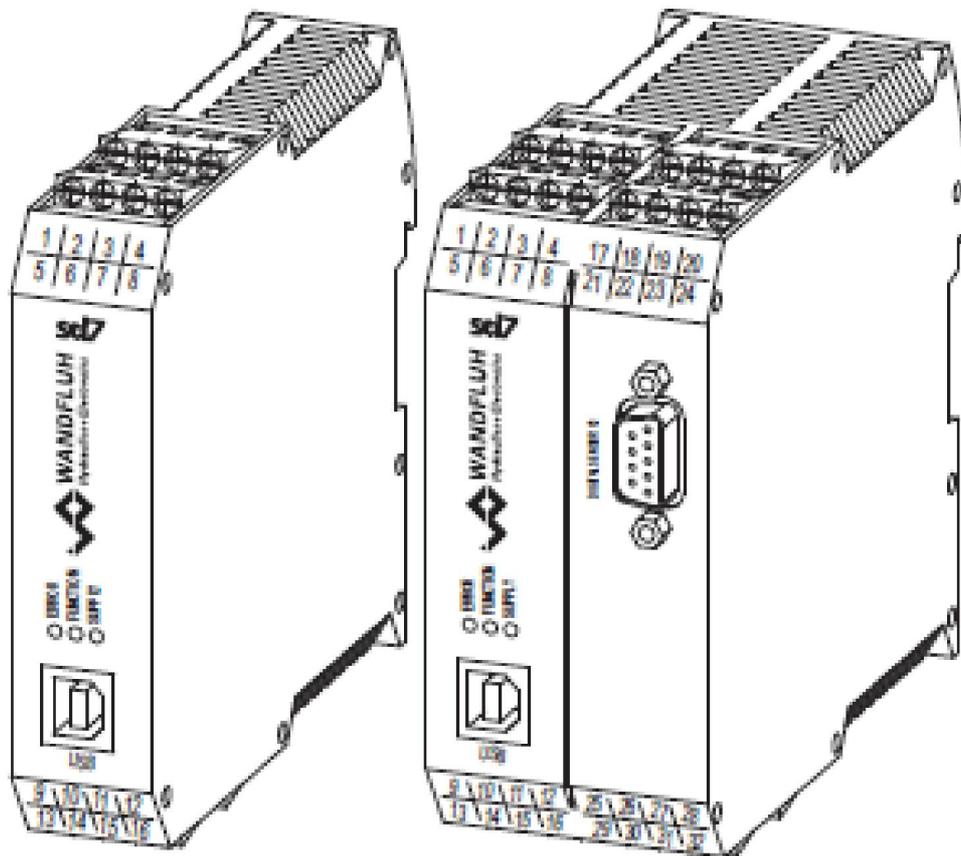


OPERATING INSTRUCTIONS

CONTROLLER MODULE SD7



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1 General information

This operating instructions makes it possible to use the SD7-Electronics safely and according to specification. The operating instructions includes instructions which Wandfluh as the manufacturer, or its resale organisations (Wandfluh sister companies or distributors), provide to users within their duty to instruct.

For this purpose, the operating instructions mainly includes:

- information about use according to specification, installation and commissioning of the SD7-Electronics
- information about safety in dealing with control.

2 Product description

2.1 General

The SD7-Electronics is integrated in a case for top-hat rail fastening. The connections are provided by terminal screw blocks.

2.2 Field of application

The field of application of the SD6-Electronics is situated in the industrial field.

2.3 Conformity

The SD7-Electronics have been developed and tested in accordance with the latest technical standards. Applied in particular was the EU Guideline 2004/108/EG (EMC Guideline).

2.4 Labeling of the product

With the PC parameterisation software PASO SD7, the following information can be directly read-off the SD7-Electronics (= electronic type code):

- Part number
- Serial number
- Software version
- Firmware version
- Card type
- Device configuration

2.5 Type code

TYPE CODE

| | | S | D7 | 3 | | 2 | | - | # | |
|---|--|---|----|--------------------------|--|--------------------------|--|---|---|--------------------------|
| Module for electrical control cubicle | | | | | | | | | | |
| Digital | | | | | | | | | | |
| Adjustable with PASO | | | | | | | | | | |
| Software configuration (function of card): | | | | | | | | | | |
| • Basic controller | | | | <input type="checkbox"/> | | | | | | |
| • Enhanced controller | | | | <input type="checkbox"/> | | | | | | |
| 2-solenoid version | | | | | | | | | | |
| Supply voltage: | | | | | | | | | | |
| 24 VDC | | | | <input type="checkbox"/> | | | | | | |
| 12 VDC | | | | <input type="checkbox"/> | | | | | | |
| Basic controller: | | | | | | | | | | |
| • Analogue input 1: voltage | | | | | | <input type="checkbox"/> | | | | |
| 2: current | | | | | | | | | | |
| • Analogue input 1 and 2: both voltage | | | | | | <input type="checkbox"/> | | | | |
| • Analogue input 1 and 2: both current | | | | | | <input type="checkbox"/> | | | | |
| Analogue input 3: always current (only with HART) | | | | | | | | | | |
| Enhanced controller: | | | | | | | | | | |
| • Analogue input 1 and 3: both voltage | | | | | | <input type="checkbox"/> | | | | |
| Analogue input 2 and 4: both current | | | | | | | | | | |
| • Analogue input 1 to 4: all voltage | | | | | | <input type="checkbox"/> | | | | |
| • Analogue input 1 to 4: all current | | | | | | <input type="checkbox"/> | | | | |
| • Analogue input 1 and 2: both voltage | | | | | | <input type="checkbox"/> | | | | |
| Analogue input 3 and 4: both current | | | | | | | | | | |
| • Analogue input 1 and 2: both current | | | | | | <input type="checkbox"/> | | | | |
| Analogue input 3 and 4: both voltage | | | | | | | | | | |
| Basic controller without HART | | | | | | | | | | |
| • Analogue input 1 and 2: 10-Bit resolution | | | | | | | | | | <input type="checkbox"/> |
| Basic controller with HART | | | | | | | | | | |
| • Analogue input 1 and 2: 10-Bit resolution | | | | | | | | | | <input type="checkbox"/> |
| • Analogue input 3: 16-Bit resolution | | | | | | | | | | |
| Enhanced controller | | | | | | | | | | |
| • Analogue input 1 and 2: 10-Bit resolution | | | | | | | | | | <input type="checkbox"/> |
| • Analogue input 3 and 4: 16-Bit resolution | | | | | | | | | | |
| Option field bus: | | | | | | | | | | |
| • without field bus | | | | | | | | | | <input type="checkbox"/> |
| • with Profibus DP | | | | | | | | | | <input type="checkbox"/> |
| • with CANopen | | | | | | | | | | <input type="checkbox"/> |
| • with J1939 | | | | | | | | | | <input type="checkbox"/> |
| • with HART | | | | | | | | | | <input type="checkbox"/> |
| Design-Index (Subject to change) | | | | | | | | | | |

2.6 Technical data

2.6.1 General specifications

| | | |
|-------------------------|---|---------------------|
| Design | Integrated in electronic case for top-hat rail clamping | |
| Dimension | Basic controller: | 105 x 114 x 22.5 mm |
| | Enhanced controller | 105 x 114 x 45 mm |
| Installation | aufschnappbar auf Hutschiene | |
| Weight | Basic controller | 130g |
| | Enhanced controller | 220g |
| | controller with Profibus | 240g |
| Connection | Terminal screw blocks, max dimension 2.5mm ² 1 USB interface (connector type B) | |
| Protection class | IP30 acc. to EN 60 529 | |

2.6.2 Electrical specifications

| | | |
|---|--|--|
| Supply voltage (depending on the type) | 24 VDC or 12 VDC | |
| Voltage range | Supply voltage 24 VDC: | 21 ... 30 VDC |
| | Supply voltage 12 VDC: | 10,5 ... 15 VDC |
| Ripple on supply voltage | < ±5 % | |
| Fuse | Customer must integrate a slow fuse into his electrical system | |
| Temperature drift | < 1% with ΔT = 40°C | |
| No load current | 40 ... 50 mA | |
| Max. solenoid current | 24VDC version | 1.8 A |
| | 12VDC version | 2.3 A |
| | The total solenoid current of simultaneously powered solenoids depends on the ambient temperature (refer to section "Solenoid outputs and ambient temperature" ^{9b}) | |
| Analogue inputs | 2 (Basic version) resp. 4 (Enhanced version) differential inputs Inputs 1 and 2 = 10-Bit resolution Inputs 3 and 4 = 16-Bit resolution All inputs are not galvanically separated | |
| | SD7XXXDX0-AA | Analogue inputs 1: 0...±10VDC Analogue inputs 2: 0...20mA, 4...20mA |
| | SD7XXXDX1-AX | Analogue inputs 1: 0...±10VDC Analogue inputs 2: 0...±10VDC * |
| | SD7XXXDX2-AX | Analogue inputs 1: 0...20mA, 4...20mA Analogue inputs 2: 0...20mA, 4...20mA |
| | SD7XXXDX4-BX | Analogue inputs 1: 0...±10VDC Analogue inputs 2: 0...20mA, 4...20mA Analogue inputs 3: 0...±10VDC Analogue inputs 4: 0...20mA, 4...20mA |
| | SD7XXXDX5-BX | Analogue inputs 1: 0...±10VDC Analogue inputs 2: 0...±10VDC * Analogue inputs 3: 0...±10VDC Analogue inputs 4: 0...±10VDC |
| | SD7XXXDX6-BX | Analogue inputs 1: 0...20mA, 4...20mA Analogue inputs 2: 0...20mA, 4...20mA |

| | |
|---|---|
| Supply voltage (depending on the type) | 24 VDC or 12 VDC |
| | Analogue inputs 3: 0...20mA, 4...20mA Analogue inputs 4: 0...20mA, 4...20mA SD7XXXDX7-BX Analogue inputs 1: 0...±10VDC Analogue inputs 2: 0...±10VDC * Analogue inputs 3: 0...20mA, 4...20mA Analogue inputs 4: 0...20mA, 4...20mA SD7XXXDX8-BX Analogue inputs 1: 0...20mA, 4...20mA Analogue inputs 2: 0...20mA, 4...20mA Analogue inputs 3: 0...±10VDC Analogue inputs 4: 0...±10VDC *) 0...10VDC at SD7 with Profibus |
| Input resistance | Voltage input against ground > 18 kOhm Burden for current input = 250 Ohm |
| Digital inputs | 2 (Basic version) resp. 8 (Enhanced version) inputs high-active Switching threshold high 6 - 30VDC Switching threshold low 0 - 1VDC |
| Serial interface | 1 USB interface (Connector Type B) |
| Stabilised output voltage | Supply voltage 24 VDC: + 10 VDC Supply voltage 12 VDC: + 8 VDC max. load 30 mA |
| Solenoid current | Minimum current I _{min} einstellbar 0 ... 950 mA Maximum current I _{max} einstellbar Supply voltage 24 VDC: I _{min} ... max. 1.8 A Supply voltage 12 VDC: I _{min} ... max. 2.3 A The total solenoid current of simultaneously powered solenoids depends on the ambient temperature (refer to section "Solenoid outputs and ambient temperature" ⁹⁾) |
| Dither | Frequency adjustable 20 ... 250 Hz Level adjustable 0 ... 200 mA |
| Digital outputs | 2 (Basic version) resp. 4 (Enhanced version) outputs Lowside Switch U _{max} 40 VDC I _{max} -0.7 A |
| Analog output (only Enhanced version) | without HART: +/– 10 VDC Output voltage +/– 3 mA max. load with HART: 0 ... 20 mA Output current max. Voltage 12 VDC |
| EMC Immunity Emission | EN 61000-6-2 EN 61000-6-4 |

2.6.3 Environment

| | | |
|---------------------|--------------------------------|--|
| Storage | Packing: | The module must be stored in the original packing |
| | Temperature range: | -25 ... +85° C |
| | Resistance to alkali and acid: | The module must be protected against alkalis and acids |
| In operation | Temperature range: | -20 ... +70° C The total solenoid current of simultaneously powered solenoids depends on the ambient temperature (refer to section " Solenoid outputs and ambient temperature " ⁹⁾) |
| | Resistance to alkali and acid: | The module must be protected against alkalis and acids |

2.6.4 Solenoid outputs and ambient temperature

If only one solenoid output is powered at a time, then there are no restrictions and the single solenoid current may reach the maximum current according to the [Electrical Specifications](#) ⁷⁾ over the whole temperature range.

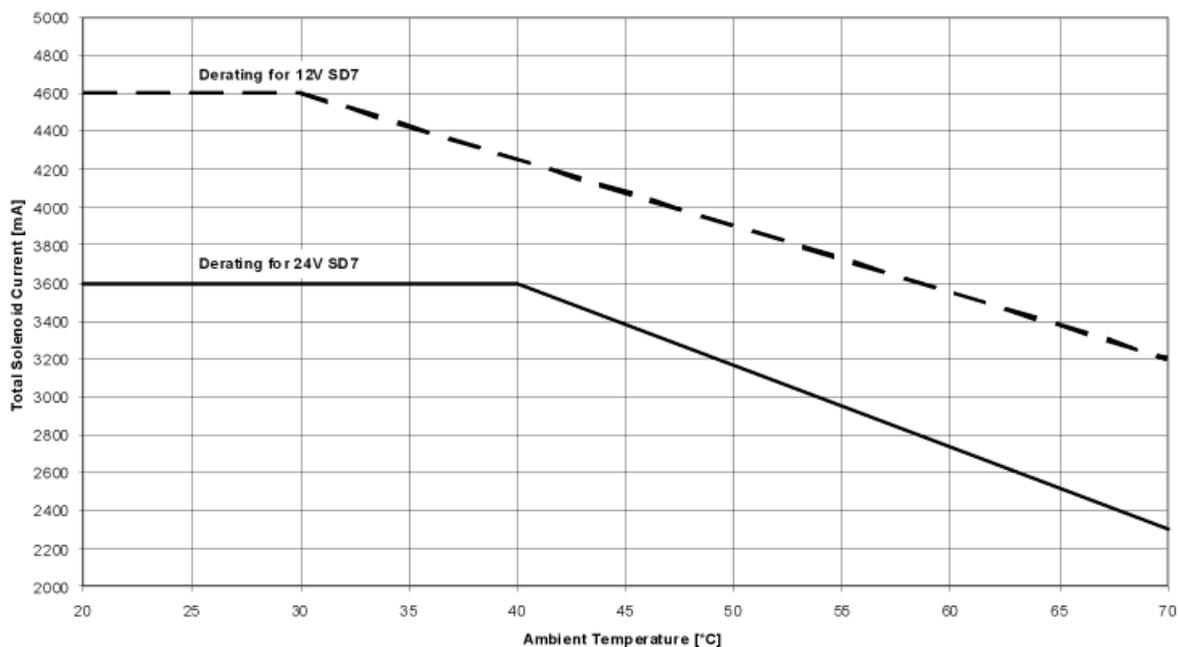
But the total solenoid current of simultaneously powered solenoids depends on the ambient temperature. Exceeding this current limit will trip the overcurrent protection circuit, the SD7 falls into the failure state and blocks all function.

Solenoids can be powered simultaneously, i.e. with two channels with one solenoid each or with inverted solenoid outputs.

If solenoids are powered with more voltage than their nominal voltage and are so over-energized, then at fast switching-on, the overcurrent protection may trip and the SD7 may fall into failure state and block all function.

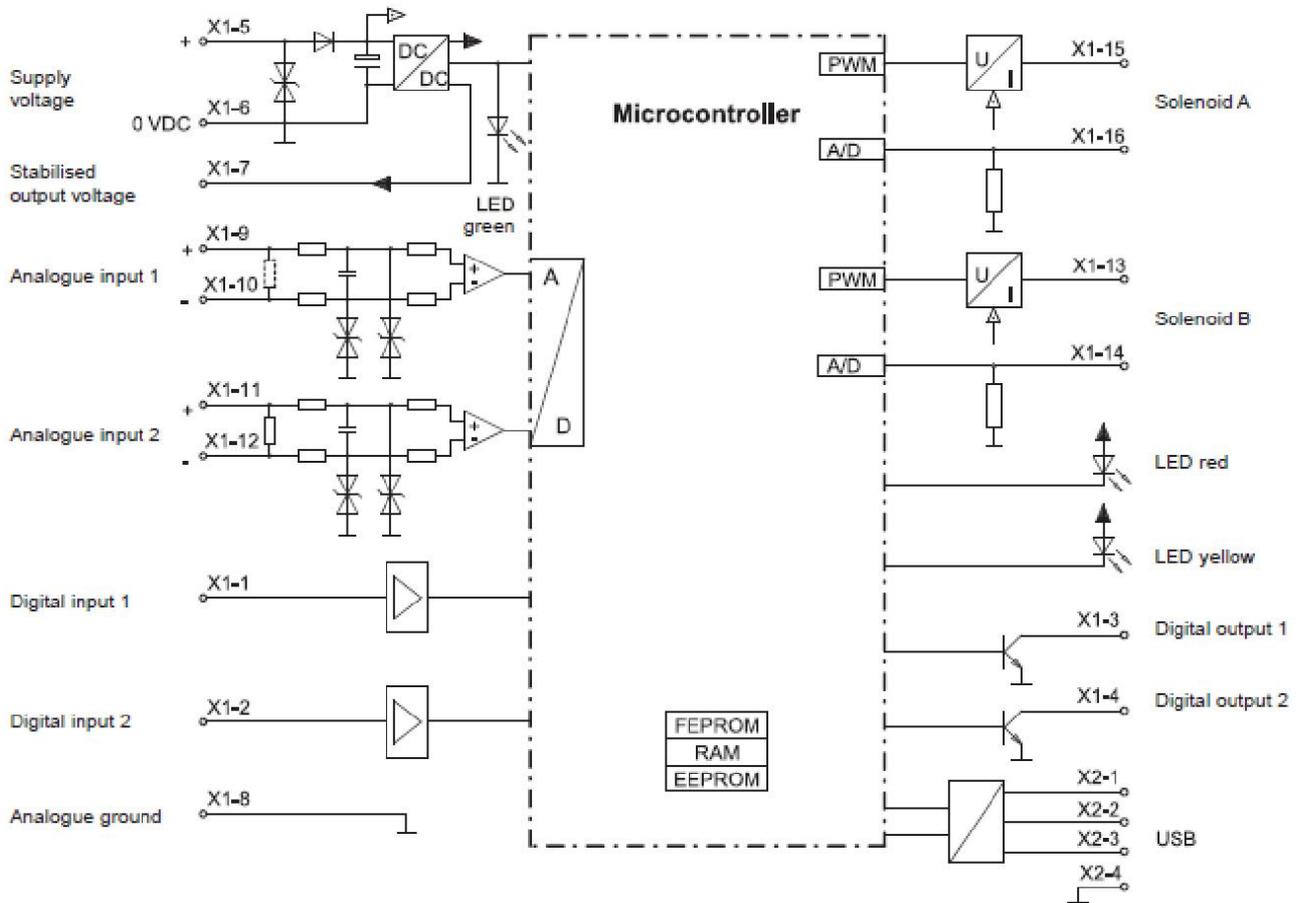
The following graphics shows the maximum allowed total solenoid current over ambient temperature when both solenoids are powered at the same time.

SD7: Derating of Total Solenoid Current when both Solenoid Outputs activated simultaneously

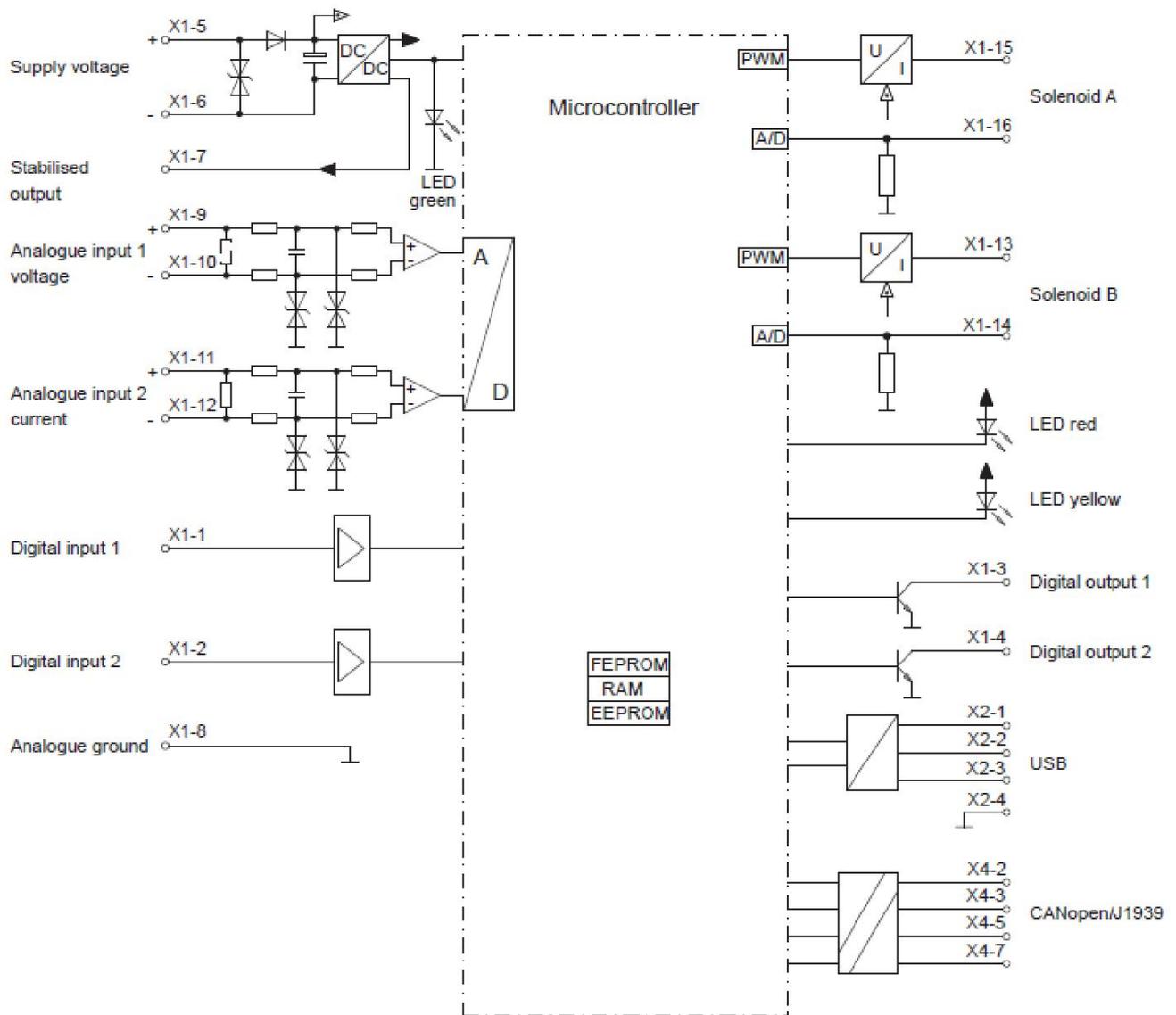


2.7 Block diagram

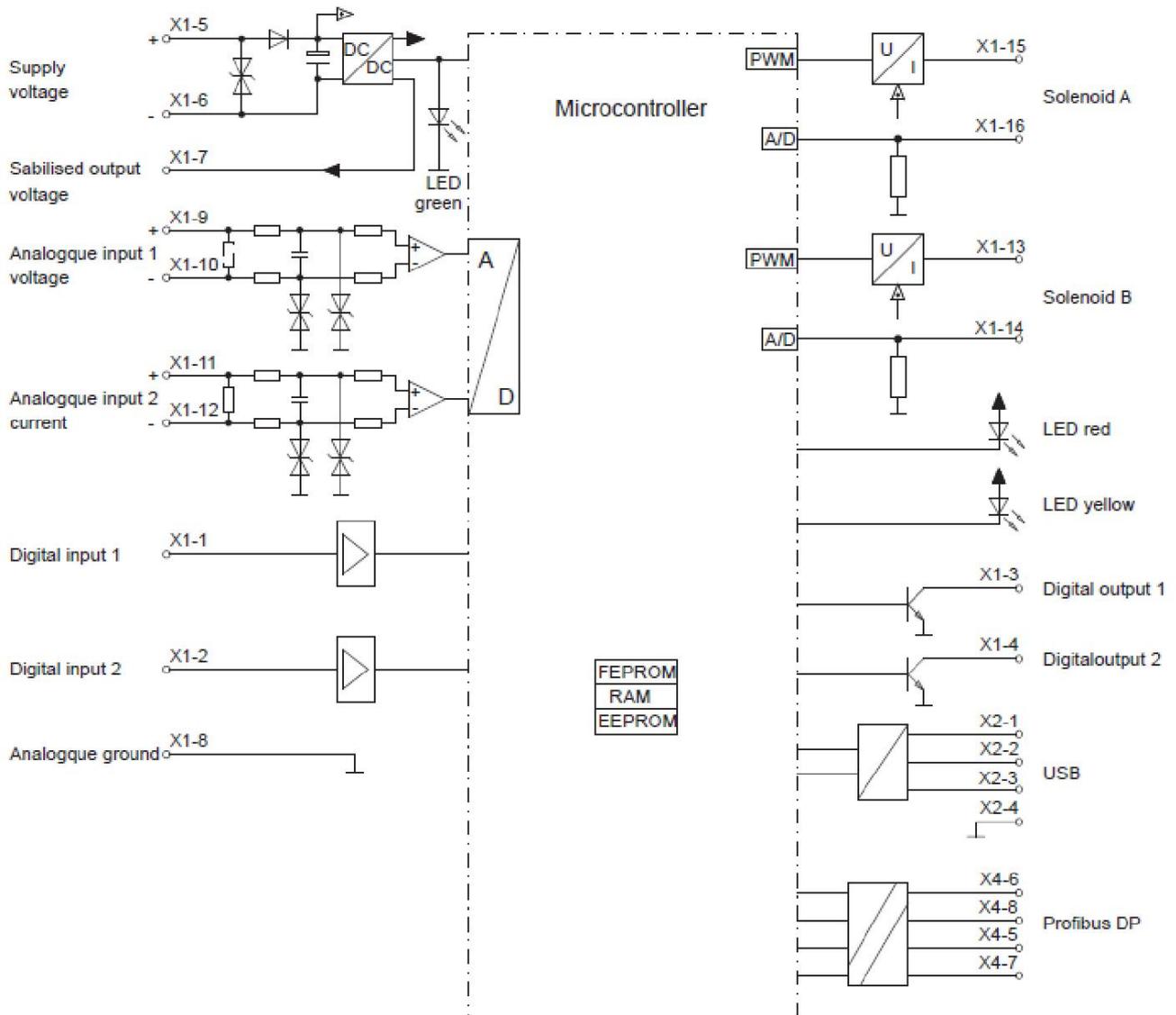
Basic version with analog interface



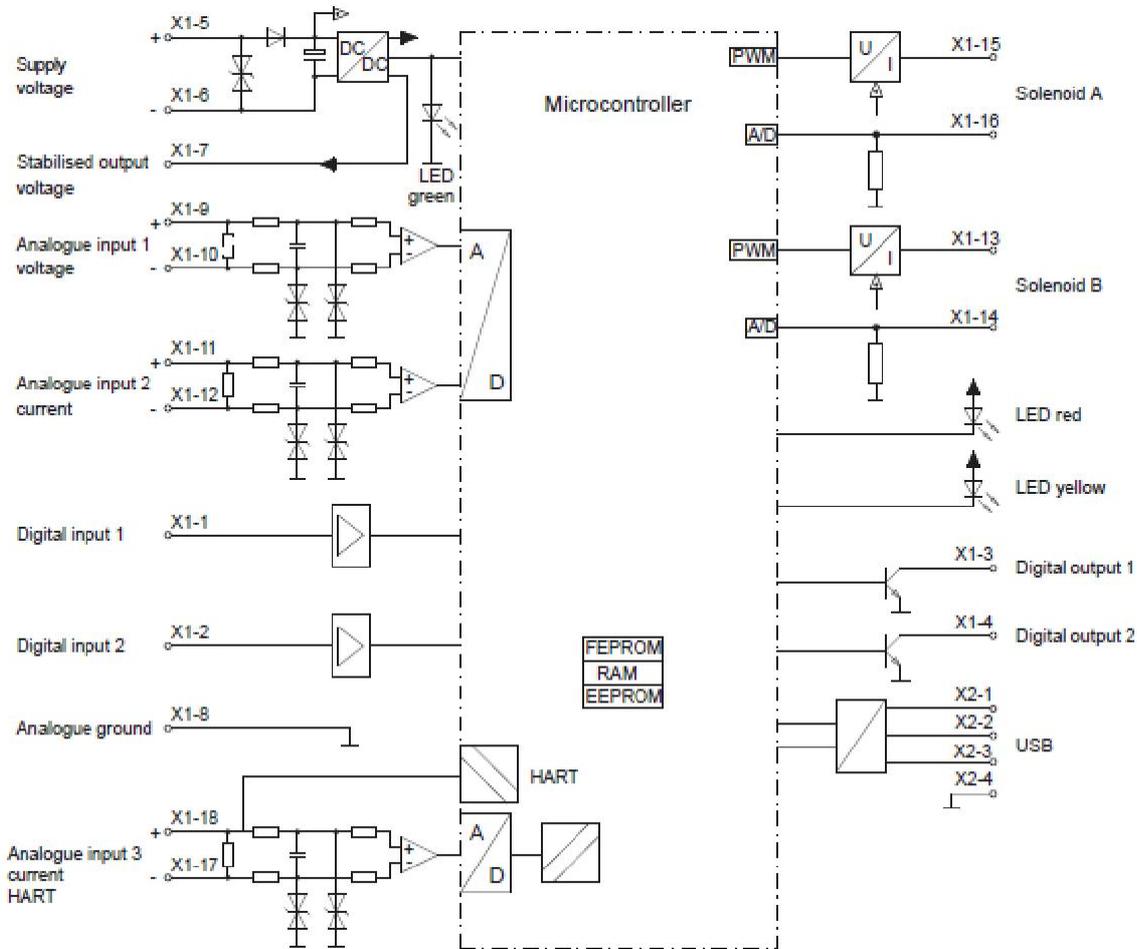
Basic version with CANopen / J1939 interface



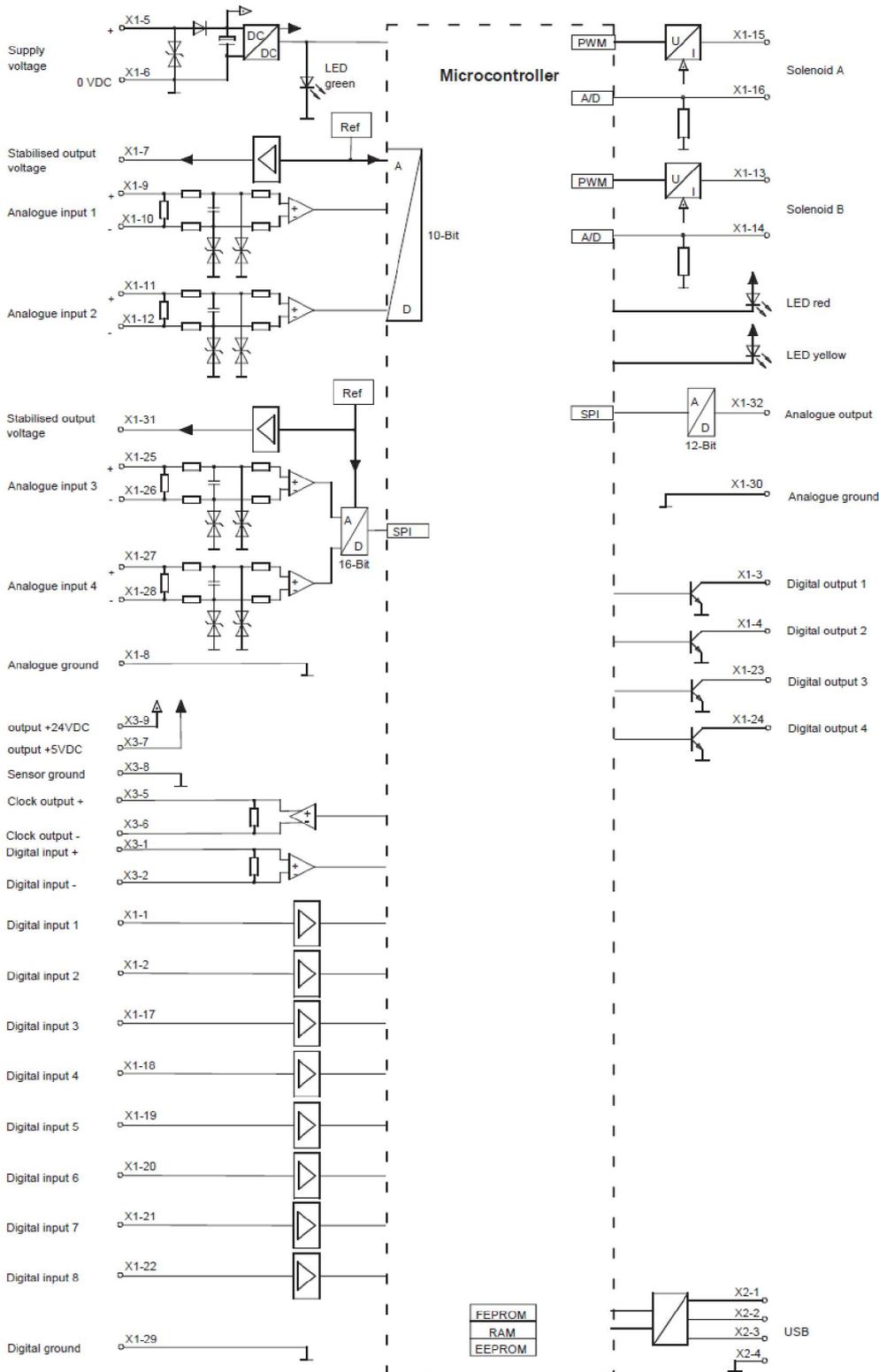
Basic version with Profibus DP interface



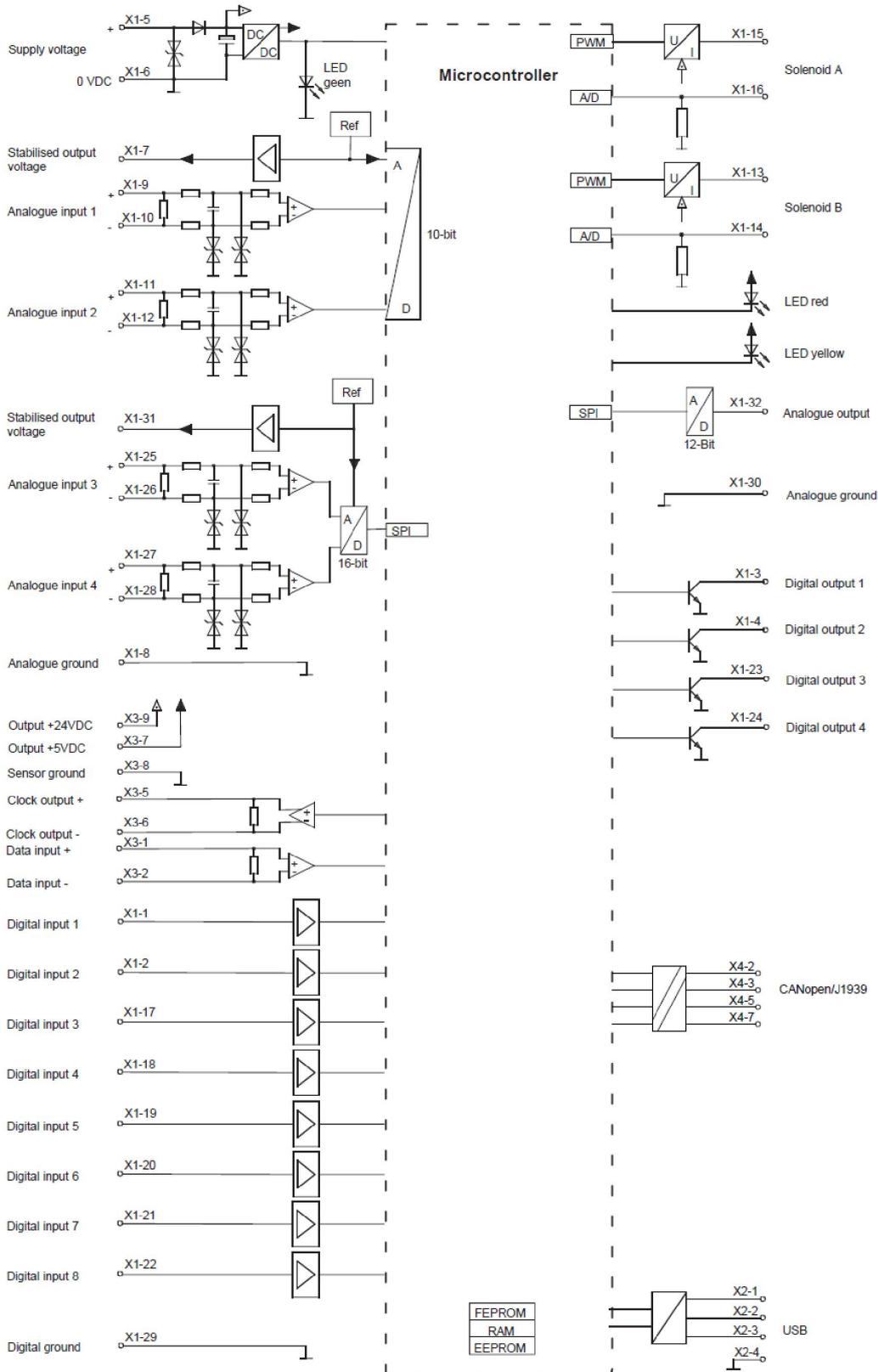
Basic version with HART interface



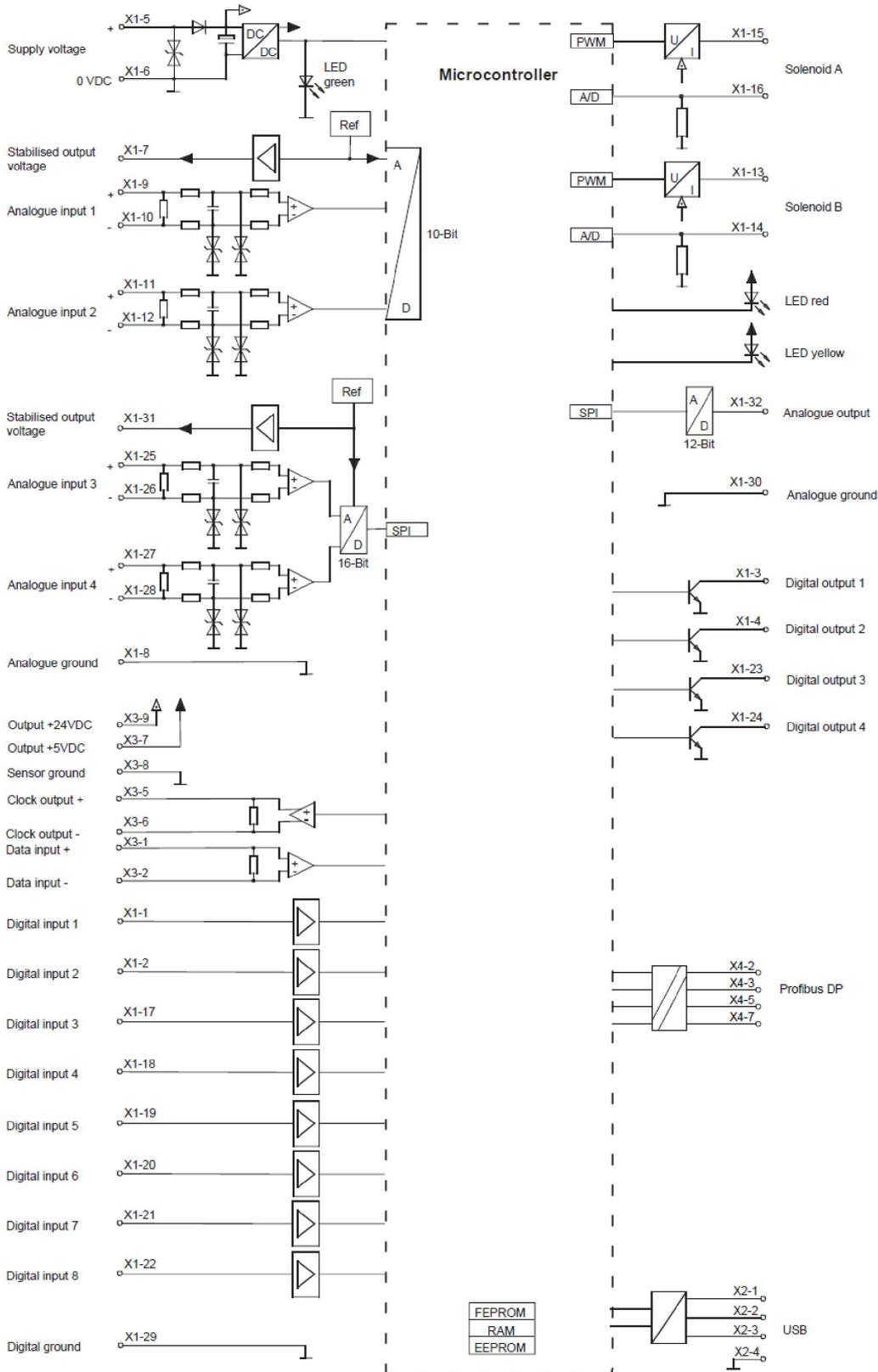
Enhanced version with analog interface



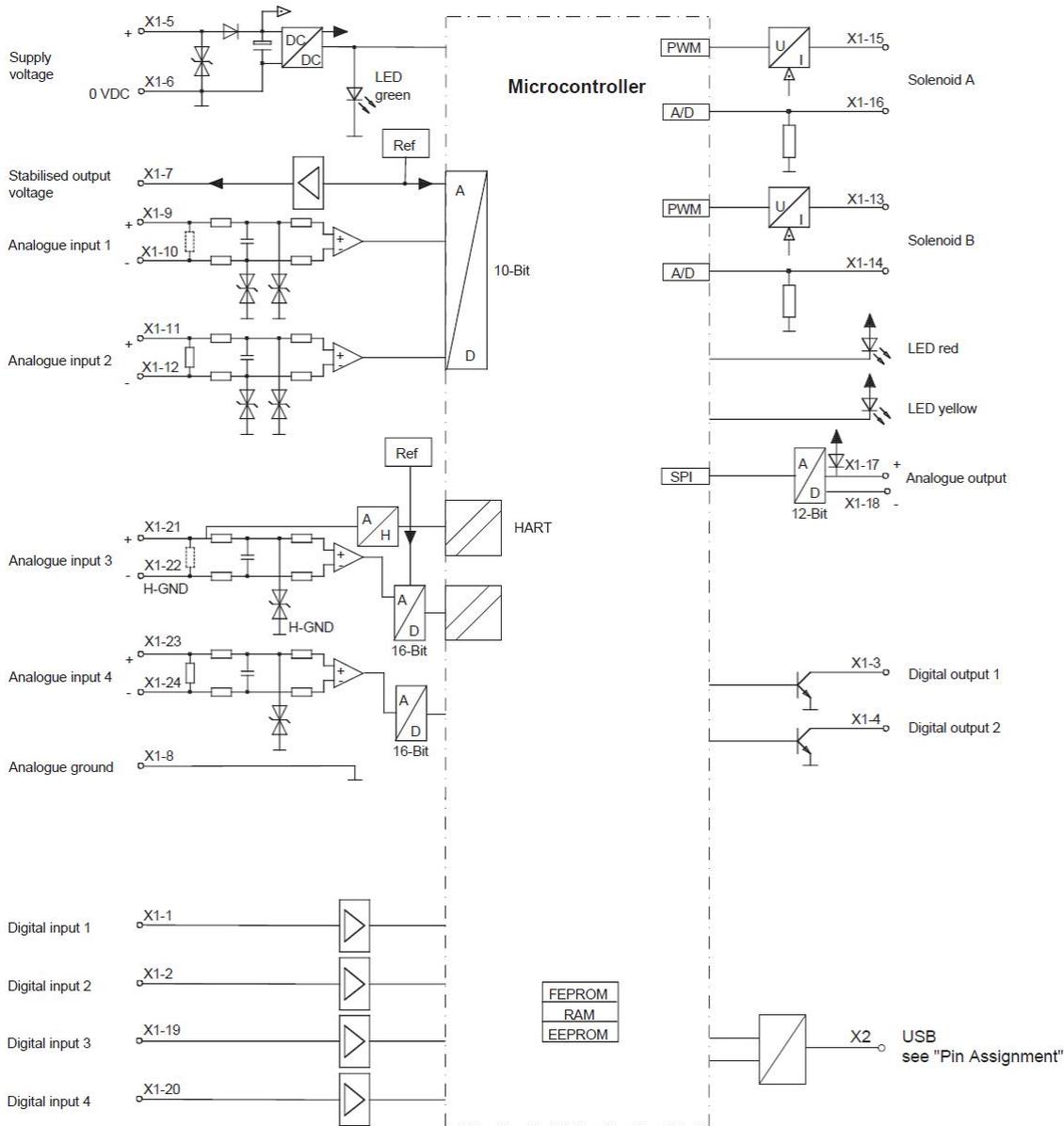
Enhanced version with CANopen / J1939 interface



Enhanced version with Profibus DP interface



Enhanced version with HART interface



3 Safety rules

3.1 Installation / Commissioning / Parameterisation

- These operating instructions have to be carefully studied beforehand and the instructions are to be complied with.
- Prior to the installation, all power supply voltages and any other energy sources have to be disconnected.
- The installation/assembly must only be carried out by specialist personnel with electrical knowledge.
- Take into account precautionary measures concerning components on the module, which are subject to damage as a result of electrostatic discharge.
- Wrong manipulations by the personnel cannot be prevented by the SD7-Electronics.
- Before the switching on of the supply voltage, the fuse protection, the correct wiring and the conformity of the power supply voltage with the permissible supply voltage range have to be verified.



- **The SD7-Electronics monitors the working conditions within the electronics and within the installation. Uncontrolled movements or force changes caused by unforeseen errors of the SD7-Electronics cannot be prevented in any case.**
- **Danger for persons has to be avoided by installing an emergency stop device which cuts off the power to the system.**

4 Construction and Function

Refer to section "[Block diagram](#)"^[10].

4.1 Introduction

- All inputs and outputs have to be contacted through the terminal screw block
- At the device front panel, there is a USB interface, through which the parameterisation and the diagnostics can be made by using the PC-Parameterisation software PASO
- In the factory, the SD7-Electronics are adjusted with the default values. The adjustment to the valves being used, has to be performed by the user.
- Wandfluh can create application specific parameters files in accordance to customer wish.

4.2 Description of the Function

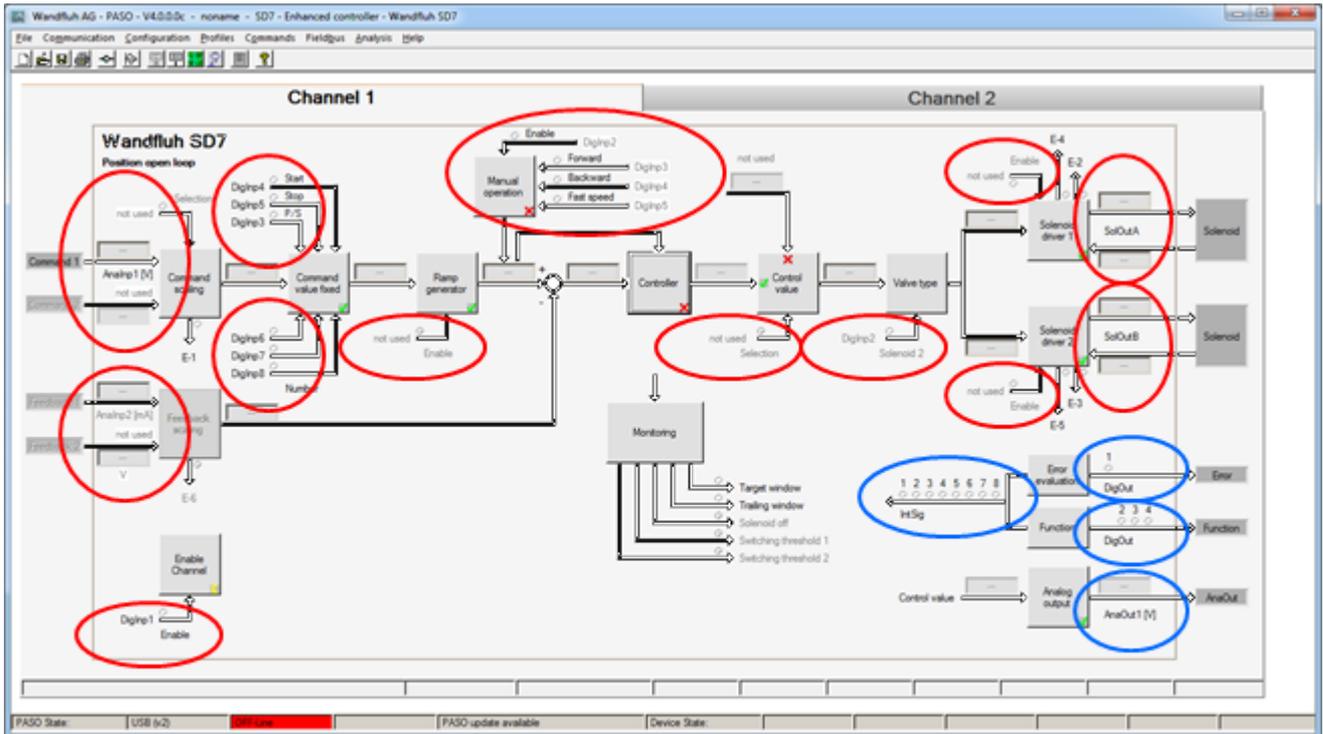
The SD7-Electronics has two channels. These can be used alternatively as closed-loop systems or as open-loop channels.

Each channel has a command value input, a feedback value input and one or two solenoid outputs. The adjustable parameters are organized in function blocks, which are displayed in PASO as small boxes. The following settings can be made per channel in these function blocks:

- Enable channel (refer to section "[Enable channel](#)"^[66])
- Command scaling (refer to section "[Command scaling](#)"^[66])
- Command value fixed (refer to section "[Command value fixed](#)"^[71])
- Ramp generator (refer to section "[Ramp generator](#)"^[77])
- Manual operation (refer to section "[Manual operation](#)"^[79], only Enhanced version)
- Feedback scaling (refer to section "[Feedback scaling](#)"^[79])
- Monitoring (refer to section "[Monitoring](#)"^[85])
- Controller (refer to section "[Controller](#)"^[88])
- Control value (refer to section "[Control value](#)"^[94])
- Valve type (refer to section "[Valve type](#)"^[96])
- Solenoid driver (refer to section "[Solenoid driver](#)"^[97])
- Error evaluation (refer to section "[Error evaluation](#)"^[101])
- Function (refer to section "[Function](#)"^[102])
- Analog output (refer to section "[Analog output](#)"^[104], only Enhanced version)

Each channel is independent. Only the limits by the hardware are to be considered. For example, if the Wandfluh-Electronics has only two solenoid outputs, it's not possible to operate two channels with each two solenoids. In this case the maximum is at two channels with one solenoid output per channel or one channels with two solenoid outputs per channel. The parameterisation software PASO automatically detects how many solenoids can be selected with the current settings.

The assignment of the analog and digital in- and outputs can freely be made by the user. Regarding inputs it is also possible to adjust a multiple allocation. That means digital and analogue inputs can be allocated to multiple channels (refer to section "[Assignment of the inputs/outputs](#)"^[51]). Digital in- and outputs which are set or reset by software (refer to section "[Configuration - Digital E/A](#)"^[110]) will be displayed with blue text color in the main window.



Inputs freely selectable

Outputs freely selectable

The command value resp. the feedback value can be a voltage-, a current-, a frequency- or a PWM-signal. the signals are individually adjustable.

The solenoid outputs includes a **pulse-width-modulated** current control with superimposed dither signal. These outputs can control either proportional or switching solenoids (for exceptions see section "[Controller](#)"^[88]). The current measurement can be switched on or off. The minimal and maximal solenoid currents or pulse widths can be adjusted separately. When using switching solenoids a fully adjustable power reduction function is available.

Parameters are set by means of the parameterising software PASO. Changed parameters are stored in a non-volatile memory in order to have them available after the Wandfluh-Electronics have been switched on again. The parameterising software PASO provides to save the settings an values of the parameter in a file, which always allows to do a download or an analysis.

Some function blocks are able to generate error messages. The function block "Error evaluation" (refer to section "[Error evaluation](#)"^[101]) picks up all error messages. This function block manages the error handling of the Wandfluh-Electronics.

The process data are displayed online (refer to section "[Analysis Show values](#)"^[131]). This helps in case of support and diagnostics.

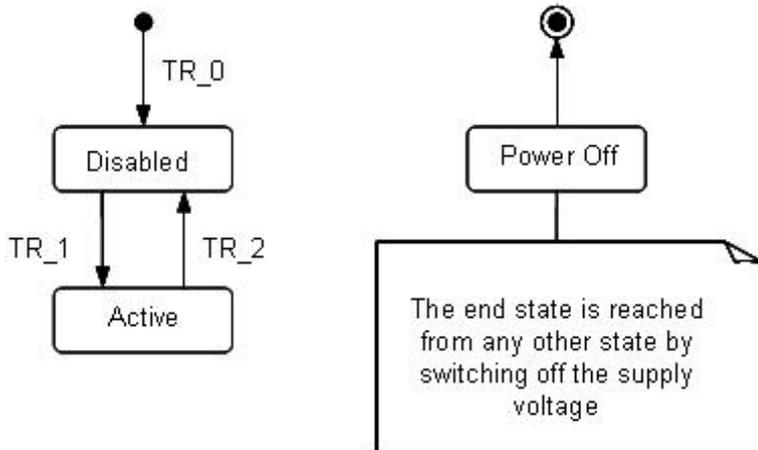
4.3 Characteristic optimisation

The SD7 electronics are provided with a possibility to optimise the characteristic "Preset value input – solenoid current output". The user is able to create a characteristic (e.g. a linearised characteristic) which matches his own application. The characteristic optimisation can be turned on or off (refer to "[Parameters Solenoid driver](#)"^[97]).

4.4 State machine

In the following, with the help of a status diagram it is described, how the start-up of the Wandfluh-Electronics takes place and which statuses are reached when and how.

Important: Each channel has its own state machine. The states of each channel can be set separately.



The following table describes the possible statuses and what is done in these statuses:

| Status | Description |
|----------|---|
| Disabled | <ul style="list-style-type: none"> The assigned channel of the Wandfluh-Electronics is disabled, no solenoid current will be active In this status, with the command "Operation mode" (refer to section "Commands_Valve operation"^{[123]) the operating mode can be set} |
| Active | <ul style="list-style-type: none"> The assigned channel of the Wandfluh-Electronics is enabled The assigned channel of the Wandfluh-Electronics can be operated according to the selected operating mode Changing the operating mode is not possible |

The following table describes the transitions from one status to the next one:

| Transition | Description |
|------------|--|
| TR_0 | Switching-on the supply voltage |
| TR_1 | Enable This is made in the operating mode "Local" through the function "Enable Channel" (refer to section "Enable channel" ^{[66]) and in the operating mode "Remote PASO" through the parameter "Control mode" (refer to section "Commands_Valve operation"^{[123]).}} |
| TR_2 | Disable This is made in the operating mode "Local" through the function "Enable Channel" (refer to section "Enable channel" ^{[66]) and in the operating mode "Remote PASO" through the parameter "Control mode" (refer to section "Commands_Valve operation"^{[123]).}} |

4.5 Operating mode

The Wandfluh-Electronics have 2 operating modes. The following table describes, what can be done in the different operating modes and how they can be activated:

| Operating mode | Activating with | Description |
|----------------|---------------------------------------|---|
| Local | Menu point "Commands_Local Operating" | Operating via analogue and digital inputs on the Wandfluh-Electronics |
| Remote PASO | Menu point "Commands_PASO Operating" | Operating direct with the PASO |

The current operating mode is displayed in the status line (refer to section "[Starting of PASO](#)"^[154]).

4.6 Analogue inputs

- The applied analogue signal is digitised on analogue inputs 1 and 2 in the 10-Bit A/D converter and on analogue 3 and 4 (only Enhanced version) in the 16-Bit A/D converter.

Attention: By the input range 4 ... 20mA, the resolution is < 10-Bit resp. 16-Bit!!

- Differential inputs**

All analogue inputs are differential inputs. Differential inputs are used if the ground potential of the external command value generator does not agree with the ground on the Wandfluh-Electronics. The differential inputs are not galvanically separated; they are made for ground potential differences up to 1.5V between the - (minus) connection of the differential input and the 0V-ground of the Wandfluh-Electronics. If the differential input is intended to use like an analogue input against ground, the - (minus) connection of the differential input must be connected to the ground of the Wandfluh-Electronics. In this case please attend that the solenoid current can cause a voltage drop between the Wandfluh-Electronics and the power supply. It is recommended to connect the - (minus) connection as near as possible to the power supply.

- Filtering**

Each analog input can be individually filtered (refer to "[Configuration Filter for analog inputs](#)"^[112]). Thereby analog noise (e.g. voltage peaks) are attenuated. The filtering is done with the function "exponential smoothing", where the speed / response time of the filter can be determined with the parameter "smoothing factor". A high value at the smoothing factor results in a high degree of filtering, but a long response time, which will delayed the reading of the analog input. A small value at the smoothing factor results in a small degree of filtering, but a fast response time. So the "smoothing factor" must be selected as compromise between high degree of filtering and fast response time.

| SD7 type | Analogue input 1 | Analogue input 2 | Analogue input 3 (only Enhanced Version) | Analogue input 4 (only Enhanced Version) |
|------------------|------------------|------------------|---|---|
| SD7XXXD X0-AX | Voltage | Current | -- | -- |
| SD7XXXD X1-AX | Voltage | Voltage | -- | -- |
| SD7XXXD X2-AX | Current | Current | | |
| SD7XXXD X4-BX | Voltage | Current | Voltage | Current |
| SD7XXXD X5-BX | Voltage | Voltage | Voltage | Voltage |
| SD7XXXD X6-BX | Current | Current | Current | Current |

| | | | | |
|------------------|---------|---------|---------|---------|
| SD7XXXD X7-BX | Voltage | Voltage | Current | Current |
| SD7XXXD X8-BX | Current | Current | Voltage | Voltage |

The assignment of the analog inputs to the corresponding channel is free to choose (refer to section ["Assignment of the inputs/outputs"](#)^[51]).

If a potentiometer is connected, a value of 1kOhm is recommended.

4.7 Cablebreak detection

The command value input can be detected for a cablebreak (only if Signal type = Voltage, Current, Frequency or PWM). Therefore, a lower and an upper cablebreak limit can be adjusted in the box [Command scaling](#)^[66] resp [Feedback scaling](#)^[79]. A cablebreak is detected, if the input signal is smaller than the lower cablebreak limit or higher than the upper cablebreak limit.

If an cablebreak is detected, the internal error "E-1" (for command value) resp. "E-6" (for feedback value) is active (refer to section ["Error evaluation"](#)^[101]).

The following conditions had to be performed:

- The parameter "Signal type" must be on "Voltage", "Current", "Frequency" or "PWM" (refer to section [Command scaling](#)^[66] resp [Feedback scaling](#)^[79])
- The parameter "Cablebreak" must be on "On" (refer to section [Command scaling](#)^[66] resp [Feedback scaling](#)^[79])
- The parameters "Lower cablebreak limit" and "Upper cablebreak limit" must be adjusted (refer to section [Command scaling](#)^[66] resp [Feedback scaling](#)^[79])
- An action must be assigned to the error "E-1" "E-6" (refer to section ["Error evaluation"](#)^[101])



Attention: Until a cablebreak will be detected, a time delay of about 100ms will pass. During this time, the cylinder can make unintentional movements or unintentional force changes

4.8 Digital inputs

The function of the digital inputs and the assignment to the corresponding channel is free to choose (refer to section ["Assignment of the inputs/outputs"](#)^[51]).

4.9 Input for digital sensor

This input makes it possible to connect digital sensors with SSI-Interface.

SSI-Interface

SSI-Interface according RS-422 standard with a baudrate of 300kHz.

4.10 Outputs

- **Proportional solenoid outputs A and B**

The solenoid outputs have a current output pulse-width-modulated at 1000Hz with superimposed dither. The current measurement can be switched on or off.

The assignment to the corresponding channel is free to choose (refer to section ["Assignment of the inputs/outputs"](#)^[51]).

- **Digital outputs**

The SD7-Electronics has two (Basic version) resp. four (Enhanced version) digital outputs. The function of the digital outputs and the assignment to the corresponding channel is free to choose (refer to section ["Assignment of the inputs/outputs"](#)^[51]) or can be set fixed on 0 or 1 with the PASO (refer to section ["Configuration Digital I/O"](#)^[110]).

- **Analog output (only Enhanced version)**

The analog output can be assigned to the following signals via the PASO SD7 (depending on the control mode, different signals are available):

- command value for the solenoid driver
- scaled command value
- scaled feedback value (only Controller version and with closed loop control modes)
- scaled control deviation (only Controller version and with closed loop control modes)

The signal at the analog output can be used for driving a valve with integrated electronics which has a voltage interface. The output level can be adjusted (refer to section ["Analog output"](#)^[104]).

4.11 Internal signals

Internal signals can be selected instead of digital inputs or outputs. They are not guided to the outside, they are processed only internally.

This allows e.g. to link a digital output to a digital input without an external connection.

4.12 Controller modes

The selection of the mode of operation is made in the box "[Controller](#)"^[88].

The SD7-Electronics provides the following controller modes:

| Controller mode | Channel | |
|--|---------|------|
| | no 1 | no 2 |
| Controller mode 1 "Spool valve open loop" | X | X |
| Controller mode 3 "Pressure/flow valve open loop" | X | X |
| Controller mode 4 "Pressure/flow valve closed loop (1-sol)" | X | |
| Controller mode -5 "Pressure control closed loop (2-sol)" | X | |
| Controller mode 6 "Position open loop" | X | X |
| Controller mode 9 "Position closed loop (2-sol)" | X | |
| Controller mode 7 "Speed control closed loop (2-sol)" | X | |
| Controller mode -6 "2-point controller (1-sol)" | X | |
| Controller mode -7 "2-point controller (2-sol)" | X | |
| Controller mode -8 "3-point controller (2-sol)" | X | |

Multiple controller modes can be linked together using the function Control value (refer to section "[Control value](#)"^[94]). Thereby it is possible to build e.g. a pQ-Controller or an Alternating control. For more details please refer to the document "Applications examples for Wandfluh Electronics cards".

- **Controller mode 1 "Spool valve open loop"**

Control of a spool valve in open loop (without feedback signal). The number of solenoids, which are activated, depends on the selected mode of operation (refer to section "[Mode of operation](#)"^[34]). This mode of operation corresponds to the "Device Control Mode = 1" of the fieldbus device profile Fluid Power Technology.

- **Controller mode 3 "Pressure/flow valve open loop"**

Control of a pressure relief-, pressure reducing- or flow control valve in open loop (without feedback signal). The number of solenoids, which are activated, depends on the selected mode of operation (refer to section "[Mode of operation](#)"^[34]). This mode of operation corresponds to the "Device Control Mode = 3" of the fieldbus device profile Fluid Power Technology.

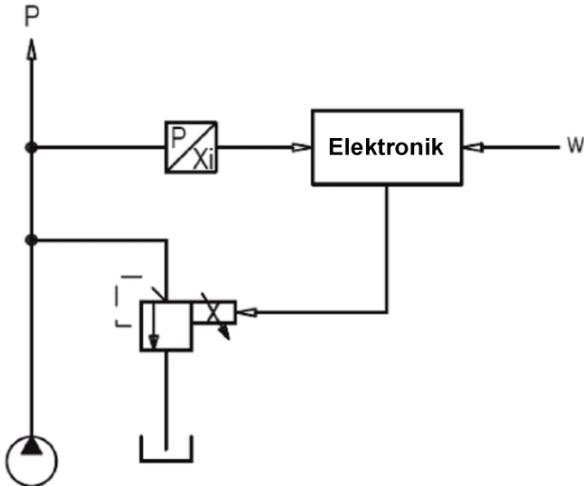
• **Controller mode 4 "Pressure/flow valve closed loop (1-sol)"**

Control of a 1-solenoid pressure relief-, pressure reducing- or flow control valve in closed loop (with feedback signal). It can only be activated one solenoid (correspond to solenoid driver 1).

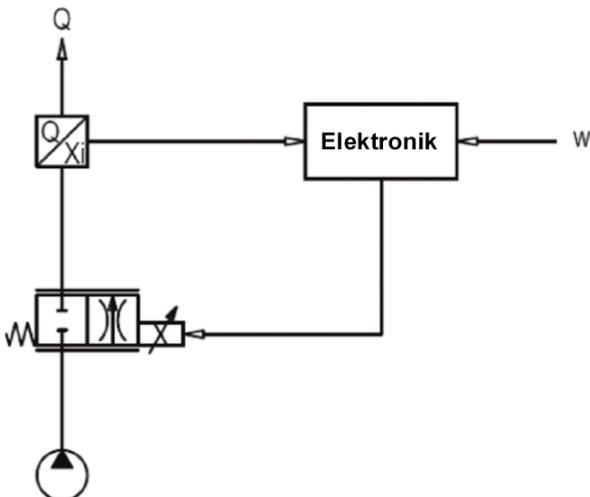
In this controller mode, the parameter "Mode of operation" has no meaning (refer to section "[Mode of Operation](#)" [34]).

This mode of operation corresponds to the "Device Control Mode = 4" of the fieldbus device profile Fluid Power Technology.

Example Application: Pressure Control: with one proportional pressure relief valve, the pressure p is held constant to the command pressure value w .



Example Application: Flow Control: with one proportional throttle valve, the flow Q is held constant to the flow command value w .

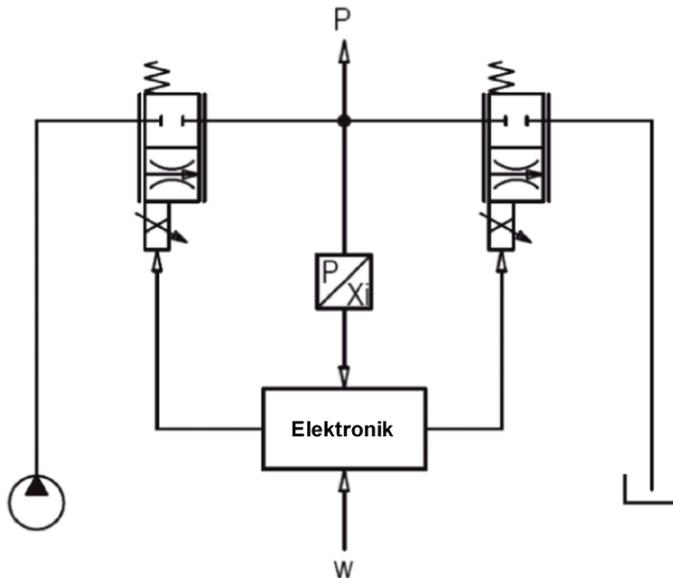


- **Controller mode –5 "Pressure control closed loop (2-sol)"**

Control of two 1-solenoid throttle valves in closed loop (with feedback signal) as a pressure reducing system. One throttle valve is the loading valve, the other throttle valve is the unloading valve. The loading valve corresponds to solenoid driver 1, the unloading valve to the solenoid driver 2.

In this controller mode, the parameter "Mode of operation" has no meaning (refer to section ["Mode of Operation"](#)^[34]).

This controller mode is a WANDFLUH specific controller mode and does not correspond to the fieldbus device profile Fluid Power Technology.



- **Controller mode 6 "Position open loop"**

Control of a spool valve in open loop (without feedback signal).

The number of solenoids, which are activated, depends on the selected mode of operation (refer to section ["Mode of operation"](#)^[34]).

This mode of operation corresponds to the "Device Control Mode = 6" of the fieldbus device profile Fluid Power Technology.

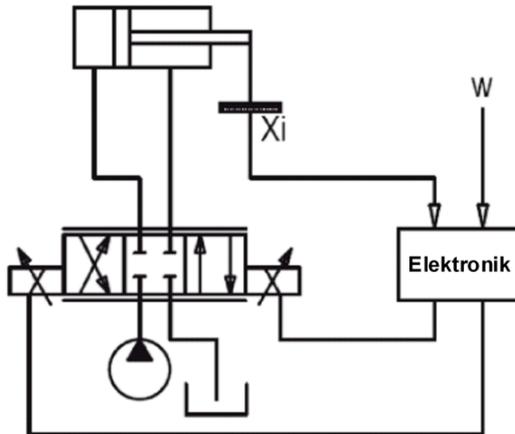
- **Controller mode 9 "Position closed loop"**

Control of a 2-solenoid spool valve in closed loop (with feedback signal). It can be activated two solenoids.

In this controller mode, the parameter "Mode of operation" has no meaning (refer to section "[Mode of Operation](#)" ^[34]).

This mode of operation corresponds to the "Device Control Mode = 9" of the fieldbus device profile Fluid Power Technology.

Example application: with a 4/3-proportional-spool valve, the axis position is held constant to the command position value w .



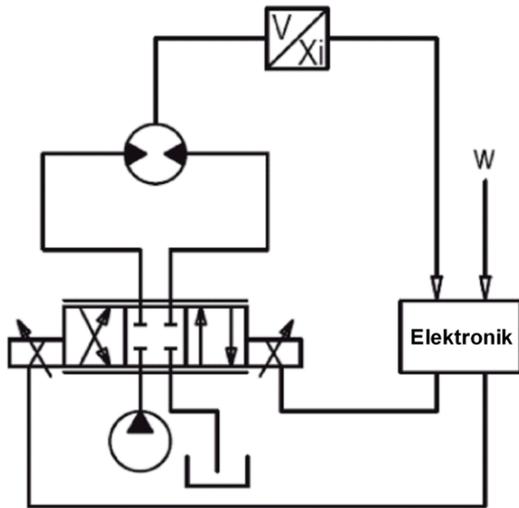
- **Controller mode 7 "Speed control closed loop (2-sol)"**

Control of a 2-solenoid pressure relief-, pressure reducing- or flow control valve in closed loop (with feedback signal). It can be activated two solenoids.

In this controller mode, the parameter "Mode of operation" has no meaning (refer to section "[Mode of Operation](#)" [34]).

This mode of operation corresponds to the "Device Control Mode = 7" of the fieldbus device profile Fluid Power Technology.

Example application: with a 4/3-proportional-spool valve the speed of a hydraulic motor is held constant to the command speed value w .

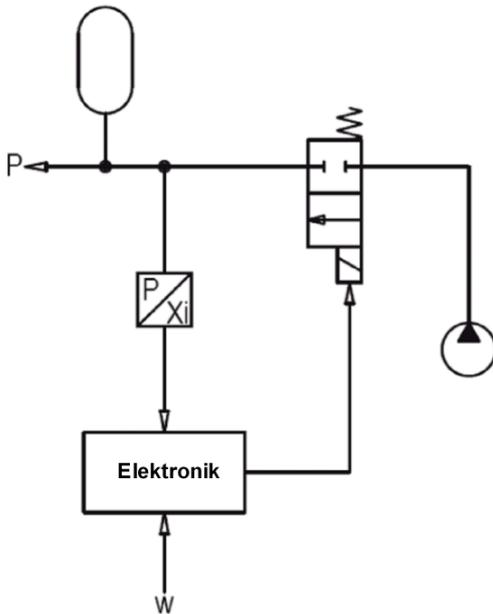


- **Controller mode –6 "2-point controller (1-sol)"**

Control of a 1-solenoid valve with a switching solenoid in closed loop (with feedback signal). It can only be activated one solenoid (correspond to solenoid driver 1).

In this controller mode, the parameter "Mode of operation" has no meaning (refer to section "[Mode of Operation](#)"^[34]). This controller mode is a WANDFLUH specific controller mode and does not correspond to the fieldbus device profile Fluid Power Technology.

Example Application: if the pressure p falls below the command pressure value w , then the accumulator is reloaded with the 2/2 spool valve.



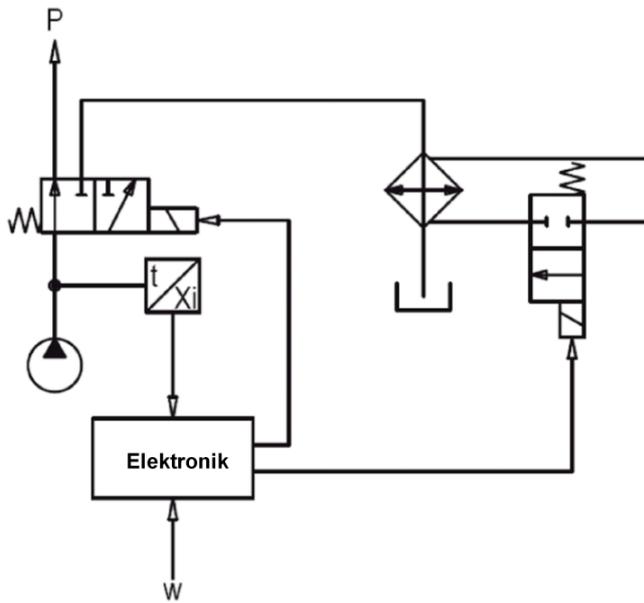
- **Controller mode –7 "2-point controller (2-sol)"**

Control of a 2-solenoid valve with switching solenoids resp. of two 1-solenoid valves with one switching solenoid each in closed loop (with feedback signal).

It can be activated two solenoids.

In this controller mode, the parameter "Mode of operation" has no meaning (refer to section "[Mode of Operation](#)" [34]). This controller mode is a WANDFLUH specific controller mode and does not correspond to the fieldbus device profile Fluid Power Technology.

Example application: oil cooling: if the temperature of the oil exceeds the command temperature value, then the 3/2 spool valve is switched to the cooler, and simultaneously the cooling circuit is switched on with the 2/2 spool valve.



- **Controller mode –8 "3-point controller (2-sol)"**

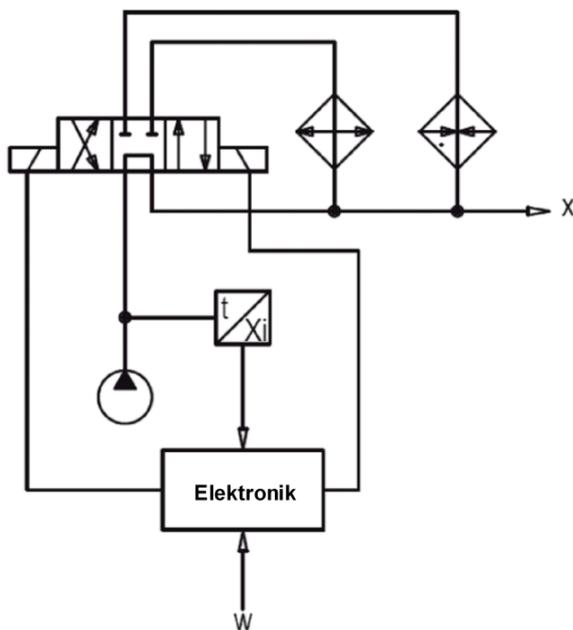
Control of a 2-solenoid valve with switching solenoids resp. of two 1-solenoid valves with one switching solenoid each in closed loop (with feedback signal).

It can be activated two solenoids.

In this controller mode, the parameter "Mode of operation" has no meaning (refer to section "[Mode of Operation](#)" [34]).

This controller mode is a WANDFLUH specific controller mode and does not correspond to the fieldbus device profile Fluid Power Technology.

Example application: oil temperature control: if the feedback oil temperature is equal to the command temperature value, the 4/3 spool valve remains in zero position. If the feedback oil temperature exceeds the command value, the 4/3 spool valve is switched to the cooler. If the feedback oil temperature drops below the command value, the 4/3 spool valve is switched to the heater.



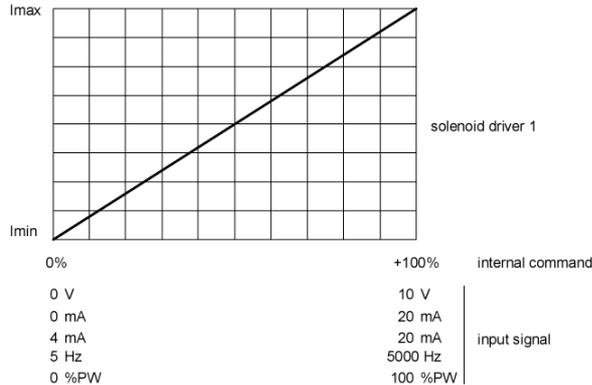
4.13 Mode of operation

The mode of operation can be set independently for each channel. The following 4 modes of operation are possible:

- **Mode of operation "Command unipolar (1-sol)" (Mode of operation 1)**

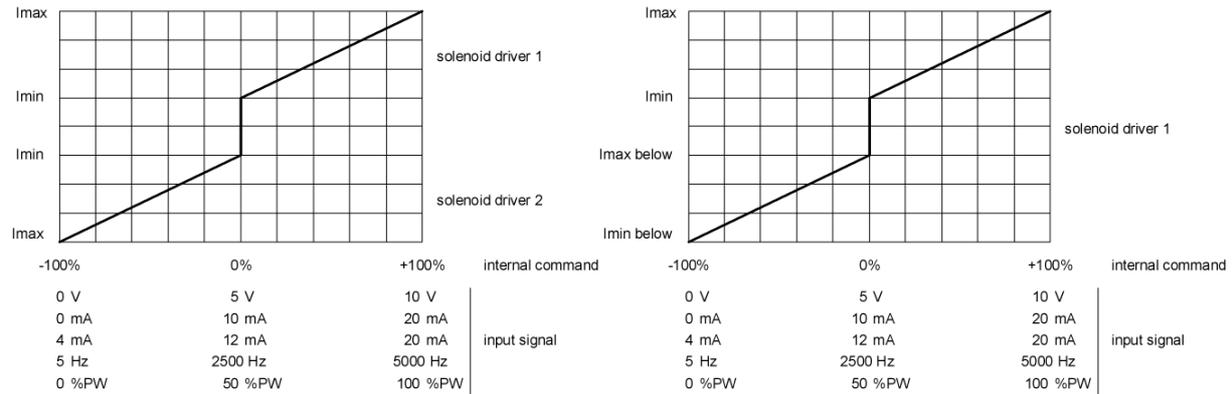
This Mode of operation is only possible, if the valve type is set to "Standard 2-solenoid" (refer to section "[Valve type](#)" 96").

With an input signal 0 ... 100% an internal command from 0 ... 100% is generated.



- **Mode of operation "Command unipolar (2-sol)" (Mode of operation 2)**

With an input signal 0 ... 100% an internal command from -100 ... +100% is generated.

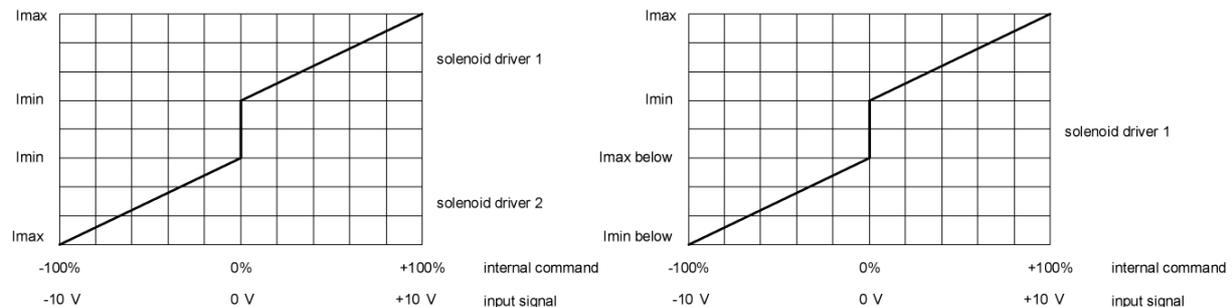


Valve type = Standard 2-solenoid

Valve type = 4/3-Wege 1-solenoid

- **Mode of operation "Command bipolar (2-sol)" (Mode of operation 3)**

With an input signal -100 ... 100% an internal command from -100 ... +100% is generated.



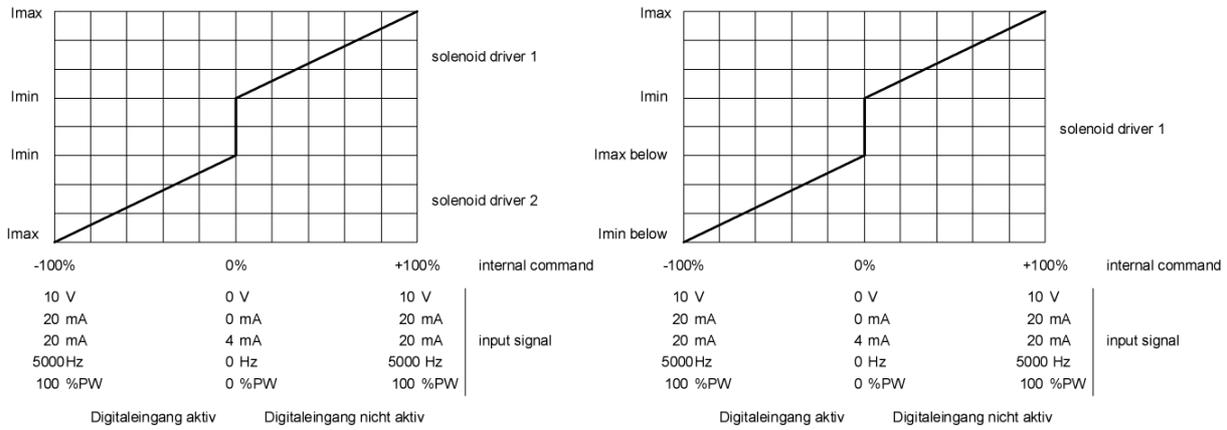
1

Valve type = 4/3-Wege 1-solenoid

Valve type = Standard 2-solenoid

• **Mode of operation "Command unpolar (2-sol mit DigInp)" (Mode of operation 4)**

With an input signal 0 ... +100% an internal command from 0 ... +100% (digital input not active) resp. 0 ... -100% (digital input active) is generated.



Valve type = Standard 2-solenoid

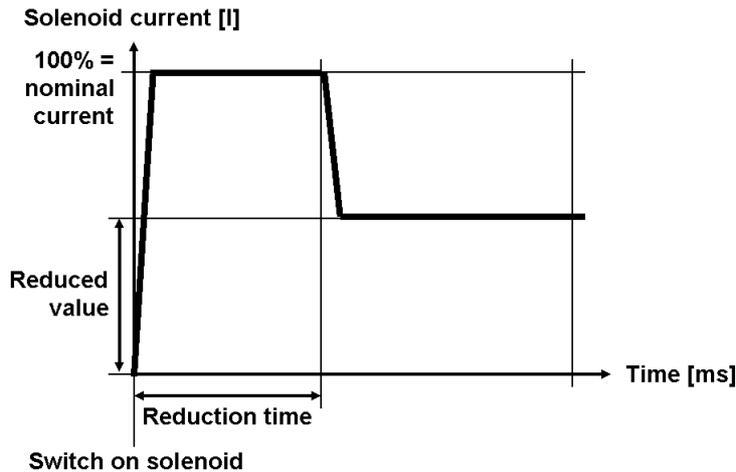
Valve type = 4/3-Wege 1-solenoid

The selection of the mode of operation is made in the box ["Valve type"](#)^[96]

4.14 Power reduction

The power reduction can be switched on with solenoid type "Switching solenoid without current measuring".

Once the solenoid has switch on, the full solenoid current (= nominal current of the solenoid) passes through during the adjusted time (Parameter "Reduction time"). Thereafter, the current is limited to the reduced value (Parameter "Reduced value"). The reduced value refers to the nominal current of the solenoid (100% = nominal current, 50% = half nominal current).



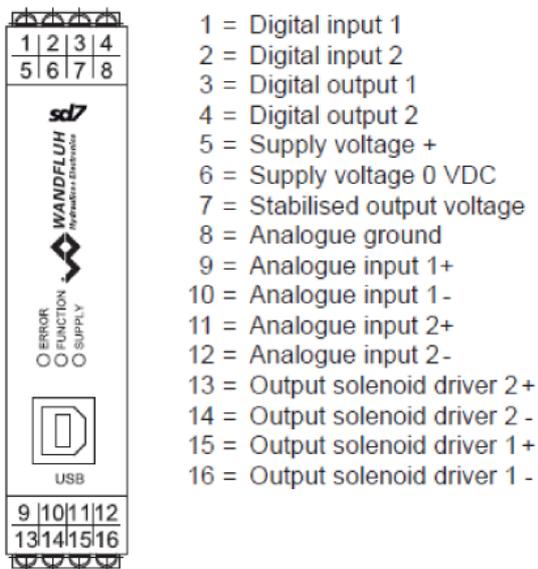
5 Operating and indicating elements

5.1 General

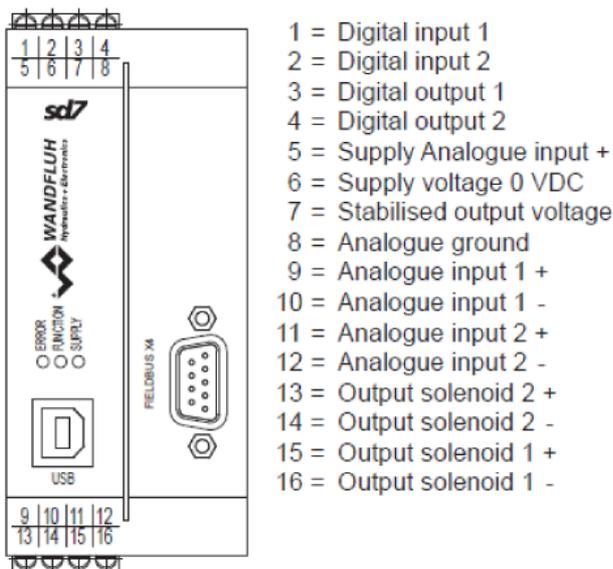
- All inputs and outputs have to be contacted through the terminal screw blocks
- On the front panel of the electronic housing, there is a USB interface, through which the parameterisation and the diagnostics can be made by using the PC-Parameterisation software PASO SD7

5.2 Connector view

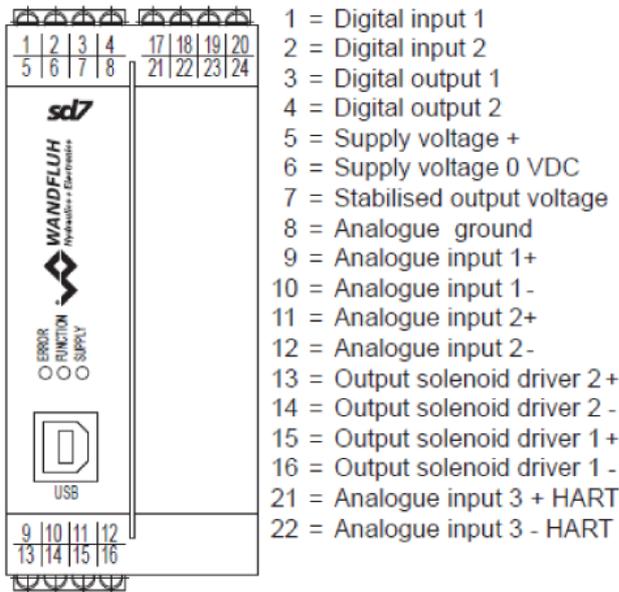
Basic controller with analog interface



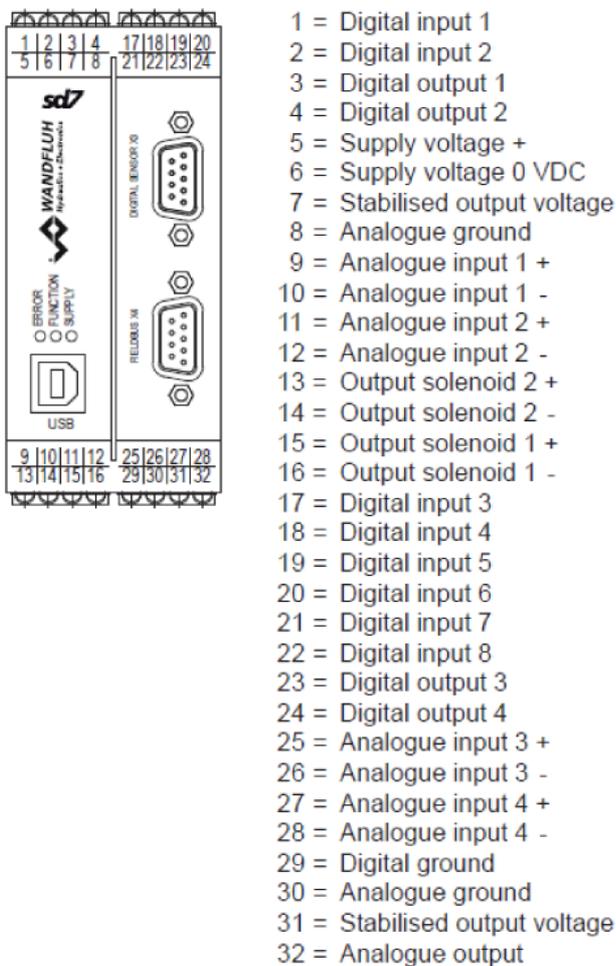
Basic controller with CANopen/J1939 or Profibus DP interface



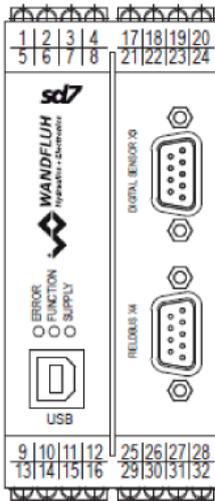
Basic controller with HART interface



Enhanced controller with analog interface

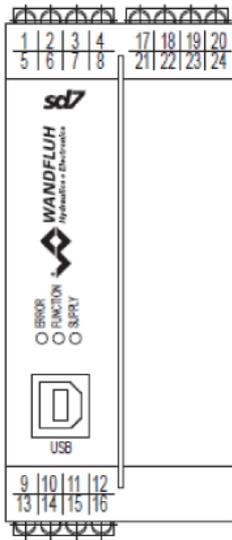


Enhanced controller with CANopen/J1939 or Profibus DP interface



- 1 = Digital input 1
- 2 = Digital input 2
- 3 = Digital output 1
- 4 = Digital output 2
- 5 = Supply voltage +
- 6 = Supply voltage 0 VDC
- 7 = Stabilised output voltage
- 8 = Analogue ground
- 9 = Analogue input 1 +
- 10 = Analogue input 1 -
- 11 = Analogue input 2 +
- 12 = Analogue input 2 -
- 13 = Output solenoid 2 +
- 14 = Output solenoid 2 -
- 15 = Output solenoid 1 +
- 16 = Output solenoid 1 -
- 17 = Digital input 3
- 18 = Digital input 4
- 19 = Digital input 5
- 20 = Digital input 6
- 21 = Digital input 7
- 22 = Digital input 8
- 23 = Digital output 3
- 24 = Digital output 4
- 25 = Analogue input 3 +
- 26 = Analogue input 3 -
- 27 = Analogue input 4 +
- 28 = Analogue input 4 -
- 29 = Digital ground
- 30 = Analogue ground
- 31 = Stabilised output voltage
- 32 = Analogausgang

Enhanced controller with HART interface



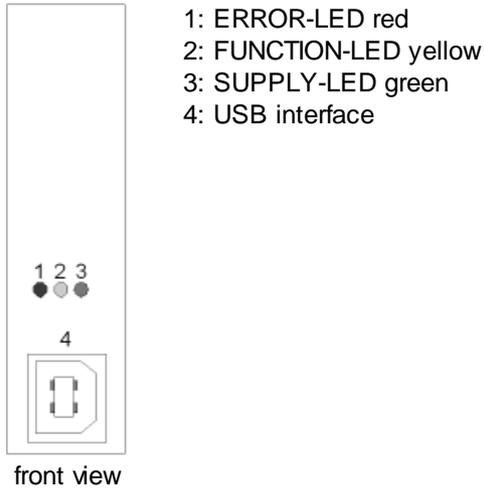
- 1 = Digital input 1
- 2 = Digital input 2
- 3 = Digital output 1
- 4 = Digital output 2
- 5 = Supply Analogue input +
- 6 = Supply voltage 0 VDC
- 7 = Stabilised output voltage
- 8 = Analogue ground
- 9 = Analogue input 1 +
- 10 = Analogue input 1 -
- 11 = Analogue input 2 +
- 12 = Analogue input 2 -
- 13 = Output solenoid B +
- 14 = Output solenoid B -
- 15 = Output solenoid A +
- 16 = Output solenoid A -
- 17 = Analogue output +
- 18 = Analogue output -
- 19 = Digital input 3
- 20 = Digital input 4
- 21 = Analogue input 3 + HART
- 22 = Analogue input 3 - HART
- 23 = Analogue input 4 +
- 24 = Analogue input 4 -

5.3 Control elements

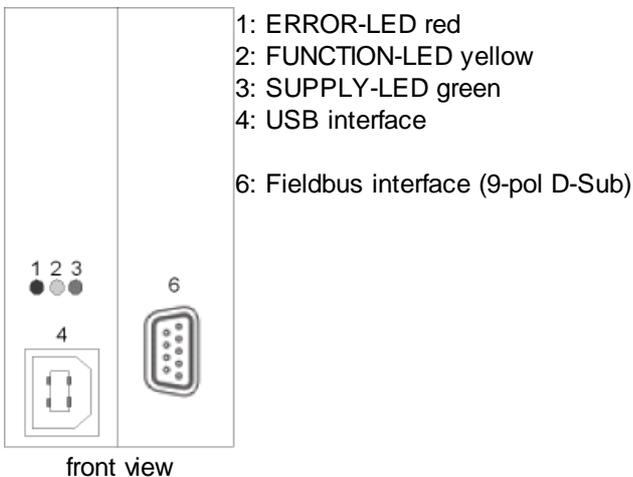
5.3.1 General

The front panel of the SD7-Electronics contains the connector to the USB-Interface. Additionally the front panel is provided with three LED's, which inform the user about the device functioning.

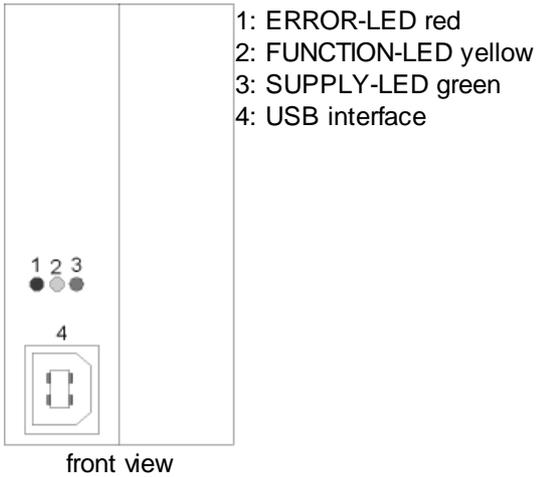
Front panel Basic controller with analog interface:



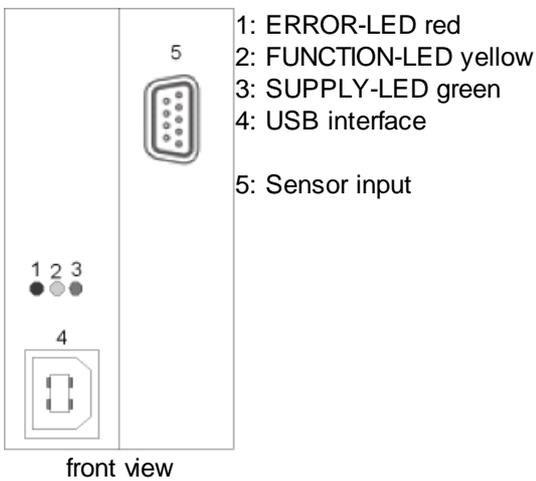
Front panel Basic controller with CANopen/J1939 or Profibus DP interface:



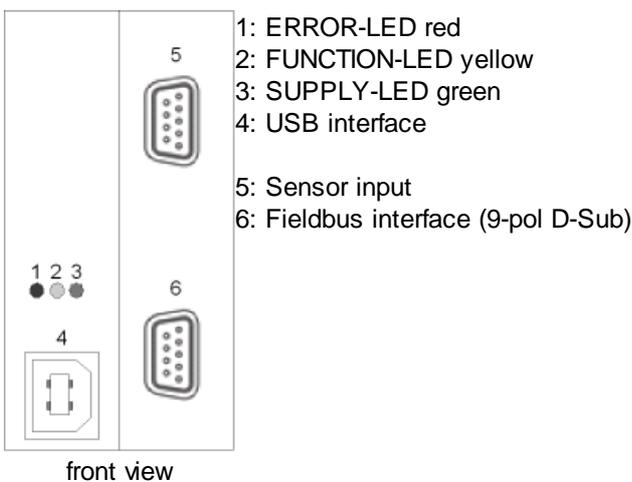
Front panel Basic controller with HART interface:



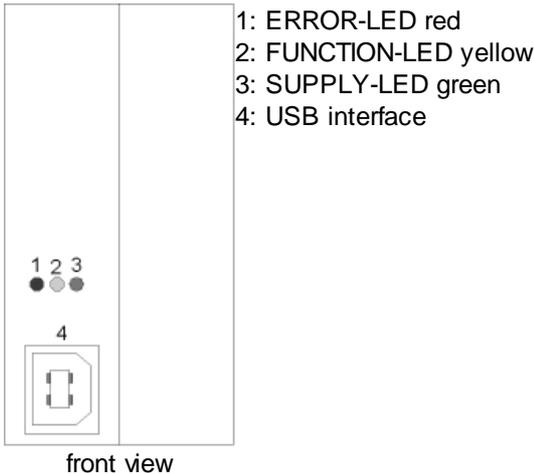
Front panel Enhanced controller with analog interface:



Front panel Enhanced controller with CANopen/J1939 or Profibus DP interface:



Front panel Enhanced controller with HART interface:



5.3.2 ERROR-LED (red)

The ERROR-LED displays, when an error is detected (refer to section ["The system does not work"](#)¹⁴⁴).

5.3.3 FUNCTION-LED (yellow)

The FUNCTION-LED is lighting as soon as a selected Function (refer to section ["Function"](#)¹⁰²) is active. Only functions which are assigned to a DigOut or a IntSig will be displayed.

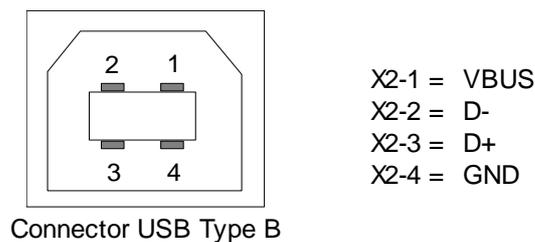
5.3.4 SUPPLY-LED (green)

The SUPPLY-LED is lighting, when the SD7-electronics are supplied.

5.3.5 USB-interface

The USB-interface is placed under the transparent plastic screw cap. It allows the parameterisation and the analysis of the SD7-electronics by PASO software. The connection to the PC is realised by standard USB-cables (USB Type A connector PC-side, USB Type B connector SD7-side).

View of the USB-interface:



Hint: The USB-cable is not included.

6 Commissioning

Please refer to section "[Safety rules](#)"^[18].

6.1 Connection instructions

The contact assignment of the following description refers to section "[Operating and Indicating elements](#)"^[38] and to section "[Connection examples](#)"^[47].

For an **installation / connection appropriate for EMC**, the following points absolutely have to be observed:

- Solenoid- and signal cables must not be laid parallel to high voltage cables.

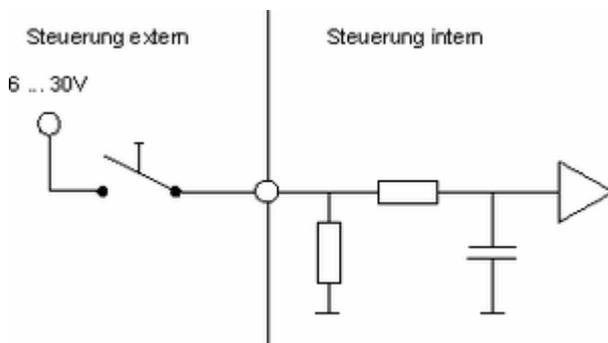
To deduce the heat, the SD7-Electronics must be mounted on a smooth metallic surface!

6.1.1 Supply voltage

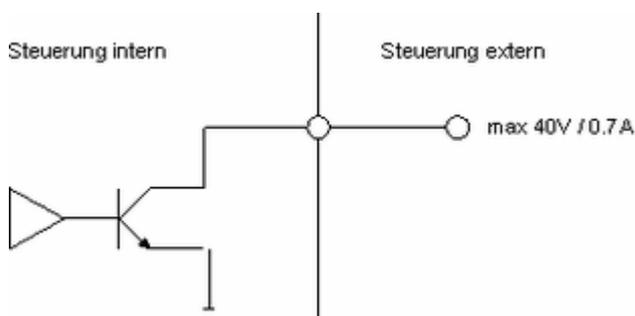
- For the dimensioning of the power supply, the maximum current demand of the solenoids has to be increased by the no load current from the SD7-Electronics (refer to section "[Electrical specifications](#)"^[7]).
- The limit values of the supply voltage and its residual ripple indispensably have to be complied with (refer to section "[Electrical specifications](#)"^[7]).
- The SD7-Electronics have to be protected with a slow acting fuse

6.1.2 Digital inputs and outputs

- The digital inputs are active-high and not galvanically separated
- For activation, they have to be connected to a voltage between 6 ... 30VDC (e.g. power supply)

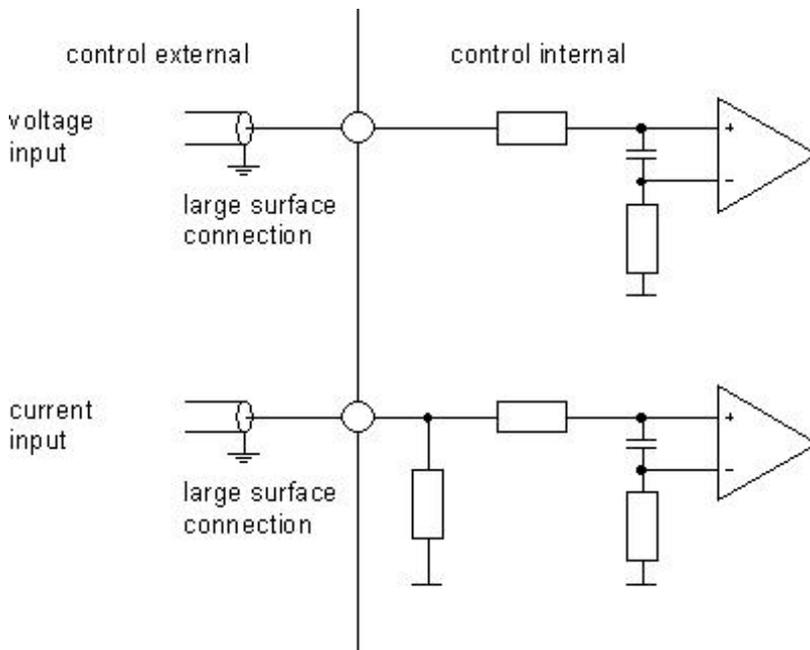


- The digital outputs are "Lowside Switch" outputs (open collector)



6.1.3 Analogue inputs

- The basic amplifier has two analog inputs with 10 Bit resolution (Basic version) resp. four analog inputs with 16-Bit resp. 16-Bit resolution (Enhanced version).
- All inputs are differential inputs
- If a potentiometer is connected, a value of 1kOhm is recommended



6.1.4 Solenoid outputs

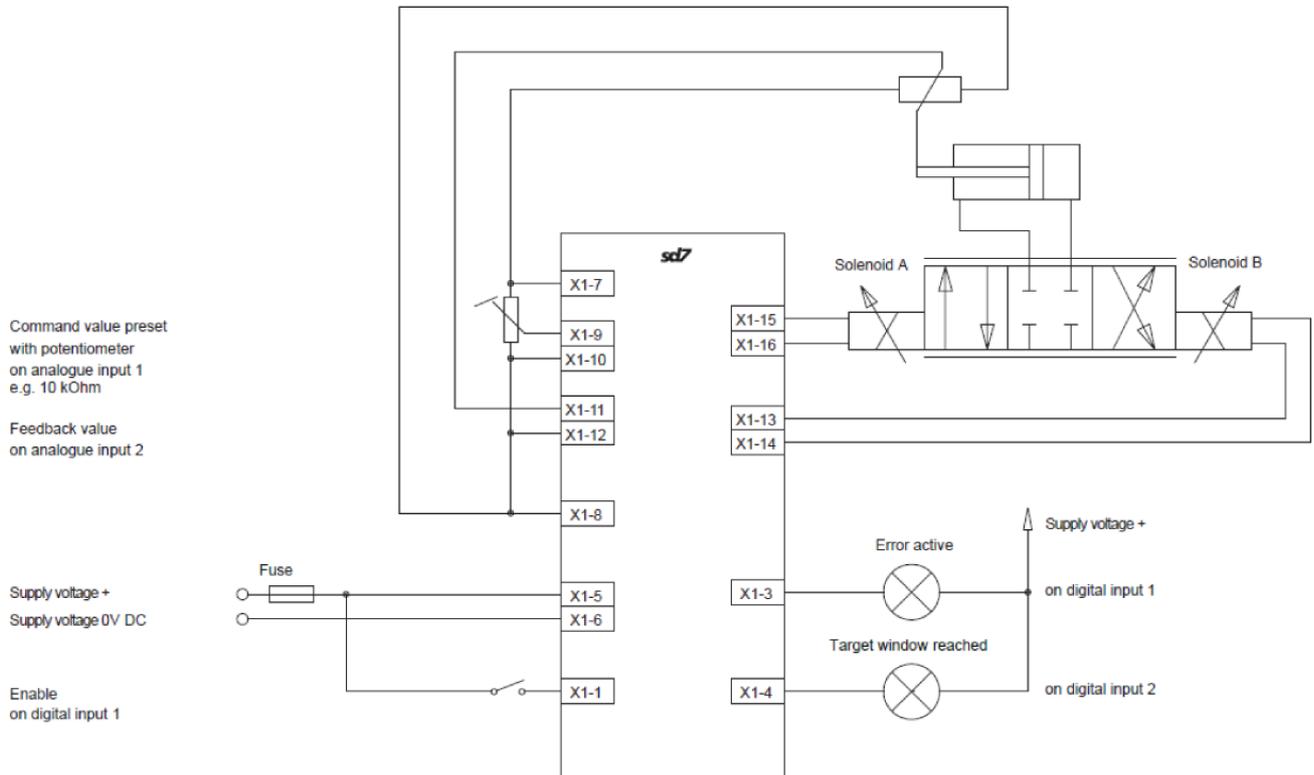
- The solenoid outputs are able to measure the solenoid current. This is necessary for controlling the solenoid current if the parameter "Solenoid type" is set to "Proportional solenoid with current measurement" (refer to section ["Valve type"](#)^[96]). In this case, the negative pole of the solenoid has to be connected to the appropriate negative pole of the solenoid output (for example "Output solenoid A -", refer to section ["Connector view"](#)^[38]).
- If the parameter "Solenoid type" is set to "Proportional solenoid without current measurement" or "Switching solenoid without current measurement" a current measurement is not necessary (refer to section ["Valve type"](#)^[96]). The negative pole of the solenoid can be connected directly to the 0VDC of the Supply Voltage (Solenoid Outputs).

6.2 Connection examples

The contact assignment of the following description refers to section "[Operating and Indicating elements](#)" [38].

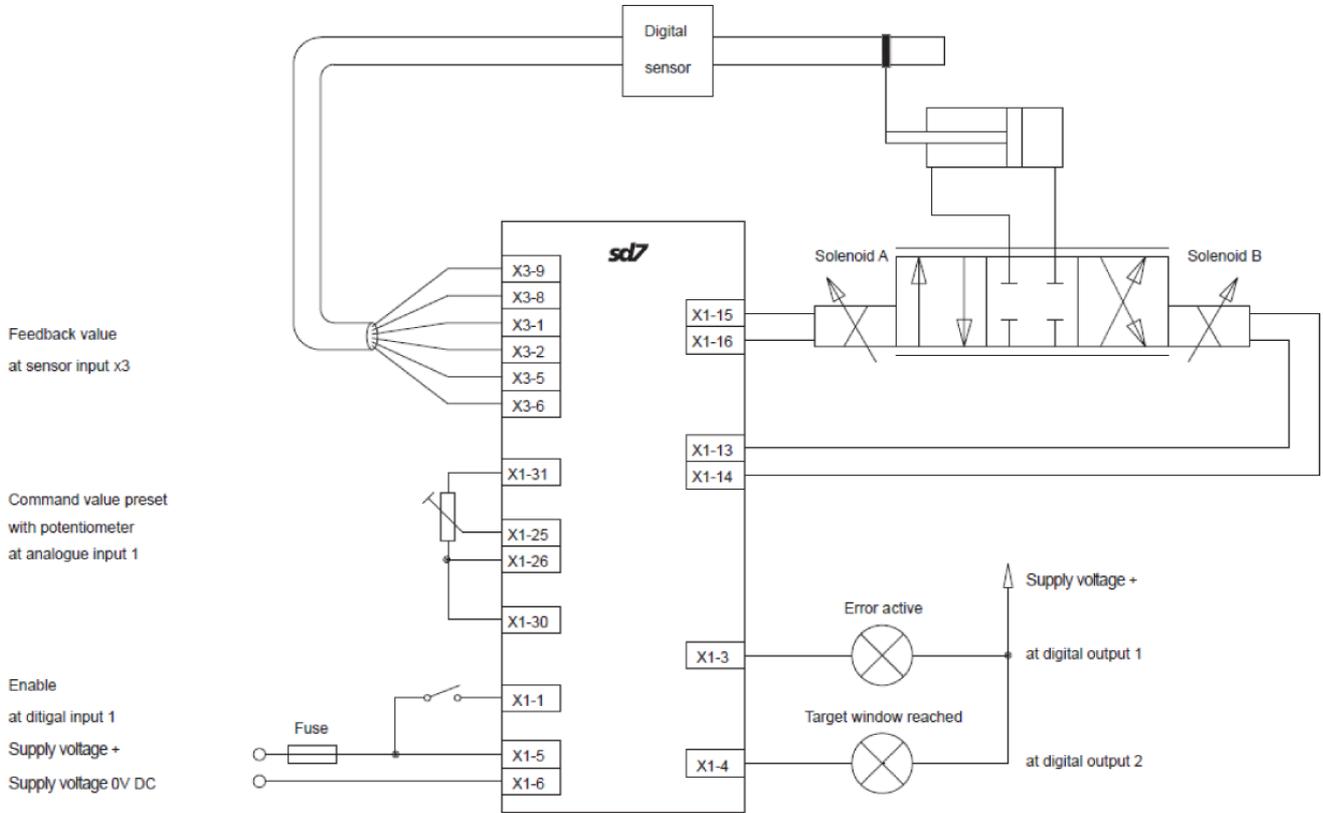
6.2.1 Basic controller

Controller mode "Position closed loop (2-sol)", command and feedback as a voltage signal



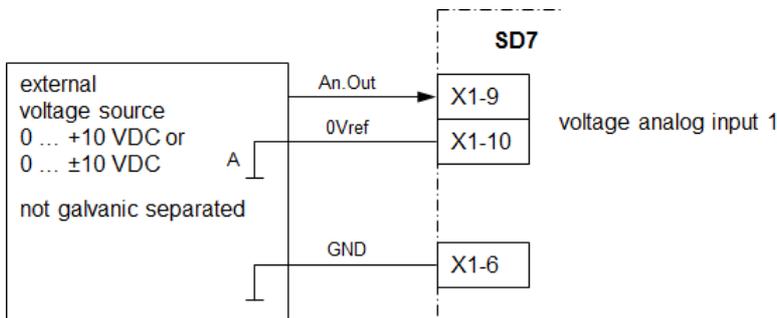
6.2.2 Enhanced controller

Controller mode "Position closed loop (2-sol)", command as a voltage signal, feedback from a digital sensor

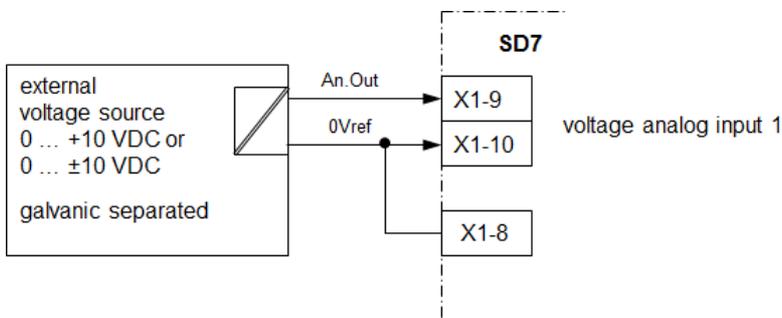


6.2.3 Alternative connections

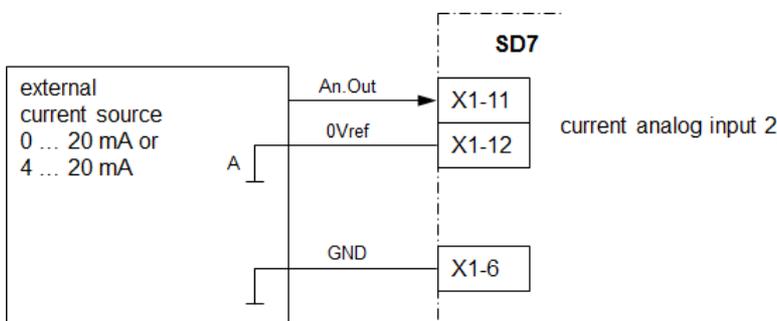
Command value 0 ... 10 VDC or -10 ... +10VDC via external PLC without galvanic separation



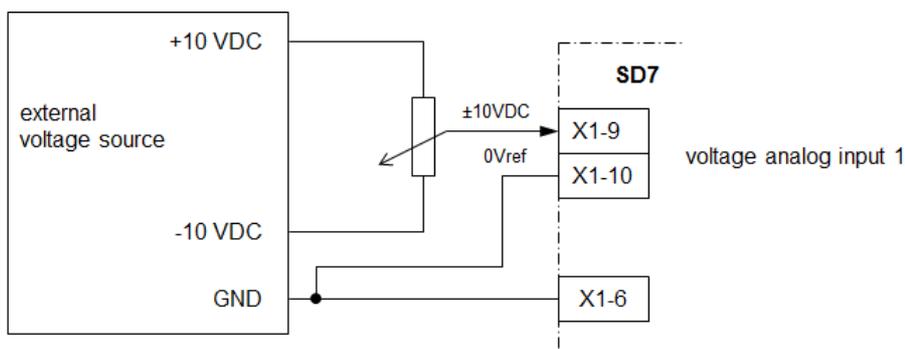
Command value 0 ... 10 VDC or -10 ... +10VDC via external PLC with galvanic separation



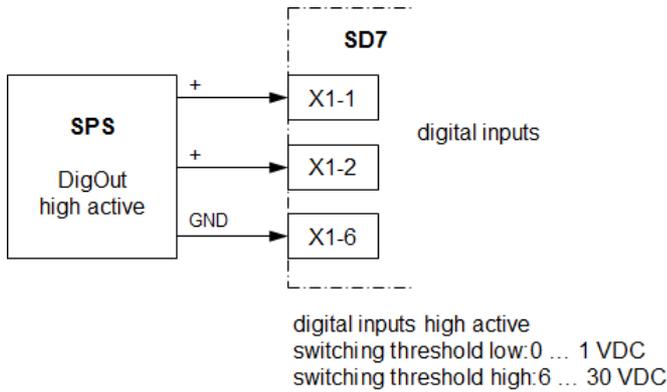
Command value 0 ... 20 mA resp. 4 ... 20 mA via external PLC



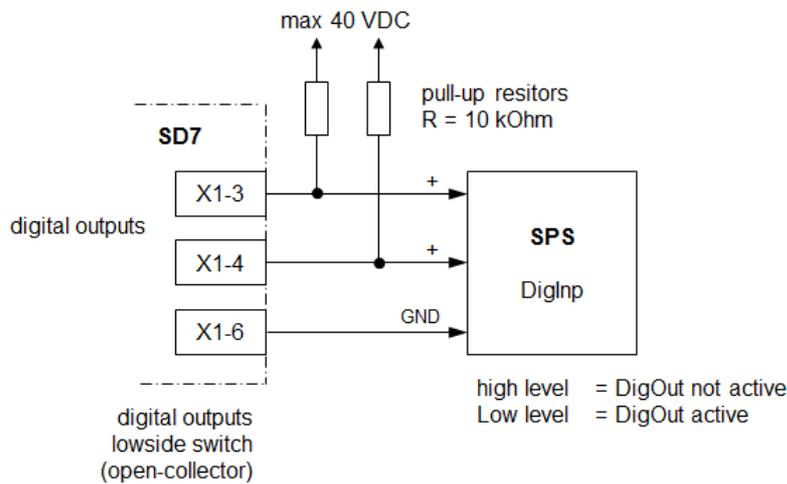
Command value -10 ... +10 VDC via potentiometer with external supply



Control of digital inputs via external PLC



Evaluation of digital outputs via external PLC



7 Settings

Please refer to section "[Safety rules](#)"¹⁸.

7.1 Introduction

- The system- and parameter settings can be made via the PC-Parameterisation software PASO. The graphic view in PASO eases the handling.
- For information about the operation via the PC-Parameterisation software PASO please refer to section "[PASO Installation](#)"¹⁴⁷.
- Depending on the connected Wandfluh-Electronics, certain settings may be blocked.

7.2 Assignment of the inputs/outputs

The allocation of inputs and outputs is not fixed. The user can choose itself which input and output is assigned to which function. The following selection is available:

Values in italic letters are only valid for the Enhanced version

| | |
|------------------|----------------|
| Digital inputs | DigInp1 |
| | DigInp2 |
| | <i>DigInp3</i> |
| | <i>DigInp4</i> |
| | <i>DigInp5</i> |
| | <i>DigInp6</i> |
| | <i>DigInp7</i> |
| | <i>DigInp8</i> |
| | IntSig1 |
| | IntSig2 |
| | IntSig3 |
| | IntSig4 |
| | IntSig5 |
| | IntSig6 |
| | IntSig7 |
| | IntSig8 |
| | not used |
| Digital outputs | DigOut1 |
| | DigOut2 |
| | <i>DigOut3</i> |
| | <i>DigOut4</i> |
| | IntSig1 |
| | IntSig2 |
| | IntSig3 |
| | IntSig4 |
| | IntSig5 |
| | IntSig6 |
| | IntSig7 |
| | IntSig8 |
| | not used |
| Analog inputs | Analnp1 |
| | Analnp2 |
| | <i>Analnp3</i> |
| | <i>Analnp4</i> |
| | not used |
| Solenoid outputs | SolOutA |
| | SolOutB |
| | not used |

| | |
|---|--------------------------|
| Sensor inputs (only Enhanced controller) | DigSens [X3] not used |
| Analog outputs | Anaus1 not used |

The selection "not used" means that no input or output will be assigned.

The selection "IntSig1 ... IntSig8" means internal signals. This allows e.g. to link a digital output to a digital input without an external connection.

With the digital inputs, digital outputs, internal signals and analog inputs, a double allocation is allowed. For example, DigInp1 can be used for enable channel 1 and channel 2 at the same time. Inputs and outputs with a double allocation will be displayed with a yellow background.

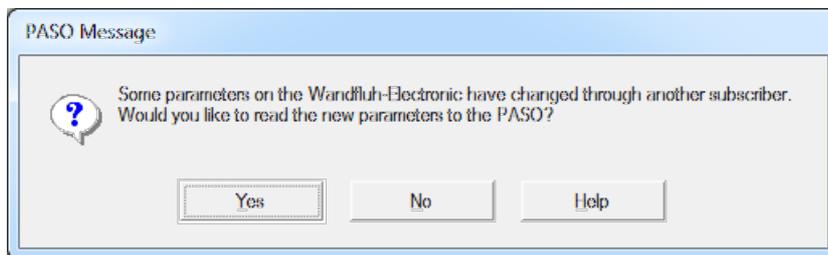
With the solenoid outputs and analog outputs, a double allocation is not allowed. If the selected output is already occupied, an error message appears.

Digital in- and outputs and internal signals, which are set or reset by software (refer to section ["Configuration - Digital E/A"](#)^[110]) will be displayed with blue text color in the main window.

7.3 Parameter inconsistency

The parameter settings can be made via the PC-Parameterisation software PASO or via the fieldbus (only if the Wandfluh-Electronics has the fieldbus option). In any case, the current parameter values will be displayed in the PASO

If a parameter value will be changed through the fieldbus, this new value does not correspond with the displayed value in the PASO. In this case, the following message appears:



If the answer is "Yes", then the parameters will be read-in from the Wandfluh-Electronics. Possible open parameter windows in the PASO will be closed automatically. If a parameter value will be changed through the manual operation terminal after the read-in of the new parameters, this message will appear again.

If the answer is "No", then the displayed parameter values in the PASO do not correspond to the current parameter value on the Wandfluh-Electronics. This will be displayed in the status line in the field "Parameter inconsistency" (refer to section ["Starting of PASO"](#)^[154]). If a parameter value will be changed through the manual operation terminal again, no further message will be appear in the PASO. But it's always possible to change also parameter values through the PASO.

7.4 Tips for the first commissioning

- Connect the power supply, leave the Wandfluh-Electronics still switched-off
- Switch-off the hydraulic drive (hydraulics switched-off)
- Carefully check the connections
- Switch-on the power supply
- Establish communication with PASO (connect PC and axis controller with a standard USB cable and start PASO)
- Configure the Wandfluh-Electronics specific to the installation. In doing so, the following sequence should be observed:
 1. Select the controller mode in the box "[Controller](#)"^[88]
 2. Select the mode of operation and the solenoid type in the box "[Valve type](#)"^[96]
 3. Make the corresponding settings in the box "[Command Scaling](#)"^[66]
 4. Make the corresponding settings in the box "[Feedback Scaling](#)"^[79]
 5. Make the corresponding settings in the box "[Fixed Command values](#)"^[71]
 6. Make the corresponding settings in the box "[Ramp generator](#)"^[77]
 7. Make the corresponding settings in the box "[Windows](#)"^[85]
 8. Make the corresponding settings in the box "[Controller](#)"^[88]
 9. Make the corresponding settings in the box "[Solenoid driver](#)"^[97]
- Switch-on the hydraulic drive (hydraulics switched-on)

7.5 Scaling

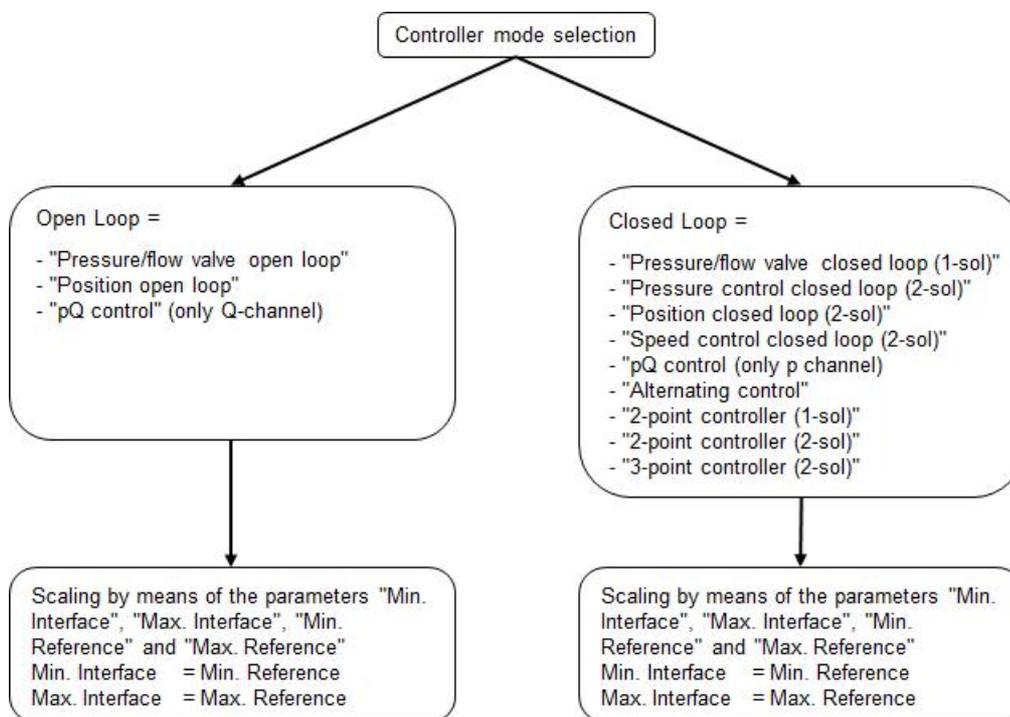
The Wandfluh-Controller has the possibility to display the comand and feedback value with a selectable unit (e.g. mm or bar). For it, both signals must be scaled. This is made with the parameters in the box "[Command scaling](#)"^[66] resp "[Feedback scaling](#)"^[79].

In the following section you will find a detailed description about these parameters.

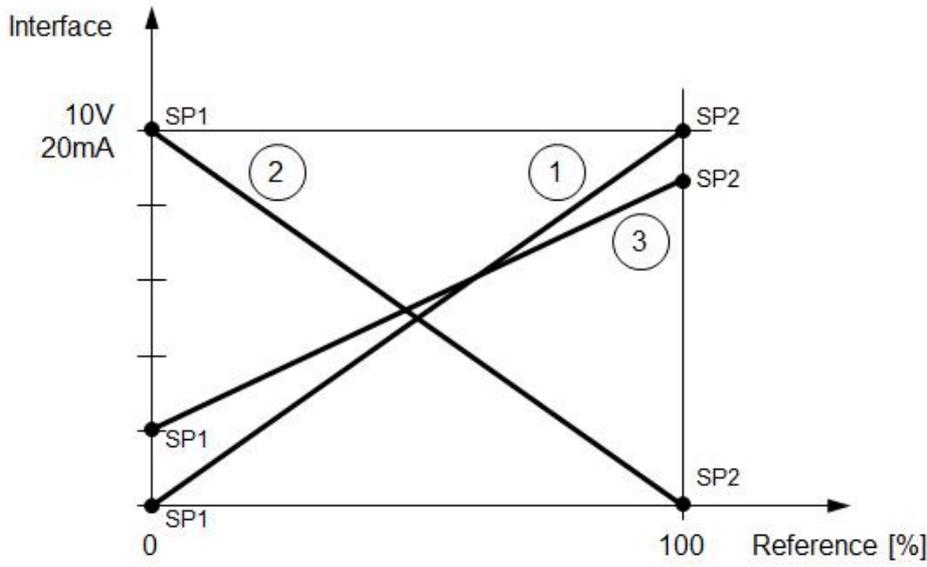
The scaling is defined by two points. These points are called scaling points (SP) in the following. A scaling point consists of an interface and a reference value. The interface value corresponds to the real signal value (e.g. in V or mA), the reference value corresponds to the real measured quantity (e.g. mm or bar). In the following examples, the measured quantity is a distance in mm.

It is advisable to select the two scaling points as far apart from one another as possible. Attention has to be paid, that Min. Reference always has to be smaller than Max. Reference.

The scaling depends on the selected controller mode:



Controller mode = Open Loop:



1

| | | | |
|------------------|----------------|---|--|
| Scaling point 1: | Min. Reference | = | -100% with mode of operation "Command unipolar (2-sol)" 0% for all other mode of operations |
| | Min. Interface | = | 0V or 0mA |
| Scaling point 2: | Max. Reference | = | 100% |
| | Max. Interface | = | 10V or 20mA |

2

This example shows an inversion of the input signal

| | | | |
|------------------|----------------|---|--|
| Scaling point 1: | Min. Reference | = | -100% with mode of operation "Command unipolar (2-sol)" 0% for all other mode of operations |
| | Min. Interface | = | 10V or 20mA |
| Scaling point 2: | Max. Reference | = | 100% |
| | Max. Interface | = | 0V or 0mA |

3

This example shows a level adaption of the input signal

| | | | |
|------------------|----------------|---|--|
| Scaling point 1: | Min. Reference | = | -100% with mode of operation "Command unipolar (2-sol)" 0% for all other mode of operations |
| | Min. Interface | = | 2V or 4mA |
| Scaling point 2: | Max. Reference | = | 100% |
| | Max. Interface | = | 8V or 16mA |

Controller mode = Closed Loop:
Command scaling:

With the command scaling, the desired working range can be adjusted. This may be less than the maximum possible working area.

1. Example:

The command value is a voltage signal (0 ... 10V). With 0V the position 0mm and with 10V the position 100mm should be approached.

| | | | |
|------------------|----------------|---|-------|
| Scaling point 1: | Min. Reference | = | 0mm |
| | Min. Interface | = | 0V |
| Scaling point 2: | Max. Reference | = | 100mm |
| | Max. Interface | = | 10V |

2. Example

The command value is a current signal (4 ... 20mA). With 4mA the position 0mm and with 20mA the position 80mm should be approached.

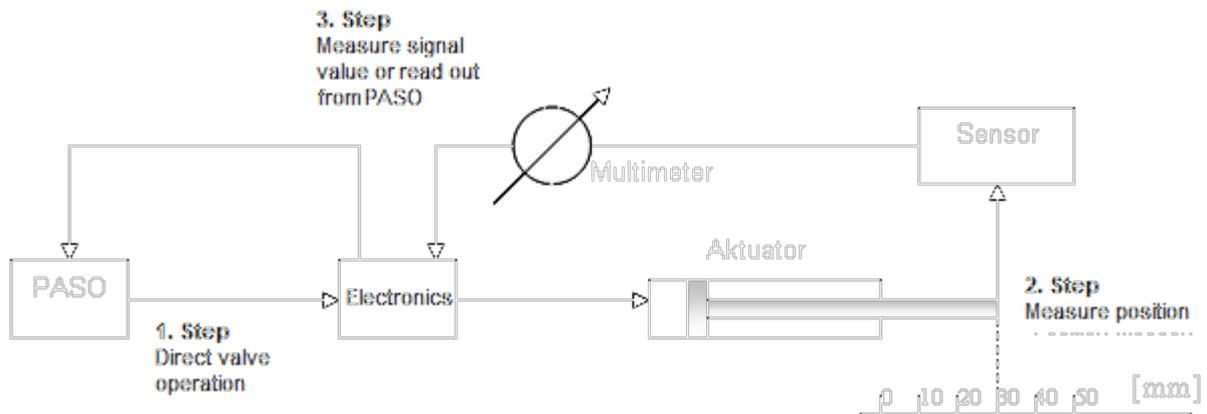
| | | | |
|------------------|----------------|---|------|
| Scaling point 1: | Min. Reference | = | 0mm |
| | Min. Interface | = | 4mA |
| Scaling point 2: | Max. Reference | = | 80mm |
| | Max. Interface | = | 20mA |

Feedback scaling:

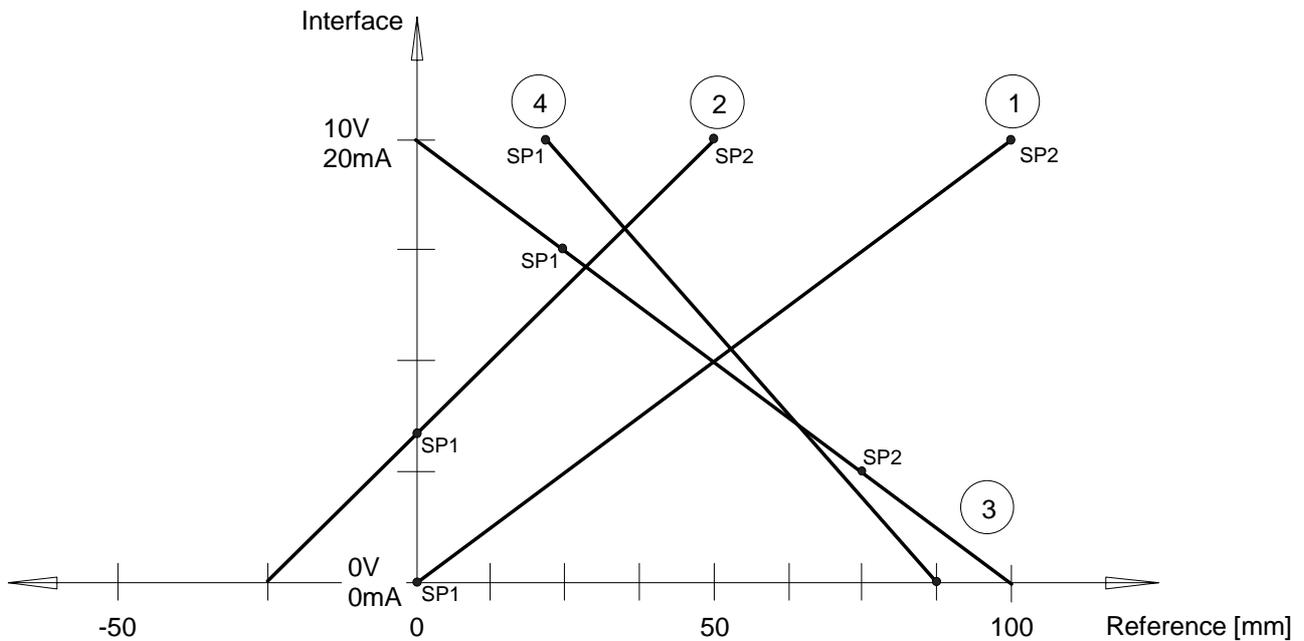
With the feedback scaling, the maximum possible working area can be adjusted.

1. Go to a small position (e.g. inside endpoint) by using direct valve operation (refer to section "[Commands_Valve operation](#)" ¹²³).
2. Measure the position (→ Min. Reference value).
3. Measure the signal value of the feedback sensor or read out this value via PASO (→ Min. Interface value).
4. Go to a large position (e.g. outside endpoint) by using direct valve operation (refer to section "[Commands_Valve operation](#)" ¹²³ ¹²³).

5. Measure the position (→ Max. Reference value).
6. Measure the signal value of the feedback sensor or read out this value via PASO (→ Max. Interface value).



The following illustration shows various examples for the scaling (SP = scaling points).



1

| | | | |
|------------------|----------------|---|-------------|
| Scaling point 1: | Min. Reference | = | 0mm |
| | Min. Interface | = | 0V or 0mA |
| Scaling point 2: | Max. Reference | = | 100mm |
| | Max. Interface | = | 10V or 20mA |

2

This example shows, that with positive interface values also negative reference values can be achieved.

Scaling point 1: Min. Reference = 0mm
 Min. Interface = 03.33V or 6.67mA

Scaling point 2: Max. Reference = 50mm
 Max. Interface = 10V or 20mA

3

This example shows, that the scaling points do not necessarily have to be the end points.

Scaling point 1: Min. Reference = 25mm
 Min. Interface = 7.5V or 15mA

Scaling point 2: Max. Reference = 75mm
 Max. Interface = 2.5V or 5mA

4

This example shows, that depending on the scaling 0mm are never reached.

Scaling point 1: Min. Reference = 25mm
 Min. Interface = 10V or 20mA

Scaling point 2: Max. Reference = 87.5mm
 Max. Interface = 0V or 0mA

7.6 Inputs/outputs according to Wandfluh standard

The allocation of inputs and outputs is not fixed. The user can choose itself which input and output is assigned to which function (refer to section ["Assignment of the inputs/outputs"](#)^[51]).

However, Wandfluh has defined a default mapping, with which all the basic functions of the card can be selected. The following table shows the corresponding settings:

| Input/Output | Basic Controller | Enhanced Controller |
|-------------------|--|--|
| Digital input 1 | Enable channel - Dig. input ^[66] | Enable channel - Dig. input ^[66] |
| Digital input 2 | Valve type - Solenoid B ^[96] (open loop) | Valve type - Solenoid B ^[96] (open loop) Manual operation - Dig. input ^[79] (closed loop) |
| Digital input 3 | | Manual operation - Forward ^[79] (manual mode) Profiles - Profile/Sequence ^[71] (automatic mode) |
| Digital input 4 | | Manual operation - Backward ^[79] (manual mode) Profiles - Start ^[71] (automatic mode) |
| Digital input 5 | | Manual operation - Fast speed ^[79] (manual mode) Profiles - Stop ^[71] (automatic mode) |
| Digital input 6 | | Command value fixes/Profiles - Selection 1 ^[71] |
| Digital input 7 | | Command value fixes/Profiles - Selection 2 ^[71] |
| Digital input 8 | | Command value fixes/Profiles - Selection 4 ^[71] |
| | | |
| Analog input 1 | Command scaling - Used analog input ^[66] | Command scaling - Used analog input ^[66] |
| Analog input 2 | Feedback scaling - Used analog input ^[79] | Feedback scaling - Used analog input ^[79] |
| | | |
| Digital output 1 | Error evaluation - Dig. output ^[101] | Error evaluation - Dig. output ^[101] |
| Digital output 2 | Function - "Target window active" ^[102] | Function - "Target window active" ^[102] |
| Digital output 3 | | Function - "Sequence End" ^[102] |
| Digital output 4 | | Function - "Profile End" ^[102] |
| | | |
| Solenoid output A | Solenoid driver 1 - Solenoid output ^[97] | Solenoid driver 1 - Solenoid output ^[97] |
| Solenoid output B | Solenoid driver 2 - Solenoid output ^[97] | Solenoid driver 2 - Solenoid output ^[97] |
| | | |
| Analog output | | Analog output - Used output ^[104] |

This setting can be rechanged at any time (refer to section ["Assignment of the inputs/outputs"](#)^[51]).

7.7 Default setting of the parameters

The SD7-Electronic will be delivered with the following default settings:

| Parameter | Basic Controller | Enhanced Controller |
|------------------------------------|------------------|---------------------|
| Digital input 1 - 2 | X | X |
| Digital input 3 - 8 | | X |
| Digital output 1 - 2 | X | X |
| Digital output 3 - 4 | | X |
| Internal signals 1 - 8 | X | X |
| Auto Reset | no | no |
| Filter type Analnp1 - Analnp2 | no filter | no filter |
| Smoothing factor Analnp1 - Analnp2 | 8 | 8 |
| Filter type Analnp3 - Analnp4 | | no filter |
| Smoothing factor Analnp3 - Analnp4 | | 8 |
| | Channel 1 - 2 | Channel 1 - 2 |
| Enable channel | external | external |
| Dig. input enable channel | DigInp1 | DigInp1 |
| Channel name | Channel 1 - 2 | Channel 1 - 2 |
| Signal type command | Voltage | Voltage |
| Used analog input command | Analnp1 [V] | Analnp1 [V] |
| Used digital input command | not used | not used |
| Cablebreak detection | no | no |
| Lower cablebreak limit command | 0.5 V | 0.5 V |
| Upper cablebreak limit command | 9.5 V | 9.5 V |
| Deadband function command | off | off |
| Deadband threshold command | 0.0 % | 0.0 % |
| Min Interface command | 0.000 V | 0.000 V |
| Max Interface command | 10.000 V | 10.000 V |
| Min Reference command | 0.0 % | 0.0 % |
| Max Reference command | 100.0 % | 100.0 % |
| Function command 2 | not used | not used |
| Dig. input command 2 | not used | not used |
| Enable fixed command values | off | Profile |
| Selection 1 fixed command values | not used | DigInp6 |
| Selection 2 fixed command values | not used | DigInp7 |
| Selection 3 fixed command values | | DigInp8 |
| Fixed command value 1 - 3 | 0.0 % | 0.0 % |
| Fixed command value 4 - 7 | | 0.0 % |
| Profile selection 1 - 7 | | Profile 1 - 7 |
| Profile control Profile / Sequence | | DigInp3 |
| Profile control Start | | DigInp4 |
| Profile control Stop | | DigInp5 |
| Enable ramp | on | on |
| Dig. input enable ramp | not used | not used |
| Ramp up positive / negative | 0.0 s | 0.0 s |

| | | |
|---|--|--|
| Ramp down positive / negative | 0.0 s | 0.0 s |
| Type Monitoring switching threshold 1 | off | off |
| Selection Monitoring switching threshold 1 | Command value | Command value |
| Function Monitoring switching threshold 1 | < (less than) | < (less than) |
| Threshold Monitoring switching threshold 1 | 100.0 % | 100.0 % |
| Delay time Monitoring switching threshold 1 | 50 ms | 50 ms |
| Type Monitoring switching threshold 2 | off | off |
| Selection Monitoring switching threshold 2 | Command value | Command value |
| Function Monitoring switching threshold 2 | < (less than) | < (less than) |
| Threshold Monitoring switching threshold 2 | 100.0 % | 100.0 % |
| Delay time Monitoring switching threshold 2 | 50 ms | 50 ms |
| Function Control value | primary | primary |
| Source Control value | not used | not used |
| Dig. input Control value | not used | not used |
| Mode of operation | Command unipolar (2-sol) | Command unipolar (2-sol) |
| Digital input solenoid B | not used | DigInp2 |
| Solenoid type | Proportional solenoid with current measuring | Proportional solenoid with current measuring |
| Error evaluation | 1111111 | 1111111 |
| Digital output error | DigOut1 | DigOut1 |
| Error action | Solenoid 1+2 off | Solenoid 1+2 off |
| Function "Solenoid 1 active" | not used | not used |
| Function "Solenoid 2 atkiv" | not used | not used |
| Function "Target window active" | DigOut2 | DigOut2 |
| Function "Ready signale" | not used | not used |
| Function "Trailing window" | not used | not used |
| Function "Command 2 active" | not used | not used |
| Function "Sequence End" | | DigOut3 |
| Function "Profile End" | | DigOut4 |
| Solenoid output 1 | not used | not used |
| Solenoid output 2 | not used | not used |
| Min Reference analog output | | 0.0 % |
| Max Reference analog output | | 100.0 % |
| Min Interface analog output | | 0.0 V |
| Max Interface analog output | | 10.0 V |
| Signale analog output | | Control value |
| Used analog output | | AnaOut1 |
| | | |
| | Channel 1 | Channel 1 |
| Speed + / - | 100.000 mm/s | 100.000 mm/s |
| Acceleration + / - | 100.000 mm/s | 100.000 mm/s |
| Deceleration + / - | 100.00 mm/s | 100.00 mm/s |
| Signal type feedback | Voltage | Voltage |

| | | |
|--|--------------------|--------------------|
| Used Analog input feedback | Analnp2 | Analnp2 |
| Used Digital input feedback | not used | not used |
| Used Sensor input feedback | | not used |
| Cablebreak detection feedback | no | no |
| Lower cablebreaklimit feedback | 0.5 V | 0.5 V |
| Upper cablebreaklimit feedback | 9.5 V | 9.5 V |
| Min Interface feedback | 0.000 V | 0.000 V |
| Max Interface feedback | 10.000 V | 10.000 V |
| Min Reference feedback | 0.00 mm | 0.00 mm |
| Max Reference feedback | 100.00 mm | 100.00 mm |
| Offset SSI feedback | | 0.0 mm |
| Resolution SSI feedback | | 0.005 mm/Inc |
| Bit number SSI feedback | | 24 |
| Overflow SSI feedback | | not limited |
| Function feedback 2 | | not used |
| Dig. input feedback 2 | | not used |
| Target window type | on | on |
| Target window threshold | 10.000 mm | 10.000 mm |
| Target window delay time | 50 ms | 50 ms |
| Trailing window type | on without error | on without error |
| Trailing window threshold | 10.000 mm | 10.000 mm |
| Trailing window delay time | 50 ms | 50 ms |
| Solenoid-Off window type | off | off |
| Solenoid-Off window threshold | 10.000 mm | 10.000 mm |
| Solenoid-Off window delay time | 50 ms | 50 ms |
| Controller mode | Position open-loop | Position open-loop |
| Displayed unit | mm | mm |
| Free unit | "empty" | "empty" |
| Command feed forward | 0 | 0 |
| Velocity feed forward | 0 | 0 |
| I-Type | on | on |
| Control deviation scaling | no | no |
| Control deviation for 100% control value | 100.000 mm | 100.000 mm |
| I-Term, if control deviation > I-Window | set to 0 | set to 0 |
| P-Ampl.. positive / negative | 5.0 | 5.0 |
| I-Time positive / negative | 0.100 s | 0.100 s |
| I-Window outside positive / negative | 5.000 mm | 5.000 mm |
| I-Window inside positive / negative | 0.000 mm | 0.000 mm |
| I-Reduction timet positive / negative | 0.100 s | 0.100 s |
| D-Time positive / negative | 0.000 s | 0.000 s |
| D-Ampl. positive / negative | 0.0 | 0.0 |
| Threshold 1 | 5.000 mm | 5.000 mm |
| Threshold 2 | 2.000 mm | 2.000 mm |

| | | |
|--|----------------|----------------|
| Threshold 3 | -2.000 mm | -2.000 mm |
| Threshold 4 | -5.000 mm | -5.000 mm |
| Speed slow speed | | 10 mm/s |
| Speed fast speed | | 100 mm/s |
| Dig. input manual operation Enable | | DigInp2 |
| Dig. input manual operation forward | | DigInp3 |
| Dig. input manual operation backward | | DigInp4 |
| Dig. input manual operation fast speed | | DigInp5 |
| | | |
| | Solenoid A - B | Solenoid A - B |
| Enable solenoid output | on | on |
| Dig. input enable solenoid output | not used | not used |
| Error solenoid output | no | no |
| Inversion | no | no |
| Characteristic optimisation | off | off |
| Solenoid immer active | no | no |
| Imin | 150 mA | 150 mA |
| Imax | 700 mA | 700 mA |
| Dither function | on | on |
| Dither frequency | 100 Hz | 100 Hz |
| Dither level | 100 mA | 100 mA |
| Switching on threshold | 60.0 % | 60.0 % |
| Switching off threshold | 40.0 % | 40.0 % |
| Reduction time | 0 ms | 0 ms |
| Reduced value | 100.0 % | 100.0 % |

In the section "[Parameter - Setting](#)"^[66] and "[Configuration - Menu](#)"^[110] there is a description of all the parameters.

With the menu "[Configuration - Default setting](#)"^[112], these values will be loaded on the connected SD7-Electronics and read to the PC

7.8 Parameters setting

By clicking with the left mouse button on the corresponding box in the channel window, the parameter values of SD7-Elektronik can be set.

7.8.1 Enable channel

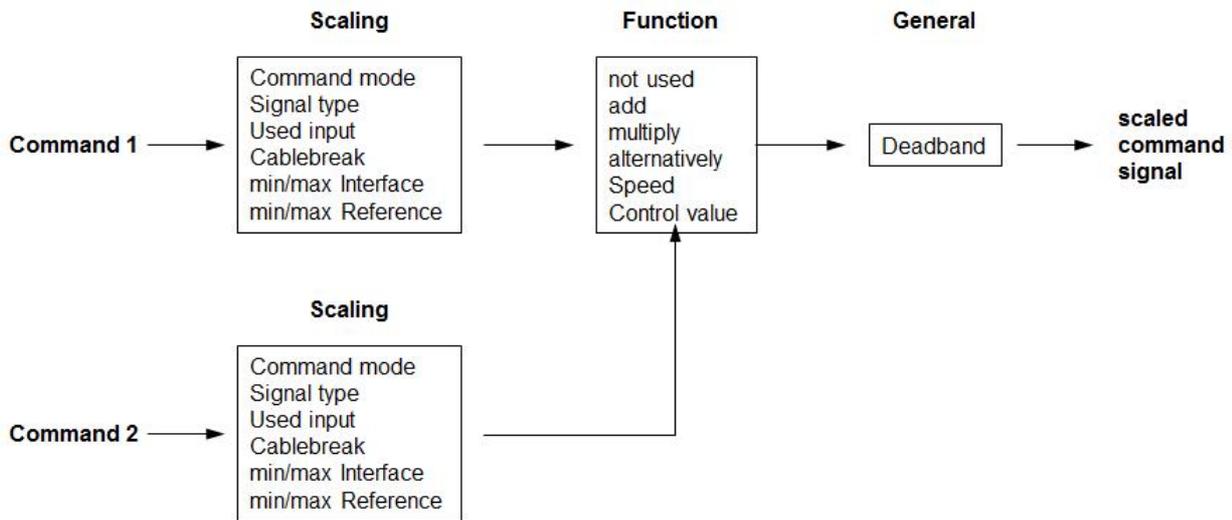
In this window, all settings specific to the channel release will be made.

| Field | Parameter description | Range / Step |
|-------------------------------|---|---|
| Operating mode (Device local) | Select the desired command value source (only valid for SD7 with Fieldbus Interface). | bus local |
| Enable | <p>Enable channel.</p> <p>With the selection "off", the corresponding channel is disabled and no solenoid current will be active (refer to section "State machine"^[21]).</p> <p>With the selection "on", the corresponding channel is enabled and the solenoid current will be operated according to the selected operating mode (refer to section "State machine"^[21]).</p> <p>With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable).</p> <p>With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable).</p> <p>The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input".</p> | off on external external inverted |
| Dig. input | <p>Active digital input for the enable if the parameter "Enable" is set to "external" or "external inverted".</p> <p>Otherwise, this setting has no effect.</p> <p>In choosing "not used", no digital input will be assigned to the enable function.</p> | refer to section "Assignment of the inputs/outputs" ^[51] |

7.8.2 Command value scaling

In this window, the adjustments and scaling values of the command value signal will be adjusted. For a detailed description about the scaling please refer to section ["Scaling"](#)^[54].

There are two command value inputs available. Each input can be scaled independently. How the second input is merged with the first input can be selected with the parameter "Function". If necessary, a deadband can be set on the resulting command value.



Command 1 and Command 2

The tab Command 2 is only active if the parameter "Function" is set to "add", "multiply" or "alternatively".

| Field | Parameter description | Range / Step |
|--|---|--|
| Command value mode (Device Local) | Select the desired command value source (only valid for MD2 with Fieldbus Interface). | local bus |
| Signal type | Select the desired command value signal type. If the parameter "Mode of operation" is set to "Command value bipolar (2-sol)", only the selection "Voltage" is possible (refer to section "Valve type" ^[96]). | Voltage Current Digital Frequency PWM |
| Used analog input | Select the desired used analog input. This control is only active, if the parameter "Signal type" is set to "Voltage" or "Current". In choosing "not used", no analog input will be assigned. | refer to section "Assignment of the inputs/outputs" ^[51] |
| Used digital input | Select the desired used digital input. This control is only active, if the parameter "Signal type" is set to "Digital", "Frequency" or "PWM". In choosing "not used", no digital input will be assigned. | refer to section "Assignment of the inputs/outputs" ^[51] |
| Function (only adjustable on command 1) | The function of the command 2 can be selected: Command 2 is not active. Only command 1 is available The value from command 2 is added to the value from command 1. A negative value on command 2 leads to a subtraction.. The value from command 1 is multiply with the value from command 2. A value < 1.0 on command 2 leads to a division. A negative value on command 2 leads to a negative command value. It will either work with command 1 or command 2. Switching between the two command value is done with the digital input from parameter "Dig. input". With the value from command 2 the speed can be adjusted. The adjustment range is always 0 ... value from parameter "speed +" resp. "Speed -" (refer to section Ramp generator ^[77]) With the value from command 2 the control value can be limited. The adjustment range is always 0 ... active control value | not used add multiply alternatively Speed Control value |
| Dig. input (only adjustable on command 1) | The desired digital inputs for switching between command 1 / command 2 can be select. This control is only active, if the parameter "Function" is set to "alternatively". | refer to section "Assignment of the inputs/outputs" ^[51] |

The following adjustments can only be made if the parameter "Signal type" is set to "Voltage", "Current", "Frequency" or "PWM".

| Field | Parameter description | Range / Step |
|----------------------|--|--------------|
| Cablebreak detection | Switch on/off the cablebreak detection of the input signal (refer to section "Cablebreak detection" ^[24]). | no yes |

| Field | Parameter description | Range / Step |
|------------------------|---|--|
| Lower cablebreak limit | Command value < Lower cablebreak limit = cablebreak active Signal type = Voltage Signal type = Current Signal type = Frequency Signal type = PWM The adjusted value must be less than the value of the Upper cablebreak limit. By changing the parameter "Signal type", this value will be set to the default value (see table below). | 0 ... 10V 0.2V 0 ... 20mA 0.3mA 5 ... 5000Hz 0.2Hz 0 ... 100%PW 0.2%PW |
| Upper cablebreak limit | Command value > Upper cablebreak limit = cablebreak active Signal type = Voltage Signal type = Current Signal type = Frequency Signal type = PWM The adjusted value must be greater than the value of the Lower cablebreak limit. By changing the parameter "Signal type", this value will be set to the default value (see table below). | 0 ... 10V 0.2V 0 ... 20mA 0.3mA 5 ... 5000Hz 0.2Hz 0 ... 100%PW 0.2%PW |
| Min Interface | Indicates the input signal value for "Min Reference". Signal type = Voltage (Mode of operation ³⁴ = 3) Signal type = Voltage (Mode of operation ³⁴ = 1, 2 or 4) Signal type = Current Signal type = Frequency Signal type = PWM By changing the parameter "Signal type", this value will be set to the default value (see table below). | -10 ... 10V 0.2V 0 ... 10V 0.2V 0 ... 20mA 0.3mA 5 ... 5000Hz 0.2Hz 0 ... 100%PW 0.2%PW |

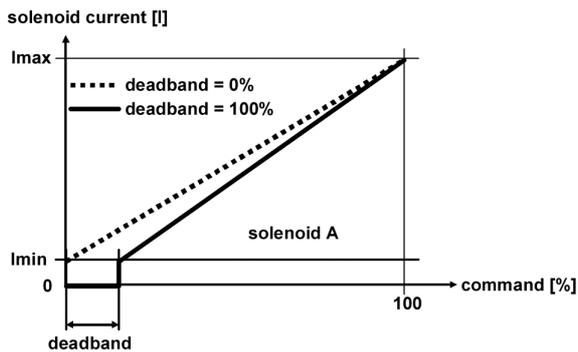
| Field | Parameter description | Range / Step |
|---------------|--|--|
| Max Interface | <p>Indicates the input signal value for "Max Reference".</p> <p>Signal type = Voltage (Mode of operation^[34] = 3)</p> <p>Signal type = Voltage (Mode of operation^[34] = 1, 2 or 4)</p> <p>Signal type = Current</p> <p>Signal type = Frequency</p> <p>Signal type = PWM</p> <p>By changing the parameter "Signal type", this value will be set to the default value (see table below).</p> | <p>-10 ... 10V 0.2V</p> <p>0 ... 10V 0.2V</p> <p>0 ... 20mA 0.3mA</p> <p>5 ... 5000Hz 0.2Hz</p> <p>0 ... 100%PW 0.2%PW</p> |
| Min Reference | Indicates the absolute command value at "Min Interface". The min reference command value has to be smaller than the max reference command value. | Dependent on unit |
| Max Reference | Indicates the absolute command value at "Max Interface". The max reference command value has to be larger than the min reference command value. | Dependent on unit |

General

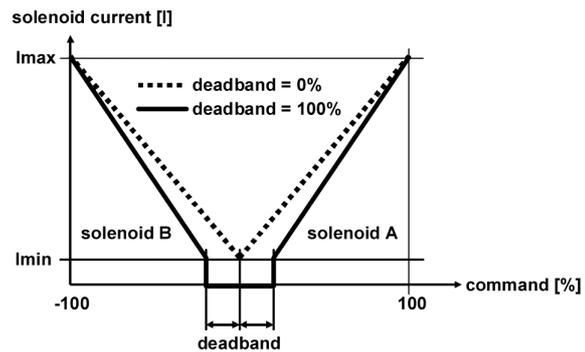
These adjustments apply to the command value after merging command 1 and command 2.

The following adjustments can only be made if the parameter "Controller mode" is set to "Pressure/flow valve open loop" or "Position open loop".

| | | |
|-------------------|---|-------------------|
| Deadband function | Switch on/off the deadband function | off on |
| Deadband | Command value < Deadband = 0 mA solenoid current Command value >= Deadband = Imin..Imax solenoid current | 0 ... 50% 0.1% |



1-solenoid version



2-solenoid version

Default values for scaling parameters

| | Signal type | | | |
|------------------------|-------------|-----------|-----------|-----------|
| | Voltage | Current | Frequency | PWM |
| Lower cablebreak limit | 0.5 V | 3.5 mA | 10 Hz | 10 %PW |
| Upper cablebreak limit | 10 V | 20 mA | 5000 Hz | 100 %PW |
| Min Interface | 0 V | 0 mA | 5 Hz | 5 %PW |
| Max Interface | 10 V | 20 mA | 5000 Hz | 95 %PW |
| Min Reference | 0.00 mm | 0.00 mm | 0.00 mm | 0.00 mm |
| Max Reference | 100.00 mm | 100.00 mm | 100.00 mm | 100.00 mm |

7.8.3 Command value fixed

In this window, all settings specific to the command values fixed will be made. Command values fixed can be used in place of the external command value. They serve to pretend of predefined, fixed set command values.

With the enhanced controller the selection is possible whether one want to work with the command value fixed or with the travel profile (refer so section "[Travel Profile](#)"¹¹⁵).

Values in italic letters are only valid for the enhanced controller.

| Field | Parameter description | Range / Step |
|-------|-----------------------|--------------|
|-------|-----------------------|--------------|

| | | |
|--------------------|---|--|
| <p>Enable</p> | <p>Enable command values fixed. With the selection "off", the command value fixed function ist switched off, that means the external input command value is 1:1 redirected to the output. With the selection "on" resp. "Command value fixed", the command value fixed function ist switched on, that means the output value is dependend on the digital inputs. With the selection "Profiles", the travel profiles function ist switched on, that means the output value is dependend on the digital inputs and the associated travel profiles. Can only be adjusted if a controller mode = closed loop is active. With the selection "Profile Position Mode", the Profile Position Mode function is switched on, that means the output value is dependend on the values from the Profil Position Mode via the fieldbus. This selection is only on SD7 with fieldbus-interface available.</p> | <p style="text-align: right;">off</p> <p style="text-align: center;">on resp. Command value fixed</p> <p style="text-align: right;">Profiles</p> <p style="text-align: center;">Profile Positon Mode (only on SD7 with fieldbus-interface)</p> |
| <p>Selection 1</p> | <p>Active digital input for command value fixed 1 resp. profile selection 1, if the parameter "enable = 1" resp. "enalbe = Profiles". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the command value fixed 1 resp. profile selection 1.</p> | <p>refer to section "Assignment of the inputs/outputs" ⁵¹</p> |
| <p>Selection 2</p> | <p>Active digital input for command value fixed 2 resp. profile selection 2, if the parameter "enable = 1" resp. "enalbe = Profiles". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the command value fixed 2 - 3 resp. profile selection 2 - 3. If "Selection 1 = not used", the control "Selection 2" is disabled.</p> | <p>refer to section "Assignment of the inputs/outputs" ⁵¹</p> |
| <p>Selection 3</p> | <p>Active digital input for command value fixed 4 resp. profile selection 4, if the parameter "enable = 1" resp. "enalbe = Profiles". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the command value fixed 4 - 7 resp. profile selection 4 - 7. If "Selection 1 = not used" and "Selection 2 = not used", the control "Selection 2" is disabled.</p> | <p>refer to section "Assignment of the inputs/outputs" ⁵¹</p> |

The following description is only valid, if the parameter "Enable" is set to "on" resp. "Command value fixed" and a controller mode = open loop is active.

| | | |
|--|---|--|
| Fixed command value 1 | Value for the fixed command value 1. The adjusted %-value correspond to the adjusted solenoid current range (0% = 0mA, 0.1% = Imin, 100% = Imax). A positive value will activate solenoid driver 1, a negative value will activate solenoid driver 2 Can only be adjusted if "Selection 1" is not set to "not used". | 0 ... 100% for 1 solenoid -100 ... +100% for 2 solenoid 0.1% |
| Fixed command value 2 Fixed command value 3 | Value for the fixed command value 2 - 3. The adjusted %-value correspond to the adjusted solenoid current range (0% = 0mA, 0.1% = Imin, 100% = Imax). A positive value will activate solenoid driver 1, a negative value will activate solenoid driver 2 Can only be adjusted if "Selection 1" and "Selection 2" are not set to "not used". | 0 ... 100% for 1 solenoid -100 ... +100% for 2 solenoid 0.1% |
| Fixed command value 4 Fixed command value 5 Fixed command value 6 Fixed command value 7 | Value for the fixed command value 4 - 7. The adjusted %-value correspond to the adjusted solenoid current range (0% = 0mA, 0.1% = Imin, 100% = Imax). A positive value will activate solenoid driver 1, a negative value will activate solenoid driver 2 Can only be adjusted if "Selection 1", "Selection 2" and "Selection 3" are not set to "not used". | 0 ... 100% for 1 solenoid -100 ... +100% for 2 solenoid 0.1% |

The following description is only valid, if the parameter "Enable" is set to "on" resp. "Command value fixed" and a controller mode = closed loop is active.

| | | |
|--|---|-----------------|
| Fixed command value 1 | Value for the fixed command value 1. The adjusted value must be between the value from "Min reference" and "Max reference" from the command value (refer to section "Command scaling" [66]). Can only be adjusted if "Selection 1" is not set to "not used". | Adapted to unit |
| Fixed command value 2 Fixed command value 3 | Value for the fixed command value 2 - 3. The adjusted value must be between the value from "Min reference" and "Max reference" from the command value (refer to section "Command scaling" [66]). Can only be adjusted if "Selection 1" and "Selection 2" are not set to "not used". | Adapted to unit |
| Fixed command value 4 Fixed command value 5 Fixed command value 6 Fixed command value 7 | Value for the fixed command value 4 - 7. The adjusted value must be between the value from "Min reference" and "Max reference" from the command value (refer to section "Command scaling" [66]). Can only be adjusted if "Selection 1", "Selection 2" and "Selection 3" are not set to "not used". | Adapted to unit |

The following description is only valid, if the parameter "Enable" is set to "Profiles" and a controller mode = closed loop is active.

| | | |
|--|---|---|
| Selection 1 | Travel profile assignment for the selection 1. The corresponding travel profile can be created in the menu " Profile - Generator ^[120] ". Can only be adjusted if "Selection 1" is not set to "not used". | no profile profile 1 ... profile 7 |
| Selection 2 Selection 3 | Travel profile assignment for the selection 2 - 3. The corresponding travel profile can be created in the menu " Profile - Generator ^[120] ". Can only be adjusted if "Selection 1" and "Selection 2" are not set to "not used". | no profile profile 1 ... profile 7 |
| Selection 4 Selection 5 Selection 6 Selection 7 | Travel profile assignment for the selection 2 - 3. The corresponding travel profile can be created in the menu " Profile - Generator ^[120] ". Can only be adjusted if "Selection 1", "Selection 2" and "Selection 3" are not set to "not used". | no profile profile 1 ... profile 7 |
| Enable | Enable the function "Profile/Sequence". With the selection "off", always "Profile" is set. With the selection "on", always "Sequenece" ist set. With the selection "external", the choice of the function is done via a digital input (input not active = Profile, input active = Sequence). With the selection "external inverted", the choice of the function is done via a digital input (input not active = Sequence, input active = Profile). The digital input for "external" resp. "external inverted" can be selected with the parameter "Profile/Sequence". | off on external external inverted |
| Profile/Sequence | Active digital input for the function "Profile/Sequence" if the parameter "Enable" is set to "external" or "external inverted". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the function "Profile/Sequence". | refer to section " Assignment of the inputs/outputs " ^[51] |
| Enable | Enable the function "Stop". With the selection "off", the function "Stop" is never active. With the selection "on", the function "Stop" is always active. With the selection "external", the choice of the function is done via a digital input (input not active = "Stop not active", input active = "Stop active"). With the selection "external inverted", the choice of the function is done via a digital input (input not active = Stop active, input active = Stop not active). The digital input for "external" resp. "external inverted" can be selected with the parameter "Stop". | off on external external inverted |
| Stop | Active digital input for the function "Stop" if the parameter "Enable" is set to "external" or "external inverted". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the function "Stop". | refer to section " Assignment of the inputs/outputs " ^[51] |
| Enable | Enable the function "Start". | off |

| | | |
|-------|--|---|
| | <p>With the selection "off", the function "Start" is never active.</p> <p>With the selection "on", the function "Start" is always active.</p> <p>With the selection "external", the choice of the function is done via a digital input (input not active = "Start not active", input active = "Start active").</p> <p>With the selection "external inverted", the choice of the function is done via a digital input (input not active = Start active, input active = Start not active).</p> <p>The digital input for "external" resp. "external inverted" can be selected with the parameter "Start".</p> | <p>on external</p> <p>external inverted</p> |
| Start | <p>Active digital input for the function "Start" if the parameter "Enable" is set to "external" or "external inverted". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the function "Start".</p> | <p>refer to section "Assignment of the inputs/outputs"^[51]</p> |

Selection of the Fixed command values:

| DigInp from Selection 4 | DigInp from Selection 2 | DigInp from Selection 1 | Fixed command value |
|--------------------------------|--------------------------------|--------------------------------|----------------------------|
| not active | not active | not active | external command value |
| not active | not active | active | 1 |
| not active | active | not active | 2 |
| not active | active | active | 3 |
| active | not active | not active | 4 |
| active | not active | active | 5 |
| active | active | not active | 6 |
| active | active | active | 7 |

7.8.4 Ramp generator

In this window, all adjustments according to the command value change (the increase speed of the command value) will be made.

The following description is only valid, if the parameter "Controller mode" is set to "Pressure/flow valve open loop" or "Position open loop".

| Field | Parameter description | Range / Step |
|---------------------|---|--|
| Enable | Enable channel. With the selection "off", the ramp function ist switched off, that means the input command value is redirected to the output without a delay. With the selection "on", the ramp function ist switched on, that means the input command value is redirected to the output with a delay. With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable). With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable). The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input". | off on external external inverted |
| Dig. input | Active digital input for the enable if the parameter "Enable" is set to "external" or "external inverted". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the enable function. | refer to section "Assignment of the inputs/outputs" [51] |
| Rampe up positive | The set ramp time refer to a command value jump from 0% to 100% for the solenoid from the solenoid driver 1. | 0 ... 500s 0.05s |
| Rampe down positive | The set ramp time refer to a command value jump from 0% to 100% for the solenoid from the solenoid driver 1. | 0 ... 500s 0.05s |
| Rampe up negative | The set ramp time refer to a command value jump from 0% to 100% for the solenoid from the solenoid driver 2. | 0 ... 500s 0.05s |
| Rampe down negative | The set ramp time refer to a command value jump from 0% to 100% for the solenoid from the solenoid driver 2. | 0 ... 500s 0.05s |

The following description is only valid, if the parameter "Controller mode" is set to "Pressure/flow valve closed loop (1-sol)", "Pressure control closed loop (2-sol)", "Position closed loop (2-sol)", "Speed control closed loop (2-sol)", "2-point controller (1-sol)", "2-point controller (2-sol)" or "3-point controller (2-sol)".

| Field | Parameter description | Range / Step |
|----------------|---|---|
| Speed | This is a command value delay. After a command value jump the new command value is run-up to over a ramp (depending on the adjusted acceleration, speed and deceleration). This corresponds to a certain travel speed. To achieve an optimal control behavior, this setting must be adapted to the hydraulic system. With this an overshoot can be reduced. | |
| Speed + | Desired speed for a positive command value jump | 0 ... 15000 * Step size depends on the scaling |
| Speed - | Desired speed for a negative command value jump | 0 ... 15000 * Step size depends on the scaling |
| Acceleration + | Desired acceleration for a positive command value jump | 0 ... 15000 * Step size depends on the scaling |
| Acceleration - | Desired acceleration for a negative command value jump | 0 ... 15000 * Step size depends on the scaling |
| Deceleration + | Desired deceleration for a positive command value jump | 0 ... 15000 * Step size depends on the scaling |
| Deceleration - | Desired deceleration for a negative command value jump | 0 ... 15000 * Step size depends on the scaling |

* depending on the adjusted command value scaling values, the maximum value can be lower

7.8.5 Manual operation

In this window, all settings specific to the manual operation will be made. With the manual operation, the command value can be changed over a defined speed. This command value change is operated through digital inputs.

| Field | Parameter description | Range / Step |
|------------|--|--|
| Enable | Enable channel. With the selection "off", the manual operation is switched off, that means the external command value is redirected to the output. With the selection "on", the manual operation is switched on, that means the external command value is not redirected to the output. With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable). With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable). The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input". | off on external external inverted |
| Dig. input | Active digital input for the enable if the parameter "Enable" is set to "external" or "external inverted". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the enable function. | refer to section "Assignment of the inputs/outputs" ^[51] |
| Forward | Active digital input for the the function "manual operation forward". If this input is active, the command value will become a higher value. If this input is not active, the command value will stay at the current level. This control is only active, if the "Operating mode" is set to "Local" (refer to section "Enable Channel" ^[66]). | refer to section "Assignment of the inputs/outputs" ^[51] |
| Backward | Active digital input for the the function "manual operation backward". If this input is active, the command value will become a lower value. If this input is not active, the command value will stay at the current level. This control is only active, if the "Operating mode" is set to "Local" (refer to section "Enable Channel" ^[66]). | refer to section "Assignment of the inputs/outputs" ^[51] |
| Fast speed | Active digital input for the the function "manual operation fast speed". If this input is active, the change of the command value is done with the fast speed. If this input is not active, the change of the command value is done with the slow speed. This control is only active, if the "Operating mode" is set to "Local" (refer to section "Enable Channel" ^[66]). | refer to section "Assignment of the inputs/outputs" ^[51] |
| Slow speed | Slow speed. This speed is active, if the input "Fast speed" is not active. | 0 ... 15000 * Step size depends on the scaling |
| Fast speed | Slow speed. This speed is active, if the input "Fast speed" is active. | 0 ... 15000 * Step size depends on the scaling |

* depending on the adjusted command value scaling values, the maximum value can be lower

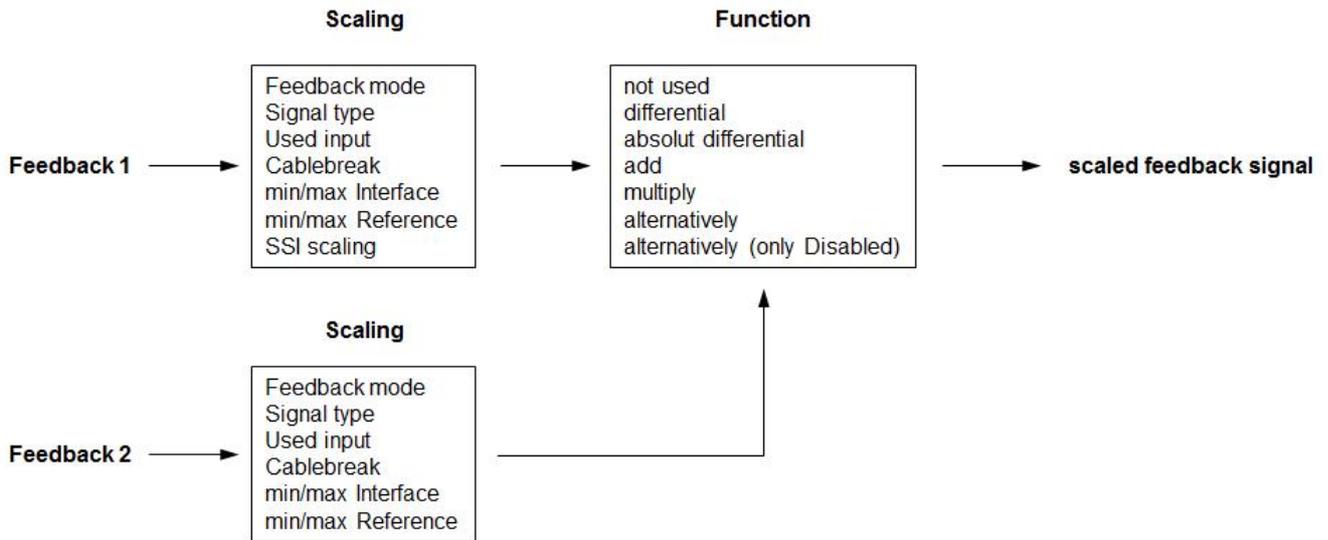
7.8.6 Feedback value scaling

The following description is only valid, if the parameter "Controller mode" is not set to "Spool valve open loop", "Pressure/flow valve open loop" or "Position open loop".

In this window, the adjustments and scaling values of the feedback signal will be adjusted. For a detailed description about the scaling please refer to section "[Scaling](#)" ^[54].

Values in italic letters are only valid for the enhanced controller.

There are two feedback inputs available. Each input can be scaled independently. How the second input is merged with the first input can be selected with the parameter "Function".



Feedback value 1 and Feedback value 2

The tab Feedback value 2 is only active if the parameter "Function" is set to "differential".

| Field | Parameter description | Range / Step |
|---------------------------------------|---|---|
| Feedback value mode (Device Local) | Select the desired feedback source (only valid for SD7 with Fieldbus Interface). | local bus |
| Signal type | Select the desired feedback signal type | Voltage Current Frequency PWM SSI-Gray SSI-Binary |
| Used analog input | Select the desired used analog input. This control is only active, if the parameter "Signal type" is set to "Voltage" or "Current". In choosing "not used", no analog input will be assigned. | refer to section " Assignment of the inputs/outputs " ^[51] |
| Used digital input | Select the desired used digital input. This control is only active, if the parameter "Signal type" is set to "Frequency" or "PWM". In choosing "not used", no digital input will be assigned. | refer to section " Assignment of the inputs/outputs " ^[51] |
| Used Sensor input | Select the desired used sensor input. This control is only active, if the parameter "Signal type" is set to "SSI-Gray" or "SSI-Binary". | refer to section " Assignment of the inputs/outputs " ^[51] |

| | | |
|---|---|--|
| | <i>In choosing "not used", no sensor input will be assigned.</i> | |
| Function (only adjustable on feedback 1) | <p>The function of the feedback 2 can be selected:</p> <p>Feedback value 2 is not active. Only feedback 1 is available</p> <p>The value from the feedback 2 is subtracted from the value from the feedback 1. Thus, for example the differential pressure can be read.</p> <p>The value from the feedback 2 is subtracted as an absolute value (without sign) from the value from the feedback 1. Thus, for example the differential pressure can be read.</p> <p>The value from feedback 2 is added to the value from feedback 1. A negative value on feedback 2 leads to a subtraction..</p> <p>The value from feedback 1 is multiply with the value from feedback 2. A value < 1.0 on feedback 2 leads to a division. A negative value on feedback 2 leads to a negative feedback value.</p> <p>It will either work with feedback 1 or feedback 2. Switching between the two feedback value is done with the digital input from parameter "Dig. input". ATTENTION: Switching the actual values leads to an immediate change in the hydraulic system!</p> <p>It will either work with feedback 1 or feedback 2. Switching between the two feedback value is done with the digital input from parameter "Dig. input". The changeover takes place only in the status "Disabled" (refer to section "State machine"^[21]).</p> | <p>not used</p> <p>differential</p> <p>absolut differential</p> <p>add</p> <p>multiply</p> <p>alternatively</p> <p>alternatively (only Disabled)</p> |

The following adjustments can only be made if the parameter "Signal type" is set to "Voltage", "Current", "Frequency" or "PWM".

| Field | Parameter description | Range / Step |
|------------------------|--|--|
| Cablebreak detection | Switch on/off the cablebreak detection of the input signal (refer to section " Cablebreak detection " ^[24]). | no yes |
| Lower cablebreak limit | <p>Feedback value < Lower cablebreak limit = cablebreak active</p> <p>Signal type = Voltage</p> <p>Signal type = Current</p> <p>Signal type = Frequency</p> <p>Signal type = PWM</p> <p>The adjusted value must be less than the value of the Upper cablebreak limit.</p> | <p>0 ... 10V</p> <p>0.2V</p> <p>0 ... 20mA</p> <p>0.3mA</p> <p>5 ... 5000Hz</p> <p>0.2Hz</p> <p>0 ... 100%PW</p> <p>0.2%PW</p> |

| | | |
|------------------------|---|--|
| | By changing the parameter "Signal type", this value will be set to the default value (see table below). | |
| Upper cablebreak limit | <p>Feedback value > Upper cablebreak limit = cablebreak active</p> <p>Signal type = Voltage</p> <p>Signal type = Current</p> <p>Signal type = Frequency</p> <p>Signal type = PWM</p> <p>The adjusted value must be greater than the value of the Lower cablebreak limit. By changing the parameter "Signal type", this value will be set to the default value (see table below).</p> | <p>0 ... 10V 0.2V</p> <p>0 ... 20mA 0.3mA</p> <p>5 ... 5000Hz 0.2Hz</p> <p>0 ... 100%PW 0.2%PW</p> |
| Min Interface | <p>Indicates the input signal value for "Min Reference".</p> <p>Signal type = Voltage</p> <p>Signal type = Current</p> <p>Signal type = Frequency</p> <p>Signal type = PWM</p> <p>By changing the parameter "Signal type", this value will be set to the default value (see table below).</p> | <p>-10 ... 10V 0.2V</p> <p>0 ... 20mA 0.3mA</p> <p>5 ... 5000Hz 0.2Hz</p> <p>0 ... 100%PW 0.2%PW</p> |
| Max Interface | <p>Indicates the input signal value for "Max Reference".</p> <p>Signal type = Voltage</p> <p>Signal type = Current</p> <p>Signal type = Frequency</p> <p>Signal type = PWM</p> <p>By changing the parameter "Signal type", this value will be set to the default value (see table below).</p> | <p>-10 ... 10V 0.2V</p> <p>0 ... 20mA 0.3mA</p> <p>5 ... 5000Hz 0.2Hz</p> <p>0 ... 100%PW 0.2%PW</p> |
| Min Reference | Indicates the absolute feedback measured value at "Min Interface". The min reference feedback has to be smaller than the max reference feedback. | Dependent on unit |
| Max Reference | Indicates the absolute feedback measured value at "Max Interface". The max reference feedback has to be larger than the min reference feedback. | Dependent on unit |

The following adjustments can only be made if the parameter "Signal type" is set to "SSI-Gray" or "SSI-Binary".

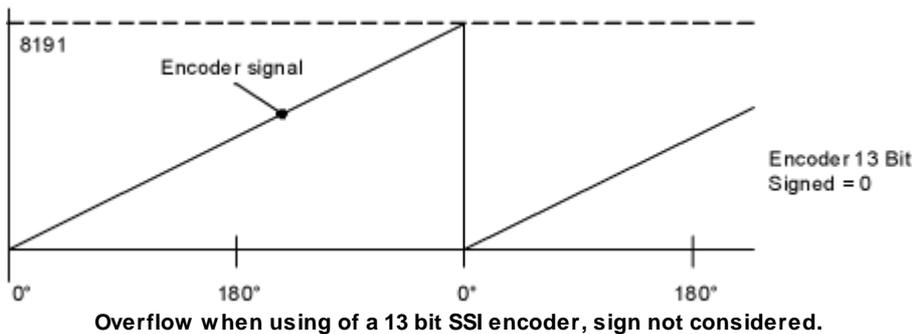
| Field | Parameter description | Range / Step |
|------------|--|----------------|
| Offset | Indicates the offset from the SSI measuring system. | Depent on unit |
| Resolution | Indicates the resolution from the SSI measuring system. This value can be found in the data sheet of the SSI meauring unit. | unit / Inc |
| Bit number | Indicates the data width at which the SSI measuring system transmits the feedback. This value can be found in the data sheet of the SSI meauring unit. | 8 ... 25 1 |
| Sign | Switch on/off the handling of the sign bit (see below). | Off On |

Handling of sign bit when using rotary encoders

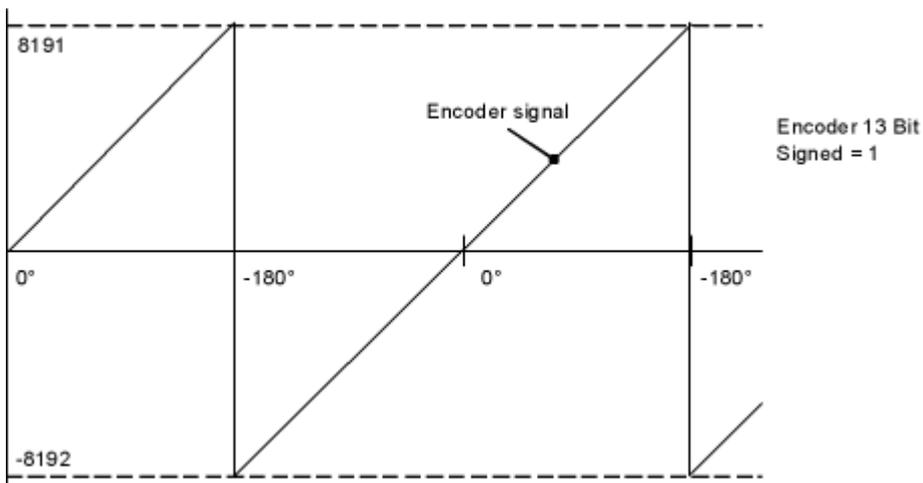
If the zero point of a rotary encoder is within the working range of the (pan-) axis, there will occur an overflow of the encoder value. In this case, the actual value jumps from 0° to 359.999° or vice versa. If this happens, the controller will move the axis the wrong direction.

To prevent this, you can set the sign handling on. The actual value is thereby continuously from 0° to -0.001° in the negative direction.

The overflow now takes place at 180° shifted. This must also be taken into account if it is within the operating range.



Overflow when using of a 13 bit SSI encoder, sign not considered.



Overflow when using of a 13 bit SSI encoder, sign considered.

Default values for scaling parameters

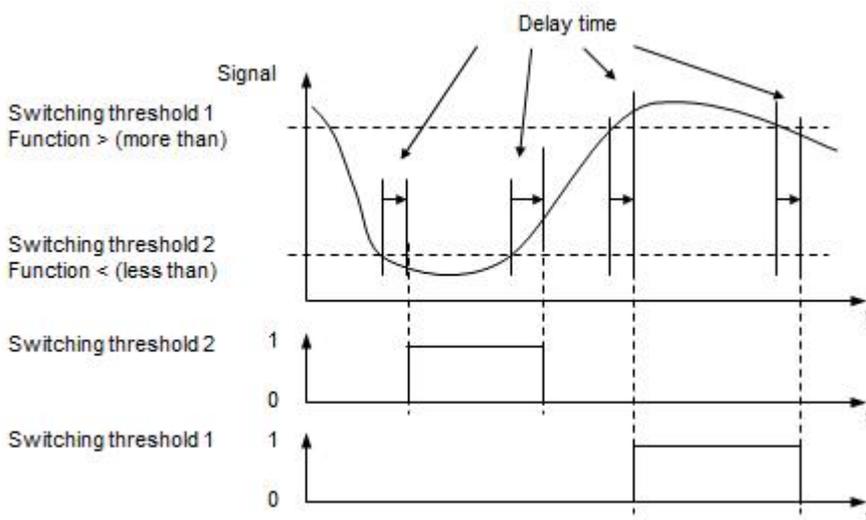
| | Signal type | | | | |
|------------------------|-------------|-----------|-----------|-----------|---------------------|
| | Voltage | Current | Frequency | PWM | SSI |
| Lower cablebreak limit | 0.5 V | 3.5 mA | 10 Hz | 10 %PW | -- |
| Upper cablebreak limit | 10 V | 20 mA | 5000 Hz | 100 %PW | -- |
| Min. Interface | 0 V | 0 mA | 5 Hz | 5 %PW | -- |
| Max. Interface | 10 V | 20 mA | 5000 Hz | 95 %PW | -- |
| Min. Reference | 0.00 mm | 0.00 mm | 0.00 mm | 0.00 mm | -- |
| Max. Reference | 100.00 mm | 100.00 mm | 100.00 mm | 100.00 mm | -- |
| <i>Offset</i> | -- | -- | -- | -- | <i>0.00 mm</i> |
| <i>Resolution</i> | -- | -- | -- | -- | <i>0.005 mm/inc</i> |
| <i>Bit number</i> | -- | -- | -- | -- | <i>24</i> |
| <i>Overflow</i> | -- | -- | -- | -- | <i>not limited</i> |

7.8.7 Monitoring

Signals

Two independent switching thresholds can be monitored. In both, the same settings are possible:

| | | |
|------------|---|---|
| Type | Switch on/off the switching threshold monitoring No monitoring of the switching threshold If the selected signal is smaller or higher (refer to "Function") than the adjusted threshold, the error E-12 will be set. This signal can be routed to a digital output (refer to section "Error evaluation" ^[101]). If the selected signal is smaller or higher (refer to "Function") than the adjusted threshold, the state "Switching threshold x" will be set. The state can be routed to a digital output (refer to section "Function" ^[102]). | off on with error on without error |
| Selection | Selection of the the monitored signal Input signal from command value 1 Input signal from command value 2 Output signal after command scaling Input signal from feedback value 1 Input signal from feedback value 2 Output signal after feedback scaling | Input command value 1 Input command value 2 Scaled command value Input feedback value 1 Input feedback value 2 Scaled feedback value |
| Function | Selection of condition that leads to the activation Signal < adjusted threshold value = active Signal > adjusted threshold value = active | < (less than) > (more than) |
| Threshold | Defines the value by which the selected signal is compared. This value is set to default if the signal is changed (parameter "Selection"). | Adapted to unit |
| Delay time | Delay time when exceeding or falling of the switching threshold | 0 ... 10000ms 1ms |

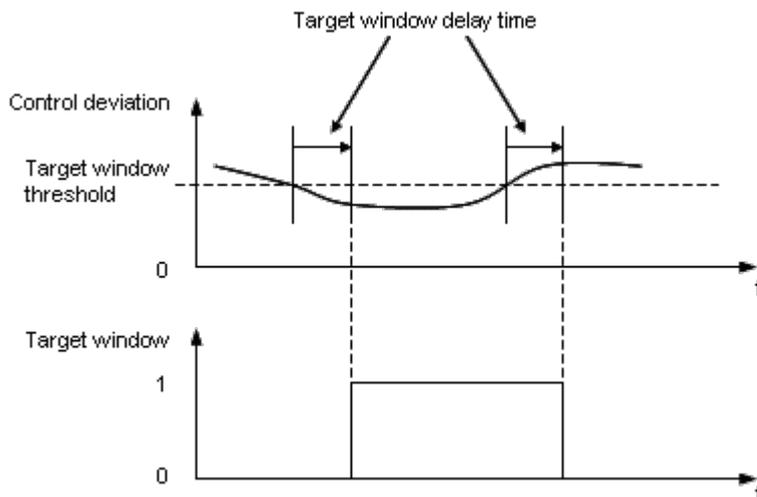


Windows

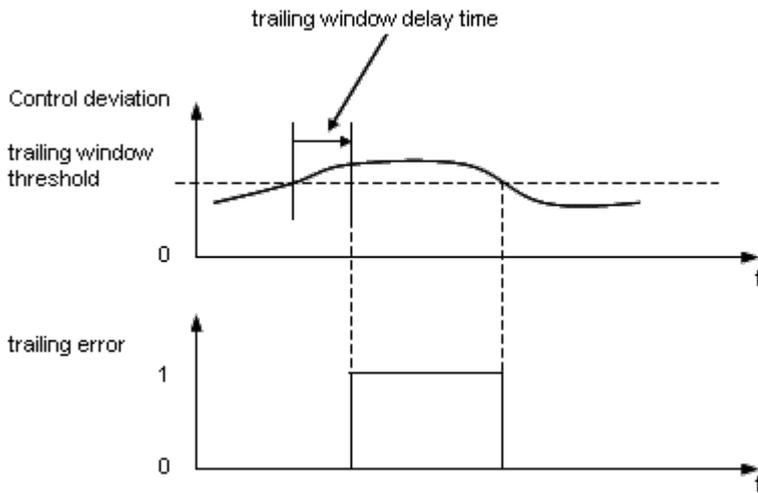
The following description is only valid, if the parameter "Controller mode" is not set to "Pressure/flow valve open loop" or "Position open loop".

| Feld | Parameter Beschreibung | Bereich / Schrittweite |
|--------------------------------|--|--|
| Target window Type | Switch on/off the target window function. HINT: This signal can be routed to a digital output (refer to section " Function " ^[102]). | off on |
| Target window threshold | Defines the target window. | Adapted to unit |
| Target window delay time | Delay time when falling below and exceeding the target window threshold. | 0 ... 100ms 1ms |
| Trailing window Type | Switch on/off the trailing window function A trailing error will not be detected A trailing error will be detected and the error E-7 will be set during an active trailing error. This signal can be routed to a digital output (refer to section " Error evaluation " ^[101]). A trailing error will be detected, but the error E-7 will not be set. The state can be routed to a digital output (refer to section " Function " ^[102]). | off on with error on without error |
| Trailing window threshold | Defines the trailing window. | Adapted to unit |
| Trailing window delay time | Delay time when falling below and exceeding the target window threshold. | 0 ... 100ms 1ms |
| Solenoid-Off window Type | Switch on/off the target window function | off on |
| Solenoid-Off window threshold | Defines the target window. If the control difference is within this window, the solenoid outputs are switched off. | Adapted to unit |
| Solenoid-Off window delay time | Delay time when falling below and exceeding the target window threshold. | 0 ... 100ms 1ms |

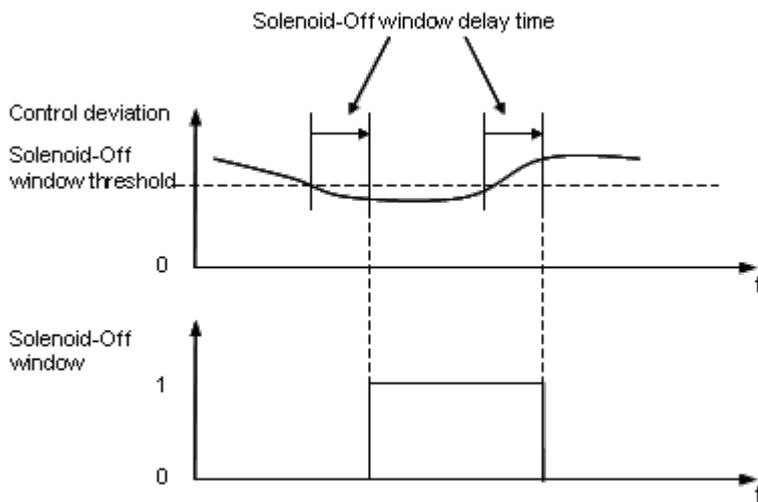
Target window:



Trailing window::



Solenoid-Off window::



7.8.8 Controller

In this window all settings concerning the controller are made. The controller is split-up into two independent blocks for positive and negative control difference. With this, asymmetrical characteristics of the hydraulic system can be compensated for.

General:

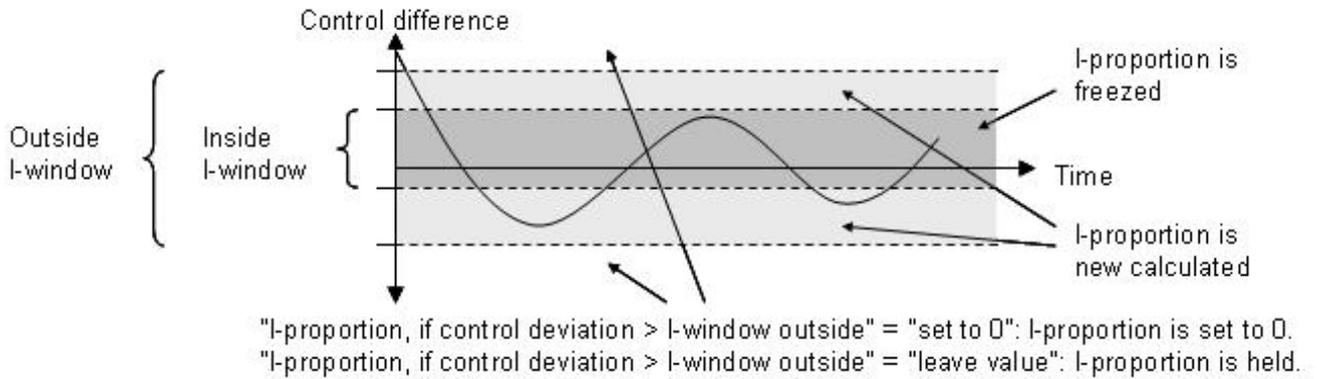
| Field | Parameter description | Range / Step |
|-----------------------|---|--|
| Controller mode | <p>Select the desired controller mode (refer to section "Controller mode"^[26]).</p> <p>Depending on the selected controller mode, may be other parameters are automatically adapted.</p> <p>Multiple controller modes can be linked together using the function Control value (refer to section "Control value"^[94]). Thereby it is possible to build e.g. a pQ-Controller or an Alternating control. For more details please refer to the document "Applications examples for Wandfluh Electronics cards".</p> | Spool valve open loop = 1 Pressure/flow valve open loop = 3 Pressure/flow valve closed loop (1-sol) = 4 Pressure control closed loop (2-sol) = -5 Position open loop = 6 Position closed loop (2-sol) = 9 Speed control closed loop (2-sol) = 7 2-point controller (1-sol) = -6 2-point controller (2-sol) = -7 3-point controller (2-sol) = -8 |
| Displayed unit | <p>In this field the required unit can be selected.</p> <p>Controller mode 3, 4 and -5: Controller mode 6 and 9: Controller mode 7: Controller mode -6, -7 and -8:</p> <p>All controller modes:</p> | bar, psi, kN, MPa mm, Grad, Zoll l/min, mm/s, 1/Min, Zoll/s, Grad/s bar, psi, kN, MPa, mm, Grad, Zoll, l/min, mm/s, 1/Min, Zoll/s, Grad/s Eigene Einheit |
| Free unit | <p>If with "Display unit" the type "Own unit" was selected, then an own unit can be entered in this field.</p> | Min. number of characters: 1 Max. number of characters: 5 |
| Command feed forward | <p>The command value is multiplied with this factor and added to the correcting variable of the controller. If this factor is 0, no command value proportion is added to the correcting variable</p> | 0 ... 10 0.001 |
| Velocity feed forward | <p>The change of the command value (the increase speed of the command value) is multiplied with this factor and added to the correcting variable of the controller. If this factor is 0, no command value addition is added to the correcting variable</p> | 0 ... 60 0.001 |

PID controller:

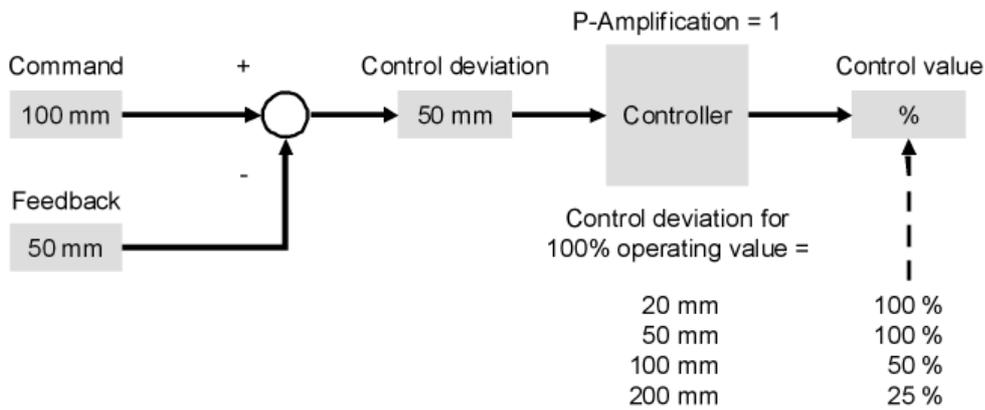
The following adjustments can only be made if the parameter "Controller mode" is set to "Pressure/flow valve closed loop (1-sol)", "Pressure control closed loop (2-sol)", "Position closed loop (2-sol)" or "Speed control closed loop (2-sol)".

| Field | Parameter description | Range / Step |
|---|---|-------------------------|
| I-Type | Set on/off the calculation of the I-term This parameter can only be set if the parameter "Controller mode" is set to "Position closed loop (2-sol)". In any other case it is set to on. | off on |
| I-term, if control deviation > I-window outside | I-term is set to 0 if control deviation is outside the outside I-window. I-term is held if control deviation is outside the outside I-window. | set to 0 leave value |
| I-term, if control value is not active | This parameter is only used if there is a selection of the used control value (refer to section " Control value " ⁹⁴). I-term is set to 0 if the control value from the current channel is not active I-term is held if the control value from the current channel is not active | set to 0 leave value |
| Symmetrical setting | If this function is activated, the setting changes of a controller block are also transferred to the other controller block. | |
| Control deviation scaling | Set on/off the function "Control deviation for 100% operating value". If the control deviation scaling is switch off, the operating value is 100% if the control deviation corresponds to the feedback value from 10V resp. 20mA. | off on |
| Control deviation for 100% control value | If the control deviation corresponds to this value, the operating value (controller output) is 100% (with a P-Amplification from 1, refer to the picture below). This allows to match optimally the influence of the PID controller parameters to the desired range. Can only be set if the parameter "Control deviation scaling" is set to "on" | Adapted to unit |
| P-Ampl. positive | P-amplification factor for positive control difference. | 0 ... 25 0.1 |
| I-Time positive | Reaction time for the integrator. If the time is set to 0s, the integrator is switched off. | 0 ... 10s 0.01s |
| I-window outside positive | Defines the outside I-window. If the control difference is within this window, the I-term is calculated with the set I-time positive. | Adapted to unit |
| I-window inside positive | Defines the inside I-window. If the control difference is within this window, the I-term is frozen. | Adapted to unit |
| D-Ampl. positive | D-amplification factor for positive control difference. | 0 ... 10 |
| D-Time positive | Defines how long the D-part should be active after a positive command value jump | 0 ... 10s 0.1s |
| P-Ampl. negative | P-amplification factor for negative control difference. | 0 ... 25 0.1 |
| I-Time negative | Reaction time for the integrator. If the time is set to 0s, the integrator is switched off. | 0 ... 10s 0.01s |
| I-window outside negative | Defines the outside I-window. If the control difference is within this window, the I-term is calculated with the set I-time negative. | Adapted to unit |
| I-window inside negative | Defines the inside I-window. If the control difference is within this window, the I-term is frozen. | Adapted to unit |
| D-Ampl. negative | D-amplification factor for negative control difference. | 0 ... 10 |
| D-Time negative | Defines how long the D-part should be active after a negative command value jump | 0 ... 10s 0.1s |

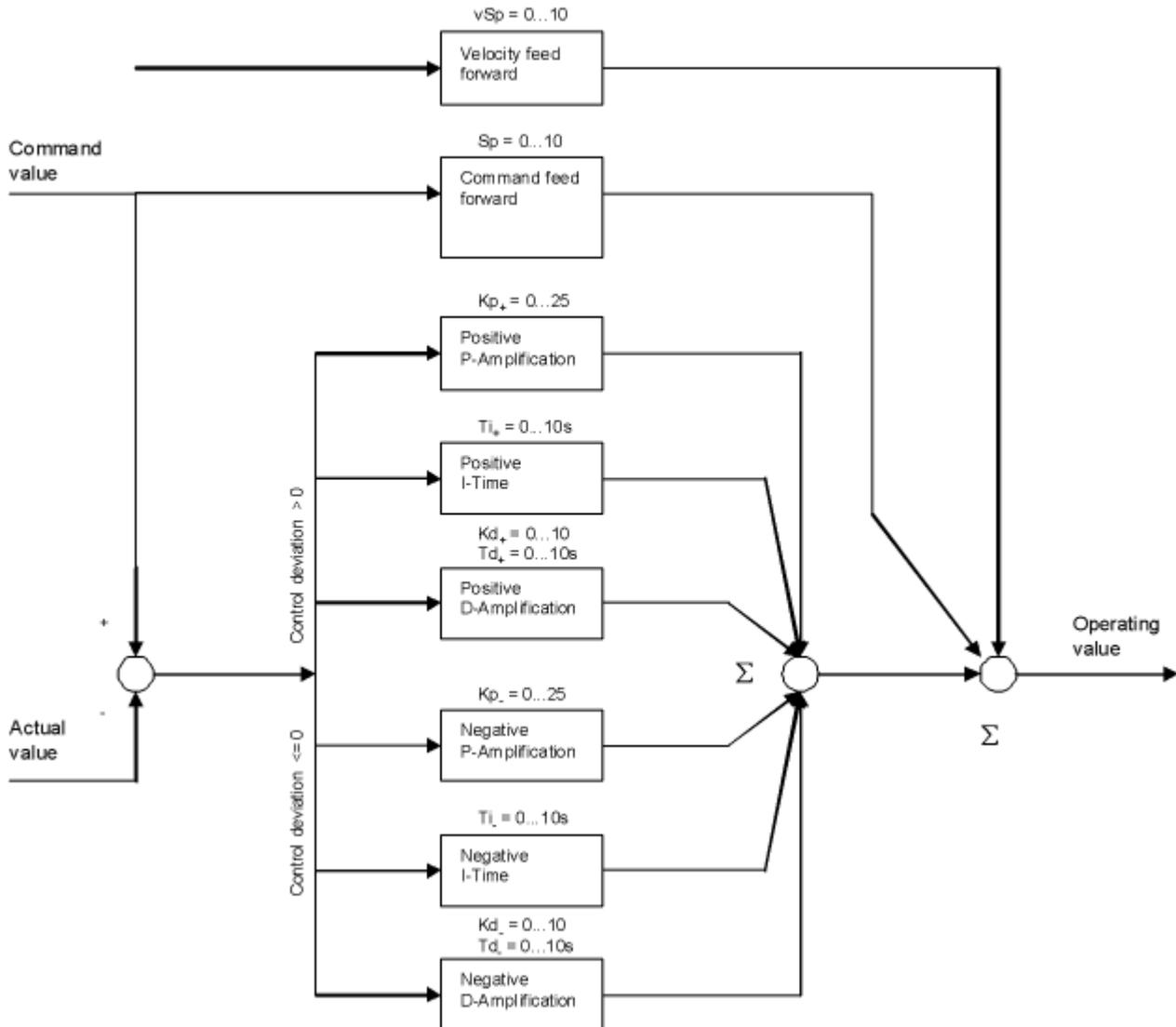
Example with outside and inside I-window



Example for control deviation scaling:



Block diagram of the controller:

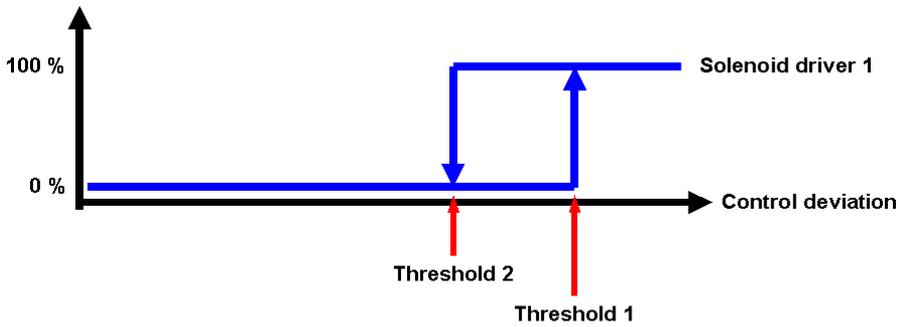


n-point controller:

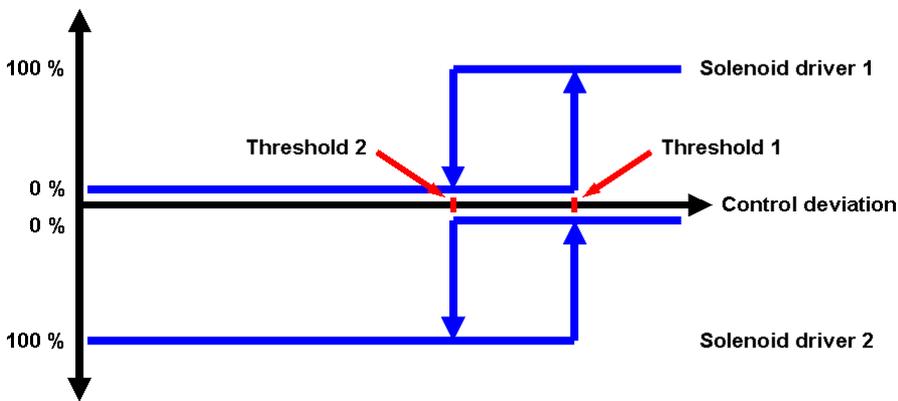
The following adjustments can only be made if the parameter "Controller mode" is set to "2-point controller (1-sol)", "2-point controller (2-sol)" or "3-point controller (2-sol)".

| Field | Parameter description | Range / Step |
|-------------|--|-----------------|
| Threshold 1 | Value for threshold 1 (see below picture) | Adapted to unit |
| Threshold 2 | Value for threshold 2 (see below picture) | Adapted to unit |
| Threshold 3 | Value for threshold 3 (see below picture) This parameter can only be set if the parameter "Controller mode" ist set to "3-point controller (2-sol)" | Adapted to unit |
| Threshold 4 | Value for threshold 4 (see below picture) This parameter can only be set if the parameter "Controller mode" ist set to "3-point controller (2-sol)" | Adapted to unit |

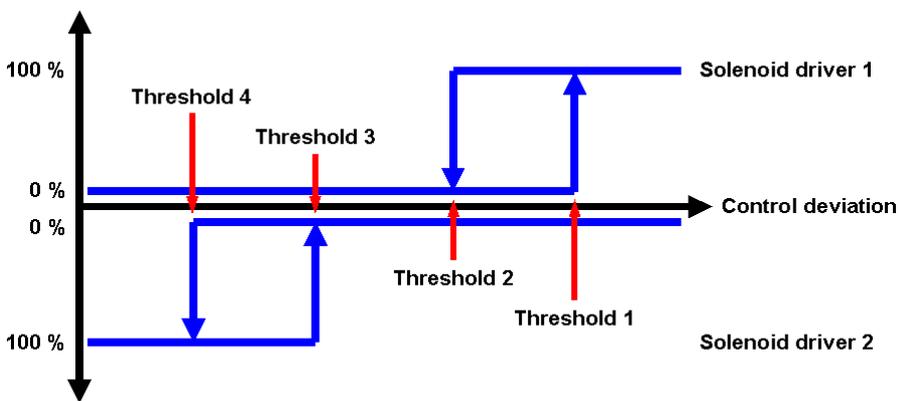
2-point controller (1-sol)



2-point controller (2-sol)



3-point controller (2-sol)



7.8.9 Control value

In this window, the selection can be made which control value will be reused

| Field | Parameter description | Range / Step |
|----------|---|--|
| Function | The control value from the current channel is used | primary |
| | The control value from the channel selected with the parameter "Source" is used | secondary |
| | With the digital input selected with the parameter "Dig. input" the selection can be made, if the control value from the current channel (digital input not active) or the control value from the channel selected with the parameter "Source" (digital input active) is used. The changeover takes place independent of the device status (Disabled or Active, refer to section " State machine " ^[21]). | alternatively |
| | With the digital input selected with the parameter "Dig. input" the selection can be made, if the control value from the current channel (digital input active) or the control value from the channel selected with the parameter "Source" (digital input not active) is used. The changeover takes place independent of the device status (Disabled or Active, refer to section " State machine " ^[21]). | alternatively inverted |
| | With the digital input selected with the parameter "Dig. input" the selection can be made, if the control value from the current channel (digital input not active) or the control value from the channel selected with the parameter "Source" (digital input active) is used. The changeover takes place only in the status "Disabled" (refer to section " State machine " ^[21]). | alternatively (only Disabled) |
| | With the digital input selected with the parameter "Dig. input" the selection can be made, if the control value from the current channel (digital input active) or the control value from the channel selected with the parameter "Source" (digital input not active) is used. The changeover takes place only in the status "Disabled" (refer to section " State machine " ^[21]). | alternatively inverted (only Disabled) |
| | The control value from the current channel and the control value from the channel selected with the parameter "Source" are compared. The lower value is used. With this, it is possible to build e.g. a pQ-Controller or an Alternating control. For more details please refer to the document "Applications examples for Wandfluh Electronics cards". | minimum bildner |
| | The control value from the current channel and the control value from the channel selected with the parameter "Source" are compared. The higher value is used. | maximum bildner |
| | | offset |
| | | offset bidirectional |

| | | |
|------------|--|---|
| | <p>The control value from the channel selected with the parameter "Source" is added to the control value from the current channel (refer to table below).</p> <p>The control value from the channel selected with the parameter "Source" is added as an absolute value to the control value from the current channel (refer to table below).</p> | |
| Source | <p>Selection of the channel, from which the control value is used. Is only active if the parameter "Source" is not set to "primary". In choosing "not used", no channel will be assigned.</p> | Channel x not used |
| Dig. input | <p>Active digital input for the selection of the control value source, unless the parameter "Function" is set to "alternatively" or "alternatively inverted". Otherwise this setting has no effect. In choosing "not used", no digital input will be assigned.</p> | refer to section "Assignment of the inputs/outputs" ^[51] |

Function "offset"

| Control value 1 | Control value 2 | Resulting control value |
|-----------------|-----------------|-------------------------|
| +50% | +10% | 60% |
| +50% | -10% | 40% |
| -50% | +10% | -40% |
| -50% | -10% | -60% |

Function "offset bidirectional"

| Control value 1 | Control value 2 | Resulting control value |
|-----------------|-----------------|-------------------------|
| +50% | +10% | 60% |
| +50% | -10% | 40% |
| -50% | +10% | -60% |
| -50% | -10% | -40% |

7.8.10 Valve type

In this window, all settings specific to the valves will be made

| Field | Parameter description | Range / Step |
|---------------|---|---|
| Solenoid type | Select the desired solenoid type If the parameter "Controller mode" is set to "2-point controller (1-sol)", "2-point controller (2-sol)" or "3-point controller (2-sol)", the solenoid type can be only set to "Switching solenoid without current measurement". | Proportional solenoid without current measurement Proportional solenoid with current measurement Switching solenoid without current measurement |
| Valve type | Valve type of the connected valve Standard valve with one or two solenoids 4/3-way valve (2-solenoid function) with only one solenoid | Standard 2-solenoid 4/3-way 1-solenoid |

The following adjustments can only be made if the parameter "Controller mode" is set to "Pressure/flow valve open loop" or "Position open loop".

| Field | Parameter description | Range / Step |
|-------------------|--|---|
| Mode of operation | Select the desired mode of operation (refer to section "Mode of operation" ^[34]). The signal type can be changed automatically it depends on the selected mode of operation. | Command unipolar (1-sol) Command unipolar (2-sol) Command bipolar (2-sol) Command unipolar (2-sol with DigInp) |
| Magnet B | Active digital input for the solenoid B selection if the parameter "Mode of operation = Command unipolar (2-sol with DigInp)". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the solenoid B selection. | refer to section "Assignment of the inputs/outputs" ^[51] |

7.8.11 Solenoid driver

In this window, all settings specific to the solenoids will be made

| Field | Parameter description | Range / Step |
|-----------------------------|---|---|
| Solenoid output | Select the desired solenoid output for the current channel. In choosing "not used", no solenoid output will be assigned to the current channel. | refer to section "Assignment of the inputs/outputs" ^[51] |
| Enable | <p>Solenoid enable</p> <p>With the selection "off", the selected solenoid output is disabled and no solenoid current will be active.</p> <p>With the selection "on", the selected solenoid output is enabled and the solenoid current will be operated according to the selected operating mode.</p> <p>With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable).</p> <p>With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable).</p> <p>The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input".</p> | <p>off</p> <p>on</p> <p>external</p> <p>external inverted</p> |
| Dig. input | <p>Active digital input for the enable if the parameter "enable = external".</p> <p>Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the enable function..</p> | refer to section "Assignment of the inputs/outputs" ^[51] |
| Inversion | <p>Inversion of the solenoid output</p> <p>0% command = lmin, 100% command = lmax</p> <p>0% command = lmax, 100% command = lmin</p> | <p>no</p> <p>yes</p> |
| Solenoid always active | <p>The behavior of the non-active solenoid can be set.</p> <p>With the selection "no", the current of the non-active solenoid is set to 0.</p> <p>With the selection "yes", the current of the non-active solenoid is set to lmin (with parameter "Inversion" = no) resp. to lmax (with parameter "Inversion" = yes).</p> | <p>no</p> <p>yes</p> |
| Characteristic optimisation | Switch on/off the characteristic optimisation (refer to section "Characteristic optimisation" ^[20]) | <p>off</p> <p>on</p> |

The following adjustments can only be made if the parameter "Solenoid type" is set to "Proportional solenoid":

| Field | Parameter description | Range / Step |
|------------------------|--|--|
| Cablebreak detection | Switch on/off the cablebreak detection on the solenoid output. This parameter can only be set with a solenoid type "Proportional solenoid with current measurement" (refer to section " Valve type " ^[96]) | no yes |
| Imin | Set minimum solenoid current A. (= solenoid current by 0% command value) With a solenoid type "... without current measurement" (refer to section " Valve type " ^[96]), this parameter can be set from 0 ... 100% duty cycle Using the menu Commands - Valve operation ^[123] the Imin can be adjusted very easily. With a valve type "4/3-way 1-solenoid" (refer to section " Valve type " ^[96]), this parameter corresponds to the solenoid current by 0% command value. | 0 ... 950mA 3mA I _{max} below < I _{min} < I _{max} |
| I _{max} | Set maximum solenoid current A. (= solenoid current by 100% command value) For the max. current refer to section " Electrical specifications " ^[7] . With a solenoid type "... without current measurement" (refer to section " Valve type " ^[96]), this parameter can be set from 0 ... 100% duty cycle Using the menu Commands - Valve operation ^[123] the I _{max} can be adjusted very easily. With a valve type "4/3-way 1-solenoid" (refer to section " Valve type " ^[96]), this parameter corresponds to the solenoid current by 100% command value. | I _{min} ... max. current 3mA I _{min} < I _{max} |
| I _{min} below | Is only active with a valve type "4/3-way 1-solenoid" (refer to section " Valve type " ^[96]). This parameter corresponds to the solenoid current by - 0.1% command value. | 0 ... 950mA 3mA I _{min} below < I _{max} below |
| I _{max} below | Is only active with a valve type "4/3-way 1-solenoid" (refer to section " Valve type " ^[96]). This parameter corresponds to the solenoid current by - 100% command value. | I _{min} below ... max. current 3mA I _{min} below < I _{max} below < I _{min} |
| Dither function | Switch on/off the dither function | off on |
| Dither frequency | The dither frequency can be set in steps.. | 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 100, 125, 165, 250, 500Hz |
| Dither level | Level of the superimposed dither signal With a solenoid type "... without current measurement" (refer to section " Valve type " ^[96]), this parameter can be set from 0 ... 100% duty cycle | 0 ... 399mA 2mA |

The following adjustments can only be made if the parameter "Solenoid type" is set to "Switching solenoid":

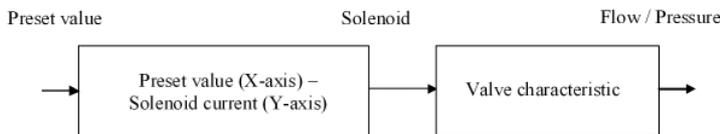
| Field | Parameter description | Range / Step |
|-------------------------|--|--------------|
| Switching on threshold | Command value > Switching on threshold = solenoid output active | 0 ... 100% |
| Switching off threshold | Command value > Switching off threshold = solenoid output not active | 0 ... 100% |
| Reduction time | After this time the PWM output will be reduced to the value which is set by parameter "reduction value" (refer to section "Power reduction" [36]). | 0...2000ms |
| Reduced value | The PWM output will be reduced to this value after the time which is set by parameter "reduction time" (refer to section "Power reduction" [36]). | 0...100% |

Characteristic optimisation:

This menu enables the optimisation of the solenoid current adjustment of DSV-Electronics. A graphic is shown which represents the characteristic "Preset value (X-axis) – Solenoid current (Y-axis)". The graphic consists of 11 points, the first and the last point (100%) are preset.

| Index | X-Axis value | Y-Axis value |
|-------|--------------|--------------|
| 0 | 0 | 0 |
| 10 | 100 | 100 |

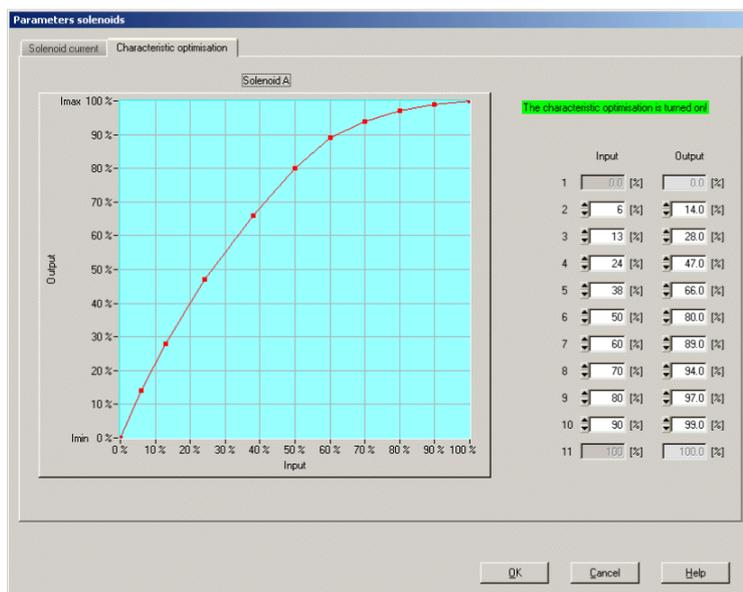
The other graphic points can be adjusted either by tracking with the mouse or by entering the value at the numeric inputs. The resolution of the X-values is in %, those of the Y-values in 0.1 %. The X-values cannot be falling.



At shipping ex work (default settings) the preset value is transmitted proportionally to the solenoid current (default characteristic). In this case the characteristic "Preset value (X-axis – Solenoid current (Y-axis))" is linear. The same behaviour occurs at any time when the characteristic optimisation is turned off.

By modifying the default linear characteristic "Preset value (X-axis) – Solenoid current (Y-axis)" e.g. a progressive valve characteristic "Current - Flow/Pressure" can be compensated in such a way that a linear relation between preset value and Flow / Pressure is realised. The characteristic "Preset value (X-axis) – Solenoid current (Y-axis)" in this case should be adjusted in the "opposite progressive" direction (refer to the example characteristic below).

Additionally the characteristic optimisation must be turned on. This will be shown in the PASO-Status line (refer to section "[Starting of PASO](#)"¹⁵⁴).



The solenoid current values are in the range Imin (0%) up to Imax (100%). Imin and Imax are adjusted in the menu "Solenoid current". At an input value which is between two graphic points, the solenoid current is interpolated. If two or more preset values overlap, at the corresponding Preset value the highest current value is calculated.

In the case of an error in the characteristic values, the characteristic optimisation is automatically turned off.

7.8.12 Error evaluation

In this window, all settings specific to the error evaluation will be made.

Solenoid 1 = selected solenoid output from the solenoid driver 1 (refer to section ["Solenoid driver"](#)^[97])

Solenoid 2 = selected solenoid output from the solenoid driver 2 (refer to section ["Solenoid driver"](#)^[97])

| Field | Parameter description | Range / Step |
|----------------|--|--|
| Selection | <p>The errors can be selected, which lead to activate the selected digital output in the active state</p> <p>E-1 = Cablebreak from Command scaling^[66]</p> <p>E-6 = Cablebreak from Feedback scaling^[79]</p> <p>E-2 = Short circuit from Solenoid driver 1^[97]</p> <p>E-3 = Short circuit from Solenoid driver 2^[97]</p> <p>E-4 = Cablebreak Solenoid driver 1^[97]</p> <p>E-5 = Cablebreak Solenoid driver 2^[97]</p> <p>E-7 = Trailing error Windows^[85]</p> <p>E-11 = Device error *</p> <p>E-12 = Switching threshold</p> | <p>E-1</p> <p>E-6</p> <p>E-2</p> <p>E-3</p> <p>E-4</p> <p>E-5</p> <p>E-7</p> <p>E-11</p> <p>E-12</p> |
| Dig. output | <p>If a selected error is active, this digital output will be activated. In choosing "not used", no digital output will be assigned to the error.</p> | <p>refer to section "Assignment of the inputs/outputs"^[51]</p> |
| Error handling | <p>The desired error handling with a cablebreak error can be set.</p> <p>With the error "Short circuit from Solenoid driver 1" and "Short circuit from Solenoid driver 2", the error handling is fixed set to "Solenoid 1+2 off"</p> | <p>Solenoid 1+2 off</p> <p>Solenoid 1 on **</p> <p>Solenoid 2 on **</p> <p>Solenoid 1+2 on **</p> |

* Device error:

In this selection, all errors are brought together who are not dependent on the channel (= device error). These are:

- Power supply fault
- Fieldbus error

** on

The solenoid is activated with 2/3 from the range $I_{min} .. I_{max}$ ($I_{min} + 2/3 \times (I_{max} - I_{min})$)

Example:

$I_{min} = 100\text{mA}$, $I_{max} = 700\text{mA} \Rightarrow 100 + 2/3 \times (700 - 100) = 500\text{mA}$

On the right side of each selection, the current status of the corresponding error is displayed (only in On-Line mode).

An active error is indicated as follows:

- the button "Diagnostics" is red
 - the corresponding current state of the error is red
 - in the status line per channel the text "Error" is displayed (instead of "Ready")
 - the box "Error evaluation" has a red frame
 - in the main window a red point appears for the corresponding error
- With the button "Diagnostics", a complete description of all present errors will be displayed (only in On-Line mode, refer to section ["Analysis_Diagnostics"](#)^[139]).

7.8.13 Function

Digital outputs can be activated, when a certain function is running. Several functions can be set at the same time. If a function should not be evaluated, the corresponding digital output can be set to "not used".

Solenoid 1 = selected solenoid output from the solenoid driver 1 (refer to section ["Solenoid driver"](#)^[97])

Solenoid 2 = selected solenoid output from the solenoid driver 2 (refer to section ["Solenoid driver"](#)^[97])

| Field | Parameter description | Range / Step |
|-----------|--|---|
| Selection | <p>The functions can be selected, which lead to activating the selected digital output. Each function can be assigned to a separate digital output.</p> <p>Solenoid 1 active The solenoid output 1 is active (the analysis value 12 is not 0, refer to section "Analysis Show values"^[131])</p> <p>Solenoid 2 active The solenoid output 1 is active (the analysis value 12 is not 0, refer to section "Analysis Show values"^[131])</p> <p>Target window active The control deviation is inside the adjusted target window threshold (refer to section "Windows"^[85])</p> <p>Ready signal No error is present</p> <p>Trailing window The control deviation is inside the adjusted trailing window threshold (refer to section "Windows"^[85])</p> <p>Command value 2 active In the function with two command values, the activation of the second command value is displayed here (refer to section "Command scaling"^[66])</p> <p>Sequence End The end of a travel profile sequence has been reached (refer to section "Travel profile"^[115])</p> <p>Profile End The end of a travel profile has been reached (refer to section "Travel profile"^[115])</p> <p>Switching threshold 1 active The selected signal is exceeding or falling of the adjusted threshold (refer to section "Windows"^[85])</p> <p>Switching threshold 2 active The selected signal is exceeding or falling of the adjusted threshold (refer to section "Windows"^[85])</p> <p>Control value 2 active</p> | <p>refer to section "Assignment of the inputs/outputs"^[51]</p> |

| | | |
|--|--|--|
| | <p>Insted of the control value from the current channel, the control value from the channel selected with the parameter "Source" is used</p> <p>Feedback value 2 active In the function with two feedback values, the activation of the second feedback value is displayed here (refer to section "Feedback scaling"⁷⁹)</p> | |
|--|--|--|

On the right side of each selection, the current status of the selected output is displayed (only in On-Line mode).

7.8.14 Analog output

In this window the adjustment and scaling of the analog output can be set.

The signal at the analog output can be used for driving a valve with integrated electronics which has a +/-10V interface.

| Field | Parameter description | Range / Step |
|----------------|--|--|
| Signal | <p>This determines which signal is to be performed on the analog output.</p> <p>Control value Corresponds to the command value for the solenoid driver (refer to "Analysis Show values"^[131] point 9). The command value for solenoid driver 1 corresponds to a positive input value, the command value for solenoid driver 2 to a negative input value.</p> <p>Command value Corresponds to the scaled command value (refer to "Analysis Show values"^[131] point 2).</p> <p>Feedback value * Corresponds to the scaled feedback value (refer to "Analysis Show values"^[131] point 6).</p> <p>Control deviation * Corresponds to the control deviation value (refer to "Analysis Show values"^[131] point 7).</p> <p>Solenoid current Corresponds to the output solenoid current (refer to "Analysis Show values"^[131] point 10). The output solenoid current from solenoid driver 1 corresponds to a positive input value, the solenoid current from solenoid driver 2 to a negative input value.</p> <p>* The selection "Feedback value" and "Control deviation" is only available in closed loop controller modes</p> | <p>Control value</p> <p>Command value</p> <p>Feedback value</p> <p>Control deviation</p> <p>Solenoid current</p> |
| Used output | Select the desired used analog output. In choosing "not used", no analog input will be assigned. | refer to section " Assignment of the inputs/outputs " ^[51] |
| Min. Reference | With this signal, the value from Min. interface is issued | depending on the parameter "Signal" |
| Max. Reference | With this signal, the value from Max. interface is issued | depending on the parameter "Signal" |
| Min.Interface | This parameter sets the minimal output voltage. | -10...+10V 0.01V |
| Max.Interface | This parameter sets the maximal output voltage. | -10...+10V 0.01V |

7.9 Menu File

Contained in the File menu are the menu points, which concern the file handling and the printing of the parameters. In the "On Line"-mode, some of these menu points are blocked.

7.9.1 New

This menu point is active only in the "Off Line"-mode.

With this command, a new file can be opened. Near it, all parameters are set to default values. A question will be displayed, if the current configuration will be retain or not.

If "Yes" will be selected, the current configuration will not be changed.

If "No" will be selected, a selection window will be displayed. In this window, the following configuration can be selected.

| | |
|---------------------|--|
| Function | <ul style="list-style-type: none">• Basic Amplifier (with/without manual operation)• Enhanced Amplifier• Basic Controller• Enhanced Controller |
| Analogoutputs | <ul style="list-style-type: none">• Input 1 voltage or current• Input 2 voltage or current• Input 2 current only if Function = Enhanced Amplifier or Enhanced Controller• Input 3 voltage or current (with Fieldbus = HART always current)• Input 4 voltage or current |
| Number of solenoids | <ul style="list-style-type: none">• 1-Solenoid• 2-Solenoid |
| Fieldbus | <ul style="list-style-type: none">• without Fieldbus• with CANopen• with Profibus DP• with J1939• with HART |
| Supply voltage | <ul style="list-style-type: none">• 12 VDC• 24 VDC |

The modified configuration only affects the "Off Line"-mode. By switching to "On Line"-mode the configuration of the connected Wandfluh-Electronics will be read in.

In both cases, the following question will be displayed:

"Should the inputs / outputs set according to the Wandfluh standard or to "not used"?"

If "not used" will be selected, the inputs / outputs are assigned itself to the corresponding functions (refer to section ["Assignment of the inputs/outputs"](#)^[51]).

If "Wandfluh standard" will be selected, the assignment of all inputs / outputs will be adjusted corresponding to the Wandfluh specification (refer to section ["Inputs/outputs according to Wandfluh standard"](#)^[61]). This setting can be rechanged at any time (refer to section ["Assignment of the inputs/outputs"](#)^[51]). With the function "Basic Amplifier", the question appears if the mode of operation 4 (solenoid single) should be enabled. If "Yes" will be selected, the assignment of the inputs / outputs will be adapted accordingly.

7.9.2 Open

This menu point is only active in the "Off Line"-mode.

With this command, an existing file from a storage medium is opened. First the file selection window appears. In this window the required file can now be selected and opened with "OK".

If the selected file was stored with the PASO SD6, the message "The selected file was created with the PASO SD7 version. To open it must first be converted. Would you like to continue?". With "No" the operation is aborted. With "Yes" the parameters will be imported (same procedure as read parameters, see the next section) and all inputs / outputs will be placed according to the SD6-Electronics . After successfully importing the parameters can be stored newly.

Attention: A file stored with the PASO can not be opened with the older PASO SD6!

More detailed information for the migration from SD6 to SD7 are located in in the document "Differences SD6 - SD7" (refer to <http://www.wandfluh.com/en/downloads/accompanying-documents-for-electronics.html>).

If the selected file WAS stored with a current PASO , the read procedure will be started. If the configuration of the selected file does not correspond to the current configuration of the PASO SD7, a message will be displayed and the current configuration from the PASO SD7 will change automatically over to the new configuration of the selected file. The read parameter values will be checked in the case of a limiting value excess. If one or more parameter values are outside the tolerance, a message will be displayed and the parameter value will be set to the default value (refer to section "[Limiting value error](#)"^[156]). The parameter values can now be edited and changed as required under the corresponding menu points.

Wandfluh can create application specific parameters files in accordance to customer wish.

7.9.3 Save

With this command, the parameters are saved on a data storage medium. All parameter values of all input windows are saved under the current file name. If no file name has been defined yet, then first the file selection window appears (refer to section "[File Save as...](#)"^[106]).

7.9.4 Save as...

With this command, the parameters are saved on a data storage medium. All parameter values of all input windows are saved under the file name entered.

First the file selection window appears. In this window the desired file name can now be entered. If the file name is entered without an extension, then the extension ".par" is automatically assigned to it. After actuating the button "Save", the file information window appears (refer to section "[File-Info](#)"^[107]). In this window the required entries can now be made. With the button "Save", the file is then finally saved under the selected file name. With the button "Cancel", one changes back to the file window.

7.9.5 Print

With this command, the current parameters are printed in ASCII text format. The File_Print window is opened. In this window one can now select, whether the printing process is to be to a printer or to a file.

If the output is to be to a printer, then the Windows printer selection window is opened.

If the output is to be to a file, then the file selection window appears. In this window the desired file name can now be entered. If the file name is entered without an extension, then automatically the extension ".txt" is assigned to it.

7.9.6 File-Info

With this command, the file information of an existing file is displayed. The file information consists of the following parts:

- Date, time: Date, time of saving.
- File name: The file name, under which the file has been saved.
- Card type: The card type of the connected Wandfluh-Electronics at the moment of saving. If no Wandfluh-Electronics are connected, then this indication remains empty. In case of saving during "On Line Operation", this indication is updated.
- Operator: The name of the originating person.
- Remarks: Possibility to enter remarks concerning the file.

When the File_Info window appears during the execution of the command "[File Save as...](#)"^[106], then the corresponding entries can be made in the various fields (with the exception of "Date", "Time", "File name" and "Card type", which cannot be edited). When the File_Info window appears during the execution of the command "[File File-Info](#)"^[107], then the various fields cannot be edited.

7.9.7 Settings

7.9.7.1 Language

In this window, the language can be selected, with which the PASO will be inscribed. This setting is automatically saved and accepted with a new start.

| Field | Parameter description | Range / Step |
|----------|---|--------------------------------|
| Language | Field, from which the desired language can be selected. | deutsch english français |

7.9.7.2 Messages

In this window, the selection can be made if the Info messages resp. the Warnings should be displayed or not

7.10 Menu Communication

Im Konfigurations Menu werden alle Einstellungen vorgenommen, welche die Funktion der SD7-Elektronik betreffen.

7.10.1 Device overview

An overview of all connected WANDFLUH devices is displayed (refer to section "[Communication start up](#)"^[150]),

7.10.2 Datarecord-Info

This menu point is only active in the "On Line"-mode.

Under this menu the current data set information of the connected Wandfluh-Electronics appears. The data correspond to the last change to the Wandfluh-Electronics data carried out.

Card type: The valve type of the connected Wandfluh-Electronics at the moment of saving
Date: Date of last change. (Format DD.MM.YYYY)
Time: Time of last change (Format HH:MM.SS)
Filename: The file name under which the parameters were saved at the last change.
If the file name is longer than 27 characters, the characters' "»" will be inserted at the end.

7.10.3 Activate Off Line / Actuvate On Line

Off Line

With this command, the connection with the Wandfluh-Electronics is interrupted. All menu points, which call for a communication with the Wandfluh-Electronics, are blocked. The PASO software now runs in the "Off Line mode". The loading, saving and the editing of parameter files is possible in this mode.

On Line

With this command, the connection with the Wandfluh-Electronics is established. If several Wandfluh-Electronic devices are connected via the USB-Interface, the selection of all available devices appears (refer to section "[Communication start up](#)"^[150]).

The communication with the Wandfluh-Electronics is briefly tested. If the connection works, then the user has the option of read in the parameters from the Wandfluh-Electronics (UPLOAD PARAMETERS) or of transferring the parameters to the Wandfluh-Electronics (DOWNLOAD PARAMETERS). During the transfer of the parameters, the user has the possibility of aborting the operation.

During UPLOAD PARAMETERS the PASO software automatically adapts to the selected device type. If the parameters have been accepted, they are checked for a limit value violation. If one or several parameters are outside the corresponding tolerance, they are replaced with standard values and a message is issued (refer so section "[Limiting value error](#)"^[150]). PASO runs in the "Off Line"-mode. To enter in this case the "On Lline" mode, the parameters must be sent to the WANDFLUH-Electronics (DOWNLAOD PARAMETERS). If the transfer is successful and the check is correct, the PASO software now runs in the "On Line mode". The loading of parameter files is not possible in this mode.

During DOWNLAOD PARAMETERS, the connected device type must correspond to the current configuration of the PASO software. If this is not the case, no communication is possible. During the transmission of the parameters to the connected WANDFLUH electronics, all solenoid outputs on the WANDFLUH electronics are disabled for safety reasons. If the transer is successful, the PASO software now runs in the "On Line mode". The loading of parameter files is not possible in this mode.

The current mode will be displayed in the status line.

7.11 Menu Configuration

In this window, the settings of the function of the SD7-Electronics will be made.

7.11.1 Digital I/O

With this command the digital inputs and outputs of the connected Wandfluh-Electronics are activated, not activated or enabled.

| Field | Parameter description | Range / Step |
|------------------|---|--------------|
| Digital inputs | Set digital input by software | 1 |
| | Reset digital input by software | 0 |
| | Activate external digital input | X |
| Digital outputs | Set digital output with software | 1 |
| | Reset digital output with software | 0 |
| | The digital output is set in case of the selected function | X |
| | The digital output is set inverted in case of the selected function | !X |
| Internal signals | Set internal signal by software | 1 |
| | Reset internal signal by software | 0 |
| | Internal signal is set in case of the selected function | X |

Digital in- and outputs which are set or reset by software will be displayed with blue text color in the main window

7.11.2 Binary operations

In this window, digital signals can be logically linked (a digital output or internal signal is set in dependence on one or two digital inputs or internal signals).

| Field | Parameter description | Range / Step |
|----------|---|---|
| Output | Output, to which the result of the logical operation is outputted. In choosing "not used", the function is switched off | refer to section " Assignment of the inputs/outputs " ^[51] |
| Inv | By selecting "Inv", the selected output can be inverted | |
| Input 1 | First operand of the logically operation. In choosing "not used", no input will be assignend to the first operand. | refer to section " Assignment of the inputs/outputs " ^[51] |
| Inv | By selecting "Inv", the selected input can be inverted | |
| Input 2 | Second operand of the logically operation. In choosing "not used", no input will be assignend to the second operand. | refer to section " Assignment of the inputs/outputs " ^[51] |
| Inv | By selecting "Inv", the selected input can be inverted | |
| Function | Desired logical operation (refer to truth tables ^[110]): | |
| | Link two signals with AND | AND |
| | Link two signals with OR | OR |
| | Link two signals with EXCLUSIV OR | XOR |
| | INVERT one signal | NOT |
| | In choosing "not used", the function is switched off | |

The following truth tables shoes all possible operation the state of the output in dependence of the operands

AND

| Output | Operand 1 | Operand 2 |
|------------|------------|------------|
| not active | not active | not active |
| not active | active | not active |
| not active | not active | active |
| active | active | active |

| Output Inv | Operand 1 | Operand 2 |
|------------|------------|------------|
| active | not active | not active |
| active | active | not active |
| active | not active | active |
| not active | active | active |

OR

| Output | Operand 1 | Operand 2 |
|------------|------------|------------|
| not active | not active | not active |
| active | active | not active |
| active | not active | active |
| active | active | active |

| Output Inv | Operand 1 | Operand 2 |
|------------|------------|------------|
| active | not active | not active |
| not active | active | not active |
| not active | not active | active |
| not active | active | active |

XOR

| Output | Operand 1 | Operand 2 |
|------------|------------|------------|
| not active | not active | not active |
| active | active | not active |
| active | not active | active |
| not active | active | active |

| Output Inv | Operand 1 | Operand 2 |
|------------|------------|------------|
| active | not active | not active |
| not active | active | not active |
| not active | not active | active |
| active | active | active |

NOT

| Output | Operand 1 |
|------------|------------|
| active | not active |
| not active | active |

7.11.3 Filter for analog inputs

In this window the adjustments for the filter of the analog inputs can be set.

| Field | Parameter description | Range / Step |
|------------------|---|-----------------------|
| Filter type | The filtering of the corresponds analog input can be switch on or off (refer to section " Analog inputs " ^[21]): | |
| | No filtering on the analog input is active | no filter |
| | The analog input is filterd with the function "exponential smoothing" | Exponential smoothing |
| Smoothing factor | Determines the speed / response time of the filter - high value = high degree of filtering, but long response time (the reading of the analog input is delayed) - small value = low degree of filtering, but fast response time | 8 |
| | | 16 |
| | | 32 |
| | | 64 |

The two parameters can be set separately for each existing analog input.

7.11.4 General errors

In this menu the handling of general errors can be set.

| Feld | Parameter Beschreibung | Bereich / Schrittweite |
|------------|--|------------------------|
| Auto reset | If the supply voltage rises above the min. voltage after a supply error appeared, the Wandfluh electronics has to be disabled and re-enabled to acknowledge the supply error. If the supply voltage rises above the min. voltage after a supply error appeared, the Wandfluh electronics acknowledges the supply error automatically. | no |
| | | yes |

7.11.5 Default setting

This menu point is only active in the "On Line"-mode and in the state "Disabled" (refer to section "[State machine](#)"^[21]).

With this command, the default settings made in the factory will be loaded on the connected Wandfluh-Electronics and read to the PC. After successfully read in, the question appears, if the values should be stored on the Wandfluh-Electronics or not. If "Yes" will be selected, the values will be stored in the way that they are available after the Wandfluh-Electronics will be switched on again (non-volatile memory). If "No" will be selected, the values are running at the moment, but after the Wandfluh-Electronics will be switched on again, the before current values will be active again.

7.11.6 ADC Scaling

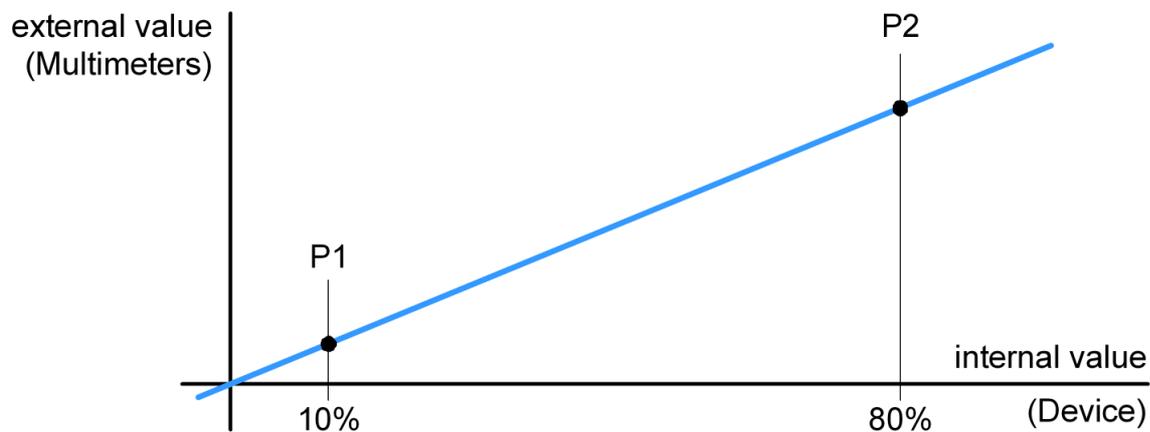
In this window the analog/digital converter (ADC) can be scaled.

The ADC scaling was done at the factory. Disruptive change of this setting can lead to malfunction!

| Field | Parameter description | Range / Step |
|---|--|---|
| Channel | <p>Here the channel for scaling can be selected. Only channels which are assigned to a function can be scaled</p> <p>Depending on the Wandfluh-Electronics type not all channels are available.</p> | Solenoid output A Solenoid output B Analog input 1 Analog input 2 Analog input 3 Analog input 4 Analog output 1 |
| Internal measured value (device) | <p>This is the value which is measured internally on Wandfluh-Electronics. This corresponds to the value which is displayed in the menu "Analysis Show values"^[131].</p> | |
| External measured value P1 (Multimeter) | <p>Here must be entered the value which is external measured with a multimeter. For bipolar signals, only the positive side is considered.</p> | Depending on channel |
| Accept | <p>The value from the field "Internal measured value (device)" and "External measured value P1 (Multimeter)" is assumed for the calculation.</p> | |
| External measured value P2 (Multimeter) | <p>Here must be entered the value which is external measured with a multimeter. For bipolar signals, only the positive side is considered.</p> | Depending on channel |
| Accept | <p>The value from the field "Internal measured value (device)" and "External measured value P2 (Multimeter)" is assumed for the calculation.</p> | |
| Calculate | <p>Using the assumed values "Internal measured value Wandfluh" and "External measured value P1 resp. P2 (Multimeter)" the new value for the offset and the amplification of ADC scaling is automatically calculated and sent to the Wandfluh-Electronics.</p> <p>The new calculated values are displayed in the field "Offset" and "Amplification".</p> <p>This button is only active if values were previously assumed.</p> | |
| Default | <p>The default values "Offset = 0.0" and "Amplification = 1.0" are sent to the Wandfluh-Electronics and will be active. The values "External measured value P1 resp. P2 (Multimeter)" are set to 0</p> | |
| Solenoid current | <p>With the selection "Solenoid current A" resp. "Solenoid current B", the direct operation of the solenoids can be made in this range.</p> <p>ATTENTION: With the direct solenoid operation, the system can move in an uncontrolled way!</p> <p>The settings correspond to the functions in the section "Commands Valve operation"^[123].</p> | |

For the ADC scaling, following sequence must be maintained for each channel:

1. Selection of the channel (Field "Channell")
2. Approach the point P1 (should be approx. 10% from the maximum value)
3. Enter the value witch is external measured with a multimeter in the field "External measured value P1 (Multimeter)"
4. Press button "Accept"
5. Approach the point P2 (should be approx. 80% from the maximum value)
6. Enter the value witch is external measured with a multimeter in the field "External measured value P2 (Multimeter)"
7. Press button "Accept"
8. Press button "Calculate". Thus, the new value for the offset and the amplification of ADC scaling is automatically calculated and sent to the Wandfluh-Electronics. If the calculation results an incorrect value, an error message is displayed and the values will not be changed.



Closing the window without pressing "Calculate" does not change the ADC scaling values.

7.12 Menu Profile

The SD7-Electronics is in a position to save - and to run through complete travel profiles, which have been predefined by the operator beforehand. A travel profile is a sequence of individual profiles (sequences), which define a course of movement.

7.12.1 Travel Profile

A travel profile as a minimum consists of one sequence and, as a maximum, of the maximum programmable number of sequences (refer to section [Sequences](#)^[116]). The sequences are consecutively numbered per travel profile (1..Maximum-Index). The sequence number 1 serves to run up to the profile starting position. Because the starting position of this sequence is not always known, this sequence is uniformly displayed in the graphic window (menu "[Profile - Generator](#)"^[120]) with two blue arrows.

The travel profile ends either upon reaching the last sequence or else when reaching a sequence, which has been programmed with the speed 0 (artificial profile end). Thereafter the following sequences are not carried out.

Per SD7-Electronics, a maximum of 50 sequences can be defined, which can be split-up in any manner required over the maximum 7 profiles. The profile can be assigned to each channel of the SD7-Electronics (refer to section "[Command value fixed](#)"^[71]).

A movement profile can either be run through completely or else step-by-step (sequence by sequence). The profile to be run through is selected through three digital inputs "Selection 1", "Selection 2" and "Selection 4" (= 7 profiles). The assignment of the digital inputs is freely selectable (refer to section "[Command value fixed](#)"^[71]). It applies the following relationship:

| Digital input Selection 1 | Digital input Selection 2 | Digital input Selection 4 | Profile |
|---------------------------|---------------------------|---------------------------|----------------------------|
| 0 | 0 | 0 | 0 (analogue command value) |
| 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 2 |
| 1 | 1 | 0 | 3 |
| 0 | 0 | 1 | 4 |
| 1 | 0 | 1 | 5 |
| 0 | 1 | 1 | 6 |
| 1 | 1 | 1 | 7 |

With the help of the digital input "Start", the profile movement is started. For every execution of a positioning, a start signal has to be applied. If the mode "Run through individual sequence" has been selected (digital input "Profile/Sequence is not active), each sequence has to be started individually. **If in doing so and a stop time = 0 has been programmed, the corresponding sequences are combined into one movement without any stopping time (sequence group).**

In the mode "Run through complete profile" (digital input "Profile/Sequence is active), after the start signal the complete profile is run through.

If a profile end is detected, then with the next start signal the processing starts again with the sequence 1. The completion announcement of every completed travel profile can be effected with setting a digital output. The state of each sequence can be also effected with setting a digital output (depends on the parameter "Sequence output", refer to section "[Profile Generator-Window](#)"^[120]). The assignment of the digital outputs is freely selectable (refer to section "[Function](#)"^[102]).

Any and all positioning operations can be stopped, if the digital input "Stop" is activated.

7.12.2 Sequence

A sequence consists of the travel command data and the stop time (dwell time after reaching the target position)

A sequence is defined by the operator with the help of the travel command data entered through the keyboard.

The travel command data contain:

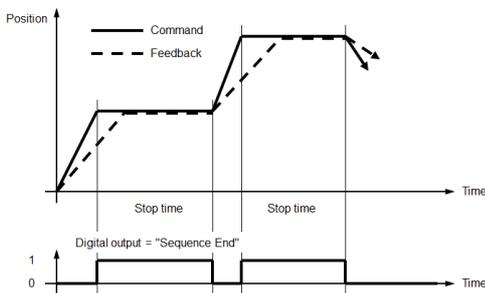
- Command position (target - or end position of the sequence) **xtarget**
- Command speed value (command travelling speed of the process) **vpreset**
- Acceleration (acceleration or deceleration necessary for reaching the travelling speed, starting out from a sequence start speed) **as**
- Deceleration (deceleration or acceleration necessary for reaching the sequence end speed) **ds**
- Stop time (possible dwell time after reaching the end position) **ts**

The travel command data of the sequences are saved in the EEPROM.

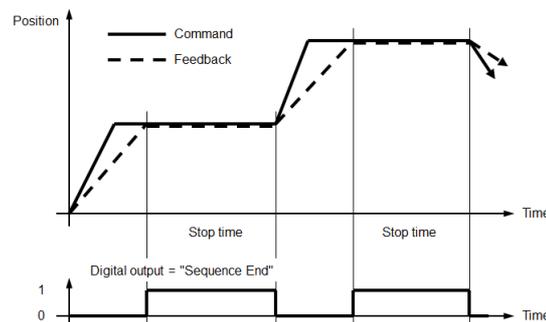
With the parameter "Sequence End" the sequence end condition can be set:

- Selection "Command = Target": Sequence end, if the command value has reached the command position
- Selection "Feedback = Target": Sequence end, if the feedback value has reached the command position. The profile generator waits to start a possible next to the sequence until the feedback value has reached the target window. The timing of the target profile is therefore delayed by the actual value.

Example "Command = Target"



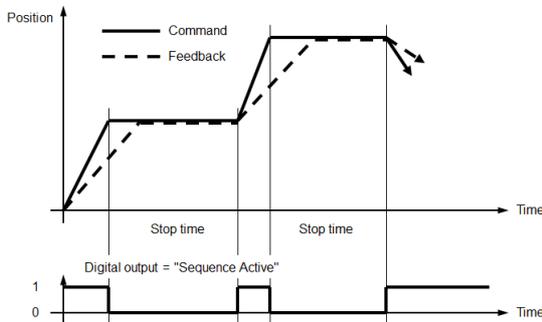
Example "Feedback = Target"



With the parameter "End output" the selection can be made, if the end of the sequence should be displayed on a digital output or not. The desired digital output must be selected in the window "Function" (refer to section "[Function](#)"¹⁰²)

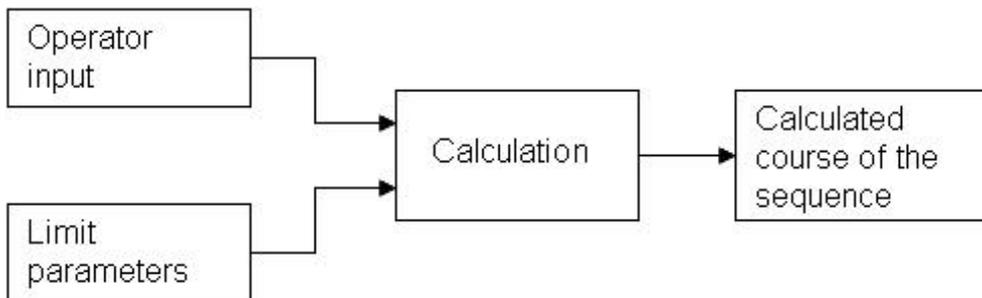
With the parameter "Sequence active" the selection can be made, if an active sequence should be displayed on a digital output or not.

Example



With the parameter "Active output" the desired digital output can be selected.

From the travel command data, the theoretical course of the sequence is calculated. The calculated course of the sequence is jointly determined by the limit parameters (position and speed at the beginning and end of the sequence) **and it can significantly differ from the travel command data entered. Command positions and possible stop times, however, are complied with in all cases.**



The limit parameters are:

- **xstart** (command position of the preceding sequence)
- **xtarget** (the command position entered)
- **vstart** (the starting speed of the sequence = target speed of the preceding sequence)
- **vtarget** (target speed when the command position is reached)

The target speed **vtarget** is determined by the operator input (travel command data) and the command speed **vpreset** of the next sequence.

vtarget is equal to zero when:

- The end of the profile has been reached
- **vpreset** of the next sequence is equal to zero (artificial profile end)
- A change of direction takes place at the end of the sequence
- A stop time **ts** greater than zero has been entered

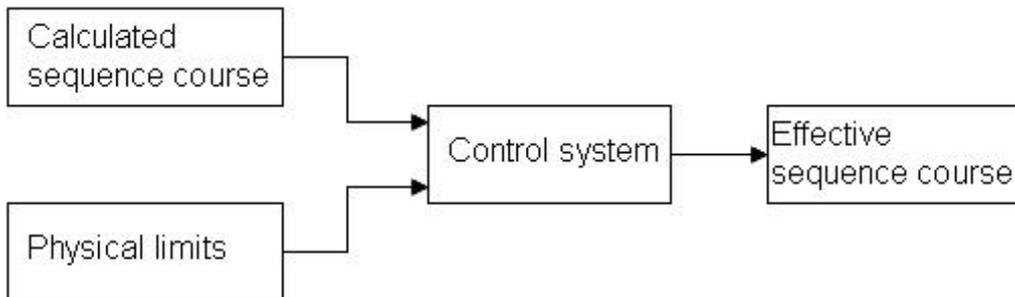
In the other cases, **vtarget** is determined as follows from the operator input of acceleration **as**, deceleration **ds** and command speed **vpreset**:

| Current sequence input value deceleration | Next sequence input value acceleration | <i>v_{target}</i> , the target speed is equated to |
|--|---|--|
| <i>ds</i> not equal to zero | <i>as</i> not equal to zero | <i>v_{preset}</i> of the next sequence |
| <i>ds</i> equal to zero | <i>as</i> not equal to zero | <i>v_{preset}</i> of the current sequence |
| <i>ds</i> not equal to zero | <i>as</i> equal to zero | <i>v_{preset}</i> of the next sequence |
| <i>ds</i> equal to zero | <i>as</i> equal to zero | <i>v_{preset}</i> of the next sequence |

Adaptation of the Acceleration or Deceleration to the Limit Parameters

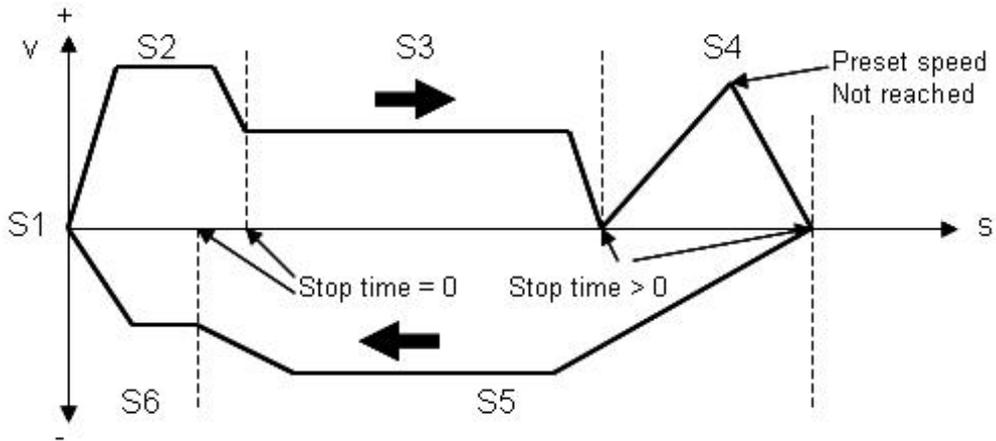
In order for the target speed *v_{target}* to be reached, the entered values for the acceleration *as* or deceleration *ds* are adapted if necessary (e.g. reverse digit sign, i.e. acceleration becomes deceleration or vice versa, or if so required change the value of the acceleration or deceleration). In conjunction with the other limit parameters, this results in the calculated course of the sequence. The adapted values in contrast to the entered ones are not saved in the EEPROM. They are only expressed in the graphic representation of the profile.

As a consequence of the physical limits of the axis control system, the calculated sequence course is possibly not implementable. **This is not verified by the Paso software.**

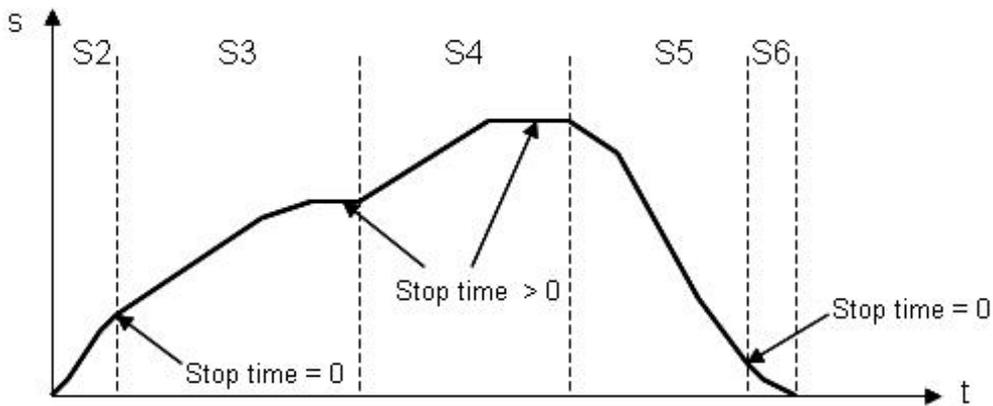


7.12.3 Example

Speed - Stroke Diagram:



Stroke - Time Diagram:



7.12.4 Profile Generator Window

In the profile generator window, the parameters for the [sequences](#) ^[116] and [profiles](#) ^[115] can be predefined.

When running through the profiles, however, because of the predefined values (speed and position) of adjacent sequences it is possible, that the values entered into the fields acceleration and deceleration of the current sequence cannot be complied with. These values in this case are adapted during the calculation of the sequence.

In the display of the travel profiles, the following has to be noted:

- The complete travel profile is indicated in black.
- The current sequence is indicated in blue (violet in the time diagram) and in boldface.
- The current sequence group is indicated in blue (violet).
- If at the end of the sequence a stop time has been defined, then this is indicated with a red cross.
- The 1st sequence is not indicated. It solely serves to predefine a defined starting position.

By clicking on a sequence in the graphic window with the left-hand mouse button, it automatically becomes the current sequence. The field "Sequence No." is adapted accordingly.

In the graphic window, the current travel profile is displayed as a speed - stroke - or stroke - time diagram. The changeover between the two types of diagram takes place by activating the corresponding selection below the graphic window or else with the button combination CTRL+D.

The displayed unit corresponds to the unit from the active channel in the PASO while opening the profile generator window is selected.

Attention:

When leaving the window with the button "Cancel", all data, which have not previously been saved by means of the button "OK", are lost!

| Field | Parameter description | Range / Step size |
|-----------------|---|---------------------------------------|
| Profile Number | Here the number of the required profile can be selected. | 1 .. 7 |
| Profile End | Here the condition for setting the function "Profile End" can be selected: - Profile end, if the command value has reached the end command value - Profile end, if the feedback value has reached the end command value | Command = Target Feedback = Target |
| Sequence Number | Here the number of the required sequence can be selected. | 1 .. 50 |
| Insert | With this button, a sequence can be inserted into the current profile. | |
| Delete | With this button, the current sequence will be deleted. At the profile end (empty sequence), this button is deactivated. | |
| Accept | With this button, the current values are accept into the current profile. | |
| Command value | Predefinition of the end command value. | Adapted to unit |
| Speed | Predefinition of the command speed. | 0...max. speed |
| Travelling time | Travelling time of the current sequence excluding stop time, only display. (Only appears in the stroke - time diagram) | |
| Acceleration | Predefinition of the command acceleration. | 0...max. acceleration |
| Deceleration | Predefinition of the command deceleration. | 0...max. acceleration |
| Stop time | Predefinition of the stop time following a sequence end. | 0...10sec |
| Sequence End | Here the condition for the sequence end can be selected - Sequence end, if the command value has reached the end command value - Sequence end, if the feedback value has reached the end command value | Command = Target Feedback = Target |

| Field | Parameter description | Range / Step size |
|--------------------|--|---|
| End Output | Predefinition, whether the sequence output is to be activated or not when the sequence end has been reached. With the selection "on", the digital output "Sequence end" is only active as long as the Sequence stop time is running (refer to section "Sequence" ^[116]) | on / off |
| Sequence active | Selection, if an active sequence should be displayed on a digital output or not. | on / off |
| Active output | Select the desired used digital output. | refer to section "Assignment of the inputs/outputs" ^[51] |
| Test moving | With the test moving, the settings from the current profile can be tested direct on a desired channel. | |
| Channel | In this channel, the test moving will be run. As standard, the active channel in the PASO while opening the profile generator window is selected | |
| Operation mode | Select the desired operating mode (refer to section "Operating mode" ^[22]) This adjustment can only be made if the field "Control mode" is set to "Disabled". | Local Remote PASO |
| Control mode | Select the desired control mode (refer to section "State machine" ^[21]) This adjustment can only be made if the field "Operation mode" is set to "Remote PASO". | Disabled Active |
| Complete profile | The command "Home" and "Start" refer to the current profile. | |
| Single sequence | The command "Home" and "Start" refer to the current sequence | |
| Home | Complete profile active: The profile command value corresponds to the start command value of the current profil and then automatically continue each sequence of the current profile Single sequence active: The profile command value corresponds to the start command value of the current sequence and stops there. At the start sequence (sequence no. 1) this button is inactive. | |
| Start | Complete profile active: The profile command value corresponds to the end command value of the current profil and then automatically continue each sequence of the current profile Single sequence active: The profile command value corresponds to the end command value of the current sequence and stops there. | |
| Graphic window | <ul style="list-style-type: none"> • Changeover between the speed - stroke - and stroke - time diagram by activating the corresponding selection below the graphic window or else with the button combination CTRL+D. • With the combination "CTRL+Left-hand mouse button", the graphic display is zoomed in, with the combination "CTRL+Right-hand mouse button", the graphic display is zoomed out. • With the combination "SHIFT+CTRL+Left-hand mouse button", the graphic display can be moved. • By clicking on a sequence in the graphic window with the left-hand mouse button, this sequence automatically | |

| Field | Parameter description | Range / Step size |
|-------|--|-------------------|
| | becomes the current sequence. The field "Sequence No." is accordingly adapted. | |

7.13 Menu Commands

In the Commands menu, direct control commands can be transmitted to the SD7-Electronics.

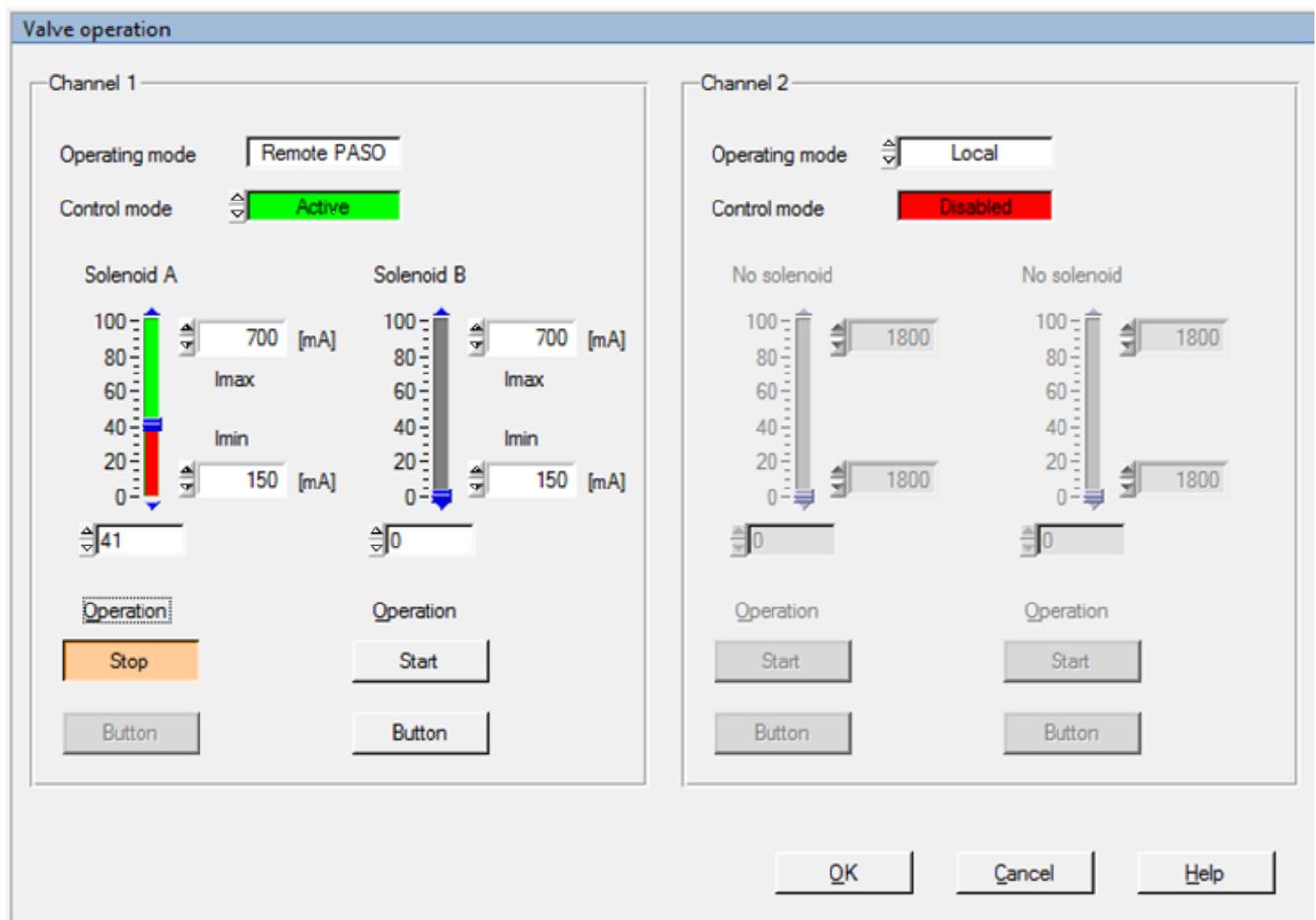
7.13.1 Valve operation

This menu point is only active in the "On Line"-mode.

In this window, the valve can be directly actuated via the elements available in the window.

It is possible to hold open also the window "Analysis - Signal recording" at the same time. These can be made with the selection of the menu item "Analysis - Signal recording" in the menu bar. Thus, the impact of the direct valve operation can be directly analyzed. If two windows are open, the window "Analysis - Signal recording" must be closed first before even the window "Valve operation" can be closed.

The following window appears:



- The number of the shown channels is equal to the number of channels that can be operated (refer to section ["Description of the Function"](#)^[97])
- The number of solenoids per channel corresponds to the selected mode of operation (refer to section ["Valve type"](#)^[96])
- The solenoid name (for example "solenoid A") corresponds to the selected solenoid output (refer to section ["Solenoid driver"](#)^[97])
- In the field "Operation mode" the current operation mode of the channel will be displayed
- In the field "Control mode" the current control mode of the channel will be displayed

| Field | Parameter description | Range / Step size |
|----------------|--|------------------------------------|
| Operation mode | Select the desired operating mode (refer to section "Operating mode" [22]). This adjustment can only be made if the field "Control mode" is set to "Disabled". | Local Remote PASO |
| Control mode | Select the desired control mode (refer to section "State machine" [21]). This adjustment can only be made if the field "Operation mode" is set to "Remote PASO". | Disabled Active |
| Operation | With this button, the adjusted current can be sent to the solenoid or the solenoid can be set to 0 current. This button can only be operated if the field "Operation mode" is set to "Remote PASO" and the field "Control mode" is set to "Active". | Start / Stop |
| Solenoid x | The desired solenoid current can be adjusted either with the slider or in the numeric field. With a proportional solenoid, the adjustment from 0...100% refers to a solenoid current from Imin...Imax. With a switching solenoid, the solenoid can be switched off or on with 0 / 1. The adjusted current will be sent to the solenoid only if the button "Operation - Start" is activated (label of the button is "Stop") | 0...100% (Imin...Imax) 0 / 1 |
| Imin / Imax | The value of the parameter Imin / Imax from the corresponding solenoid driver can be changed (refer to section "Solenoid driver" [97]). If the window is closed with the button "OK", the changed values from Imin / Imax will be take over. If the window is closed with the button "Cancel", the changed values from Imin / Imax will be reset to the original values. | |

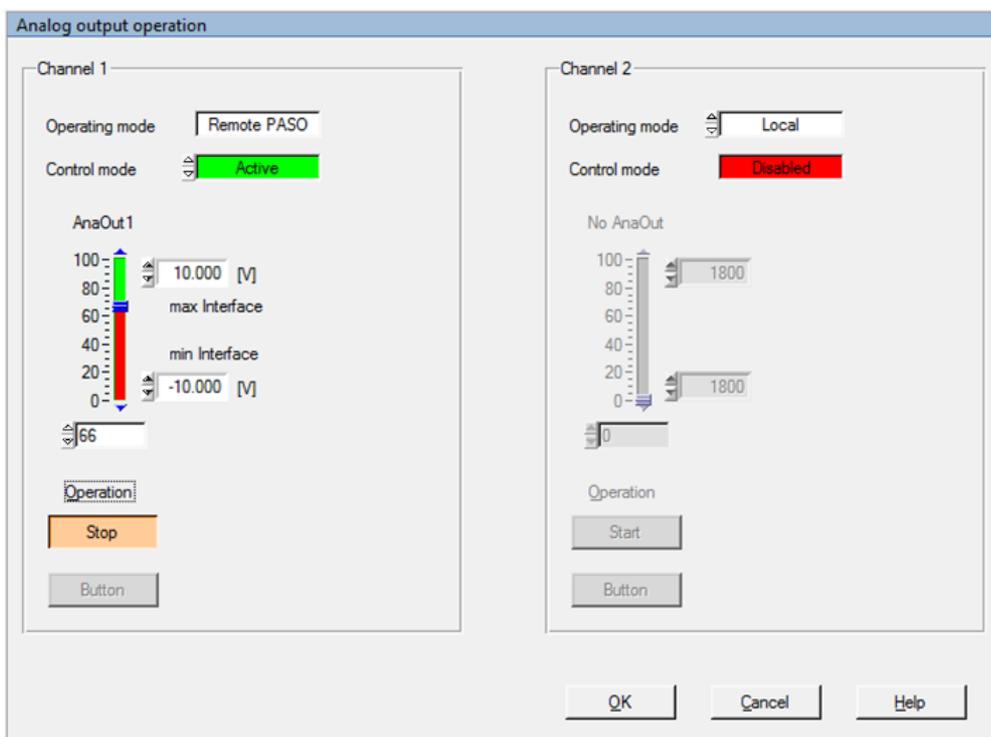
7.13.2 Analog output operation

This menu point is only active in the "On Line"-mode.

In this window, the valve can be directly actuated via the elements available in the window.

It is possible to hold open also the window "Analysis - Signal recording" at the same time. These can be made with the selection of the menu item "Analysis - Signal recording" in the menu bar. Thus, the impact of the analog output operation can be directly analyzed. If two windows are open, the window "Analysis - Signal recording" must be closed first before even the window "Analog output operation" can be closed.

The following window appears:



- The number of the shown channels is equal to the number of channels that can be operated (refer to section ["Description of the Function"](#) (19))
- The number of analog outputs per channel corresponds to the number of total available analog outputs
- In the field "Operation mode" the current operation mode of the channel will be displayed
- In the field "Control mode" the current control mode of the channel will be displayed

| Field | Parameter description | Range / Step size |
|--------------------------------|---|---|
| Operation mode | Select the desired operating mode (refer to section "Operating mode" ^[22]) This adjustment can only be made if the field "Control mode" is set to "Disabled". | Local Remote PASO |
| Control mode | Select the desired control mode (refer to section "State machine" ^[21]) This adjustment can only be made if the field "Operation mode" is set to "Remote PASO". | Disabled Active |
| Operation | With this button, the adjusted voltage can be sent to the analog output or the analog output can be set to 0 voltage. This button can only be operated if the field "Operation mode" is set to "Remote PASO" and the field "Control mode" is set to "Active". | Start / Stop |
| AnaOutX | The desired analog output voltage can be adjusted either with the slider or in the numeric field. The adjustment from 0...100% refers to a analog output voltage from min Interface ... max Interface. The adjusted voltage will be sent to the analog output only if the button "Operation - Start" is activated (label of the button is "Stop") | 0...100% (min Interface...max Interface) |
| min Interface max Interface | The value of the parameter min Interface / max Interface from the corresponding analog output can be changed (refer to section "Analog output" ^[104]). If the window is closed with the button "OK", the changed values from min Interface / max Interface will be take over. If the window is closed with the button "Cancel", the changed values from min Interface / max Interface will be reset to the original values. | |

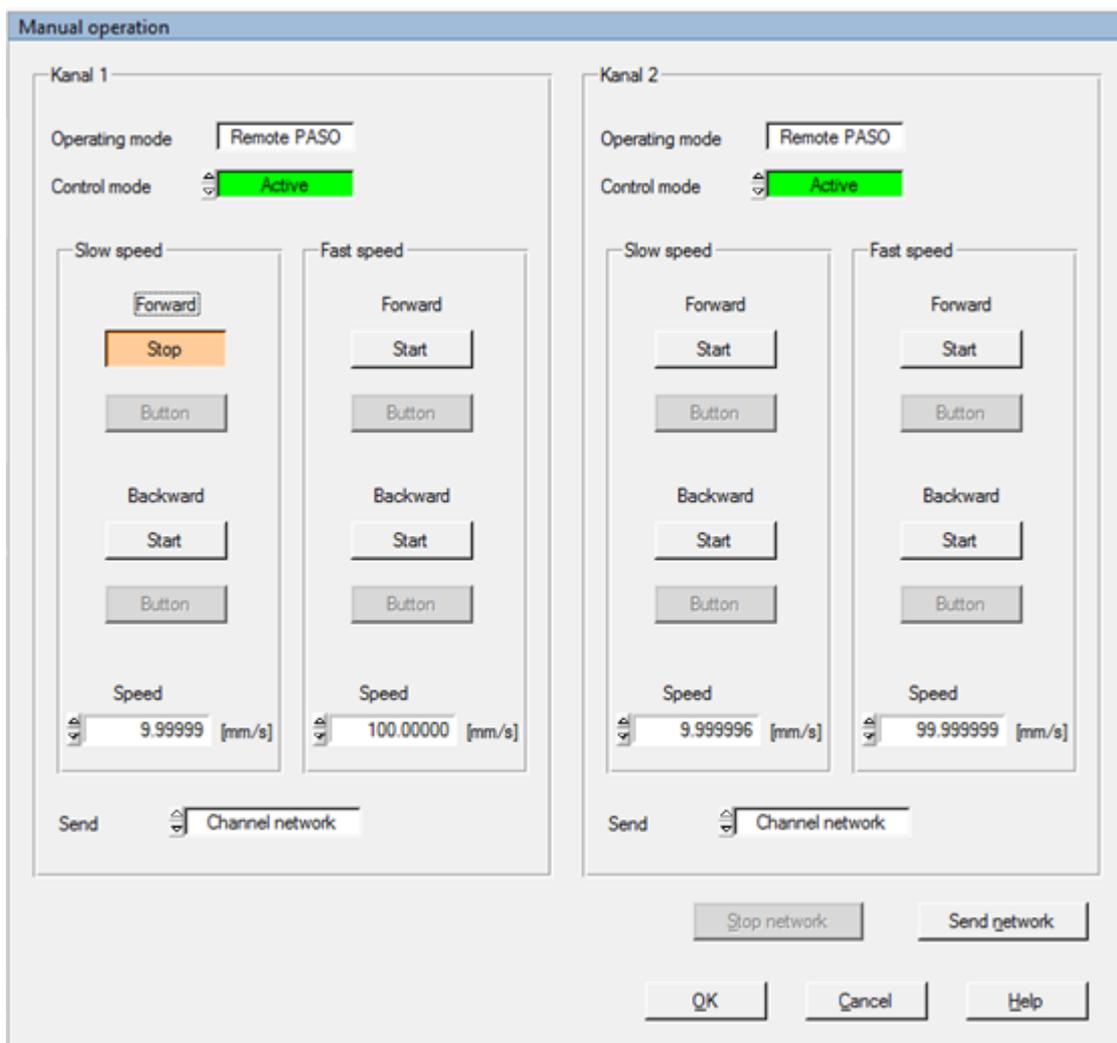
7.13.3 Manual operation

This menu point is only active in the "On Line"-mode.

In this window, the channels can be directly actuated in the manual operation via the elements available in the window.

It is possible to hold open also the window "Analysis - Signal recording" at the same time. These can be made with the selection of the menu item "Analysis - Signal recording" in the menu bar. Thus, the impact of the manual operation can be directly analyzed. If two windows are open, the window "Analysis - Signal recording" must be closed first before even the window "Manual operation" can be closed.

The following window appears:



- The number of the shown channels is equal to the number of channels that can be operated in the manual operation
- The number of active channels corresponds to the number of channels, for which a closed loop control mode is selected and for which the manual operation is enabled (refer to section "[Manul operation](#)"^[79])
- In the field "Operation mode" the current operation mode of the channel will be displayed
- In the field "Control mode" the current control mode of the channel will be displayed

| Field | Parameter description | Range / Step size |
|-------|-----------------------|-------------------|
|-------|-----------------------|-------------------|

| | | |
|--------------------------|---|---|
| Operation mode | Select the desired operating mode (refer to section "Operating mode" [22]) This adjustment can only be made if the field "Control mode" is set to "Disabled". | Local Remote PASO |
| Control mode | Select the desired control mode (refer to section "State machine" [21]) This adjustment can only be made if the field "Operation mode" is set to "Remote PASO". | Disabled Active |
| Slow speed Fast speed | Selection, if the manual mode should operate in slow speed or fast speed | |
| Start | If parameter "Send = Direct": By actuating this button, the manual operation forward or backward is switched on and switched off by actuating again. If parameter "Send = Channel network": By actuating this button, the manual operation forward or backward is switched on as soon as also the button "Send network" is actuating This button can only be operated if the field "Operation mode" is set to "Remote PASO" and the field "Control mode" is set to "Active". | Start / Stop |
| Button | As long as the left mouse button is pushed, the manual operation is switched on forward or backward. If the left mouse button is released or the mouse cursor moves outside of the button, it will switched off. This button can only be operated if the field "Operation mode" is set to "Remote PASO" and the field "Control mode" is set to "Active". | |
| Speed | Slow reps. fast speed. This value corresponds to the parameter "Slow speed" resp. "Fast speed" (refer tot section "Manual operation" [7]). If the window is closed with the button "OK", the changed values for the speed will be take over. If the window is closed with the button "Cancel", the changed values for the speed will be reset to the original values. | 0 ... 15000 Step size depends on the scaling |
| Send | With actuating the button "Start", the manual operation is started directly The manual operation is only activated when in addition to the the button "Start" also the button "Send network" is activated | Direct Channel network |
| Send network | The manual mode is switched on for all channels with the setting "Send = Channel network" and with the "Start" key activated | |
| Stop network | The manual mode is switched off for all channels with the setting "Send = Channel network" | |

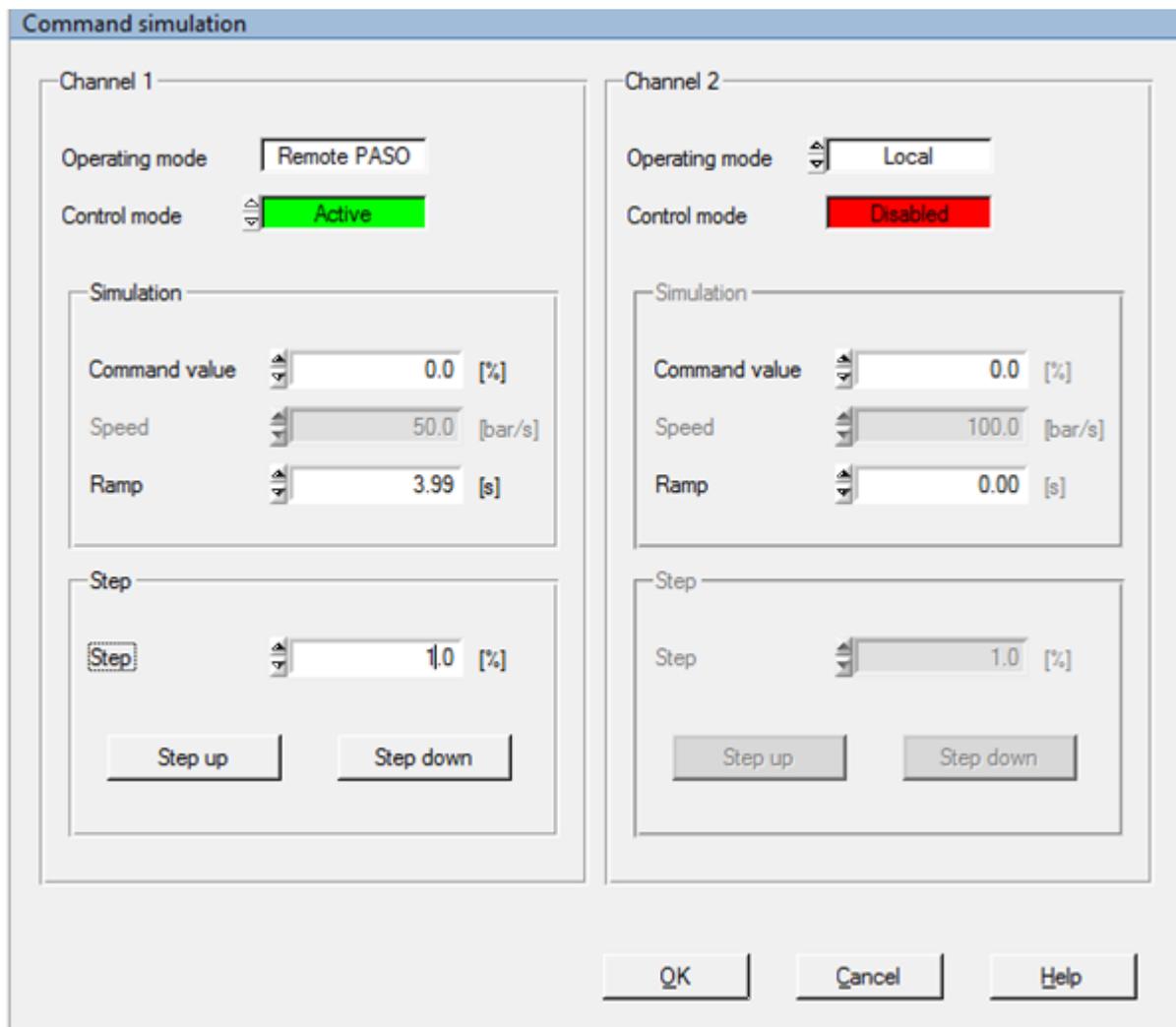
7.13.4 Command simulation

This menu point is only active in the "On Line"-mode.

In this window a command value can be set directly for each active axis.

It is possible to hold open also the window "Analysis - Signal recording" at the same time. These can be made with the selection of the menu item "Analysis - Signal recording" in the menu bar. Thus, the impact of the command simulation can be directly analyzed. If two windows are open, the window "Analysis - Signal recording" must be closed first before even the window "Command simulation" can be closed.

The following window appears:



- The number of the shown channels is equal to the number of active channels (refer to section "[Description of the Function](#)" (19))
- In the field "Operation mode" the current operation mode of the channel will be displayed
- In the field "Control mode" the current control mode of the channel will be displayed

| Field | Parameter description | Range / Step size |
|----------------|--|--|
| Operation mode | Select the desired operating mode (refer to section "Operating mode" [22]) This adjustment can only be made if the field "Control mode" is set to "Disabled". | Local Remote PASO |
| Control mode | Select the desired control mode (refer to section "State machine" [21]) This adjustment can only be made if the field "Operation mode" is set to "Remote PASO". | Disabled Active |
| Command value | Desired value of the command value. The setting depends on the selected control mode: Open-Loop control mode: The adjusted %-value refer to the adjusted solenoid current range (0 ... 100% = Imin ... Imax). A positive %-value will activate the solenoid A, a negative %-value will activate the solenoid B (0% = Imin A). Closed-Loop control mode: Desired value of the command value. The value can be adjusted in the selected unit. | -100% ... 100% 0.1% Adapted to unit |
| Speed | After a command value jump the new command value is run-up to over a linear ramp (depending on the speed set). On the actuator this corresponds to a certain travel speed. This parameter can only be set with a closed loop control mode. | 0 ... 2000 Step size depends on the scaling |
| Ramp | After a command value jump, the new command value is approached via a linear ramp. The adjusted ramp time refer to a command value jump from 0% to 100% resp. from 100% to 0%. This parameter can only be set with a closed loop control mode. | 0 ... 500s 0.05s |
| Step | With this value the command value will be added by clicking on the button "Step up" resp. will be subtracted by clicking on the button "Step down". | Adaped to command value |
| Step up | The command value will be added with the value from "Step" | |
| Step down | The command value will be subtracted with the value from "Step" | |

7.14 Fieldbus-Menu

If the SD7-Electronics have a fieldbus, with this menu point the necessary bus node adjustments can be made. Also bus states will be displayed here.

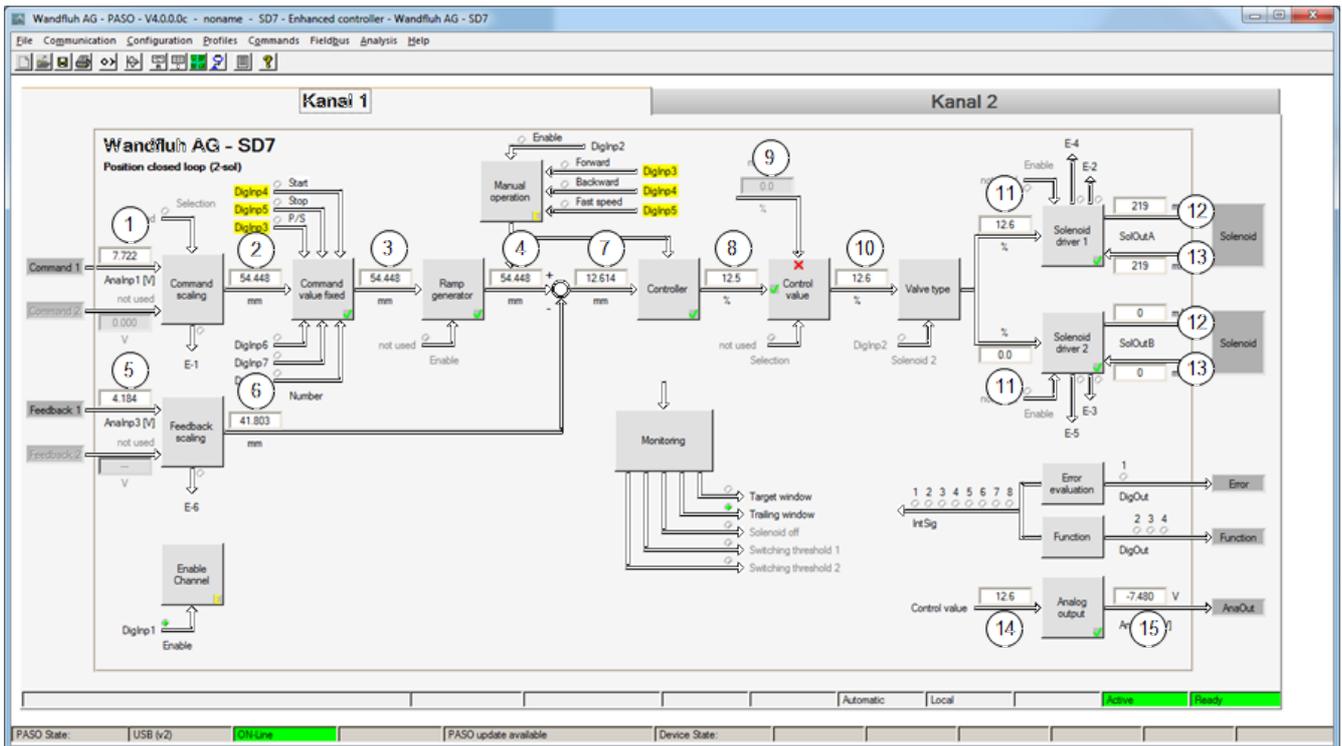
7.15 Menu Analysis

In the Analysis menu, measured values and possible errors on the SD7-Electronics can be displayed on-line.

7.15.1 Show values

The process data on the entire signal path are displayed online. This is helpful in maintenance and diagnostics.

Values in italic letters are only valid for the enhanced version



1 Input command value resp. command value 2

Actual command value. Is shown in V, mA, % or Hz, depending on the selected signal type (refer to section ["Command scaling"](#)^[66]).

2 Output value command scaling

Command value scaled to Min./Max. reference (refer to section ["Command scaling"](#)^[66]) and selected unit (refer to section ["Controller"](#)^[88]).

3 Output value command values fixes

Command value scaled to Min./Max. reference (refer to section ["Command scaling"](#)^[66]) and selected unit (refer to section ["Controller"](#)^[88]). If fixed command values are selected this value can differ to field 2.

4 Output value ramp generator

Command value scaled to Min./Max. reference (refer to section ["Command scaling"](#)^[66]) and selected unit (refer to section ["Controller"](#)^[88]). If a ramp is running this value can differ to field 3.

5 Input feedback value resp. feedback value 2

Actual Feedback value. Is shown in V, mA, % or Hz, depending on the selected signal type (refer to section ["Feedback scaling"](#)^[79]).

6 Output value feedback scaling

Feedback value scaled to Min./Max. reference (refer to section ["Feedback scaling"](#)^[79]) and selected unit (refer to section ["Controller"](#)^[88]).

7 Control deviation

Control deviation (Difference between field 4 - field 6) scaled to Min./Max. reference (refer to section ["Feedback scaling"](#)^[79]) and selected unit (refer to section ["Controller"](#)^[88]).

8 Output value controller

Command value scaled to -100...+100%. This value corresponds with the control deviation from field 7 charged

with the controller adjustments (refer to section "[Controller](#)"^[88]) and scaled to -100...+100%.

9 Control value 2

Control value from the channel selected with the parameter "Source"

10 Output value control value

Depending on the selected function, the value from field 8 or from field 9 is shown

11 Input value solenoid driver 1 resp. solenoid driver 2

Command value scaled to 0...100%.

If the value in field 10 is -100...0% a command value is given to solenoid driver 2. The command value for solenoid driver 1 is 0.

If the value in field 10 is 0...100% a command value of is given to solenoid driver 1. The command value for solenoid driver 2 is 0.

12 Command solenoid current solenoid driver 1 resp. solenoid driver 2

Output solenoid current. It is shown in mA if solenoid type is "Proportional solenoid with current measurement".

If solenoid type is "Proportional solenoid without current measurement" or "Switching solenoid without current measurement" the value is shown in % (refer to section "[Valve type](#)"^[96]).

13 Actual solenoid current solenoid driver 1 resp. solenoid driver 2

Measured solenoid current. It is only shown if solenoid type is "Proportional solenoid with current measurement" (refer to section "[Valve type](#)"^[96]).

14 Command analog output

Preset value for the analog output. The unit depends on the selected signal (refer to section "[Analog output](#)"^[104])

15 Analog output

Value of the analog output. It is shown in V.

7.15.2 Values window

This menu point is only active in the "On Line" - mode.

With this command, all relevant data of the connected Wandfluh-Electronics are read-in and displayed. The values are continuously updated (on-line).

| Field | Description | Unit |
|------------------|---|--------|
| Supply voltage | Supply voltage of the Wandfluh-Electronics . | V |
| Digital inputs | Logical status of the digital input: <ul style="list-style-type: none"> • If the input is set • If the input is not set | 1 0 |
| Digital outputs | Logical status of the digital output: <ul style="list-style-type: none"> • If the output is set • If the output is not set | 1 0 |
| Internal signals | Logical status of the internal signals: <ul style="list-style-type: none"> • If the signal is set • If the signal is not set | 1 0 |

7.15.3 Signal Recording

In this menu, various signals of the connected SD7-Electronics can be recorded and analysed.

The selection of the data to be recorded takes place in the menu "Signal assignment", which is selected through the button "Signal assignment". In the "Offline - mode" it is not possible to record signals, it is possible, however, to process the recording parameters (menu "Signal assignment").

With the selection "Start - single", it is possible to record up to 250 measuring values per measuring channel (maximum 4 channels). The maximum recording duration of the recording can be derived from the scanning rate set multiplied with the number of the measuring values. The scanning rate is a minimum of 4ms. Because the first measured value is recorded at the point in time zero (start), the last measurement is situated one scanning step before the end of the measuring duration.

With the selection "Scroll - continuous", it is possible to record up to 20000 measuring values per measuring channel (maximum 4 channels). Displayed will be always the last 250 measuring values. All previous measured values can be displayed using a scroll bar. The scanning rate is a minimum of 12ms. With a small scanning rate, may the PC can not read in the measured values fast enough. In this case, a message appears and the recording is finished.

The recording parameters (signal type, scanning rate, etc.) together with the parameters are saved on the card and when saving to a file they are saved on the hard-disk.

The recorded measuring values are **not** saved with the parameters. However, there is the possibility of exporting the recorded measuring values (button "Export").

With the help of the time cursor, the measuring values are displayed for every point in time.

When changing the mode "On-Line / Off-Line" and when terminating the PASO, the recorded measuring values are lost.

| Field | Parameter description |
|----------------------------|--|
| Signal display | Switching-on the fields makes the recorded curve of the respective channel visible. |
| Time cursor | Positioning the time cursor over the input field time [s] or with the help of the slider control underneath the graphics. |
| Signal assignment | Opens the menu Signal Assignment ¹³⁵ |
| New | Any recorder data are deleted and the card is ready for a new recording. |
| Start / Stop (single) | <p>Start A new recording is started. As soon as the trigger is actuated (or with "Trigger condition - start directly" immediately), the recording runs (apparent by the blinking of the field "Recording") and the measuring data are transmitted. If there are already measuring data in the memory, then the recording continues as from this point. Once the maximum number of measuring values (= 250) has been read-in, the possible remaining recording data are transmitted (the curves continue to be updated). During the transmission, it is already possible to analyse the curves ("Signal display", "Auto-scaling").</p> <p>Stop Stops the transmission and the recording. As from this point it is possible to record once again by a renewed actuation of Start.</p> <p>Once the maximum number of measuring values has been read-in or if "Scroll" was pressed, the Start button is dimmed.</p> |
| Scroll / Stop (continuous) | <p>Scroll A new recording is started. As soon as the trigger is actuated (or with "Trigger condition - start directly" immediately), the recording runs (apparent by the blinking of the field "Recording") and the measuring data are transmitted. If there are already measuring data in the memory, then the recording continues as from this point. As long as the buttons "Stop" or "New" are not pressed, the measuring values are read in. If the data memory on the SD7-Electronics is full or the maximum number of measuring value (= 20000) has been read-in, a message appears and the recording is stopped. During the transmission, it is already possible to analyse the curves ("Signal display", "Auto-scaling").</p> <p>Stop Stops the transmission and the recording. As from this point it is possible to record once again by a renewed actuation of Start.</p> <p>If "Start" was pressed, the Scroll button is dimmed.</p> |
| Export | <p>By the actuation of this button the recorded data are saved on the hard-disk. The format used is a text format with tabulators as separators, so that it is easily possible to import the values into a different program (e.g. Excel). The decimal marker of the numbers can be selected: Decimal point or comma.</p> |
| Auto-scaling | <p>With this button, the curves are displayed in the graphics in an optimum manner. The optimisation is only carried out for the inserted curves. The values "Scaling/Div" and "Offset" of the corresponding channels ("Signal assignment¹³⁵"), are adapted for this purpose. The auto-scaling is also operative during a recording.</p> |
| Close | <p>With this button, one leaves the signal recording menu. Any recording data are kept and these are displayed once more by a renewed selection of the menu.</p> |

Menu Signal Assignment

This menu is opened by the actuation of the button "Signal Assignment" in the Signal Recording window.

| Field | Parameter description |
|--------------------------|---|
| Range "Signal selection" | In this menu, the selection which signals should be recorded can be made |
| Signal | The desired signals can be activated / not activated |
| Recording signal | The desired signal for recording can be selected (refer to "' Show values '" and " Values window ") |
| Supplementary | For the following recording signals, the supplementary selection is active: - all channel depending signals desired channel - digital input desired digital input - digital output desired digital output - internal signal desired internal signal |
| Scale / Div | Vertical value for one step in the signal recording window |
| Offset | Offset value for the signal display in the signal recording window. If offset value = 0 the 0 - line from the signal value is in the middle of the signal recording window |
| Range "Trigger" | In this range the condition for the Trigger signal are made |
| Condition | Start condition for starting the recording: - negative slope: Signal level must change from higher than level value to smaller than level value - positive slope: Signal level must change from smaller than level value to higher than level value - pos/neg slope: Signal level must change from higher than level value to smaller than level value or from smaller than level value to higher than level value - start directly: by operating the "Start" button, the recording is started directly |
| Signal | Signal, on which triggering takes place |
| Level | Value for the start condition |
| Range "Sample time" | In this Range the recording time can be set |
| Sample time | Scanning rate for the recording (0.004 ... 60s, a multiple of 4ms). After this time interval, a new measurement is made. The value from the recording time will be adapted accordingly |
| Recording time | Desired recording period (1 ... 15000s). The value from the sample time will be adapted accordingly |
| OK | If changes have been made, then any possible recording data (together with the graphics) are deleted |
| Cancel | Any possible changes are cancelled again |

The display parameters "Scaling/Div" and "Offset" are saved on the card together with the parameters.

7.15.4 Individual values

With this command, different On-line signals can be displayed in a separate window. Which signals should be displayed can be selected by yourself. It is possible to display On-line signals from different channels.

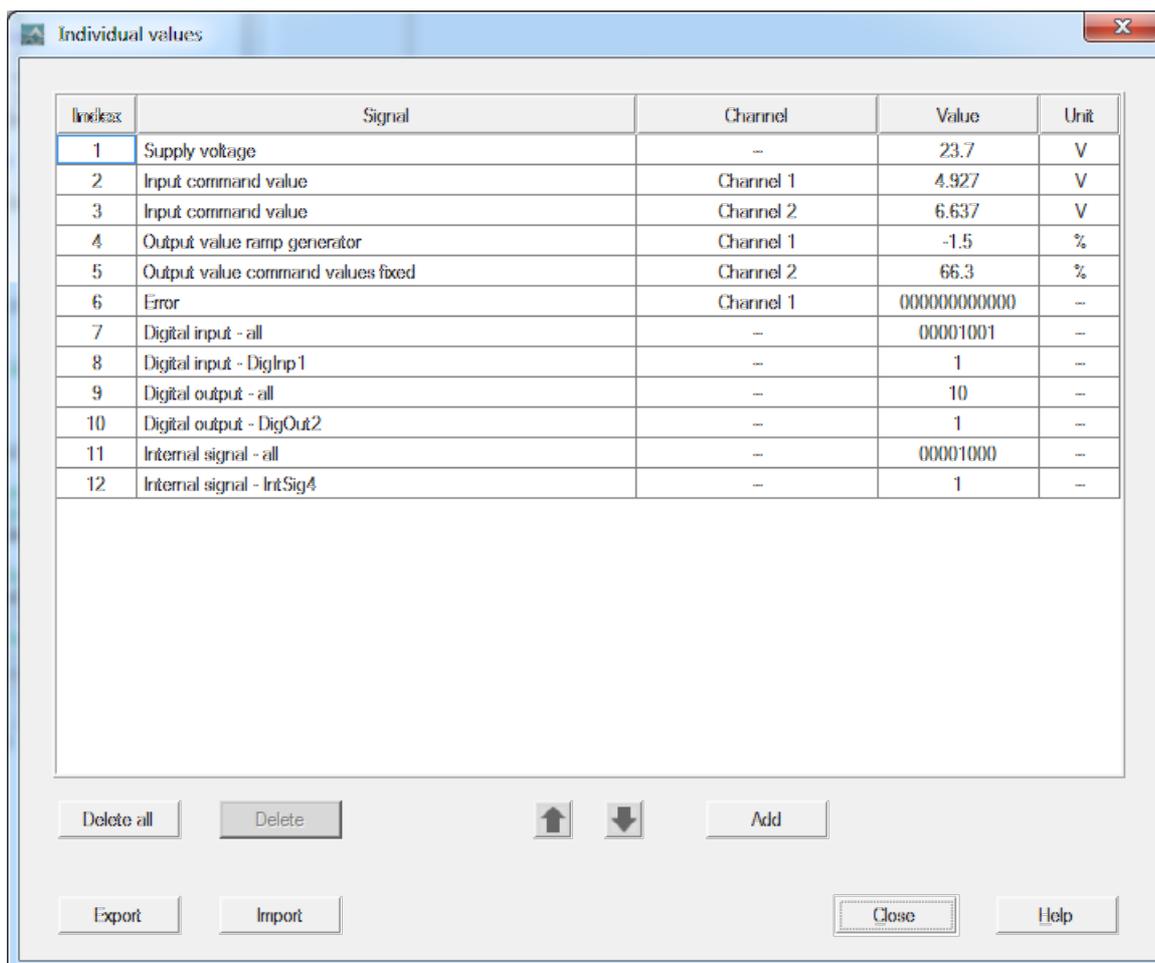
The window can remain open regardless of other input windows. If a different window is open, the values in the individual data window are updated, but no input is possible.

Adding a further signal is done either via the button "Add" (siehe Abschnitt "[Add signals using the button "Add"](#)"¹³⁷) or Or by right-clicking on the desired On-line signal in the main window (siehe Abschnitt "[Add signals by clicking with the right mouse button](#)"¹³⁷).

Existing signals can be removed from the signal list either by pressing the button "Delete" (deletes only the selected signal in the list) or the button "Delete all" (deletes all signals in the list).

The buttons  and  can be used to move the selected signal up or down in the list

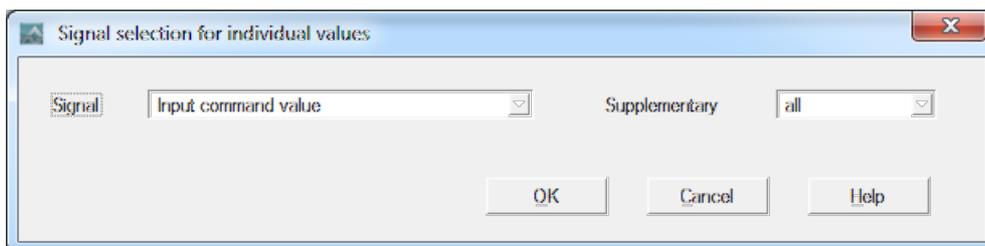
The selected signals are not stored on the connected Wandfluh-Electronics. By means of the buttons "Export" and "Import", created On-line signal lists can be created for different measurement or display procedures. When importing, it is checked whether the signals are present with the selected card type or not. No existing signals are deleted from the list. When PASO is terminated, the currently available signal list is automatically saved and is available again when PASO is started again



| | |
|---------|---|
| Signal | <p>Desired On-line signal. The following signal types are distinguished:</p> <p>General signals: Signals, which are present only once on the connected Wandfluh-Electronics (in the picture above index 1)</p> <p>Channel dependent signals: Signals, which are separately available for each existing channel. Numerical signals are displayed with their effective value with unit (in the picture above index 2 - 5). Digital signals are displayed in binary format (in the picture above index 6). A detailed description of the signals is located in the section "Representation of the signals¹³⁹".</p> <p>Digital inputs: Digital inputs are only available once on the connected Wandfluh.Electronics. However, it can be chosen, whether all digital inputs (in the picture above index 7) or only a single digital input (in the picture above index 8) is to be displayed. A detailed description of the signals is located in the section "Representation of the signals¹³⁹".</p> <p>Digital outputs: Digital outputs are only available once on the connected Wandfluh.Electronics. However, it can be chosen, whether all digital outputs (in the picture above index 9) or only a single digital output (in the picture above index 10) is to be. A detailed description of the signals is located in the section "Representation of the signals¹³⁹".</p> <p>Internal signals: Internal signals are only available once on the connected Wandfluh.Electronics. However, it can be chosen, whether all internal signals (in the picture above index 11) or only a single internal signal (in the picture above index 12) is to be. A detailed description of the signals is located in the section "Representation of the signals¹³⁹".</p> |
| Channel | With channel dependent signals the corresponding channel is displayed here |
| Value | The current value of the selected signal. This value is constantly updated. If PASO runs in "Off Line"-mode, no values are displayed here- |
| Unit | The unit corresponding to the signal is displayed here |

Add signals using the button "Add"

A selection window appears in which the desired signal can be selected. Depending on the signal type, a corresponding supplementary selection appears (e.g. desired channel). The selected signal is added at the end of the list.



Add signals by clicking with the right mouse button

All on-line signals displayed in the main window can be inserted directly into the signal list by right-clicking with the mouse. For channel dependent signals, a selection can be made whether the signal is to be inserted only from the current channel or from all channels.

Representation of the signals

Numerical signals are displayed with their effective value with unit.

Digital signals are displayed in binary format. Instead of x there will be a "0" if the signal is not active and a "1" if the signal is active. The assignment of the signals is from right to left.

Values in italic letters are only valid for the enhanced version.

| Signal | Format | Description |
|---------------------|---|--|
| Digital inputs | x8 x7 x6 x5 x4 x3 x2 x1 | x1 = state of digital input 1 x2 = state of digital input 2 x3 = <i>state of digital input 3</i> x4 = <i>state of digital input 4</i> x5 = <i>state of digital input 5</i> x6 = <i>state of digital input 6</i> x7 = <i>state of digital input 7</i> x8 = <i>state of digital input 8</i> |
| Digital output | x4 x3 x2 x1 | x1 = state of digital output 1 x2 = state of digital output 2 x3 = <i>state of digital output 3</i> x4 = <i>state of digital output 4</i> |
| Internal signals | x8 x7 x6 x5 x4 x3 x2 x1 | |
| Error | x12 x11 x10 x9 x8 x7 x6 x5 x4 x3 x2 x1 | x1 = E-1 cablebreak command value signal x2 = E-2 Kurzschluss solenoid driver 1 x3 = E-3 Kurzschluss solenoid driver 2 x4 = E-4 cablebreak solenoid driver 1 x5 = E-5 cablebreak solenoid driver 2 x6 = E-6 cablebreak feedback value signal (only with Controller-Version) x7 = E-7 trailing error (only with Controller-Version) x8 = E-8 J1939 error (only with devices with J1939 bus node) x10 = E-10 short circuit solenoid digital output x11 = E-11 device error x12 = E-12 switching threshold A detailed description of the errors is located in the section " Error evaluation ^[101] ". |
| Window | x3 x2 x1 | x1 = state of target window (only with Controller-Version) x2 = state of trailing window (only with Controller-Version) x3 = state of solenoid-off window (only with Controller-Version) A detailed description of the window is located in the section " Monitoring ^[85] ". |
| Switching threshold | x2 x1 | x1 = state of switching threshold 1 x2 = state of switching threshold 2 A detailed description of the errors is located in the section " Monitoring ^[85] ". |
| Control value | x1 | x1 = state of control value 2 A detailed description of the errors is located in the section " Control value ^[94] ". |

7.15.5 Diagnostics

With this command, possibly present errors on the connected Wandfluh-Electronics are indicated. The error is read in once. A complete description of the error will be displayed.

An active error is indicated as follows:

- on the Wandfluh-Electronics, the red LED flashes (refer to "Blink code")
- in the status line per channel the text "Error" is displayed (instead of "Ready")
- in the main window a red point appears for the corresponding error
- the box "[Error evaluation](#)^[101]" has a red frame
- the button "Diagnostics" in the box "[Error evaluation](#)^[101]" is red
- in the box "[Error evaluation](#)^[101]" the corresponding current state of the error is red

The reaction to an existing error can be set in the box "Error evaluation" (refer to section "[Error evaluation](#)"^[101])

| Diagnostics: | Error | Error remedy | Blink code |
|----------------------------------|--|--|------------|
| Power supply fault | If the supplied voltage < 18VDC resp. < 8VDC. In the general status line it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenale the control. If the parameter "Auto reset" is set to "yes", the error will be automatically reset if the supply voltage is > 18VDC resp. > 8VDC (refer to section " General errors " ^[112]) | 1 x |
| Cable break command value input | This error is only detected, if the parameter "cablebreak" is set to "yes" and the command value is smaller than the lower cable break limit or higher than the upper cable break limit. In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenale the corresponding channel. | 2 x |
| Cable break feedback value input | This error is only detected, if the parameter "cablebreak" is set to "yes" and the feedback value is smaller than the lower cable break limit or higher than the upper cable break limit. In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenale the corresponding channel. | 2 x |
| Short circuit solenoid output | There is a short circuit on the solenoid output In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenale the corresponding channel. | 3 x |
| Cable break solenoid output | There is a cable break on the solenoid output In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenale the corresponding channel. | 6 x |
| Trailing error | The control deviation is higher than the threshold value from the trailing window (refer to section " Windows " ^[85]). | | 6 x |

| | | | |
|---|---|---|-----|
| | In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready). | | |
| Memory error | There is an internal memory error on the Wandfluh-Electronics | Switch off and switch on again the control | 4 x |
| Fieldbus error (only on Wandfluh with Fieldbus-Interface) | A detailed description of the error can be read via the fieldbus | Reset or restart of the fieldbus connection | 5 x |

If several errors are present, it can be switched between the various error messages with the button "Next" resp. "Back".

7.15.6 Operating hours

With this command the operating hours of the Wandfluh-Electronics is displayed.

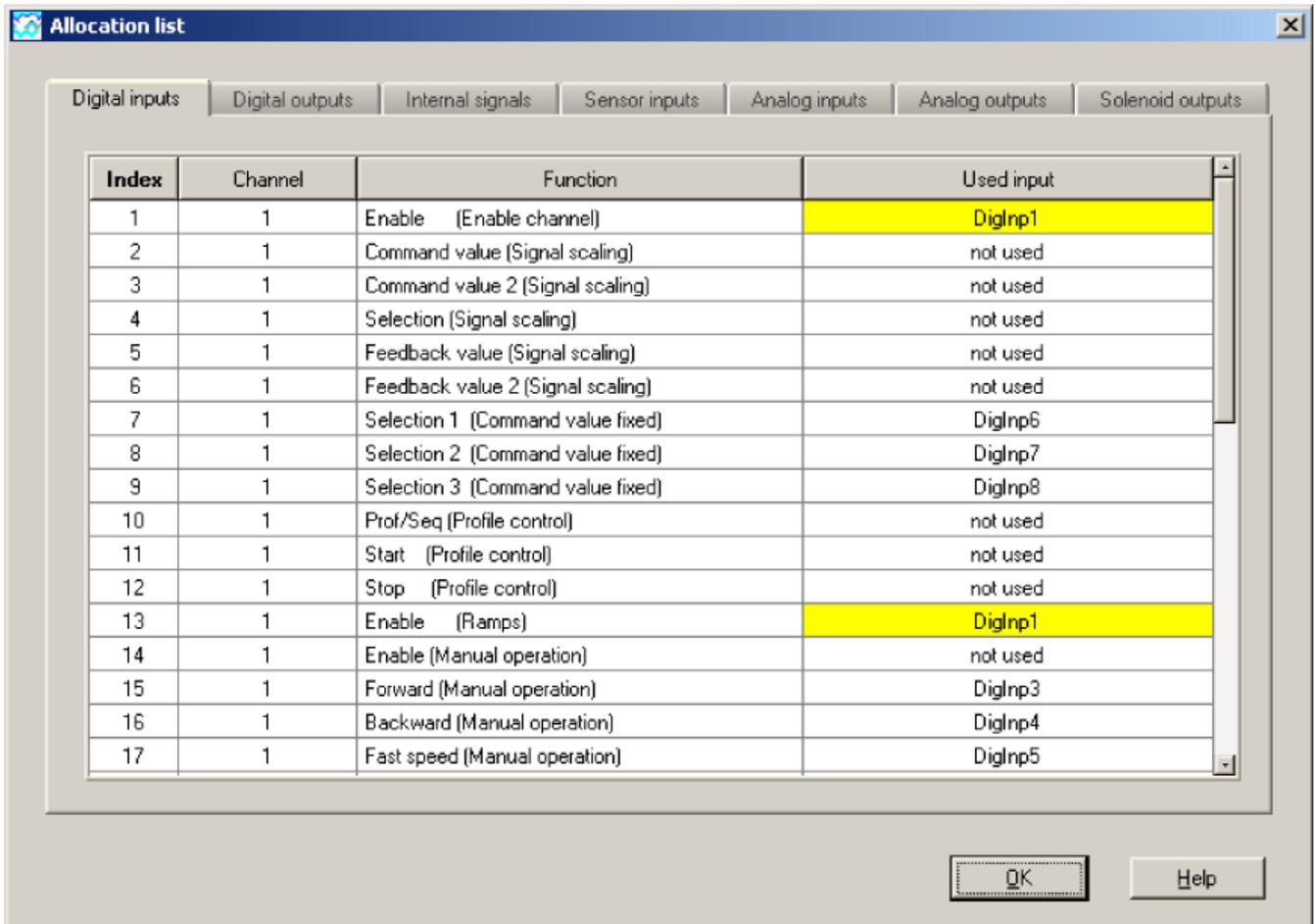
This value is saved once per hour in the Wandfluh non-volatile memory. If the Wandfluh is operated for less than one hour, the value of the last operation period is not saved.

At the opening of the window, the current value are read from the memory and displayed. While the window is open, the displayed value is not continuously updated.

| Field | Description | Unit |
|-----------------|--|------|
| Operating hours | Every hour the operating hours counter is increased with one step and subsequently saved in memory. If the counter reached the highest value of 65535, the counter will not be updated furthermore. | |

7.15.7 Allocation list

With this command, the current allocation list of all inputs and outputs can be displayed.



| Index | Channel | Function | Used input |
|-------|---------|-----------------------------------|------------|
| 1 | 1 | Enable (Enable channel) | DigInp1 |
| 2 | 1 | Command value (Signal scaling) | not used |
| 3 | 1 | Command value 2 (Signal scaling) | not used |
| 4 | 1 | Selection (Signal scaling) | not used |
| 5 | 1 | Feedback value (Signal scaling) | not used |
| 6 | 1 | Feedback value 2 (Signal scaling) | not used |
| 7 | 1 | Selection 1 (Command value fixed) | DigInp6 |
| 8 | 1 | Selection 2 (Command value fixed) | DigInp7 |
| 9 | 1 | Selection 3 (Command value fixed) | DigInp8 |
| 10 | 1 | Prof/Seq (Profile control) | not used |
| 11 | 1 | Start (Profile control) | not used |
| 12 | 1 | Stop (Profile control) | not used |
| 13 | 1 | Enable (Ramps) | DigInp1 |
| 14 | 1 | Enable (Manual operation) | not used |
| 15 | 1 | Forward (Manual operation) | DigInp3 |
| 16 | 1 | Backward (Manual operation) | DigInp4 |
| 17 | 1 | Fast speed (Manual operation) | DigInp5 |

The display of the allocation list can be divided in digital inputs, digital outputs, internal signals, sensor inputs (only Enhanced controller version), analog inputs, analog outputs (only Enhanced version) and solenoid outputs. The display can be individually sorted (mouse click on the title bar of the desired column). Inputs and outputs which are double occupied have a yellow background (refer to section "[Assignment of the inputs/outputs](#)"^[51]).

7.16 Menu Help

7.16.1 Description of the function

A general information about the function of the Wandfluh-Electronics will be displayed.

7.16.2 Contents

The list of contents of the PASO Help will be displayed. By clicking on the desired subject, the corresponding help text will be displayed.

7.16.3 Step by Step Guide

The step by step guide will be opened automatically.

7.16.4 Device Identification

Here the current version of the hardware and the software from the connected Wandfluh-Electronics will be read and displayed. They can not be changed.

| | |
|-----------------------|---|
| Part number: | Corresponds to the Wandfluh part number |
| Serial number: | The serial number has the following structure: YYDDDDXXXXX JJ: Production year TTT: Production day (different for each device type) XXXX: Continuous number (different for each device type) |
| Software version: | Corresponds to the installed software version on the connected Wandfluh-Electronics. This information should be always applied when a request to Wandfluh is made. |
| Firmware version: | Corresponds to the installed firmware version on the connected Wandfluh-Electronics. This information should be always applied when a request to Wandfluh is made. |
| Device type: | Corresponds to the Wandfluh type code |
| Device configuration: | This includes all relevant information about the existing hardware and software components. This information should be always applied when a request to Wandfluh is made. |

Using the "Save" button, these values can be stored in a file. By some questions to the Wandfluh AG, this file can be sent via eMail to sales@wandfluh.com for an analysis.

7.16.5 WANDFLUH on the Web

A link to the [WANDFLUH home page](#).

7.16.6 Check for Updates

It is checked whether a newer PASO version is available (refer to section "[PASO Update](#)¹⁴⁸").

7.16.7 Info

Information about PASO and its version.

8 System does not work

In this section, the generally possible errors and the procedures for eliminating them are listed and explained.

8.1 Procedure

The following check list can be used in case of an error.

An active error is indicated as follows:

- on the Wandfluh-Electronics, the red LED flashes (refer to "Blink code")
- in the status line per channel the text "Error" is displayed (instead of "Ready")
- in the main window a red point appears for the corresponding error
- the box "[Error evaluation](#)¹⁰¹" has a red frame
- the button "Diagnostics" in the box "[Error evaluation](#)¹⁰¹" is red
- in the box "[Error evaluation](#)¹⁰¹" the corresponding current state of the error is red

| Question: | Action: | Possible errors and causes | Blink code |
|--------------|--|---|------------|
| State: Error | Analysis_Diagnostics Power supply error | <ul style="list-style-type: none"> The supplied voltage is under 6VDC. The error is also displayed if a supplied voltage interruption occurred ($t > 250\text{ms}$). Is the supplied power sufficient? Is the AC voltage too high (refer to section "Electrical specifications"^[77])? When the error is cleared, disable the controller for a short period and re-enable. With the parameter "Auto reset", the error can be automatically reset if the supply voltage is $> 18\text{VDC}$ resp. $> 8\text{VDC}$ (refer to section "General errors"^[112]) | 1 x |
| | Analysis_Diagnostics Cable break command value input | <ul style="list-style-type: none"> The command value is either smaller than the lower cable break limit or higher than the upper cable break limit. Check the command value signal connections between the command value encoder and SD7-Electronics. If the cablebreak detection is not desired, switch off the cablebreak detection (refer to section "Command scaling"^[66]). When the error is cleared, disable the corresponding channel for a short period and re-enable. | 2 x |
| | Analysis_Diagnostics Cable break feedback value input | <ul style="list-style-type: none"> The feedback value is either smaller than the lower cable break limit or higher than the upper cable break limit. Check the feedback value signal connections between the command value encoder and SD7-Electronics. If the cablebreak detection is not desired, switch off the cablebreak detection (refer to section "Feedback scaling"^[79]). When the error is cleared, disable the corresponding channel for a short period and re-enable. | 2 x |
| | Analysis_Diagnostics Short circuit solenoid output | <ul style="list-style-type: none"> There is a short circuit on the solenoid output. When the error is cleared, disable the corresponding channel for a short period and re-enable. | 3 x |
| | Analysis_Diagnostics Cable break solenoid output | <ul style="list-style-type: none"> There is a cable break on the solenoid output. When the error is cleared, disable the corresponding channel for a short period and re-enable. | 6 x |
| | Analysis_Diagnostics Trailing error | <ul style="list-style-type: none"> The control deviation is higher than the threshold value from the trailing window (refer to section "Windows"^[85]), If the trailing error function is not desired, switch off the detection with the parameter "Trailing window type = off" (refer to section "Windows"^[85]). When the error is cleared, disable the corresponding channel for a short period and re-enable. | 6 x |
| | Analysis_Diagnostics Memory error | <ul style="list-style-type: none"> There is an internal memory error on the SD7-Electronics Switch off and switch on again the control | 4 x |
| | Analysis_Diagnostics Fieldbus error | <ul style="list-style-type: none"> A detailed description of the error can be read via the fieldbus Reset or restart of the fieldbus connection | 5 x |

9 PASO Installation and Operation

The parameterisation software PASO serves for the parameterising and diagnosing of all Electronic cards of the WANDFLUH AG company. The software provides a user interface, through which by means of a keyboard or a mouse all adjustments and settings can easily be carried out. The communication with the digital card takes place through a USB-interface.

The parameterisation software PASO can only be utilised in connection with a Wandfluh-Electronics.

9.1 System presupposition

A description of the different PASO versions is located in the file "history.pdf". This file is located in the directory where the PASO will be installed.

In order to be able to correctly utilise the PASO, an IBM-compatible PC with the following requirements has to be available:

- Operating system Windows 7, Windows 10 or higher
- Standard VGA or higher graphics card, min resolution 1425 x 800
- At least one USB interface (USB 1.1 or USB 2.0)
- USB cable
 - type A => Mini-B for DSV
 - type A => B for all other cards
- Wandfluh own USB adapter PC - PD2 (only for communication with PD2 / MKY)

9.2 Installation

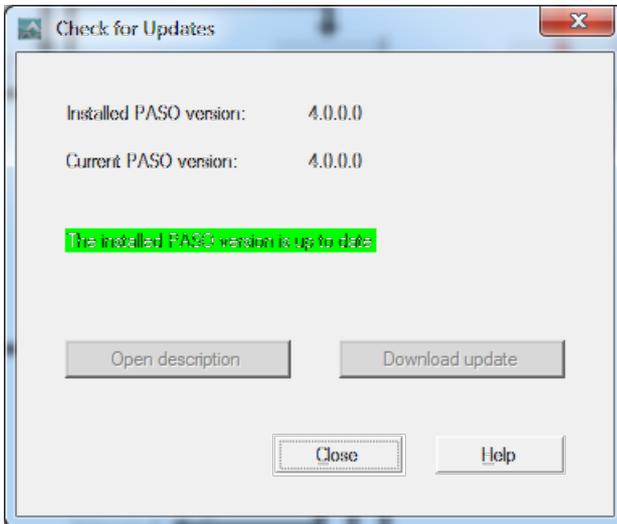
The PASO software can be downloaded via the Internet free of charge (www.wandfluh.com/Download => PASO).

The installation of the PASO is then carried out by executing the file "setupPasovnnnn.exe", where "nnnn" means the current version (e.g. setupPasov4000.exe). An installation program takes over the complete installation of PASO. To them, the Windows Installer must be installed. This is normally a part of the Windows Environment. If not, please download it from the Microsoft Website.

If there is already a version of the PASO software installed on the PC, it is automatically overwritten with the newer version.

9.3 PASO Update

After start-up, PASO checks automatically if a newer PASO version is available. If an update is available, this is indicated in the status line (refer to section "[Starting of PASO](#)¹⁵⁴"). By clicking on the corresponding entry in the status line or through the menu item "Help - Nach Updates suchen" (siehe Abschnitt "[Check for Updates](#)¹⁴³") the following window will open:



Next to "Installed PASO version", the version number of the installed PASO on the corresponding PC appears. Next to "Current PASO version", the version number of the newest PASO version appears.

If the installed PASO version is current, the message "The installed PASO version is up to date" appears.

If a newer PASO version is available, but does not require a mandatory update (e.g. a new function is included), the message "A newer PASO version is available. The update must not be carried out mandatory." appears.

If a newer PASO version is available, which requires a mandatory update (e.g. fix an error), the message "A newer PASO version is available. It is recommended to perform the update!" appears.

In both cases, using the button "Open description" a brief description about the changes in the PASO will be opened and using the button "Download update" the latest setup file can be downloaded directly.

After downloading, the following procedure is as follows:

- close the installed PASO
- install the downloaded new PASO (start the setup file)
- start the new installed PASO

In order to check for a newer PASO version, a connection to the Wandfluh server must be possible. If this is not possible (e.g. no internet connection), the message "Check for updates is not possible. There was no connection to the Wandfluh server possible." appears.

9.4 Connection to the Wandfluh card

The connection between the PC, on which the parameterisation software PASO Wandfluh is installed, and the Wandfluh-Electronics takes place through the USB interface. To do this, a USB cable has to be connected with the desired USB port on the PC and with the USB socket on the Wandfluh-Electronics.

During the installation of the parameterisation software PASO Wandfluh, the used USB driver for the Wandfluh-Electronics will be installed automatically. A new installation of this driver is possible. In the directory, where the parameterisation software PASO Wandfluh is installed, there is a sub directory "USB_Driver". In this sub directory, there is a file "Preinstaller.exe". With executing this file, the installation of the USB driver is possible.

If the USB driver for the Wandfluh-Electronics is installed correctly, it must be shown in the Windows Devicemanager in the "USB-Controller" as "Wandfluh AG - xxx" (xxx corresponds to corresponding device type) while a Wandfluh-Electronics is connected to the PC.

9.5 Mode "Off Line" / "On Line"

The parameterisation software PASO DSV runs in one of two modes:

- In the **"Off Line"-mode**, the processing of the parameter files is possible. This has no influence in a possible connected Wandfluh-Electronics. The communication with the Wandfluh-Electronics is not active. A connection is allowed, but not necessary.

All menu points and keys, which involve an action in connection with the communication, are then blocked.

- In the **"On Line"-mode**, there is active communication with the Wandfluh-Electronics. Every change becomes immediately effective in the Wandfluh-Electronics. In this mode, the loading and processing of files is not possible. Only the saving of the currently active parameters to a file is possible.

There is permanent communication between the PASO DSV and the connected Wandfluh-Electronics.

Because of that, it is not allowed to disconnect the connection to the Wandfluh-Electronics or to switch off the Wandfluh-Electronics in the "On Line"-mode.

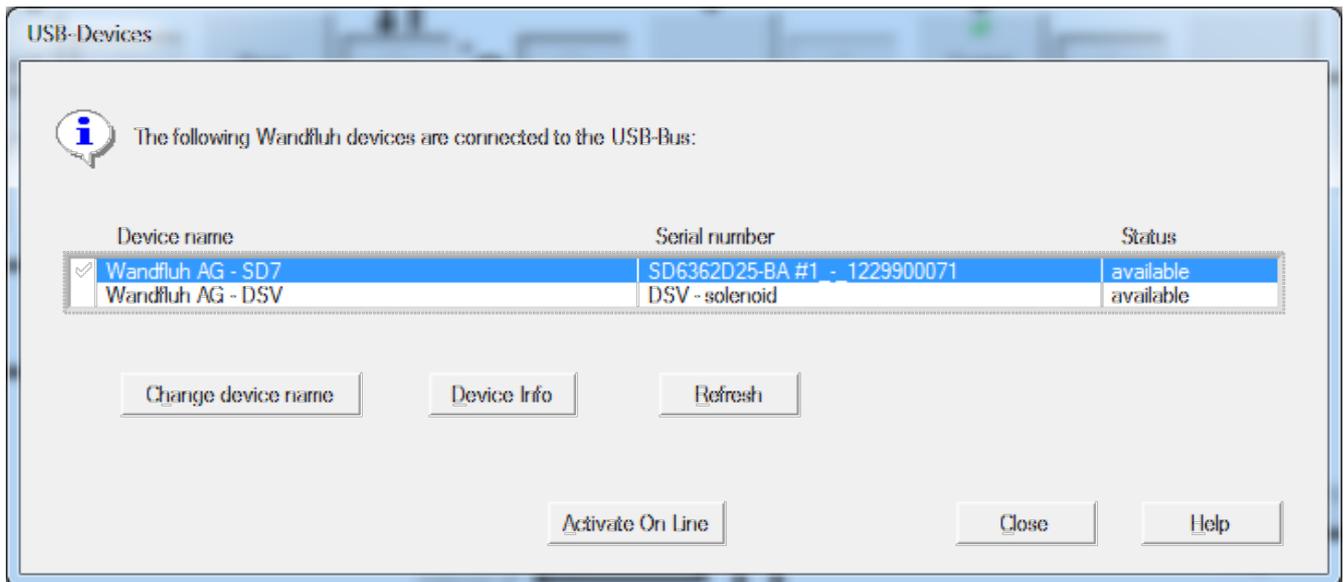
The change between the two modes takes place through the menu point "[Communication Activate On Line / Activate Off Line](#)"^[109]". Near it, it's possible to select if the data should take over from the Wandfluh-Electronics (UPLOAD PARAMETERS, data flow Wandfluh-Electronics => PASO) or if the Wandfluh-Electronics should be reprogrammed with the new actual data (DOWNLOAD PARAMETERS, data flow PASO => Wandfluh-Electronics).

In case of an interference in the communication, the controlling of the Wandfluh-Electronics is not assured anymore. An error message follows and the PASO DSV software automatically changes over to the "Off Line"-mode (refer to section "[Communication interruption](#)"^[152]).

9.6 Communication start up

When the parameterisation software PASO DSV is started up, a check takes place, as to whether a communication with the Wandfluh-Electronics is possible. If no communication can be established, an error message appears (refer to section "[Communication interruption](#)"^[152]). If a communication is possible, the configuration from the PASO will change automatically over to the configuration of the connected Wandfluh-Electronics and the parameters are read from the device.

If several Wandfluh-Electronic devices are connected via the USB-Interface, the following window appears:

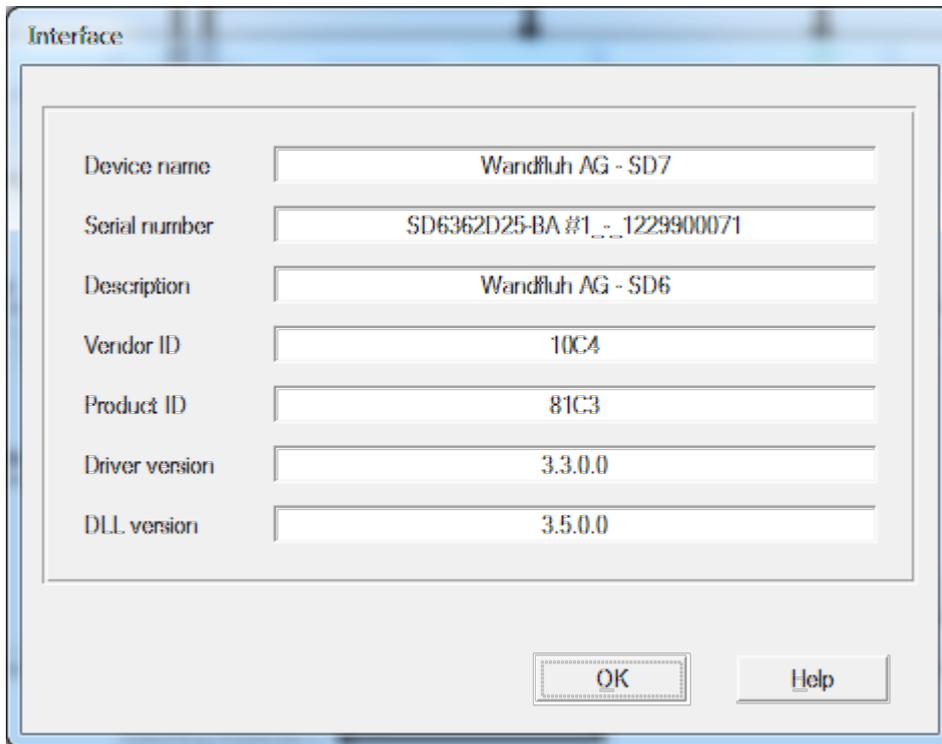


Here, the desired device for the communication start up can be selected.

| | |
|--------------------|--|
| Device name | Individual name of the device. This can be changed by means of the button "Change device name". The device name is displayed in the PASO software (refer to section " Starting of PASO " ^[154]). |
| Serial number | Unique identification of the device. This entry is assigned by the factory and can not be changed. |
| Status | available: Communication can be established with this device in use: Communication is already active with this device; no new communication can be established |
| Change device name | The device name of the selected device can be changed (only if the Status is "available") |
| Device Info | The device info of the selected device is displayed (refer to section " Device Info " ^[151]) |
| Refresh | Updates the entries |
| Activate On Line | Establish communication with the selected device |

Device Info

The device info of the selected device is displayed:



| | |
|----------------|--|
| Device name | Individual name of the device |
| Serial number | Unique identification of the device |
| Description | Description of the device |
| Vendor ID | Identification number from the manufacturer |
| Product ID: | Identification number from the product |
| Driver version | Version of the installed USB driver. This is installed automatically with the installation of PASO |
| DLL version | Version of the USB DLL. This is installed automatically with the installation of PASO |

9.7 Communication interruption

If no communication is possible during the start up or the interruption of the communication occurs during the operation of the parameterisation software PASO, then an error message with an error number and an error description appears. The further procedure can be selected

Repeat: The communication is restarted
Cancel: The communication is canceled
Detail: Detailed information about the communication error can be displayed.
A further window with all the detailed information appears. This information can be saved in a file using the "Save" button.

The detailed information is not meaningful to the user. In the case of an error, however, they can be saved in a file and sent by email to sales@wandfluh.com for analysis

Wurde die Kommunikation abgebrochen oder ist immer noch keine Kommunikation möglich, wird die PASO SD7 Software in den "Off Line"-Modus gesetzt. Alle Menüpunkte und Tasten, die eine Aktion im Zusammenhang mit der Kommunikation beinhalten, sind jetzt gesperrt. Um wieder eine Kommunikation aufzubauen, muss der Menüpunkt "Datei_On Line" angewählt werden.

If the communication has been canceled or communication is still not possible, PASO is set to "Off Line"-mode. All menu items and buttons that contain an action related to the communication are now blocked. To re-establish a communication, the menu item "[Communication Activate On Line / Off Line gehen](#)"¹⁴⁹⁾ has to be selected.

Possible reasons for a communication interruption are:

- No Wandfluh-Electronics are connected
- The connected Wandfluh-Electronics are not switched on
- The USB driver is not correct installed (refer to section "[Connection to the Wandfluh card](#)"¹⁴⁹⁾)
- The connection cable is defect or not plugged in

9.8 Program description

9.8.1 Description of the keys

| | |
|-----------|--|
| TAB | Transfer to the next input element |
| SHIFT-TAB | Transfer to the previous input element |
| ENTER | Execution of the active input element or conclusion of an input. |
| ESC | Abort, undoing of an action. In many cases corresponds to the key "Cancel". |
| F1 | Activate the key "Help" |

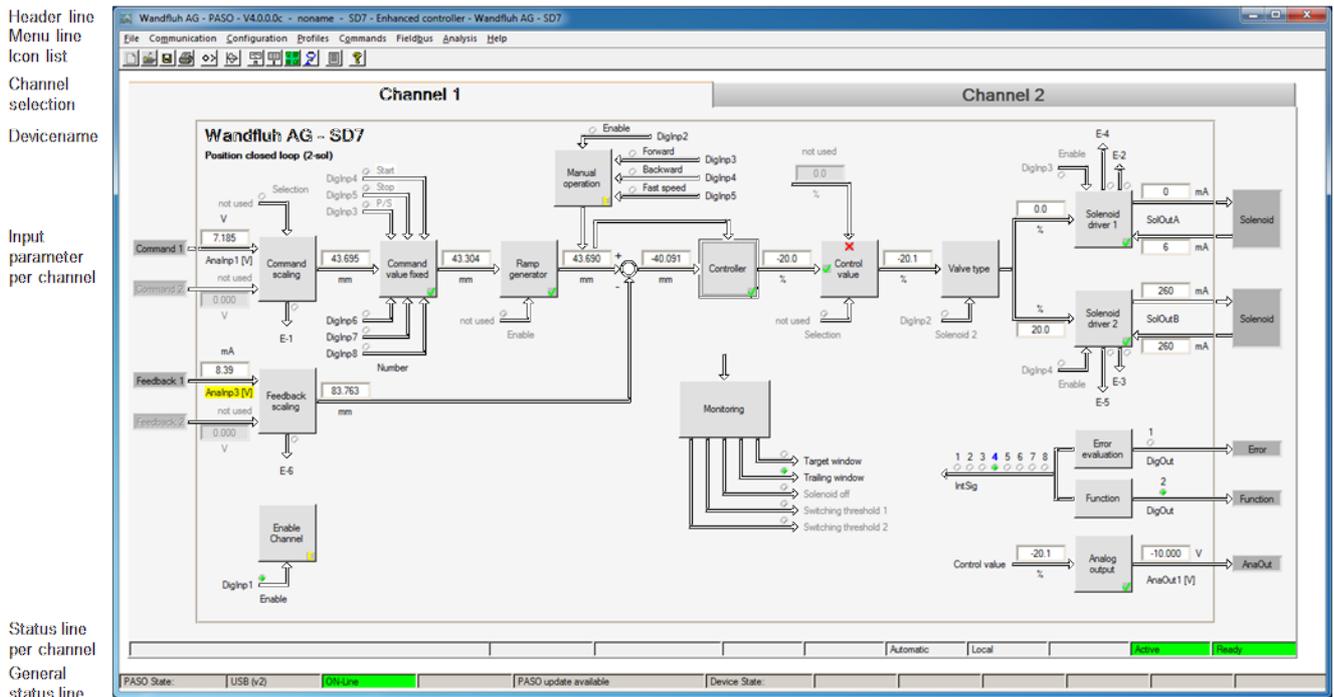
9.8.2 Input elements

| | |
|-----------------|---|
| Key | <p>A key executes the action, with which it is inscribed.</p> <p>Actuation of a key through the keyboard:</p> <ul style="list-style-type: none"> • Push the key TAB, until the key becomes active. • Push the key ENTER. The action is now carried out. • Push the key ALT and the underlined letter of the key inscription: The action is carried out immediately. <p>Actuation of a key with the mouse:</p> <ul style="list-style-type: none"> • Click on the corresponding key. The action is now carried out. |
| Input field | <p>The input fields enable the entering of numbers or text. All applicable keys of the keyboard are allowed, including the keys HOME, END, LEFT, RIGHT. In certain cases when taking it over, the input is checked and if necessary an error message is issued.</p> <p>Actuation of an input field through the keyboard:</p> <ul style="list-style-type: none"> • Push the key ENTER or TAB to finish with the input field. • In the case of input fields with ARROW keys UP and DOWN: Actuation of the UP-/DOWN - keys for the step by step changing of the values. <p>Actuation of an input field with the mouse:</p> <ul style="list-style-type: none"> • Click within the input field, in order to position the cursor in it. • In the case of input fields with ARROW keys UP and DOWN: Click on the corresponding arrow for the step by step changing of the values. |
| Selection field | <p>The selection fields enable the selection from various possibilities.</p> <p>Actuation of a selection field through the keyboard:</p> <ul style="list-style-type: none"> • Push the SPACE key to open all selection possibilities. With the help of the keys UP, DOWN, HOME, END, make the required selection. Subsequently push the ENTER key to confirm the required selection, or else the ESC key to undo the selection. • Push the key UP to cyclically select the previous selection. • Push the key DOWN to cyclically select the next selection. • Push the key HOME to select the first item of the selection list. • Push the key END to select the last item of the selection list. <p>Actuation of a selection field with the mouse:</p> <ul style="list-style-type: none"> • Click inside the selection field so that all selection possibilities are displayed and then click on the required selection. |

9.9 Starting of PASO

Following the successful installation, the parameterisation software PASO can be started by double-clicking on the PASO icon. Certain settings of the PASO software, e.g., the selected language etc, are saved in a separate configuration file. When PASO is started for the first time, the configuration values in this file are set to standard values. During the course of running the program, these values can be corrected.

After the start-up, the Start window appears:



During the start-up, the parameterisation software PASO checks, whether a Wandfluh-Electronics device is connected. If no communication can be established, an error message appears (refer to section "[Communication interruption](#)"^[152]) and the "Off Line"-mode will become active. All menu points and keys, which involve an action in connection with the communication, are then blocked. All other functions of the parameterisation software PASO can be utilised without any limitation.

Subsequently the parameters are loaded from the card and subsequently a verification of the Wandfluh-Electronics values takes place. If one or several parameters are outside the corresponding tolerance, they are replaced with standard values and a message is issued (refer so section "[Limiting value error](#)"^[156]). The changed parameters can be either sent directly to the connected Wandfluh-Electronics or the communication start-up can be terminated (the "Off-Line"-mode will become active). In the latter case the user has the possibility to correct the parameters in "Off-Line"-mode. The communication is resumed again via the menu point "[Communication Activate On Line / Off Line gehen](#)"^[109]". Subsequently the user has to select the option "Reprogram the Wandfluh-Electronics", in order for the corrected values to be made active on the Wandfluh-Electronics.

The parameter input can be made with clicking with the left mouse key on the corresponding box in the channel window. A input window will appear where all the desired values can be entered.

The menu points in the menu line can be selected in the following manner:

- by clicking on them with the mouse
- by actuating the key "ALT" and the underlined letter of the required menu point
- if a menu point has been selected, then by means of the keys "←" and "→" one can change to the next menu point and with the keys "↑" and "↓" one can change to the next sub-menu point within the menu selection field.

- by clicking on the corresponding icon in the icon list

In the header line of the window, the name of the current file is always displayed. If no existing file has been loaded or if the data have not been saved to a file, then this line reads "noname".

The following states will be displayed in the general status line:

- 1. field: Selected interface ("USB")
- 2. field: Current mode ("On Line" or "Off Line", refer to section "[Mode "Off Line" and "On Line"](#)"^[149])
- 4. field: PASO Update ("PASO update available", refer to section "[PASO Update](#)"^[148])

The following states will be displayed in the channel status line:

- 1. field: Teach-In ("Teach-In", only if this special function is available)
- 2. field: Parameter Inconsistency ("Parameter inconsistency", refer to section "[Parameter inconsistency](#)"^[52])
- 3. field: Temperature Derating ("Derating", no used on this Wandfluh-Electronics)
- 4. field: Characteristic optimisation active ("Optimisation", refer to section "[Characteristic optimisation](#)"^[97])
- 5. field: Automatic / Manual operation active ("Automatic" or "Manual", refer to section "[Manual operation](#)"^[79])
- 6. field: Operating mode ("Remote PASO" or "Local", refer to section "[Operating mode](#)"^[22])
- 7. field: Warning ("Warning")
- 8. field: DSV state ("Disabled" or "Active", refer to section "[State machine](#)"^[21])
- 9. field: Error state ("Ready" or "Error", refer to section "[Diganostics](#)"^[139])

9.10 Store parameter

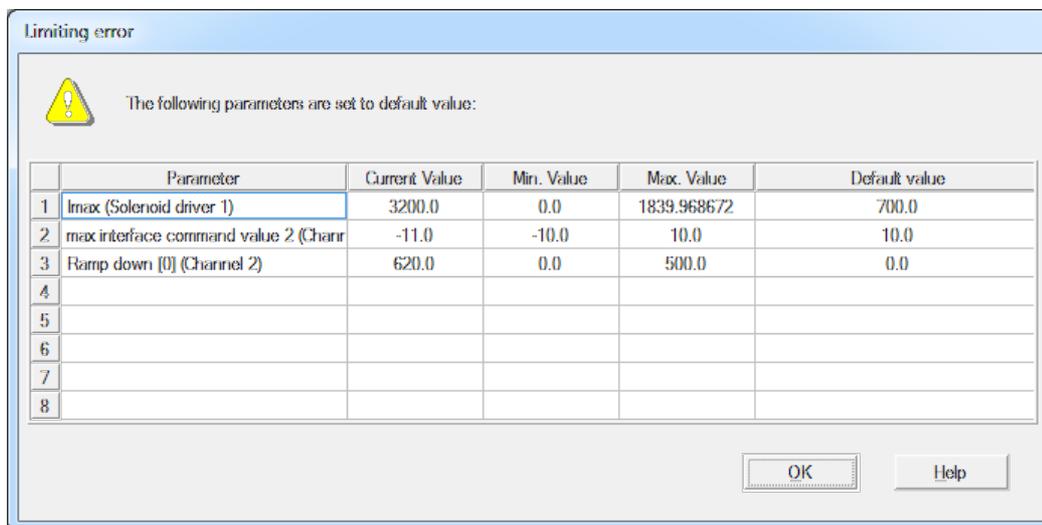
Each new input value is immediately transferred to the connected Wandfluh-Electronics after the completion of the input field (either by pushing the key ENTER or by activating another input field).

If the window is closed with the key "OK", the values are stored in the Wandfluh-Electronics so that they are available after the Wandfluh-Electronics are switched on again (non-volatile memory).

If the window is closed with the key "Cancel", the previous current values are active again. All inputs made in the current window are cancelled.

9.11 Limiting value error

Each incoming parameter (either transferred via the USB interface or loaded from a file) is checked against the limiting value. If a parameter is smaller or bigger than its limiting value (= limiting value error), it is set automatically to the default value and the following window appears:



Parameter: Name of the parameter with the limiting value error
 Current value: Current value of the parameter
 Min. value: Minimum allowed value of the parameter
 Max. value: Maximum allowed value of the parameter
 Default value: Default value of the parameter

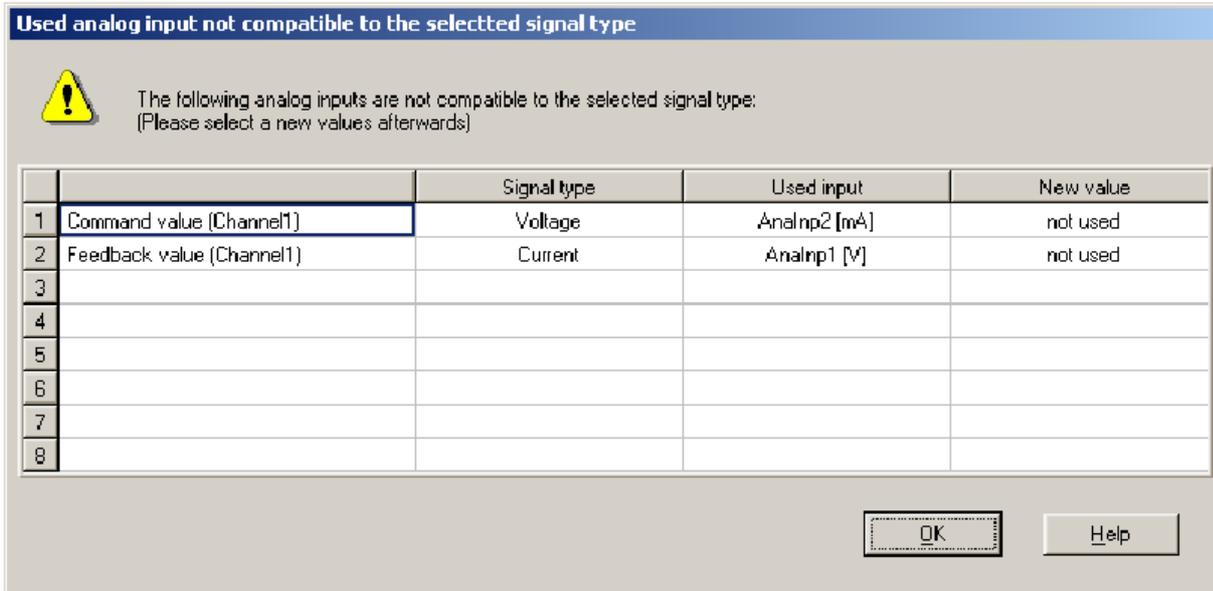
After pressing the key "OK", the current value is overwritten by the default value.

Normally, a limiting value error does not happen. However, in the following cases it can happen:

- loading a file, in which parameter values have been changed from outside
- reading parameter values from a Wandfluh-Electronics device with another configuration than the current configuration in the PASO (only if the Wandfluh-Electronics were changed while in the "On Line"-mode)
- if the transmission of the parameter values is wrong

9.12 Used analog input not compatible to the selected signal type

Before activating the ON-Line mode (only with DOWNLOAD Parameters, refer to section "[Mode "Off Line" and "On Line"](#)^[149]"), PASO is checking, if the selected analog inputs are compatible with the selected signal types (voltage inputs for signal type "Voltage", current inputs for signal type "Current"). If one or more analog inputs are not compatible, it is set automatically to "not used" (refer to section "[Assignment of the inputs/outputs](#)^[51]") and the following window appears:



Signal type: Selected signal type
 Used input: Selected analog input
 New value: New value for the used analog input

After pressing the button "OK", the value of the used analog input is to not used. Afterwards, it must be readjust (refer to section "[Assignment of the inputs/outputs](#)^[51]").

9.13 Description of Commands

The description of the individual commands and parameters is contained in section "[Settings](#)"^[19].

10 Disposal

- The SD7-Electronics have to be disposed of in accordance with the generally applicable regulations of that country, in which it is being used.
- Electronics components are recycled by companies specialised in this field.

11 Accessories

- Parameterisation software PASO refer to [Installation of PASO](#)¹⁴⁷

12 Additional information

You can find additional information in the following Wandfluh documentations:

| | | | |
|---|-----------------|----------|------|
| Wandfluh-Electronics general | Documentation A | Register | 1.13 |
| Accessories | Documentation A | Register | 1.13 |
| Proportional directional control valves | Documentation A | Register | 1.10 |
| Proportional pressure control valves | Documentation A | Register | 2.3 |
| Proportional flow control valves | Documentation A | Register | 2.6 |