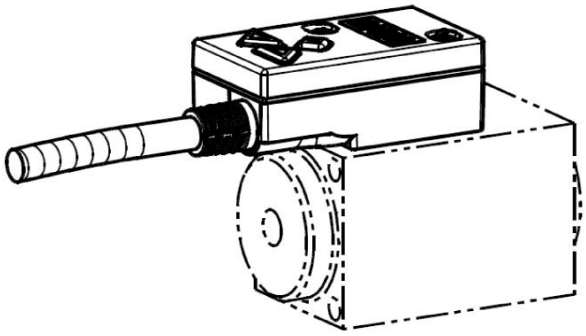
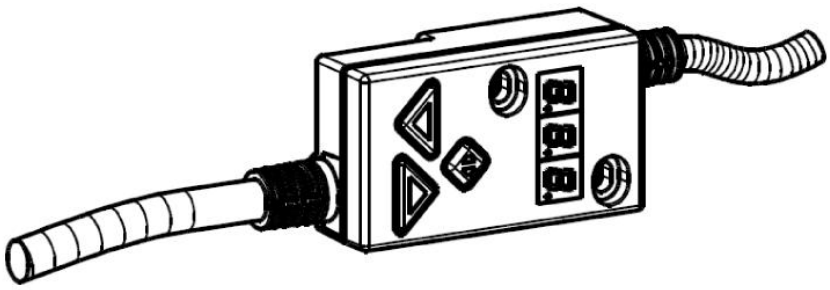
# OPERATING INSTRUCTIONS

# AMPLIFIER ELECTRONICS PD2





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# 1 General information

This operating instructions makes it possible to use the PD2-Electronics safely and according to specification. The operating instructions includes instructions which Wandfluh as the manufacturer, or its resale organisations (Wandfluh sister companies or distributors), provide to users within their duty to instruct.

For this purpose, the operating instructions mainly includes:

- information about use according to specification, installation and commissioning of the MD2-Electronics
- information about safety in dealing with control.

# 2 Product description

## 2.1 General

The PD2-Electronics is available in two different versions:

- **direct mounted on the solenoid**
  The PD2-Electronics is mounted direct on the solenoid can not be removed. No additional connection is necessary to the solenoid. The connection for power supply, command value etc. takes place via the fixed mounted 5pol cable.

- **with additional solenoid cable**
  The PD2-Electronics is connected to the solenoid via the fixed mounted solenoid cable. The solenoid cable has flying leads. Therefore any available connector type can be mounted (ATTENTION: connector is not part of the scope of delivery!). The connection for power supply, command value etc. takes place via the fixed mounted 5pol cable.

## 2.2 Field of application

Because of the compact form of construction, the field of application of the PD2-Electronics is situated in the industrial field as well as in the mobile field.

## 2.3 Conformity

The PD2-Electronics have been developed and tested in accordance with the latest technical standards.
Applied in particular was the EU Guideline EN 61 000-6-2 (Immunity) and EN 61 000-6-4 (Emission).

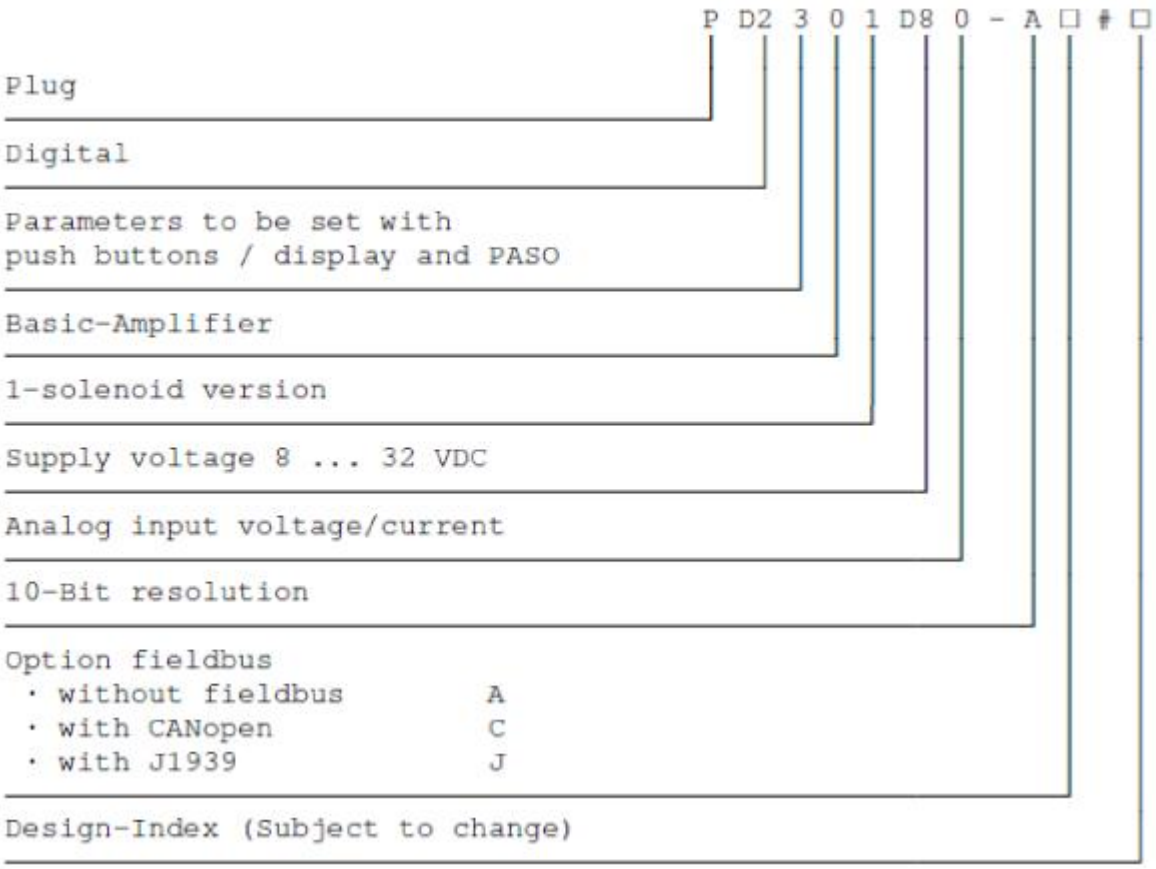
## 2.4 Labelling of the product

With the PC parameterisation software PASO PD2, the following information can be directly read-off the PD2-Electronics (= electronic type code):

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

## 2.5 Type code

This type code only applies to the version with additional solenoid cable. For the direct mounted version the type code of the solenoid / valve is valid.



## 2.6 Technical data

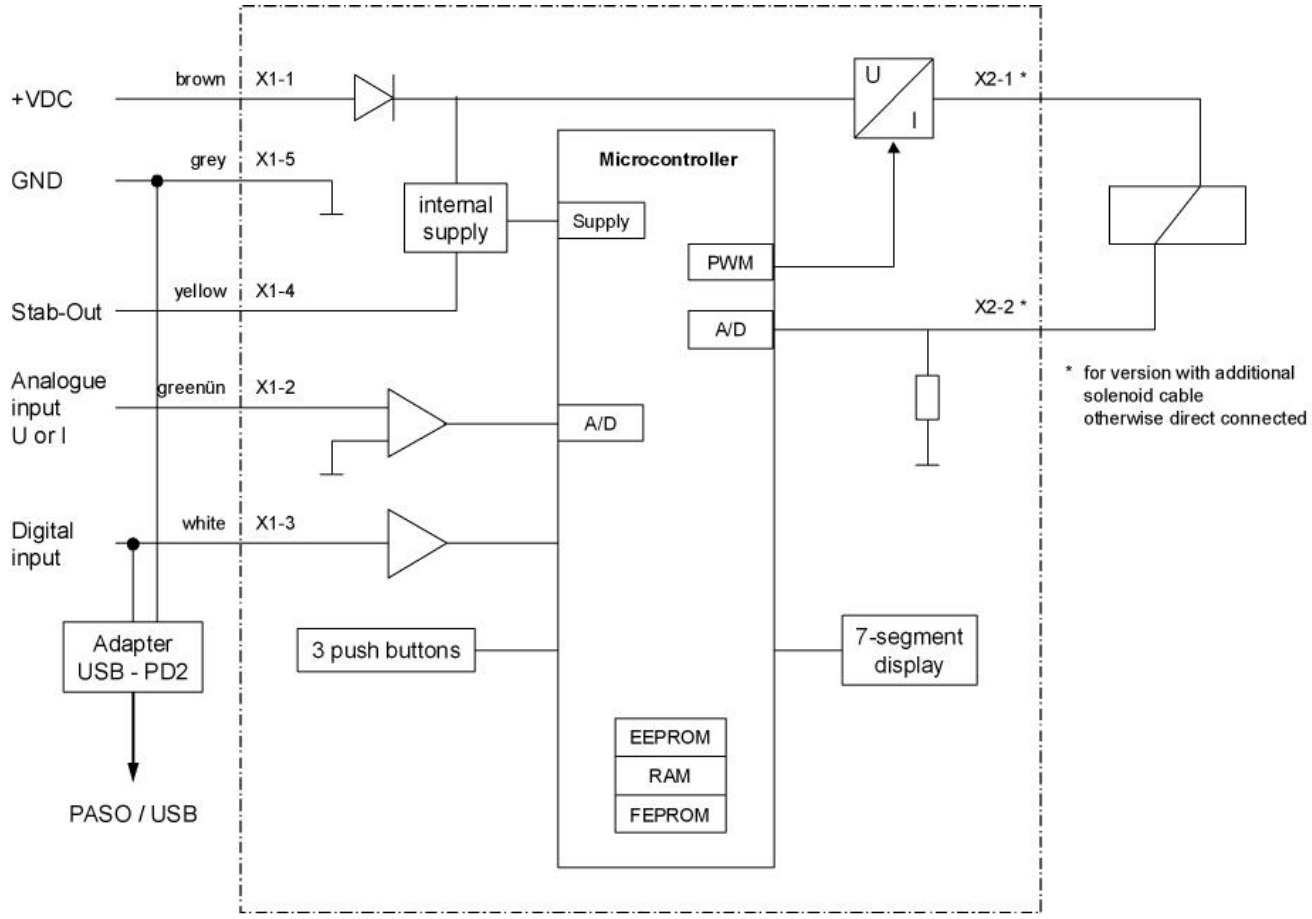
### 2.6.1 General specifications

| | | |
|---|---|---|
| **Execution** | Direct mounted on the solenoid or with additional solenoid cable | |
| **Connections** | Connecting cable<br><br>Solenoid cable (only version with additional solenoid cable)<br><br>USB interface | 5pol cable (1.5m or 7.5m)<br>for power supply, command value, etc<br><br>2pol calbe (0.5m)<br>for connection to the solenoid<br><br>via connection "Ditial input"<br>The USB communication requires a separately available USB Adapter (refer to section "Accessories 69"). |
| **Ambient temperature** | -40 ... +85 °C | under difficult circumstances the solenoid current and with it the valve performance can if necessary be reduced (refer to section "Temperature monitoring" 13) |
| **Protection class** | IP67 to EN 60 529 | |

### 2.6.2 Electrical specifications

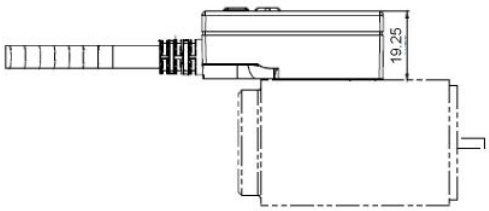
| | | |
|---|---|---|
| **Supply voltage** | | 8 ... 32 VDC |
| **Ripple on supply voltage** | | < ±5 % |
| **Fuse** | The PD2-Electronics must be protected by a slow fuse on the user side | |
| **Temperature drift** | | < 1% with ΔT = 40° C |
| **No load current** | | ca. 40 ... 50 mA |
| **Maximum current consumption** | | 2.5 A |
| **Analogue input** | 1 input single-ended<br>voltage / current switchable<br>Resolution<br>Input resistance for voltage input<br>Burden for current input | 0 ... ±10 VDC<br>0/4 ... 20 mA<br>10 Bit<br>> 100 kOhm<br>250 Ohm |
| **Digital input** | 1 input high-active<br>Switching threshold high<br>Switching threshold low<br>Utilisable as frequency input (frequencies 5...5000Hz) and as PWM-input (automatic frequency identification) | <br>6 ... 32 VDC<br>0 ... 1 VDC |
| **USB interface** | correspond to the digital input<br><br>The USB communication requires a separately available USB Adapter (refer to section "Accessories 69"). | |
| **Stabilised output voltage** | | + 5 VDC<br>max. load 20 mA |
| **Solenoid current** | Minimum current Imin adjustable<br>Default setting<br>Maximum current Imax adjustable<br>Default setting: | 0 ... Imax mA<br>150 mA<br>Imin ... max. sol. current<br>700 mA |
| **Dither** | Frequenz adjustable<br>Default setting<br>Pegel adjustable<br>Default setting | 4 ... 500 Hz<br>80 Hz<br>0 ... 400 mA<br>150 mA |
| **EMC**<br>**Immunity**<br>**Emission** | <br>EN 61000-6-2<br>EN 61000-6-4 | |

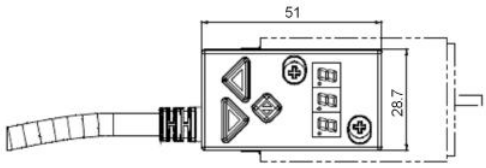
## 2.7 Block diagram




## 2.8 Dimensions

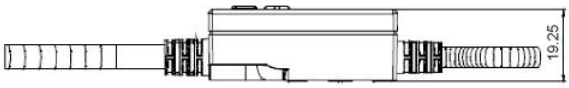
**direct mounted on the solenoid:**

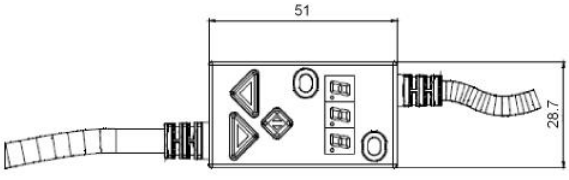



Connecting cable = 1.5m or 7.5m

**with additional solenoid cable:**




Connecting cable = 1.5m or 7.5m
Solenoid cable = 0.5m

# 3 Safety rules

## 3.1 Installation / Commissioning / Parameterisation

- These operating instructions have to be carefully studied beforehand and the instructions are to be complied with.
- Prior to the installation, all power supply voltages and any other energy sources have to be disconnected.
- The installation/assembly must only be carried out by specialist personnel with electrical knowledge.
- Take into account precautionary measures concerning components on the module, which are subject to damage as a result of electrostatic discharge.
- Wrong manipulations by the personnel cannot be prevented by the PD2-Electronics.
- Before the switching on of the supply voltage, the fuse protection, the correct wiring and the conformity of the power supply voltage with the permissible supply voltage range have to be verified.

- **The PD2-Electronics monitors the working conditions within the electronics and within the installation. Uncontrolled movements or force changes caused by unforeseen errors of the PD2-Electronics cannot be prevented in any case.**

- **Danger for persons has to be avoided by installing an emergency stop device which cuts off the power to the system.**

# 4 Construction and Function

Please refer to section "Block diagram" 9.

## 4.1 Introduction

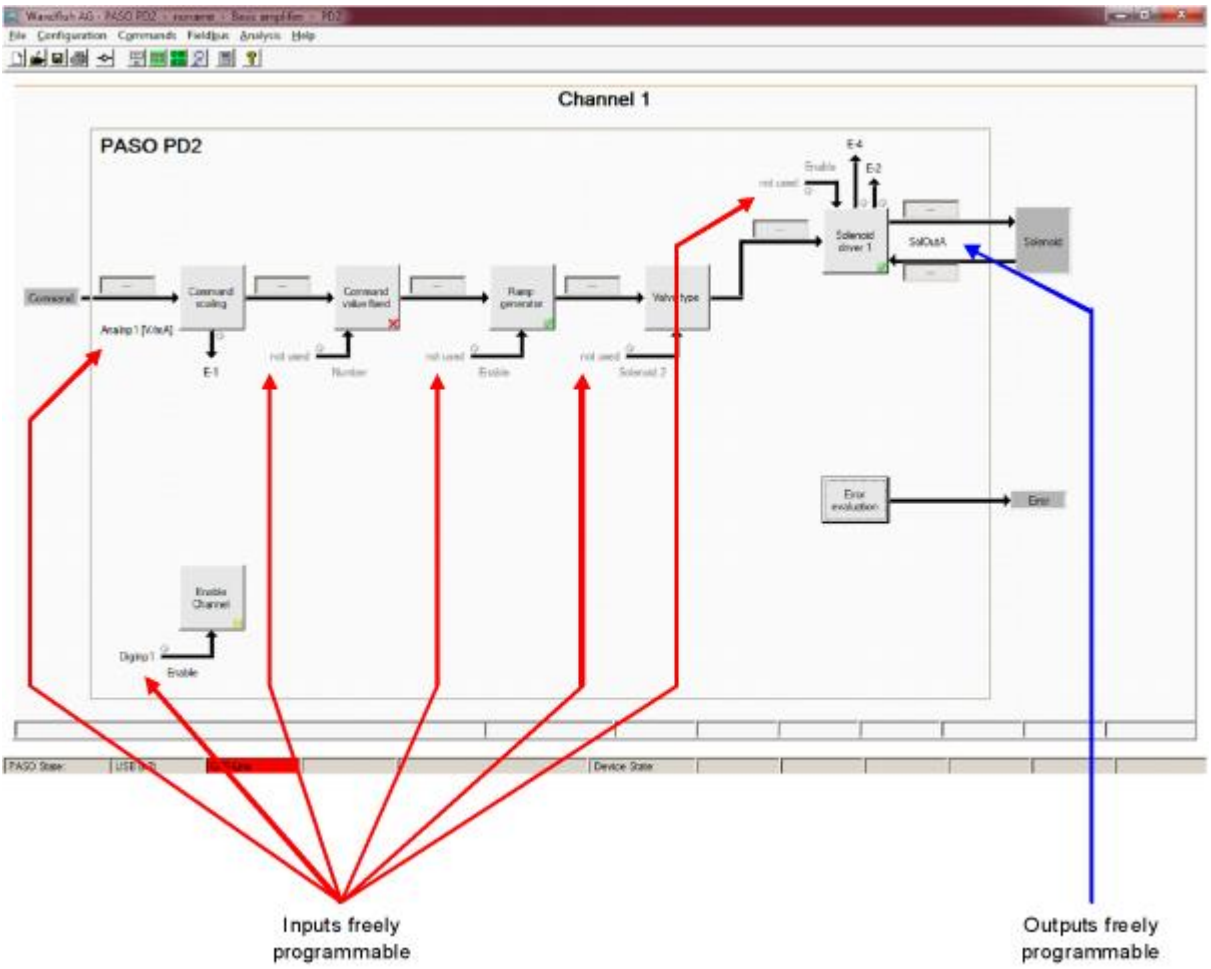
- All inputs and outputs have to be contacted through the 5pol cable
- With the version with additional solenoid cable, the solenoid has t obe contacted through the 2pol cable
- The input "Digital input" can be used as a USB interface, through which the parameterisation and the diagnostics can be made by using the PC-Parameterisation software PASO PD2. The USB communication requires a separately available USB Adapter (refer to section "Accessories 69").
  **ATTENTION:** during the communication, the digital input can not be used for another function!
- The device cover is equipped with a simple manual operation, which permits to set the most important parameter through push-buttons and a 7-segment display

## 4.2 Description of the function

The PD2-Electronics has one channel. This channel has a command value input and one solenoid output. The adjustable parameters are organized in function blocks, which are displayed in PASO as small boxes. The following settings can be made in these function blocks:

- Enable channel (refer to section "Enable channel" 33)
- Command scaling (refer to section "Command scaling" 34)
- Command value fixed (refer to section "Command value fixed" 38)
- Ramps (refer to section "Ramps" 38)
- Valve type (refer to section "Valve type" 39)
- Solenoid driver (refer to section "Solenoid driver" 40)
- Error evaluation (refer to section "Error evaluation" 44)

The assignment of the analog and digital in- and outputs can freely be made by the user. Digital in- and outputs which are set or reset by software (refer to section "Configuration - Digital E/A" 48) will be displayed with blue text color in the main window.




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

The solenoid output includes a **p**ulse-**w**idth-**m**odulated current control with superimposed dither signal. This output can control either a proportional or a switching solenoid. The current measurement can be switched on or off. The minimal and maximal solenoid currents or pulse widths can be adjusted. When using switching solenoids a fully adjustable power reduction function is available.

Parameters are set by means of the parameterising software PASO PD2 or direct through the input elements on the PD2-Electronics. Changed parameters are stored in a non-volatile memory in order to have them available after the PD2-Electronics have been switched on again. The parameterising software PASO PD2 provides to save the settings an values of the parameter in a file, which always allows to do a download or an analysis.

Some function blocks are able to generate error messages. The function block "Error evaluation" (refer to section "Error evaluation" 44) picks up all error messages. This function block manages the error handling of the PD2 electronics.

The process data can be displayed online (refer to section "Analysis - Show values" 53). This helps in case of support and diagnostics.

## 4.3 Temperature monitoring

The PD2-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 "Parameters - Valves 40" on page 21) is limited, depending on the temperature. The temperature of the PD2 electronics is visible in the PASO data window (Menu "Analysis - Values 54"). Since the self-heating of the solenoid, on which the PD2 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.

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 PD2-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 PD2-electronics will decrease:

$$T_{PD2_new} = \frac{I_{eff_new}^2}{I_{eff_old}^2} \times (T_{PD2_old} - T_{ambient}) + T_{ambient}$$

Description of the parameters:
$T_{PD2_new}$ : temperature of the PD2-electronics after reducing the solenoid current
$T_{PD2_old}$ : temperature of the PD2-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 PD2 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 PD2 temperature after current reduction will be:

$$T_{PD2} = (0.90)^2 \times (70 - 30) + 30 = 62.4°C$$

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.

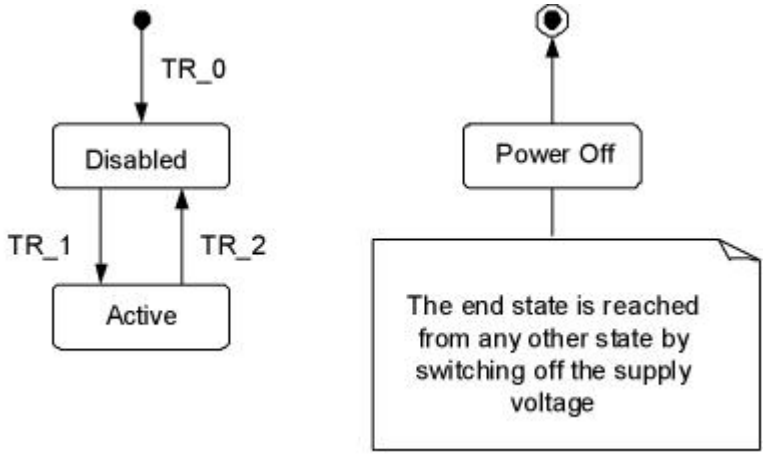
REMARK:
If the monitored temperature exceeds the boundary of 90°C, the PD2 is switched into the error state. The solenoid outputs are blocked, in order to prevent permanent electronics damage. After cooling off and acknowledging the error (refer to chapter "The system does not work" on page 33) the PD2 can be started up again.

## 4.4 Characteristic optimisation

The PD2 electronics are provided with a possibility to optimise the characteristic “Input solenoid driver – Output solenoid current”. The user is able to create a characteristic (e.g. a linearised characteristic) which matches his own application. The characteristic optimisation can be turned on or off (refer to section "Parameters - Valves" 40).

## 4.5 PD2 State Machine

In the following, with the help of a status diagram it is described, how the start-up of the PD2-Electronics takes place and which statuses are reached when and how.




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

| Status | Description |
|---|---|
| Disabled | • The assigned channel of the PD2-Electronics is disabled, no solenoid current will be active<br>• In this status, with the command "Operation mode" (refer to section "Commands - Valve operation" 49) the operating mode can be set |
| Active | • The assigned channel of the PD2-Electronics is enabled<br>• The assigned channel of the PD2-Electronics can be operated according to the selected operating mode<br>• Changing the operating mode is not possible |

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

| Transition | Description |
|---|---|
| TR_0 | Switching-on the supply voltage |
| TR_1 | **Enable**<br>This is made in the operating mode "Local" through the function "Enable Channel" (refer to section "Enable channel" 33) and in the operating mode "Remote PASO" through the parameter "Control mode" (refer to section "Commands - Valve operation" 49). |
| TR_2 | **Disable**<br>This is made in the operating mode "Local" through the function "Enable Channel" (refer to section "Enable channel" 33) and in the operating mode "Remote PASO" through the parameter "Control mode" (refer to section "Commands - Valve operation" 49). |

## 4.6 Operating mode

The PD2-Electronics have 2 operating modes. The following table describes, what can be done in the different operating modes and how they can be activated:

| Operating mode | Activating with | Description |
|---|---|---|
| Local | Menu point "Commands - Valve operation" 49 | Operating via analogue and digital inputs on the PD2-Electronics |
| Remote PASO | Menu point "Commands - Valve operation" 49 | Operating direct with the PASO |

The current operating mode is displayed in the status line (refer to section "Starting of PASO PD2" 65).

## 4.7 Analogue inputs

- The applied analogue signal is digitised in the 10 Bit A/D converter
  **Attention:** By the input range 4 ... 20mA, the resolution is < 10Bit!

- **Voltage / Current**
  The analogue inputs can be used either as a voltage or a current input.

The assignment of the analog inputs to the corresponding channel is free to choose (refer to section "Assignment of the inputs/outputs" 30).

## 4.8 Cablebreak detection

The command value input can be detected for a cablebreak (only if Signal type = Current, Frequency or PWM). Therefore, a lower and an upper cablebreak limit can be adjusted in the box Signal scaling 16 .A cablebreak is detected, if the input signal is smaller than the lower cablebreak limit or higher than the upper cablebreak limit.

If an cablebreak is detected, the internal error "E-1" is active (refer to section "Error evaluation" 44).

The following conditions had to be performed:

- The parameter "Signal type" must be on "Current", "Frequency" or "PWM" (refer to section "Signal scaling" 16)
- The parameter "Cablebreak" must be on "On" (refer to section "Signal scaling" 16)
- The parameters "Lower cablebreak limt" and "Upper cablebreak limit" must be adjusted (refer to section "Signal scaling" 16)
- An action must be assigned to the error "E-1" (refer to section "Error evaluation" 44)

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

## 4.9 Digital inputs

The PD2-Electronics has one digital input. The function of the digital input is free to choose (refer to section "Assignment of the inputs/outputs" 30) or can be set fix to 0 or 1 with the Parameterisation PASO PD2 (refer to section "Configuration - Digital I/O" 48).

The input "Digital input" can be used as a USB interface, through which the parameterisation and the diagnostics can be made by using the PC-Parameterisation software PASO PD2. The USB communication requires a separately available USB Adapter (refer to section "Accessories 69").

**ATTENTION:** during the communication, the digital input can not be used for another function!

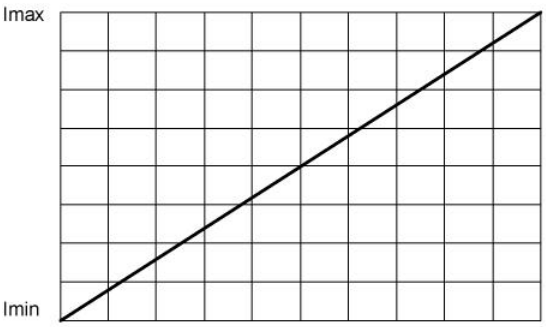
## 4.10 Outputs

- **Proportional solenoid outputs A**
  The solenoid output has a current output **p**ulse-**w**idth-**m**odulated at 1000Hz with superimposed dither. The current measurement can be switched on or off.

## 4.11 Mode of operation

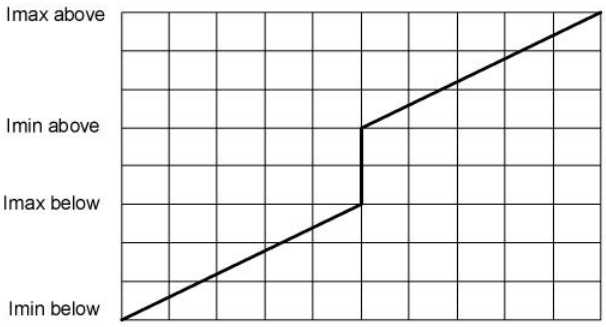
The mode of operation depends on the selected valve type (refer to section "Valve type 39"). The following mode of operation are possible:

- **Mode of operation "Command uni/bipolar (1-sol)"**
  This Mode of operation is only possible, if the valve type is set to "Standard 1-solenoid".
  With an input signal 0 ... 100% resp. -100 ... +100% an internal command from 0 ... 100% is generated, which control a standard 1-solenoid valve.



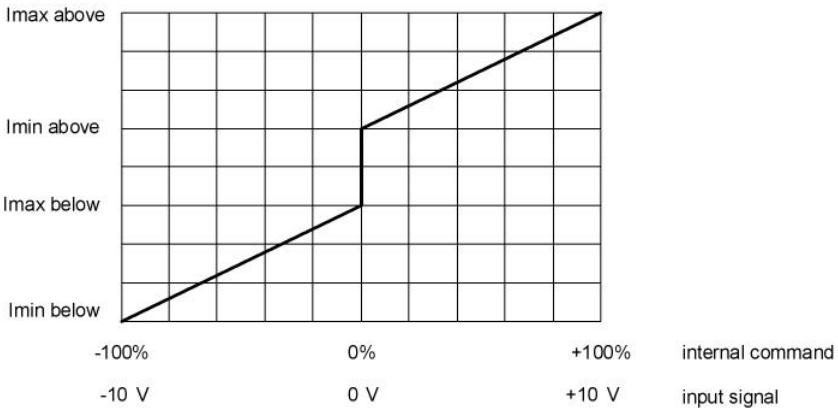

| 0% | +100% | internal command |
|---|---|---|
| 0 V | 10 V | |
| 0 mA | 20 mA | |
| 4 mA | 20 mA | |
| -10 V | +10 V | input signal |
| 0 V | -10 V | |
| 5 Hz | 5000 Hz | |
| 0 %PW | 100 %PW | |

- **Mode of operation "Command unipolar (2-sol)"**
  This Mode of operation is only possible, if the valve type is set to "4/3-way 1-solenoid".
  With an input signal 0 ... 100% an internal command from von -100 ... +100% is generated, which control a 4/3-way 1-solenoid valve

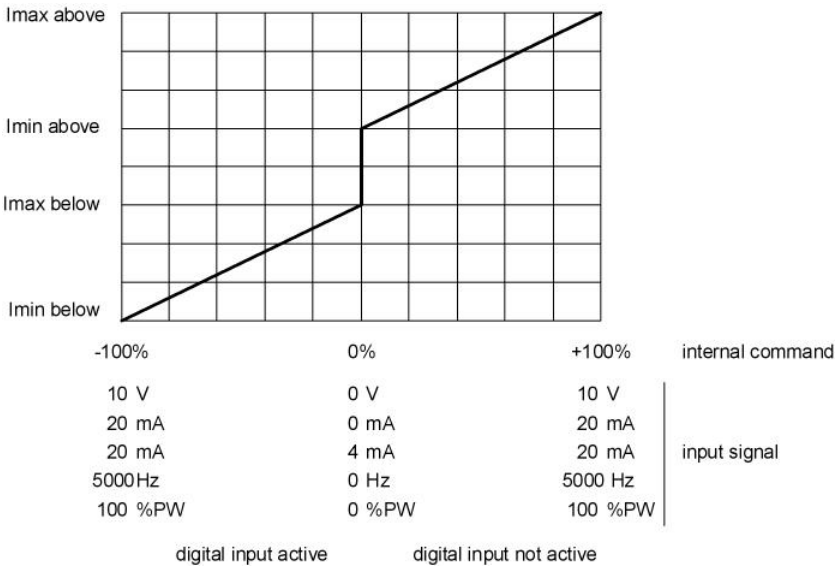



| -100% | 0% | +100% | internal command |
|---|---|---|---|
| 0 V | 5 V | 10 V | |
| 0 mA | 10 mA | 20 mA | |
| 4 mA | 12 mA | 20 mA | input signal |
| 5 Hz | 2500 Hz | 5000 Hz | |
| 0 %PW | 50 %PW | 100 %PW | |

- **Mode of operation "Command bipolar (2-sol)"**
  This Mode of operation is only possible, if the valve type is set to "4/3-way 1-solenoid".
  With an input signal -100 ... 100% an internal command from von -100 ... +100% is generated, which control a 4/3-way 1-solenoid valve



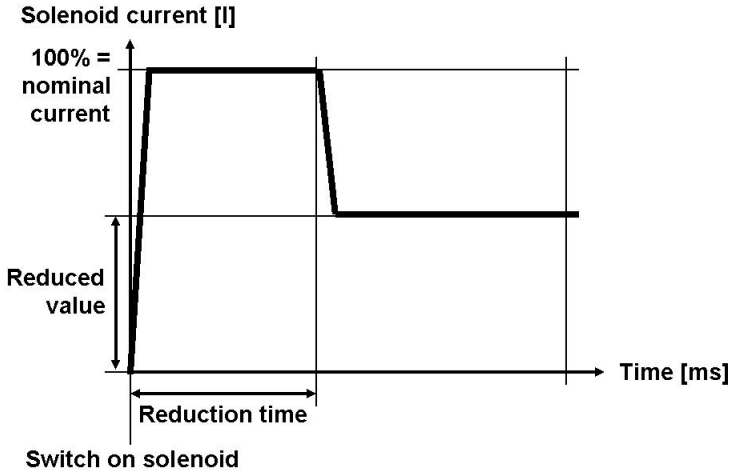

- **Mode of operation "Command unipolar (2-sol with DigInp)"**
  This Mode of operation is only possible, if the valve type is set to "4/3-way 1-solenoid".
  Mit einem Eingangsignal 0 ... +100% an internal command from von 0 ... +100% (digital input not active) resp. 0 ... -100% (digital input active) is generated, which control a 4/3-way 1-solenoid valve



## 4.12 Power reduction

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

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



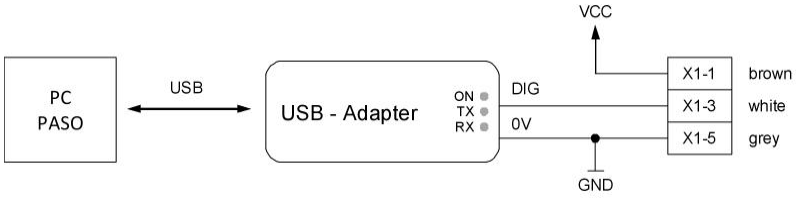
# 5 Operating and indicating elements

## 5.1 General

The PD2-Electronics has operating and display elements directly on the device cover.

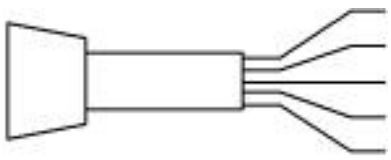
## 5.2 USB-interface

As the USB-interface the digital input 1 is used. The USB communication requires a separately available USB Adapter (refer to section "Accessories 69"). During the communication, the digital input 1 can not be used for another function!




## 5.3 Connector cable

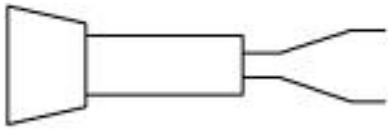
**Analog interface:**



| | |
|---|---|
| 1 (brown): | Power supply VCC + |
| 2 (green): | Command value |
| 3 (white) | Digital input |
| 4 (yellow) | Stabilised output voltage |
| 5 (grey) | Power supply 0 VDC / GND |

Connector cable X1

**Solenoid connection (only with version with additional solenoid cable ):**



| | |
|---|---|
| 1 (brown): | Solenoid connection 1 |
| 2 (white) | Solenoid connection 2 |

Solenoid cable X2

## 5.4 Operating elements

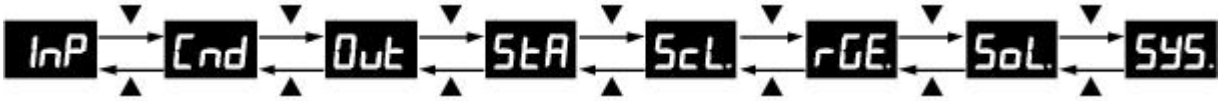
7-segment display
to display the configuration and diagnostics values

Enter push-button (◆)
Selecting a menu point or confirm an input

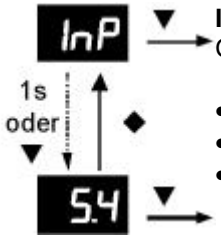
Arrow up push-button (▲)
Move to the previous menu item or to increase a value

Arrow down push-button (▼)
Move to the next menu item or to decrease a value

## 5.5 Menu structure

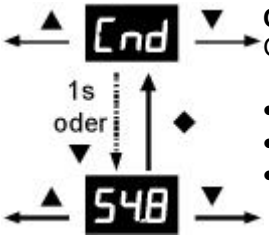



- to move between the various menu items the push-buttons ▲ resp. ▼ can be used.
  **Note**: Therefore, the push-button lock must be not active (refer to section "Push-button lock" 25).
- if the device has an error, the error code is displayed flashing after 10s without push-button operation (refer to section "Error code" 26). However, settings are still possible.
- Menu items which contain sub-menus are displayed with a dot at the end



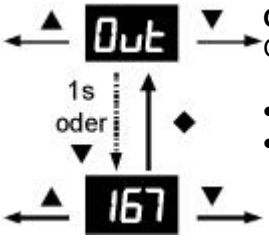

**InP**ut
Current value of the analog input (in the unit)

- the current value of the analog input is displayed with one decimal point
- the display occurs in the unit of the selected signal type
- corresponds to the value "Input command value" (value 1) from section "Analysis - Show values" 53



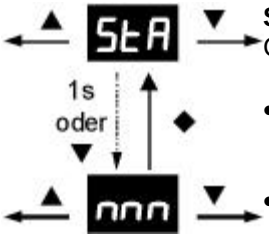

**Com**man**d**
Current value of the command value

- the current value of the command value is displayed with one decimal point
- the display occurs in %
- corresponds to the value "Output value ramp generator" (value 4) from section "Analysis - Show values" 53




**Out**put
Current value the solenoid current

- the current value of the solenoid current is displayed without a decimal point
- the display occurs in
  - mA (solenoid type = Proportional solenoid with current measuring
  - % (solenoid type = Proportional solenoid without current measuring or solenoid type = Switching solenoid without current measuring)
- corresponds to the value "Actual solenoid current solenoid driver 1" (value 7) from section "Analysis - Show values" 53



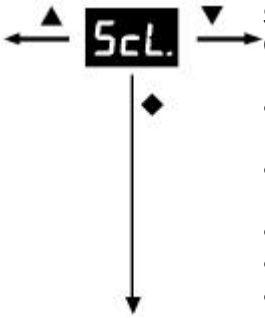

**StA**te
Current value of the channel state

- display the channel state of the device
- possible indicators for nnn are:

Device is disabled (status "**Dis**able", refer to section "PD2 State machine" 15)

Device is released (status "**Act**ive", refer to section "PD2 State machine" 15)

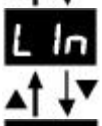
Device has an error (**E**rror) and is disabled. The error code "nn" is a value between 01 ... 30 (refer to section "Error code" 26)




**Sc**a**L**ing
Command scaling

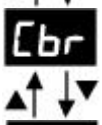
- settings are only possible if the push-button lock is not active (refer to section "Push-button lock" 25)
- select the desired parameter (scroll through the menu using the push-buttons ▲ and ▼ )
- after 1s or by pressing the push-button ◆ the current setting value appears
- to change the value, press the push-button ◆ for 1s => value flashes
- now the value can be changed using the push-buttons ▲ and ▼
- if the desired value is reached, the setting can be stopped with pressing the push-button ◆
- change to the previous parameter using the push-button ▲, to the next parameter using the push-button ▼ or to the current parameter using the push-button ◆

**SiG**nal type
Parameter "Signal type" (refer to section "Signal scaling - Signal type" 34)



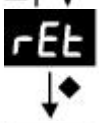

**L**ow **In**terface
Parameter "min interface" (refer to section "Signal scaling - min Interface" 34)

**H**igh **In**terface
Parameter "max interface" (refer to section "Signal scaling - max Interface" 34)



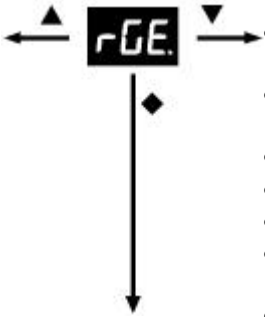

**C**able**br**eak
Parameter "Cablebreak detection" (refer to section "Signal scaling - Cablebreak detection" 36)

**d**ead**b**an**d**
Parameter "Deadband" (refer to section "Signal scaling - Deadband" 37)

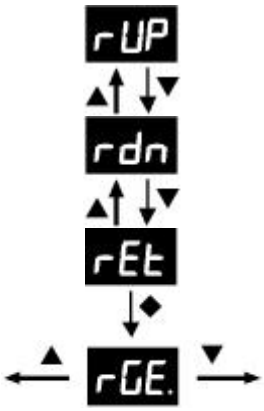



**rEt**urn
back to menu "Parameters setting"

**r**amp **GE**nerator
Ramp Generator




- settings are only possible if the push-button lock is not active (refer to section "Push-button lock" 25)
- select the desired parameter (scroll through the menu using the push-buttons ▲ and ▼ )
- after 1s or by pressing the push-button ◆ the current setting value appears
- to change the value, press the push-button ◆ for 1s => value flashes
- now the value can be changed using the push-buttons ▲ and ▼
- if the desired value is reached, the setting can be stopped with pressing the push-button ◆
- change to the previous parameter using the push-button ▲, to the next parameter using the push-button ▼ or to the current parameter using the push-button ◆

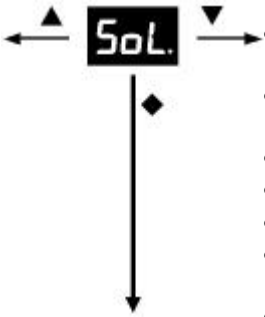



**r**amp **UP**
Parameter "Ramp up positive" (refer to section "Ramps - Ramp up positive" 38)

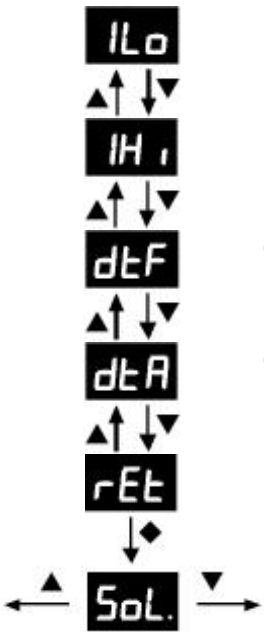
**r**amp **d**ow**n**
Parameter "Ramp up positive" (refer to section "Ramps - Ramp up positive" 38)

**rEt**urn
back to menu "Parameters setting"

**SoL**enoid
Solenoid driver




- settings are only possible if the push-button lock is not active (refer to section "Push-button lock" 25)
- select the desired parameter (scroll through the menu using the push-buttons ▲ and ▼ )
- after 1s or by pressing the push-button ◆ the current setting value appears
- to change the value, press the push-button ◆ for 1s => value flashes
- now the value can be changed using the push-buttons ▲ and ▼
- if the desired value is reached, the setting can be stopped with pressing the push-button ◆
- change to the previous parameter using the push-button ▲, to the next parameter using the push-button ▼ or to the current parameter using the push-button ◆



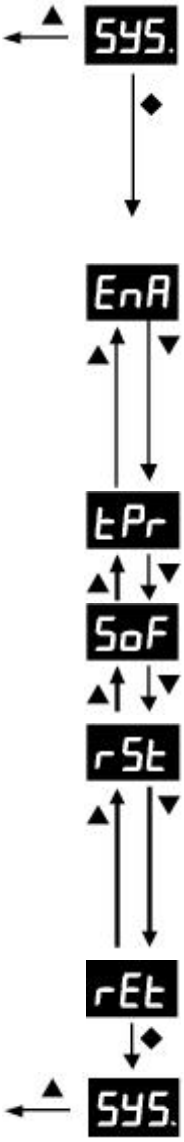

**I Lo**w
Parameter "Imin" (refer to section "Solenoid driver - Imin" 41)

**I Hi**gh
Parameter "Imax" (refer to section "Solenoid driver - Imax" 41)

**di**ther **F**requenz
Parameter "Dither frequenz" (refer to section "Solenoid driver - Dither Frequency" 41)

**di**ther **A**mplitude
Parameter "Dither level" (refer to section "Solenoid driver - Dither level" 41)

**rEt**urn
back to menu "Parameters setting"




**SYS**tem
Enable, Device informations and Reset

- settings are only possible if the push-button lock is not active (refer to section "Push-button lock" 25)
- select the desired information value
- after 1s or by pressing the push-button ◆ the current information value appears
- change to the previous value using the push-button ▲, to the next value using the push-button ▼ or to the current value using the push-button ◆

**EnA**ble
Parameter "Enable" (refer to section "Enable Channel" 33)

- to change the value, press the push-button ◆ for 1s => value flashes
- now the value can be changed using the push-buttons ▲ and ▼
- if the desired value is reached, the setting can be stopped with pressing the push-button ◆

**t**em**Per**ature
Current device temperature in °C

**Sof**tware
Installed software version

**r**e**S**e**t**
Load default settings

- by pressing the push-button ◆ while 1s the value "no" appears (flashing)
- with using the push-buttons ▲ and ▼ the value "yes" (flashing) can be selected
- **ATTENTION:** be pressing the push-button ◆ all parameters will be set to the delivered default settings (refer to section "Default setting of the parameters 32")d software version

**rEt**urn
back to menu "Enable, Devie informations and Reset"

## 5.6 Push-button lock

- if no push-button is pressed during 120s, the push-button lock is automatically activated
- if the push-button lock is active, the display is dimmed and "Loc" will appear when a push-button is pressed

- to unlock, the push-buttons ▲ and ▼ must be pressed simultaneously for 1s
- if the push-button lock is inactive, the display is not dimmed and "UnL" will appear for 1s
- after unlocking, both push-buttons must first be released before any further input with the push-buttons ▲ and ▼ can be made

## 5.7 Error codes

If an error occurs on the device, an error code (Enn) is displayed in the 7-segment display (flashing). This error code (nn) corresponds to the display in the menu "Analysis - Diagnostics 57".

| Error code nn | Error | Description |
|---|---|---|
| 01 | Supply voltage error | The supplied voltaged is under 8VDC. The error is also displayed if a supplied voltage interruption occurred (t > 250ms). |
| 04 | Memory error | Error in verifying EPROM-RAM data. Error has occurred while writing to or reading from the EPROM. |
| 08 | Temperature error | he temperature has exceeded the error limit.. |
| 10 | Buffer overflow | There was a hard- or software buffer overflow in the fieldbus module. |
| 11 | Bus communication reset | There was a reset communication on the bus. |
| 12 | Bus communication stop | There was a stop communication on the bus. |
| 13 | Bus communication nodeguarding | There was a nodeguarding error on the bus communication. |
| 14 | Bus initialisation | There was a error during the initialisiation of the bus. |
| 15 | Bus state | Bus communication is lost |
| 23 | Cablebreak command value | The command value is either smaller than the lower cable break limit or higher than the upper cable break limit |
| 24 | Short circuit solenoid driver 1 | There is a short circuit on the solenoid driver |
| 26 | Cablebreak solenoid driver 1 | There is a cablebreak on the solenoid driver |
| 30 | J1939 error | Adress claim failed |

# 6 Commissioning

**Please refer to section "Safety rules" 10.**

## 6.1 Connection instructions

The contact assignment of the following description refers to section "Operating and Indicating elements" 21 and to section "Connection examples" 28.

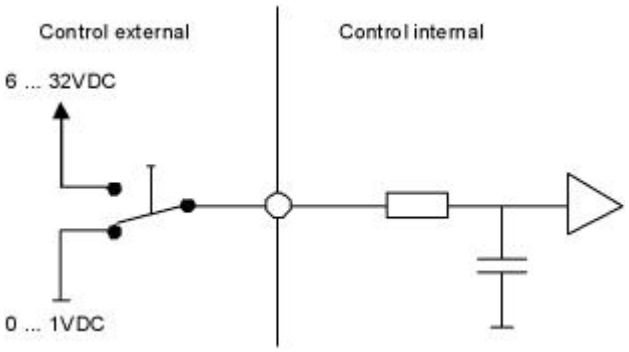
For an **installation / connection appropriate for EMC**, the following points absolutely have to be observed:
- Solenoid- and signal cables must not be laid parallel to high voltage cables.

### 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 PD2-Electronics (refer to section "Electrical Characteristics" 8).
- The limit values of the supply voltage and its residual ripple have to be observed indispensably (refer to section "Electrical Characteristics" 8).
- The PD2-Electronics have to be fuse protected with a slow-blow fuse.

### 6.1.2 Digital inputs / outputs

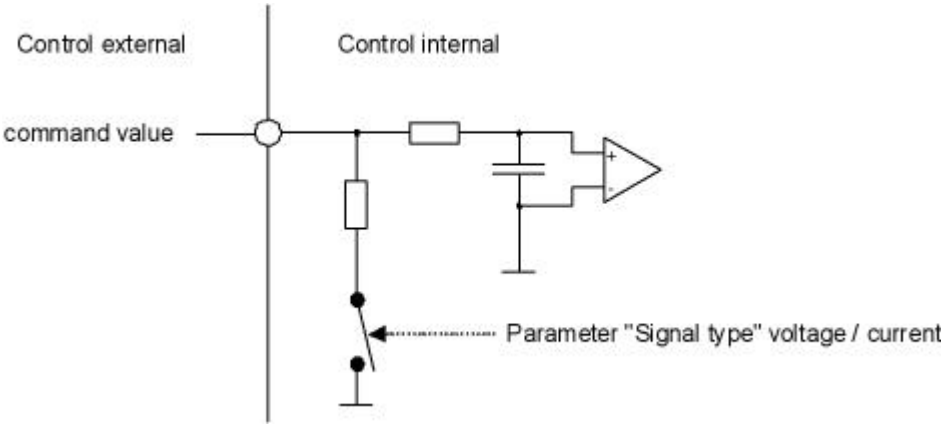
- the digital input is ”high-active” and not galvanically separated.
- for activation it has to be connected to a voltage between 6 ... 32VDC (e.g., supply voltage)
- for not activation it has to be connected to a voltage between 0 ... 1VDC (e.g. GND)
- ileft it open means a not defined state




- this input is also used for the command value signal "Digital", "Frequency" and "PWM"
- the switching between Digital / Frequency / PWM is made with the parameter "Signal type" (refer to section " Command scaling 34")
- this input can also be used as a USB interface, through which the parameterisation and the diagnostics can be made by using the PC-Parameterisation software PASO PD2. The USB communication requires a separately available USB Adapter (refer to section "Accessories 69").
  **ATTENTION:** during the communication, the digital input can not be used for another function!

### 6.1.3 Analog inputs

- the analogue input can be used either as a voltage or a current input
- the switching between Voltage / Current is made with the parameter "Signal type" (refer to section "Command scaling 34")



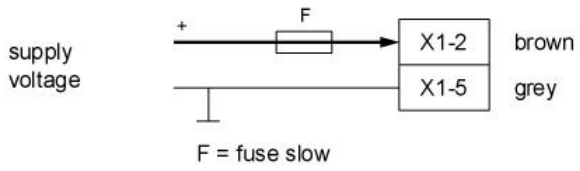

### 6.1.4 Solenoid outputs

- The solenoid output is able to measure the solenoid current. This is necessary for controlling the solenoid current if the parameter "Solenoid type" is set to "Proportional solenoid with current measurement" (refer to section "Valve type" 39).
- If the parameter "Solenoid type" is set to "Proportional solenoid without current measurement" or "Switching solenoid without current measurement" (refer to section "Valve type" 39) a current measurement is not possible.

## 6.2 Connection examples

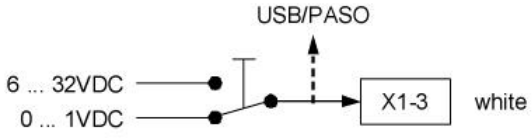
The contact assignment of the following description refers to section "Operating and Indicating elements" 21.

### 6.2.1 Supply voltage

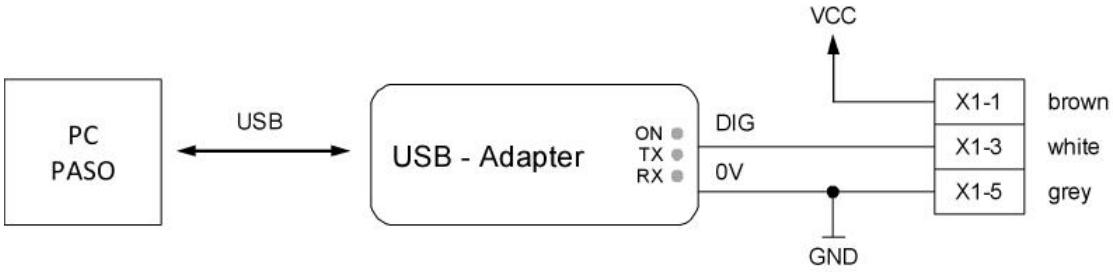



### 6.2.2 Digital input

as function input:

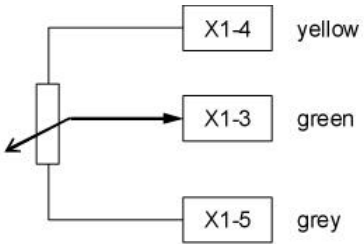


as USB interface (with separately available USB Adapter (refer to section "Accessories 69"):

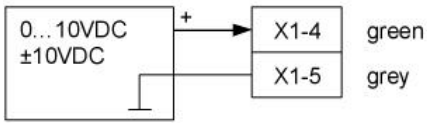



### 6.2.3 Analog input

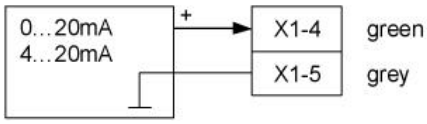
With Potentiometer (preferably 5kOhm):




With external voltage:




With external current:



# 7 Settings

**Please refer to section "Safety rules" 10.**

## 7.1 Introduction

- The system - and parameter settings can be made either through the operating elements integrated in the cover, through the PC - parameterisation software PASO PD2 or through the field bus (only, if the PD2-Electronics has a field bus node)
- Information about the installation and operation of the PC - parameterisation software PASO PD2 can be found in the section "PASO PD2 Installation and Operation" 61.
- For information about the possibilities for the PD2-Electronics with fieldbus, please refer to the document "Operating Instructions PD2 CANopen - Protocol with Device Profile in accordance with CiA DSP 408".
- Depending on the connected PD2-Electronics, certain setting may be not available, resp. disabled.

## 7.2 Assignment of the inputs/outputs

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

| | |
|---|---|
| Digital inputs | DigInp1 |
| | not used |
| Analog inputs | AnaInp1 |
| | not used |
| solenoid outputs | SolOutA |
| | not used |

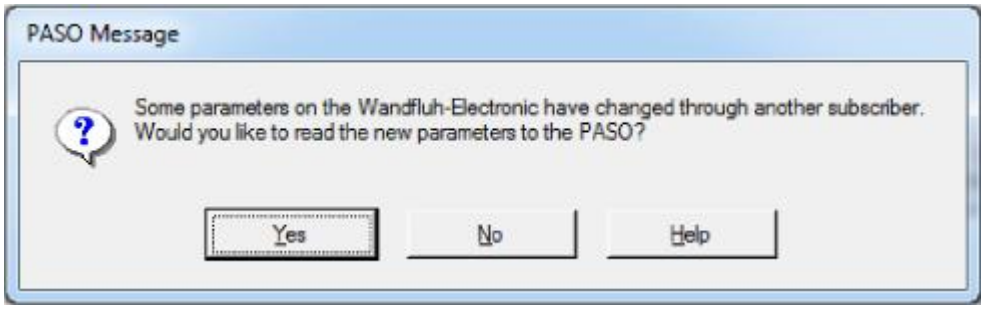
The selection "not used" means that no input or output will be assigned.

Digital inputs which are set or reset by software (refer to section "Configuration - Digital E/A" 48) will be displayed with blue text color in the main window.

## 7.3 Parameter inconsistency

The system - and parameter settings can be made either through the operating elements integrated in the device cover, through the PC - parameterisation software PASO PD2 or through the field bus (only, if the PD2-Electronics has a field bus node). In any case, the current parameter values will be displayed in the PASO

If a parameter value will be changed externaly (not through the PASO), 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 PD2-Electronics. Possible open parameter windows in the PASO will be closed automatically. If a parameter value will be changed through the manual operation terminal after the read-in of the new parameters, this message will appear again.

If the answer is ”No”, then the displayed parameter values in the PASO do not correspond to the current parameter value on the PD2-Electronics. This will be displayed in the status line in the field "Parameter inconsistency" (refer to section "Starting of PASO PD2" 65). If a parameter value will be changed through the manual operation terminal again, no further message will be appear in the PASO. But it's always possible to change also parameter values through the PASO.

## 7.4 Tips for the first commissioning

- Connect the power supply, leave the PD2-Electronics still switched-off
- Switch-off the hydraulic drive (hydraulics switched-off)
- Carefully check the connections
- Switch-on the power supply
- Establish communication with PASO (connect PC and axis controller with a standard USB cable and start PASO)
- Configure the PD2-Electronics specific to the installation. In doing so, the following sequence should be observed:
  1. Select the mode of operation and the solenoid type in the box "Valve type" 39
  2. Make the corresponding settings in the box "Signal Scaling" 34
  3. Make the corresponding settings in the box "Fixed Command values" 38
  4. Make the corresponding settings in the box "Ramps" 38
  5. Make the corresponding settings in the box "Solenoid driver" 40
- Switch-on the hydraulic drive (hydraulics switched-on)

## 7.5 Default setting of the parameters

The PD2-Electronic will be delivered with the following default settings:

| **Parameter** | **Ampifier** |
|---|---|
| Digital input 1 | X (external) |
| Auto Reset for Supply Voltage Fault | no |
| | |
| | Channel 1 |
| Enable channel | external |
| Dig. input enable channel | DigInp1 |
| Signal type | Voltage |
| Used analog input | AnaInp1 |
| Used digital input | DigInp1 |
| Cablebreak detection | no |
| Lower cablebreak limit | 3.5 mA |
| Upper cablebreak limit | 20.191 mA |
| Min Interface | 0.000 V |
| Max Interface | 5.000 V |
| Deadband function | off |
| Deadband threshold | 0.0 % |
| Enable fixed command values | off |
| Selection 1 Fixed command values | DigInp1 |
| Fixed command value 1 | 0.0 % |
| Enable ramp | on |
| Dig. input enable ramp | DigInp1 |
| Ramp up positive | 0.0 s |
| Ramp down positive | 0.0 s |
| Mode of operation | Command uni/bipolar (1-sol) |
| Digital input solenoid B | not used |
| Solenoid type | Proportional solenoid with current measurement |
| Solenoid output 1 | SolOutA |
| Cablebreak input signal Error evaluation | Solenoid 1+2 off |
| | |
| | Solenoid A |
| Enable | on |
| Dig. input enable | DigInp1 |
| Inversion | no |
| Cablebreak detection | no |
| Characteristic optimisation | off |
| Imin | 150 mA |
| Imax | 700 mA |
| Dither function | on |
| Dither frequency | 80 Hz |
| Dither level | 100 mA |
| Switching on threshold | 100.0 % |
| Switching off threshold | 0.0 % |
| Reduction time | 0 ms |
| Reduced Value | 100.0 % |

In the section "Parameter setting" 33 and "Configurations - Menu" 48 there is a description of all the parameters.

## 7.6 Parameters setting

By clicking with the left mouse button on the corresponding box in the channel window, the parameter values of PD2-Electronics can be set.

### 7.6.1 Enable channel

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

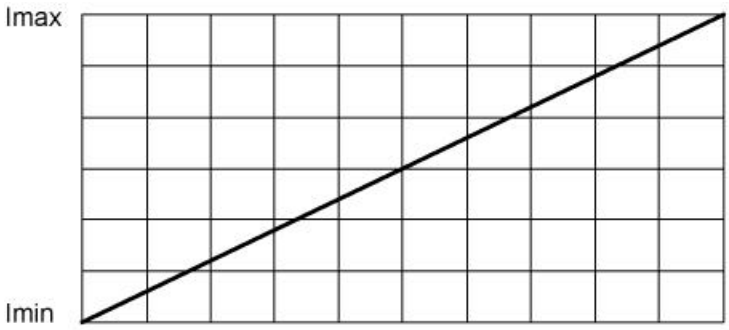
| Field | Parameter description | Range / Step |
|---|---|---|
| Operating mode (Device local) | Select the desired command value source (only valid for PD2 with Fieldbus Interface). | bus<br>local |
| Enable<br> | Enable channel.<br>With the selection "off", the corresponding channel is disabled and no solenoid current will be active (refer to section "PD2 State machine" 15).<br>With the selection "on", the corresponding channel is enabled and the solenoid current will be operated according to the selected operating mode (refer to section "PD2 State machine" 15).<br>With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable).<br>With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable).<br>The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input". | off<br> on<br> external<br> external inverted |
| Dig. input | Active digital input for the enable if the parameter "enable = external". Otherwise, this setting has no effect.<br>In choosing "not used", no digital input will be assigned to the enable function. | refer to section "Assignment of the inputs/outputs" 30 |

### 7.6.2 Signal scaling

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

| Field | Parameter description | Range / Step |
|---|---|---|
| Command value mode (Device Local) | Select the desired command value source (only valid for PD2 with Fieldbus Interface). | local<br>bus |
| Signal type<br> | Select the desired command value signal type. | Voltage<br> Current<br> Digital<br> Frequency<br> PWM |
| Used analog input | Select the desired used analog input.<br>This control is only active, if the parameter "Siganl type" is set to "Voltage" or "Current".<br>In choosing "not used", no analog input will be assigned. | refer to section "Assignment of the inputs/outputs" 30 |
| Used digital input | Select the desired used digital input.<br>This control is only active, if the parameter "Siganl type" is set to "Digital", "Frequency" or "PWM" .<br>In choosing "not used", no digital input will be assigned. | refer to section "Assignment of the inputs/outputs" 30 |
| min interface<br> | Indicates the input signal value for 0% command value.<br><br>Signal type = Voltage<br><br>Signal type = Current<br><br>Signal typ = Digital<br><br>Signal type = Frequency<br><br>Signal type = PWM [1)]<br><br>By changing the parameter "Signal type", this value will be set to the default value (refer to Default values for scaling parameters 37). | <br><br>-10 ... 10V<br>0.1V<br>0 ... 20mA<br>0.1mA<br>0 ... 1<br>1<br>5 ... 5000Hz<br>0.1Hz<br>0 ... 100%PW<br>0.1%PW |
| max interface<br> | Indicates the input signal value for 100% command value.<br><br>Signal type = Voltage<br><br>Signal type = Current<br><br>Signal typ = Digital<br><br>Signal type = Frequency<br><br>Signal type = PWM [1)]<br><br>By changing the parameter "Signal type", this value will be set to the default value (refer to Default values for scaling parameters 37). | <br><br>-10 ... 10V<br>0.1V<br>0 ... 20mA<br>0.1mA<br>0 ... 1<br>1<br>5 ... 5000Hz<br>0.1Hz<br>0 ... 100%PW<br>0.1%PW |

[1)] The detection of the pass from 0% to 100% can take up to 250ms!




| | | |
|---|---|---|
| 0 % | 100 % | command (Reference) |
| 0 V | 10 V | Analog value (Interface) |
| 0 mA | 20 mA | |
| 4 mA | 20 mA | |
| -10 V | +10 V | |
| 0 V | -10 V | |
| 5 Hz | 5000Hz | Digital value (Interface) |
| 0 %PW | 100 %PW | |

If the parameter "min. interface" is set higher than the parameter "max. interface", this represents an inversion of the input signal value.

**Cablebreak**

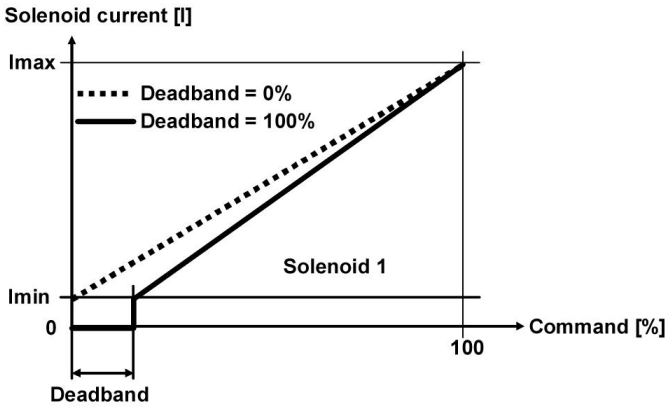
The following adjustments can only be made if the parameter "Signal type" is set to "Current", "Frequency" or "PWM".

| Field | Parameter description | Range / Step |
|---|---|---|
| Cablebreak detection<br><br>CbR | Switch on/off the cablebreak detection of the input signal (refer to section "Cablebreak detection" 16). | oFF no<br>on yes |
| Lower cablebreak limit | Command value < Lower cablebreak limit = cablebreak active<br><br>Signal type = Current<br><br>Signal type = Frequency<br><br>Signal type = PWM<br><br>The adjusted value must be less than the value of the Upper cablebreak limit.<br><br>By changing the parameter "Signal type", this value will be set to the default value (see table below). | 0 ... 20mA<br>0.1mA<br>5 ... 5000Hz<br>0.1Hz<br>0 ... 100%PW<br>0.1%PW |
| Upper cablebreak limit | Command value > Upper cablebreak limit = cablebreak active<br><br>Signal type = Current<br><br>Signal type = Frequency<br><br>Signal type = PWM<br><br>The adjusted value must be greater than the value of the Lower cablebreak limit.<br><br>By changing the parameter "Signal type", this value will be set to the default value (see table below). | 0 ... 20mA<br>0.1mA<br>5 ... 5000Hz<br>0.1Hz<br>0 ... 100%PW<br>0.1%PW |

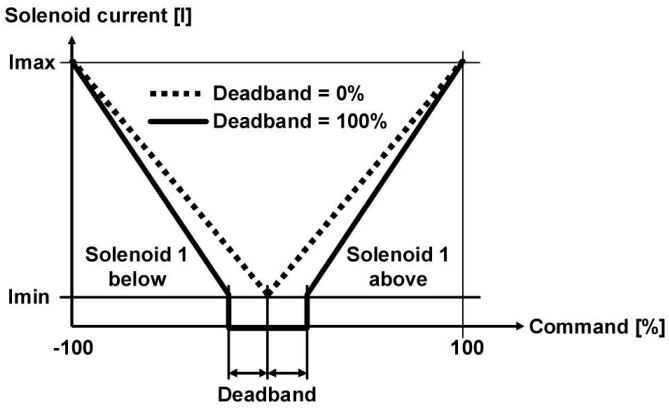
### Deadband

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

| Field | Parameter description | Range / Step |
|---|---|---|
| Deadband function | Swtich on/off the deadband function | off<br>on |
| Deadband<br>dbd | Command value < Deadband = 0 mA solenoid current<br>Command value >=Deadband = Imin..Imax solenoid current<br>oFF If the value is 0.0% the deadband function is switch off in the 7-segment display | 0 ... 50%<br>0.1% |




Standard 1-solenoid valve




4/3-way 1-solenoid valv

### Default values for scaling parameters

| | Signal type | | | | |
|---|---|---|---|---|---|
| | **Voltage** | **Current** | **Digital** | **Frequency** | **PWM** |
| Lower cablebreak limit | -- | 3.5 mA | -- | 10 Hz | 10 %PW |
| Upper cablebreak limit | -- | 20.0 mA | -- | 5000 Hz | 95 %PW |
| min interface | 0 V | 0 mA | 0 | 5 Hz | 5 %PW |
| max interface | 10 V | 20 mA | 1 | 5000 Hz | 95 %PW |

### 7.6.3 Command value fixed

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

| Field | Parameter description | Range / Step |
|---|---|---|
| Enable | Enalbe command values fixed.<br>With the selection "off", the command value fixed function ist switched off, that means the input command value is 1:1 redirected to the output.<br>With the selection "on", the command value fixed function ist switched on, that means the output value is dependend on the digital inputs. | off<br>on |
| Selection 1 | Active digital input for command value fixed 1, if the parameter "enable = 1". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the command value fixed 1. | refer to section "Assignment of the inputs/outputs" 30 |
| Fixed command value 1 | Value for the fixed command value 1. The adjusted %-value correspond to the adjusted solenoid current range (0% = 0mA, 0.1% = Imin, 100% = Imax).<br>Can only be adjusted if "Selection 1" is not set to "not used". | 0 ... 100%<br>0.1% |

### 7.6.4 Rampe Generator

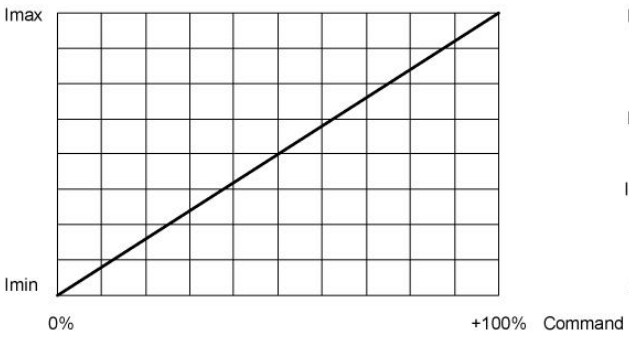
In this window, all adjustments according to the ramp function will be made

| Field | Parameter description | Range / Step |
|---|---|---|
| Enable | Enalbe ramp function.<br>With the selection "off", the ramp function ist switched off, that means the input command value is redirected to the output without a delay.<br>With the selection "on", the ramp function ist switched on, that means the input command value is redirected to the output with a delay.<br>With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable).<br>With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable).<br>The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input". | off<br>on<br>external<br>external inverted |
| Dig. input | Active digital input for the enable if the parameter "enable = external". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the enable function. | refer to section "Assignment of the inputs/outputs" 30 |
| Rampe up positive | The set ramp time refer to a command value jump from 0% to 100% for the solenoid from the solenoid driver 1. | 0 ... 500s<br>0.05s |
| Rampe down positive | The set ramp time refer to a command value jump from 0% to 100% for the solenoid from the solenoid driver 1. | 0 ... 500s<br>0.05s |

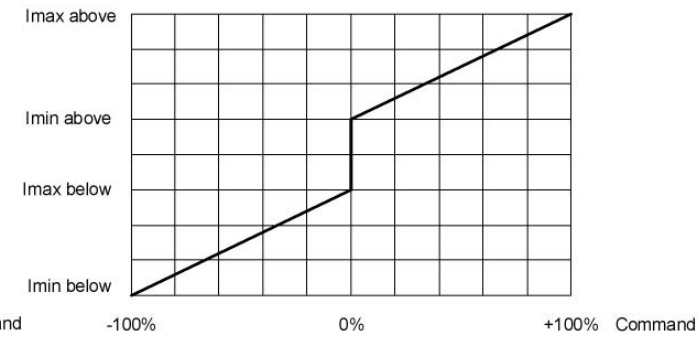
### 7.6.5 Valve type

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

| Field | Parameter description | Range / Step |
|---|---|---|
| Mode of operation | Select the desired mode of operation (refer to section "Mode of operation" 18). | Command uni/bipolar (1-sol)<br>Command unipolar (2-sol)<br>Command bipolar (2-sol)<br>Command unipolar (2-sol with DigInp) |
| Solenoid type | Select the desired solenoid type | Proportional solenoid without current measurement<br>Proportional solenoid with current measurement<br>Switching solenoid without current measurement |
| Valve type | Valve type of the connected valve<br><br>Standard valve with one solenoid<br><br>4/3-way valve (2-solenoid function) with only one solenoid | <br><br>Standard 1-solenoid<br><br>4/3-way 1-solenoid |
| Controller mode (Device control mode) | Select the desired Controller mode (only valid for PD2 with Fieldbus Interface). | Spool valve open loop<br>Pressure/flow valve open loop |




Standard 1-solenoid




4/3-Wege 1-solenoid

### 7.6.6 Solenoid driver

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

**Solenoid current:**

| Field | Parameter description | Range / Step |
|---|---|---|
| Solenoid output | Select the desired solenoid output for the current channel. In choosing "not used", no solenoid output will be assigned to the current channel. | SolOutA<br>not used |
| Enable | Solenoid enable<br>With the selection "off", the selected solenoid output is disabled and no solenoid current will be active.<br>With the selection "on", the selected solenoid output is enabled and the solenoid current will be operated according to the selected operating mode.<br>With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable).<br>With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable).<br>The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input". | off<br>on<br>external<br>external inverted |
| Dig. input | Active digital input for the enable if the parameter "enable = external".<br>Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the enable function.. | refer to section "Assignment of the inputs/outputs" 30 |
| Inversion | Inversion of the solenoid output<br>0% command = Imin, 100% command = Imax<br>0% command = Imax, 100% command = Imin | no<br>yes |
| Characteristic optimisation | Switch on/off the characteristic optimisation (refer to section "Characteristic optimisation 14") | off<br>on |

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

| Field | Parameter description | Range / Step |
|---|---|---|
| Cablebreak detection | Switch on/off the cablebreak detection on the solenoid output.<br>This parameter can only be set with a solenoid type "Proportional solenoid with current measurement" (refer to section "Valve type" 39) | no<br>yes |
| Imin<br> | Set minimum solenoid current A.<br>(= solenoid current by 0% command value)<br>With a solenoid type "... without current measurement" (refer to section "Valve type" 39), this parameter can be set from<br>0 ... 100% duty cycle.<br>Using the menu Commands - Valve operation 49 the Imin can be adjusted very easily.<br>With a valve type "4/3-way 1-solenoid" (refer to section "Valve type" 39), this parameter corresponds to the solenoid current by 0% command value. | 0 ... 950mA<br>3mA<br><br><br><br><br><br>Imax below < Imin < Imax |
| Imax<br> | Set maximum solenoid current A.<br>(= solenoid current by 100% command value)<br>For the max. current refer to section "Electrical specifications" 8.<br>With a solenoid type "... without current measurement" (refer to section "Valve type" 39), this parameter can be set from 0 ... 100% duty cycle.<br>Using the menu Commands - Valve operation 49 the Imax can be adjusted very easily.<br>With a valve type "4/3-way 1-solenoid" (refer to section "Valve type" 39), this parameter corresponds to the solenoid current by 100% command value. | Imin ... max. current<br>3mA<br><br><br><br><br><br>Imin < Imax |
| Imin below | Is only active with a valve type "4/3-way 1-solenoid" (refer to section "Valve type" 39). This parameter corresponds to the solenoid current by -0.1% command value. | 0 ... 950mA<br>3mA<br>Imin below < Imax below |
| Imax below | Is only active with a valve type "4/3-way 1-solenoid" (refer to section "Valve type" 39). This parameter corresponds to the solenoid current by -100% command value. | Imin below ... max. current<br>3mA<br>Imin below < Imax below < Imin |
| Dither function | Switch on/off the dither function | off<br>on |
| Dither frequency<br> | The dither frequency can be set in steps.. | 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 100, 125, 165, 250, 500Hz |
| Dither level<br> | Level of the superimposed dither signal<br>With a solenoid type "... without current measurement" (refer to section "Valve type" 39), this parameter can be set from 0 ... 20% duty cycle.<br>**Attention:** The delay in the current building of the coil due to the inductivity can lead to the selected level is not quite reached! | 0 ... 399mA<br>6mA |

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

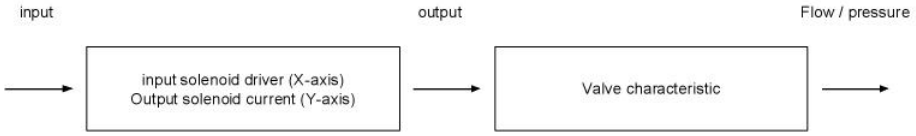
| Field | Parameter description | Range / Step |
|---|---|---|
| Switching on threshold | Command value >= Switching on threshold = solenoid output active | 0 ... 100% |
| Switching off threshold | Command value <= Switching off threshold = solenoid output not active | 0 ... 100% |
| Reduction time | After this time the PWM output will be reduced to the value which is set by parameter "reduction value" (refer to section "Power reduction" 20). | 0...2000ms |
| Reduced value | The PWM output will be reduced to this value after the time which is set by parameter "reduction time" (refer to section "Power reduction" 20). | 0...100% |

**Characteristic optimisation:**

This menu enables the optimisation of the solenoid current adjustment of PD2-Electronics. A graphic is shown which represents the characteristic “Input solenoid driver (X-axis) – Output Solenoid current (Y-axis)”. The graphic consists of 11 points, the first and the last point (100%) are preset.

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

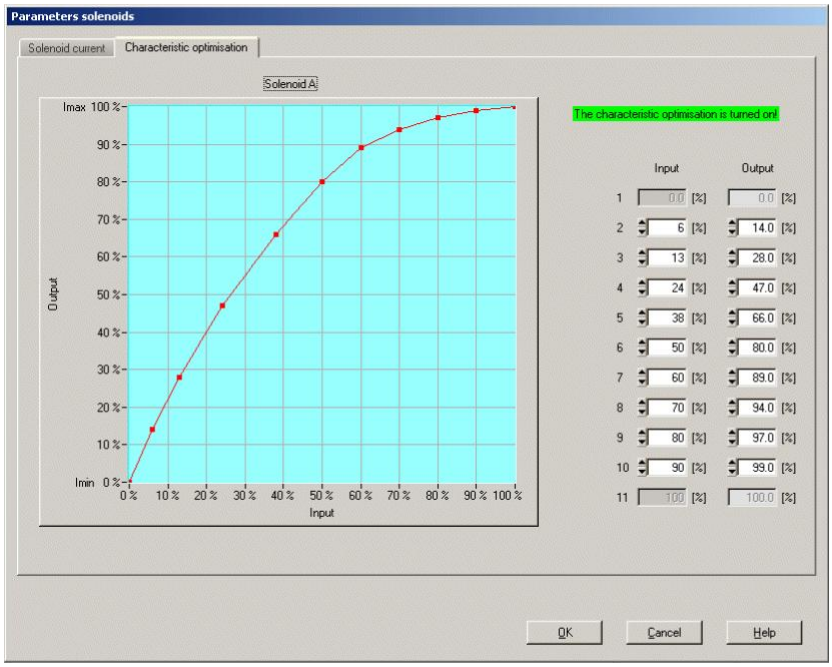
The other graphic points can be adjusted either by tracking with the mouse or by entering the value at the numeric inputs. The resolution of the X-values is in %, those of the Y-values in 0.1 %. The X-values cannot be falling.




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

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

Additionally the characteristic optimisation must be turned on. This will be shown in the PASO-Status line (refer to section "Starting of PASO PD2" 65).




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

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

### 7.6.7 Error evaluation

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

Solenoid 1 = selected solenoid output from the solenoid driver 1 (refere to section "Solenoid driver" 40)

| Field | Parameter description | Range / Step |
|---|---|---|
| Error handling | The desired error handling with a cablebreak error from the input signal (error E-1) can be set.<br><br>With the error "Short circuit from Solenoid driver 1", "Cablebreak Solenoid driver 1"and "J1939 Error", the error handling is fixed set to "Solenoid 1 off" | Solenoid 1 off<br>Solenoid 1 on |

In the status line per channel is displayed if an error is present (status: Error) or not (status: Ready) (refer to section "Analysis - Diagnostics" 57).

## 7.7 File-Menu

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

### 7.7.1 New

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

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

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

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

Fieldbus
- without Fieldbus
- with CANopen
- with J1939

**The modified configuration only affects the "Off Line"-mode. By switching to "On Line"-mode the configuration of the connected PD2-electronics will be read in.**

### 7.7.2 Open...

This menu point is only active in the "Off Line"-mode.
With this command, an existing file from a storage medium is opened. First the file selection window appears. In this window the required file can now be selected and opened with ”OK”.

If the selected file was not stored with the PASO PD2, the messge "The selected file is not a PASO PD2 Datei. File can not be loaded!" will be displayed and the operation is aborted.

If the selected file stored with a current PASO PD2, the read procedure will be started. If the configuration of the selected file does not correspond to the current configuration of the PASO PD2, a message will be displayed and the current configuration from the PASO PD2 will change automatically over to the new configuration of the selected file. The read parameter values will be checked in the case of a limiting value excess. If one or more parameter values are outside the tolerance, a message will be displayed and the parameter value will be set to the default value (refer to section "Limiting value error" 67). The parameter values can now be edited and changed as required under the corresponding menu points.

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

### 7.7.3 Save

With this command, the parameters are saved on a data storage medium. All parameter values of all input windows are saved under the current file name. If no file name has been defined yet, then first the file selection window appears (refer to section "File - Save as..." 45).

### 7.7.4 Save as...

With this command, the parameters are saved on a data storage medium. All parameter values of all input windows are saved under the file name entered.
First the file selection window appears. In this window the desired file name can now be entered. If the file name is entered without an extension, then the extension ”.par” is automatically assigned to it. After actuating the button ”Save”, the file information window appears (refer to section "File-Info" 46). In this window the required entries can now be made. With the button ”Save”, the file is then finally saved under the selected file name. With the button ”Cancel”, one changes back to the file window.

### 7.7.5 Print

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

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

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

### 7.7.6 Info

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

| | |
|---|---|
| Date, time | Date, time of saving. |
| File name: | The file name, under which the file has been saved. |
| Valve type: | The valve type of the connected PD2-Electronics at the moment of saving. If no PD2-Electronics are connected, then this indication remains empty. In case of saving during "On Line Operation", this indication is updated. |
| Operator: | The name of the originating person. |
| Remarks: | Possibility to enter remarks concerning the file. |

When the File-Info window appears during the execution of the command "File - Save as..." 45, then the corresponding entries can be made in the various fields (with the exception of "Date", "Time", "File name" and "Card type", which cannot be edited). When the File-Info window appears during the execution of the command "File - File-Info" 46, then the various fields cannot be edited.

### 7.7.7 Activate Off Line / Activate On Line

**Off Line**
With this command, the connection with the PD2-Electronics is interrupted. All menu points, which call for a communication with the PD2-Electronics, are blocked. The PASO PD2 software now runs in the "Off Line mode". The loading, saving and the editing of parameter files is possible in this mode.

**On Line**
With this command, the connection with the PD2-Electronics is established. The communication with the PD2-Electronics is briefly tested. If the connection works, then the user has the option of taking over the parameters from the PD2-Electronics or of transfering the parameters to the PD2-Electronics. During the transfer of the parameters, the user has the possibility of aborting the operation.

Before parameters are transferred to the PD2-Electronics, a verification is carried out as to whether the configuration of the PD2-Electronics supports the parameter values. The configuration corresponds here to the number of the solenoids. If the configuration of the connected PD2-Electronics do not match with the current configuration of the PASO PD2, a message will be displayed and the current configuration from the PASO PD2 will change automatically over to the new configuration.

If the parameters have been taken over by the PD2-Electronics, then they will be checked in the case of a limiting value excess. If one or more parameter values are outside the tolerance, a message will be displayed and the parameter value will be set to the default value (refer to section "Limiting value error" 67). The PASO PD2 will stay in the "Off Line"-mode. For going On Line in this case, the parameter must be transferred to the PD2-Electronics. If the transfer was successful and the limiting value check was also successful, then the software subsequently runs in the "On Line"-mode. The loading of parameter files is not possible in this mode.

The current mode will be displayed in the status line.

### 7.7.8 Datarecord info

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

Under this menu the current data set information of the connected PD2-Electronics appears. The data correspond to the last change to the PD2-Electronics data carried out.

| | |
|---|---|
| Card type: | The valve type of the connected PD2-Electronics at the moment of saving |
| Date: | Date of last change. (Format DD.MM.YYYY) |
| Time: | Time of last change (Format HH:MM.SS) |
| Filename: | The file name under which the parameters were saved at the last change.<br>If the file name is longer than 27 characters, the characters' "»" will be inserted at the end. |

### 7.7.9 Exit

With this command, the PASO PD2 is terminated. If parameter data have been changed and have not yet been saved, then the question appears, as to whether these data should be saved. This is referring only to the save in file. On the PD2-Electronics, the parameter will be saved automatically by clicking on the button "OK" in the corresponding windows (refer to section "Store parameter" 66).

## 7.8 Configuration-Menu

In this window, the settings of the function of the PD2-Electronics will be made.

### 7.8.1 Digital I/O

With this command the digital inputs and outputs of the connected PD2-Electronics are activated, not activated or enabled.

| Feld | Parameter Beschreibung | Bereich / Schrittweite |
|---|---|---|
| Digital inputs | Set digital input by software<br>Reset digital input by software<br>Readdigital input from external | 1<br>0<br>X |
| Digital outputs | The PD2-Electronics has no digital outputs | |

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

### 7.8.2 General errors

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

| Feld | Parameter Beschreibung | Bereich / Schrittweite |
|---|---|---|
| Auto reset | If the supply voltage rises above 8VDC after a supply error appeared, the PD2 electronics has to be disabled and re-enabled to acknowledge the supply error.<br>If the supply voltage rises above 8VDC after a supply error appeared, the PD2 electronics acknowledges the supply error automatically. | no<br><br>yes |

### 7.8.3 Default setting

This menu point is only active in the "On Line"-mode and in the PD2-state "Disabled" (refer to section "PD2 State machine" 15).

With this command, the default settings made in the factory will be loaded on the connected PD2-Electronics and read to the PC. After successfully read in, the question appears, if the values should be stored on the PD2-Electronics or not.
If "Yes" will be selected, the values will be stored in the way that they are available after the PD2-Electronics will be switched on again (non-volatile memory).
If "No" will be selected, the values are running at the moment, but after the PD2-Electronics will be switched on again, the before current values will be active again.

### 7.8.4 Interface

If a Wandfluh-device with USB interface is connected, by this command the USB parameters will be displayed otherwise an error message will be displayed. For displaying the USB parameters, the connected Wandfluh device must not be supplied. The USB communication requires a separately available USB Adapter (refer to section "Accessories 69").

### 7.8.5 Language

In this window, the language can be selected, with which the PASO PD2 will be inscribed. This setting is automatically saved and taken over with a new start.

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

## 7.9 Commands-Menu

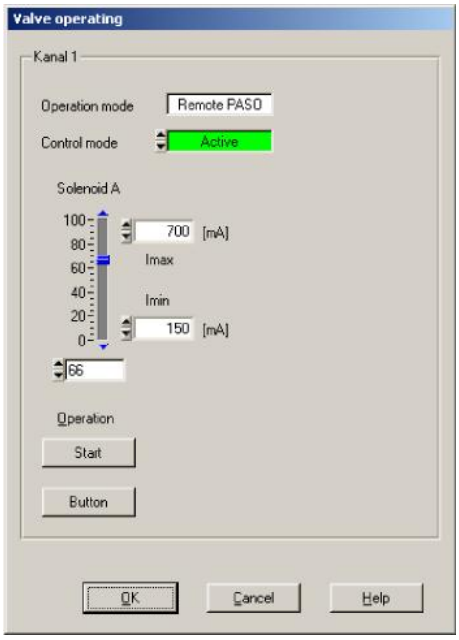
In the Commands menu, direct control commands can be transmitted to the PD2-Electronics.

### 7.9.1 Valve operating

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

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

The following window appears:




- The number of the shown channels is equal to the number of channels that can be operated (refer to section "Description of the Function" 11)
- The number of solenoids per channel corresponds to the selected mode of operation (refer to section "Valve type" 39)
- The solenoid name (for example "solenoid A") corresponds to the selected solenoid output (refer to section "Solenoid driver" 40)
- In the field "Operation mode" the current operation mode of the channel will be displayed
- In the field "Control mode" the current control mode of the channel will be displayed

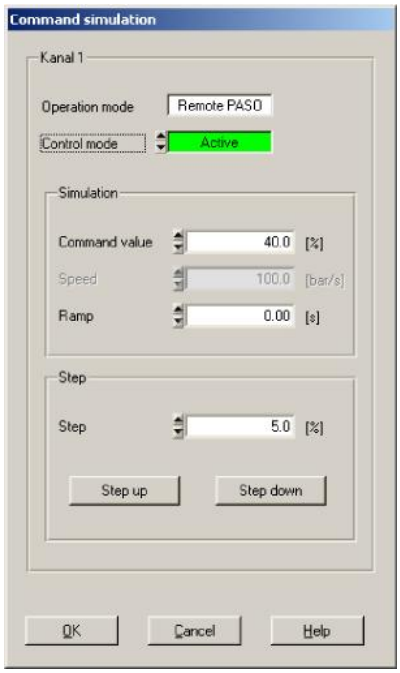
| Field | Parameter description | Range / Step size |
|---|---|---|
| Operation mode | Select the desired operating mode (refer to section "Operating mode" 16)<br>**This adjustment can only be made if the field "Control mode" is set to "Disabled".** | Local<br>Remote PASO |
| Control mode | Select the desired control mode (refer to section "PD2 State machine" 15)<br>**This adjustment can only be made if the field "Operation mode" is set to "Remote PASO".** | Disabled<br>Active |
| Operation | With this button, the adjusted current can be sent to the solenoid or the solenoid can be set to 0 current.<br>**This button can only be operated if the field "Operation mode" is set to "Remote PASO" and the field "Control mode" is set to "Active".** | Start / Stop |
| Solenoid x | The desired solenoid current can be adjusted either with the slider or in the numeric field.<br>With a proportional solenoid, the adjustment from 0...100% refers to a solenoid current from Imin...Imax.<br>With a switching solenoid, the solenoid can be switched off or on with 0 / 1.<br>**The adjusted current will be sent to the solenoid only if the button "Operation - Start" is activated (label of the button is "Stop")** | 0...100%<br>(Imin...Imax)<br>0 / 1 |
| Imin / Imax | The value of the parameter Imin / Imax from the corresponding solenoid driver can be changed (refer to section "Solenoid driver" 40).<br><br>If the window is closed with the button "OK", the changed values from Imin / Imax will be take over.<br><br>If the window is closed with the button "Cancel", the changed values from Imin / Imax will be reset to the original values. | |

### 7.9.2 Command simulation

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

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

The following window appears:




- The number of the shown channels is equal to the number of active channels (refer to section "Function description" 11)
- In the field "Operation mode" the current operation mode of the channel will be displayed
- In the field "Control mode" the current control mode of the channel will be displayed

| Field | Parameter description | Range / Step size |
|---|---|---|
| Operation mode | Select the desired operating mode (refer to section "Operating mode" 16)<br>**This adjustment can only be made if the field "Control mode" is set to "Disabled".** | Local<br>Remote PASO |
| Control mode | Select the desired control mode (refer to section "PD2 State machine" 15)<br>**This adjustment can only be made if the field "Operation mode" is set to "Remote PASO".** | Disabled<br>Active |
| Command value | Desired value of the command value.<br>The adjusted %-value refer to the adjusted solenoid current range (0 ... 100% = Imin ... Imax). | 0% ... 100%<br>0.1% |
| Ramp | After a command value jump, the new command value is approached via a linear ramp. The adjusted ramp time refer to a command value jump from 0% to 100% resp. from 100% to 0%. | 0 ... 500s<br>0.05s |
| Step | With this value the command value will be added by clicking on the button "Step up" resp. will be subtracted by clicking on the button "Step down". | Adaped to command value |
| Step up | The command value will be added with the value from "Step" | |
| Step down | The command value will be subtracted with the value from "Step" | |

## 7.10 Fieldbus-Menu

If the PD2-Electronics have a fieldbus, with this menu point the necessary bus node adjustments can be made. Also bus states will be displayed here.

If the PD2-Electronics have no fieldbus, the message "The connected PD2-Electronics don't provide an external bus port" will appear.

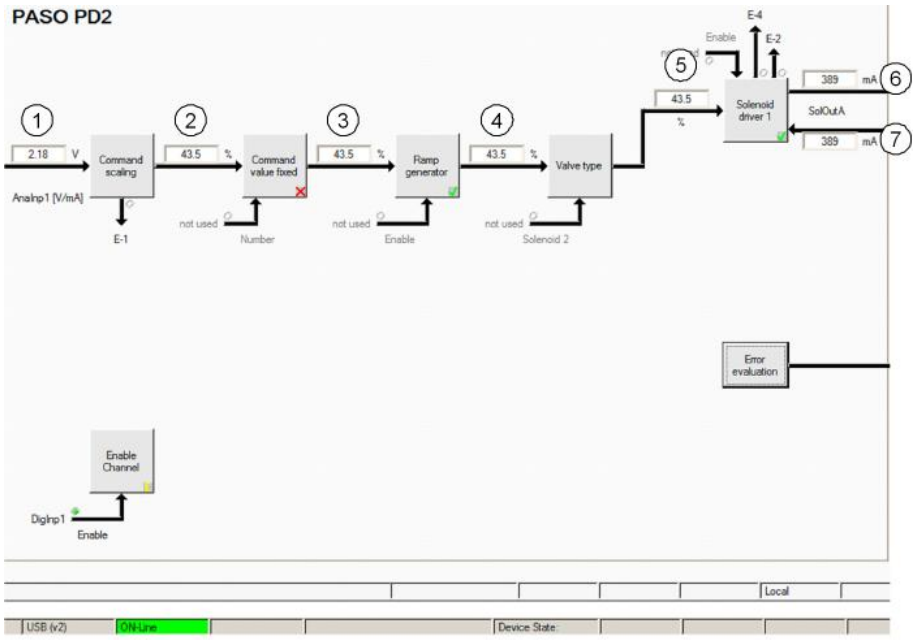
For more information about the possibilities for the PD2-Electronics with CANopen, please refer to the document "Operating Instructions PD2 CANopen - Protocol with Device Profile in accordance with CiA DSP 408".

## 7.11 Analysis-Menu

In the Analysis menu, measured values and possible errors on the PD2-Electronics can be displayed on-line.

### 7.11.1 Show values

With this command the display of the data in the current channel window can be turned on or off.




1 **Input command value**
Actual command value Is shown in V, mA, % or Hz, depending on the selected signal type (refer to section "Signal scaling" 34).

2 **Output value command scaling**
Command value scaled to 0...100% or -100...100%. Includes deadband.

3 **Output value command values fixed**
Command value scaled to 0...100% or -100...100%. If fixed command values are active and selected this value can be different to field 2.

4 **Output value ramp generator**
Command value scaled to 0...100% or -100...100%. If a ramp is running this value can differ to field 3.

5 **Input value solenoid driver 1**
Command value scaled to 0...100%.
If the value in field 4 is -100...0% a command value is given to solenoid driver 2. The command value for solenoid driver 1 is 0.
If the value in field 4 is 0...100% a command value of is given to solenoid driver 1. The command value for solenoid driver 2 is 0.

6 **Command solenoid current solenoid driver 1**
Output solenoid current. It is shown in mA if solenoid type is "Proportional solenoid with current measurement". If solenoid type is "Proportional solenoid without current measurement" or "Switching solenoid without current measurement" the value is shown in % (refer to section "Valve type") 39.

7 **Actual solenoid current solenoid driver 1**
Measured solenoid current. It is only shown if solenoid type is "Proportional solenoid with current measurement" (refer to section "Valve type") 39.

### 7.11.2 Values window

This menu point is only active in the "On Line" - mode.
With this command, all relevant data of the connected PD2-Electronics are read-in and displayed. The values are continuously updated (on-line).

| Field | Description | Unit |
|---|---|---|
| Supply voltage | Supply voltage for the PD2-Electronics . | V |
| Temperature | Actual PD2 temperature. | °C |
| Digital inputs | Logical statuses of the digital input:<br>• If the input is set<br>• If the input is not set | <br>1<br>0 |

### 7.11.3 Signal recording

In this menu, various signals of the connected PD2-Electronics can be recorded and analysed.

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

With the selection "Start - single", it is possible to record up to 250 measuring values per measuring channel (maximum 2 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.

With the selection "Scroll - continuos", it is possible to record infinite number of measuring values per measuring channel (maximum 2 channels). Displayed will be always the last 250 measuring values. All previous measurements measuring values can not be displayed. The scanning rate as a minimum amounts to 40ms.

The recording parameters (signal type, scanning rate, etc.) together with the parameters are saved on the card and when saving to a file they are saved on the hard-disk.
The recorded measuring values are **not** saved with the parameters. However, there is the possibility of exporting the recorded measuring values (button "Export").

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

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

| Field | Parameter description |
|---|---|
| Signal display | Switching-on the fields makes the recorded curve of the respective channel visible. |
| Time cursor | Positioning the time cursor over the input field time [s] or with the help of the slider control underneath the graphics. |
| Signal assignment | Opens the menu Signal Assignment 56 |
| New | Any recorder data are deleted and the card is ready for a new recording. |
| Start / Stop (single) | **Start**<br>A new recording is started. As soon as the trigger is actuated (or with "Trigger condition - start directly" immediately), the recording runs (apparent by the blinking of the field "Recording") and the measuring data are transmitted.<br>If there are already measuring data in the memory, then the recording continues as from this point.<br>Once the maximum number of measuring values has been read-in, the possible remaining recording data are transmitted (the curves continue to be updated).<br>During the transmission, it is already possible to analyse the curves ("Signal display", "Auto-scaling").<br><br>**Stop**<br>Stops the transmission and the recording. As from this point it is possible to record once again by a renewed actuation of Start.<br><br>Once the maximum number of measuring values has been read-in or if "Scroll" was pressed, the Start button is dimmed. |
| Scroll / Stop (continuos) | **Start**<br>A new recording is started. As soon as the trigger is actuated (or with "Trigger condition - start directly" immediately), the recording runs (apparent by the blinking of the field "Recording") and the measuring data are transmitted.<br>If there are already measuring data in the memory, then the recording continues as from this point.<br>As long as the buttons "Stop" or "New" are not pressed, the measuring values are read in. If the data memory on the PD2-Electronics is full, a message appears and the recording is stopped. During the transmission, it is already possible to analyse the curves ("Signal display", "Auto-scaling").<br><br>**Stop**<br>Stops the transmission and the recording. As from this point it is possible to record once again by a renewed actuation of Start.<br><br>If "Startl" was pressed, the Scroll button is dimmed. |
| Export | By the actuation of this button the recorded data are saved on the hard-disk.<br>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).<br>The decimal marker of the numbers can be selected: Decimal point or comma. |
| Auto-scaling | With this button, the curves are displayed in the graphics in an optimum manner. The optimisation is only carried out for the inserted curves. The values “Scaling/Div” and “Offset” of the corresponding channels ("Signal assignment 56"), are adapted for this purpose. The auto-scaling is also operative during a recording. |
| Close | With this button, one leaves the signal recording menu. Any recording data are kept and these are displayed once more by a renewed selection of the menu. |

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

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

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

### 7.11.4 Diagnostics

With this command, possibly present errors on the connected PD2-Electronics are indicated. The error is read in once. A complete description of the error will be displayed.

| Diagnostics: | Error | Error remedy |
|---|---|---|
| Power supply fault<br> | If the supplied voltage < 7.8VDC.<br>In the general status line it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenable the control.<br><br>If the parameter "General errors - Auto reset" is set to "yes", the error will be reset automatically if the supplied voltage becomes > 7.8VDC |
| Cable break command value input<br> | This error is only detected, if the parameter "cablebreak" is set to "yes" and the command value is smaller than the lower cable break limit or higher than the upper cable break limit.<br>In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenable the corresponding channel. |
| Short circuit solenoid output<br> | There is a short circuit on the solenoid output<br>In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenable the corresponding channel. |
| Cable break solenoid output<br> | There is a cable break on the solenoid output<br>In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready). | Disable and reenable the corresponding channel. |

### 7.11.5 Temperature statistics

With this command the temperature history of the PD2-Electronics is displayed.

All statistic values are saved once per hour in the PD2 non-volatile memory. If the PD2 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 PD2 temperature.<br>Is updated continuously in the background, however only once per hour saved in memory. | °C |
| Max. temperature value | Shows the highest ever measured internal PD2 temperature.<br>Is updated continuously in the background, however only once per hour saved in memory.. | °C |
| Temperature classes | Shows the frequency of the measured internal PD2 temperatures, distributed over 6 temperature classes.<br>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.<br>If one of the counters reached the highest value of 65535, the counters will not be updated furthermore. | |

### 7.11.6 Operating hours

With this command the operating hours of the PD2-Electronics is displayed.

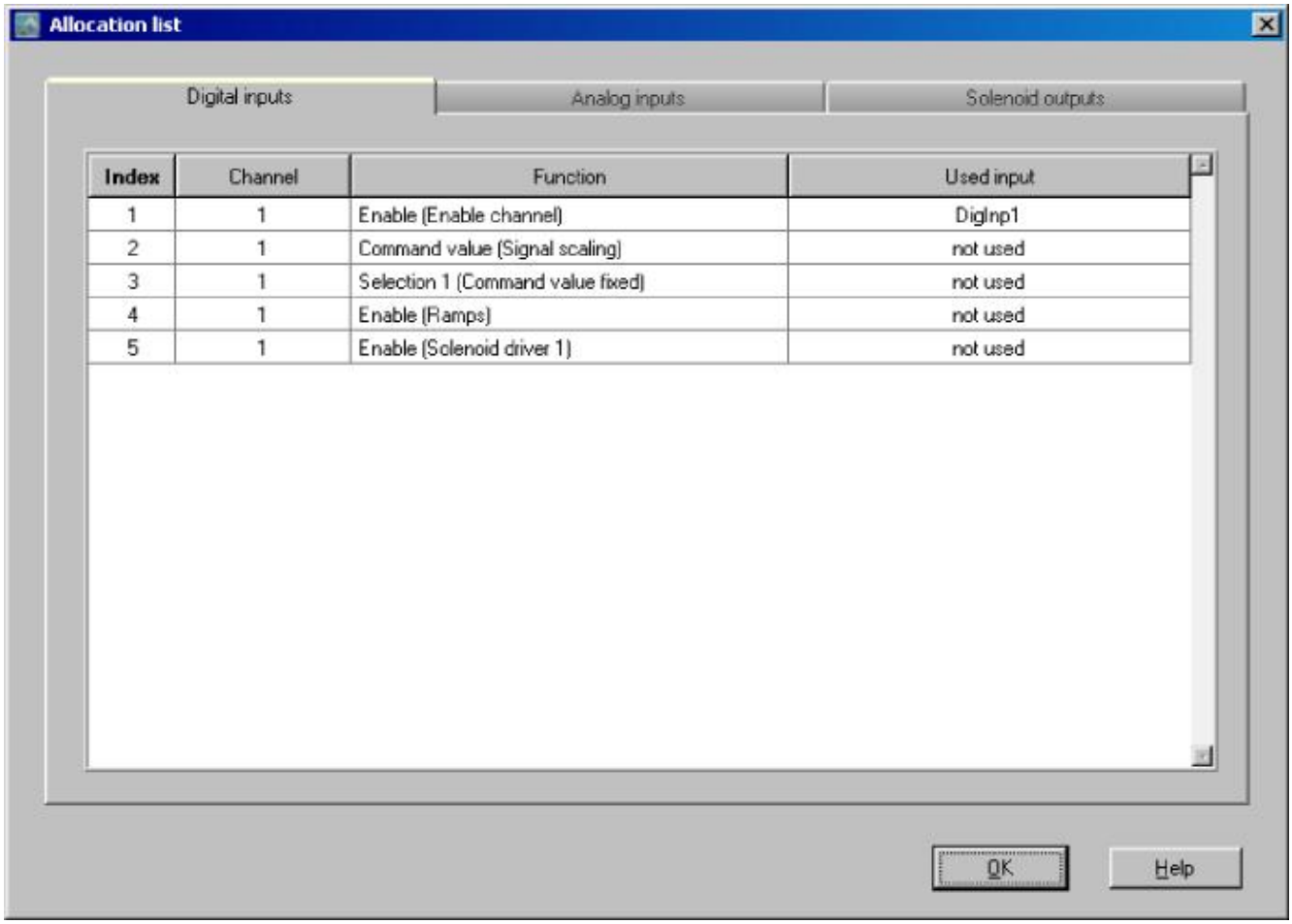
This value is saved once per hour in the PD2 non-volatile memory. If the PD2 is operated for less than one hour, the value of the last operation period is not saved.

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

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

### 7.11.7 Allocation list

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




The display of the allocation list can be divided in digital inputs, analog inputs and solenoid outputs. The display can be individually sorted. Inputs and outputs which are doubly occupied, have a yellow background (refer to section "Assignment of the inputs/outputs" 30).

## 7.12 Help-Menu

### 7.12.1 Description of the function

A general information about the function of the PD2-Electronics will be displayed.

### 7.12.2 Contents

The list of contents of the PASO PD2-Help will be displayed. By clicking on the desired subject, the corresponding help text will be displayed.

### 7.12.3 Step by Step Guide

The step by step guide will be opened automatically.

### 7.12.4 Card Identification

Here the current version of the hardware and the software from the connected PD2-Electronics will be read and displayed. They can not be changed.

| | |
|---|---|
| Part number: | Corresponds to the Wandfluh part number |
| Serial number: | The serial umber has the following structure: YYDDDXXXXX<br>YY: Production year<br>DDD: Production day (different for each card type)<br>XXXX: Continuous number (different for each card type) |
| Software version: | Corresponds to the installed software version on the connected PD2-Electronics. This information should be always applied when a request to Wandfluh is made. |
| Firmware version: | Corresponds to the installed firmware version on the connected PD2-Electronics. This information should be always applied when a request to Wandfluh is made. |
| Card type: | Corresponds to the Wandfluh type code |
| Device configuration: | This includes all relevant information about the existing hardware and software components. This information should be always applied when a request to Wandfluh is made. |

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

### 7.12.5 WANDFLUH on the Web

A link to the WANDFLUH home page.

### 7.12.6 Info

Information about PASO PD2 and its version.

# 8 System does not work

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

## 8.1 Procedure

The following check list can be used to help, if a problem is arised.

| Question: | Action: | Possible errors and causes |
|---|---|---|
| State: Error | Analysis - Diagnostics Power supply error | • The supplied voltage is under 8VDC. The error is also displayed if a supplied voltage interruption occurred (t > 250ms).<br>• Is the supplied power sufficient?<br>• Is the AC voltage too high (refer to section "Electrical specifications" 8)?<br>• When the error is cleared, disable the controller for a short period and re-enable. |
| | Analysis - Diagnostics Cable break command value input | • The command value is either smaller than the lower cable break limit or higher than the upper cable break limit.<br>• Check the command value signal connections between the command value encoder and MD2-Electronics.<br>• If the cablebreak detection is not desired, switch off the cablebreak detection (refer to section "Signal scaling" 34).<br>• When the error is cleared, disable the corresponding chanel for a short period and re-enable. |
| | Analysis - Diagnostics Short circuit solenoid output | • There is a short circuit on the solenoid output.<br>• When the error is cleared, disable the corresponding chanel for a short period and re-enable. |
| | Analysis - -Diagnostics Cable break solenoid output | • There is a cable break on the solenoid output.<br>• When the error is cleared, disable the corresponding chanel for a short period and re-enable. |

# 9 PASO PD2 Installation and Operation

The parameterisation software PASO PD2 serves for the parameterising and diagnosing of all Electronic cards PD2 of the WANDFLUH AG company. The software provides a user interface, through which by means of a keyboard or a mouse all adjustments and settings can easily be carried out. The communication with the digital card takes place through a USB-interface (USB cable, connectors type A to 5-pole Mini-B)

**The parameterisation software PASO PD2 can only be utilised in connection with a PD2-Electronics of the WANDFLUH AG company.**

## 9.1 System presupposition

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

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

- Processor Pentium 4/M, min. 256MB RAM (recommended 1GB RAM)
- Free harddisk storage space of minimum 250MB
- Operating system Windows 2000, Windows XP, Windows Vista, Window 7 or higher
- Standard VGA or higher graphics card, min resolution 1024 x 768
- At least one USB interface (USB 1.1 or USB 2.0)
- Wandfluh own USB adapter PC - PD2

## 9.2 Installation

The PASO software can be downloaded via the Internet free of charge (www.wandfluh.com/Download => PASO PD2 => Download Program files) or on request delivered on an installation-CD.

The installation of the PASO is then carried out by executing the file "setupPasoPD2.exe". An installation program takes over the complete installation of PASO. To them, the Windows Installer must be installed. This is normally a part of the Windows Environment. If not, please download it from the Microsoft Website.
If there is already a version of the PASO software installed on the PC, one can select if the existing version should be overwritten or removed.
The helpfiles are included in the setup and are installed automatically.

## 9.3 Connection to the Wandfluh card

The connection between the PC, on which the parameterisation software PASO PD2 is installed, and the PD2-Electronics takes place through the USB interface. The USB communication requires a separately available USB Adapter (refer to section "Accessories 69").

During the installation of the parameterisation software PASO PD2, the used USB driver for the PD2-Electronics will be installed automatically. A new installation of this driver is possible. In the directory, where the parameterisation software PASO PD2 is installed, there is a sub directory "USB_Driver". In this sub directory, there is a file "PreInstaller.exe". With executing this file, the installation of the USB driver is possible.

If the USB driver for the PD2-Electronics is installed correctly, it must be shown in the Windows Devicemanager in the "USB-Controller" as "Wandfluh AG - PD2" while a PD2-Electronics is connected to the PC.

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

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

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

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

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

  There is permanent communication between the PASO DSV and the connected Wandfluh-Electronics. **Because of that, it is not allowed to disconnect the connection to the Wandfluh-Electronics or to switch off the Wandfluh-Electronics in the "On Line"-mode.**

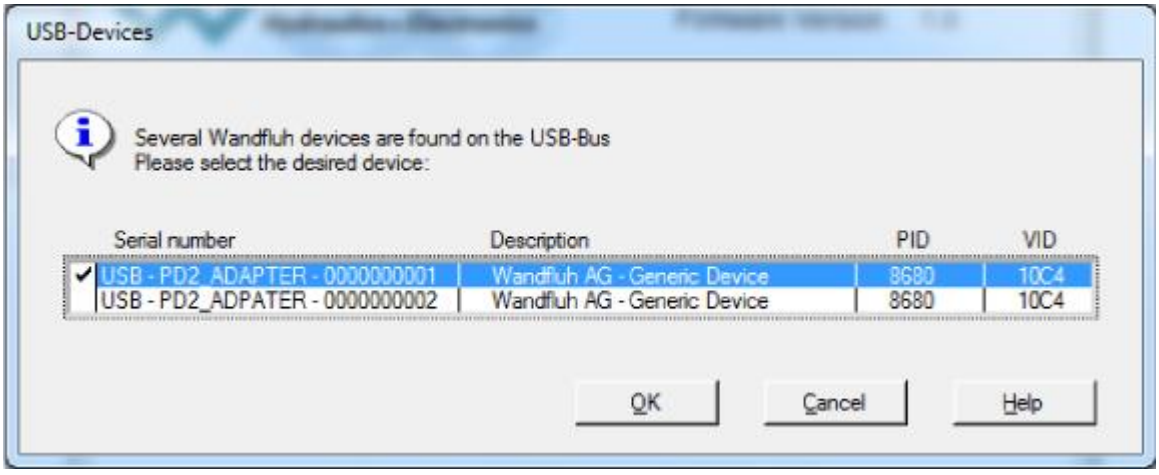
The change between the two modes takes place through the menu point ”File - Activate On Line / Activate Off Line”. Near it, it's possible to select if the data should take over from the Wandfluh-Electronics (data flow Wandfluh-Electronics => PASO) or if the Wandfluh-Electronics should be reprogramed with the new actual data (data flow PASO => Wandfluh-Electronics).

In case of an interference in the communication, the controlling of the Wandfluh-Electronics is not assured anymore. An error message follows and the PASO DSV software automatically changes over to the "Off Line"-mode (refer to section "Communication interruption" 63).

## 9.5 Communication start up

When the parameterisation software PASO PD2 is started up, a check takes place, as to whether a communication with the Wandfluh-Electronics is possible. If no communication can be established, an error message appears (refer to section "Communication interruption" 63). If a communication with the connected card is possible, a check will be made, whether the current configuration of the PASO PD2 corresponds to the configuration of the connected Wandfluh-Electronics. If yes, the parameters will be transferred from the Wandfluh-Electronics to the PASO PD2. If no, a message will be displayed and the current configuration from the PASO PD2 will change automatically over to the new configuration and the parameters will be transferred from the Wandfluh-Electronics to the PASO PD2.

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




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

## 9.6 Communication interruption

If no communication is possible during the start up or the interruption of the communication occurs during the operation of the parameterisation software PASO PD2, then an error message appears and the PASO PD2 software is set to the "Off Line"-mode. All menu points and buttons, which involve an action in connection with the communication, are now blocked. In order to re-establish a communication, the menu point ”File - Activate On Line” has to be selected.

Possible reasons for a communication interruption are:

- No Wandfluh-Electronics are connected
- The connected Wandfluh-Electronics are not switched on
- The USB driver is not correct installed (refer to section "Connection to the Wandfluh card" 61)
- The connection cable is defect or not pluged in

## 9.7 Program description

### 9.7.1 Description of the buttons

| | |
|---|---|
| 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.<br>In many cases corresponds to the button "Cancel". |
| F1 | Activate the button "Help" |

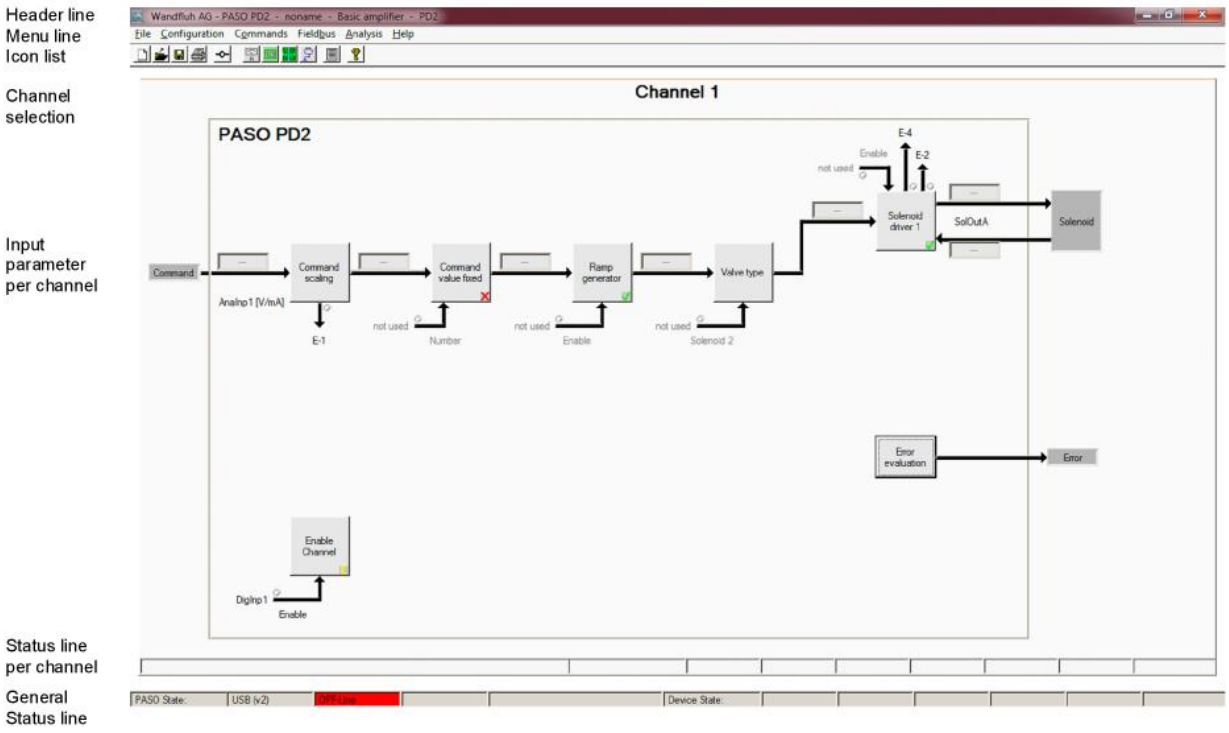
### 9.7.2 Input elements

| | |
|---|---|
| Button | A button executes the action, with which it is inscribed.<br><br>Actuation of a button through the keyboard:<br>• Push the button TAB, until the button becomes active.<br>• Push the button ENTER. The action is now carried out.<br>• Push the button ALT and the underlined letter of the button inscription: The action is carried out immediately.<br><br>Actuation of a button with the mouse:<br>• Click on the corresponding button. 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.<br><br>Actuation of a switch through the keyboard:<br>• Push the buttons UP or HOME to switch on the switch.<br>• Push the buttons DOWN or END to switch off the switch.<br>• Push the SPACE button for changing over (switching over).<br><br>Actuation of a switch with the mouse:<br>• Click on the switch for changing over (switching over). |
| Input field | The input fields enable the entering of numbers or text. All applicable buttons of the keyboard are allowed, including the buttons HOME, END, LEFT, RIGHT. In certain cases when taking it over, the input is checked and if necessary an error message is issued.<br><br>Actuation of an input field through the keyboard:<br>• Push the button ENTER or TAB to finish with the input field.<br>• In the case of input fields with ARROW buttons UP and DOWN: Actuation of the UP-/DOWN - buttons for the step by step changing of the values.<br><br>Actuation of an input field with the mouse:<br>• Click within the input field, in order to position the cursor in it.<br>• In the case of input fields with ARROW buttons UP and DOWN: Click on the corresponding arrow for the step by step changing of the values. |
| Selection field | The selection fields enable the selection from various possibilities.<br><br>Actuation of a selection field through the keyboard:<br>• Push the SPACE button to open all selection possibilities. With the help of the buttons UP, DOWN, HOME, END, make the required selection. Subsequently push the ENTER button to confirm the required selection, or else the ESC button to undo the selection.<br>• Push the button UP to cyclically select the previous selection.<br>• Push the button DOWN to cyclically select the next selection.<br>• Push the button HOME to select the first item of the selection list.<br>• Push the button END to select the last item of the selection list.<br><br>Actuation of a selection field with the mouse:<br>• Click inside the selection field so that all selection possibilities are displayed and then click on the required selection. |

## 9.8 Starting of PASO PD2

Following the successful installation, the parameterisation software PASO PD2 can be started by double-clicking on the PASO PD2 - icon. Certain settings of the PASO PD2 software, e.g., the selected interface port, are saved in the file ”konfig.kon”. When PASO PD2 is started for the first time, the configuration values in this file are set to standard values. During the course of running the program, these values can be corrected.

After the start-up, the Start window appears:




During the start-up, the parameterisation software PASO PD2 checks, whether a Wandfluh-Electronics device is connected. If no communication can be established, an error message appears (refer to section "Communication interruption" 63) and the "Off Line"-mode will become active. All menu points and buttons, which involve an action in connection with the communication, are then blocked. All other functions of the parameterisation software PASO PD2 can be utilised without any limitation.

If the communication works without any interference, the software PASO PD2 checks, whether the current configuration of the PASO PD2 corresponds with the configuration of the connected digital controller card. If no, a message will be displayed and the current configuration from the PASO PD2 will change automatically over to the new configuration.

Subsequently the parameters are loaded from the card and subsequently a verification of the Wandfluh-Electronics values takes place. If one or several parameters are outside the corresponding tolerance, they are replaced with standard values and a message is issued (refer so section "Limiting value error" 67). 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 parameter input can be made with clicking with the left mouse button on the corresponding box in the channel window. A input window will appear where all the desired values can be entered.

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

- by clicking on them with the mouse

- by actuating the button "ALT" and the underlined letter of the required menu point
- if a menu point has been selected, then by means of the buttons "←" and "→" one can change to the next menu point and with the buttons "↑" and "↓" one can change to the next sub-menu point within the menu selection field.
- by clicking on the corresponding icon in the icon list

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

The following states will be displayed in the general status line:
- 1st field: Selected interface ("USB")
- 2nd field: Current mode ("On Line" or "Off Line", refer to section "Mode "Off Line" and "On Line"" 62

The following states will be displayed in the chanel status line:
- 2nd field: Parameter Inconsistency ("Parameter inconsistency", refer to section "Parameter inconsistency" 31)
- 3nd field: Derating ("Derating", refer to section "Temperature monitoring" 13)
- 4nd field: Characteristic optimisation active ("Optimisation", refer to section "Characteristic optimisation" 14)
- 5nd field: Operating mode ("Remote PASO" or "Local", refer to section "Operating mode" 16)
- 7th field: PD2 state ("Disabled" or "Active", refer to section "PD2 State machine" 15)
- 8th field: Error state ("Ready" or "Error", refer to section "Analysis - Diagnostic" 57)

## 9.9 Store parameter

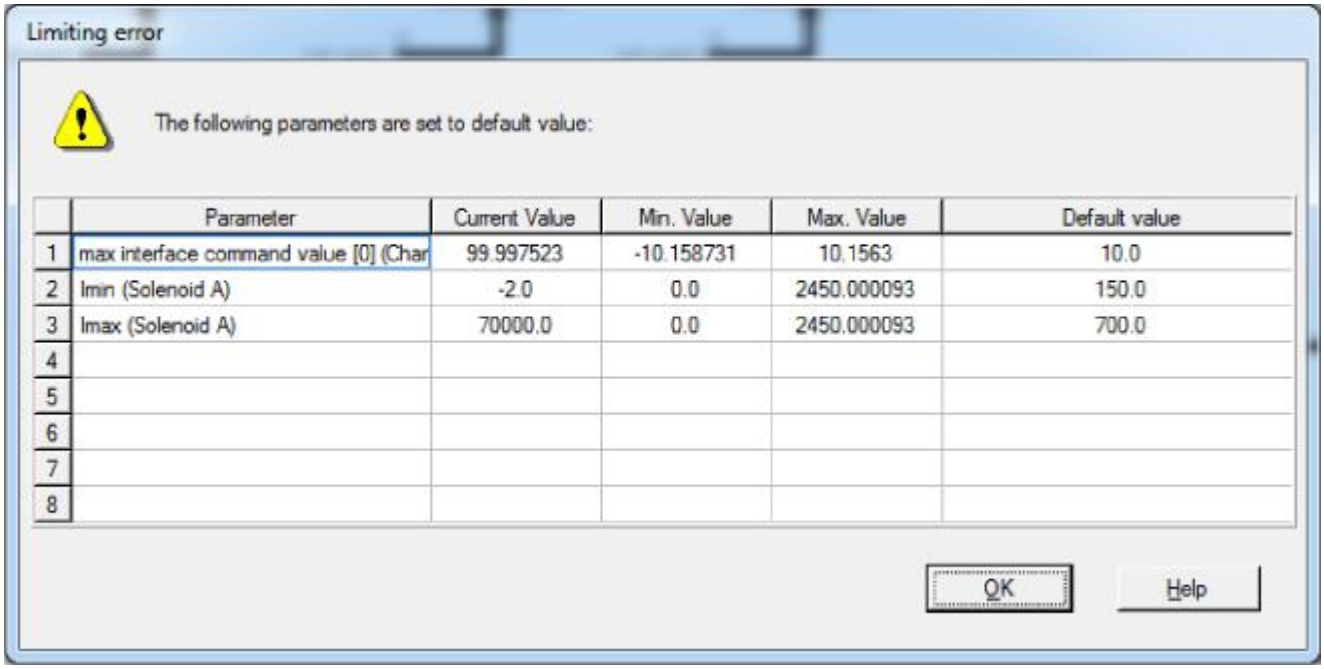
Each new input value is immediately transferred to the connected Wandfluh-Electronics after the completion of the input field (either by pushing the button ENTER or by activating another input field).

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

## 9.10 Limiting value error

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




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

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

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

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

## 9.11 Description of Commands

The description of the individual commands and parameters is contained in section "Settings" 11.

# 10 Disposal

- The PD2-Electronics have to be disposed of in accordance with the generally applicable regulations of that country, in which it is being used.
- Electronics components are recycled by companies specialised in this field.

# 11 Accessories

- Parameterisation software PASO — download free of chargerefer to Installation of PASO PD2 61
- Adapter USB - PD2 (incl. 1.8m USB cable) — article no. 726.9900 is necessary for the communication with PASO

# 12 Additional information

You can find additional information in the following Wandfluh documentations:

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