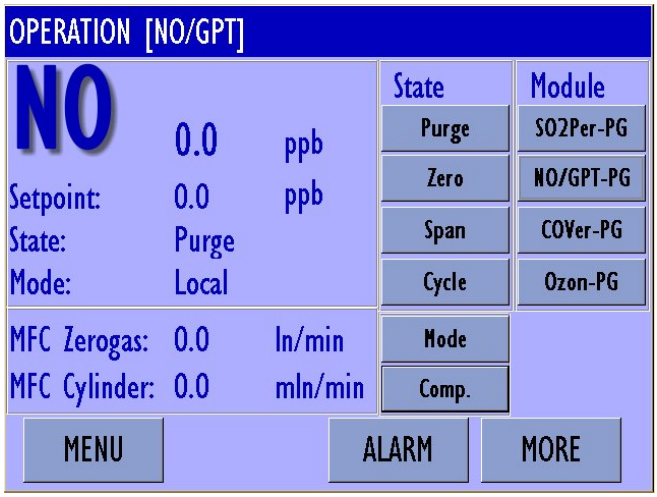
Operation Manual

SOFTWARE eASGU



for CalibrationUnit

ASGU-370 S
ASGU-370 TS
ASGU-370 P
OZGU-370SE

Rev.: 1.02

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... technical questions or problems?

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1. Overview

This software is designed to control the hardware of calibration units for performing quality control activities of gas analyzers. Several test programs can run automatically without usage of external control units. Typical applications are routine work like

- 2 point calibration
- Lack of fit
- Converter efficiency check

in ambient air measuring networks.

The software supports modular construction of devices. Therefore, calibration units may be adapted to customers specification or enlarged with additional features. All system functions are controlled by an industrial standard 3,5" single board computer with a 32-bit real-time operating system. Support of a large touch screen makes it possible to operate the software very easy without external buttons or keyboard.

To reach a high accuracy of calibration gas it is necessary to use precise and stable mass flow controllers. Support of digital mass flow controllers calibrated by default at the factory by a polynomial function is implemented in the software therefore. Operation of analog mass flow controllers is also possible to offer a cost-saving solution of calibration units or to upgrade existing devices.

The software serves two serial RS232 ports, one to connect an external computer, the second to connect an analyzer. The computer port allows operating the calibration unit via the extended Bayern/Hessen protocol and to read values and concentrations. The analyzer port is used by the integrated data logger.

The integrated Ethernet port allows an additional way of remote operation. The suitable remote software works like a mirror of the touch screen. This allows to perform all functions from an external PC.

1.1. Terms

At operation of the software some specialist terms are used. Please notice the meaning of these terms because they are used frequently in this manual.

- MODE..... Defines who is allowed to cause an action or control the software respectively to avoid conflicts. Local, automatic or several remote control are possible.
- MODULE ..... This term is used for a calibration gas source like a gas cylinder or permeation tube and its corresponding parts and parameters. Several types of modules are available. A calibration unit consists of up to 6 modules.
- ACTIVE MODULE ..... One selected module from the list of all existing modules in a device.
- COMPONENT ..... Name for the calibration gas source inside the module. Up to 6 components are possible inside one module. As example a mix gas cylinder with filling SO_2, NO and CO are 3 components in one module.
- SELECTED COMPONENT. In case of more than one component inside a module, it is necessary to define only one component to indicate in some screens. This component is named "selected component".
- STATE..... This term describes whether a module offers gas to a connected analyzer, and in case which type of gas. Possible states are Purge, Zerogas, Pulsed purge, Spangas, Spangas GPT and Spangas remote.
- CYCLE..... Free definable test procedures for analyzers. A procedure contains different states.

- SEQUENCE..... Free definable test procedures for analyzers. A sequence contains different cycles.

2. Configuration

Because of the modular device construction the software has to be adapted. This factory configuration is done by Horiba. However, you should take care to some basic items of the configuration. This is necessary to understand some functions or different functionality of the software according the configuration.

2.1. Device type

The software is used in all ASGU-370 series calibration units. Refer to Table 1 for explanation of different functionality depending on device type.

	ASGU-370P	ASGU-370S ASGU-370TS
MODE of the modules	independent	similar
Operation of modules	simultaneously	serial
STATE of modules	independent one to another	all in Purge, except 1 active module
Zero air MFC sharing between modules	no	yes
Cylinder MFC sharing between modules	no	possible

Table 1: Device type

2.2. Module type

There are different types of modules depending on the source of the calibration gas. Basically 4 module types are possible.

- Dilution
- Dilution + GPT (Gas Phase Titration)
- Permeation
- UV Radiation

A calibration unit consists of up to 6 modules as a combination of these types. Refer to Table 2 for explanation of the most important differences depending on module type.

	Dilution	Dilution + GPT	Permeation	UV Radiation
Source type	gas cylinder	gas cylinder	Permeation tube	HG Lamp
Number of needed MFCs	2	2	1	1
Heated oven	no	yes	yes	yes
Number of components	up to 6	up to 6	up to 6	1

Table 2: Module type

3. Operation

Start-up procedure for the electronics after switching on the device takes up to 20 seconds. Afterwards the main operation screen is shown. The operating conditions like mode, state and so on are stored continuously. Therefore, initially the software will enter the last condition before it was shut down.

To guarantee the specified accuracy it is essential that the mass flow controller's operation temperature is stable. For this reason keep a warm-up time of approximately 30 minutes. In case of built in ovens take care of temperature stabilization of this system before they are used.

Operate the software via the touch screen by touch on the screen at the position wanted. The computer reacts likewise clicking a mouse button. Acknowledge for touch on the screen is a short beep. Details are explained in the following paragraphs, assuming you are familiar with the terms explained in chapter 1.1.

3.1. Screen elements

There are a lot of information in several screens of the software necessary to operate all functions. When design the software big effort was taken to unify screen elements and functionality of buttons to make it easy to operate the software. Details of screen construction and screen elements are explained in the following paragraph.

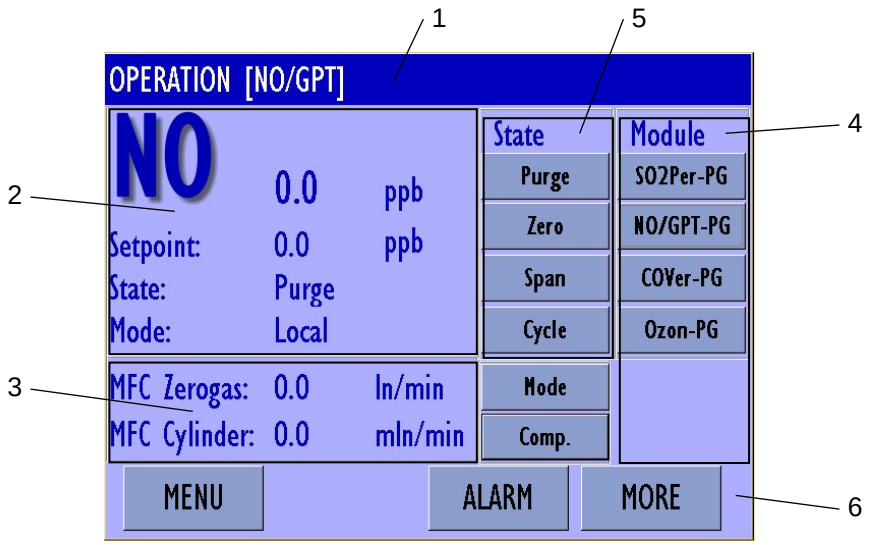


Fig. 1: Main operation screen

1.. Headline

The headline inform you about some main information. It contains no active buttons. To explain the information we use our example in Fig. 1.

- Background color ....The background color inform about the section of operating the software. Meaning of blue color is section operation. Meaning of red color is section parameterization.
- OPERATION .....Name or short description of the actual selected function.
- [NO/GPT].....Between the square bracket the name of the active module is indicated. This name is in relation to the information in operating condition area (2) and flow rate area (3).
- Date / Time.....Date and time are indicated as an option if this information is necessary for the selected function.

2.. Operating condition area

This area indicates actual operating conditions. It contains no active buttons. The operating conditions depends on some functions of the software. The information in this area is in relation to the active

module and the selected component inside the module. To explain the information we use our example in Fig. 1.

- NO ..... Name of the selected component inside the active module. Up to 6 components are possible inside one module.
- 0.0 ..... Actual value of the span gas concentration for the selected component. The value is in relation to the selected unit. When calculating this value the actual flow rates read from the mass flow controllers are used. It is fixed to zero in state purge, zero gas and pulsed purge.
- ppb ..... Unit of the span gas concentration. This unit is in relation to the actual value.
- Set point: 0.0 ppb.... Value and unit of the span gas set point. The value depends on the state. It is fixed to zero in state purge and zero gas.
- State: Purge ..... Indication of the actual state.
- Mode: Local ..... Indication of the actual mode.

3.. Flow rate area

This area indicates the actual flow rates read from the mass flow controllers. It contains no active buttons. These values are also used to calculate the actual span gas concentration. The information in this area is in relation to the active module. To explain the information we use our example in Fig. 1.

- MFC Zero gas..... Indication for whom the following flow rate value is referred.
- MFC Cylinder..... Indication for whom the following flow rate value is referred.
- 0.0 ..... Actual value of the flow rate. The value is in relation to the following unit.
- ln/min mln/min..... Unit of the indicated flow rate value.

4.. Module selection area

In this area one active button for each build in module is placed. The buttons contain two information. First is the name of the module. The second is an acronym for the actual state of the module. Because of this acronym, it is possible to gives you an overview of the state of all modules without the necessity to switchover to another active module. These acronyms for the states are used.

- PG..... Purge
- ZG ..... Zerogas
- PP ..... Pulsed Purge
- SG..... Spangas
- GPT ..... Spangas GPT

Refer to function module selection for details.

5.. State selection area

This area contains the buttons to switchover the state of the active module. The name written inside the buttons inform you about their functionality. Precondition for operation of these active buttons is mode Local. If mode is not Local, the buttons are inactive, except the button Cycle. Refer to function state selection for details.

6.. Function call area

The software contains a lot of functions. To activate functions or open tables of existing sub functions active buttons in this area are used. This makes it easy to activate frequently used functions directly from the main operation screen on the one hand, and select sub functions to activate them on the other hand. To explain the information we use our example in Fig. 1.

- Mode ..... Open mode selection screen. Refer to function mode selection in chapter 4.1 for details.
- Comp. ..... Open show component screen. Refer to function show component for details.
- ALARM ..... Open alarm message screen. Refer to function alarm message for details.
- MORE ..... Open drop down table to indicate the available sub functions. Refer to chapter 3.2 for details to operate a drop down table.
- MENU ..... Open drop down table to switchover between software operation and parametrization or to open an information screen. Refer to chapter 3.2 for details to operate a drop down table.

3.2. Drop down table

This software use drop down tables similar as they are known from common PC software. This makes it very easy to move inside the software structure. Touch on the screen at the position wanted to select a function from the list in the drop down table. Details of drop down table elements are explained in the following paragraph.

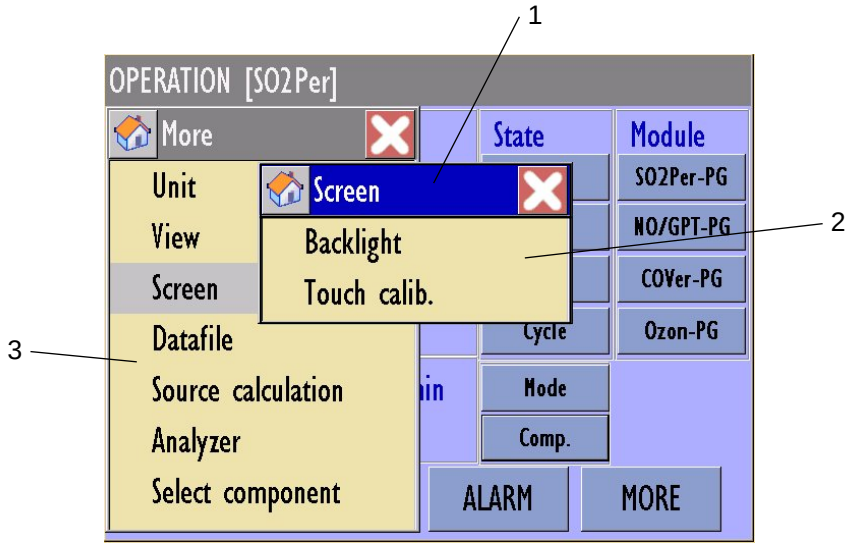


Fig. 2: Drop Down Table

1.. Headline
The headline informs you about the name of the function you called. In addition it contains 2 active buttons. These are used to close the drop down table without select a listed function. To explain the elements we use our example in Fig. 2.

- Background color ....The background color inform you about the active and inactive drop down table. Meaning of blue color is active. Meaning of grey color is inactive. You can operate only the active table.
- Screen .....Name of the drop down table. The name is like a chapter heading of the listed function in the table.
- Symbol (Home, X) ...Active buttons to close the drop down table. Refer to chapter 3.3 to explain the meaning of these buttons.

2.. Function area
In this area the available functions are listed. Touch on the screen at the position of the function you want to activate.

3.. Inactive table
To reach some functions it is necessary to open more than one drop down table. In this case always the active table overlap the inactive table. You cannot operate the inactive table. The background of the root function you selected in the inactive drop down table is colored light blue.

3.3. Navigation

When touch on the screen at the position wanted you open screens or drop down tables as described. Use special navigation buttons to close these screens and return to the main operation screen. In the following paragraph you find the meaning of the navigation buttons the software uses.

Close the active screen and return to the upper screen. You move only 1 step higher. Modification will be discarded if they are done in this screen.

Close all screens and return to the main operation screen or main parametrization screen, respectively. Modification will be discarded if they are done in this screen.

Store modifications if they are done in the active screen. Close the screen and return to the upper screen. You move only 1 step higher.

This button is used in the headline of drop down tables. Close the active drop down table and return to the upper drop down table.

This button is used in the headline of drop down tables. Close all drop down tables and return to the main operation screen or main parametrization screen, respectively.

3.4. Keyboard

There are two different masks of keyboard-entries to enter various numbers or letters. These contain besides numbers and letters some keys such as the <- or the BS-key to delete the last digit. Moreover there are the X and the Del-key to clear the whole entry-box. Furthermore there is the SHF-key in the 'numbers and letters'-mask to switch between small letters and capital letters and the Num-key to open the mask to enter numbers or other characters.
The parameter that wants to be modified has to be pressed for making a data entry or it is like by the password input already automatically active. Now the background color of this entry box should change. Afterwards the values can be deleted and new ones can be entered with the keyboard.

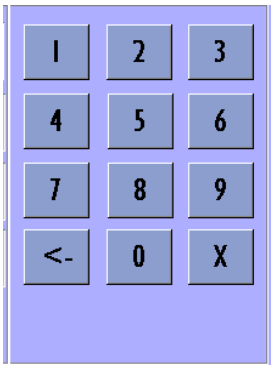


Fig. 3 keyboard to enter numbers

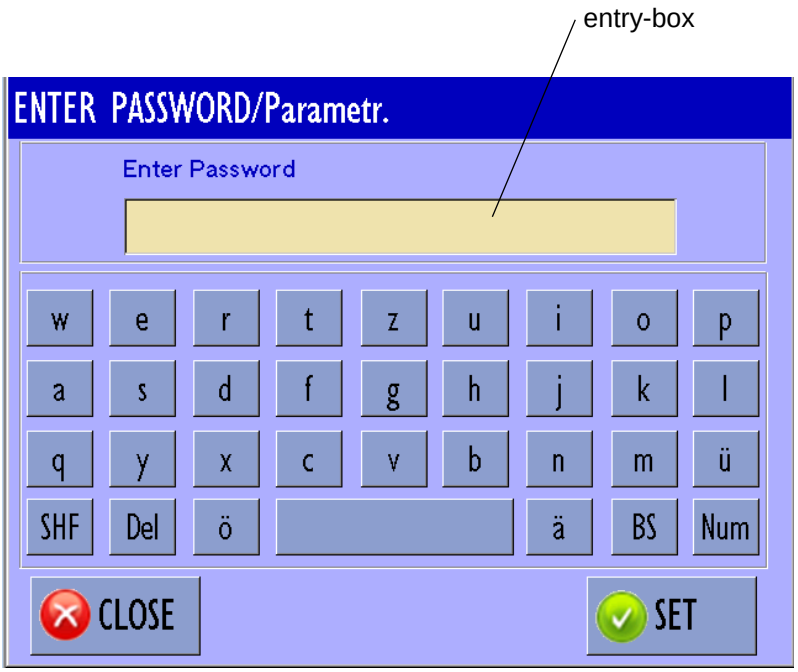


Fig. 4 keyboard for enter numbers and letters

4. Functions

The structure of the functions is shown in Table 3. The structure is hierarchical, similar to a tree structure. The specific functions are described in detail in the corresponding chapter.

Operation
Module selection ..... *Set the active module*

Mode selection ..... *Definition, who controls the software*
State selection ..... *Switchover state*
Select component ..... *Set selected component*
Show component ..... *Indicate all components inside a module*
Select component ..... *Set selected component*

Calibration cycle
Cycle/Sequence ..... *Start and stop calibration cycles*
Analyzer ..... *Option Datalogger: Select Analyzer*
Timer ..... *Program and activate timer for cycles*

More
Unit ..... *Set the calibration gas unit*
View
Parameter ..... *Indicate additional parameters (temperature, …)*
Data Trend ..... *Option Datalogger: Data Trend*
Alarm History ..... *Recording alarms*
Screen
Backlight ..... *Brightness and OFF delay of the lighting*
Touch calib. ..... *Calibration from the touch*
Datafile ..... *Option Datalogger: datafiles*
Source calculation ..... *Calculate the rate/concentration of calibration gas source*
Analyzer ..... *Option Datalogger: Select Analyzer*
Select component ..... *Set selected component*
Alarm *Active Alarm*

Menu
Info ..... *Information about the system*
Parametrization ..... *Set parameters*

Table 3: Structure of functions

Condition after start up the software is function operation and the same condition before shut down. Touch the screen in the order according the structure of functions to activate the function you want. Precondition to work with the calibration unit reasonable is a correct setting of all parameters. For explanation how to set parameters refer to chapter parametrization.

4.1. Mode selection

Switchover states of the calibration unit can be controlled manually via the touch screen. In addition remote control via the serial computer port by a PC or via the optional remote sockets by an analyzer is also possible. To provide conflicts, the control mode must be set. Take care of the configured device type and therefore, whether the mode is similar for all modules or independent for each module.

- ASGU-370P ..... independent for each module
- ASGU-370S, ASGU-370TS .... similar for all modules

Procedure

1. Use the button Mode to open the mode selection screen.

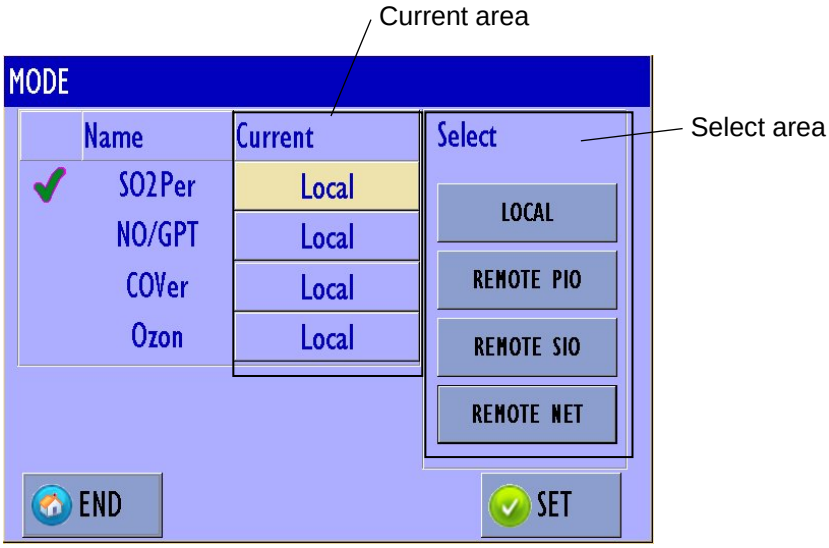


Fig. 5: Mode selection screen

2. Select the module in the Current area on the screen you want to modify the mode. The background color of the selected module becomes white. When enter the screen the active module is colored white.
3. Select the desired mode in the Select area on the screen.
4. Leave the screen.

4.1.1. LOCAL

The software is controlled manually by use of the touch screen. The following table defines priority of state selection and mode selection orders in Local mode.

	state selection	mode selection [1)]
touch panel	allowed	allowed
analyzer	ignored	-
computer (RS232 port)	ignored	allowed
computer (Ethernet port)	ignored	allowed

[1)] **Note:** During mode AUTO (active calibr. cycle/sequence) no change of mode is possible for this module.

Always when change to mode LOCAL is performed, the state is reset to Purge for all modules, which are affected by change of mode.

4.1.2. Remote PIO

The software is controlled via the optional remote sockets by an analyzer. The following table defines priority of state selection and mode selection orders in Remote PIO mode.

	state selection	mode selection [1)]
touch panel	ignored	allowed
analyzer	allowed	-
computer (RS232 port)	ignored	allowed
computer (Ethernet port)	ignored	allowed

[1)] **Note:** During mode AUTO (active calibr. cycle/sequence) no change of mode is possible for this module.

Always when change to mode Remote PIO is performed, immediately the state according the signals on the remote socket is selected for the modules, which are affected by change of mode.

Priority if more than one signal is active for one module at the same time: GPT2, GPT1, Spangas, Zerogas (from high to low).

In case of device configuration ASGU-370S and ASGU-370TS, care must be taken to avoid a conflict if more than 1 module has active signals. Priority in this case is module1, module2, and so on (high to low).

4.1.3. Remote SIO

The software is controlled via the serial computer port by a PC. Use the modified Bayern/Hessen protocol for the communication. For explanation how to communicate refer to the protocol description. The following table defines priority of state selection and mode selection orders in Remote SIO mode.

	state selection	mode selection [1)]
touch panel	ignored	allowed
analyzer	ignored	-
computer (RS232 port)	allowed	allowed
computer (Ethernet port)	ignored	allowed

[1)] **Note:** During mode AUTO (active calibr. cycle/sequence) no change of mode is possible for this module.

Always when change to mode Remote SIO is performed, the state is reset to Purge for the modules, which are affected by change of mode.

4.1.4. Remote NET

This functionality will follow.

4.1.5. AUTO

This mode is selected automatically on active calibration cycle or sequence for this module. No function is allowed to interrupt an active cycle or sequence. This means the functions mode selection and state selection cannot be performed for modules which are in mode AUTO. For device type ASGU-370S and ASGU-370TS also it is not possible to change the active module. The following table defines priority of state selection and mode selection orders in AUTO mode.

	state selection	mode selection
touch panel	ignored	ignored
analyzer	ignored	-
computer (RS232 port)	ignored	ignored
computer (Ethernet port)	ignored	ignored

After the cycle or sequence is finished or manual stopped, the mode returns from AUTO back to the condition before the cycle/sequence was started.

4.2. Module selection

A calibration unit can contain up to 6 modules. Because of the lot of information if more than 1 module is included in the device, the main operation screen can contain the elements only for one module. Therefore it is necessary to switchover between the modules to operate them or to get information.

Take care of the configured device type whether module selection has affect to the state of particular modules or not.

- ASGU-370P..... no affect or limitation. Simultaneously operation of modules is possible. Unrestricted switchover between modules.

- ASGU-370S, ASGU-370TS some affects or limitations. Only serial operation of modules is possible. Therefore the term active module is used for these devices. For definition of active module selection refer to Table 4.

Procedure
Use the active buttons in the module selection area in the main operation screen to select a module manually. The information on the screen will follow your selection.
For ASGU-370S and ASGU-370TS active module selection is done automatic in any Remote mode. Also the information in the main operation screen will follow this automatic active module selection.

	Mode LOCAL	Mode Remote PIO	Mode Remote SIO, NET
touch panel	limited [1)]	limited [3)]	limited [3)]
analyzer	not possible	possible (auto) [4)]	not possible
computer (RS232 port)	possible (auto) [2)]	possible (auto) [2)]	possible (auto) [2)]
computer (Ethernet port)	possible (auto) [2)]	possible (auto) [2)]	possible (auto) [2)]

Table 4: Active module selection

[1)] Module selection depends on the state of active module.

-) Active module = Purge: switchover to other module is possible without limitation.

-) Active module ≠ Purge: acknowledge of a message like 'Active module will be set to Purge!' is necessary. This message is indicated in a popup screen which contain button Continue and Cancel. If message is acknowledged positively, first action is to reset the active module to Purge, and then switchover to the new selected module.

[2)] Active Module selection is done automatic if another than the active module receive a command. No separate control character is used therefore. The identifier in the serial command includes the information which module will become the new active module. Module selection depends on the state of the actual active module.

-) Actual Active module = Purge: switchover to other module is possible without limitation.

-) Actual Active module ≠ Purge: First action is to reset the active module to Purge. Second action is switchover to the new module.

[3)] Module selection depends on the state of active module.

-) Active module = Purge: switchover to other module is possible without limitation.

-) Active module ≠ Purge: acknowledge of the message 'Not possible! Change mode first.' is necessary. This message is indicated in a popup screen which contain button Quit.

[4)] Active Module selection is done automatic at state selection. Old active module is switched to purge. New active module is the module with active signals at the remote socket. Priority if digital inputs for more than one module are active at the same time: module1, module2, and so on (high to low).

4.3. State selection

There are several buttons in the state selection area to switch between the states of the selected module manually. All possible states are listed in the following table. Some of them cannot be activated manually or have some other specifics. Please notice the remarks for explanation.

- Purge .....
- Zerogas.....
- Pulsed Purge ..... optionally; start automatic; configured by Horiba
- Spangas..... use of 1 of 20 predefined Spanpoints
- Spangas GPT ..... use of GPT1 or GPT 2 is selectable
- Spangas Remote .... no manual activation; used only in mode Remote PIO

For device type ASGU-370S and ASGU-370TS always the active module selection starts automatic before execute change of state.

4.3.1. Purge

Touch the button Purge in state selection area to activate state Purge. The information in the operating condition and module selection area will follow your selection. Setpoint and actual value of the concentration is 0 at this state. The flow rates are regulated to the parameterized values.

4.3.2. Zerogas

Touch the button Zero in state selection area to activate state Zerogas. The information in the operating condition and module selection area will follow your selection. Setpoint and actual value of the concentration is 0 at this state. The flow rates are regulated to the parameterized values.

4.3.3. Pulsed Purge

When activate state Spangas optionally Pulsed Purge is performed automatically. Precondition to start Pulsed Purge is:

- Module type is Dilution or Dilution + GPT
- Enable this state in the configuration for the device. Device configurations are factory settings. Therefore decision to enable this state or not is made by Horiba.

The software check the parameter Pulsed purge interval when activate Spangas. This time is compared with the time, passed since the last shut off of the state span 1-20, span remote, GPT1 or GPT2. If passed time is not as long than the set interval, Pulsed Purge is not activated. If passed time is longer or device was shut off it is activated.
The state Pulsed Purge is active according the parameter Pulsed Purge duration. Afterwards the software switchover to Spangas, Spangas GPT or Spangas Remote automatically.

The parameter Pulsed purge interval and duration are factory settings. You cannot modify it. The information in the operating condition and module selection area will follow this state. Setpoint of the concentration is indicated according the Spanpoint. The actual value of the concentration is 0 at this state. The flow rates remain according the state before.GPT area

4.3.4. Spangas

You can select 1 of 20 predefined Spanpoints or span gas concentrations respectively. Refer to chapter parametrization how to set the span gas concentration for each Spanpoint. In addition a factory setting for each Spanpoint define if it is flow related or concentration related.

- Flow related Spanpoint
  That means the flow rates are fixed in parametrization. The spangas concentration is the result of a calculation with these flow rates, the source concentration and if necessary the correction factor for the unit.

- Concentration related Spanpoint
  That means the spangas concentration is fixed in parametrization. The flow rates are a result of a calculation with this concentration, the source concentration and if necessary the correction factor for the unit.
  For the module types who need only one mass flow controller no special rule is necessary. Only the limit for the minimum allowed flow rate and the full scale of the MFC have to be observed.
  For the module types who need two mass flow controllers a rule for calculation of the flow rate is applied. This rule defines setting the flow rate for one mass flow controller to the allowed minimum value. The flow rate for the second MFC is calculated. It depends on the level of span gas concentration whether MFC for dilution air or for cylinder gas is held to the allowed minimum value.

Procedure

1. Touch the button Span in state selection area to open the Spangas screen.

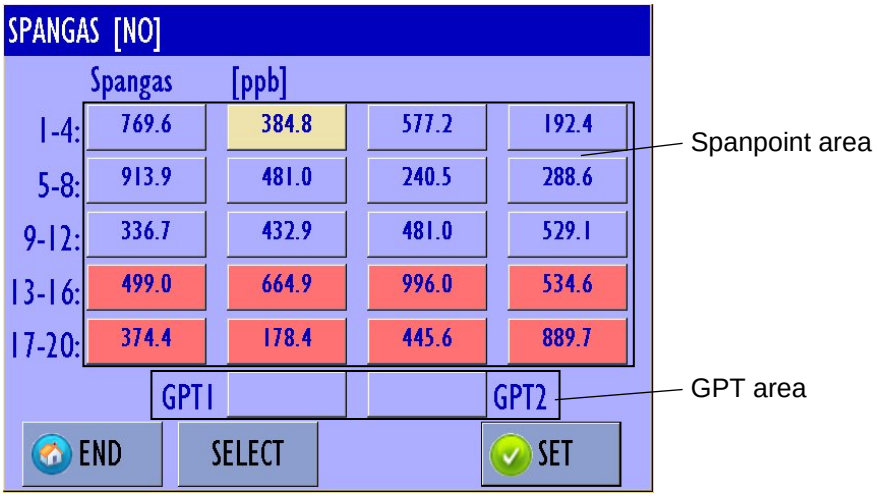


Fig. 6: Spangas screen

2. Select one spanpoint from the available 20 points in the Spanpoint area. Buttons of concentration related spanpoints are colored blue. Flow related spanpoints are colored red. The background color of the selected spanpoint becomes white.
3. Touch SET button to leave the screen and activate the selected state.
4. The software checks whether the Pulse purge state has to start. If not or after finish Pulse purge the state Spangas is active. The information in the operating condition and module selection area will follow your selection. Setpoint and actual value of the concentration are displayed. The flow rates are regulated to the setpoint values according the selected spanpoint.

4.3.5. Spangas GPT

In case of module type dilution + GPT the state Spangas GPT1 and Spangas GPT2 is available for the spanpoints 1 – 20 and spanpoint remote. A UV- lamp is switched on at these states in addition to the common functionality of state spangas. The value for the intensity of the lamp is fixed in parametrization separate for Spangas GPT1 and Spangas GPT2 and individual for each spanpoint. Spangas GPT can be activated only together with state Spangas, and not in state Zerogas or Purge.

1. Touch the button Span in state selection area to open the Spangas screen.
2. Touch the buttons GPT1 or GPT2 in the GPT area (refer to Fig. 6) to select the state wanted. The background color of the selected state becomes white. For deselect the state touch the white button again.
3. Touch SET button to leave the screen and activate the selected state. The information in the operating condition and module selection area will follow your selection.

Note for converter efficiency check for NOx analyzers:

To reach the concentrations for check of the converter efficiency according EN14211 several parameters work together. Parameters which have influence to this concentrations are:

- Intensity of the UV lamp
- Minimum flow of MFC for zero air in state spangas
- Minimum flow of MFC for cylinder gas in state spangas
- Flow rate or concentration setting for the spanpoint which is used for this check
- Concentration of the used gas cylinder

It is necessary to check whether a parameter has to be modified else, if one of the above parameters is changed to make sure to reach the concentrations corresponding to EN14211.

4.3.6. Spangas Remote

This state is identical to the common state Spangas. There is only used a 21st spanpoint for this state. It is activated in mode remote PIO via the remote socket by the analyzer. Factory configuration and user specific parametrization is equal to spanpoint 1 – 20.

This span point is configured by default as a blue concentration-related span point. Only with modules in which several components can be selected and can be controlled via several PGG control sockets will this test point be configured as a red flow-related span point.

4.4. Calibration cycle

You can perform different test procedures for analyzers in automatic with this software. Make the settings for the test procedures you want to use one time in parametrization. Afterwards you can use them whenever you want, started manual or automatic by an internal timer. This gives you the possibility to run very time consumption tests of analyzers e.g. during night.

Procedure

1. Touch the button [Cycle] to open the drop down table for the functions related to the test procedures.
2. Select the function you want to enter from the list.

4.4.1. Cycle1-8/Sequence

A calibration cycle is any sequence of state Zerogas, Spangas 1-20 and if needed Spangas GPT. A cycle consists of up to 20 test points. The conditions for each test point are the same like corresponding to his state. In addition, duration for each test point is defined in parametrization. Each module contain up to 8 cycles.

A calibration sequence is any sequence of calibration cycle 1-8. The sequence consists of up to 10 cycles. The conditions for each test point are the same like corresponding to his state. Each module contain 1 sequence.

Procedure

1. Select function [Cyc.1-8/Seq] in the drop down table to open the cycle screen.

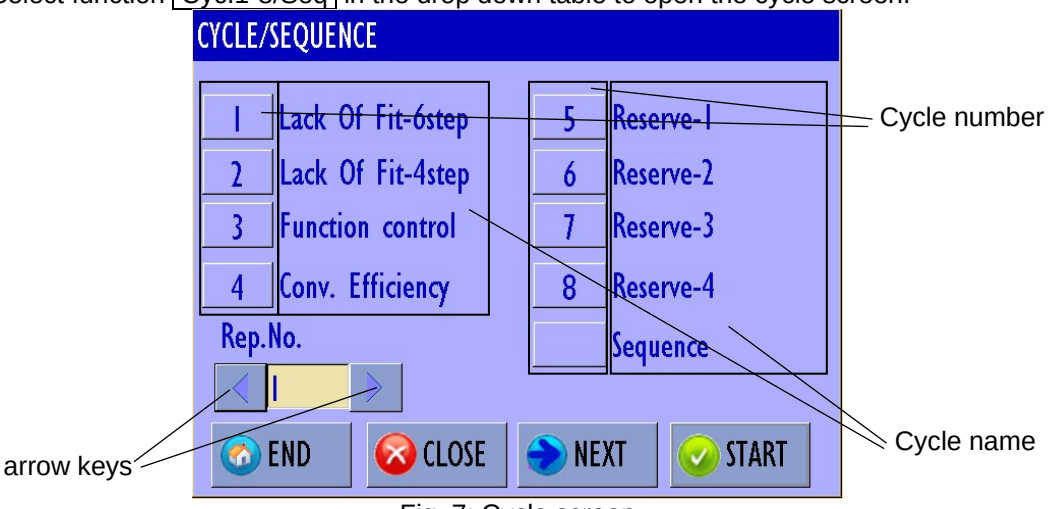


Fig. 7: Cycle screen

2. Select one cycle or the sequence by the cycle number buttons. The background color of the selected cycle/sequence becomes white.
3. Set the number how many times the selected cycle/sequence should work. Use the arrow keys beside the number. The number will follow your setting.
4. Start the cycle/sequence. Use the button [Start]. The button will change to [Stop] immediately. This is the indication of an active cycle/sequence.
5. As an option you can open an additional screen to get more detailed information about the active cycle/sequence. Use the button [Next] to enter it. In this screen you will find in addition to the known parameters like component, actual concentration and flow rates these information.

    - Step a/b ..... Actual testpoint (a) from the complete number of testpoints (b) in the cycle, or actual cycle (a) from the complete number of cycles (b) in the sequence, respectively.
    - Rep.No..... Actual pass (a) from the complete number of passes (b) of the cycle or sequence.
    - Rem.Time ..... Remaining time, necessary to pass the cycle/sequence.

Note: During active cycle/sequence mode AUTO is selected automatically. Therefore mode-, module- and state selection is limited or disabled.

4.4.2. Analysator

The menu item analyzer is required only when using the data logger function and will therefore be described only in section 7.7.

4.4.3. Timer

Use the timer to start cycles or sequence automatically. This gives you the possibility to run very time consumption tests of analyzers e.g. during night. Setting the timer is possible for each module separate. Please take care to avoid collisions for device type ASGU-370S and ASGU-370TS, because no parallel operation of modules is possible.

Procedure

1. Select function [Timer] in the drop down table to open the Timer screen.

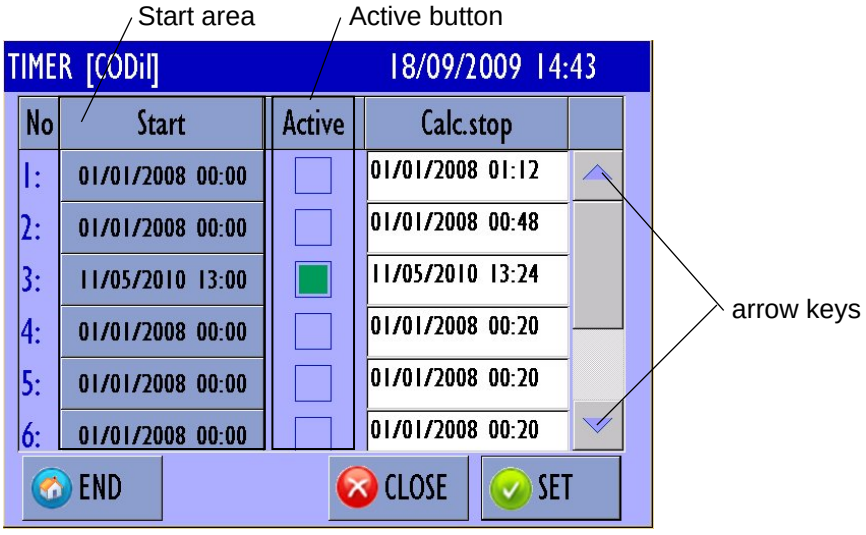


Fig. 8: Timer screen

2. Use the arrow keys, if necessary, to scroll to the cycle number you want do activate or modify. Cycle No. 9 in this screen is the sequence.

3. To modify the start time of a cycle touch the button in the Start area. Refer to Fig. 9.
4. The right column shows the calculated stop time. This result is the duration of the cycle/sequence added to the start time.
5. If the cycle should start at the programmed time touch the Active button. The background color of the button is green if timer is active.
6. Touch SET button to leave the screen and activate your settings.

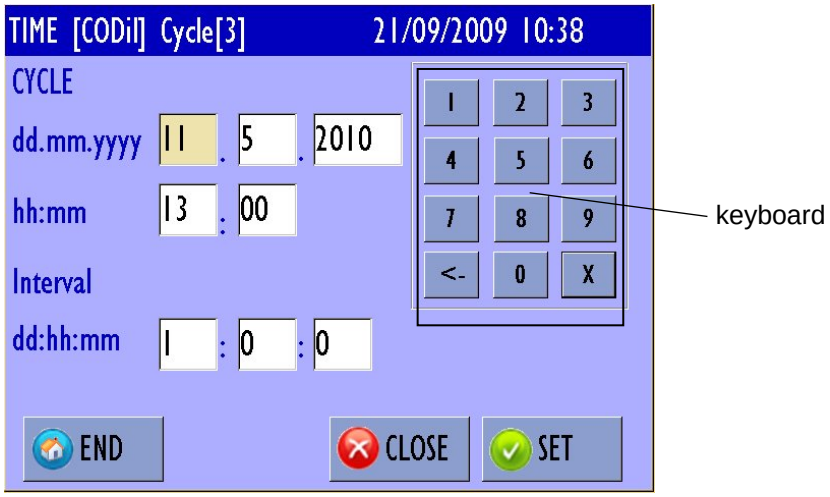


Fig. 9: Timer setting screen

In the timer setting screen you can modify the start date and time. Touch on the parameter you want to modify. The background color of the selected parameter will be changed. Use the keyboard to delete old values and enter new values.
At this screen you can also set an interval for the cycle/sequence. The cycle will be repeated according these settings. Always when a cycle is finished or stopped manually, a new start date and time is calculated in a way of take the old values and increase the values by the interval to get the new start date and time. Precondition for restart it again is Active button is still activated.

Condition when activate a timer (Active button):

Setting of interval is zero

- If date/time is in the past: no start of cycle/sequence
- If date/time is in the future: perform cycle/sequence 1 time

Setting of interval is not zero

- If date/time is in the past: calculation of new start date/time according old time and interval with respect to the actual date and time. The next calculated date/time in the future is the new setting, as long as this time is not in collision with start time and duration with another activated cycle inside the module. In that case the calculated value is increased by the interval until no collision will occur. The cycle/sequence will be performed repeatedly until it is deactivated by the Active button.
- If date/time is in the future: Cycle will be performed repeatedly until it is deactivated by the Active button.

4.5. Show component

Up to 6 components are possible inside one module. But only one of them is indicated in the main operation screen. Open the show component screen to get information about further available components inside the module and their concentration.

Procedure

1. Use the button Comp. to open the Component screen.

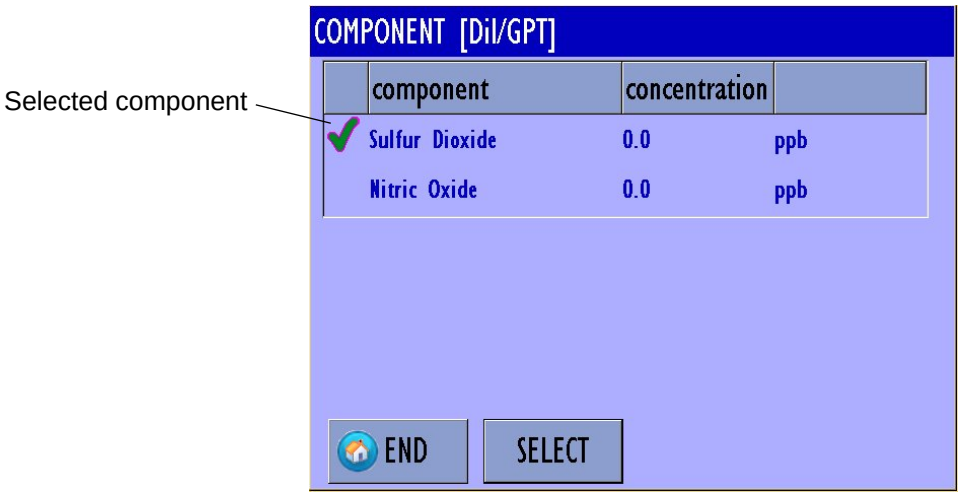


Fig. 10: Show component screen

This screen is only for information. No further functionality. The checkmark indicates the selected component which is indicated in the main operation screen.

The button Comp. is available in several screens of different functions. The meaning is always the same, independent where it is used.

4.6. Select component

This function defines only one component as the selected component to indicate in some screens. There are different ways to open select component function.

- Use button Select in all screens where it is available.
- Enter function by means of drop down table More.

In both ways a drop down table will be opened. It contains a list of all available components in the module. Touch on the screen at the position of the name of the component you want to select. The checkmark at the beginning of the line indicates the actual selected component.

5. Parametrization

For the configuration of the different modules from the calibrations unit, press the button MENU and select in the dropdown table the Params. After a password request with the button SET opens the parametrization. At first delivery of the calibration unit no password is set, but in the menu DEVICE Password you can select a password. In the parametrization menu the color of the headline will change to red and the keys on the screen get other functions.

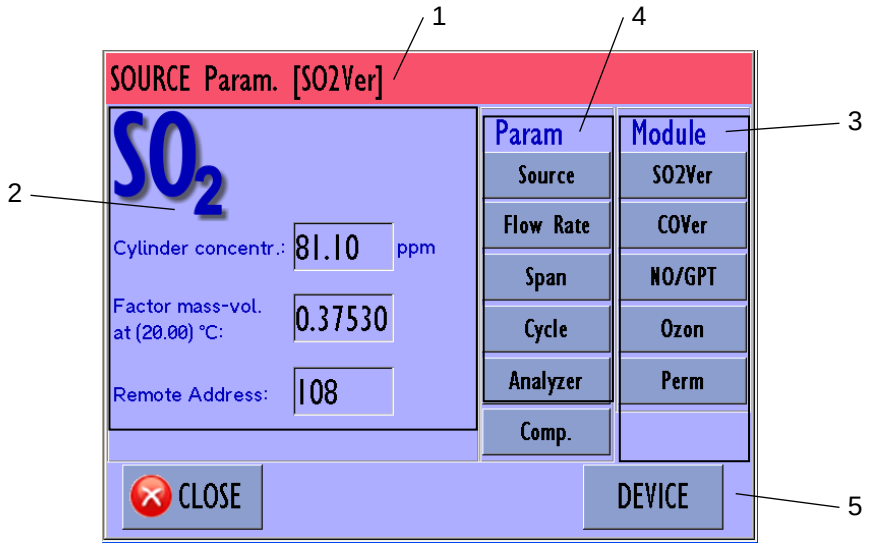


Fig. 11: parametrization screen

1.. Headline.
The headline is changing the color to red in the parameterization menu.

2.. Param display
This area shows the actual values of the selected modules.

3.. Module selection area
For details see module selection.

4.. Param selection area
This area contains the buttons for configuring the different elements of the selected module. When you press one of the buttons the different values either in the value display area or in a newly opened window will be displayed.

5.. Function call area
In this area are the buttons CLOSE and DEVICE.

- Comp.. .....Opens the component selection screen. For details, see chapter 4
- CLOSE .....Returning to the main operation screen
- DEVICE .....Opens a drop-down table to select modules independent parameter.

The structure of the different parameterization elements is shown in table 5. The structure is similar to a hierarchical tree structure.

Parametrization

Module selection	*Set the active module*
Source	*Source concentration, conversion factor, B/H address*
Flow Rate	*Flowrates for purge, zero gas and minimum flow rates*
Span	*Values of the 20 test points and the external test point*
Concentration related	*Selection of concentrations and possible GPT intensity*
Flow related	*Selection of flow rate and possible GPT intensity*
Cycle	*Values of the different cycles*
Cycle/Sequence number	*Parameterization of the cycle or sequence*
Cycle/Sequence change	*Concentration, duration or expiry of cycles*
Cycle/Sequence name	*Input of the cycle or sequence name*
Analyzer	*Option Datalogger: Parameters of the tested analyzer*
Comp.	*Select the component*
Close	*Back in the main operation screen*
Device	*Modules independed system settings*
Date/Time	*Setting the date and time*
Communication	*Selection of the different interfaces*
Ethernet	*IP Number and further Ethernet adjustments*
RS232	*Baud rate and further RS232 adjustments*
Other	*Multiplier for datalogging*
Protocol	*Option Datalogger: Horiba Protocol, TransmissionID, no Function*
Alarm limit	*Alarm limits of the calibration unit.*
Flow	*Alarm limits of the MFC Flowrate*
Temperature	*Alarm limits Permeation, O3, GPT and other ovens*
Other	*Delay time of the alarm*
Password	*Password Access Parameterization and network connection*

Table 5: Structure of the Parametrization

5.1. Source

In the menu Source is in the field Cylinder concentr for entering the concentration of the used test gas cylinder in ppm or the permeation rate of the permeation in ng/min. The field Factor mass vol.is for enter the conversion factor for the passage of the appropriate gas between the mass and the volume. By default, the TMD is calibrated to 0 ° C, 1013.25 mbar and will converted from ASGU to 20 ° C. 1013.25 mbar. The field Remote Address is for enter the components used identifier of Bayern Hessen protocol. The HORIBA standard identifiers are for SO2-108, NO-109, NOx 110 CO-111, O3-112, H2S-113, NO2 114.

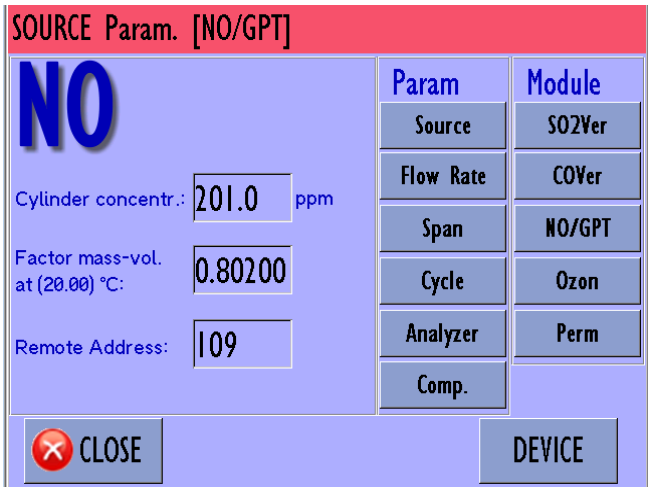


Fig. 12: Parametrization Source

5.2. Flow Rate

In the menu flowrate, various parameters for the flow control can be set.
The field Purge Zerogas is for enter the desired flowrate of zerogas in the operating state Purge. This air is used mainly for purge the permeation tube and is by default set to 0,150ln/min.
The field Purge Cylindergas is for enter the desired bottle gas flowrate during the operating state Purge. By default it is set to 1mln/min but for economical flat consumption (eg when ASGU-370TS) the value can eventually be reduced to 0,5mln/min.
The field Zero Zerogas is for enter the desired flowrate of zero air during the operating state Zero. This flowrate is depending on the analyzer flow and the value should be higher by at least 0,3 l/min. Therefore minimal flowrate is for the Horiba AP-370 series is for the APSA 1ln/min, for the APOA 1ln/min, for the APNA 1,5ln/min and for the APMA 1,8ln/min.
The field Zero Cylindersgas is for cylinder gas flow during the operation state zero. The flowrate should always be set to 0 mln/min.
The field Span Zerogas Minimum is for enter the minimal zero air-flowate. This should be about the same as the Zerogas flowrate.
The field Span Cylindergas Minimum is for enter the flowrate of cylinder gas during the operating state Span. This flowrate should be at least 2mln/min or 20% of the full scale of the cylinder used MFC.
The concentration-related spanpoints are regulate by these two minimum-flow parameters as described in Section 4.3.4.

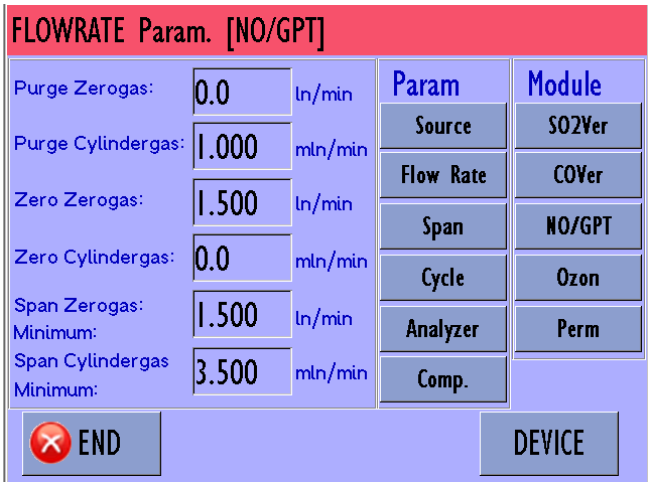


Fig. 13: Parametrization Flowrate

5.3. Span

The menu Span is for the configuration of the blue concentration-related span points and the red flow related span points. Pressing the desired span gas point and another submenu will open in which directly the concentration or the desired flow rates can be entered

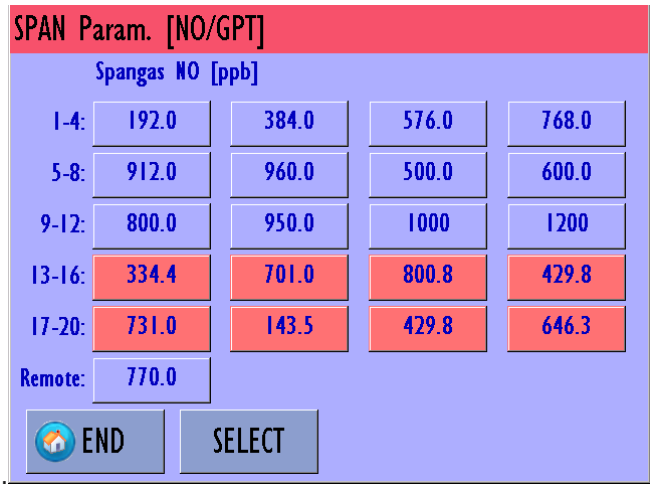


Fig. 14: Parametrization Spangas

In the concentration-related mask is the field concentration for enter the desired concentration in the selected unit. Furthermore the range which was calculated from the minimum flowrate and the cylinder concentration is shown in parentheses.

In the flow-related mask are the field for the Flow zerogas and if available the field Flow cylindergas. Furthermore are shown the respective maximum flowrates of the mass flow controllers in parentheses and the predicted concentration for the selected flow rates.
In case the module type dilution + GPT is available the intensity of the UV lamp for ozone and NO2 generation can be set in this input masks. The setting range for intensity GPT1 and GPT2 is 0-100%.
In the case of the OZGU-370SE, changing the concentration in the input field has no effect on the ozone concentration, since this change can only be made directly by HORIBA in the Device.xml configuration file

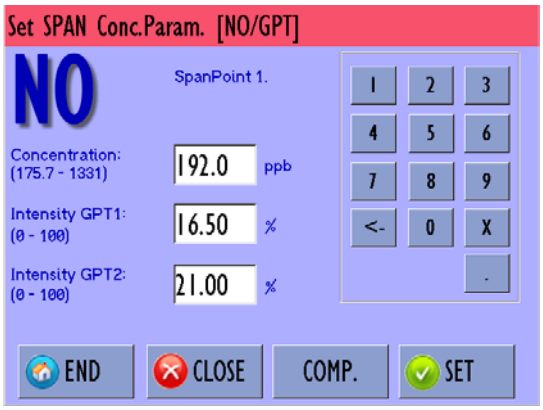


Fig. 15: concentration-related input mask

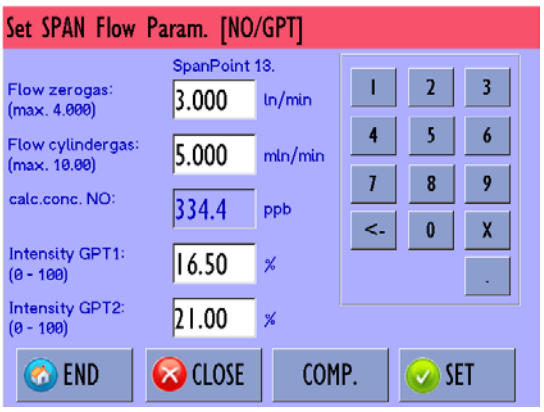


Fig. 16: flow-related input mask

5.4. Cycle

In cycle menu 8 different cycles can be configured. These are described in section 3.8, freely selectable cycles, in which up to 20 different checkpoints with preconfigured duration processes. Further, under 9 Sequence, run the various cycles in any configurable order. When you press the number 1 -9 of the cycle or the sequence the mask opens for configuring the input sequence. By pressing the cycle name field, the mask entry opens for the description of the cycle or the Sequence.

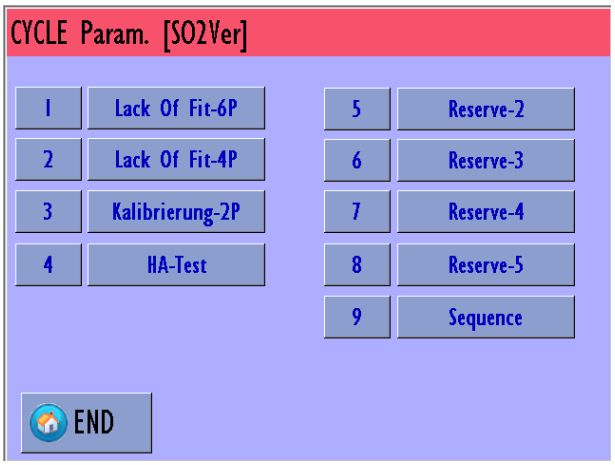


Fig. 17: Parametrization cycle

After press a number from the different cycles appear a mask with an overview of the selected concentrations and the duration of the test points. When you press one of these check point fields another submenu will appear to select a concentration of the 20 preconfigured concentration or flow related span gas points. Furthermore in the field Duration it is possible to enter the desired time for the every checkpoint.
In case of module type dilution + GPT it is used for the respective concentration, also GPT1 or GPT2 can be activated.

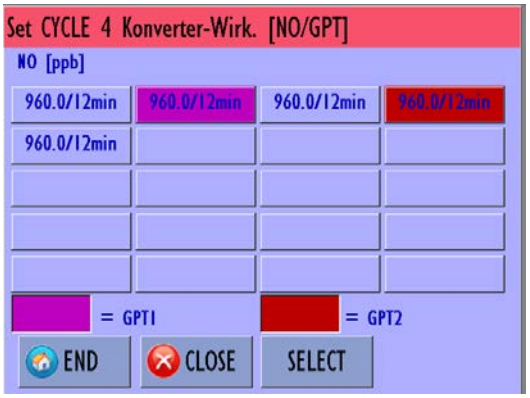


Fig. 18: Parametrization cycle number

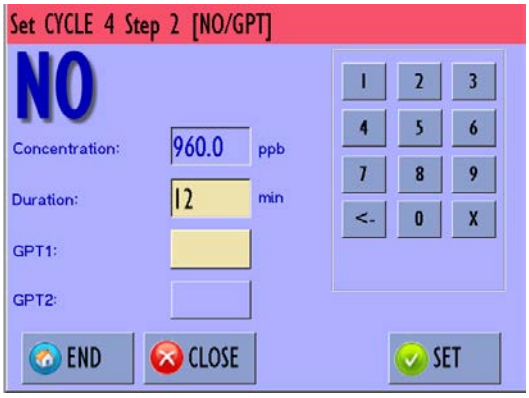


Fig. 19: Parametrization concentration, duration

After press of the sequence number, an overview of the selected cycle for the sequence appears. Here press the the keypads P1 to P10 and select the pre-configured cycles.

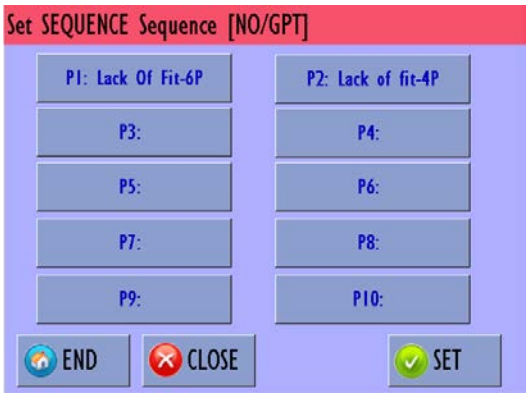


Fig. 20: Parametrization Sequence / cycle number

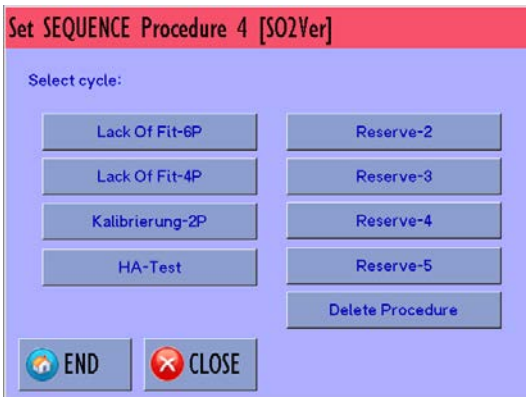


Fig. 21: Parametrization Sequence / cycle name

After pressing the name field for the various cycles appears a mask for the entry of the name of the respective cycle or the sequence. As described in Section 7. It has to be ensured when using the Data Logger option that this name is the same as the corresponding filename of the Excel template.

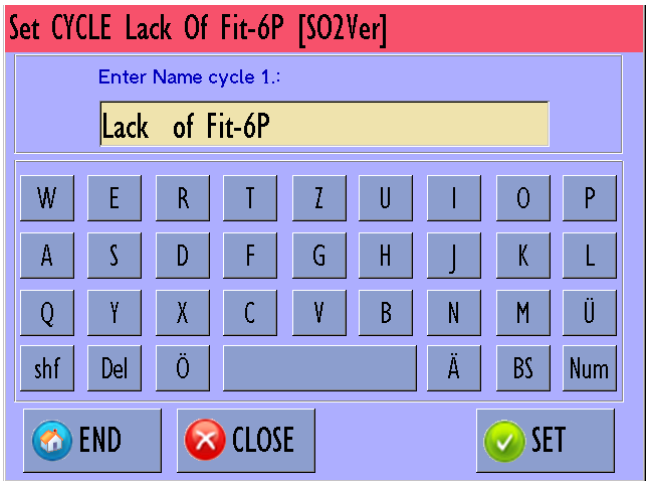


Fig. 22: Parametrization cycle-name

5.5. Analyzer

The menu analyzer is required only when you using the data logger function as described in section 7

5.6. Component

The menu component in the parameterization has the same meaning as in the main operation screen and is described in chapter 4.5

5.7. System

The SYSTEM button opens a drop-down box to select independents module parameters.
Here you are able to configure the date/time, the parameters of Ethernet and RS232 interface, the alarm limits and some passwords for the ASGU.

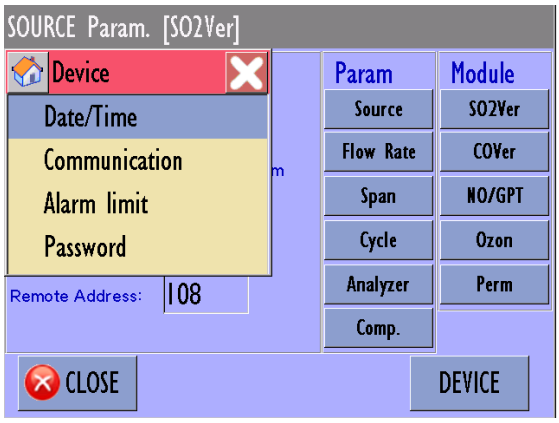


Fig. 23: Parametrization System Dropdown table

5.7.1. Date/Time

After pressing the field Date/time on the drop-down box appears an input mask for the time and date.
As described in chapter 3.4, is this to adjust with the keypad.

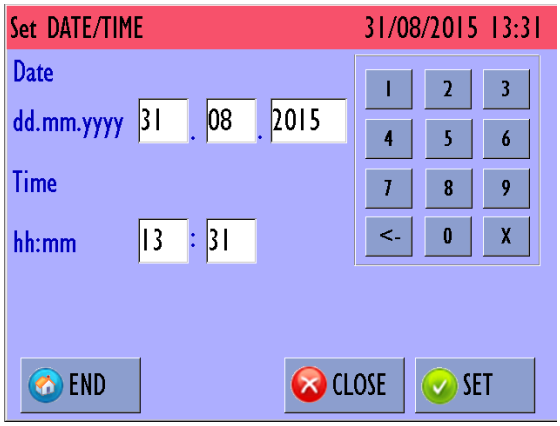


Fig. 24: Parametrization Date/Time

5.7.2. Communication

Pressing the field of communication opens more dropdown table, in which the parameters of Ethernet and the 25 pol. RS 232 interface are configurable. These two interfaces used to control and query the method described in section 9 (described advanced Bayern- Hessen protocol). The fields Other and Protocol are parameters for the datalogger function and are described in Section 7.

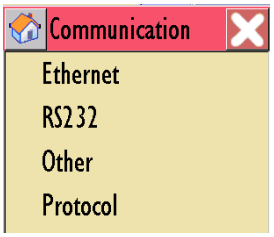


Fig. 25: Parametrization Communication

- Ethernet:

After pressing the field Communication/Ethernet on the dropdown table appears an input mask for entering all relevant data for the Ethernet interface.
In the field IP is to enter the IP number of the ASGU. If you use the datalogger function the connected analyzers need a IP number in the same subnet as the ASGU.
In the field Gateway, is enter the IP, whither the unknown IP numbers are forwarded, e.g. the address from the router.
But for VPN connection can it cause to problems because the Remote Software eASGU use the NetBIOS protocol which used broadcast for local networks.
The field Mask determines the local subnet. Default is a class C network set.
The DNS field (Domain Name System) is not used for the ASGU.
In the Port field 40002 is entered the port address for the Bayern/Hessen Protocol over Ethernet/UDP. This protocol is used from the RS232 interface too and is described in Chapter. 9.

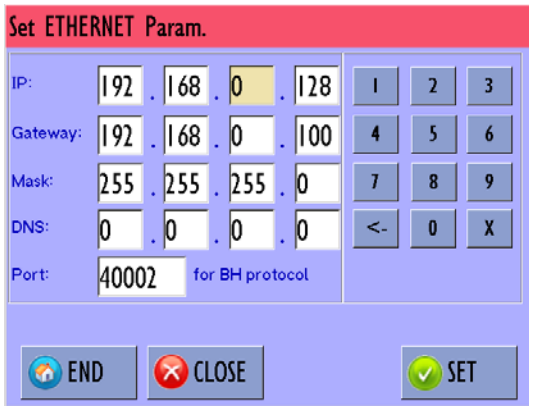


Fig. 26: Parametrization Ethernet

- RS 232

After pressing the field Communication/RS232 on the dropdown table appears an input mask for entering all relevant parameters for the 25 pin. RS232 interface. The following parameters can be set for serial transmission.
Baudrate 1200.4800, 9600, 19200 and 38400
Data bit 7 or 8
Stop bit 1 and 2
Parity no, odd, even
The MD-Addr (0-9) field is provided for the multi-drop function, but which is not implemented in the ASGU.

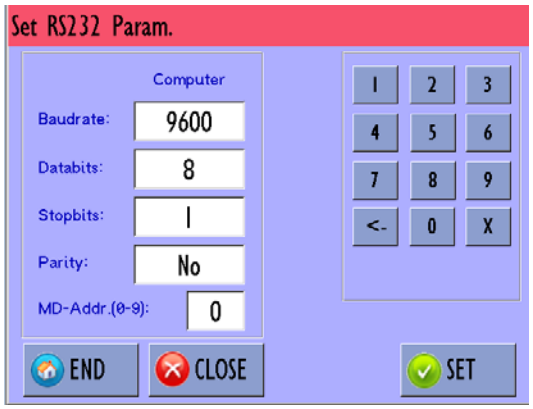


Fig. 27: Parametrization RS232

5.7.3. Alarm limit

Pressing the field Alarms opens one more drop-down table, in which the parameters of the alarm limits for the mass flow controller and the different temperatures are configurable. Furthermore a delay for the alarm output on the display, the LED, which switches on alarm from green to red, and the interface is possible.

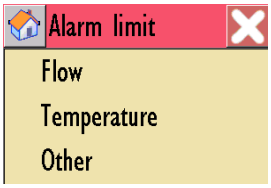


Fig. 28: Parametrization Alarm limit

- Alarm flow

After pressing the field Alarm limits / flow on the drop-down table appears an input mask for entering the alarm limits of all used mass flow controller (MFC) in ASGU.
After pressing on the input field of the various flow controller opens a second mask, in which the end value of the respective flow controller is displayed and the desired alarm limit can be entered in percent of full scale.

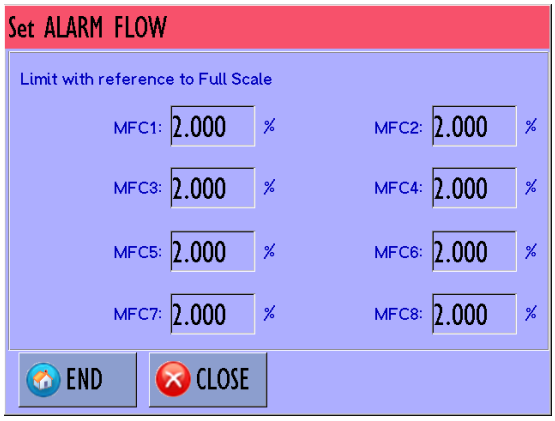


Fig. 29: Parametrization Alarm Flow

- Alarm temperature

After pressing the field Alarm limits / temperature on the drop-down table appears an input mask for entering the alarm limits of all heated oven in ASGU.
After pressing on the input field of the various ovens another mask opens, in which the desired alarm limit can be entered in ° C from the target value.

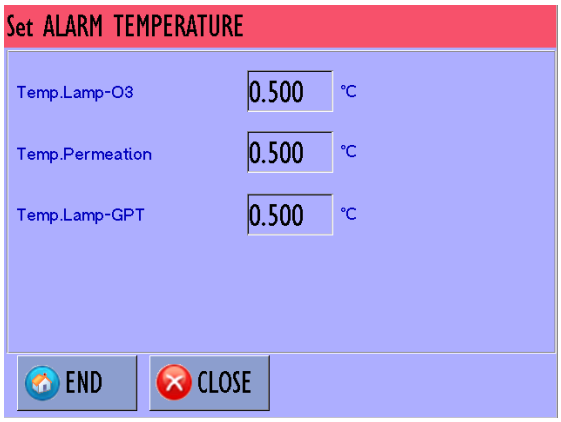


Fig. 30: Parametrization Alarm Temperature

- Alarmdelay

After pressing the field Alarm limits / Other on the drop-down table appear an input mask for entering the time delay of all alarms used in ASGU.
After pressing on the input field of the delay the desired delay time can be entered by default a delay of 30 seconds is set. The value 999 can be taken to switch of the alarm completely.

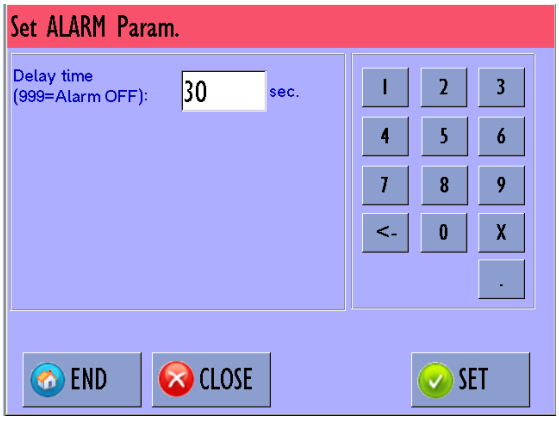


Fig. 31: Parametrization Alarmdelay

5.7.4. Password

After pressing the field Password on the drop-down table an input mask appears for the change of passwords for access to the parameterization, the access password for the remote software, and to access the Samba server. After pressing the corresponding password field, as described in Section 3.4, enables to enter the current password using the keypad. If the password is correct, a further input mask opens, in which you can enter the old and the desired new password.
The default passwords when delivered is for the Remote Software: “remote” for the network connection is the name and password: “user” for entry into the parameter setting no password is used.

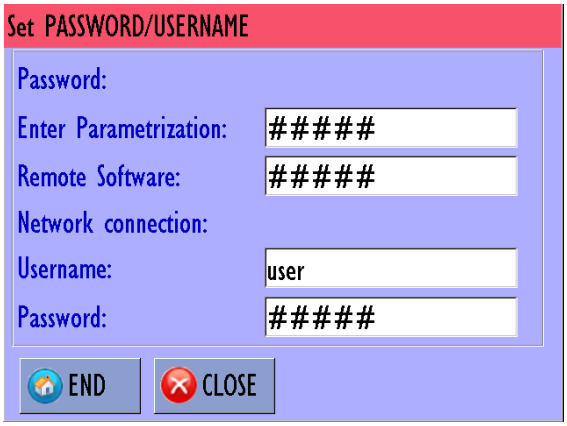


Fig. 32: Parametrization Password

6. Further Software

In addition to direct operation on the display, the Ethernet connection allows remote operation with the eASGU Remote Software.
Furthermore, an external access to the FTP and Samba server to the Internet- or Windows Explorer is possible.

6.1. Samba Sever from the ASGU

The ASGU-370 comes with a built-in Samba server. This file server with the folder listed below can be easily integrated into a Windows network. The ASGU-370 is set by default in the delivery to the address 192.168.0.28 for a Class C network. To establish a network connection from their PC to ASGU-370, both should be in the same subnet.

6.1.1. Sign in with Windows XP

To establish the connection you can search in Windows Explorer to the computer IP address 192.168.0.28. After the appearance of ASGUs in the Explorer you can log in with the default user name "user" and the default password "user" (see Figure 33). If the connection is not possible check whether the working group is set to WGASGU in the Control System / Computer Name and whether the ASGU menu: Configuration / System / Communication / Ethernet gateway was set to the IP Address of the PC

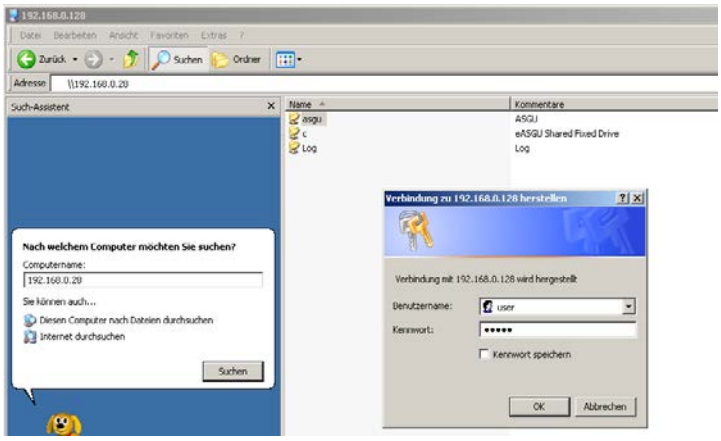


Fig. 33: Samba Server Access with Win XP

6.1.2. Sign in with Windows 7

Starting with Windows Vista is in the basic settings when logging in to the Samba LAN Manager the NTLMv2 authentication method used. But to have to carry out a successful access to the Samba server of the ASGU select in the local security policies the NTLM authentication.
The necessary settings for the security policy in Windows 7 Professional you find under Control Panel / Administrative Tools /Local. In these security policies double click the LAN manager authentication level and then select in the properties window the “Send LM & NTLM responses” for the correct authentication.

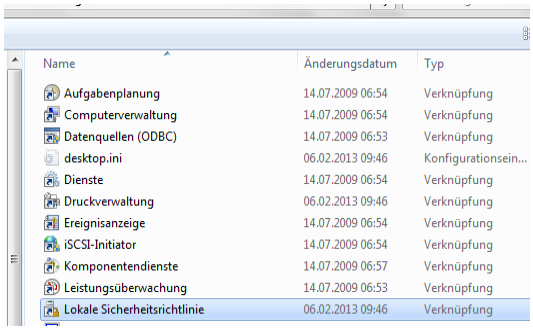


Fig. 34: Administration Local Security Policy

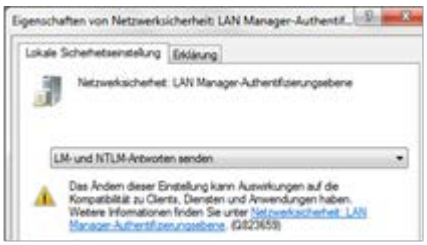


Fig. 35: LAN Manager-authentication

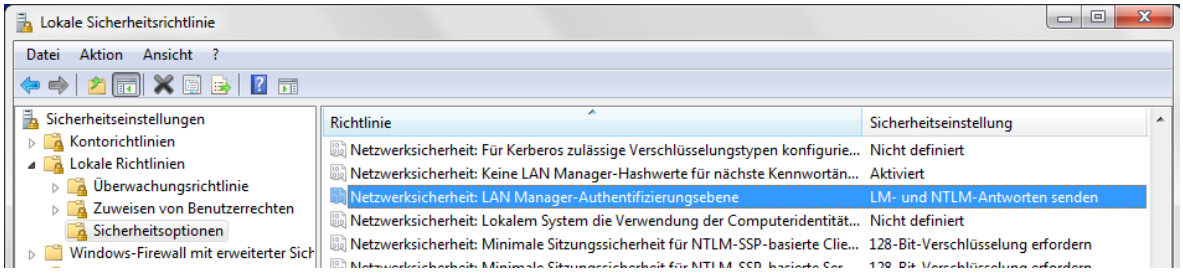


Fig. 36: Local Security Policies

For connection enter in the search box above and press the Start button, 2 backslash and the correct IP address (eg \ \ 192.168.0.28). After a successful connection in the Windows Explorer appears the folder of ASGU and the registration window.

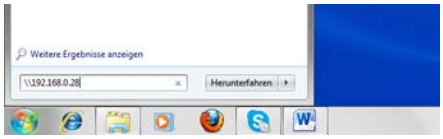


Fig. 37: Samba Server Windows 7 entry field

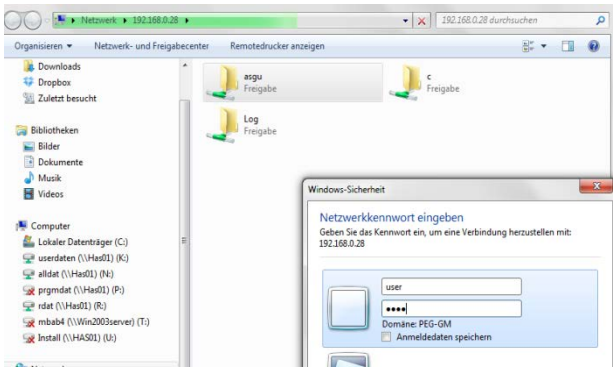


Fig. 38: Samba Server Zugriff Win 7

6.1.3. Folder on the Samba Server

The network folder of ASGUs a drive letter can be assigned and should be available afterwards as shown in Figure 39. In the ASGU folders are the two encrypted configuration files DEVICE.cfg, System.cfg and the following subfolders:

- Analyzer: with the file analyzer.csv for the parameter of the test analyzer
- Backup: the encrypted device and system file
- Data: Templates and the raw data of cycles
- Fonts: Folder for different character sets (language)
- History: encrypted file (Alarm History)
- Language: folder for different languages
- Logs: encrypted log file
- Pictures: empty, historical folder
- Remote: Remote Software for the ASGU
- Report: for storing of your personal documents

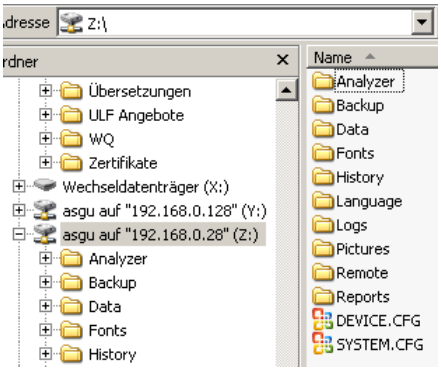


Fig. 39: Samba Server Folder

6.2. FTP Server des ASGU

In similar manner to the Samba server the access to the FTP server of the ASGU is possible. After proper network configuration, you can directly enter the IP address preceded by ftp:// and if need the username and password “ftp://user:user@192.168.0.28” in the address bar of Windows or Internet Explorer and get access to the FTP server of ASGU. In the FTP directory you are able to find again the folder ASGU with the same sub-folders as the directories of the Samba server described in Section 6.1.3.

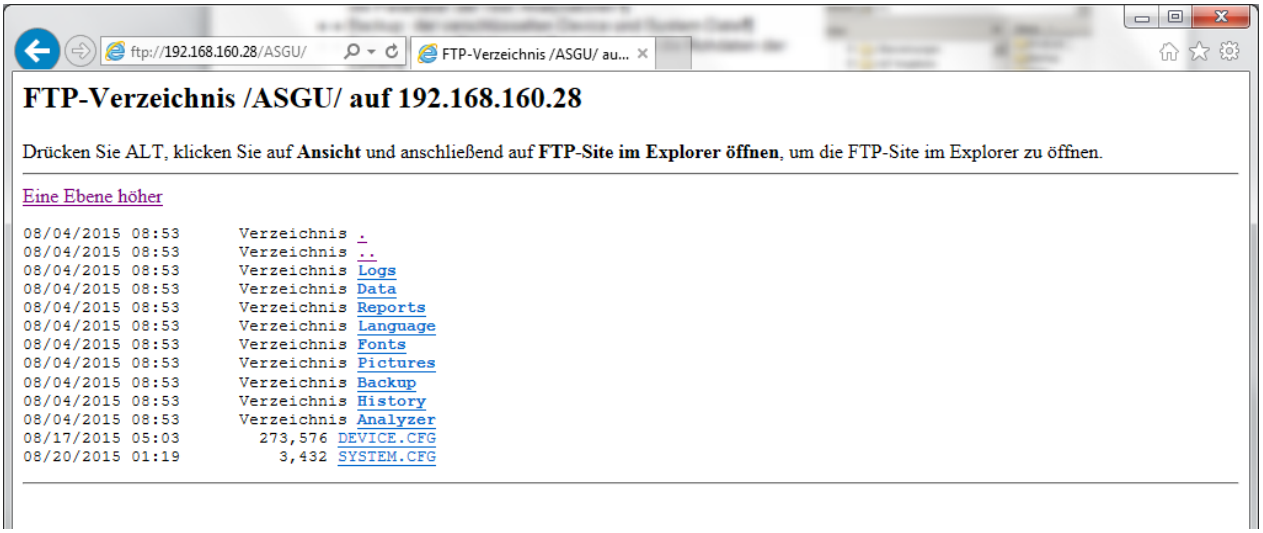


Fig. 40: FTP Server Folder

6.3. Remote Software

On the Samba server is in the remote folder with the setup installer eRemote 2.3.1
This remote software can now be copied from the Samba server to the internal hard drive and can be performed. For installation follow the accordant program of eRemote Setup Wizard menus. Select the desired installation folder and install the program on your computer.

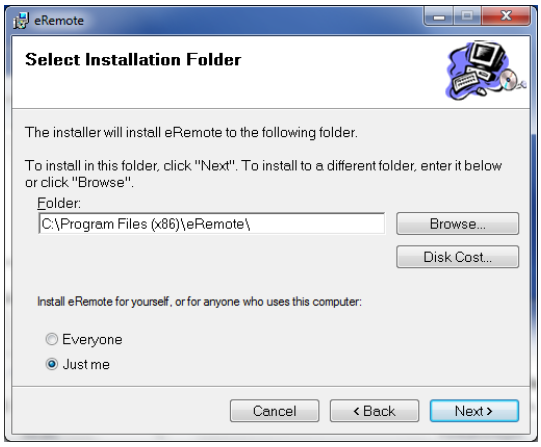


Fig. 41: eASGU Remote Setup Wizard

After starting the program, the local network is searched for existing ASGU-370 and added it to the list of ASGU unit. This search process is done well, after pressing the Browse button. After that you can direct connect with a double-click for an entry. Furthermore is a connection possible if you enter the ASGU-370 IP in the Remote IP box and press the Connect button. The input field Local IP is provided for entering the IP address of the remote computer, but this field can also be left blank

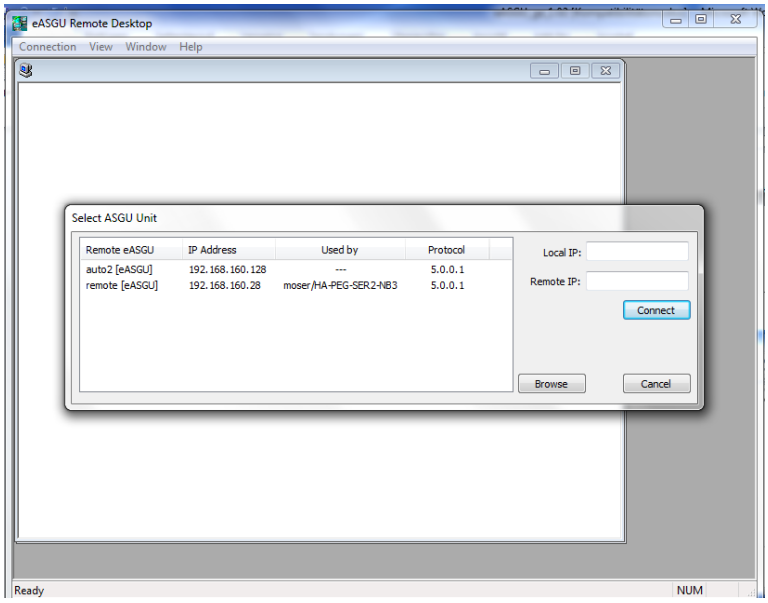


Fig. 42: eASGU Remote Software with ASGU selection window

After a successful connection, an exact reproduction of the touchscreen will now be displayed on the remote computer. During that the display of the remote access ASGU-370 is darkened and a local operation is no longer possible. The remote software now allows for complete remote control of the ASGU-370 calibrations unit.

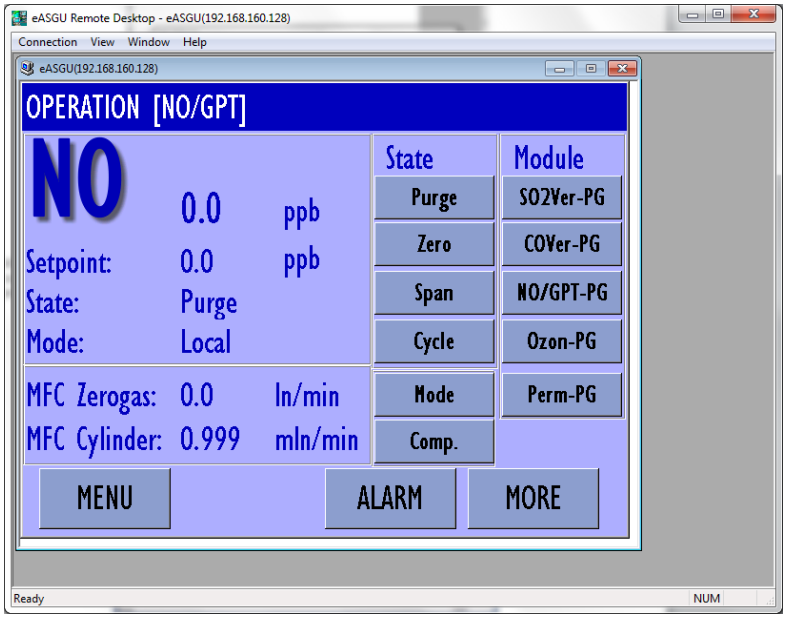


Fig. 43: eASGU Remote Software

The ASGU-370 can still be remotely controlled only from one computer and in the ASGU selection window box in the column used by is visible the currently connected remote computer. For remote operation with another ASGU-370, you can find in the menu Connection the button New . The ASGU selection window will open and connection to additional ASGU-370 is possible. To end the existing remote connection, press the Close button and terminating the remote software is done with the button Exit.

7. Datalogger Function

The data logger function in ASGU with the associated Excel macros is an additional option which can be purchased from Horiba. With this feature, the recording and the subsequent evaluation of the analyzer data with excel report is possible..

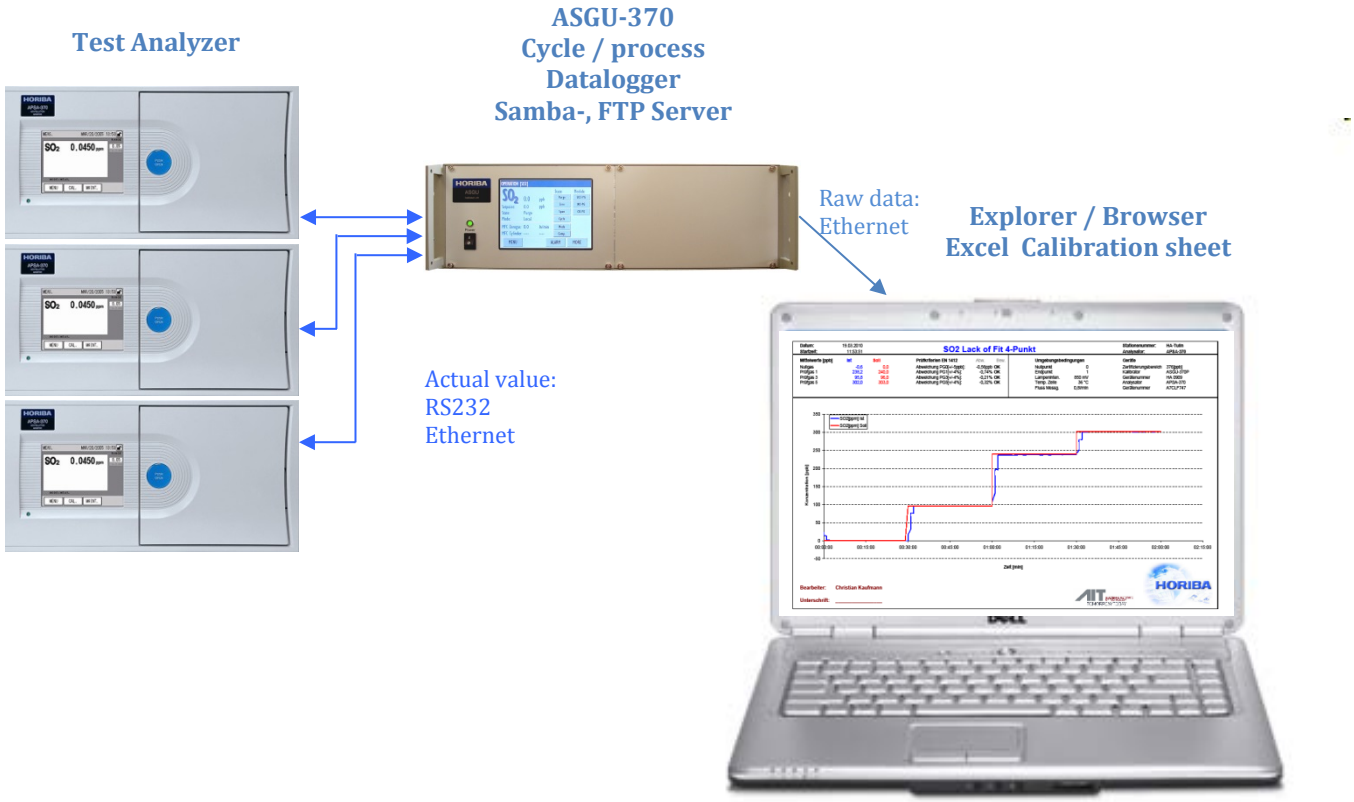


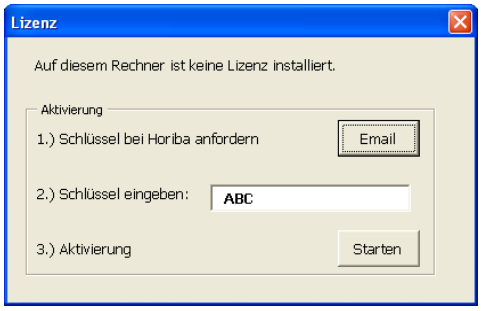
Fig. 44: Datalogger Function

7.1. Scope of delivery

In the scope of delivery are in the folder **Report/Templates** the evaluation macro, the Excel Add-In „Kalib.xla“ and templates for different calibrations reports in German and English (e.g. SO2 Lack of fit, NOx converter efficiency) included.
For Testing purposes, there exist in the folder **RowData/Samples** different raw data .CSV files. In the folder **Report/Samples** are the corresponding finished Excel and PDF reports.
To enable the Datalogger function there is on the ASGU-370 or OZGU-370 samba server the folder /**Analyzer** with the Analyzer.csv file and the folder /**Data/Template** with the respective cycle or sequence templates necessary.
A freely available PDF Creator, which is necessary for the storage of the final reports, can be found in the PDF creator folder.

7.2. Installation Excel Macros

The folder **HORIBA_CalibrationTool_vx.xx** should be saving directly on the hard disk on c:, when another location is chosen, maybe the references must be re-adjusted as described under point 7.3 Kalib.xla. The use of the Excel macro requires a Microsoft Excel version from 2003 and a PC-bound key (code). This key is queried when you first start the Excel macro. To open the Excel templates go in to the folder **Report/Templates** and start any .xltm template



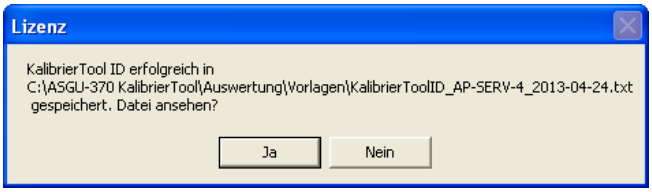


Fig. 45: Lizenz query

After pressing the E-mail button will automatically create a text file in the Templates folder with PC data and a Primary key. This text file should then be returned to HORIBA. You get then a key that is used to activate the calibration tools.

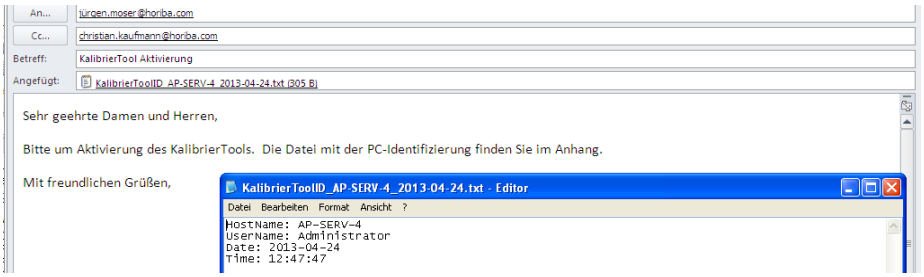


Fig. 46: e-mail with Primary key

Horiba creates from the Primary key a key which will be sent to you. This key can be entered in point 2. After successfully entering and activation of the key the message Fig.47 should appear and the Excel add-in **kalib.xla** should available for all templates.

This key cannot be simply written on CD and passed on, because it only works for a PC. If you change the PC configuration, a new key must be requested but not when reinstalling on the same PC..

Fig. 47: CalibrationTool successful activated

7.3. Kalib.xla

Each template use the Excel Add-In **Kalib.xla**. It is important that the path to the calibration add-in is correct. If the path not correct than the VBA message „project or library not found" can appear. To update or create the correct path reference in the VBA editor, select the menu **Extras/References** when present hacked out the line "NOT PRESENT Kalib.xla" and search in the Templates folder the **Kalib.xla file**. Then save the .xltm template again.

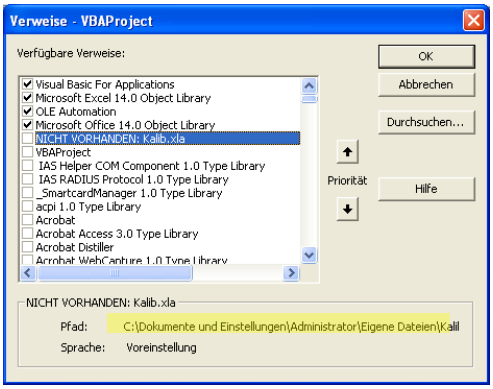


Fig. 48: References VBA Editor

7.4. PDF Creator

To use the Kalib.xla macro there is the installation from the PDF Creator necessary, otherwise there will appear right at the start of a template a „MacAddress compiler error".

7.5. PDF Printer

For saving a PDF Report a PDF Printer such as PDF Creator, PDF XChange or Adobe PDF Printer has to be installed. If no PDF Printer is installed an error message such as Fig.49 might be appear. To select the correct PDF printer in the. Excel Template sheet see section 8.3 „ Worksheet Definition „Definitionen". The worksheet with the correct PDF printer should be saved as a template xltm.

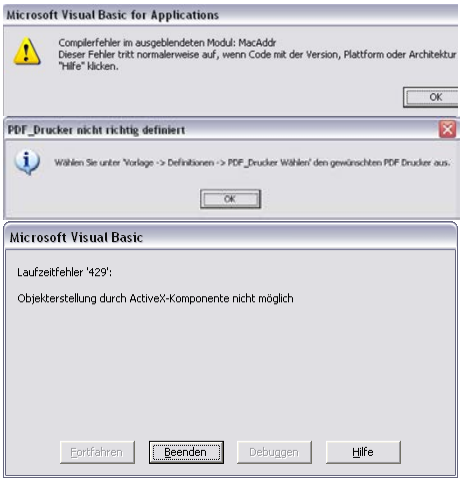


Fig. 49: PDF Printer Error Message

7.6. Data import

Depending on the language, Horiba uses a point in English and a comma in German for the decimal separator in the System.xml and VBA Excel code.
To ensure correct data import from the raw data, the correct format must be selected in Windows in the system control in the menu / Regional and language options depending on the language.
The symbol of the decimal separator should be a point for English, a comma for German, and for the digit grouping a point for German and a comma for English.
Also, when importing data from the Excel template, the date should be in format dd.mm.yyyy.hh:mm:ss. If selected English in the Regional and Language Options see to chapter 8.3.1. General definitions for the evaluation.
For other country settings, runtime error 13 (types incompatible) may occur. In this case, please contact HORIBA.

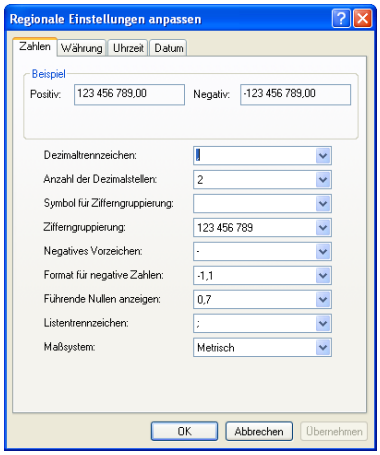


Fig. 50: Regional and Language Options

7.7. Folder data and analyzer

For the Datalogger extension, as stated above, there are two folders named **Data** and **Analyzer**. The Data folder contains the received raw data of a calibration cycle and the template folder with the different cycle-templates for the raw data. That the correct template is used, when running a cycle, the file name of the template is for example: Lack of Fit-4P conform to the name from the Parameter setting menu / cycle in the ASGU-370. In this menu the processes or names can be customized. As can be seen in Figure 51 up to 8 cycles or templates are created. These cycles can with Button 9 Sequence also be combined and then running in this preconfigured sequence.

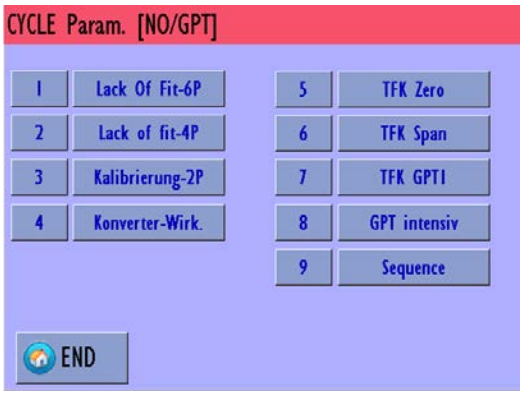


Fig. 51: Menu cycles

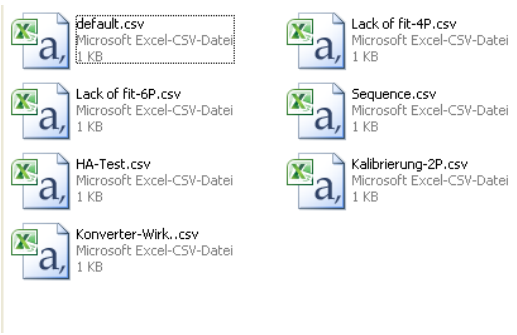


Fig. 52: Folder Templates

In template see Fig 53 or later in the exel report itself can entered the additional parameters from the tested analyzers.

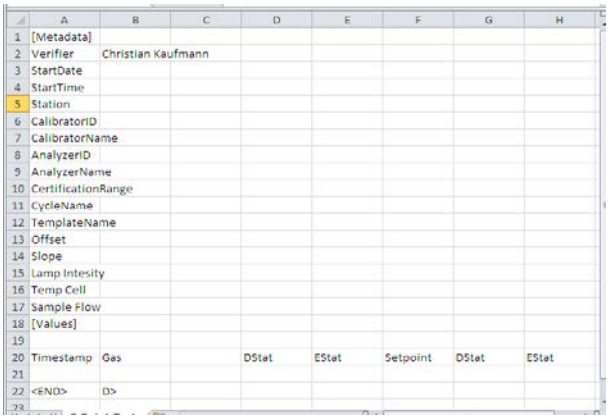


Fig. 53: Templates

The Folder **Analyzer** contains the analyser.csv file with the parameters of the test analyzer. This file is necessary for the configuration of the analyzer to be tested and includes the parameters described in Table 6.

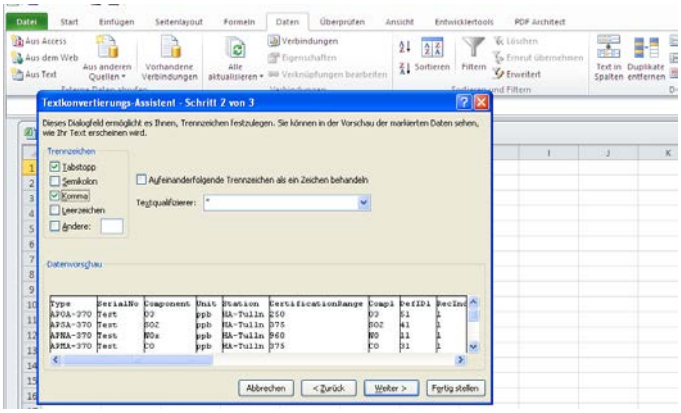
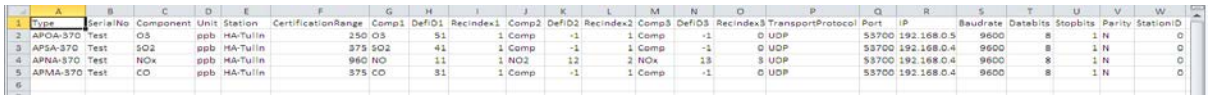


Fig. 54: Analyzer.csv import to excel

Creation of a new test analyzers can be made in the analyzer.csv file additional entries. Devices which are selected in the ASGU-370 analyzer menu should not be deleted from this file (ASGU-370 could move not

high). For a clear table open the analyzer.csv file with the import function procedure (data/from text) and import the table such in Fig 52.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Type	SerialNo	Component	Unit	Station	CertificationRange	Comp1	DefID1	RecIndex1	Comp2	DefID2	RecIndex2	Comp3	DefID3	RecIndex3	TransportProtocol	Port	IP	Baudrate	Databits	Stopbits	Parity	StationID
2	APOA-370	Test	O3	ppb	HA-Tulln	250	O3	51	1	Comp	-1	1	Comp	-1	0	UDP	53700	192.168.0.5	9600	8	1	N	0
3	APSA-370	Test	SO2	ppb	HA-Tulln	375	SO2	41	1	Comp	-1	1	Comp	-1	0	UDP	53700	192.168.0.4	9600	8	1	N	0
4	APNA-370	Test	NOx	ppb	HA-Tulln	960	NO	11	1	NO2	12	2	NOx	13	3	UDP	53700	192.168.0.4	9600	8	1	N	0
5	APMA-370	Test	CO	ppb	HA-Tulln	375	CO	31	1	Comp	-1	1	Comp	-1	0	UDP	53700	192.168.0.4	9600	8	1	N	0
6																							

Fig. 55: content from analyser.csv

After saving this .csv file the semicolons have to be converted again though commas. This is most easily done with the replace function from the text editor.

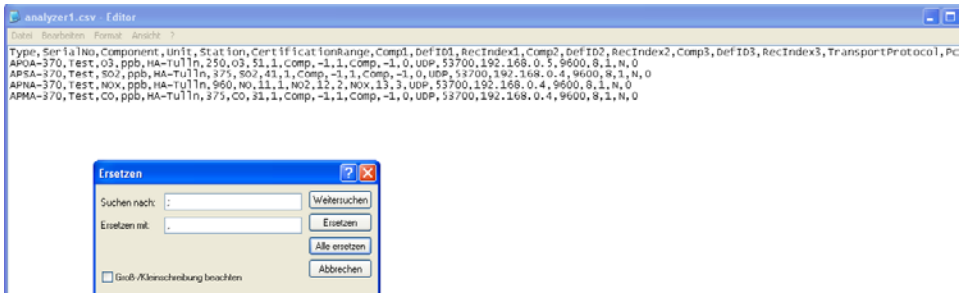


Fig. 56: Texteditor

Parameter	Display	Description
Type	selectable	Name of the Analyzer eg.:APNA-370
SerialNo	selectable	Serial number from the Analyzer
Component	configurable	Component name .eg.: NOx
Unit	changeable	Possible units: ppb, ppm, ug/m3, mg/m3 (the raw data value is converted to this unit)
Station	changeable	Location of the test run eg.: HA-Tulln
CertificationRang	fix	Certification area eg.:375ppb
Comp1	Conf.->Component	Name of the desired first component.: NO
DefID1	Conf.->Component	ID first component (eg.:11, for B/H protocol without Multidrop)
RecIndex1	Conf.->Component	Index, position in the response string (eg.: 1)
Comp2	Conf.->Component	Name of the desired second component eg.: NO2
DefID2	Conf.->Component	ID second component (eg.:12, for B/H Protocol without Multidrop)
RecIndex2	Conf.->Component	Index, Position in the response string (eg.: 2)
Comp3	Conf.->Component	Name of the desired third component eg.: NOx
DefID3	Conf.->Component	ID third component (eg.:13, for B/H Protocol without Multidrop)
RecIndex3	Conf.->Component	Index, Position in the response string (eg.: 3)
TransportProtocol	fix	If Horiba/UDP or C-Link/TCP protocol is used
Port	changeable	The port address of the test Analyzer (Horiba APxA = 53700)
IP	changeable	The IP number of the test Analyzer (has to be in same Sub net like ASGU-370)
Baud rate	selectable	RS 232 parameters: transmission speed (eg :: 9600)
Data bits	selectable	RS 232 parameters: number of data bits (eg: 8)
Stoppbits	selectable	RS 232 parameters: number of stop bits (eg: 1)

Table 6: Paramter description Analyzer.csv

After uploading the file analyzer.csv and restarting the ASGU, you can modify in the menu / parameter / analyzer most of these parameters as described in Table 6.

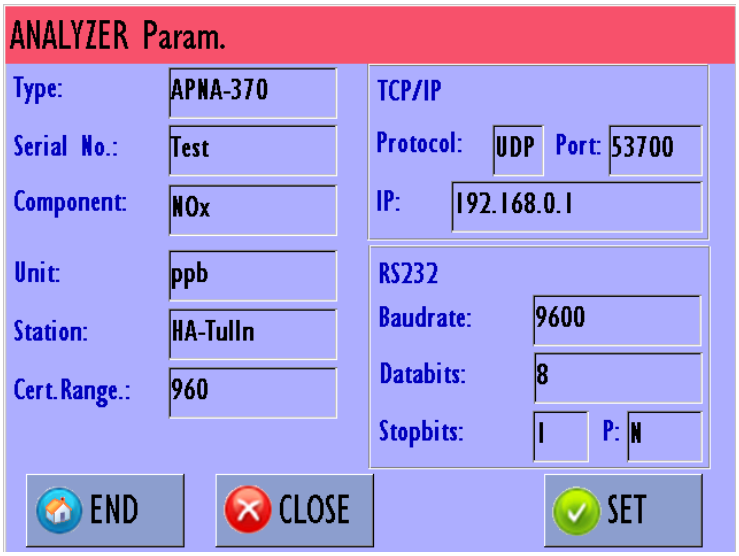


Fig. 57: Parametrization Analyzer

7.8. RS232 or Ethernet Connection to the Analyzer

To establish a connection to the analyzer select for the desired device under test cycle / analyzer and activate in dependence on your connection, the RS232 or TCPIP field. The ASGU-370 asks at an interval of 5 seconds, the instantaneous values from the analyser. To increase the polling intervals, there is the possibility in the parameterization under System / Communications / Other to change with a multiplier these polling intervals. Another parameter in the drop-down table System / Communications / Protocol is the send ID from the HORIBA protocol. This was prepared for the Datalogger function, but since the HORIBA devices are by default retrieved using the Broadcast ID, this menu has no meaning.

After a successful connection should be the recording of the setpoint and actual data visible in the more / view / data trend.

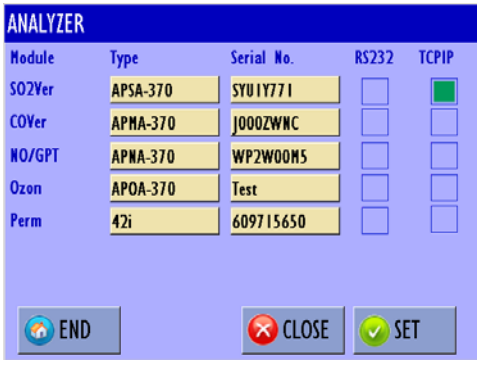


Fig. 58: Menü Analysator

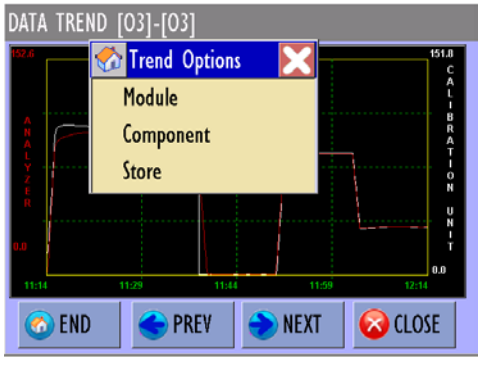


Fig. 59: Datengrafik

Pressing on the graphic enables to store recorded data. By a successful end of a cycle, this storage is done automatically in the Data folder.

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7.9. Download raw data via Samba- or FTP Server

The stored data files are visible in menu more / data file see Figure 60.
The download of this raw data can be done from the Samba server or via the Internet Explorer from the FTP server. To connect to this server enter in the browser just ftp:// and the correct IP number. Of course, the PC and the ASGU-370 must be in the same subnet here

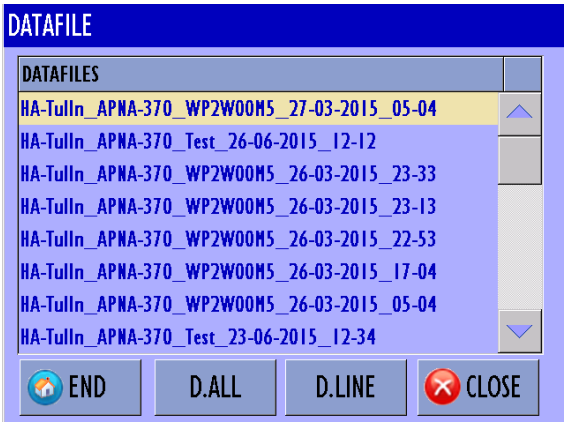


Fig. 60: Datenfiles

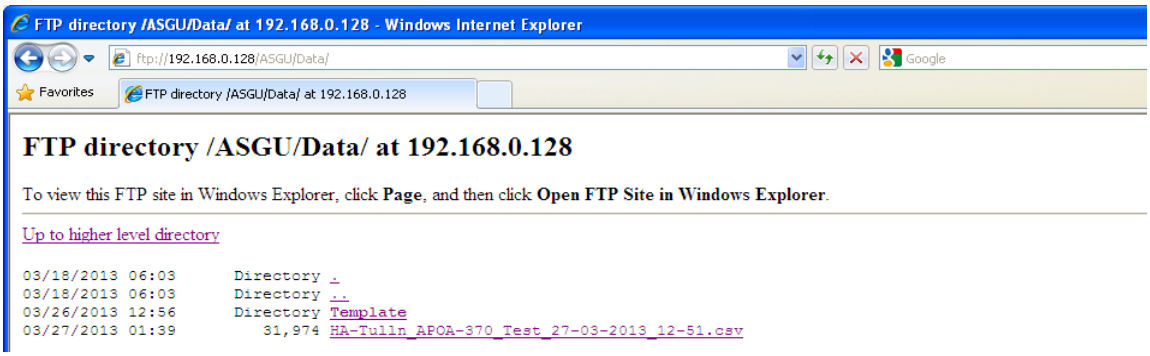


Fig. 61: Internet Explorer with FTP connection

7.10. Supported protocols

The connection ASGU-370 - Test device via RS232 is done with a crossed RS 232 cable (handshaking lines are not required). The connection ASGU-370 - Test device via Ethernet is done with a patch cable.
To receive now the instantaneous values from these two interfaces different protocols has been implemented. Currently, the following protocols are supported:

Protocol	Interface	request String
Bayern/Hessen	RS232	All instantaneous values: <STX>DA<CR>
Horiba / UDP	Ethernet	All instantaneous values: <SOH>FFFF00R001<STX>60<ETX> Line status: <SOH>FFFF00R024<STX>67<ETX>
C-Link / TCP	Ethernet	NO instantaneous values: <ASCII 167>no<CR> NO2 instantaneous values: <ASCII 167>no2<CR> NOx instantaneous values: <ASCII 167>nox<CR> O3 instantaneous values: <ASCII 167>o3<CR> SO2 instantaneous values:: <ASCII 167>so2<CR> CO instantaneous values: <ASCII 167>co<CR> Operation-, Error Status: flags<CR> <ASCII 167> = Station ID (in this example 39) + 128

Table 7: Test Analyzer Protocols

8. Evaluation of the calibration in Excel

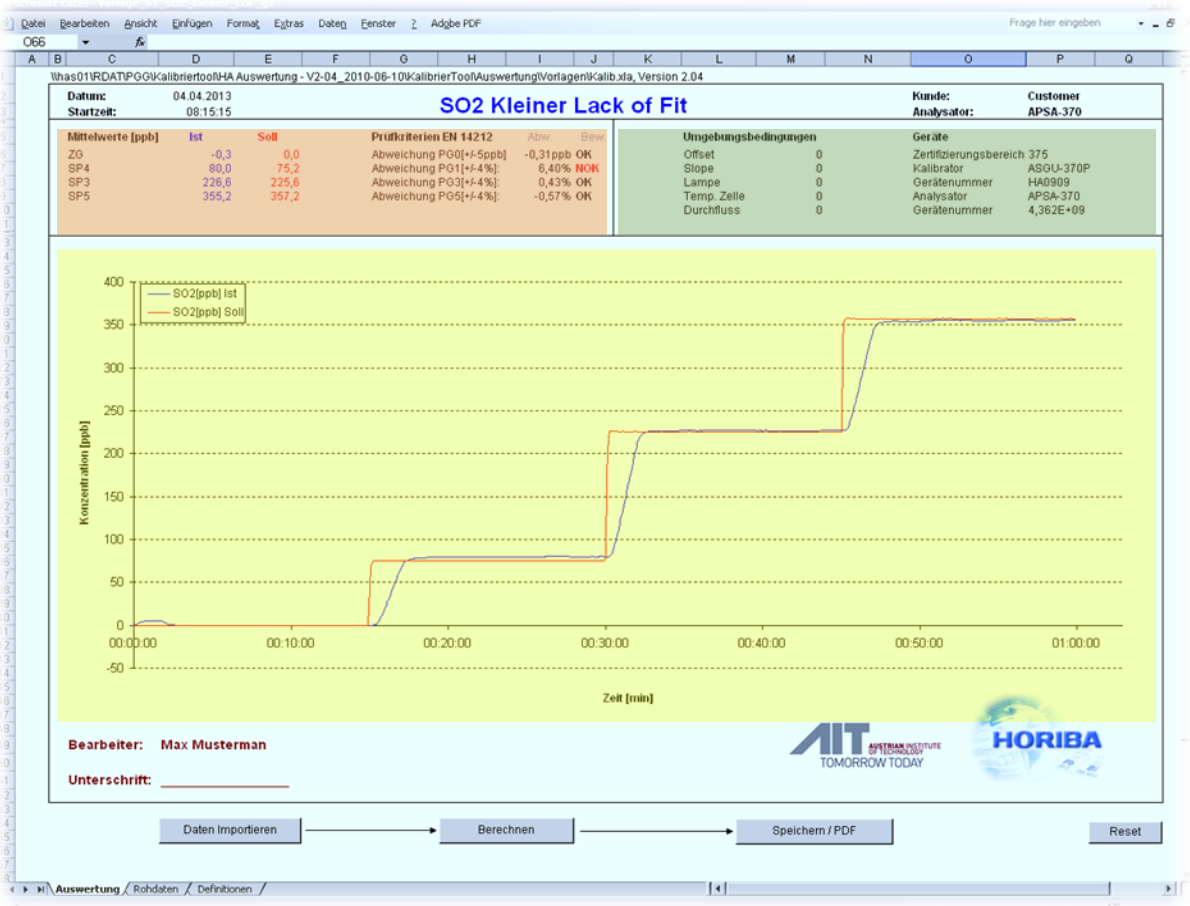


Fig. 62: Evaluation worksheet

8.1. Worksheet Evaluation „Auswertung“

The first worksheet is the actual evaluation with the calibration sheet, which consists of three main areas:

1.) In the **evaluation area** (colored red), are the mean values, set point values and test criteria, leading to the evaluation of the analyzer (OK / NOK).

2) In the **metadata area** (colored green), are discribed the additional information on calibration, such as environmental conditions and device parameters. The values are "raw data" referenced directly from the worksheet. In addition, the names can be referenced for the parameters themselves from the "raw data". This avoids the erroneous assignment of a value (eg 1716mV) to a wrong parameter (e.g "offset" instead of "Lamp Intensity").

3) The **diagram** (colored yellow) offers a graphical presentation of the calibration history. The graph can be formatted as desired.

8.1.1. Control area

On the one hand all areas can be formatted freely with Excel and on the other hand automatically writable by special macros that are controlled by the worksheet "Definition".

Under the calibration sheet, the control elements are arranged, which typically are needed for evaluation:

1) With the button **Import data** any raw data can be selected from the file open dialog

2) With the button **Calculate** the calculation macros are started in the "evaluation area" for the report.

3) The third button **Save / PDF** allows you to save the report as an Excel file and as a PDF . The file names are assumed by the name of the raw data import. The template itself is not stored because it is supposed to be available for the next evaluation again .Therefore, templates are read-only.

4) The **Reset** button brings the template back to its original state .

8.1.2. Interim Results

In the table "intermediate results" are the mean values for all sample components (measuring and reference values) and all span gas steps (eg SP0, SP1 ...) must be entered, to guarantee the reproducibility of the calculation and to provide figures for native Excel Formulas. For example the latter make sense in the calibration "converter efficiency", as shown in the following figure.

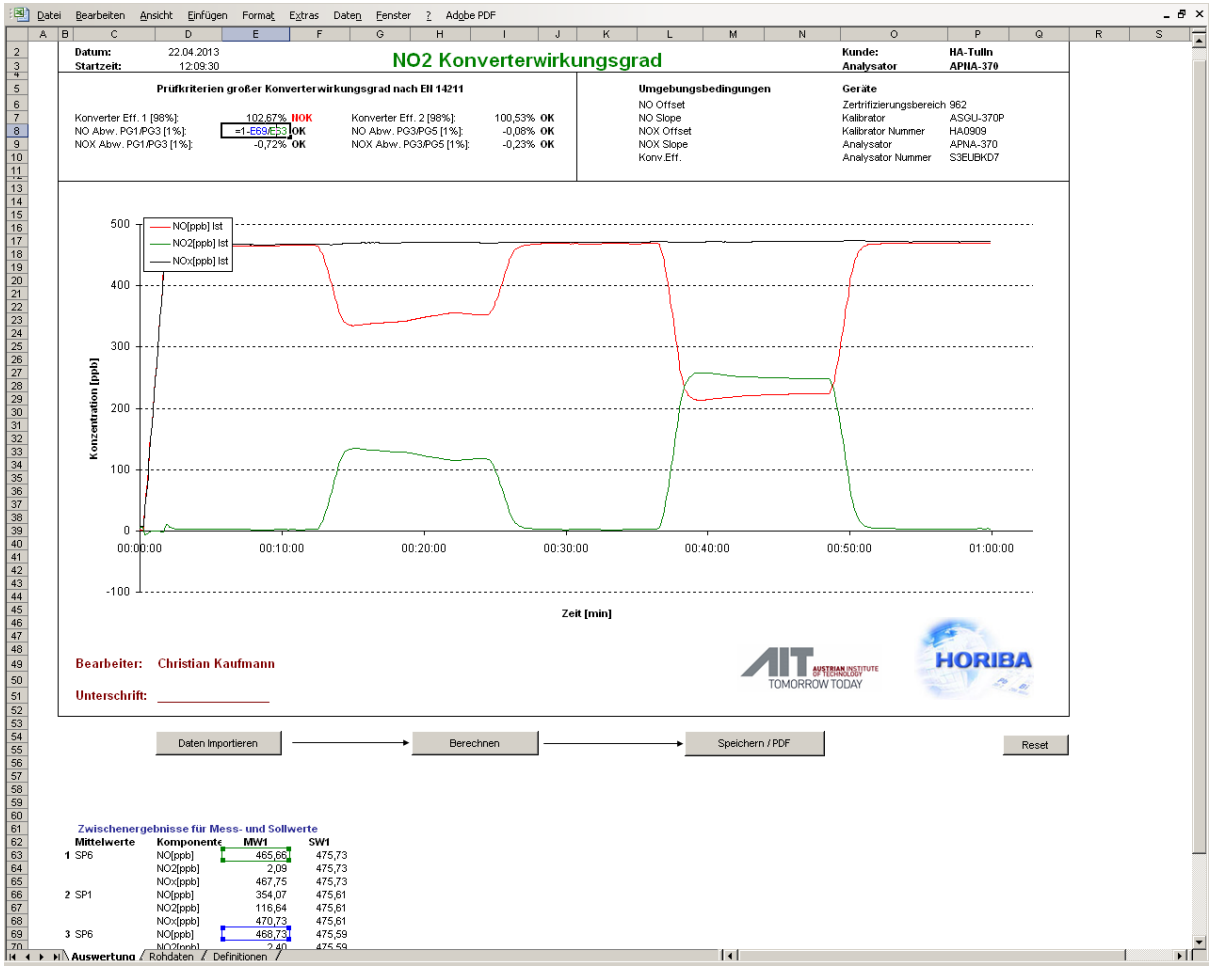
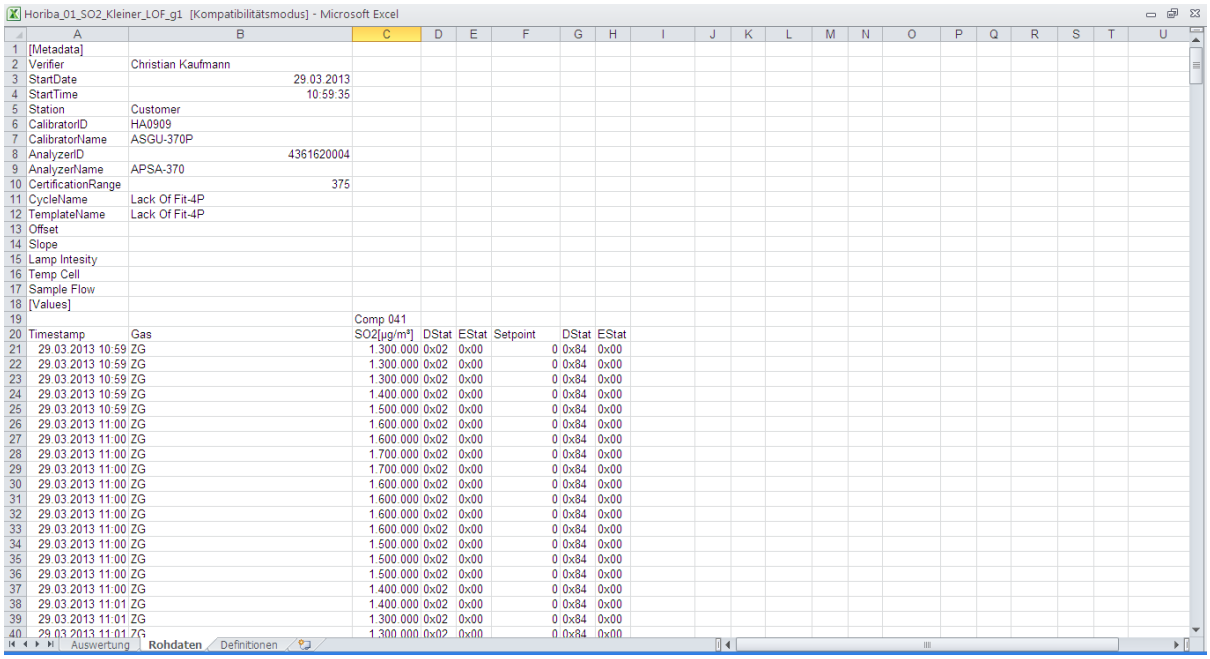


Fig. 63: Intermediate values for NO2 converter efficiency

The evaluation of the analyzer is realized through own Excel formulas which refer to the intermediate values.

8.2. Worksheet Row data „Rohdaten“



Horiba_01_SO2_Kleiner_LOF_g1 [Kompatibilitätsmodus] - Microsoft Excel

	A	B	C	D	E	F	G	H
1	[Metadata]							
2	Verifier	Christian Kaufmann						
3	StartDate	29.03.2013						
4	StartTime	10:59:35						
5	Station	Customer						
6	CalibratorID	HA0909						
7	CalibratorName	ASGU-370P						
8	AnalyzerID	4361620004						
9	AnalyzerName	APSA-370						
10	CertificationRange	375						
11	CycleName	Lack Of Fit-4P						
12	TemplateName	Lack Of Fit-4P						
13	Offset							
14	Slope							
15	Lamp Intesity							
16	Temp Cell							
17	Sample Flow							
18	[Values]							
19			Comp 041					
20	Timestamp	Gas	SO2[µg/m³]	DStat	EStat	Setpoint	DStat	EStat
21	29.03.2013 10:59	ZG	1.300.000	0x02	0x00	0	0x84	0x00
22	29.03.2013 10:59	ZG	1.300.000	0x02	0x00	0	0x84	0x00
23	29.03.2013 10:59	ZG	1.300.000	0x02	0x00	0	0x84	0x00
24	29.03.2013 10:59	ZG	1.400.000	0x02	0x00	0	0x84	0x00
25	29.03.2013 10:59	ZG	1.500.000	0x02	0x00	0	0x84	0x00
26	29.03.2013 11:00	ZG	1.600.000	0x02	0x00	0	0x84	0x00
27	29.03.2013 11:00	ZG	1.600.000	0x02	0x00	0	0x84	0x00
28	29.03.2013 11:00	ZG	1.700.000	0x02	0x00	0	0x84	0x00
29	29.03.2013 11:00	ZG	1.700.000	0x02	0x00	0	0x84	0x00
30	29.03.2013 11:00	ZG	1.600.000	0x02	0x00	0	0x84	0x00
31	29.03.2013 11:00	ZG	1.600.000	0x02	0x00	0	0x84	0x00
32	29.03.2013 11:00	ZG	1.600.000	0x02	0x00	0	0x84	0x00
33	29.03.2013 11:00	ZG	1.600.000	0x02	0x00	0	0x84	0x00
34	29.03.2013 11:00	ZG	1.500.000	0x02	0x00	0	0x84	0x00
35	29.03.2013 11:00	ZG	1.500.000	0x02	0x00	0	0x84	0x00
36	29.03.2013 11:00	ZG	1.500.000	0x02	0x00	0	0x84	0x00
37	29.03.2013 11:00	ZG	1.400.000	0x02	0x00	0	0x84	0x00
38	29.03.2013 11:01	ZG	1.400.000	0x02	0x00	0	0x84	0x00
39	29.03.2013 11:01	ZG	1.300.000	0x02	0x00	0	0x84	0x00
40	29.03.2013 11:01	ZG	1.300.000	0x02	0x00	0	0x84	0x00

Auswertung | Rohdaten | Definitionen

Fig. 64: worksheet row data

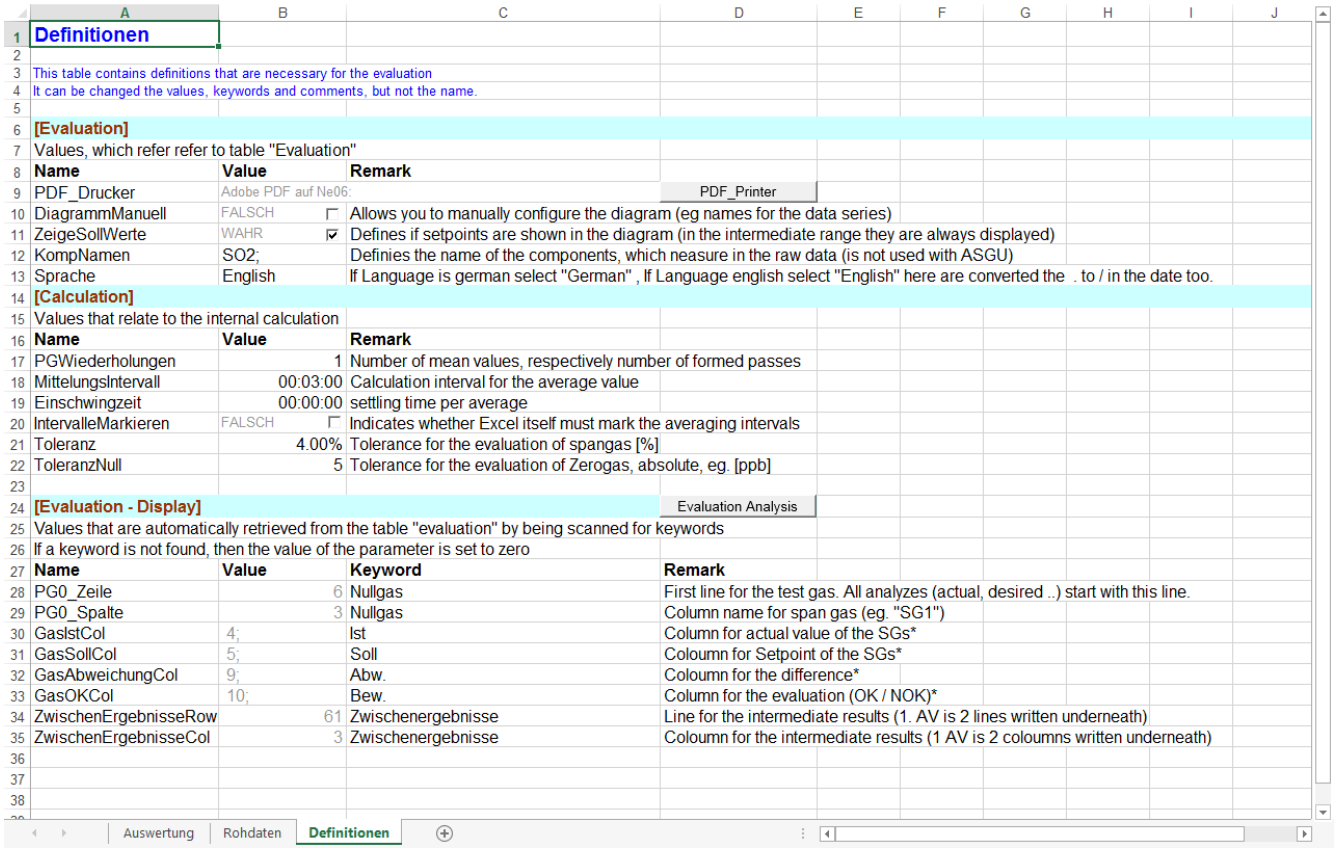
The raw data are recorded by ASGU-370 as a csv table and include a metadata field, and the value range. A time stamp and the set span gas point are recorded per measurement line. This is followed by one or more components, with respective set point and actual values along with their status (device status, error status). The actual value is obtained from the device under test (analyzer), the set point directly from the calibrator. In the case of error status of this is highlighted in red in the calculation. Measurements that were used for averaging are highlighted in blue.

The raw data end with a special ID that announces the reason for the end of the raw data recording:

<END>	Cycle 'Lack Of Fit-4P' finished successful.

Incomplete as raw data can be detected, for example, could arise from a termination of ongoing calibration..

8.3. Worksheet Definition „Definitionen“



	A	B	C	D
1	**Definitionen**			
2				
3	This table contains definitions that are necessary for the evaluation			
4	It can be changed the values, keywords and comments, but not the name.			
5				
6	**[Evaluation]**			
7	Values, which refer refer to table "Evaluation"			
8	**Name**	**Value**	**Remark**	
9	PDF_Drucker	Adobe PDF auf Ne06:		PDF_Printer
10	DiagrammManuell	FALSCH ☐	Allows you to manually configure the diagram (eg names for the data series)	
11	ZeigeSollWerte	WAHR ☑	Defines if setpoints are shown in the diagram (in the intermediate range they are always displayed)	
12	KompNamen	SO2;	Definies the name of the components, which neasure in the raw data (is not used with ASGU)	
13	Sprache	English	If Language is german select "German" , If Language english select "English" here are converted the . to / in the date too.	
14	**[Calculation]**			
15	Values that relate to the internal calculation			
16	**Name**	**Value**	**Remark**	
17	PGWiederholungen	1	Number of mean values, respectively number of formed passes	
18	MittelungsIntervall	00:03:00	Calculation interval for the average value	
19	Einschwingzeit	00:00:00	settling time per average	
20	IntervalleMarkieren	FALSCH ☐	Indicates whether Excel itself must mark the averaging intervals	
21	Toleranz	4.00%	Tolerance for the evaluation of spangas [%]	
22	ToleranzNull	5	Tolerance for the evaluation of Zerogas, absolute, eg. [ppb]	
23				
24	**[Evaluation - Display]**			Evaluation Analysis
25	Values that are automatically retrieved from the table "evaluation" by being scanned for keywords			
26	If a keyword is not found, then the value of the parameter is set to zero			
27	**Name**	**Value**	**Keyword**	**Remark**
28	PG0_Zeile	6	Nullgas	First line for the test gas. All analyzes (actual, desired ..) start with this line.
29	PG0_Spalte	3	Nullgas	Column name for span gas (eg. "SG1")
30	GaslstCol	4;	Ist	Column for actual value of the SGs*
31	GasSollCol	5;	Soll	Coloumn for Setpoint of the SGs*
32	GasAbweichungCol	9;	Abw.	Coloumn for the difference*
33	GasOKCol	10;	Bew.	Column for the evaluation (OK / NOK)*
34	ZwischenErgebnisseRow	61	Zwischenergebnisse	Line for the intermediate results (1. AV is 2 lines written underneath)
35	ZwischenErgebnisseCol	3	Zwischenergebnisse	Coloumn for the intermediate results (1 AV is 2 coloumns written underneath)
36				
37				
38				

Auswertung | Rohdaten | Definitionen

Fig. 65: Worksheet Definition

In the third worksheet, the macro for the analysis of raw data is configured. They are an integral part of the template and therefore unaffected by a reset of the template. The control parameters can be divided into 4 groups:

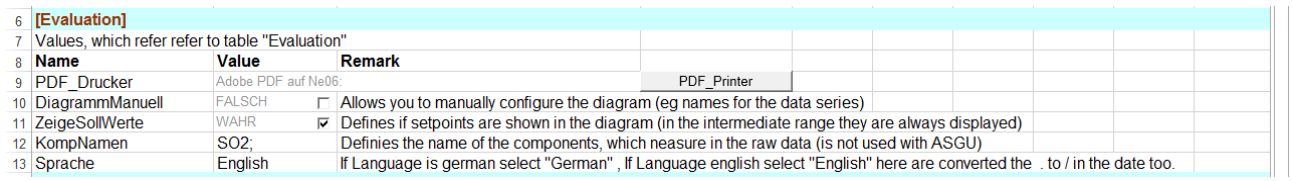
1) General definitions for the **Evaluation**

2) Parameters for the **Calculation**

3) Parameters for the graphical display in the **Evaluation - Display**

4) User-defined formulas (optional)

8.3.1. General definitions for the evaluation



6	**[Evaluation]**			
7	Values, which refer refer to table "Evaluation"			
8	**Name**	**Value**	**Remark**	
9	PDF_Drucker	Adobe PDF auf Ne06:		PDF_Printer
10	DiagrammManuell	FALSCH ☐	Allows you to manually configure the diagram (eg names for the data series)	
11	ZeigeSollWerte	WAHR ☑	Defines if setpoints are shown in the diagram (in the intermediate range they are always displayed)	
12	KompNamen	SO2;	Definies the name of the components, which neasure in the raw data (is not used with ASGU)	
13	Sprache	English	If Language is german select "German" , If Language english select "English" here are converted the . to / in the date too.	

Fig. 66: Definitionen fort he Evaluation

For saving an evaluation as PDF a PDF printer “PDF_Drucker” is used, such as PDF Creator, PDF XChange or Adobe PDF. This can be selected with the button PDF_Printer from a list of all available on the respective computer PDF printer.

If the Diagram manual "DiagramManuell" parameter is set to false "FALSCH", so the automaticity is activated, this inserts the name for the data series in the chart from the raw data. Thus, the names of the actually measured components in the raw data are displayed in the graph. This is optional, and so the data rows from the raw data are displayed in the graph correctly by default false "FALSCH". If the value is set to

True "WAHR", the name of the data series can be assigned (through a static reference to the raw data, for example) in the chart manually.

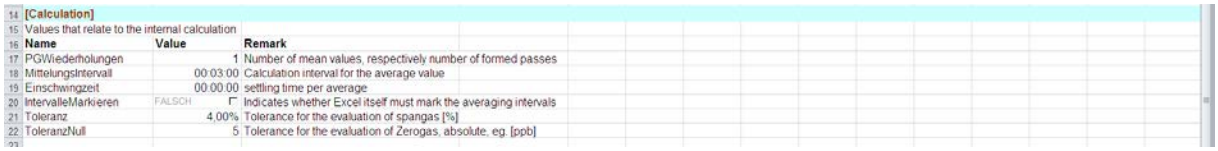
Show set points "ZeigeSollWerte" defines whether set points are shown in the diagram. In the intermediate range of values they are always displayed.

With the component name "KompNamen" the name of the measurement components (and their order) are defined which are expected in the raw data file. In the event of inconsistency, a warning is issued. The parameter has a function similar to the one used in environmental monitoring systems, device ID. It prevents that mistakenly wrong raw data are evaluated.

Note: The number of data series in the chart by default does not automatically adjust to the number of components. This will give you greater influence on the format of the rows (eg colors). Dynamic will only be adjusted, when all the data rows are deleted in the diagram. Then new rows will be created according to the parameters " ZeigeSollWerte " and "KompNamen"; However, without manual formatting option.

The Language parameter “Sprache” is to select the language from the message box. If the Value “German” then the message box are German. If the value field empty or other letters the language from the message box is English. If the value “English” the language is English too, but when you press the button “ImportData” the format of the date will convert from dd.mm.yyyy hh:mm:ss to the English format dd/mm/yyyy hh:mm. see chapter 7.6. Region and Language in Windows.

8.3.2. Definition for the calculation of the mean values



14	[Calculation]		
15	Values that relate to the internal calculation		
16	**Name**	**Value**	**Remark**
17	PGWiederholungen	1	Number of mean values, respectively number of formed passes
18	MittelungsIntervall	00:03:00	Calculation interval for the average value
19	Einschwingzeit	00:00:00	settling time per average
20	IntervalleMarkieren	FALSCH ☐	Indicates whether Excel itself must mark the averaging intervals
21	Toleranz	4,00%	Tolerance for the evaluation of spangas [%]
22	ToleranzNull	5	Tolerance for the evaluation of Zerogas, absolute, eg. [ppb]

Fig. 67: Definition for the calculation of the means values

The parameter "PGWiederholungen" (Span gas repeats) sets the number of averages to be formed per span gas step. If the value is 0, the average values are automatically determined from the raw data (see 03_NO2_Converter_efficiency.xls) and written to the table with the intermediate results.

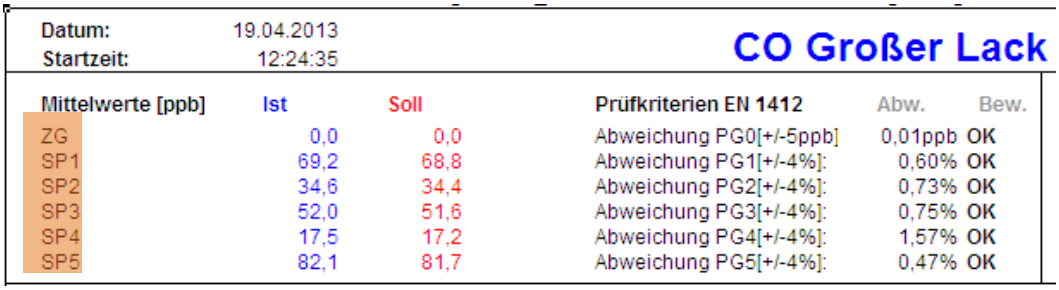
	Average value	componente	MW 1	SW 1
1	SP6	NO[ppb]	465,21	475,66
		NO2[ppb]	2,12	475,66
		NOx[ppb]	467,32	475,66
2	SP1	NO[ppb]	336,86	475,62
		NO2[ppb]	133,36	475,62
		NOx[ppb]	470,23	475,62
3	SP6	NO[ppb]	468,77	475,65
		NO2[ppb]	1,89	475,65
		NOx[ppb]	470,65	475,65
4	SP1	NO[ppb]	222,60	475,48
		NO2[ppb]	248,96	475,48
		NOx[ppb]	471,57	475,48

5	SP6	NO[ppb]	468,21	475,47
		NO2[ppb]	3,62	475,47
		NOx[ppb]	471,84	475,47

Table 8: Intermediate results for Measuring- and Set point value

Would now seem a SP2 (Span Point) in the raw data, an average would be calculated for this test gas (assuming it was measured long enough, at least "averaging interval" + "transient"). If there is instead of the present three nitrates only SO2 in the raw data, averages would be calculated without warning only for this component. Since the table is normally used with the intermediate results for further manual calculations with static cell references, it is to ensure that the structure of the raw data remains the same!

If the value for Span gas repeats "PGWiederholungen" is greater than 0, and a column with the name of the raw data of to be searched span gas steps must be defined. This is defined by the parameter "ZG_Zeile" and "ZG_Spalte". This is in the following illustration reddish colored region defined.

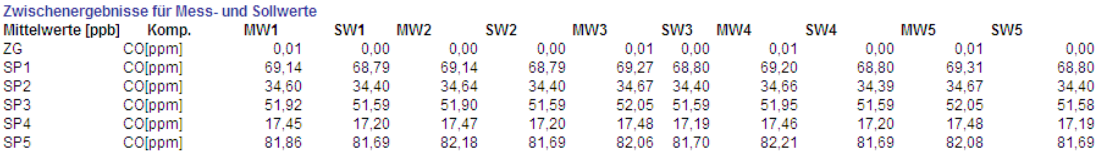


Datum:	19.04.2013				
Startzeit:	12:24:35		CO Großer Lack		
Mittelwerte [ppb]	Ist	Soll	Prüfkriterien EN 1412	Abw.	Bew.
ZG	0,0	0,0	Abweichung PG0[+/-5ppb]	0,01ppb	OK
SP1	69,2	68,8	Abweichung PG1[+/-4%]:	0,60%	OK
SP2	34,6	34,4	Abweichung PG2[+/-4%]:	0,73%	OK
SP3	52,0	51,6	Abweichung PG3[+/-4%]:	0,75%	OK
SP4	17,5	17,2	Abweichung PG4[+/-4%]:	1,57%	OK
SP5	82,1	81,7	Abweichung PG5[+/-4%]:	0,47%	OK

Fig. 68: Review field of measurement and set point values

In the example above first will be looked for the gas "ZG" searched in the raw data, then "SP1" etc. The names of the test gases are steps freely selectable, so instead of "SG" and "zero gas" or anything a name used can be choosen. The order is specified only by the column with the Span gas name and not by the raw data. If a test gas is not found or there are not enough values for the required number of averages available then a warning message will appear.

Following Table shows the intermediate results for the mean values. The order of the gases is defined by "ZG_Zeile" and "ZG_Spalte". The number of averages per test gas is specified by "PGWiederholungen".



Zwischenergebnisse für Mess- und Sollwerte

Mittelwerte [ppb]	Komp.	MW1	SW1	MW2	SW2	MW3	SW3	MW4	SW4	MW5	SW5
ZG	CO[ppm]	0,01	0,00	0,00	0,00	0,01	0,00	0,01	0,00	0,01	0,00
SP1	CO[ppm]	69,14	68,79	69,14	68,79	69,27	68,80	69,20	68,80	69,31	68,80
SP2	CO[ppm]	34,60	34,40	34,64	34,40	34,67	34,40	34,66	34,39	34,67	34,40
SP3	CO[ppm]	51,92	51,59	51,90	51,59	52,05	51,59	51,95	51,59	52,05	51,58
SP4	CO[ppm]	17,45	17,20	17,47	17,20	17,48	17,19	17,46	17,20	17,48	17,19
SP5	CO[ppm]	81,86	81,69	82,18	81,69	82,06	81,70	82,21	81,69	82,08	81,69

Fig. 69: Interim results measurement and set point values

The averaging interval "MittelungsIntervall" parameter defines the interval over which the (arithmetic) mean value is formed . The interval is always measured backwards from the end of the tracer gas step.

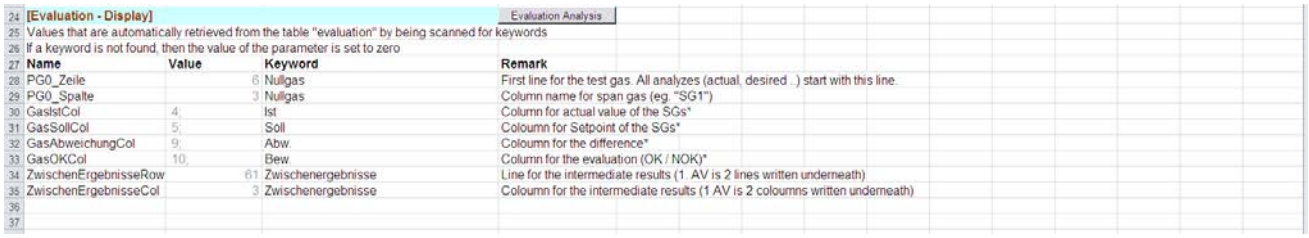
In addition, you can define the settling "Einschwingzeit". If now in a span gas step was not long enough (averaging interval + transient) measured, so a warning will be issued.

In the calibration is the "Big Lack of Fit" by the European standard EN 1412 required. That means 5 steps on the same test gas must be formed, each with 3 minutes averaging interval and 12 minutes settling time. For

this calculation, there is the possibility of several intervals on the same stage to highlight, if the Highlight intervals "IntervalleMarkieren" is set to True "WAHR".

The parameters tolerance "Toleranz" or zero tolerance "ToleranzNull" check the deviation of each span gas step. According this tolerance is the span gas step OK or NOK. The result is written to the worksheet evaluation " Auswertung" in the column gas deviation column " GasAbweichungCol " .

8.3.3. Definitions for the evaluation display



24	[Evaluation - Display]			Evaluation Analysis
25	Values that are automatically retrieved from the table "evaluation" by being scanned for keywords			
26	If a keyword is not found, then the value of the parameter is set to zero			
27	**Name**	**Value**	**Keyword**	**Remark**
28	PG0_Zeile	6	Nullgas	First line for the test gas. All analyzes (actual, desired ..) start with this line.
29	PG0_Spalte	3	Nullgas	Column name for span gas (eg. "SG1")
30	GasIstCol	4	Ist	Column for actual value of the SGs"
31	GasSollCol	5	Soll	Coloumn for Setpoint of the SGs"
32	GasAbweichungCol	9	Abw.	Coloumn for the difference"
33	GasOKCol	10	Bew.	Column for the evaluation (OK / NOK)"
34	ZwischenErgebnisseRow	61	Zwischenergebnisse	Line for the intermediate results (1. AV is 2 lines written underneath)
35	ZwischenErgebnisseCol	3	Zwischenergebnisse	Coloumn for the intermediate results (1 AV is 2 coloumns written underneath)
36				
37				

Fig. 70: Definition of the evaluation indicator

These parameters generally relate to a column or a row of certain cells in the worksheet "Evaluation" and can be downloaded automatically by pressing the button Evaluation Analyze. The evaluation is checked for the respective key words, starting with the cell A1. For example, if a cell is found in which the keyword "PG0" occurs, so this cell is considered as the first line in the column for test gases. If a keyword is not found, the value of 0 for the missing parameter is written.

The parameters "PG0_Zeile" and "PG0_Spalte" have already been described in the previous chapter. In addition to its function for the averaging calculation "PG0_Zeile" is used as a line for all assessment results so that the matching columns are specified for actual values in the column for actual value ("GasIstCol"), for the target values the column for setpoint ("GasSollCol"), the relative or absolute deviation in the column for deviation ("GasAbweichungCol") and for textual evaluation the column ("GasOKCol").

The table for the intermediate results will be placed directly under the key word, which is defined in addition to the parameters ("ZwischenErgebnisseRow" ZwischenErgebnisseCol ").

If it is made an evaluation of several components, there can be defined a column for the respective measurement result for each component. This is illustrated with the following example ("07_NOX_Basiskalibrierung.xls"):

	A	B	C	D
1	**Definitionen**			
2				
3	This table contains definitions that are necessary for the evaluation			
4	It can be changed the values, keywords and comments, but not the name.			
5				
6	**[Evaluation]**			
7	Values, which refer refer to table "Evaluation"			
8	**Name**	**Value**	**Remark**	
9	PDF_Drucker	Adobe PDF auf Ne06:		PDF_Printer
10	DiagrammManuell	FALSCH ☐	Allows you to manually configure the diagram (eg names for the data series)	
11	ZeigeSollWerte	WAHR ☑	Defines if setpoints are shown in the diagram (in the intermediate range they are always displayed)	
12	KompNamen	SO2;	Definies the name of the components, which neasure in the raw data (is not used with ASGU)	
13	Sprache	English	If Language is german select "German" , If Language english select "English" here are converted the . to / in the date too.	
14	**[Calculation]**			
15	Values that relate to the internal calculation			
16	**Name**	**Value**	**Remark**	
17	PGWiederholungen	1	Number of mean values, respectively number of formed passes	
18	MittelungsIntervall	00:03:00	Calculation interval for the average value	
19	Einschwingzeit	00:00:00	settling time per average	
20	IntervalleMarkieren	FALSCH ☐	Indicates whether Excel itself must mark the averaging intervals	
21	Toleranz	4.00%	Tolerance for the evaluation of spangas [%]	
22	ToleranzNull	5	Tolerance for the evaluation of Zerogas, absolute, eg. [ppb]	
23				
24	**[Evaluation - Display]**			Evaluation Analysis
25	Values that are automatically retrieved from the table "evaluation" by being scanned for keywords			
26	If a keyword is not found, then the value of the parameter is set to zero			
27	**Name**	**Value**	**Keyword**	**Remark**
28	PG0_Zeile	6	Nullgas	First line for the test gas. All analyzes (actual, desired ..) start with this line.
29	PG0_Spalte	3	Nullgas	Column name for span gas (eg. "SG1")
30	GasIstCol	4;	Ist	Column for actual value of the SGs*
31	GasSollCol	5;	Soll	Coloumn for Setpoint of the SGs*
32	GasAbweichungCol	9;	Abw.	Coloumn for the difference*
33	GasOKCol	10;	Bew.	Column for the evaluation (OK / NOK)*
34	ZwischenErgebnisseRow	61	Zwischenergebnisse	Line for the intermediate results (1. AV is 2 lines written underneath)
35	ZwischenErgebnisseCol	3	Zwischenergebnisse	Coloumn for the intermediate results (1 AV is 2 coloumns written underneath)
36				

Fig. 71: Analysis for muliple components

Under "KompNamen" the names of the components have been defined. For each of these components, the actual value is shown in the analysis ("GasIstCol"), the target value ("GasSollCol") and the deviation ("GasAbweichungCol ') are shown only for" NO ". The column for the textual evaluation ("GasOKCol") does not exist. The next image shows the corresponding evaluation:

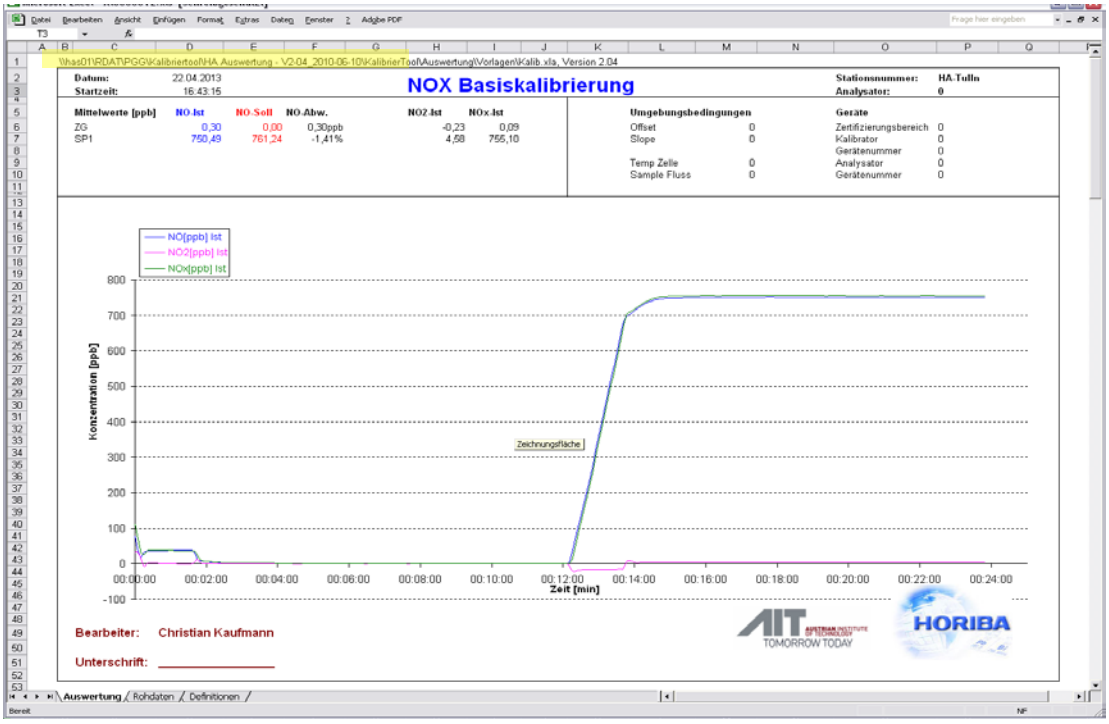


Fig. 72: Value assignment

This example makes it clear that the keyword (eg "Is") somewhere may occur in the text of a cell. The assignment of the respective components then will be accomplished by comparing the "KompNamen". If a cell cannot be associated with a keyword of one component, a warning will be issued.

9. Interface Protocols

The chapter describes the data communication between the eASGU and the supervised PC for remote control of the calibrator. The data transfer is based on the interface protocol “Serial Measuring Devices” of the federal states of Germany Bavaria and Hessen, also known as “Bayern / Hessen Protocol” . This protocol is used also to transfer the measuring values from the analyzer.

9.1. Interface protocol „Serial Measurement Devices“

In the following the standard interface for serial communication between PC and measuring device of the federal states of Germany, Bavaria and Hessen, is described shortly. This interface is used to transfer data, operating status and error status as well as acceptance of control commands.

Interface description

- Asynchronous serial data transfer
- Baud rate: 1200 Baud (selectable)
- Data format; 1 start bit , 7 data bits, 1 bit even parity, 1 stop bit
- Transmission type: half-duplex; polling

The serial interface of the measuring device must be implemented as data terminal equipment (DTE).

9.1.1. Data transmission

The data transmission (computer <--> measuring station) is accomplished by standard commands, protected by a block check character (BCC). Communication is by the standard USASCII character set (0-9, A-Z); control characters are added for command security. Several analyzers and the calibration unit in a station can be connected by a single V.24 interface. The identification of the individual device is done by means of the unique identifier. This identifier is set in the calibration unit.

9.1.2. Data transfer protocol

The data transmission between measuring station and DCE is carried out strictly by master-slave operation. The measuring station never contacts the DCE. The DCE (MSR) sends commands to the measuring station; this one answers with an answering telegram. All commands include an address, the so called measurement device identifier. The address addresses either the complete measuring station or a single device of the measuring station. Baud rate and data format are configurable to all common formats.

9.1.3. General protocol format

Fundamental construction of each command:

** Byte 001: STX (Start of Text)
** Byte 002-nnn: <TEXT>; command text, max. 120 characters USASCII
** Byte nnn+1: ETX (End of Text)
** Byte nnn+2/3: BCC (Block Check Character)

Instead of the ETX and BCC character (bytes nnn+1; nnn+2 / 3) a < CR > can be sent as a terminator character by the host computer; the examination of the BCC is ignored in this case The reply from station is always in the data format, in which the command was received.

9.1.4. Polling

The data captured at the measuring station are sent to the DCE on request (polling). Using the polling telegram data of all measuring stations or of a specific station can be requested.

9.1.5. Data transfer

The reply to a data request is by means of an answer telegram. The measurement data of a measuring station with several measuring devices is summarized in one telegram.
The data formats shown in the command and response descriptions are to be interpreted as follows:

*n:	Numeric 0 - 9 (ASCII Character set 30H - 39H)
*hh:	ASCII-character one Byte, e.g. "4CH" = 34H 43H
*±nnnn±ee:	±n.nnn * $10^{\pm ee}$, e.g. +4567-01 = +0.4567
*# :	Blank

9.1.6. Control

To control a measuring device a command will be sent to the measuring station. Only one specific measuring device will be addressed by a command. The command is sent by using the "ST" telegram, which uses a single character mnemonic for each command.

9.1.7. Construction of BCC

The BCC is constructed by the byte wise calculation of the Exclusive OR of all transmitted characters including STX and ETX starting from 00H. The resulting hexadecimal byte is transferred as two characters in the sequence MSB, LSB.

9.1.8. Data request to the measuring station

The data of the measuring station shall be transferred to the DCE. All measuring devices of the measuring station or just specific ones can be addressed. The measuring station answers with a MD protocol.

Byte No.	Data	Description
1	<STX>	Start of Text
2	DA	protocol identifier DA
4	nnn	address of the measuring device, may be omitted for all devices
7	<ETX>	End of Text
8	<BCC1><BCC2>	Checksum BCC

9.1.9. Measurement device control

Commands to control the measurement device are sent to the measuring station using the ST command. There is no reply from the measurement device.

Byte No.	Data	Description
1	<STX>	Start of Text
2	ST	protocol identifier ST
4	nnn#	address of the measuring device
8	A	Control byte 1 character (mnemonic)
9	<ETX>	End of Text
10	<BCC1><BCC2>	Checksum BCC

9.1.10. Data response from the measuring station to the DCE

The data from the measuring station to the DCE will be transmitted on request. This is the response to the DA command.

Byte No.	Data	Description	
1	<STX>	Start of Text	
2	MD	protocol identifier MD	
4	nn#	Number of measuring devices returning data	
7	nnn#	identifier measuring device 1	Data block component 1
11	±nnnn±ee#	measurement value, definition ±n.nnn * $10^{\pm ee}$	
20	hh#	operating status	
23	hh#	error status	
26	hhh#	serial number of the measurement device	
30	000000#	Not used at this time	
34	hh#	extended operating status, End data block component 1	
37 - 66.		Possible Data block for component 2	
67 - ….		Possible Data block for component 3 - m	
.			
7+m*30	<ETX>	End of Text	
8+m*30	<BCC1><BCC2>	Checksum BCC	

9.2. Protocol for Polling and Control of the calibration unit

The data request and the remote control of the ASGU-370 via the serial interface are carried out by the protocol described in chapter 9.1. Further details are summarized here.

9.2.1. Control

The first action must be the command to switch the calibration unit to mode SIO Ctrl, before any other command can be performed from the device (refer to 9.1.9). The following tables list the mnemonic control commands (byte 8) of the ST protocol.

character	description
M	Purge
N	Zero gas
k	start calibration cycle 1
l	start calibration cycle 2
m	start calibration cycle 3
n	start calibration cycle 4
o	start calibration cycle 5
p	start calibration cycle 6
q	start calibration cycle 7
r	start calibration cycle 8
s	start calibration sequence
t	stop cycle/sequence
0…9	nominal values 1 to 10
a…j	nominal values 11 to 20
G	alter span gas NO to GPT1
C	alter span gas NO to GPT2
D	alter span gas GPT1 or 2 to NO
H	LOCAL mode
V	SIO Ctrl mode
E	PIO Ctrl mode
F	Remote NET mode

Table 9: Mnemonic control commands

9.2.2. Polling

The requested data including the operation and error status bits are formatted in the answer telegram MD as follows.

Pos.	identifier	measuring device
1	n1	instantaneous value (concentration with set unit) – component1
2	n2	instantaneous value (concentration with set unit) – component2
.	.	
.	.	
36	n36	instantaneous value (concentration with set unit) – component36

Table 10: Measuring channels at request

The identifier is equivalent to the identifier configured for the remote interface.

Answer of requested data includes only 1 component in case of <STX>DAnnn or all components in case of <STX>DA.

operating status	description
Bit 0	Purge
Bit 1	Maintenance [1)]
Bit 2	Zero gas
Bit 3	Span gas, GPT1+2
Bit 4	GPT1
Bit 5	GPT2
Bit 6	
Bit 7	Calibration cycle

[1)] Local mode

Table 11: Operating status

error status	description
Bit 0	
Bit 1	
Bit 2	flow
Bit 3	
Bit 4	
Bit 5	temperature
Bit 6	
Bit 7	

Table 12: Error status

Data response Byte No.	extended operating status	description
35	Bit 0	Spanpoint 1
	Bit 1	Spanpoint 2
	Bit 0 + 1	Spanpoint 3
	Bit 2	Spanpoint 4
	Bit 2 + 0	Spanpoint 5
	Bit 2 + 1	Spanpoint 6
	Bit 2 + 1 + 0	Spanpoint 7
	Bit 3	Spanpoint 8
	Bit 3 + 0	Spanpoint 9
	Bit 3 + 1	Spanpoint 10
	Bit 3 + 1 + 0	Spanpoint 11
	Bit 3 + 2	Spanpoint 12
	Bit 3 + 2 + 0	Spanpoint 13
	Bit 3 + 2 + 1	Spanpoint 14
	Bit 3 + 2 + 1 + 0	Spanpoint 15
34	Bit 4	Spanpoint 16
	Bit 4 + 0	Spanpoint 17
	Bit 4 + 1	Spanpoint 18
	Bit 4 + 1 + 0	Spanpoint 19
	Bit 4 + 2	Spanpoint 20
	Bit 5	
	Bit 6	
	Bit 7	

Table 133: Extended Operating status

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