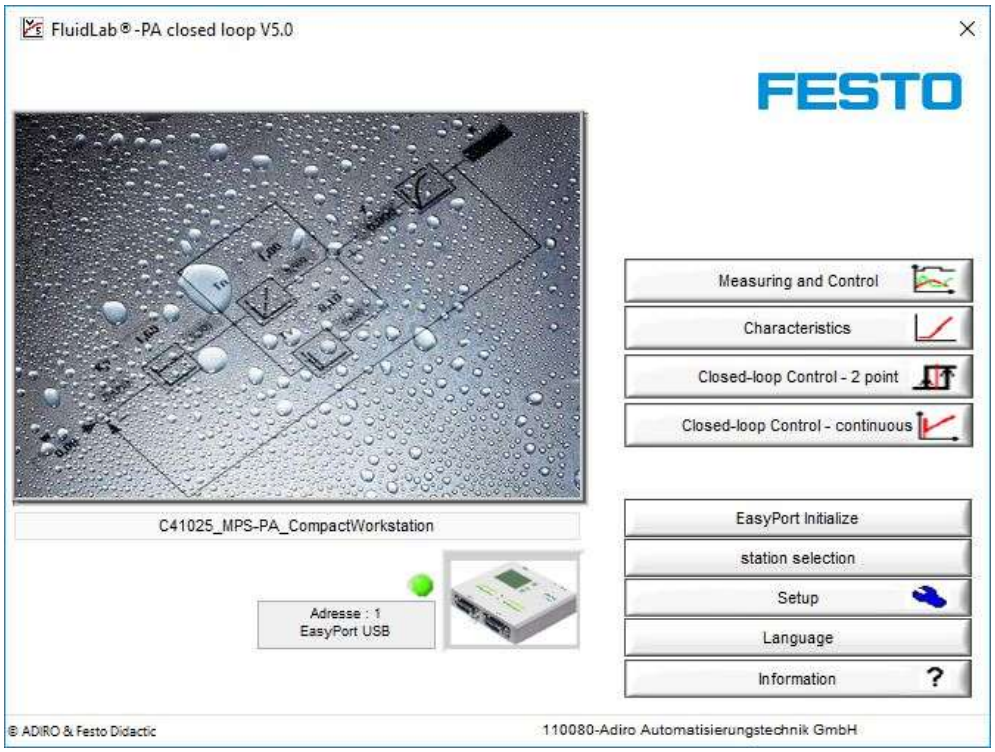
FluidLab®-PA closed-loop

Manual

Version 5.0



Festo Didactic
705894 en
07/2019

Intended use

This software has been developed and produced solely for vocational and further training purposes in the field of automation and communication. The company undertaking the training and / or the instructors is / are to ensure that trainees observe the safety precautions described in the manuals provided.
Festo Didactic herewith excludes any liability for damage or injury caused to trainees, the training company and / or any third party, which may occur if the system is in use for purposes other than purely for training, unless the said damage / injury has been caused by Festo Didactic deliberately or through gross negligence.

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Status:	07/2019
Authors:	Jürgen Helmich, Adiro Automatisierungstechnik GmbH
Graphics:	Thomas Schwab, Adiro Automatisierungstechnik GmbH
Layout:	Jürgen Helmich, Adiro Automatisierungstechnik GmbH

Internet: www.festo.com/didactic http://www.festo.com/didactic/de/ProcessAutomation

E-mail: did@de.festo.com

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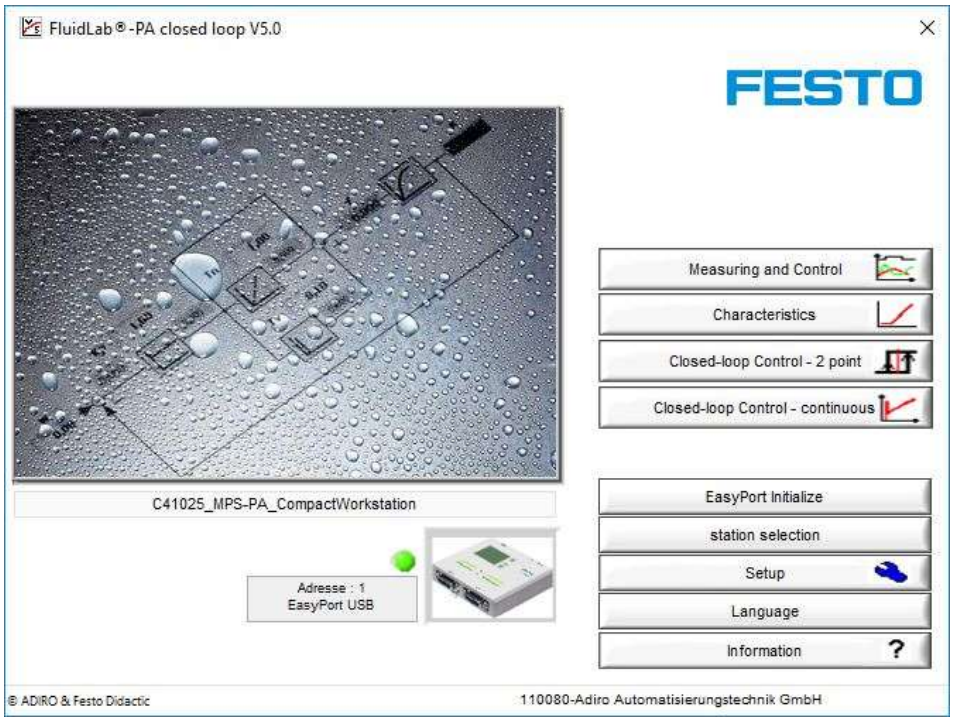
1 Introduction



FluidLab®-PA closed-loop start up window

The FluidLab® PA closed-loop software in combination with the EasyPort USB offers you the possibility to measure and analyze the signals of 8 digital/4 analog inputs.

The electrical control interface (E/A Syslink and analog terminal) is the same like MPS®.

Three main functions are integrated in FluidLab® PA closed-loop:

M as in measurement, for signal detection and analysis of 8 digital/4 analog input signals

C as in open loop control, for binary or continuous control of 8 digital/2 analog outputs

R as in regulate a closed-loop system, free selectable closed-loop control elements for 2-point, P, I, PI and PID

With the Compact Workstation of the learning system for process automation you have the possibility to work with the following systems:

- level controlled system
- flow rate controlled system
- pressure controlled system
- temperature controlled system

It is possible to work with the following functions by using the 4 closed-loop systems:

- two point control of a level control system with a analog standard signal
- continuous control of a level control system with a analog standard signal
- continuous control of a flow rate control system with a pump as controlled system and with a analog standard signal
- continuous control of a flow rate control system with a proportional valve as controlled system and with a analog standard signal
- continuous control of a pressure control system with a pump as controlled system and with a analog standard signal
- continuous control of a pressure control system with a proportional valve as controlled system and with a analog standard signal
- two point control of a temperature control system with a analog standard signal

Alternatively you are able to work with a simulation environment, with which you can simulate the systems of a Compact Workstation.

By using the simulation environment with the continuous loop control you can simulate the following functions:

- level controlled system
- flow rate controlled system
- temperature controlled system

By using the simulation environment with the continuous loop control you can simulate the following functions:

- level controlled system
- flow rate controlled system

1.1 Training contents

Training contents covering the following subjects can be taught:

- Sensors
  - Correct use of sensors
  - Measuring of non-electrical, process and control variables
- Closed-loop control technology
  - basics of closed-loop control technology
  - Extension of measuring chains into closed control loops
  - Analyze a closed-loop system
  - P, I, D-control
  - Optimize a closed-loop system

- Closed-loop controller
  - Configuration, assigning operation parameters and optimization of a closed-loop controller
- Commissioning
  - Commissioning of a closed-loop system
  - Commissioning of a process engineering system
- Fault finding
  - Systematic fault finding on a process engineering system
  - Examination and maintenance of a process engineering system
  - Operation and observation of a process

1.2 Important notes

The basic requirement for safe use and trouble-free operation of FluidLab® PA closed-loop is to observe the fundamental safety recommendations and regulations.

These operating instructions contain important notes concerning the safe operation of FluidLab® PA closed-loop.

The safety recommendations in particular must be observed by anyone working on FluidLab® PA closed-loop as well as for the used hardware.

Furthermore, the rules and regulations for the prevention of accidents applicable to the place of use must be observed.

1.3 Duty of the operating authority

The operating authority undertakes to ensure that FluidLab® PA closed-loop is used only by persons who:

- are familiar with the basic regulations regarding operational safety and accident prevention and who have received instructions in the handling of FluidLab® PA closed-loop,

- have read and understood the chapter on safety and the cautionary notes in these operating instructions and confirmed this by signing,
- are regularly vetted to ensure safe working.

1.4 Duty of trainees

Prior to commencing work, all persons assigned to working on FluidLab® PA closed-loop have a duty to:

- observe the basic regulations regarding operational safety and the prevention of accidents,
- read the chapter on safety and the cautionary notes in these operating instructions and to confirm that they have understood these by signing.

1.5 Risks involved in dealing with FluidLab® PA closed-loop

The Fluid Lab® PA closed-loop software is designed according to state of the art technology and in compliance with recognised safety regulations. However when using the system there is nevertheless a risk of physical or fatal injury to the user or third parties or of damage being caused to the machinery or other material assets.

Fluid Lab® PA closed-loop is to be used only:

- for its intended purpose and
- in an absolutely safe conditions.

Faults impairing safety must be rectified immediately!

1.6 Warranty and liability

In principle all of our „Terms and Conditions of Sale“ apply. These are available to the operating authority upon conclusion of the contract at the latest. Warranty and liability claims for persons or material damage are excluded if these can be traced back to one or several of the following causes

- Use of the machine not in accordance with its intended purpose
- Incorrect assembly, commissioning, operation and maintenance of the machine
- Operation of the machine using faulty safety equipment or incorrectly fitted or non operational safety or protective devices

- Non observance of notes in the operating instructions regarding transport, storage, assembly, commissioning, operation, maintenance and setting up of the machine
- Unlawful constructional modifications on the machine
- Inadequate monitoring of machine components subject to wear
- Incorrectly carried out repairs
- Catastrophes as a result of foreign objects and acts of force major.

Festo Didactic herewith rules out any liability for damage or injury to trainees, the training company and /or other third parties which may occur during the use / operation of the system other than purely in a training situation, unless such damage has been caused intentionally or due to gross negligence by Festo Didactic.

1.7 Use for intended purpose

This system has been developed and produced exclusively for vocational and further training in the field of automation and communication. The training authority and / or the instructors is / are to ensure that trainees observe the safety precautions described in the manual provided.

The use of the system for its intended purpose also includes:

- following all advice in the operating instructions and
- carrying out inspection and maintenance work.

2 Installation

Note

The installation routine described applies to the FluidLab® PA closed-loop. FluidLab® PA closed-loop is delivered on CD.

2.1 Design

FluidLab® PA closed-loop uses following basic components:

- FluidLab® PA closed-loop program files und LabVIEW© Runtime environment (Version 2017) (files from NI)
- EasyPortUSB driver (files from Festo Didactic)

2.2 FluidLab® PA closed-loop program files

Table of the sub-folders created on your local system after the installation process has been finished successfully:

Folder name	Description
AddFiles	Folder for additional components like icons, internet links, etc.
Documentation	Manuel
Menue	Languages for the menu texts
Stations	Parameters and language-dependent texts for the individual stations

2.3 EasyPort USB driver

The ActiveX driver is needed for communication between FluidLab® PA closed-loop software and EasyPort USB via USB cable.

2.4 LabVIEW© runtime engine

Because FluidLab® PA closed-loop is developed with LabVIEW© of National Instruments© the software uses a runtime environment to be executed on your system.

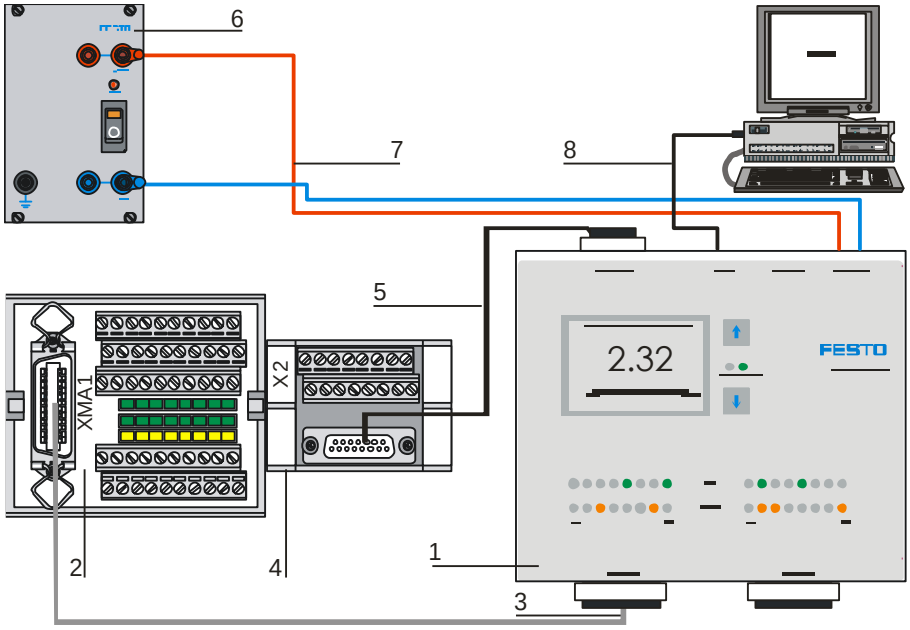
2.5 Requirements for usage

System requirements:

- PC with Windows 7/8/10
- Pentium III or equivalent
- 2 GB RAM
- 300 MB free hard disk space
- USB 2.0 oder serial interface
- graphics resolution 1280 x 1024 Pixel
- CD-ROM drive

Hardware:

The softweare FluidLab-PA® closed-loop is used in connection with the EasyPortUSB and the MPS-PA Compact Workstation, EduKit PA Basic+Advanced or any other equivalent station.



Hardware connections Compact Workstation – EasyPort USB

1	EasyPort USB
2	I/O terminal Syslink
3	SysLink cable
4	Analog terminal
5	Analogue cable, 15-PIN, parallel
6	Power supply 24 V DC, 4,5 A
7	Labor cable with Safty plug(red/blue)
8	USB Cable oder PC data cable RS 232

Cable connections

1. Connect the EasyPort USB after installation of the USB driver to the USB port of your computer.
2. Switch on the power supply to the EasyPort USB after establishing all electrical connections between Easyport and station.

2.6 Starting installation

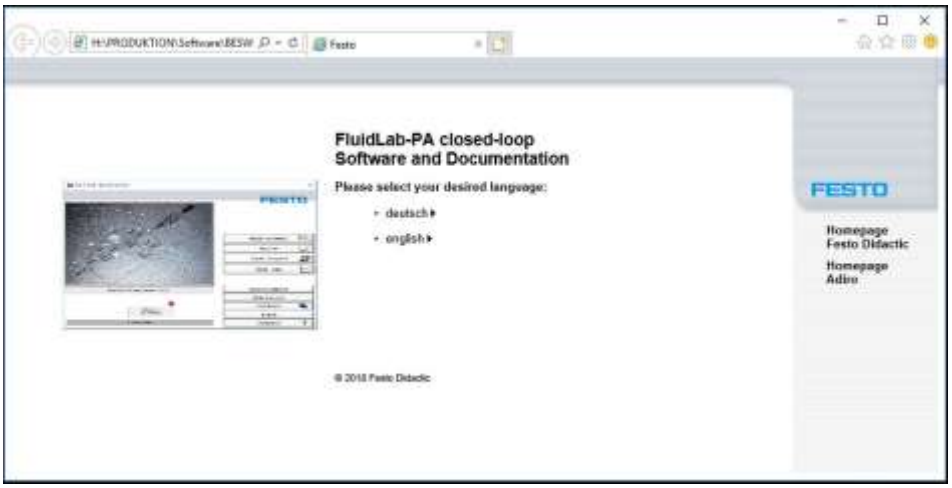
It is advisable to exit all other programmes before you start installing FluidLab® PA closed-loop.

Insert the installation CD into the CD drive. An installation routine should start automatically and assists you throughout the installation process.

If the installation routine does not start automatically, open Windows Explorer and click the icon of the CD drive into which the CD has been inserted. Then click the "Start.exe" file.

2.7 Selecting the set-up language

Two different languages can be selected for the installation website including German and English. The language selection takes place in the Internet Explorer window.

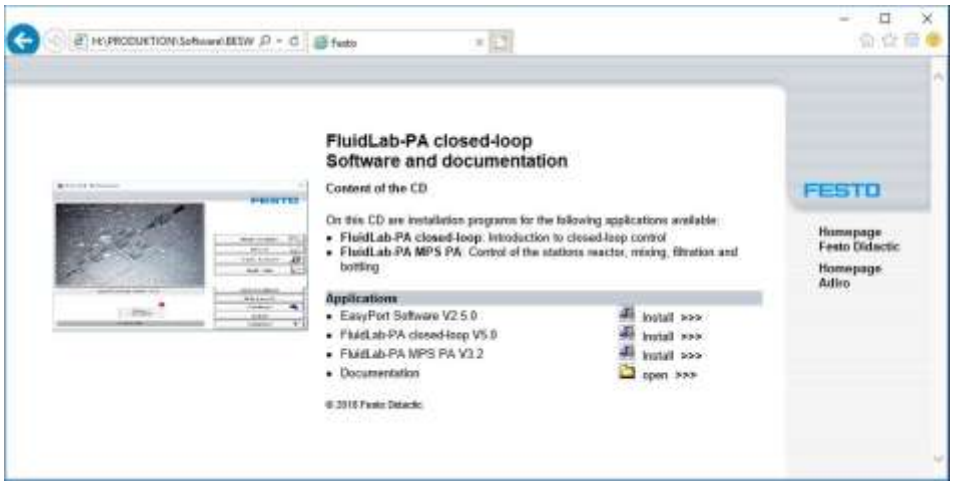


Select language

2.8 Welcome window

The installation website shows the programms for installation:

- EasyPort Software V2.5.0
- FluidLab-PA closed-loop V5.0
- FluidLab-PA MPS PA 3.2



Welcome window

By pressing the respective Button “Install” you get automatically into the installation routine.
Through the future steps leads an installation wizard.

2.9 Uninstall the FluidLab® PA closed-loop

FluidLab® PA closed-loop software can be automatically removed from your PC. Click **"**Uninstall FluidLab® PA closed-loop**"** in the start menu folder.

Please note that only FluidLab® PA closed-loop files are removed during the uninstall process, not files from other manufacturers.

3 Design and function

After the software is launched either by double clicking the icon on the desktop or clicking the shortcut in the start menu folder or double clicking the executable in the Windows Explorer the following window will appear.

FluidLab® PA closed-loop icon V5.0

3.1 Programm administration

Since Windows 7 the programm administration of FluidLab®-PA closed-loop is located in „my documents“ of the logged in user.

Upon first activation of FluidLab®-PA closed-loop a new folder „FluidLab_closed_loop_Data_V4“ is generated in. „my documents“. That folder includes all language files, setting files and the licence file.
Storage location:
...\Users\<Benutzername>\Documents\FluidLab_closed_loop_Data_V4

If this folder is deleted all made settings of the user can be reseted.

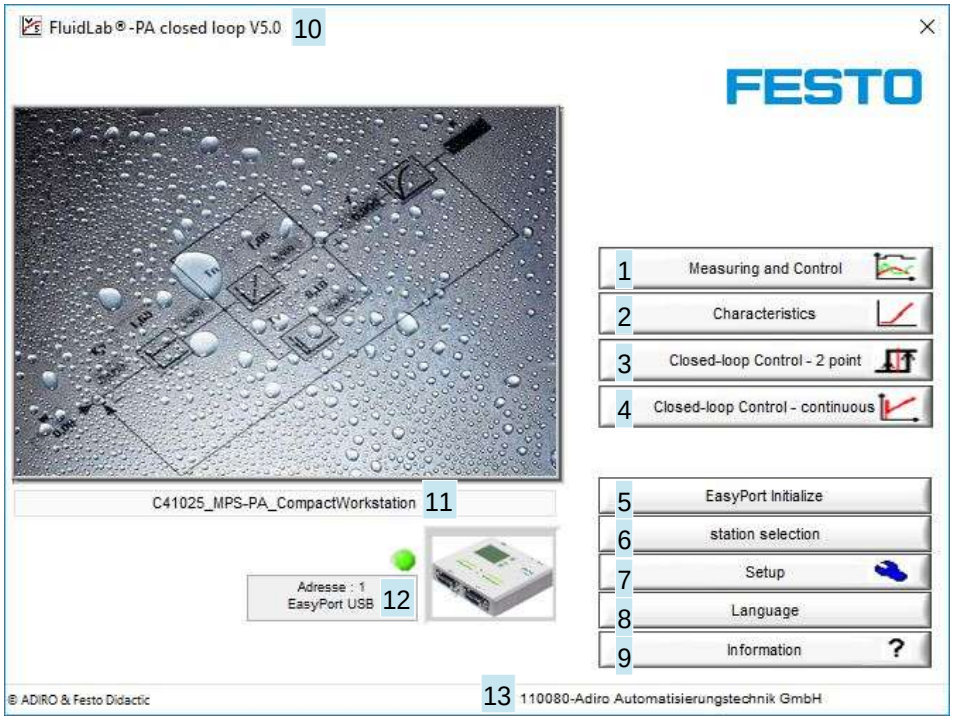
Administration

For the administration of trainers/lecturers it is possible to customize the program with administration rights in the program folder. Therefore all settings, language selection and menue inputs are saved to the Windows main program folder.

These modification are then available for every new user – as well after deleting the folder „FluidLab_closed_loop_Data_V5_0“ in „my documents“. Deliberate and unconscious changes can be also simply reversed by deletion.

3.2 Main menue

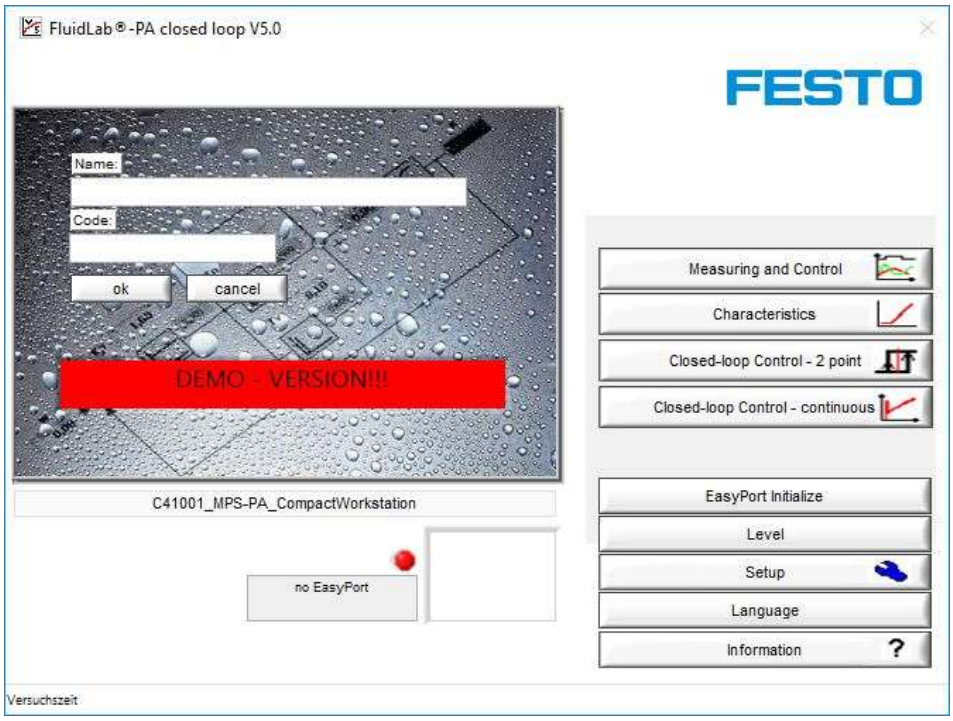
FluidLab®-PA closed-loop starts with the main menue. From there it is possible to access to all functions.



Number	Function
1	Open the ''Measuring and Control'' window (not available in simulation mode)
2	Open the ''Characteristics'' window (not available in simulation mode)
3	Open the ''Closed loop – 2 point'' window
4	Open the ''Closed loop - continuous'' window
5	Initializing the EasyPort interface
6	Open the ''Station selection'' window
7	Open the ''Setup'' window for setting up the FluidLab® PA closed-loop software.
8	Language selection
9	Show information
10	Version of FluidLab® PA
11	Selected station
12	Initialise communication to EasyPort Display connected Easyport
13	License name

3.3 Licence input

If the user is running the software for the first time, the licence has to be inserted. If running demo mode or at false input of the licence the input fields are visible.
Enter licence “Name” and “Code” and confirm with “ok”. If the software is activated “run as administrator” the software can be licenced for all users (siehe 3.1).

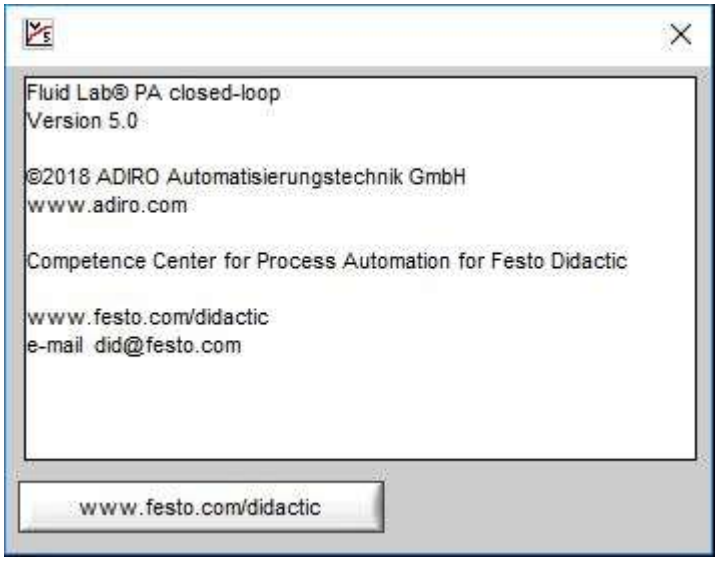


License input

See backside of the Fluidlab® PA closed-loop CD cover for license information.

3.4 Information

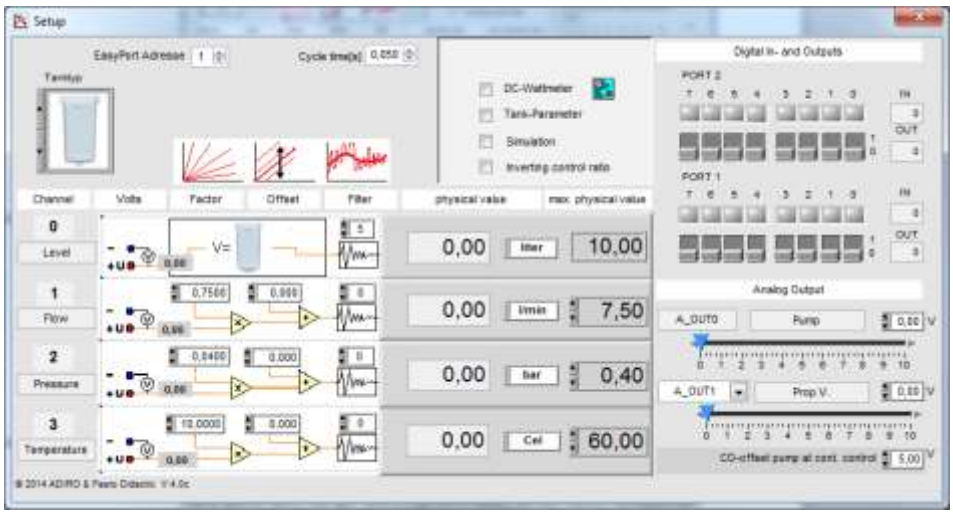
Click the “Information” button in the main window. A window appears containing various information such as copyrights.



Information window

3.5 Setup

Click at the setup button in the start up window. The following window will appear.

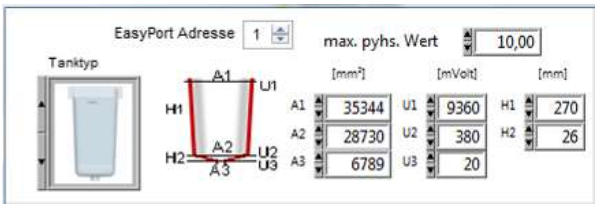


Setup window

Select from 3 different tank geometries. Click upon the tank and select the model.

Tank settings

For each selected tank geometry there are input fields available after activating the check-box “Tank-Parameter. Tank-Parameters consists of the declaration of the areas, heights and corresponding voltage measure values.

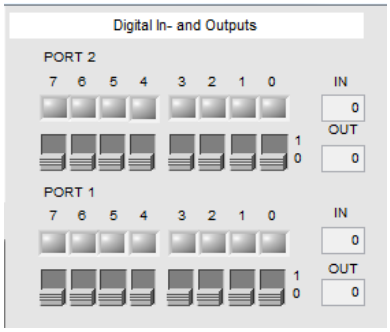


Tank-Parameter – Example for 10L Tank, rectangular

Notice

This software in combination with the EasyPort DA is only for measuring voltage signals from 0 to 10VDC.

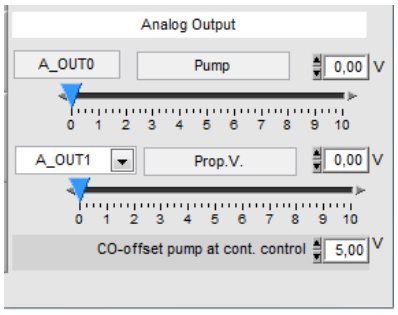
Check all functions of each binary sensor and actuator.



Digital inputs/outputs in the setup window for Port1 and Port2

Note

It is recommended to check functions of analog sensors and actuators with the software before running any other experiment to ensure that all hardware connections have been established successfully.

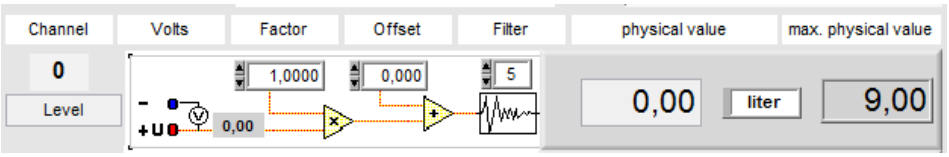


Analog outputs in the setup window

Note

It is possible to swap the outputs channel 0 and 1 at the “Proportional valve”. The PCS Compact Workstation (until to 2005) has the pump assigned to output channel 1 (A_OUT1)!

The analog signal of the sensor, normally 0...10V, has to be converted into its physical valve.



Analog input channel 0

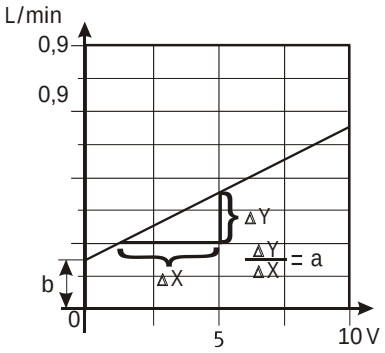
Component	Description
Channels	Analog input channels 0...3
Volts	Input voltage of EasyPort
Factor	Factor for multiplying the input voltage Standard value: 1
Offset	Zero offset factor Standard value: 0
Filter	For damping the input signal with gliding average, 0...90 measure cycles Standard value: 0
physical value	Indication of physical value
Einheitenfeld	Input field for physical unit
Max. physical value	Input field for maximum shown physical value for full scale

This conversion of the scaling is based upon a straight line equation:

$$Y = a \cdot x + b$$

Where:
a = factor;
b = Offset;
x = measure value and
y = physical value

Graph of straight line equation



Example

A flow sensor with a measure transmitter reads out a voltage signal within a range of 0 to 10 V for a measuring range of 0.3 to 7.5 litres per minute.
In this case, factor "a" for a full scale value of 7.5 l/min calcates as follow:

$$a = \frac{y - b}{x} = \frac{7.5 - 0.3}{10} = 0.72$$

The offset is found by shifting of the line's initial point to the origin at y_0 = 0,3 and x_0 = 0:

$$b = y_0 - a \cdot x_0 = 0.3 - 0.72 \cdot 0 = \underline{\underline{0.3}}$$

Example for factor

Sensor: 0...200 bar
Signal: 0...10V
so the factor has to be = 20

Example for offset

Sensor: 0...100 bar
Signal: 0...10V, for measurement 5 bar should be = 0V.
55 bar should be 5 Volt
so the offset has to be = -5
Eventually the factor has to be adjusted, too.

Simulation

Check the box “Simulation” for operating the software without hardware station and Easyport.

Note

At the startup of Fluid Lab® PA closed-loop always the file “default.txt” in the sub folder “Settings” is loaded. If you want to have the simulation mode selected every time you start Fluid Lab® PA closed-loop you should save the simulation settings in this file. Alternatively you have to load your preferred configuration every time you start Fluid Lab® PA closed-loop.

Inverting control ratio

It is possible to change the direction of the control ratio for 2-point and continous controllers.

Inverting control ratio	Description
0	Positive control ratio y = 0...100% (0...1), if e > 0
1	Negative control ratio y = 100...0% (1...0)), if e < 0

Y-offset for final control element

For continous controller the final control element (pump or proportional valve) can be set to an offset value of the controller ouput.

3.6 Changing texts

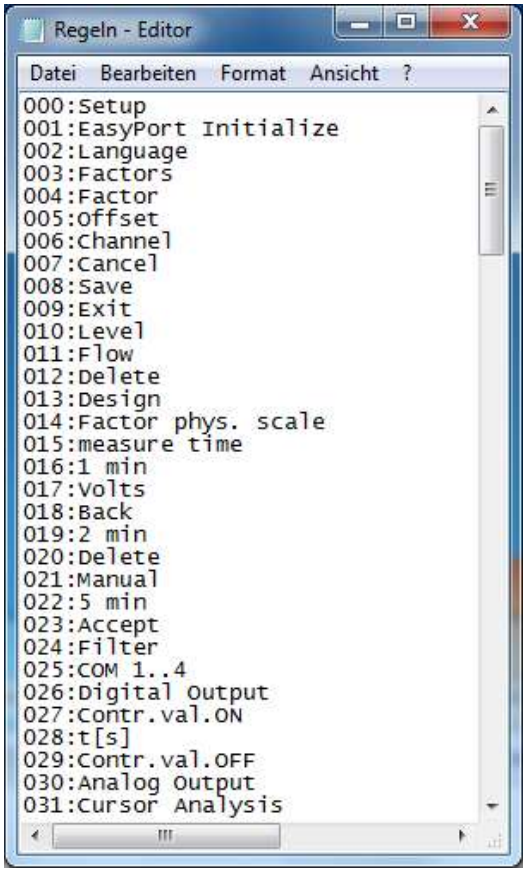
FluidLab® PA closed-loop is designed with multi language support. The displayed window and popup texts are available in following languages:

- German
- English
- French
- Spanish
- Swedish
- Chinese
- Portugese
- ... other languages available upon request

3.6.1 Window texts

The window texts in FluidLab® PA closed-loop can be changed. Use an editor like Microsoft© Editor.
The relevant files are located in subdirectories „...\FluidLab_closed_loop_Data_V5_0\Menue“ of the FluidLab® PA closed-loop user folder and differ by their folder names:

- German language text ...\German\ Regeln.txt
- English language text ...\English\ Regeln.txt
- ...



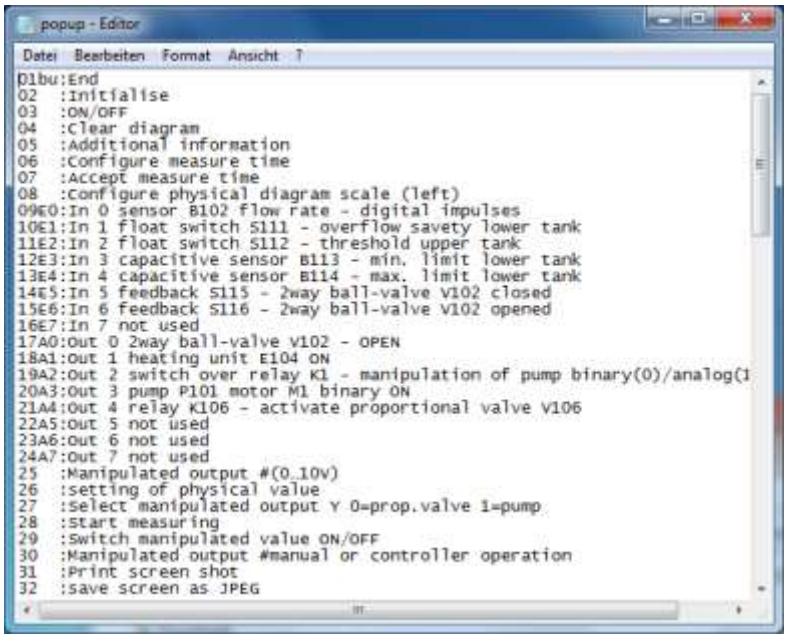
Microsoft© Editor for editing window texts

Layout of the text file	Every line starts with a number and a following colon. Behind the colon the caption text begins. It is recommended not to change this layout. Only edit the text behind the colon!
Note	It is recommended to choose short texts for the window texts.

3.6.2 **Pop up's**

FluidLab® PA closed-loop provides a "Pop up" function, which helps you to orientate with every single component on the window.
If you move the mouse over a component and leave it there for just a split second a text will come up to show you information about the component.
The pop up's are collected in a text file which can be opened with Microsoft©Editor for example.
The relevant files are located in subdirectories of the FluidLab® PA closed-loop directory and differ by virtue of their folder name „...\FluidLab_closed_loop_Data_V5_0\Menue":

- German pop up texts ...\German\ popup.txt
- English pop up texts ...\English\ popup.txt
- ...

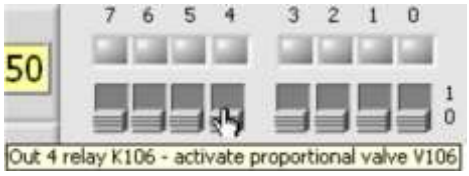


Microsoft© Editor for editing the pop up texts

3.6.3 Station-related texts

Layout of the text file

Every line starts with a variablename and a following “=”. Behind the “=” the pop up text begins. It is recommended not to change this layout. Only edit the text behind the colon!



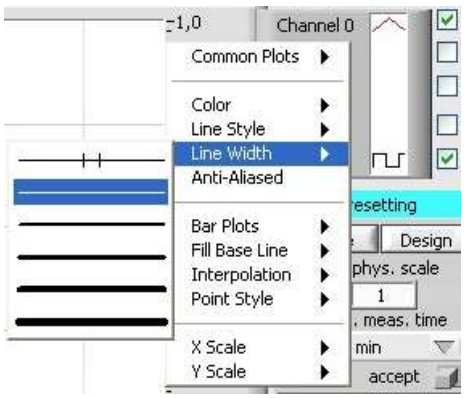
Pop up for the proportional valve

Note

Please note that the length of the text must not exceed about 54 signs. If the text is longer it will be cut off. Mulitline popup´s can be created with a spacer “#”.

3.7
Graph adjustment

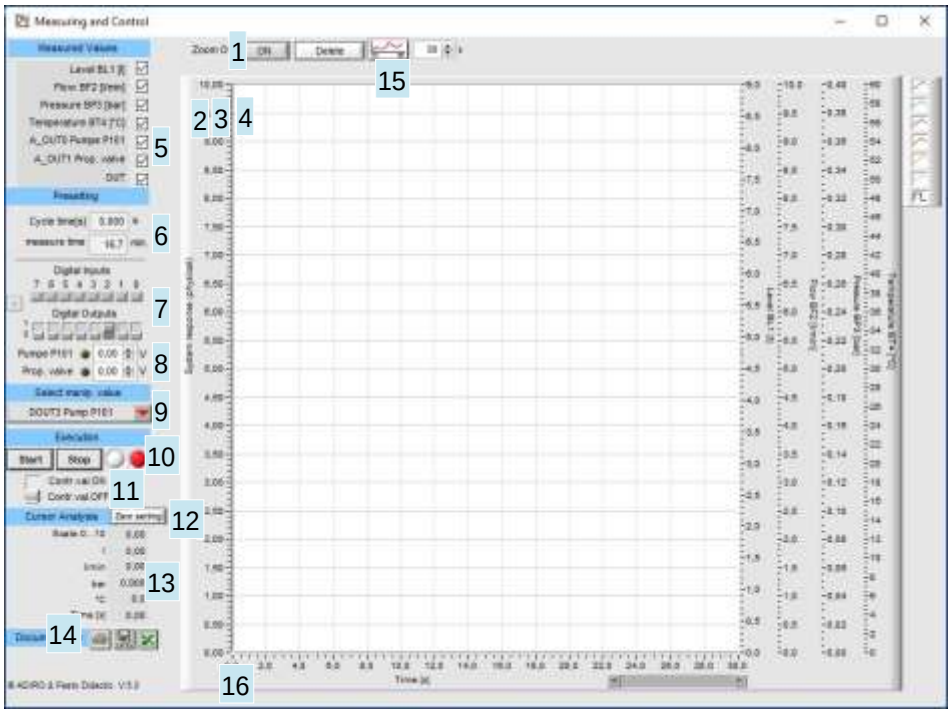
The colors, line styles, line width etc. of the single graphs in the diagram can be modified. To do this, position the mouse cursor on the displayed line and press the left mouse button. A submenu for setting will be opened.
The line with can be adjusted centrally in the "Setup” menu.



Graph adjustment

3.8 Measuring and Control

The Measuring and Control window is to analyze your actual system and to control every single element of it.
The "Measuring and Control" –function can be selected at the main window.



Measuring and Control window

Note

This function is only available when used in combination with an EasyPort. In the simulation mode this function is disabled.

Number	Function
1	Switch on diagram zoom
2	Switch off diagram zoom
3	Select zoom zone
4	Switch courser to basic form
5	Select signals and colouor of the curves
6	Select cycle time (min. 40ms or higher)
7	Digital input and outputs
8	Pull-down menu fort he manipulated value, can be switched ON/OFF by the button ''control value ON/OFF''
9	Analogue outputs 0 ... 10V
10	Start/Stop reading of the values
11	control value ON/OFF
12	Reset cursor to the left upper corner of the graph
13	Cursor analysis fort he recorded curves
14	Print window (screenshot) Save window (screenshot) as JPG Save values to ASCII file
15	Auto scaling ON/OFF - input field for measure periode for recorder mode - switch over button for Auto Scaling or Recorder mode
16	Start postion of curser

Table of available functions to measure and control window

3.8.1 Example of how to measure a system response

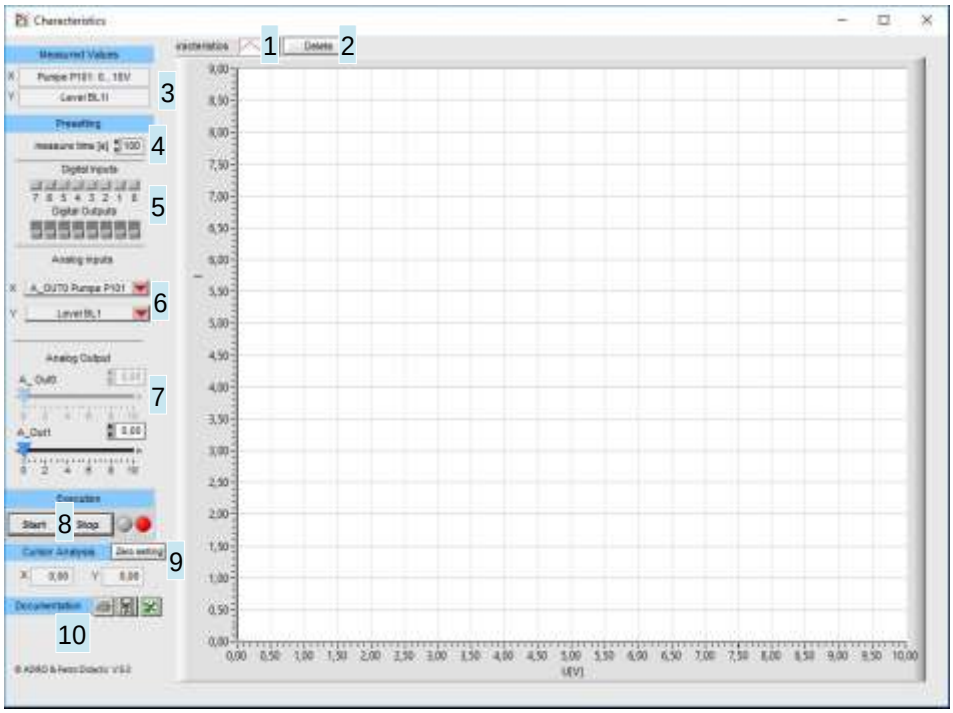
This example describes how to measure a system response of the flow rate system for working with Compact-Workstation.
The window is layouted to be able to work in the easiest way possible. Just start at the top of the tool bar at the left side of the window and move down step by step. After completion do your measurement and solve the exercise.

1. Choose the analog input channel to display at the graph. (To work with the flow rate sensor choose channel 1)
2. Presetting: Click the "delete"-button to delete an old measurement. It is recommended to do this step before every new measurement exercise.
3. Choose the digital outputs.
   Flow rate system: Ensure output bit 2 is disabled (digital control of the pump)
4. Set manipulated value to „DOUT3 pump"
5. Press the "start"-button to start the measurement. After that it will change to a "stop"-button with which you will have to stop the measurement again before proceeding.
6. Stellgröße ein- und ausschalten um ein Signal auf die Pumpe zu geben.
7. Use the "Cursor analysis" for analyzing the system response.
8. Documentation: Save the window as a picture (JPG-file) on your system or print it to a connected printer.

3.9 Characteristics

Characteristic curves can be mearued in this menu.

- flow rate of the pump for the voltage 0 ... 10V and 10V ... 0V
- pressure rate of the pump for the voltage 0 ... 10V and 10V ... 0V
- coherence between flow rate and pressure for a specific voltage



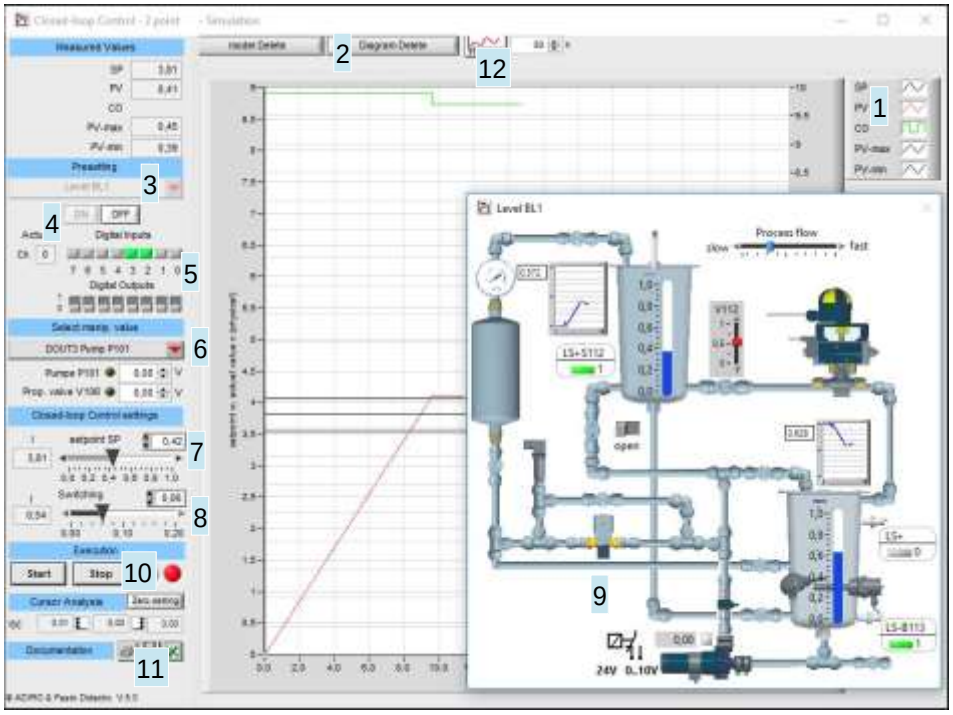
Window Characteristics

Number	Function
1	Curve
2	Clear diagram
3	Display of the x/y signals
4	Setting of the experiment time [s]
5	Display digital inputs and control digital outputs
6	Select analogue signals x/y
7	Display and control the analogue outputs
8	Start/Stopp experiment
9	Cursor analysis
10	Print window (screenshot) Save window (screenshot) as JPG Save values to ASCII file

Table of available functions in characteristic window

3.10 Closed loop – 2 point

With the “Closed loop – 2 point”-function you are able to realize a closed loop 2- point control for example for the level system.



Closed loop – 2 point control window in simulation mode

Procedure using Simulation

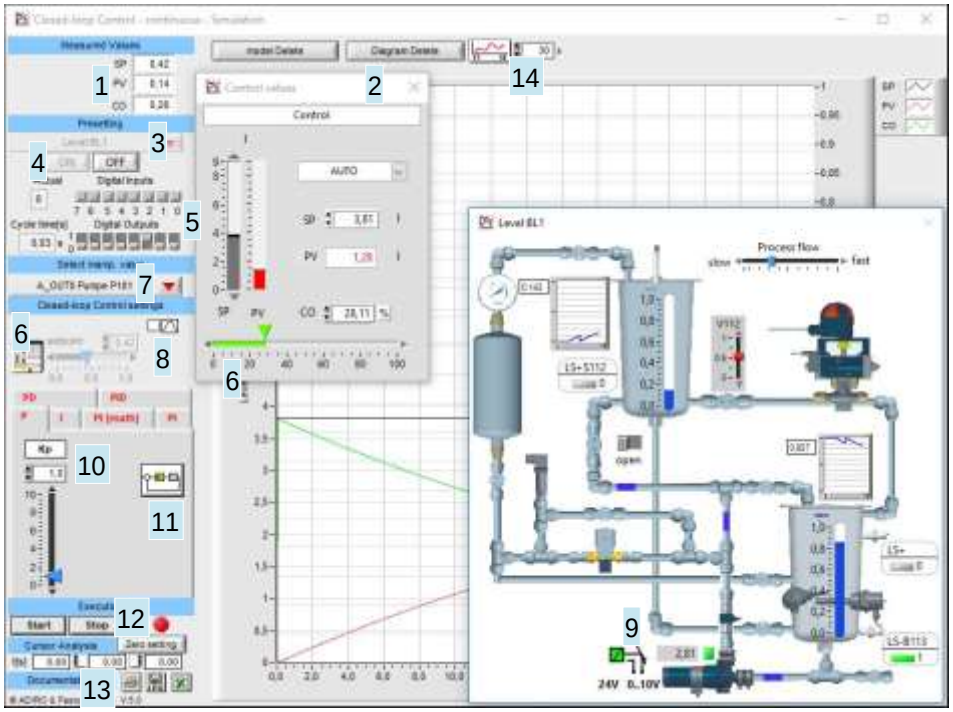
- Select control system (3)
- diagram and settings are set automatically
- Set controller’s parameters (6)
  - Set point (7) and switching difference (8).
- For simulation additionally: select simulation switch ON(3)
- Start the closed loop control with the “Start”-button(10).
- Stop the closed loop control with the “Stop”-button(10)
- Documentation(13)

Nummer	Funktion
1	Curve
2	Clear diagram and model or open a bmp file
3	Select control system
4	Switch ON/OFF simulation window (only accessible if using Simulation mode)
5	Digital inputs
6	Select manipulated output
7	Setting set point value SP
8	Setting of switching distance
9	Simulation window of the system
10	Start/Stopp experiment
11	Print window (screenshot) Save window (screenshot) as JPG Save values to ASCII file
12	Auto scaling ON/OFF - input field for measure periode for recorder mode - switch over button for Auto Scaling or Recorder mode

Table of available functions in closed loop 2 point control window

3.11 Continuous loop control

With the “Closed loop – continuous”-function you are able to realize a continuous closed loop control for example the pressure system.



Window of closed loop control (continuous) of the level system in simulation mode

Procedure using Simulation

- Select control system (3)
- For simulation additionally: select switch ON (4)
- Choose the controller you prefer and set its parameters (10).
- Start the closed loop control with the “Start”-button (12).
  - Watch and work with the closed loop control.
- Stop the closed loop control with the “Stop”-button (12)
- Documentation (13)

Number	Function
1	Curve
2	Clear diagram or open a bmp file
3	Select Closed-Loop
4	Switch ON/OFF simulation window (only accessible if using Simulation mode)
5	Settings for process value will be automatically selected
6	Setting setpoint
7	Select manipulated output
8	Setting set point value SP
9	Simulation window of the system (only accessible if using Simulation mode)
10	Setting of controller type and parameters P P-controller, adjustable proportional gain Kp I I-controller, adjustable integral time TI PI[math] PI-controller, mathematical controller in parallel structur adjustable proportional gain Kp und integral time TI PI PI-controller, technical controller in series structur, DIN EN 60027-6 adjustable proportional gain Kp and reset time Ti PD PD-controller, technical controller, series structur, DIN EN 60027-6 adjustable proportional gain Kp, derivative time Td and control ouput y0 at working point if e=0 PID PID-controller, technical controller, series structur, DIN EN 60027-6 adjustable proportional gain Kp, reset time Ti and derivative time Td
11	Open controller block function diagram
12	Start/Stopp experiment
13	Documentation (only when execution stopped): - cursor analysis - Print window (screenshot) - Save window (screenshot) as JPG - Save values to ASCII file
14	Auto scaling ON/OFF - input field for measure periode for recorder mode - switch over button for Auto Scaling or Recorder mode

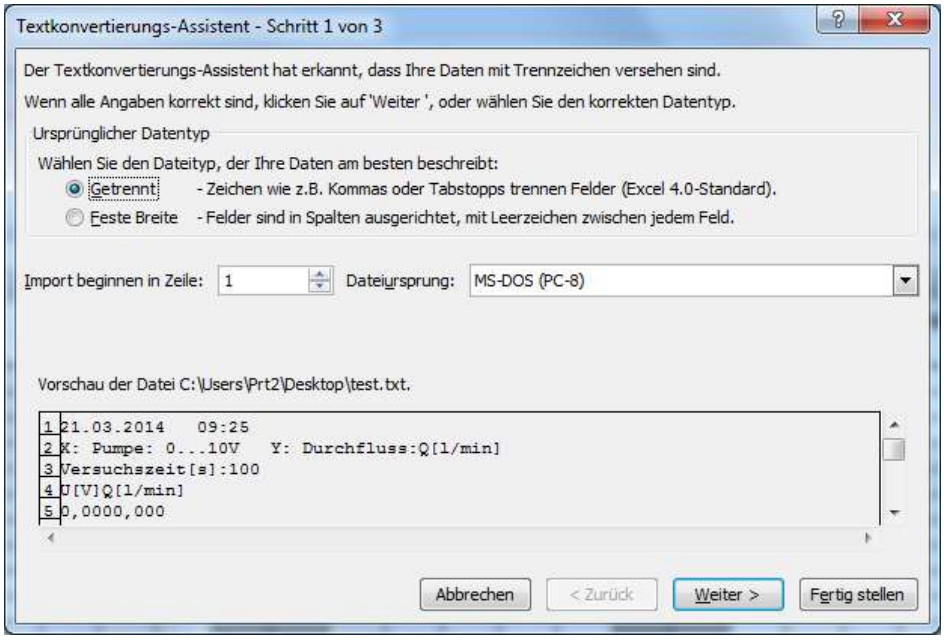
Table of available functions in closed loop control window

3.12 Saving results as ASCII files

In all 4 menues the measured values of the data logging can be save into an ASCII file. This file can be imported in Microsoft© Excel e.g. for further documentation or calculations.

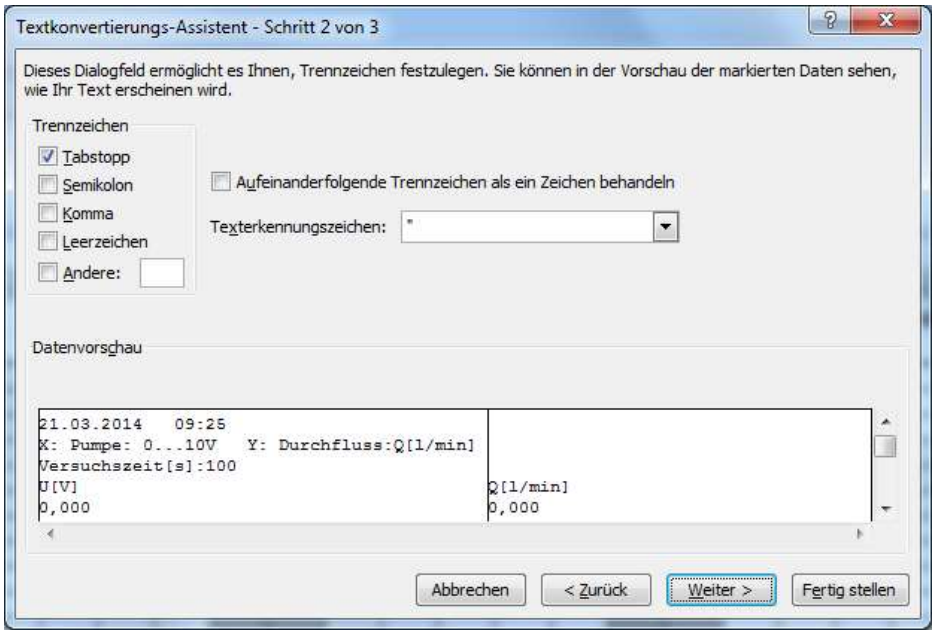
Example how to import the data file into Microsoft© Excel:

1. Record the measuring
2. Click the button „ASCII“(13) to save the values to a file
3. Open Mircosoft© Excel
4. Open the saved file
   Menu “File” → Open - change the file filter to “all files (*.*)
5. Follow the convert assistant as shown below



Microsoft© Excel convert-assistant, Step 1 of 3

Options to choose at Step 1 of 3:
Original file type: separated
Click on „Next ⇢“

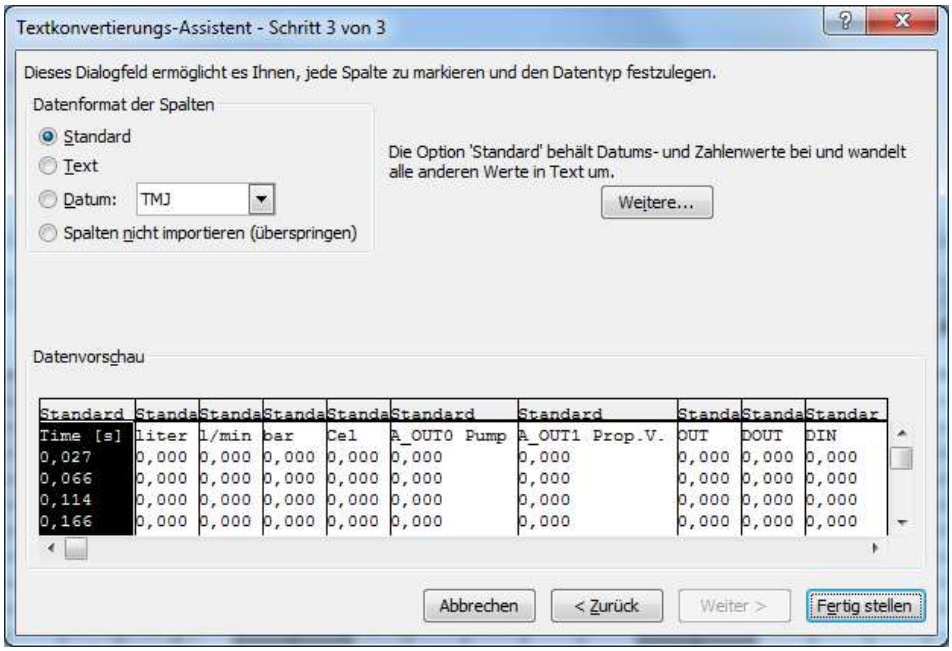


Microsoft© Excel convert-assistant, Step 2 of 3

Options to choose at Step 2 of 3:

Use successive separators as one sign
Separator: tabulator
blank
Sign to identify text: “

Click on „Next ⇢“



Microsoft© Excel convert-assistant, Step 3 of 3

Options to choose at Step 3 of 3:

Data format of columns: Standard

Click on „finish“

The data will now be imported into Excel.

4 Trouble shooting

4.1 Easyport

Questions: No measured values appear?

- Check whether voltage is applied to the system
- Check whether all cables are properly connected.
- Check the connection status. The green status LED indicates two states:
  - Flashing at a frequency of 1 Hz: Status immediately after start-up, the EasyPort USB module has not yet started communicating.
  - Pulsating flashing: The EasyPort USB module has been addressed. The address is indicated every 2 seconds by a series of briefly flashing light signals.
- Terminate software which could also be connected to the Easyport.
- Check the address of the Easyport and in the settings of the software setup.

4.2 User interface

Questions: My measured values are wrong?

If the values do not correspond with the physical quantities, then factor and offset must be set in the setup window (spanner icon).

Questions: FluidLab® PA closed-loop does not start?

LabVIEW Runtime environment is not installed, please install.

Questions: My window resolution seems too small?

The software is set to 1042 x 7680 pixels or higher. Please set your window to this resolution in Windows©.

Questions: My measured values appear, but there are no lines in the diagram?

Check the minimum and maximum scale values. You may have to set them to the momentary measured values.

Check the colors of the characteristic curves (white on white?)

Questions: My measured values exhibit extreme oscillation?

Change the default for damping of the signals in the setup window.

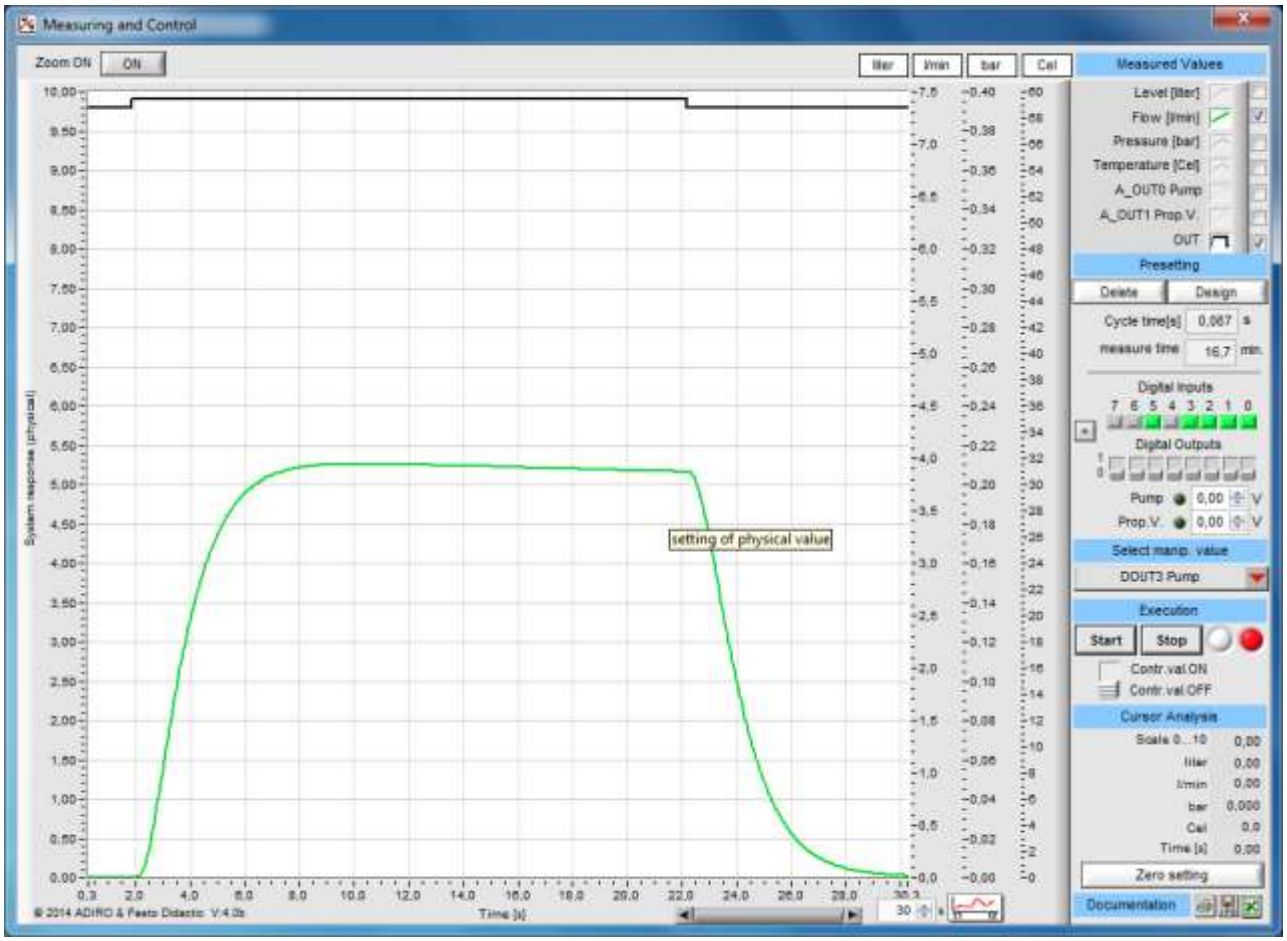
For online support please contact our Competence Center for Process Automation:
info@adiro.com

More FAQ are available at:
https://www.adiro.com/en/service/faq/faq-fluidlab-pa.php

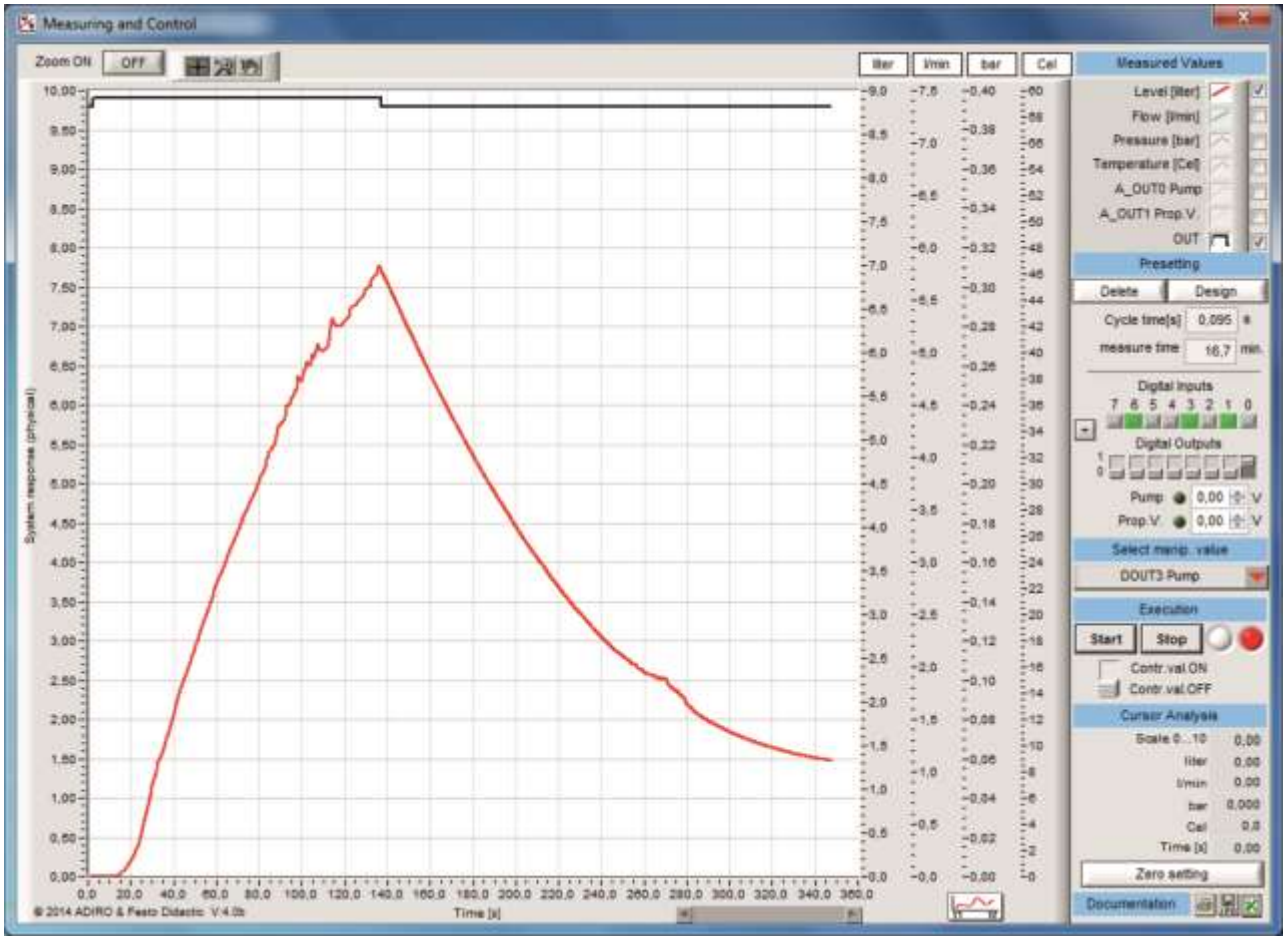
5 Appendix

5.1 Examples for system responses

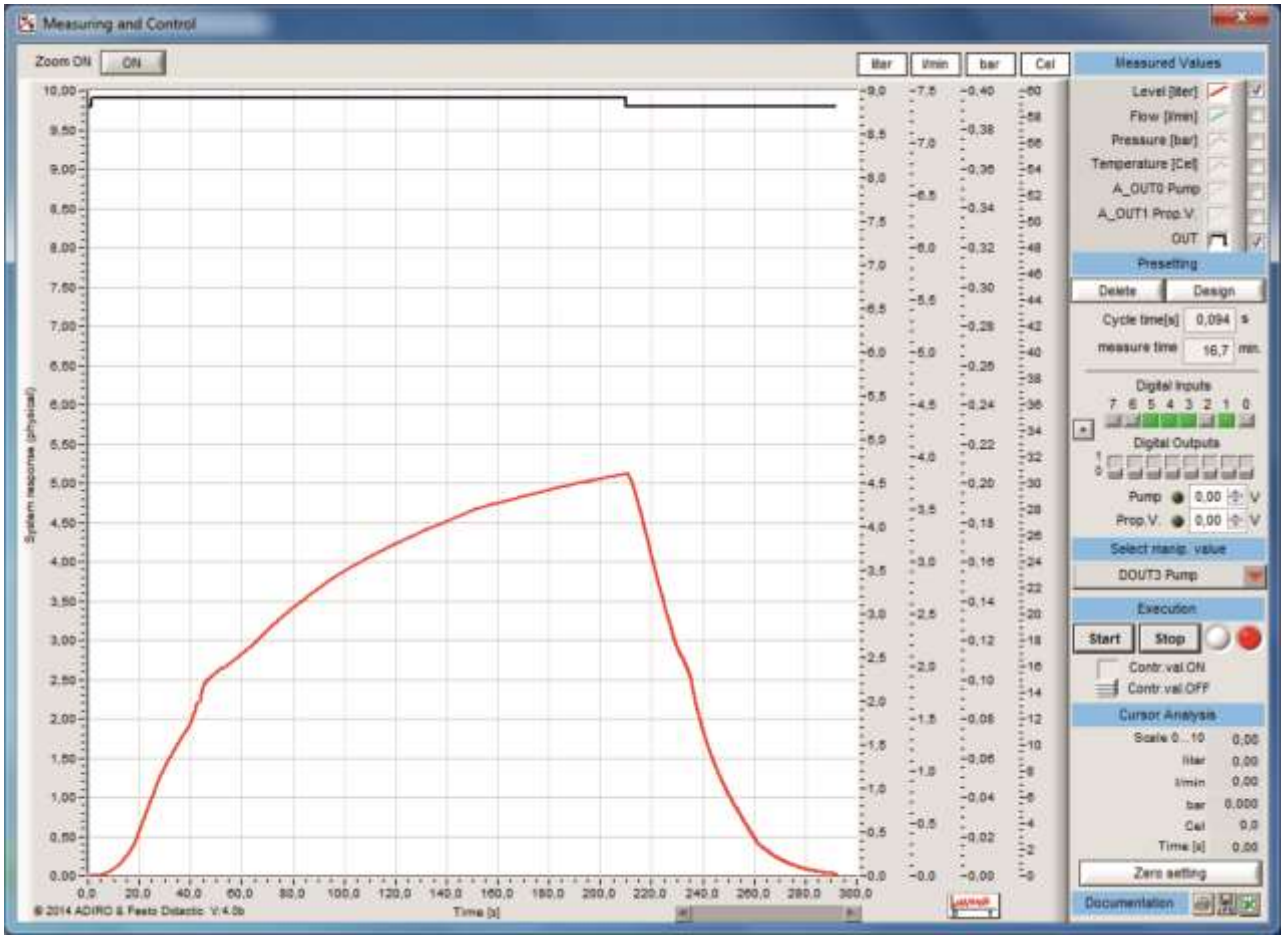
See screen shots below for detailed information of how to measure system responses with FluidLab PA® closed-loop. All results shown refer to the work with PCS Compact-Workstation.



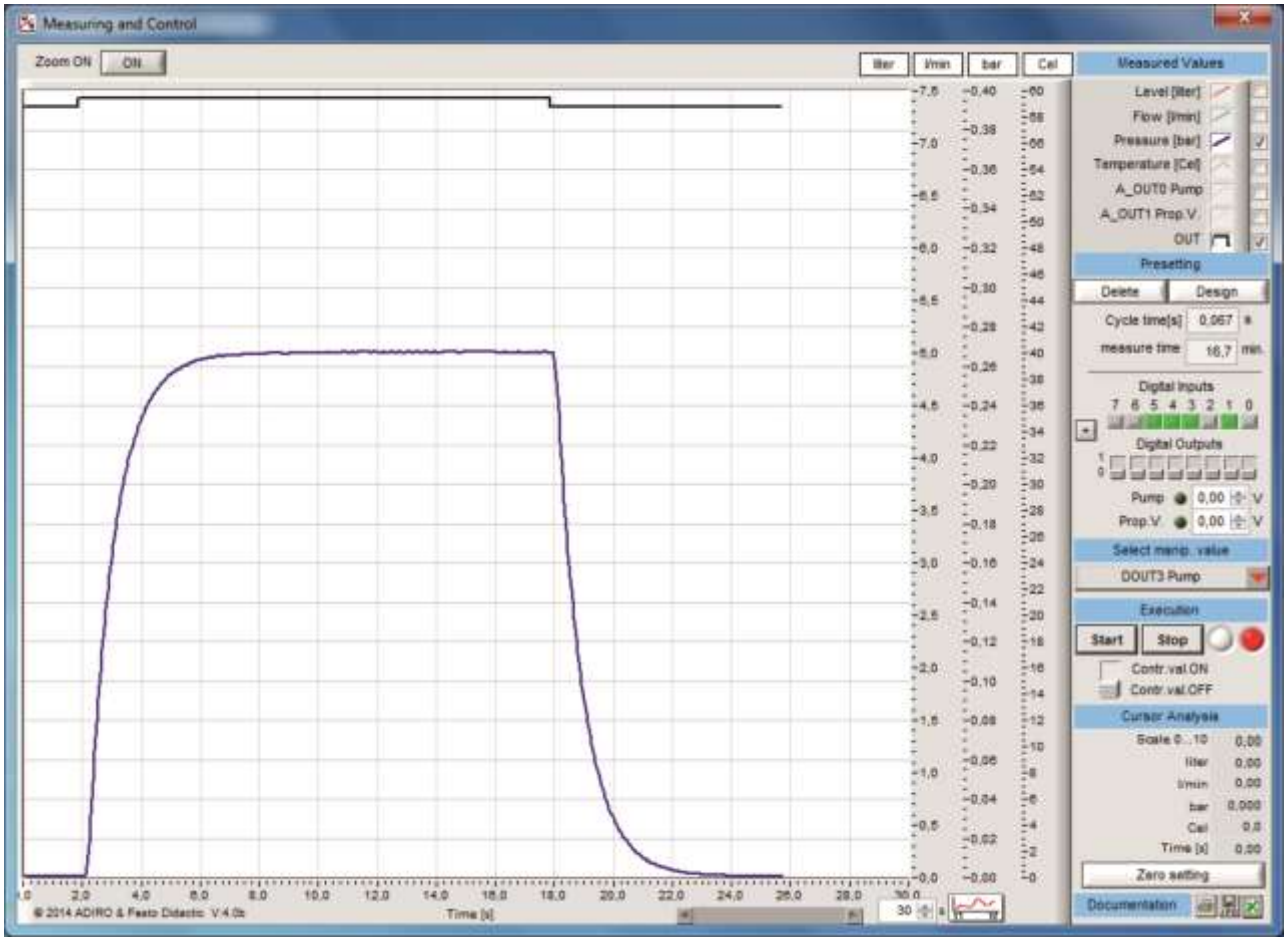
System response flow rate system



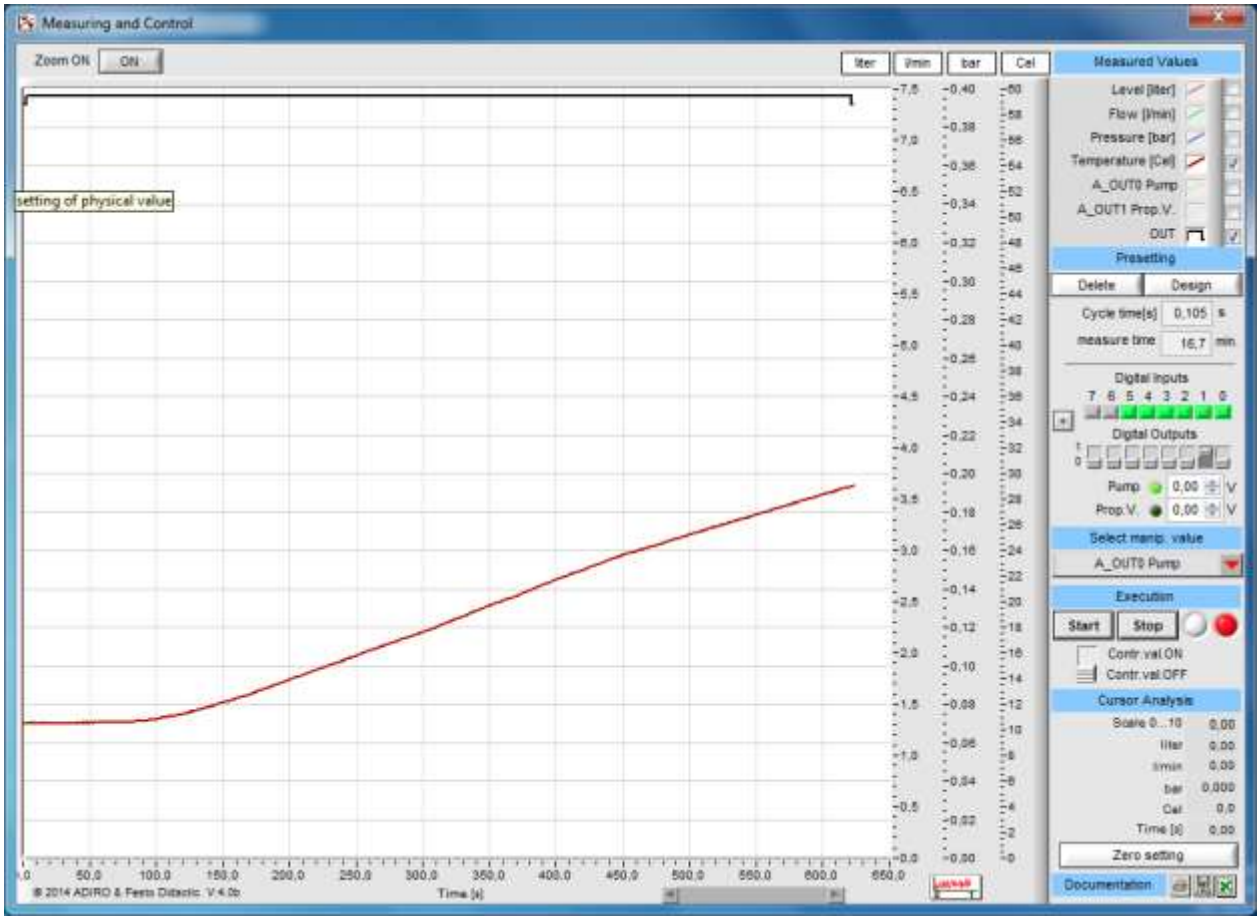
System response level system without compensation



System response of level system with compensation



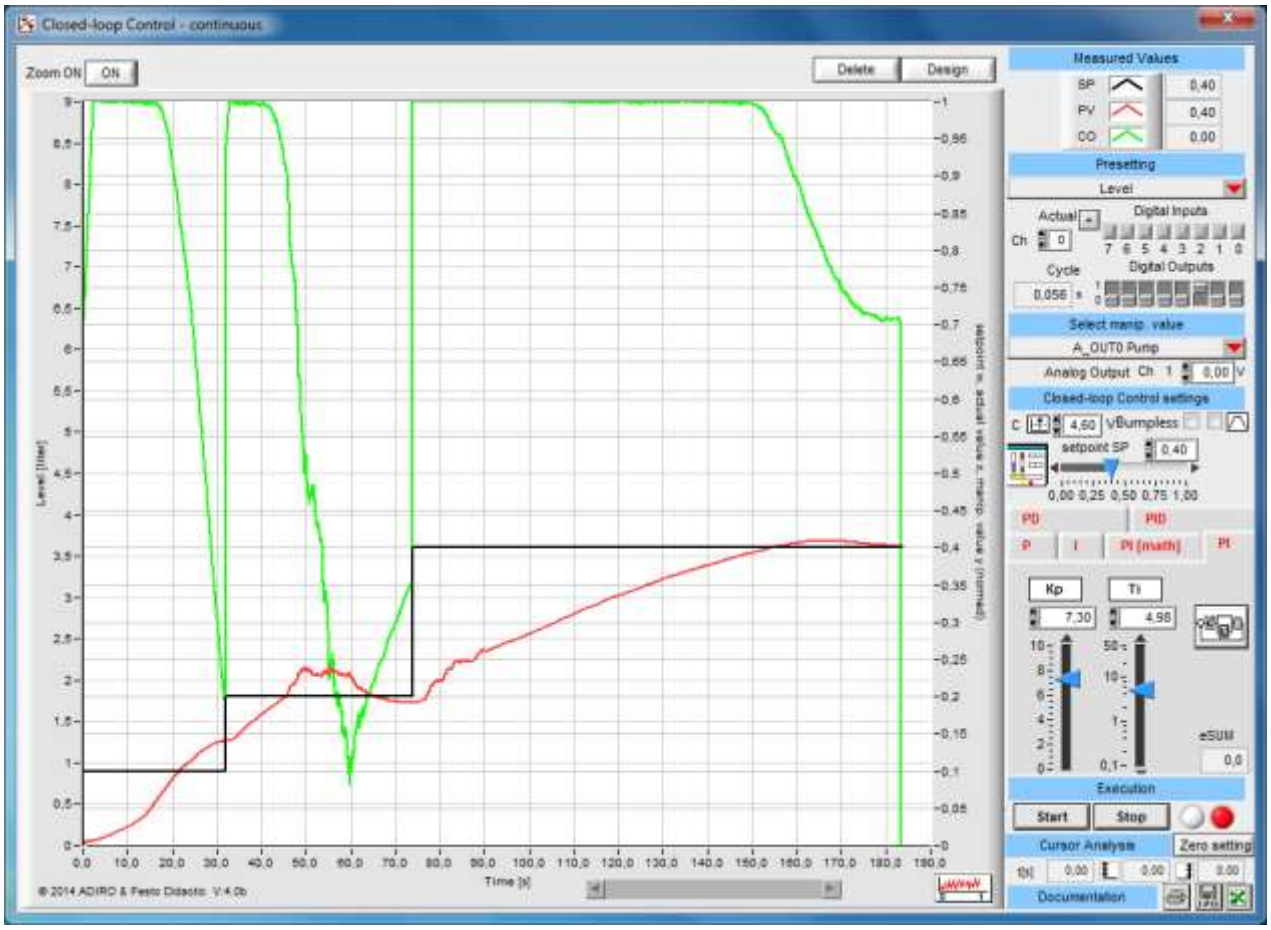
System response pressure system



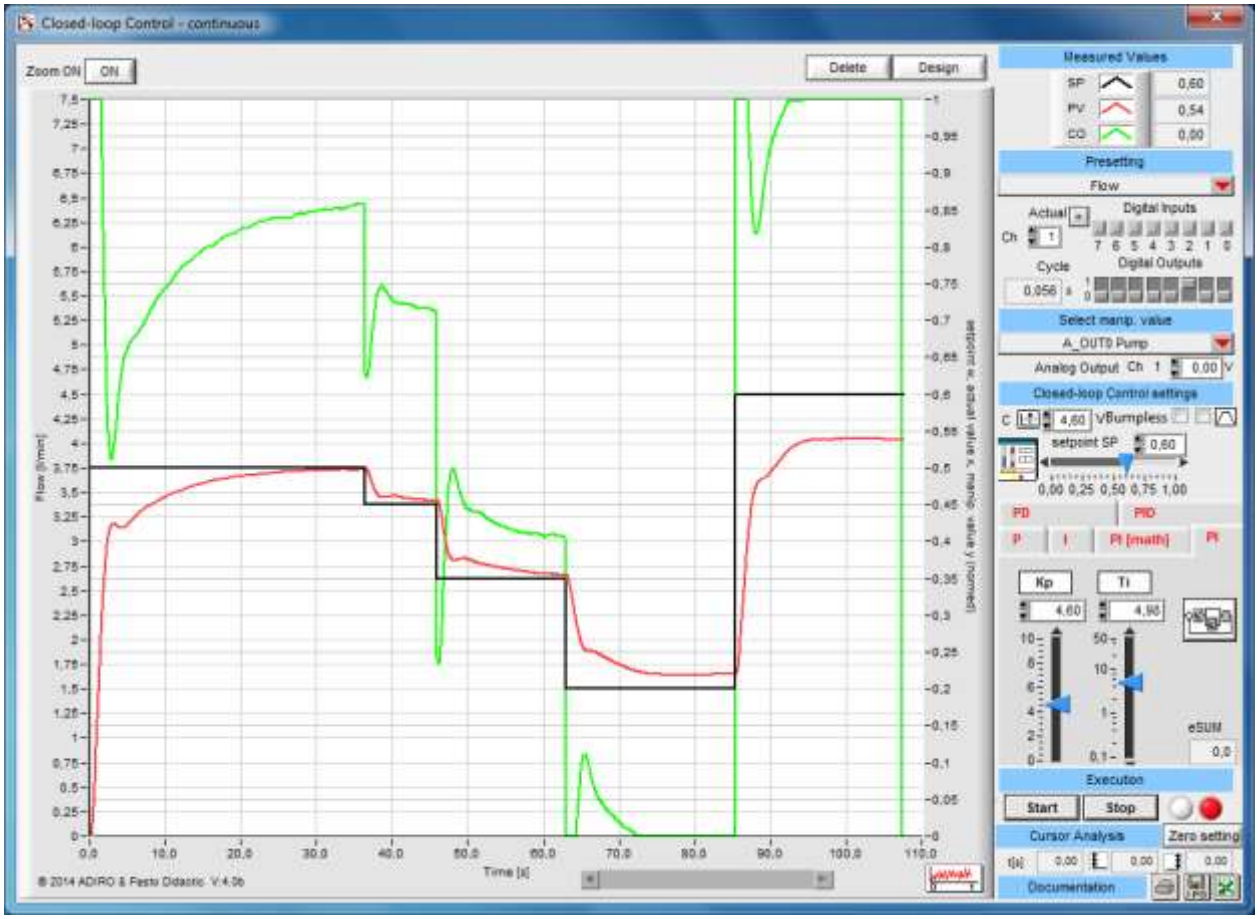
System response of temperature system

5.2 Examples for closed loop controls

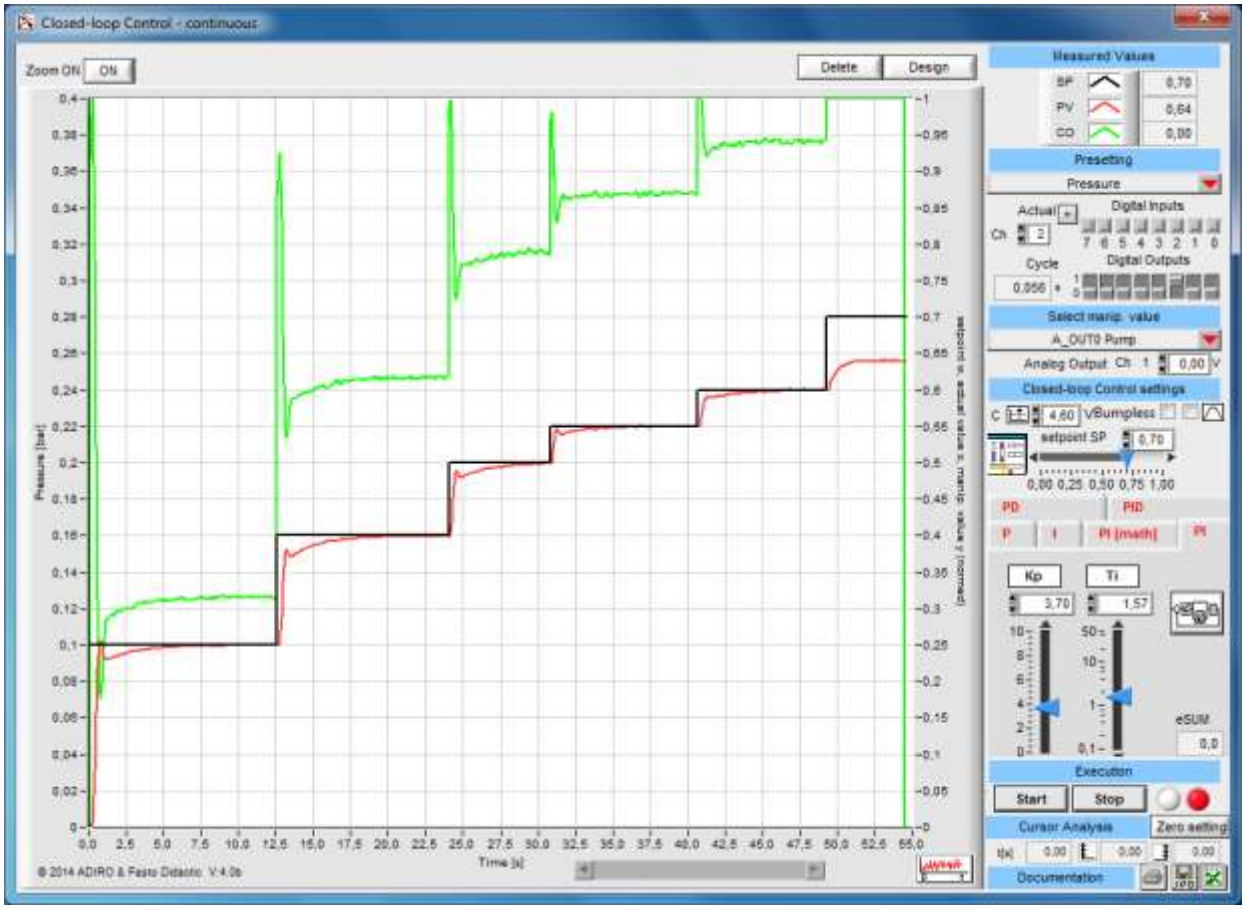
See screen shots below for detailed information of how to run closed loop controls with FluidLab® PA closed-loop. All results shown refer to the work with the MPS PA Compact-Workstation.



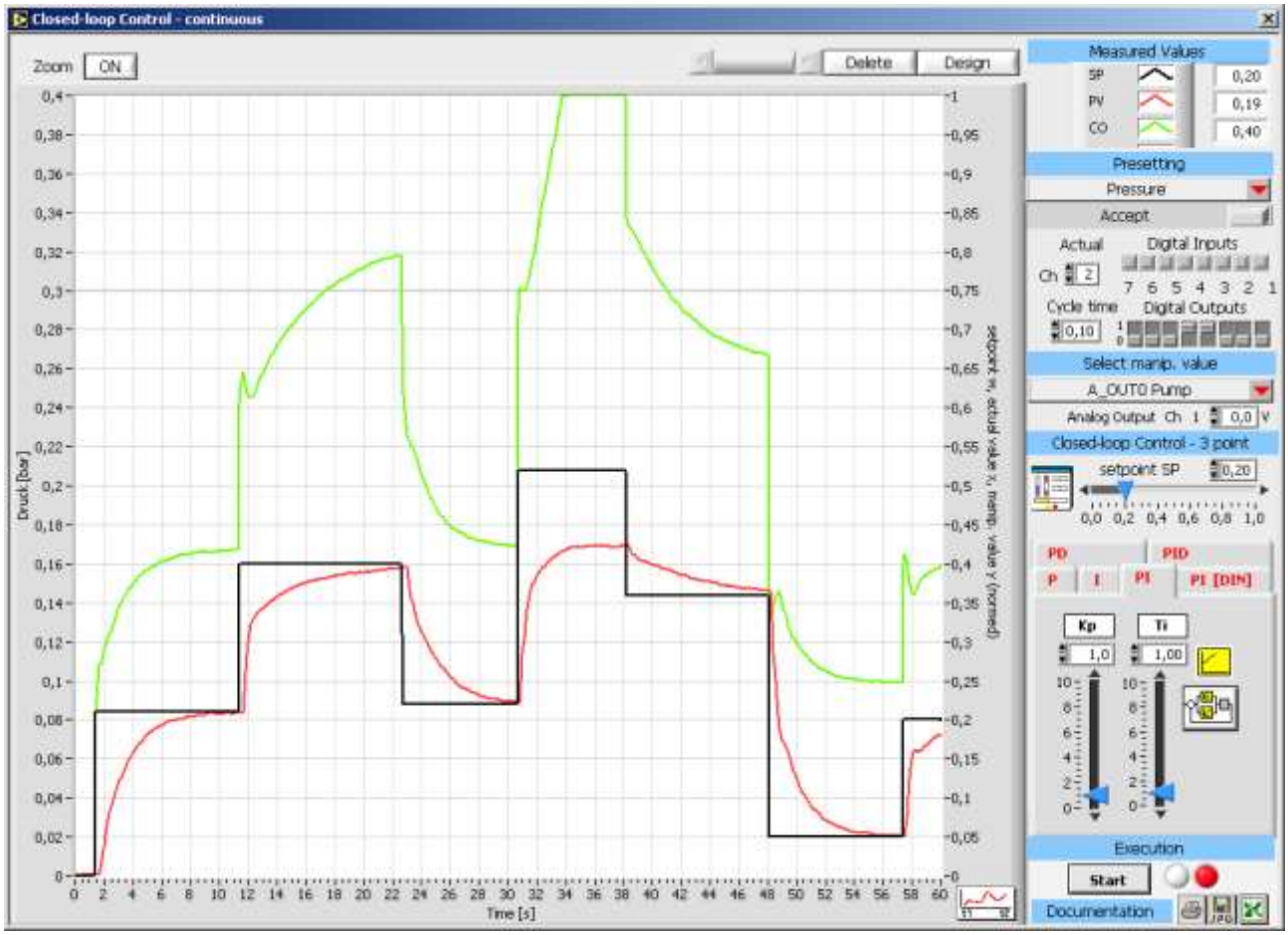
Closed loop control of level system



Closed loop control of flow rate system with disturbances



Closed loop control of pressure system via pump



Closed loop control of pressure system via proportional valve

5.3 Controller parameters

The following table shows examples for controller parameters for the work with MPS-PA Compact-Workstation.

Controller	Level	Flow rate pump	Flow rate prop. valve	Pressure pump	Pressure prop. valve	Temperature
switching						
2-point	X	-	-	-	-	X
continuous						
P	w = 0,3 K_P = 5,0 w_{max}= 0,6	w = 0,3 K_P = 5,0 w_{max}= 0,55	-	w = 0,5 K_P = 1,5 w_{max}= 1,0	-	-
I	w = 0,3 T_I = 2,0s w_{max}= 0,6	w = 0,3 T_I = 2,0s w_{max}= 0,6				-
PI[math]	w = 0,3 K_P = 5,0 T_I = 5,0s w_{max}= 0,6					-
PI	w = 0,3 K_P = 5,0 T_i = 25,0s w_{max}= 0,6	w = 0,3 K_P = 1,0 T_i = 2,0s w_{max}= 0,6	w = 0,15 K_P = 1,0 T_i = 1,0 w_{max}= 0,3	w = 0,5 K_P = 1,0 T_i = 1,0s w_{max}= 1,0	w = 0,5 K_P = 1,0 T_i = 1,0s w_{max}= 1,0	-
PID				w = 0,5 K_P = 1,0 T_i = 1,0s T_d = 0,1s w_{max}= 1,0 better K_P = 0,6 - no oscillation	w = 0,5 K_P = 0,4 T_i = 3,0s T_d = 1,0s w_{max}= 1,0	-

5.4 I/O assignment list Worksheet

Symbol	PIN assignment	EasyPort/Simbox address	PLC address	Descritption
Binary inputs (XMA1)				
	I 0	I 0	%I0.0	
	I 1	I 1	%I0.1	
	I 2	I 2	%I0.2	
	I 3	I 3	%I0.3	
	I 4	I 4	%I0.4	
	I 5	I 5	%I0.5	
	I 6	I 6	%I0.6	
	I 7	I 7	%I0.7	
Binary outputs (XMA1)				
	O 0	Q 0	%Q0.0	
	O 1	Q 1	%Q0.1	
	O 2	Q 2	%Q0.2	
	O 3	Q 3	%Q0.3	
	O 4	Q 4	%Q0.4	
	O 5	Q 5	%Q0.5	
	O 6	Q 6	%Q0.6	
	O 7	Q 7	%Q0.7	
Analogue inputs (X2) – AI = analog input channel				
	UE1	AI 0	(P)IW256	
	UE2	AI 1	(P)IW258	
	UE3	AI 2	(P)IW260	
	UE4	AI 3	(P)IW262	
Analogue outputs (X2) – AO = analog output channel				
	UA1	AQ 0	(P)QW256	
	UA2	AQ 1	(P)QW258	