OPERATING INSTRUCTIONS

DSV-Controller ELECTRONICS

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Operating Instructions for the DSV-Electronics

1 General Information

These Operating Instructions serve for using the electronics (DSV electronics) integrated into a DSV - valve (1 - or 2 - solenoid version) in line with their purpose, correctly, effectively and safely. The Operating Instructions comprise behavioural instructions, which Wandfluh or its resale organisations (Wandfluh sister companies or Wandfluh representatives) issue to the user in accordance with their obligation to instruct.

For this purpose, the operating instructions mainly contain:

• Information about the use in line with the purpose, installation and commissioning of the DSV - Electronics
• Information concerning safety when handling the control system

2 Product Description

2.1 General

The DSV-Electronics are a fixed component of a DSV-valve and are fixed installed on it. The connection takes place through one or more device plugs depending on the mode of driving.

2.2 Field of Application

Thanks to its compact design, the field of application of the DSV-Electronics is both in the mobile - as well as in the industrial field.

2.3 Conformity

The DSV-Electronics have been developed and tested according to the applicable rules of technology. In particular the EC - Guideline 89/336/EWG (EMV - Guideline) was applied.

2.4 Identification of the Product

With the PC - parameterisation software PASO DSV, the following information can be read directly from the DSV-Electronics (= electronic nameplate):

• Valve type
• Article number
• Serial number
• Software version
• Firmware version
• Card type
• Hardware configuration

2.5 Type Code

The DSV-Electronics do not have their own type code. The information concerning the DSV-Electronics is contained in the type code of the DSV-valve. A detailed description of them is included in the data sheet of the corresponding DSV-valve.

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2.6 Technical Data

2.6.1 General Characteristics

Version	Integrated on valve	
Connections	Device plug	M23 12pole male (power supply, digital I/O, set-point value)
	1 RS232 interface	M12 female (actual value)
		Plug RJ10 (under housing cover)
Operating temperature	-20 ... +65 °C	under difficult circumstances the solenoid current and with it the valve performance can if necessary be reduced (refer to the section "Temperature monitoring" on page 7)
Protection type	IP67 according to EN 60 529	With suitable counter-plug and housing cover closed

2.6.2 Electrical Characteristics

Supply voltage (dependent on valve type)		24 VDC or 12 VDC
Voltage range		21 ... 30 VDC or 10,5 ... 15 VDC
Residual ripple		< ±5 %
Fuse protection	The DSV-Electronics have to be protected with a slow-blow fuse on the user side	
Temperature drift		< 1% at $\Delta T = 40°$ C
No-load current		approx. 40 ... 50 mA
Maximum current demand	Installed on PI35 solenoid (24VDC)	1.0 A
	Installed on PI45 solenoid (24VDC)	1.2 A
	Installed on PI35 solenoid (12VDC)	2.0 A
	Installed on PI45 solenoid (12VDC)	2.4 A
Analogue inputs	1 differential input 10-Bit	0 ... 10 VDC
	1 differential input 10-Bit	0/4 ... 20 mA
	1 input 10-Bit (not differential)	0 ... 10 VDC or 0/4 ... 20 mA
	All inputs not galvanically separated	
Input resistance	Voltage input to mass	> 18 kOhm
	Working resistance for current inputs	= 250 Ohm
Digital input	1 input high-active	
	Switching level high	6 - 30VDC
	Switching level low	0 - 1VDC
Serial interface	1 interface acc. to RS232 C (plug RJ10) under housing cover	
Stabilised output voltages	1 output	+ 10 VDC
	at 12V supply voltage	+ 8 VDC
		max. load 10 mA
Solenoid current	Minimum current Imin adjustable	0 ... max. current demand
	Works setting	adapted to valve
	Maximum current Imax adjustable	Imin ... max. current dem.
	Works setting	adapted to valve
Dither	Frequency adjustable	20 ... 250 Hz
	Works setting	adapted to valve
	Level adjustable	0 ... 200 mA
	Works setting	adapted to valve
Digital output	1 output lowside switch	
	Umax	40 VDC
	Imax	-0.7 A
EMV: Interference immunity	EN 61000-6-2	
Interference emission	EN 61000-6-4	

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2.7 Block Diagram

Driving through the analogue interface:

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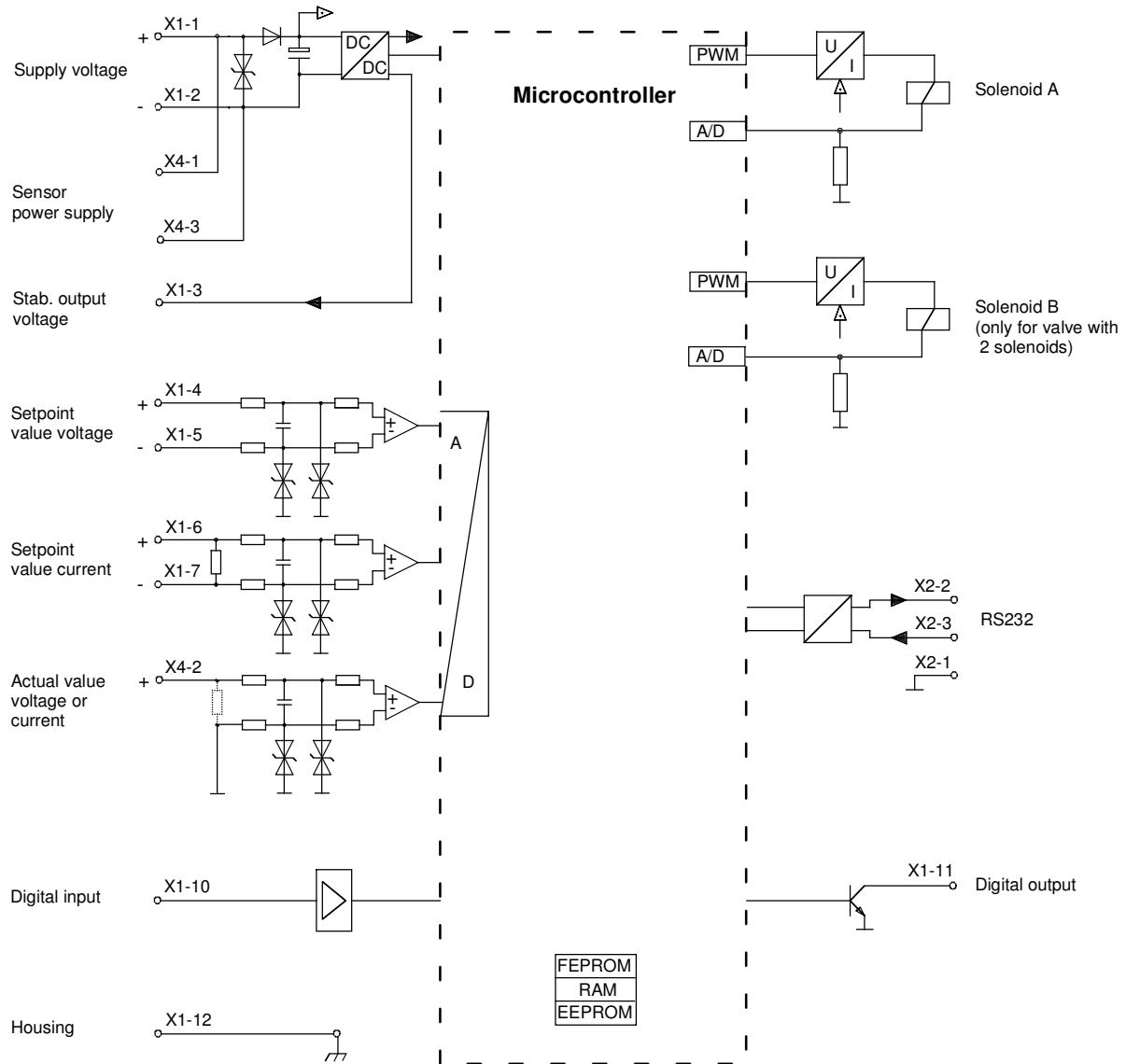
3 Safety Regulations

3.1 Installation / Commissioning / Parameterisation

- These Operating Instructions have to be thoroughly studied beforehand and its instructions have to be followed.
- Prior to the installation, all supply voltages and other energy sources have to be disconnected.
- Maloperation by the personnel cannot be prevented by the DSV-Electronics.
- Prior to switching on the supply voltage, the fuse protection, the correct wiring and the correspondence of the supply voltage with the admissible supply voltage range have to be checked.

- **The control system monitors internal control - as well as operating statuses on the plant side, it cannot, however, prevent uncontrolled movements resulting from an unforeseeable error on the DSV-Electronics in all cases.**

- **Danger to persons therefore has to be prevented on the plant side by interruption of the operating voltage through the EMERGENCY-OFF-CHAIN.**

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4 Construction and Function

Refer to section 2.7 "Block Diagram", page 5

4.1 Introduction

- The DSV-Electronics are fixed integrated on a DSV-valve.
- All inputs and outputs have to be contacted through the **device plugs**.
- Located under the housing cover is an RS232-interface, through which with the parameterisation software PASO DSV/SD6 the parameterisation and the diagnostics can be carried out.
- On the works side the DSV-Electronics are matched to the valve, so that, as a rule, no intervention by the user is necessary.

4.2 Functional Characteristics

With the „DSV"-Electronics, it is possible to build different closed circuit controls: positional control -, speed -, pressure - or volume flow control systems. They can optionally be adjusted in the form of a controller mode. In addition, an amplifier part is integrated, with which the built-on solenoid is directly driven.

The set-point value is conducted to the controller as an electric signal, a sensor records the actual value, this signal is also conducted to the controller. In correspondence with the control difference (set-point value - actual value), a control signal (solenoid current) is output to the valve.

By means of the scaling of the set-point value and actual value, all further inputs can be made in the required, resp., selectable physical unit (e.g., bar or mm, etc.). When the set-point value has been reached, then the „DSV" is capable of outputting a digital signal (optionally an „Error"- or „Target window reached " - signal).

The „DSV" - controller has a set-point value generator, with which the up - and down ramp of the internal set-point value can be predefined. The controller is designed as a PID - controller. The control characteristics as a result of this can be equalised and adapted to the control circuit. Furthermore, it is also possible to switch-off the control system completely for testing - and adjusting purposes. The „DSV" in this case operates in correspondence with normal amplifier electronics.

Furthermore, the „DSV" - electronics have a digital input for the enabling, as well as a digital output, which optionally is able to be parameterised as an "Error -" or "Target window reached" - output.

Changed parameters can be saved in a non-volatile memory, so that following a renewed switching-on of the control system they are still available once again.

The „DSV" - electronics in addition have a signal recording function. By means of PASO, this makes possible a recording of different system signals, such as, e.g., set-point value / actual value, control difference, solenoid currents, etc., which are able to be graphically displayed on a common time axis.

4.3 Temperature monitoring

The DSV electronics are provided with an internal, factory set temperature monitoring. Starting from a temperature threshold of 80 °C of the internal electronics temperature the preset solenoid current (Imax, refer to PASO Menu "Parameter_Valves" on page 24) is limited, depending on the temperature. The temperature of the DSV electronics is visible in the PASO data window (Menu "Analysis_Values", page 41). Since the self-heating of the solenoid, on which the DSV electronics are mounted, has an significant influence on the electronics temperature, this current limiting reduces the electronics temperature and allows electronics to be run (with reduced solenoid current) at higher ambient temperatures. In the PASO status line is displayed if this limiting, the so called 'derating', is active. With active 'derating' the valve operating range is restricted – the effect complies with that of a reduced preset value signal range (refer to the valve data sheet). In case of 2-solenoid service the derating affects both solenoids.

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Under typical operating conditions (valve mounted on hydraulic block, natural convection possible, oil temperature <70°C) the derating will usually not be activated, i.e. the internal electronics temperature is staying below the threshold of 80°C. Depending on the application, the derating activation temperature, i.e. the ambient temperature at which the internal electronics temperature exceeds the threshold of 80°C, is within the range between 45°C and 80°C.

☞ REMARK:
   At constant operating conditions, depending on the initial state, the thermal equilibrium, and with it the stationary temperature of the DSV-electronics, will possibly be reached only after ca. 2 hours.

In order to prevent exceeding the derating threshold, the electronics temperature can, if necessary, be reduced by one or more of the following measures:
1. Heat removal by
   - heat conduction (e.g. big hydraulic block, bigger oil flow, effect positive, up to 10°C less electronics temperature)
   - natural convection (valve not mounted in a narrow, closed box, effect positive, up to 20°C less electronics temperature)
   - forced convection (e.g. by ventilator, effect positive, up to 30°C less electronics temperature)
2. Preventing of external heating by
   - radiation (shielding from direct sun radiation resp. thermal radiation of hot objects effect up to 10°C less electronics temperature)
3. Average level reduction of solenoid current
   - Shorter power-on time of the solenoid (e.g. pressure controller with controlling time 10s, pause 10s)
   - Processing with less preset value and consequently less solenoid current
   - Overdesigned valve, allowing control with less preset value (solenoid current)

If the long-time rms-value of the solenoid current is reduced from I_{eff_old} to I_{eff_new}, the temperature of DSV-electronics will decrease:

$$T_{dsv\_new} = \frac{I_{eff\_new}^2}{I_{eff\_old}^2} \times (T_{dsv\_old} - T_{ambient}) + T_{ambient}$$

Description of the parameters:

T_{dsv_new} : temperature of the DSV-electronics after reducing the solenoid current
T_{dsv_old} : temperature of the DSV-electronics before reducing the solenoid current
$T_{ambient}$: ambient temperature
I_{eff_new} : reduced solenoid current rms-value
I_{eff_old} : original solenoid current rms-value

Example:
The temperature of DSV is 70°C and the ambient temperature is 30°C.
If the rms-value of the solenoid current is reduced by 10% (I_{eff_neu} / I_{eff_alt} = 0.90), the DSV temperature after current reduction will be:

$$T_{dsv} = (0.90)^2 \times (70 - 30) + 30 = 62.4°C$$

As a result of the number of influencing variables the maximum allowable ambient temperature can only be acquired by experiment in an appropriate application. In this sense the upper ambient temperature limit of 65°C, indicated in the data sheet, has to be interpreted as an approximate value.

☞ REMARK:
   If the monitored temperature exceeds the boundary of 90°C, the DSV is switched into the error state. The solenoid outputs are blocked, in order to prevent permanent electronics damage. After cooling off and acknowledging the error (refer to chapter "The System does not operate" on page 45) the DSV can be started up again.

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4.4 DSV State Machine

In the following, with the help of a status diagram it is described, how the start-up of the DSV-Electronics takes place and which operating statuses are reached when and how.
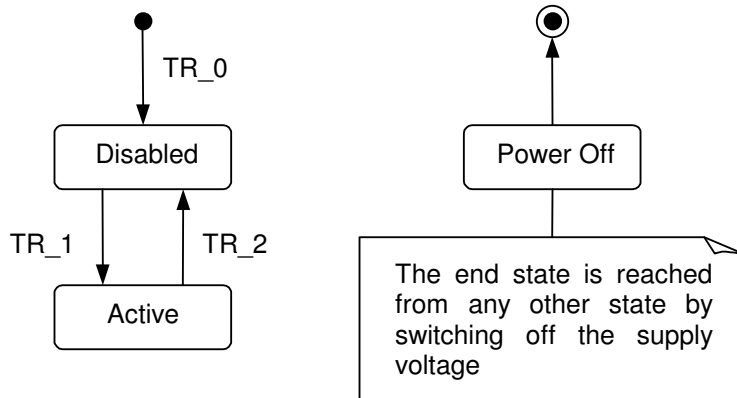
For a description of the start-up procedure for a DSV-Electronic with CAN-fieldbus please refer to the document "Operating Instructions DSV CANopen - Protocol with Device Profile in accordance with CiA DSP 408".

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

Operating status	Description
Disabled	• The DSV-Electronics are disabled, no solenoid current is active • In this status the operating mode can be set with the command "Local operation", resp. "PASO operation" (refer to section "Commands_Local Operation / PASO Operation" page 40)
Active	• DSV-Electronics are enabled • The DSV-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	Enabling This takes place in the operating mode "Local" through the digital input "Enable control system" (refer to section "Digital Input" page 11) and in the operating mode "PASO operation" with the command "Enable" (refer to section "Commands_Disable / Enable" page 40).
TR_2	Disabling This takes place in the operating mode "Local" through the digital input "Enable control system" (refer to section "Digital Input" page 11) and in the operating mode "PASO operation" with the command "Enable" (refer to section "Commands_Disable / Enable" page 40).

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4.5 Operating Mode

The DSV-Electronics have 3 operating modes. The following table shows, what can be done in the different operating modes and how they are set:

Operating mode	Activated by	Description
Local	Menu point "Commands_Local operation" or by field-bus object "Device local"	Driving through the analogue - and digital inputs on the DSV-Electronics
Remote PASO	Menu point "Commands_PASO operation"	Driving directly through PASO
Remote	By field-bus object "Device local"	Driving through the field-bus

The current operating mode is indicated in the status line (refer to the image of section "Starting of PASO DSV/SD6" page 49).

More detailed information about the operating mode "Local" and "Remote PASO" can be found in the section "Commands_Local Operation / PASO Operation" page 40.

More detailed information about the possibilities of the DSV-Electronics with bus nodes can be found in the document "Operating Instructions DSV CANopen - Protocol with device profile in accordance with CiA DSP 408".

4.6 Analogue Inputs

- The analogue signal present is digitalised in the 10-Bit A/D-converter.
  Attention: In case of the selection of the range 4 ... 20mA, the resolution is < 10-Bit!
- **Differential inputs**
  The analogue inputs 1 and 2 are implemented as differential inputs. Differential inputs are used, when the potential of the mass of the external set-point value transmitter does not correspond to the mass on the DSV-Electronics. If the differential input is to be used as an analogue input versus mass, the
  – (minus) connection of the differential input has to be connected with the mass of the DSV-Electronics.
- **Analogue input 1** (for differential voltage signal)
  Input voltage range: 0 ... +10V
                         0 ... ±10V (only 2-solenoid version)
- **Analogue input 2** (for differential current signal)
  Input current range: 0 ... +20mA / 4 ... +20mA
- **Analogue input 3** (not differential)
  Depending on the DSV-type:
  Analogue input as voltage input: 0 ... +10V
  Analogue input as current input: 0 ... +20mA / 4 ... +20mA

4.7 Cable-break Monitoring

The analogue inputs can be detected for a cablebreak, as far as it concerns current inputs (depending on the DSV type). If a cablebreak is present, the corresponding solenoid outputs will be disabled or supplied with a fixed current value (refer to section "Analysis_Diagnostics" on page 43), and the output "Error" will be activated. For the monitoring to be effective, the following conditions have to be fulfilled:

- The input signal has to be a current signal 4 ... 20mA
- The parameter "Cable-break monitoring" has to be on "On"
  (refer to section "Configuration_Signal scaling" Page 32)

Attention: Approx. 100 ms pass until the detection of a cable-break. During this time the axis can make unintended movements!

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4.8 Digital Input

- **Digital input "Enable control system"**
  The digital input is high-active (refer to section "Electrical Characteristics" page 4).
  Enables the DSV-Electronics in general. Without this enabling, no solenoid current is output. This digital input can also be set with the parameterisation software PASO DSV
 (refer to section "Configuration_Digital I/O" page 39)

4.9 Outputs

- **Proportional solenoid outputs A and B**
  The max. 2 solenoid outputs have a current output with 1000 Hz **P**ulse-**W**idth-**M**odulation with superimposed dither. Because the DSV-Electronics are fixed integrated on the DSV-valve, the solenoid connections are fixed wired and cannot be separated from outside!

- **Digital output "Error"/"Ready" or "Inside target window"/"Outside target window"**
  The digital output can be configured by the PASO DSV Software as "Error"/"Ready"-output or as "Inside target window"/"Outside target window"-signalisation or the output can be set fixed on 0 or 1 (refer to section "Configuration_Digital I/O" on page 39). An once detected error is active until the DSV-Electronics will be disabled and enabled through the digital input "Enable control" or by PASO (refer to section "Configuration_Digital I/O" page 39).

Functioning of a cable break at the digital output with the setting "Error":
(Default setting)
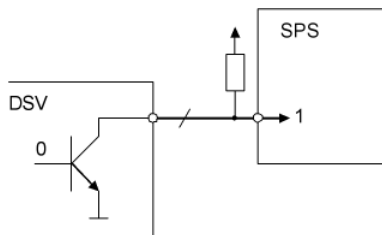
- if no error is active, the DSV supplies a 0 (no connection to GND)
- in the PLC, this gives a 1
- PLC must be programmed in the way that a 1 will be detected as "No error"
4. if the cable breaks between DSV and PLC, the PLC is still getting a 1
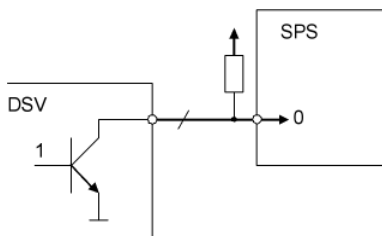
- if an error is active, the DSV supplies a 1 (connection to GND)
- in the PLC, this gives a 0
- PLC must be programmed in the way that a 0 will be detected as "Error"
- if the cable breaks between DSV and PLC, the PLC is getting a 1 again (= No error)

Functioning of a cable break at the digital output with the setting "Ready":
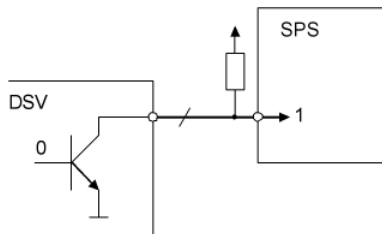
- if an error is active, the DSV supplies a 0 (no connection to GND)
- in the PLC, this gives a 1
- PLC must be programmed in the way that a 1 will be detected as "Error"
- if the cable breaks between DSV and PLC, the PLC is still getting a 1
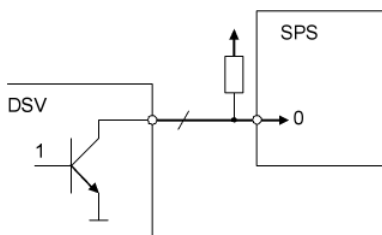
- if no error is active, the DSV supplies a 1 (connection to GND)
- in the PLC, this gives a 0
- PLC must be programmed in the way that a 0 will be detected as "No error"
- if the cable breaks between DSV and PLC, the PLC is getting a 1 again (= Error)

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4.10   Controller Modes

The DSV-Electronics provide the following controller modes:

- **Controller mode 3 "Pressure control valve without pressure sensor"**
  This controller mode corresponds to a pressure control open loop.
- **Controller mode 4 "Pressure control valve with pressure sensor"**
  This controller mode corresponds to a pressure control closed loop.
- **Controller mode 6 "Axis position controlled"**
  This controller mode corresponds to a positional control open loop.
- **Controller mode 7 "Speed control"**
  This controller mode corresponds to a speed control.
- **Controller mode 9 "Run to axis position under control"**
  This controller mode corresponds to a position control closed loop.

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4.11   Mode of Operation

The mode of operation is only of significance in controller mode 3 and 6. In all other controller modes the mode of operation is not taken into consideration. The following 4 modes of operation are possible:

- **Mode of operation "Set-point value unipolar (1-solenoid)"**
  This mode of operation is only selectable with the 1-solenoid version.
  With an analogue input (voltage or current) with a 1-solenoid valve the solenoid A is driven.
   0% ... 100% set-point value = Imin ... Imax solenoid A
- **Mode of operation "Set-point value unipolar (2-solenoid)"**
  This mode of operation is only selectable with the 2-solenoid version.
  With an analogue input (voltage or current) with a directional control valve, solenoid A and solenoid B are driven.
     0% ...   50% set-point value = Imax ... Imin solenoid B
   50% ... 100% set-point value = Imin ... Imax solenoid A
- **Mode of operation "Set-point value bipolar (2-solenoid)"**
  This mode of operation is only selectable with the 2-solenoid version.
  With an analogue input (voltage) of 0 ... ±10V with a directional control valve, solenoid A (positive voltage) and solenoid B (negative voltage) are driven.
   -100% ...   0% set-point value = Imax ... Imin solenoid B
       0% ... +100% set-point value = Imin ... Imax solenoid A
- **Mode of operation "Set-point value unipolar (2-solenoids individually)"**
  This mode of operation is only selectable with the 2-solenoid version.
  The 2 solenoids are driven independently of one another. Two separate set-point value inputs are necessary.
  With an analogue input (voltage or current) solenoid A is driven, with a second analogue input (voltage or current) solenoid B is driven.
   0% ... 100% set-point value1 = Imin ... Imax solenoid A
   0% ... 100% set-point value2 = Imin ... Imax solenoid B

  This mode of operation is not in available on the DSV-Electronics in standard version!

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5 Operation - and Display Elements

5.1 General

The DSV-Electronics do not have any actual operation - and display elements. All inputs and outputs have to be contacted through the device plug or plugs. Under the housing cover there is an RS232 (serial) interface, through which with the PC - parameterisation software PASO DSV the parameterisation and diagnostics can be carried out.

On the works side the DSV-Electronics are adapted to the valve, so that, as a rule, no intervention by the user is necessary.

5.2 View of the Device Plug

Power supply, digital - I/O and set-point value:
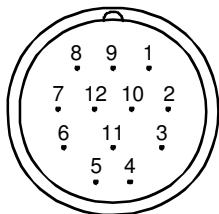
1 = Supply voltage +
2 = Supply voltage 0 VDC
3 = Stabilised output voltage
4 = Set-point value signal voltage +
5 = Set-point value signal voltage -
6 = Set-point value signal current +
7 = Set-point value signal current -
8 = Reserved for options
9 = Reserved for options
10 = Enable signal (digital input)
11 = Error or Ready signal (digital output)
12 = Chassis

Device plug M23, 12-pole (male)

Actual value:

1 = Supply voltage +
2 = Actual value signal +
3 = Supply voltage 0 VDC
4 = Reserved
5 = Reserved
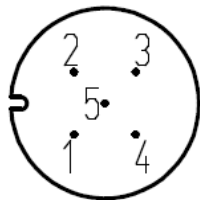
Device plug M12, 5-pole (female)

5.3 View of Serial Parameterisation Interface RS 232 C
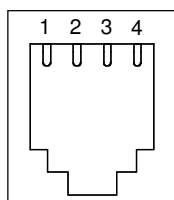
1 = GND
2 = TXD
3 = RXD
4 = not assigned

Plug RJ10

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6   Commissioning

Please take note of the section "Safety Regulations" on page 6.

6.1   Connection Instructions

The contact assignment of the following description refers to the section "Operation - and Display Elements" page 14 as well as to the section "Connection Examples" page 17.

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 of the DSV-Electronics (refer to section "Electrical Characteristics" page 4).
- The limit values of the supply voltage and its residual ripple have to be observed indispensably (refer to section "Electrical Characteristics" page 4).
- The DSV-Electronics have to be fuse protected with a slow-blow fuse.

6.1.2   Digital Inputs and Outputs

- The digital input is "high-active" and not galvanically separated.
- For activation it has to be connected to a voltage of between 6 ... 30VDC (e.g., supply voltage)

Control external   Control internal

6 ... 30V
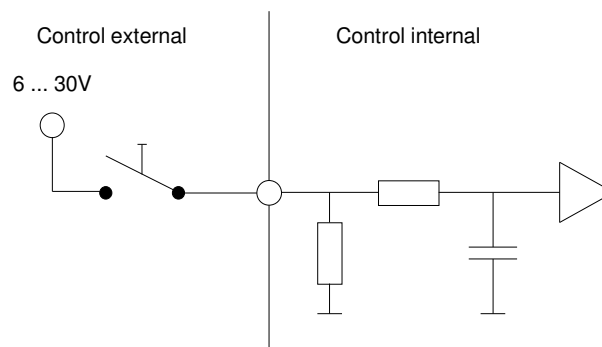
- The digital output is a "Lowside switch" - output (open - collector).

Control internal   Control external

max 40V / 0.7A

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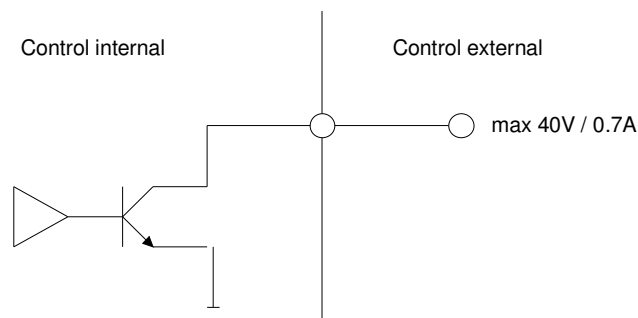
6.1.3 Set-point Value Analogue Inputs 10-Bit

- Available are both a voltage -p and a current input.
- Both inputs are differential inputs.
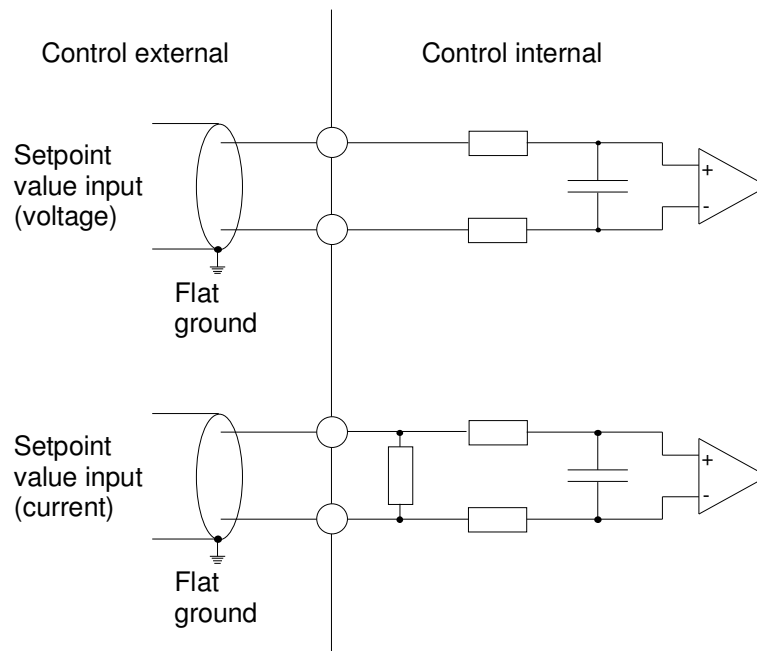
6.1.4 Configuration of the Set-point Value Analogue Inputs 10-Bit

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

Input signal	Assignment device socket	Input range
Voltage input against mass	+ to X1-4 / X1-5 to mass	0 ... +10V
		0 ... ±10V
Voltage differential input	+ to X1-4 / - to X1-5	0 ... +10V
		0 ... ±10V
Current input against mass	+ to X1-6 / X1-7 to mass	0 ... 20mA
		4 ... 20mA
Current differential input	+ to X1-6 / - to X1-7	0 ... 20mA
		4 ... 20mA

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6.1.5   Actual Value Analogue Input 10-Bit

- There is only one analogue input available for the actual value. Depending on the DSV-type, it is configured as a voltage - or current input.
- **The actual value input is not differential**
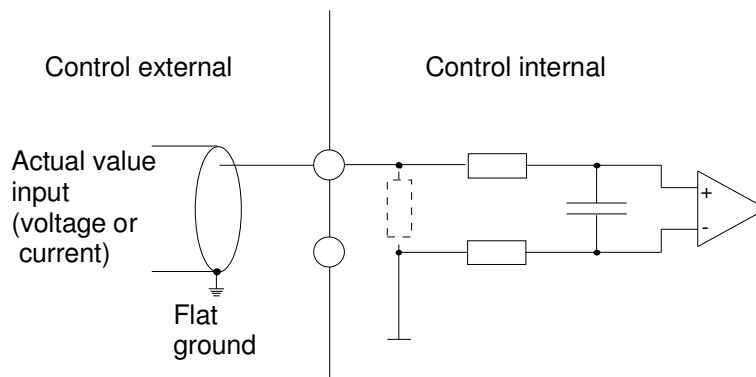
6.1.6   Configuration of the Actual Value Analogue Input 10-Bit

The actual value analogue input 10-Bit can be configured as follows:

Input signal	Assignment device socket	Input range
Voltage input against mass	+ to X4-2	0 ... +10V
		0 ... ±10V
Current input against mass	+ to X4-2	0 ... 20mA
		4 ... 20mA

6.2   Connection Examples

The contact assignment of the following connection examples refers to the section "Operation - and Display Elements" page 14.

REMARK:
In this document different device interfaces are described (refer to section "Functional Characteristics" page 7), correspondingly the connection assignments are different.

6.2.1   Connection of the Supply Voltage

F = Slow-blow fuse
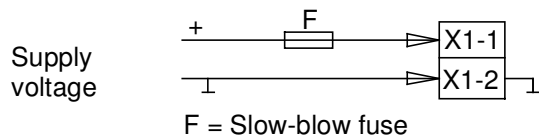
6.2.2   Connection of the Digital Inputs / Outputs

R = Consumer resistance for max current 0.7A

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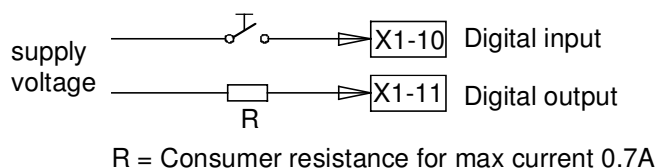
6.2.3 Connection Set-point Value with Potentiometer (not differential)

```
                    ┌──────┐
          ┌─────────│ X1-3 │
          │         └──────┘
      ┌───┤
      │   │         ┌──────┐
      │   └────────▷│ X1-4 │
      │             └──────┘
      │         ┌───┌──────┐
      │         │   │ X1-5 │
      │         │   └──────┘
      │         │   ┌──────┐
      └─────────┴───│ X1-2 │─┐
                    └──────┘
```
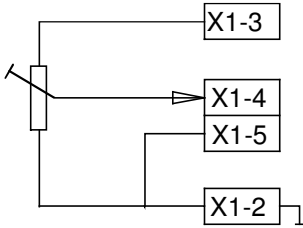
6.2.4 Connection Voltage Set-point Value with External Set-point Value Transmitter (differential)

```
┌─────────┐ +         ┌──────┐
│ 0…10 V  │────────▷──│ X1-4 │
│ ±10V    │─┐──────▷──│ X1-5 │
└─────────┘           └──────┘
```
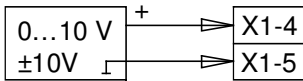
6.2.5 Connection Current Set-point Value with External Set-point Value Transmitter (differential)

```
┌──────────┐ +        ┌──────┐
│ 0…20 mA  │──────▷───│ X1-6 │
│ 4…20 mA  │─┐────▷───│ X1-7 │
└──────────┘          └──────┘
```
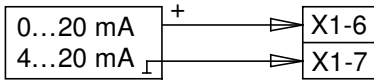
6.2.6 Connection Voltage Actual Value with Potentiometer
(DSV version with sensor voltage input, not differential)

```
                    ┌──────┐
          ┌─────────│ X1-3 │
          │         └──────┘
      ┌───┤
      │   │         ┌──────┐
      │   └─────────│ X4-2 │
      │             └──────┘
      │             ┌──────┐
      └─────────────│ X4-3 │─┐
                    └──────┘
```
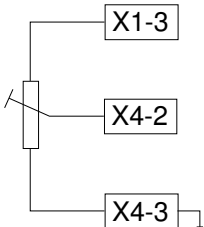
6.2.7 Connection Actual Value of a Pressure Sensor with Current Signal
(DSV version with sensor current input, not differential)

2-conductor

```
┌─────────┐ +Vs    ┌──────┐
│ P  /    │────────│ X4-1 │
│   /     │        └──────┘
│  / Iout │        ┌──────┐
│ /    I  │───────▷│ X4-2 │
└─────────┘        └──────┘
```

3-conductor

```
┌─────────┐ +Vs    ┌──────┐
│ P  /    │────────│ X4-1 │
│   / Iout│        └──────┘
│  /      │        ┌──────┐
│ /    I  │───────▷│ X4-2 │
│      GND│        └──────┘
│         │        ┌──────┐
└─────────┘────────│ X4-3 │─┐
                   └──────┘
```

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7 Settings

Please take note of the section "Safety Regulations" page 6.

7.1 Introduction

- The system - and parameter settings can be made through the PC - parameterisation software PASO.
- Information about the installation and operation of the PC - parameterisation software PASO DSV can be found in the section "PASO DSV/SD6 Installation and Operation" page 46.
- Depending on the connected DSV-Electronics, certain setting may be not available, resp. disabled.

7.2 General

In order to be able to select the menus, resp. sub-menus listed below, first a parameter set for the processing in the memory has to be present, or a new one has to be established. To do this, one of the following commands has to be executed:

- File_New
- File_Load
- Start PASO DSV with an active connection to the DSV-Electronics (in this case the data are loaded from the DSV-Electronics)

7.3 Parameter inconsistency

The parameter settings can be made via the PC-Parameterisation software PASO DSV or via the fieldbus (only, if the DSV-Electronics have a fieldbus). 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:
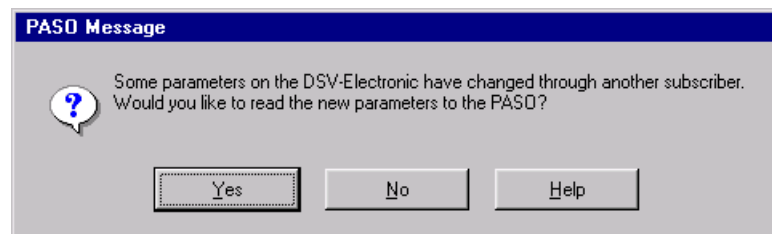
If the answer is "Yes", then the parameters will be read-in from the DSV-Electronics. Possible open parameter windows in the PASO will be closed automatically. If a parameter value will be changed through the fieldbus after the read-in of the new parameters, this message will appear again.

If the answer is "No", then the displayed parameter values in the PASO do not correspond to the current parameter value on the DSV-Electronics. This will be displayed in the status line in the field "Parameter inconsistency" (refer to the image of section "Starting of PASO DSV/SD6" page 49). 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.

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7.4 Information for the First Commissioning

1. Connect the power supply, leave the DSV-Electronics still switched-off.
2. Switch-off the hydraulic drive (hydraulics switched-off).
3. Carefully check the connections.
4. Switch-on the power supply.
5. Establish communication with PASO (connect PC and axis controller with RS232 cable and start PASO).
6. Configure the DSV-Electronics specific to the installation. In doing so, the following sequence should be observed:
   - In the menu "Configuration_Controller mode" make the corresponding settings
   - In the menu "Configuration_Signal scaling" make the corresponding settings
7. Switch-on the hydraulics.
8. For the card to be enabled, the digital input "Enable Control" has to be set (refer to section "Digital Input" page 11).
9. Corresponding to the set-point value preset, the axis should now run up to the required position.
   If the axis only runs up to the mechanical stop in one direction, then the system control sense is probably wrong (change it in the menu point "Parameter_Controller mode").
   The set-point value direction (e.g., potentiometer left/right) should correspond to the axis direction. If not, either change the set-point value direction or the actual value direction (change in the menu point "Configuration_Signal scaling"). If the actual value direction is reversed, then simultaneously the connection of the solenoids 1 and 2 have to be switched.
10. Set the drive currents of the valves in the menu "Parameter_Valves".
11. Set the control parameters in the menu "Parameter_Controller".
12. Make the settings in the menu "Parameter_Window".

☞ REMARK:
   The DSV-Electronics are supplied configured with the controller mode 3 "Pressure control valve without pressure sensor" (1-solenoid version), resp. controller mode 6 "Move without control " (2-solenoid version).

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7.5 File Menu

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

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.

- Device type:
  The device type of the connected Wandfluh-Electronics
- Selection of the function (only with device type "DSV"):
  The function of the selected device type
- Number of solenoids:
  The number of solenoids from the selected device type

7.5.2 File_Load...

This menu point is only active in the "Off Line" - mode.
With this command an existing file is opened from a data carrier. First the file selection window appears. In this window the required file can be selected and opened with "OK". If the configuration of the selected file does not correspond to the current configuration of the PASO DSV, then a remark appears, that the PASO DSV is being adapted to the new configuration of the selected file. The parameters read-in are checked for a limit value exceeding. If one or several parameters are outside the tolerance, then a corresponding message appears and standard values are assigned to these parameters (refer to section "Limiting value error" page 51). After the successful loading, now the parameters can be edited and changed under the corresponding menu points if required.

7.5.3 File_Save

With this command, the parameters are saved to a data carrier. All parameter values of all input windows are saved under the current file name. If no file name has been defined yet, i.e., the file name is 'noname', then first the file selection window appears (refer to section "File_Save as... " page 21)

7.5.4 File_Save as...

With this command the parameters are saved to a data carrier. All parameter values of all input windows are saved under the entered file name.
First the file selection window appears. In this window the required file name can be entered. If the file name is entered without extension, then automatically the extension ".par" is assigned. After actuating the key "Save", the file information window appears (refer to "File_File-Info" on page 22). In this window the required entries can be made. With the key "Save" the file is finally saved under the selected file name. With the key "Cancel" one returns to the file window.

7.5.5 File_Print...

With this command the current parameters are printed in ASCII text format. The print window is opened. In this window one can 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".** Otherwise possibly a new program start is necessary and any data not saved will be lost.

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

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7.5.6 File_File-Info

With this command the file information of an existing file is displayed. A 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 DSV-Electronics at the moment of saving. If no DSV-Electronics are connected ("Off Line" – mode) then this output remains void. In the case of saving during the "On Line" -, this indication is updated.
Operator:	The name of the operator
Remarks:	Possibility of entering remarks about the file.

If the File-Information window appears during the execution of the command "File_Save under…", then the corresponding entries can be made in the various fields (with the exception of the fields "Date", "Time", "File name" and "Valve type", which cannot be edited). If the File-Information window appears during the execution of the command "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 DSV-Electronics is broken off. All the menu points, which require a communication with the DSV-Electronics, are disabled. The PASO DSV software now runs in the "Off Line" - mode. The loading, saving and the processing of parameter files is possible in this mode.

On Line

With this command the connection with the DSV-Electronics is established. The communication with the DSV-Electronics is briefly checked. If the connection works, then the user has the choice of taking over the parameters from the DSV-Electronics or of transferring the parameters to the DSV-Electronics. During the transfer of the parameters the user has the possibility of aborting.

First it is checked, whether the current configuration of the PASO DSV corresponds with the configuration of the connected DSV-Electronics. With configuration here is number of solenoids is meant. If the configuration of the connected DSV-Electronics does not correspond to the current configuration of the PASO DSV, then the remark appears, that the PASO DSV is being adapted to the new configuration.

If the parameters have been taken over by the DSV-Electronics, then the parameters are checked for exceeding the limit values. If one or several parameters are outside the tolerance, then a corresponding message appears and standard values are assigned to these parameters (refer to section "Limiting value error" page 51). The PASO DSV remains in the "Off Line" - mode. In order to get to the "On Line" - mode in this case, the parameters have to be transferred to the DSV-Electronics. If the transfer is successful and the verification check OK, then the software subsequently runs in the "On Line" - mode. The loading of parameter files is not possible in this mode.

The respective status is displayed in the Status line.

7.5.8 File_Datarecord - Info

This menu point is only active in the "On Line" - mode.
Under this menu, the current data set information of the connected DSV-Electronics appears. The data correspond to the last made change of the parameters.

7.5.9 File_SW-Download

If the axis controller is equipped with a flash EPROM, then by choosing this command a new axis controller software can be loaded into the axis controller. This menu item is mainly used for customer specific solutions and it is protected by password. The menu is only active in "Off Line Mode". The download file with axis controller software together with the password will be provided by Wandfuh AG. After password input the File Selection Window appears. The download file can be selected and downloaded on the axis controller. Please notify the Paso instructions.
ATTENTION: Any failed download will make the axis controller ineffective!

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7.5.10 File_Exit

With this command PASO DSV is terminated. If parameter files have been changed and not yet saved to a file, then the question appears whether these data still have to be saved. This only refers to the saving to a file. On the DSV-Electronics the parameter data are saved respectively by actuating the key "OK" in the corresponding input window (refer to section "Store parameter" page 50).

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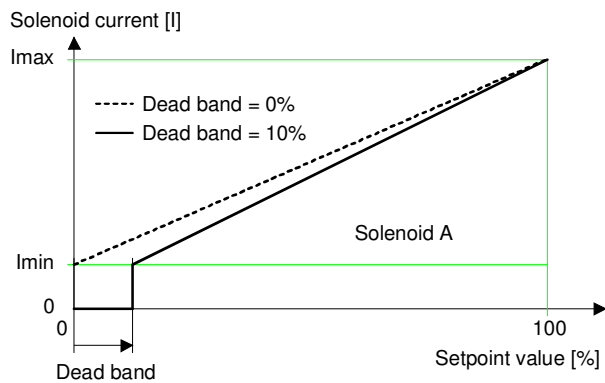
7.6 Parameter - Menu

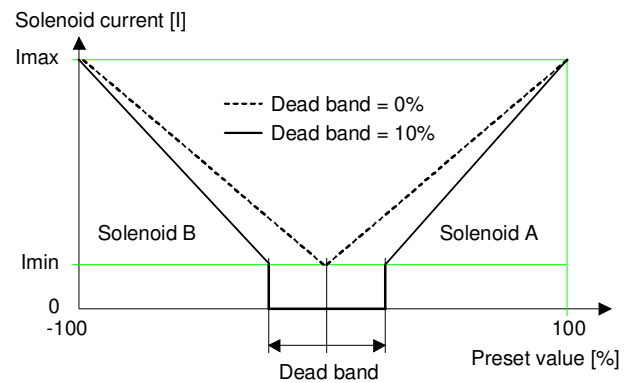In the Parameter - menu, all parameter values of the DSV-Electronics are set.

7.6.1 Parameter_Valves

In this window all valve-specific settings are made. On delivery ex works, these settings are made adapted to the valve. **By changing the valve parameters, the valve characteristics are changed. This has an influence on the system behaviour.** By the execution of the menu point "Configuration_Load Works Setting", the settings made by the works can be activated again at any time.

Field	Parameter description	Range / Step size
Direct solenoid actuation	If this switch is selected, then with the Imin and Imax setting automatically internal 0% resp., 100% set-point value is preset. If this switch is not selected, then the external set-point value is read in. **This command is only active in the "On line" - mode and in the operation mode "Remote PASO".**	
Solenoid current	For every solenoid output a minimum and a maximum solenoid current can be individually set, corresponding to 0%, resp. 100% of the set-point value. In the "Off Line" mode, the theoretical Imin/Imax - values are entered, without a valve, resp. a solenoid being connected to the control system. In the "On Line" - mode, when entering an Imin value on the DSV-Electronics, a set-point value of 0%, resp. in the case of Imax, a set-point value of 100% is applied (only when the switch "Direct solenoid actuation" is selected). Due to the digitalisation, the numbers entered may be modified into less 'rounded-off' numbers.	
Imin A	Setting minimum solenoid current A. (= Solenoid current at 0% set-point value)	0 ... max. current 1.5mA
Imax A	Setting maximum solenoid current A. (= Solenoid current at 100% set-point value) Max. current refer to section "Electrical Characteristics" page 4.	Imin ... max. current 1.5mA
Imin B (only 2-solenoid version)	Setting minimum solenoid current B. (= Solenoid current at 0% set-point value)	0 ... max. current 1.5mA
Imax B (only 2-solenoid version)	Setting maximum solenoid current B. (= Solenoid current at 100% set-point value) Max. current refer to section "Electrical Characteristics" page 4.	Imin ... max. current 1.5mA
Frequency	The dither frequency can be set in steps.	20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 100, 125, 165, 250, 500Hz
Level	Level of the alternating current superimposed on the solenoid.	0 ... 199mA 1.5mA
Dead band	Set-point value <Dead band = 0mA solenoid current A and B Set-point value >=Dead band = Imin ... Imax solenoid current A and B **This setting can only be made with controller mode 3 and 6.**	0 ... 100% 0.1%

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1-solenoid version

2-solenoid version

Influence of Deadband adjustement on Solenoid characterstitics
In the second example the Deadband range is: -10%...+10%

7.6.2 Parameter_Ramps

In this window all settings of the ramp function are made. **The ramps can only be set in the controller mode 3 and 6**. In all other controller modes the ramp settings have no significance.

Field	Parameter description	Range / Step size
Ramps	After a set-point value jump the new set-point value is run-up to over a linear ramp (depending on the ramp time set). For both solenoids separately a ramp time Up and a ramp time Down can be set.	
Ramp A Up	The ramp time set refers to a set-point value jump from 0% to 100% for the solenoid A.	0 ... 51s 0.05s
Ramp A Down	The ramp time set refers to a set-point value jump from 100% to 0% for the solenoid A.	0 ... 51s 0.05s
Ramp B Up (only 2-solenoid version)	The ramp time set refers to a set-point value jump from 0% to 100% for the solenoid B.	0 ... 51s 0.05s
Ramp B Down (only 2-solenoid version)	The ramp time set refers to a set-point value jump from 100% to 0% for the solenoid B.	0 ... 51s 0.05s

7.6.3 Parameter_Preset Value Generator

In this window all settings concerning the set-point value generator are made**. The set-point value generator can only be set in the controller modes 4, 7, and 9.** In all other controller modes, the set-point value generator settings have no significance.

Field	Parameter description	Range / step size
Speed+	After a positive set-point value jump the new set-point value is run-up to over a linear ramp (depending on the speed+ set). On the actuator this corresponds to a certain travel speed.	0 ... 2000 0.01
Speed-	After a negative set-point value jump the new set-point value is run-up to over a linear ramp (depending on the speed- set). On the actuator this corresponds to a certain travel speed.	0 ... 2000 0.01

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7.6.4 Parameter_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 deviation. This way, asymmetrical characteristics of the hydraulic system can be compensated for.

Field	Parameter description	Range / step size
Symmetrical setting	If this function is activated, the setting changes of the positive controller block are also transferred to the negative controller block or vice versa.	
Command feed forward	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.	0 ... 10 0.1
Velocity feed forward	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.	0 ... 10 0.1
I-Term, if control deviation > I-Window outside	I-Term is set to 0 if the control deviation is greater than I-Window outside. I-Term is frozen if the control deviation is greater than I-Window outside. I-Term is reduced by the I-Reduction time if the control deviation is greater than the I-Window outside. If the I-Reduction time is set to 0, the I-Term is frozen if the |control deviation| is greater than I-Window outside.	set to 0 leave value reduce
P-Ampl. positive	P-Amplification factor for positive control deviation	0 ... 25 0.1
I-Time positive	Time constant to integrate positive control deviations. If this time is set to 0, positive control deviations are not integrated. If the I-Time positive and the I-Time negative are set to 0, the I-Term is set to 0, as it is at pover up.	0 ... 10s 0.001s
I-Reduction time positive	Time constant for the reduction of the I-Term, if the control deviation is greater than the I-Window outside positive. The I-Reduction time positive can only be set if the "I-Term, if control deviation > I-Window outside" has been set to "reduce".	0 ... 3.3s 0.001s
I-Window outside positive	Defines the outside I-Window. If the control deviation is positive and less than the I-Window outside positive, the I-Term is calculated with the I-Time positive.	Adapted to unit
I-Window inside positive	Defines the inside I-Window. If the control deviation is within this window, the I-Term is frozen.	Adapted to unit
D-Ampl. positive	D-Amplification factor for positive control deviations.	0 ... 10
D-Time positive	Filter time constant for positive control deviations for the DT1-controller	0 ... 10s 0.001s
P-Ampl. negative	P-Amplification factor for negative control deviation	0 ... 25 0.1

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I-Time negative	Time constant to integrate negative control deviations. If this time is set to 0, negative control deviations are not integrated. If the I-Time positive and the I-Time negative are set to 0, the I-Term is set to 0, as it is at pover up.	0 ... 10s 0.001s
I-Reduction time negative	Time constant for the reduction of the I-Term, if the control deviation is greater than the I-Window outside negative. The I-Reduction time negative can only be set if the "I-Term, if control deviation > I-Window outside" has been set to "reduce".	0 ... 3.3s 0.001s
I-Window outside negative	Defines the outside I-Window. If the control deviation is negative and less than the I-Window outside negative, the I-Term is calculated with the I-Time negative.	Adapted to unit
I-Window inside negative	Defines the inside I-Window. If the control deviation is within this window, the I-Term is frozen.	Adapted to unit

Example with outside and inside I-window:
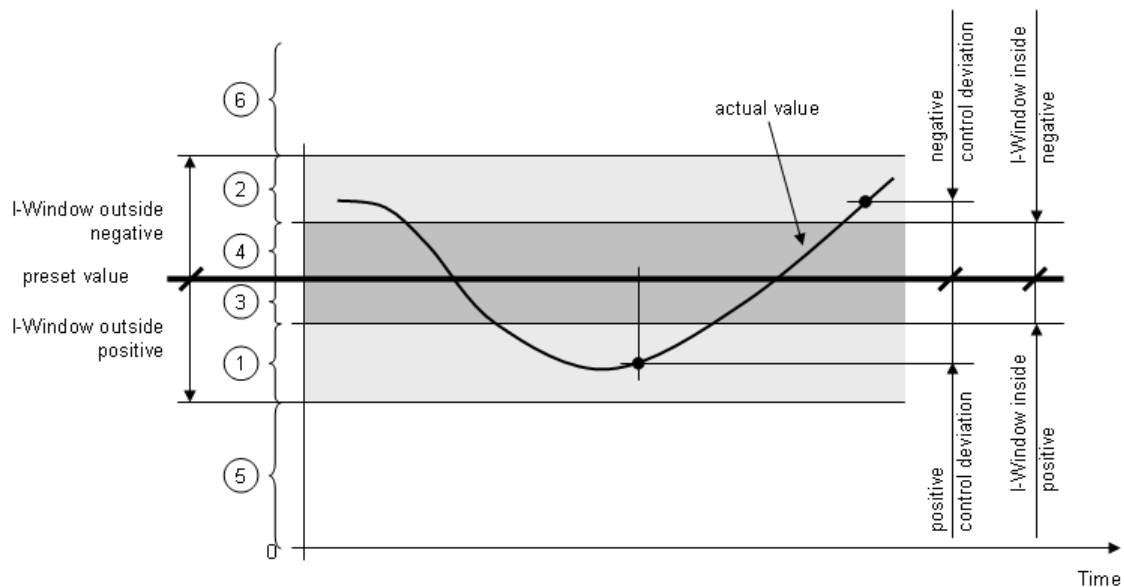
1   In this band, the I-Term is calculated with the I-Time positive

2   In this band, the I-Term is calculated with the T-Time negative

3, 4   In this band, the I-Term is frozen

5   Below (preset value - I-Window outside positive) the I-Term is either set to zero, frozen or reduced depending on the setting "I-Term, if control deviation > I-Window outside"

6   Above (preset value + I-Window outside negative) the I-Term is either set to zero, frozen or reduced depending on the setting "I-Term, if control deviation > I-Window outside"

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Block diagram of the controller:

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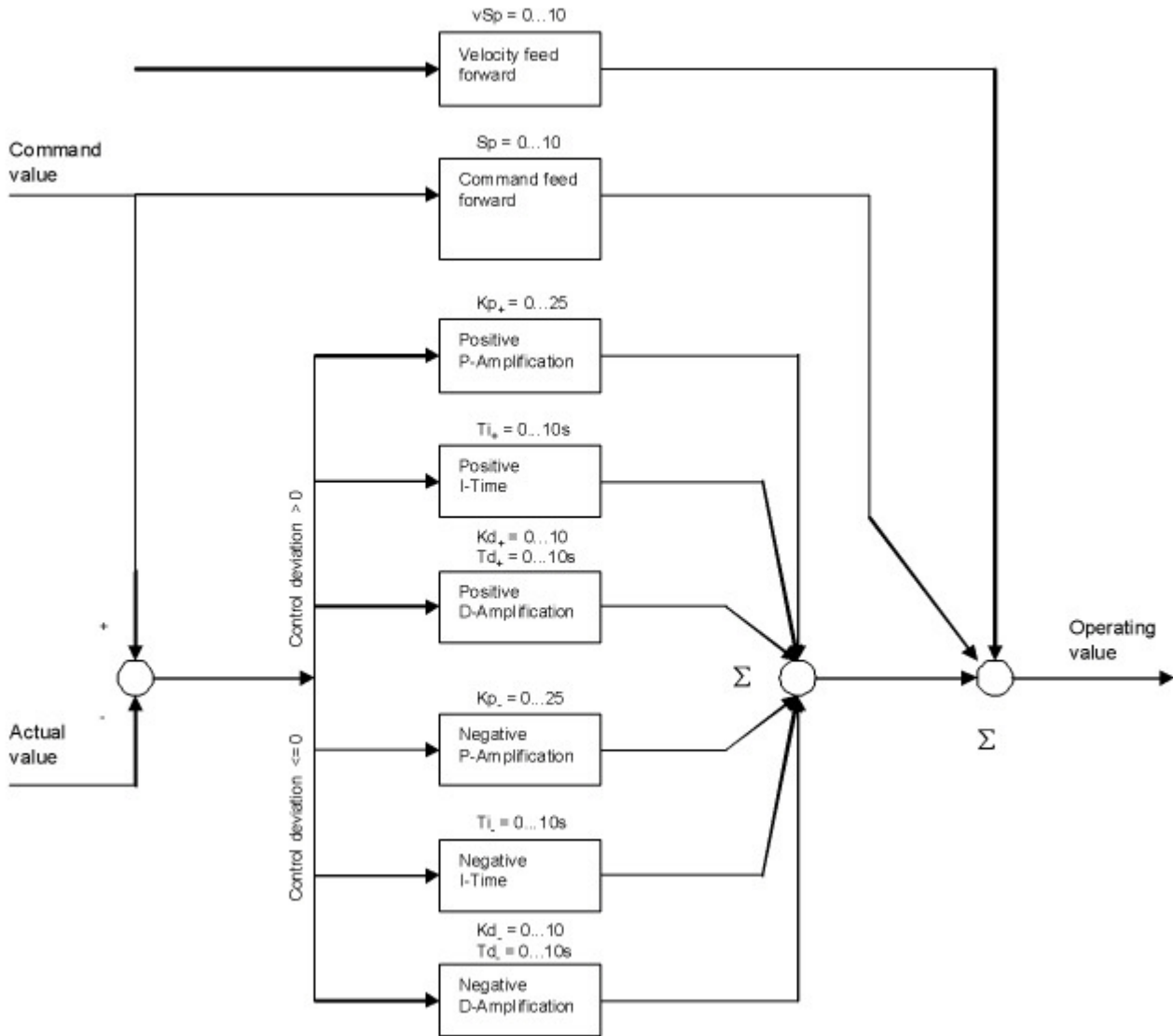
7.6.5 Parameter_Window

Field	Parameter description	Range / step size
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 error window threshold	Defines the trailing error window.	Adapted to unit
Trailing error window delay time	Delay time when exceeding the trailing error window threshold.	0 ... 100ms 1ms
Solenoid-off window threshold	Defines the solenoid-off 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 solenoid-off window threshold.	0 ... 100ms 1ms

Target window:

This is only a message.

Trailing error window:

This is only a message.

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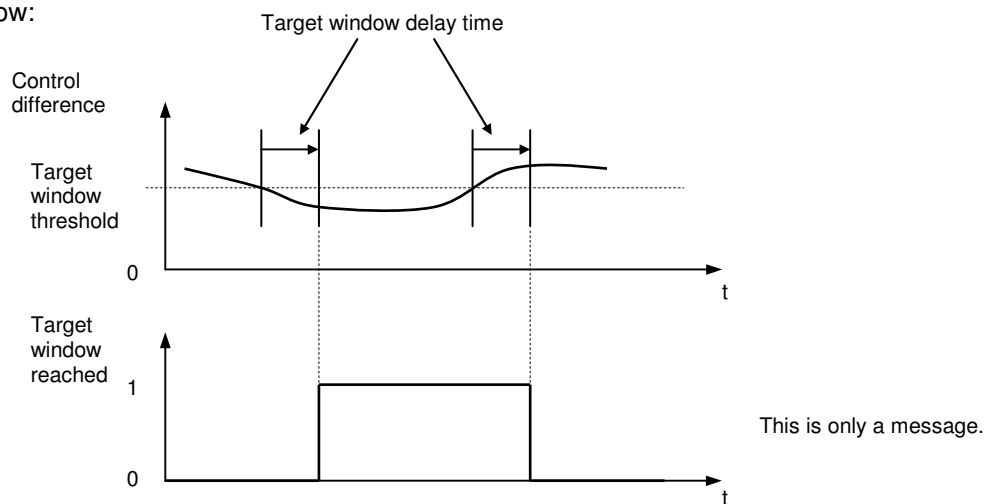
Solenoid-off window:

Solenoid-off window delay time

Control difference

Solenoid-off window threshold

0

t

Solenoid-off window reached

1

0

t
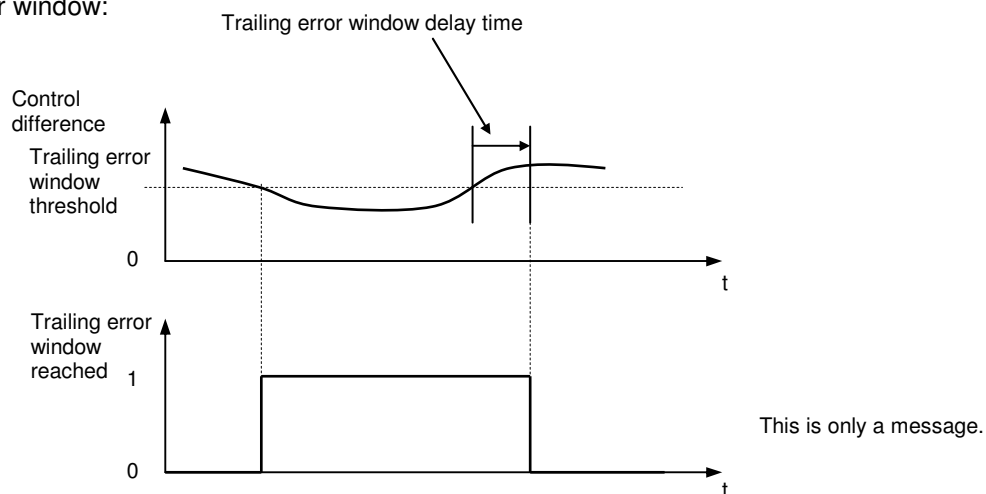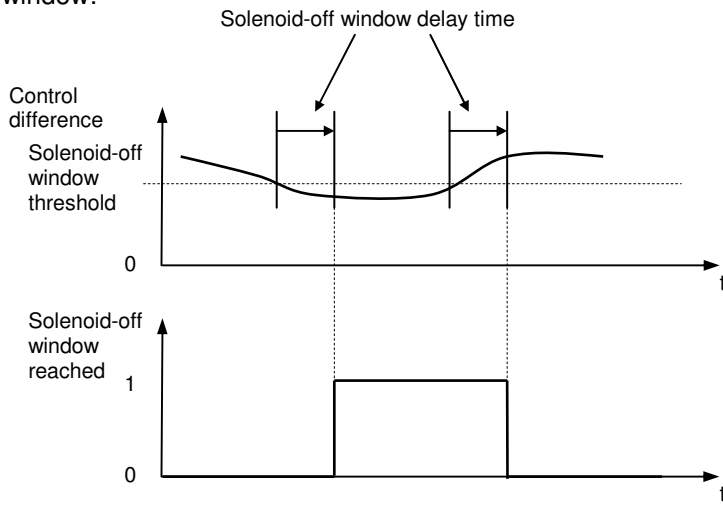
If the parameter "Solenoid ,In position '" is switched off, then in this window the solenoids are switched off.

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7.7   Configuration - Menu

In the configuration menu, all settings are made concerning the function of the DSV-Electronics.

7.7.1   Configuration_Controller mode

The DSV-Electronics support the following controller modes:

Controller mode	Designation	Description
3	Pressure/flow control open loop	Pressure or flow control 1-solenoid without sensor feedback
4	Pressure/flow control closed loop	Pressure or flow control 1-solenoid with sensor feedback
6	Position open loop	Amplifier for 4/3 directional control valve 2-solenoid without sensor feedback
7	Speed control closed loop	Flow control or speed control 1-solenoid
9	Position control closed loop	Positional control with 4/3 directional control valve 2-solenoid with sensor feedback

Field	Parameter description	Range / step size
Output solenoid A	Solenoid output A can be inverted. Cannot be selected with the controller modes 6 and 9.	inverted not inverted
Output solenoid B	Solenoid output B can be inverted. Cannot be selected with the controller modes 6 and 9.	inverted not inverted
Imin always active	If this function is activated, then the solenoid current is never less than Imin.	no yes
System control sense	With this function the solenoid outputs can be interchanged. With solenoid current A the solenoid output B is driven and with solenoid current B the solenoid output A is driven	inverted not inverted
Solenoid, In Position'	off: Solenoids are switched off, when the solenoid-off window is reached. on: Solenoids are not switched off, even when the solenoid-off window is reached. (Chapter "Parameter_Window" page 29)	off on

7.7.2   Configuration_Operating mode

This menu point is only active in the DSV-state "Disabled" (refer to section "DSV State Machine" on page 9).

In this window the operating mode of the DSV-Electronics is set. The operating mode can only be selected in case of controller mode 3 and 6, in case of all other controller modes the operating mode has no significance.

Field	Parameter description	Range / step size
Operating mode	Select the required operating mode (refer to section "Mode of Operation" page 13). Depending on the selected operating mode it may be, that the signal type is automatically adapted.	Set-point value unipolar (1-sol) Set-point value unipolar (2-sol) Set-point value bipolar (2-sol) Set-point value unipolar (2-sol individually)
Error handling	Select the DSV state in case of an error: Solenoid activating with 0mA (off) or with two-thirds of the current range Imin...Imax (on), refer to section "Analysis_Diagnostics" on page 43.	Solenoid A+B off Solenoid A on Solenoid B on Solenoid A+B on

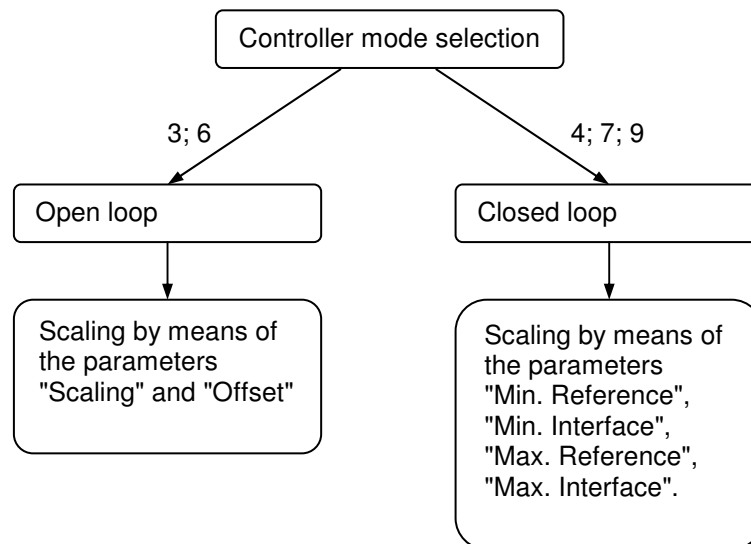|			
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7.7.3 Configuration_Signal scaling

This menu point is only active in the DSV-state "Disabled" (refer to section "DSV State Machine" on page 9).

In this window the settings and the scaling of the set-point value - and actual value signal is made.

Set-point value:

Field	Parameter description	Range / step size
Signal type	In this field the required signal type can be selected. The signal type +/-10 VDC can only be selected in the controller mode 3 and 6 and operating mode "Set-point value bipolar (2-sol)".	0...10 VDC +/-10 VDC 0...20 mA 4...20 mA
Input used	Available are 1 voltage - and 1 current input. The input suitable for the selected signal type is automatically set.	AnaIn [V] AnaIn [mA]
Inverting	The analogue value read-in can be inverted (refer to the figure below). The set-point value input can only be inverted in the controller mode 3 and 6.	no yes
Cable break	Switching-on/-off of the cable break detection of the analogue input signals (refer to section "Cable-break Monitoring" page 10).	no yes
Scaling	With this parameter it is defined, by how many percent the set-point value is to change in case of a change of 1V, resp. 1mA at the analogue input (= gradient). If the signal type is changed, then the parameter scaling is automatically set to the corresponding default value (refer to table below). **Attention:** If the scaling does not correspond to the default value, the resolution is < 10-Bit! The scaling can only be set in case of the controller modes 3 and 6. In all other controller modes the scaling has no significance.	0.001 ... 100.000% 0.001%
Offset	With this parameter the zero point of the analogue signal is set (refer to the figure below). Depending on the signal type, the setting is in V or mA. Voltage: Current: The offset can only be set in the controller mode 3 and 6. In all other controller modes the scaling has no significance.	0 ... ±10.00V 0.01V 0 ... ±20.00mA 0.02mA
Min. Interface set-point value	Indicates the set-point A/D value in case of "Min. Reference set-point value". Voltage: Current: This parameter can only be set in case of the controller modes 4, 7, and 9. In the controller modes 3 and 6 it has no significance.	0 ... 10.00V 0.01V 0 ... 20.00mA 0.02mA

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Max. Interface set-point value	Indicates the set-point A/D value in case of "Max. Reference set-point value".	
	Voltage:	0 ... 10.00V
		0.01V
	Current:	0 ... 20.00mA
		0.02mA
	This parameter can only be set in the controller modes 4, 7, and 9. In the controller modes 3 and 6 it has no significance.	
Min. reference set-point value	Indicates the absolute set-point value measured value in a freely selected measuring point. The min. reference set-point value has to be smaller than the max. reference set-point value.	Dependent on unit
	This parameter can only be set in the controller modes 4, 7, and 9. In the controller modes 3 and 6 it has no significance.	
Max. reference set-point value	Indicates the absolute set-point value measured value in a freely selected measuring point. The max. reference set-point value has to be smaller than the min. reference set-point value.	Dependent on unit
	This parameter can only be set in the controller modes 4, 7, and 9. In the controller modes 3 and 6 it has no significance.	

```
                    ┌─────────────────────────┐
                    │ Controller mode selection │
                    └─────────────────────────┘
              3; 6    ╱                      ╲  4; 7; 9
          ┌───────────────┐          ┌───────────────┐
          │   Open loop   │          │  Closed loop  │
          └───────────────┘          └───────────────┘
                  │                          │
        ┌──────────────────┐       ┌──────────────────────┐
        │ Scaling by means │       │ Scaling by means of  │
        │ of the parameters│       │ the parameters       │
        │ "Scaling" and    │       │ "Min. Reference",    │
        │ "Offset"         │       │ "Min. Interface",    │
        │                  │       │ "Max. Reference",    │
        │                  │       │ "Max. Interface".    │
        └──────────────────┘       └──────────────────────┘
```

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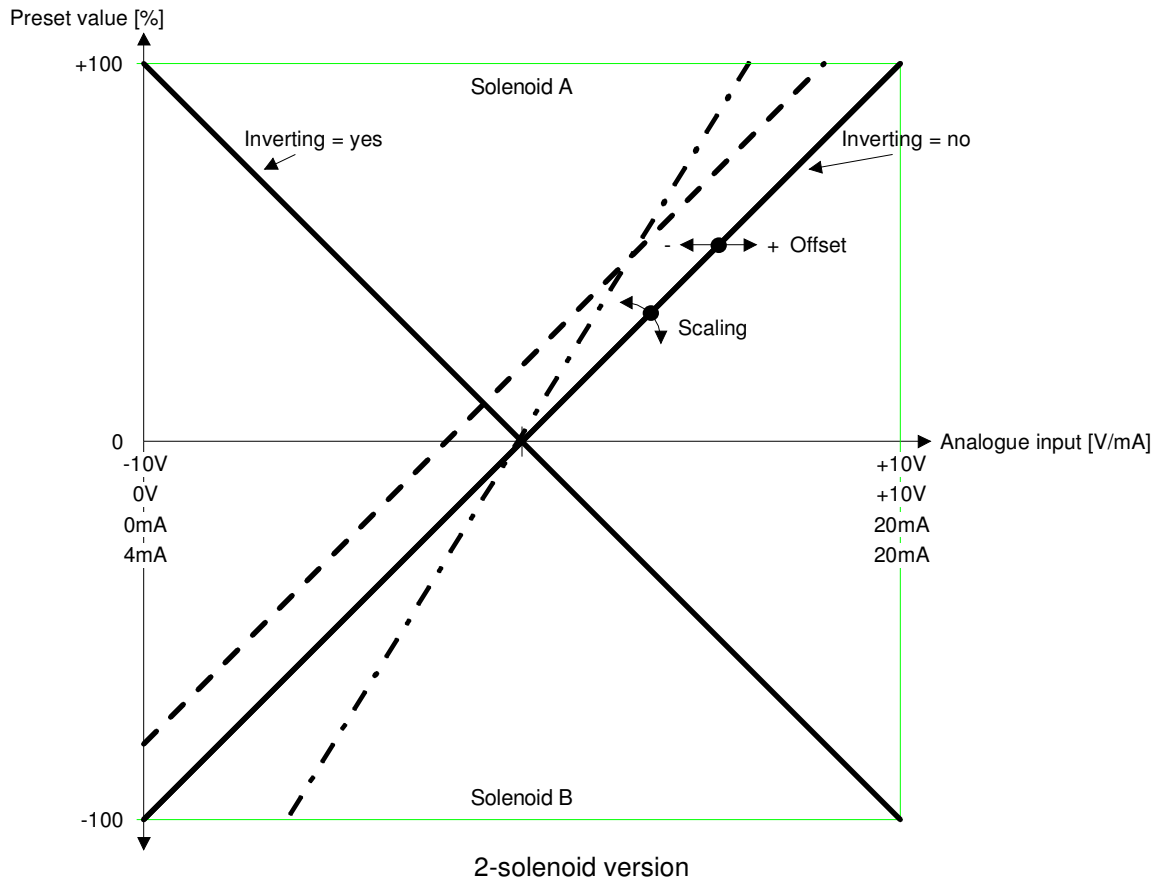*CH-3714 Frutigen*   *DSVx1bae.doc*

Actual value (only settable in case of the controller modes 4, 7 and 9):

Field	Parameter description	Range / step size
Signal type	In this field the required signal type can be selected. The selection is dependent on the DSV-type. Analogue input 3 as voltage input: The signal type +/-10 VDC can only be selected in controller modes 3 and 6 and operating mode "Set-point value bipolar (2-sol)". Analogue input 3 as current input:	 0...10 VDC +/-10 VDC 0...20 mA 4...20 mA
Input used	Depending on the DSV-type 1 voltage - or 1 current input is available.	AnaIn [V] AnaIn [mA]
Cable break	Switching-on/-off the cable break detection of the analogue input signals (refer to section "Cable-break Monitoring" page 10).	nein ja
Min. interface actual value	Indicates the actual A/D-value in case of "Min. reference actual value" an. (Refer to figure below). Voltage: Current:	 0 ... 10.00V 0.01V 0 ... 20.00mA 0.02mA
Max. interface actual value	Indicates the Ist-A/D-value in case of "Max. reference actual value" an. (Refer to figure below). Voltage: Current:	 0 ... 10.00V 0.01V 0 ... 20.00mA 0.02mA
Min. reference actual value	Indicates the absolute actual value measured in a freely selectable measuring point (refer to figure below). Min. reference actual value has to be smaller than the Max. reference actual value.	Dependent on unit
Max. reference actual value	Indicates the absolute actual value measured in a freely selectable measuring point (refer to figure below). Max. reference actual value has to be higher than the Min. reference actual value.	Dependent on unit

General:

Field	Parameter description	Range / step size
Display unit	In this field the required unit can be selected. Controller mode 3 and 4: Controller mode 7: Controller mode 6 and 9: All controller modes:	 bar, psi, kN, MPa l/min, mm/s, 1/Min, inch/s, deg/s mm, deg, inch Own unit
Own unit	If with "Display unit" the type "Own unit" was selected, then an own unit can be entered in this field.	Min. number of characters: 1 Max. number of characters: 5

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Controller mode 3 und 6:

2-solenoid version

Examples:

Used analogue signal:	4 ... 20 mA
Selected signal type:	4 ... 20 mA
Signal working range:	20 mA - 4 mA = 16 mA
Signal stroke per solenoid:	16 mA / 2 = 8 mA
Signal centre:	4 mA + 8 mA = 12 mA
Setting offset:	12 mA - (4 mA + 8 mA) = **0 mA**
Setting scaling:	100 % / 8 mA = **12.5 %/mA**

Used analogue signal:	1.0 ... 8.0 V
Selected signal type:	0 ... 10 V
Signal working range:	8.0 V - 1.0 V = 7 V
Signal stroke per solenoid:	7.0 V / 2 = 3.5 V
Signal centre:	1.0 V + 3.5 V = 4.5 V
Setting offset:	4.5 V - (10 V / 2) = **-0.5 V**
Setting scaling:	100 % / 3.5 V = **28.57 %/V**

Used analogue signal:	-9.0 ... +9.0 V
Selected signal type:	+/-10 V
Signal working range:	9.0 V - (-9.0 V) = 18.0 V
Signal stroke per solenoid:	18.0 V / 2 = 9.0 V
Signal centre:	-9.0 V + 9.0 V = 0.0 V
Setting offset:	0.0 V - (20 V / 2) = **0.0 V**
Setting scaling:	100 % / 9.0 V = **11.11 %/V**
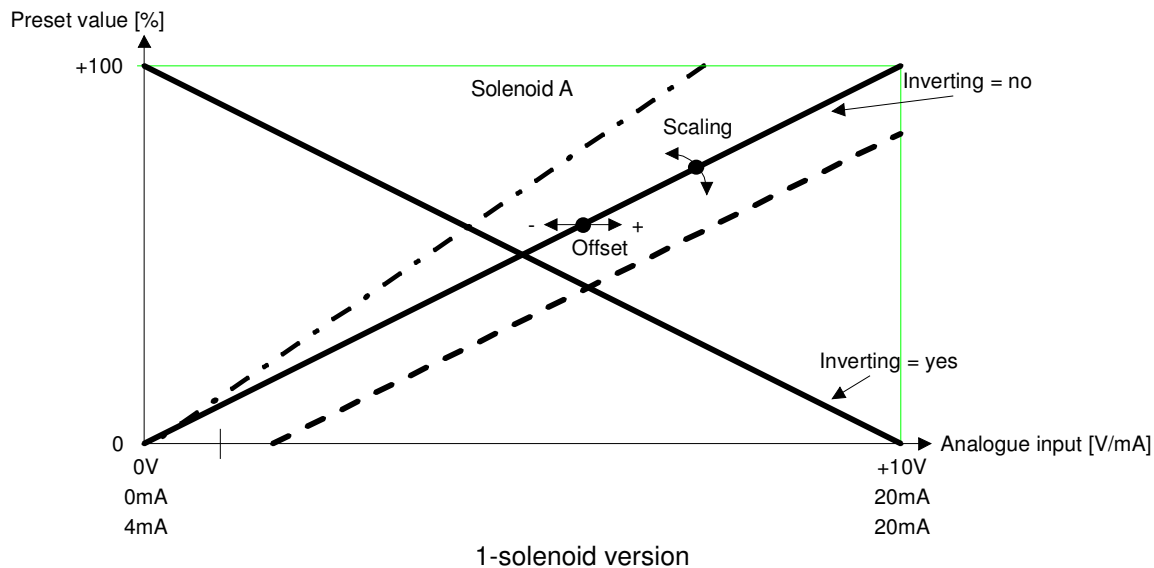
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1-solenoid version

Examples:

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

Used analogue signal:	2.0 ... 9.0 V
Selected signal type:	0 ... 10 V
Signal working range:	9.0 V - 2.0 V = 7 V
Signal stroke per solenoid:	7.0 V (= signal working range)
Setting offset:	0.0 V - 2.0 V = **-2.0 V**
Setting scaling:	100 % / 7.0 V = **14.28 %/V**

Default - values of the parameter "Scaling"

	Signal type			
Operating mode	0 ... 10 VDC	+/-10 VDC	0 ... 20 mA	4 ... 20 mA
Set-point value unipolar (1-sol)	10 %/V	--	5 %/mA	6.25 %/mA
Set-point value unipolar (2-sol)	20 %/V	--	10 %/mA	12.5 %/mA
Set-point value bipolar (2-sol)	--	10 %/V	--	--
Set-point value unipolar (2-sol individually)	10 %/V	--	5 %/mA	6.25 %/mA

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Controller mode 4, 7, and 9:

In controller mode 4, 7 and 9 the scaling is not set by means of gain and offset, but defined with two points. These points in the following are called scaling points. A scaling point consists of a reference value and an interface value.

Reference corresponds to the measuring value. In the following examples, the measuring value is a length. Interface corresponds to the analogue signal.

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

Set-point value scaling:

In case of the set-point value normally the interface range and the reference range are known. From this two scaling points can be decided on without any measuring.

1st Example:

An external control system presets the set-point value in the form of a voltage signal (0 ... 10V). At 0V the position 0mm, and at 10V the position 100mm shall be run-up to.

| Scaling point 1: | Min. Reference | = | 0mm |
| | Min. Interface | = | 0V |

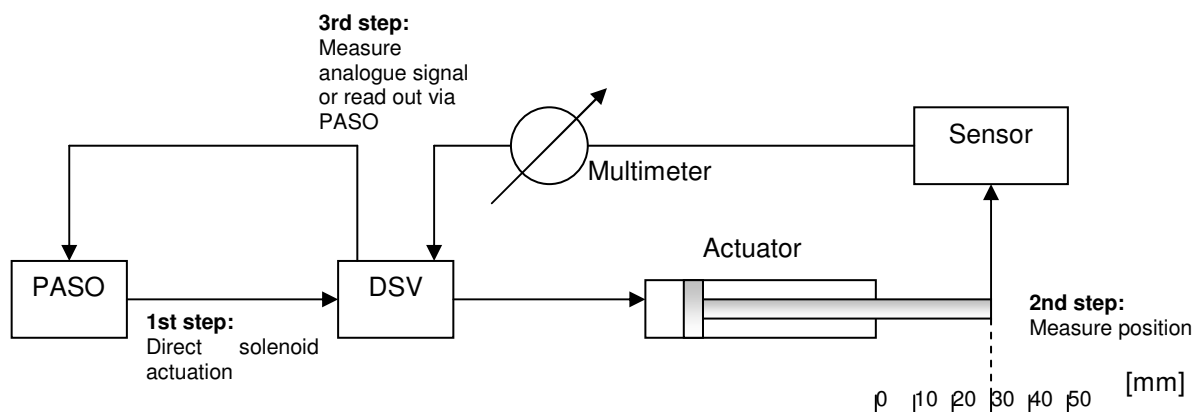| Scaling point 2: | Max. Reference | = | 100mm |
| | Max. Interface | = | 10V |

2nd Example:

An external control system presets the set-point value in the form of a current signal (4 ... 20mA). At 4mA the position 0mm, and at 20mA the position 100mm shall be run-up to.
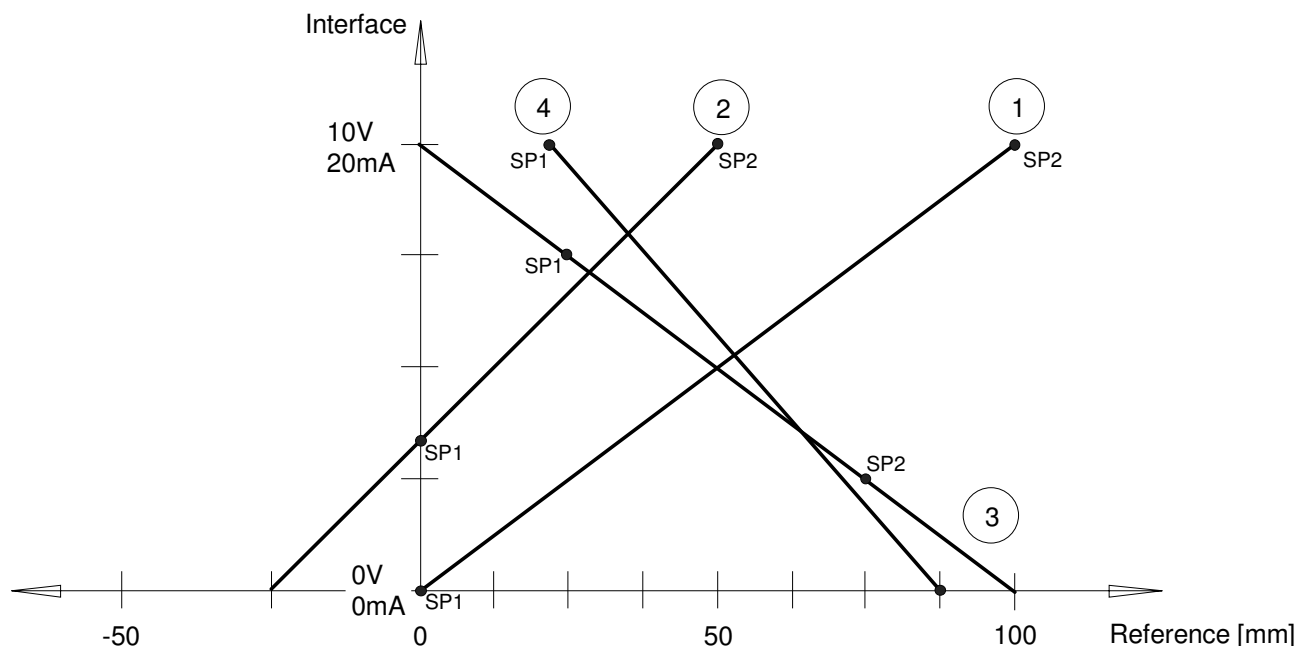
| Scaling point 1: | Min. Reference | = | 0mm |
| | Min. Interface | = | 4mA |

| Scaling point 2: | Max. Reference | = | 100mm |
| | Max. Interface | = | 20mA |

Actual value scaling:

1. By means of direct solenoid actuation (chapter "Commands_Valve actuation" page 40) run-up to a position.
2. Measure the position (→ Reference value).
3. Measure the signal value of the actual value sensor or select it by means of PASO (→ Interface value).
4. In this manner define two differing scaling points.

3rd step:
Measure analogue signal or read out via PASO

Multimeter

Sensor

Actuator

PASO

DSV

1st step:
Direct solenoid actuation

2nd step:
Measure position

[mm]
0 10 20 30 40 50

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The following illustration shows various examples for the scaling. In actual practice, the set-point value and the actual value can be scaled differently.

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

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7.7.4 Configuration_Digital I/O

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

Field	Parameter description	Range / step size
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 shows error	X Error
	The digital output shows ready	X Ready
	(refer to section 8. "The System does not operate" on page 45).	
	The digital output shows inside window	X Inside target window
	Teh digital output shows outside winow	X Outside target window
	(refer to section 7.6.5 "Parameter_Window" on page 29).	

7.7.5 Configuration_Default Setting

This menu point is only active in the "On Line" - mode and in the DSV state "Disabled" (refer to section "DSV State Machine" page 9).

With this command, the default settings made in the factory will be loaded on the connected DSV-Electronics and saved into the memory. After saving, the default settings are read to the PC in order to refresh the parameter values in PASO.

7.7.6 Configuration_Interface

With this command the serial output port for the communication with the connected DSV-Electronics can be selected. This setting is automatically saved to the file "konfig.kon" and taken over during the restart.
If the software is in the "On Line" - mode, the communication is aborted when the "OK" - key is actuated. If the software is in the "Off Line" - mode, then a confirmation window appears with the question, whether the communication with the DSV-Electronics is to be checked. If the communication works, a corresponding message is issued and through the menu point File_On Line a connection with the DSV-Electronics can be established.

If no communication can be established (transmission disrupted or no DSV-Electronics connected), then an error message appears. All menu points and keys, which contain an action in association with the communication, will then be disabled.

Field	Parameter description	Range / step size
Output port	Here the serial interface of the PC can be selected.	COM1 ... COM9

7.7.7 Configuration_Language

In this window the language can be selected, in which the PASO DSV is to be displayed. This setting is automatically saved to the file "konfig.kon" and taken over when restarting.

Field	Parameter description	Range / step size
Language	Field, from which the required language can be selected.	German
		English
		French

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7.8 Commands - Menu

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

7.8.1 Commands_Valve Actuation

This menu point is only active in the "On Line" - mode and in the operating mode "Remote PASO" (refer to section "Mode of Operation" page 13).
In this window the valve can be operated directly through the elements present in the window.

Field	Parameter description	Range / step size
Current	The solenoid current can be preset either on the slider control or in the numerical field.	0...100% (Imin...Imax)
Actuation	Through this key the current set can be switched to the solenoid, or the solenoid can be switched to current-less.	Start / Stop
Solenoid change	If a 2-solenoid valve is present, then with the switch available here it is possible to changeover between the A- and the B-solenoid.	A / B

7.8.2 Commands_Local Operation / PASO Operation

This menu point is only active in the "On Line" – mode and in the DSV state "Disabled" (refer to section "DSV State Machine" page 9)

If the command "PASO Operation" is executed (only possible if the operating mode is on "Local" or "Remote"), then the DSV-Electronics can be driven directly from the PASO through the commands "Valve actuation" and "Enable / Disable". A driving through the analogue - and digital inputs or through the field-bus is not possible. The operating mode changes to the status "Remote PASO".

If the command "Local Operation" is executed (only possible if the operating mode is on "Remote PASO"), then the DSV-Electronics can be driven either through the analogue and digital inputs on the DSV-Electronics themselves or through the field-bus. A direct valve actuation (refer to section "Commands_Valve Actuation" page 40) from the PASO is not possible. The operating mode changes into the status "Local" or "Remote".

7.8.3 Commands_Disable / Enable

This menu point is only active in the "On Line" - mode and in the operating mode "Remote PASO" (refer to section "Mode of Operation" page 13).

With the command "Enable", the DSV-Electronics are set to the status "Active" (refer to section "DSV State Machine" page 9) and therefore enabled again.

With the command "Disable", the DSV-Electronics are set to the status "Disabled" (refer to section "DSV State Machine" page 9) and therefore disabled.

7.9 Fieldbus_Fieldbus Info

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

If the DSV-Electronics have no fieldbus, the message "The connected DSV-Electronics don't provide an external bus port" will appear.

For more information about the possibilities for the DSV-Electronics with fieldbus, please refer to the document "Operating Instructions DSV CANopen - Protocol with Device Profile in accordance with CiA DSP 408".

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7.10 Analysis - Menu

In the analysis menu, measuring values and possibly present errors on the connected DSV-Electronics can be displayed on-line.

7.10.1 Analysis_Values

This menu point is only active in the "On Line" - mode.
With this command, all relevant data of the connected DSV-Electronics are read-in and displayed. The values are continuously updated (on-line).

Field	Description	Unit
Analogue input set-point value	Voltage -, resp. current value of the analogue input A	V mA
Set-point value	Scaled set-point value A	Unit set
Analogue input actual value	Voltage -, resp. current value of the analogue input C	V mA
Actual value	Scaled actual value C, is only indicated in controller mode 4, 7 and 9.	Unit set
Control difference	Scaled control difference, is only indicated in controller mode 4, 7 and 9.	Unit set
Set-point solenoid current A	Control signal before the solenoid output A If applicable this control signal is derated by temperature monitoring.	mA
Solenoid current A	Measured solenoid current to the solenoid A	mA
Set-point solenoid current B	Control signal before the solenoid output B If applicable this control signal is derated by temperature monitoring.	mA
Solenoid current B	Measured solenoid current to the solenoid B	mA
Supply voltage	Supply voltage of the DSV-Electronics	V
DSV Temperature	Current temperature of DSV-Electronics	°C
Target window reached	Indicates, whether the set target window has been reached (Chapter "Parameter_Window", page 26).	yes / no
Trailing error	Indicates, whether the set trailing error limit has been exceeded (Chapter "Parameter_Window", page 26).	yes / no
Digital input	Logical statuses of the digital input: • If the input is set • If the input is not set	1 0
Digital outputs	Logical statuses of the digital output: • If the outputs are set • If the outputs are not set	1 0

7.10.2 Analysis_Signal Recording

In the menu "Analysis_Signal recording", various signals of the connected DSV-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.

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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).
New	Any recorder data are deleted and the card is ready for a new recording.
Start / Stop	**Start** 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"). **Stop** 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 (refer to "Signal assignment"), 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.

1. Up to four recording channels are available and can be activated for the recording.
2. Under "Signal" you can select, which type of signal you would like to record.
3. Under "Trigger" you can select the channel, on which triggering takes place, as well as the triggering flank and the triggering level.
4. Under "Sample Time", the scanning rate is defined (0.004...60 s, a multiple of 4ms).
5. The display of the recording curves is defined by "Scaling/Div" and "Offset".
6. Leaving the menu with OK:
   If changes under 1-5 have been made, then any possible recording data (together with the graphics) are deleted.
7. 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.

7.10.3 Analysis_Diagnostics

With this command, any possible errors present on the connected DSV-Electronics are displayed. The error is read-in once and displayed. A complete description of the cause for the error and of the remedy for the error is displayed.

If an error is detected, the solenoid current outputs will be disabled or supplied with a fixed current value (two-thirds of the corresponding current range Imin...Imax). Which of these states the DSV electronics will reach in case of error, is determined by the parameter "Error handling" (refer to section "Configuration_Operating mode" on page 31).

In the following cases however, the solenoid current outputs are always disabled (0mA), regardless of the parameter "Error handling":
- Short-circuit at the solenoid current output
- Temperature error
- Digital input (Enabling) on '0' with operating mode "Local" (refer to section "Operating Mode" on page 10)
- Error event with operating mode "Remote PASO" (refer to section "Operating Mode" on page 10)

In the status line of the main window it is indicated, whether an error is present (status: Error) or not (status: Ready).

Diagnostics	Cause for the error	Remedy for the error
Power supply error	If the power supply of the DSV-Electronics is < 18VDC.	By disabling and subsequent enabling of the control system.
Cable break (setpoint current input or actual value current input)	In order for this error to be able to respond, the parameter "Cable break" has to be on "yes" and the signal type of the corresponding input on "4 ... 20mA".	By disabling and subsequent enabling of the control system.
Short-circuit solenoid output	A short-circuit has occurred on the solenoid output.	By switching the control system off and -on again.
Temperature error	The DSV temperature has exceeded the error limit	– Disable the control – Cool the DSV – Reenable the control again

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7.10.4 Analysis_Temperature statistics

With this command the temperature history of the DSV controller is displayed.
All statistic values are saved once per hour in the DSV non-volatile memory. If the DSV is operated for less than one hour, the values of the last operation period are not saved.

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

Field	Description	Unit
Min. temperature value	Shows the deepest ever measured internal DSV temperature. Is updated continuously in the background, however only once per hour saved in memory.	°C
Max. temperature value	Shows the highest ever measured internal DSV temperature. Is updated continuously in the background, however only once per hour saved in memory.	°C
Temperature classes	Shows the frequency of the measured internal DSV temperatures, distributed over 6 temperature classes. Every hour the current temperature is measured and the corresponding temperature counter is increased with one step and subsequently saved in memory, together with the minimal and maximal temperature. If one of the counters reached the highest value of 65535, the counters will not be updated furthermore.	

7.11 Help-Menu

The PASO DSV-Help is based on the standard Windows - help structure.

By the actuation of the key "Help" in the respective input window, the corresponding help text is automatically displayed.

7.11.1 Help_Functional Description

The general description of the function of the DSV-Electronics appears.

7.11.2 Help_Contents

The contents of the PASO DSV-Help are displayed. By clicking-on the required subject the corresponding help text is displayed.

7.11.3 Help_Index

The contents of the PASO DSV-Help are displayed. By entering a search term, all the subjects containing the search term are listed.

7.11.4 Help_DSV Identification

This menu point is only active in the "On Line" - mode.
Here the current information of the connected DSV-Electronics is 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 the PASO DSV and its version.

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8 The System does not operate

In this chapter, the generally possible errors and the procedures for remedying the errors are listed and explained.

8.1 Procedure

The following check-list can be used in the case of any problems.

The state on the DSV-electronics in case of an error can be selected with the parameter "Error handling" (refer to section "Configuration_Operating mode" page 31)

Question:	Action:	Possible cause for the error:
Status: Error	Analysis_Diagnostics Power supply error	• The supply voltage is below 18VDC. This error is also displayed, when a voltage failure (t > 250ms) has occurred. • Is the power of the power supply sufficient? • Is the alternating current component too high (refer to section "Electrical Characteristics" page 4)? • When the error has been remedied, disable the control system briefly and then enable it once more.
	Analysis_Diagnostics Cable break set-point value	• The cable break monitoring is only operative in case of a set-point value preset with 4 ... 20mA. • The set-point value signal is lower than 4mA. • Check the connections between the set-point value transmitter and the DSV-Electronics. • If the cable break function is not required, the monitoring can be switched off in the menu "Configuration" Cable break = no). • When the error has been remedied, disable the control system briefly and enable it once more.
	Analysis_Diagnostics Short-circuit solenoid	• A short-circuit has occurred at the solenoid output. • Switch the control system off and on once more.
Control system does not work	The carriage runs-up to the stop	• Invert the control sense (chapter "Configuration_Controller mode" page 31)
	The carriage does not travel	• Are the solenoid outputs enabled? (Chapter "Digital" page 11)
	Analysis_Diagnostics Temperature error	• The DSV temperature has exceeded the error limit • Disable the control • Cool the DSV • Reenable the control again

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9 PASO DSV/SD6 Installation and Operation

The parameterisation software PASO DSV/SD6 serves for the parameterising and diagnosing of all electronic cards DSV and SD6 of WANDFLUH AG company. The software provides an 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 either through a USB-interface (SD6) or through a serial RS 232 interface (DSV).

The parameterisation software PASO DSV/SD6 can only be utilised in connection with DSV- or SD6-Electronics of the WANDFLUH AG company.

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.

9.1 System Requirements

In order to be able to correctly utilise the PASO DSV/SD6 with the DSV Electronics, 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 MS-WINDOWS 2000 or XP
- Standard VGA or higher graphics card, recommended resolution 800x600
- At least one serial RS232 interface
  Notebooks without a RS232 interface, need an additional hardware like a PCMCIA-card → RS232 converter or a USB → RS232 converter to get the proper RS232 interface.
  Note:
  Not all USB → RS232 converters work properly, if necessary we assist you with the choice of the right one.
- Serial RS232 cable 1:1 (RxD and TxD not crossed)

9.2 Installation

The PASO software can be downloaded via the Internet free of charge (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 whether 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 DSV-Electronics takes place through the serial RS 232 interface. To do this, a 1:1 cable (RxD and TxD not crossed) has to be connected with the desired output port on the PC and with the RS 232 socket on the DSV-Electronics.

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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 device. 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 whether the data should take over from the Wandfluh-Electronics (data flow Wandfluh-Electronics => PASO) or whether the Wandfluh-Electronics should be reprogrammed with the new actual data (data flow PASO => Wandfluh-Electronics).

With data flow PASO => Wandfluh-Electronics it can be selected, if all parameters or only the not valve specific parameters should be overwritten. The valve specific parameters (Imin, Imax, Dither frequency, Dither level, Deadband) will be optimised to work off the valve in the factory. When override these parameters, the valve characteristic will change. The valve characteristic (hydraulic size - signal-characteristics) according to data sheet can be changed.

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 "Communication interruption" page 47).

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 "Communication interruption" page 47). 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.

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.

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Possible reasons for a communication interruption are:

- No Wandfluh-Electronics are connected
- The connected Wandfluh-Electronics are not switched on
- The selected RS232 COM port is wrong (refer to section "Configuration_Interface" page 39)
- The connection cable is defect or not pluged in

9.7 Program description

9.7.1 Description of the keys

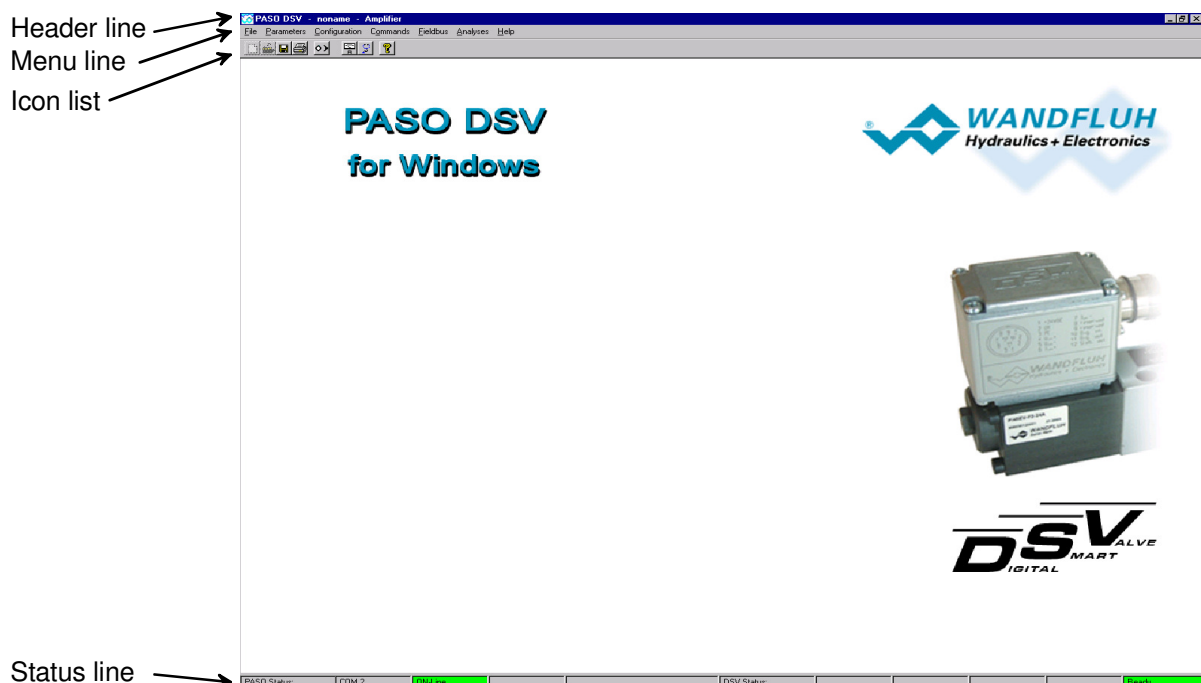| TAB	Transfer to the next input element
SHIFT-TAB	Transfer to the previous input element
ENTER	Execution of the active input element or conclusion of an input.
ESC	Abort, undoing of an action. In many cases corresponds to the key "Cancel".
F1	Activate the key "Help"

9.7.2 Input elements

Key	A key executes the action, with which it is inscribed.
	Actuation of a key through the keyboard:
	• 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.
	Actuation of a key with the mouse:
	• Click on the corresponding key. The action is now carried out.
Switch	By means of a switch, a selection between two possibilities is possible. A switch is either switched on or - off.
	Actuation of a switch through the keyboard:
	• Push the keys UP or HOME to switch on the switch.
	• Push the keys DOWN or END to switch off the switch.
	• Push the SPACE key for changing over (switching over).
	Actuation of a switch with the mouse:
	• Click on the switch for changing over (switching over).
Input field	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.
	Actuation of an input field through the keyboard:
	• 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.
	Actuation of an input field with the mouse:
	• 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.

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Selection field	The selection fields enable the selection from various possibilities.
	Actuation of a selection field through the keyboard:
	• 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.
	Actuation of a selection field with the mouse:
	• Click inside the selection field so that all selection possibilities are displayed and then click on the required selection.

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:

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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 "Communication interruption" page 47) 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 to section "Limiting value error" page 51). 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 "Arrow Left" and "Arrow Right" one can change to the next menu point and with the keys "Arrow Up" and "Arrow Down" 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 RS232 interface
- 2nd field: Current mode ("On Line" or "Off Line", refer to section
                      "Mode "Off Line" and "On Line"" page 47)
- 4th field: Parameter Inconsistency (only with DSV-Electronics with Fieldbus, refer to the section
                      "Parameter inconsistency" page 19

Device state:
- 1st field: Derating (refer to section "Temperature monitoring" page 7)
- 3nd field: Operating mode ("Remote PASO" or "Local", refer to section "Operating Mode" page 10
- 5th field: DSV state ("Disabled" or "Active", refer to the section "DSV State Machine" page 9)
- 6th field: Error state (Ready or Error, refer to the section "Analysis_Diagnostics" page 43)

9.9   Store parameters

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.

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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:

Limiting error

⚠ The following parameters are set to default value:

	Parameter	Current Value	Min. Value	Max. Value	Default value
1	Imax A	1051.5	0.0	1000.0	700.0
2	Imax B	1087.5	0.0	1000.0	700.0
3	Signal type analog input A	8	0	3	0 [0...10 VDC]
4	Digital output 1	-2	0	2	2 [X]
5					
6					
7					
8					

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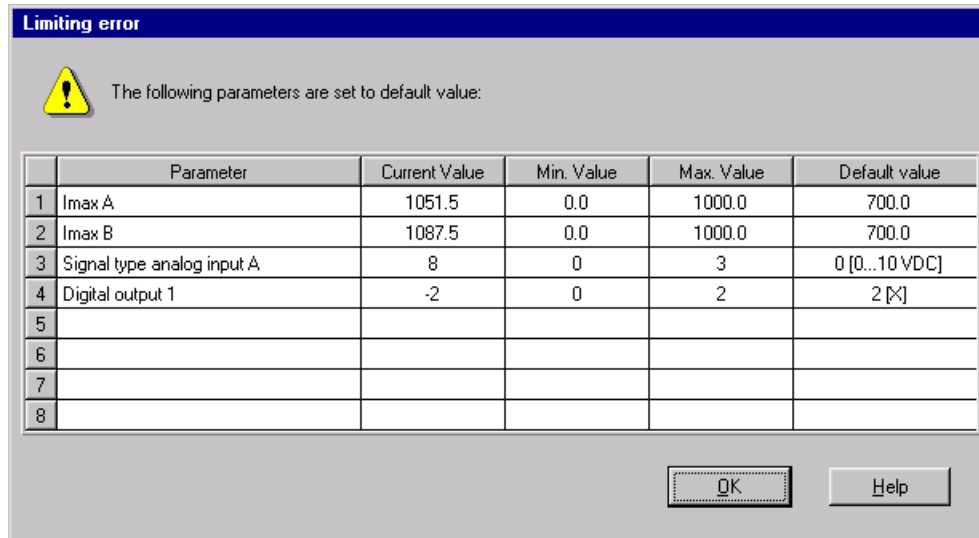
Parameter:	Name of the parameter with the limiting value error
Current value:	Current value of the parameter
Min. value:	Minimum allowed value of the parameter
Max. value:	Maximum allowed value of the parameter
Default value:	Default value of the parameter

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 could 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" page 19.

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10 Disposal

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

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

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