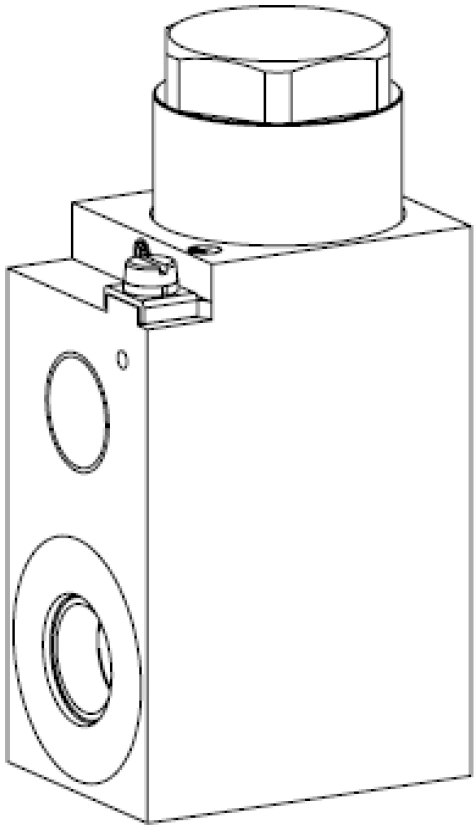
OPERATING INSTRUCTION

AMPLIFIER ELECTRONICS MKY



Contents

1 General information

This operating instructions makes it possible to use the MKY-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 MKY-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).

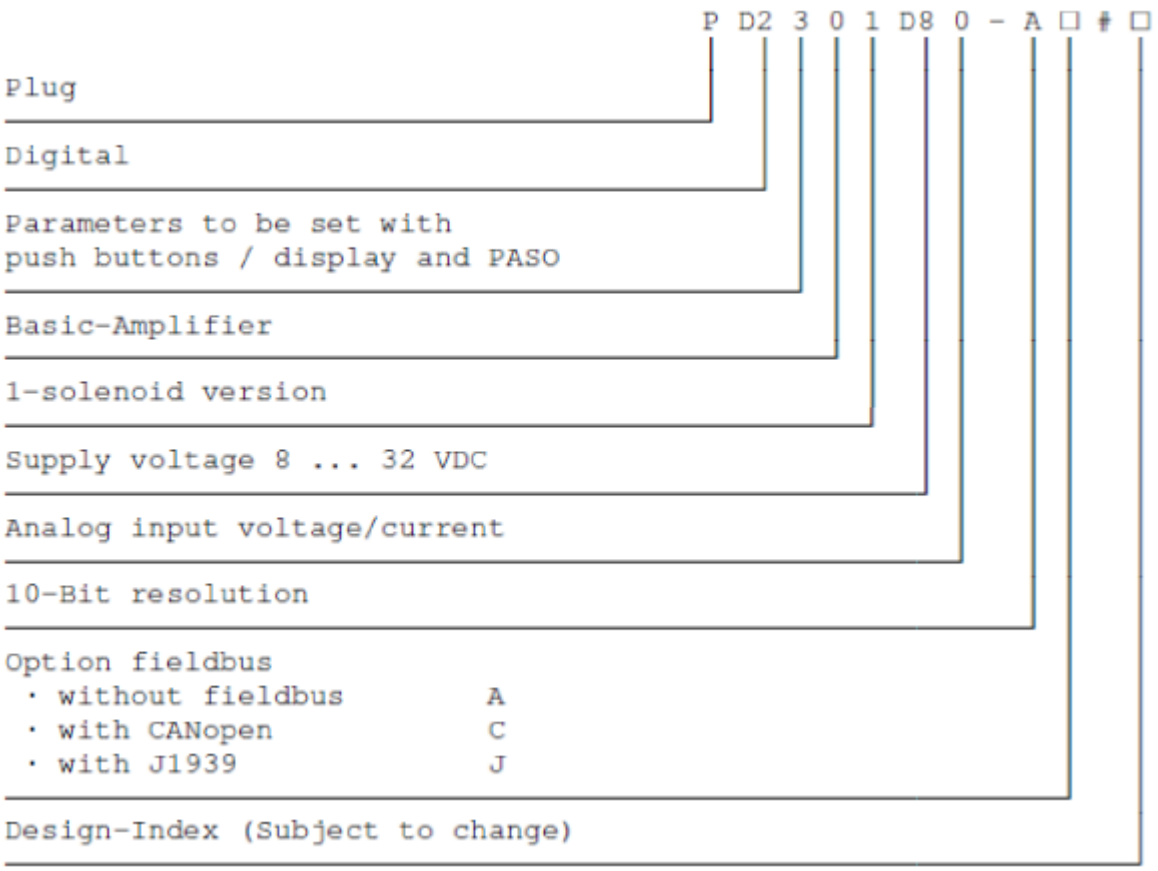
2.4 Labelling of the product

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

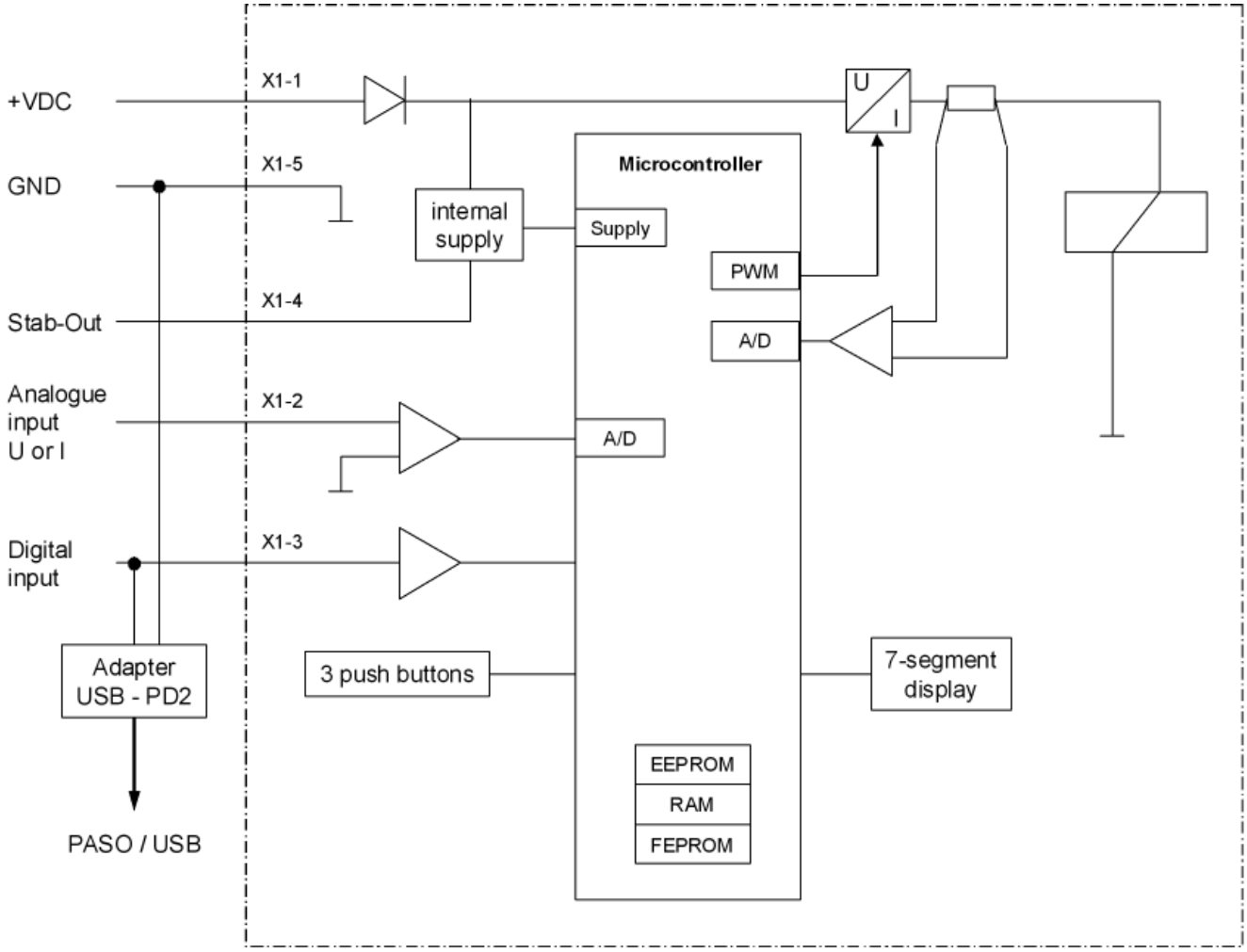
2.6.1 General specifications

Execution	Direct mounted on the solenoid or with additional solenoid cable	
Connections	Connecting cable Solenoid cable (only version with additional solenoid cable) USB interface	5pol cable (1.5m or 7.5m) for power supply, command value, etc 2pol calbe (0.5m) for connection to the solenoid via connection "Ditial input" The USB communication requires a separately available USB Adapter (refer to section "Accessories 89").
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" 14)
Protection class	IP67 to EN 60 529	

2.6.2 Electrical specifications

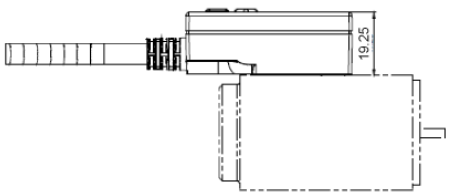
Supply voltage		8 ... 32 VDC
Ripple on supply voltage		< ±5 %
Fuse	The PD2-Electronics must be protected by a slow fuse on the user side	
Temperature drift		< 1% with ΔT = 40° C
No load current		ca. 40 ... 50 mA
Maximum current consumption		2.5 A
Analogue input	1 input single-ended voltage / current switchable Resolution Input resistance for voltage input Burden for current input	0 ... ±10 VDC 0/4 ... 20 mA 10 Bit > 100 kOhm 250 Ohm
Digital input	1 input high-active Switching threshold high Switching threshold low Utilisable as frequency input (frequencies 5...5000Hz) and as PWM-input (automatic frequency identification)	 6 ... 32 VDC 0 ... 1 VDC
USB interface	correspond to the digital input The USB communication requires a separately available USB Adapter (refer to section "Accessories 89").	
Stabilised output voltage		+ 5 VDC max. load 20 mA
Solenoid current	Minimum current Imin adjustable Default setting Maximum current Imax adjustable Default setting:	0 ... Imax mA 150 mA Imin ... max. sol. current 700 mA
Dither	Frequenz adjustable Default setting Pegel adjustable Default setting	4 ... 500 Hz 80 Hz 0 ... 400 mA 150 mA
EMC **Immunity** **Emission**	 EN 61000-6-2 EN 61000-6-4	

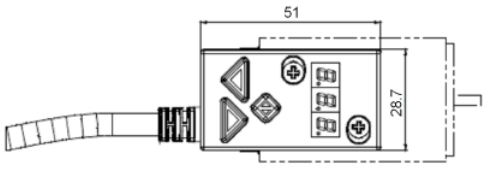
2.7 Block diagram



2.8 Dimensions

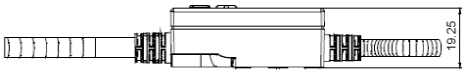
direct mounted on the solenoid:



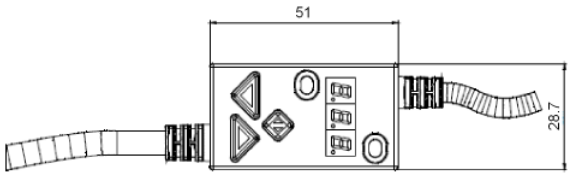


Connecting cable = 1.5m or 7.5m

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

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

4 Construction and Function

Refer to section "Block diagram" 9.

4.1 Introduction

- All inputs and outputs have to be contacted through the 5pol 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. The USB communication requires a separately available USB Adapter (refer to section "Accessories 89").
  ATTENTION: during the communication, the digital input can not be used for another function!
- The MKY-Electronics is equipped with a simple manual operation, which permits to set the most important parameter through push-buttons and a 7-segment display

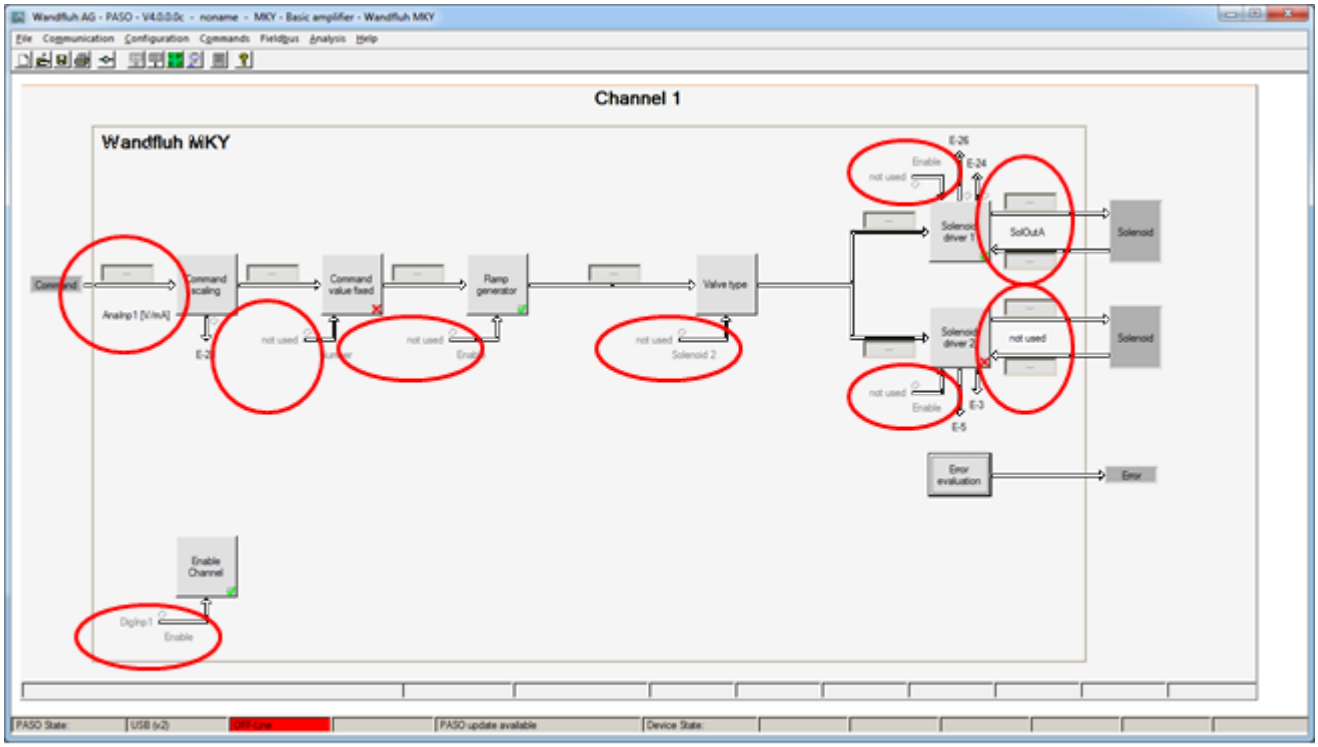
4.2 Description of the Function

The MKY-Electronics has one channel.

Each 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 per channel in these function blocks:

- Enable channel (refer to section "Enable channel" 40)
- Command scaling (refer to section "Command scaling" 40)
- Command value fixed (refer to section "Command value fixed" 45)
- Ramp generator (refer to section "Ramp generator" 46)
- Valve type (refer to section "Valve type" 47)
- Solenoid driver (refer to section "Solenoid driver" 48)
- Error evaluation (refer to section "Error evaluation" 52)

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" 58) will be displayed with blue text color in the main window.



Inputs freely selectable

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

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

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

Some function blocks are able to generate error messages. The function block "Error evaluation" (refer to section "Error evaluation" 52) picks up all error messages. This function block manages the error handling of the Wandfluh-Electronics.

The process data are displayed online (refer to section "Analysis_Show values" 66). This helps in case of support and diagnostics.

4.3 Temperature monitoring

The DSV-electronics are provided with an internal, factory set temperature monitoring. Starting from a temperature threshold of 80 °C of the internal electronics temperature the preset solenoid current (Imax, refer to PASO Menu "Parameters_Valves" on page 21) is limited, depending on the temperature. The temperature of the DSV electronics is visible in the PASO data window (Menu "Analysis_Values", page 30). Since the self-heating of the solenoid, on which the DSV electronics are mounted, has an significant influence on the electronics temperature, this current limiting reduces the electronics temperature and allows electronics to be run (with reduced solenoid current) at higher ambient temperatures. In the PASO status line is displayed if this limiting, the so called 'derating', is active. With active 'derating' the valve operating range is restricted – the effect complies with that of a reduced preset value signal range (refer to the valve data sheet). In case of 2-solenoid service the derating affects both solenoids.

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

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

In order to prevent exceeding the derating threshold, the electronics temperature can, if necessary, be reduced by one or more of the following measures:

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

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

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

Description of the parameters:

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

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

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

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

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

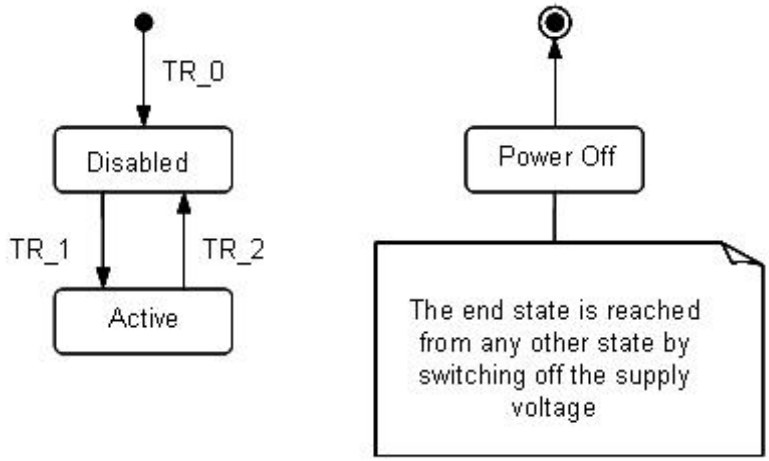
4.4 Characteristic optimisation

The SD7 electronics are provided with a possibility to optimise the characteristic “Preset value input – solenoid current output”. The user is able to create a characteristic (e.g. a linearised characteristic) which matches his own application. The characteristic optimisation can be turned on or off (refer to “Parameters_Solenoid driver 48”).

4.5 State machine

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

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



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

Status	Description
Disabled	• The assigned channel of the Wandfluh-Electronics is disabled, no solenoid current will be active • In this status, with the command "Operation mode" (refer to section "Commands_Valve operation" 62) the operating mode can be set
Active	• The assigned channel of the Wandfluh-Electronics is enabled • The assigned channel of the Wandfluh-Electronics can be operated according to the selected operating mode • Changing the operating mode is not possible

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

Transition	Description
TR_0	Switching-on the supply voltage
TR_1	Enable This is made in the operating mode "Local" through the function "Enable Channel" (refer to section "Enable channel" 40) and in the operating mode "Remote PASO" through the parameter "Control mode" (refer to section "Commands_Valve operation" 62).
TR_2	Disable This is made in the operating mode "Local" through the function "Enable Channel" (refer to section "Enable channel" 40) and in the operating mode "Remote PASO" through the parameter "Control mode" (refer to section "Commands_Valve operation" 62).

4.6 Operating mode

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

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

The current operating mode is displayed in the status line (refer to section "Starting of PASO" 84).

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 < 10-Bit!

- **Filtering**
  Each analog input can be individually filtered (refer to "Configuration_Filter for analog inputs 59"). Thereby analog noise (e.g. voltage peaks) are attenuated. The filtering is done with the function "exponential smoothing", where the speed / response time of the filter can be determined with the parameter "smoothing factor". A high value at the smoothing factor results in a high degree of filtering, but a long response time, which will delayed the reading of the analog input. A small value at the smoothing factor results in a small degree of filtering, but a fast response time. So the "smoothing factor" must be selected as compromise between high degree of filtering and fast response time.

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" 34).

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

4.8 Cablebreak detection

The command value input can be detected for a cablebreak (only if Signal type = Voltage, Current, Frequency or PWM). Therefore, a lower and an upper cablebreak limit can be adjusted in the box Signal scaling 40. A cablebreak is detected, if the input signal is smaller than the lower cablebreak limit or higher than the upper cablebreak limit.

If an cablebreak is detected, the internal error "E-1" (for command value) resp. "E-6" (for feedback value) is active (refer to section "Error evaluation" 52).

The following conditions had to be performed:

- The parameter "Signal type" must be on "Voltage", "Current", "Frequency" or "PWM" (refer to section Signal scaling 40)
- The parameter "Cablebreak" must be on "On" (refer to section Signal scaling 40)
- The parameters "Lower cablebreak limt" and "Upper cablebreak limit" must be adjusted (refer to section Signal scaling 40)
- An action must be assigned to the error "E-1" (refer to section "Error evaluation" 52)

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 functin of the digital inputs and the assignment to the corresponding channel is free to choose (refer to section "Assignment of the inputs/outputs" 34).

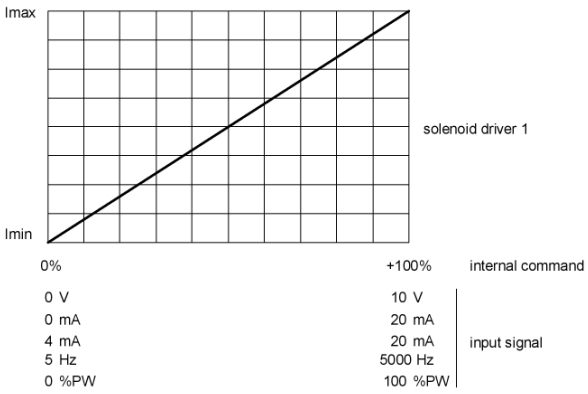
4.10 Outputs

- **Proportional solenoid outputs A**
  The solenoid outputs have a current output **p**ulse-**w**idth-**m**odulated at 1000Hz with superimposed dither. The current measurement can be switched on or off.
  The assignment to the corresponding channel is free to choose (refer to section "Assignment of the inputs/outputs" 34).

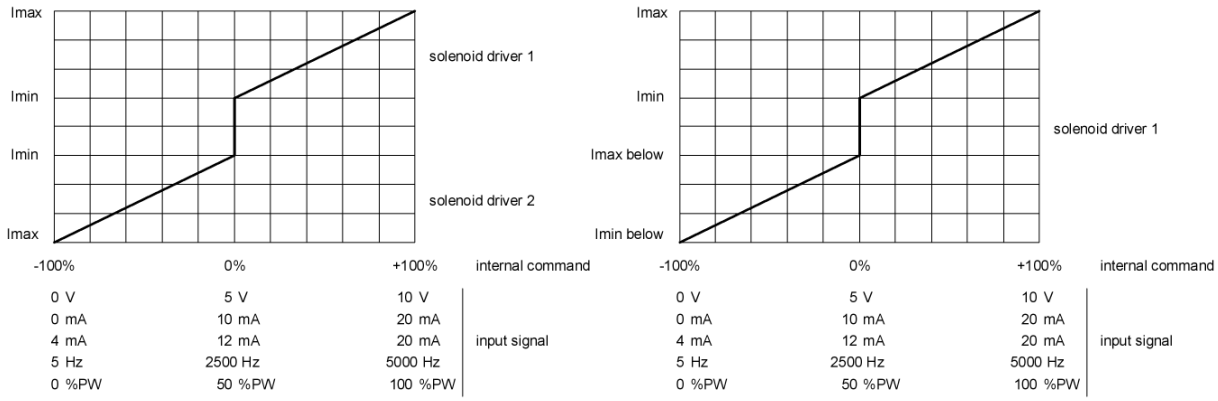
4.11 Mode of operation

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

- **Mode of operation "Command unipolar (1-sol)" (Mode of operation 1)**
  This Mode of operation is only possible, if the valve type is set to "Standard 2-solenoid" (refer to section "Valve type 47").
  With an input signal 0 ... 100% an internal command from 0 ... 100% is generated.



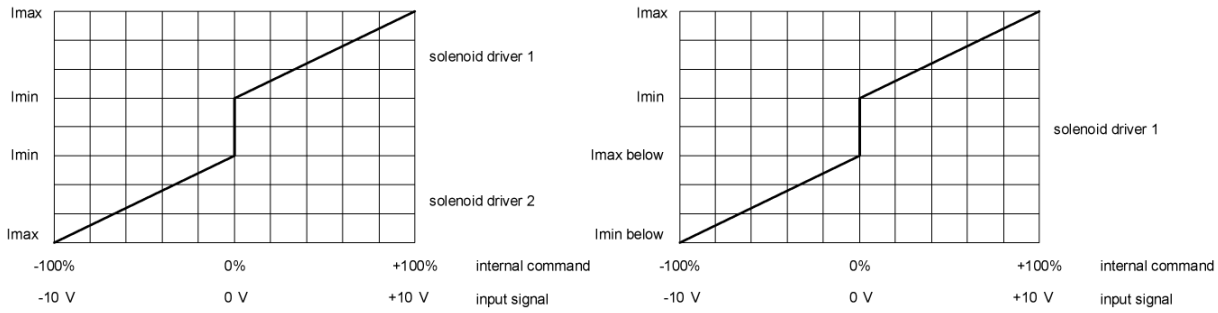
- **Mode of operation "Command unipolar (2-sol)" (Mode of operation 2)**
  With an input signal 0 ... 100% an internal command from -100 ... +100% is generated.



Valve type = Standard 2-solenoid

Valve type = 4/3-Wege 1-solenoid

- **Mode of operation "Command biipolar (2-sol)" (Mode of operation 3)**
  With an input signal -100 ... 100% an internal command from -100 ... +100% is generated.



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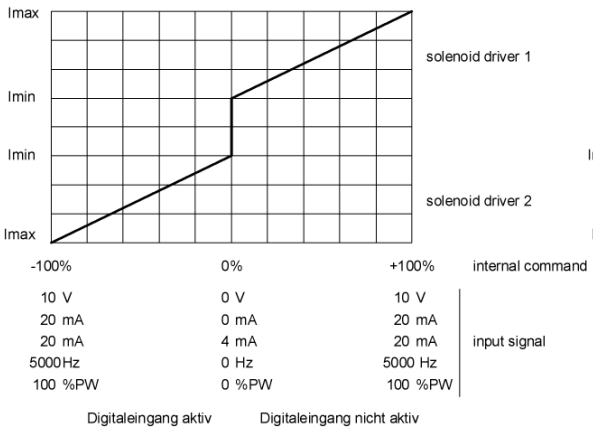
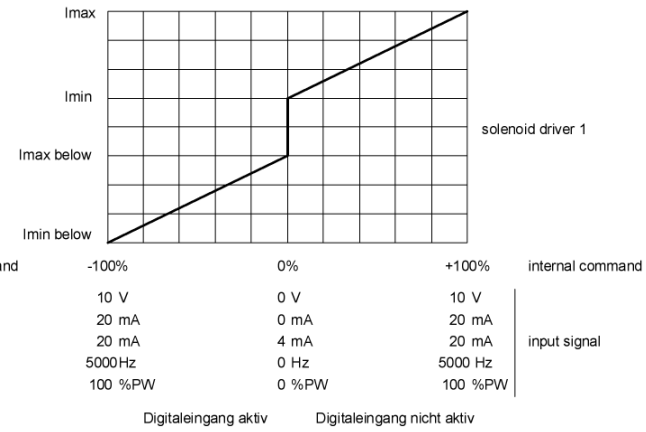
Valve type = 4/3-Wege 1-solenoid

Valve type = Standard 2-solenoid

- **Mode of operation "Command unpolar (2-sol mit DigInp)" (Mode of operation 4)**
  With an input signal 0 ... +100% an internal command from 0 ... +100% (digital input not active) resp. 0 ... -100% (digital input active) is generated.



Valve type = Standard 2-solenoid



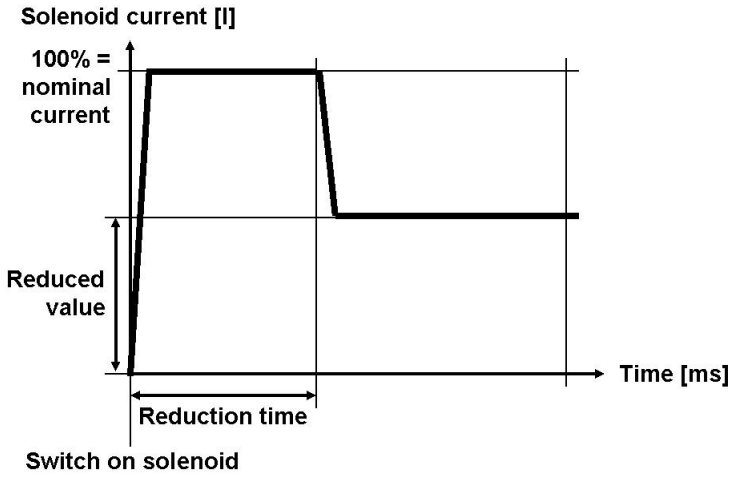
Valve type = 4/3-Wege 1-solenoid

The selection of the mode of operation is made in the box "Valve type" 47

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).



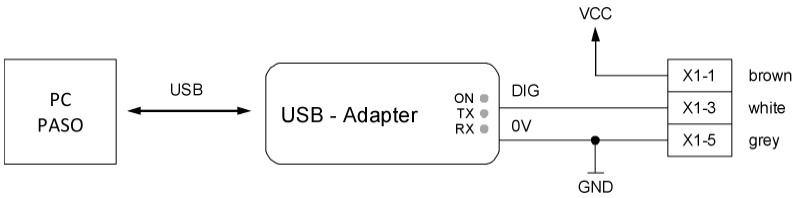
5 Operating and indicating elements

5.1 General

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

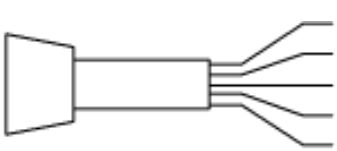
5.2 USB-interface

As the USB-interface the digital input 1 is used. The USB communication requires a separately available USB Adapter (refer to section "Accessories 89"). During the communication, the digital input 1 can not be used for another function!



5.3 Connector cable

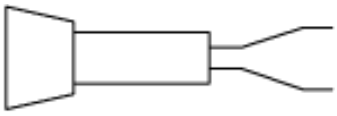
Analog interface:



Connector cable X1

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

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



Solenoid cable X2

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

5.4 Operating elements

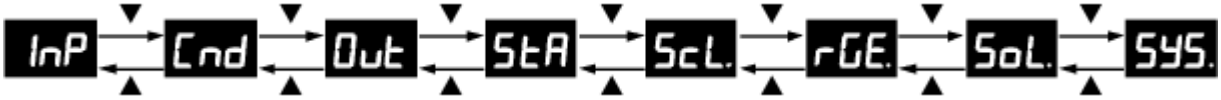
7-segment display
to display the configuration and diagnostics values

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" 29).
- if the device has an error, the error code is displayed flashing after 10s without push-button operation (refer to section "Error code" 30). However, settings are still possible.
- Menu items which contain sub-menus are displayed with a dot at the end

InP → **InP**ut
1s oder ◆
54 →
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" 66

Cnd → **Com**man**d**
1s oder ◆
548 →
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" 66

Out → **Out**put
1s oder ◆
167 →
Current value the solenoid current

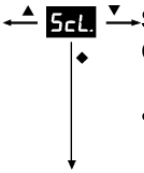
- the current value of the solenoid current is displayed without a decimal point
- the display occurs in
  - mA (solenoid type = Proportional solenoid with current measuring
  - % (solenoid type = Proportional solenoid without current measuring or solenoid type = Switching solenoid without current measuring)
- corresponds to the value "Actual solenoid current solenoid driver 1" (value 7) from section "Analysis - Show values" 66

StA → **StA**te
1s oder ◆
nnn →
Current value of the channel state

- display the channel state of the device

- possible indicators for nnn are:

dis Device is disabled (status "**Dis**able", refer to section "State machine" 16)
Act Device is released (status "**Act**ive", refer to section "State machine" 16)
Enn Device has an error (**E**rror) and is disabled. The error code "nn" is a value between 01 ... 30 (refer to section "Error code" 30)



ScaLing
Command scaling

- settings are only possible if the push-button lock is not active (refer to section "Push-button lock" 29)
- 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 ◆

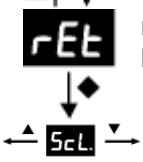
SiGnal type
Parameter "Signal type" (refer to section "Signal scaling - Signal type" 41)

Low **In**terface
Parameter "min interface" (refer to section "Signal scaling - min Interface" 41)

High **In**terface
Parameter "max interface" (refer to section "Signal scaling - max Interface" 41)

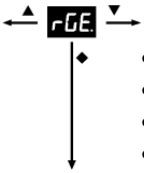
Cable**br**eak
Parameter "Cablebreak detection" (refer to section "Signal scaling - Cablebreak detection" 43)

dead**b**an**d**
Parameter "Deadband" (refer to section "Signal scaling - Deadband" 44)



rEturn
back to menu "Parameters setting"

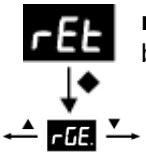
ramp **GE**nerator
Ramp Generator



- settings are only possible if the push-button lock is not active (refer to section "Push-button lock" 29)
- 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 ◆

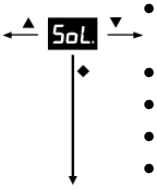
ramp **UP**
Parameter "Ramp up positive" (refer to section "Ramps - Ramp up positive" 46)

ramp **d**ow**n**
Parameter "Ramp up positive" (refer to section "Ramps - Ramp up positive" 46)



rEturn
back to menu "Parameters setting"

SoLenoid
Solenoid driver



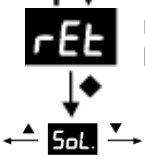
- settings are only possible if the push-button lock is not active (refer to section "Push-button lock" 29)
- select the desired parameter (scroll through the menu using the push-buttons ▲ and ▼)
- after 1s or by pressing the push-button ◆ the current setting value appears
- to change the value, press 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 Low
Parameter "Imin" (refer to section "Solenoid driver - Imin" 49)

I High
Parameter "Imax" (refer to section "Solenoid driver - Imax" 49)

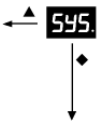
dither **F**requenz
Parameter "Dither frequenz" (refer to section "Solenoid driver - Dither Frequency" 49)

dither **A**mplitude
Parameter "Dither level" (refer to section "Solenoid driver - Dither level" 49)



rEturn
back to menu "Parameters setting"

SYStem
Enable, Device informations and Reset



- settings are only possible if the push-button lock is not active (refer to section "Push-button lock" 29)
- 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 ◆

EnAble
Parameter "Enable" (refer to section "Enable Channel" 40)

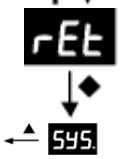
- to change the value, press the push-button ◆ for 1s => value flashes
- now the value can be changed using the push-buttons ▲ and ▼
- if the desired value is reached, the setting can be stopped with pressing the push-button ◆

tem**P**er**a**ture
Current device temperature in °C

Software
Installed software version

re**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 37")d software version



rEturn
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 73".

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" 11.

6.1 Connection instructions

The contact assignment of the following description refers to section "Operating and Indicating elements" 24 and to section "Connection examples" 32.

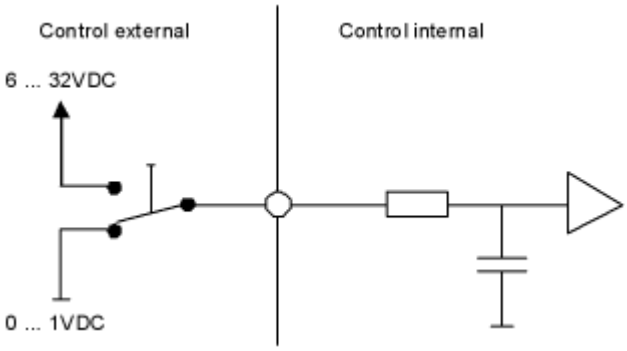
For an **installation / connection appropriate for EMC**, the following points absolutely have to be observed:
- Solenoid- and signal cables must not be laid parallel to high voltage cables.

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

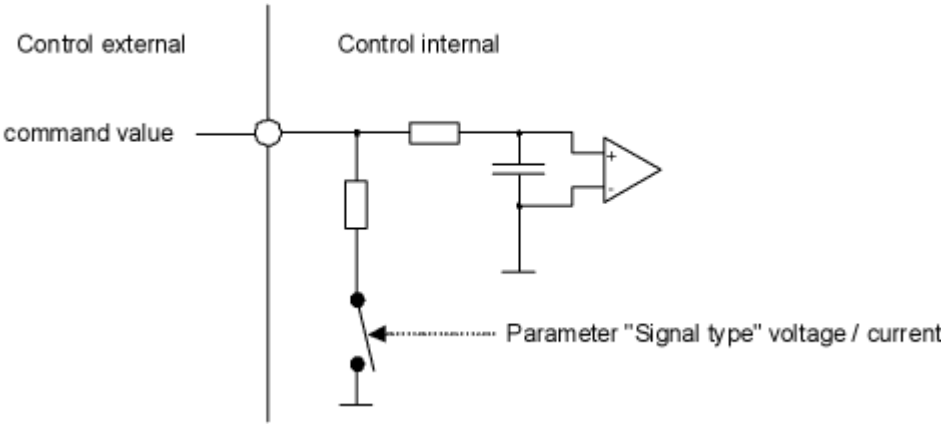
- the digital input is ”high-active” and not galvanically separated.
- for activation it has to be connected to a voltage between 6 ... 32VDC (e.g., supply voltage)
- for not activation it has to be connected to a voltage between 0 ... 1VDC (e.g. GND)
- ileft it open means a not defined state



- 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 40")
- 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 89").
  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 40")



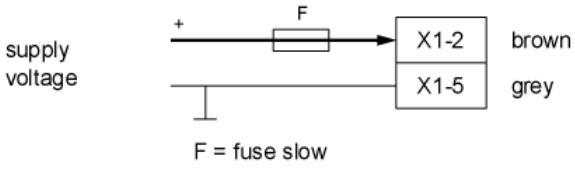
6.1.4 Solenoid outputs

- 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" 47).
- If the parameter "Solenoid type" is set to "Proportional solenoid without current measurement" or "Switching solenoid without current measurement" (refer to section "Valve type" 47) a current measurement is not possible.

6.2 Connection examples

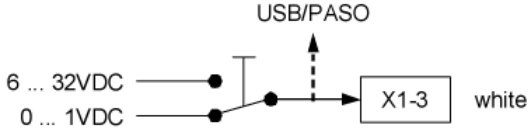
The contact assignment of the following description refers to section "Operating and Indicating elements" 24.

6.2.1 Supply voltage

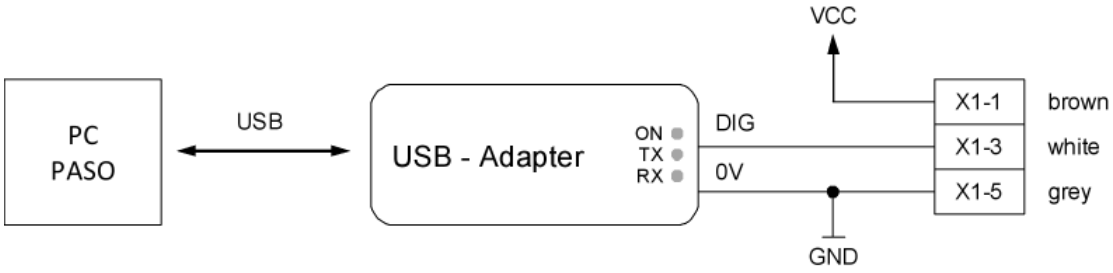


6.2.2 Digital input

as function input:

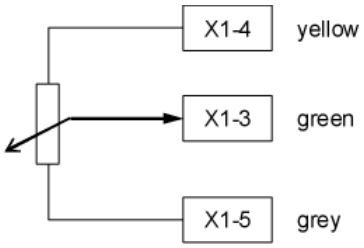


as USB interface (with separately available USB Adapter (refer to section "Accessories 89"):

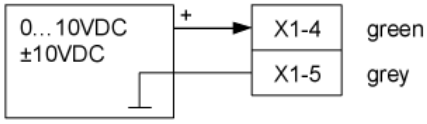


6.2.3 Analog input

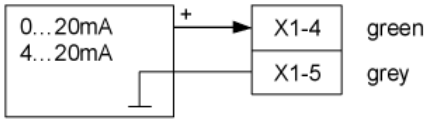
With Potentiometer (preferably 5kOhm):



With external voltage:



With external current:



7 Settings

Please refer to section "Safety rules" 11.

7.1 Introduction

- The system- and parameter settings can be made via the PC-Parameterisation software PASO. The grafic view in PASO eases the handling.
- For information about the operation via the PC-Parameterisation software PASO please refer to section "PASO Installation" 78.
- Depending on the connected Wandfluh-Electronics, certain settings may be blocked.

7.2 Assignment of the inputs/outputs

The allocation of inputs and outputs is not fixed. The user can choose 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

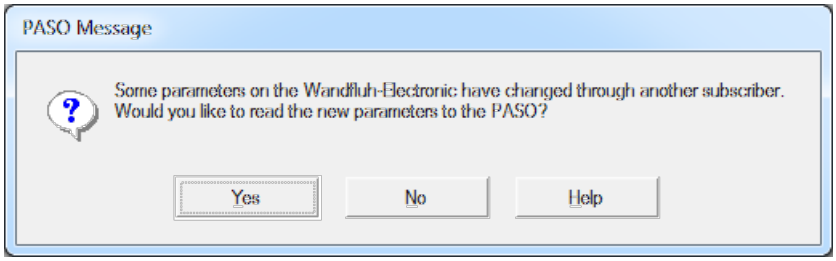
The selection "not used" means that no input or output will be assigned.

Digital inputs, which are set or reset by software (refer to section "Configuration - Digital E/A" 58) will be displayed with blue text color in the main window.

7.3 Parameter inconsistency

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

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



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

If the answer is ”No”, then the displayed parameter values in the PASO do not correspond to the current parameter value on the Wandfluh-Electronics. This will be displayed in the status line in the field "Parameter inconsistency" (refer to section "Starting of PASO" 84). If a parameter value will be changed through the manual operation terminal again, no further message will be appear in the PASO. But it's always possible to change also parameter values through the PASO.

7.4 Tips for the first commissioning

- Connect the power supply, leave the Wandfluh-Electronics still switched-off
- Switch-off the hydraulic drive (hydraulics switched-off)
- Carefully check the connections
- Switch-on the power supply
- Establish communication with PASO (connect PC and axis controller with a standard USB cable and start PASO)
  1. Select the mode of operation and the solenoid type in the box "Valve type" 47
  2. Make the corresponding settings in the box "Command Scaling" 40
  3. Make the corresponding settings in the box "Fixed Command values" 45
  4. Make the corresponding settings in the box "Ramp generator" 46
  5. Make the corresponding settings in the box "Solenoid driver" 48
- 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" 40 and "Configurations - Menu" 58 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 MKY-Elektronik can be set.

7.6.1 Enable channel

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

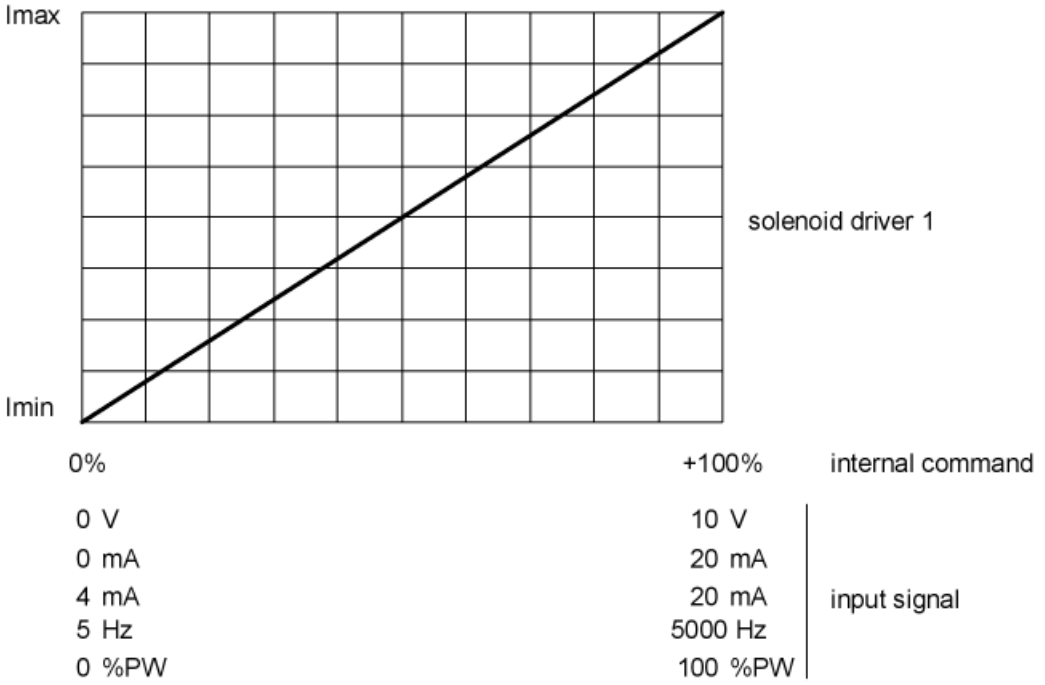
Field	Parameter description	Range / Step
Operating mode (Device local)	Select the desired command value source (only valid for SD7 with Fieldbus Interface).	bus local
Enable	Enable channel. With the selection "off", the corresponding channel is disabled and no solenoid current will be active (refer to section "State machine" 16). With the selection "on", the corresponding channel is enabled and the solenoid current will be operated according to the selected operating mode (refer to section "State machine" 16). With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable). With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable). The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input".	off on external external inverted
Dig. input	Active digital input for the enable if the parameter "Enable" is set to "external" or "external inverted". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the enable function.	refer to section "Assignment of the inputs/outputs" 34

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 bus
Signal type 	Select the desired command value signal type.	 Voltage  Current  Digital  Frequency  PWM
Used analog input	Select the desired used analog input. This control is only active, if the parameter "Siganl type" is set to "Voltage" or "Current". In choosing "not used", no analog input will be assigned.	refer to section "Assignment of the inputs/outputs" 34
Used digital input	Select the desired used digital input. This control is only active, if the parameter "Siganl type" is set to "Digital", "Frequency" or "PWM" . In choosing "not used", no digital input will be assigned.	refer to section "Assignment of the inputs/outputs" 34
min interface 	Indicates the input signal value for 0% command value. Signal type = Voltage Signal type = Current Signal typ = Digital Signal type = Frequency Signal type = PWM [1)] By changing the parameter "Signal type", this value will be set to the default value (refer to table below).	 -10 ... 10V 0.1V 0 ... 20mA 0.1mA 0 ... 1 1 5 ... 5000Hz 0.1Hz 0 ... 100%PW 0.1%PW
max interface 	Indicates the input signal value for 100% command value. Signal type = Voltage Signal type = Current Signal typ = Digital Signal type = Frequency Signal type = PWM [1)] By changing the parameter "Signal type", this value will be set to the default value (efer to table below).	 -10 ... 10V 0.1V 0 ... 20mA 0.1mA 0 ... 1 1 5 ... 5000Hz 0.1Hz 0 ... 100%PW 0.1%PW

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



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

Cablebreak

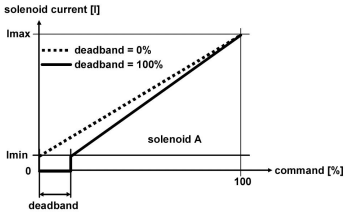
The following adjustments can only be made if the parameter "Signal type" is set to "Current", "Frequency" or "PWM".

Field	Parameter description	Range / Step
Cablebreak detection CbR	Switch on/off the cablebreak detection of the input signal (refer to section "Cablebreak detection" 18).	oFF no on yes
Lower cablebreak limit	Command value < Lower cablebreak limit = cablebreak active Signal type = Current Signal type = Frequency Signal type = PWM The adjusted value must be less than the value of the Upper cablebreak limit. By changing the parameter "Signal type", this value will be set to the default value (see table below).	0 ... 20mA 0.1mA 5 ... 5000Hz 0.1Hz 0 ... 100%PW 0.1%PW
Upper cablebreak limit	Command value > Upper cablebreak limit = cablebreak active Signal type = Current Signal type = Frequency Signal type = PWM The adjusted value must be greater than the value of the Lower cablebreak limit. By changing the parameter "Signal type", this value will be set to the default value (see table below).	0 ... 20mA 0.1mA 5 ... 5000Hz 0.1Hz 0 ... 100%PW 0.1%PW

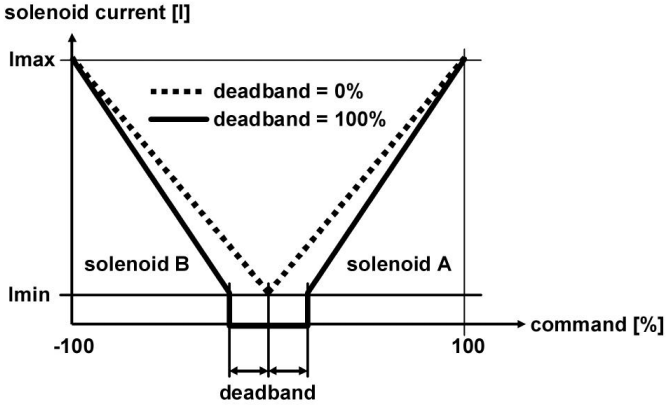
Deadband

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 on
Deadband  	Command value < Deadband = 0 mA solenoid current Command value >= Deadband = Imin..Imax solenoid current  If the value is 0.0% the deadband function is switch off in the 7-segment display	0 ... 50% 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. 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. With the selection "on", the command value fixed function ist switched on, that means the output value is dependend on the digital inputs.	off 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" 34
Fixed command value 1	Value for the fixed command value 1. The adjusted %-value correspond to the adjusted solenoid current range (0% = 0mA, 0.1% = Imin, 100% = Imax). A positive value will activate solenoid driver 1, a negative value will activate solenoid driver 2 Can only be adjusted if "Selection 1" is not set to "not used".	0 ... 100% 0.1%

7.6.4 Command generator

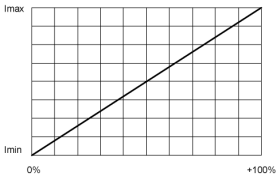
In this window, all adjustments according to the ramp function will be made.

Field	Parameter description	Range / Step
Enable	Enalbe ramp function. With the selection "off", the ramp function ist switched off, that means the input command value is redirected to the output without a delay. With the selection "on", the ramp function ist switched on, that means the input command value is redirected to the output with a delay. With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable). With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable). The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input".	off on external external inverted
Dig. input	Active digital input for the enable if the parameter "Enable" is set to "external" or "external inverted". Otherwise, this setting has no effect. In choosing "not used", no digital input will be assigned to the enable function.	refer to section "Assignment of the inputs/outputs" 34
Rampe up positive 	The set ramp time refer to a command value jump from 0% to 100% for the solenoid from the solenoid driver 1.	0 ... 500s 0.05s
Rampe down positive 	The set ramp time refer to a command value jump from 0% to 100% for the solenoid from the solenoid driver 1.	0 ... 500s 0.05s

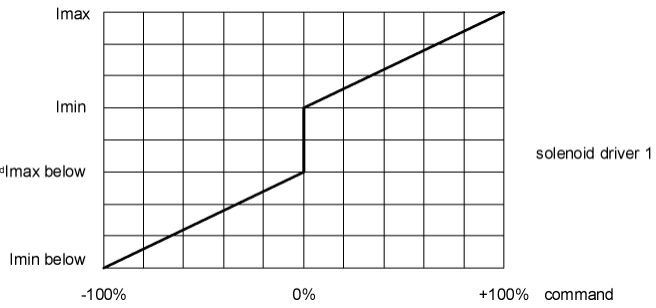
7.6.5 Valve type

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" 20).	Command unipolar (1-sol) Command unipolar (2-sol) Command bipolar (2-sol)
Solenoid type	Select the desired solenoid type	Proportional solenoid without current measurement Proportional solenoid with current measurement Switching solenoid without current measurement
Valve type	Valve type of the connected valve Standard valve with one or two solenoids 4/3-way valve (2-solenoid function) with only one solenoid	 Standard 1-solenoid 4/3-way 1-solenoid
Controller mode (Device control mode)	Select the desired Controller mode (only valid for Wandfluh-Electronics with Fieldbus Interface).	Spool valve open loop Pressure/flow valve open loop



Standard 1-solenoid



4/3-way 1-solenoid

7.6.6 Solenoid driver

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

Field	Parameter description	Range / Step
Solenoid output	Select the desired solenoid output for the current channel. In choosing "not used", no solenoid output will be assigned to the current channel.	refer to section "Assignment of the inputs/outputs" 34
Enable	Solenoid enable With the selection "off", the selected solenoid output is disabled and no solenoid current will be active. With the selection "on", the selected solenoid output is enabled and the solenoid current will be operated according to the selected operating mode. With the selection "external", the enable of the channel is made through a high-signal on a digital input (input active = enable). With the selection "external inverted", the enable of the channel is made through a low-signal on a digital input (input not active = enable). The digital input for "external" resp. "external inverted" can be selected with the parameter "Dig. input".	off on external external inverted
Dig. input	Active digital input for the enable if the parameter "enable = 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" 34
Inversion	Inversion of the solenoid output 0% command = Imin, 100% command = Imax 0% command = Imax, 100% command = Imin	no yes
Solenoid always active	The behavior of the non-active solenoid can be set. With the selection "no", the current of the non-acitve solenoid is set to 0. With the selection "yes", the current of the non-active solenoid is set to Imin (with parameter "Inversion" = no) resp. to Imax (with parameter "Inversion" = yes).	no yes
Characteristic optimisation	Switch on/off the characteristic optimisation (refer to section "Characteristic optimisation 15")	off 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. This parameter can only be set with a solenoid type "Proportional solenoid with current measurement" (refer to section "Valve type" 47)	no yes
Imin 	Set minimum solenoid current A. (= solenoid current by 0% command value) With a solenoid type "... without current measurement" (refer to section "Valve type" 47), this parameter can be set from 0 ... 100% duty cycle Using the menu Commands - Valve operation 62 the Imin can be adjusted very easily. With a valve type "4/3-way 1-solenoid" (refer to section "Valve type" 47), this parameter corresponds to the solenoid current by 0% command value.	0 ... 950mA 3mA Imax below < Imin < Imax
Imax 	Set maximum solenoid current A. (= solenoid current by 100% command value) For the max. current refer to section "Electrical specifications" 8. With a solenoid type "... without current measurement" (refer to section "Valve type" 47), this parameter can be set from 0 ... 100% duty cycle Using the menu Commands - Valve operation 62 the Imax can be adjusted very easily. With a valve type "4/3-way 1-solenoid" (refer to section "Valve type" 47), this parameter corresponds to the solenoid current by 100% command value.	Imin ... max. current 3mA Imin < Imax
Imin below	Is only active with a valve type "4/3-way 1-solenoid" (refer to section "Valve type" 47). This parameter corresponds to the solenoid current by -0.1% command value.	0 ... 950mA 3mA Imin below < Imax below
Imax below	Is only active with a valve type "4/3-way 1-solenoid" (refer to section "Valve type" 47). This parameter corresponds to the solenoid current by -100% command value.	Imin below ... max. current 3mA Imin below < Imax below < Imin
Dither function	Switch on/off the dither function	off on
Dither frequency 	The dither frequency can be set in steps..	2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 100, 125, 165, 250, 500Hz
Dither level 	Level of the superimposed dither signal With a solenoid type "... without current measurement" (refer to section "Valve type" 47), this parameter can be set from 0 ... 100% duty cycle	0 ... 399mA 2mA

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

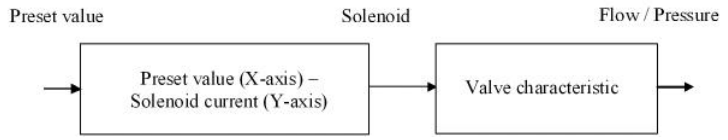
Field	Parameter description	Range / Step
Switching on threshold	Command value > Switching on threshold = solenoid output active	0 ... 100%
Switching off threshold	Command value > Switching off threshold = solenoid output not active	0 ... 100%
Reduction time	After this time the PWM output will be reduced to the value which is set by parameter "reduction value" (refer to section "Power reduction" 22).	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" 22).	0...100%

Characteristic optimisation:

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

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

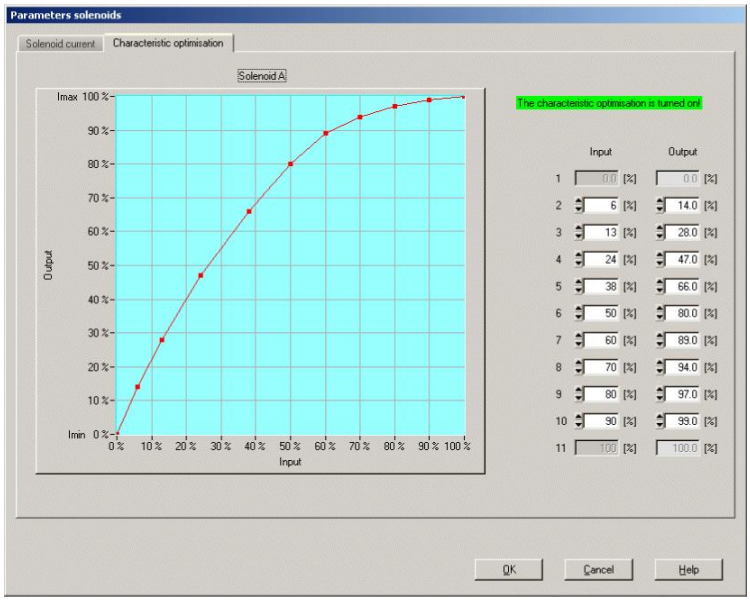
The other graphic points can be adjusted either by tracking with the mouse or by entering the value at the numeric inputs. The resolution of the X-values is in %, those of the Y-values in 0.1 %. The X-values cannot be falling.



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

By modifying the default linear characteristic “Preset value (X-axis) – Solenoid current (Y-axis)” e.g. a 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 “Preset value (X-axis) – Solenoid current (Y-axis)” in this case should be adjusted in the “opposite progressive” direction (refer to the example characteristic below).

Additionally the characteristic optimisation must be turned on. This will be shown in the PASO-Status line (refer to section "Starting of PASO" 84).



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" 48)

Field	Parameter description	Range / Step
Error handling	The desired error handling with a cablebreak error can be set. With the error "Short circuit from Solenoid driver 1" and "Short circuit from Solenoid driver 2", the error handling is fixed set to "Solenoid 1+2 off"	Solenoid 1+2 off Solenoid 1 on ** Solenoid 2 on ** Solenoid 1+2 on **

With the button "Diagnostics", a complete description of all present errors will be displayed (only in On-Line mode, refer to section "Analysis_Diagnostics" 73).

7.7 Menu File

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

7.7.1 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
Supply voltage	• 12 VDC • 24 VDC

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

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 stored with a current PASO , the read procedure will be started. If the configuration of the selected file does not correspond to the current configuration of the PASO SD7, a message will be displayed and the current configuration from the PASO SD7 will change automatically over to the new configuration of the selected file. The read parameter values will be checked in the case of a limiting value excess. If one or more parameter values are outside the tolerance, a message will be displayed and the parameter value will be set to the default value (refer to section "Limiting value error" 86). 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..." 53).

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" 55). 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 File-Info

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

Date, time: Date, time of saving.

File name: The file name, under which the file has been saved.

Card type: The card type of the connected Wandfluh-Electronics at the moment of saving. If no Wandfluh-Electronics are connected, then this indication remains empty. In case of saving during ”On Line Operation”, this indication is updated.

Operator: The name of the originating person.

Remarks: Possibility to enter remarks concerning the file.

When the File_Info window appears during the execution of the command "File_Save as..." 53, 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" 55, then the various fields cannot be edited.

7.7.7 Settings

7.7.7.1 Language

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

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

7.7.7.2 Messages

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

Field	Parameter description	Range / Step
Info messages 	Info messages are normally displayed in a separate window. They contain information on a particular topic. If e.g. the parameter "Mode of operaton" is changed, the info message "The scaling parameters will be adapted!" appears. All these info messages must be closed with the "OK" button. If "Hide info messages" is selected, these info messages do not appear. In the background, however, the corresponding action is still executed Info messages are not displayed Info messages are displayed	 hide show
Warnings 	Warnings are normally displayed in a separate window. They contain a warning on a particular topic. If e.g. in the signal recording the signal selection is changed, the warning "Your recording data will be discarded!" appears. All these warnings must be closed with the "OK" button. If "Hide warnings" is selected, these warnigns do not appear. In the background, however, the corresponding action is still executed Warnings are not displayed Warnings are displayed	 hide show

7.7.8 Exit

With this command, the PASO 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 Wandfluh-Electronics, the parameter will be saved automatically by clicking on the button "OK" in the corresponding windows (refer to section "Store parameter" 86).

7.8 Menu Communication

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

7.8.1 Device overview

An overview of all connected WANDFLUH devices is displayed (refer to section "Communication start up 80"),

7.8.2 Datarecord-Info

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

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

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

7.8.3 Activate Off Line / Actuvate On Line

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

On Line
With this command, the connection with the Wandfluh-Electronics is established. If several Wandfluh-Electronic devices are connected via the USB-Interface, the selection of all available devices appears (refer to section "Communication start up 80").

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

During UPLOAD PARAMETERS the PASO software automatically adapts to the selected device type. If the parameters have been accepted, they are checked for a limit value violation. If one or several parameters are outside the corresponding tolerance, they are replaced with standard values and a message is issued (refer so section "Limiting value error" 86). PASO runs in the "Off Line"-mode. To enter in this case the "On LIne" mode, the parameters must be sent to the WANDFLUH-Electronics (DOWNLAOD PARAMETERS). If the transfer is successful and the check is correct, the PASO software now runs in the ”On Line mode”. The loading of parameter files is not possible in this mode.

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

The current mode will be displayed in the status line.

7.9 Menu Configuration

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

7.9.1 Digital I/O

With this command the digital input of the connected Wandfluh-Electronics is activated, not activated or enabled.

Feld	Parameter description	Range / Step
Digital inputs	Set digital input by software	1
	Reset digital input by software	0
	Activate external digital input	X

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

7.9.2 Filter for analog inputs

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

Field	Parameter description	Range / Step
Filter type	The filtering of the corresponds analog input can be switch on or off (refer to section "Analog inputs 17"):	
	No filtering on the analog input is active	no filter
	The analog input is filterd with the function "exponential smoothing"	Exponential smoothing
Smoothing factor	Determines the speed / response time of the filter - high value = high degree of filtering, but long response time (the reading of the analog input is delayed) - small value = low degree of filtering, but fast response time	8 16 32 64

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

7.9.3 General errors

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

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

7.9.4 Default setting

This menu point is only active in the "On Line"-mode and in the state "Disabled" (refer to section "State machine" 16).

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

7.9.5 ADC Scaling

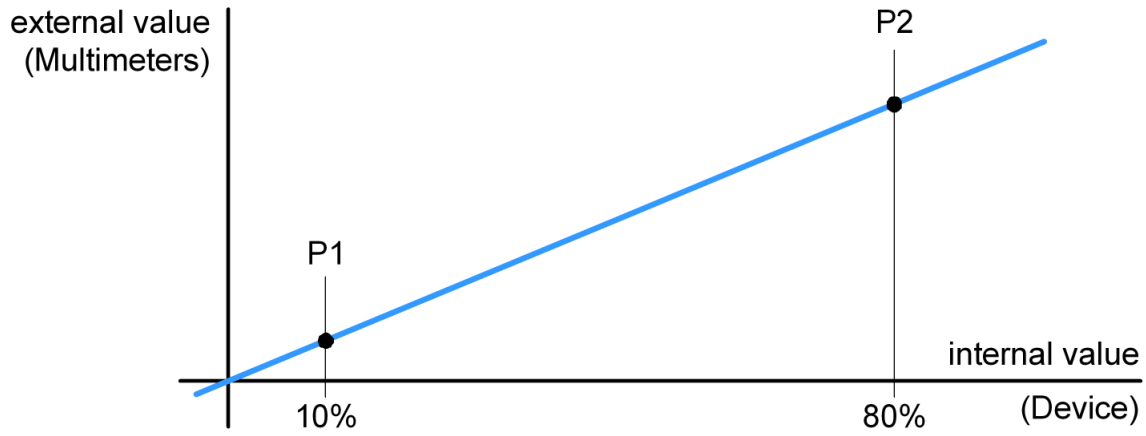
In this window the analog/digital converter (ADC) can be scaled.

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

Field	Parameter description	Range / Step
Channel	Here the channel for scaling can be selected. Only channels which are assigned to a function can be scaled Depending on the Wandfluh-Electronics type not all channels are available.	Solenoid output A Analog input 1
Internal measured value (device)	This is the value which is measured internally on Wandfluh-Electronics. This corresponds to the value which is displayed in the menu "Analysis_Show values" 66.	
External measured value P1 (Multimeter)	Here must be entered the value witch is external measured with a multimeter. For bipolar signals, only the positive side is considered.	Depending on channel
Accept	The value from the field "Internal measured value (device)" and "External measured value P1 (Multimeter)" is assumed for the calculation.	
External measured value P2 (Multimeter)	Here must be entered the value witch is external measured with a multimeter. For bipolar signals, only the positive side is considered.	Depending on channel
Accept	The value from the field "Internal measured value (dewcie)" and "External measured value P2 (Multimeter)" is assumed for the calculation.	
Calculate	Using the assumed values "Internal measured value Wandfluh" and "External measured value P1 resp. P2 (Multimeter)" the new value for the offset and the amplification of ADC scaling is automatically calculated and sent to the Wandfluh-Electronics. The new calculated values are displayed in the field "Offset" and "Amplification". This button is only active if values were previously assumed.	
Default	The default values "Offset = 0.0" and "Amplification = 1.0" are sent to teh Wandfluh-Electronics and will be active. The values "External measured value P1 resp. P2 (Multimeter)" are set to 0	
Solenoid current	With the selection "Solenoid current A" resp. "Solenoid current B", the direct operation of the solenoids can be made in this range. **ATTENTION: With the direct solenoid operation, the system can move in an uncontrolled way!** The settings correspond to the functions in the section "Commands_Valve operation" 62.	

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

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



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

7.10 Menu Commands

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

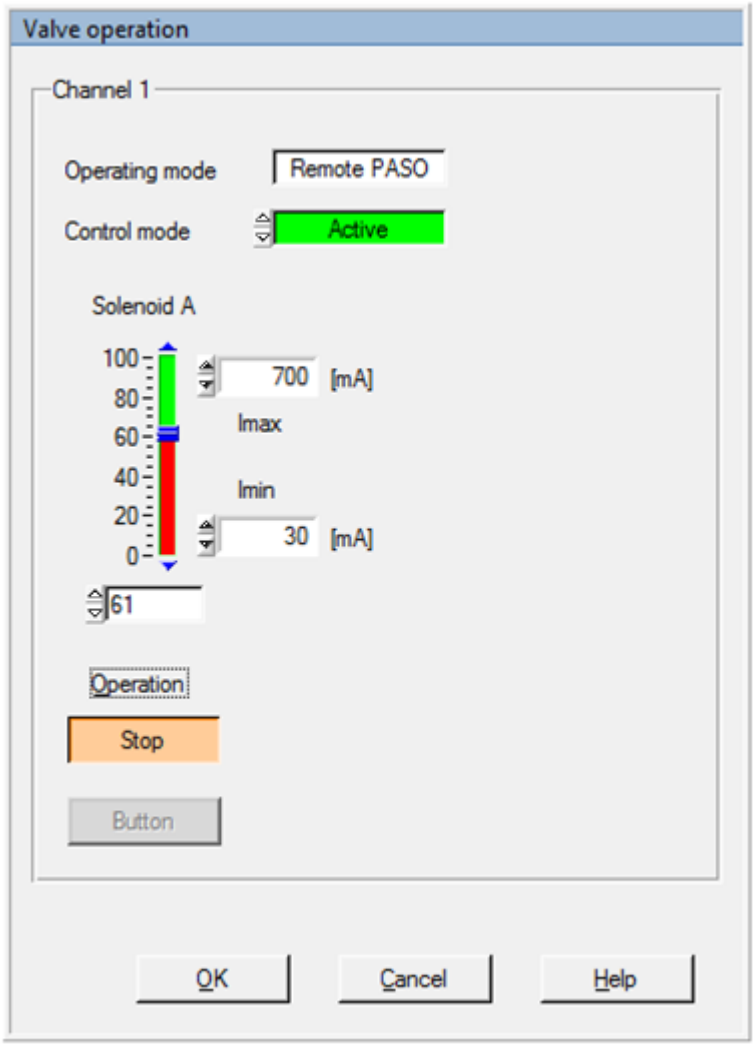
7.10.1 Valve operation

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

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

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

The following window appears:



- The number of the shown channels is equal to the number of channels that can be operated (refer to section "Description of the Function" 12)
- The number of solenoids per channel corresponds to the selected mode of operation (refer to section "Valve type" 47)
- The solenoid name (for example "solenoid A") corresponds to the selected solenoid output (refer to section "Solenoid driver" 48)

- 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" 17) **This adjustment can only be made if the field "Control mode" is set to "Disabled".**	Local Remote PASO
Control mode	Select the desired control mode (refer to section "State machine" 16) **This adjustment can only be made if the field "Operation mode" is set to "Remote PASO".**	Disabled Active
Operation	With this button, the adjusted current can be sent to the solenoid or the solenoid can be set to 0 current. **This button can only be operated if the field "Operation mode" is set to "Remote PASO" and the field "Control mode" is set to "Active".**	Start / Stop
Solenoid x	The desired solenoid current can be adjusted either with the slider or in the numeric field. With a proportional solenoid, the adjustment from 0...100% refers to a solenoid current from Imin...Imax. With a switching solenoid, the solenoid can be switched off or on with 0 / 1. **The adjusted current will be sent to the solenoid only if the button "Operation - Start" is activated (label of the button is "Stop")**	0...100% (Imin...Imax) 0 / 1
Imin / Imax	The value of the parameter Imin / Imax from the corresponding solenoid driver can be changed (refer to section "Solenoid driver" 48). If the window is closed with the button "OK", the changed values from Imin / Imax will be take over. If the window is closed with the button "Cancel", the changed values from Imin / Imax will be reset to the original values.	

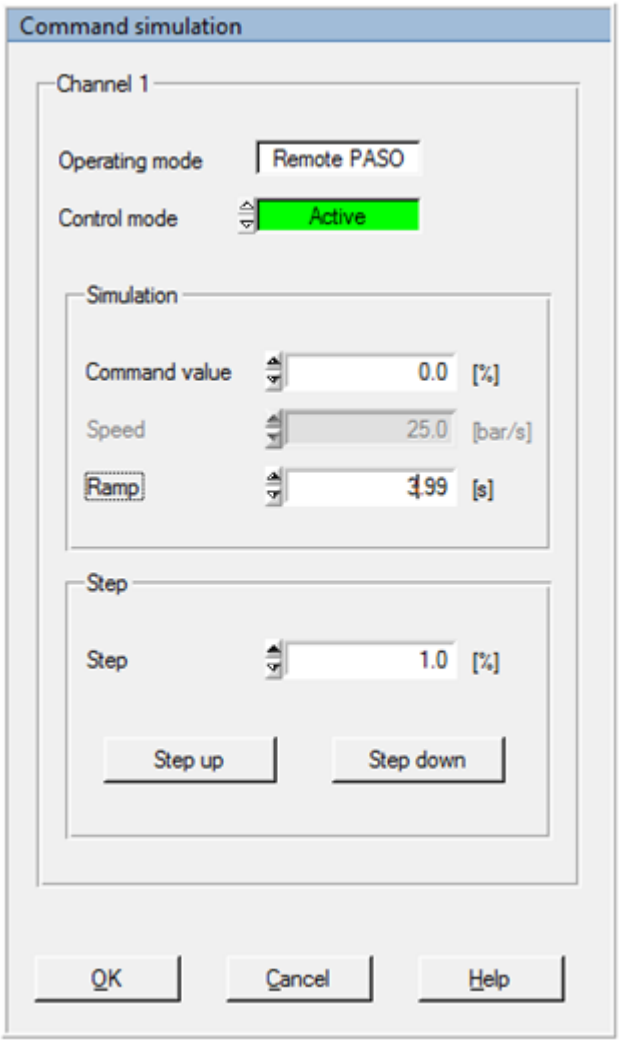
7.10.2 Command simulation

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.

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

The following window appears:



- The number of the shown channels is equal to the number of active channels (refer to section "Description of the Function" 12)
- 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" 17) **This adjustment can only be made if the field "Control mode" is set to "Disabled".**	Local Remote PASO
Control mode	Select the desired control mode (refer to section "State machine" 16) **This adjustment can only be made if the field "Operation mode" is set to "Remote PASO".**	Disabled Active
Command value	Desired value of the command value. The adjusted %-value refer to the adjusted solenoid current range (0 ... 100% = Imin ... Imax). A positive %-value will activate the solenoid A, a negative %-value will activate the solenoid B (0% = Imin A).	-100% ... 100% 0.1%
Speed	This parameter is only active on a controller card.	
Ramp	After a command value jump, the new command value is approached via a linear ramp. The adjusted ramp time refer to a command value jump from 0% to 100% resp. from 100% to 0%.	0 ... 500s 0.05s
Step	With this value the command value will be added by clicking on the button "Step up" resp. will be subtracted by clicking on the button "Step down".	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"	

7.11 Fieldbus-Menu

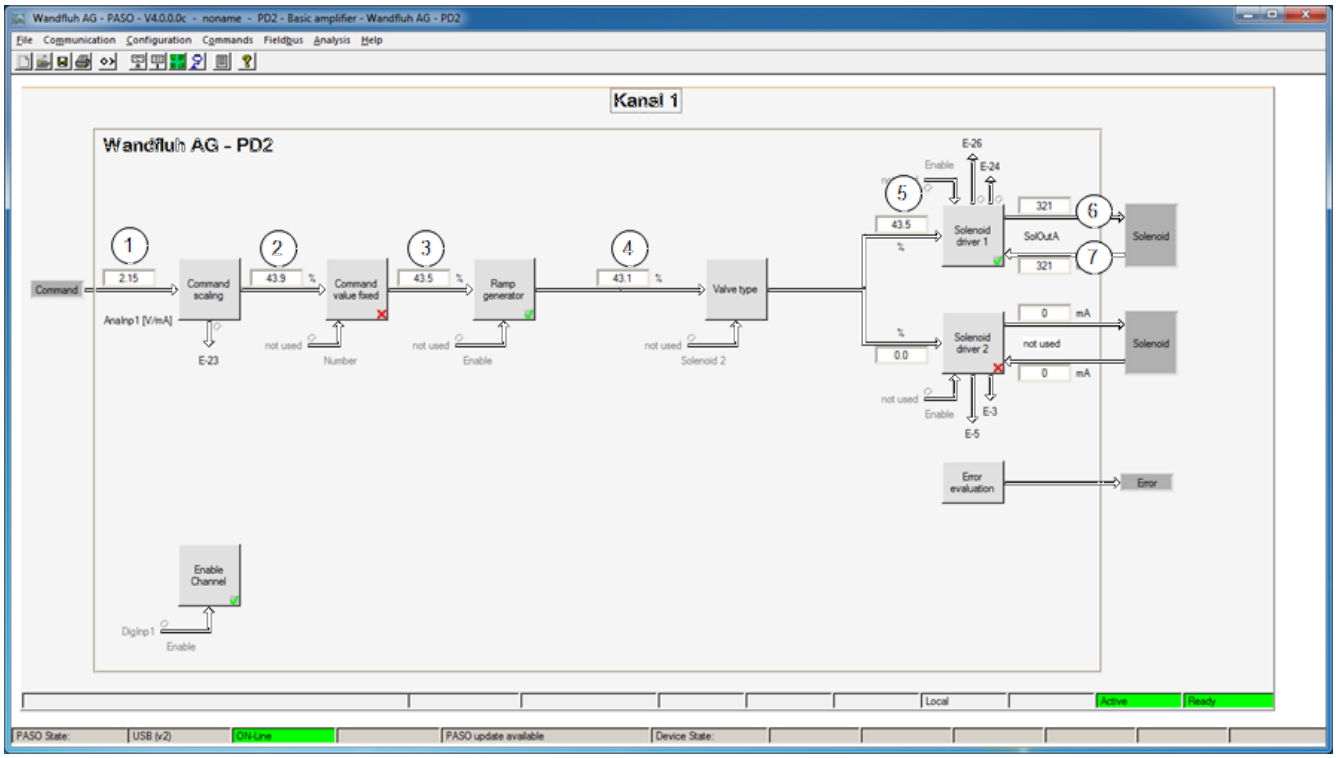
If the SD7-Electronics have a fieldbus, with this menu point the necessary bus node adjustments can be made. Also bus states will be displayed here.

7.12 Menu Analysis

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

7.12.1 Show values

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



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" 40).

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

3 **Output value command values fixes**
Command value scaled to 0...100% or -100...100%. If fixed command values are selected this value can differ 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 resp. solenoid driver 2**
Command value scaled to 0...100%.
If the value in field 6 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 6 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") 47.

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") 47.

7.12.2 Values window

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

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

Field	Description	Unit
Supply voltage	Supply voltage of the Wandfluh-Electronics .	V
Temperature	Actual temperature of the Wandfluh-Electronis	°C
Digital inputs	Logical status of the digital input: • If the input is set • If the input is not set	 1 0

7.12.3 Signal Recording

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

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

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

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

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

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

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

Field	Parameter description
Signal display	Switching-on the fields makes the recorded curve of the respective channel visible.
Time cursor	Positioning the time cursor over the input field time [s] or with the help of the slider control underneath the graphics.
Signal assignment	Opens the menu Signal Assignment 70
New	Any recorder data are deleted and the card is ready for a new recording.
Start / Stop (single)	**Start** A new recording is started. As soon as the trigger is actuated (or with "Trigger condition - start directly" immediately), the recording runs (apparent by the blinking of the field "Recording") and the measuring data are transmitted. If there are already measuring data in the memory, then the recording continues as from this point. Once the maximum number of measuring values (= 250) has been read-in, the possible remaining recording data are transmitted (the curves continue to be updated). During the transmission, it is already possible to analyse the curves ("Signal display", "Auto-scaling"). **Stop** Stops the transmission and the recording. As from this point it is possible to record once again by a renewed actuation of Start. Once the maximum number of measuring values has been read-in or if "Scroll" was pressed, the Start button is dimmed.
Scroll / Stop (continuos)	**Scroll** A new recording is started. As soon as the trigger is actuated (or with "Trigger condition - start directly" immediately), the recording runs (apparent by the blinking of the field "Recording") and the measuring data are transmitted. If there are already measuring data in the memory, then the recording continues as from this point. As long as the buttons "Stop" or "New" are not pressed, the measuring values are read in. If the data memory on the SD7-Electronics is full or the maximum number of measuring value (= 20000) has been read-in, a message appears and the recording is stopped. During the transmission, it is already possible to analyse the curves ("Signal display", "Auto-scaling"). **Stop** Stops the transmission and the recording. As from this point it is possible to record once again by a renewed actuation of Start. If "StartI" was pressed, the Scroll button is dimmed.
Export	By the actuation of this button the recorded data are saved on the hard-disk. The format used is a text format with tabulators as separators, so that it is easily possible to import the values into a different program (e.g. Excel). The decimal marker of the numbers can be selected: Decimal point or comma.
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 70"), 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 (refer to ""Show values 66" and "Values window 67")
Supplementary	For the following recording signals, the supplementary selection is active: - all channel depending signals — desired channel - digital input — desired digital input - digital output — desired digital output - internal signal — desired internal signal
Scale / Div	Vertical value for one step in the signal recording window
Offset	Offset value for the signal display in the signal recording window. If offset value = 0 the 0 - line from the signal value is in the middle of the signal recording window
Range "Trigger"	In this range the condition for the Trigger signal are made
Condition	Start condition for starting the recording: - negative slope: Signal level must change from higher than level value to smaller than level value - positive slope: Signal level must change from smaller than level value to higher than level value - pos/neg slope: Signal level must change from higher than level value to smaller than level value or from smaller than level value to higher than level value - start directly: by operating the "Start" button, the recording is started directly
Signal	Signal, on which triggering takes place
Level	Value for the start condition
Range "Sample time"	In this Range the recording time can be set
Sample time	Scanning rate for the recording (0.004 ... 60s, a multiple of 4ms). After this time interval, a new measurement is made. The value from the recording time will be adapted accordingly
Recording time	Desired recording period (1 ... 15000s). The value from the sample time will be adapted accordingly
OK	If changes have been made, then any possible recording data (together with the graphics) are deleted
Cancel	Any possible changes are cancelled again

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

7.12.4 Individual values

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

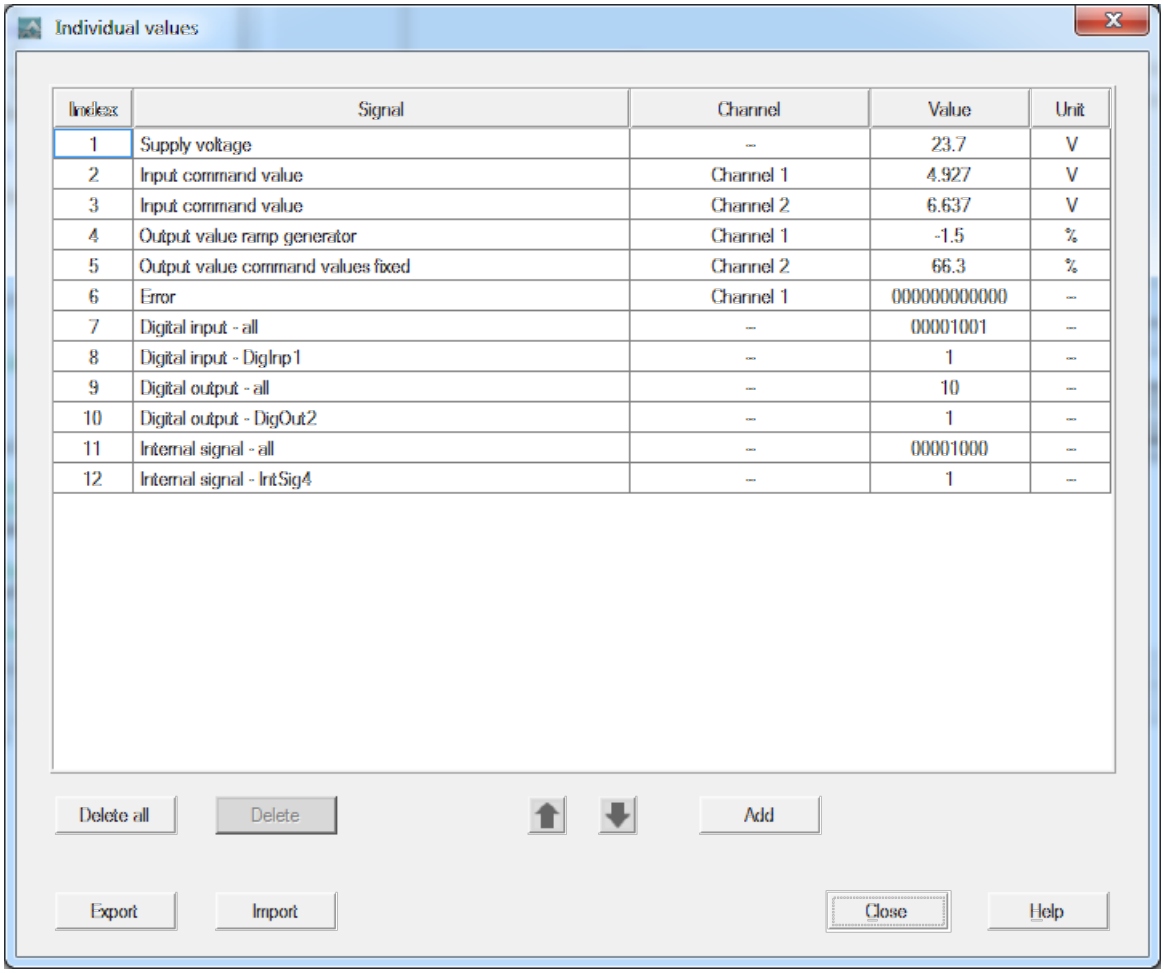
The window can remain open regardless of other input windows. If a different window is open, the values in the individual data window are updated, but no input is possible.

Adding a further signal is done either via the button "Add" (siehe Abschnitt "Add signals using the button "Add"" 72") or Or by right-clicking on the desired On-line signal in the main window (siehe Abschnitt "Add signals by clicking with the right mouse button 72").

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

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

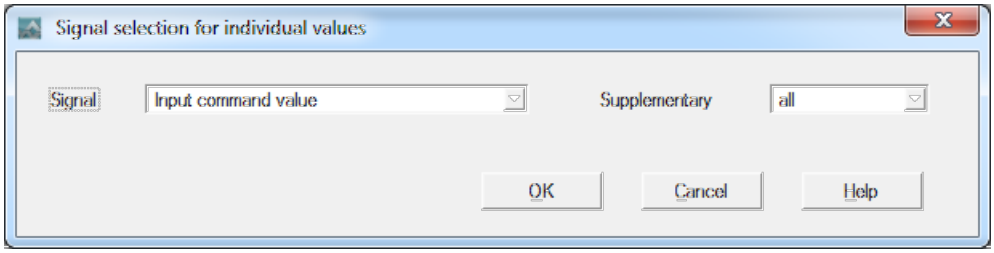
The selected signals are not stored on the connected Wandfluh-Electronics. By means of thebuttons "Export" and "Import", created On-line signal lists can be created for different measurement or display procedures. When importing, it is checked whether the signals are present with the selected card type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



Signal	Desired On-line signal. The following signal types are distinguished: General signals: Signals, which are present only once on the connected Wandfluh-Electronics (in the picture above index 1) Channel dependent signals: Signals, which are separately available for each existing channel. Numerical signals are displayed with their effective value with unit (in the picture above index 2 - 5). Digital signals are displayed in binary format (in the picture above index 6). A detailed description of the signals is located in the section "Representation of the signals 73". Digital inputs: Digital inputs are only available once on the connected Wandfluh.Electronics. However, it can be chosen, whether all digital inputs (in the picture above index 7) or only a single digital input (in the picture above index 8) is to be displayed. A detailed description of the signals is located in the section "Representation of the signals 73".
Channel	With channel dependent signals the corresponding channel is displayed here
Value	The current value of the selected signal. This value is constantly updated. If PASO runs in "Off Line"-mode, no values are displayed here-
Unit	The unit corresponding to the signal is displayed here

Add signals using the button "Add""

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



Add signals by clicking with the right mouse button

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

Representation of the signals

Numerical signals are displayed with their effective value with unit.

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

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

Signal	Format	Description
Digital inputs	x1	x1 = state of digital input 1
Digital output	not available	
Internal signals	not available	x1 = state of internal signal 1 x2 = state of internal signal 2 x3 = state of internal signal 3 x4 = state of internal signal 4 x5 = state of internal signal 5 x6 = state of internal signal 6 x7 = state of internal signal 7 x8 = state of internal signal 8
Error	x12 x11 x10 x9 x8 x7 x6 x5 x4 x3 x2 x1	x1 = E-1 cablebreak command value signal x2 = E-2 Kurzschluss solenoid driver 1 x3 = E-3 Kurzschluss solenoid driver 2 x4 = E-4 cablebreak solenoid driver 1 x5 = E-5 cablebreak solenoid driver 2 x6 = E-6 cablebreak feddback value signal (only with Controller-Version) x7 = E-7 trailing error (only with Controller-Version) x8 = E-8 J1939 error (only with devices with J1939 bus node) x10 = E-10 short circuit solenoid digital output x11 = E-11 device error x12 = E-12 swtiching threshold A detailed description of the errors is located in the section "Error evaluation 52".
Window	not available	
Switching threshold	not available	
Control value	not available	

7.12.5 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 	If the supplied voltage < 7.8VDC. 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. 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 	This error is only detected, if the parameter "cablebreak" is set to "yes" and the command value is smaller than the lower cable break limit or higher than the upper cable break limit. In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready).	Disable and reenable the corresponding channel.
Short circuit solenoid output 	There is a short circuit on the solenoid output In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready).	Disable and reenable the corresponding channel.
Cable break solenoid output 	There is a cable break on the solenoid output In the status line of the corresponding channel it will be displayed if this error is present (State: Error) or not (State: Ready).	Disable and reenable the corresponding channel.

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

7.12.6 Temperature statistics

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

All statistic values are saved once per hour in the Wandfluh non-volatile memory. If the Wandfluh 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 Wandfluh temperature. Is updated continuously in the background, however only once per hour saved in memory.	°C
Max. temperature value	Shows the highest ever measured internal Wandfluh temperature. Is updated continuously in the background, however only once per hour saved in memory..	°C
Temperature classes	Shows the frequency of the measured internal Wandfluh temperatures, distributed over 6 temperature classes. Every hour the current temperature is measured and the corresponding temperature counter is increased with one step and subsequently saved in memory, together with the minimal and maximal temperature. If one of the counters reached the highest value of 65535, the counters will not be updated furthermore.	

7.12.7 Operating hours

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

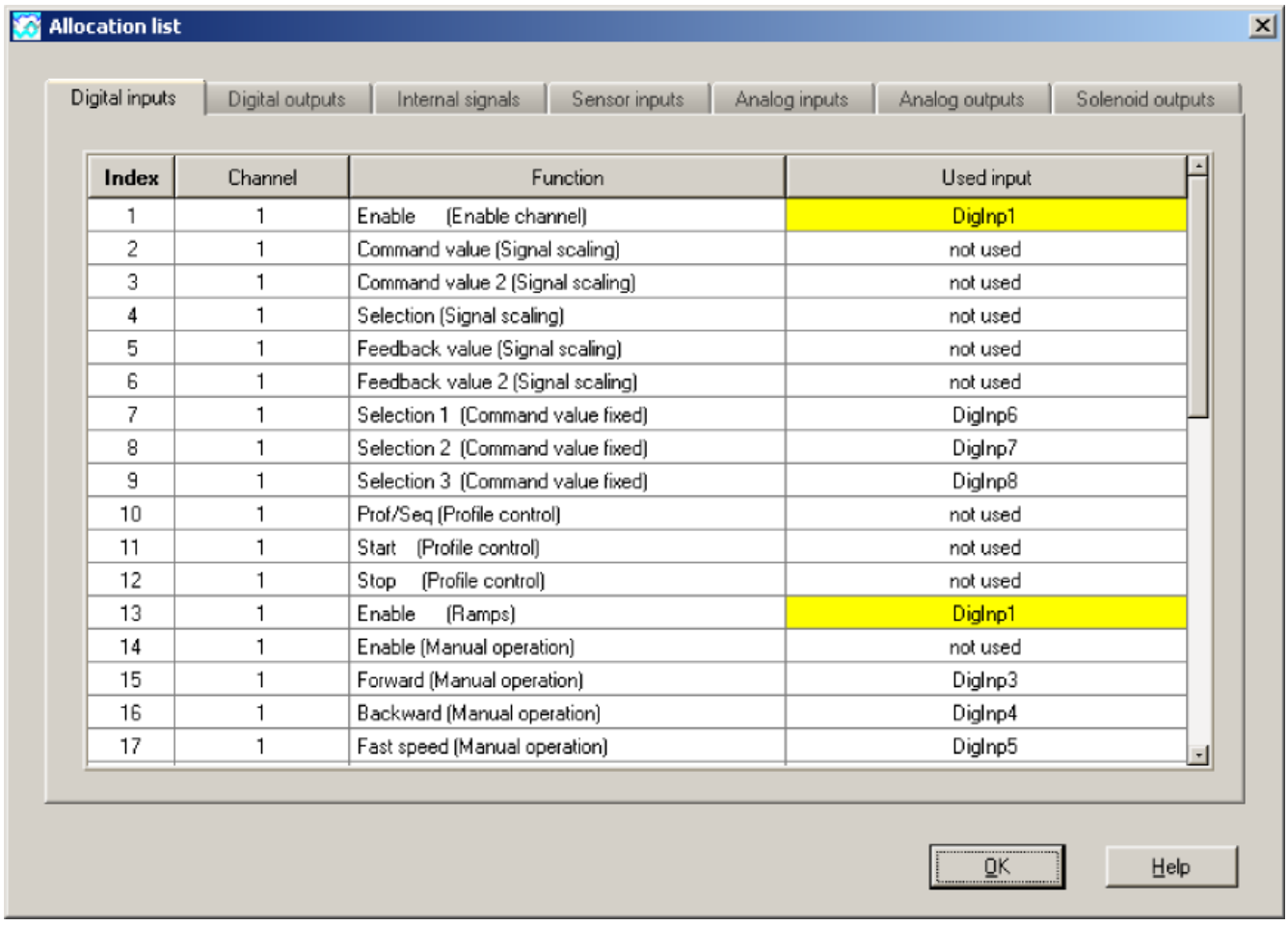
This value is saved once per hour in the Wandfluh non-volatile memory. If the Wandfluh is operated for less than one hour, the value of the last operation period is not saved.

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

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

7.12.8 Allocation list

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



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

The display of the allocation list can be divided in digital inputs, analog inputs, and solenoid outputs. The display can be individually sorted (mouse click on the title bar of the desired column). Inputs and outputs which are double occupied have a yellow background (refer to section "Assignment of the inputs/outputs" 34).

7.13 Menu Help

7.13.1 Description of the function

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

7.13.2 Contents

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

7.13.3 Step by Step Guide

The step by step guide will be opened automatically.

7.13.4 Device Identification

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

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

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

7.13.5 WANDFLUH on the Web

A link to the WANDFLUH home page.

7.13.6 Info

Information about PASO and its version.

8 System does not work

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

8.1 Procedure

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

An active error is indicated as follows:
- in the status line per channel the text "Error" is displayed (instead of "Ready")
- in the main window a red point appears for the corresponding error
- the box "Error evaluation 52" has a red frame
- the button "Diagnostics" in the box "Error evaluation 52" is red
- in the box "Error evaluation 52" the corresponding current state of the error is red

Question:	Action:	Possible errors and causes	Blink code
State: Error	Analysis_Diagnostics Power supply error	• The supplied voltage is < 18VDC resp. < 8VDC. The error is also displayed if a supplied voltage interruption occurred (t > 250ms). • Is the supplied power sufficient? • Is the AC voltage too high (refer to section "Electrical specifications" 8)? • When the error is cleared, disable the controller for a short period and re-enable. • With the parameter "Auto reset", the error can be automatically reset if the supply voltage is > 18VDC resp. > 8VDC (refer to section "General errors 59")	1 x
	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. • Check the command value signal connections between the command value encoder and SD7-Electronics. • If the cablebreak detection is not desired, switch off the cablebreak detection (refer to section "Signal scaling" 40). • When the error is cleared, disable the corresponding chanel for a short period and re-enable.	2 x
	Analysis_Diagnostics Short circuit solenoid output	• There is a short circuit on the solenoid output. • When the error is cleared, disable the corresponding chanel for a short period and re-enable.	3 x
	Analysis_Diagnostics Cable break solenoid output	• There is a cable break on the solenoid output. • When the error is cleared, disable the corresponding chanel for a short period and re-enable.	6 x
	Analysis_Diagnostics Memory error	• There is an internal memory error on the SD7-Electronics • Switch off and switch on again the control	4 x
	Analysis_Diagnostics Fieldbus error	• A detailed description of the error can be read via the fieldbus • Reset or restart of the fieldbus connection	5 x

9 PASO Installation and Operation

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

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

9.1 System presupposition

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

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

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

9.2 Installation

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

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

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

9.3 Connection to the Wandfluh card

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

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

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

9.4 Mode "Off Line" / "On Line"

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

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

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

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

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

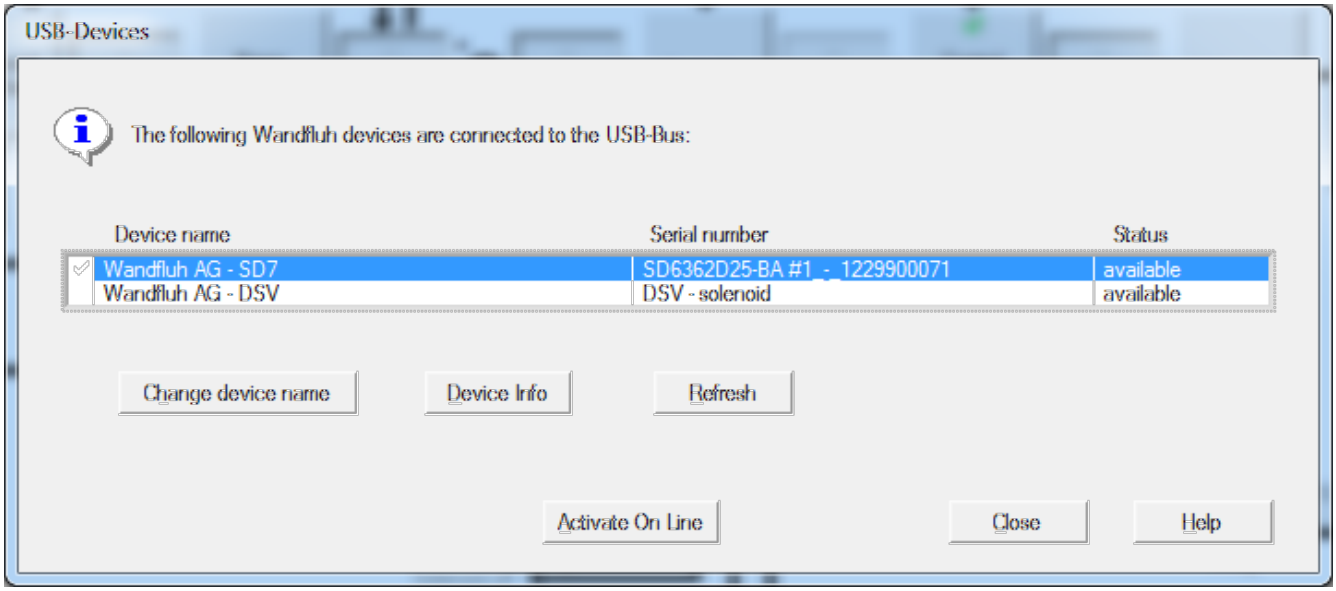
The change between the two modes takes place through the menu point . Near it, it's possible to select if the data should take over from the Wandfluh-Electronics (UPLOAD PARAMETERS, data flow Wandfluh-Electronics => PASO) or if the Wandfluh-Electronics should be reprogramed with the new actual data (DOWNLOAD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

In case of an interference in the communication, the controlling of the Wandfluh-Electronics is not assured anymore. An error message follows and the PASO DSV software automatically changes over to the "Off Line"-mode (refer to section "Communication interruption" 82).

9.5 Communication start up

When the parameterisation software PASO DSV is started up, a check takes place, as to whether a communication with the Wandfluh-Electronics is possible. If no communication can be established, an error message appears (refer to section "Communication interruption" 82). If a communication is possible, the configuration from the PASO will change automatically over to the configuration of the connected Wandfluh-Electronics and the parameters are read from the device.

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

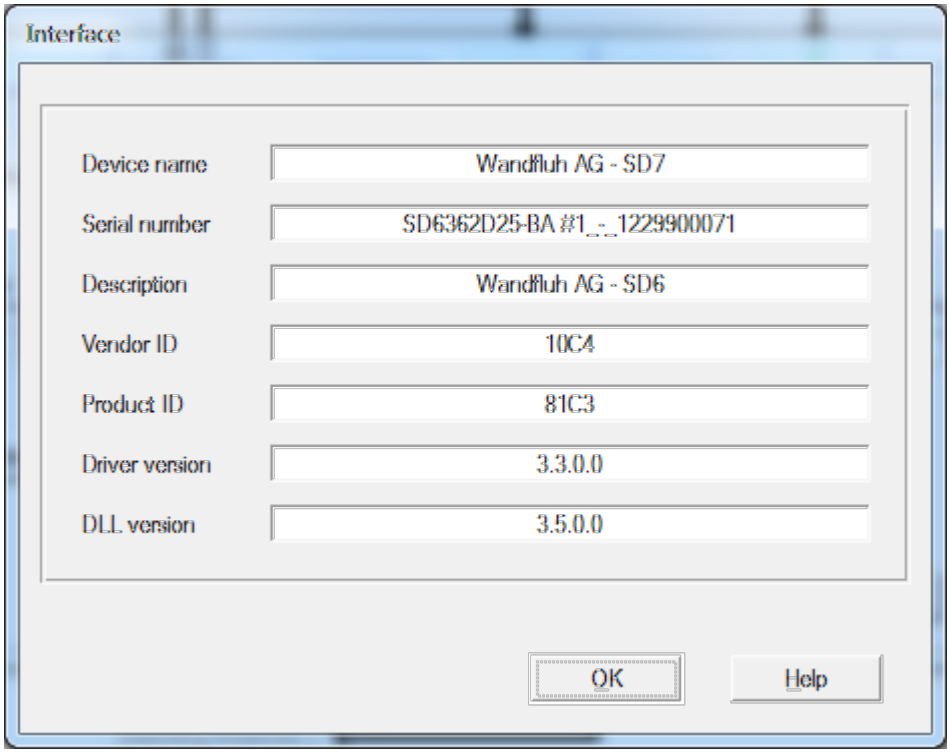


Here, the desired device for the communication start up can be selected.

Device name	Individual name of the device. This can be changed by means of the button "Change device name". The device name is displayed in the PASO software (refer to section "Starting of PASO 84").
Serial number	Unique identification of the device. This entry is assigned by the factory and can not be changed.
Status	available: Communication can be established with this device in use: Communication is already active with this device; no new communication can be established
Change device name	The device name of the selected device can be changed (only if the Status is "available")
Device Info	The device info of the selected device is desplayed (refer to section "Device Info 81")
Refresh	Updates the entries
Activate On Line	Establish communication with the selected device

Device Info

The device info of the selected device is desplayed:



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

9.6 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, then an error message with an error number and an error description appears. The further procedure can be selected

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

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

Wurde die Kommunikation abgebrochen oder ist immer noch keine Kommunikation möglich, wird die PASO SD7 Software in den "Off Line"-Modus gesetzt. Alle Menupunkte und Tasten, die eine Aktion im Zusammenhang mit der Kommunikation beinhalten, sind jetzt gesperrt. Um wieder eine Kommunikation aufzubauen, muss der Menupunkt ”Datei_On Line” angewählt werden.
If the communication has been cancled or communication is still not possible, PASO it set to "Off LIne"-mode. All menu items and buttons that contain an action related to the communication are now blocked. To re-establish a communication, the menu item "Communication_Activate On Line / Off Line gehen 57" 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" 79)
- The connection cable is defect or not pluged in

9.7 Program description

9.7.1 Description of the keys

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

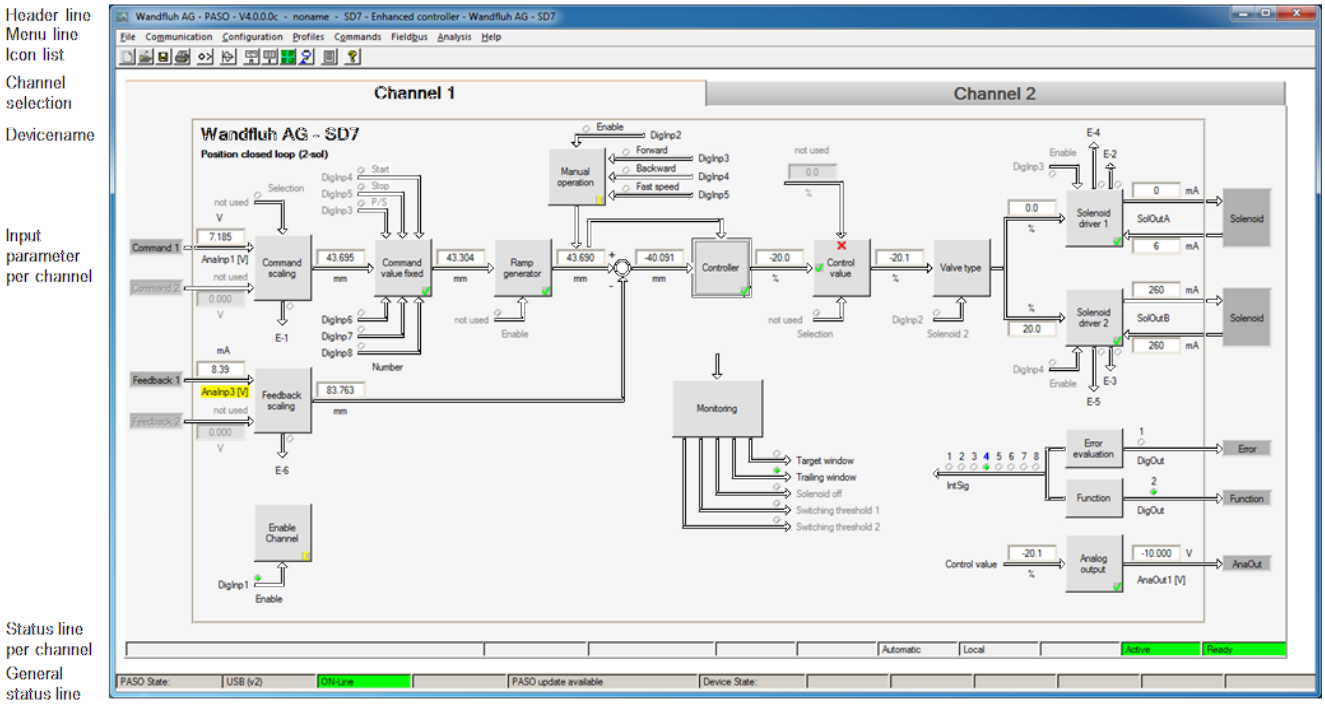
9.7.2 Input elements

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

9.8 Starting of PASO

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

After the start-up, the Start window appears:



During the start-up, the parameterisation software PASO checks, whether a Wandfluh-Electronics device is connected. If no communication can be established, an error message appears (refer to section "Communication interruption" 82) and the "Off Line"-mode will become active. All menu points and keys, which involve an action in connection with the communication, are then blocked. All other functions of the parameterisation software PASO can be utilised without any limitation.

Subsequently the parameters are loaded from the card and subsequently a verification of the Wandfluh-Electronics values takes place. If one or several parameters are outside the corresponding tolerance, they are replaced with standard values and a message is issued (refer so section "Limiting value error" 86). The changed parameters can be either sent directly to the connected Wandfluh-Electronics or the communication start-up can be terminated (the "Off-Line"-mode will become active). In the latter case the user has the possibility to correct the parameters in "Off-Line"-mode. The communication is resumed again via the menu point "Communication_Activate On Line / Off Line gehen 57". 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 wiht the left mouse key on the corresponding box in the chanel window. A input window will appear where all the desired values can be entered.

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

- by clicking on the corresponding icon in the icon list

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

The following states will be displayed in the general status line:
- 1. field: Selected interface ("USB")
- 2. field: Current mode ("On Line" or "Off Line", refer to section "Mode "Off Line" and "On Line" 79
- 4. field: PASO Update ("PASO update available", refer to section "PASO Update")

The following states will be displayed in the channel status line:
- 1. field: Teach-In ("Teach-In", only if this special function is available)
- 2. field: Parameter Inconsistency ("Parameter inconsistency", refer to section "Parameter inconsistency" 35)
- 3. field: Temperature Derating ("Derating", refer to section "'Temperature monitoring" 14')
- 4. field: Characteristic optimisation active ("Optimisation", refer to section "Characteristic optimisation" 48)
- 5. field: Automatic / Manual operation active ("Automatic" or "Manual", no used on this Wandfluh-Electronics)
- 6. field: Operating mode ("Remote PASO" or "Local", refer to section "Operating mode" 17)
- 7. field: Warning ("Warning")
- 8. field: DSV state ("Disabled" or "Active", refer to section "State machine" 16)
- 9. field: Error state ("Ready" or "Error", refer to section "Diganostics" 73)

9.9 Store parameter

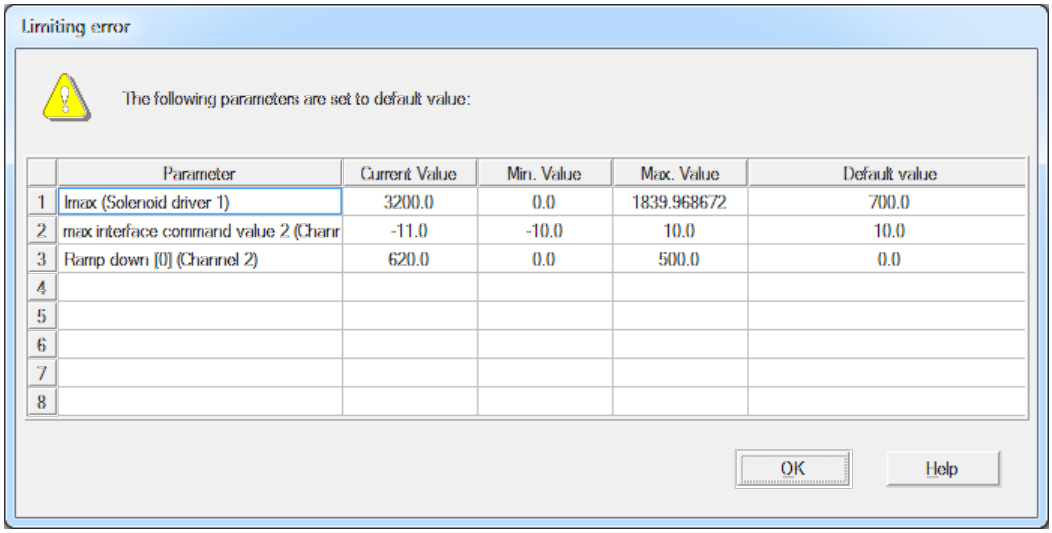
Each new input value is immediately transferred to the connected Wandfluh-Electronics after the completion of the input field (either by pushing the key ENTER or by activating another input field).

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

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

9.10 Limiting value error

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



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

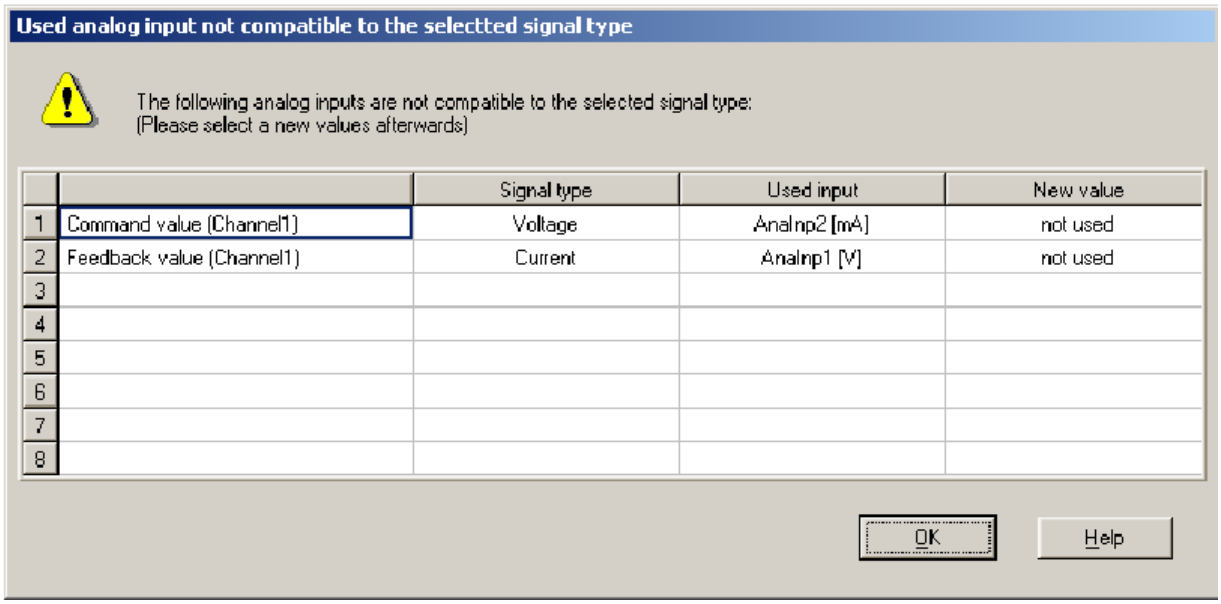
After pressing the key "OK", the current value is overwritten by the default value.

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

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

9.11 Used analog input not compatible to the selected signal type

Before activating the ON-Line mode (only with DOWNLOAD Parameters, refer to section "Mode "Off Line" and "On Line" 79"), PASO is checking, if the selected analog inputs are compatible with the selected signal types (voltage inputs for signal type "Voltage", current inputs for signal type "Current"). If one or more analog inputs are not compatible, it is set automatically to "not used" (refer to section "Assignment of the inputs/outputs 34") and the following window appears:



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

After pressing the button "OK", the value of the used analog input is to not used. Afterwards, it must be readjust (refer to section "Assignment of the inputs/outputs 34").

9.12 Description of Commands

The description of the individual commands and parameters is contained in section "Settings" 12.

10 Disposal

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

11 Accessories

- Parameterisation software PASO — refer to Installation of PASO 78

- 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