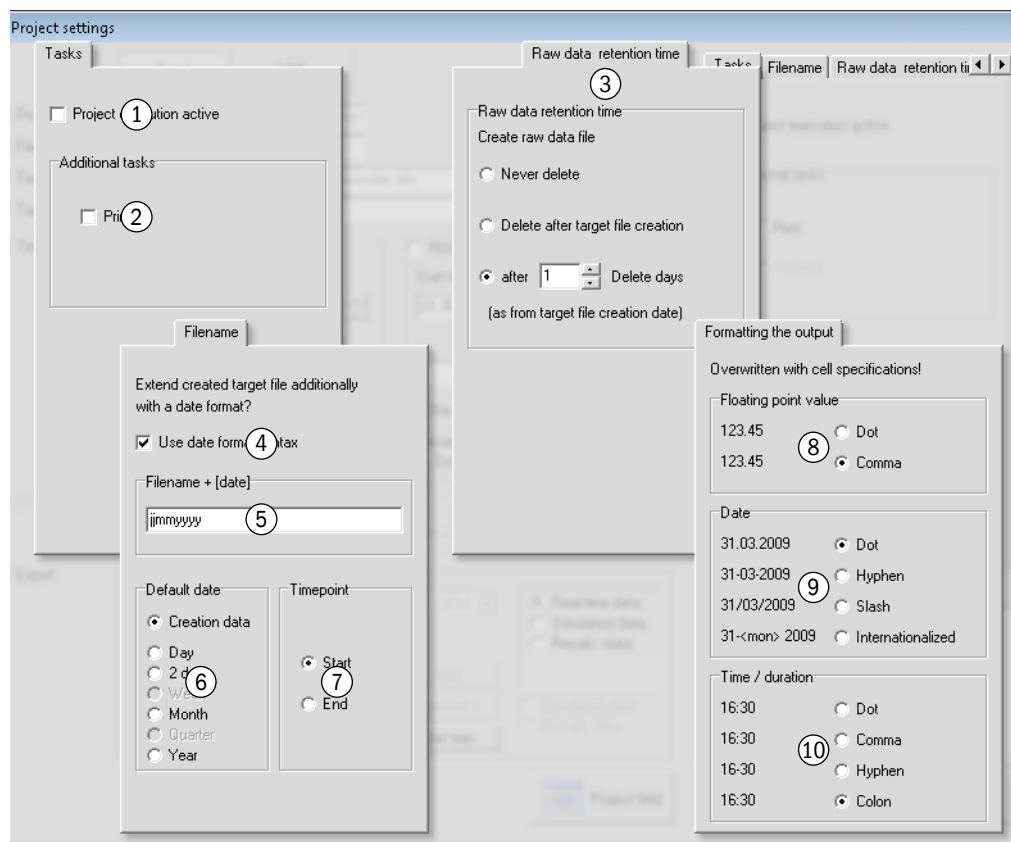
1	Name of the report project (see “Creating/selecting a report project” , page 18)
2	File name of the data containers [1]
3	► Select/change the document template for reports in “Excel” format.
4	► Select/change the folder in which the reports are saved (“Excel” files).
5	► Select the time control for regular, automatic creation of data containers. [2]
6	Path to the folder of the MEAC program
7	► If required: Change the path to the MEAC program.
8	► Select basic settings (see “Determining basic settings for the report project” , page 20).
9	► Enter a comment on the displayed report project.
10	► Configure the content of the reports of this report project (see “Configuring the contents of reports” , page 22).
11	► Save the displayed configuration of the report project.
12	see “Creating data containers with selected data” , page 13

[1] The file name extension is added automatically. Also applies to “Excel” files created therefrom.

[2] The data originate from the last complete report period. (When an interval control is activated: The first report period starts after the current 10-minute interval.)

2.5.7 Determining basic settings for the report project

Fig. 10: Configuring the report project with the MEx Configurator: Basic settings

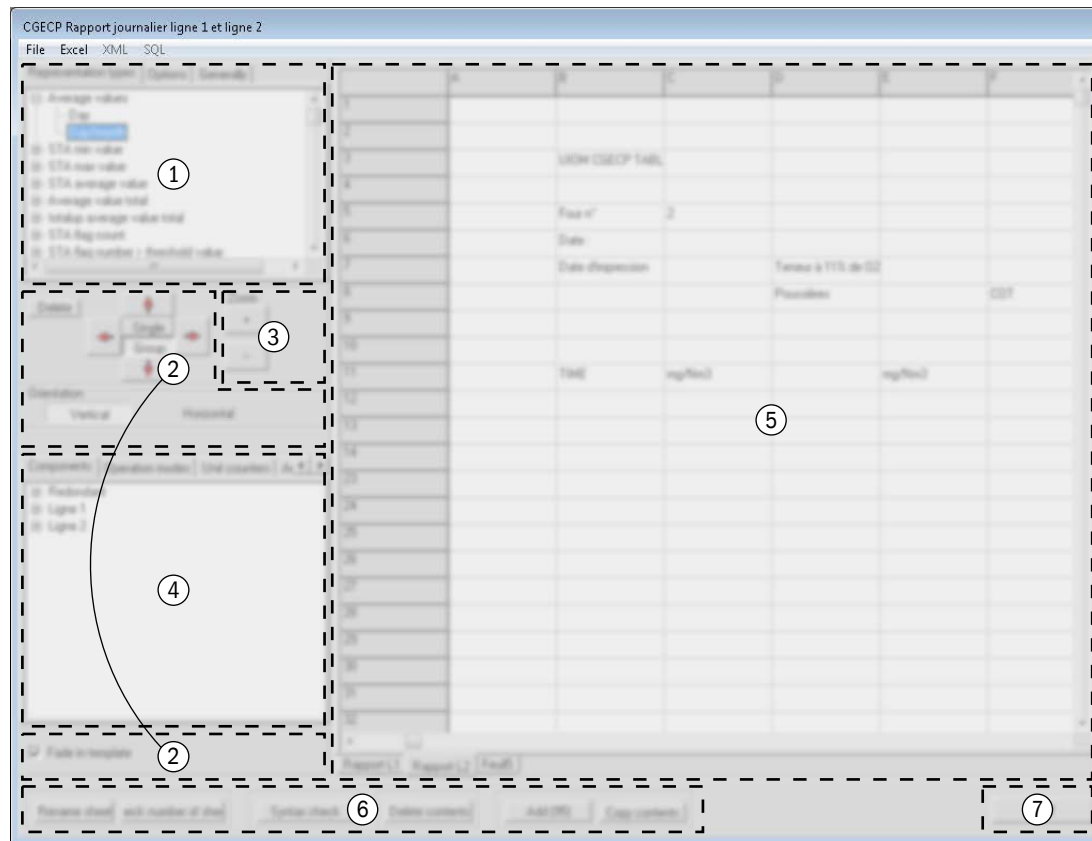


1	► Execute this report project automatically.
2	► Send reports of this report project automatically to the standard printer of the Emission PC.
3	► Select whether the data containers of this report project are saved or deleted automatically.
4	► Supplement the file names of the "Excel" files automatically with a timestamp.
5	► Define the number format of the timestamp.
6	► Select which date the timestamp represents (report date or report period).
7	► Select whether the timestamp represents the beginning or the end of the report period.
8	► Define which decimal character is used in the reports. [1]
9	► Define how the date is displayed in the reports. [1]
10	► Define how the time is displayed in the reports. [1]

[1] Individual settings have priority (see "Configuring report content with the MEx Configurator: Determining settings for a data group", page 31).

2.5.8 General functions for report projects

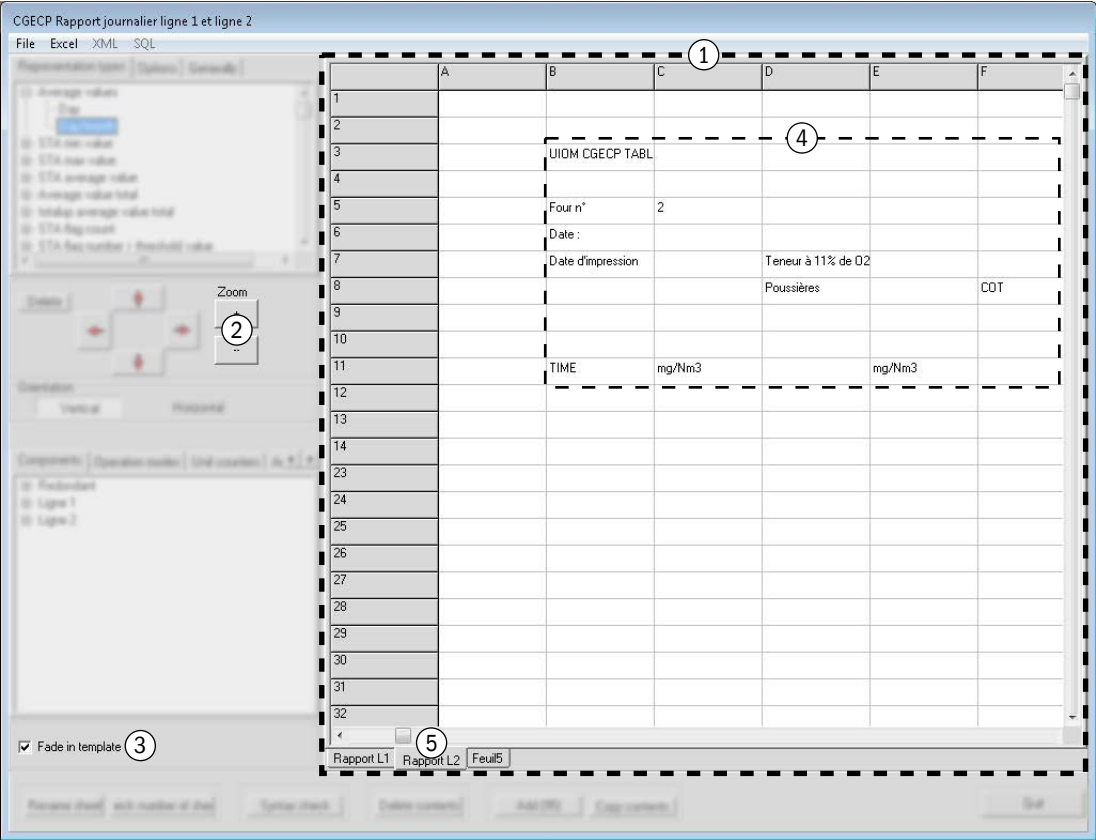
Fig. 11: Configuring a report with the MEx Configurator: Overview



- | | |
|---|---|
| 1 | Selectable representation types (see “Configuring report content with the MEx Configurator: Step 2”, page 23)/ representation options (see “Configuring report content with the MEx Configurator: Step 3 (if required)”, page 24) |
| 2 | Edit functions for the project field (see “Configuring report content with the MEx Configurator: Step 1”, page 22) |
| 3 | Zoom function for the project field |
| 4 | Selectable objects of the MEAC emission data (application see “Configuring report content with the MEx Configurator: Step 2”, page 23) |
| 5 | Project field (schematic content of the reports; see “Configuring the contents of reports”, page 22) |
| 6 | Help functions (see “Configuring report content with the MEx Configurator Help functions”, page 34) |
| 7 | ► Close this window. |

2.5.9 Configuring the contents of reports

Fig. 12: Configuring report content with the MEx Configurator: Step 1



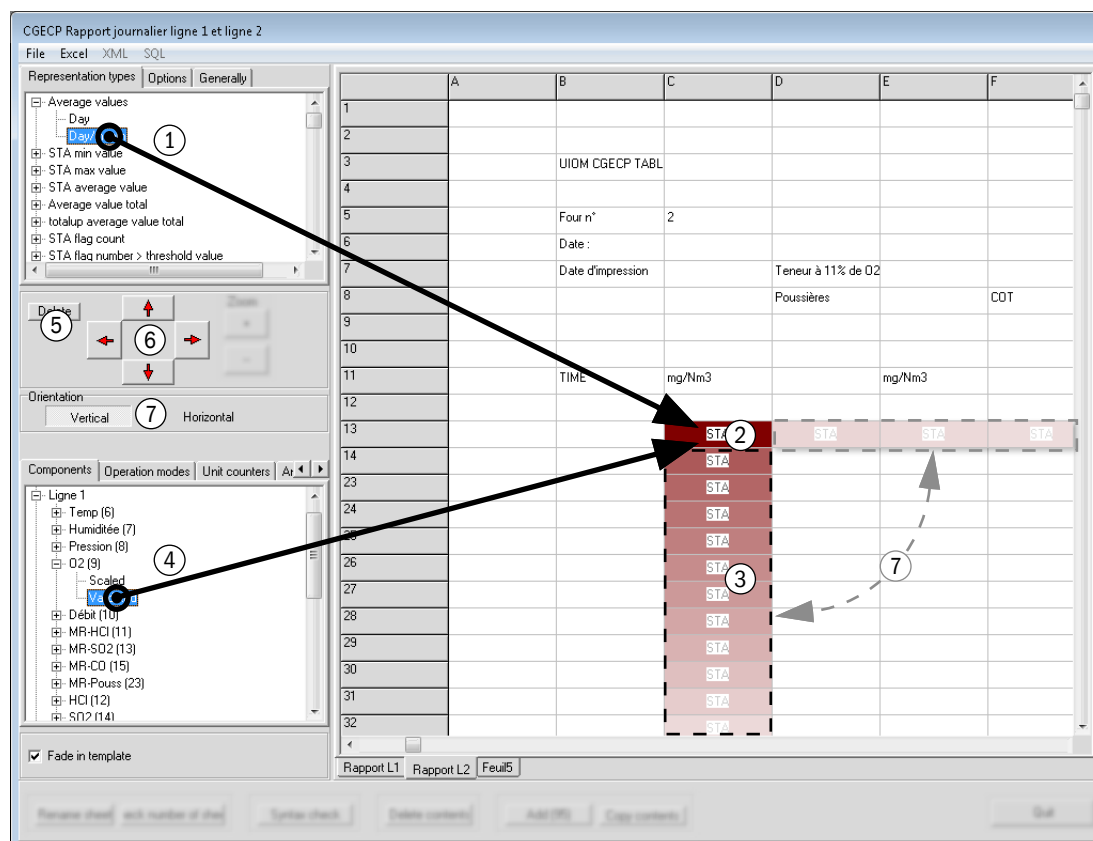
1	Project field
2	► Zoom the screen of the project field in/out.
3	► Display the content of the "Excel" document template in the project field.
4	Content of the "Excel" document template (example) [1]
5	► Select the desired Table sheet.

[1] Only texts; other elements are not displayed.



When MEx sends reports automatically to the standard printer of the Emission PC, only those Table sheets "activated" in the document template are printed (see "Creating an "Excel" document template", page 17).

Fig. 13: Configuring report content with the MEx Configurator: Step 2



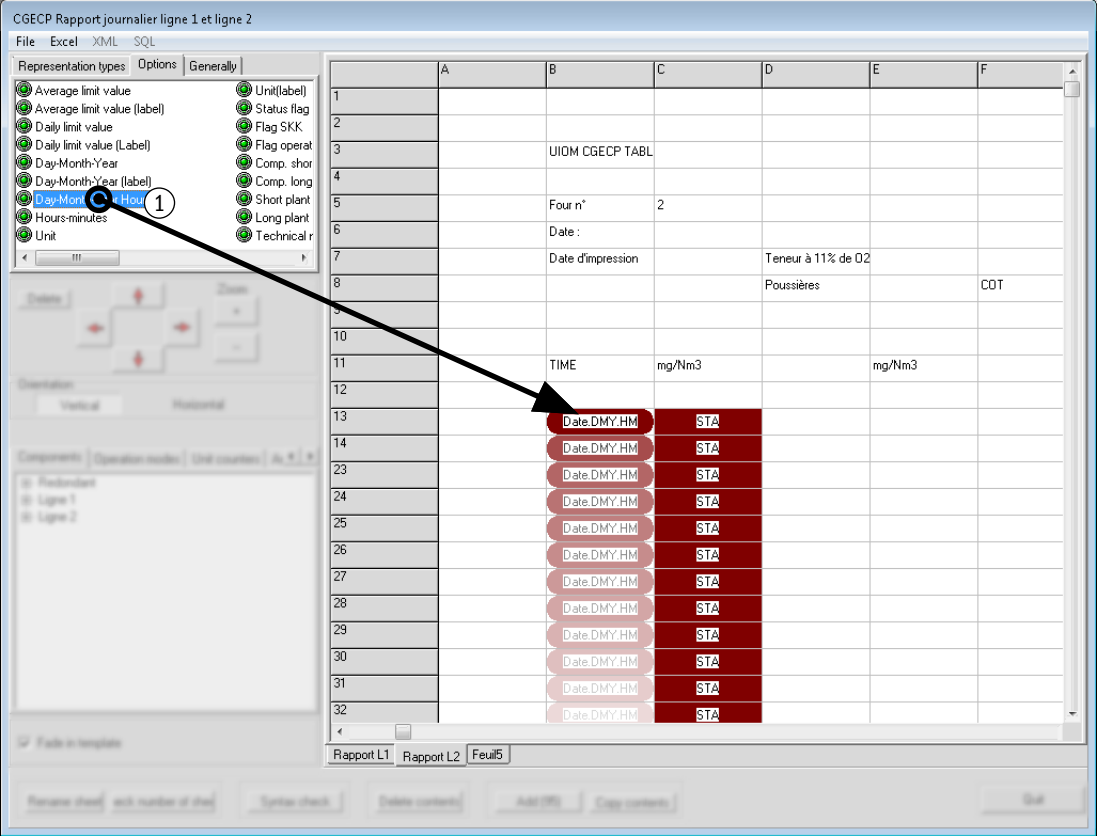
- | | |
|---|---|
| 1 | <p><i>First select a representation type:</i></p> <ul style="list-style-type: none"> ► Drag the name of the desired representation type^[1] to an (empty) Table cell (Drag&Drop). |
| 2 | The placeholder for the value appears in the Table cell. ^[2] |
| 3 | <p><i>When there are several values for this placeholder within the report period:</i></p> <p>A number of placeholders are added automatically below the Table cell (selection [7]) as can be expected for the selected representation type. The placeholders form a related group of cells with identical characteristics.</p> |
| 4 | <p><i>2 Now select the data object where the values are to be displayed instead of the placeholders:</i></p> <ul style="list-style-type: none"> ► Drag the name of the desired data object to the group of placeholders. ^[3] |
| 5 | ► Delete the marked placeholders. |
| 6 | ► Move the marked group of placeholders. |
| 7 | ► Change the representation orientation of the marked group of placeholders. |

[1] Explanation of representation types, see “List of representation types (with explanation)”, page 35.

[2] The placeholder is automatically adjusted to the report period when the function of the placeholder refers to the report period.

[3] Only those data objects suitable for the selected representation type are usable (checked automatically).

Fig. 14: Configuring report content with the MEx Configurator: Step 3 (if required)



- 1 To add a representation type to the group of placeholders (if required):
▶ Drag the name of the desired representation option^[1] to a Table cell. ^[2]

[1] Explanation of representation options, see “List of representation options (with explanation)”, page 39.
[2] The placeholder is automatically adjusted to the report period when the function of the placeholder refers to the report period. Enough placeholders are added automatically when the function is suitable for the marked group of placeholders. Thus, a group of placeholders is created.

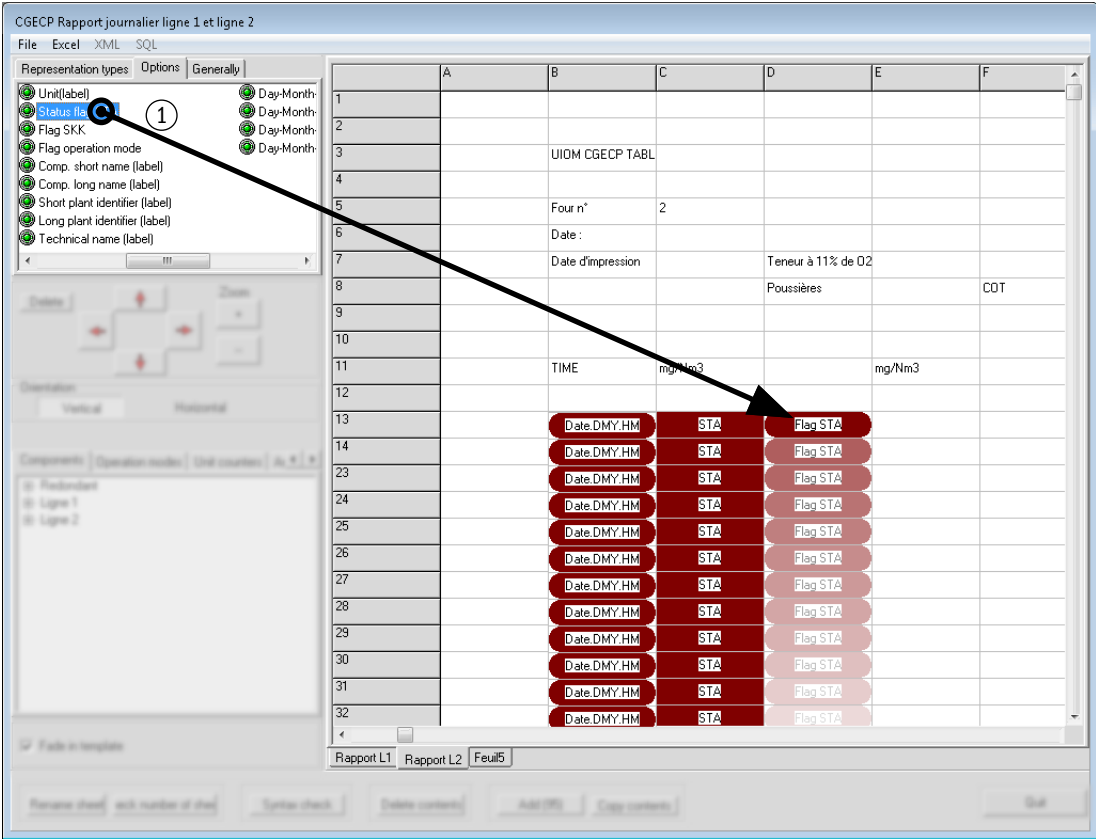


- Placeholders for representation types are rectangular.
- Placeholders for representation options are round.



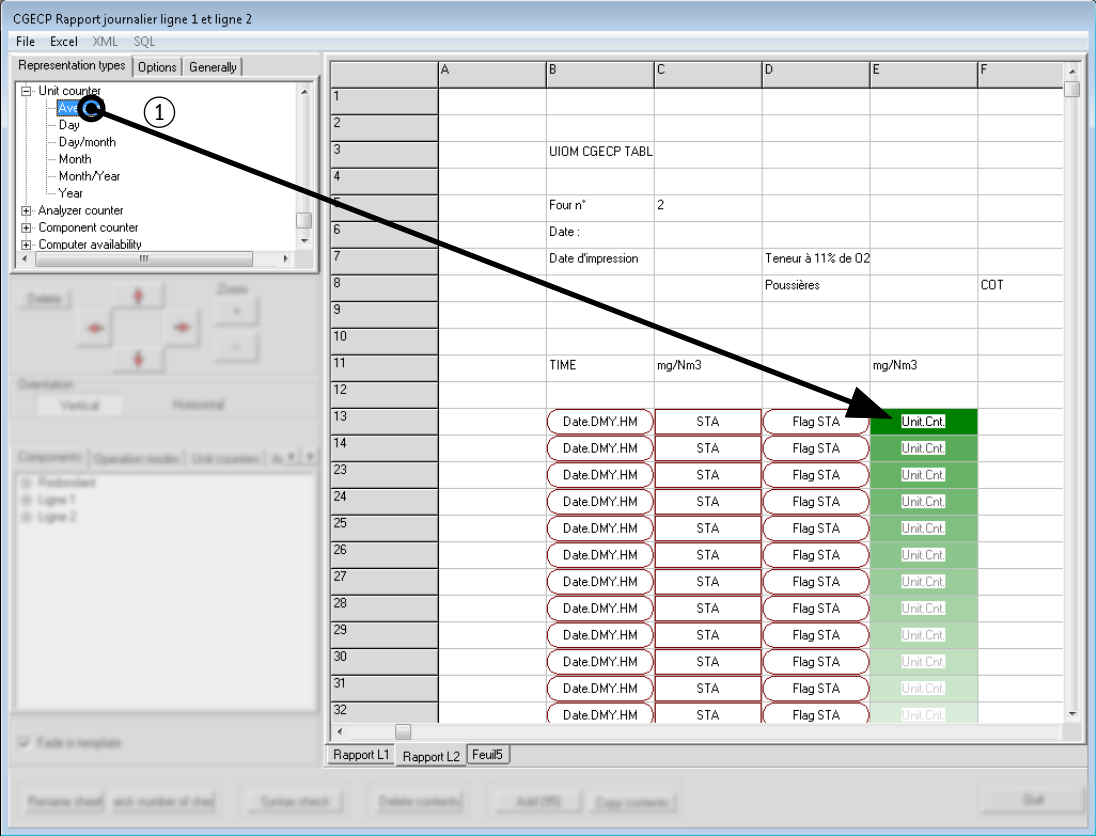
When several objects are displayed next to each other and a time information is desired as representation option, it might be sufficient to add the time information to only one representation type (e.g. to the first representation type).

Fig. 15: Configuring report content with the MEx Configurator: Step 4 (if required)



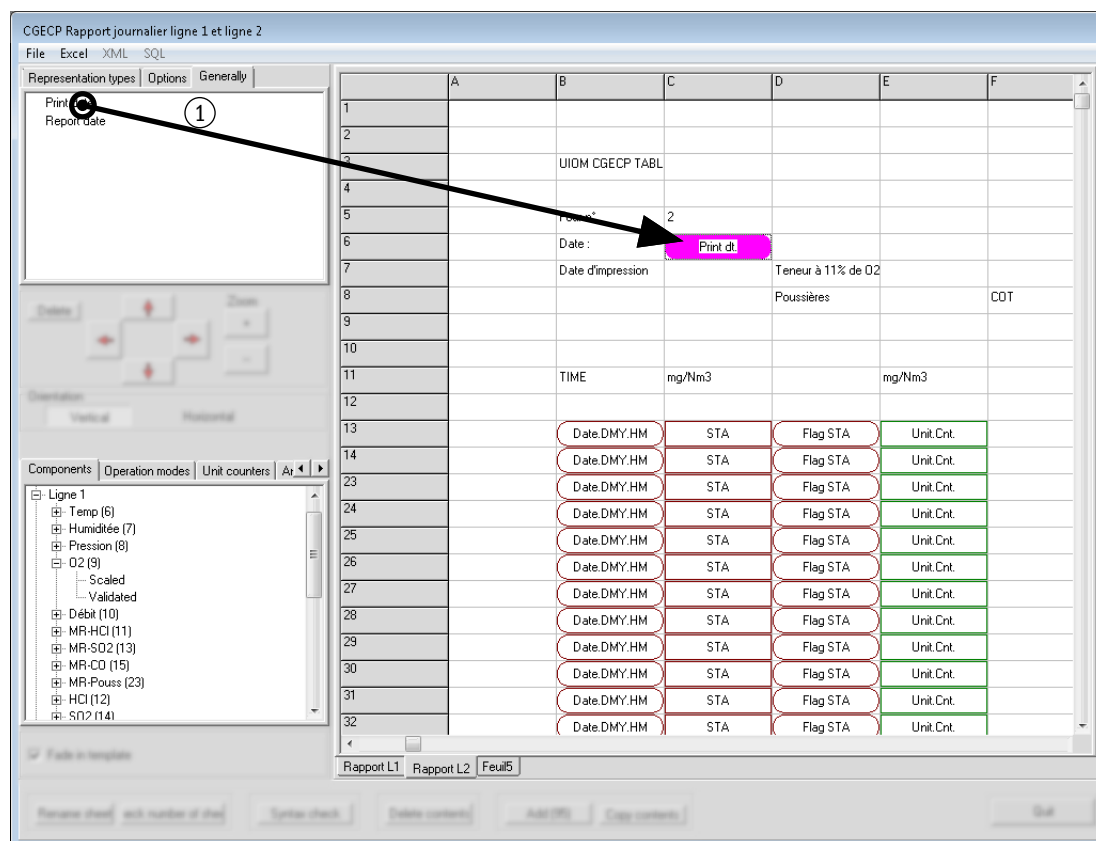
If required:	
1	► Add further representation options.

Fig. 16: Configuring report content with the MEx Configurator: Step 5 (if required)



If required:	
1	► Add further representation types (as in see Fig. 13).
(2)	► Add further representation options (as in see Fig. 14).

Fig. 17: Configuring report content with the MEx Configurator: Step 6 (if required)

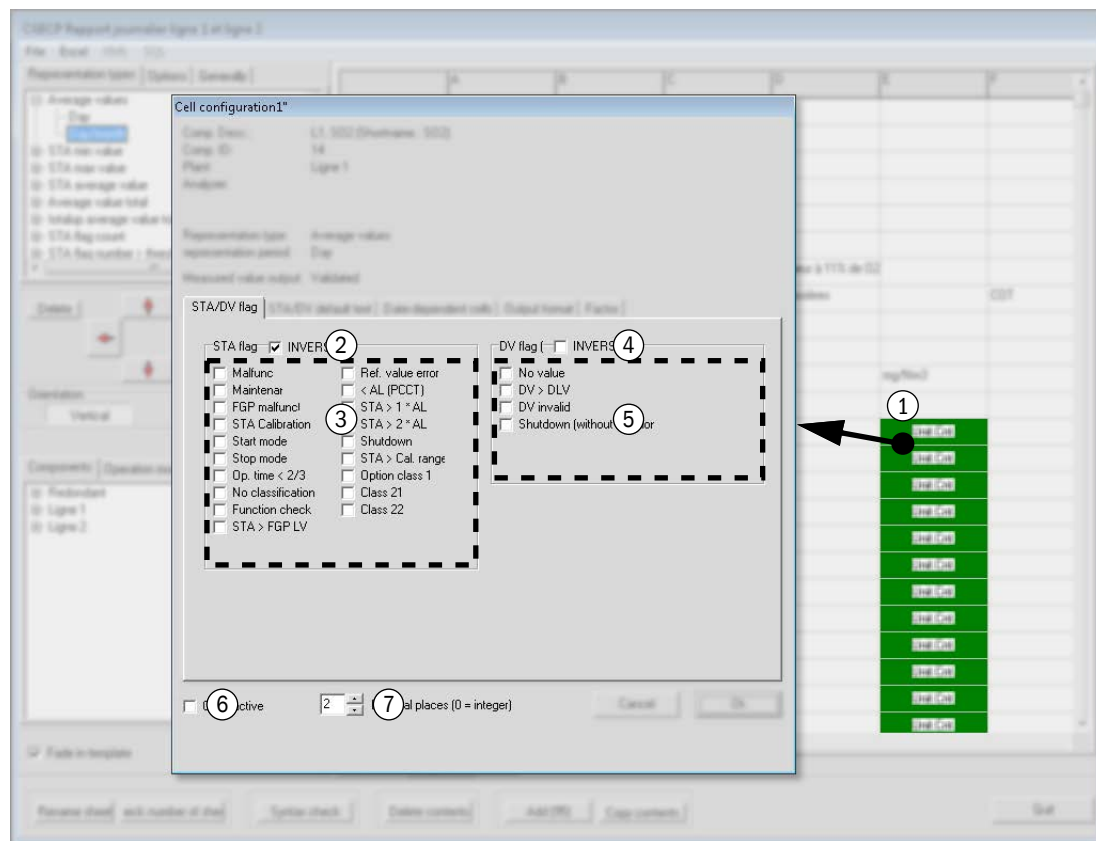


If required:

- 1 ► Add the date.

2.5.10 Configuring a representation type individually

Fig. 18: Configuring report content with the MEx Configurator: Limiting the considered values



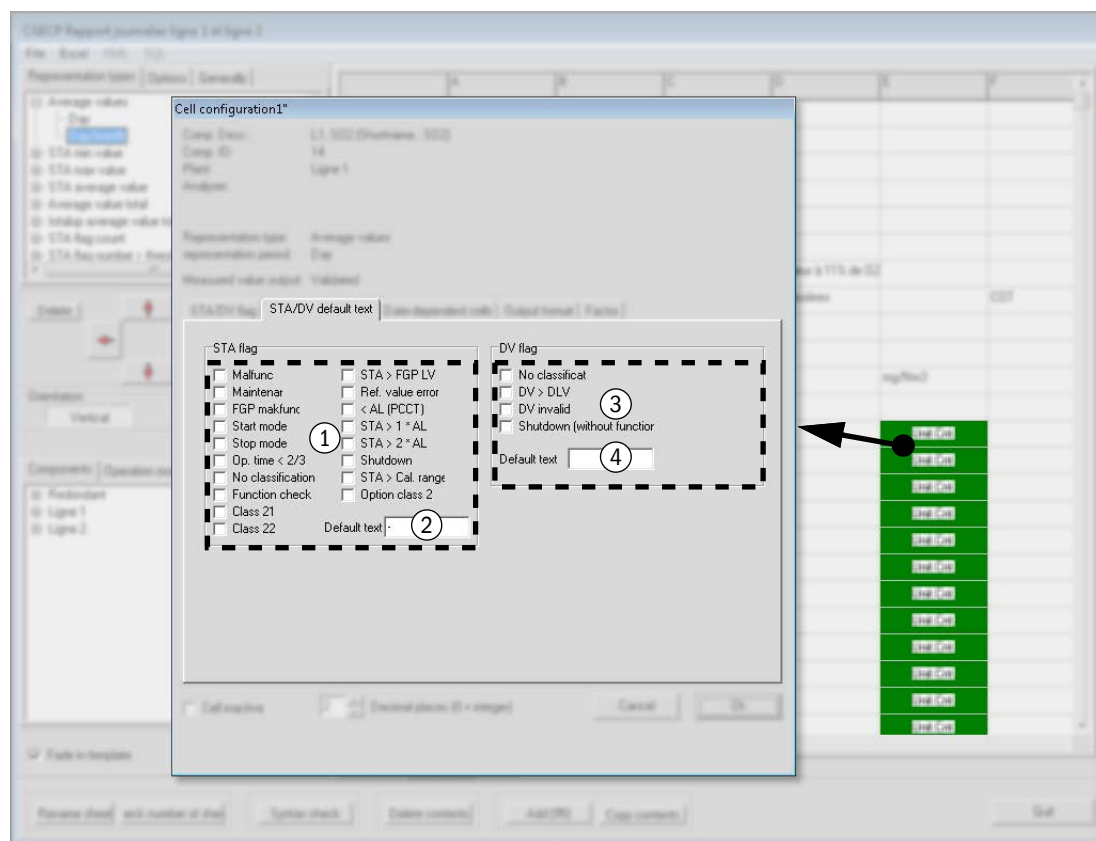
1	To configure a group of placeholders: ▶ Doubleclick on the relevant group of placeholders.
2	▶ Invert the effect of selection [3].
3	▶ Only consider average values for which at least one of the flags marked here is true. [1]
4	▶ Invert the effect of selection [5].
5	▶ Only consider daily values for which at least one of the flags marked here is true. [2]
6	▶ Deactivate the group of placeholders (the relevant data remain empty in the report).
7	▶ Set the number of decimal places. [3]

[1] To take all saved average values into account: Do not activate anything in [3] and activate [2].

[2] To take all saved daily values into account: Do not activate anything in [5] and activate [4].

[3] When the set number is higher than in the saved emission data, the missing decimal places are supplemented as "0".

Fig. 19: Configuring report content with the MEx Configurator: Determining substitute texts for flags



1 (►) Replace the marked flag identification texts of the average values with text [2]. [1]

2 (►) Enter the substitute text for the flag identification of the average values here.

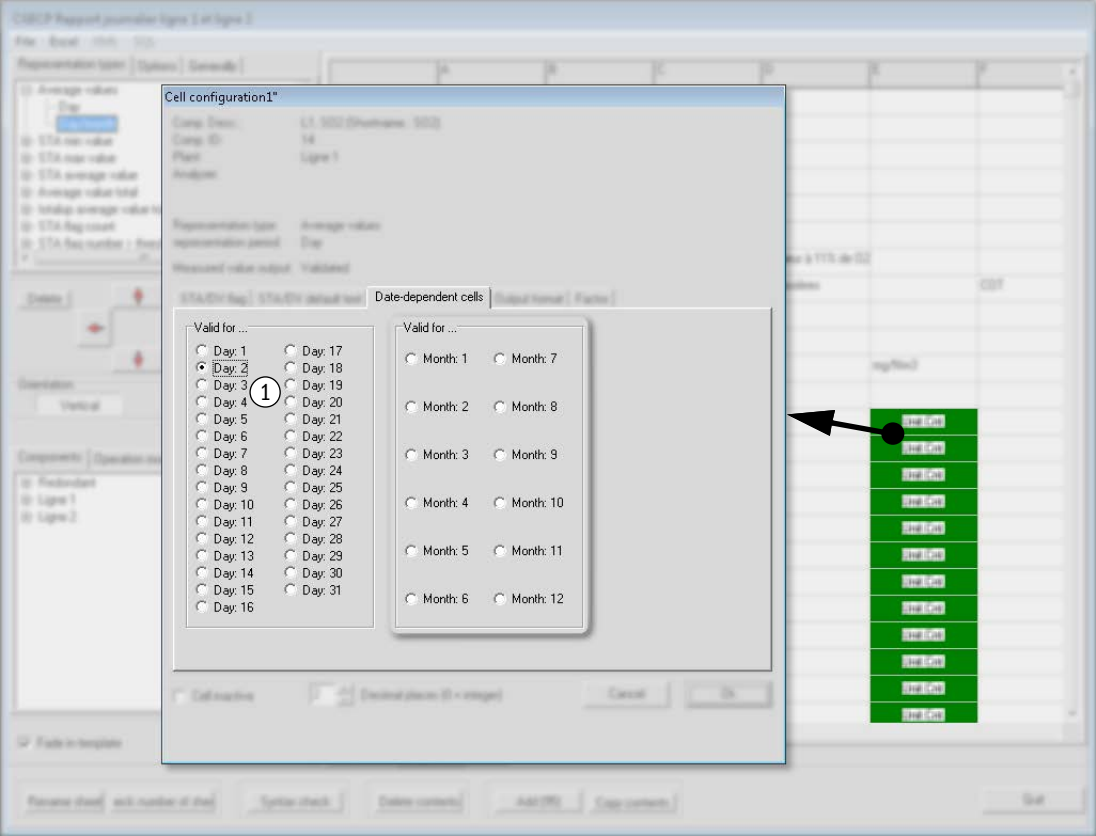
3 (►) Replace the marked flag identification texts of the daily values with text [4]. [2]

4 (►) Enter the substitute text for the flag identification of the daily values here.

[1] Only available for representation types for average values.

[2] Only available for representation types for daily values.

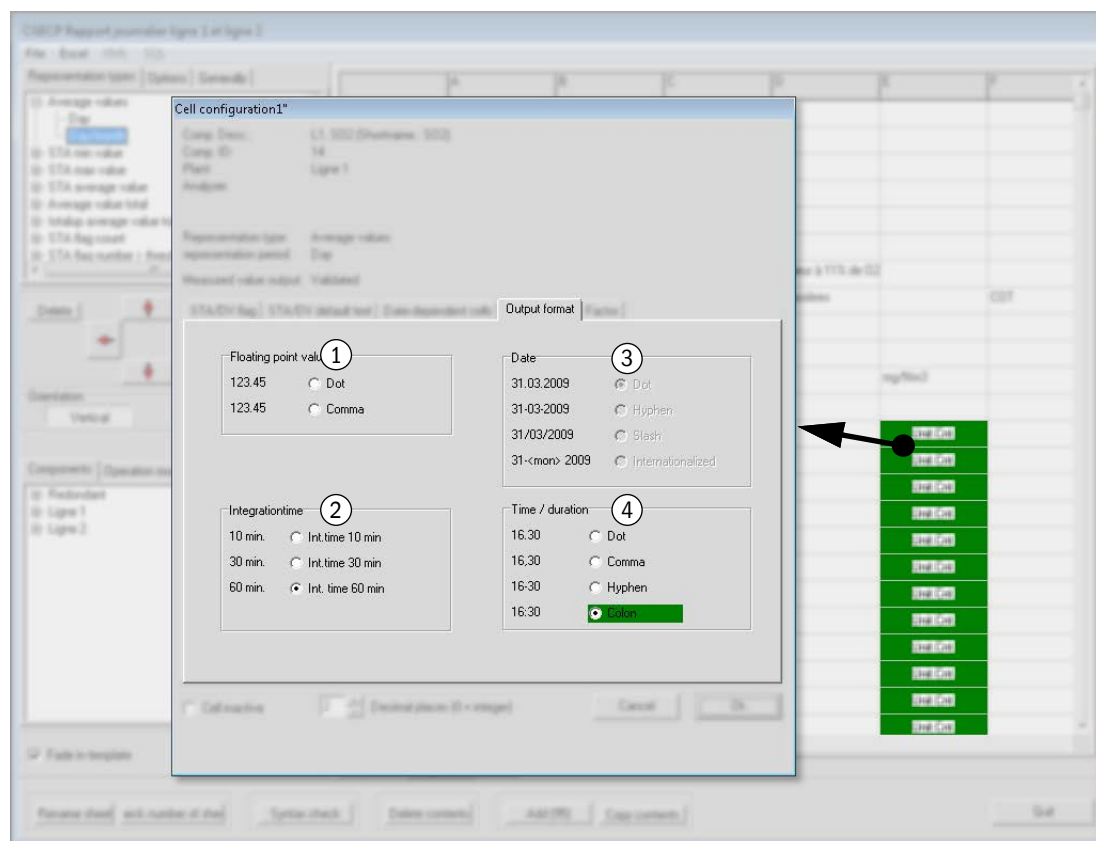
Fig. 20: Configuring report content with the MEx Configurator: Selecting an individual time unit



For representation types with several time units:

1	► Select the calendar time unit from which the emission data should originate.
---	--

Fig. 21: Configuring report content with the MEx Configurator: Determining settings for a data group

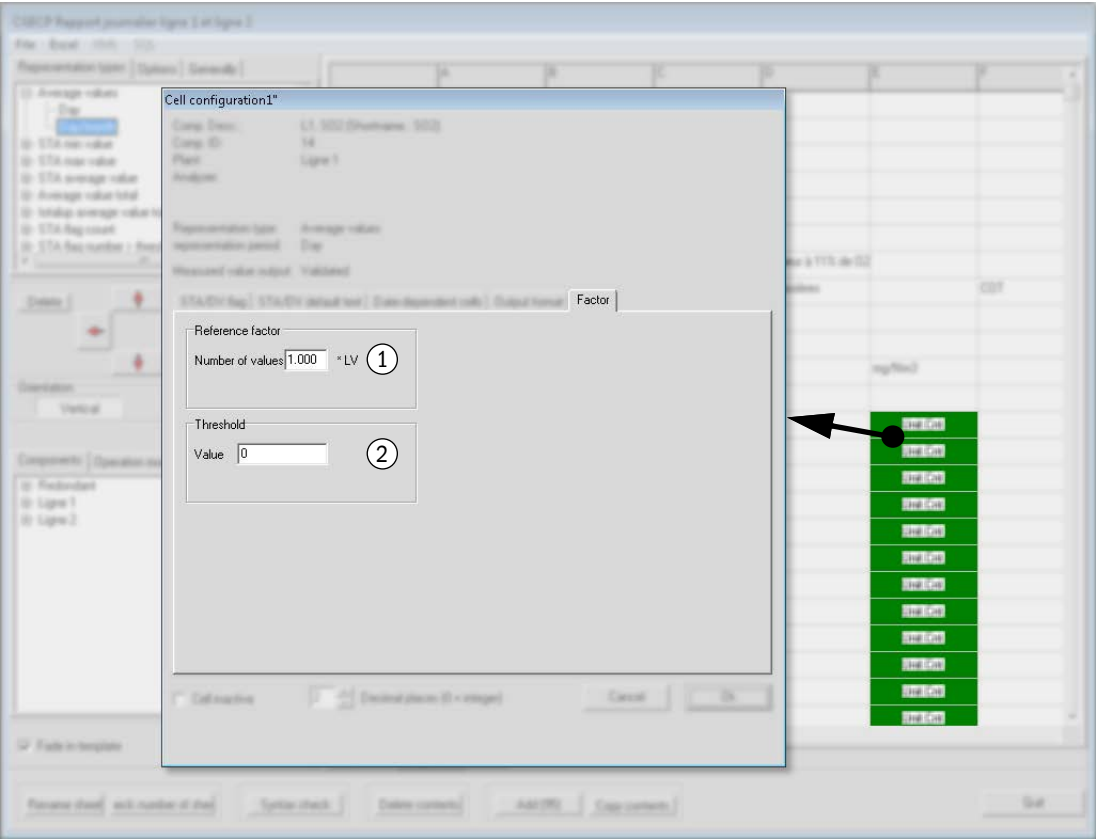


- | | |
|---|--|
| 1 | ► Select the decimal character used for these values in the reports. |
| 2 | ► Count the events of the plant in the marked period. |
| 3 | ► Select the date format used for these values in the reports. |
| 4 | ► Select the time format used for these values in the reports. |



Only the settings matching the representation type are available.

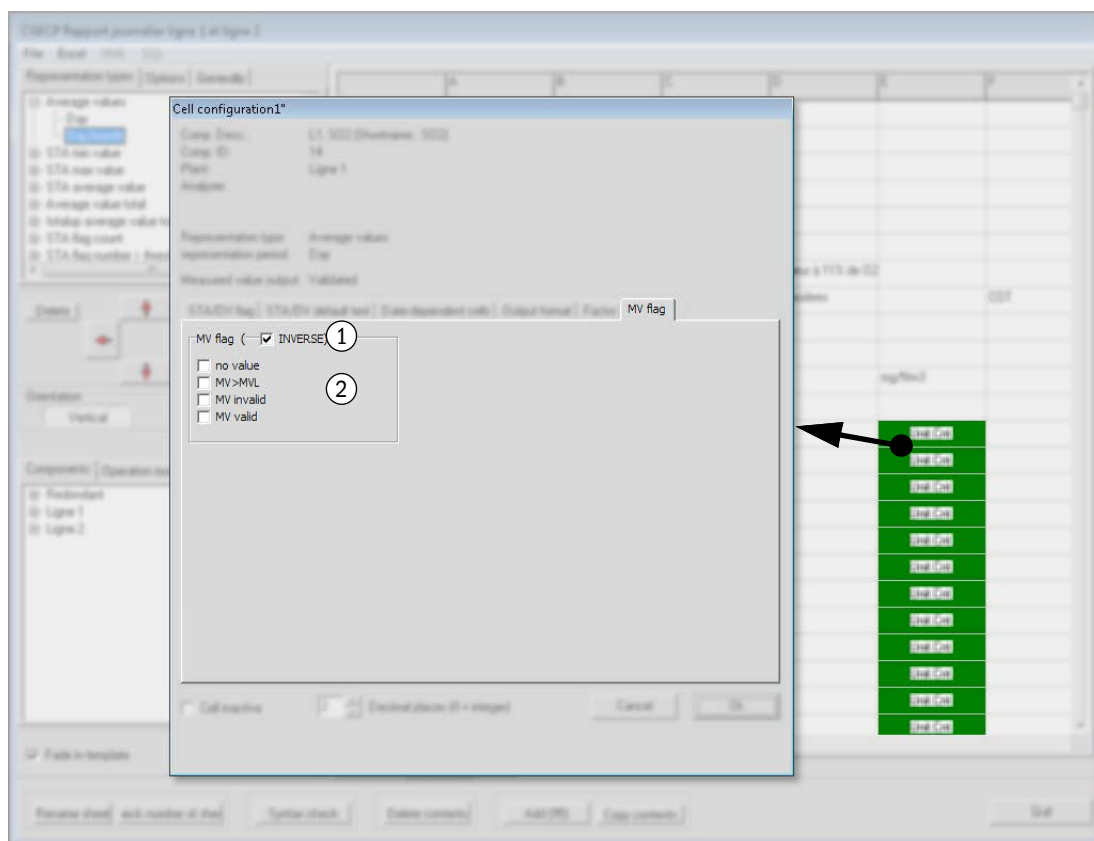
Fig. 22: Configuring report content with the MEx Configurator: Determining rating factors



For representation types for average values and daily values:	
1	To show the number of values higher than the x-fold of the related limit value in the report: ▶ Enter the factor “x”. [1]
2	▶ Enter how many of the relevant values are allowed to exist before the counting of these values starts with “1”.

[1] Only applies to representation types which contain the factor “x”.

Fig. 23: Configuring report content with the MEx Configurator: Determining monthly values



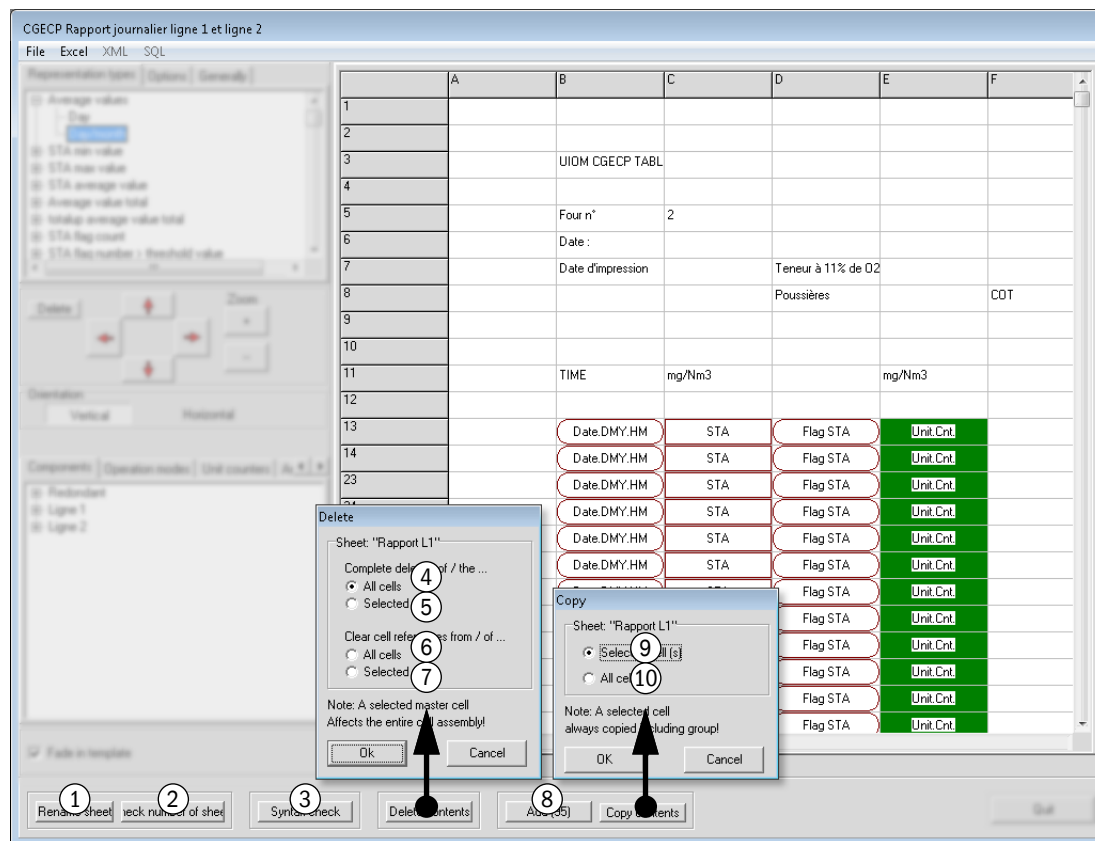
For representation types for average values and daily values:

- 1 (▶) Invert the effect of selection [2].
- 2 (▶) Only consider monthly values for which at least one of the flags marked here is true. [1]

[1] To take all saved monthly values into account: Do not activate anything in [2] and activate [1].

2.5.11 Help functions for editing

Fig. 24: Configuring report content with the MEx Configurator Help functions



1	► Change the name of the displayed Table sheet.
2	► Adjust the number and names of the Table sheets to the template.
3	► Find placeholders which have not yet been assigned to an object of the MEAC emission data.
4	► Delete all groups of placeholders.
5	► Delete the marked groups of placeholders.
6	► Delete data objects in all groups of placeholders. [1]
7	► Delete data objects of the marked groups of placeholders. [1]
8	► Enter the copied content into the Table at the marked position (paste). [2]
9	► Copy the marked group of placeholders to the Windows clipboard (copy).
10	► Copy all groups of placeholders to the Windows clipboard.

[1] Assigning new data objects see "Configuring report content with the MEx Configurator: Step 2", page 23.

[2] Also works in other Table sheets.

2.5.12 List of representation types (with explanation)



Many representation types are configurable (see “Configuring a representation type individually”, page 28).

int. ID	Representation type ^[1]			Significance
	DE	EN	FR	
1	Rasterwerte	Average values	Valeurs moyennes	Average values
2	RW Minwert	STA min value	VM valeur min.	Lowest average value
3	RW Maxwert	STA max value	VM valeur max.	Highest average value
4	RW Mittelwert	STA average value	VB valeur moyenne	Average of average values
5	RW Flag Anzahl	STA flag count	VM flag nombre	Number of average values which have the selected flags
7	RW Flag Anzahl > Schwellwert	STA flag number > threshold value	VM flag nombre > seuil	Number of average values with the selected flags which is beyond the limit value for this number
8	RW Flag Dauer > Schwellwert	STA flag duration > threshold value	VM flag durée > seuil	Duration, during which there were average values with the selected flags, which is beyond the tolerated duration (limit value)
9	Average value volume	Average value total	Flux du Val.Moyenne	Emission volumes per average value
10	RW Betriebsart	STA operating mode	VM nombre valeurs > x* VLE	Prevailing operating mode for the average values
11	RW Flag Total Zeit	STA flag total time	VB flag temps total	Total duration (sum) of times during which there were average values with the selected flags
12	RW Flag Längste Zeit	STA flag longest time	VM flag temps le plus long	Highest contiguous duration of times during which there were average values with the selected flags
14	Summe Rasterfrachten	totalup average value total	Somme flux du VM	Total of emission volumes
15	RW Messunsicherheit	STA measurement uncertainty	VM incertitude de mesure	Measurement uncertainty of the average value
16	RW Anzahl Werte > GW + MUS	STA number of values > LV + MU	VM nombre valeurs > VLE + IM	Number of average values higher than [average limit + measurement uncertainty]
17	RW Anzahl Werte > 1.1 GW + MUS	STA number of values > 1.1 LV + MU	VM nombre valeurs > 1.1 VLE + IM	Number of average values higher than [110% average limit + measurement uncertainty]
18	RW Anzahl Werte > 1.2 GW + MUS	STA number of values > 1.2 LV + MU	VM nombre valeurs > 1.2 VLE + IM	as [17], but 120%
19	RW Anzahl Werte > 2 GW + MUS	STA number of values > 2 LV + MU	VM nombre valeurs > 2 VLE + IM	as [17], but 200%
20	RW Prozentual Werte > GW + MUS	STA percentage value > LV + MU	VM valeur en pourcentage > VLE + IM	Percentage share of [16]
21	RW Prozentual Werte > 1.1 GW + MUS	STA percentage value > 1.1 LV + MU	VM valeur en pourcentage > 1.1 VLE + IM	Percentage share of [17]
22	RW Prozentual Werte > 1.2 GW + MUS	STA percentage value > 1.2 LV + MU	VM valeur en pourcentage > 1.2 VLE + IM	Percentage share of [18]
23	RW Prozentual Werte > 2 GW + MUS	STA percentage value > 2 LV + MU	VM valeur en pourcentage > 2 VLE + IM	Percentage share of [19]
26	RW Roll	STA roll	VB roll	Rolling average of the average values in the selected time interval
30	Tageswerte	Daily values	Valeurs journalières	Daily values
31	Tageswerte Minwert	Daily values min. value	Valeurs journalières min.	Lowest daily value
32	Tageswerte Maxwert	Daily values max. value	Valeurs journalières max.	Highest daily value
36	Anzahl Tageswerte > Wert	Number of daily values > value	Nombre de valeurs quotidiennes > valeur	Number of daily values higher than the set value
60	Monatswerte	Monthly values	Valeurs mensuelles	Monthly values
61	MW Minwert	MV min. value	Valeur min. MM	Lowest monthly value
62	MW Maxwert	MV max. value	MM valeur max.	Highest monthly value
70	Yearly values	Yearly values	Valeurs annuelles	Yearly value
90	Fracht Tag	Load day	Fret quotidien	Daily emission volumes
93	Fracht Tag Summe	Load day total	Total fret quotidien	Total of the daily emission volumes in the selected time interval
96	Fracht Messunsicherheit	Load measurement uncertainty	Fret incertitude mesure	Measurement uncertainty of the emission volume in the selected time interval

int. ID	Representation type [1]			Significance
	DE	EN	FR	
97	Fracht Messunsicherheit Kroatien	Load measurement uncertainty Croatia	Fret incertitude mesure Croatie	Measurement uncertainty of the emission volume in the selected time interval (version for Croatia)
98	Fracht GW Überschreitung in Tagen	Load number of daily exceedances	Dépass. de flux journalier	Number of days in the year on which the daily emission volumes were higher than the daily emission limit value
100	Fracht Monat	Load month	Fret mensuel	Monthly emission volume
103	Fracht Monat Summe	Load month total	Total fret mensuel	Total of monthly emission volumes
110	Fracht Jahr	Load year	Fret annuel	Yearly emission volume
130	TW-Zähler Dauer [hh:mm]	DV counter duration [hh:mm]	Durée compteurs JM [hh:mm]	Result of the selected time counter at the end of the day [hh:mm]
131	MW-Zähler Dauer [hh:mm]	MV counter duration [hh:mm]	Durée compteur MM [hh:mm]	Result of the selected time counter at the end of the month [hh:mm]
140	TW-Zähler Anzahl	DV counter number	Nombre compteurs JM	Result of the selected time counter at the end of the day
141	MW-Zähler Anzahl	MV counter number	Nombre compteur MM	Result of the selected time counter at the end of the month
180	RW Messunsicherheit Kroatien	STA measurement uncertainty Croatia	VM incertitude de mesure Croatie	Measurement uncertainty of the average values (version for Croatia)
181	TW Messunsicherheit Kroatien	DV measurement uncertainty Croatia	Incetitude mesure JM Croatie	Measurement uncertainty of the daily values (version for Croatia)
192	TW Anzahl Werte > x * GW	DV number of values > x * LV	Nombre valeurs JM > x * VLE	Number of daily values higher than the x-fold of the daily limit value
193	TW Prozentual Werte > x * GW	DV percentage value > x * LV	Valeur en pourcent. JM > x * VLE	Percentage share of [192]
194	RW Anzahl Werte > x * RGW97%	STA number of values > AL97%	VM nombre valeurs > MS97%	Number of average values higher than the x-fold of the limit value which applies to the "97 percentage rule"
195	RW Prozentual Werte > x * RGW97%	STA percentage value > x * AL97%	VM valeur en pourcentage > x * VLES97%	Percentage share of [194]
196	RW Anzahl Werte kl x * GW	STA number of values < x * LV	VM nombre valeurs < x * VLE	Number of average values lower than the x-fold of the average limit
197	RW Prozentual Werte kl x * GW	STA percentage value <= x * LV	VM valeur en pourcentage <= x * VLE	Percentage share of [196]
198	Verfügbarkeit Komp. Mw-Basis	Component availability based on MV	Disponibilité composant en VB	Percentage share of the valid momentary values (availability of the component, alternative to ID 375)
200	Klassen M1-M20	Classes M1-M20	Classes M1-M20	Number of average values in the Classes M1 ... M20
202	Klasse M21	Class M21	Classe M21	Number of average values in Class M21 [2]
204	Klasse M22	Class M22	Class M22	Number of average values in Class M22
210	1,2*RG < RW =< 1,2*RG + VB	1,2*AL < STA =< 1,2*AL + CL	1,2*MS < MN =< 1,2*SM + IC	Number of average values where the value is higher than 120% of the average limit but not higher than the total of [120% average limit + confidence range].
211	RW <= 1,2*GW+VB[%]	STA <= 1,2*LV+CL[%]	VM <= 1,2*VLE+IC[%]	Percentage share of average values where the value is not higher than the total of [120% average limit + confidence range].
239	Klassen S01-S16	Classes S01S16	Classes S01-S16	Number of average values in the Classes S01 ... S16
240	Klassen S1 > GW	Classes S1 > LV	Classes S1 > VLE	Number of average values in Class S1
242	Klassen S2 Messzeit < 2/3	Classes S2 Meas.time < 2/3	Classes S2 temps de mesure < 2/3	Number of average values in Class S2
243	Klassen S3 Stoer. Bezugsw.	Classes S3 Malf.ref.value	Classes S3 défaut val REF	as [243], but Class S3
244	Klassen S4 Stoerung	Classes S4 Malfunction	Classes S4 Défaut	as [243], but Class S4
245	Klassen S5 Wartung	Classes S5 Maintenance	Classes S5 Maintenance	as [243], but Class S5
246	Klassen S6 Anl. in Betrieb	Classes S6 Plant in operation	Classes S6 Installation en fonctionnement	as [243], but Class S6
247	Klassen S7 Messz. < 2/3	Classes S7 Meas.time < 2/3	Classes S7 temps de mesure < 2/3	as [243], but Class S7
248	Klassen S8 Unplausibel	Classes S8 Implausible	Classes S8 non plausible	as [243], but Class S8
249	Klassen S9 Kal.B.Kurz	Classes S9 Cal.range short	Classes S9 plage étal. court	as [243], but Class S9
250	Klassen S10 Kal.B.Lang	Classes S10 Cal.range long	Classes S10 plage étal. long.	as [243], but Class S10

int. ID	Representation type [1]			Significance
	DE	EN	FR	
251	Klassen S11 Ausf.ARE	Classes S11 Fail.FGP	Classes S11 panne PPG	as [243], but Class S11
252	Klassen S12 Ausf.ARE	Classes S12 Fail.FGP	Classes S12 panne PPG	as [243], but Class S12
253	Klassen S13 Ausf.ARE	Classes S13 Fail.FGP	Classes S13 panne PPG	as [243], but Class S13
254	Klassen S14 An-u.Abfahr	Classes S14 Start/stop	Classes S14 Start/stop	as [243], but Class S14
255	Klassen S15 Staub <= 150	Classes S15 dust <= 150	Classes S15 poussières <= 150	as [243], but Class S15
256	Klassen S16 Staub > 150	Classes S16 Dust > 150	Classes S15 poussières > 150	as [243], but Class S16
257	Klassen RRA-Stoerung akt.	Classes FGP malfunction current	Classes défaut IPF actuel	Last contiguous number of average values classified in the Class "FGP malfunction" (malfunction of the exhaust gas purification unit)
258	Klassen RRA-Stoerung ges.	Classes FGP malfunction total	Classes défaut IPF total-anc. règles allemandes	Number of average values classified in the Class "FGP malfunction" (malfunction of the exhaust gas purification unit) during the report period
259	Klassen RRA-Stoerung > max 72h	Classes FGP malfunction > max. 72h	Classes défaut IPF > 72 h.	Number of average values classified in Class "FGP malfunction" (malfunction of the exhaust gas purification unit), when the status "FGP malfunction" was activated in the report period for at least 72 hours
260	Klassen Sum. An-u.Abfahr	Classes Total start/stop	Classes total start/stop	Number of average values in the Classes "Start-up operation" and "Shutdown operation" (total)
261	Klassen Anlage außer Betrieb	Classes Plant out of operation	Classes installation hors service	Number of average values in the Class "Plant out of operation"
262	Klassen Funktions-pruefung	Classes Function check	Classes test fonctionnement	Number of average values in the Class "Function check"
263	Klassen Messz. < 2/3	Classes Meas.time < 2/3	Classes temps de mesure < 2/3	Number of average values classified in Class "Measuring time < 2/3" (two-thirds criterion not met)
264	Klassen keine Klassierung	Classes no classification	Classes sans classement	Number of average values in Class "no classification"
270	Klassen T1-T10	Classes T1-T10	Classes T1-T10	Number of average values in Classes T1 ... T10
275	Klassen TV <= TG	Classes DV <= DL	Classes JM <= JS	Number of average values in the Class "the validated daily value is not higher than the daily limit value" [3]
276	Klassen TW <= TG	Classes DV <= DL + CL	Classes MJ <= JS + IC	Number of average values in the Class "the validated daily value is not higher than the daily limit value"
277	Klassen TW > TG	Classes DV > DL	Classes MJ > JS	Number of average values in the Class "the validated daily value is higher than the daily limit value" [3]
278	Klassen TW > TG + VB	Classes DV > DL + CL	Classes MJ > JS + IC	Number of average values in the Class "the validated daily value is higher than [daily limit value + confidence range] [2]
279	Klassen TW <= TG + VB	Classes DV <= DL + CL	Classes MJ <= JS + IC	Number of average values in the Class "the validated daily value is not higher than [daily limit value + confidence range] [2]
300	Klassen TS1-TS5	Classes TS1-TS5	Classes TS1-TS5	Number of average values in the Classes TS1 ... TS5
302	Klassen TS2 kein TW	Classes TS2 without DV	Classes TS2 sans MJ	Number of average values in Class TS2
303	Klassen TS3 TW ungueltig	Classes TS3 DV invalid	Classes TS3 MJ invalide	as [243], but Class TS3
304	Klassen TS4 SAG < GW	Classes TS4 DSR < LV	Classes TS4 DSR < VLE	as [243], but Class TS4
305	Klassen TS5 SAG >= GW	Classes TS5 DSR >= LV	Classes TS5 DSR >= VLE	as [243], but Class TS5
310	Klassen kein TW	Classes NO DV	Classes sans VLE	Number of average values in Class "no daily value"
375	Verfügbarkeit Komp.	Component availability	Disponibilité composant	Percentage share of valid average values (availability of the component, alternative to ID198)
380	Komponenten Anfahrzeit	Components start time	Heure de départ composants UE	Total duration of start times for the component
381	Komponenten Abfahrzeit	Components stop time	Heure d'arrêt composants UE	Total duration of shutdown times for the component
382	Komponenten RRA-Str.ZeitEU	Components FGR malf. time	Temps défaut UE composants IPF	Total duration of the status "FGR malfunction" for the component
400	Momentanwerte	Minutes values	Valeurs minutes	Momentary values [4]

int. ID	Representation type [1]			Significance
	DE	EN	FR	
406	Momentanwerte unkorrigiert	uncorrected Momentary values	Valeurs brutes non corrigées	Uncorrected momentary values [4]
407	Momentanwerte Dauer gült. Werte	MV valid counter duration	Durée compteurs VB valides	Total duration of times during which the momentary values were valid in the selected time frame
410	Rasterwerte ungültig	STA invalid	VM invalide	Component counter: Number of invalid average values
411	Tageswerte ungültig	Daily value invalid	Moyenne Jour. inval.	Component counter: Number of invalid daily values
412	Rasterwert > Rastergrenzwert	Average value > Limit value	Moyenne > Limite	Component counter: Number of average values higher than the average limit value
413	Tageswert > Tagesgrenzwert	Daily value > Limit value	Moyenne Jour > Limite	Number of daily values higher than the daily limit value
500	Anlagen Betriebszeit	Plant operating time	Temps fonctionnement installation	Total duration of times during which the status "Plant in operation" was activated
511	Anlagen Zähler	Unit counter	Compteur d'installation...	Result of the selected counter (for plants)
512	Analysatoren Zähler	Analyzer counter	Compteur d'analyseur	Result of the selected counter (for analyzers)
513	Komponenten Zähler	Component counter	Compteur de composant	
520	Verfügbarkeit Rechner	Computer availability	Disponibilité calculateur	Duration of times during which the MEAC program was running
521	MMW auf RW-Basis	Monthly value based on validated STAs	[5]	Number of monthly values, selectively related to month, month/ year or year
522	Anzahl MMW>MG	MV > MLV	[5]	Number of monthly values that were higher than the monthly limit during the current year
524	Rw Prozentual Werte < RGW%	Percent STA < AL%	[5]	Percentage share of average values not higher than the special limit value, selectively related to the current day/current month/ current year
525	Tw prozentual Werte < TGW%	Percent LTA < LV%	[5]	Percentage share of daily values not higher than the special limit value, selectively related to the current month/current year

[1] It is possible that only those representation types which match the individual application are displayed.

[2] According to the "Bundeseinheitliche Praxis bei der Überwachung der Emissionen" ("Uniform practice in monitoring emissions"), Rundschreiben des Bundesministeriums für Umwelt, Naturschutz, und Reaktorsicherheit (BMU) (Circular of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety), editions before 2005.

[3] According to the "Bundeseinheitliche Praxis bei der Überwachung der Emissionen" ("Uniform practice in monitoring emissions"), editions before 2005, and the corresponding European guidelines and directives.

[4] Only with interval control (see "Configuring the report project with the MEx Configurator: Data control, time control", page 19).

[5] Not specified yet.

2.5.13 List of representation options (with explanation)

- in preparation -

3 MEAC-UniversalModbus

3.1 Guideline for program module “MEAC-UniversalModbus”



- The MEAC-UniversalModbus can be used selectively as Modbus Client (data inquiry entity) or as Modbus Server (data delivery entity).
- The MEAC-UniversalModbus can manage Modbus inputs and outputs.
- The original Modbus documentation describes the Modbus protocol as seen by a Modbus-Client.



Several variants of the MEAC-UniversalModbus program module can be configured independently and run at the same time on one Emission PC.

► Carry out the steps described for each Modbus variant desired.

Step 1: Set up the Modbus interface

1 Start Simulation mode in the MEAC program.	See “Technical Information MEAC300”
2 Connect the hardware interfaces of the Modbus devices with the Emission PC.	see “Installing hardware interfaces”, page 47
3 Create an internal MEAC interface for Modbus.	see “Adding a MEAC interface for Modbus”, page 47
4 Select Client mode or Server mode.	see “Configuring the Modbus interface”, page 48
5 Set the parameters of the hardware interface used.	see “Configuring the Modbus interface”, page 48

Step 2: Configure the Modbus functions

<i>When the MEAC-UniversalModbus is to function as Client:</i>	
1 Configure Servers.	see “Configuring Modbus Slaves”, page 51
2 Configure messages.	see “Configuring Modbus messages”, page 52
3 Configure Modbus inputs for the data to be requested from the Server (Discrete Inputs, Input Registers).	see “Configuring Modbus inputs”, page 53
4 <i>If required:</i> Configure Modbus outputs for the data to be sent to the Servers (Coils, Holding Registers).	see “Configuring Modbus outputs”, page 56
<i>When the MEAC-UniversalModbus is to function as Server:</i>	
1 Configure Modbus outputs for the data to be requested by a Client (Discrete Inputs, Input Registers).	see “Configuring Modbus outputs”, page 56
2 <i>If required:</i> Configure Modbus inputs for the data to be received by the Client (Discrete Inputs, Input Registers).	see “Configuring Modbus inputs”, page 53

Step 3: Connect the MEAC data with Modbus

► Configure one MEAC component for each Modbus input.	see “Configuring MEAC components for MEAC-UniversalModbus”, page 49
► Configure one hardware output for each Modbus output.	see “Configuring hardware outputs for Modbus”, page 58

Step 4: Activate the Modbus functions

► Activate the simulated MEAC evaluation configuration.	see “Activating MEAC-UniversalModbus”, page 58
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3.2 Short information on the Modbus protocol

Modbus protocol variants

- TCP data transfer mode is used in networks.
- RTU transfer mode or ACSII transfer mode [1] is used with serial interfaces.



- The terms “Client” and “Server” are generally used in networks.
 - The terms “Master” and “Slave” are used for serial interfaces.
- The terms “Client” and “Server” are used here.*



The original Modbus documentation (<http://www.Modbus.org>) describes the Modbus protocol as seen by a Modbus Client.

Interaction between Client and Servers

- Modbus Client communicates with Modbus Servers with a “message”[2]. The message contains the function code to be executed by the respective Server. Apart from that, data can be sent to the Server.
- The Server confirms the execution of the Client message by sending an echo of the message. The echo contains the relevant data when the Client requested data. The echo contains an error message (error identifier + error code) when the Server cannot execute the Client message.



- A Modbus Server in a network is identified via its port number.
- A Modbus Server (Slave) using serial interfaces is identified via the Slave ID. A Slave ID must be part of the message.
- The Slave ID can also be transported in a network message to reach Modbus devices with a serial interface that are connected to the network (via a gateway).

Message layout

Slave ID (address)	Function Code (function)	Data (data)	Check sum (check sum)
Slave ID:	Only required for data transfer via serial interface. Defined individually for each connected Modbus device.		
Function Codes:	Commands for the Server to output device data (Read) or to accept data (Write). The Function Codes are specified in the Modbus protocol.		
Data:	Contain the required information for the Function Code. Function Code + data form the command that the Server should execute. Some Function Codes function without data.		
Check sum:	Calculated automatically by sender and receiver. The data transfer was correct and the function executed when the check sums are identical.		

Basic Modbus functions

READ	Discrete Input	Status inquiry (1 bit)
READ/WRITE	Coil	Set function (1 bit)
READ	Input register	Value inquiry (16 bits, READ)
READ/WRITE	Holding Register	Set value (16 bits)

[1] MEAC-UniversalModbus only supports RTU.

[2] The message contents are an “Application Data Unit (ADU)”.

3.3 Information on MEAC-UniversalModbus

3.3.1 General functions

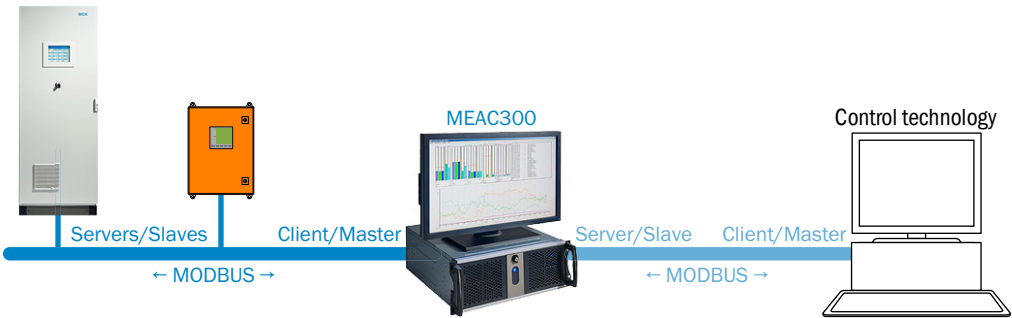
The “MEAC-UniversalModbus” software module serves to implement digital data transfers between the MEAC system and other devices via Modbus.

• Hardware interfaces supported:	- Networks (Ethernet/LAN) [1] - Serial interfaces (RS232, TTY, RS422, RS485) [2]
• Multiple variants:	- Several MEAC-UniversalModbus variants configured individually can run at the same time.
• Operating modes:	- Each MEAC-UniversalModbus variant can function as a Modbus Client or as a Modbus Server.
• Free configuration of Modbus protocol and function data:	- The contents of the Modbus protocol can be configured freely (see “Configuring the Modbus functions”, page 50).

[1] With TCP transfer mode.

[2] With RTU transfer mode.

Fig. 25: MEAC system with Modbus connections (principle)



3.3.2 System requirements

- Emission PC with functional evaluation configuration.
- Interface connection between Emission PC and Modbus devices.
- “MEAC-UniversalModbus” software module installed.
- Configuration of Modbus functions in the MEAC evaluation configuration.

3.3.3 Restrictions to Modbus standard

- *Data transfer via serial interfaces:* Broadcast Messages (Slave address 0) are not supported. ^[1]
- *Server mode:* Inquiries to Holding Registers reference other MEAC data as inquiries to Input Registers.

This is because “Holding” data and “Input” data are stored separately in the Auxiliary components for MEAC300 (see [“Linking the MEAC system with MEAC-UniversalModbus”, page 46](#)).

Examples:

- Command “Read Input Register 27” returns a different value than “Read Holding Register 27”. This is because Input Register 27 and Holding Register 27 are different storage areas in the Auxiliary components for MEAC300.
- The command to read one Coil (1 bit) returns a different value than the command to read the relevant Register and to select a bit from the Register.



- Modbus output values are updated in step with the momentary values.
- When the MEAC-UniversalModbus receives numeric data, these are accepted by the MEAC program in step with the momentary values. When several numeric values arrive within the cycle time, the average value of these values is calculated automatically and used as momentary value.

3.3.4 Extensions to Modbus standard

- *Extended value range:* The data can be longer than 16 bits when a special function is used (see [“Configuring numeric Modbus inputs”, page 54](#)/see [“Configuring numeric Modbus outputs”, page 57](#)).
- *Client mode with implementation of Guideline VDI 4201:* Allows using Modbus Server devices that conform to Guideline VDI 4201, Sheet 3 (see [“Implementation of Guideline VDI 4201, Sheet 3”, page 43](#)).

3.3.5 Implementation of Guideline VDI 4201, Sheet 3

MEAC-UniversalModbus has functions that support the data transmission standard according to guideline VDI 4201 Sheet 3.



Detailed information, see [“Special functions for Guideline VDI 4201”, page 61](#).

[1] Valid for Client mode and for Server mode.

3.3.6 Modbus transfer functions supported

3.3.6.1 Function Codes supported

Function Code	Modbus function	Function in MEAC-UniversalModbus
01	Read Coils	Client inquires 1 ... 2000 Coils (individual statuses), bit-by-bit.
02	Read Discrete Inputs	Client inquires 1 ... 2000 Discrete Inputs (individual statuses), bit-by-bit.
03	Read Holding Registers	Client inquires 1 ... 125 Holding Registers (numeric values).
04	Read Input Registers	Client inquires 1 ... 125 Input Registers (numeric values).
05	Write Single Coil	Client sends one Coil (status signal/control signal).
06	Write Single Register	Client sends one Register (numeric value). ^[1]
08	Diagnostics	Diagnostic request from Client to a Server. ^[2]
15	Write Multiple Coils	Client sends 1 ... 2000 Coils.
16	Write Multiple Registers	Client sends 1 ... 123 Holding Registers. ^[1]

[1] Deviation from the Modbus specification (1 ... 123 Registers). Broadcasts are not supported.

[2] Only Echo Test (Diagnostic Code \$0000) supported.

3.3.6.2 Exception Codes supported

If a received Modbus command is erroneous, the MEAC-UniversalModbus returns a fault message (exception response).

Exception Code	Significance
01	Illegal function
02	Illegal data address
03	Illegal data value
04	Failure in associated device



The fault message is not generated when the message has an incorrect length or an invalid checksum.

3.3.6.3 Modbus messages supported

Mode	Read Coil/Discrete Input											
Client	SA	FC	AH	AL	NH	NL	CH	CL				
Server	SA	FC	NB	DB	-	-	Data	-	-	DB	CH	CL

Table 3: Command structure for Function Codes 01 and 02

Mode	Read Holding Register/Input Registers											
Client	SA	03	AH	AL	NH	NL	CH	CL				
Server	SA	03	NB	DH	DL	-	-	Data	-	-	CH	CL

Table 4: Command structure for Function Codes 03 and 04

Mode	Write Single Coil/Single Register											
Client	SA	06	AH	AL	DH	DL	CH	CL				
Server	SA	06	AH	AL	DH	DL	CH	CL				

Table 5: Command structure for Function Codes 05 and 06

Mode	Write Multiple Coils/Multiple Registers													
Client	SA	FC	AH	AL	NH	NL	NB	DH	DL	Data	DH	DL	CH	CL
Server	SA	FC	AH	AL	NH	NL	CH	CL						

Table 6: Command structure for Function Codes 15 and 16

Mode	Loopback Test											
Client	SA	FC	ZH	ZL	YH	YL	CH	CL				
Server	SA	FC	ZH	ZL	YH	YL	CH	CL				

Table 7: Command structure for Function Code 08 (only for data transfers via serial interfaces with MEAC-UniversalModbus as Server (Slave))

Mode	Reply											
Server	SA	FE	EC	CH	CL							

Table 8: Command structure for the reply to an erroneous message

Legend:

FC	Function Code
Data	Data (variable)
AH	Data address high
AL	Data address low
CH	Checksum high
CL	Checksum low
DB	Packed data of coils
DH/DL	16-bit data of one register high/low [1]
EC	Error code
FE	Function Code with bit 7 set
NB	Number of data bytes
NH/NL	Number of bits or register high/low
SA	Server address
YH/YL	Diagnostic data for FC8
ZH/ZL	Diagnostic code [2]

[1] For Function Code 05: DL = \$00. DH = \$00 or \$FF (depending on Coil value).

[2] Only \$0000 supported.

3.3.7 Linking the MEAC system with MEAC-UniversalModbus

Functional principle of the Modbus inputs

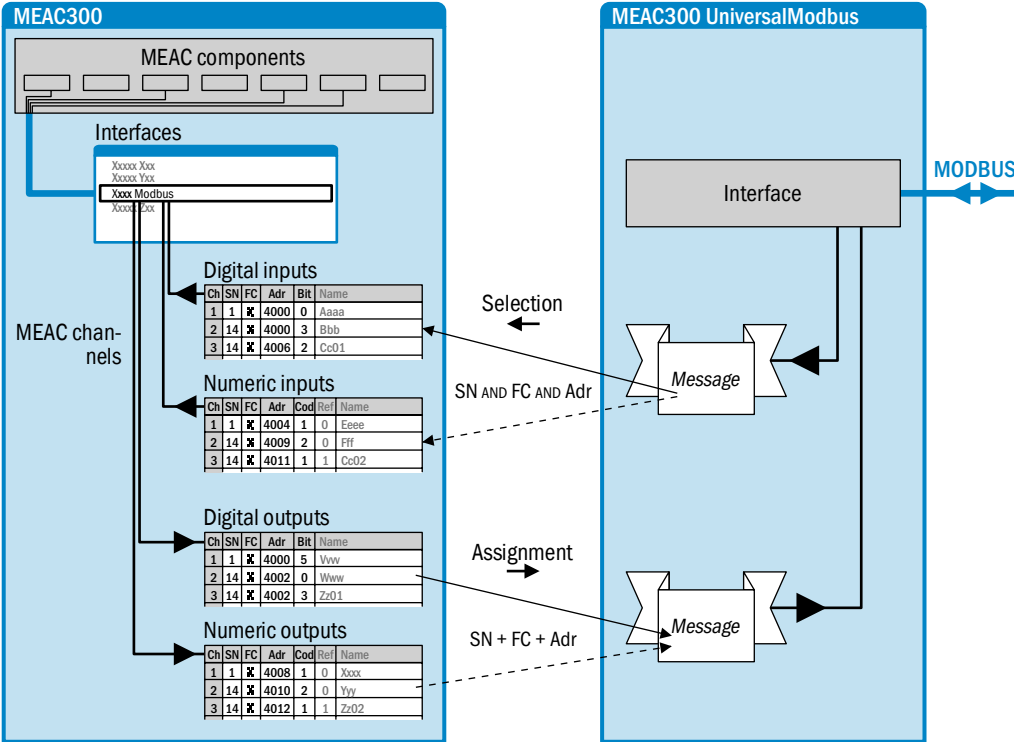
MEAC inputs must be configured in order to be able to accept Modbus data in the MEAC system. These inputs are identified with Slave ID + Function Code + Address range. The data of a received Modbus message are stored in the relevant MEAC input.

Functional principle of the Modbus outputs

When MEAC-UniversalModbus sends data, these originate from a digital or numeric MEAC output configured for this purpose.

In Server mode, such data can be requested via Modbus with the relevant identification (Slave Number + Function Code + Address). The data originate from the MEAC component linked to the respective MEAC output.

Fig. 26: Link between MEAC system and MEAC-UniversalModbus (schematic)



3.4 Installing hardware interfaces

- ▶ *Either:* Connect the Emission PC to the network (Ethernet/LAN) to be used for Modbus data transfers.
- ▶ *Or:* Connect the serial interfaces of the Modbus devices to the Emission PC.

When several MEAC-UniversalModbus variants should run on the Emission PC: Each Modbus variant can use an own hardware interface or several Modbus variants use the same hardware interface (e.g., LAN).

3.5 Adapting the MEAC evaluation configuration for Modbus

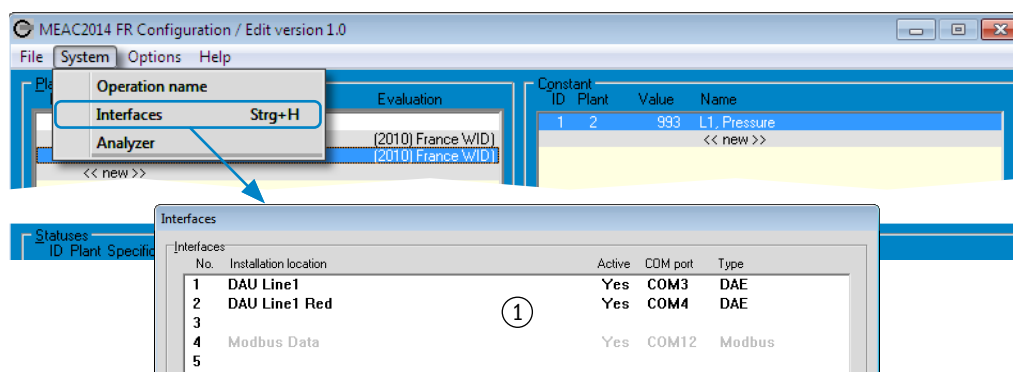


In many application cases, the MEAC system is delivered with an adapted, individual evaluation configuration. This also applies to the Modbus functions. The individual configuration data are described in a separate document.

3.5.1 Adding a MEAC interface for Modbus

- 1 Call up the list of configured interfaces (see Fig. 27).

Fig. 27:  Configuring a new interface



- 1 (►) List of configured interfaces

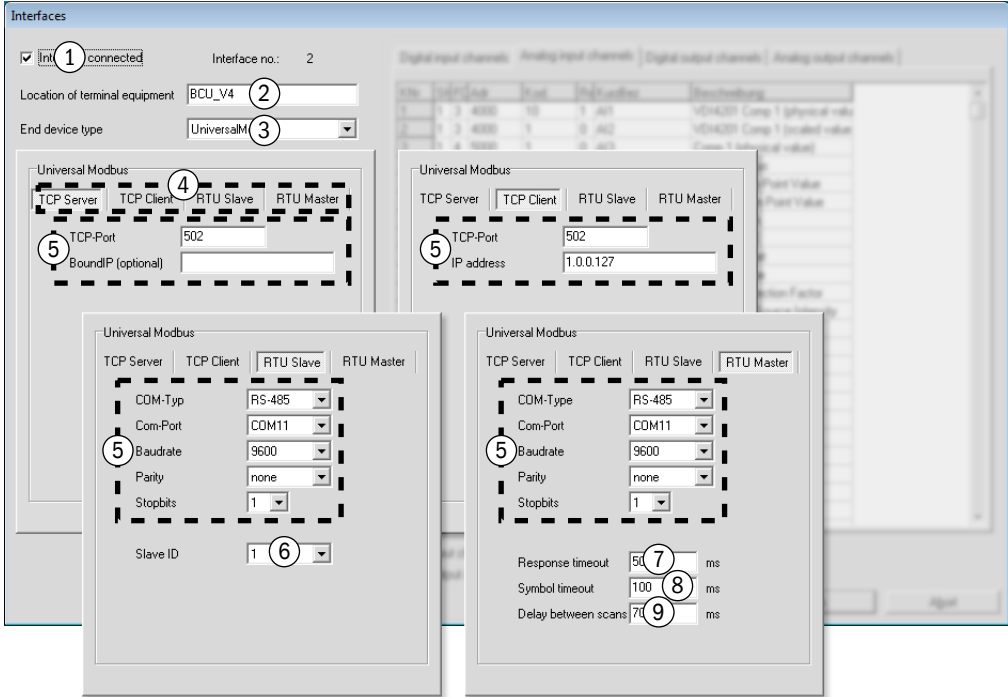
- 2 To add the Modbus interface: Doubleclick on an empty line.
- 3 Configure the new interface (see Fig. 28).

To configure several MEAC-UniversalModbus variants:

- 4 Add further Modbus interfaces in the same manner.

3.5.2 Configuring the Modbus interface

Fig. 28:  Configuration Configuring the Modbus interface



- | | |
|---|---|
| 1 | ▶ Activate this interface. |
| 2 | ▶ Enter the internal MEAC identification of this interface. |
| 3 | ▶ Select "UniversalModbus". |
| 4 | ▶ Select the mode of the Modbus interface. [1] |
| 5 | ▶ Set the interface parameters. |

[1] For Ethernet/LAN: Select a TCP mode. For a serial interface: Select an RTU mode.

For "RTU Slave":

- | | |
|---|--|
| 6 | ▶ Enter the Slave ID of this Modbus variant. [1] |
|---|--|

[1] Value range: 1 ... 247. All Modbus Slaves using a common serial interface must have different Slave IDs.

For "RTU Master": [1]

- | | |
|---|--|
| 7 | ▶ Enter the time interval in which this mode variant waits for the answer from a Slave device. [2] |
| 8 | ▶ Enter the maximum time interval between two consecutive bytes of the Slave device. [3] |
| 9 | ▶ Enter the minimum time interval this Modbus variant waits after sending a message before sending the next message. |

[1] All values in milliseconds. See below for examples.

[2] The answer is stored as "no data" when the answer does not arrive within this time interval.

[3] This function is not Modbus standard.

For "RTU Master": Recommended settings for Endress+Hauser products

	BCU [1]	Dusthunter	SIDOR			
5	9600 Baud	9600 Baud	9600 Baud			
7	500	500	200			
8	100	100	100			
9	70	100	200			

[1] Operating unit.

3.5.3 Configuring MEAC components for MEAC-UniversalModbus

For each component for which the values are to be passed to the evaluation via MEAC-UniversalModbus:

- In “Configuring component acquisition”:

Device that receives the measuring signal	► Select the Modbus interface to be used for the data transfer. [1]
Analog input that receives the measuring signal	► Select the input channel for the component (see “Configuring Modbus inputs”, page 53).

[1] When the signal source type is “2 channel”: Make this setting for both channels.

3.5.4 Configuring the internal statuses for MEAC-UniversalModbus

For each status to be passed to the evaluation via MEAC-UniversalModbus:

- In “Defining the internal statuses”:

Device with the relevant signal input	► Select the Modbus interface to be used for the data transfer.
Signal input that receives the relevant signal	► Select the input channel for the component (see “Configuring Modbus inputs”, page 53).

3.6 Configuring the Modbus functions



The Modbus settings belong to the MEAC evaluation configuration and can therefore only be carried out in Simulation mode. Modified Modbus settings are first effective after the simulated evaluation configuration has been activated.

3.6.1 Exporting/importing Modbus configurations

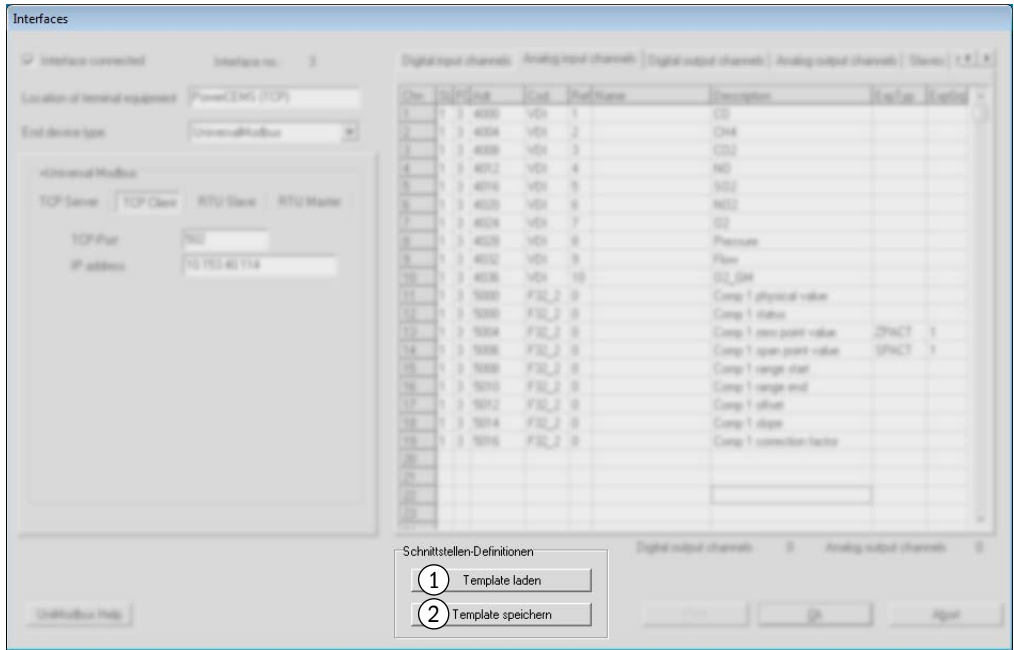
The entire Modbus settings of a Modbus instance can be exported and imported. This allows existing Modbus settings to be quickly transferred to another Modbus instance, or prepared Modbus settings can be quickly adopted.



NOTE: Importing overwrites the existing data.

► *Recommendation:* Save the existing Modbus settings before replacing them.

Fig. 29: Configuring Modbus Slaves (with data examples)



- | | |
|---|---|
| 1 | ► Load Modbus settings from a file (replaces all previous settings of this Modbus variant with the settings from the file). |
| 2 | ► Save all Modbus settings of this Modbus variant in a file. |

3.6.2 Configuring Modbus Slaves

Only valid for Client mode.



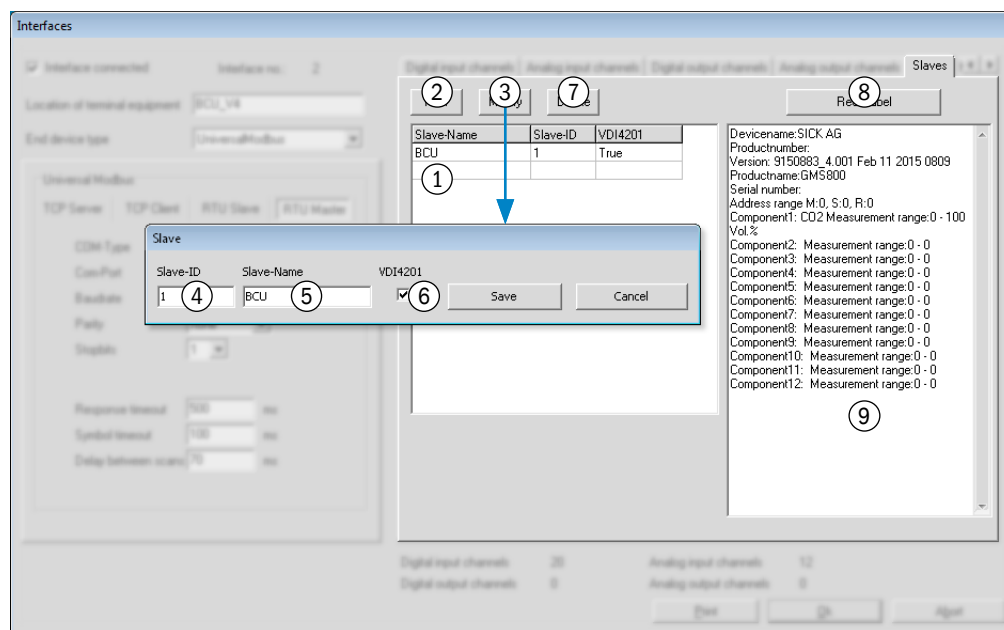
- Configure a separate slave device for each Modbus slave.



In a network, a client-server connection is a point-to-point connection and is identified with IP address + port. However, the following additionally applies here:

- Slave IDs are needed for the configuration of interfaces and signal connections (see "Technical Information Auxiliary components for MEAC300").
- If several Modbus slaves are connected via a TCP RTU gateway, each Modbus slave must have its own Slave ID.

Fig. 30: Configuring Modbus Slaves (with data examples)



1	List of configured Slave devices
2	► Configure a new Modbus Slave.
3	► Modify the settings for a selected Slave device.
4	► Enter the Slave ID.
5	► Enter the internal MEAC name of the Slave device.
6	► Activate when data transfer in accordance with Guideline VDI 4201, Sheet 3 is to be used for this Slave device (explanation see "Implementation of Guideline VDI 4201, Sheet 3", page 43).
7	► Delete the selected Slave device in the configuration.
8	► Request the electronic label for the selected Slave device. [1]
	Usage:
	1 Request the electronic label. [2]
	2 Visually check the received electronic label [9].
	3 Click "OK" when MEAC-UniversalModbus should use this electronic label later to identify the selected Server device.
9	Electronic label received

[1] Only possible when data transfer in accordance with VDI 4201 is activated.

[2] Does not function when a MEAC-UniversalModbus variant is already connected to this interface. **Workaround:** Terminate (temporarily) the MEAC-UniversalModbus variant involved (see "Modbus program window: Operating functions", page 59).

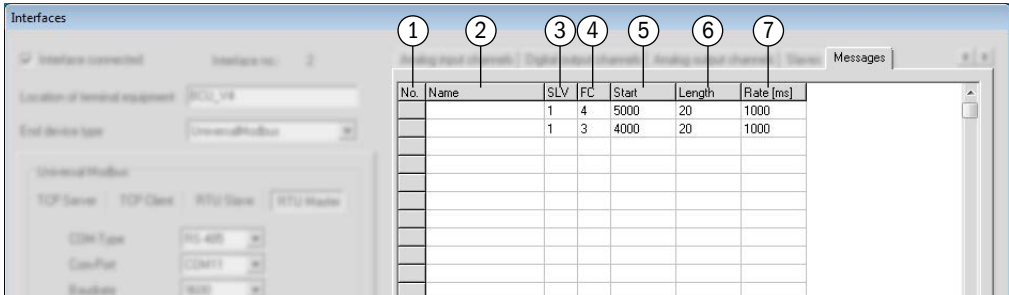
3.6.3 Configuring Modbus messages

Only valid for Client mode.



- Configure at least one message.
 - To receive data from Servers: Configure Modbus inputs to correspond to the requested data.
 - To send data to Servers: Configure Modbus outputs to provide the data (see “Configuring Modbus outputs”, page 56).
- Otherwise Client mode does not function.

Fig. 31: Configuring Modbus Messages (with data examples)



1	Consecutive message number
2	► If required: Internal MEAC identifier of the message.
3	► Enter the internal MEAC number of the Server device to which the message is to be sent.
4	► Enter the Function Code to be sent.
5	► Enter the start address valid for the desired data in the Server device.
6	► Enter the number of Coils/Discrete Inputs/Holding Registers/Input Registers (= length of data as from the start address).
7	► Enter the send interval (repetition cycle) of the message [milliseconds]. The appropriate setting basically depends on the individual circumstances. ► Observe the important note.



- The following is applicable for each configured message:
- Maximum number of Coils/Discrete Inputs: 2000
 - Maximum number of Holding Registers/Input Registers: 125
- Otherwise the Modbus specifications are not fulfilled.



- Important note for messages used to retrieve QAL3 data:
- Set the transmission interval to at least 30 seconds.
- This is because the received QAL3 data is temporarily stored until this data is retrieved by the processing program. Large amounts of data could potentially exceed the PC's storage capacity.

3.6.4 Configuring Modbus inputs

3.6.4.1 Configuring digital Modbus inputs

Fig. 32: MEAC inputs for Modbus Discrete Inputs (with data examples)

Chn	Sl	FC	Adr	Bit	Name	Description	Pm
1	1	3	4002	0		Failure, Comp 1	
2	1	3	4002	1		Maintenance, Comp 1	
3	1	3	4002	2		Check, Comp 1	
4	1	3	4002	3		Out of control, Comp 1	
5	1	3	4002	4		Simulation, Comp 1	
6	1	3	4006	0		Failure, Comp 2	
7	1	3	4006	1		Maintenance, Comp 2	
8	1	3	4006	2		Check, Comp 2	
9	1	3	4006	3		Out of control, Comp 2	
10	1	3	4006	4		Simulation, Comp 2	
11	1	2	4010	0		Failure, Comp 3	

1	Internal MEAC number of the channel
2	► Enter the Slave ID which must correspond to the data received. [1]
3	► Enter the Function Code which must correspond to the data received (see below).
4	For data from a Discrete Input or Coil: ► Enter the address of the bit (0 ... 65535) for which the discrete value is to be read. For data from a Register: ► Enter the address of the register (0 ... 65535) from which the discrete value (1 bit) is to be read.
5	For data from a Register: ► Enter the number of bits in the Register (0 ... 15). [2]
6	(►) If required: Enter the UPI identifier for this input.
7	► Enter the internal MEAC identifier of the channel.
8	(►) Enter "X" when each status change of the digital input is to appear in the printed protocol.

[1] Only required for Client mode (has no effect in Server mode).

[2] Select a Status bit here for data transfer in accordance with VDI 4201.

Function Codes for digital Modbus inputs:

Client mode		
Function Code in the message sent		
↓	Significance	Content of the digital input
01	Read Coils	One Coil
02	Read Discrete Inputs	One Discrete Input
03	Read Holding Registers	One bit from a Holding Register
04	Read Input Registers	One bit from an Input Register

Server mode		
Function Code in the message received		
↓	Significance	Content of the digital input
05	Write Single Coil	One Coil
06	Write Single Register	One bit from a Holding Register
15	Write Multiple Coils	One Coil
16	Write Multiple Registers	One bit from a Register

3.6.4.2 Configuring numeric Modbus inputs

Fig. 33: MEAC inputs for Modbus Input Registers (with data examples)

Chn	Sl	FC	Adr	Cod	Ref	Name	Description	ExpTyp	ExpGrp
1	1	3	4000	VDI	1		CO		
2	1	3	4004	VDI	2		CH4		
3	1	3	4008	VDI	3		CO2		
4	1	3	4012	VDI	4		NO		
5	1	3	4016	VDI	5		SD2		
6	1	3	4020	VDI	6		NO2		
7	1	3	4024	VDI	7		O2		
8	1	3	4028	VDI	8		Pressure		
9	1	3	4032	VDI	9		Flow		
10	1	3	4036	VDI	10		O2_GM		
11	1	3	6000	E32	0		From 1 physical value		

1	Internal MEAC number of the channel
2	► Enter the Slave ID which must correspond to the data received. [1]
3	► Enter the Function Code which must correspond to the data received (see below).
4	► Enter the address of the register (0 ... 65535) from which the value is to be read from the data received (16 bits). [2]
5	► Enter the data type of the value (see “Data types for numeric Modbus data”, page 55).
6	Only for Client mode and data type = “VDI”: ► Enter the identification number of the measuring component of the Server device (as shown on the label).
7	► If required: Enter the UPI identifier for the input.
8	► Enter the internal MEAC identifier of the channel.

[1] Only required for Client mode (has no effect in Server mode).

[2] Some data types [5] have several consecutive 16 bit Registers.

9	► Specify the export type of the value (see “Export types for numeric Modbus inputs”, page 55).
10	Only if an export type is specified: ► Assign an identical identification number to the data that belong together to a particular comparison measurement. [1]

[1] This keeps the values together that belong to a particular comparison measurement (time stamp, actual value, setpoint, drift). The identification numbers are arbitrary, but must uniquely identify a particular comparison measurement.

Function Codes for numeric Modbus inputs

Client mode		
Function Code in the message sent		
↓	Significance	Content of the numeric input
03	Read Holding Registers	One Holding Register [1]
04	Read Input Registers	One Input Register or several related Input Registers [1]

[1] Or a value that is transported in several Registers (see “Data types for numeric Modbus data”, page 55).

Server mode		
Function Code in the message received		
↓	Significance	Content of the numeric input
06	Write Single Register	One Holding Register [1]
16	Write Multiple Registers	One Holding Register or several related Holding Registers [1]

[1] Or a value that is transported in several Registers (see “Data types for numeric Modbus data”, page 55).

Data types for numeric Modbus data

Data Type	Format	Setting range [1]	Function
S16	16 bit with sign (Signed-16)	-32768 ... +32767	Conversion in -100.0% ... +99.9969%
U15	15 bit without sign (Unsigned-15)	0 ... 32767	Conversion in 0% ... 100%
U64	Value in range 0 ... 64000	0 ... 64000	Conversion in 0% ... 100%
VDI	32-bit floating point value + 32-bit registers	-10.000 ... +10.000	Scaled measured value + status information about the measured value

[1] "0" corresponds to measured value "0".

Data type	Format	Byte Order	Function
R16_1	16 bit register	AB	
R16_2	16 bit register	BA	
R32_1	32 bit register	CDAB	
R32_2	32 bit register	ABCD	
R32_3	32 bit register	DCBA	
R32_4	32 bit register	BADC	
F32_1	32 bit floating point value	CDAB	Unscaled QAL3 measured value
F32_2	32 bit floating point value	ABCD	
F32_3	32 bit floating point value	DCBA	
F32_4	32 bit floating point value	BADC	
REFMAT	32 bit Register	CDAB	1 status bit for each reference material
UNIXTS	32 bit integer value	CDAB	Timestamp according to POSIX standard
BCUTS	6 Register Block	[YYYY] [MM] [DD] [hh] [mm] [ss]	Timestamp in BCU format (ISO8601) [1]
S7TS	4 register block	[MM] [DD] [-] [YY] [hh] [mm] [-] [ss] (MSB ... LSB)	Timestamp in S700/SIDOR format [1]
Bit	1 bit in a 16 bit register		

[1] Date: Y → year, M → month, D → day. Time: h → hour, m → minute, s → second.



To see this information on the screen:
► Click "UniversalModbus Help".

Export types for numeric Modbus inputs

Export type	Function
ZPTS	Timestamp
ZPACT	Actual value
ZPSET	Setpoint
ZPDRIFT	Relative deviation of the actual value from the reference point
SPTS	Timestamp
SPACT	Actual value
SPSET	Setpoint
SPDRIFT	Relative deviation of the actual value from the nominal value



To see this information on the screen:
► Click "UniversalModbus Help".

3.6.5 Configuring Modbus outputs

3.6.5.1 Configuring digital Modbus outputs

Fig. 34: MEAC outputs for Modbus Coils (with data examples)

1	Internal MEAC number of the channel
2	► Enter the number of the Server device to which the data are sent. [1]
3	► Enter the Function Code with which the data are sent (see below).
4	For Function Codes 01, 02, 05, 15: ► Enter the address of the bit (0 ... 65535) where the output value is to be stored. For Function Codes 03, 04, 06, 16: ► Enter the address of the register in which the output value is to be stored.
5	► Enter the bit number within the register (0 ... 15) in which the output value is to be stored (1 bit).
6	► If required: Enter the UPI identifier for this output. [2]
7	► Enter the internal MEAC identifier of the channel.
8	► Enter "X" when each status change of the digital input is to appear in the printed protocol.

[1] Only required for Client mode (has no effect in Server mode).

[2] Only effective for Function Codes 03, 04, 06, 16.

Function Codes für digital Modbus outputs

Client mode		
Function Code in the message sent		
↓	Significance	Content of the digital output
05	Write Single Coil	One Coil
06	Write Single Register	One bit from a Register
15	Write Multiple Coils	One Coil
16	Write Multiple Registers	One Coil

Server mode		
Function Code in the message received		
↓	Significance	Content of the digital output
01	Read Coils	One Coil
02	Read Discrete Inputs	One Discrete Input
03	Read Holding Registers	One bit from the Holding Register
04	Read Input Registers	One bit from the Input Register

3.6.5.2 Configuring numeric Modbus outputs

Fig. 35: MEAC outputs for Modbus Holding Registers (with data examples)

Chn	Sl	FC	Adr	Cod	Re Name	Description
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

1	Internal MEAC number of the channel
2	► Enter the number of the Server device to which the data are sent. [1]
3	► Enter the Function Code with which the data are sent (see below).
4	► Enter the Register address (0 ... 65535) in which the output value is to be stored (16 bits).
5	► Enter the data type for the output value (see “Data types for numeric Modbus data”, page 55).
6	Without function
7	► If required: Enter the UPI identifier for this output.
8	► Enter the internal MEAC identifier of the channel.

[1] Only required for Client mode (has no effect in Server mode).

Function Codes für digital Modbus outputs

Client mode		
Function Code in the message sent		
↓	Significance	Content of the numeric output
06	Write Single Register	One Holding Register [1]
16	Write Multiple Registers	Several Holding Registers [1]

[1] Or a value that is transported in several Registers (see “Data types for numeric Modbus data”, page 55).

Server mode		
Function Code in the message received		
↓	Significance	Content of the numeric output
03	Read Holding Registers	One Holding Register [1]
04	Read Input Registers	One Input Register [1]

[1] Or a value that is transported in several Registers (see “Data types for numeric Modbus data”, page 55).

3.6.6 **Configuring hardware outputs for Modbus**

- ▶ Configure a digital hardware output for each digital (discrete) value to be output via Modbus.
- ▶ Configure a numeric hardware output for each numeric value to be output via Modbus.

Output device	▶ Select the Modbus interface to be used for the data transfer.
Output channel of the output device	▶ Select the Modbus output channel: - Output channel of a digital value see “Configuring digital Modbus outputs”, page 56. - Output channel of a numeric value see “Configuring numeric Modbus outputs”, page 57.

3.7 **Activating MEAC-UniversalModbus**

To make the configured Modbus functions effective:

- ▶ Activate the simulated evaluation configuration for the real evaluation (see “Technical Information MEAC300”).

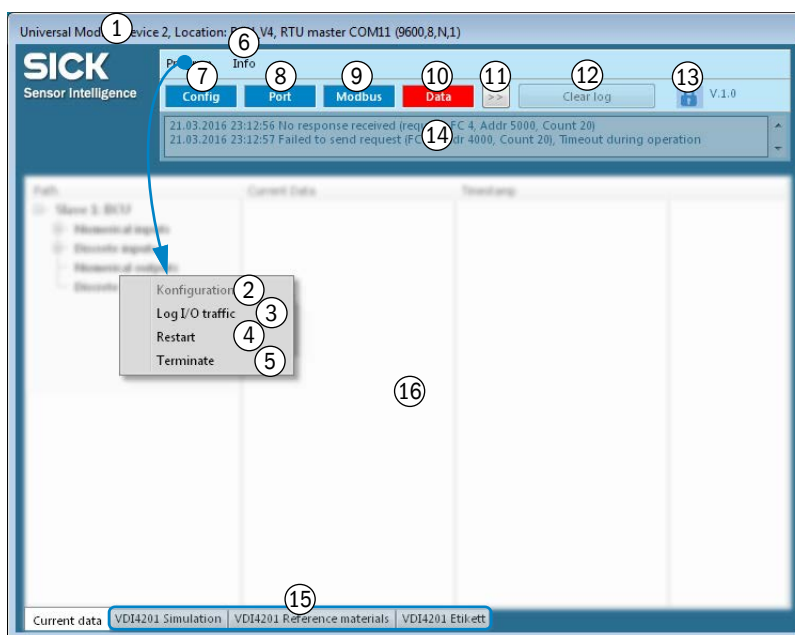
3.8 Modbus operating functions

3.8.1 Modbus program window: Operating functions



- The Modbus program window is displayed permanently when the MEAC program runs with MEAC-UniversalModbus.
- The Modbus program window is applicable for just one Modbus variant. Several Modbus program windows exist when several Modbus variants run at the same time.

Fig. 36: Modbus program window: Operating functions



1	Identification of the Modbus variant
2	► Call up the configuration function for this UniversalModbus variant. [1]
3	► Record the data transfers of this Modbus variant. [2][3]
4	► Terminate and restart the data transfer of this MEAC-UniversalModbus variant.
5	► Terminate this Modbus variant.
6	► Call up information on MEAC-UniversalModbus.
7	Status display for the Modbus configuration [4]
8	Status display for the hardware interfaces used [4]
9	Status display for the Modbus data transfer [4]
10	Status display for the values transferred [4]
11	► Activate/deactivate display of Log messages (14). [5]
12	► Clear the Log. [5]
13	Symbol for current user access rights [6]
14	Log messages
15	Special functions (see "Special functions for Guideline VDI 4201", page 61) [7]
16	Lists and displays, depending on the selected function

[1] Only available on a PC without Auxiliary components for MEAC300 (Stand-alone configurator).

[2] In text file <MEAC folder>\log\MBxx.log (xx = number of the Modbus variant in the list of interfaces).

[3] Only available with extended access rights (see [13]).

[4] BLUE = operating state. RED = Modbus operation is possibly interrupted.

[5] Only available with the highest access rights (Supervisor).

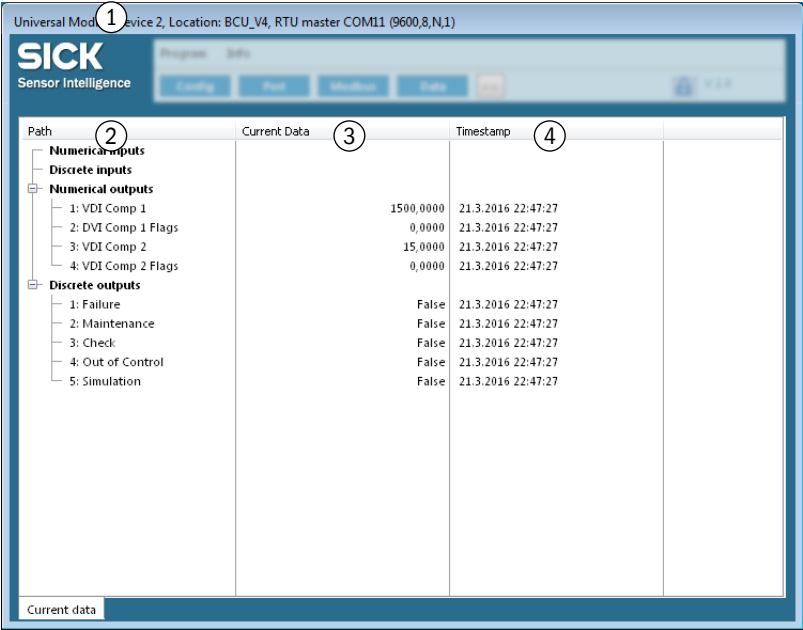
[6] "Open padlock" = the logged in user has the extended access rights for the Modbus operating functions.

[7] Only when corresponding program configuration present.

3.8.2 Modbus program window: Modbus Status

- Select the tab for current data in the Modbus window.

Fig. 37: Modbus program window: Current data (example)



1	Identification of the Modbus variant
2	Configured Modbus inputs and outputs of this Modbus variant
3	Last values transferred
4	Timestamp of last values transferred

3.9 Special functions for Guideline VDI 4201

3.9.1 Brief information on guideline VDI 4201

Guideline VDI 4201, Sheet 3 specifies the data transfer between an evaluation computer functioning as Modbus Client and analyzers functioning as Server. [1]

The Guideline defines a transfer standard: The transfer of a measured value comprises the numeric measured value as 32 bit floating point value plus the current status information as 32 bit status. This contiguous information comprises 64 bits split into 4 sequential Modbus Registers. All measured values are scaled to value range 0 ... 10000. The function of some Status bit is defined (see below). Further Status bits can be defined by the manufacturer of a Modbus device (see product information of the respective Modbus device).

3.9.2 Functions supported for guideline VDI 4201

Modbus special functions in MEAC-UniversalModbus according to guideline VDI 4201 Sheet 3

• Label	see "VDI 4201: Viewing the label", page 64
• Simulation mode	see "VDI 4201: Using the special functions", page 62
• Reference materials	see "VDI 4201: Using reference materials", page 63

Status bits in accordance with guideline VDI 4201, Sheet 3

Bit number:	1	2	3	4	5
Significance :	Malfunction	Maintenance	Maintenance request	Simulation	Out of control

Parallel operation with VDI 4201

The normal Modbus transfer standard and the transfer standard in accordance with VDI 4201 can be used together at the same time next to each other in each MEAC-UniversalModbus variant.

3.9.3 VDI 4201: Create prerequisites (overview)

- ▶ Configure at least one numerical input for each measurement component of an analyzer.
- ▶ Configure at least one digital input for each status signal of an analyzer.
- ▶ Activate the data transmission according to VDI 4201 Sheet 3 for the corresponding Modbus slaves ([see "Configuring Modbus Slaves", page 51](#)).
- ▶ *To be able to use the active special functions:* Unlock the Modbus functions ([see "Modbus program window: Operating functions", page 59](#)).



The active special functions for VDI 4201 are only available after the label of the analyzer concerned has been retrieved ([see "VDI 4201: Viewing the label", page 64](#)).

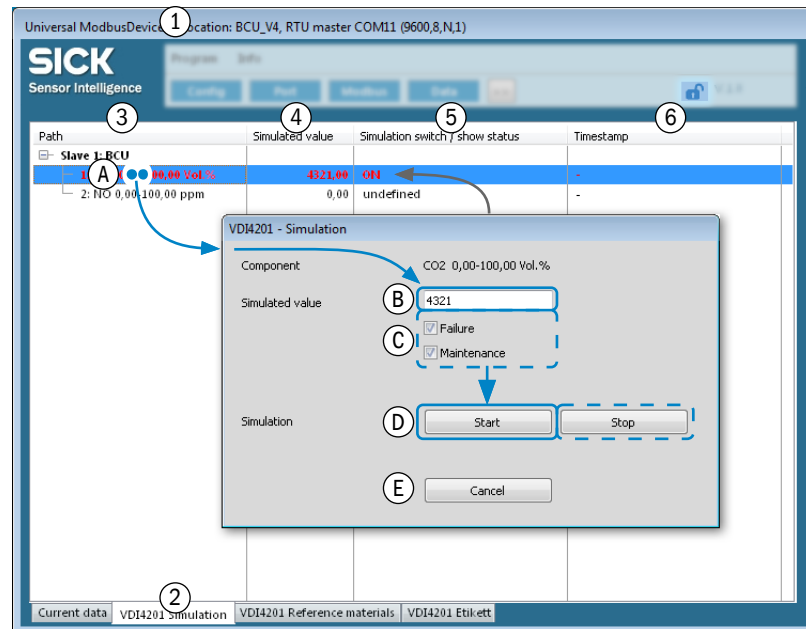
[1] VDI 4201, Sheet 3: Minimum requirements for automated measuring and electronic data evaluation systems for monitoring emissions - Digital interface - Specific requirements for Modbus.

3.9.4 VDI 4201: Using the special functions

The simulation function is used to command the analyzer to constantly output a specific measured value. In this way, the processing chain of this measured value can be tested.

Status signals “Malfunction” and “Maintenance” can be simulated at the same time.

Fig. 38: Modbus program window: Simulation functions for VDI 4201 (example)



1	Modbus variant identification
2	Special function for measured value simulation according to VDI 4201 [1]
3	List of measuring components of the Server device (name from label) – Red font: Simulated measured value requested.
4	Current measured value from the analyzer – Red font: Simulated measured value.
5	Current simulation status – OFF: No simulation (measurement mode) – ON: Simulation active – undefined: Simulation has not been used yet

[1] Only available with corresponding configuration (see “VDI 4201: Create prerequisites (overview)”, page 61) and only when the label of the analyzer has been received.

Usage:

A	▶ Double-click on a line in the list of measurement components. [1]
B	▶ Enter the desired simulation value.
C	▶ Select the statuses the analyzer should signal simultaneously (malfunction, maintenance). [2]
D	▶ Request the simulation value from the analyzer/end the simulation.
E	▶ Close this menu.

[1] Only works when the Modbus functions are unlocked (see “Modbus program window: Operating functions”, page 59).

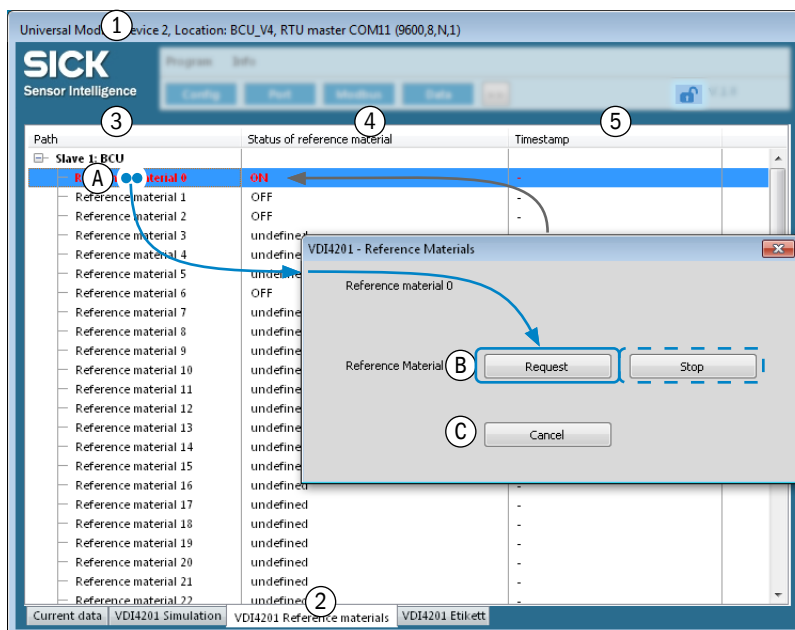
[2] Possible at the same time.

3.9.5 VDI 4201: Using reference materials

“Reference material function X” serves to command the connected analyzer to activate the reference material in question. The effect depends on how the analyzer responds to this command.

According to VDI 4201, a maximum of 32 reference materials are provided.

Fig. 39: Modbus program window: Reference materials for VDI 4201 (example)



1	Modbus variant identification
2	Special function for reference materials according to VDI 4201 ^[1]
3	List of reference materials of the Server device
4	Current status. - OFF: No reference material activated (measuring mode) - ON: Reference material activated - undefined: Function has not been used yet
5	Timestamp

[1] Only available with corresponding configuration (see “VDI 4201: Create prerequisites (overview)”, page 61) and only after the label of the analyzer has been received.

Usage:

A	► Double-click on a line in the list of reference material. ^[1]
B	► Send the function command/stop the function.
C	► Close this menu.

[1] Only works when the Modbus functions are unlocked (see “Modbus program window: Operating functions”, page 59).

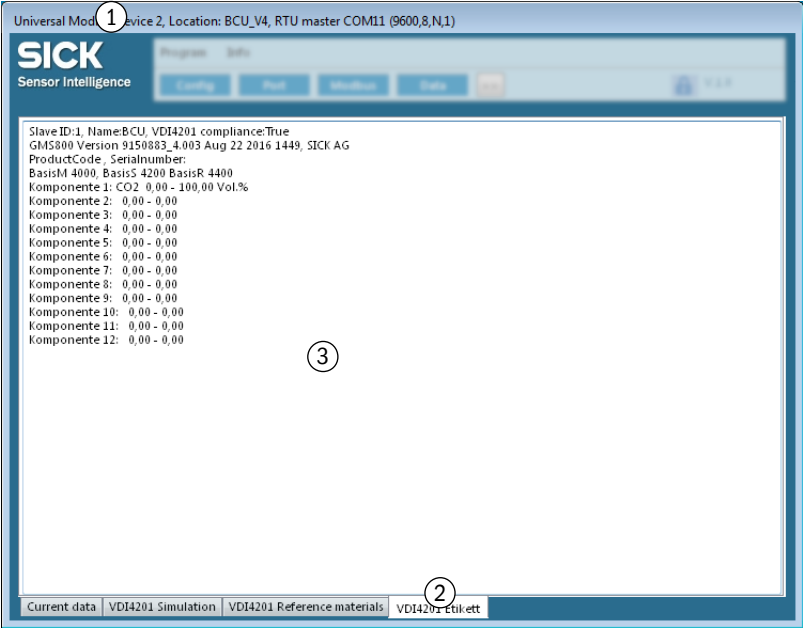
3.9.6 VDI 4201: Viewing the label

The “Label” according to VDI 4201 is a data record identifying the analyzer (measuring components, measuring range, manufacturer, serial number, version information).
The label is automatically requested by the Modbus client after each restart of the Modbus data transmission (Function Code 43). During operation, the label is used for identity verification to detect whether the analyzer has been modified.



The active special functions for the guideline VDI 4201 are only available when the MEAC-UniversalModbus has received the label of the connected analyzer.

Fig. 40: Modbus program window: Label for VDI 4201 (example)



1	Modbus variant identification
2	Special function to display the label according to VDI 4201 [1]
3	Received label of the analyzer connected to this Modbus variant

[1] Only available with corresponding configuration (see “VDI 4201: Create prerequisites (overview)”, page 61).

4 MEAC-Redundanzpaket

4.1 General information on the MEAC-Redundanzpaket

4.1.1 Purpose of the MEAC-Redundanzpaket

The MEAC-Redundanzpaket serves to extend the MEAC300 with redundant features:

Redundant feature	Effect
Acquire and process measured values from redundant analyzers	- Higher availability - Greater reliability
Acquire measured values via redundant data paths	
Operate two redundant Emission PCs	- Hardware backup - Automatic data mirroring - Automatic PC monitoring - Automatic switchover to the interference-free system

Fig. 41: Principle of redundant Emission PCs

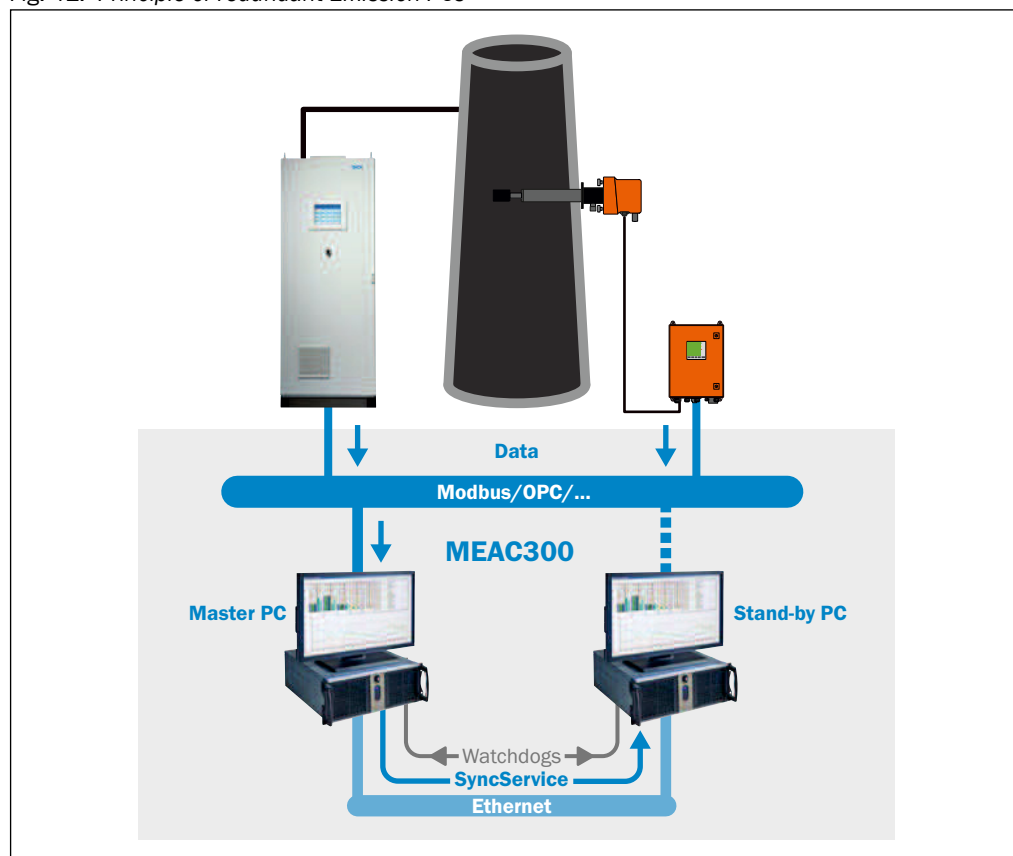
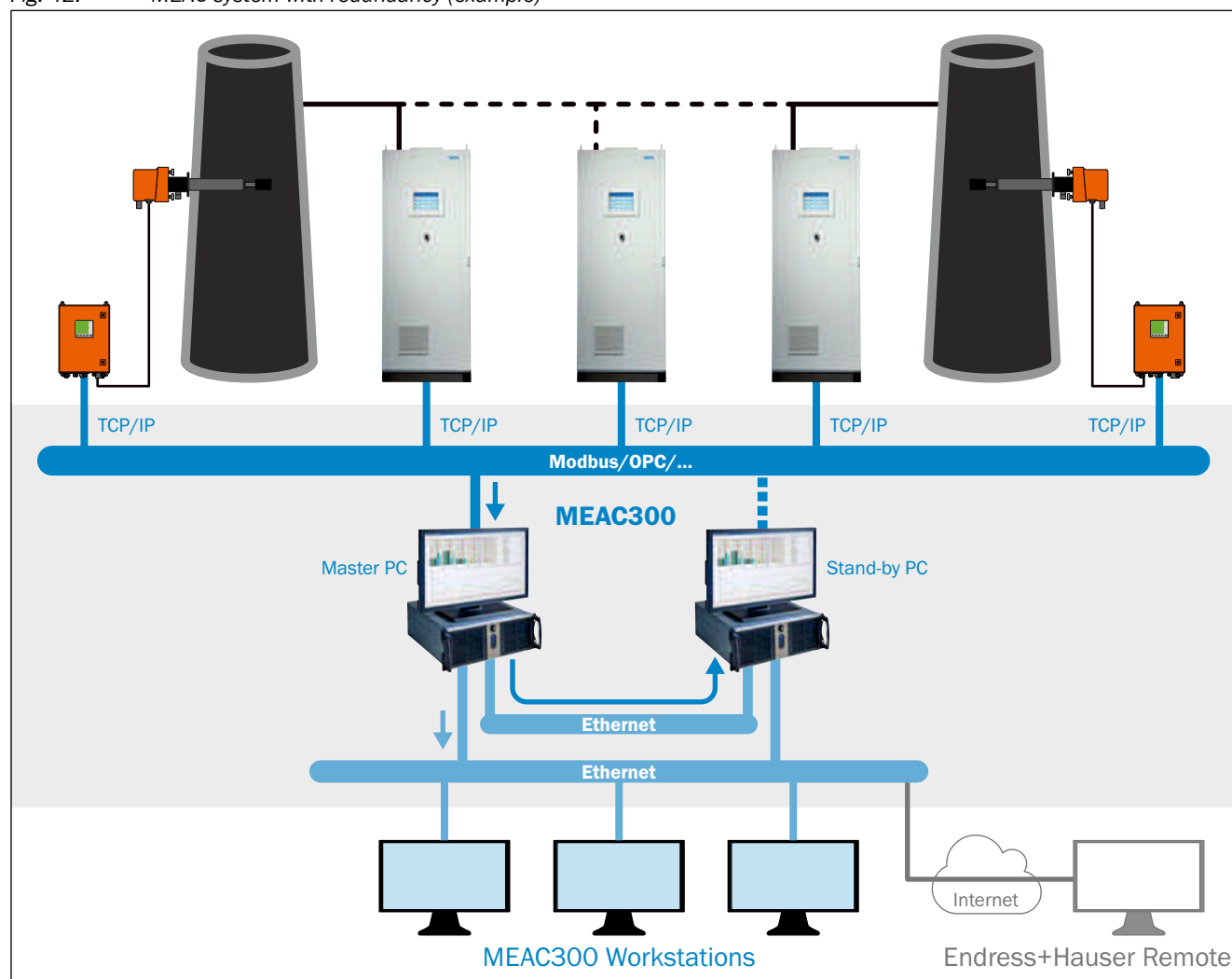


Fig. 42: MEAC system with redundancy (example)



4.1.2 Terms and functions in MEAC-Redundanzpaket

Term	Function in redundant system
Master PC	Emission PC, which actively performs data acquisition and emission data evaluation. ^[1] – The evaluation program runs in “Master MEAC” operating mode (performs data acquisition and emission data evaluation). – The SyncService runs in operating mode “FTP-Client”.
Standby PC	Emission PC, which can take over the function of the Master PC at any time. ^[1] – The evaluation program runs in “Standby MEAC” operating mode (technical monitoring of the I/O interfaces without data acquisition, no evaluation). – The SyncService runs in operating mode “FTP-Server”.
APC-Server	PC server that receives emission data from the Master PC and stores it so that the data can be retrieved by workstation PCs.
SyncService	Synchronization service that automatically synchronizes the data of the Standby PC with the Master PC and ensures that the Standby PC can be made the Master PC at any time should the Master PC fail. – Runs on the Master PC as FTP client. – Runs on the Standby PC as FTP server. The SyncService can also automatically transfer the Master PC's dataset to other locations (e.g. APC server, passive backup PCs).
Watchdog	Control service for automatic exchange of status information and commands. The interaction of the watchdogs of the Master PC and the Standby PC controls the redundant system. – Is connected on the own Emission PC with the MEAC program and the SyncService. – Is connected constantly to the Watchdog of the other (redundant) Emissions-PC. – Can switch the operating modes of the MEAC program and SyncService.
PC1 ^[2]	The Emission PC, which acts as the Master PC during trouble-free operation.
PC2 ^[3]	The Emission PC, which acts as the Master PC during trouble-free operation.

^[1] Further information see [“Interaction of the redundant Emission PCs”](#), page 68.

^[2] In configuration files “DefaultMaster”.

^[3] In configuration files “DefaultSlave”.

4.1.3 Interaction of the redundant Emission PCs

Master PC

One of the redundant Emission PCs acts as Master PC (see [“Interaction of the redundant Emission PCs”, page 68](#)). The Master PC collects all emission data and processes the data according to the evaluation configuration.

Standby PC

The second Emission PC acts as a Standby PC. It automatically receives the current MEAC data of the Master PC from SyncService; so it always has the same data as the Master PC.

Automatic Master/Standby switching

The Master PC is monitored by the Watchdog. When the Watchdog detects a persistent malfunction in the Master-PC (during data transfer or emission data evaluation), it communicates with the Watchdog of the Standby PC. If this reports that the Standby PC is functioning without interference and can receive the emission data without interference, the Master/Standby operating mode of the two Emission PCs is automatically swapped.



- When the Emission PC configured as PC1 is running as a Standby PC after an interruption in operation, the Master/Standby operating mode is automatically “switched back” as soon as all data has been synchronized.
- Automatic Master/Standby switching can be deactivated (see [“Operating with redundancy functions”, page 72](#)).

4.1.4 Redundancy upgrade for MEAC2000 EU (overview)

MEAC2000 EU systems can also be subsequently extended so that this MEAC-Redundanzpaket can be used:

Step [1]	Measure
(1) Install hardware for redundant operation.	► see “Installing hardware for redundant operation”, page 69
2 Change the MEAC system to MEAC300 (perform migration procedure). [2]	► See “Technical Information MEAC300” (separate document)
3 Install software for the MEAC-Redundanzpaket.	► see “Installing the MEAC-Redundanzpaket”, page 70
4 Adjust the evaluation configuration. [3]	► see “Customizing the evaluation configuration”, page 71
5 Start the redundant operation.	► see “Operating with redundancy functions”, page 72

[1] (...) = only when required.

[2] Only valid for MEAC2000 EU.

[3] On the Emission PC configured as PC1.

4.2 Installing hardware for redundant operation

4.2.1 Installing redundancy in emission measurement (note)

If required:

- ▶ Install redundant analyzers.
- ▶ Install redundant signal paths.

4.2.2 Preparing redundant Emission PCs

- ▶ Install the Emission PC hardware in the designated location.
- ▶ Connect both Emission PCs via network to the signal paths of the emission data (Modbus/OPC/COM server).
- ▶ In addition, connect both Emission PCs directly to each other (separate Ethernet connection).
- ▶ Install the same MEAC300 software on both Emission PCs.

4.2.3 Connecting MEAC data acquisition units (when required)

When MEAC data acquisition units are used:

- Do not connect a MEAC data acquisition unit with serial point-to-point protocol directly via serial interface, but via a COM server to which both Emission PCs are connected via network.



The COM server emulates the serial interface of the MEAC data acquisition unit in the network and automatically connects an Emission PC to the MEAC data acquisition unit.

4.3 Installing software for redundant operation

4.3.1 Application options of the installation program

- Install MEAC300 software
- Install MEx (see *separate extract of this Technical Information*).
- Install Watchdog and SyncService.
- Create appropriate configuration files automatically.

4.3.2 Installing the MEAC-Redundanzpaket

Perform once on each redundant Emission PC:

- 1 When the MEAC program is running: Terminate the MEAC program.
- 2 Connect delivered data medium and Emission PC (e.g. insert the DVD in the DVD drive).
- 3 Search for and start the installation program on the data medium.
- 4 Follow the instructions of the installation program:

Step	Explanation
1 Select the destination folders.	► Select the folders where the software components in question are to be saved. [1]
2 Select the desired software components.	<i>To install the MEAC-Redundanzpaket:</i> ► Select "MEAC300FW". ► Select "Watchdog and SyncService".
3 Select installation options.	► Select the desired options.
4 Select the standard role of this Emission PC (Master/Standby).	► Select whether the Emission PC starts as Master PC or as Standby PC. [2]
5 Select the network address of this Emission PC.	► Select which IP address to use for the direct (exclusive) connection of the Emission PCs.
6 Enter the network address of the other Emission PC.	► Enter the network address of the second Emission PC with which this Emission PC functions redundantly.
7 Enter the communication ports of the program modules.	► Enter the communication ports the MEAC-Redundanzpaket should use on this Emission PC. [3]
8 Enter the name of the other Emission PC.	► Enter the name specified as "computer name" in the operating system of the other Emission PC. [4]
9 Select automatic time synchronization mode for the PC2. [5]	► Select whether the MEAC program synchronizes the time automatically or whether another method is used (e.g. source on the network, special hardware, special software).

[1] Select different folders in each case. Select a separate folder for SyncService (no subfolder in MEAC300 folder). During operation, the SyncService automatically creates the folder __SyncService, which contains several files, in the program folder of the MEAC program.

[2] Select "Master" on one Emission PC and "Standby" on the other Emission PC.

[3] The standard settings are preset. – *Recommendation:* In range 1024 ... 49151 (in accordance with IANA → <http://www.iana.org/assignments/service-names-port-numbers>).

[4] *If not yet available:* Enter the planned name.

[5] In preparation.



- The settings for the SyncService are in the SyncService program folder in file syncservice.ini.
- The Watchdog settings are in the MEAC System folder in \config\meacipc.ini.
- The installation program for Watchdog and SyncService creates these files new in each case.

4.4 Customizing the evaluation configuration

4.4.1 Customizing components

Step		Instructions
1	Configure one component for each real signal source ^[1] ("raw component").	Select the signal source type for each of these components: ▶ When signal source has 1 measuring range: "1-channel". ▶ When signal source has 2 measuring ranges: "2-channel".
2	Configure one component for each emission component whose measured values can come from different (redundant) signal sources.	For these components: ▶ Select "4:1" as signal source type (mode). ▶ Select at least 2 matching redundant raw components (maximum 4). ^[2]
3	When the emission data evaluation contains reference value calculations:	▶ Configure one component for each reference value component that is to come from redundant signal sources - as for emission components with redundant signal sources, but select "4:1 Ref." as the signal source type (mode). ^[3]

[1] Also applies to each individual redundant real signal source. These can be, for example, a measurement component of an analyzer or individual data channels from different MEAC data acquisition units.

[2] In operation, the MEAC system automatically uses the first signal source that provides valid values.

[3] This type ensures that the current reference values are recorded before calculating the emission values.



When upgrading from MEAC2000 EU with redundant functions to MEAC300 + MEAC-Redundanzpaket:

In MEAC2000 EU, components with redundant signal sources are represented using formulas. These formulas would also work in the MEAC300 system. However, it is recommended to change these components on the current system (type of signal source = "4:1").

This may require setting up new components for the real (redundant) signal sources. However, for components with redundant signal sources that are evaluated, no new components should be created, but the existing configuration of these components should be changed. In this way, the internal program IDs of these components are not changed. This preserves the links to previous emission data.

4.4.2 Configuring status output of redundancy functions (if required)

Type of status output

The current status of the redundancy functions can be output as bit packet:

Bit	Meaning in state	
	1	0
0	PC1 functioning normal	PC1 malfunctioning
1	PC1 acts as Master PC	PC1 acts as Standby PC
2	Interfaces on PC1 functioning normal	Interfaces on PC1 malfunctioning
3	PC2 functioning normally	PC2 malfunctioning
4	PC2 acts as Master PC	PC2 acts as Standby PC
5	Interfaces on PC2 functioning normal	Interfaces on PC2 malfunctioning
6	Synchronization functioning normal	Synchronization not functioning
7	Automatic Master/Standby switching	Automatic Master/Standby switching

Table 9: Bit information in "Redundant System Flags"

Configure status output



Detailed description of work steps → "Technical information MEAC300".

1 Configure an interface:

Communication path (type of device connected):	► Modbus or ► OPC
Signal connection type:	► Analog outputs
Analog output type: [1]	1 Select a channel. 2 Enter "RAW" as type.

[1] For Modbus only. Not applicable for OPC.

2 Configure a numeric output (hardware output):

Output device:	► The interface configured above
Output device output:	► "RAW" channel number
Component value (mode):	► "Redundant System Flags"

4.5 Operating with redundancy functions

4.5.1 Starting redundant operation



After an upgrade from MEAC2000 EU to MEAC300 + MEAC-Redundanzpaket:

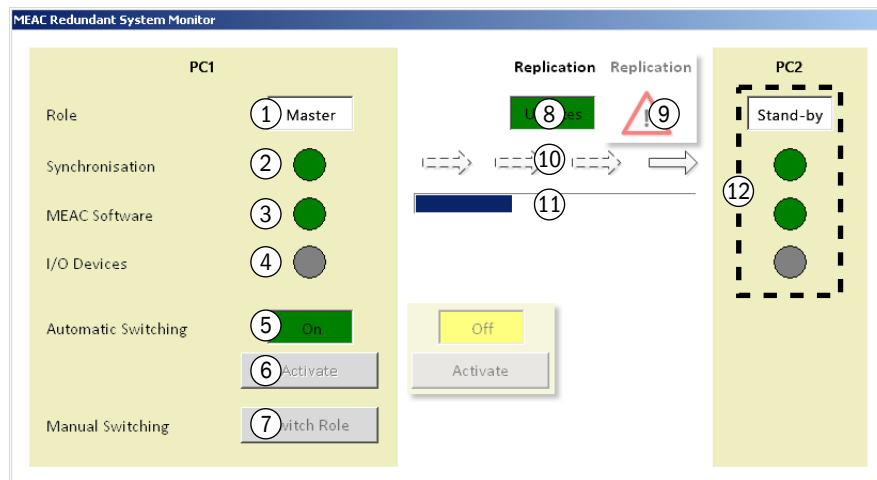
- Do not continue the emission data evaluation until the migration procedure has been completed (see "Redundancy upgrade for MEAC2000 EU (overview)", page 68).

Otherwise the MEAC system may calculate incorrect emission data.

Usual start:	► Start both Emission PCs.
Manual start of the entire software:	► Run StartRedundantSystem.bat.

4.5.2 Checking/controlling status of redundancy functions

Fig. 43: Menu of redundancy functions in Master-PC (example for PC1)



1	Active redundancy operating mode for this Emission PC
2	SyncService-Status
	● green: Data synchronization works normally. ● yellow: SyncService is running on this Emission PC, but synchronization is currently not taking place due to a fault in the other (redundant) Emission PC. ● red: SyncService does not run on this Emission PC.
3	Status of the MEAC program ^[1]
	● green: The evaluation program works normally. ● red: The evaluation program is not running.
4	Status of I/O interfaces ^[1]
	● green: All I/O interfaces function normally. ● yellow: In the last 10 minutes, at least 10% of the received momentary values (5-second values) were down or defective. ● red: In the last 10 minutes, at least 90% of the received momentary values were down or defective.
5	Status of automatic Master/Stand-by switching ("On"/"Off")
6	▶ Activate automatic Master/Stand-by switching ^[2] , ^[3]
7	▶ Master/Standby operating mode of the redundant Emissions-PC. ^[4]
	Deactivates automatic Master/Standby switching.
8	Status of data synchronization
9	Fault indication (replaces Status of data synchronization)
10	Direction of data synchronization
11	Progress of current data synchronization
12	Status in the other (redundant) Emission PC

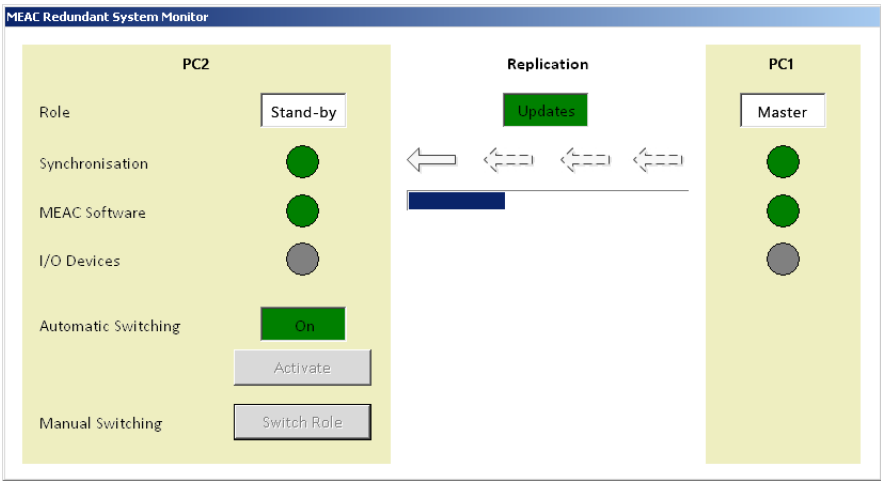
[1] Valid only for this Emission PC.

[2] Explanation see ["Interaction of the redundant Emission PCs"](#), page 68.

[3] Only available when automatic Master/Standby switching is disabled (see [Master/Stand-by switching (see [7])).

[4] Only available with highest access rights (login as Supervisor).

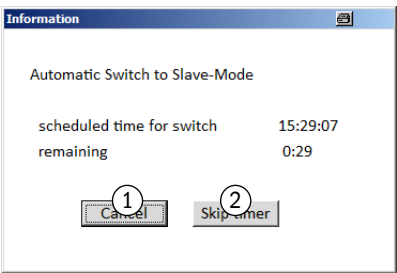
Fig. 44: Menu of redundancy functions in Master-PC (example for PC2)



4.5.3 Influencing automatic Master/Standby switching

When the operating functions for redundant operation are displayed (see “Operating with redundancy functions”, page 72): Before an automatic Master/Standby switchover takes place, a countdown is displayed (see Fig. 45).

Fig. 45: Countdown display before automatic Master/Stand-by switchover



1	► Prevent this automatic Master/Slave switchover.
2	► Perform this automatic Master/Slave switchover now immediately.

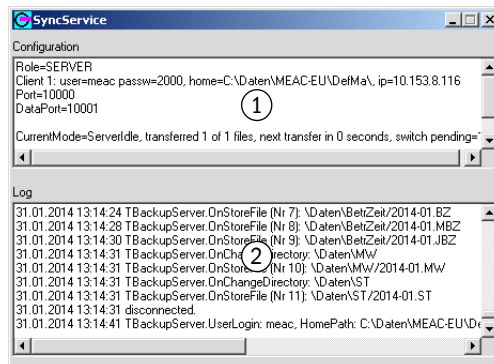


- Deactivating/activating Master/Stand-by switching see “Checking/controlling status of redundancy functions”, page 73.
- Function explanation see “Interaction of the redundant Emission PCs”, page 68.

4.5.4 Viewing SyncService status

- Click program icon “SyncService” (in the Windows task bar, alternatively on the Windows Desktop).

Fig. 46: SyncService window

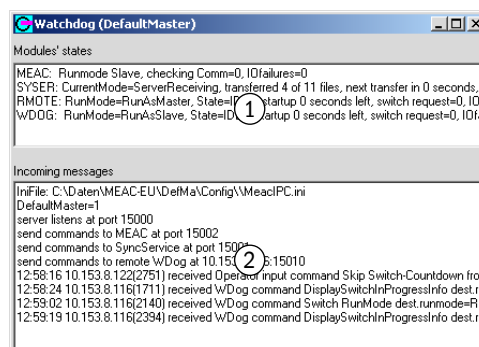


1	Current SyncService program status
2	Current SyncService Log (Contents of file syncservice.log)

4.5.5 Viewing Watchdog status

- Click program icon “MEACwatchdog” (on Windows Task bar, alternatively on Windows Desktop).

Fig. 47: Watchdog window



1	Status of the program modules on this Emission PC
	MEAC: Evaluation program on this Emission PC
	SYSER: SyncService on this Emission PC
	WDOG: Watchdog on this emissions PC
	RMOTE: Watchdog on the other (redundant) Emission PC
2	– Messages coming from a watchdog – Operator commands (contents of “wdog.log” file)

5 Emission data remote transfer (MEAC-EFÜ)

5.1 Introduction to Emission data remote transfer

5.1.1 Purpose of MEAC-EFÜ functions

With remote emission data transfer, emission data stored in the MEAC system is transmitted to an external entity - e.g., the regulatory agency that monitors emissions. The data are transmitted in the officially prescribed manner. Data transfers start automatically or after a manual trigger.

5.1.2 Terms

ERT	Emission data remote transfer
LAI	State Committee for Immission Control (Federal Republic of Germany)
B System	Transmitter of emission data (computer of the plant operator)
G System	Recipient of the emission data (computer of the supervisory authority)
Data model	Structure and links of a data set. <i>In Auxiliary components for MEAC300:</i> Evaluation configuration (configuration of data acquisition and processing).
Modem	Device for data transmission via telecommunication links. Analog transmission technology; two modems are connected to each other (modem = modulator/demodulator).
ISDN	Integrated Services Digital Network (technical standard for data transmission via telecommunications links using digital transmission technology).
ISDN Terminal Adapter	Device for data transmission in the ISDN standard (ISDN protocol). ISDN terminal adapters are used to establish telecommunications connections between ISDN terminals.
ISDN Hybrid	Unlike ISDN terminal adapters, ISDN hybrids can also transmit data to analog terminals (e.g. modems). Another common name is "ISDN modem". ISDN hybrids are connected to each other via ISDN ("S0 bus"), not via analog connections.
PBX	Telecommunications system (private branch exchange)

5.1.3 Sequence of a data transmission



The data transmission complies with the guideline "Remote emission transmission interface definition", revised version of the resolution of the LAI dated 28.09.2005, as of April 2017.

The ERT protocol specifies

- the transfer of data models, messages and continuous emission monitoring data from the B system to the G system
- the data requests from the G system to the B system.

The data can be transferred via a modem connection or via an FTPES connection via the Internet (FTP-SSL).

Emission data is transmitted from the B system when the G system requests it. Data transfers can also take place automatically at specific times. In addition, the B system can be configured to automatically transmit emission data when a certain limit has been exceeded.

Modem connections can be initiated by the B system or the G system. Only the B system can initiate an FTPES connection. The B system periodically starts FTPES connections automatically to fetch the data requests from the G system.

5.1.4 Data transfer security

Safe pairing

Before a data transmission starts, the systems verify each other with individual identifiers.

Security via modem

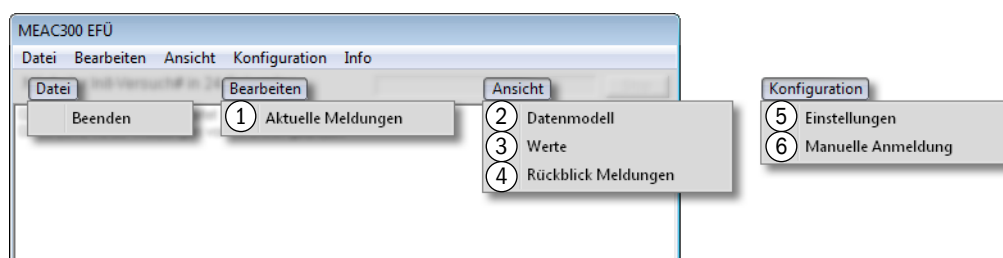
- The phone number and an alphanumeric string (see [“Configuring an ERT connection via modem”, page 83](#)) serve as identifier.
- With each new modem connection, the G system generates a new “handle” for the B system.
- Emission data are exchanged in a recall procedure - i.e. request for data and data transmission take place separately. When the G system sends a request to the B system, it terminates the connection afterwards. The B system then establishes a new connection itself and sends the requested data to the G system.
- B system and G system cannot access each other.

Security via internet

- IP address + port number and an alphanumeric string (see [“Configuring the ERT connection via Internet”, page 84](#)) serve as identifier.
- The B system must accept the certificate of the G system.
- The G system only accepts FTPES connections.
- The B system has access only to its own root directory in the G system.

5.2 MEAC-EFÜ-Functions (overview)

Fig. 48:  Window “Auxiliary components for MEAC300 MEAC-EFÜ” (overview)



1	see “Processing and releasing messages”, page 88
2	see “Viewing ERT data models”, page 86
3	see “Viewing ERT measured values”, page 87
4	see “Displaying transmitted messages”, page 89
5	see “Configuring an ERT connection via modem”, page 83
	see “Configuring the ERT connection via Internet”, page 84
6	see “Initiating the first modem connection to the G system”, page 85

5.3 Configuring ERT functions

5.3.1 MEAC internal preparations

Getting access rights to the ERT settings

To be able to make the necessary settings in Auxiliary components for MEAC300, a user with the following access rights must be logged in to the MEAC system:

- Change regulation-compliant configuration
- Activate configuration
- ERT “Reading and Writing”

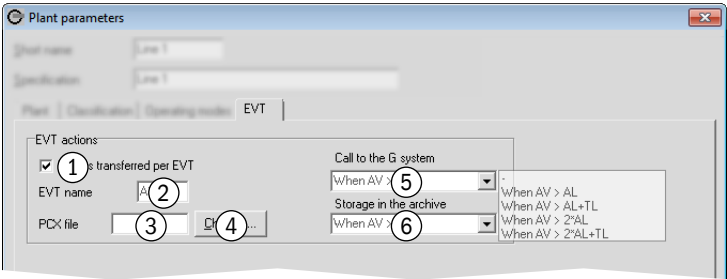
Using the Simulation mode

- The MEAC-EFÜ functions are part of the evaluation configuration.
 - The evaluation configuration can only be changed in Simulation mode.
- 1 *When the MEAC-EFÜ settings are to be configured or changed:* Start the Simulation mode.
 - 2 *After settings have been changed:* Activate the simulated evaluation configuration for the real evaluation.

 For detailed instructions on the program section “Simulation” see Operating Instructions Auxiliary components for MEAC300”.

5.3.2 Configuring a plant for MEAC-EFÜ

Fig. 49:  Plant: ERT parameters



1	► Activate the Emission data remote transfer for this plant.
2	► Enter the short name for the plant in the Emission data remote transfer (maximum 4 characters for unique identification). [1]
3	File name of the image file that is transferred as an overview image of the plant together with the ERT data.
4	► Select/change image file for the overview image.
5	► Select at which limit event a message is automatically sent to the G system.
6	► Select under which condition the data should be included in the archive of the G system.

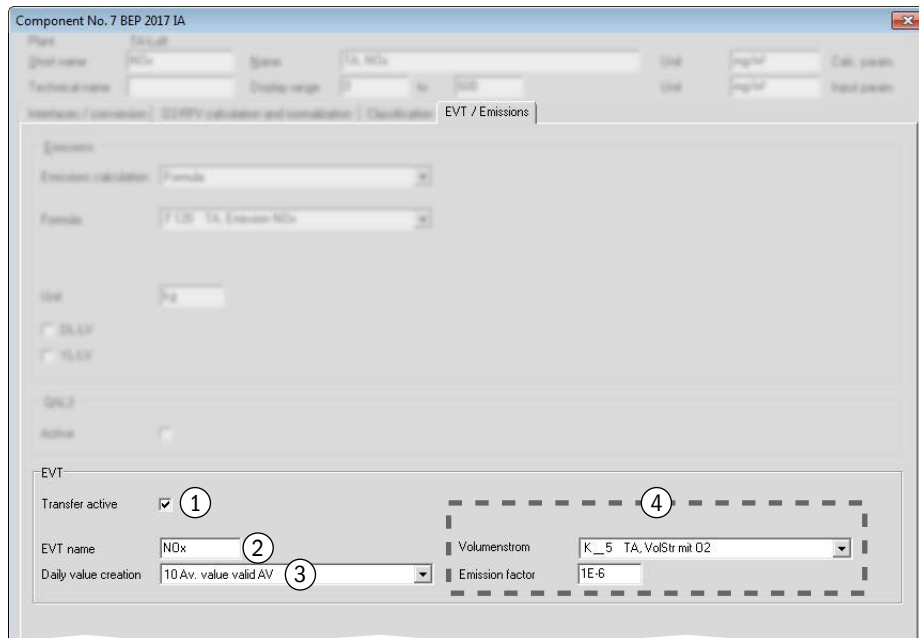
[1] The official guidelines stipulate that this short designation consists of a maximum of 4 alphanumeric characters. Special characters are not allowed.

5.3.3 Configuring components for ERT

For plants where the Emission data remote transfer activated is (see “Configuring a plant for MEAC-EFÜ”, page 78):

- Perform the following settings for each component of the plant:

Fig. 50:  Configuration Components: ERT parameters



1	► Activate when data of this component is to be transmitted via ERT.
2	► Enter the short name for this component in the Emission data remote transfer (maximum 20 characters). [1]
3	► Select which mode is to be used when calculating the daily values of this component. [2]
4	When the regulator calculates the pollutant emission amount for this component: ► Select the appropriate settings for volume flow rate and factor (see “Information on calculating emission values”, page 80).

[1] This identification must be unique within the plant.

[2] The correct setting depends on the MEAC settings of the system. Take regulations of the supervisory authority into account.

5.3.4 Information on calculating emission values

5.3.4.1 Basis of the emission quantity calculation

Although the Auxiliary components for MEAC300 can also calculate the emission values, the ERT Protocol does not provide for the transmission of these data - because the supervisory authorities should calculate the emission quantities themselves. For this purpose, flue gas volume flow and pollutant concentration in the flue gas must be transmitted to the supervisory authority.

5.3.4.2 Information and standardization in the EU Protocol

Factor

When the physical unit of the components in the MEAC system is not "m³/h":

- Set the "Factor" so that the quotient of MEAC internal physical unit and "Factor" is exactly 1 m³/h.



In the ERT protocol, a volume flow always has the physical unit "m³/h".

Volume flow

When the emission quantities of the component are to be calculated:

- 1 Select which component represents the associated flue gas volume flow.
- 2 Set the "Factor" so that the quotient of MEAC-internal physical unit of the component and "Factor" results in 1 kg/m³ (example [see Fig. 50, page 79](#)).

Physical unit for emission volume

- The multiplication of the physical units of pollutant component, flue gas volume flow component and both correction factors must always result in "kg/h". The following Table shows useful combinations:

Pollutant component		
Unit	Vol. factor	
kg / m ³	1	
g/m ³	1E-3	(10 ⁻³)
mg/m ³	1E-6	(10 ⁻⁶)
µg/m ³	1E-9	(10 ⁻⁹)
ng/m ³	1E-12	(10 ⁻¹²)

Volume flow component	
Unit	Flue gas volume flow factor
m ³ /h	1
1E3 m ³ /h	1E3
1E6 m ³ /h	1E6
1E9 m ³ /h	1E9
m ³ /min	60
m ³ /s	3600

Settings examples to calculate emission volumes

Fig. 51: ERT parameter – example for a volume flow component

Component No. 8

Plant: Plant 1

Short name: Flow Name: A1, Flow Unit: m³/h calc. parameter

Technical name: Display range: 0 to 100 Unit: m³/h input parameter

Interfaces / conversion / CO2EF and correction calculation / ERT / Classification: EVT / Emissions

Loads

Formula: None Unit:

Flow

Flow: None Unit:

Flow factor (g/h):

SQL3

Active: ☐

Analysed

Analysed: None Unit:

EVT

Transfer active: ☒

EVT name: Flow

Daily value creation: 0 no daily value created

Fig. 52: ERT parameter – example for a pollutant component

Component No. 8

Plant: Plant 1

Short name: SO2 Name: A1, thermal output Unit: mg/m³ calc. parameter

Technical name: Display range: 0 to 100 Unit: mg/m³ input parameter

Interfaces / conversion / CO2EF and correction calculation / ERT / Classification: EVT / Emissions

Loads

Formula: None Unit:

SQL3

Active: ☐

Analysed

Analysed: None Unit:

EVT

Transfer active: ☒

EVT name: SO2

Daily value creation: 10 Av. value valid 4V

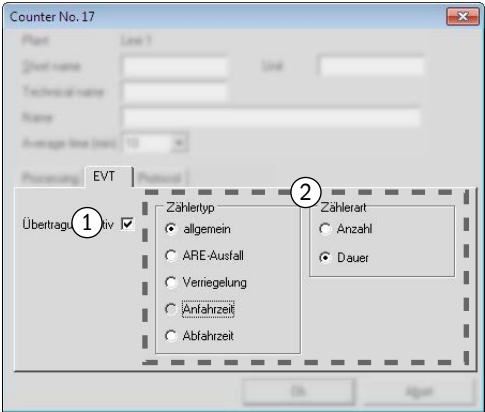
Flow

Flow: K__1 A1, Flow Unit:

Factor: 1E6

5.3.5 Configuring the MEAC-EFÜ

Fig. 53:  Configuration Emission data remote transfer: Counter configuration

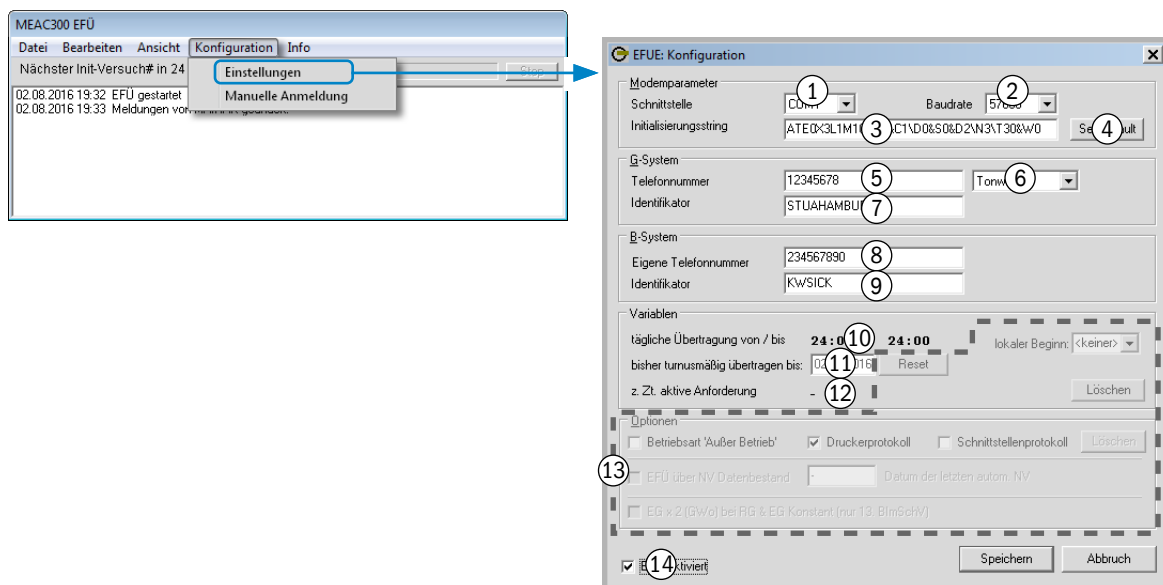


1	► Activate the emission data remote transmission for this counter.
2	► Select function.

5.3.6 Configuring an ERT connection via modem

Applies only with activated connection module “Efue.exe” (for modem connections)

Fig. 54: Emission data remote transfer: Configuration for modem (with value examples)



1	► Set the Emission PC interface to which the modem is connected (Standard: COM2).
2	► Set the transfer speed between the Emission PC and the connected modem (Standard: 57600).
3	► Enter the start command ^[1] that the Emission PC sends to the modem. ^[2]
4	► Set the standard values for the start command. ^[3]
5	Enter the telephone number with which the modem of the issuing PC reaches the modem of the supervisory authority. ^[4] <i>Control characters possible within the telephone number:</i> • “W” = dialing pause (<i>Recommendation:</i> Use after the number of the “trunk line”). • “,” (comma) = pause with adjustable length (see Modem manual).
6	► Set the dialing method used in the telecommunication connection (tone dialing or pulse dialing; Standard: Tone dialing). ► If the dialing method must be changed in the course of the phone number: Set the dialing method with which the modem is to start. ^[5]
7	► Enter the individual identifier of the authority system (copy the information of the supervisory authority exactly).
8	► Enter the telephone number of the modem on the Emission PC (informative specification for system-internal documentation, not actively used by the MEAC program).
9	► Enter the relevant individual identifier assigned by the supervisor to this MEAC system (copy the supervisor’s specification exactly).
10	Daily period in which the emission data are to be transmitted from the B system to the G system (sent specification of the G system).
11	Date of the last successful data transmission to the G system. • “30.12.99” = no data transmission so far.
12	Current data request from the G system.
13	<i>These functions are not described in this document.</i>
14	► Activate the emission data remote transmission of MEAC300 (“Main switch” for ERT).

^[1] String with AT-compatible commands. The appropriate setting depends on the modem model used and the data transmission requirements. The initialization string must be programmed in such a way that error correction according to V.42 is established during the connection, alternatively according to MNP4 (otherwise the G system must not accept the connection, according to LAI guideline). V.42 can be selected for data compression, alternatively MNP5.

^[2] The start commands are sent when the MEAC-EFÜ program module starts, when a new connection is to be established and when the MEAC-EFÜ configuration is saved.

^[3] Suitable for modem “ELSA 33.6 TQV”.

^[4] Area code for the “trunk line” of the system operator (if necessary) + local area code (if necessary) + individual telephone number of the supervisory authority (incl. extension).

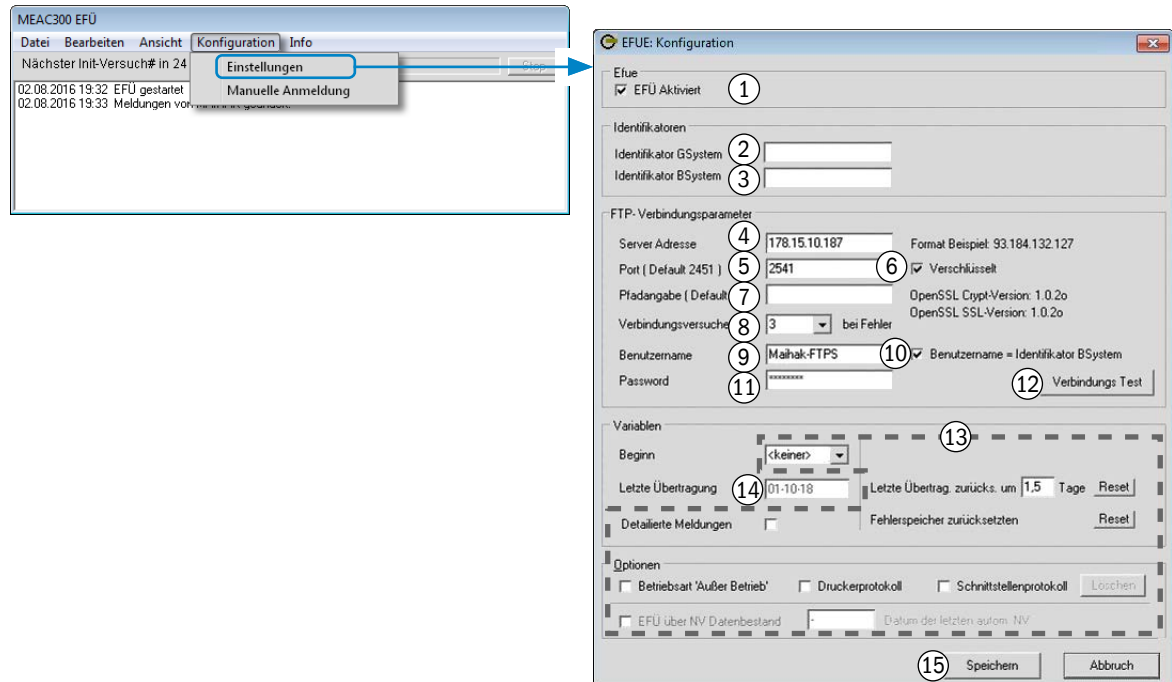
^[5] Refer to the Modem manual for possible control characters for switching the dialing method within the telephone number.

5.3.7 Configuring the ERT connection via Internet

System prerequisites:

- Activated connection module "EfueFtp.exe" (for Internet connection)
- Authorized access to the FTP server of the supervisory authority
- Permanent connection from the Emission PC to the Internet

Fig. 55: Emission data remote transfer: Configuration for internet (with value examples)



1	▶ Activate emission remote data transfer from MEAC300 ("Main switch" for ERT).
2	▶ Enter the individual identification of the authorities system (copy the supervisory authority's information exactly).
3	▶ Enter the relevant individual identifier assigned by the supervisory authority to this MEAC system (copy the supervisory authority's specification exactly).
4	▶ Enter the IP address of the supervisory authority's FTP server.
5	▶ Enter the TCP port of the supervisory authority's FTP server.
6	▶ Activate SSL encryption.
7	▶ Enter the root directory this MEAC system should use on the FTP server.
8	▶ Select how often the Emission PC should try to connect to the supervisor's FTP server if the connection fails.
9	▶ Enter the user name for logging in to the FTP server.
10	▶ Use the identifier of the MEAC system as the user name [3].
11	▶ Enter the password for logging in to the FTP server.
12	▶ Connect to the FTP server of the supervisory authority on a trial basis (including login).
13	<i>These functions are not described in this document.</i>
14	Date of the last successful data transmission to the G system. • "30.12.99" = no data transmission so far.
15	▶ Save and activate the displayed settings.

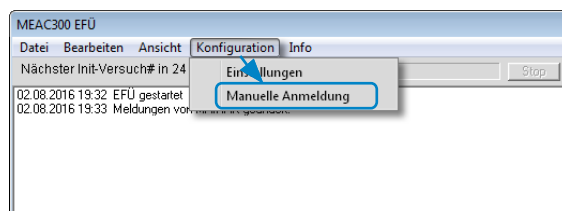
5.4 Initiating the first modem connection to the G system

– Does not apply for FTPES connections (via Internet) –

The first modem connection of the B system with the G system must be established manually.

- 1 Ensure the emission data remote transmission is activated (see Fig. 53, page 82).
- 2 Select the function for manual login (see Fig. 56).

Fig. 56: Emission data remote transfer: Connect the device for the first time



The following then happens:

- The B system (Emission PC with Auxiliary components for MEAC300) tries to establish a connection to the G system (call via modem).
- When the connection is established, mutual identifiers are exchanged. The B system then terminates the connection.
- The G system establishes the connection to the B system.
- G system and B system compare each other's identifiers.
- If this is successful, the G system sends the first banner for the B system.
- The G system then terminates the connection.



The “banner” is a dynamic identifier. It is different for each connection. Each time a connection is made, the G system sends a new banner to the B system as a “key” for the next connection.



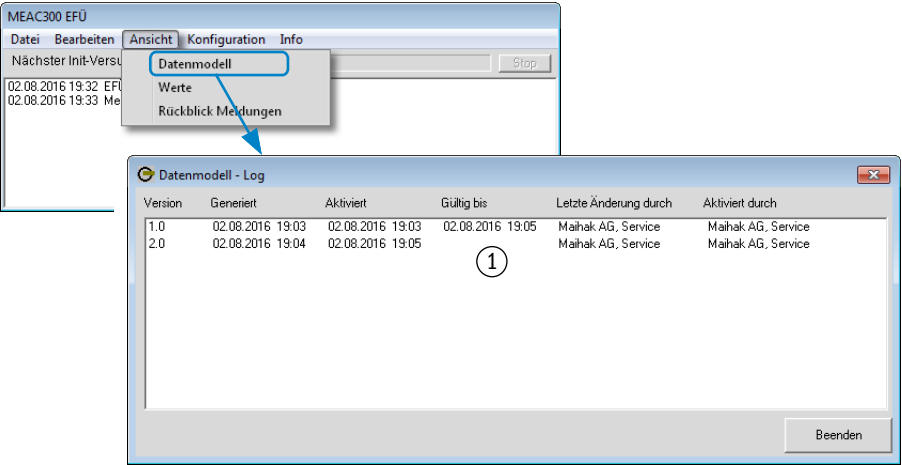
► Pay attention for error messages when running the procedure.

After this procedure, the B system and G system can communicate with each other fully automatically. Emission data remote transfer is in operation.

5.5 Displaying ERT information

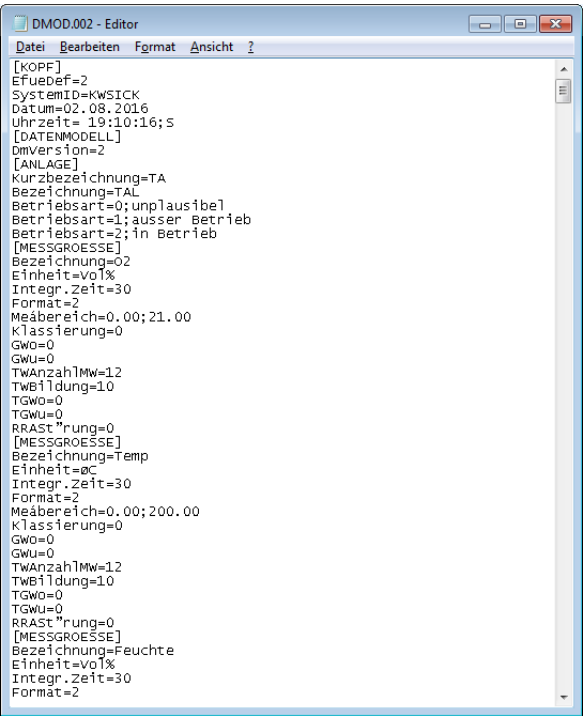
5.5.1 Viewing ERT data models

Fig. 57: Emission data remote transfer: View the form of data transfers (example)



- 1 List of evaluation configurations (data models) stored in the MEAC system (B system).
► To see the form of the data of an evaluation configuration to be sent to the supervisory authority:
Double-click on the relevant line in the list.
The list is generated as a text file and automatically displayed in the text editor of the Windows system (see Fig. 58, page 86).

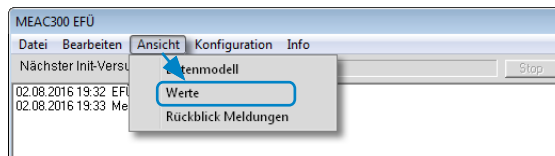
Fig. 58: Emission data remote transfer: Text output for form of transmission data (example)



For detailed information, see FCI guideline “Remote emission transmission interface definition”.

5.5.2 Viewing ERT measured values

Fig. 59: Emission data remote transfer: View transferred data



- 1 Start the function (see Fig. 59, page 87).
- 2 Select the day when the values were transferred (date).

The data are then displayed:

Fig. 60: Emission data remote transfer: Transmitted data (example)

	03.08. 19:00S	03.08. 19:10S	03.08. 19:20S	03.08. 19:30S	03.08. 19:40S	03.08. 19:50S	03.08. 20:00S
Dampf	0.00 XX	0.00 XX	37.50 IB	37.50 GB	37.50 GB	37.50 GB	37.50 GB
TNBZ kl	0.00 XX	0.00 XX	1111.50 IB	1111.50 GB	1111.50 GB	1111.50 GB	1111.50 GB
O2	0.00 XX		1.97 IB				1.97 GB
Temp	0.00 XX		96.38 IB				96.38 GB
Feuchte	0.00 XX		4.29 IB				4.29 GB
Druck	0.00 XX		1000.00 IB				1000.00 GB
VolStr	0.00 XX		2.99 IB				2.99 GB
CO	0.00 XX		35.75 IB				35.75 GB
NOx	0.00 XX		138.75 IB				138.75 GB
SO2 roh	0.00 XX		44.53 IB				44.53 GB
SO2 rein	0.00 XX		12.50 IB				12.50 GB
SAG	0.00 XX		71.93 IB				71.93 GB
Staub qu	0.00 XX		2.69 IB				2.69 GB
TNBZ	0.00 XX	0.00 XX	514.50 IB	514.50 GB	514.50 GB	514.50 GB	514.50 GB
O2	0.00 XX						1.97 GB
Temp	0.00 XX						96.38 GB
CO	0.00 XX						35.75 GB

1. Buchstabe nach Wert (Komponentenstatus)
 X - Außer Betrieb W - Wartung N - keine Kl.
 G - Gültiger Wert S - Störung K - Kal.-Ber.
 I - Ungültiger Wert E - mit Ersatzwert U - Unklarer Fehlerzust.

2. Buchstabe nach Wert (Betriebsart)
 X - Außer Betrieb R - RRA-Störung A - An-/Abfahrbetrieb
 B - Betrieb N - keine Klassierung

1	Data model number
2	Short designation of the plant in the Emission data remote transfer ^[1]
3	Components
4	All integration times of the selected day
5	Average values with associated status code (measured variable status according to FCI guideline)
6	Explanation of the status codes

[1] Definition see "Configuring a plant for MEAC-EFÜ", page 78.

5.6 Messages via ERT

5.6.1 Processing and releasing messages

For each limit overrun reported via ERT, MEAC2012 automatically generates an associated comment - this is a text message that can be sent to the G system. The comment contains standardized information about the event and a text part that you can edit.

Comments are automatically generated, but not sent immediately. This happens only after you have manually given the release.

How to edit a comment:

- 1 Open the “Current messages” menu (see Fig. 61).
 - 2 Click on an entered comment under “Overview”.
 - 3 If necessary, edit the text of the message.
 - 4 Release the comment for transmission to the G system.
 - 5 Click on “Save & Exit” to save the message (with changes) in the Auxiliary components for MEAC300 system.
- Click “Cancel” to exit the menu without saving.

Fig. 61: Emission data remote transfer: Current messages (example)

1	► Select message type.
2	Message list ► To select a message: Click on a line.
3	► To change the comment: Edit the text.
4	► Release the comment for transmission to the G system. [1]

[1] Sent at the next opportunity.

5.6.2 Composing messages

A message is a manually generated text message that can be transmitted to the G system. Messages serve to share any “pertinent” information.

A message is not sent until it is released. So you can prepare messages without sending them and release them later.

How to create a message:

- 1 Open the “Current messages” menu (see Fig. 61, page 88).
 - 2 Click on “-” (minus sign) in the message list.
 - 3 Select “Message” as the message type.
 - 4 Write the text of the message.
 - 5 Release the message for transmission to the G system.
 - 6 Click on “Save & Exit” to save the message (with changes) in the Auxiliary components for MEAC300 system.
- Click “Cancel” to exit the menu without saving.



- You can release a message at any time later.
- You can also cancel an existing release at any time - as long as the message has not yet been sent.

5.6.3 Displaying transmitted messages

You can display all text messages that were transmitted via ERT in the past. This includes the automatic notifications of limit violations, comments and messages. You can view the contents of each message and check when it was submitted:

Fig. 62: Emission data remote transfer: Sent messages/messages (example)

- | | |
|---|--|
| 1 | ► Select the day on which the message was transmitted. |
| 2 | List of messages transmitted on the selected day.
► To select a message: Click on a line. |

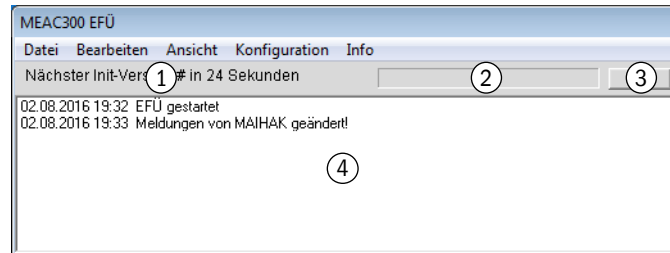
5.7 Error conditions and behavior

The ERT system will work without any further necessary support when the settings are correct. Nevertheless, problems may occur due to poor telephone connections or unilaterally changed parameters.

Displays in MEAC-EFÜ window

All actions are continuously documented in the ERT window and can also be displayed and printed in retrospect in the system log.

Fig. 63: Emission data remote transfer: Status messages (example)



1	When the modem is not initialized: Countdown for the next initialization attempt (2 minutes).
2	Display for a running file transfer via modem (progress bar).
3	► Cancel the active transfer to the authority.
4	Status messages of the MEAC system for Emission data remote transfer

Possible error messages

Message:	Remote station does not answer
Status:	Manual intervention if necessary
Cause:	Authority system is not accessible.
Measure:	Internally up to 4 repeated attempts to transfer the data if the communication was initiated by the B system (= call was made by the B system).
Message:	Connection failure: <Error text>
Status:	Manual intervention if necessary
Cause:	E.g. No carrier signal due to bad telephone line
Measure:	Up to 4 repeated attempts to transmit the data if the communication was initiated by the B system.
Message:	Banner incorrect for <action>
Status:	Manual intervention
Cause:	Transferred banner is rejected by the authority system.
Consequence:	Existing connection is interrupted
Measure:	Manual initial registration.
Message:	Unidentified G system
Status:	After coordination with the authority, manual intervention if necessary
Cause:	Identifier transmitted by the G system does not match the one stored in the system.
Consequence:	Existing connection is interrupted
Measure:	After clarification with the authority, correct the G system identifier if necessary.
Measure:	Review of the B system and, if necessary, the authority system.

Message:	Identifier rejected for <Action>
Status:	After coordination with the authority, manual intervention if necessary
Cause:	Identifier transmitted by the B system does not match the one stored in the system.
Consequence:	Existing connection is interrupted.
Measure:	After clarification with the authority, correct the B system identifier if necessary.

Message:	Telegram unknown for <action>
Status:	Automatic internal recovery
Cause:	Protocol violation within the scope of communication.
Consequence:	Existing connection is interrupted.
Measure:	Up to 4 repeated attempts to transmit the data if the communication was initiated by the B system.

Message:	No value transfer possible <action>
Cause:	Subsequent error due to above causes, even after 5 attempts, transmission of the requested data or data to be transmitted automatically was not possible.
Consequence:	ERT is displayed in the system window with status "Fault".
Measure:	Review of the B system and, if necessary, the authority system as well.

For ZModem transmission:	
Message:	Termination by user
	Termination by remote terminal
	wrong file size
	Incorrect block identifier received
	Abort, too many errors
	Timeout
	unspecifiable
Cause:	File transfer was aborted due to repeated ZModem errors (usually caused by incorrect modem settings or also bad telephone line).
Consequence:	Existing connection is interrupted.
Measure:	Up to 4 repeated attempts to transmit the data if the communication was initiated by the B system.

6 Hardware information

6.1 PC specifications

6.1.1 Emission PC

System requirements (minimum equipment)

- Microsoft Windows
- 2048 MB RAM
- Hard disks
- Network connection (LAN/Ethernet)
- Serial interface (COM port)
- Keyboard and mouse
- PCI cards
- GPS / DCF77 radio clock
- Multi-IO interface card (RS232/RS485)
- DVD burner
- Monitor with HDMI resolution (1920 × 1080 pixels)

Hardware options for installation

- RAID1 or RAID5 array (requires third hard disk)
- PC housing as midi-tower or as 19" rack mount
- Additional network cards
- Additional multi/IO interface card
- Watchdog board

Hardware options for installation

- TFT monitor
- Protocol graphic printer
- External hard disk
- Analog or ISDN modem
- UPS unit
- External protocol converter (RS232/TTY, RS232/RS422/RS485, RS232/Ethernet, Modbus RTU/Profibus DP)
- External media converter (copper/optical fiber)

6.1.2 Workplace PC

(Recommended minimum equipment)

- Microsoft Windows
- 2048 MB RAM
- Hard disk
- Ethernet port
- Serial interface (COM port)
- Keyboard and mouse
- DVD burner

6.2 Connecting the data acquisition unit and Emission PC

6.2.1 Checking/connecting inputs and outputs

- ▶ Send measured values via analog inputs (see “Pin assignment: Analog input board”, page 94).
- ▶ Send status signals via digital inputs (see “Pin assignment: Status input board”, page 95).
- ▶ Output calculated numeric values via analog outputs (see “Pin assignment: Analog output board”, page 96).
- ▶ Output stored and calculated signals via digital outputs (see “Pin assignment: Status output board”, page 97).

6.2.2 Connection options

- RS232 (see Fig. 64)
- RS485
- TTY (see Fig. 65)
- Fiber optic cable
- Ethernet (LAN)
- Field module



Connection with redundant signal sources (scheme) see “MEAC system with redundancy (example)”, page 66.

Fig. 64: RS232 connection variants

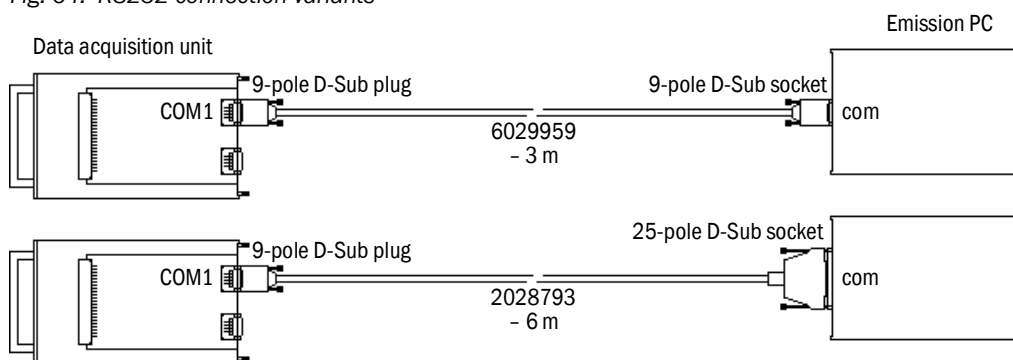
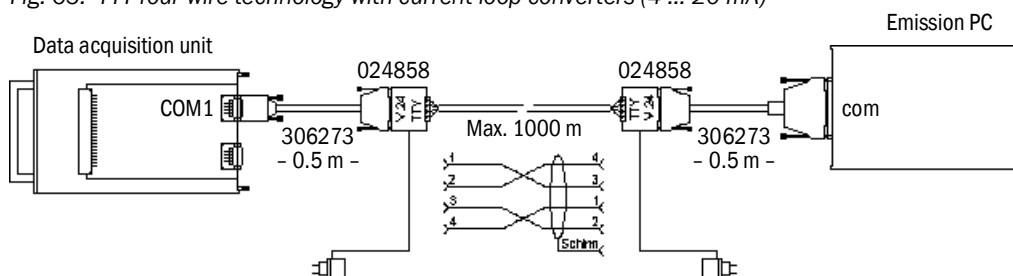
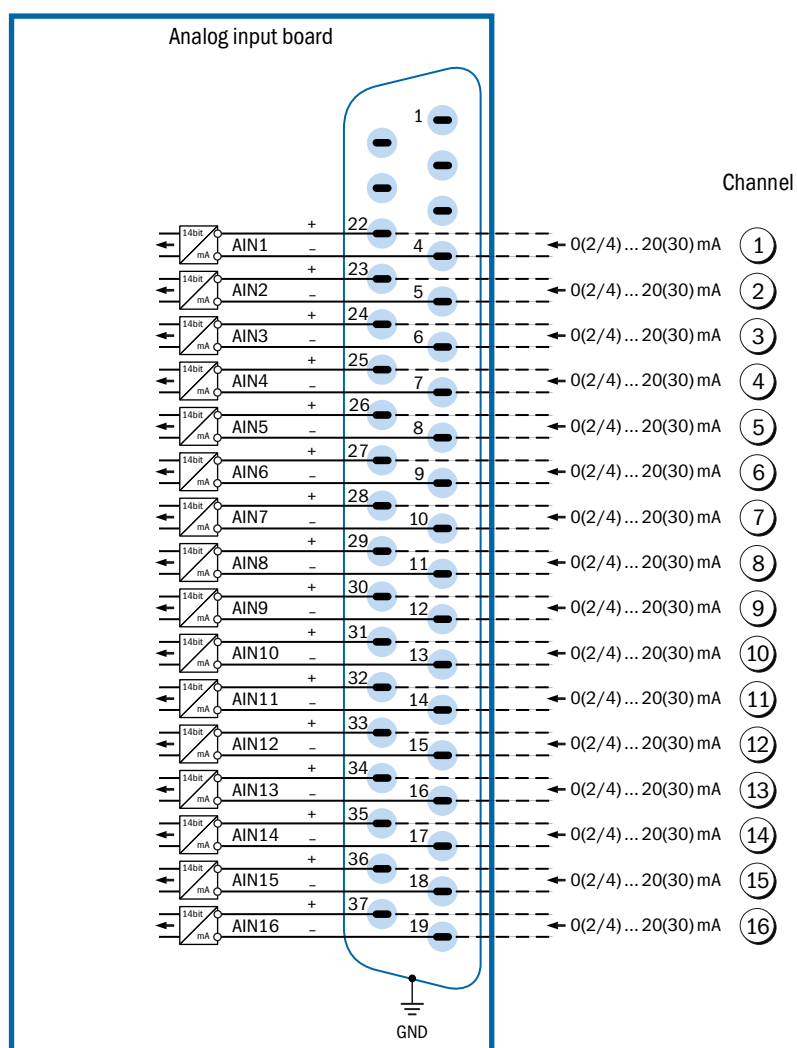


Fig. 65: TTY four-wire technology with current loop converters (4 ... 20 mA)



6.3 Information on MEAC data acquisition units

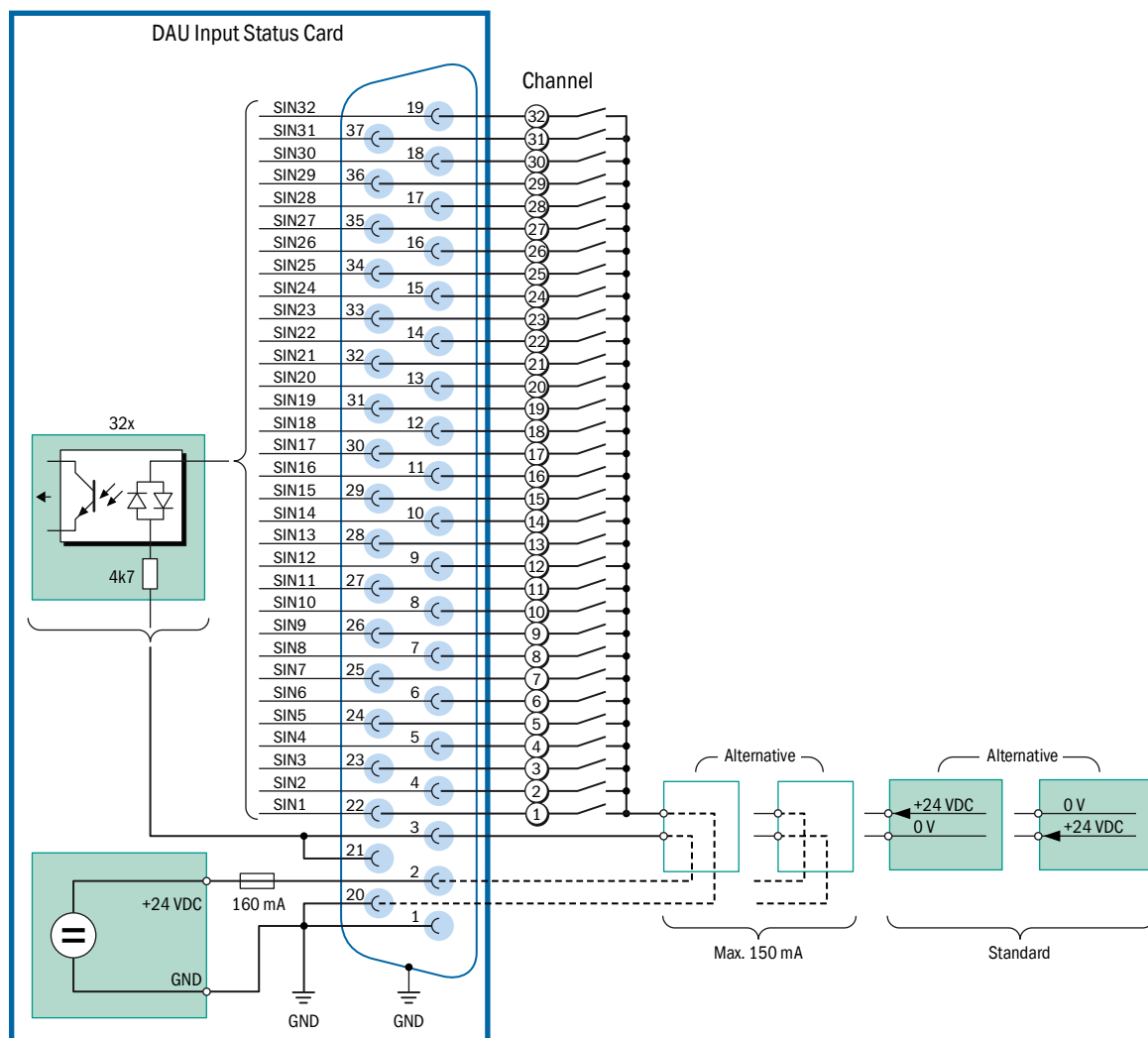
6.3.1 Pin assignment: Analog input board



Channel	+	-
1	22	4
2	23	5
3	24	6
4	25	7
5	26	8
6	27	9
7	28	10
8	29	11

Channel	+	-
9	30	12
10	31	13
11	32	14
12	33	15
13	34	16
14	35	17
15	36	18
16	37	19

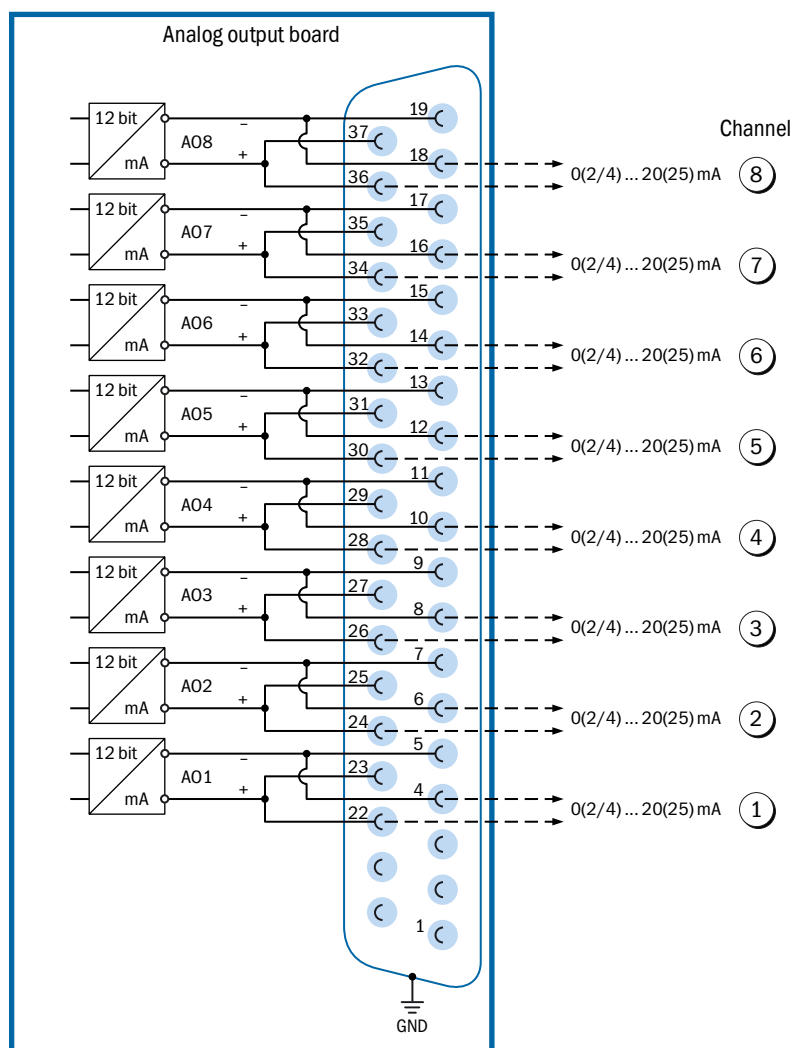
6.3.2 Pin assignment: Status input board



Channel	-	+
1	22	3, 21
2	4	
3	23	
4	5	
5	24	
6	6	
7	25	
8	7	
9	26	
10	8	
11	27	
12	9	
13	28	
14	10	
15	29	
16	11	

Channel	-	+
17	30	3, 21
18	12	
19	31	
20	13	
21	32	
22	14	
23	33	
24	15	
25	34	
26	16	
27	35	
28	17	
29	36	
30	18	
31	29	
32	11	

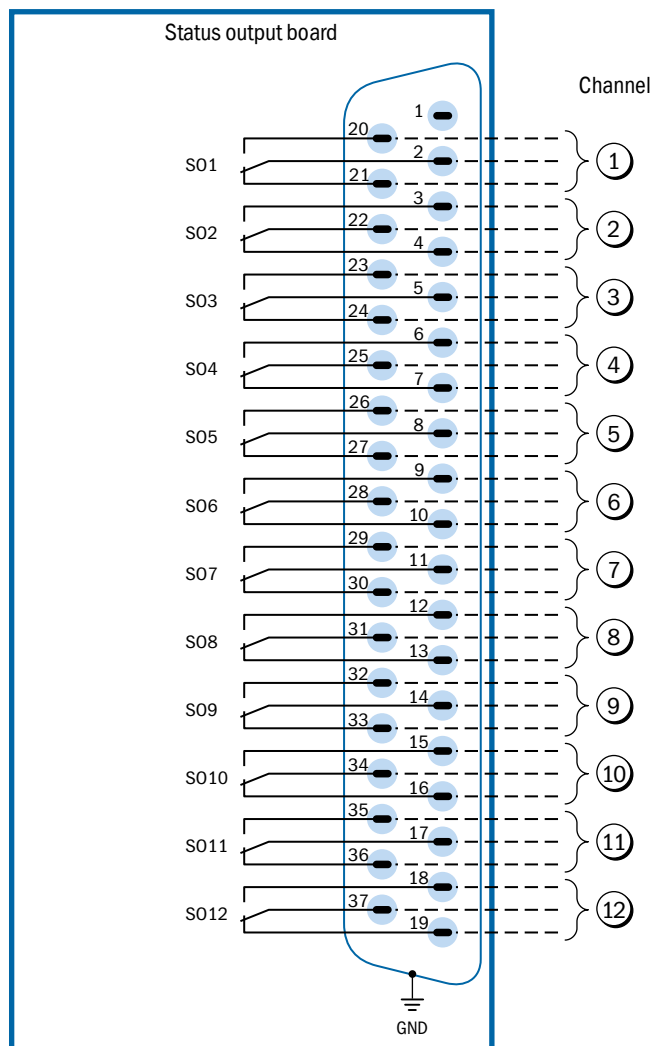
6.3.3 Pin assignment: Analog output board



Channel	+	-
1	22, 23	4, 5
2	24, 25	6, 7
3	26, 27	8, 9
4	28, 29	10, 11

Channel	+	-
5	30, 31	12, 13
6	32, 33	14, 15
7	34, 35	16, 17
8	36, 37	18, 19

6.3.4 Pin assignment: Status output board



Channel	Reference contact	Open contact ^[1] (normally open)	Closed contact ^[1] normally closed
1	2	20	21
2	22	3	4
3	5	23	24
4	25	6	7
5	8	26	27
6	28	9	10
7	11	29	30
8	31	12	13
9	14	32	33
10	34	15	16
11	17	35	36
12	37	18	19

[1] In current-free state.

6.3.5 Specifications for plug-in boards

Analog input board (16 inputs)

Signal inputs type:	Differential input (poles galvanically isolated up to ± 10 V)
Signal current:	-5 ... +30 mA
Resolution:	14 bits, 1 bit = 3.66 μ A
Sampling rate:	10 Hz
Peak filter:	Electronic attenuation (RC = 100 μ s) + software filter
Maximum error:	± 0.1 %
Load:	100 Ω
Power input:	-
Cable connection:	D-Sub plug-in connector, 37 poles, plug (male)
Per data acquisition unit max:	5 plug-in cards
Pin assignment:	see "Pin assignment: Analog input board", page 94
Part No.:	2028426

Status input card (32 inputs)

Signal voltage:	± 5 ... 48 V DC
Signal voltage source:	± 5 ... 48 V DC external or ± 24 V internal ^[1]
Response/Bounce time:	< 10
Power input:	3.8 W
Cable connection:	D-Sub connector, 37-pin, socket (female)
Signal inputs type:	Differential input (poles galvanically isolated up to ± 10 V)
Per data acquisition unit max:	8 plug-in cards

[1] Max. 150 mA; cancels potential separation.

Pin assignment:	see "Pin assignment: Status input board", page 95
Part No.:	2028430

Analog output card (8 outputs)

Signal output type:	Controlled power sources; Minus pole = 0 V/GND
Resolution:	5.0 μ A (full scale = 12.3 Bit _{eff} ; 1 Bit = 5.0 μ A)
Output signal:	0 ... 25 mA
Maximum error:	± 0.1 %
Load:	0 ... 500 Ω
Power input:	3.8 W
Cable connection:	D-Sub connector, 37-pin, socket (female)
Per data acquisition unit max:	4 plug-in cards
Pin assignment:	see "Pin assignment: Analog output board", page 96
Part No.:	2028425

Status output card (12 outputs)

Execution of the signal outputs:	Potential-free relay switchover contacts
Permissible contact load:	max. 48 V / 0.5 A
Response/Bounce time:	< 10
Power input:	3.6 W
Cable connection:	D-Sub plug-in connector, 37 poles, plug (male)
Per data acquisition unit max:	8 plug-in cards
Pin assignment:	see "Pin assignment: Status output board", page 97
Part No.:	2028429

6.4 Connections via field module (general)



Technical information about field modules, see [“Information on WAGO field modules”](#), page 100.

6.4.1 Field module properties

- Field modules are used to digitalize analog measured values from the analyzers and transfer these to the Emission PC.
- Field modules are a cost-effective alternative to MEAC data acquisition units - especially when the emission data originate from measuring facilities located far away from each other.
- Unlike MEAC data acquisition units, field modules do not have a data memory to temporarily store emission data. Therefore, no lost emission data can be “reprocessed” after a malfunction.
- The field modules send all measured values directly to the Emission PC. Momentary values (5-second averages) are calculated only in the Emission PC.

6.4.2 Modbus data transfer with field modules

- The data are transmitted via RS232 interface or RS485 interface.
- The Modbus protocol is used for transmission.
- Modbus master is the Emission PC.
- A field module acts as Modbus-Server. The Slave address is adjustable (see [“Configuring a WAGO field module \(DIP switch\)”](#), page 101).
- The Emission PC automatically requests the emission data from the field module.

6.5 Information on WAGO field modules

This information applies to the WAGO field modules offered as an option for MEAC systems.

6.5.1 Hardware components of a WAGO field module

- Power supply unit (24 V DC)
- Controller (with RS485 interface)
- IO modules (see [“Available IO modules”](#))

6.5.2 Available IO modules

- 2 analog inputs (0 ... 20 mA, 50 Ω)
- 2 analog outputs
- 4 digital inputs
- 4 digital outputs

6.5.3 Example configuration of a WAGO field module

Controller (750-315)		AI module (750-465)		AI module (750-465)		DI module (750-402)		End module (750-600)
24 V	0 V	AI1	AI2	AI3	AI4	DI1	DI2	
+	+	+	+	+	+	+	+	
-	-	[-] 0 V	[-] 0 V	[-] 0 V	[-] 0 V	[-] 0 V	[-] 0 V	
GND	GND	Shield	Shield	Shield	Shield	DI3	DI4	

6.5.4 Configuring a WAGO field module (DIP switch)

- 1 Open the enclosure.
- 2 Adapt the setting of the DIP switches to the application (see Fig. 10/see Fig. 11). – For Auxiliary components for MEAC300: Use the marked settings.

Baud rate	FR1	FR2	FR3
1200	On	On	off
2400	off	off	On
4800	On	off	On
9600	off	On	On
19200	On	On	On
38400	off	off	off
57600	On	off	off
115000	off	On	off

Table 10: Field module: DIP1 (RS232 parameters)

Data bits	Stop bits	Parity	FR4	FR5	FR6
8	1	None	off	off	off
8	1	Even	On	off	off
8	1	Odd	off	On	off
8	2	None	On	On	off
7	2	None	off	off	On
7	1	Even	On	off	On
7	1	Odd	off	On	On
7	3	None	On	On	On

End of Frame Time	P1	P2	P3
3x Frame Time	off	off	off
1 ms	ON	off	ON
10 ms	off	ON	ON
50 ms	ON	ON	ON
100 ms	ON	off	off
200 ms	off	ON	off
500 ms	ON	ON	off
1 s	off	off	ON

Table 11: Field module: DIP2 (Controller functions Modbus parameters)

Function	Setting	P4	P5	P6	P7	P8
Modbus mode	ASCII	off				
	RTU	ON				
Error check	Ignore		off			
	Process		ON			
Advanced functions	Deactivated			off		
	Activated			ON		
Watchdog	Activated				off	
	Deactivated				ON	
Firmware update	Blocked					off
	Possible					ON

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