Operating Instructions
Communication Software PSCS for PS-AMS

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Subject to changes!

Contents

1. System requirements

To operate the software PSCS the following computer requirements have to be met as a minimum:
Operating system: Windows 98, Windows 2000 or Windows XP, Windows 7, Windows 8, Windows 10.
Processor: Pentium minimum 300MHz
Free RAM: ca. 10 MB
Interfaces: USB

2. License agreement

During installation of the software, the wording of a licence agreement is displayed. Please read this carefully and confirm with OK if you agree in all points.

3. Installation

3.1. Software PSCS

The software and all auxiliary files are included in an application of the form „Setup_PSCS___.exe". The recent version is available on our homepage www.ps-automation.com under „Downloads"- „Software" - „Software PSCS". Store this file to one of your drives and start the application. An „Install Shield" will guide you through the whole installation.

4. Function

The software PSCS serves for adjustment, commissioning and diagnostic interrogation of smart actuators of series PS-AMS11/12/13 of PS Automation.

5. Menu structure

5.1. Status window

Depending from where the active dataset has been loaded, the right hand section of the status window displays either (after loading from the a data medium) the file name (1) of the active dataset, or (after loading from an actuator) the firmware version (2) and serial number (3) of the actuator, plus the current operating status in plain text (4).
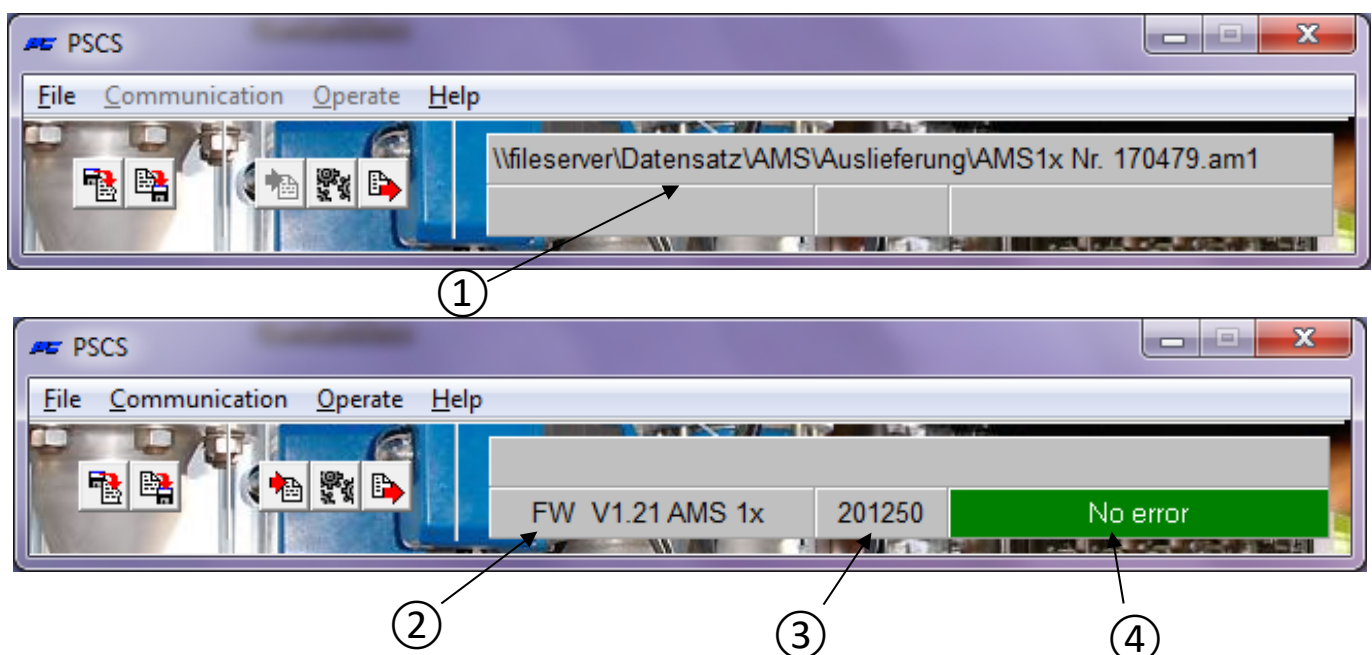
5.2. Shortcuts

 loads a dataset of the type *.am1 (for actuators AMS 11/12/13) from a data medium

 stores the current dataset as file of the type *.am1 to a data medium
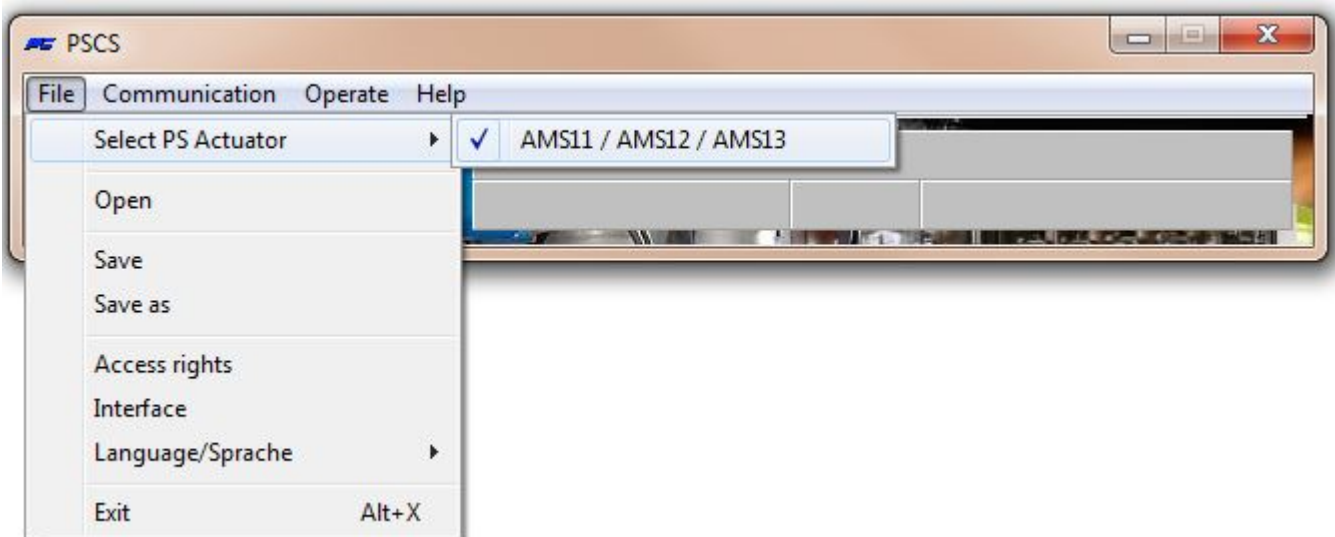
 loads the active dataset from an operational actuator

 opens the window „Parameter AMS" (same as "Operate" - "Configuration")

 transmits the currently displayed dataset or the dataset edited lastly to the actuator

5.3. File

This menu allows the following actions:

- **Select** a PS-AMS-actuator type
- **File management** with „Open", „Save", „Save as"
- **Access rights** need not be entered for normal operation; it is required only for service staff from PS Automation.
- The selection of the **Interface** (COM-port) as USB by a selection window. This will be stored permanently to the PC; it has to be corrected only in case the interface structure of the PC is changed, or the software is newly installed. A routine for **automatic** allocation is available, which requires connection to an operational PS-AMS-actuator. This routine can lead to a system crash, if a large portion of the COM-ports of the PC is already in use. In this case, abort via Task Manager, and reduce the number of COM-ports in use while performing the routine.

    Manual allocation of the COM-ports is possible as well.

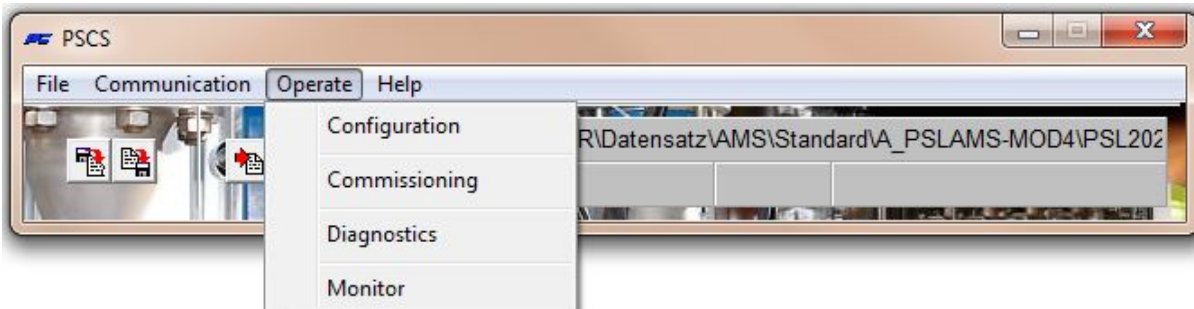- Selection of menu **language** (English or German)

5.4. Communication

This menu allows the following actions:

- **Load** the current dataset from the actuator to the PSCS Communication Software.
- **Send** the displayed or lastly edited dataset to the actuator. Before sending, a dataset MUST be loaded, either from the actuator or from a data medium.
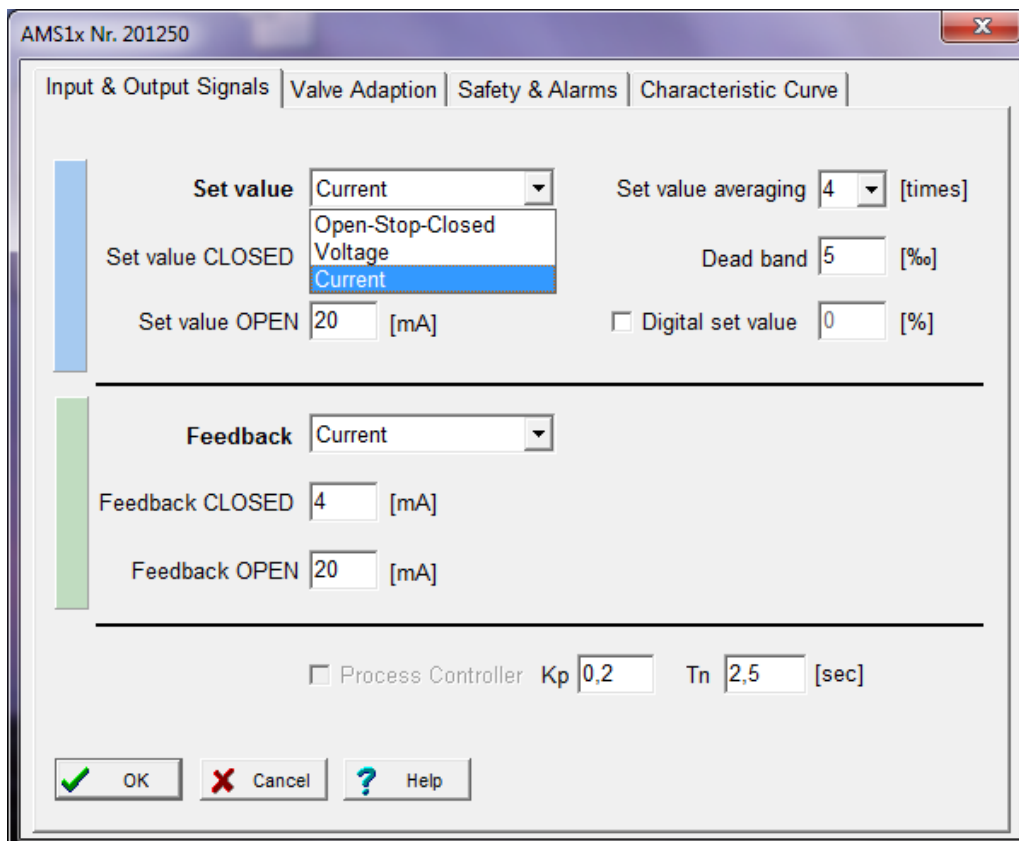
5.5. Operate

5.5.1. Configuration

Changes of configuration in PSCS will be active in the actuator only after sending the dataset to the actuator. Changes on one or more pages have to be transferred to the temporary memory of the PC by confirming with "OK" before leaving the page.

5.5.1.1. Set Value & Feedback

- Under **Set Value** the mode of control of the actuator has to be defined: as modulating set value (current or voltage input) or as 3-point control service (Open-Stop-Close). The range of values is 0 mA to 20 mA for the current signal and 0 V to 10 V for the voltage signal. Upper and lower limits may be selected freely, even inverted, according to the process requirements.

- Three-point operation command have always priority over modulating and digital set value. This means that the actuator may be driven by phase signal for open/close even if control by modulating set value is selected. It drives to the respective direction as long as the phase for opening or closing is applied. After switching off the phase, the actuator returns to the position corresponding to the applied/entered set value, or drives to the position that is defined for "Set value error".

- **Set Value Filter:** The applied setpoint signal is measured by the electronics inside the AMS-actuator each 12,5 ms and the control deviation against the momentary position is calculated. The responding behaviour on this deviation is adjustable via the number of reading points (maximum 32 points) that are being averaged. A small number of points will result in quick reaction on setpoint changes. Default setting is averaging over 4 points.

- **Dead Band** allows adjustment in one-tenth of a percent of the maximum possible value of the set value range (20 mA and 10 V respectively) in the range of 5 ‰ to 50 ‰. Default setting is 10 ‰.

- **Digital Set Value** is a fixed set value in % of the adjusted valve travel, activated by the tick box. It has priority over the modulating set value. Typical application is a fixed set-point control loop. Final values for the modulating set value can be entered only if the fixed digital set value is inactive.

- Digital set value **must** be activated in case the actuator is controlled via an optionally available bus interface!

- **Feedback** allows configuration of an active position feedback. It can be selected as signal of current (in the range of 0 mA to 20 mA) or voltage (in the range of 0 V to 10 V), with free choice of end points, depending on the process requirements.

- **Process Controller:** An integrated PI-process-controller PSIC plus power supply output for an external process sensor is available as option in PS-AMS. If this option is included in the actuator, it may be activated by ticking the box in this menu. Adapting the controller to the behaviour of the control loop requires adjustment of delay time Tn and amplification factor Kp. The range of values is 50 msec to 100 sec for Tn, and 0.05 to 100 for Kp. A useful tool for doing this adjustment is the "5.5.4 Monitor" function.
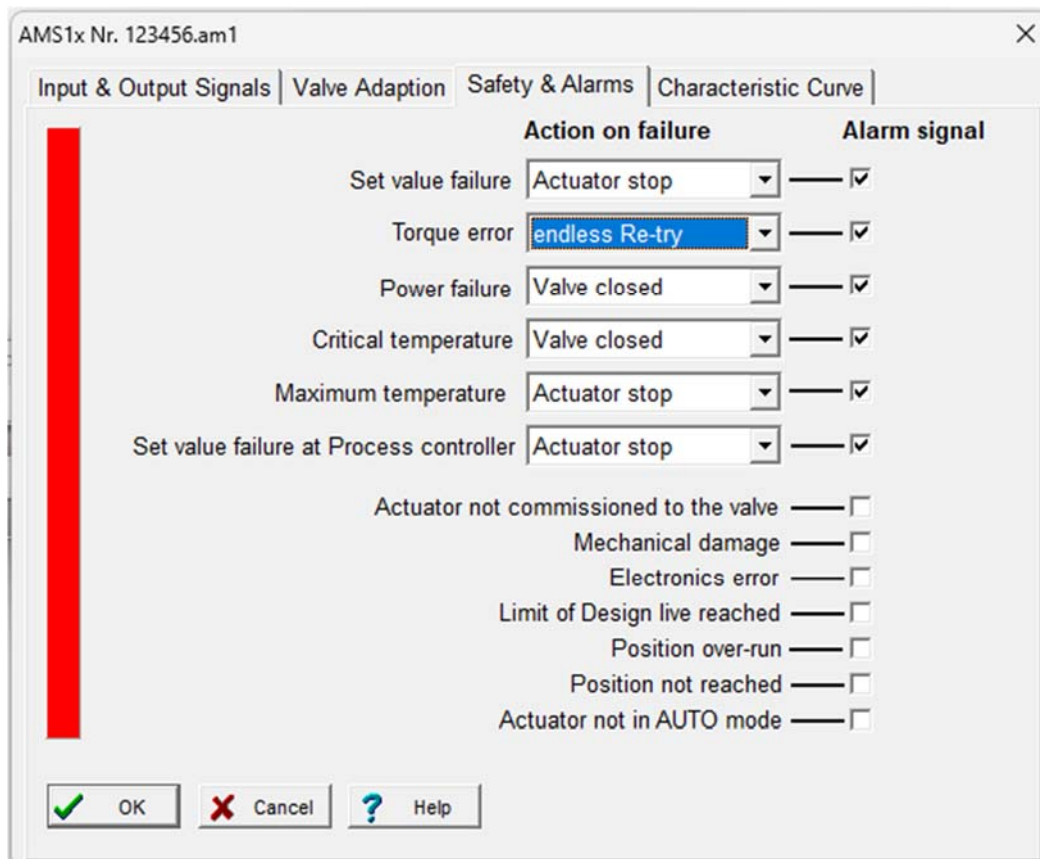
5.5.1.2. Valve Adaption

- **Closing Direction** defines, with view on the valve, the direction/orientation in which the actuator shall move the valve to closed position. It is displayed as "valve stem retracting / extending" (at linear actuators PS-AMS PSL) or clockwise / counter-clockwise (looking at the actuator from the top, at quarter-turn actuators PS-AMS PSQ). The allocation of "open" and "closed" positions for set value, feedback, etc. is resulting from this field.
  Please note that the closing direction is inverted in case of a PSQ2003-3003AMS with additional gearbox.
- **Valve Travel** defines the actual travel of the valve, in mm at linear actuators PS-AMS PSL and in ° (degrees) at quarter-turn actuators PS-AMS (PSQ).
- The **Cut-Off** in either end position has to be selected dependent on the design of the valve, either **by position** or **by position automatic** or **by force/torque**. Automatic commissioning of the actuator to the valve is conducted if at least one cut-off is defined "by position automatic" or "by force/torque".
- **Torque Increase** can be used to break away a closed valve from its seat. An increase by maximum 50% of the nominal force/torque for maximum 2.5 sec may be adjusted.
- **Maximum force/torque** allows a reduction of the switch-off force/torque to minimum 50% with respect to the specific nominal values for an actuator.
- **Maximum speed** allows a reduction of the actuation speed to minimum 50% (at PS-AMS PSL) and an extension of the actuation time to maximum 200% (at PS-AMS PSQ) with respect to the specific nominal values for an actuator.
- **FailSafe** – Set an individual actuator speed by failsafe (with failsafe unit PSCP or input for emergency shut-down FSP), free adjustable between 50% and 100% of the maximum speed.
- **Positions** allow to define up to 5 actuator positions that should be approached in the case of various failures of the actuator (see „5.5.1.3 Safety & Failures").

5.5.1.3. Safety & Failures
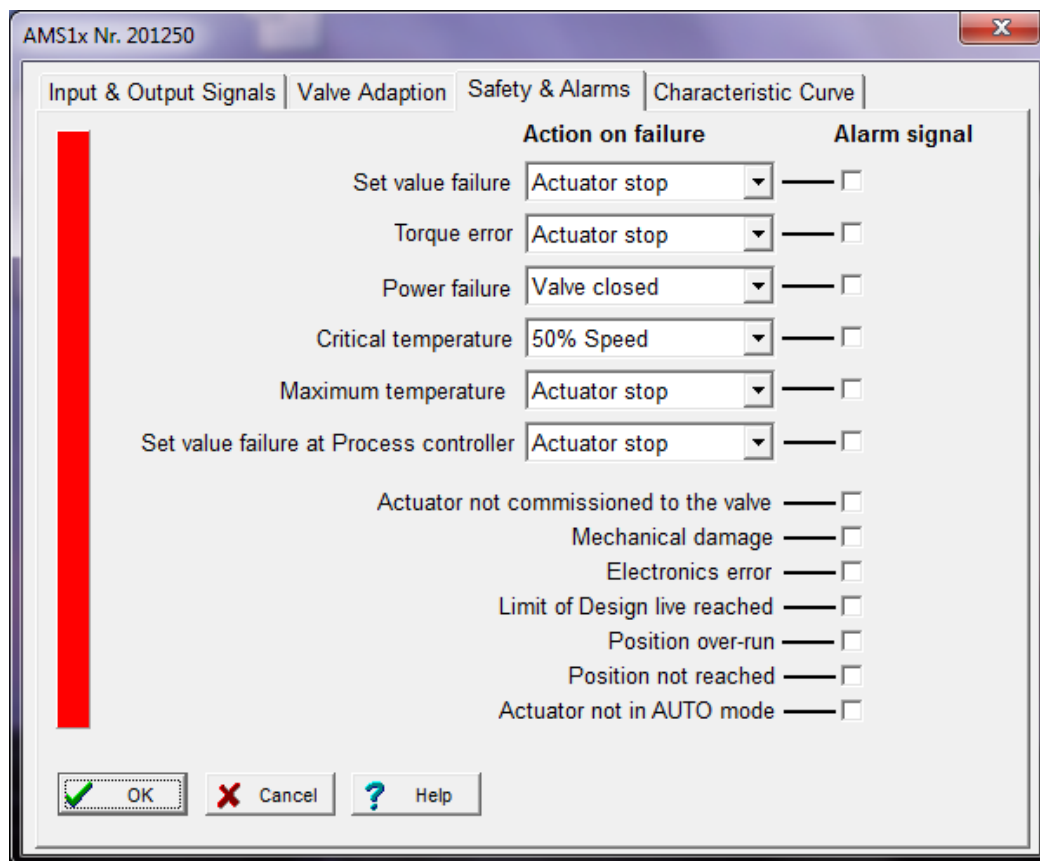
All **Safety Functions** and **Statuses** listed here are displayed by two LEDs in the terminal compartment with specific light sequences. The optionally available potential-free monitor relay FIR allows transmission of the ticked items as (summarised) binary alarm to a control board.

- **Set Value Failure** occurs if the applied set value is below 50% of the parameterised minimum set value. In this case the actuator may be driven to a selected position, or stopped immediately.

- **Torque Error** means that the actuator has to deliver the maximum adjusted force / torque apart from the stored end positions, for example when the valve plug is blocked. One option is to stop the actuator immediately („Actuator Stop"). The other is to drive back (i.e. away from the found obstacle) and then again to the originally desired ("Retry") - up to three times; then the actuator's drive component will be stopped. After such a stopping the actuator can only drive electrically on in the direction opposite to the initial one.

The dialog box shows "AMS1x Nr. 123456.am1" with tabs: Input & Output Signals | Valve Adaption | Safety & Alarms | Characteristic Curve

	Action on failure	Alarm signal
Set value failure	Actuator stop	☑
Torque error	endless Re-try	☑
Power failure	Valve closed	☑
Critical temperature	Valve closed	☑
Maximum temperature	Actuator stop	☑
Set value failure at Process controller	Actuator stop	☑
Actuator not commissioned to the valve		☐
Mechanical damage		☐
Electronics error		☐
Limit of Design live reached		☐
Position over-run		☐
Position not reached		☐
Actuator not in AUTO mode		☐

[✓ OK] [✗ Cancel] [? Help]

- The safety function **Power Failure** is used to drive the valve to a freely selectable safety position (see "Positions" in chapter "5.5.1.2 Valve Adaption") if one of the following two options is installed:

  - **Power failsafe device PSCP:** With the optional power failsafe device PSCP the actuator drives to the selected position in case a loss of power supply is detected.

  - **Failsafe port FSP:** If no PSCP is installed, this safety drive may be activated by applying a voltage to the failsafe port (FSP) in the terminal compartment.

- **Critical Temperature** inside the actuator indicates thermal overload, due to very high ambient temperature or excessive number of activations. As a measure the actuator may be stopped in a selected position, or be driven with 50% only of the adjusted speed in order to cool down the actuator inside. During use as per specification however (see specific limits for the maximum allowed temperature and operating mode in the relevant data sheets) the critical temperature won't be reached.

- When **maximum** allowed **Temperature** is reached, the actuator has to stop in a selected position to avoid damage due to further heat generation in continuing operation (see "Positions" in "5.5.1.2 Valve Adaption"). This maximum temperature is reached only at lack of success of the remedies on critical temperature. The reasons for this destructive rise in temperature have to be eliminated to prevent serious damage to the actuator and further disturbance of the process.

- **Set Value Failure at Process Controller** (only with the optional process-controller PSIC) indicates that the set value coming from the process sensor is below 50% of the parameterised minimum set value. In this case the actuator may be driven to a selected position (see "Positions" in "5.5.1.2 Valve Adaption"), or stopped immediately.

- **Actuator not commissioned to the valve** means that no commissioning has been performed with this actuator yet. This must be made after mechanical mounting in any case, and is done via "Operate" - "Commissioning", either automatically or manually, depending on the mode of cut-offs selected (see "5.5.2 Commissioning").

- **Mechanical Damage** is displayed if no change in position of the actuator's drive component is detected with the motor turning for 120 sec and longer. The actuator is non-functioning and requires service.

- **Electronics Error** reports an inconsistency of data in the actuator's internal memory. The actuator is non-functioning and requires service. Consistency check is done at each electronics start-up after switching on of the power supply.

- **Limit of Design Life reached:** This function is not yet implemented.

- "**Position overrun**" or "**Position not reached**" means a difference of more than 1.5% between actually reached position and calculated desired position of the actuator's drive component depending on the direction of the deviation. This is for information only and does not affect the actuator's readiness for operation.

- **Actuator not set to AUTO mode** (only if used with a local control panel PSC.2) means that the selector switch of the local control panel PSC.2 is not set to AUTO mode. Also see separate instruction manual for PSC.2

5.5.1.4. Characteristic Curve
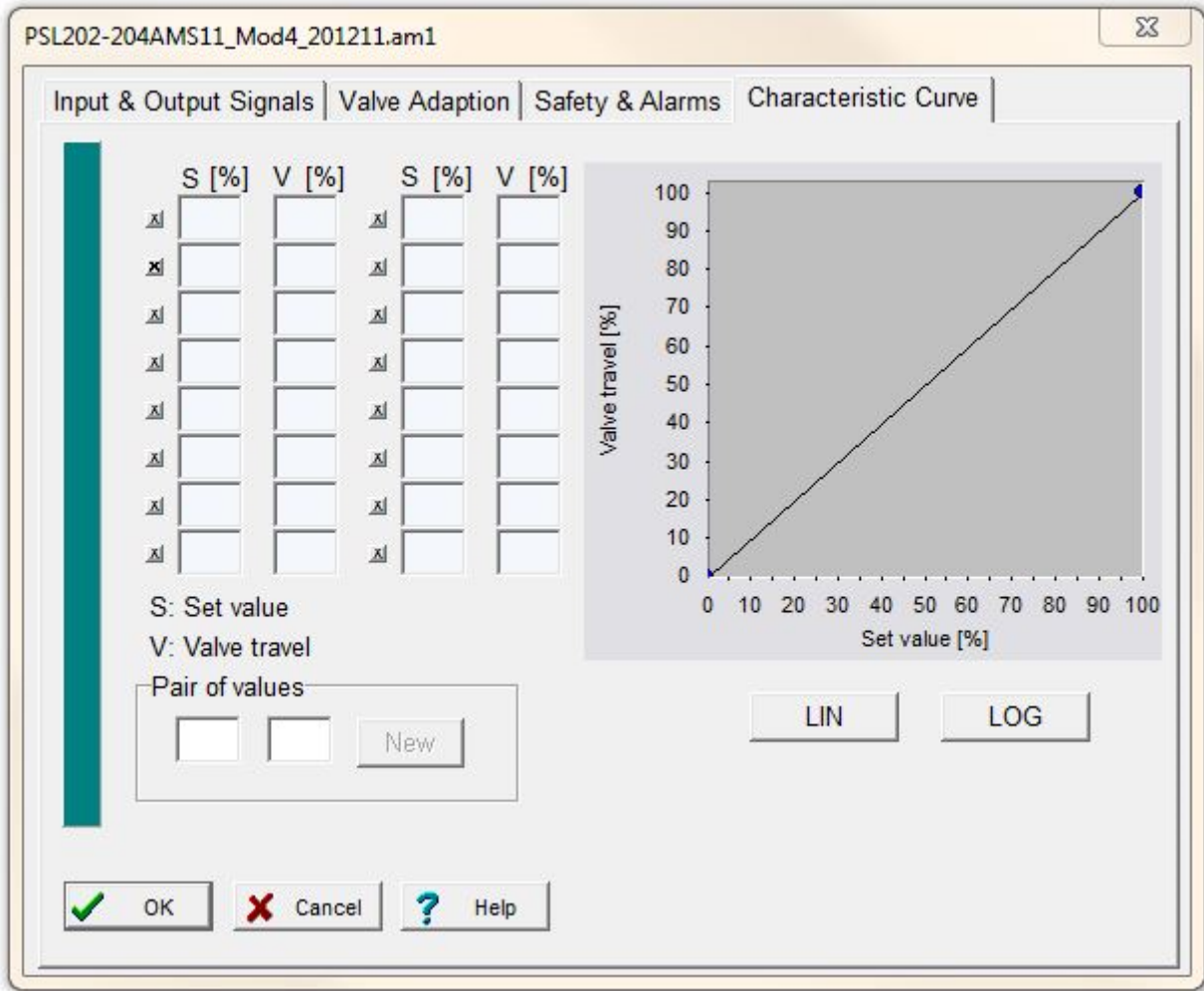
The valve travel in reference to the set value may be modified by the actuator electronics. Linear (LIN) and equal-percentage (LOG) pre-defined characteristic curves are available via buttons. Furthermore, a free curve of up to 16 pairs of values may be defined. Enter the respective pairs for set value and actuator position to the field below "Pair of values" and confirm with the button "New". They will then be transferred to the table above and to the graphics curve. The buttons marked "x" activate / de-activate the respective pair.

5.5.2. Commissioning

After mechanical mounting, commissioning is mandatorily required to match the limits of the actuator to the end positions of the valve.

5.5.2.1. Automatic Commissioning

Commissioning is conducted automatically if **at least one** end position is selected to be **by force / by torque or by position automatic.** After "Operate" - "Commissioning" and confirming the below window by "OK" the actuator will drive to either end positions of the valve and store the measured values permanently.
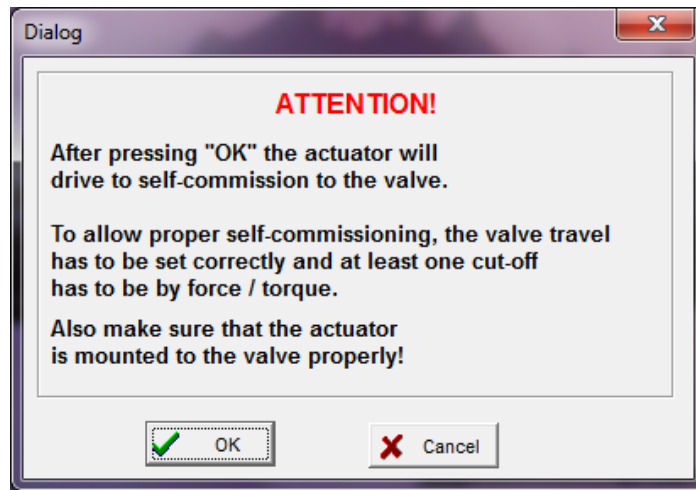
5.5.2.2. Manual Commissioning

Commissioning has to be made manually using the software PSCS in case **both** end positions are selected **by position**.
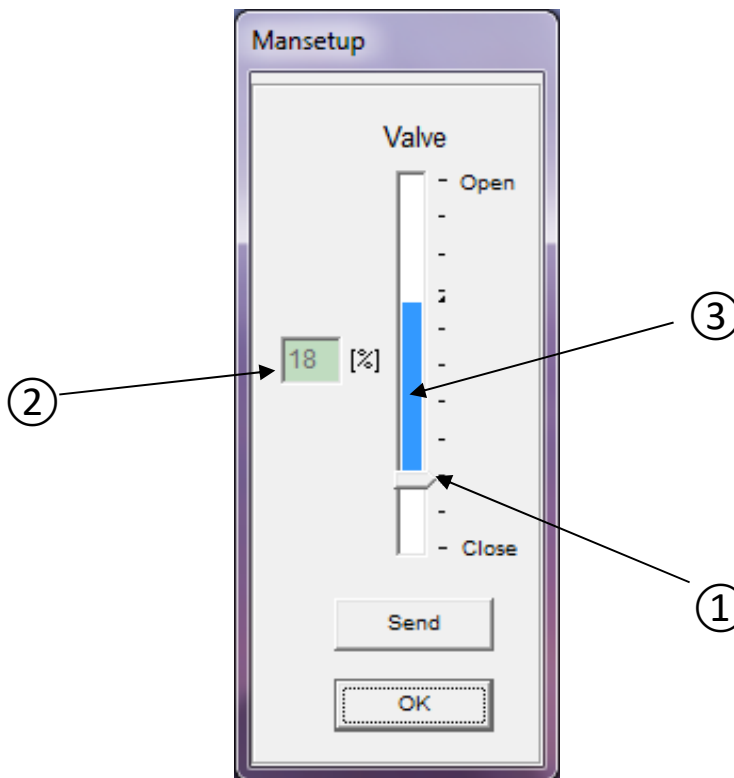
Attention: When doing manual commissioning, make sure that the correct set value for the closed position, or the binary signal for driving to closed position is permanently applied, depending on the parameterised mode of operation. See "Instruction manual PS-AMS11", section "Manual Commissioning".

The window displays a sliding bar arrangement. The arrow at its basis (1 – closed point) indicates the closed point of the valve as it is momentary active in the actuator. This point is also displayed in the field aside (2) as percentage of the possible travel of the actuator. The vertical bar itself (3 – stroke indicator) above the arrow indicates the currently parameterised valve travel (see 5.5.1.2 Valve Adaption). It also shows how far the closed point can be shifted before the travel is reduced automatically because it exceeds the maximum travel of the actuator (i.e. if the bar is reaching the upper end of the possible travel und must be further shifted).

⚠️ **Attention:** The display is not reflecting the selected closing direction of the actuator!

The actuator may be moved to any position by shifting the closed position and pressing "Send". In this way the valve has to be moved by the actuator to closed position. When this is reached, proved by visual examination at the valve, confirm by "OK" to store the found value to the actuator's permanent memory.

5.5.3. Diagnostics

The use of the diagnostic functions depends on the PSCS firmware and the drive software.

Standard diagnostics: PSCS firmware up to version 3.27, drive firmware up to version 1.125.
Extended diagnostics: PSCS firmware from version 3.28, drive firmware from version 1.160.

5.5.3.1. Standard Diagnostics

Standard diagnostics are possible with the PSCS firmware up to version 3.27 and the drive firmware up to version 1.125.

This function requires connection to an operational PS-AMS-actuator. Several sets of data about the recent status and function of the actuator are being read out and displayed.

Counting Values

At each starting of the actuator, totalling is done and displayed in blocks of
- number of starts
- number of starts at critical temperature
- total operation time of the actuator, in hours
- running time of the motor, in minutes
- running time of the motor at critical temperature, in seconds

Running Values

At each starting of the actuator the values for

- applied set value,
- reached feedback value,
- generated motor torque,
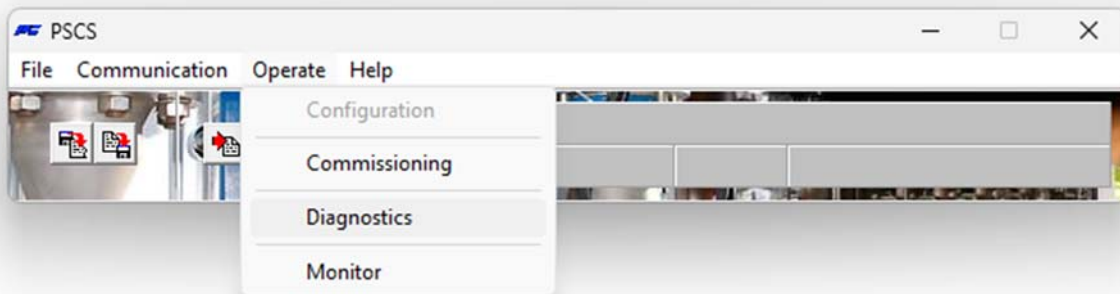- temperature inside the actuator

are measured and stored to a sequential memory of 11 data sets. They may be displayed as table or as graph.
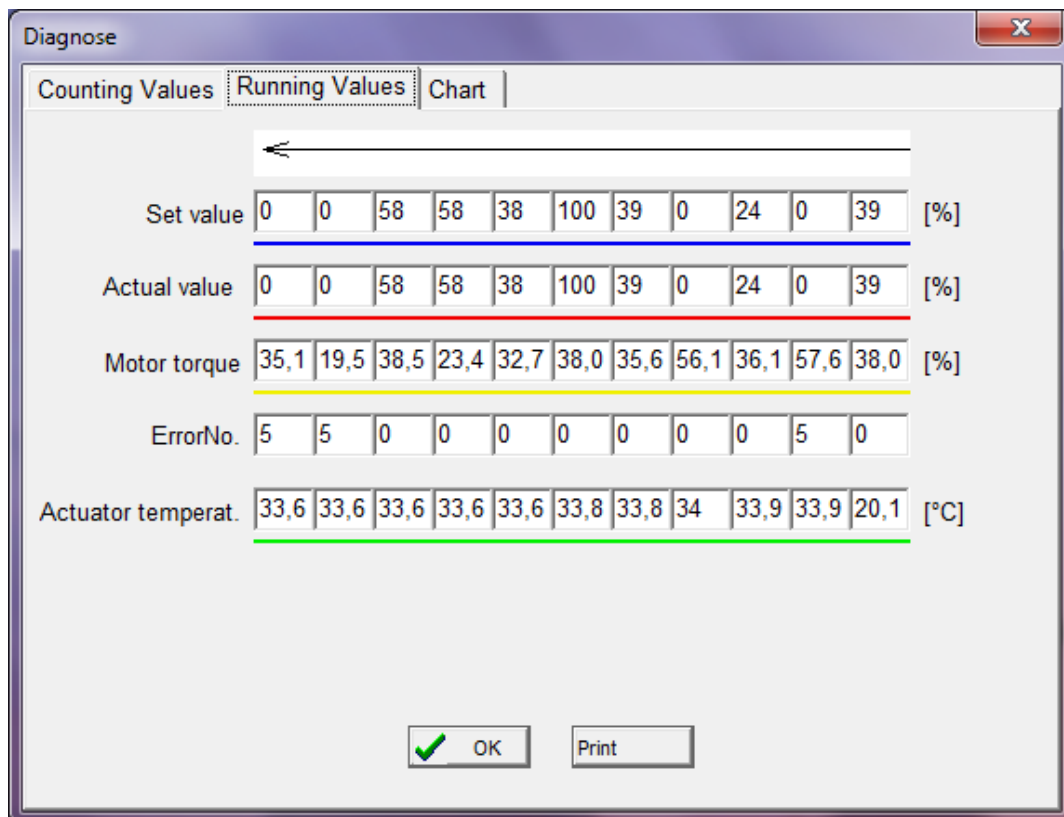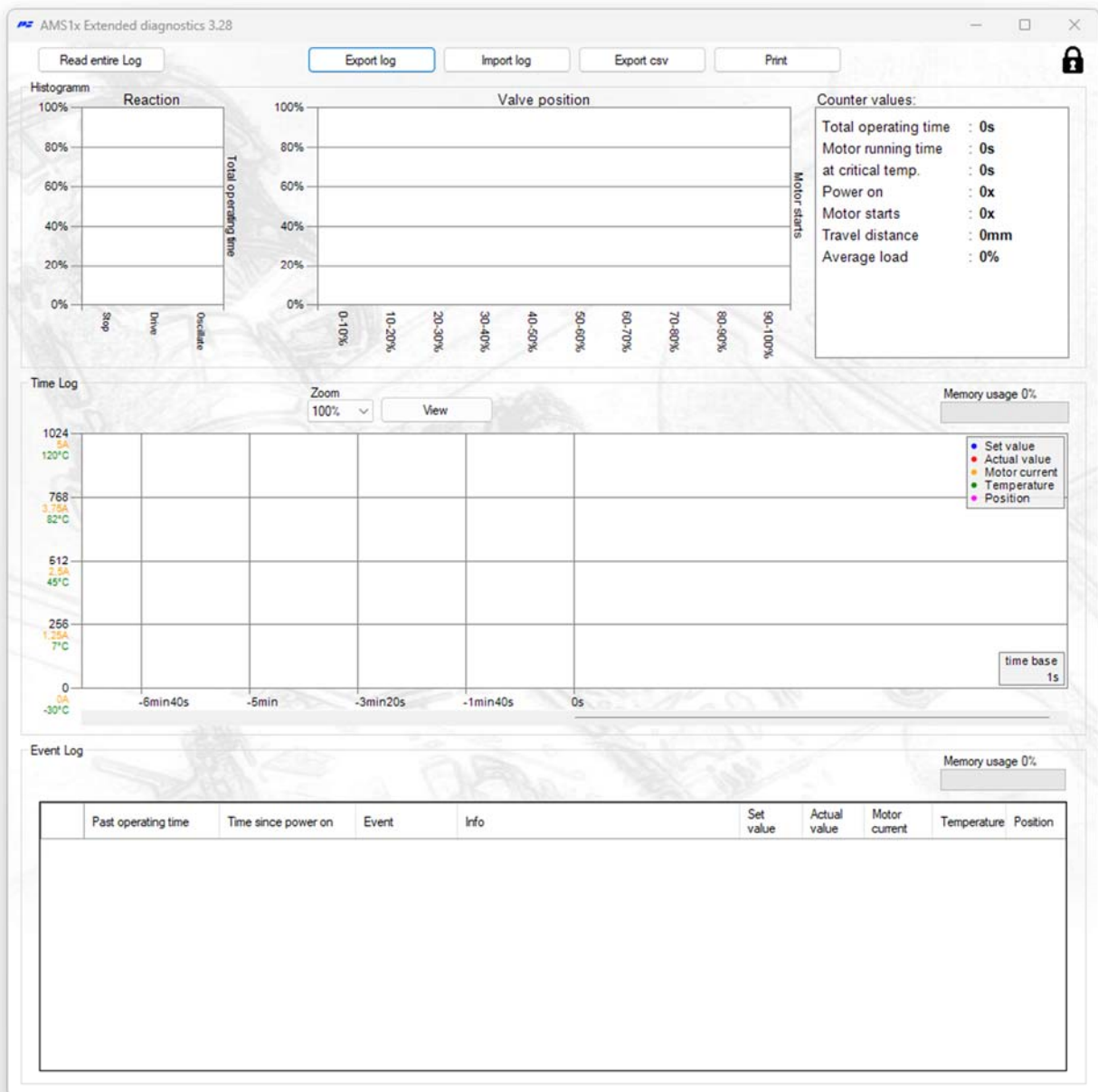
5.5.3.2. Extended diagnosis

PSCS firmware version 3.28 or higher and drive firmware version 1.160 or higher are required for extended diagnostics.

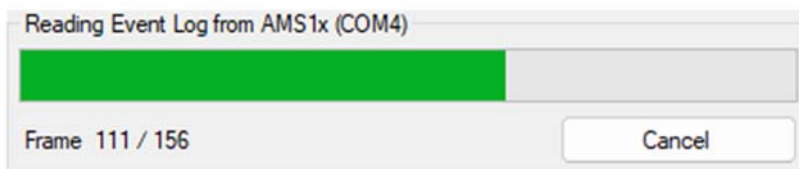The extended diagnostics are started as usual via -> Operate -> Diagnostics.

The extended diagnostics opens if the drive firmware is >= 1.160. Otherwise, the previous diagnostics are loaded.
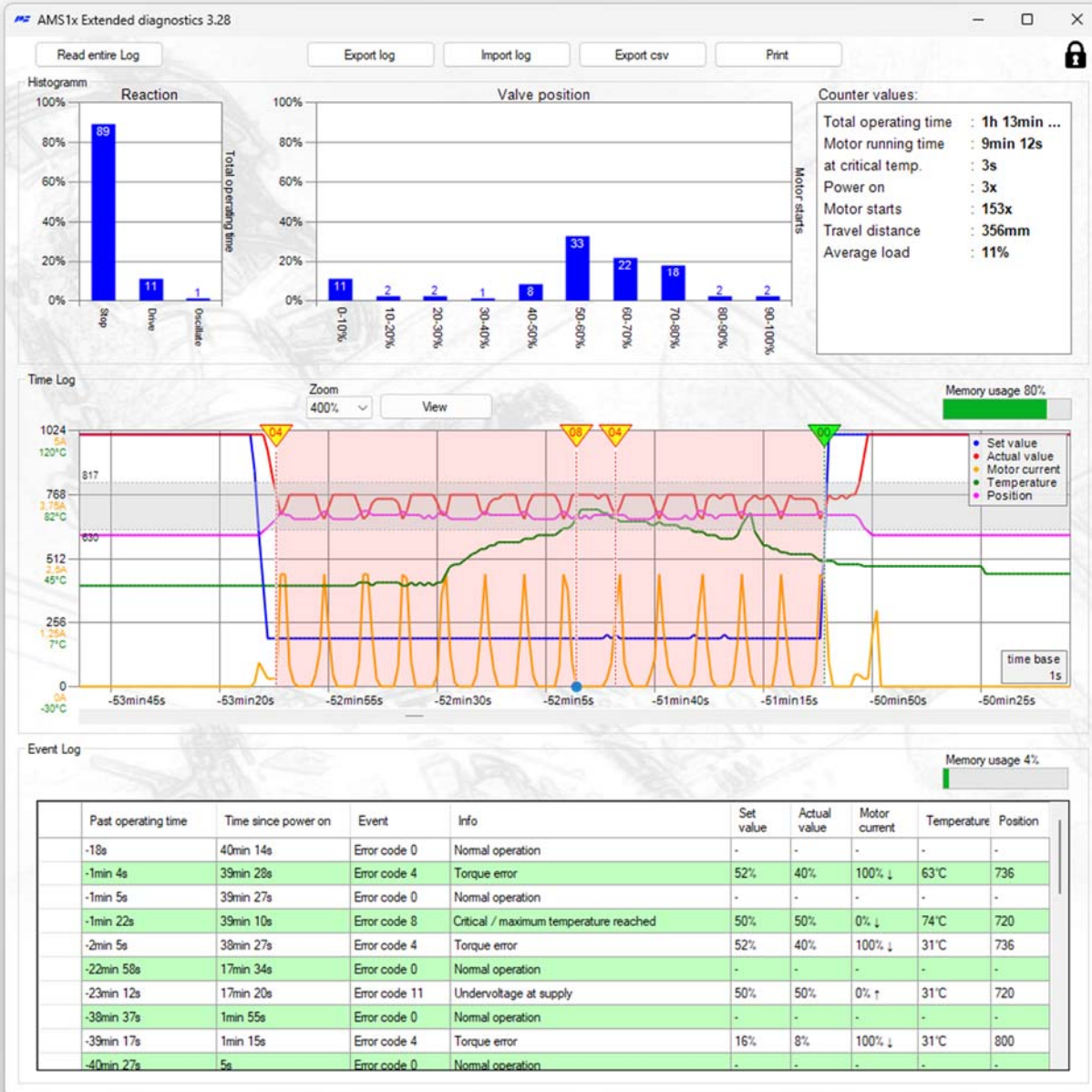
Main view of the extended diagnosis

All logging data are read from the drive via -> Read entire log.
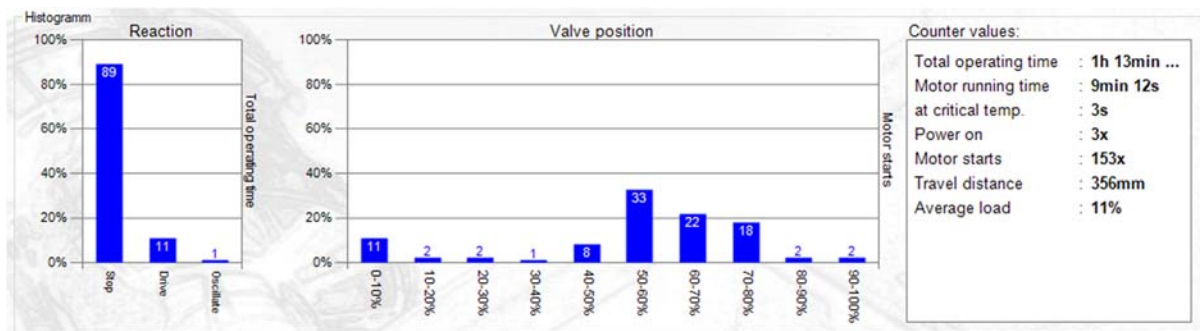This may take some time and can be cancelled at any time.

After successful reading the data are displayed:

The extended diagnosis is divided into three areas:

Histogram and count values

The chart 'histogram' shows the relation between motor operation and total operating time in percentage. If there is mainly one oscillation, the control setting may need to be optimized.

The position histogram shows the relation between the approached position and the switch-on processes in percentage.

The chart 'position valve stem' shows the distribution of the positions in which the actuator stopped its movements as percentage over the valve stroke (histogram).
In case the actuator modulates near the upper or lower position limits, the valve selection or the control range might need to be optimized.

Counting values:

Total operating time	Duration of the power supply to the drive
Motor running time	Duration for which the motor was running
At critical temperature	Duration of motor running time at critical temperature
Engine starts	Number of motor starts
Distance traveled	Stroke or rotations traveled so far
Average load	Average load on the motor during driving

Time-Log:
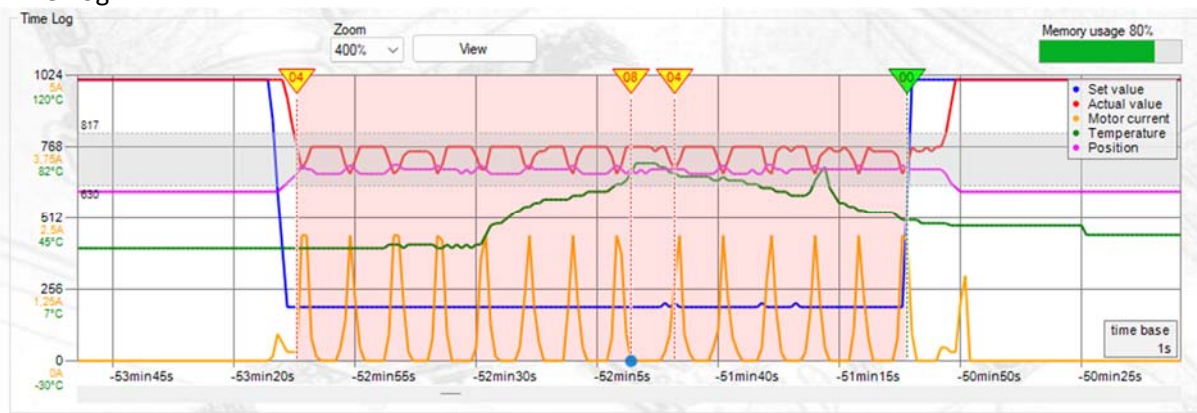
The following values are displayed:

- Past operating time
- Set value in digits
- Actual value in digits
- Motor current in A
- Temperature in °C
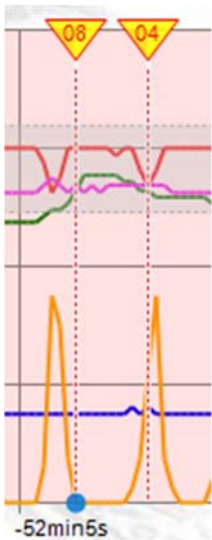- Position in digits
- Error code and description
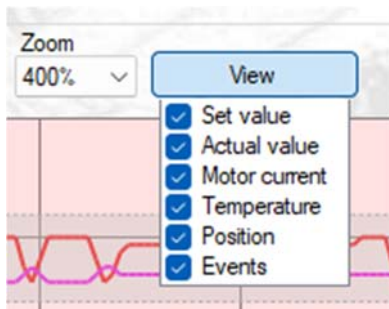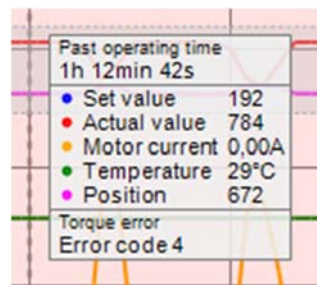
By clicking on the chart and scrolling the mouse, it can be moved and zoomed.
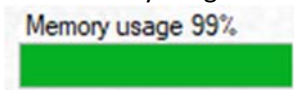
The current zoom level is displayed at the top.

Values can be shown or hidden via 'View'.

Each error recorded in the event log is displayed graphically in the time log also including the error number:

The blue dot above the time axis indicates that the error from the event log has been pointed on (see event log).

The memory usage of the time log is displayed in %:
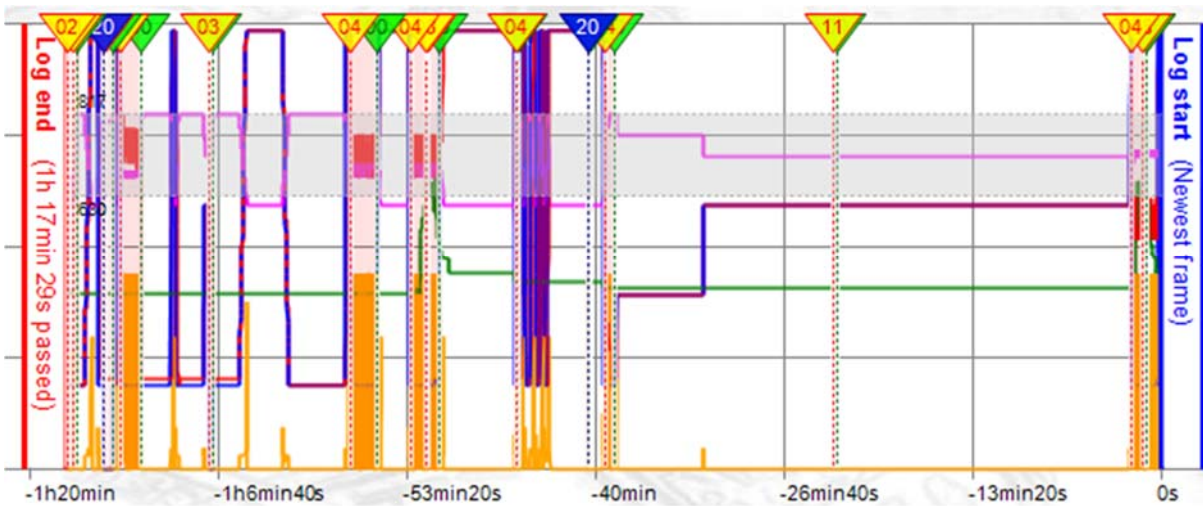

Data is saved every 1 second if at least one value changes. Approx. 15 minutes can be recorded with constantly changing values. The chart length of the time log therefore depends on the behaviour (e.g. movement) of the drive.

When memory is full, the oldest values will be deleted and the display is scrolling.

Chart over a longer period of time with sporadically changing values:

Event-Log

The event log shows all past events that trigger an error code in the drive.
The following values are saved for each event:

Past operating time	Total duration for which the drive was supplied with power when the event occurred
Time since power on	Time elapsed since the last power-on when the event occurred
Event	Corresponding error code
Info	Meaning of the error code
Set value	Set value at this point in time in %
Actual value	Actual value at this point in time in %
Motor current	Motor current at this time in %
Temperature	Temperature at this time in °C
Position	Drive position at this time in digits

By clicking on an event it can be pointed on in the time log (if available).

Approx. 500 events can be saved.
When memory is full, the oldest values are deleted and the display is scrolling.

Import / Export

All data loaded from the actuator can be saved using the 'Export log' button.

A file name is generated, consisting of the serial number, date and time:

A saved file can be imported and displayed using the 'Import log' button. No actuator needs to be connected for this.

The saved *.log files are highly compressed. They are suitable to send them for remote diagnostics.

All logs can be exported in *.csv format using the 'Export CSV' button.
Right-click on 'Export CSV' to specify the separator for the CSV files:

Export csv	
	separate values with
on	;

Click the 'Print' button to display the printer selection and a preview:
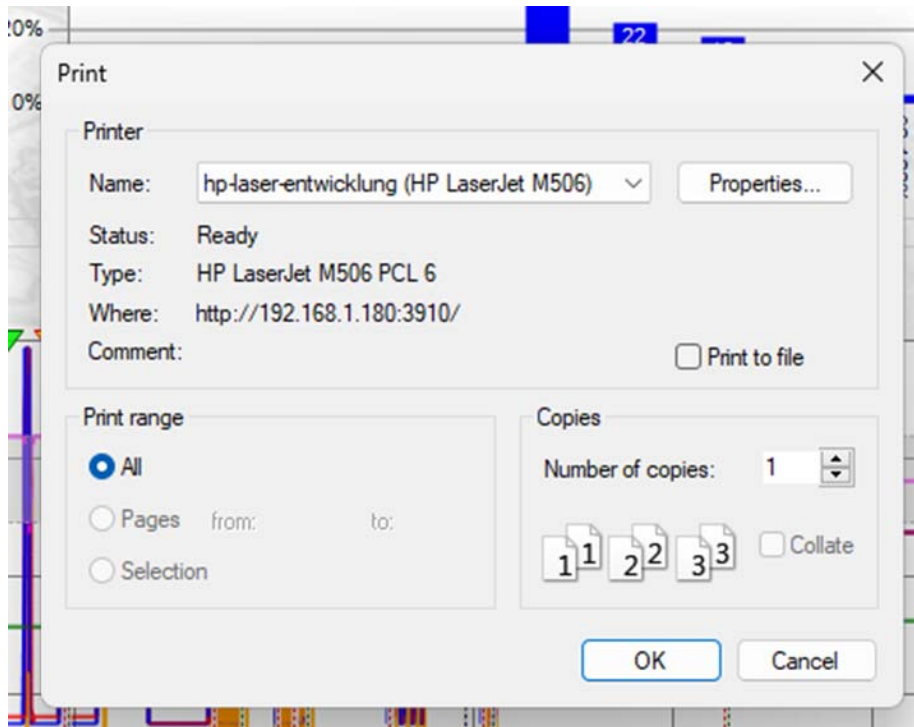
The current view of the extended diagnosis is printed:

Extended diagnostics 3.28
AMS1x SN 123456, FW V1.146

03.11.2023
11:05:03

Counter values:

Total operating time	: 36min 43s		Travel distance	: 356mm
Motor running time	: 4min 36s		Average load	: 11%
at critical temp.	: 2s			
Power on	: 3x			
Motor starts	: 153x			

Histogramm

Reaction — Total operating time
Stop: 89, Drive: 11, Oscillate: 1

Valve position — Motor starts
0-10%: 11, 10-20%: 2, 20-30%: 2, 30-40%: 1, 40-50%: 8, 50-60%: 33, 60-70%: 22, 70-80%: 18, 80-90%: 2, 90-100%: 2

Time Log

Legend: Set value, Actual value, Motor current, Temperature, Position

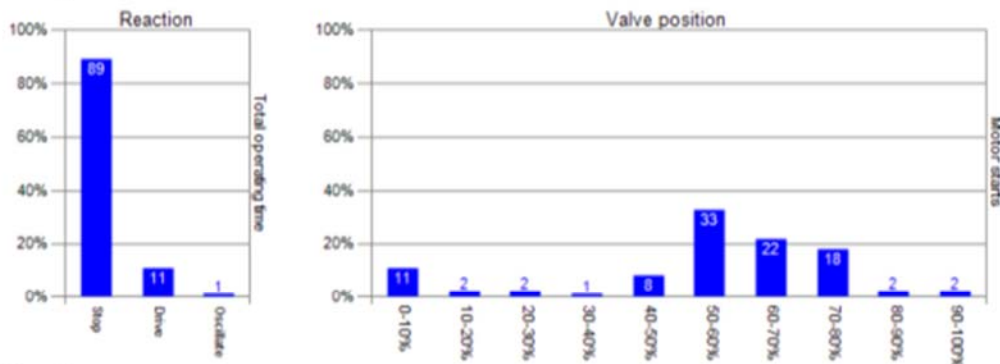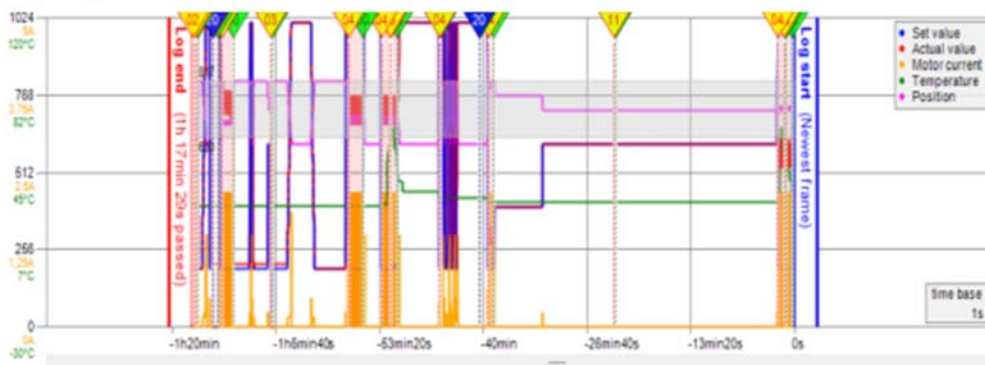Log end (1h 17min 29s passed) ... Log start (Newest frame)

time base 1s

Event Log

Past operating time	Time since power on	Event	Info	Set value	Actual value	Motor current	Temperature	Position
-18s	40min 14s	Error code 0	Normal operation	-	-	-	-	-
-1min 4s	39min 28s	Error code 4	Torque error	52%	40%	100%	63℃	736
-1min 5s	39min 27s	Error code 0	Normal operation	-	-	-	-	-
-1min 22s	39min 10s	Error code 8	Critical / maximum temperature reached	50%	50%	0%	74℃	720
-2min 5s	38min 27s	Error code 4	Torque error	52%	40%	100%	31℃	736
-22min 50s	17min 34s	Error code 0	Normal operation	-	-	-	-	-
-23min 12s	17min 20s	Error code 11	Undervoltage at supply	50%	50%	0%	31℃	720
-38min 37s	1min 55s	Error code 0	Normal operation	-	-	-	-	-
-39min 17s	1min 15s	Error code 4	Torque error	16%	8%	100%	31℃	800
-40min 27s	5s	Error code 0	Normal operation	-	-	-	-	-

5.5.4. Monitor

This function requires connection to an operational PS-AMS-actuator. It is used for on-line monitoring of function and performance of control, and for optimising the optionally available integrated process controller.
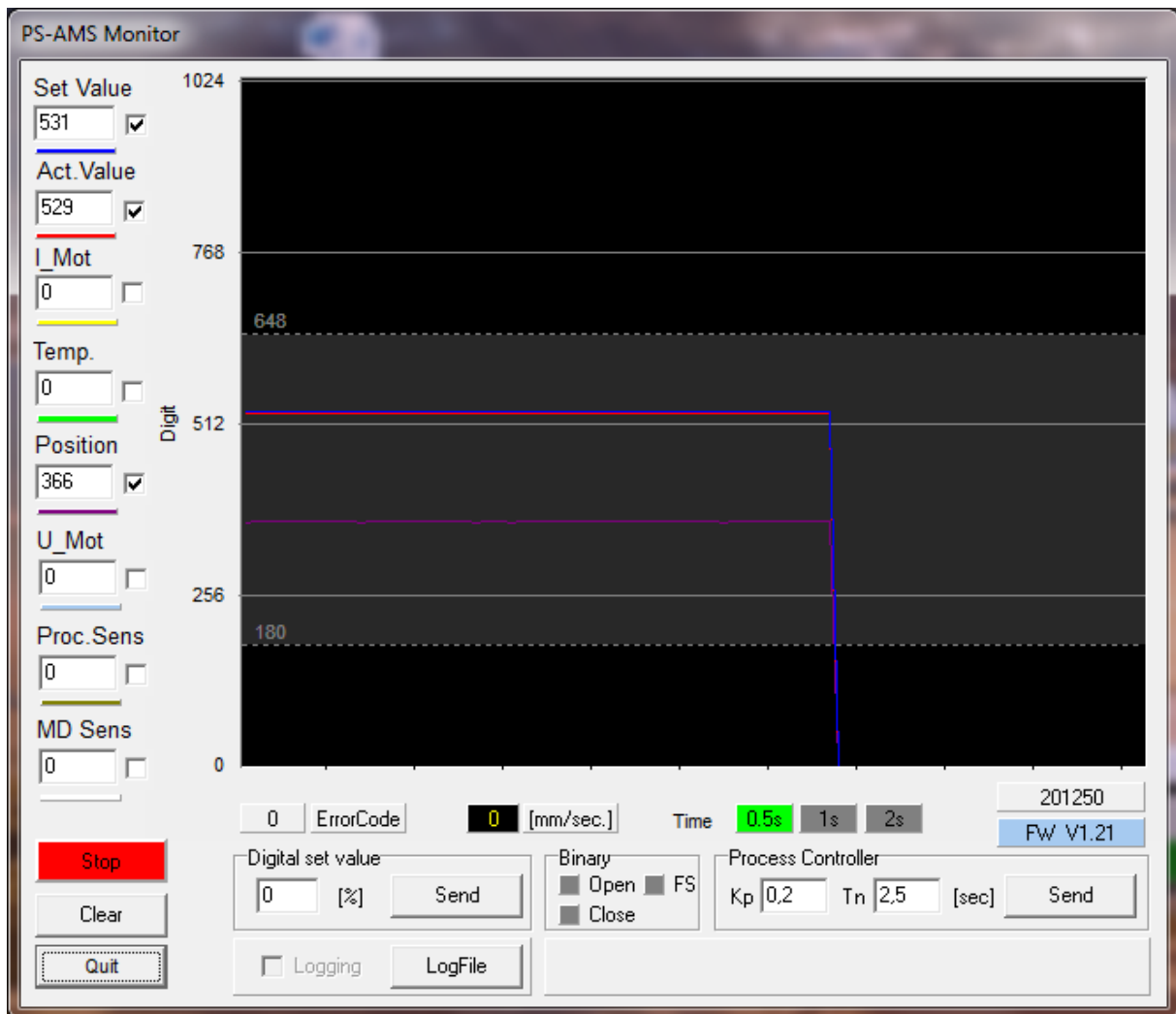
The display shows non-standardised raw data; for example, a value of 4 mA out of a range of 20 mA (= 1023 digits) will be displayed as 205 digits. Displaying the value may be selected by marking the respective click box. The graph screen is erased by "Clear". "Stop" holds the currently visible curve. "Quit" closes the monitor.

- **Set Value:** shows the actually applied value
- **Feedback Value:** momentary value as calculated from the actuator position and readable at the terminals for active feedback
- **I_Mot:** Current that is supplied to the motor by the electronics. This is approximately proportional to the output torque of the motor.
- **Temp:** temperature inside the actuator
- **Position:** momentary travel position of the actuator
- **U_Mot:** Voltage that is supplied to the motor by the electronics. This is approximately proportional to the motor speed.
- **Proc.Sens:** Feedback from the (optionally available) integrated process sensor.
- **Error Code** displays the status of the actuator as per the error codes below.

Error Code	Description of Status
Working condition	
0	Normal operation
1	Actuator doing auto-commissioning
2	Actuator not commissioned to the valve
14	Actuator not in AUTO mode (in conjunction with local control unit PSC.2)
Peripheral errors	
3	Set value error
4	Torque error
5	Failsafe action is started
6	Set value error of the process sensor
12	Position passed over
13	Position nor reached
11	Undervoltage at supply
Errors in actuator	
7	Mechanical / positioning error
8	Critical / maximum temperature reached
9	Electronics error / CRC
10	Limit of wear reached

- **[mm/sec.]** At PS-AMS PSL and **[°/sec]** respectively shows the actual output speed.
- **Digital Set Value:** can be altered and sent here if "Digital Set Value" is activated under "Input & Output Signals". This value is used only as long as the monitor is opened and is not stored permanently to the actuator!
- **Binary** indicates the presence of a binary signal for driving Open or Close by showing one of the two fields in green. Also show the green field by failsafe whether it is activate.
- **Process controller:** In case the optionally available process controller PSIC is activated (requires release by the PS Automation factory), in these arrays the values for Tn and Kp may be entered and adjusted here. „Send" writes the values to the actuator. Tn is delay time and Kp is proportional amplification factor.
- **Time** set the refresh time of the monitor.
- Furthermore, **firmware version** and **serial number** of the actuator are indicated in the lower right corner.
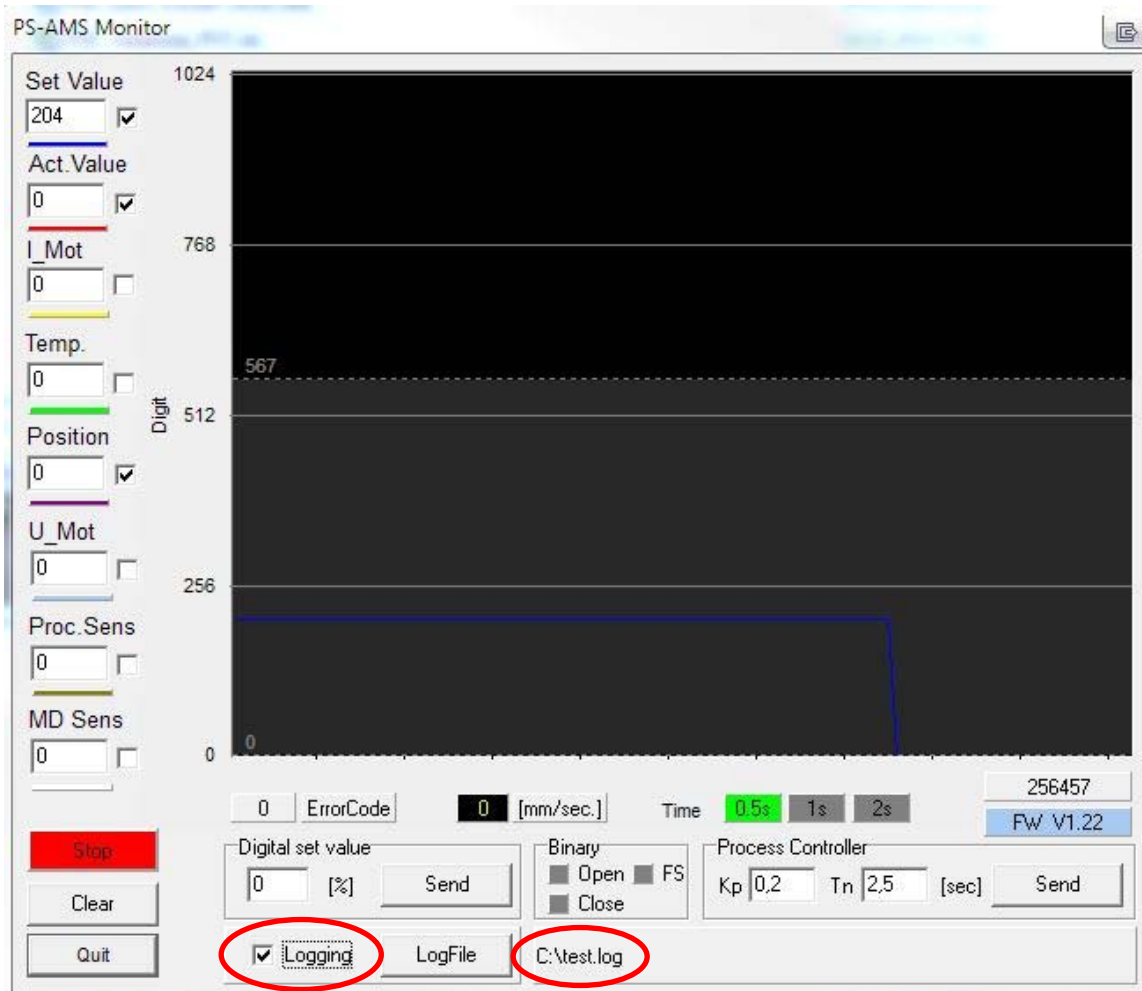
5.5.4.1 Monitor Logging

For the monitor logging please note the following instructions:
- Klick on the „LogFile" button, create a logfile and store the file in a user-definable file path
- Mark the checkbox „Logging" -> logging starts

⚠ **Note!** The logging fails when closing the monitor.

- **LogFile** allows readout of the displayed curves as sets of values in an unformatted log-file. Pressing "LogFile" prompts creating a file <filename>.log in any directory. Ticking the box in front of "Logging" writes sets of values to that file each 500 msec, in a form as shown below. Writing is done as long as "Logging" is active or until the monitor is closed. These data may be used for further evaluation, e.g. in a spreadsheet processing program.

    PS Automation GmbH AMS1x LogFile ID 166571; FW V1.15; 16:31:38; 22.02.2007
    Time;Setvalue;Actualvalue;I_Mot,Temp;Pos;U_Mot;PR_Ist;MD_Sens;ErrNo.
    16:31:40;367;464;4;632;221;338;0;726;0
    16:31:41;367;463;4;632;221;338;0;727;0
    16:31:41;367;463;4;633;221;339;0;727;0
    16:31:42;367;463;4;632;221;339;0;726;0
    16:31:42;367;463;4;631;221;339;0;727;0
    16:31:43;367;457;4;632;125;144;0;728;0

5.6. Help

Shows the version and issue date of the software PSCS in use.

6. Tracing Faults

In case no communication is possible with the actuator, please check:

- Supply voltage has to be connected and switched on
- The plugs of the communication cable must be firmly plugged in the sockets at both actuator and computer.
- The correct COM-port has to be selected via software PSCS, and it must not be assigned to other devices. At laptop PCs, COM 1 is often used internally for a touch panel. Also, some installed software may block some ports. See "Interface" in chapter "5.3 File".

Our representatives:

Italy
PS Automazione S.r.l.
Via Pennella, 94
I-38057 Pergine Valsugana (TN)
Phone: <+39> 04 61-53 43 67
Fax: <+39> 04 61-50 48 62
E-mail: info@ps-automazione.it

India
PS Automation India Pvt. Ltd.
Srv. No. 25/1, Narhe Industrial Area,
A.P. Narhegaon, Tal. Haveli, Dist.
IND-411041 Pune
Phone: <+ 91> 20 25 47 39 66
Fax: <+ 91> 20 25 47 39 66
E-mail: sales@ps-automation.in

To find out more about all our sales partners and subsidiaries please scan the QR code below or visit our website:
https://www.ps-automation.com/ps-automation/locations/?lang=en

PS Automation GmbH
Philipp-Krämer-Ring 13
D-67098 Bad Dürkheim

Phone: +49 (0) 6322 94980 – 0
E-Mail: info@ps-automation.com
www.ps-automation.com