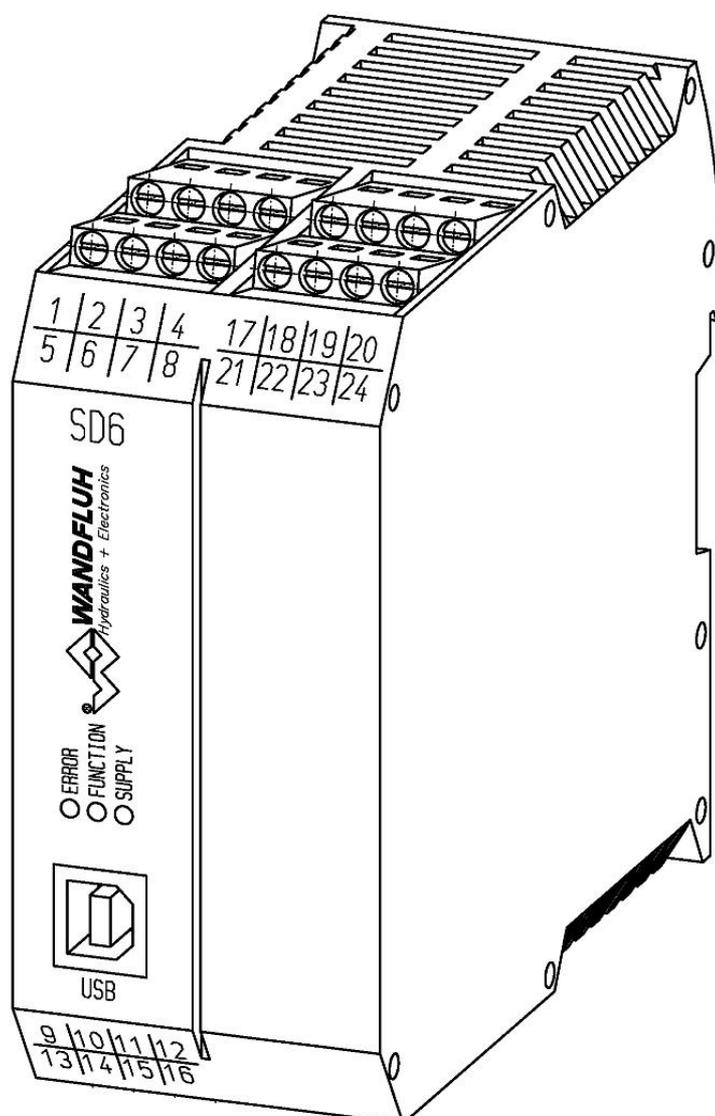


# OPERATING INSTRUCTIONS

## AMPLIFIER MODULE SD6 WITH FIXED COMMAND VALUES



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## **1 General information**

This operating instructions makes it possible to use the SD6-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 SD6-Electronics
- information about safety in dealing with control.

## **2 Product description**

### **2.1 General**

The SD6-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 SD6-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 Labelling of the product**

With the PC parameterisation software PASO DSV/SD6, the following information can be directly read-off the SD6-Electronics (=electronic type code):

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

## 2.5 Type code

### TYPE CODE

	S	D6	3	2	<input type="checkbox"/>	<input type="checkbox"/>	0	-	A	A	#	<input type="checkbox"/>
Module for electrical control cubicle												
Digital												
Parameters to be set with:												
• PASO without manual operation												
Software configuration (function of card):												
• Amplifier with fixed command values												
1-solenoid version												
2-solenoid version												
Supply voltage:												
24 VDC												
12 VDC												
Standard amplifier:												
• Preset value selectable voltage or current												
Hardware configuration:												
• 10-Bit resolution												
Option field bus:												
• without field bus (with analogue input signal)												
Design-Index (Subject to change)												

## 2.6 Technical Data

### 2.6.1 General specifications

<b>Design</b>	Integrated in electronic case for top-hat rail clamping
<b>Dimension</b>	105 x 114 x 45mm
<b>Mounting</b>	For top-hat rail clamping
<b>Weight</b>	220g
<b>Connection</b>	Terminal screw blocks, max dimension 2.5mm <sup>2</sup> 1 USB interface (connector type B)
<b>Protection class</b>	IP30 acc. to EN 60 529

### 2.6.2 Electrical specifications

<b>Supply voltage (depending on the type)</b>	24 VDC or 12 VDC
<b>Voltage range</b>	Supply voltage 24 VDC: 21 ... 30 VDC Supply voltage 12 VDC: 10,5 ... 15 VDC
<b>Ripple on supply voltage</b>	< ±5 %
<b>Fuse</b>	Customer must integrate a slow fuse into his electrical system
<b>Temperature drift</b>	< 1% with ΔT = 40°C
<b>No load current</b>	40 ... 50 mA
<b>Max. solenoid current</b>	24VDC version 1.8 A 12VDC version 2.3 A
<b>Analogue inputs</b>	2 differential inputs 10-Bit Both inputs are not galvanically separated SD6322DX2-AA Analogue input 1: 0...±10VDC Analogue input 2: 0...20mA, 4...20mA
<b>Input resistance</b>	Voltage input against ground > 18 kOhm Burden for current input = 250 Ohm
<b>Digital inputs</b>	8 inputs active-high Switching threshold high 6 - 30VDC Switching threshold low 0 - 1VDC
<b>Serial interface</b>	1 USB interface (Connector Type B)
<b>Stabilised output voltage</b>	Supply voltage 24 VDC: + 10 VDC Supply voltage 12 VDC: + 8 VDC max. load 30 mA
<b>Solenoid current</b>	Minimum current I <sub>min</sub> adjustable 0 ... 950 mA Maximum current I <sub>max</sub> adjustable Supply voltage 24 VDC: I <sub>min</sub> ... 1.8 A Supply voltage 12 VDC: I <sub>min</sub> ... 2.3 A
<b>Dither</b>	Frequency adjustable 20 ... 250 Hz Level adjustable 0 ... 200 mA
<b>Digital outputs</b>	2 outputs Lowside Switch. U <sub>max</sub> 40 VDC I <sub>max</sub> -0.7 A
<b>EMC Immunity Emission</b>	EN 61000-6-2 EN 61000-6-4

## 2.6.3 Environment

<b>Storage</b>	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
<b>In operation</b>	Temperature range	-20 ... +70° C The total solenoid current of simultaneously powered solenoids depends on the ambient temperature. Further information can be found in chapter <a href="#">Solenoid outputs and ambient temperature</a> <sup>7</sup> .
	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](#) <sup>5</sup> over the whole temperature range.

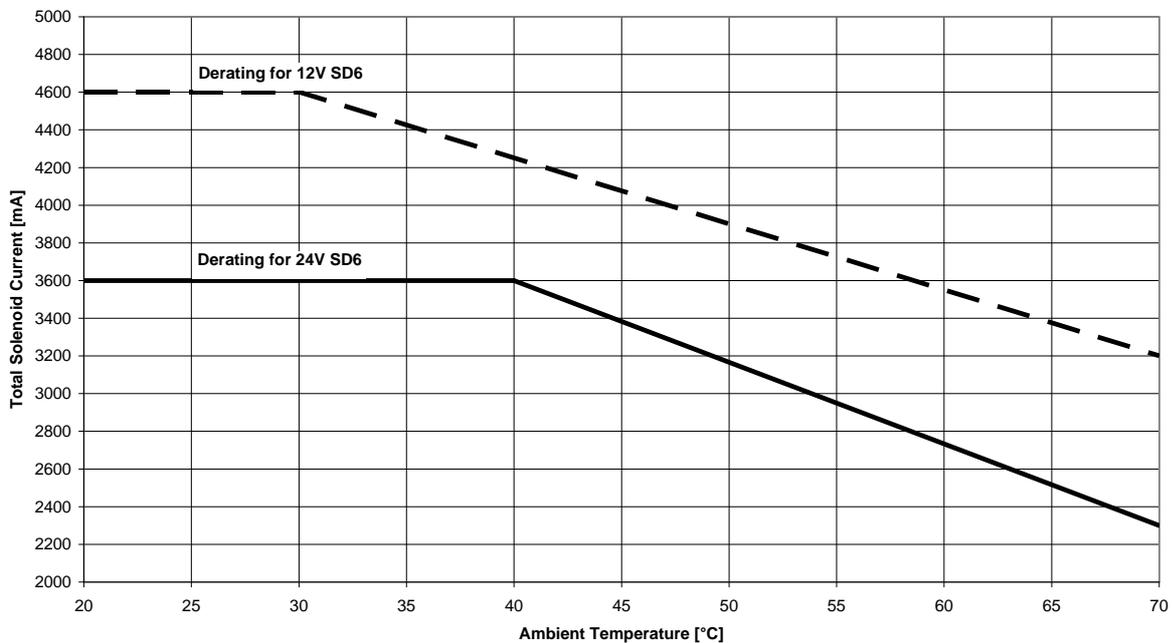
But the total solenoid current of simultaneously powered solenoids depends on the ambient temperature. Exceeding this current limit will trip the overcurrent protection circuit, the SD6 falls into the failure state and blocks all function.

Solenoids can be powered simultaneously, i.e. on the amplifier in operating mode 4, 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 SD6 may fall into failure state and block all function.

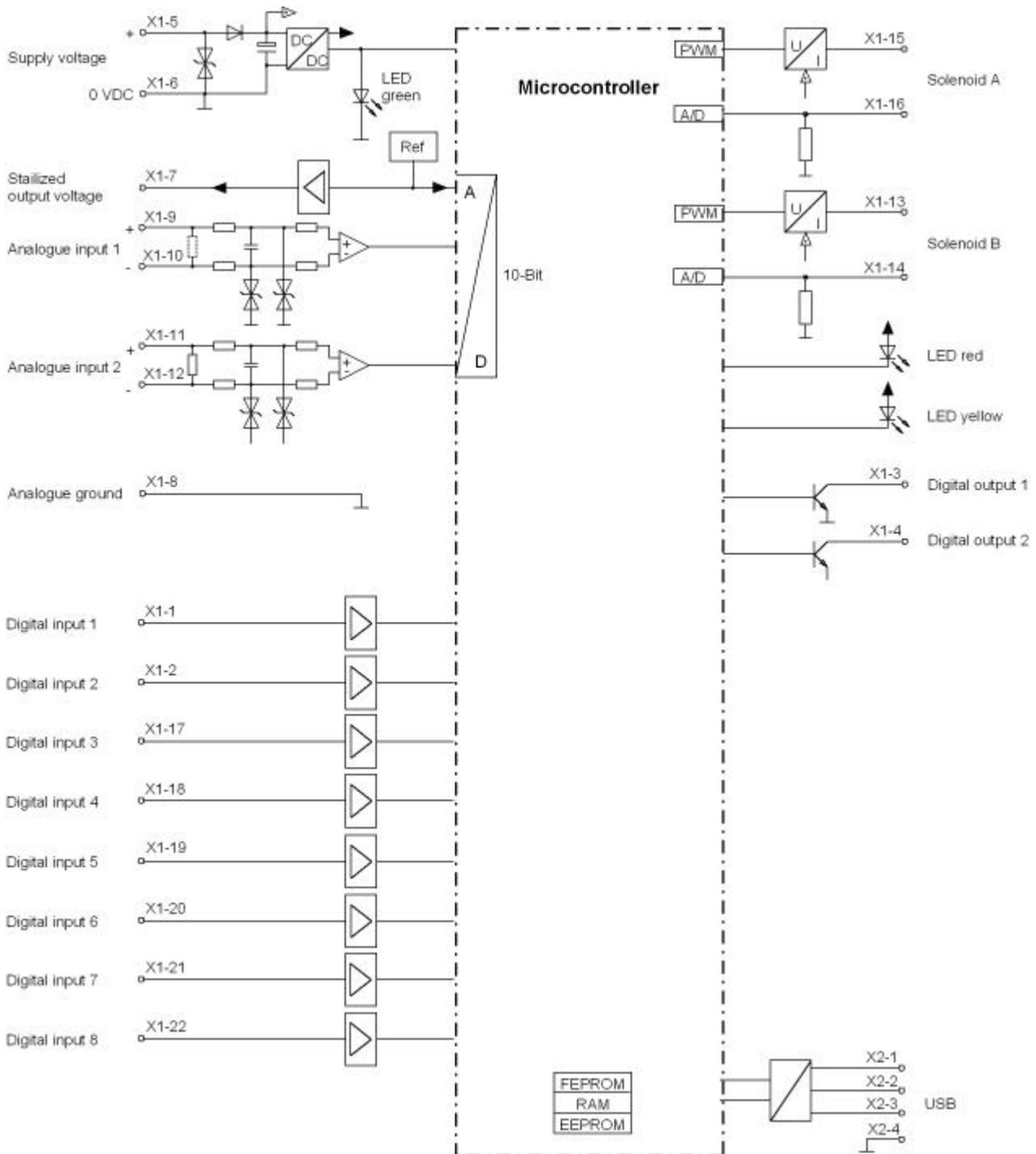
The following graphics shows the maximum allowed total solenoid current over ambient temperature when both solenoids are powered at the same time.

SD6: Derating of Total Solenoid Current when both Solenoid Outputs activated simultaneously



## 2.7 Block diagram

Driving through the analogue 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 SD6-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 SD6-Electronics monitors the working conditions within the electronics and within the installation. Uncontrolled movements or force changes caused by unforeseen errors of the SD6-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"](#) .

### 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 DSV/SD6
- In the factory, the SD6-Electronics are adjusted with the default values. The adjustment to the valves being used, has to be performed by the user.

### 4.2 Description of the Function

The SD6-Electronics serve for controlling proportional valves with one or two solenoids and includes a pulse-width-modulated current control with superimposed dither signal. Dither frequency and amplitude are adjustable separately.

The command value can be a voltage signal 0 ... 10V resp.  $\pm 10V$  (only for the 2-solenoid version) or a current signal 0 ... 20mA resp. 4 ... 20mA. The SD6-Electronics provide one digital input for enabling the controller and one digital input for the switching between the solenoids A and B. Two digital outputs are provided signalling "error/solenoid A active" (switchable) and "solenoid B active".

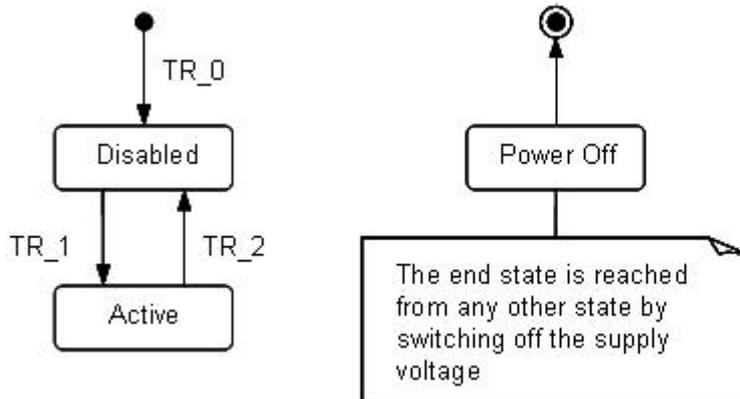
Parameters are set by means of the parameterising software PASO or by using the optional manual operation terminal. Changed parameters are stored in a non-volatile memory in order to have them available after the DSV-Electronics have been switched on again.

### 4.3 Characteristic optimisation

The SD6 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\_Valves" on page 21). This setting is available only with a SD6-electronics with software version higher than 1.1.1.6 and PASO with software version higher than 1.5.0.9!

#### 4.4 SD6 State machine

In the following, with the help of a status diagram it is described, how the start-up of the SD6-Electronics takes place and which statuses are reached when and how.



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

Status	Description
Disabled	<ul style="list-style-type: none"> <li>The SD6-Electronics are disabled, no solenoid current will be active</li> <li>In this state, with the command "Local operation" resp. "PASO operation" (refer to section <a href="#">"Commands Local Operating / PASO"</a><sup>[39]</sup>) the operating mode can be set.</li> </ul>
Active	<ul style="list-style-type: none"> <li>The SD6-Electronics are enabled</li> <li>The SD6-Electronics can be operated according to the selected operating mode</li> <li>Changing the operating mode is not possible</li> </ul>

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 digital input "Enable control" (refer to section <a href="#">"Digital inputs"</a> <sup>[13]</sup> ) and in the operating mode "Remote PASO" through the command "Enable" (refer to section <a href="#">"Commands Disable / Enable"</a> <sup>[39]</sup> ).
TR_2	Disable This is made in the operating mode "Local" through the digital input "Enable control" (refer to section <a href="#">"Digital inputs"</a> <sup>[13]</sup> ) and in the operating mode "Remote PASO" through the command "Enable" (refer to section <a href="#">"Commands Disable / Enable"</a> <sup>[39]</sup> ).

## 4.5 Operating mode

The SD6-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 SD6-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 DSV/SD6"](#)<sup>50</sup>). For more information about the operating mode "Local" and "Remote", please refer to section ["Commands\\_Local Operating / PASO"](#)<sup>39</sup>.

## 4.6 Analogue inputs

- The applied analogue signal is digitized in the 10Bit A/D converter  
**Attention:** By the input range 4 ... 20mA, the resolution is < 10Bit!
- 
- **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 SD6-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 SD6-Electronics. In this case please attend that the solenoid current can cause a voltage drop between the SD6-Electronics and the power supply. It is recommended to connect the - (minus) connection as near as possible to the power supply.

SD6-Type	Analogue input 1	Analogue input 2
SD632XDX0-AA	0...10VDC, 0...±10VDC ( 2-solenoids only)	0...20mA, 4...20mA

## 4.7 Cablebreak detection

The analogue inputs with input signal range of 4...20mA can be detected for a cablebreak. If a cablebreak is present (input signal less than 3mA), the corresponding solenoid outputs will be blocked and the output "Error" will be active. The following conditions had to be performed:

- The input signal must be a current value 4 ... 20mA
- The parameter "Cablebreak" must be on "On"



**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

### Digital input 1 "Disable solenoid A"

The digital input is active-high (refer to section ["Electrical specifications"](#)<sup>[5b]</sup>).  
 If this input is set, solenoid output A is disabled.

- **Digital input 2 "Disable solenoid B"**

The digital input is active-high (refer to section ["Electrical specifications"](#)<sup>[5b]</sup>).  
 If this input is set, solenoid output B is disabled.

- **Digital input 3 " Enable control"**

The digital input is active-high (refer to section ["Electrical specifications"](#)<sup>[5b]</sup>).  
 If this input is set, the SD6-Electronics are enabled. Without this enable, no solenoid current will be output.

- **Digital input 4 "Solenoid B"**

The digital input is active-high (refer to section ["Electrical specifications"](#)<sup>[5b]</sup>).  
 In the operating mode "Command value unipolar (2-solenoids, toggled by digital input 2)" (refer to section ["Mode of operation"](#)<sup>[15b]</sup>) the solenoid B is active if the digital input is "active". If the the digital input is "inactive" then the solenoid A is active.

- **Digital input 5 "Rampf off"**

The digital input is active-high (refer to section ["Electrical specifications"](#)<sup>[5b]</sup>).  
 The ramp can be temporarily switched off by setting this input.

- **Digital input 6...8 "Fixed command values"**

The digital input is active-high (refer to section ["Electrical specifications"](#)<sup>[5b]</sup>).  
 7 fixed preset values, selectable in binary form, are available. When a fixed preset value is selected via the digital inputs 6 - 8, the external preset value is ineffective.  
 The following inputs must be set to activate the corresponding fixed preset value:

Digital input 6	Digital input 7	Digital input 8	Command value
0	0	0	0
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

All digital inputs can be set also through the parameterisation software PASO DSV/SD6 (refer to section ["Configuration Digital I/O"](#)<sup>[34]</sup>).

## 4.9 Outputs

- **Proportional solenoid outputs A and B**  
The max. 2 solenoid outputs have a current output **pulse-width-modulated** at 1000Hz with superimposed dither.
- **Digital output 1 "Error" or "Solenoid A active"**  
This output can be configured by the PASO DSV/SD6 Software as "Error"-output or as "Solenoid A active"-signalisation or the output can be set fixed on 0 or 1 (refer to section ["Configuration Digital I/O"](#)<sup>[34]</sup>).
- **Digital output 2 "Solenoid B active"**  
This output can be configured by the PASO DSV/SD6 Software as "Solenoid B active"-signalisation or the output can be set fixed on 0 or 1 (refer to section ["Configuration Digital I/O"](#)<sup>[34]</sup>).

## 4.10 Mode of operation

The following modes of operation are possible:

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

This mode of operation is only possible with the 1-solenoid version

With one analogue input (voltage or current), solenoid A from a 1-solenoid valve will be controlled.

0% ... 100% command value = I<sub>min</sub> ... I<sub>max</sub> solenoid A

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

This mode of operation is only possible with the 2-solenoid version

With one analogue input (voltage or current), solenoid A and solenoid B from a directional valve will be controlled.

0% ... 50% command value = I<sub>max</sub> ... I<sub>min</sub> solenoid B

50% ... 100% command value = I<sub>min</sub> ... I<sub>max</sub> solenoid A

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

This mode of operation is only possible with the 2-solenoid version

With one voltage command value from 0 ... ±100%, solenoid A (positive voltage) and solenoid B (negative voltage) from a directional valve will be controlled.

-100% ... 0% command value = I<sub>max</sub> ... I<sub>min</sub> solenoid B

0% ... +100% command value = I<sub>min</sub> ... I<sub>max</sub> solenoid A

- **Mode of operation 5 "Command unipolar (2 solenoids toggled by digital input 2)"**

This mode of operation is only possible with the 2-solenoid version.

From the command value a command current is calculated, which is output to the solenoid A, if the digital input 2 is "low". Otherwise the command current is output to the solenoid B.

Digital output 2 "low"

0% ... 100% command value 1, = I<sub>min</sub> ... I<sub>max</sub> solenoid A

Digital output 2 "high"

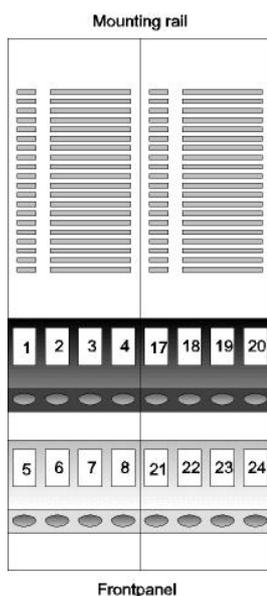
0% ... 100% command value 2, = I<sub>min</sub> ... I<sub>max</sub> solenoid B

## 5 Operating and Indicating elements

### 5.1 General

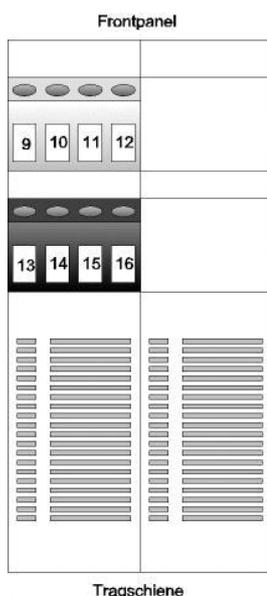
All inputs and outputs have to be contacted through the terminal screw blocks. On the front panel of the electronic housing, there is a USB interface, through which the parameterisation and the diagnostics can be made by using the PC-Parameterisation software PASO DSV/SD6.

### 5.2 Screw terminator view



- X1-1 = Digital input 1
- X1-2 = Digital input 2
- X1-3 = Digital output 1
- X1-4 = Digital output 2
- X1-5 = Supply voltage +
- X1-6 = Supply voltage 0 VDC
- X1-7 = Stabilised output voltage
- X1-8 = Analogue ground
- X1-17 = Digital input 3
- X1-18 = Digital input 4
- X1-19 = Digital input 5
- X1-20 = Digital input 6
- X1-21 = Digital input 7
- X1-22 = Digital input 8
- X1-23 = reserved
- X1-24 = reserved

Top view of box



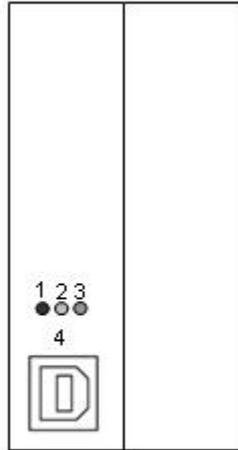
- X1-9 = Analogue input 1 +
- X1-10 = Analogue input 1 -
- X1-11 = Analogue input 2 +
- X1-12 = Analogue input 2 -
- X1-13 = Output Solenoid B +
- X1-14 = Output Solenoid B -
- X1-15 = Output Solenoid A +
- X1-16 = Output Solenoid A -

Bottom view of box

## 5.3 Control elements

### 5.3.1 General

The front panel of the SD6-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.



- 1: ERROR-LED red
- 2: FUNCTION-LED yellow
- 3: SUPPLY-LED green
- 4: USB-Interface

Front panel view

### 5.3.2 ERROR-LED (red)

The ERROR-LED displays, when an error is detected (refer to section ["The system does not work"](#)<sup>[44]</sup>).

### 5.3.3 FUNCTION-LED (yellow)

The FUNCTION-LED is lighting, as soon as a solenoid current is forced (Solenoid A and/or Solenoid B).

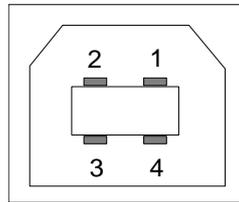
### 5.3.4 SUPPLY-LED (green)

The SUPPLY-LED is lighting, when the SD6-electronics are supplied.

### 5.3.5 USB-interface

The USB-interface allows the parameterisation and the analysis of the SD6-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 SD6-side).

View of the USB-interface:



X2-1 = VBUS  
X2-2 = D-  
X2-3 = D+  
X2-4 = GND

Connector USB Type B

Hint: The USB-cable is not included.

## 6 Commissioning

Please refer to section ["Safety rules"](#) <sup>[9]</sup>.

### 6.1 Connection instructions

The contact assignment of the following description refers to section ["Operating and Indicating elements"](#) <sup>[16]</sup> and to section ["Connection examples"](#) <sup>[21]</sup>.

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

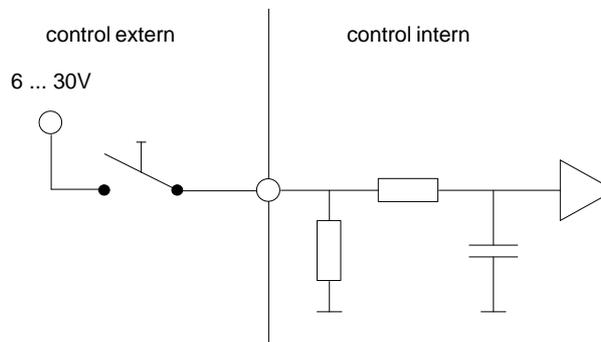
- Cable length longer than 10m requires shielded cables. The shield of the cable must only be connected with the earthing on the switchboard side using a large surface area and low Ohm connection.
- The top-hat rail has to be connected with the earthing with an as short as possible conductor with a strand cross section  $\geq 1.5 \text{ mm}^2$ .
- Solenoid- and signal cables must not be laid parallel to high voltage cables.

#### 6.1.1 Supply voltage

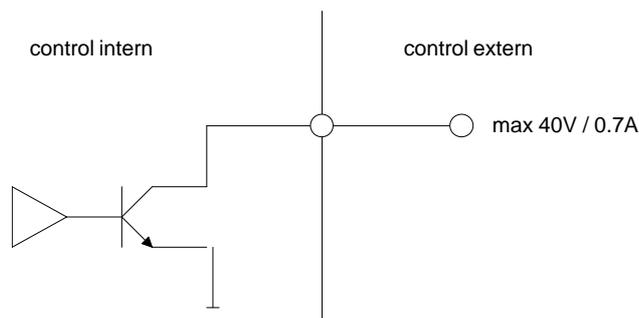
- For the dimensioning of the power supply, the maximum current demand of the solenoids (in case of directional control valves only the maximum current demand of 1 solenoid) has to be increased by the no load current from the SD6-Electronics (refer to section ["Electrical specifications"](#) <sup>[5]</sup>).
- The limit values of the supply voltage and its residual ripple indispensably have to be complied with (refer to section ["Electrical specifications"](#) <sup>[5]</sup>).
- The SD6-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)

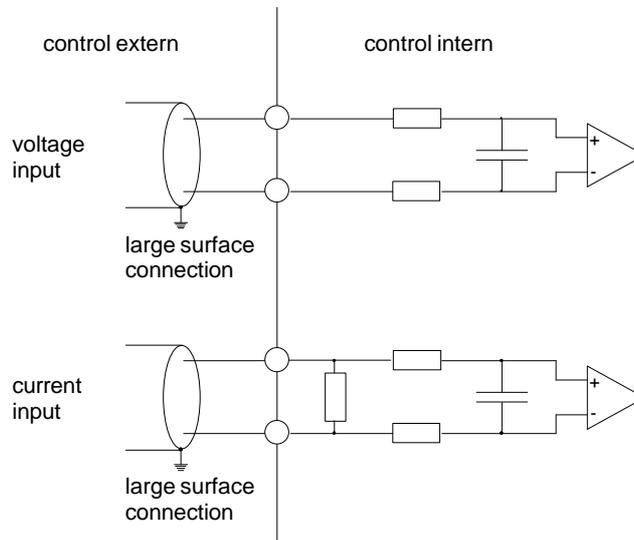


- The digital outputs are "Lowside Switch" outputs (open collector)



### 6.1.3 Analogue inputs 10-Bit

- There is one voltage and one current input available.
- Both inputs are differential inputs.



### 6.1.4 Configuration of the analogue inputs 10-Bit

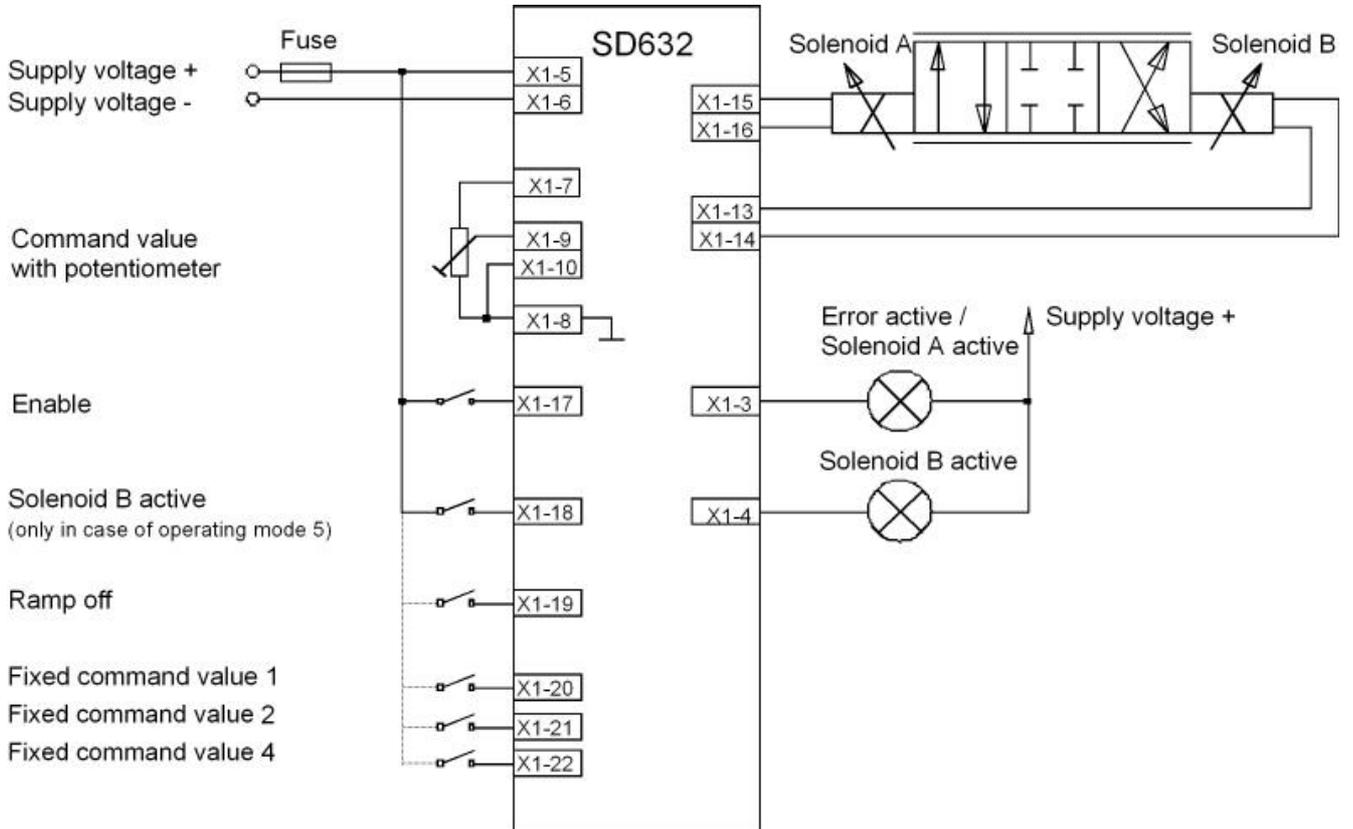
The analogue inputs 10-Bit can be configured as follows:

Input signal	Terminator assignment	Input range
Voltage input against ground	+ to X1-9 / ground to X1-10	0 ... +10V 0 ... ±10V
Voltage differential input	+ to X1-9 / - to X1-10	0 ... +10V 0 ... ±10V
Current input against ground	+ to X1-11 / ground to X1-12	0 ... +20mA 4 ... +20mA
Current differential input	+ to X1-11 / - to X1-12	0 ... +20mA 4 ... +20mA

## 6.2 Connection examples

The contact assignment of the following description refers to section ["Operating and Indicating elements"](#) <sup>16</sup>.

### 6.2.1 Mode of operation 2, 3 and 5



## 7 Settings

Please refer to section ["Safety Rules"](#) <sup>9</sup>.

### 7.1 Introduction

- The system- and parameter settings can be made via the RS232 interface with the PC-Parameterisation software PASO DSV/SD6.
- For information about the operation via the PC-Parameterisation software PASO DSV/SD6 please refer to section ["PASO DSV/SD6 Installation and Operation"](#) <sup>45</sup>.
- Depending on the connected SD6-Electronics, certain settings may be blocked.

### 7.2 Parameter inconsistency

The parameter settings can be made via the PC-Parameterisation software PASO DSV/MD2 or via the manual operation terminal (not by controller versions of MD2-Electronics, and only if they have an optional manual operation terminal). In any case, the current parameter values will be displayed in the PASO

If a parameter value will be changed through the manual operation terminal, 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 MD2-Electronics. Possible open parameter windows in the PASO will be closed automatically. If a parameter value will be changed through the fieldbus 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 MD2-Electronics. This will be displayed in the status line in the field "Parameter inconsistency" (refer to section "Starting of PASO DSV/MD2"). If a parameter value will be changed through the fieldbus again, no further message will be appear in the PASO. But it's always possible to change also parameter values through the PASO.

### 7.3 Tips for the first commissioning

- Connect the power supply, leave the SD6-Electronics still switched off
- Switch off the hydraulic system (Hydraulics switched off)
- Carefully check the connections
- Switch on the power supply
- Establish the communication with PASO (connect PC and SD6 with a standard USB cable and start PASO)
- Configure the SD6 Electronics in accordance with the properties of the connected installation. Proceed in the order described below:
  1. Select the desired operating mode in the menu "Configuration\_Mode of operation"
  2. Make the appropriate settings in the menu "Configuration\_Scaling command value"
  3. Make the appropriate settings in the menu "Parameters\_Valves"
  4. Set the ramps in the menu "Parameters\_Ramps"
- Switch on the hydraulic system (Hydraulics switched on)

## 7.4 Default settings

In the factory, the SD6-Electronics will be set to the following default values:

Parameter	1-solenoid version	2-solenoid version
Mode of operation	command unipolar (1-sol)	command unipolar (2-sol. with DigInp2)
Signal type	0...10V	0...10V
Used input	Analogue input 1	Analogue input 1
Inversion	no	no
Cablebreak detection	no	no
Scaling	10.000 %/V	10.000 %/V
Offset	0.00 V	0.00 V
Deadband	0.0 %	0.0 %
IminA	150 mA	150 mA
ImaxA	700 mA	700 mA
IminB	-	700 mA
ImaxB	-	700 mA
Ramp A up	0.00 s	0.00 s
Ramp A down	0.00 s	0.00 s
Ramp B up	-	0.00 s
Ramp B down	-	0.00 s
Dither frequency	100 Hz	100 Hz
Dither level	100 mA	100 mA

In the sections ["Parameters - Menu"](#)<sup>[27]</sup> and ["Configuration - Menu"](#)<sup>[31]</sup> you will find detailed descriptions of each of these parameters.

## 7.5 File-Menu

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.

### 7.5.1 File\_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"><li>• Amplifier</li><li>• Amplifier with manual operation</li><li>• Amplifier with fixed command values</li><li>• Basic Controller</li><li>• Enhanced Controller</li></ul>
Analogoutputs	<ul style="list-style-type: none"><li>• Input 1 voltage or current</li><li>• Input 2 voltage or current</li><li>• Input 2 current only if Function = Enhanced Controller</li><li>• Input 3 voltage or current</li><li>• Input 4 voltage or current</li></ul>
Number of solenoids	<ul style="list-style-type: none"><li>• 1-Solenoid</li><li>• 2-Solenoid</li></ul>
Mode of operation	<ul style="list-style-type: none"><li>• without mode of operation 'Solenoid single' (only if Function = Amplifier)</li><li>• with mode of operation 'Solenoid single' (only if Function = Amplifier)</li></ul>
Fieldbus	<ul style="list-style-type: none"><li>• without Fieldbus</li><li>• with Profibus DP (only if Function = Amplifier, Basic Controller or Enhanced Controller)</li></ul>

**The modified configuration only affects the "Off Line"-mode. By switching to "On Line"-mode the configuration of the connected SD6-electronics will be read in.**

### 7.5.2 File\_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 configuration of the selected file does not correspond to the current configuration of the PASO DSV/SD6, a message will be displayed and the current configuration from the PASO DSV/SD6 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"](#)<sup>[51]</sup>). The parameter values can now be edited and changed as required under the corresponding menu points.

### 7.5.3 File\_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..."](#)<sup>[25]</sup>).

#### 7.5.4 File\_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 key "Save", the file information window appears (refer to section "[File-Info](#)"<sup>[25]</sup>). In this window the required entries can now be made. With the key "Save", the file is then finally saved under the selected file name. With the key "Cancel", one changes back to the file window.

#### 7.5.5 File\_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. **In this window, please do not select "Print to File"**. If you do, a new program start might possibly be required and you could lose any data not yet saved.

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.

#### 7.5.6 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.

Valve type: The valve type of the connected SD6-Electronics at the moment of saving. If no SD6-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", 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", then the various fields cannot be edited.

#### 7.5.7 File\_Activate Off Line / Activate On Line

##### Off Line

With this command, the connection with the SD6-Electronics is interrupted. All menu points, which call for a communication with the SD6-Electronics, are blocked. The PASO DSV/SD6 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 SD6-Electronics is established. The communication with the SD6-Electronics is briefly tested. If the connection works, then the user has the option of taking over the parameters from the SD6-Electronics or of transferring the parameters to the SD6-Electronics. During the transfer of the parameters, the user has the possibility of aborting the operation.

Before parameters are transferred to the SD6-Electronics, a verification is carried out as to whether the configuration of the SD6-Electronics supports the parameter values. The configuration corresponds here to the number of the solenoids. If the configuration of the connected SD6-Electronics do not match with the current configuration of the PASO DSV/SD6, a message will be displayed and the current configuration from the PASO DSV/SD6 will change automatically over to the new configuration.

If the parameters have been taken over by the SD6-Electronics, then they 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](#)"<sup>[51]</sup>). The PASO

DSV/SD6 will stay in the "Off Line"-mode. For going On Line in this case, the parameter must be transferred to the SD6-Electronics. If the transfer was successful and the limiting value check was also successful, then the software subsequently 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.

### 7.5.8 File\_SD6 datarecord info

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

Under this menu the current data set information of the connected SD6-Electronics appears. The data correspond to the last change to the SD6-Electronics data carried out.

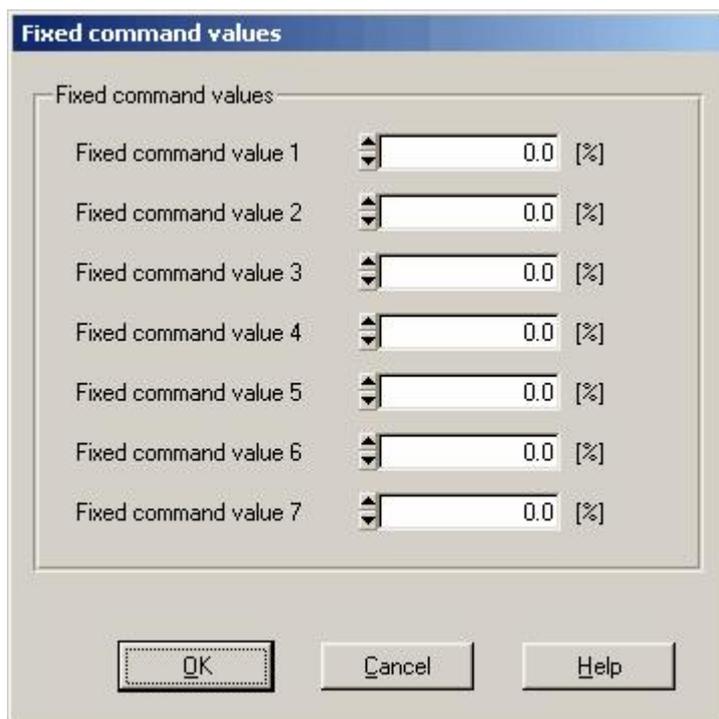
### 7.5.9 File\_Exit

With this command, the PASO DSV/SD6 is terminated. If parameter data have been changed and have not yet been saved, then the question appears, as to whether these data should be saved. This is referring only to the save in file. On the SD6-Electronics, the parameter will be saved automatically by clicking on the button "OK" in the corresponding windows (refer to section "[Store parameter](#)"<sup>[51]</sup>).

## 7.6 Fixed command values-Menu

### 7.6.1 Fixed\_command\_values\_Generator

In this window, all adjustments according to the fixed command values will be made.



Field	Parameter description	Range / Step
Fixed command value X	Desired value of the corresponding fixed command value. The adjusted %-value refer to the adjusted solenoid current range (0% = no solenoid current, 0.1% = Imin, 100% = Imax). A positive %-value will activate the solenoid A, a negative %-value will activate the solenoid B.	-100% ... 100% 0.1%

## 7.7 Parameters-Menu

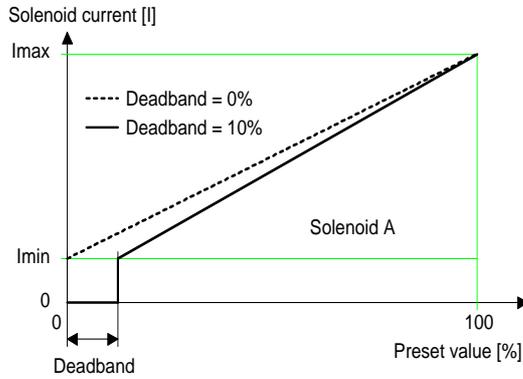
In this window, all parameter values of the SD6-Electronics will be adjusted.

### 7.7.1 Parameters\_Valves

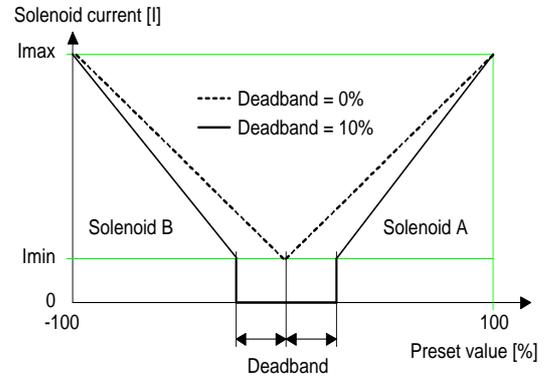
In this window, all settings specific to the valves will be made. In the factory, the SD6-Electronics will be adjusted to the valve. **By changing the valves parameters, the valve characteristic is changed also. This has a influence on the system response.** With the menu item "Configuration\_Default setting", the values set in the factory can be reloaded at any time.

Field	Parameter description	Range / Step
Direct solenoid operation	If this switch is selected, an internal command value from 0% resp. 100% will be active during the setting of the Imin resp. Imax. If this switch is not selected, the external command value will be active. <b>This command is only active in the "On Line"-mode and if the operating mode is set to "Remote PASO".</b>	
Solenoid current	The minimum and the maximum solenoid current can be set separately for each solenoid output, corresponding to 0% resp. 100% command value. In the "Off Line"-mode, the displayed current value is the theoretical command current. This makes it possible to set the Imin/Imax values without a solenoid or a valve is connected to the SD6-Electronics. In the "On Line"-mode, if the Imin setting is active, a command value of 0% resp. if the Imax setting is active, a command value of 100% is automatically applied internally (only if the switch "Direct solenoid operation" is selected). As a result of the digitalisation, the numbers entered max be modified to less "rounded-off" number.	
Imin A	Set minimum solenoid current A. (= solenoid current by 0% command value)	0 ... 950mA 1.8mA (24V-Version) 2.3mA (12V-Version)
Imax A	Set maximum solenoid current A. (= solenoid current by 100% command value) For the max. current refer to section "Electrical specifications" page 5.	Imin ... max. current 1.9mA (24V-Version) 2.3mA (12V-Version)
Imin B (only 2-solenoid version)	Set minimum solenoid current B. (= solenoid current by 0% command value)	0 ... 950mA 1.9mA (24V-Version) 2.3mA (12V-Version)
Imax B (only 2-solenoid version)	Set maximum solenoid current B. (= solenoid current by 100% command value) For the max. current refer to section "Electrical specifications" page 5.	Imin ... max. current 1.9mA (24V-Version) 2.3mA (12V-Version)
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
Level	Level of the superimposed dither signal	0 ... 399mA 3.8mA (24V-Version) 4.6mA (12V-Version)
Deadband A	command value < Deadband = 0 mA solenoid current A command value >= Deadband = Imin .. Imax solenoid A	0 ... 100% 0.1%
Deadband B	Command value < Deadband = 0 mA solenoid current B	0 ... 100%

Field	Parameter description	Range / Step
(only with Mode of operation "Command unipolar (2-sol. single)")	Command value $\geq$ Deadband = Imin .. Imax solenoid B	0.1%



1-solenoid version



2-solenoid version

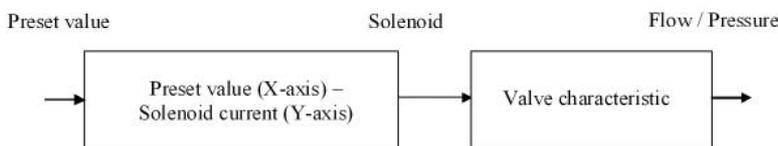
**Characteristic optimisation:**

This setting is available only with a SD6-electronics with software version > 1.1.1.6 and PASO with software version > 1.5.0.9!

This menu enables the optimisation of the solenoid current adjustment of SD6-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

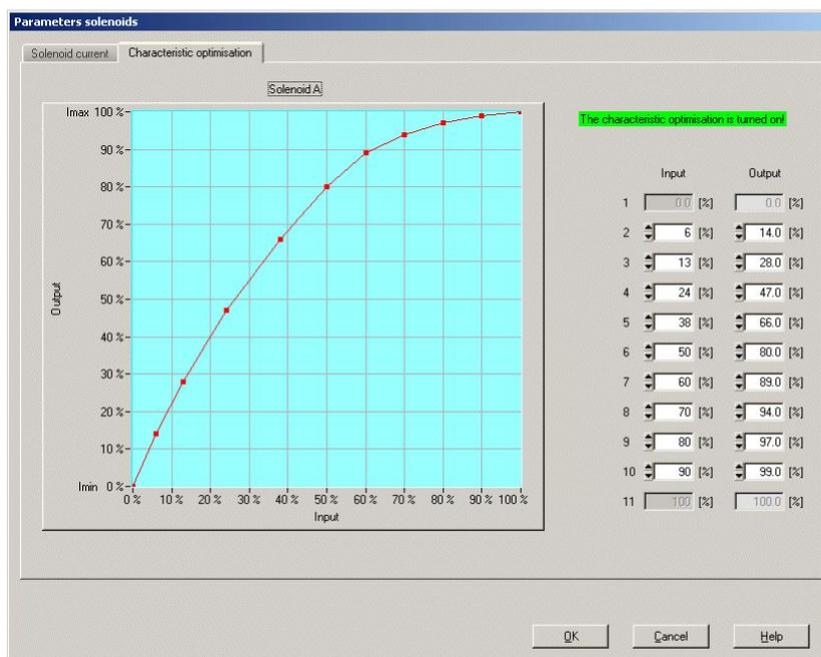
The other graphic points can be adjusted either by tracking with the mouse or by entering the value at the numeric inputs. The resolution of the X-values is in %, those of the Y-values in 0.1 %. The X-values cannot be falling.



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 DSV/SD6](#)" <sup>[50]</sup>).



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.

### 7.7.2 Parameters\_Ramps

In this window, all adjustments according to the ramp function will be made.

Field	Parameter description	Range / Step
Ramps	After a command value jump, the new command value is approached via a linear ramp (with the set ramp time). A ramp time up and ramp time down can be set separately for each solenoid.	
Ramp A up	The set ramp time refer to a command value jump from 0% to 100%	0 ... 51s 0.05s
Ramp A down	The set ramp time refer to a command value jump from 100% to 0%	0 ... 51s 0.05s
Ramp B up (only 2-solenoid version)	The set ramp time refer to a command value jump from 0% to 100%	0 ... 51s 0.05s
Ramp B down (only 2-solenoid version)	The set ramp time refer to a command value jump from 100% to 0%	0 ... 51s 0.05s

## 7.8 Configuration-Menu

In this window, the settings of the function of the SD6-Electronics will be made.

### 7.8.1 Configuration\_Mode of operation

The following parameters can be only changed in the SD6-state "Disabled" (refer to section "SD6 State machine" page 9).

In this window, the mode of operation of the SD6-Electronics will be adjusted.

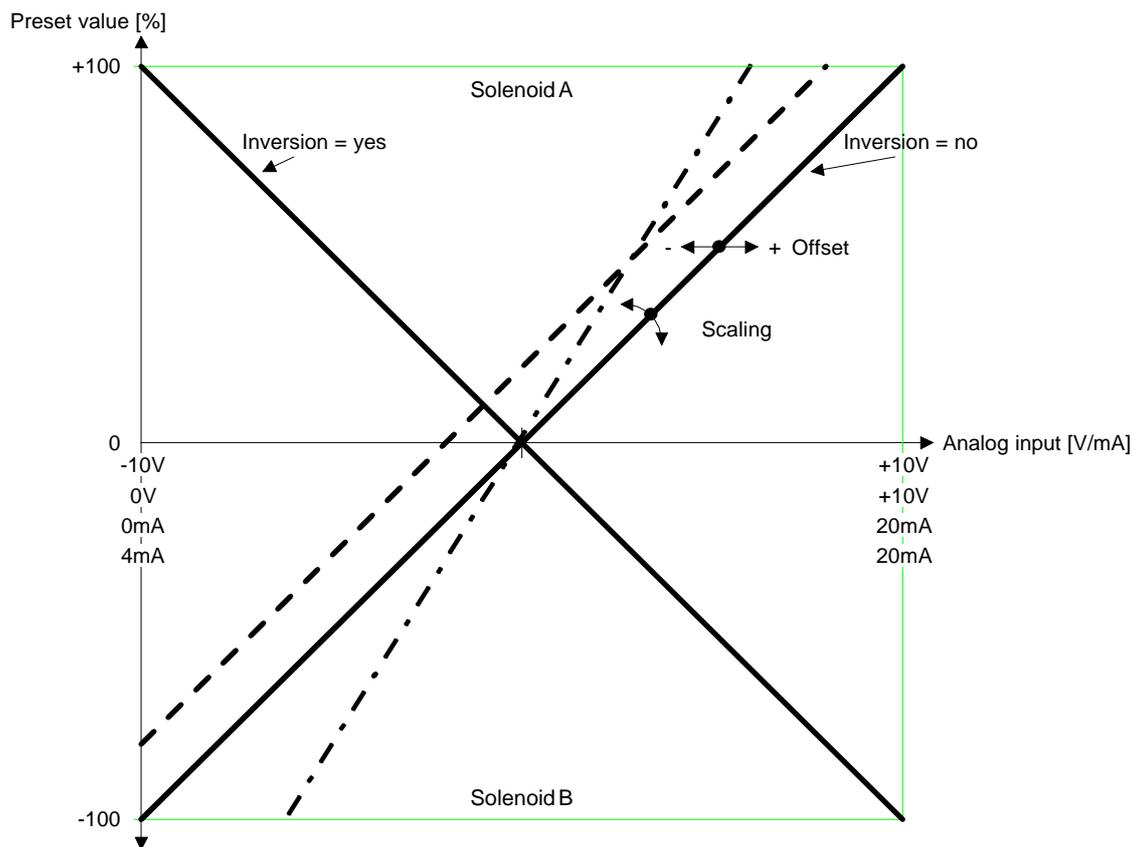
Field	Parameter description	Range / Step
Mode of operation	Select the desired mode of operation (refer to section "Operating mode" page 11). The signal type can be changed automatically it depends on the selected mode of operation.	Command unipolar (1-sol) Command unipolar (2-sol) Command bipolar (2-sol) Command value unipolar (2-sol, selectable by digital input)

### 7.8.2 Configuration\_Signal scaling

The following parameters can be only changed in the SD6-state "Disabled" (refer to section "SD6 State machine" page 9).

In this window, the adjustments and scaling values of the command value signal will be adjusted.

Field	Parameter description	Range / Step
Signal type	Select the desired signal type. Dependent of the selected mode of operation, not all signal types are available.	0...10 VDC +/-10 VDC 0...20 mA 4 ..20 mA
Used input	There is one voltage and one current input available. It will be adjusted automatically the correct input corresponding to the selected signal type.	Analnp [V] Analnp [mA]
Inversion	The value of the analogue input can be inverted (refer to the below picture).	no yes
Cablebreak detection	Switch on/off the cablebreak detection of the analogue inputs (refer to section "Cablebreak detection" page 11).	no yes
Scaling	The adjustment of how many per cent the command value will change by a alteration from 1V resp. 1mA on the analogue input (= gain) can be made here (refer to the below picture). If the signal type will be changed, the parameter Scaling will be set automatically to the default value (refer to below table). <b>Attention:</b> If the parameter Scaling does not correspond to the default value, the resolution is < 10-Bit!	0.001 ... 100.000% 0.001%
Offset	The zero point of the analogue input signal can be made here (refer to the below picture).  Dependent of the selected signal type, the setting is in V or mA. Voltage: Current:	0 ... ±10V 0.01V 0 ... ±20mA 0.02mA



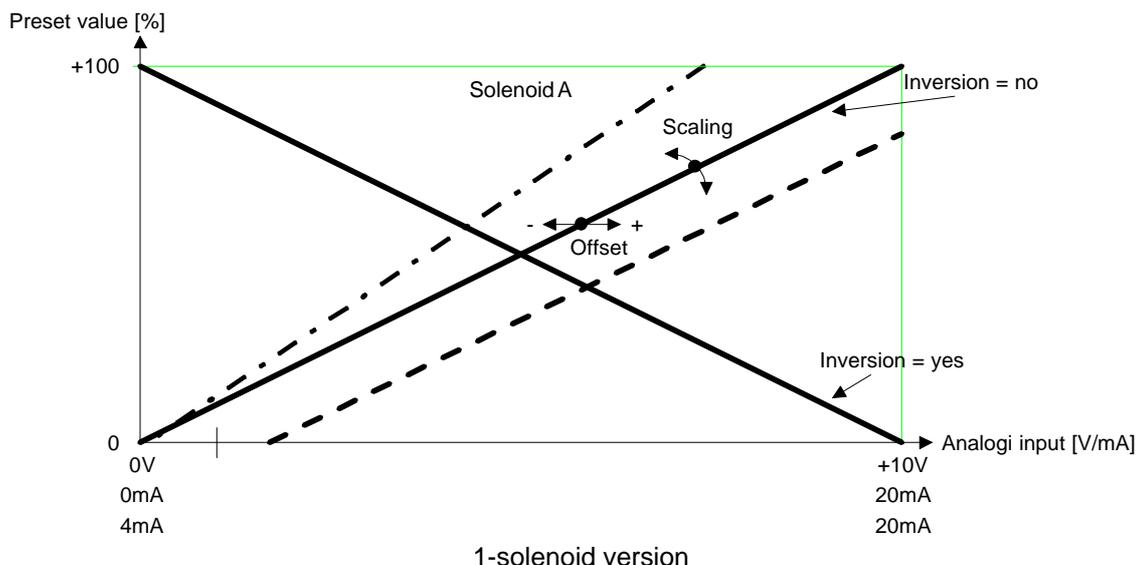
2-solenoid version

## Examples:

Used analogue signal: 4 ... 20 mA  
 Command-Zero:  $(4 \text{ mA} + 20 \text{ mA}) / 2 = 12 \text{ mA}$  (middle of signal)  
 Selected signal type: 4 ... 20 mA  
 Standard Command-Zero: 12 mA (middle of signal)  
 Adjustment offset:  $12 \text{ mA} - 12 \text{ mA} = \mathbf{0 \text{ mA}}$   
 Signal working range:  $20 \text{ mA} - 4 \text{ mA} = 16 \text{ mA}$   
 Signal range per solenoid:  $8 \text{ mA} (= \text{Signal working range} / 2)$   
 Adjustment Scaling:  $100 \% / 8 \text{ mA} = \mathbf{12.5 \% / mA}$

Used analogue signal: 1.0 ... 8.0 V  
 Command-Zero:  $(1.0 \text{ V} + 8.0 \text{ V}) / 2 = 4.5 \text{ V}$  (middle of signal)  
 Selected signal type: 0 ... 10 V  
 Standard Command-Zero: 5 V (middle of signal)  
 Adjustment offset:  $4.5 \text{ V} - 5 \text{ V} = \mathbf{-0.5 \text{ V}}$   
 Signal working range:  $8.0 \text{ V} - 1.0 \text{ V} = 7.0 \text{ V}$   
 Signal range per solenoid:  $3.5 \text{ V} (= \text{Signal working range} / 2)$   
 Adjustment scaling:  $100 \% / 3.5 \text{ V} = \mathbf{28.57 \% / V}$

Used analogue signal: -9.0 ... +9.0 V  
 Command-Zero:  $(-9.0 \text{ V} + 9.0 \text{ V}) / 2 = 0.0 \text{ V}$  (middle of signal)  
 Selected signal type: +/-10 V  
 Standard Command-Zero: 0.0 V (middle of signal)  
 Adjustment offset:  $0.0 \text{ V} - 0.0 \text{ V} = \mathbf{0.0 \text{ V}}$   
 Signal working range:  $9.0 \text{ V} - (-9.0 \text{ V}) = 18.0 \text{ V}$   
 Signal range per solenoid:  $9.0 \text{ V} (= \text{Signal working range} / 2)$   
 Adjustment scaling:  $100 \% / 9.0 \text{ V} = \mathbf{11.11 \% / V}$


**Examples:**

Used analogue signal: 4 ... 20 mA  
 Command-Zero at: 4 mA  
 Selected signal type: 4 ... 20 mA  
 Standard Command-Zero at: 4 mA  
 Adjustment offset: 4 mA - 4 mA = **0 mA**  
 Signal working range: 20 mA - 4 mA = 16 mA  
 Signal range per solenoid: 16 mA (= Signal working range)  
 Setting scaling: 100 % / 16 mA = **6.25 %/mA**

Used analogue signal: 2.0 ... 9.0 V  
 Command-Zero at: 2.0 V  
 Selected signal type: 0 ... 10 V  
 Standard Command-Zero at: 0.0 V  
 Adjustment offset: 2.0 V - 0.0 V = **2.0 V**  
 Signal working range: 9.0 V - 2.0 V = 7 V  
 Signal range per solenoid: 7.0 V (= Signal working range)  
 Setting scaling: 100 % / 7.0 V = **14.29 %/V**

**Default-values of the parameter "Scaling"**

Mode of operation	Signal type			
	0 ... 10 VDC	+/-10 VDC	0 ... 20 mA	4 ... 20 mA
Command unipolar (1-sol)	10 %/V	--	5 %/mA	6.25 %/mA
Command unipolar (2-sol)	20 %/V	--	10 %/mA	12.5 %/mA
Command bipolar (2-sol)	--	10 %/V	--	--
Command unipolar (2-sol with DigInp)	10 %/V	--	5 % %/mA	6.25 %/mA

### 7.8.3 Configuration\_Digital IO

With this command, the digital inputs and outputs (refer to section "[Digital inputs](#)"<sup>[13]</sup> and "[Outputs](#)"<sup>[14]</sup>) of the connected SD6-Electronics can be set to active, not active or released.

Field	Parameter description	Range / Step
Digital Inputs	Reset digital input with software	Off
	Set digital input with software	On
	Read in the external digital input	External
Digital output 1	Reset digital output with software	Off
	Set digital output with software	On
	Set in case of an error	Error
	* Set in case of no error	Ready
	Set in case of solenoid A is active	Solenoid A active
* Set in case of solenoid A is not active	Solenoid A not active	
Digital output 2	Reset digital output with software	Off
	Set digital output with software	On
	Set in case of solenoid B is active	Solenoid B active
	* Set in case of solenoid B is not active	Solenoid B not active

\* This setting is available only with a SD6-electronics with software version > 1.1.1.6 and PASO with software version > 1.5.0.9!

### 7.8.4 Configuration\_Default setting

This menu point is only active in the "On Line"-mode and in the SD6-state "Disabled" (refer to section "[SD6 State machine](#)"<sup>[11]</sup>).

With this command, the default settings made in the factory will be loaded on the connected SD6-Electronics and read to the PC. After successfully read in, the question appears, if the values should be stored on the SD6-Electronics or not.

If "Yes" will be selected, the values will be stored in the way that they are available after the SD6-Electronics will be switched on again (non-volatile memory).

If "No" will be selected, the values are running at the moment, but after the SD6-Electronics will be switched on again, the before current values will be active again.

### 7.8.5 Configuration\_ADC Scaling

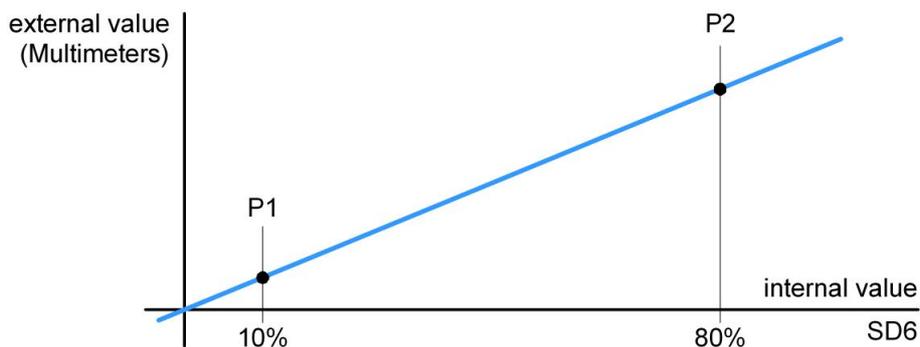
In this window the analog/digital converter (ADC) can be scaled.

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

Field	Parameter description	Range / Step
Channel	Here the channel for scaling can be selected.  Depending on the SD6 card type not all channels are available.	Solenoid output A Solenoid output B Analog input 1 Analog input 2 Analog input 3 Analog input 4 Analog output 1
Internal measured value SD6	This is the value which is measured internally on SD6-electronics. This corresponds to the value which is displayed in the menu " <a href="#">Analysis Values</a> " <sup>[40]</sup> .	
External measured value P1 (Multimeter)	Here must be entered the value witch is external measured with a multimeter. For bipolar signals, only the positive side is considered.	Depending on channel
Take over	The value from the field "Internal measured value SD6" and "External measured value P1 (Multimeter)" is assumed for the calculation.	
External measured value P2 (Multimeter)	Here must be entered the value witch is external measured with a multimeter. For bipolar signals, only the positive side is considered.	Depending on channel
Take over	The value from the field "Internal measured value SD6" and "External measured value P2 (Multimeter)" is assumed for the calculation.	
Calculate	Using the assumed values "Internal measured value SD6" 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 SD6-Electronics.  The new calculated values are displayed in the field "Offset" and "Amplification".  This button is only active if values were previously assumed.	
Return	The values "External measured value P1 resp. P2 (Multimeter)" are set to 0	
Solenoid current	With the selection "Solenoid current A" resp. "Solenoid current B", the direct operation of the solenoids can be made in this range.  <b>ATTENTION: With the direct solenoid operation, the system can move in an uncontrolled way!</b>  The settings correspond to the functions in the section " <a href="#">Commands_Valve operation</a> " <sup>[38]</sup> .	

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 "Take over"
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 "Take over"
8. Press button "Calculate". Thus, the new value for the offset and the amplification of ADC scaling is automatically calculated and sent to the SD6-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.

### 7.8.6 Configuration\_Interface

If a Wandfluh-device with USB interface is connected, by this command the USB parameters will be displayed otherwise an error message will be displayed.

### 7.8.7 Configuration\_Language

In this window, the language can be selected, with which the PASO DSV/SD6 will be inscribed. This setting is automatically saved in the file "konfig.kon" and taken over with a new start.

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

## 7.9 Commands-Menu

In the Commands menu, direct control commands can be transmitted to the SD6-Electronics.

### 7.9.1 Commands\_Command simulation

This menu point is only active in the "On Line"-mode and if the operating mode is set to "Remote PASO" (refer to section "[Operating mode](#)"<sup>[12]</sup>).

In this window, the input of a command value can be made directly.

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

**NOTE:** Each entry has a direct impact on the system

Field	Parameter description	Range / Step
Enable	The command simulation is enabled The command simulation is disabled (the last active command value is maintained)	Enable Disable
Command value	Desired value of the command value. 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)	-100% ... 100% 0.1%
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%.	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".	-100% ... 100% 0.1%
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"	

### 7.9.2 Commands\_Valve operation

This menu point is only active in the "On Line"-mode and if the operating mode is set to "Remote PASO" (refer to section "[Operating mode](#)"<sup>[12]</sup>).

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 - Values" or "Analysis - Signal recording" at the same time. These can be made with the selection of the menu item "Analysis - Values" or "Analysis - Signal recording" in the menu bar. Thus, the impact of the changed command value can be directly analyzed. If two windows are open, the window "Analysis - Values" resp. "Analysis - Signal recording" must be closed first before even the window "Command simulation" can be closed.

Field	Parameter description	Range / Step
Current	The solenoid current can be command either with the slide control or in the numerical field.	0...100% (Imin...Imax)
Operation	Through this key, the current set can be switched to the solenoid or else the solenoid can be switched to be without current.	Start / Stop
Solenoid change	If a two solenoid valve is available, then with this switch one can changeover between solenoid A and - B.	A / B

### 7.9.3 Commands\_Local Operating PASO Operating

This menu point is only active in the "On Line"-mode and if the SD6-state is set to "Disabled" (refer to section ["SD6 State machine"](#)<sup>[11b]</sup>).

If the command "PASO operating" will be activated (only possible if the operating mode is set to "Local"), the SD6-Electronics can be operated direct through the PASO with the commands "Valve operation" and "Enable / Disable". There is no operation through the analogue and digital inputs possible. The operating mode will be changed to "Remote PASO".

If the command "Local operating" will be activated (only possible if the operating mode is set to "Remote PASO"), the SD6-Electronics can be operated through the analogue and digital inputs. A direct valve operation (refer to section ["Commands\\_Valve operation"](#)<sup>[38b]</sup>) is not possible. The operating mode will be changed to "Local".

### 7.9.4 Commands\_Disable Enable

This menu point is only active in the "On Line"-mode and if the operating mode is set to "Remote PASO" (refer to section ["Mode of operation"](#)<sup>[15b]</sup>).

With the command "Enable", the SD6-Electronics will be set to the state "Active" (refer to section ["SD6 State machine"](#)<sup>[11b]</sup>) and it is generally enabled.

With the command "Disable", the SD6-Electronics will be set to the state "Disabled" (refer to section ["SD6 State machine"](#)<sup>[11b]</sup>) and it is generally disabled.

## 7.10 Analysis-Menu

In the Analysis menu, measured values and possible errors on the SD6-Electronics can be displayed on-line.

### 7.10.1 Analysis\_Values

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

With this command, all relevant data of the connected SD6-Electronics are read-in and displayed. The values are continually updated (on-line).

Field	Description	Unit
Analogue input	Voltage- resp. current value of the analogue input	V mA
Command value	Scaled command value	%
Command solenoid current A	Control signal before solenoid output A	mA
Solenoid current A	Solenoid current of solenoid A	mA
Command solenoid current B	Control signal before solenoid output B	mA
Solenoid current B	Solenoid current of solenoid B	mA
Supply voltage	Power supply voltage of the card	V
Digital inputs	Logical conditions of the digital inputs: <ul style="list-style-type: none"> <li>• When the inputs are set</li> <li>• When the inputs are not set</li> </ul>	1 0
Digital outputs	Logical conditions of the digital outputs: <ul style="list-style-type: none"> <li>• When the outputs are set</li> <li>• When the outputs are not set</li> </ul>	1 0

### 7.10.2 Analysis\_Signal Recording

In the menu "Analysis\_Signal recording", various signals of the connected SD6-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 key "Signal assignment". In the "Off - mode" it is not possible to record signals, it is possible, however, to process the recording parameters (menu "Signal assignment").

As a standard, 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 as a minimum amounts to 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.

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 (key "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 (see below).

Field	Parameter description
New	Any recorder data are deleted and the card is ready for a new recording.
Start / Stop	<b>Start</b> A new recording is started. As soon as the trigger is actuated, 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 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"). <b>Stop</b> Stops the transmission and the recording. As from this point it is possible to record once again by a renewed actuation of Start. Once the maximum number of measuring values has been read-in, or in the case of "Off-Line operation", the Start key is dimmed.
Export	By the actuation of this key 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.
Auto-scaling	With this key, 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 (" <a href="#">Signal assignment</a> <sup>41</sup> "), are adapted for this purpose. The auto-scaling is also operative during a recording.
Closing	With this key, one leaves the signal recording menu. Any recording data are kept and these are displayed once more by a renewed selection of the menu.

### Menu Signal Assignment

This menu is opened by the actuation of the key "Signal assignment" in the Signal Recording window. In this menu, you can select which signals you would like to record.

- Up to four recording channels are available and can be activated for the recording.
- Under "Signal" you can select, which type of signal you would like to record.
- Under "Trigger" you can select the channel, on which triggering takes place, as well as the triggering flank and the triggering level.
- Under "Sample Time", the scanning rate is defined (0.004...60 s, a multiple of 4ms).
- The display of the recording curves is defined by "Scaling/Div" and "Offset".
- Leaving the menu with OK:  
If changes under 1-5 have been made, then any possible recording data (together with the graphics) are deleted.
- Leaving the menu with Cancel:  
Any possible changes are cancelled again.

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

**HINT:** The signal "Solenoid current A/B" is averaged over one dither-period (even when setting the dither-amplitude to 0). This causes a "staircase effect" in the signal recording at low dither-frequencies. The real solenoid current does not showing this effect!

### 7.10.3 Analysis\_Diagnostics

With this command, possibly present errors on the connected SD6-Electronics are indicated. The error is read in once. A complete description of the error will be displayed.

**In the status line of the main window it will be displayed if an error is present (State: Error) or not (State: Ready).**

The red LED on the SD6-Electronics will blink in accordance with the current error.

<b>Diagnostics:</b>	<b>Error</b>	<b>Error remedy</b>	<b>Blink code</b>
Power supply fault	If the supplied voltage < 18VDC. The solenoid outputs are blocked.	Disable and reenable the control	1 x
Cable break input 2	This error is only detected, if the parameter "cablebreak" is set to "yes" and the parameter "signal type" is set to "4...20 mA". The solenoid outputs are blocked.	Disable and reenable the control	2 x
Short circuit solenoid output	There is a short circuit on the solenoid output	Disable and reenable the control	3 x
Memory error	There is an internal memory error on the SD6-Electronics	Switch off and switch on again the control	4 x

## **7.11 Help-Menu**

The PASO DSV/SD6-Help based on the standard Windows-Help construction.

**With the button "Help" in each window, the corresponding help text will be displayed.**

### **7.11.1 Help\_Description of the function**

A general information about the function of the SD6-Electronics will be displayed.

### **7.11.2 Help\_Contents**

The list of contents of the PASO DSV/SD6-Help will be displayed. By clicking on the desired subject, the corresponding help text will be displayed.

### **7.11.3 Help\_Index**

The list of index of the PASO DSV/SD6-Help will be displayed. With entering a search item, all subject corresponding to the search item will be listed.

### **7.11.4 Help\_SD6 Identification**

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

Here the current version of the hardware and the software from the connected SD6-Electronics will be read and displayed.

### **7.11.5 Help\_WANDFLUH on the Web**

A link to the WANDFLUH home page.

### **7.11.6 Help\_Info**

Information about PASO DSV/SD6 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 to help, if a problem is arised.

Question:	Action:	Possible errors and causes	Blink code
State: Error	Analysis_Diagnos- tics Power supply error	<ul style="list-style-type: none"> <li>The supplied voltage is under 18VDC. The error is also displayed if a supplied voltage interruption occurred (<math>t &gt; 250\text{ms}</math>).</li> <li>Is the supplied power sufficient?</li> <li>Is the AC voltage too high (refer to section "<a href="#">Electrical specifications</a>"   5<sup>b</sup>)</li> <li>When the error is cleared, disable the controller for a short period and re-enable (Digital Input 1)</li> </ul>	1 x
	Analysis_Diagnos- tics Cable break input	<ul style="list-style-type: none"> <li>The cable break detection functions only with 4 ... 20mA command value.</li> <li>The command value signal is absent or is smaller than 3mA.</li> <li>Check the command value signal connections between the command value encoder and SD6-Electronics.</li> <li>If the cablebreak detection is not desired, switch off the cablebreak function in the menu "Configuration".</li> <li>When the error is cleared, disable the controller for a short period and re-enable.</li> </ul>	2 x
	Analysis_Diagnos- tics Short circuit solenoid output	<ul style="list-style-type: none"> <li>There is a short circuit on the solenoid output</li> <li>When the error is cleared, disable the controller for a short period and re-enable.</li> </ul>	3 x

## 9 PASO DSV/SD6 Installation and Operation

The parameterisation software PASO DSV/SD6 serves for the parameterising and diagnosing of all Electronic cards SD6 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 DSV/SD6 can only be utilised in connection with a SD6-Electronics of the WANDFLUH AG company.**

### 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:

- Processor 486 or higher, min. 33MHz, min. 8MB RAM  
Recommended: 80586 66MHz or higher, 16 MB RAM or more
- Free harddisk storage space of minimum 4MB, plus storage space for program files
- Operating system Windows 2000 or Windows XP (Windows Vista on request)
- Standard VGA or higher graphics card, recommended resolution 800x600
- At least one USB interface (USB 1.1 or USB 2.0)
- USB cable type A => B, male/male

### 9.2 Installation

The PASO software can be downloaded via the Internet free of charge ([www.wandfluh.com/Download](http://www.wandfluh.com/Download) => PASO DSV/SD6 => Download Program files) or on request delivered on an installation-CD.

The installation of the PASO is then carried out by executing the file "setupPasoDSVvxxxx.exe", where "xxxx" means the current version (e.g. setupPasoDSVv1000.exe, see also version index). 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, one can select if the existing version should be overwritten or removed.

The helpfiles are included in the setup and are installed automatically.

### 9.3 Connection to the Wandfluh card

The connection between the PC, on which the parameterisation software PASO DSV/SD6 is installed, and the SD6-Electronics takes place through the USB interface. To do this, a USB cable type A => B, male/male has to be connected with the desired USB port on the PC and with the USB socket on the SD6-Electronics.

During the installation of the parameterisation software PASO DSV/SD6, the used USB driver for the SD6-Electronics will be installed automatically. A new installation of this driver is possible. In the directory, where the parameterisation software PASO DSV/SD6 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 SD6-Electronics is installed correctly, it must be shown in the Windows Devicemanager in the "USB-Controller" as "Wandfluh AG - SD6" while a SD6-Electronics is connected to the PC.

Hint: The USB driver is not Windows certificated. Therefore a Windows warning message appears during installation with Windows XP. Please click "install" to continue installation. The PC will not be

damaged. The same warning message appears by connecting a SD6-Electronics to the PC the first time. In this case please click "install". Both warning messages appear only with Windows XP. They do not appear with Windows 2000.

## 9.4 Mode "Off Line" and "On Line"

The parameterisation software PASO DSV/SD6 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/SD6 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.**

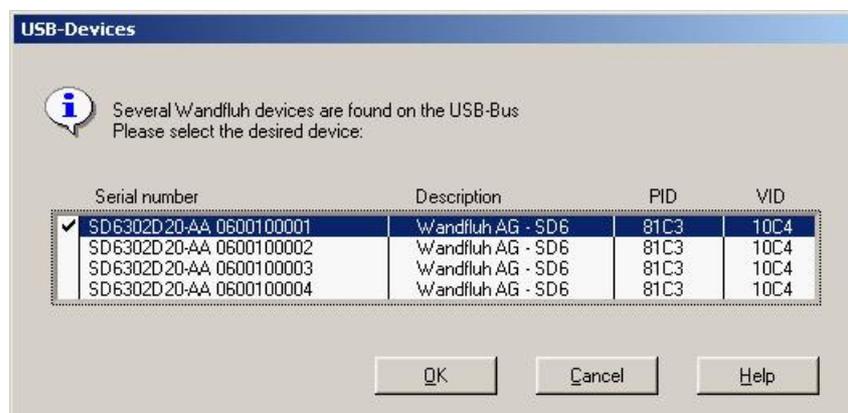
The change between the two modes takes place through the menu point "File\_Activate On Line / Activate Off Line". Near it, it's possible to select if the data should take over from the Wandfluh-Electronics (data flow Wandfluh-Electronics => PASO) or if the Wandfluh-Electronics should be reprogrammed with the new actual data (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/SD6 software automatically changes over to the "Off Line"-mode (refer to section ["Communication interruption"](#) <sup>[47]</sup>).

## 9.5 Communication start up

When the parameterisation software PASO DSV/SD6 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"](#) <sup>[47]</sup>). If a communication with the connected card is possible, a check will be made, whether the current configuration of the PASO DSV/SD6 corresponds to the configuration of the connected Wandfluh-Electronics. If yes, the parameters will be transferred from the Wandfluh-Electronics to the PASO DSV/SD6. If no, a message will be displayed and the current configuration from the PASO DSV/SD6 will change automatically over to the new configuration and the parameters will be transferred from the Wandfluh-Electronics to the PASO DSV/SD6.

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.

## 9.6 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 DSV/SD6, then an error message appears and the PASO DSV/SD6 software is set to the "Off Line"-mode. All menu points and keys, which involve an action in connection with the communication, are now blocked. In order to re-establish a communication, the menu point "File\_Activate On Line" has to be selected.

Possible reasons for no communication is possible during the start up are:

- **Wrong Device type**

The device type must be SD6. The picture in the PASO must be as follows:

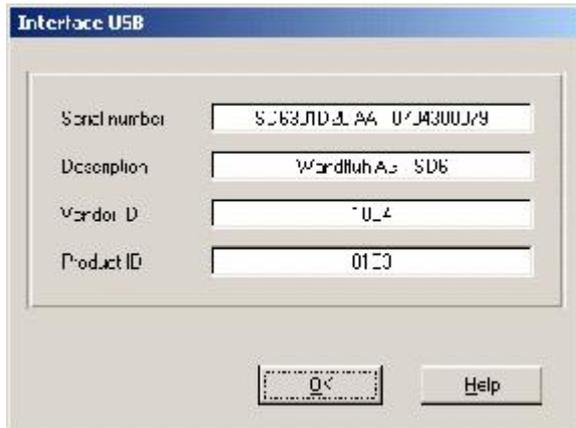


If there is another picture, go through the following steps:

- Menu "[File - New](#)<sup>24)</sup>" (only possible in the OFF-Line mode)
- "Would you like to retain the current configuration?" say "No"
- Select device type "SD6" => "OK"
- Select the desired function => "OK"
- Select the desired number of solenoid => "OK"

- **No device connected**

In the menu "[Configuration - Interface](#)<sup>37)</sup>", you can see the following items:



You can see these items also in the OFF-Line mode and without power supply on the SD6 card. If these items are not visible, there is a problem with the USB driver or with the USB connection. To check the USB driver, go through the following steps:

- Select in the Windows "Start - System - Hardware - Device Manager"
- In the item "USB-Controller" the entry "Wandfluh AG - SD6" must be written
- If this entry is missing, no USB connection to the SD6 card is available => check the USB cable
- If the entry "Wandfluh AG - SD6" is marked with a yellow mark, double click on it and reinstall the driver
- If you have to look for a driver, the directory is "location\PasoDSVSD6v...\USB\_Driver" (the location is the directory where the PASO is installed)

To check the USB connection, go through the following steps:

- take out the USB cable
- wait 10s
- reconnect the USB cable

#### • SD6 card not supplied

If step 1 and 2 are ok, but there is still no communication possible, be sure that the SD6 card is supplied with supply voltage.

## 9.7 Program description

### 9.7.1 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"

### 9.7.2 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"> <li>• Push the key TAB, until the key becomes active.</li> <li>• Push the key ENTER. The action is now carried out.</li> <li>• Push the key ALT and the underlined letter of the key inscription: The action is carried out immediately.</li> </ul>
-----	--

	<p>Actuation of a key with the mouse:</p> <ul style="list-style-type: none"> <li>• Click on the corresponding key. The action is now carried out.</li> </ul>
Switch	<p>By means of a switch, a selection between two possibilities is possible. A switch is either switched on or - off.</p> <p>Actuation of a switch through the keyboard:</p> <ul style="list-style-type: none"> <li>• Push the keys UP or HOME to switch on the switch.</li> <li>• Push the keys DOWN or END to switch off the switch.</li> <li>• Push the SPACE key for changing over (switching over).</li> </ul> <p>Actuation of a switch with the mouse:</p> <ul style="list-style-type: none"> <li>• Click on the switch for changing over (switching over).</li> </ul>
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"> <li>• Push the key ENTER or TAB to finish with the input field.</li> <li>• 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.</li> </ul> <p>Actuation of an input field with the mouse:</p> <ul style="list-style-type: none"> <li>• Click within the input field, in order to position the cursor in it.</li> <li>• 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.</li> </ul>
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"> <li>• 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.</li> <li>• Push the key UP to cyclically select the previous selection.</li> <li>• Push the key DOWN to cyclically select the next selection.</li> <li>• Push the key HOME to select the first item of the selection list.</li> <li>• Push the key END to select the last item of the selection list.</li> </ul> <p>Actuation of a selection field with the mouse:</p> <ul style="list-style-type: none"> <li>• Click inside the selection field so that all selection possibilities are displayed and then click on the required selection.</li> </ul>

## 9.8 Starting of PASO DSV/SD6

Following the successful installation, the parameterisation software PASO DSV/SD6 can be started by double-clicking on the PASO DSV/SD6 - icon. Certain settings of the PASO DSV/SD6 software, e.g., the selected interface port, are saved in the file "konfig.kon". When PASO DSV/SD6 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 DSV/SD6 checks, whether a Wandfluh-Electronics device is connected. If no communication can be established, an error message appears (refer to section ["Communication interruption"](#)<sup>[47]</sup>) 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 DSV/SD6 can be utilised without any limitation.

If the communication works without any interference, the software PASO DSV/SD6 checks, whether the current configuration of the PASO DSV/SD6 corresponds with the configuration of the connected digital controller card. If no, a message will be displayed and the current configuration from the PASO DSV/SD6 will change automatically over to the new configuration

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"](#)<sup>[51]</sup>). 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 "File\_Activate On Line". 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 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 status line:

PASO state:

- 1st field: Selected interface ("USB")
- 2nd field: Current mode ("On Line" or "Off Line", refer to section ["Mode "Off Line" and "On Line"](#))

Device state:

- 2nd field: Operating mode ("Remote PASO" or "Local", refer to section ["Mode of operation"](#))
- 4th field: SD6 state ("Disabled" or "Active", refer to section ["SD6 State machine"](#))
- 5th field: Error state (Ready or Error, refer to section ["Analysis Diagnostic"](#))

## 9.9 Store parameter

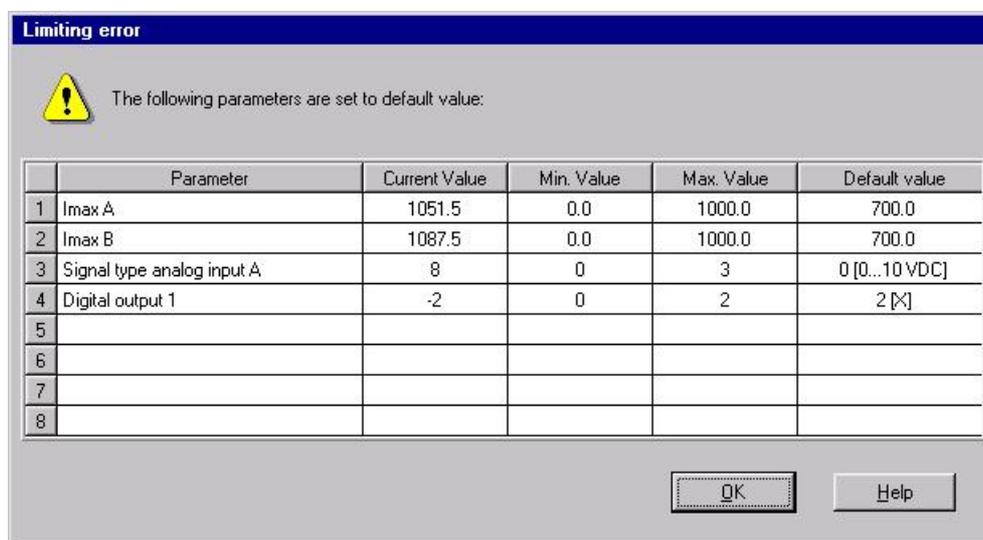
Each new input value is immediately transferred to the connected Wandfluh-Electronics after the completion of the input field (either by pushing the key ENTER or by activating another input field).

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.

## 9.10 Limiting value error

Each incoming parameter (either transferred via the serial 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

## 9.11 Description of Commands

The description of the individual commands and parameters is contained in section ["Settings"](#)<sup>10</sup>.

## 10 Disposal

- The SD6-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 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