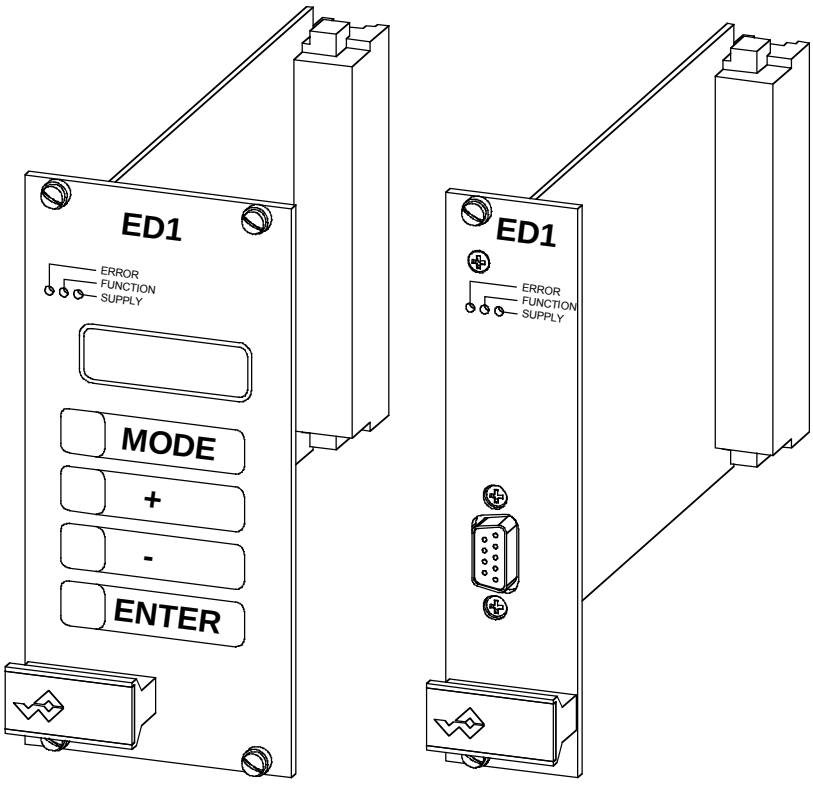
OPERATING GUIDE

PRESSURE/FLOW CONTROLLER ED1X2



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Operating guide to Pressure/Flow controller ED1X2

1 General information

This operating guide (OG) makes it possible to use the WANDFLUH Pressure/Flow controller ED1X2 (Pressure/Flow controller) 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 Pressure/Flow controller card
- information about safety in dealing with control.

2 Product description

2.1 General

The Pressure/Flow controller 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 Pressure/Flow controller is situated above all in the industrial field.

2.3 Conformity

The Pressure/Flow controller 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 Labeling of the product

The connector strip of the Pressure/Flow controller 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 Pressure/Flow controller:

- Card type
- Software version
- Firmware version

2.5 Type code

E D1 ☐ 2 2 D2 0 0 ☐ ☐ # ☐

- Eurocard
- Digital
- Parameters to be set with:
  - Multi-function term. MTG02/TESO 1
  - Display/keys 2
  - PC-Software 3
- Pressure/Flow controller
- 2-solenoid version
- 24VDC supply voltage
- Preset value input selection
- Actual value input selection
- Hardware configuration
  - 10-Bit resolution A
  - 12-Bit resolution, without galvanic separation B
  - 12-Bit resolution, with galvanic separation C
- Hardware configuration
  - without Bus A
  - with profibus DP B (on request)
  - with CAN-bus C (on request)
- Design-Index (Subject to change)

2.6 Technical data

2.6.1 General specifications

Execution	Eurocard	
Dimensions	Front plate: ED11 / ED13 10-Bit ED11 / ED13 12-Bit and ED12 10-Bit and 12-Bit Print plate	 30.1 x 128.4 mm 6 TE / 3 HE 60.6 x 128.4 mm 12 TE / 3 HE 160.0 x 100.0 mm
Weight	ED11 / ED13 10-Bit ED11 / ED13 12-Bit ED12 10-Bit ED12 12-Bit	180g 250g 220g 250g
Connections	1 connector strip	in according to DIN 41612, type F48
Ambient temperature		-20 ... +60° C

2.6.2 Electrical specifications

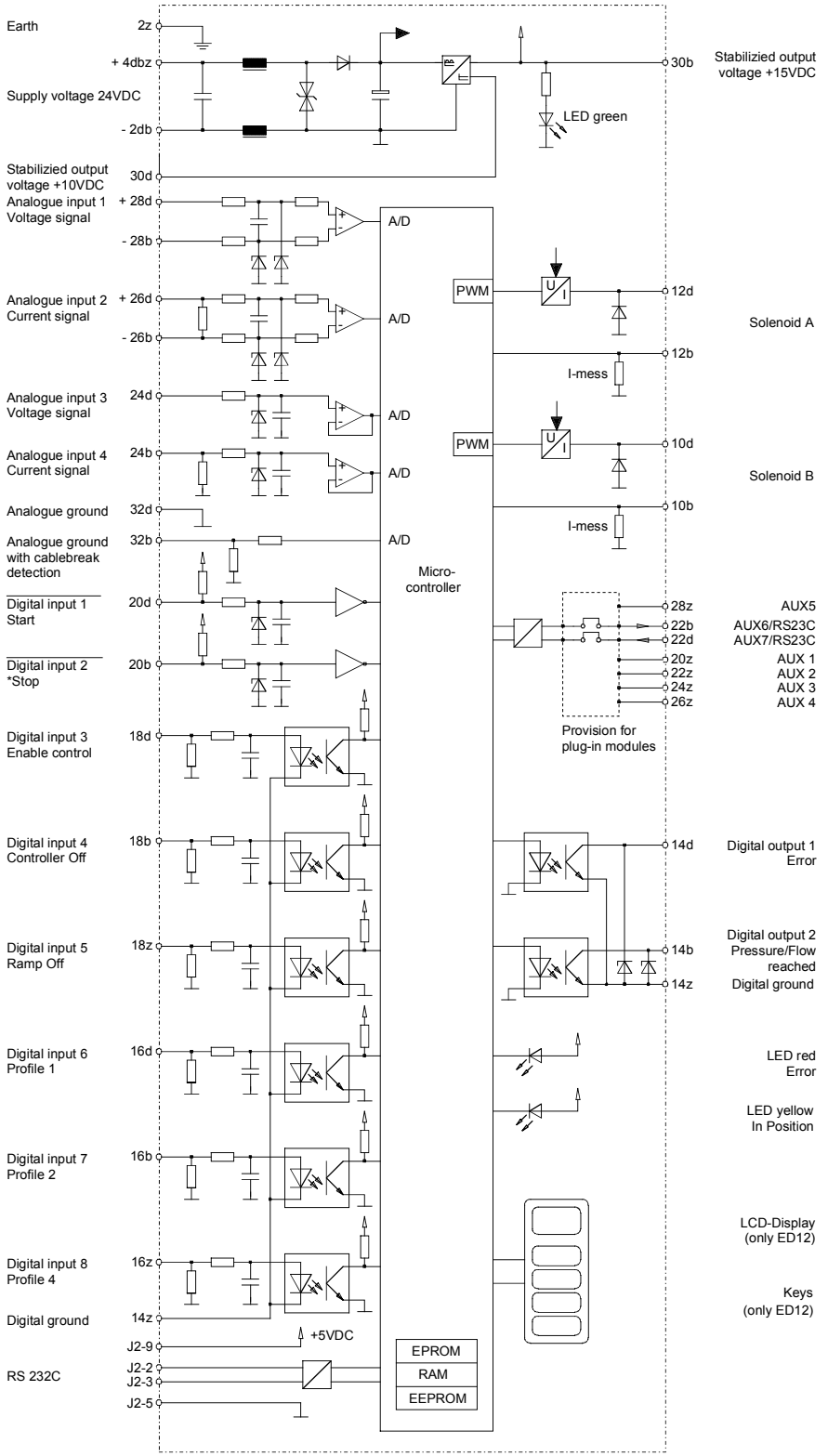
Supply voltage	24 VDC
Voltage range	21 ... 30 VDC
Ripple on supply voltage	+/-10 %
Fuse	Customer must integrate a slow fuse into his electrical system (A-value = no load power plus max solenoid current)
Temperature drift	< 1% with $\Delta T = 40°C$
No load power	1.2 W

Analog inputs	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
	Option:	
	1 differential input 12-Bit for preset value	0 ... ±10VDC or 0/4 ... 20mA
	1 differential input 12-Bit for actual value	0 ... ±10VDC or 0/4 ... 20mA
Input resistance	Voltage input against ground	> 100kOhm
	Voltage differential input	> 27kOhm
	Burden for current input	= 250Ohm
Digital inputs	2 inputs acitve-low	
	6 input acitve-high	
	Switching threshold high	12 - 34VDC
	Switching threshold low	0 - 4VDC
Serial interface	1 interface D-SUB 9-pin socket (female) on the front plate according to RS232 C standard	
Stabilized output voltage	1 output + 15 VDC, max. Load 100 mA	
	1 output + 10 VDC, max. Load 10 mA	
Solenoid outputs	The solenoid outputs are short circuit proof and protected against negative voltage peaks by a suppression diode.	
Solenoid current	Minimum current Imin adjustable	0 ... 950 mA
	Default setting	150 mA
	Maximum current Imax adjustable	Imin ... 1800 mA
	Default setting	700 mA
Dither	Frequency adjustable	20 ... 250 Hz
	Default setting	100 Hz
	Level adjustable	0 ... 200 mA
	Default setting	100 mA
Digital outputs	2 outputs optically coupled.	
	Open collector connected to Digital ground	
	Umax	50 VDC
	Imax	15 mA
Free pins	4 pins AUX1 - AUX4 reserved for customer specific adaptations on the plug-in modules area	
Status indication by LED		
LED green	Supply voltage	
LED yellow	Function	
LED red	Error	
EMC		
Immunity	EN 50082-2	
Emission	EN 55022 Class B	

2.6.3 Environment

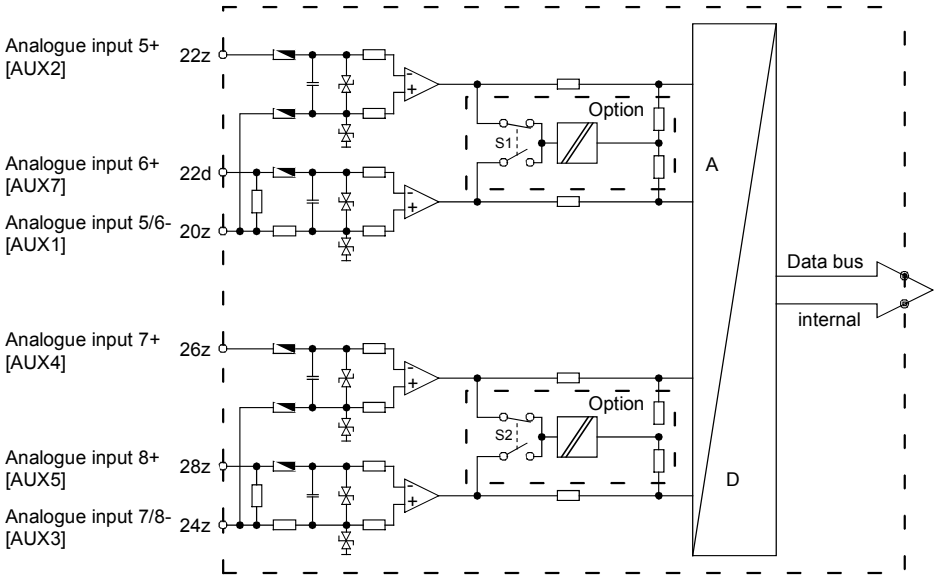
Storage	packing:	The card must be stored in the original packing
	Temperature range:	-25 ... +85° C
	Resistance to alkali and acid:	The card must be protected against alkalis and acids
In operation	Temperature range	-20 ... +60° C
	Resistance to alkali and acid:	The card must be protected against alkalis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

2.7 Block diagram ED1 basic card

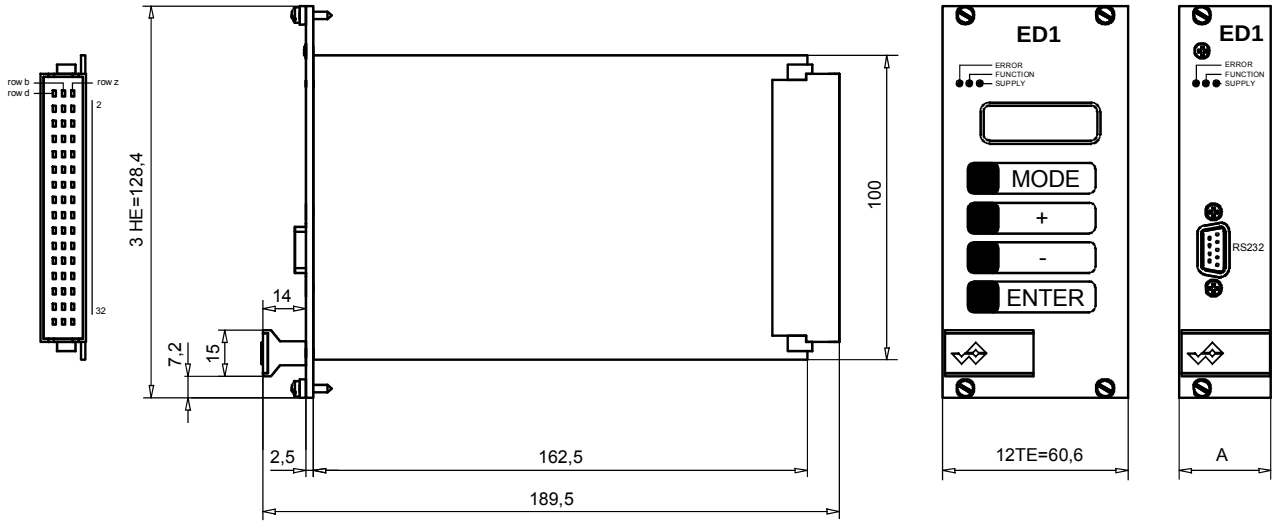


2.8 Block diagram 12-Bit additional print

(mounted on the provision for plug-in modules)



2.9 Dimensions



A: 6TE = 30.1mm for the 10-Bit card
10TE = 60.6mm for the 12-Bit card

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

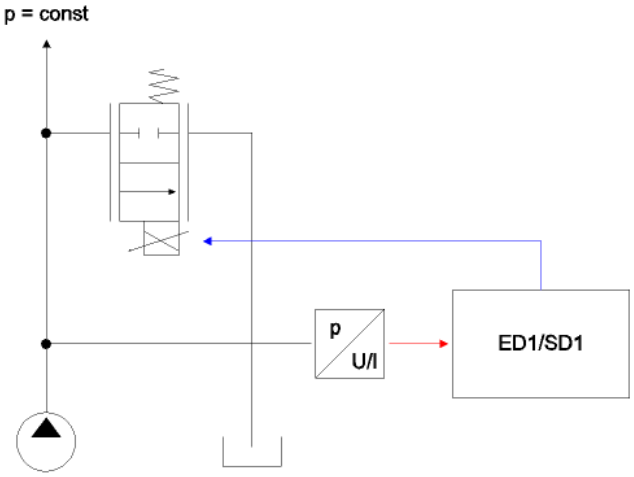
- The Pressure/Flow controller is constructed as an **Eurocard**
- All inputs and outputs have to be contacted trough the **connector strip**
- The Pressure/Flow controller is available as standard with a front plate
- The **Version ED1122D200XA** has a RS232 (serial) interface on the front plate, via which the parameterization and the diagnostics can be made by using the multi-function terminal (MTG02) or PC-Terminalsoftware TESO
- The **Version ED1222D200XA** has a display and keys on the front plate, via which the parameterization and the diagnostics can be made
- The **Version ED1322D200XA** 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

Integrated in the card is beside the pressure/flow controller also the Pressure/Flow controller for direct operating proportional valves. The preset pressure/flow is given as an electrical signal (preset value) on the pressure/flow controller. A sensor is measuring the real pressure/flow and this signal is given also as an electrical signal (actual value) on the pressure/flow controller. Corresponding to the control deviation (preset value - actual value) an operating signal (solenoid current) will be output.
The preset value may also be input in the form of a fixed preset pressure/flow and selected digitally. By linking multiple profiles a pressure/flow profile may be preset (not with the controller type "Pressure reducing control with throttle valve for clamping function"). Near it, it's possible to set a stop time (for waiting after reached the preset position) for each profile.
By scaling the preset and actual values, it's possible to make the following adjustments in e.g. bar.
If the preset pressure/flow is reached, the controller outputs a digital signal. The changing of the preset pressure/flow may be smoothened by varying ramp time. The control characteristic can be adjusted to the respective control system by means of various parameters. The controller is built as a PID-controller. It is also possible to switch off the control system completely for carrying out tests or setting procedures.
In the controller type "Pressure reducing control with throttle valve for clamping function", there is an additional clamping function integrated. The clamping function has a non regulated forward movement for a clamping cylinder, until a pressure threshold is reached and the pressure regulation is switched on. With another signal the cylinder can move backward unregulated.
Amended parameters can be stored in a non volatile memory to have them available when the control system is switched on again.

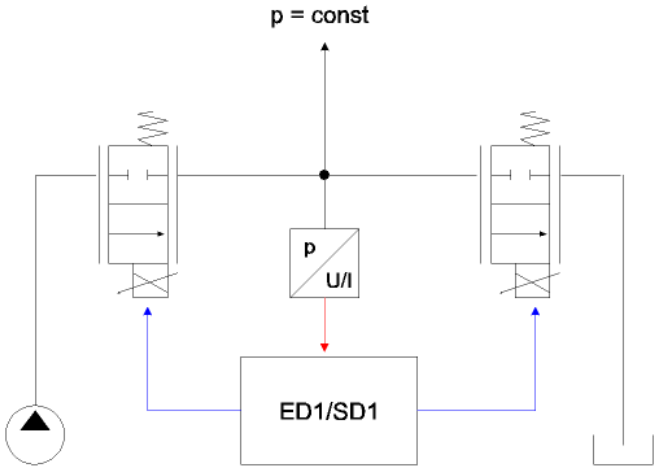
In the following section, all possible controller types which are possible with the pressure/flow controller, are listed.

4.2.1 Pressure relief control with throttle valve (1-solenoid application)



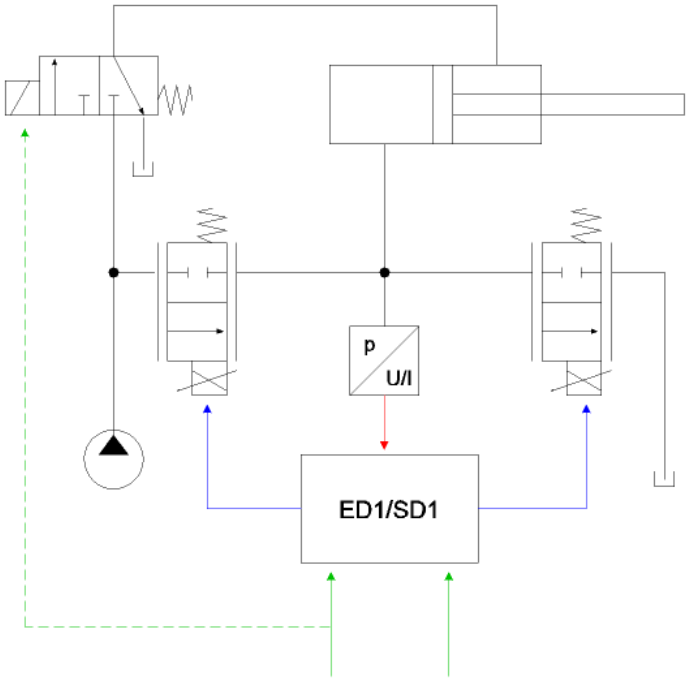
With this system, high dynamic and static requests can be performed.
Any proportional valves with one active control edge can be used.
Recommended valves: D.PPM18, D.PPM22, D.PPM33

4.2.2 Pressure reducing control with throttle valves (2-solenoid application)



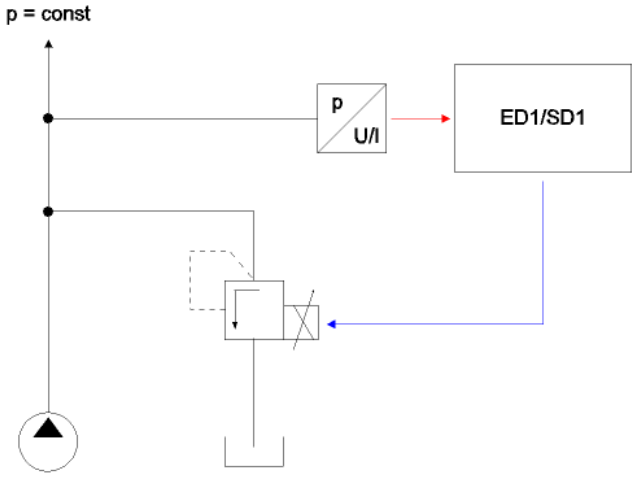
With this system, high dynamic and static requests can be performed.
Any proportional valves with one active control edge can be used. A loading and unloading valve will be used.
Recommended valves: D.PPM18, D.PPM22, D.PPM33

4.2.3 Pressure reducing control with throttle valves for clamping function (2-solenoid application)



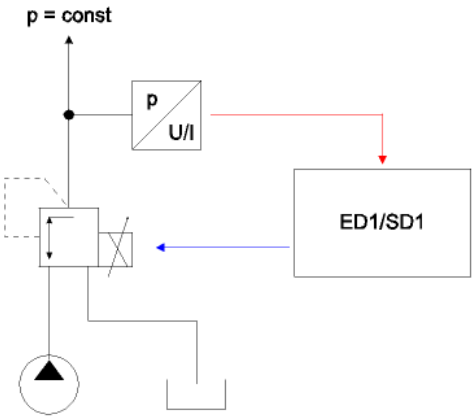
This system correspond to the pressure reducing with throttel valves function (refer to section "Pressure reducing control with throttle valves (2-solenoid application)" page 10.
There is an additional clamping function integrated. In the clamping function, with setting the digital input "Forward", the solenoid of the loading valve will be operated direct with a adjustable current. The control is switched off. This stage is active until the actual value has reached an adjustable pressure/flow threshold. At this moment, the control will switch on and the card is working as a standard pressure/flow controller. If the digital input "Backward" is set, the solenoid of the unloading valve will be operated direct with a adjustable current. The control is switched off. If the digital input "Backward" is set to not active, the loading- and unloading valve will stay in the basic state until the whole procedure will be restarted by resetting. The digital input "Forward".

4.2.4 Pressure relief control with pressure relief valve (1-solenoid application)



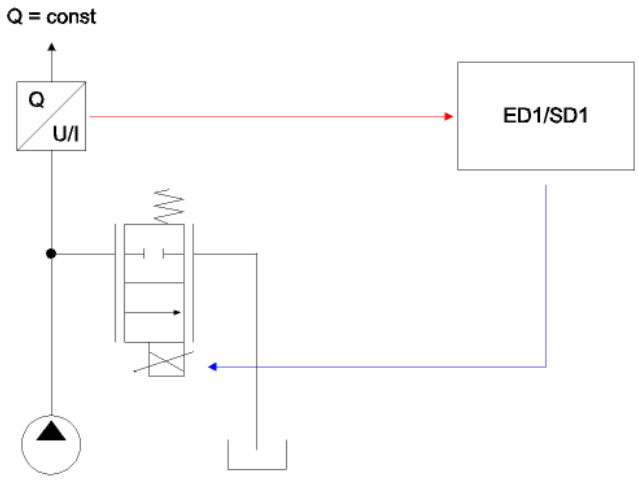
This system is actual only a electronically preset value re-lead. The problem is, that the pressure already is mechanical controlled inside the valve. Because this mechanical control is very slow, the electronically control must be made slow artificially (cascade control: the exterior loop must be slower than the interior loop). With such a system, good static requests can be performed. However, dynamic requests can be bad performed.
Any proportional pressure relief valves can be used.
Recommended valves: B.PPM18, B.PPM22

4.2.5 Pressure reducing control with pressure reducing valve (1-solenoid application)



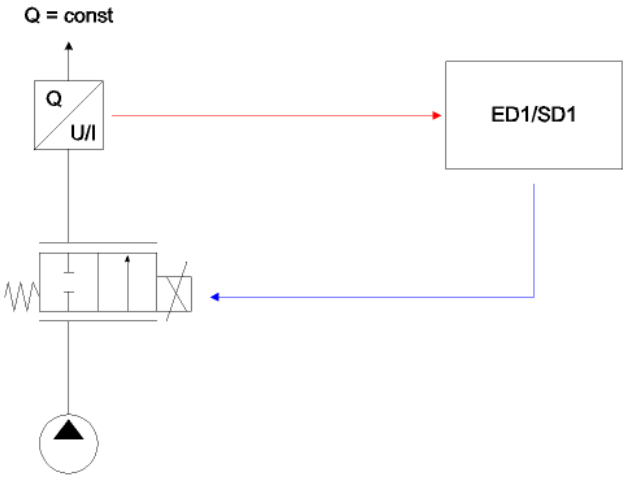
This system is actual only a electronically preset value re-lead. The problem is, that the pressure already is mechanical controlled inside the valve. Because this mechanical control is very slow, the electronically control must be made slow artificially (cascade control: the exterior loop must be slower than the interior loop). With such a system, good static requests can be performed. However, dynamic requests can be bad performed.
Any proportional pressure reducing valves can be used.
Recommended valves: M.PPM18, M.PPM22, M.PPM33

4.2.6 3-way flow control with throttle valve (1-solenoid application)



With this system, high dynamic and static requests can be performed.
Any proportional valves with one active control edge can be used.
Recommended valves: D.PPM18, D.PPM22, D.PPM33

4.2.7 2-way flow control with throttle valve (1-solenoid application)



With this system, high dynamic and static requests can be performed.
Any proportional valves with one active control edge can be used.
Recommended valves: D.PPM18, D.PPM22, D.PPM33

4.2.8 Recommended valves

Valves	pressure reducing control	pressure relief control	3-way flow control	2-way flow control	dynamic control response	static control response	register
Throttle valve							
DNPPM18	X	X	X	X	+	++	2.6
DOPPM18	X	X	X	X	+	++	2.6
DNPPM22	X	X	X	X	+	++	2.6
DOPPM22	X	X	X	X	+	++	2.6
DNPPM33	X	X	X	X	o	++	2.6
Pressure reducing valves							
BDPPM18	X				-	+	2.3
BVPPM18	X				-	+	2.3
BDPPM22	X				-	+	2.3
BVPPM22	X				-	+	2.3
Pressure relief valves							
MVPPM18		X			-	+	2.3
MPPPM22		X			-	+	2.3
MVPPM22		X			-	+	2.3
MVPPM33		X			-	+	2.3

++ very good control response
+ good control response
0 sufficent control response
- bad control response

4.3 Analog inputs

- The applied analog signal is digitalized in the A/D converter as follows:
  - 10-Bit for the card ED1X22D200**A**A (only by 0 ... +10V and 0 ... 20mA)
  - 12-Bit for the card ED1X22D200**B**A (only by 0 ... +5V, 0 ... +10V and 0 ... 20mA)

  Attention: By the input range 0 ... 8V, 0 ... 5V (only 10-Bit) or 4 ... 20mA, the resolution is < 10-Bit resp. < 12-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 Pressure/Flow controller 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.
- **Galvanic separation of analog inputs (optional)**
  (only 12-Bit version)
  Two of the four 12-Bit analog inputs (selectable) can be separated or isolated galvanically on the controller card.
- **Analog input 1** (for differential voltage signal)
  (only 10-Bit version)
  Input voltage range: 0 ... +10V / 0 ... +8V / 0 ... +5V
- **Analog input 2** (for differential current signal)
  (only 10-Bit version)
  Input current range: 0 ... +20mA / 4 ... +20mA

- **Analog input 3** (for voltage signal against analog ground)
  (only 10-Bit version)
  Input voltage range: 0 ... ±10V / 0 ... ±8V / 0 ... ±5V
- **Analog input 4** (for current signal against analog ground)
  (only 10-Bit version)
  Input current range: 0 ... +20mA / 4 ... +20mA
- **Analog input 5 [AUX2]** (for differential voltage signal)
  (only 12-Bit version)
  Input voltage range: 0 ... +10V / 0 ... +8V / 0 ... +5V
- **Analog input 6 [AUX7]** (for differential current signal)
  (only 12-Bit version)
  Input current range: 0 ... +20mA / 4 ... +20mA
- **Analog input 7 [AUX4]** (for differential voltage signal)
  (only 12-Bit version)
  Input voltage range: 0 ... +10V / 0 ... +8V / 0 ... +5V
- **Analog input 8 [AUX5]** (for differential current signal)
  (only 12-Bit version)
  Input current range: 0 ... +20mA / 4 ... +20mA

4.4 Cablebreak detection

The analog inputs can be detected for a cablebreak. If a cablebreak is present, the corresponding solenoid outputs will be blocked and the red LED and the output "Error" will be active. The following conditions had to be performed:

- The input signal must be a current value 4 ... 20mA or a voltage value from a potentiometer.
- By a voltage signal with a potentiometer, the ground connection must be connected with the terminal "Analog ground with cablebreak fuse" (32b).
- The parameter "Cablebreak detection" must be on "On" (refer to section "Configuration_Preset/Actual value signals" page 37). By a voltage signal with a potentiometer, the card always had to be restarted after switching On the cablebreak detection.

Attention: Until a cablebreak will be detected, a time from about 100ms will passed. During this time, the cylinder can make unintentional movements.

4.5 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 acitve-high (refer to section (refer to section "Electrical specifications" page 4) and galvanically separated via optical couplers.
  Attention: Connect common optical coupler ground (14z)!
- **Digital input 1 (*Start, acitve-low)**
  If this input is set, the changing of the preset pressure/flow will be started. Dependent of the digital inputs 6 - 8, either the external preset value or a profile preset pressure/flow will be acitve. If this input is not set, the current state will be stored.
  If each change on the digital inputs 6 - 8 should be read in immediately, the digital input 1 must be set fixed to active.
- **Digital input 2 (*Stop, acitve-low)**
  If this input is set, the changing of the preset pressure/flow is stopped. If this input is not set, the changing of the preset pressure/flow is enabled.
- **Digital input 3 (Enable control, acitve-high)**
  If this input is set, the Pressure/Flow controller is enabled. Without this enable, no movements can be made.

- **Digital input 4 (Controller Off, acitve-high)**
  The controller function can be temporarily switched off by setting this input. To do this, the parameter "Controller" must be on "external" (refer to section "Controller function" page 17).
- **Digital input 5 (Ramp Off, acitve-high)**
  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 (Profile selection resp. Backward/Forward, active-high)**
  The allocation of the digital inputs 6 - 8 depents of the parameter "Controller type" (refer to section "Configuration_Controller type" page 37.

Controller type = "Pressure reducing control with throttle valves for clamping function" (6)

- **Digital input 6 (Profile selection, active-high)**
  There is 1 profile available. When a fixed preset value is selected via the digital inputs 6 - 8 and the digital input 1 "Start" is set, the external preset value is ineffective.
- **Digital input 7 (Backward, active-high)**
  If this input is set**,** the solenoid of the unloading valve will be operated direct with a current. This current is adjustable with the parameter "Current backward". The control is switched off. This stage is active untill the digital input "Backward" is set to not active.
- **Digital input 8 (Backward, active-high)**
  If this input is set**,** the solenoid of the unloading valve will be operated direct with a current. This current is adjustable with the parameter "Current backward". The control is switched off. This stage is active untill the actual value has reached an pressure/flow threshold (adjustable with the parameter "Pressure threshold"). At this moment, the control will switch on and the card is working as a standard pressure/flow controller.

Controller type = all, except "Pressure reducing control with throttle valves for clamping function" (0 ... 5)

- **Digital input 6 - 8 (Profil selection, active-high)**
  7 Profiles, selectable in binary form, are available. When a fixed preset value is selected via the digital inputs 6 - 8 and the digital input 1 "Start" is set, the external preset value is ineffective.
  The following inputs must be set to activate the corresponding profile:

Profile selection	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

Profiles 1, 2 and 4 can be selected directly, i.e. without coding.

4.6 Outputs

- **Proportional solenoid outputs A and B**
  The 2 solenoid outputs have a current output **p**ulse-**w**idth-**m**odulated 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 (Pressure/flow reached)**
  This output becomes acitve, when the preset pressure/flow is reached.
- **Light emitting diodes LED green / yellow / red**
  LED green: Supply voltage is present
  LED yellow: Pressure/flow reached
  LED red: Indicates an error

4.7 Controller function

The following 3 controller functions are possible:

- **Controller On**
  In this mode, the control is working as a pressure/flow controller in a closed loop system. The preset value signal correspond to the desired pressure/flow on the system. The different controller settings can be made here.

- **Controller Off**
  In this mode, the control is working as a normal amplifier in a open loop system. A solenoid current corresponding to the preset value signal is output:

  With 1-solenoid application:
  0% ... 100% preset value = Imin ... Imax solenoid A

  With 2-solenoid application:
  0% ... 50% preset value = Imax ... Imin solenoid B
  50% ... 100% preset value = Imin ... Imax solenoid A

- **Controller Extern**
  In this mode, the external digital input 4 (Controller Off) decide, if the control is working as a Pressure/Flow controller (DI4 not active) or as a normal amplifier (DI4 active).

For more information about the control parameters, please refer to section "Parameters_Controller" on page 33.

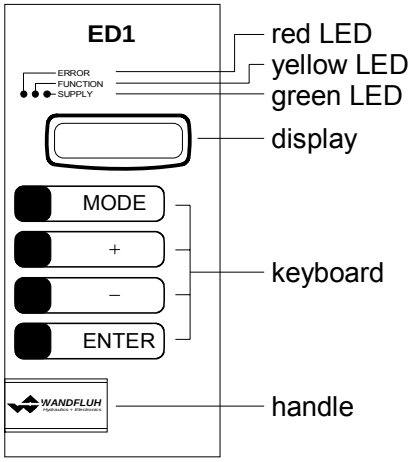
5 Operating and Indicating elements

5.1 Introduction

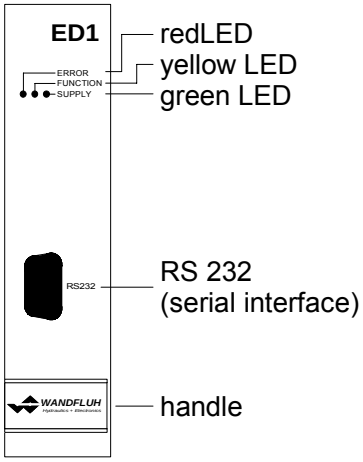
The Pressure/Flow controller is available as standard with a front plate:

- The **Version ED1122D200XA** 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 ED1222D200XA** has a display and keys on the front plate, via which the parameterization and the diagnostics can be made
- The **Version ED1322D200XA** 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 8.

6.1 Installation / Connection

The Pressure/Flow controller 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 Pressure/Flow controller 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 >= 1,5 mm²·
- 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 23.

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 Pressure/Flow controller (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 Pressure/Flow controller 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.

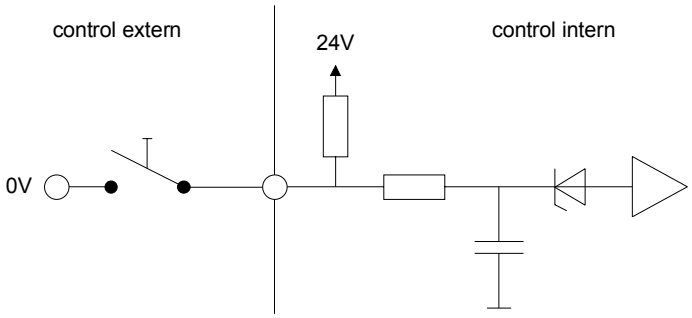
6.2.2 Solenoid outputs

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

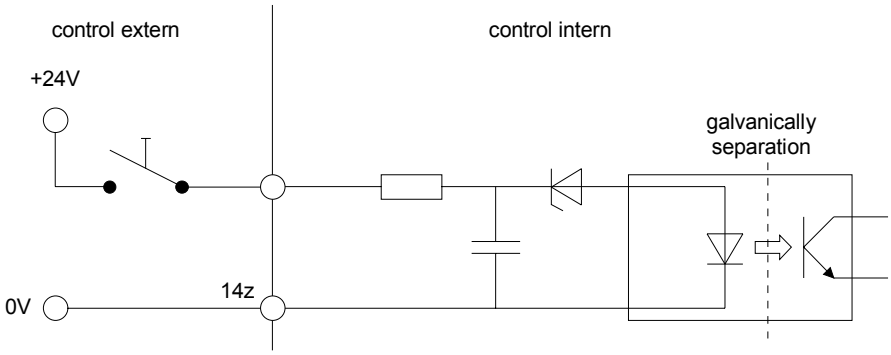
- The conductor strand cross section has to be adapted to the solenoid current
- Screened cables have to be used; the screen must be grounded only on the rack resp. housing side.

6.2.3 Digital inputs and outputs

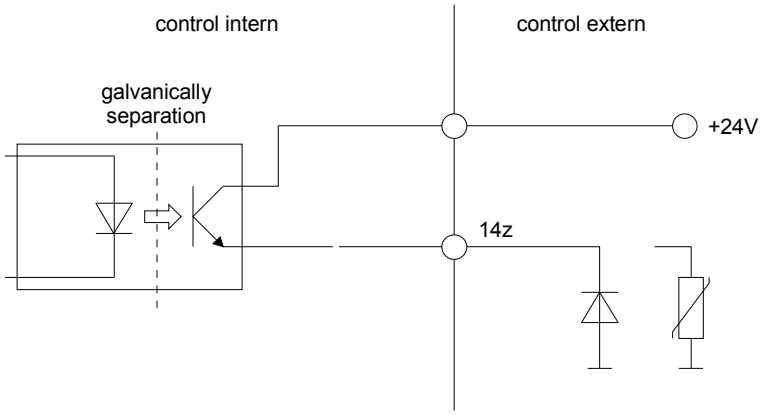
- Digital inputs 1 and 2 are active-low and not galvanically separated.
- For activation, they have to be connected to 0V (ground)



- Digital inputs 3 - 8 are acitve-high and galvanically separated via optical couplers.
- In order to use the galvanically separation, the connection "Digital ground" (14z) has to be connected to the ground of the external digital signal transmitter.
- If no galvanically 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.

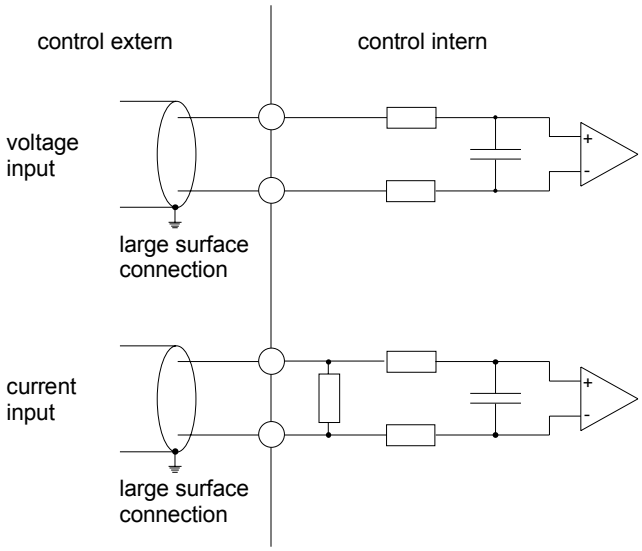


- The digital outputs are "open collector" outputs.



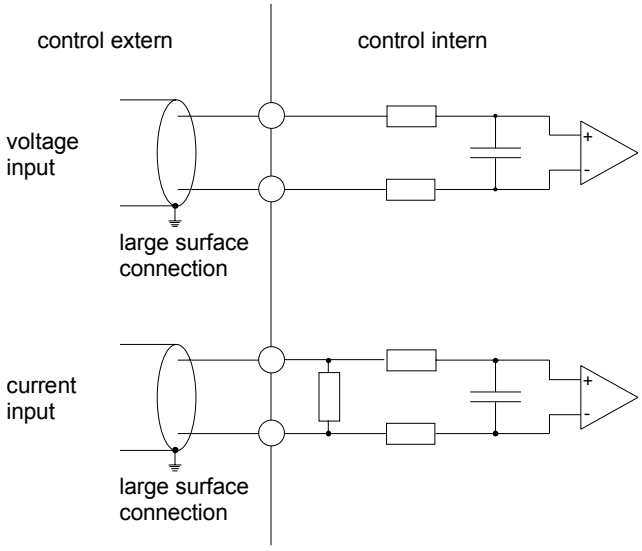
6.2.4 Analog inputs 10-Bit

- There are two voltage and two current inputs available.
- One of each is a differential input.



6.2.5 Analog inputs 12-Bit

- There are two voltage and two current inputs with a common feedback available.
- The inputs 5 and 7 are for voltage signals, inputs 6 and 8 for current signals



6.2.6 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

6.2.7 Configuration of the analog inputs 12-Bit

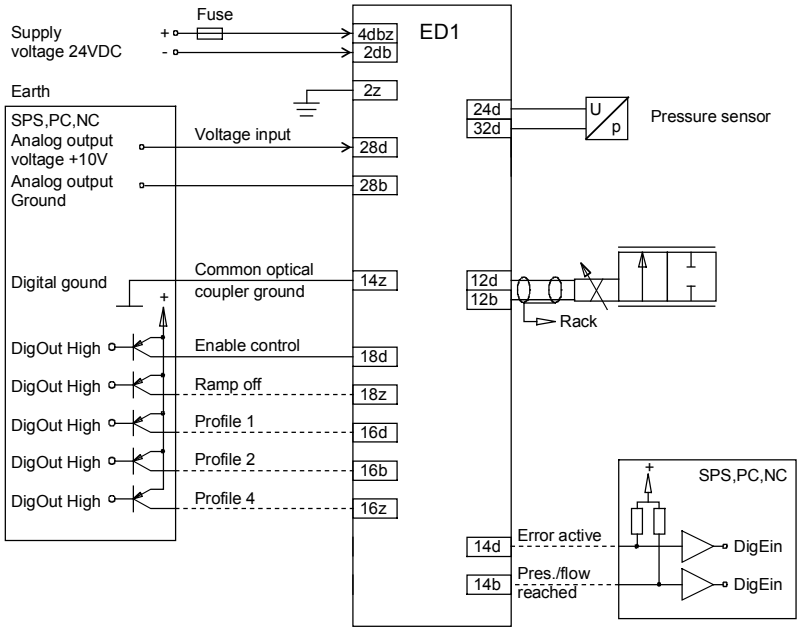
The analog inputs 12-Bit can be configured as follows:

Input signal	Connector strip assignment	Input range
Voltage differential input	+ to 22z / - to 20z + to 26z / - to 24z	0 ... +5/8/10V
Current differential input	+ to 22d / - to 20z + to 28z / - to 24z	0 ... +20mA 4 ... +20mA

6.3 Connection examples

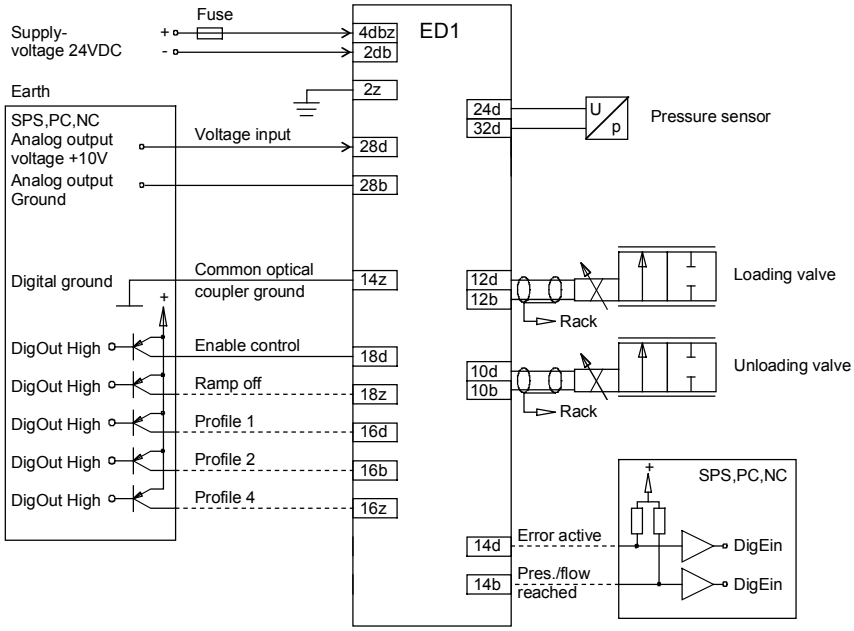
6.3.1 Pressure relief control with throttle valve

- +10VDC voltage preset value from external MPCS, PC or NC
- +10VDC voltage actual value with pressure sensor
- digital inputs from external MPCS, PC or NC with galvanically separation



6.3.2 Pressure reducing control with throttle valves

- +10VDC voltage preset value from external MPCS, PC or NC
- +10VDC voltage actual value with potentiometer on the cylinder
- digital inputs from external MPCS, PC or NC with galvanically separation



7 Settings

Please refer to the section "Safety rules" on page 8.

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 47.
- For information about the operation via the PC-Parameterization software PASO please refer to section "PASO Installation and Operation" page 48.
- 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 (only PASO - Version)

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 Pressure/Flow controller (in this case, the data are loaded from the Pressure/Flow controller)

7.3 Tips for the first commissioning

ATTENTION: During the first commissioning, the system can make uncontrolled movements. Please be sure that the working area of the system is really open!

1. Connect the power supply, leave the Position controller PLUS still switched off
2. Switch off the hydraulic drive (hydraulics switched off)
3. Carefully check the connections
4. Switch on the power supply
5. Establish communication with the PASO (connect PC and pressure/flow with an RS 232 cable and start PASO).
6. Configure the pressure/flow controller specific to the installation. Please pay attention to the following order:
   1. In the Menu "Configuration_Controller type": Select the desired controller type
   2. In the Menu "Configuration_Preset/Actual value signals": Set the corresponding values
   3. In the Menu "Parameters_General": Set the corresponding limits
7. Switch on the hydraulic system
8. For releasing the card, the digital input 3 "Enable control" must be active (refer to section "Digital inputs" page "15")
9. For reading in changes on the input signals, the digital input 1 "Start" must be active and the digital input 2 "Stop" must be not active (refer to section "Digital inputs" page "15")
10. The system should now reach the desired pressure/flow corresponding to the preset value.
    The preset value direction (e.g., potentiometer left / right) should correspond to the increase/decrease of the pressure/flow. Otherwise either the preset value direction or the actual value direction has to be reversed. If the actual value direction is reversed, then simultaneously the connections of the solenoid A and B also have to be reversed.

11. Set the drive currents of the valves in the menu “Parameter_Valves”
12. Set the control parameters in the menu “Parameter_Controller”

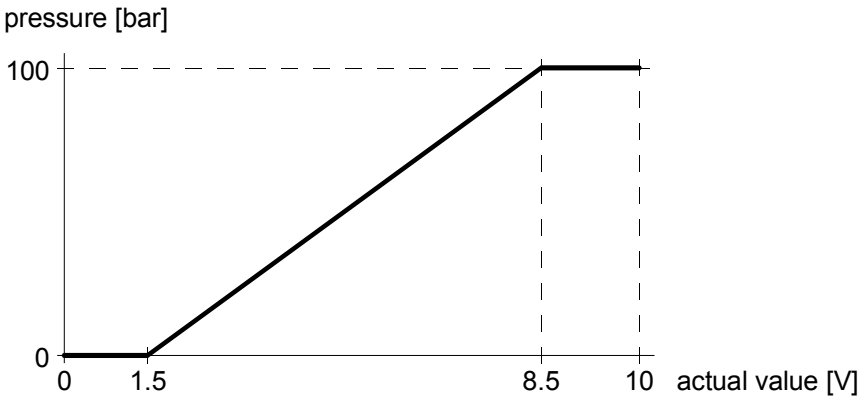
In the section A you will find a detailed step by step description for the start up for all controller types.

7.4 Scaling

The pressure/flow controller has the possibility to display the preset and actual value with a selectable unit (e.g. bar). For it, both signals must be scaled. This is made with the parameters "Resolution actual value", "Resolution preset value" and "Offset measuring system".

In the following section you will find a detailed description about these parameters. It is important to keep the pretended order (1. resolution actual value, 2. offset measuring system, 3. resolution preset value).

The declared calculation examples correspond to a pressure control system. Therefore the selected unit is "bar". For pressure control system with another unit or for flow control systems the examples are analogous.



7.4.1 Determination of the resolution actual value

With the parameter "Resolution actual value" the actual value can be adjusted to the maximum working area. The value of the "Resolution actual value" results of the maximum working area divided with the maximum input signal range from the actual value.

The maximum working area correspond to the maximum pressure range. It is important to calculate always with the maximum possible pressure range, even only a part of this will be used.

The maximum input signal range correspond to the range between the minimum and maximum actual value signal.
Example: Actual value signal 0V ... 10V => maximum input signal range 10V (10V - 0V = 10V).
Actual value signal 1.5V ... 8.5V => maximum input signal range 7V (8.5V - 1.5V = 7V)

With a maximum pressure range from 0 ... 100bar (= maximum working area from 100bar) and with an actual value signal from 1.5V ... 8.5V (= maximum input signal range from 7V), the "Resolution actual value" proves a value from 100bar / 7V = 14.29bar/V.

The value of the "Resolution actual value" can be also determined by adjusting of two different pressures on the system. With the indicated pressure (Menu "Analysis_Values") and the real pressure, the existing value of the "Resolution actual value" et can be corrected.

Example of a determination of the value "Resolution actual value" by adjusting two different pressures:

- Adjust the 1. pressure, e.g. minimum pressure
- Make a note of the measured and indicated pressure
- Adjust the 2. pressure, e.g. maximum pressure
- Make a note of the measured and indicated position
- Calculate the measured range Δpressure measured = Pressure 2 measured - Pressure 1 measured
- Calculate the indicated range Δ Pressure indicated = Pressure 2 indicated - Pressure 1 indicated
- Correction factor: K = Δ Pressure measured / Δ Pressure indicated
- New value of the "Resolution actual value" = current value "Resolution actual value" x correction factor K

Calculation example:

current resolution = 10bar/V (default setting)

Pres 1 measured	0bar	Pres 1 indicated	15bar	(1.5V x 10bar/V)
Pres 2 measured	100bar	Pres 2 indicated	85bar	(8.5V x 10bar/V)
	---		---	
ΔPres measured	100bar	ΔPres indicated	70bar	

correction factor K = ΔPres mes. / ΔPres ind. = 100bar / 70bar = 1.4286

new resolution = current resolution x K = 10bar/V x 1.4286 = **14.29bar/V**
=========

Control: 7V x 12.29bar/V = 100.00bar

7.4.2 Determination of the offset measuring system

With the parameter "Offset measuring system", the zero position of the actual value can be adjusted. The adjusted value will be subtracted from the actual value.

The parameter "Offset measuring system" correspond to the signal range from the actual value signal. The range of adjustment is ±50% from the selected signal type (e.g. ±5V with signal type 0 ... 10V). But the value of the "Offset measuring system" will be adjusted in the selected unit (e.g. bar). Therefore the displayed value will be multiplied with the parameter "Resolution actual value". Because of the relationship to the signal type and the resolution, the displayed value of the parameter "Offset measuring unit" will be changed, as soon as the parameter "Resolution actual value" or "Signal type" will be changed.

With a pressure range from 0 ... 100bar, with an actual value signal from 1.5V ... 8.5V and with a adjusted parameter "Resolution actual value" from 14.29bar/V, the "Offset measuring system " proves a value from 1.5V x 14.29bar/V = 21.44bar.

The value of the "Offset measuring system" can be also determined by adjusting a pressure on the system. With the indicated pressure (Menu "Analysis_Values") and the real pressure, the existing value of the "Offset measuring system" can be corrected.

Example of a determination of the value "Offset measuring system" by adjusting a pressure on the system:

- Adjust a pressure, e.g. minimum pressure
- Make a note of the measured and indicated pressure
- Offset correction = pressure indicated / pressure 1 measured
- New value of the "Offset measuring system" = current value "Offset measuring system" + offset correction

7.4.3 Determination of the resolution preset value

With the parameter "Resolution preset value", the desired working range for the preset value can be adjusted. The value of the "Resolution preset value" results of the desired working range divided with the maximum input signal range from the preset value.

Examples:

Pressure range = 0 ... 100bar, preset value signal = 0 ... 10V
Resolution preset value = 2bar/V => working range 0 ... 20bar
Resolution preset value = 4bar/V => working range 0 ... 40bar
Resolution preset value = 7bar/V => working range 0 ... 70bar

7.5 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..

7.5.1 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.

7.5.2 File_Open...

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

7.5.3 File_Save

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

7.5.4 File_Save as...

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

7.5.5 File_Print...

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

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

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

7.5.6 File-Info

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

Date, time	Date, time of saving.
File name:	The file name, under which the file has been saved.
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.

7.5.7 File_Off Line (On Line)

Off Line

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

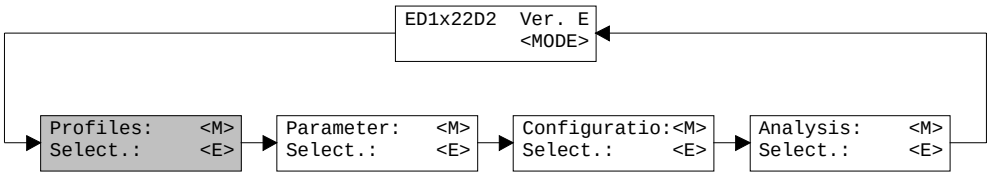
Before parameters are transfered to the Pressure/Flow controller, a verification is carried out as to whether the version of the Pressure/Flow controller supports the parameter values. If this is not the case, then a message is issued and a transfer to the controller is not possible.

If the parameters have been taken over by the Pressure/Flow controller, 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.

7.5.8 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.

7.6 Profiles - Menu



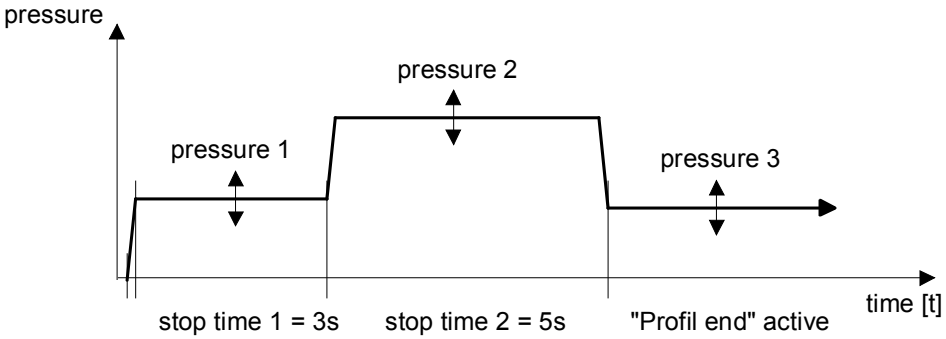
The pressure/flow controller is able to set the system pressure/flow in a preselected value. After an adjustable stop time, the pressure/flow controller change automatically to the next preselected pressure/flow.

7.6.1 Generator

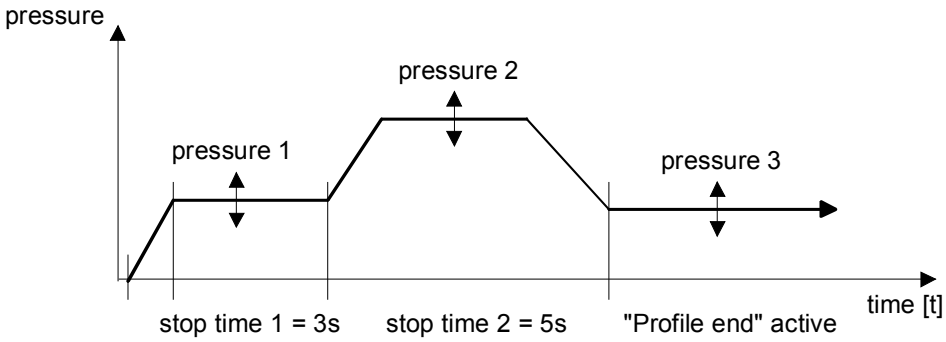
In this window, all adjustments according to the Profiles will be made.

Field	Parameter description	Range / Step
Profile No.	Number of the preset value	1 - 7
Actual value (only PASO-Version)	In the "On Line Mode", the actual pressure/flow will be displayed here.	
Preset value	The target pressure/flow.	dependent on the adjusted actual value resolution
Stop time	Define the waiting time on the reached pressure/flow before the system moves to the next pressure/flow. This field is only active if the field "Profile end" is not active.	0 ... 10s 0.1s
Dig. output 'Pressure/flow reached'	If this field is set, the output "Pressure/flow reached" will be active when the system reached the target pressure/flow. If this filed is not set, the output "Pressure/flow reached" will not be acitve when the system reached the target pressure/flow.	set not set
Profile end	If this field is active, the stop time will be endless, i.e. the system stays an the current pressure/flow until a new fixed preset value will be selected	
Direct control on/off	If the direct control is off, the adjustments in this window has no direct influence on the system. If the direct control is on, the system will stay on the current pressure/flow until the button "Start" will be set. In the version with display/keys or multi-function terminal resp. PC-Terminalsoftware TESO, the system will move to the current profil pressure/flow immediately if the direct control is set to active.	PASO-Version: on off Display/keys or MTG02 resp. TESO-Version: start stop
Direct control Start/Stop (only PASO-Version)	With activating the button "Start", the system will move to the current profil pressure/flow and the label of the button will change to "Stop". With activating the button "Stop", the system will stay on the current pressure/flow and the label of the button will change to "Start".	Start Stop

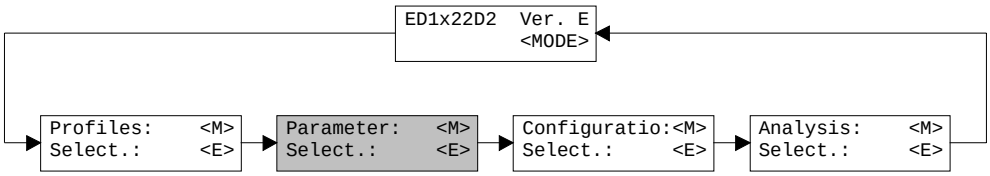
Profile with stop time without ramp time



Profile with stop time with ramp time



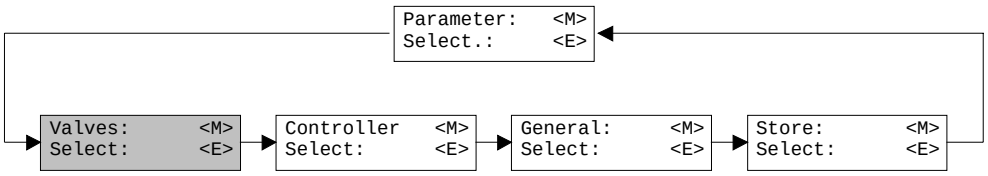
7.7 Parameters - Menu



In this window, all parameter values of the Pressure/Flow controller will be made.

In the version with display/keys or multi-function terminal resp. PC-Terminalsoftware TESO, a password question appears. Input the value "9" in succession as the password.

7.7.1 Parameters_Valves

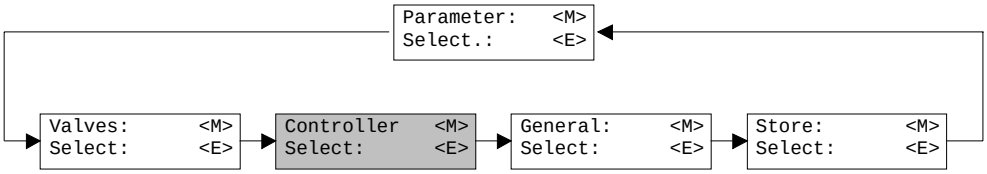


In this window, all settings specific to the valves will be made.

Field	Parameter description	Range / Step
Actual value (only PASO-Version)	In the "On Line Mode", the actual pressure/flow will be displayed here.	
Direct solenoid operation	If this switch is selected, an internal preset value from 0% resp. 100% will be active during the setting of the Imin resp. Imax.	
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 Pressure/Flow controller (only PASO-Version). If the switch "Direct solenoid operation" is selected, 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 in the "On Line Mode"). As a result of the digitalisation, the numbers entered max be modified to less "rounded-off" number.	
Imin A	Set minimum solenoid current A.	0 ... 950mA 2mA
Imax A	Set maximum solenoid current A.	0 ... 1800mA 2mA
Imin B	Set minimum solenoid current B.	0 ... 950mA 2mA
Imax B	Set maximum solenoid current B.	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

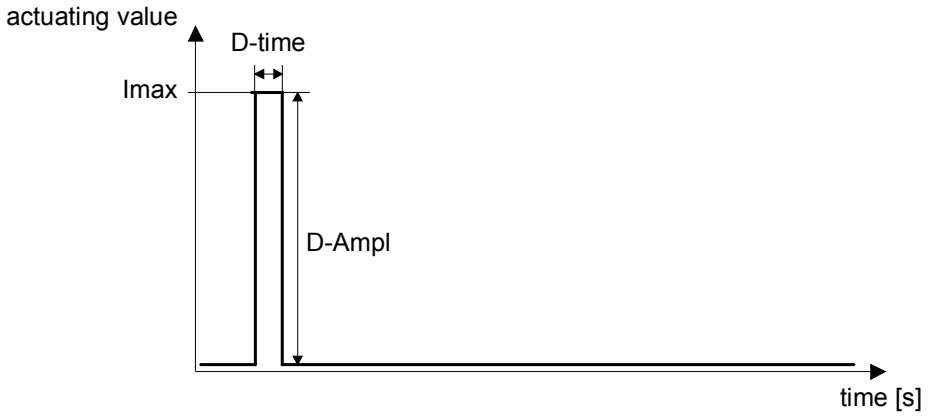
7.7.2 Parameters_Controller



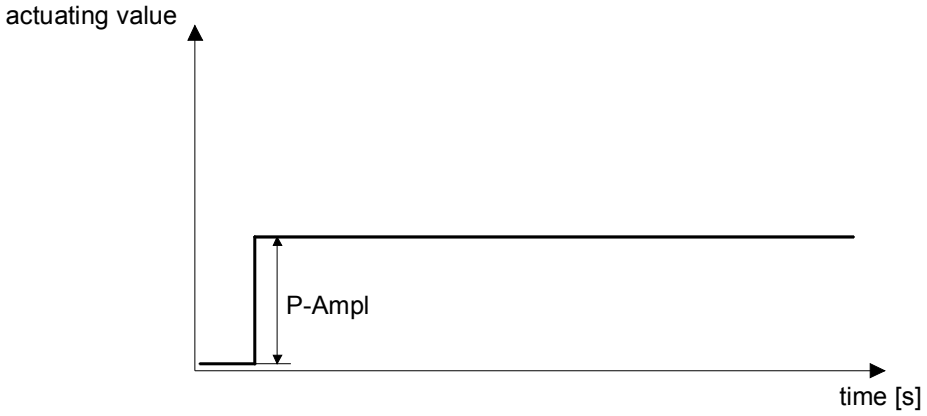
In this window, all settings specific to the controller will be made.

Field	Parameter description	Range / Step
Positive	The controller characteristics for the positive side can be adjusted here. Positive side = positive control deviation	
Negative	The controller characteristics for the negative side can be adjusted here. Negative side = negative control deviation	
P-Ampl.	Amplification (proportional coefficient) of the P-control (see below picture). If the P-Ampl. is set to 0, the P-control ist switched off.	0.1 ... 25.0 0.1
I-Window	Inside this window, the integrator is switched on. Outside this window, the controller is working as a real P- resp. PD-controller.	dependent on the adjusted actual value resolution
I-Time	Reaction time of the I-control (see below picture). If the time is set to 0s, the I-control is switched off	0.00 ... 10.00s 0.01s
D-Ampl.	Amplification of the D-control (see below picture).	0.01 ... 10.00 0.01
D-Time	Reaction time of the D-control (see below picture). If the time is set to 0s, the D-control is switched off	0.00 ... 10.00s 0.01s
Symmetric adjustment (only PASO-Version)	If this switch is selected, the inputed values from the positive resp. negative side will be taken over automatically for the negative resp. positive side.	

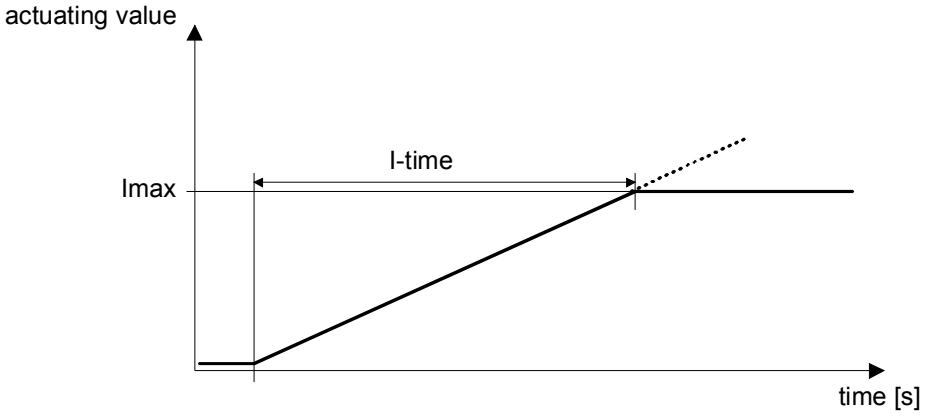
The following pictures show the transient response of the output signal with a jump of the input signal from 0 ... 100%



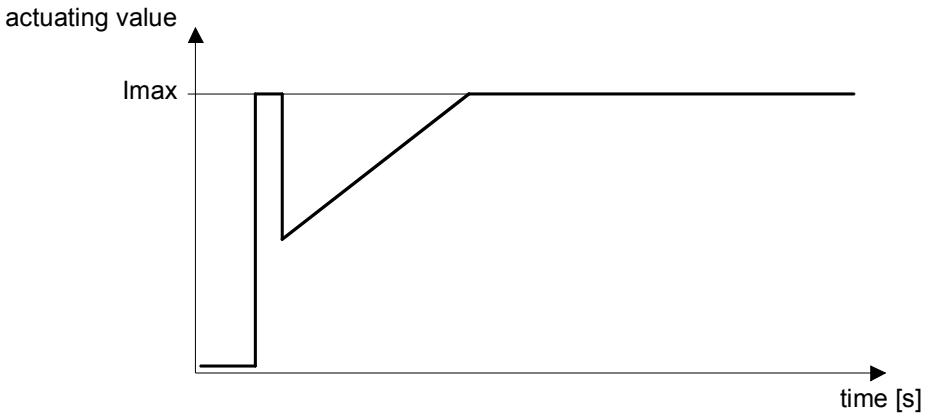
D-control



P-control

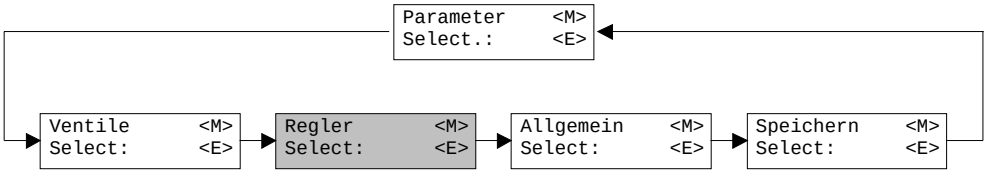


I-control



PID-control

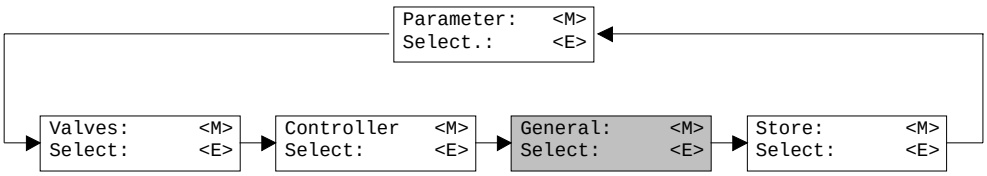
7.7.3 Parameter_Ramps



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

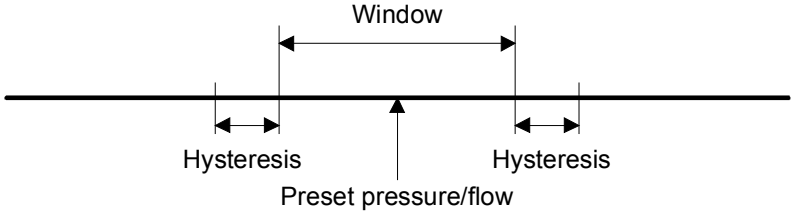
Field	Parameter description	Range / Step
Ramp +	Ramptime for a positive preset changing (pressure/flow increase)	0.00 ... 51.00s 0.05s
Ramp -	Ramptime for a negative preset changing (pressure/flow decrease)	0.00 ... 51.00s 0.05s

7.7.4 Parameter_General



In this window, all general adjustments for the controller will be made.

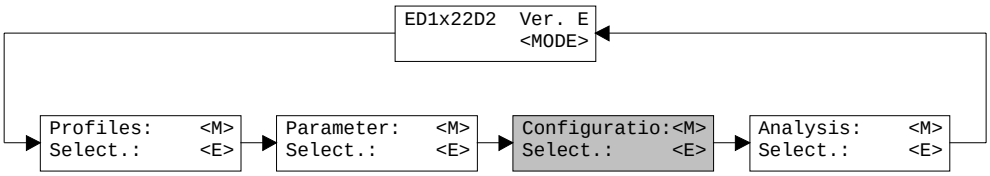
Field	Parameter description	Range / Step
Window	If the control deviation is inside this window, the output "Pressure/flow reached" and the yellow LED will be set to active.	dependent on the adjusted actual value resolution
Window hysteresis	Is on the border of the window. Prevents a fast switch on/off on transition (swing).	dependent on the adjusted actual value resolution
Dig. output 'Pressure/flow reached'	If this field is set, the output "Pressure/flow reached" will be active when the target pressure/flow is reached. If this filed is not set, the output "Pressure/flow reached" will not be acitve when the.	set not set
Controller	Select the desired controller function	off on external
System control	The system control can be inverted. This correspond to the exchange from solenoid A and solenoid B.	invert not invert



The following parameters are only active if the controller type is set to "Pressure reducing control with throttle valves for clamping function".

Field	Parameter description	Range / Step
Current Forward	Current value for the solenoid of loading valve, if the digital input "Forward" is set. The %-value correspond to the adjusted Imin and Imax values from the loading valve.	0.0 ... 100.0% 0.1%
Pressure Threshold	Pressure thresehold where the controller will switch on again if the digital input "Forward" is set. The %-value correspond to the current preset value.	0.0 ... 100.0% 0.1%
Current Backward	Current value for the solenoid of unloading valve, if the digital input "Forward" is set. The %-value correspond to the adjusted Imin and Imax values from the unloading valve.	0.0 ... 100.0% 0.1%

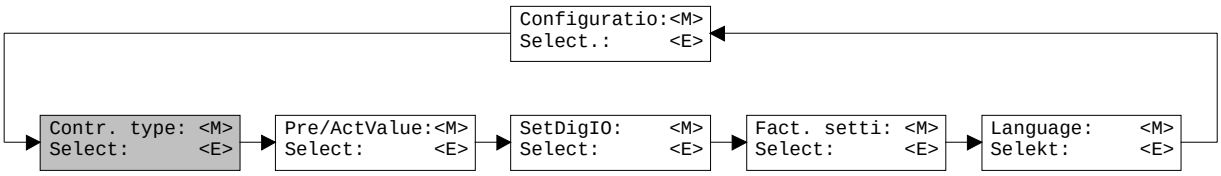
7.8 Configuration - Menu



In this window, the settings of the function of the Pressure/Flow controller will be made.

In the version with display/keys or multi-function terminal resp. PC-Terminalsoftware TESO, a password question appears. Input the value "9" in succession as the password.

7.8.1 Configuration_Controller type



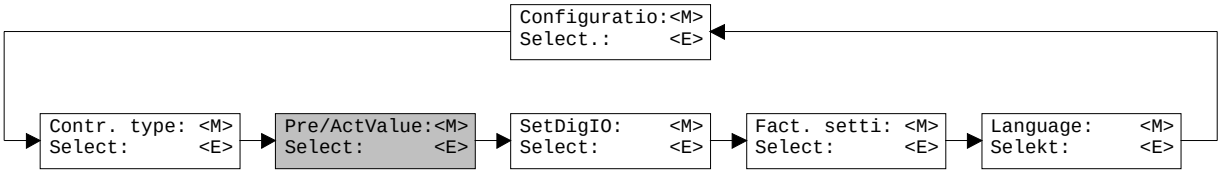
In this window, all settings specific to the controller type will be made.

Field	Parameter description	Range / Step
Controller type	Select the desired controller type. In the PASO-version, a corresponding function schematic will be displayed below the switch. In the version with display/keys or multi-function terminal resp. PC-Terminalsoftware TESO, only the number written in the parenthesis will be displayed. Refer to the section "Description of the Function" for an exact description of all controller types. ● Pressure relief control with throttle valve ● Pressure reducing control with throttle valve ● Pressure relief control with pressure relief valve ● Pressure reducing control with pressure reducing valve ● 3-way flow control with throttle valve ● 2-way flow control with throttle valve ● Pressure reducing control with throttle valves for clamping function	 0 1 2 3 4 5 6
Default	With this switch, the default values from the section "Additional settings" for the selected controller type will be loaded. These values will be send to the card automatically.	
Loading valve	Here the selection can be made if the loading valve is an normally open or a normally closed valve. The symbol in the function schematic will be updated automatically. With the controller type "Pressure relief control with pressure relief valve" and "Pressure reducing control with pressure reducing valve", the selection can be made if the used valve has a normal function or an inverse function.	Normally open Normally closed not invert invert

Unloading valve	Here the selection can be made if the loading valve is an normally open or a normally closed valve. The symbol in the function schematic will be updated automatically.	Normally open Normally closed

System control	The system control can be inverted. This correspond to the exchange from solenoid A and solenoid B.	invert not invert
Imin always active	Here the selection can be made if the Imin is always active or not. With the controller type "Pressure reducing control with throttle valves", this switch should be always active. With it, the overlap between load and unload can be eliminated.	yes no
Factor preset value offering	With the controller types "Pressure relief control with pressure relief valve" and "Pressure reducing control with pressure reducing valve", a preset value offering can be adjusted here. This preset value offering achieves that the preset and actual value will be more or less the same also by "controller off". By that, the controller has to control by "controller on" only the effective controller deviation.	0.0 ... 10.0 0.1

7.8.2 Configuration_Preset/Actual value signals



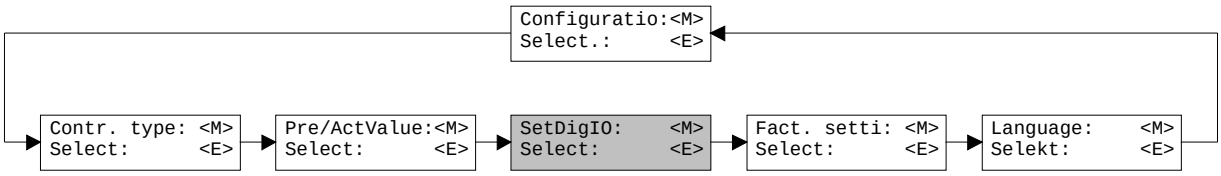
In this window, the signal types of the preset and actual value will be set and the cross reference of the analog inputs will be made.

Field	**Parameter description**	**Range / Step**
Controller	Select the desired controller function	off on external
Displayed unit	In this ring menu, the displayed unit can be selected. In all program windows, the travel distance will be indicated in accordance with this setting. Controller type = pressure control Controller type = flow control	 bar psi kN l/min m/s 1/Min inch/s
Input Signal	Here the selection is possible, if the following settings should be for the analog input for the preset value or for the actual value.	Preset value Actual value
Signal type	Select the desired signal type.	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.	AnaInp1 [V] AnaInp2 [mA] AnaInp3 [V] AnaInp4 [mA]
Inversion	The analog input value can be inverted.	no yes
Cablebreak detection	Switch on/off the cablebreak detection of the analog input signal	no yes
Offset measuring system	The zero position of the actual value can be adjusted here. The adjusted value will be subtracted from the actual value. (refer to section "Scaling" page "25")	±50% from the selected signal type
Resolution	Serves for the scaling of the preset and actual value. Maximum working range / actual value signal range = resolution actual value Desired working range / preset value signal range = resolution preset value (refer to section "Scaling" page "25")	0.001 ... 999.999 0.001

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

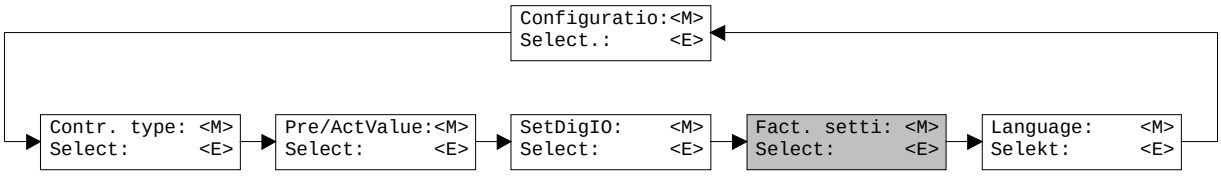
7.8.3 Configuration_Digital I/O



With this command, the digital inputs and outputs of the connected Pressure/Flow controller 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
Digital outputs	Set digital input with software Reset digital input with software The digital output is driven by the running program	1 0 X

7.8.4 Configuration_Default setting



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

7.8.5 Configuration_Interface (only PASO-Version)

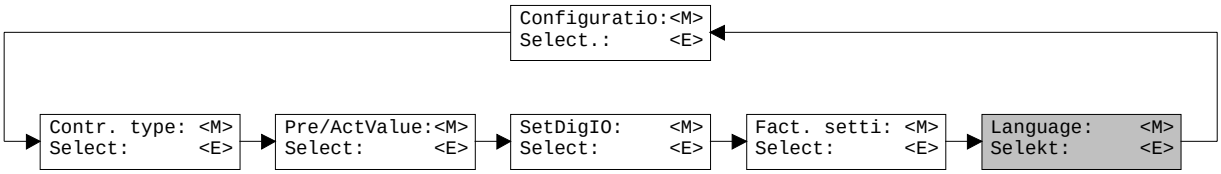
With this command, the serial output port for the communication with the connected control card can be selected. This setting is automatically saved in the file “konfig.kon” and taken over with a new start.

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

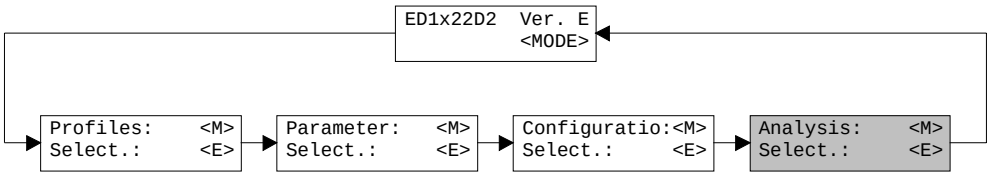
7.8.6 Configuration_Language



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.

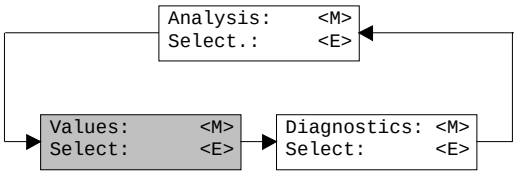
Field	Parameter description	Range / Step
Language	Field, from which the desired language can be selected.	deutsch english français

7.9 Analysis - Menu



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

7.9.1 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
Preset value	current preset position	Displayed unit
Actual value	current actual position	Displayed unit
Control deviation	current control deviation	Displayed unit
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

7.9.2 Analysis_Signal Recording (only PASO-Version)

In the menu "Analysis_Signal Recording" different signals of the connected card can be recorded and analyzed. Not all card types do support Signal Recording. In "On Line Mode" the availability also is dependent on the card software version. If Signal Recording is not supported, the menu "Analysis_Signal Recording" is dimmed.

Configuration and performance of the connected card determine which signals can be recorded. The selection is made in the menu "Signal Assignment", which can be activated by clicking on the key "Signal Assignment" (see below).
In "Off-Line Mode" signal recording is not possible, however the recording parameters can still be set ("Signal Assignment").

For each measuring channel (maximum 4 channels) up to 250 measuring values will be recorded. The sampling rate consequently is determining the maximum recording time: sampling rate times number of measuring values. Some card types may have a different distribution of channels and total number of values. The minimal sample time is 5 ms. As first measuring value is sampled on time zero (start), the last measuring value is sampled one sample time before end of measuring span.

The recording parameters, signal type, sampling rate, etc., are saved on the card together with the parameters, as well as on hard disk, when saving into file.
The recorded measuring values will **not** be saved with the parameters, however there exists an export possibility (Key "Export").

The time cursors allows you to show the measurement values for each recording sample.

The recorded measuring values will be lost by changing "Off-Line" / "On-Line" mode, or by leaving PASO.

Field	Description	Range
Signal graph	Switching on the controls makes visible the recorded plots of the corresponding channels	
Time cursor	Positioning the time cursor using the input control Time [s] or by moving the slide control below the graphics	0 up to measuring span (see description in text)
Signal Assignment	Opens the menu " Signal Assignment" (see below)	
New	Possible recording data will be lost and the connected card is standby for a new recording	
Start/Stop	**Start** A new recording will be started. On trigger event the signal recording is active (showing the field "Recording" blinking) and the measuring data are transmitted If there are already measuring data in memory, recording will continue from this point. If the maximum number of measuring values is recorded, eventually remaining data will be transmitted (plots will continue actualizing). During transmission the plots can already been analyzed ("Signal graph", "Auto Scaling"). **Stop** Stops the data transmission and signal recording. At this point recording can be continued by actuating the "Start" key. If the maximum number of measuring values is read, or in case of "Off-Line" operation the "Start" key is dimmed.	Start / Stop

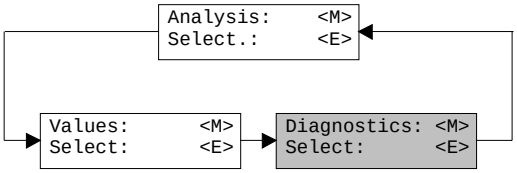
Export	By actuating this key recording data will be saved on hard disk. The used format is a text format with tabs as separators to enable an easy import into another program (e.g. Excel) The numbers decimal sign is chooseable: point or comma.	
Autoscaling	By means of this key data plots in the signal graph will be showed in optimized presentation. Optimizing is only executed on the visible plots. "Scaling" and "Offset" of the corresponding channels (see "Signal Assignment") will be modified automatically. Autoscaling is also possible during signal recording.	
Close	By actuating this key the signal recording menu will be left. Eventual signal recording data will be retrieved and can be made visible by opening the menu again.	

Menu Signal Assignment
In this submenu, which can be opened by actuating the "Signal Assignment" key, you make a choice of the signals you want to record.

13. Up to 4 channels are provided, which can be made active for signal recording.
14. Under "Signal" you choose for each channel the signal type to be recorded.
15. Under "Supplementary" you can specify the desired signal, if necessary.
16. Under "Trigger" you can indicate the desired trigger channel, as well as trigger slope and level.
17. Under "Sample Time" you can select the recording sample time (range 0.005..60 s, as a multiple of 5 ms).
18. Signal plot representation is controlled by the inputs in "Scale/div" and "Offset".
19. Leaving the menu with OK
    If there has been modifications under 1-5, eventual recording data will be deleted (as well as the graph plots).
20. Leaving the menu with Cancel
    Eventual changes will be discarded.

The plot parameters "Scale/div" and "Offset" are saved on connected card together with the parameters.

7.9.3 Analysis_Diagnostic



With this command, possibly present errors on the connected Pressure/Flow controller 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.

Diagnostics:	Error	Error remedy
Power supply fault	If the supplied voltage < 18VDC. the solenoid outputs are blocked.	Disable and reenable the control
Cable break supply	This error is only detected, if the parameter "Cablebreak detection" is set to "yes". The power supply and/or the ground of the preset generator is interrupted. The solenoid outputs are blocked.	Disable and reenable the control
Cable break input X	This error is only detected, if the parameter "Cablebreak detection" is set to "yes". The preset value signal to the controller is interrupted. The corresponding solenoid output is blocked.	Disable and reenable 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

7.10 Help - Menu (only PASO-Version)

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

7.10.1 Help_Description of the function

A general information about the function of the Pressure/Flow controller will be displayed.

7.10.2 Help_Contents

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

7.10.3 Help_Index

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

7.10.4 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 Pressure/Flow controller will be read and displayed.

7.10.5 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.

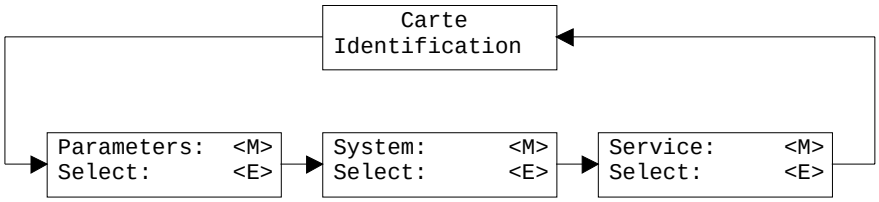
8.1 Procedure

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

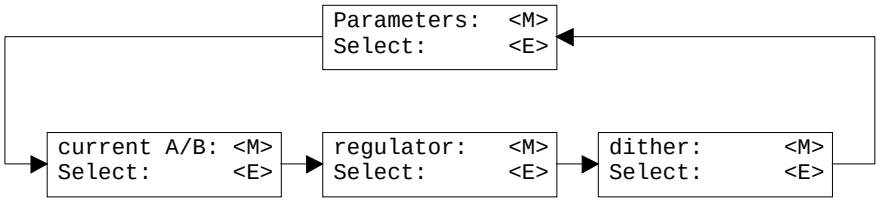
Question:	Action:	Possible errors and causes
Green LED off		● The 24VDC supply is not switched on ● The 24VDC supply is wrongly or not connected ● If the supply voltage value is between 21VDC and 30VDC, the supply is correct
Red LED on	Analysis_Values Power supply error	● The supplied voltage is under 18VDC. The error is also displayed if a supplied voltage interruption occurred (t > 250ms). ● Is the supplied power enough? ● Is the AC voltage too high (refer to section "Electrical specifications" page 4) ● When the error is cleared, disable the controller for a short period and re-enable (DigInp 3)
	Analysis_Diagnostic Cablebreak supply	● If the preset value encoder is a potentiometer, the supply is absent ● The ground connection of the potentiometer is not connected to the connector strip. ● Check connections to the potentiometer ● If the cablebreak detection is not desired, switch off the Cablebreak detection function in the menu "Configuration". ● When the error is cleared, disable the controller for a short period and re-enable (DigInp 3)
	Analysis_Diagnostic Cable break input X	● The cable break detection functions only with potentiometer or 4 ... 20mA preset value. ● The preset value signal is absent or is smaller than 4mA. ● Check the preset value signal connections between the preset value encoder and card. ● If the cablebreak detection is not desired, switch off the Cablebreak detection function in the menu "Configuration". ● When the error is cleared, disable the controller for a short period and re-enable (DigInp 3).
	Analysis_Diagnostic Memory XX	● Error in verifying EPROM-RAM data. ● Error has occurred while writing to or reading from the EPROM. ● If fault occurred while storing, store again, then switch card off and on. ● If fault occurred when card was switched on, store parameter, then switch card off and on.

9 Cyclic menu construction

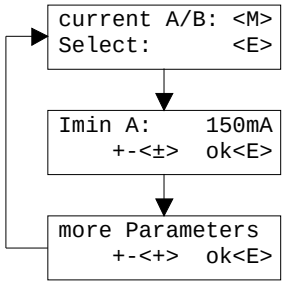
The operation via the display/keys or the multi-function terminal MTG02 resp. the PC-Terminalsoftware TESO is in the form of a cyclic menu structure.



To move through the cyclic menu, press the key "MODE". All existing menu items are listed in the section "Settings" page 24 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 24 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 24 with the column "Field".

The detailed description of all commands and parameters is located in the section "Settings" page 24 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 => 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 => 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 41.

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 transfered. 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 transfered.

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	A key executes the action, with which it is inscribed. Actuation of a key through the keyboard: ● Push the key TAB, until the key becomes active. ● Push the key ENTER. The action is now carried out. ● Push the key ALT and the underlined letter of the key inscription: The action is carried out immediately. Actuation of a key with the mouse: ● Click on the corresponding key. The action is now carried out.
Switch	By means of a switch, a selection between two possibilities is possible. A switch is either switched on or - off. Actuation of a switch through the keyboard: ● Push the keys UP or HOME to switch on the switch. ● Push the keys DOWN or END to switch off the switch. ● Push the SPACE key for changing over (switching over). Actuation of a switch with the mouse: ● Click on the switch for changing over (switching over).
Input field	The input fields enable the entering of numbers or text. All applicable keys of the keyboard are allowed, including the keys HOME, END, LEFT, RIGHT. In certain cases when taking it over, the input is checked and if necessary an error message is issued. Actuation of an input field through the keyboard: ● Push the key ENTER or TAB to finish with the input field. ● In the case of input fields with ARROW keys UP and DOWN: Actuation of the UP-/DOWN - keys for the step by step changing of the values. Actuation of an input field with the mouse: ● Click within the input field, in order to position the cursor in it. ● In the case of input fields with ARROW keys UP and DOWN: Click on the corresponding arrow for the step by step changing of the values.
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.

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 int 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 52). 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

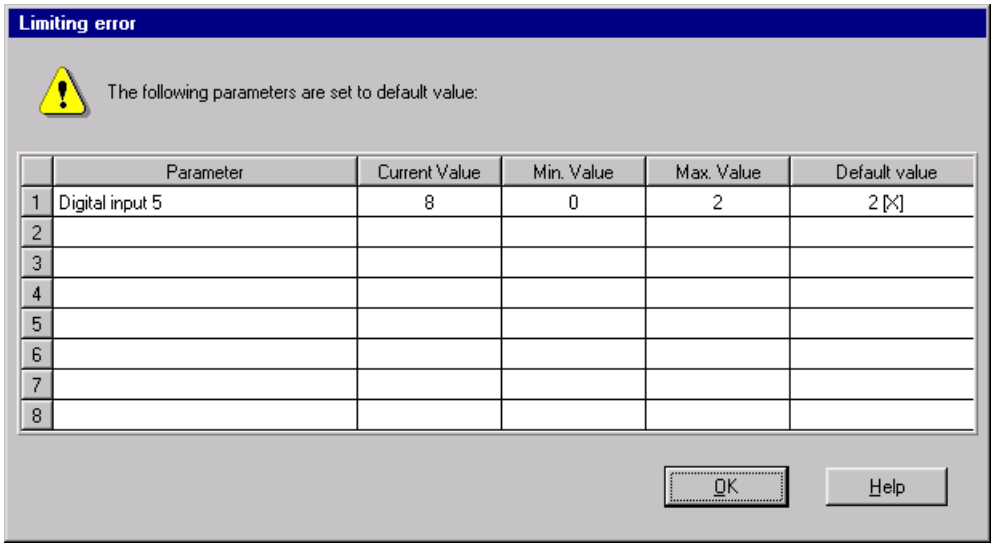
Each new input value is immediately transferred to the connected controller card after the completion of the input field (either by pushing the key ENTER or by activating another input field).

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 24.

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

A Setting instruction

A.1 Pressure relief control with throttle valve

- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch off the controller (position "off")
- In the menu "Configuration_Controller type" with "Controller type" select the controller type "Pressure relief control with throttle valve
- In the menu "Configuration_Controller type" press the button "Default". In this case, all values from this window will be set to default values.
- In the menu "Configuration_Preset/Actual value signals" with "Used input" select the corresponding inputs for the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Signal type" select the input range of the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Resolution" adjust the ratio between the actual value signal and the pressure sensor range
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Offset" adjust the offset from the actual signal if necessary
- In the menu "Configuration_Preset/Actual value signals" with "Preset value_Resolution" adjust the ratio between the preset value signal and the working range
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch on the direct solenoid operation
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin A" adjust the minimum current in the case, that the maximum pressure will be active
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax A" adjust the maximum current in the case, that the minimum pressure will be active
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch off the direct solenoid operation
- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch on the controller (position "on" or "external", if the digital input 4 "Controller off" is connected)
- In the menu "Parameters_Regulator" you can adjust now the desired values for the controller characteristic with the P-, I- and D-values.

A.2 Pressure reducing control with throttle valves

- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch off the controller (position "off")
- In the menu "Configuration_Controller type" with "Controller type" select the controller type "Pressure reducing control with throttle valve
- In the menu "Configuration_Controller type" press the button "Default". In this case, all values from this window will be set to default values.
- In the menu "Configuration_Preset/Actual value signals" with "Used input" select the corresponding inputs for the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Signal type" select the input range of the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Resolution" adjust the ratio between the actual value signal and the pressure sensor range
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Offset" adjust the offset from the actual signal if necessary
- In the menu "Configuration_Preset/Actual value signals" with "Preset value_Resolution" adjust the ratio between the preset value signal and the working range
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch on the direct solenoid operation
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin A" adjust the minimum current for the loading valve in the case, that the pressure will increase slowly
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax A" adjust the maximum current for the loading valve in the case, that the pressure will increase fast
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin B" adjust the minimum current for the unloading valve in the case, that the pressure will decrease slowly
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax B" adjust the maximum current for the unloading valve in the case, that the pressure will decrease fast
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch off the direct solenoid operation
- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch on the controller (position "on" or "external", if the digital input 4 "Controller off" is connected)
- In the menu "Parameters_Regulator" you can adjust now the desired values for the controller characteristic with the P-, I- and D-values.

A3 Setting instructions for pressure reducing control with throttle valves for clamping function

- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch off the controller (position "off")
- In the menu "Configuration_Controller type" with "Controller type" select the controller type "Pressure reducing control with throttle valve
- In the menu "Configuration_Controller type" press the button "Default". In this case, all values from this window will be set to default values.
- In the menu "Configuration_Preset/Actual value signals" with "Used input" select the corresponding inputs for the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Signal type" select the input range of the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Resolution" adjust the ratio between the actual value signal and the pressure sensor range
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Offset" adjust the offset from the actual signal if necessary
- In the menu "Configuration_Preset/Actual value signals" with "Preset value_Resolution" adjust the ratio between the preset value signal and the working range
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch on the direct solenoid operation
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin A" adjust the minimum current for the loading valve in the case, that the pressure will increase slowly
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax A" adjust the maximum current for the loading valve in the case, that the pressure will increase fast
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin B" adjust the minimum current for the unloading valve in the case, that the pressure will decrease slowly
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax B" adjust the maximum current for the unloading valve in the case, that the pressure will decrease fast
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch off the direct solenoid operation
- In the menu "Parameters_General" with "Current forward" adjust the current value for the solenoid of loading valve, if the digital input "Forward" is set
- In the menu "Parameters_General" with "Pressure threshold" adjust the rressure thresehold where the controller will switch on again if the digital input "Forward" is set
- In the menu "Parameters_General" with "Current backward" adjust the current value for the solenoid of unloading valve, if the digital input "Forward" is set
- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch on the controller (position "on" or "external", if the digital input 4 "Controller off" is connected)
- In the menu "Parameters_Regulator" you can adjust now the desired values for the controller characteristic with the P-, I- and D-values.

A.4 Pressure relief control with pressure relief valve

- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch off the controller (position "off")
- In the menu "Configuration_Controller type" with "Controller type" select the controller type "Pressure relief control with pressure relief valve
- In the menu "Configuration_Controller type" press the button "Default". In this case, all values from this window will be set to default values.
- In the menu "Configuration_Preset/Actual value signals" with "Used input" select the corresponding inputs for the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Signal type" select the input range of the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Resolution" adjust the ratio between the actual value signal and the pressure sensor range
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Offset" adjust the offset from the actual signal if necessary
- In the menu "Configuration_Preset/Actual value signals" with "Preset value_Resolution" adjust the ratio between the preset value signal and the working range
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch on the direct solenoid operation
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin A" adjust the minimum current in the case, that the maximum pressure will be active
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax A" adjust the maximum current in the case, that the minimum pressure will be active
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch off the direct solenoid operation
- In the menu "Analysis_Values" calculate the ratio between the displayed preset value and the displayed actual value (preset value / actual value). Because of the not really linear characteristic of the pressure valves, this factor will not be the same for the whole range. Because of this, this setting should be made in the working range of the controller.
- In the menu "Configuration_Controller type" with "Factor preset value offering" enter the factor you have calculated above
- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch on the controller (position "on" or "external", if the digital input 4 "Controller off" is connected)
- In the menu "Parameters_Regulator" you can adjust now the desired values for the controller characteristic with the P-, I- and D-values.

A.5 Pressure reducing control with pressure reducing valve

- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch off the controller (position "off")
- In the menu "Configuration_Controller type" with "Controller type" select the controller type "Pressure reducing control with pressure reducing valve
- In the menu "Configuration_Controller type" press the button "Default". In this case, all values from this window will be set to default values.
- In the menu "Configuration_Preset/Actual value signals" with "Used input" select the corresponding inputs for the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Signal type" select the input range of the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Resolution" adjust the ratio between the actual value signal and the pressure sensor range
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Offset" adjust the offset from the actual signal if necessary
- In the menu "Configuration_Preset/Actual value signals" with "Preset value_Resolution" adjust the ratio between the preset value signal and the working range
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch on the direct solenoid operation
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin A" adjust the minimum current in the case, that the minimum pressure will be active
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax A" adjust the maximum current in the case, that the maximum pressure will be active
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch off the direct solenoid operation
- In the menu "Analysis_Values" calculate the ratio between the displayed preset value and the displayed actual value (preset value / actual value). Because of the not really linear characteristic of the pressure valves, this factor will not be the same for the whole range. Because of this, this setting should be made in the working range of the controller.
- In the menu "Configuration_Controller type" with "Factor preset value offering" enter the factor you have calculated above
- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch on the controller (position "on" or "external", if the digital input 4 "Controller off" is connected)
- In the menu "Parameters_Regulator" you can adjust now the desired values for the controller characteristic with the P-, I- and D-values.

A.6 3-way flow control with throttle valve

- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch off the controller (position "off")
- In the menu "Configuration_Controller type" with "Controller type" select the controller type "3-way flow control with throttle valve
- In the menu "Configuration_Controller type" press the button "Default". In this case, all values from this window will be set to default values.
- In the menu "Configuration_Preset/Actual value signals" with "Used input" select the corresponding inputs for the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Signal type" select the input range of the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Resolution" adjust the ratio between the actual value signal and the flow sensor range
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Offset" adjust the offset from the actual signal if necessary
- In the menu "Configuration_Preset/Actual value signals" with "Preset value_Resolution" adjust the ratio between the preset value signal and the working range
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch on the direct solenoid operation
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin A" adjust the minimum current in the case, that the maximum flow will be active
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax A" adjust the maximum current in the case, that the minimum flow will be active
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch off the direct solenoid operation
- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch on the controller (position "on" or "external", if the digital input 4 "Controller off" is connected)
- In the menu "Parameters_Regulator" you can adjust now the desired values for the controller characteristic with the P-, I- and D-values.

A.7 2-way flow control with throttle valve

- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch off the controller (position "off")
- In the menu "Configuration_Controller type" with "Controller type" select the controller type "2-way flow control with throttle valve
- In the menu "Configuration_Controller type" press the button "Default". In this case, all values from this window will be set to default values.
- In the menu "Configuration_Preset/Actual value signals" with "Used input" select the corresponding inputs for the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Signal type" select the input range of the preset- and actual value signals.
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Resolution" adjust the ratio between the actual value signal and the flow sensor range
- In the menu "Configuration_Preset/Actual value signals" with "Actual value_Offset" adjust the offset from the actual signal if necessary
- In the menu "Configuration_Preset/Actual value signals" with "Preset value_Resolution" adjust the ratio between the preset value signal and the working range
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch on the direct solenoid operation
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imin A" adjust the minimum current in the case, that the minimum flow will be active
- In the menu "Parameters_Valves" with "Prop. Valve settings_Imax A" adjust the maximum current in the case, that the maximum flow will be active
- In the menu "Parameters_Valves" with "Direct solenoid operation" switch off the direct solenoid operation
- In the menu "Configuration_Preset/Actual value signals" with "Controller" switch on the controller (position "on" or "external", if the digital input 4 "Controller off" is connected)
- In the menu "Parameters_Regulator" you can adjust now the desired values for the controller characteristic with the P-, I- and D-values.

B Parameter Setting

Parameters	Default setting	Customer setting 1	Customer setting 2
Profile pressure 1 - 7	0bar		
Stop time 1 - 7	0s		
Output 'Pressure reached' 1 - 7	set		
Imin solenoid A	150mA		
Imax solenoid A	700mA		
Imin solenoid B	150mA		
Imax solenoid B	700mA		
Frequency	100Hz		
Level	100mA		
P-Ampl positive	1		
I-Time positive	0.00s		
I-Window positive	0.00bar		
D-Ampl positive	1.00		
D-Time positive	0.00s		
P-Ampl negative	1		
I-Time negative	0.00s		
I-Window negative	0.00bar		
D-Ampl negative	1.00		
D-Time negative	0.00s		
Ramp +	0.00s		
Ramp -	0.00s		
Window	1bar		
Window hysteresis	1bar		
Output 'Pressure reached'	set		
Controller	external		
System control	not invert		
Controller type	Pressure reducing with throttle valves		
Loading valve	Normally closed		
Unloading valve	Normally closed		
Imin always active	yes		
Factor preset value offering	0.0		
Displayed unit	bar		
Signal type preset value	0 ... 10VDC		
Used input preset value	AnaInp1 [V]		
Inversion preset value	no		
Cablebreak detection preset value	no		
Resolution preset value	10bar/V		
Signal type actual value	0 ... 10VDC		
Used input actual value	AnaInp [V]		
Inversion actual value	no		
Cablebreak detection actual value	no		
Offset actual value	0.00bar		
Resolution actual value	10bar/V		
Digital input 1 - 8	X		
Digital output 1 - 2	X		