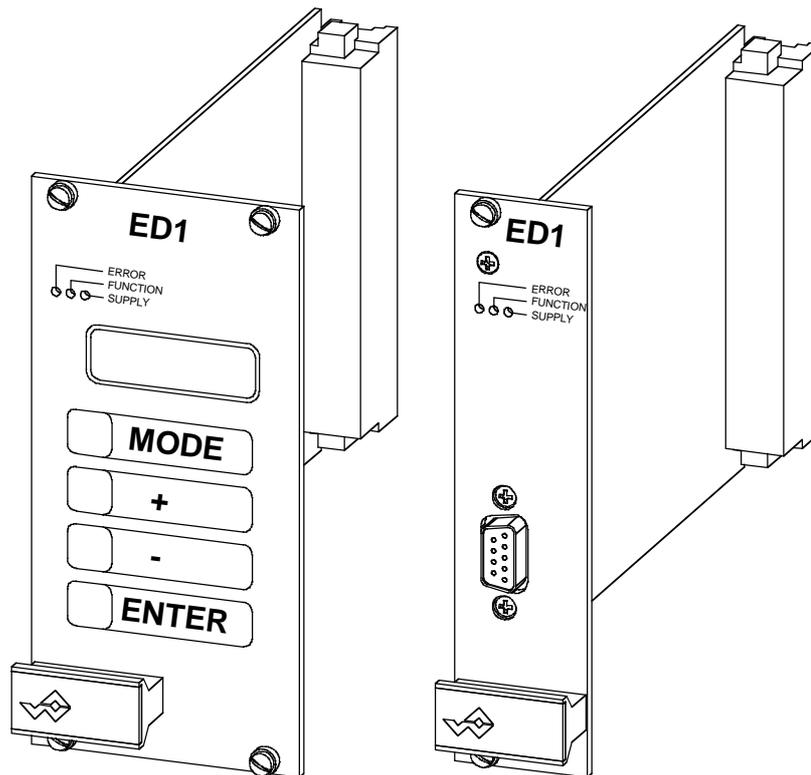


# OPERATING GUIDE

## AMPLIFIER ED1X0



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## **Operating guide to Amplifier ED1X0**

### **1 General information**

This operating guide (OG) makes it possible to use the Wandfluh Amplifier ED1X0 (Amplifier) safely and according to specification. The OG 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 OG mainly includes:

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

### **2 Product description**

#### **2.1 General**

The Amplifier is built in the Eurocard format with a connector strip according to DIN41612, type F48.

#### **2.2 Field of application**

As an Eurocard, the field of application of the Amplifier is situated above all in the industrial field.

#### **2.3 Conformity**

The Amplifier has been developed and tested in accordance with the latest technical standards. Applied in particular was the EU Guideline 89/336/EEC (EMC Guideline).

#### **2.4 Labelling of the product**

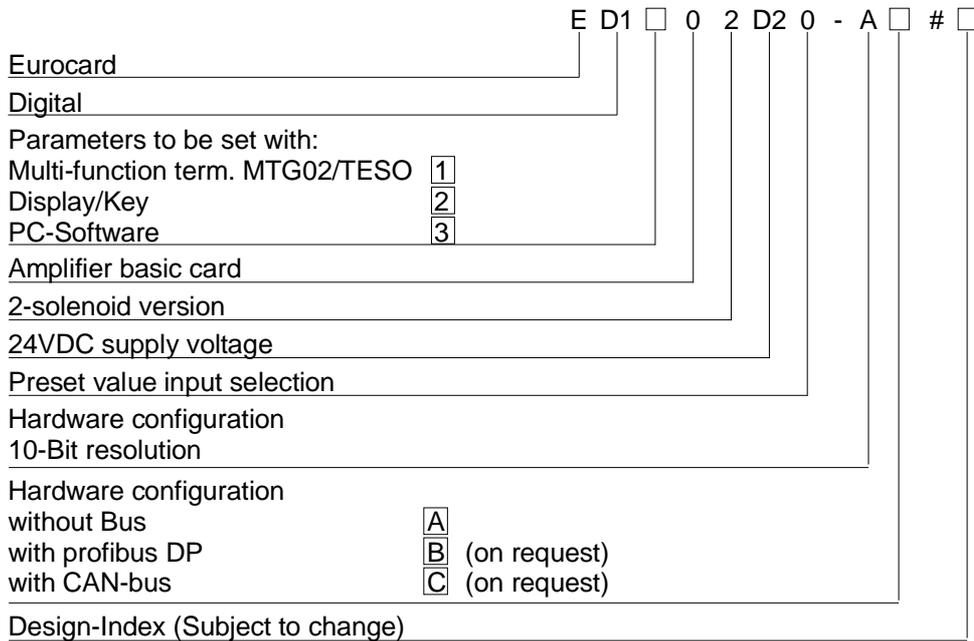
The connector strip of the Amplifier is provided with the following adhesive labels:

- with an adhesive type label
- with an adhesive serial number label (with the initials of the tester)

With the PC-Parameterizationsoftware PASO, the following information can be directly read-off the Amplifier:

- Card type
- Software version

## 2.5 Type code



## 2.6 Technical data

### 2.6.1 General specifications

<b>Execution</b>	Eurocard		
<b>Dimensions</b>	Front plate ED11 / ED13	30.1 x 128.4 mm	6 TE / 3 HE
	Front plate ED12	60.6 x 128.4 mm	12 TE / 3 HE
	Print plate	160.0 x 100.0 mm	
<b>Weight</b>	ED11 and ED13 / ED12	180g / 220g	
<b>Connections</b>	1 connector strip	in according to DIN 41612, type F48	
<b>Ambient temperature</b>	-20 ... +60° C		

### 2.6.2 Electrical specifications

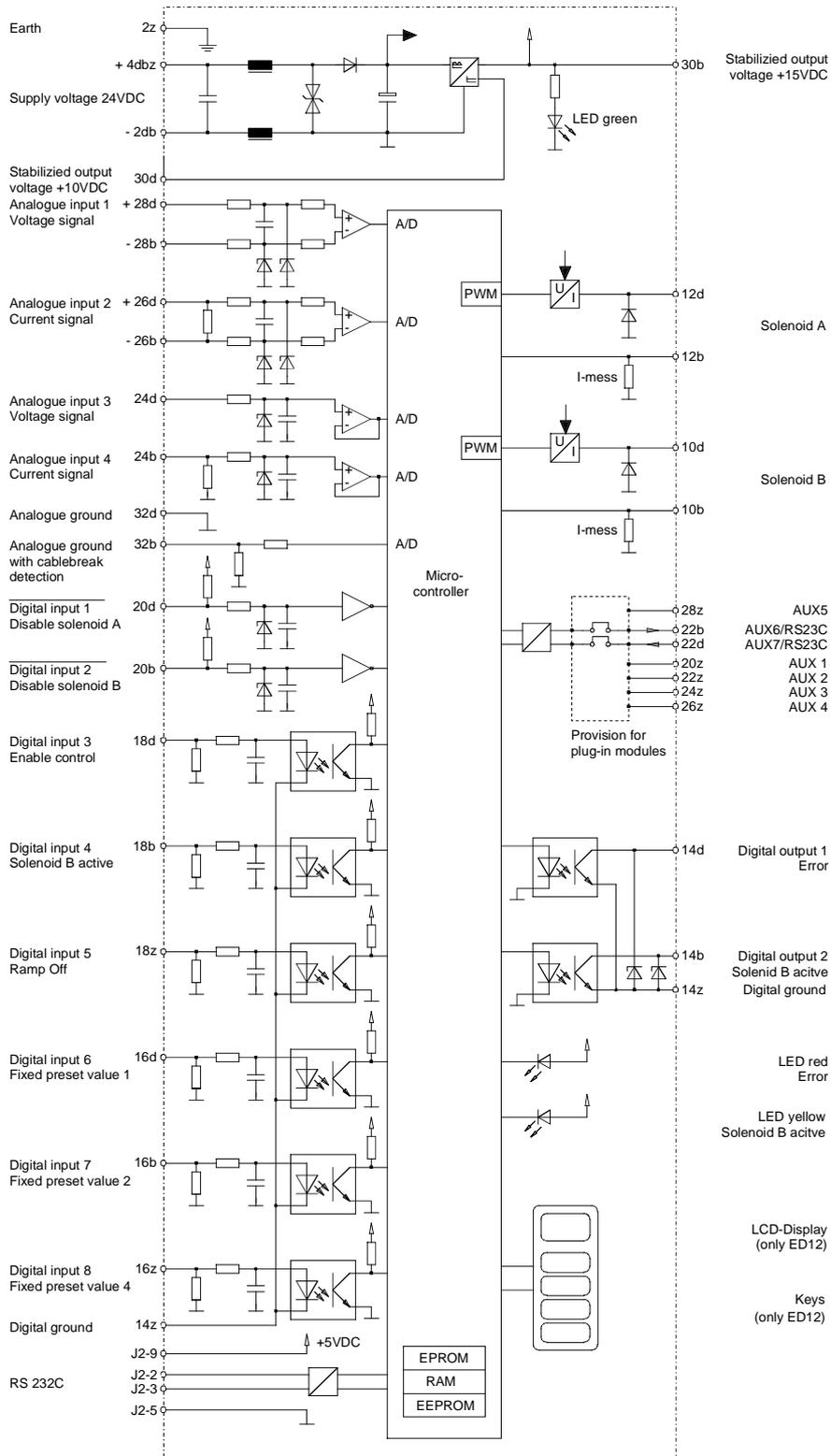
<b>Supply voltage</b>	24 VDC	
<b>Voltage range</b>	21 ... 30 VDC	
<b>Ripple on supply voltage</b>	+/-10 %	
<b>Fuse</b>	Customer must integrate a slow fuse into his electrical system (A-value = no load power plus max solenoid current)	
<b>Temperature drift</b>	< 1% with $\Delta T = 40^\circ C$	
<b>No load power</b>	1.2 W	
<b>Analog inputs</b>	1 differential input 10-Bit	0 ... 10 VDC
	1 differential input 10-Bit	0/4 ... 20 mA
	1 input 10-Bit	0 ... +/- 10 VDC
	1 input 10-Bit	0/4 ... 20 mA
<b>Input resistance</b>	Voltage input against ground	> 100kOhm
	Voltage differential input	> 27kOhm
	Burden for current input	= 250Ohm
<b>Digital inputs</b>	2 inputs active-low	
	6 input active-high	
	Switching threshold high	12 - 34VDC
	Switching threshold low	0 - 4VDC

<b>Serial interface</b>	1 interface D-SUB 9-pin socket (female) on the front plate according to RS232 C standard
<b>Stabilized output voltage</b>	1 output + 15 VDC, max. Load 100 mA 1 output + 10 VDC, max. Load 10 mA
<b>Solenoid outputs</b>	The solenoid outputs are short circuit proof and protected against negative voltage peaks by a suppression diode.
<b>Solenoid current</b>	Minimum current I <sub>min</sub> adjustable 0 ... 950 mA Default setting 150 mA Maximum current I <sub>max</sub> adjustable I <sub>min</sub> ... 1800 mA Default setting 700 mA
<b>Dither</b>	Frequency adjustable 20 ... 250 Hz Default setting 100 Hz Level adjustable 0 ... 200 mA Default setting 100 mA
<b>Digital outputs</b>	2 outputs optically coupled. Open collector connected to Digital ground U <sub>max</sub> 50 VDC I <sub>max</sub> 15 mA
<b>Free pins</b>	4 pins AUX1 - AUX4 reserved for customer specific adaptations on the plug-in modules area
<b>Status indication by LED</b> LED green LED yellow LED red	Supply voltage Function Error
<b>EMC</b> Immunity Emission	EN 50082-2 EN 55022 Class B

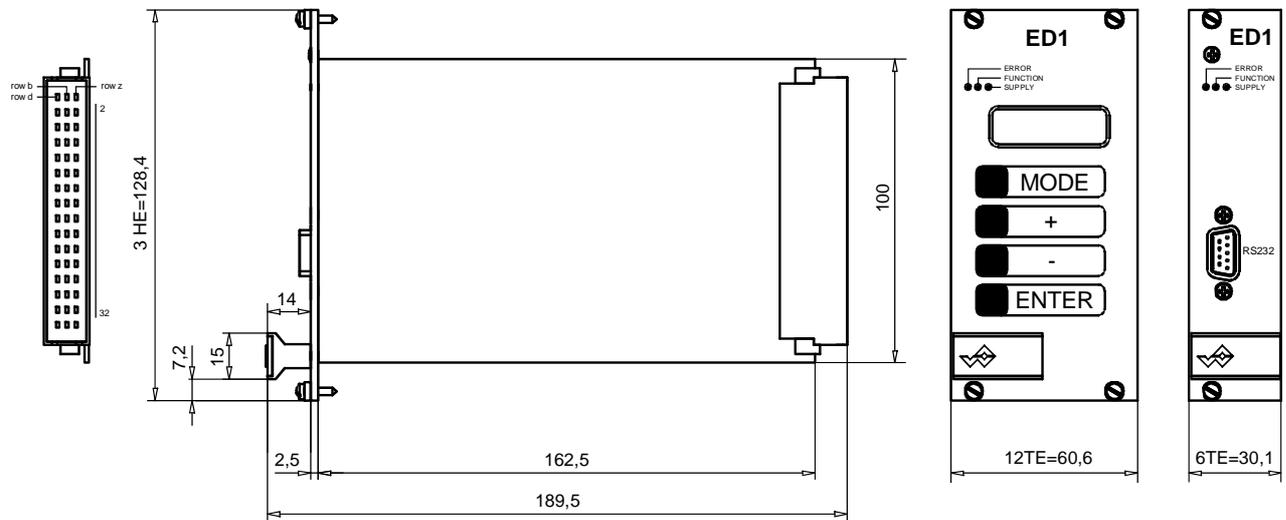
### 2.6.3 Environment

<b>Storage</b>	packing:	The card must be stored in the original packing
	Temperature range:	-25 ... +85° C
	Resistance to alkali and acid:	The card must be protected against alkalis and acids
<b>In operation</b>	Temperature range	-20 ... +60° C
	Resistance to alkali and acid:	The card must be protected against alkalis and acids

## 2.7 Block diagram ED1 basic card



## 2.8 Dimensions



## 3 Safety rules

### 3.1 Installation / Commissioning / Parameterization

- These operating instructions has 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.
- During unpacking and when installing it, the card must only be gripped by the handle on the front plate. Any contact with soldering points, components and contact pins of the card should be avoided.
- Wrong manipulations by the personal cannot be prevented by the card.
- 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 control monitors the working conditions within the electronic and within the installation. Uncontrolled movements caused by unforeseen errors cannot be prevented.**
- **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 the section "Block diagram ED1 " page 6

### 4.1 Introduction

- The Amplifier is constructed as an **Eurocard**
- All inputs and outputs have to be contacted through the **connector strip**
- The Amplifier is available as standard with a front plate
- The **Version ED1102D20-AA** has a RS232 (serial) interface on the front plate, via which the parameterization and the diagnostics can be made by using the multi-function terminal (MTG02) or PC-Terminalsoftware TESO
- The **Version ED1202D20-AA** has a display and keys on the front plate, via which the parameterization and the diagnostics can be made
- The **Version ED1302D20-AA** has a RS232 (serial) interface on the front plate, via which the parameterization and the diagnostics can be made by using the PC-Parameterization software PASO

### 4.2 Description of the Function

The Amplifier serves for controlling proportional valves with one or two solenoids and includes constant current control. Dither frequency and level are adjustable independently. Solenoid outputs are made short circuit proof. Preset values can be connected in the range of 0 ... 10V or 0 ...  $\pm 10V$ . The analog inputs can be used also as current inputs 0 ... 20mA or 4 ... 20mA. By that, the Amplifier can be adapted to all common input signal types. By selecting one of the 4 operating modes, the Amplifier can be set in very universal. Further, two independently working control loops are selectable.

Amended parameters can be stored in a non volatile memory to have them available when the control system is switched on again.

### 4.3 Analog inputs

- The applied analog signal is digitalized in the 10-Bit A/D converter  
**Attention:** By the input range 0 ... 8V, 0 ... 5V or 4 ... 20mA, the resolution is < 10-Bit!
- **Differential inputs**  
Differential inputs must be used if the ground potential of the external preset value generator does not agree with the analog ground on the Amplifier card.  
If the differential input is intended to use like an analog input against analog ground, the - (minus) connection of the differential input must be connected to the analog ground.
- **Analog input with cable break detection**  
The preset value must be a current signal 4 ... +20mA or a voltage signal from a potentiometer. If a potentiometer is used, its ground connection must be wired to the terminal "Analog ground with cable break detection".
- **Analog input 1** (for differential voltage signal)  
Input voltage range: 0 ... +10V / 0 ... +8V / 0 ... +5V
- **Analog input 2** (for differential current signal)  
Input current range: 0 ... +20mA / 4 ... +20mA
- **Analog input 3** (for voltage signal against analog ground)  
Input voltage range: 0 ...  $\pm 10V$  / 0 ...  $\pm 8V$  / 0 ...  $\pm 5V$
- **Analog input 4** (for current signal against analog ground)  
Input current range: 0 ... +20mA / 4 ... +20mA

#### 4.4 Digital inputs

- Digital inputs 1 and 2 are active-low (refer to section "Electrical specifications" page 4) and not galvanically separated.
- Digital inputs 3 to 8 are active-high (refer to section "Electrical specifications" page 4) and galvanically separated via optical couplers.  
**Attention: Connect common optical coupler ground (14z)!**
- **Digital input 1 (Disable solenoid A)**  
 If this input is set, solenoid output A is disabled.
- **Digital input 2 (Disable solenoid B)**  
 If this input is set, solenoid output B is disabled.
- **Digital input 3 (Enable control)**  
 If this input is set, the Amplifier is enabled. Without this enable, no movements can be made.
- **Digital input 4 (Solenoid B active)**  
 If this input is set, the solenoid B is active (only in the mode of operation 1).
- **Digital input 5 (Ramp Off)**  
 The ramp can be temporarily switched off by setting this input. If the ramp is never required, this input needs not to be set since the ramp time is set to 0s.
- **Digital input 6 - 8 (Fixed preset values)**  
 7 fixed preset values, selectable in binary form, are available. When a fixed preset value is selected via the digital inputs 6 - 8, the external preset value is ineffective.  
 The following inputs must be set to activate the corresponding fixed preset value:

Fixed preset value	Digital input 6	Digital input 7	Digital input 8
External preset value			
1	1		
2		1	
3	1	1	
4			1
5	1		1
6		1	1
7	1	1	1

Fixed preset values 1, 2 and 4 can be selected directly, i.e. without coding.

#### 4.5 Outputs

- **Proportional solenoid outputs A and B**  
 The 2 solenoid outputs have a current output **pulse-width-modulated** at 1000Hz with superimposed dither. The polarity of the connected solenoids is irrelevant. The outputs are short circuit proof and may be loaded up to 1.8A.
- **Digital output 1 (Error)**  
 This output becomes active, when an error is present.
- **Digital output 2 (Solenoid B active)**  
 This output becomes active, when the solenoid B is active.
- **Light emitting diodes LED green / yellow / red**  
 LED green: Supply voltage is present  
 LED yellow: Solenoid B is active  
 LED red: Indicates an error

## 4.6 Mode of operation

The following 4 mode of operation are possible:

- **Mode of operation 1**

With one analog input (voltage or current) and the digital input 4 (Solenoid B active), solenoid A and solenoid B from a directional valve will be controlled.

0% ... 100% preset value, digital input 4 not active = Imin ... Imax solenoid A

0% ... 100% preset value, digital input 4 active = Imin ... Imax solenoid B

- **Mode of operation 2**

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

0% ... 50% preset value = Imax ... Imin solenoid B

50% ... 100% preset value = Imin ... Imax solenoid A

- **Mode of operation 3**

With one voltage preset value from 0 ... ±100% at analog input 3, solenoid A and solenoid B from a directional valve will be controlled.

-100% ... 0% preset value = Imax ... Imin solenoid B

0% ... +100% preset value = Imin ... Imax solenoid A

- **Mode of operation 4**

In this mode of operation, two solenoids can be controlled independently from each other. Each solenoid is controlled by separate voltage or current input.

0% ... 100% analog input A = Imin ... Imax solenoid A

0% ... 100% analog input B = Imin ... Imax solenoid B

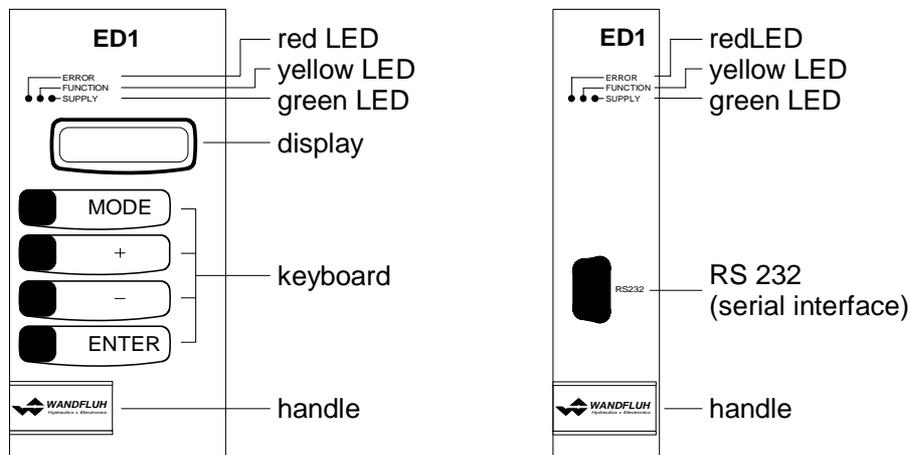
## 5 Operating and Indicating elements

### 5.1 Introduction

The Amplifier is available as standard with a front plate:

- The **Version ED1102D20-AA** has a RS232 (serial) interface on the front plate, via which the parameterization and the diagnostics can be made by using the multi-function terminal (MTG02) or PC-Terminalsoftware TESO
- The **Version ED1202D20-AA** has a display and keys on the front plate, via which the parameterization and the diagnostics can be made
- The **Version ED1302D20-AA** has a RS232 (serial) interface on the front plate, via which the parameterization and the diagnostics can be made by using the PC-Parameterization software PASO

### 5.2 Front plate view



Version ED12

Version ED11 and ED13

## 6 Commissioning

Please refer to the section "Safety rules" on page 7.

### 6.1 Installation / Connection

The Amplifier should preferably be installed in a 19" rack or in a closed housing.

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

- The surface (at least the surface on which the front plate of the Amplifier rests) of the rack / housing has to be electrically conductive (not anodised)!
- The rack / housing has to be grounded on an electrically conducting sub-surface using a conductor strand with a large cross section.
- On the rack / housing side, a female connector strip in accordance with DIN 41612, type F48, have to be foreseen as the plug-in connector.
- The shielding connection (X1-32z) on the connector strip has to be connected with the rack resp. housing with an as short as possible conductor with a strand cross section  $\geq 1,5 \text{ mm}^2$ .
- The screening of the cable on the rack resp. housing side must only be connected with the rack / housing using a large surface area and low Ohm connection (best by means of a clamp shackle).
- Solenoid- and signal cables must not be laid parallel to high voltage cables.

### 6.2 Connection instructions

The contact assignment of the following description refers to the section "Connection examples" page 15.

#### 6.2.1 Supply voltage

- For the dimensioning of the 24VDC power supply, the maximum power demand of the solenoid has to be calculated (in case of directional valves, only the maximum power demand of one solenoid has to be considered). This power then has to be increased by the no load power from the Amplifier (refer to the section "Electrical specifications" page 4).
- The limit values of the supply voltage and its residual ripple indispensably have to be complied with (refer to the section "Electrical specifications" page 4).
- The Amplifier has to be protected with a slow acting fuse. The rating of this fuse should correspond to approx. 1.5 times the current calculated above.

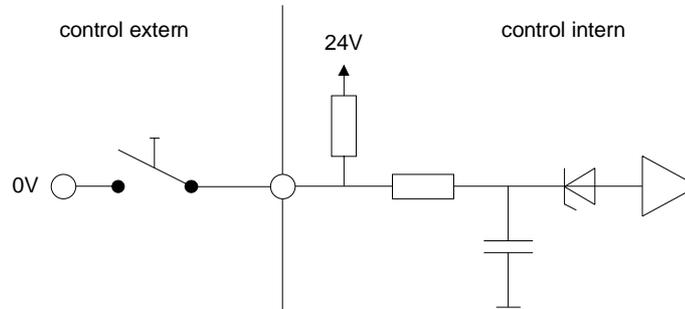
#### 6.2.2 Solenoid outputs

For the solenoid outputs, the polarity, with which the solenoids are connected, does not matter. The following, however, has to be observed:

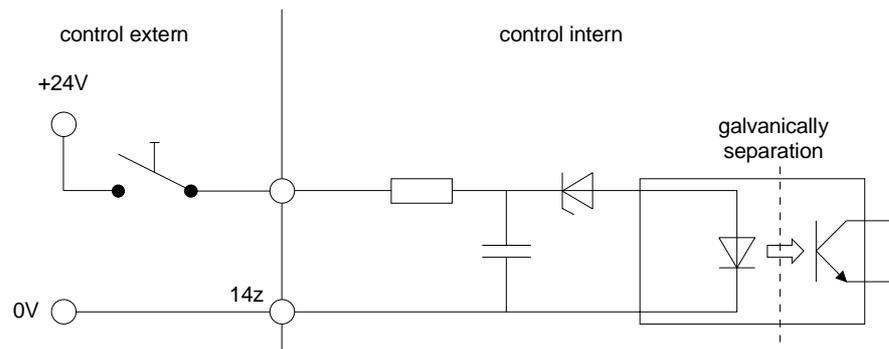
- The conductor strand cross section has to be adapted to the solenoid current
- Screened cables have to be used; the screen must be grounded only on the rack resp. housing side.

### 6.2.3 Digital inputs and outputs

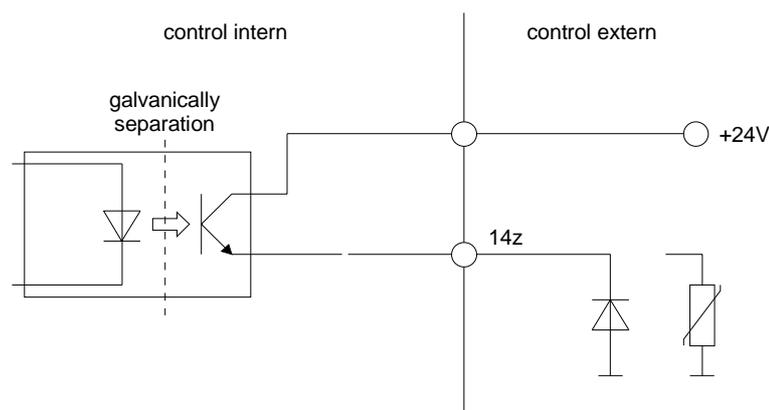
- Digital inputs 1 and 2 are active-low and not galvanically separated.
- For activation, they have to be connected to 0V (ground)



- Digital inputs 3 - 8 are active-high and galvanically separated via optical couplers.
- In order to use the galvanic separation, the connection "Digital ground" (14z) has to be connected to the ground of the external digital signal transmitter.
- If no galvanic separation is necessary, the "Digital ground" (14z) can be connected with the minus of the 24VDC power supply.
- For activation, they have to be connected to +24VDC.

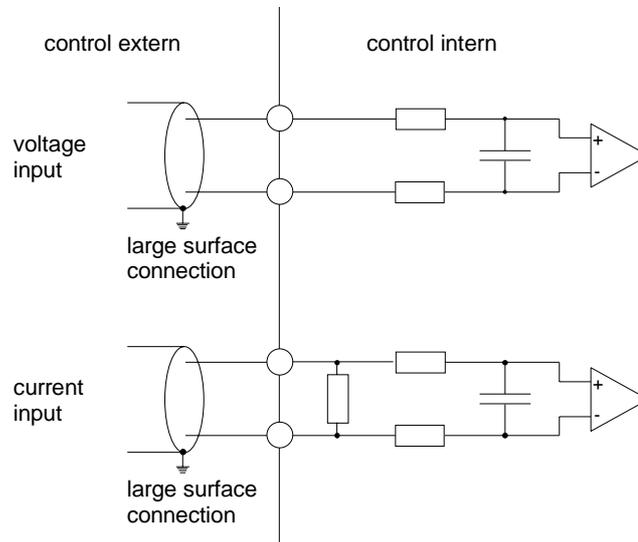


- The digital outputs are "open collector" outputs.



### 6.2.4 Analog inputs 10-Bit

- There are two voltage and two current inputs available.
- One of each is a differential input.
- Each input can be adjust for each solenoid output.



### 6.2.5 Configuration of the analog inputs 10-Bit

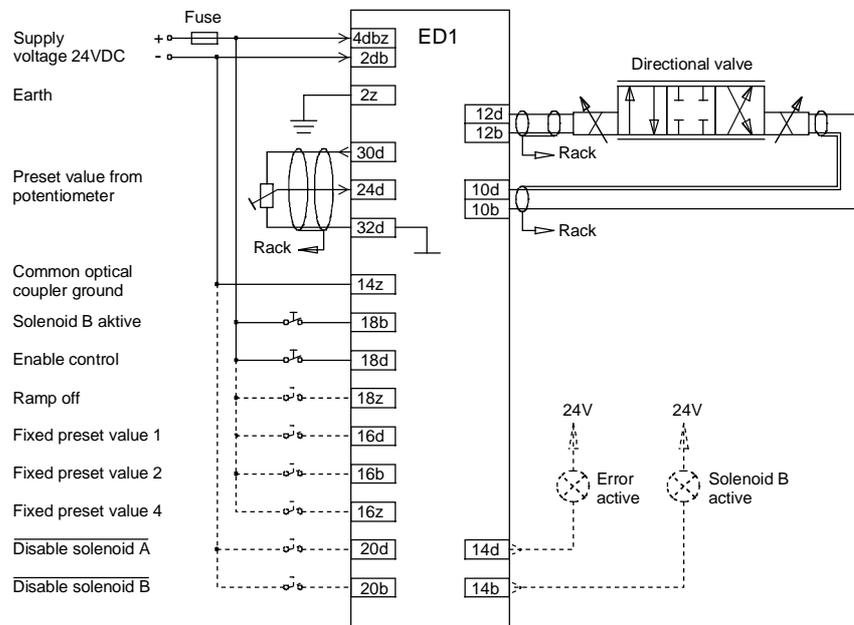
The analog inputs 10-Bit can be configured as follows:

Input signal	Connector strip assignment	Input range
Voltage input against analog ground	+ to 24d / ground to 32d	0 ... +5/8/10V 0 ... ±5/8/10V
Voltage input against analog ground with cable break detection	+ to 24d / ground to 32b	0 ... +5/8/10V
Voltage differential input	+ to 28d / - to 28b	0 ... +5/8/10V
Current input against analog ground	+ to 24b / ground to 32d	0 ... +20mA 4 ... +20mA
Current differential input	+ to 26d / - to 26b	0 ... +20mA 4 ... +20mA

## 6.3 Connection examples

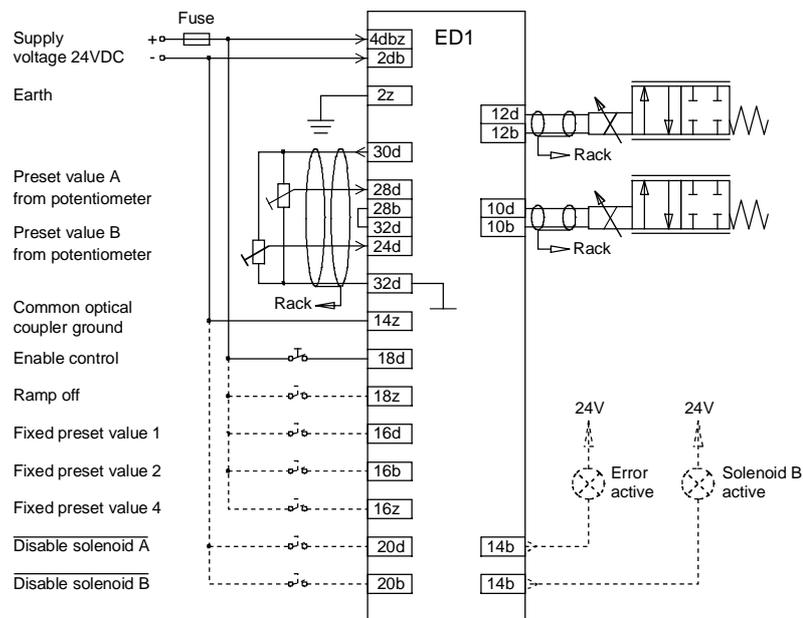
### 6.3.1 Mode of operation 1

- +10VDC voltage preset value with potentiometer
- digital inputs with switches without galvanically separation



### 6.3.2 Mode of operation 4

- +10VDC voltage preset value with potentiometer
- digital inputs with switches without galvanically separation



## 7 Settings

Please refer to the section "Safety rules" on page 7.

### 7.1 Introduction

- The system- and parameter settings can be made it depends on the card version either via the display/keys on the front plate or via the RS232 interface with the multi-function terminal MTG02 resp. the PC-Terminal software TESO or the PC-Parameterization software PASO.
- For information about the operation via the display/keys or the multi-function terminal MTG02 resp. PC-Terminalsoftware TESO please refer to section "Cyclic menu construction" page 27.
- For information about the operation via the PC-Parameterization software PASO please refer to section "PASO Installation and Operation" page 28.
- The following instructions refer to the Menu order of the PC-Parameterization software PASO. To look for the corresponding points in the version with display/keys or multi-function terminal MTG02 resp. PC-Terminal software TESO, the corresponding cyclic menu construction is also displayed.
- **Depending on the software version and connecting card type, certain settings may be blocked.**

### 7.2 General

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

- File\_New
- File\_Open
- Start PASO with the connection to the Amplifier (in this case, the data are loaded from the Amplifier)

### 7.3 Tips for the first commissioning

- Connect the power supply, leave the Amplifier still switched off
- Switch off the hydraulic drive (hydraulics switched off)
- Carefully check the connections
- Switch on the power supply
- Establish the communication with PASO (connect the PC and the Amplifier with an RS232 cable and start PASO)
- In the menu "Configuration", define the correct input for the preset value
- In the menu "Parameters\_Valves", set the desired current for the solenoids

### 7.4 File - Menu (only PASO - Version)

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..

#### 7.4.1 File\_New

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

With this command, a new file can be opened. A selection window will be displayed. In this window, the desired function from the PASO can be selected. The selected function should correspond to the function of the connected digital card. All parameter values are set to standard values. The required values can now be entered.

#### 7.4.2 File\_Open...

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

With this command, an existing file from a storage medium is opened. First the file selection window appears. In this window the required file can now be selected and opened with "OK". If the function of the selected file does not correspond to the current function of the PASO, a message will be displayed. A selection is now possible, if the event should be cancelled or if the current function from the PASO should

change over to the new function of the selected file. The parameter values can now be edited and changed as required under the menu points "Configuration" or "Parameters".

#### 7.4.3 File\_Save

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

#### 7.4.4 File\_Save as...

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

First the file selection window appears (see File\_Open). In this window the desired file name can now be entered. If the file name is entered without an extension, then the extension ".par" is automatically assigned to it. After actuating the key "Save", the file information window appears (see File\_File-Info). In this window the required entries can now be made. With the key "Save", the file is then finally saved under the selected file name. With the key "Cancel", one changes back to the file window.

#### 7.4.5 File\_Print...

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

If the output is to be to a printer, then the Windows printer selection window is opened.. **In this window, please do not select "Print to File"**. If you do, a new program start might possibly be required and you could lose any data not yet saved.

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

#### 7.4.6 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 type of digital control card at the moment of saving. If no card is connected, then this indication remains empty. In case of saving during "On Line Operation", this indication is updated.
Operator:	The name of the originating person.
Remarks:	Possibility to enter remarks concerning the file.

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

#### 7.4.7 File\_Off Line (On Line)

##### Off Line

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

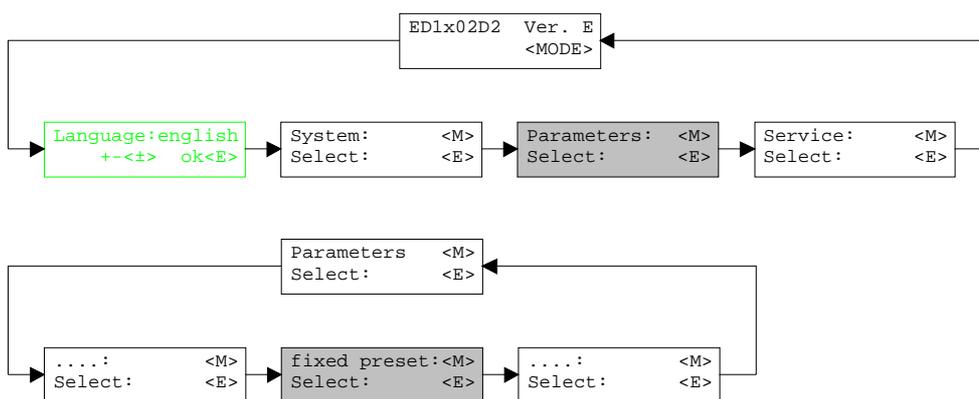
Before parameters are transferred to the Amplifier, a verification is carried out as to whether the version of the Amplifier supports the parameter values. If this is not the case, then a message is issued and a transfer to the controller is not possible.

If the parameters have been taken over by the Amplifier, then they are briefly checked. If one or several of the parameters are outside the tolerance, standard values are assigned instead and a message is issued. If the transfer was successful and the verification check was also successful, then the software subsequently runs in the "On Line Mode". The loading of parameter files is not possible in this mode.

### 7.4.8 File\_Exit

With this command, the parameterization program 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. When terminating, the current data from the configuration window are also saved.

## 7.5 Fixed preset value - Menu



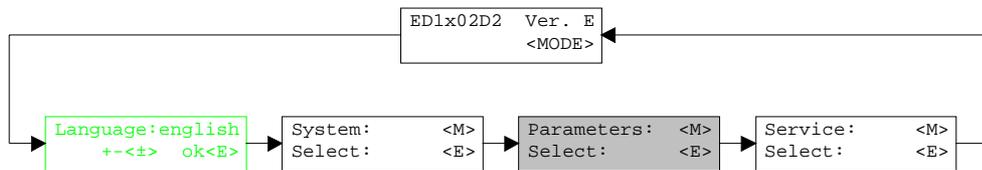
When one of the fixed preset values 1 - 7 is selected, the external preset value is ineffective.

### 7.5.1 Generator

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

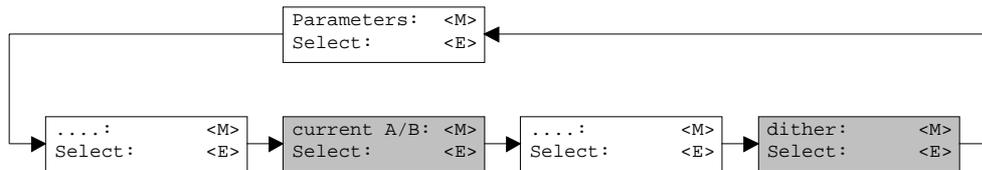
Field	Parameter description	Range / Step
Fixed preset value X	Desired value of the corresponding fixed preset value. The adjusted %-value refer to the adjusted solenoid current range (0% = I <sub>min</sub> , 100% = I <sub>max</sub> ). A positive %-value will activate the solenoid A, a negative %-value will activate the solenoid B.	0 ... 100% 0.1%

## 7.6 Parameters - Menu



In this window, all parameter values of the Amplifier will be made.

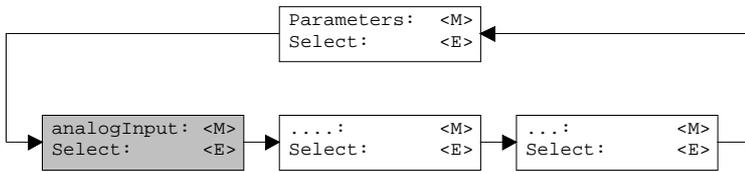
### 7.6.1 Parameters\_Valves



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

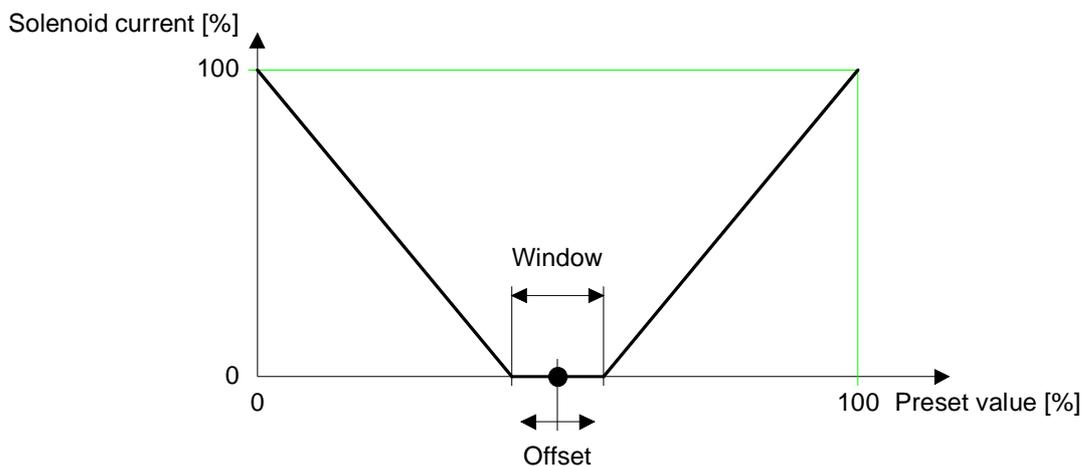
Field	Parameter description	Range / Step
Preset value internal (only PASO-Version)	If this switch is selected, an internal preset value from 0% resp. 100% will be active during the setting of the Imin resp. Imax. If this switch is not selected, the external preset value will be active.	
Prop. Valve settings	The minimum and the maximum solenoid current can be set separately for each solenoid output, corresponding to 0% resp. 100% preset value. In the "Off Line Mode", the displayed current value is the theoretical preset current. This makes it possible to set the Imin/Imax values without a solenoid or a valve is connected to the Amplifier (only PASO-Version). In the "On Line Mode", if the Imin setting is active, a preset value of 0% resp. if the Imax setting is active, a preset value of 100% is automatically applied internally (with the PASO-Version only if the switch "Preset value internal" is selected). As a result of the digitalisation, the numbers entered max be modified to less "rounded-off" number.	
Imin A	Set minimum solenoid current A. (= solenoid current by 0% preset value)	0 ... 950mA 2mA
Imax A	Set maximum solenoid current A. (= solenoid current by 1000% preset value)	0 ... 1800mA 2mA
Imin B	Set minimum solenoid current B. (= solenoid current by 0% preset value)	0 ... 950mA 2mA
Imax B	Set maximum solenoid current B. (= solenoid current by 1000% preset value)	0 ... 1800mA 2mA
Frequency	The dither frequency can be set in steps.	20, 40, 60, 70, 80, 90, 100, 110, 125, 140, 165, 200, 250Hz
Level	Level of the superimposed AC signal	0 ... 199mA 2mA

## 7.6.2 Parameters\_Analog inputs

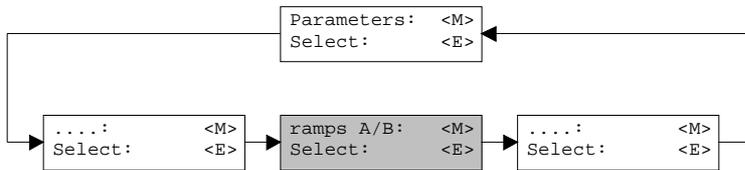


Dependent of the settings from the menu "Configuration\_System", certain settings may be blocked.

Field	Parameter description	Range / Step
Analog inputs	Dependent of the selected mode of operation and the selected analog inputs, the settings of the parameter "Offset" and "Window" can be made here (refer to the below figure)	
Offset	This parameter can be set only in the mode of operation 2. Dependent of the selected signal type, the setting is in V or mA. Voltage: Current:	0 ... ±1.24V 0.01V 0 ... ±2.48mA 0.02mA
Window X	Window width for each analog input. Dependent of the selected mode of operation are one or two settings possible. Dependent of the selected signal type, the setting is in V or mA. Voltage: Current:	0 ... 2.48V 0.02V 0 ... ±4.96mA 0.04mA



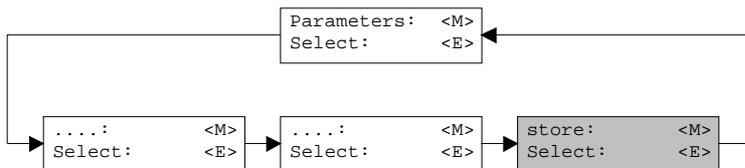
### 7.6.3 Parameter\_Ramps



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

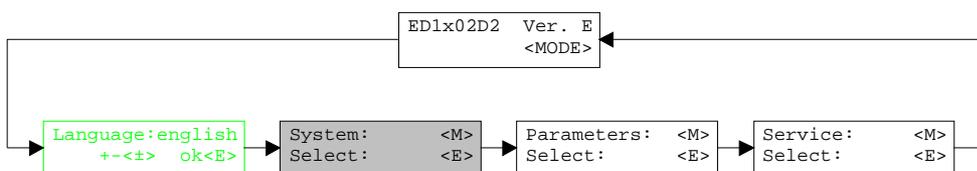
Field	Parameter description	Range / Step
Ramps Up Ramps Down	After a preset value jump, the new preset value is approached via a linear ramp (with the set ramp time). A ramp time up and ramp time down can be set separately for each solenoid.	
Ramp up	The set ramp time refer to a preset value jump from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

### 7.6.4 Parameters\_Store (not PASO-Version)



With this command, the set parameters can be stored in the non volatile memory (EEPROM) on the Amplifier. With the PASO-Version, this will be made automatically by leaving a input window with the key "OK".

## 7.7 Configuration - Menu



In this window, the settings of the function of the Amplifier will be made.

### 7.7.1 Configuration\_System

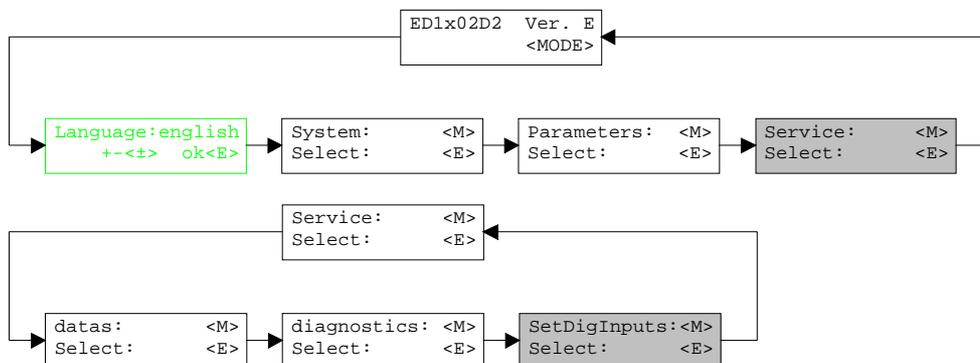
In this window, the basic function of the Amplifier will be adjust.

In the version with display/keys or multi-function terminal resp. PC-Terminalsoftware TESO, a password question appears. Press the + and - keys in succession as the password.

Field	Parameter description	Range / Step
Mode of operation	Select the desired mode of operation	1 / 2 / 3 / 4
Cablebreak	Switch on/off the cablebreak detection of the analog inputs	no yes
Input Signal	In the mode of operation 4, the selection is possible, if the following settings should be for the analog input for the solenoid A or for the solenoid B.	Input A Input B
Signal type	Select the desired signal type. Dependent of the selected mode of operation, not all signal types are available.	0-5V 0-8V 0-10V 0-20mA 4-20mA
Used input	A selection can be made between voltage and current inputs. Only the corresponding inputs to the selected signal type are available.	Analnp1 [V] Analnp2 [mA] Analnp3 [V] Analnp4 [mA]
Inversion	The preset value can be inverted. 0% preset value = 100% solenoid current 100% preset value = 0% solenoid current	no yes

With leaving the window with the key "OK", a check will be made, if for the input A and input B the used input is different. If not, a message will be displayed and the window cannot be left.

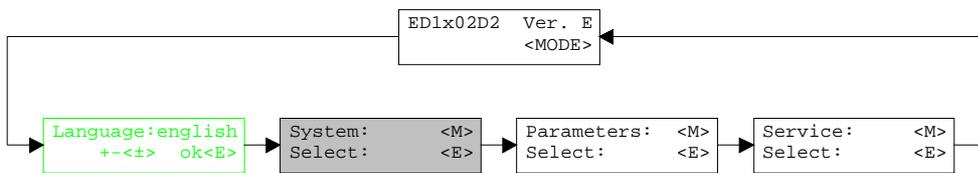
### 7.7.2 Configuration\_Digital I/O



With this command, the digital inputs of the connected Amplifier can be set to active, not active or released.

Field	Parameter description	Range / Step
Digital Inputs	Set digital input with software Reset digital input with software Read in the external digital input	1 0 X

### 7.7.3 Configuration\_Default setting



With this command, the default settings in the EPROM on the connected Amplifier will be loaded and read to the PC in the PASO-Version.

### 7.7.4 Configuration\_Interface (only PASO-Version)

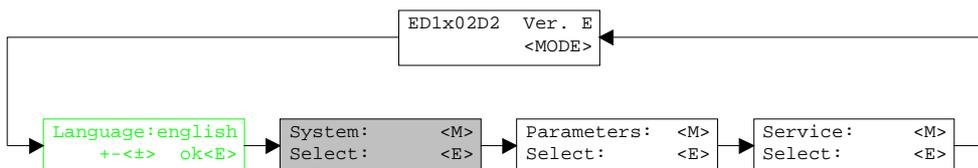
With this command, the serial output port for the communication with the connected control card can be selected. This setting is automatically saved in the file "konfig.kon" and taken over with a new start.

If the software is in the "On Line Mode", then the communication is broken off when the "OK" key is pushed. If the software is in the "Off Line Mode", then a confirmation window appears with the question, as to whether the communication with the axis controller is to be tested. If the communication works, a corresponding message is issued and a connection with the axis controller can be established via the menu point File\_On Line.

If no communication can be established (transmission interference or no axis controller card connected), then an error message appears. All menu points and keys, which contain an action in connection with the communication, are then blocked.

Field	Parameter description	Range / Step
Output port	The serial port of the PC can be selected.	COM1 COM2 COM3 COM4

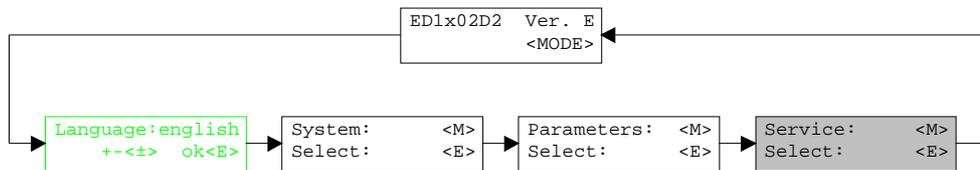
### 7.7.5 Configuration\_Language



In this window, the language can be selected, with which the menu will be inscribed. In the version with display/keys or multi-function terminal MTG02 resp. PC-Terminalsoftware TESO, the menu language question appears after the card is switched on for the first time. During the execution, the language can be changed at any time in menu "System". In the PASO-Version, this setting is automatically saved in the file "konfig.kon" and taken over with a new start.

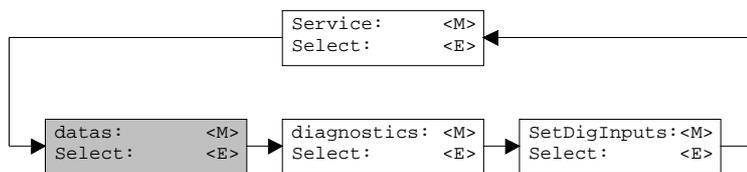
Field	Parameter description	Range / Step
Language	Field, from which the desired language can be selected.	deutsch english français

## 7.8 Analysis - Menu



In the Analysis menu, measured values can be displayed on-line and various process signals can be recorded and correspondingly displayed.

### 7.8.1 Analysis\_Values

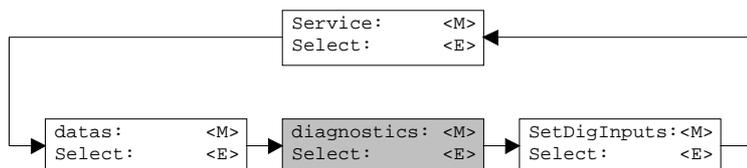


This menu point is active only in the "On Line Mode".

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

Field	Description	Unit
Supply voltage	Power supply voltage of the card	V
Analog input X	Voltage- resp. current value of the analog input for the solenoid A	V mA
Analog input X	Voltage- resp. current value of the analog input for the solenoid B	V mA
Control voltage A	Control signal before solenoid output A	V
Solenoid current A	Solenoid current of solenoid A	mA
Control voltage B	Control signal before solenoid output B	V
Solenoid current B	Solenoid current of solenoid B	mA
Digital inputs 1 - 8	Logical conditions of the digital inputs When the inputs are set When the inputs are not set	1 0
Digital outputs 1 - 2	Logical conditions of the digital outputs When the outputs are set When the outputs are not set	1 0

### 7.8.2 Analysis\_Diagnostic



With this command, possibly present errors on the connected Amplifier are indicated. The error is read in once. In the version with display/keys or multi-function terminal MTG02 resp. PC-Terminalsoftware TESO, only the text in the column "Diagnostics" will be displayed. For making an exact analysis of the error, this operating guide has to be contacted. In the PASO-Version, a complete description of the error will be displayed.

<b>Diagnostics:</b>	<b>Error</b>	<b>Error remedy</b>
Power supply fault	If the supplied voltage < 18VDC. the solenoid outputs are blocked.	Disable and reenale the control
Cable break supply	This error is only detected, if the parameter "cablebreak" is set to "yes". The power supply and/or the ground of the preset generator is interrupted. The solenoid outputs are blocked.	Disable and reenale the control
Cable break input X	This error is only detected, if the parameter "cablebreak" is set to "yes". The preset value signal to the controller is interrupted. The corresponding solenoid output is blocked.	Disable and reenale the control
Solenoid output X	The connection to the solenoid is interrupted. The corresponding solenoid output is blocked. This fault is only detected if the solenoid current should be > 100mA.	Disable and reenale the control
Memory: XX	Error in verifying EEPROM-RAM data. The solenoid outputs are blocked.	Switch off and on the control or resave the parameters

## 7.9 Help - Menu (only PASO-Version)

The PASO-Help based on the standard Windows-Help construction.

### 7.9.1 Help\_Description of the function

A general information about the function of the Amplifier will be displayed.

### 7.9.2 Help\_Contents

The list of contents of the PASO-Help will be displayed.

### 7.9.3 Help\_Index

The list of index of the PASO-Help will be displayed.

### 7.9.4 Help\_Card Identification

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

Here the current version of the hardware and the software from the connected Amplifier will be read and displayed.

### 7.9.5 Help\_Info

Information about PASO and its version.

## 8 The system does not work

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

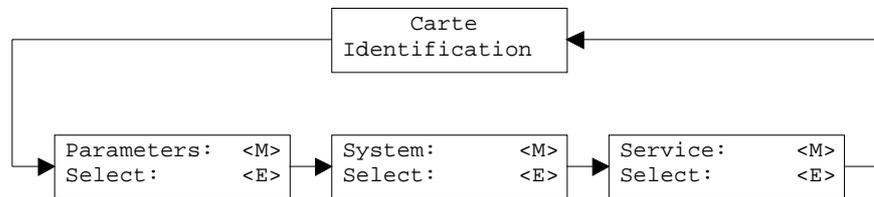
### 8.1 Procedure

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

Question:	Action:	Possible errors and causes
Green LED off	Analysis_Values	<ul style="list-style-type: none"> <li>The 24VDC supply is not switched on</li> <li>The 24VDC supply is wrongly or not connected</li> <li>If the supply voltage value is between 21VDC and 30VDC, the supply is correct</li> </ul>
Red LED on	Analysis_Values Power supply error	<ul style="list-style-type: none"> <li>The supplied voltage is under 18VDC. The error is also displayed if a supplied voltage interruption occurred (<math>t &gt; 250\text{ms}</math>).</li> <li>Is the supplied power enough?</li> <li>Is the AC voltage too high (refer to section "Electrical specifications" page 4)</li> <li>When the error is cleared, disable the controller for a short period and re-enable (DigInp 3)</li> </ul>
	Analysis_Diagnostic Cablebreak supply	<ul style="list-style-type: none"> <li>If the preset value encoder is a potentiometer, the supply is absent</li> <li>The ground connection of the potentiometer is not connected to the connector strip.</li> <li>Check connections to the potentiometer</li> <li>If the cablebreak detection is not desired, switch off the cablebreak function in the menu "Configuration".</li> <li>When the error is cleared, disable the controller for a short period and re-enable (DigInp 3)</li> </ul>
	Analysis_Diagnostic Cable break input X	<ul style="list-style-type: none"> <li>The cable break detection functions only with potentiometer or 4 ... 20mA preset value.</li> <li>The preset value signal is absent or is smaller than 4mA.</li> <li>Check the preset value signal connections between the preset value encoder and card.</li> <li>If the cablebreak detection is not desired, switch off the cablebreak function in the menu "Configuration".</li> <li>When the error is cleared, disable the controller for a short period and re-enable (DigInp 3).</li> </ul>
	Analysis_Diagnostic Solenoid output X	<ul style="list-style-type: none"> <li>The connections to the solenoid is interrupted.</li> <li>Check the connections to the solenoids.</li> <li>When the error is cleared, disable the controller for a short period and re-enable (DigInp 3) or disable the corresponding solenoid only a for short period and re-enable.</li> </ul>
	Analysis_Diagnostic Memory XX	<ul style="list-style-type: none"> <li>Error in verifying EPROM-RAM data.</li> <li>Error has occurred while writing to or reading from the EPROM.</li> <li>If fault occurred while storing, store again, then switch card off and on.</li> <li>If fault occurred when card was switched on, store parameter, then switch card off and on.</li> </ul>

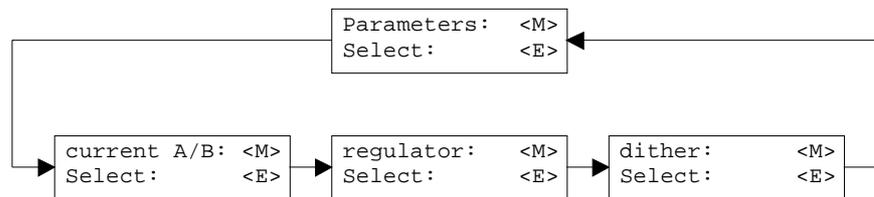
## 9 Cyclic menu construction

The operation via the display/keys or the multi-function terminal MTG02 resp. the PC-Terminalsoftware TESO is in the form of a cyclic menu structure.



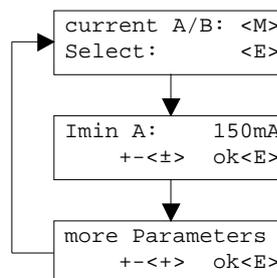
To move through the cyclic menu, press the key "MODE". All existing menu items are listed in the section "Settings" page 16 with the number 7.x.

To enter a program branch, press the key "ENTER":



to move through the sub cycle menu, press the key "MODE". All existing menu items are listed in the section "Settings" page 16 with the number 7.x.x.

To enter a parameter branch, press the key "ENTER":



With the keys "+" and "-", the desired value can be adjusted. With the key "ENTER", the next parameter value will be displayed. All existing parameters are listed in the section "Settings" page 16 with the column "Field".

The detailed description of all commands and parameters is located in the section "Settings" page 16 of this operating guides.

## 10 PASO Installation and Operation

The parameterisation software PASO serves for the parameterising and diagnosing of digital control 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 control card takes place through a serial RS 232 interface.

**The parameterisation software PASO can only be utilised in connection with a digital control card of the WANDFLUH AG company. It is necessary to carefully study the operating instructions of the connected digital control card beforehand.**

### 10.1 PASO system requirements

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

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

- Processor 486 or higher, min. 33MHz, min. 8MB RAM  
Recommended: 80586 66MHz or higher, 16 MB RAM or more
- Free harddisk storage space of minimum 4MB, plus storage space for program files
- Operating system MS-WINDOWS 95/98, NT 4.0 or higher
- Standard VGA or higher graphics card, recommended resolution 800x600
- At least one serial RS 232 interface (with Laptops resp. Notebooks without a serial interface, this can be realised with a PCMCIA-card)
- Serial RS232 cable 1:1 (RxD and TxD not crossed)

### 10.2 PASO installation

The PASO software can be downloaded via the Internet free of charge ([www.wandfluh.com/Download](http://www.wandfluh.com/Download) => PASO ED1/SD1 => Download Program files) or on request delivered on an installation-CD.

The installation of the PASO is then carried out by executing the file "setupPasoEd1vxxxx.exe", where "xxxx" means the current version (e.g. setupPasoEd1v3000.exe, see also version index). An installation program takes over the complete installation of PASO. To them, the Windows Installer must be installed. This is normally a part of the Windows Environment. If not, please download it from the Microsoft Website.

If there is already a version of the PASO software installed on the PC, one can select if the existing version should be overwritten or removed.

For all standard cards (Amplifier, Position controller, Pressure/Flow controller and Position controller PLUS), the helpfiles are included in the setup and are installed automatically. For the special cards ED1AE, ED1AF, ED1AG, ED1AP, SD1AY and SD1BA the helpfiles can be downloaded separate via the internet ([www.wandfluh.com/Download](http://www.wandfluh.com/Download) => PASO ED1/SD1 => Download Helpfiles for Special types)

### 10.3 PASO connection to the digital card

The connection between the PC, on which the parameterisation software PASO is installed and the axis controller takes place through the serial RS 232 interface. To do this, a 1:1 cable (RxD and TxD not crossed) has to be connected with the desired output port on the PC and with the RS 232 socket on the axis controller.

The parameterisation software PASO runs in one of two modes:

- In the "Off Line"-mode, the processing of the parameter files is possible. The communication with the axis controller is not active. A connection is not necessary.
- In the "On Line"-mode, there is active communication with the axis controller card. Every change becomes immediately effective in the axis controller. In this mode, the loading and processing of files is not possible. Solely the saving of the currently active parameters into a file is possible.

The change between the two modes takes place through the menu point "File\_On Line / Off Line". In case of an interference in the communication, the controlling of the axis controller is not assured anymore. An error message follows and the PASO software automatically changes over to the "Off Line"-mode.

When the parameterisation software PASO is started up, a check takes place, as to whether a communication with the axis controller is possible. If no communication can be established, an error message appears. The reason for this message is either a not connected - or a not switched on axis controller, or else on the PASO side not the same interface has been selected as the one used for the connection cable to the axis controller. In the latter case, one must reply with "No" and after the PASO start has taken place one changes the interface port setting in the menu "Configuration\_Interface (only PASO-Version)" page 23.

If one replies with "No", then an additional message appears. The PASO software is set to the "Off Line"-mode. 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, such as the processing of parameter files, can be utilised without any limitation.

If one replies with "Yes", then it is once again checked, whether now a communication with the digital controller card is possible.

If the interruption of the communication occurs during the operation of the parameterisation software PASO, then an error message appears and the PASO software is set to the "Off Line"-mode. All menu points and keys, which involve an action in connection with the communication, are now blocked.

**In order to re-establish a communication, the menu point "File\_Activate On Line" has to be selected.**

If a communication with the connected card is possible, a check will be made, if the current function from the PASO correspond to the function of the connected card type. If yes, the parameters will be transferred. If no, in case of "Take over", a question will be displayed if the current function from the PASO should be changed or not. In case of "Reprogram", an error message will be displayed and the parameters can not be transferred.

## 10.4 PASO program description

In the following section, you will find a detailed description of the function from the parameterisation software PASO.

### 10.4.1 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	Activation the key "Help"

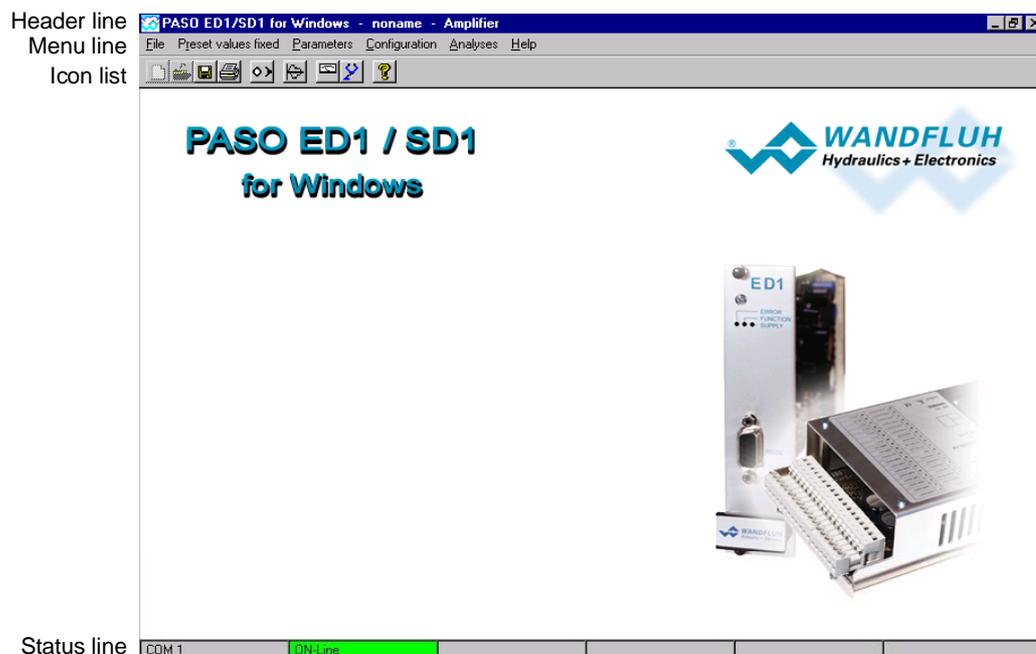
## 10.4.2 Input elements

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

### 10.4.3 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 interface port, are saved in the file "konfig.kon". 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 digital controller card is connected. If no communication can be established (communication interference or no axis controller connected), an error message appears. 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.

If the communication works without any interference, the software PASO checks, if the current function of the PASO correspond with the function of the connected digital controller card. If no, a question will be displayed if the current function from the PASO should be changed or not.

If the function is ok or will be changed, the parameters are loaded from the card and subsequently a verification of the axis controller values takes place. If one or several parameters are outside the corresponding tolerance, they are replaced with standard values and a message is issued (refer to section "Limiting value error" page 32). In this case the communication is set to the "Off Line"-mode. The user now has the possibility to check the parameters and if necessary to correct them. The communication is resumed again via the menu point "File\_On Line". Subsequently one has to select the option "Re-program the axis controller", in order for the corrected values to be made active on the axis controller.

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

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

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". Also the current function of the PASO is displayed.

The following states will be displayed in the status line:

- 1. field: Selected RS232 interface
- 2. field: Current mode (On line or Off Line)

#### 10.4.4 Store parameter on the controller card

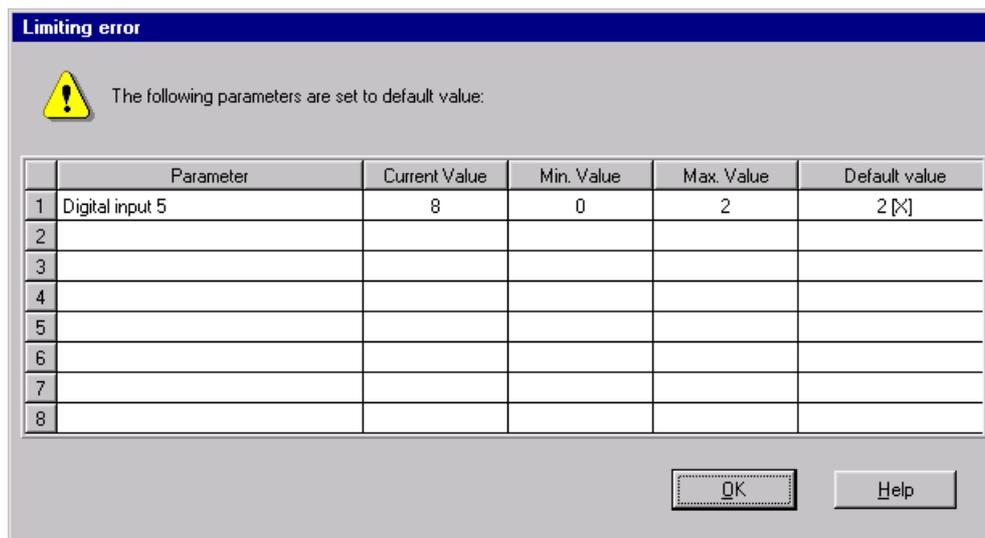
Each new input value is immediately transferred to the connected controller card after the completion of the input field (either by pushing the key ENTER or by activating another input field).

If the window is closed with the key "OK", the values are stored in the connected controller card so that they are available after the controller card is 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.

#### 10.4.5 Limiting value error

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



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

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

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

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

## **10.5 Description of Commands**

The description of the individual commands and parameters is contained in section "Settings" page 16.

## **11 Disposal**

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

## **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

## A1 Parameter Setting

Parameters	Default setting	Customer settings 1	Customer setting 2
Fixed preset value 1	0%		
Fixed preset value 2	0%		
Fixed preset value 3	0%		
Fixed preset value 4	0%		
Fixed preset value 5	0%		
Fixed preset value 6	0%		
Fixed preset value 7	0%		
Imin solenoid A	150mA		
Imax solenoid A	700mA		
Imin solenoid B	150mA		
Imax solenoid B	700mA		
Frequency	100Hz		
Level	100mA		
Offset	0.00V		
Window 1	0.00V		
Window 2	0.00V		
Ramp A up	0.00s		
Ramp A down	0.00s		
Ramp B up	0.00s		
Ramp B down	0.00s		
Mode of operation	4		
Cablebreak	no		
Signal type analog input A	0 ... 10VDC		
Used analog input A	Analnp1 [V]		
Inversion analog input A	no		
Signal type analog input B	0 ... 10VDC		
Used analog input B	Analnp3 [V]		
Inversion analog input B	no		
Digital input 1	X		
Digital input 2	X		
Digital input 3	X		
Digital input 4	X		
Digital input 5	X		
Digital input 6	X		
Digital input 7	X		
Digital input 8	X		