SPXFLOW

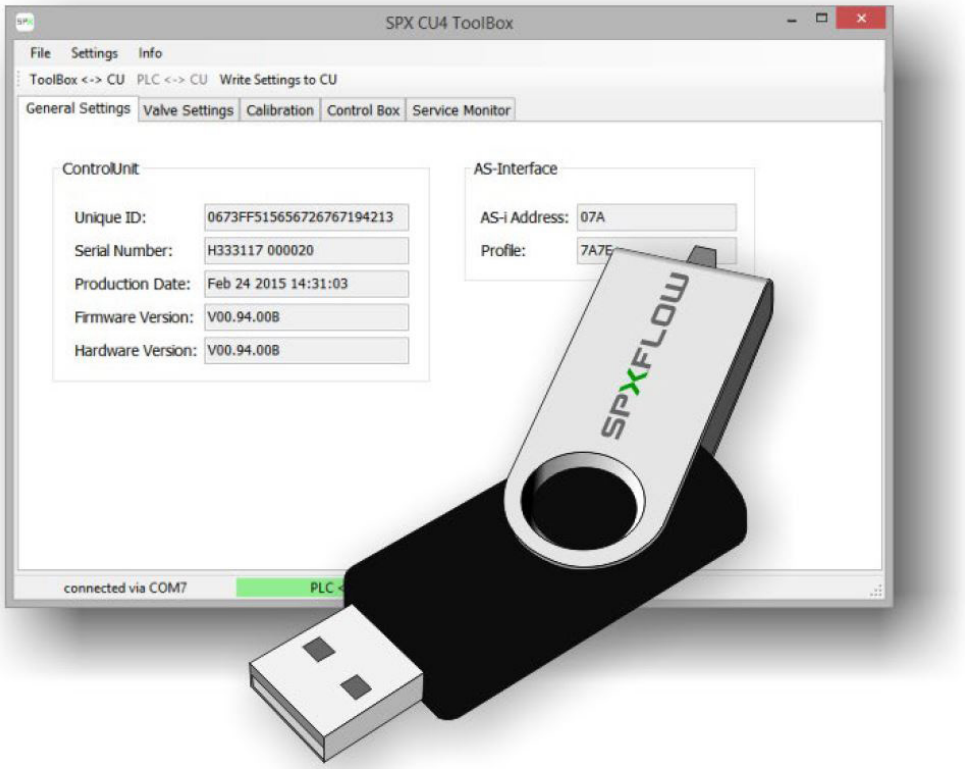
INSTRUCTION MANUAL

TOOLBOX Service & Maintenance Software for APV CU4plus AS-interface

CONTROL PROGRAM FOR WINDOWS® OPERATING SYSTEMS

FORM NO.: H335331 VERSION: 01.01.07

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.



APV®

Content

References:

[1] Instruction Manual "CU4plus AS-Interface" Control Unit, Form No. H333978

It is essential to read this operating manual before use of the Service and Maintenance Software!

1. Abbreviations and Definitions

CSV	Comma separated values (standard file format)
CU	Control Unit for process valves
NC	Normally closed (valve)
NO	Normally open (valve)
PC	Personal Computer or Laptop Computer
PLC	Programmable Logic Controller
USB	Universal Serial Bus

2. Safety Instructions

2.1. Sentinels

Danger! Direct danger which can lead to severe bodily harm or to death.

Caution! Dangerous situation which can lead to bodily harm and/or material damage.

Note Important technical information or recommendation.

These special safety instructions point directly to the respective handling instructions. They are accentuated by the corresponding symbol. Please read the instructions carefully to which the sentinels refer. Continue handling the control unit and the control software only after having read these instructions.

2.2. Intended Use

The Toolbox Service and Maintenance Software for CU4plus AS-Interface is only intended for parameterisation, diagnosis and maintenance of CU4plus Control Units. Use beyond this does not comply with the regulations and SPX Flow Technology shall not be held responsible for any damage resulting from this non-observance. The operator bears the full risk. Intended use also means the observance of operating, service and maintenance conditions.

2.3. Persons

Installation, parameterisation, diagnosis and maintenance work may only be carried out by qualified personnel and by means of appropriate tools.

Qualified personnel must get a special training with regard to possible risks and must know and observe the safety instructions indicated in the instruction manual.

2.4. Toolbox Kit

The Toolbox kit with appropriate USB/serial cable can be purchased from SPX Flow using the article number H333470.

The latest version of the Toolbox Software is always available from the SPX Flow F&B Sharepoint. Please contact your SPX Flow Sales representative.

3. Installation Guide

For installation and start-up of the Toolbox Service and Maintenance Software for CU4plus AS-Interface and of the USB/Serial Converter on your computer you have to perform the following steps:

3.1. Connection to the PC and installation of the Software

Before you connect the USB/Serial Converter for the first time to your PC please install the Toolbox Service and Maintenance Software for CU4plus AS-Interface and the necessary drivers.

The minimum system requirements are:

- CPU with 800MHz clocking frequency,
- mouse or other pointing device,
- 800 x 600 screen resolution,
- 256 colours (true color recommended),
- USB interface,
- Operating system Microsoft Windows® XP SP2, Vista, Windows7, Windows 8.1 or Windows 10.

The program requires about 10MByte disc space.

In order to be authorised to install programs you may have to be logged in as administrator or user with administrator rights.

If the Microsoft® .NET Framework is not installed on your Laptop/PC or if you have a version older than 3.5, it is necessary to update your installation. The setup package will attempt to install it (internet access required). This procedure will take several minutes.

For the installation of the program and drivers it is not necessary to be connected to the internet.

Please make sure that the USB/Serial Converter is **not** connected to your PC. Insert the Memory Stick and start the program Setup_CU4_ToolBox. This program will guide you through the necessary installation steps.

In order to connect the USB/Serial Converter to the PC please use the standard USB cable provided. Connect it to the USB port of the converter and to an USB port of your computer and start your program.

Note: In some versions of Windows the operating system is not able to find the folder with the required driver information automatically. In these cases they have to be identified manually.

3.2. Software Updates

Software is the Toolbox Service and Maintenance Software for CU4plus AS-Interace on your PC. For updates please contact your regional SPX company.

If you want to install a new version please download the Zip file and unpack it in a local file of your computer. Then start the program Update_CU4_ ToolBoxXXX (XXX stands for the current version number). The program will guide you through the necessary installation steps.

3.3. Firmware Updates

Firmware Updates for the CU are accessible with a master password only.

4. User Guide

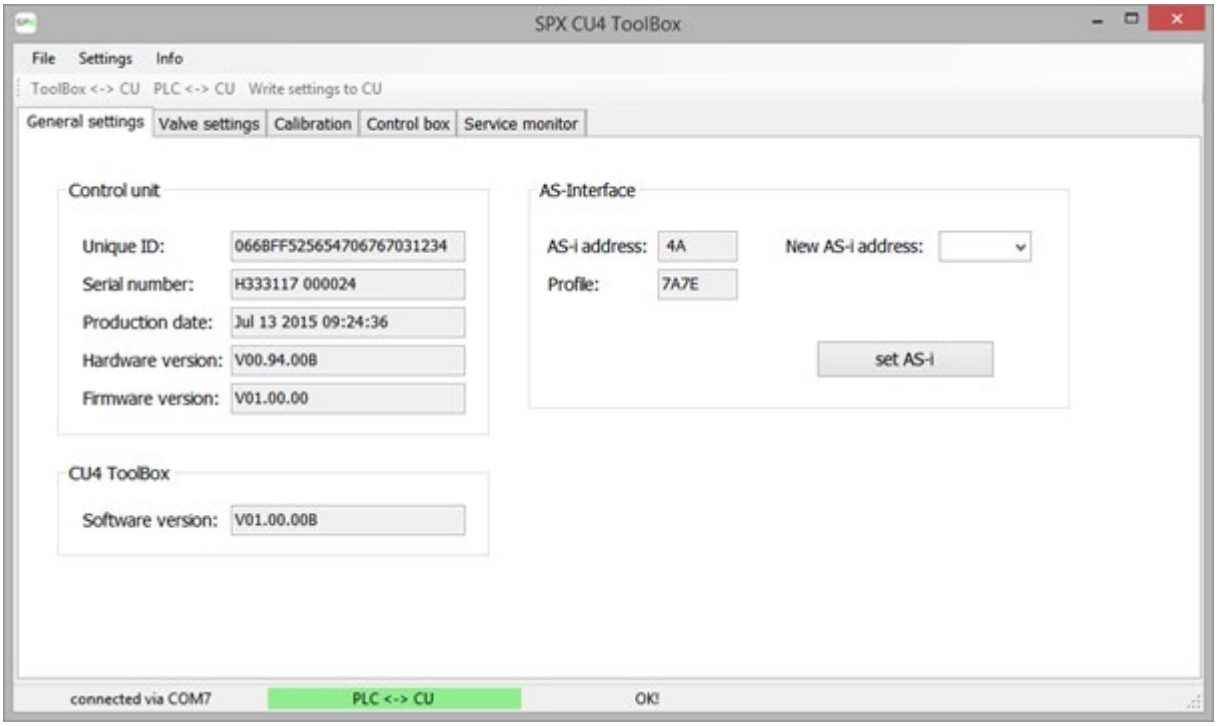
4.1. General

DANGER

Do not connect a CU to your PC without the USB/Serial Converter as this converter provides necessary galvanic separation between AS-Interface potential and PC potential.

When connecting the serial cable to the CU please make sure that electro-static voltages are discharged before.

When you connect a CU4plus Control Unit via the USB/Serial Converter to your PC and start the program CU4_ToolBox you will get the following opening window:



The information given in this window is described in detail in chapter 4.2.1 of this manual.

The status line of the window shows the port that has been chosen automatically by the operating system to connect to the USB/Serial converter on the left side. It further shows which device controls the CU. This may be either the PLC via the AS-Interface master (i.e. the control of the machine, green background) or the Toolbox (yellow background). It finally shows status information (OK or Error). A detailed list of messages is given in chapter 5.2.

If you use the program for the first time after installation you should change the default password to your own so that only authorised personnel can enter the Read/Write Mode of the Toolbox program. Keep the memory stick with the installation software in a safe place.

The drop down menues allow to perform the following actions:

> File

> Load valve settings

This option allows to load predefined valve settings for storing in Control Units. Valve settings files are binary files and have the file extension .cu4vs.

> Save valve settings

If valve settings have been set with the help of the Toolbox program (tab "Valve settings"), they can be stored on your PC for duplication in other Control Units. Valve settings files are binary files and have the file extension .cu4vs.

> Close program

This function updates the .ini file and closes the program.

> Settings

> Enter Password

If write access to the Control Unit is required a password has to be entered first to make write functions accessible.

> Change Password

If installed for the first time the factory setting of the password ("00000000") should be changed here.

> Expert Mode

In "Expert Mode" some additional information is accessible (e.g. the pressure readings in raw format on the tab "Calibration").

> Info

> Online help

Here a brief description of the functions of the program is given.

> About CU4 ToolBox

Here information about the program and it's environment is displayed which is necessary for service requests.

4.2. Read Only Mode

In Read Only Mode the Toolbox Service and Maintenance Software for CU4plus AS-Interface can only read out information from the Control Unit. It cannot modify the parameterisation of the unit except the AS-Interface address. The status line displays "PLC <-> CU" on green background.

If you want to modify parameterisation or reset service counters please refer to chapter 4.3 of this manual.

Please note that in this mode it is possible to change the AS-i address of the unit which may cause unwanted reactions of the valve.

4.2.1. Tab "General Settings"

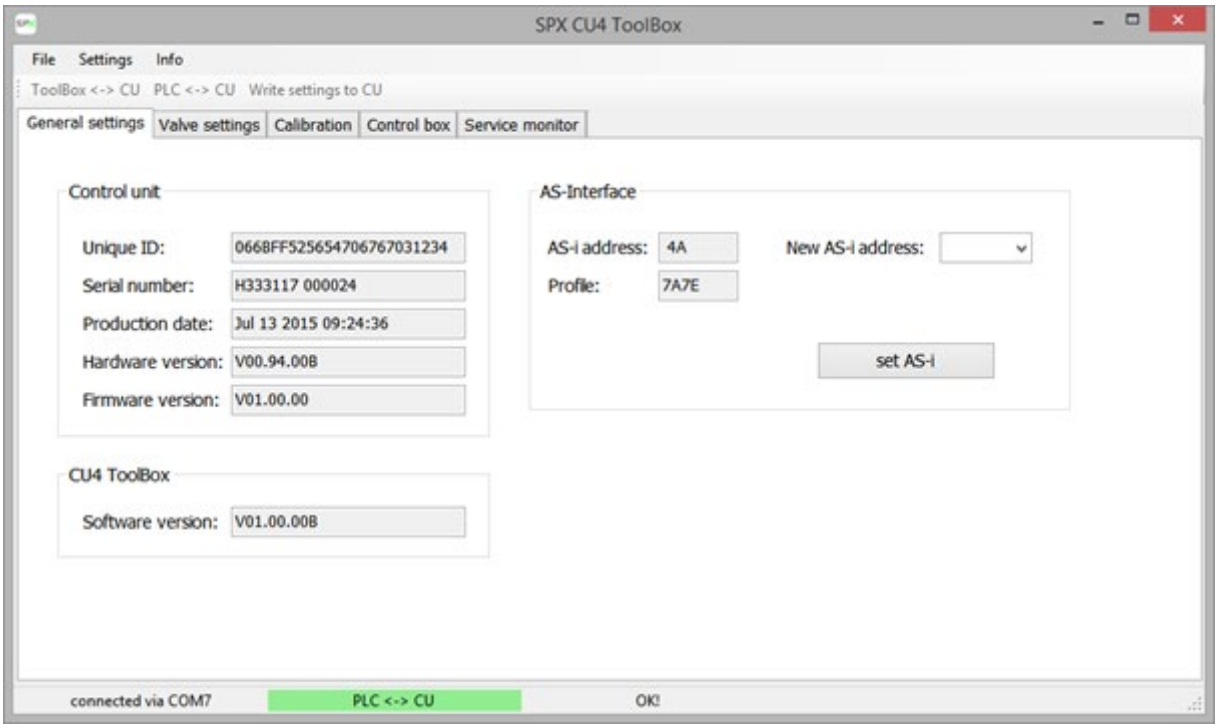
The program reads and displays the following basic information from the CU4plus Control Unit (left side of the window):

- Unique ID — This is the ID of the main processor. It cannot be modified.
- Serial number — This is the serial number of the CU.
- Production date — This is the production date and time of the CU.
- Firmware version — This is the current firmware version. It can be updated.
- Hardware version — This is the hardware version of the CU.

Additionally you get the version of the installed CU4 Toolbox software:

- Software version — This is the software version of your Toolbox software.

If firmware and software version are not compatible you will get a warning message.



On the right side of the window the following AS-Interface relevant information is displayed:

- AS-i Address — The current AS-Interface address of the slave
- Profile — The slave profile of the AS-Interface slave

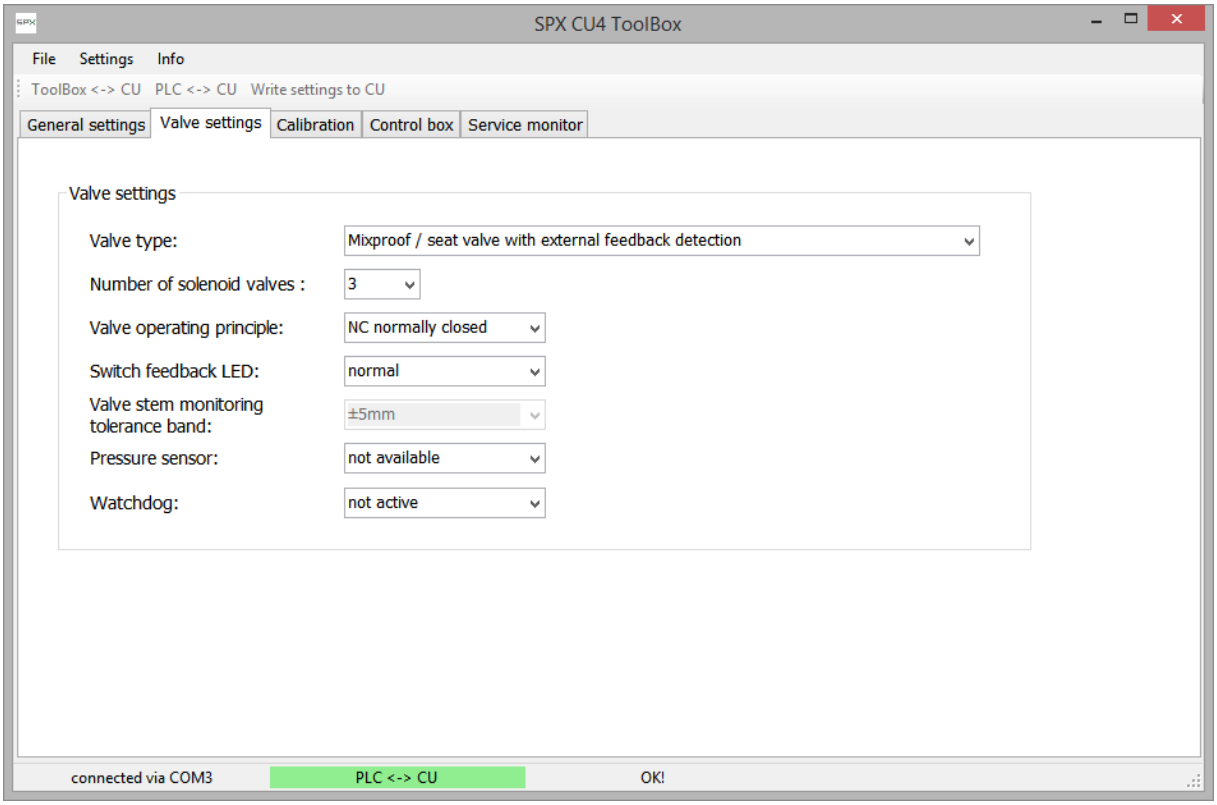
It is possible to use the ToolBox software as addressing tool and to change the AS-Interface address with it. For this purpose please select the new AS-i address in the select box and activate the "set AS-i" button.

Note: This addressing procedure is not identical to the standard addressing procedure of AS-Interface. It may e.g. take place with a Slave with Address 0 in the network.

4.2.2. Tab "Valve Settings"

The program reads and displays the following informations from the CU with regard to the current valve settings:

- Valve type — Here the selected valve type is shown. For details please refer to [1].
- Number of valves — Depending on the valve type a number between 1 and 3 can be selected.
- Valve operating principle: NC or NO can be selected
- Switch feedback LED: normal or inverted can be selected
- Valve stem monitoring tolerance band: Here ±1, ±3 or ±5mm can be selected
- Pressure sensor: is either available or not available.
- Watchdog: a watchdog can be configured that shuts down the valves in case of communication loss.



In Read Only Mode the current settings of the parameters are shown. If parameters are to be modified it is necessary to change to Read/Write Mode (see chapter 4.3 of this manual).

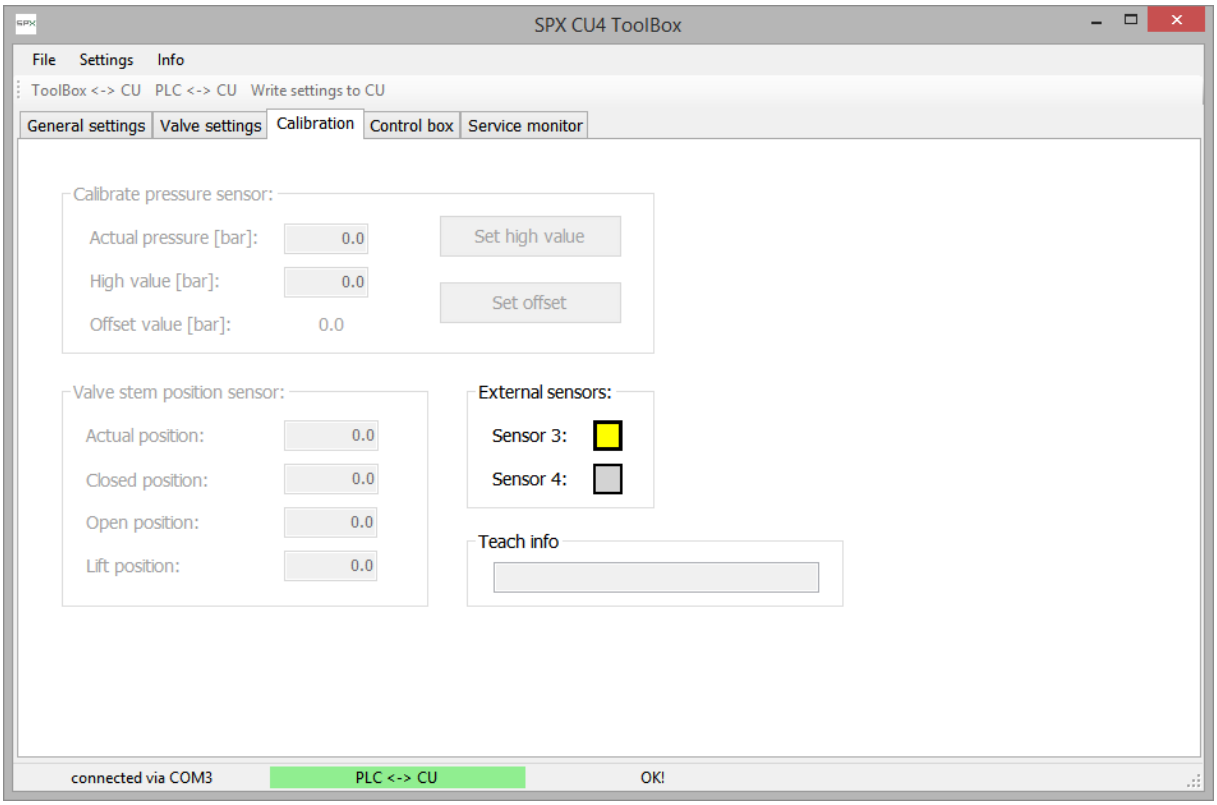
4.2.3. Tab "Calibration"

Depending on the valve type and some options selected the pressure sensor calibration and the teach in of the valve stem positions sensor are displayed on this window. The position value corresponds approximately with 1mm. Additionally the status of the external sensors is shown.

If any of these features are not selected they are greyed out and inactive. If "Settings -> Expert Mode" is selected the raw data of the pressure sensor is additionally displayed.

The actual pressure and the actual position are updated automatically by the program if the CU is connected.

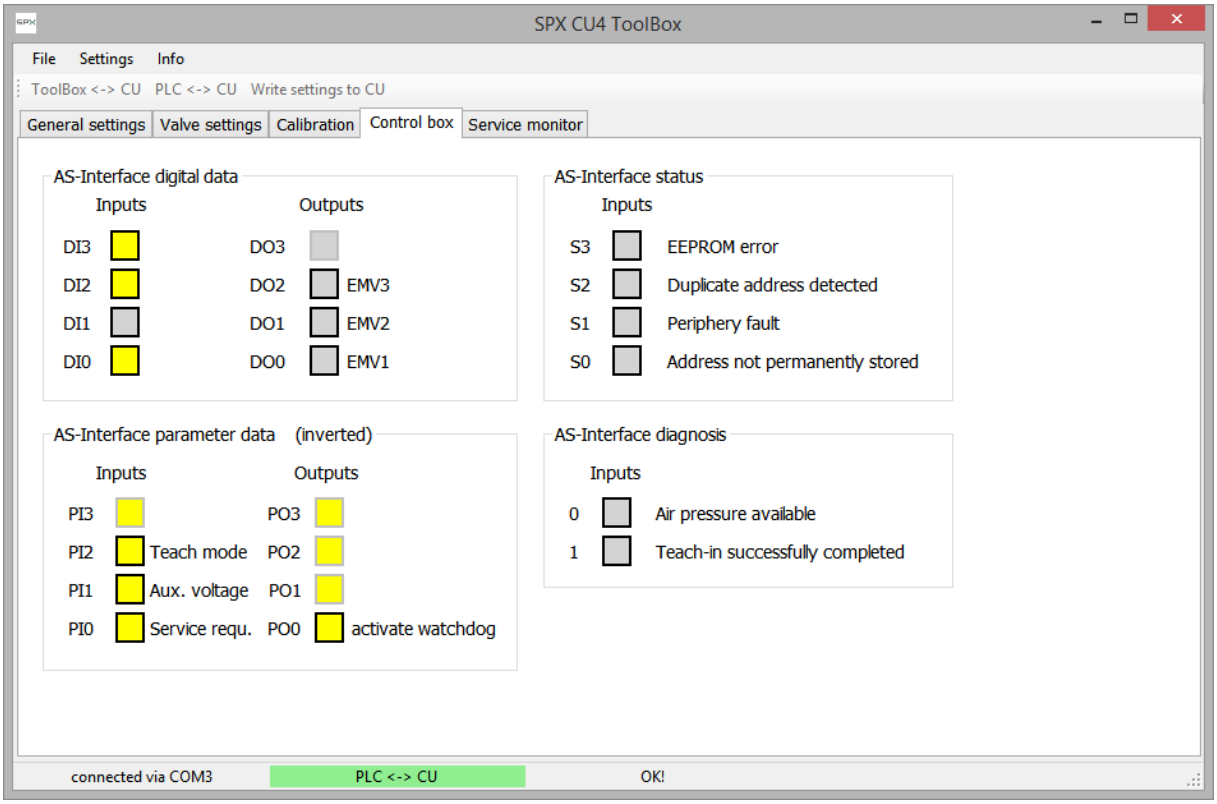
If this tab is selected during "Teach" it is possible to follow the procedure in the "Teach Info". If the teach procedure is not successfully completed a diagnosis information is given. If the teach procedure does not receive the signals expected it times out after approx. 30s.



Note: The teach procedure can only be started by pressing the teach button on the CU.

4.2.4. Tab "Control Box"

This tab shows the AS-Interface data that is exchanged between the master and the CU4plus slave.



In Read/Write Mode it is possible to operate the valves (see chapter 4.3).

Note: Some AS-Interface Masters do not support the independant communication of parameter inputs and parameter outputs. It, therefore, may occur that the parameter input data differs when viewed via the ToolBox or via the AS-Interface master.

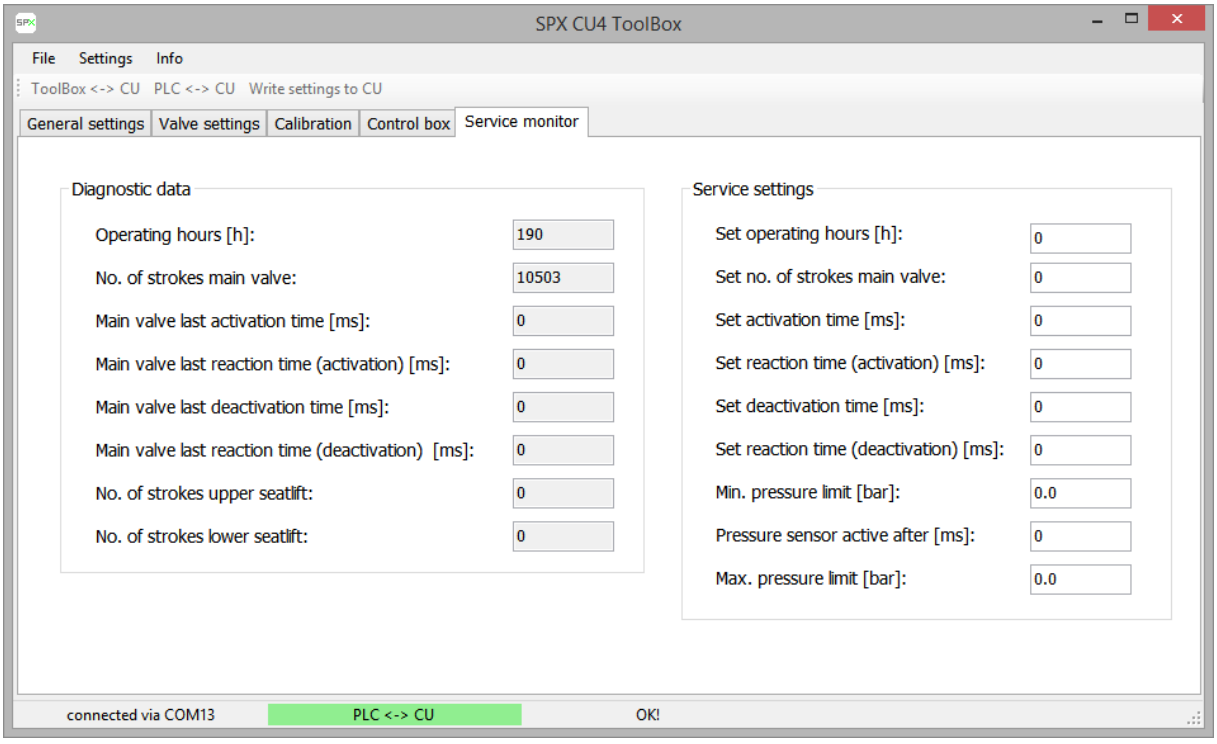
Note: AS-Interface Diagnosis data is not yet available in this version. The "activate watchdog" function is not yet available in this version.

4.2.5. Tab "Service Monitor"

This tab displays some diagnostic data and the service settings of the CU.

The diagnostic data comprise:

- The operating hours of the CU.
- The number of strokes that the main valve has performed.
- The last activation time of the main valve (i.e. the time in ms that the valve needs to travel from 0% to 100%).
- The last reaction time (activation) of the main valve (i.e. the time in ms that the valve needs from the time the command arrives to the time the valve leaves it's current position).
- The last deactivation time of the main valve (i.e. the time in ms that the valve needs to travel from 100% to 0%).
- The last reaction time (deactivation) of the main valve (i.e. the time in ms that the valve needs from the time the command arrives to the time the valve leaves it's current position).
- The number of strokes of the two seatlift valves.



The service settings comprise limit values for the diagnostic data. If these limit values are exceeded a service request is issued to the master (PI0 in the tab "Control Box", see chapter 4.2.4 of this manual).

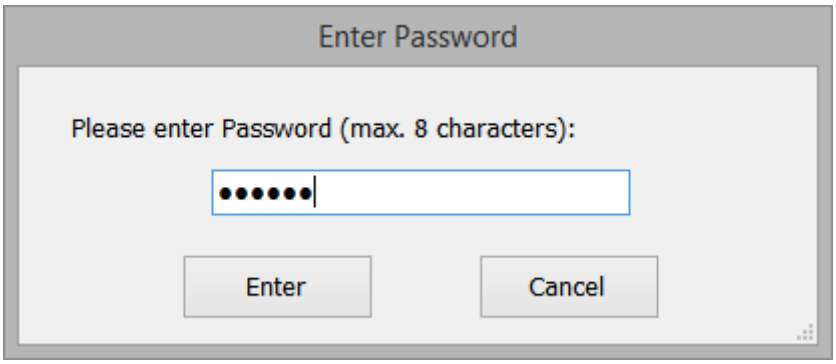
The limit value that triggered the service request is highlighted with yellow background in order to make it easier to identify the cause of the request.

Note: In order to minimise write cycles for the EEPROM the current diagnostic data is saved approximately every 6 minutes. In case of a power loss it may, therefore, happen that some diagnostic data (i.e. events that occured during the last minutes) is lost.

4.3. Read/Write Mode

4.3.1. Enter Password

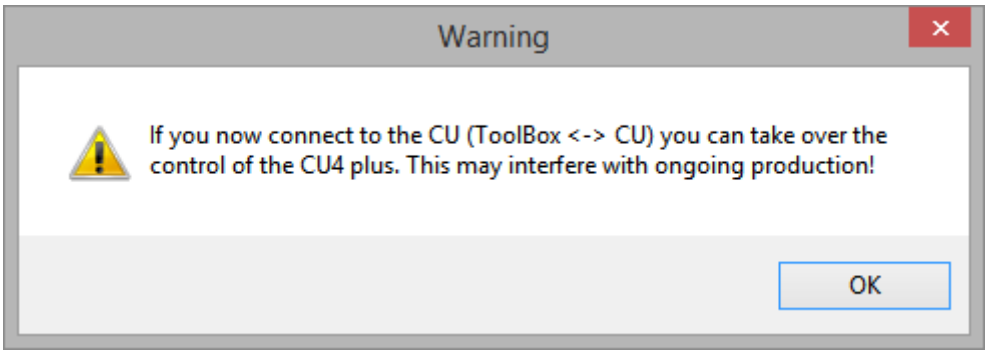
In order to enter the Read/Write Mode of the Toolbox Service and Maintenance Software for CU4plus AS-Interface it is mandatory to enter the password via the pulldown menu item "Settings -> Enter Password".



After having entered the correct password the following warning is issued, as now the control of the valve is changed over from the PLC to the Toolbox program.

DANGER

If you proceed you must make sure that the process valve is disconnected from any potentially dangerous material flow.



If you now press the button "ToolBox <-> CU" you take over control of the CU and can operate the valves. The text in the status line of the program changes to "ToolBox <-> CU" on yellow background. You can return control to the PLC at any time by pressing the button "PLC <-> CU".

After a longer period of no transaction between the control program and the CU the connection is interrupted and control is automatically returned to the PLC. This may also happen when the PC enters a sleep mode.

If data is written to the CU the main CPU performs a restart to ensure data integrity. If data recording is performed during a write access, it is, therefore, stopped.

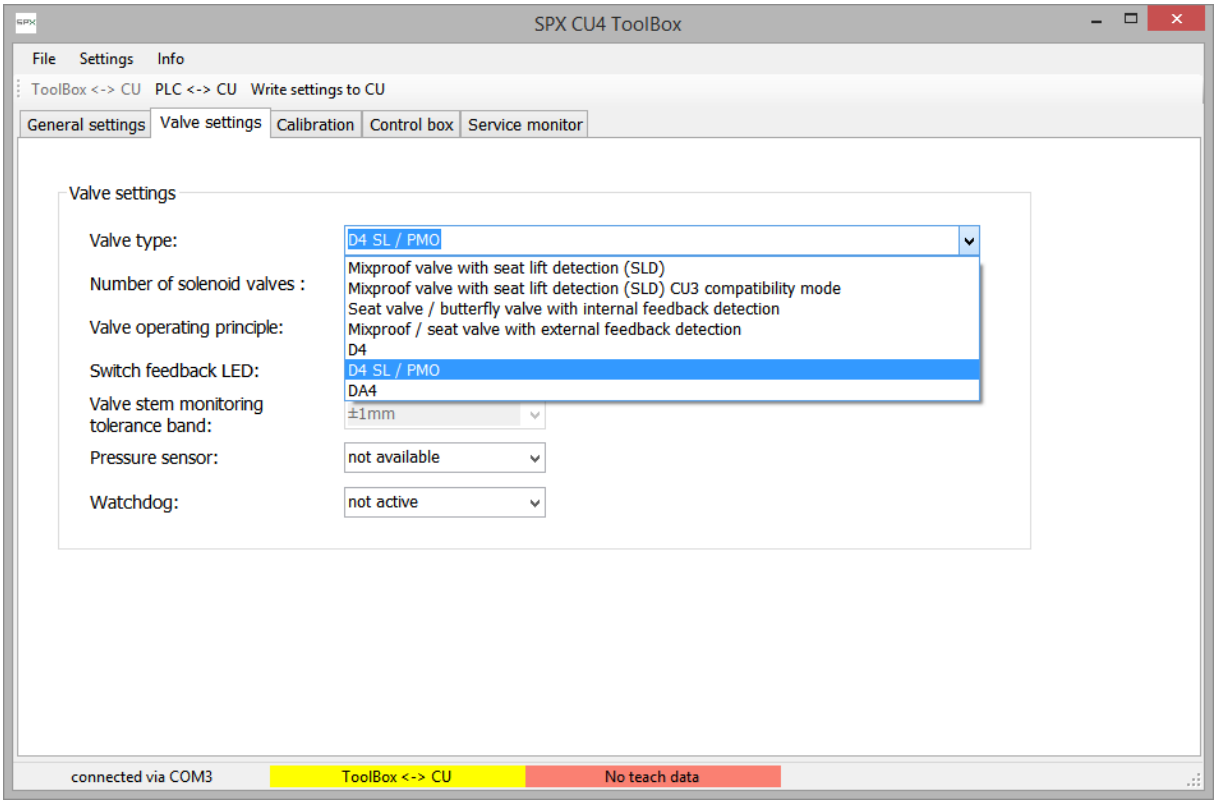
4.3.2. Tab "Valve Settings"

In Read/Write Mode the parameters in this tab are made selectable. Depending on which type of valve has been selected all or some of the other selections are being made available, too.

As soon as a new parameter is selected the message "Data changed" appears in the status line of the program. This indicates that the button "Write Settings to CU" should be pressed in order to transfer the newly selected parameter setting to the control unit and store it there permanently.

For details of the parameterisation of the different valve types please refer to [1].

The data selected here can be stored in a file on your PC via the function "File -> Save valve settings". Valve settings files have the file extension .cu4vs.



If new settings are stored in the CU the CU will perform a reset and thus go offline from the AS-Interface network for a brief period of time.

Note: If a new valve type is selected or other parameters are changed calibration data may be obsolete. In most cases it will be necessary to perform a new teach and to recalibrate the pressure sensor.

Note: When the watchdog is activated in case of a communication failure between the master and the slave the solenoids will be deenergised in order to close the valves to a safe position.

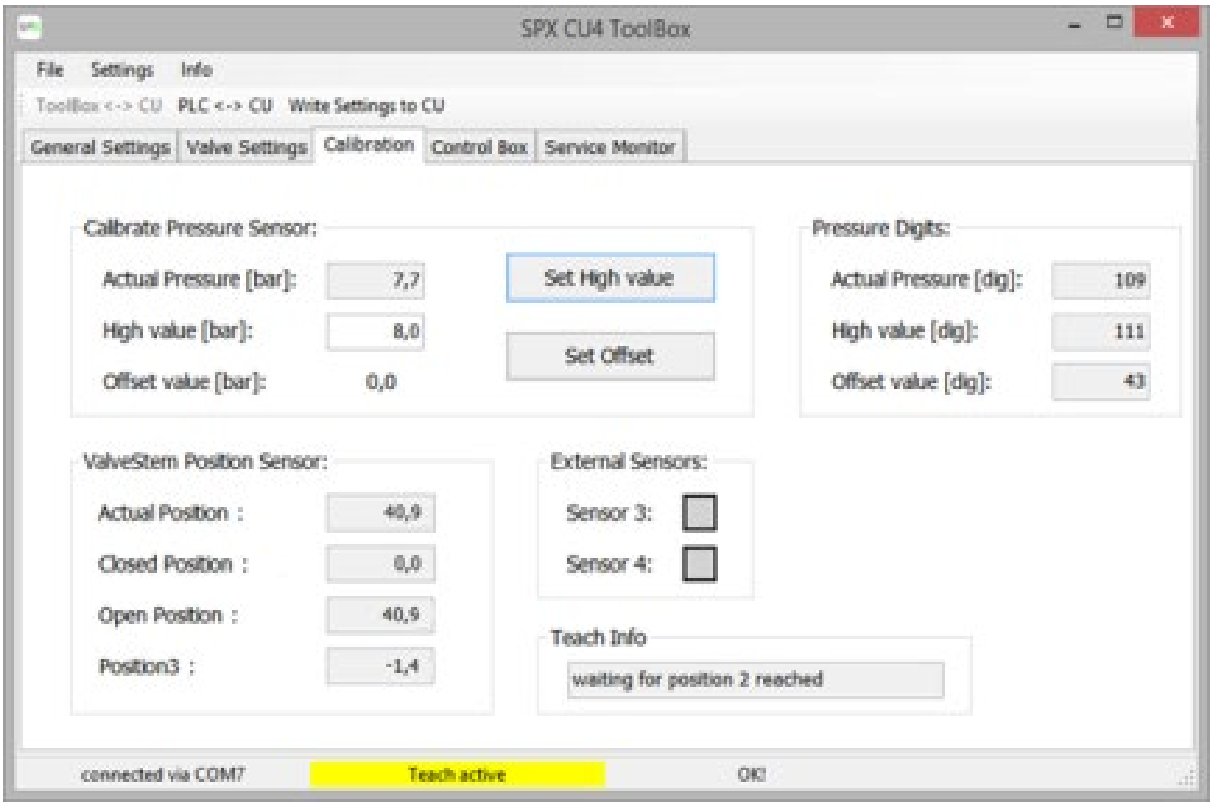
4.3.3. Tab "Calibration"

With this tab calibration of the pressure sensor can be done in the following way:

- Put main valve in OFF position. Press "Set Offset" button.
- Put main valve in ON position. Enter high value pressure in appropriate field. Press "Set High value" button.
- Save calibration to EEPROM by pressing "Write Settings to CU" button.

With this tab the teach procedure can be monitored. The teach mode has to be activated by the button on the control unit itself. The progress of the teach process is shown in the window "Teach Info". When the Teach process has finished successfully the text "Teach END" is displayed. If the Teach process has encountered an error (e.g. Sensor 3 and Sensor 4 exchanged) the text "Teach ERROR" is displayed.

Since the teach data is generated in the CU itself it is not necessary to save it by pressing the button "Write Settings to CU".

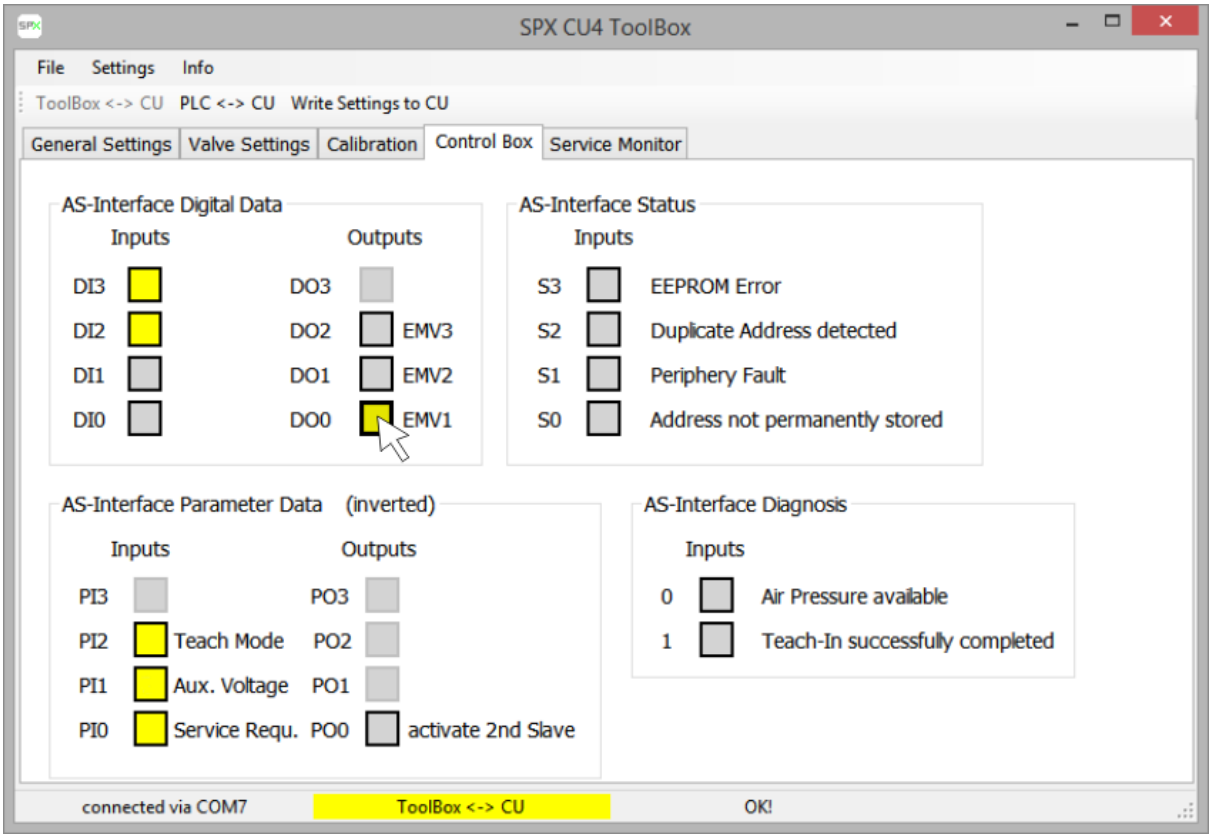


4.3.4. Tab "Control Box"

In Read/Write Mode it is possible to operate the valves by pointing on the corresponding symbol and clicking the left mouse button.

Note: The function "AS-Interface diagnosis" is not yet available in Software version 01.01.07.

Note: It is not possible to operate the parameter outputs.

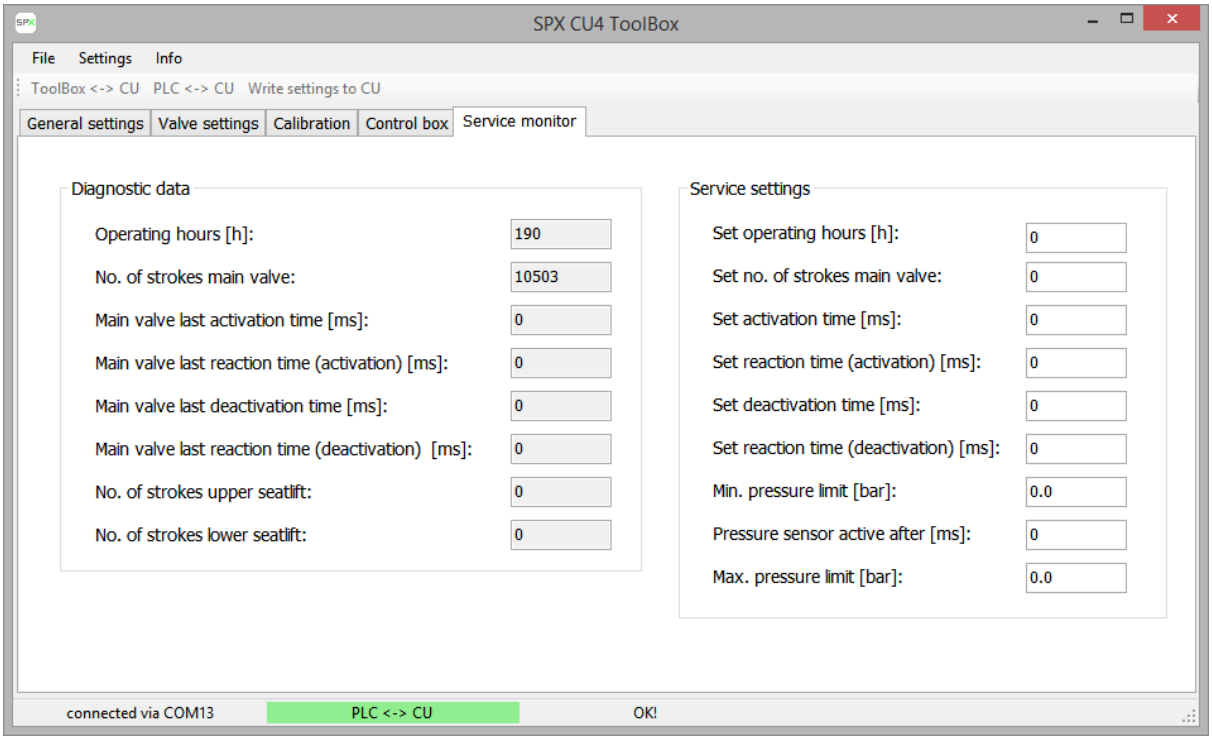


4.3.5. Tab "Service Monitor"

With this tab setting of service parameters is possible. The service parameters are shown on the right side of the window and and act as limit values for the diagnostic parameters on the left side. If any of the limit values is exceeded during operating time of the CU a service request (AS-Interface input parameter PI0) is issued.

It is possible to reset the diagnostic data operating hours and number of strokes on the left side of the window by pressing the button "Reset Diagnostic Data" (shown in "Expert Mode" only).

The service settings on the right side of the window have a default value (0 for all parameters). If the default value is selected no service request is generated. They can be edited and saved to the EEPROM of the Control Unit.


SPX CU4 ToolBox
File
Settings
Info
ToolBox <-> CU
PLC <-> CU
Write settings to CU
General settings
Valve settings
Calibration
Control box
Service monitor
Diagnostic data
Operating hours [h]:
190
No. of strokes main valve:
10503
Main valve last activation time [ms]:
0
Main valve last reaction time (activation) [ms]:
0
Main valve last deactivation time [ms]:
0
Main valve last reaction time (deactivation) [ms]:
0
No. of strokes upper seatlift:
0
No. of strokes lower seatlift:
0
Service settings
Set operating hours [h]:
0
Set no. of strokes main valve:
0
Set activation time [ms]:
0
Set reaction time (activation) [ms]:
0
Set deactivation time [ms]:
0
Set reaction time (deactivation) [ms]:
0
Min. pressure limit [bar]:
0.0
Pressure sensor active after [ms]:
0
Max. pressure limit [bar]:
0.0
connected via COM13
PLC <-> CU
OK!

5. Trouble Shooting

5.1. Online Help Desk

For quick help please refer to the "Info -> Online Help" menu item of the program:

Online Help for CU4plus ToolBox

To connect to a CU4plus control unit use the SPX USB/Serial Converter only! Start the CU4plus ToolBox program. If installed correctly the program will automatically establish a connection to the valvehead control unit and display "Connected via COMxx" in the status line.

For problems with installation of program and driver software please refer to the setup manual or contact support (see "Info").

- File

- Load Valve Settings
With this menu item you can load files that contain parameter data for CU4 plus units. These parameter data can be edited and loaded into the CU4 plus units via the ToolBox program.

- Save Valve Settings
If parameter data for CU4 plus units have been edited they can be saved to a file with this menu item.

- Load Record File
for future versions of the Toolbox program.

- Save Record File
for future versions of the Toolbox program.

- Export Record File
for future versions of the Toolbox program.

- Close program
With this menu item the program is closed.

- Settings

- Enter Password
With this menu item you can enter a password to be able to write parameter data to the control units.

Attention: If you take over control of the control unit with the ToolBox program you will disconnect the CU4plus from it's process control PLC. You can directly operate process outputs via the ToolBox program. This may interfere with ongoing production!

- Change Password
With this menu item you should change the factory set password to your own password when the ToolBox program first is installed.

- Expert Mode
In Expert Mode some additional functions of the Toolbox program are accessible.

- Info

- Online help
Here this online help is displayed.

- Info
Here you get information on the program and the program version. This is important for feedback information or questions arising.

- ToolBox <-> CU
With this button you can change the state of the CU4 plus to "ToolBox <-> CU", i.e. to disconnect it from it's process control and put it under the control of the CU4plus ToolBox. This action is password protected. You have to enter the correct password first. In ToolBox <-> CU mode you have write access to all parameter settings of the CU4plus.

Note: Control is returned to "PLC <-> CU" when there is no communication activity for approx. 1 minute. This may happen e.g. if your PC is configured to enter Sleep Mode after a certain period of inactivity.

- PLC <-> CU
With this button you can change the state of the CU4 plus to "PLC <-> CU", i.e. to (re)connect it to the process control and exit the control of the CU4plus ToolBox.

- Write Settings to CU
With this button you write the parameters that are loaded and displayed in the ToolBox program to the CU4plus and save them there in a EEPROM. This action is password protected.

5.2. Messages in the Status Line

Flash data error

When reading the data from the nonvolatile memory the CU performs a CRC check. If this check fails, flash data error is signalled. The CU will stop and display "Periphery fault" (red/green alternate flashing).

It may be possible to recover from this state by "write settings to CU" or disconnecting and reconnecting power to the CU.

No teach data

For some valve types a teach of the end positions is necessary. As long as this teach has not been performed "No teach data" is signalled. The CU will display "Periphery fault" (red/green alternate flashing).

To recover from this fault please perform a teach.

Valve error (short/open loop)

The number of valves to be connected is defined in the tab "Valve settings". If the corresponding number of ports on the CU are either open or short circuited this error message will be signalled. The CU will display "Periphery fault" (red/green alternate flashing).

To recover from this fault please check the connections to the solenoid valves or correct the number of active solenoid valves in the tab "Valve settings".

AS-i communication error

If there is no communication between AS-Interface master and the slave this error message will be signalled. The CU will display "AS-i communication error" (red continuously) or "AS-i address 0" (red continuously and green flashing).

A communication error will be signalled e.g. if the master is in stop mode, if the master requests cannot be decoded by the slave, if the master is in protected mode and the slave is not projected. An "AS-i address 0" error will be signalled if the slave has no address > 0 assigned.

Note: If a watchdog is configured (see chapter 4.2.2) the outputs of the CU are off in case of a communication error.

To recover from this fault please check the master state and check the AS-i signals at the point where the slave is connected to the network. If the slave has address 0 please assign an address > 0.

AS-i duplicate address detected

The slaves are equipped with a duplicate address detection feature. If a slave senses that annother slave in the network has a conflicting address, it will delete it's own address and display "Duplicate address detection" (red flashing). This feature will work with every AS-i master and even in networks where segments are connected via repeaters.

Note: It may take up to several minutes until an address conflict is detected.

To recover from this fault please assign a free address to the slave.

AS-i protocol error

This error refers to the diagnosis slave only (not yet implemented).

Air pressure low

If the air pressure sensor is available and the air pressure falls below the "minimum pressure limit" set in the tab "Service monitor" this error is displayed. The air pressure can only be measured when the main valve is active.

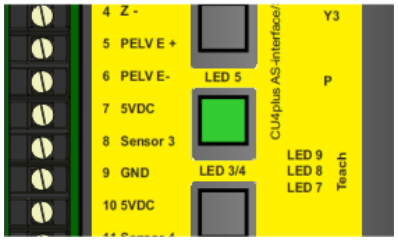
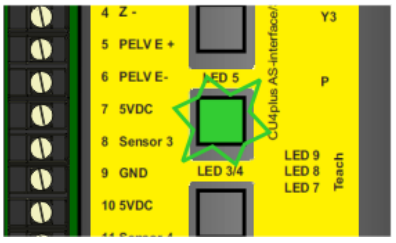
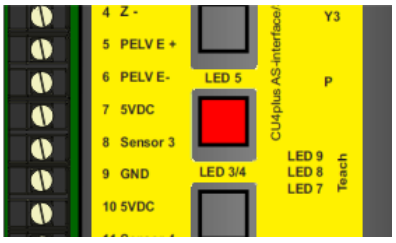
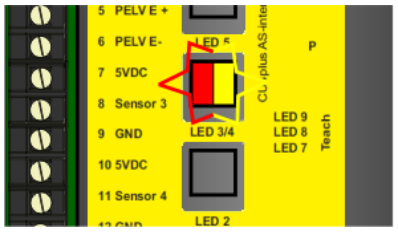
To recover from this error either increase the air pressure available or lower the "minimum pressure limit" in the tab "Service monitor".

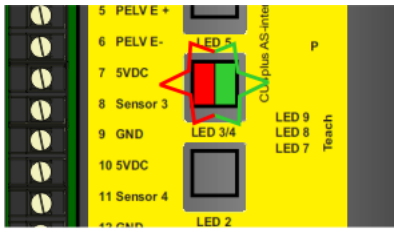
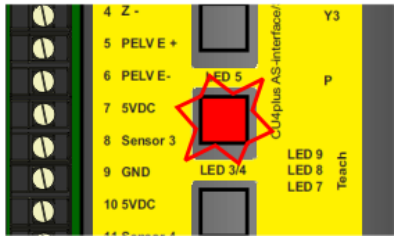
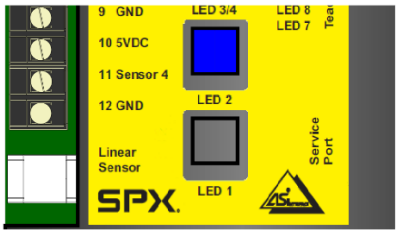
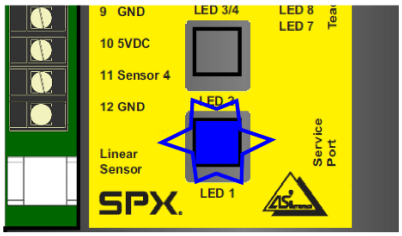
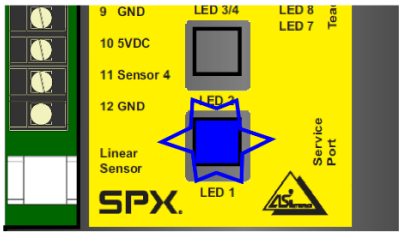
Air pressure too high

If the air pressure sensor is available and the air pressure exeeds the "maximum pressure limit" set in the tab "Service monitor" this error is displayed. The air pressure can only be measured when the main valve is active.

To recover from this error either decrease the air pressure available or set the "maximum pressure limit" in the tab "Service monitor" to a higher value.

5.3. LED signals on the CU

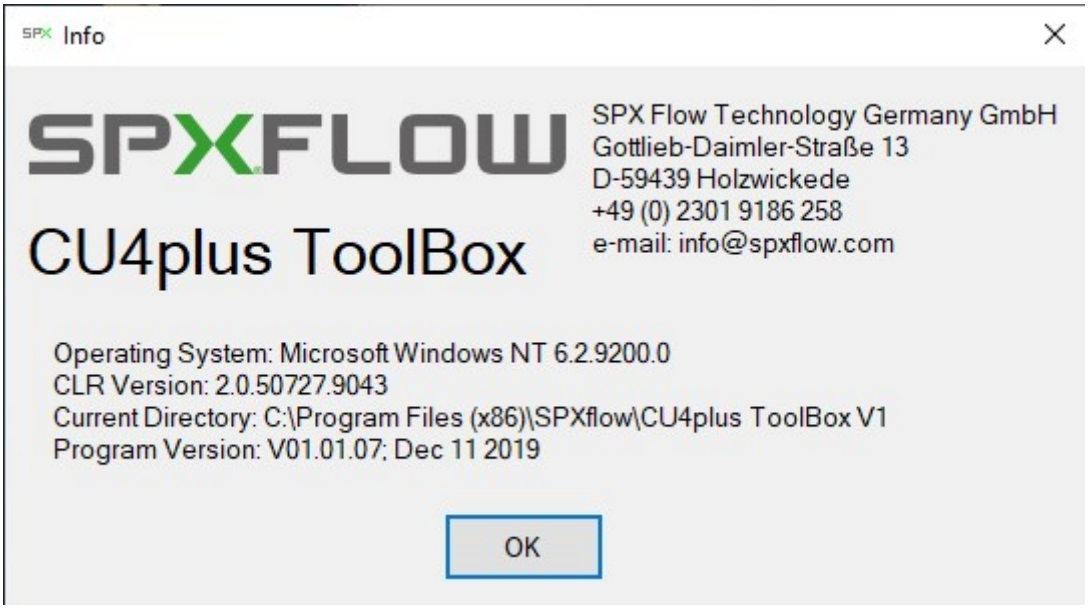
	LED 3/4 continuously green	Everything OK.
	LED 3/4 green flashing	Auxiliary voltage low. Auxiliary voltage may not be sufficient to drive solenoids.
	LED 3/4 continuously red	No data exchange with master. Possible causes: Master is in stop mode. Slave cannot read master requests. Master is in protected mode and slave is not projected.
	LED 3/4 red/yellow flashing	Slave has address 0.

	LED 3/4 red/green flashing	Periphery fault. Possible causes: Teach required and not yet performed. Flash data error. Valve error or wrong number of valves connected. Overload on sensor supply voltage.
	LED 3/4 red flashing	Duplicate address detected.
	LED 2 continuously blue	Solenoid 0 for Main Valve activated. *Note:* This LED signals the state of data bit DO0 except when the watchdog of the CU is active.
	LED 1 flashing once	Upper Seat Lift Position. *Note:* For valves with SLD this LED is active after successful teach only.
	LED 1 flashing twice	Lower Seat Lift Position. *Note:* For valves with SLD this LED is active after successful teach only.

5.4. Additional help

If during installation or operation of the CU4 the Toolbox program does not perform as expected and the information required cannot be found in this manual please contact your local SPX company.

Please have the version numbers of the USB/Serial Converter (shown on the label of the product), the CU4plus Hardware and Firmware Version numbers (shown on the tab "General Settings") and the version of the Toolbox Service and Maintenance Software for CU4plus AS-Interface and your operating system (shown on the "Info" window which can be reached via "Info -> About CU4 ToolBox") available as they may be necessary to track down the problem.


Info
SPXFLOW
CU4plus ToolBox
SPX Flow Technology Germany GmbH
Gottlieb-Daimler-Straße 13
D-59439 Holzwickede
+49 (0) 2301 9186 258
e-mail: info@spxflow.com
Operating System: Microsoft Windows NT 6.2.9200.0
CLR Version: 2.0.50727.9043
Current Directory: C:\Program Files (x86)\SPXflow\CU4plus ToolBox V1
Program Version: V01.01.07; Dec 11 2019
OK

TOOLBOX Service and Maintenance Software for APV CU4plus AS-interface

CONTROL PROGRAM FOR WINDOWS® OPERATING SYSTEMS

SPXFLOW

SPX FLOW

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