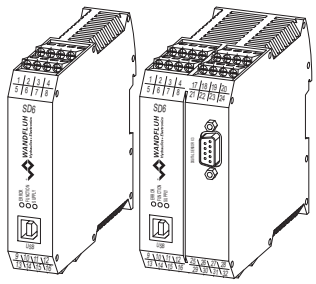
## Digital Controller Module SD6

- **For positional-, pressure- and volume flow controlling**
- **Interface: - analogue**
  **- programmable**
  **- Profibus DP**
- **Analogue or SSI sensors for the actual value feedback**
- **Integrated final power stage**
- **Adjustment and diagnostics via PC**
- **Signal recording**



### DESCRIPTION

Digital controller module for top-hat rail installation for driving proportional valves with two solenoids. The controller serves to control a predefined pressure, volume flow or a position. The parameterisation takes place by means of the menu-controlled parameterisation and diagnostics software «PASO» of Wandfluh (USB-interface). The module is available as a basic controller and as an enhanced controller.

### CONTENT



### FUNCTION

The set-point position is predefined externally (e.g. with a potentiometer). In case of the enhanced controller, it is additionally possible to predefine the set-point position by means of freely adjustable travel profiles. As actual value transmitters, it is possible to connect analogue (in case of the enhanced controller also digital-) measuring systems directly to the controller module. The basic controller has a 10-bit, the enhanced controller a 16-bit resolution.

### APPLICATION

As a snap-on module, the electronics card is mainly used in the industrial field. The module can be installed on top-hat rails. Thanks to several digital inputs and outputs, it is possible to connect the controller module to a superordinate machine control system. With the enhanced controller, valves with integrated amplifier (e.g. DSV) can be driven.

### TYPE CODE

S D6 3 ☐ 2 ☐ ☐ ☐ - ☐ ☐ # ☐

Module for electrical control cubicle

Digital

Parameters to be set with PASO

Software configuration (function of card):
- Basic-controller 3
- Enhanced-controller 6

2-solenoid version

Supply voltage:
- 24 VDC D2
- 12 VDC D3

Digital controller module Basic:
- Analogue input 1: voltage; Analogue input 2: current 0
- Analogue input 1 and 2: both voltage 1
- Analogue input 1 and 2: both current 2

Digital controller module Enhanced:
- Analogue input 1 and 3: both voltage 4
- Analogue input 2 and 4: both current
- Analogue input 1 to 4: all voltage 5
- Analogue input 1 to 4: all current 6

Digital controller modul Basic:
- Analogue input 1 und 2: 10-Bit resolution A

Digital controller modul Enhanced:
- Analogue input 1 and 2: 10-Bit resolution B
  Analogue input 3 and 4: 16-Bit resolution

Option field bus:
- without field bus (with analogue input signal) A
- with Profibus DP B

Design-Index (Subject to change)

### GENERAL SPECIFICATIONS

| | |
|---|---|
| Execution | Module for electrical control cubicle, housing made of plastic |
| Dimensions: | |
| • Digital controller module Basic: | 105 x 114 x 22,5 mm (see dimensions) |
| • Digital controller module Basic with Profibus DP: | 105 x 114 x 45 mm (see dimensions) |
| • Digital controller module Enhanced: | 105 x 114 x 45 mm (see dimensions) |
| Installations | for 35 mm dome rail acc. to EN 60715 |
| Weight: | |
| • Digital controller module Basic / with Profibus: | 130 g / 220 g |
| • Digital controller module Enhanced / with Profibus: | 220 g / 240 g |
| Connections | Screw terminals, max. cable cross-sections 2,5 mm² |
| Working temperature | -20…+60 °C |

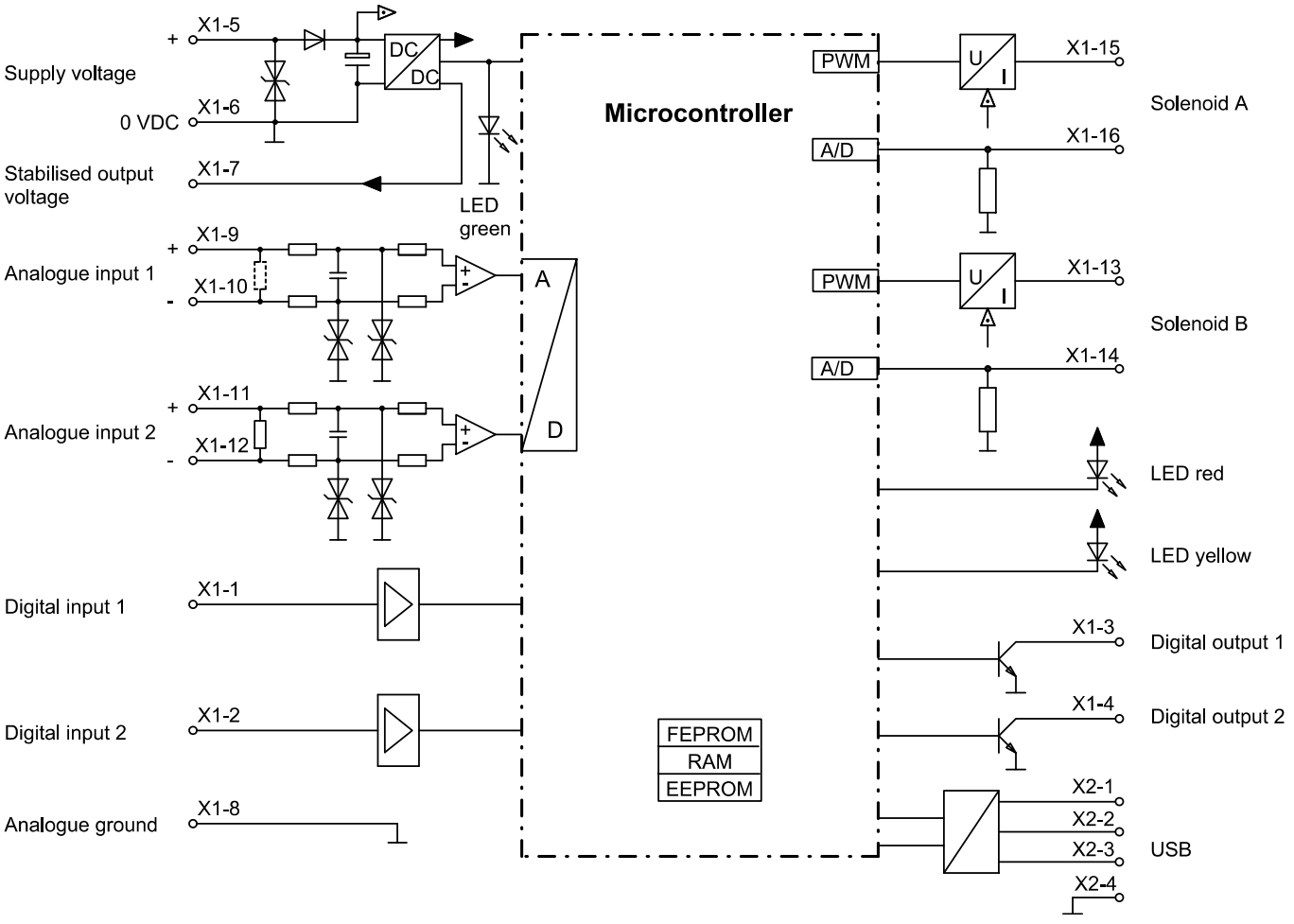
# Controller Module Basic with analogue interface

## ELECTRICAL SPECIFICATIONS

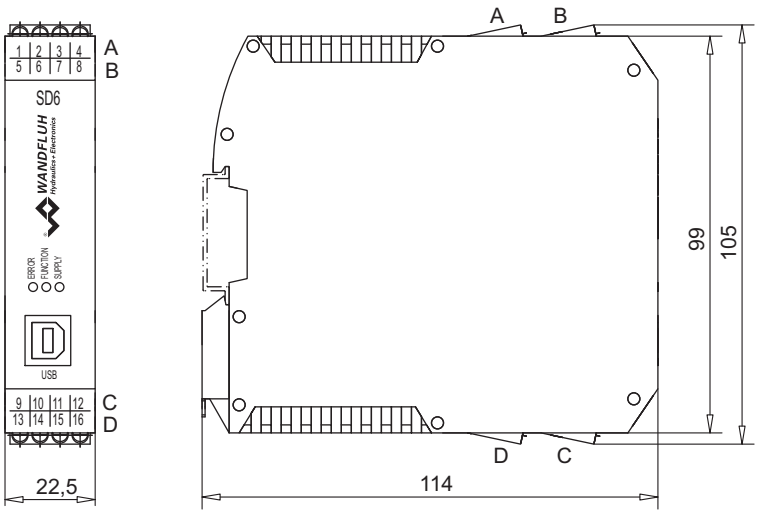
| | |
|---|---|
| Protection class | IP30 acc. to EN 60 529 |
| Supply voltage | 24 VDC or 12 VDC |
| *Voltage range:* | |
| • 24 VDC | 21…30 V |
| • 12 VDC | 10,5…15 V |
| Ripple on supply vol. | <10 % |
| Fuse | slow |
| *Current consumption:* | |
| • No-load current | approx. 40 mA |
| • Maximum current consumption | no-load current + 1,8 A per solenoid (with 24 VDC)<br>no-load current + 2,3 A per solenoid (with 12 VDC) |
| Preset and actual value signal: | Selectable with software<br>Diff. inputs not galvanically separated, for earth potential differences up to 1,5 V<br>4…+20 mA / 0…+20 mA<br>0…+10 V<br>-10…+10 V |
| Input resistance | Voltage input >18 kΩ<br>Load for current input = 250 Ω |
| Stabilised output voltage | 10 VDC (with version 24 VDC)<br>8 VDC (with version 12 VDC)<br>max. load 30 mA |

| | |
|---|---|
| *Solenoid current:* | |
| • Minimal current $I_{min}$ | Adjustable 0…950 mA<br>Factory-preset 150 mA |
| • Maximal current $I_{max}$ | Adjustable $I_{min}$…1,8 A (with 24 VDC)<br>$I_{min}$…2,3 A (with 12 VDC)<br>Factory-preset 700 mA |
| Dither | Frequency adjustable 20…500 Hz<br>Factory-preset 100 Hz<br>Amplitude adjustable 0…400 mA<br>Factory-preset 100 mA |
| Temperature drift | <1 % at ΔT = 40 °C |
| Digital inputs | Switching threshold high 6…30 VDC<br>Switching threshold low 0…1 VDC<br>Signal active at 6…30 VDC (active high) |
| Digital outputs | Low-Side-Switch:<br>$U_{max}$ = 40 VDC<br>$I_{max}$ = -700 mA |
| Serial interface | USB (receptacle type B)<br>to set parameters with «PASO» |
| EMV | |
| Immunity | EN 61 000-6-2 |
| Emission | EN 61 000-6-4 |

## BLOCK DIAGRAM

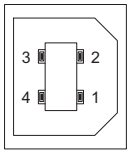


## DIMENSIONS




## CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

**USB-interface, USB Type B X2**




1 = VBUS
2 = D -
3 = D +
4 = GND

Socket USB type B

**REMARK!**
The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

**PIN-assignment X1**


1 = Digital input 1
2 = Digital input 2
3 = Digital output 1
4 = Digital output 2
5 = Supply Analogue input +
6 = Supply voltage 0 VDC
7 = Stabilised output voltage
8 = Analog-Masse
9 = Analogue ground 1 +
10 = Analogue input 1 -
11 = Analogue input 2 +
12 = Analogue input 2 -
13 = Output solenoid B +
14 = Output solenoid B -
15 = Output solenoid A +
16 = Output solenoid A -

**Configuration Analogue input**

| Type description | Analogue input 1 | Analogue input 2 |
|---|---|---|
| SD6332D. **0**-AA | Voltage | Current |
| SD6332D. **1**-AA | Voltage | Voltage |
| SD6332D. **2**-AA | Current | Current |

## START-UP

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.

Additional information can be found on our website:
**«www.wandfluh.com»**

Free-of-charge download:
• «PASO-DSV / SD6» Parameterisation software
• Operating instructions (*.pdf)

## ADDITIONAL INFORMATION

| | Wandfluh documentation | |
|---|---|---|
| Wandfluh electronics general | register | 1.13 |
| Accessories | register | 1.13 |
| Proportional directional valves | register | 1.10 |
| Proportional pressure valves | register | 2.3 |
| Proportional flow control valves | register | 2.6 |

**DESCRIPTION** of Controller module basic «SD6» with analogue interface

**Design**

The controller module can be parameterised by means of the parameterisation software «PASO-DSV/SD6» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-DSV/SD6» is supported by Windows 2000 and Windows XP.

**Description of Function**
**Hardware-Configuration with Analogue Signal**

With the controller module «SD6» different control circuits can be built-up; positional -, speed -, pressure - or volume flow controllers. They can optionally be adjusted in the form of a controller mode. Additionally an amplifier part is integrated, with which the valve, resp. its solenoids are directly driven. In addition an amplifier part is integrated; with this the valve, resp. its solenoids are directly driven. The set-point value is brought to the controller as an electric signal; a sensor records the effective actual value, and this signal is also brought to the controller. In correspondence with the control difference (set-point value - actual value), a control signal (solenoid current) is output to the valve. By means of the scaling of set-point value and actual value, all further inputs can be made in the required, resp. selectable physical unit (e.g., bar or mm, etc.). Once the set-point value has been reached, the controller module «SD6» can output a digital signal.

The controller module «SD6» has a set-point value generator, with which the up- and down ramp of the internal set-point value can be preset. The controller is designed as a PID-controller. Because of this, the control characteristics can be correspondingly adjusted, resp. adapted to the control circuit. Furthermore it is also possible to switch the control system off completely for testing and adjustment purposes. The controller module «SD6» then function corresponding to normal amplifier electronics.

In addition the controller module «SD6» are equipped with two digital inputs for the enabling, and for changing over to solenoid B (only in operating mode 5) as well as with two digital outputs, which output the conditions «Error» or «Target window reached».

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

**Signal Recording**
The controller module «SD6» furthermore have a signal recording function. This by means of PASO makes possible a recording of various system signals, such as set-point value, actual value, control difference, solenoid currents, etc., which can graphically be depicted on a common time axis.

**Analogue Inputs**
The analogue signal present is digitalised in the 10-bit A/D-converter.
**Attention:**
When selecting the range 4...20 mA, the resolution is <10-bit! All analogue inputs are executed as differential inputs. Differential inputs are utilised, when the potential of the mass of the external transmitters does not correspond to the mass from the controller module «SD6». If the differential input is to be utilised like an analogue input to mass, then the - (minus) connection if the differential input has to be connected to mass.

**Cable Break Monitoring at the Analogue Input**
The analogue input 2 can be monitored for cable breaks. If a cable break is detected, the solenoid output is blocked and the output «Error» is activated. For the monitoring to be effective, the following conditions have to be fulfilled:
• The input signal has to be a current signal of 4...20.
• The cable break monitoring has to be activated.

**Attention:**
Up until the identification of a cable break approx. 100 ms elapse. During this time, the axis may carry out unintended movements or unintendedly modified forces!

**Analogue input voltage**
Input voltage range 0…±10 V
If in case of the version 12 VDC, the stabilised voltage (0…8 V) is utilised, then in the PASO the scaling [%/V] has to be correspondingly adapted.

**Analogue input current**
Input current range 0…20 mA/4…20 mA

**Digital input 1 «Enable control»**
Enables the controller module «SD6» in general. Without this enabling, no solenoid current is output. The digital input 1 as standard setting is high-active (refer to electrical characteristic values).

**Digital input 2 «Solenoid B»**
In the operating mode 5 «Preset value unipolar (2-sol. with DigInp2)» (refer to data sheet 1.11-100, page 5), the solenoid B is active, when the digital input 2 is «active». When the digital input 2 is «inactive», then solenoid A is active.

All digital inputs are low-side switches (refer to characteristics electrical values).

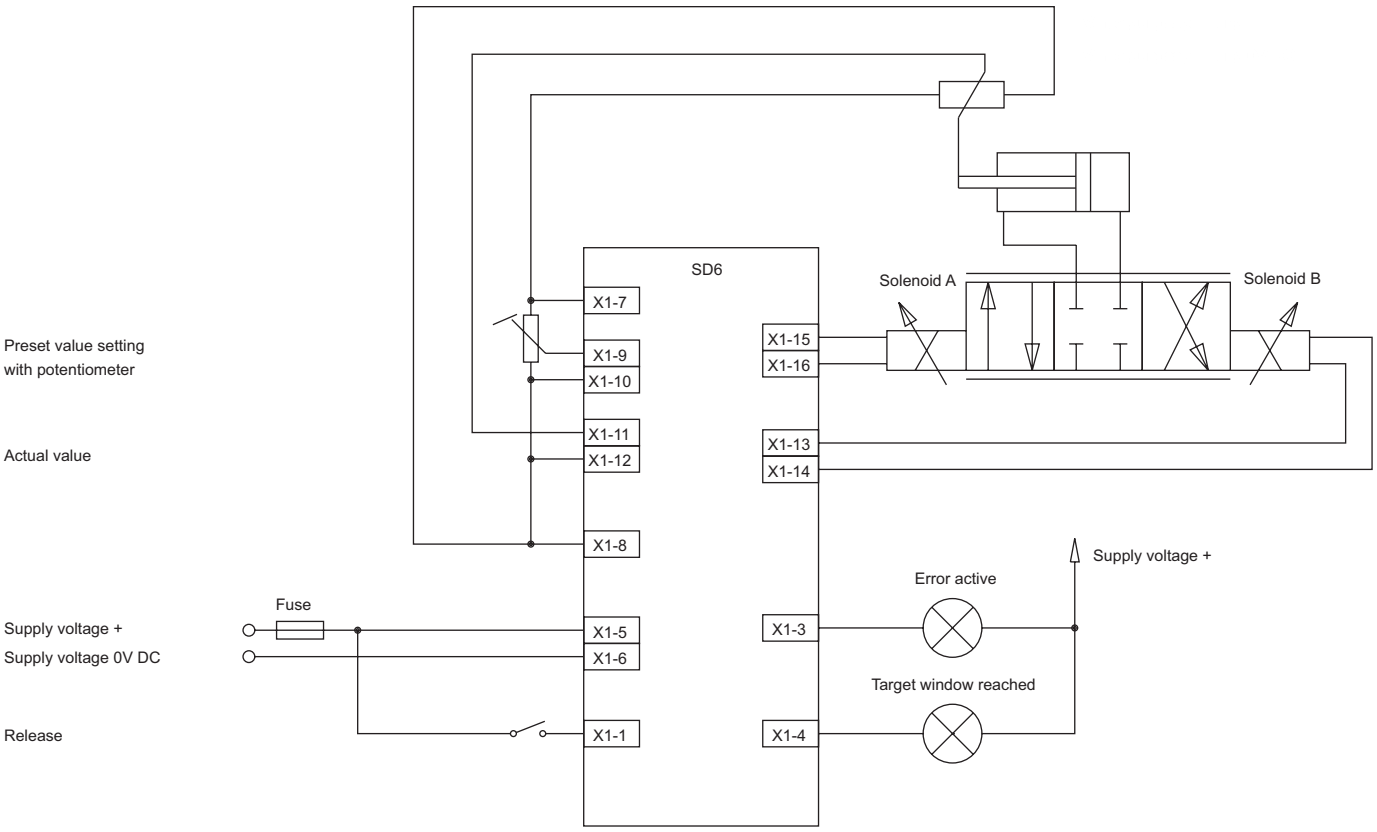
**Digital Output 1 «Error»**
This output becomes active, when an error is detected. An error once detected is indicated until the «SD6»-controller module is disabled through the digital input «Enable control» and enabled once again.

**Digital Output 2 «Target Window Reached»**
This output becomes active, when the control difference is within the target window.

**Ramps**
Per solenoid, two linear ramps for Up and Down can be adjusted separately. The ramps are only available in the amplifier mode.

**CONNECTION EXAMPLE** «SD6»-Controller module with analogue interface

Position control (Set-point value and actual value 10-bit, 16-bit not possible in case of «SD6»-Controller Module Basic)

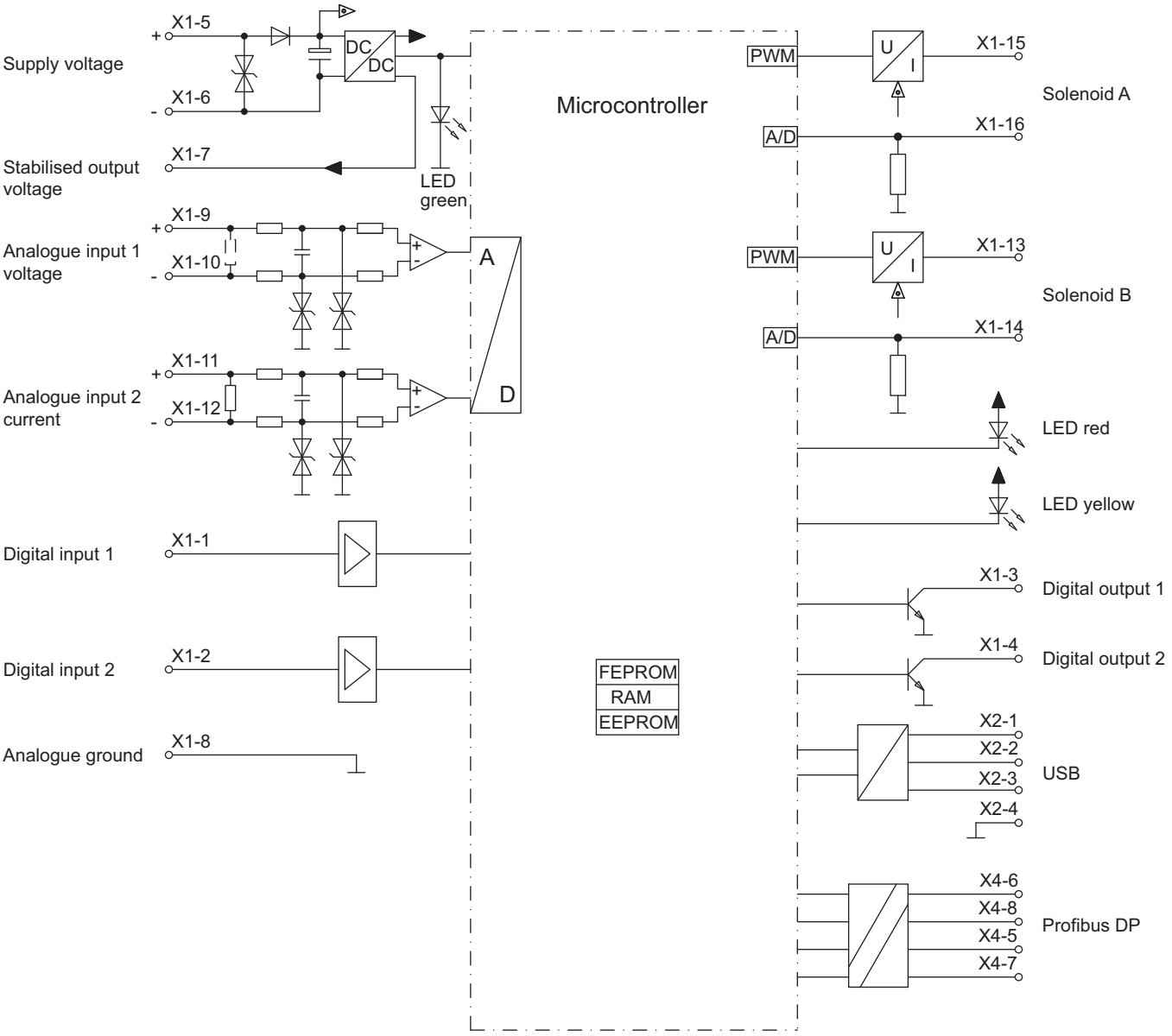


# Controller Module Basic with Profibus interface

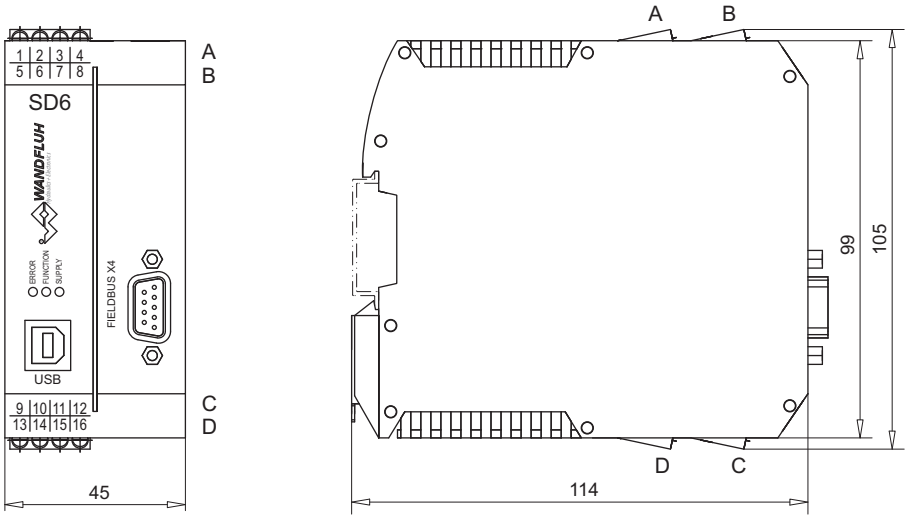
## ELECTRICAL SPECIFICATIONS

| | |
|---|---|
| Protection class | IP 30 acc. to EN 60 529 |
| Device receptacle | |
| Profibus (female) | DSUB, 9-poles |
| Mating connector | Plug (male)<br>DSUB, 9-poles |
| Supply voltage | 24 VDC or 12 VDC |
| *Voltage range:* | |
| • 24 VDC | 21…30 V |
| • 12 VDC | 10,5…15 V |
| Ripple on supply vol. | <10 % |
| Fuse | slow |
| *Current consumption:* | |
| • No-load current | approx. 50 mA |
| • Maximum current consumption | no-load current + 1,8 A per solenoid (with 24 VDC)<br>no-load current + 2,3 A per solenoid (with 12 VDC) |
| Preset and actual value signal: | Selectable with software<br>Diff. inputs not galvanically separated, for earth potential differences up to 1,5 V<br>4…+20 mA / 0…+20 mA<br>0…+10 V<br>-10…+10 V (not with analogue input 2) |
| Input resistance | Voltage input >18 kΩ<br>Load for current input = 250 Ω |
| Stabilised output voltage | 10 VDC (with version 24 VDC)<br>8 VDC (with version 12 VDC)<br>max. load 30 mA |
| Measuring system input | D-Sub plug-in connector DSUB 9-poles, female on front plate, differential signal transmission |
| Bus topology | Line |
| Potential separation | Profibus to «SD6»-electronics 500 VDC |
| *Solenoid current:* | |
| • Minimal current $I_{min}$ | Adjustable 0…950 mA<br>Factory-preset 150 mA |
| • Maximal current $I_{max}$ | Adjustable $I_{min}$…1,8 A (with 24 VDC)<br>$I_{min}$…2,3 A (with 12 VDC)<br>Factory-preset 700 mA |
| Dither | Frequency adjustable 20…500 Hz<br>Factory-preset 100 Hz<br>Amplitude adjustable 0…400 mA<br>Factory-preset 100 mA |
| Temperature drift | <1 % at ΔT = 40 °C |
| Digital inputs | Switching threshold high 6…30 VDC<br>Switching threshold low 0…1 VDC<br>Signal active at 6…30 VDC (active high) |
| Digital outputs | Low-Side-Switch:<br>$U_{max}$ = 40 VDC<br>$I_{max}$ = -700 mA |
| Serial interface | USB (receptacle type B)<br>to set parameters with «PASO» |
| EMV | |
| Immunity | EN 61 000-6-2 |
| Emission | EN 61 000-6-4 |

**BLOCK DIAGRAM**

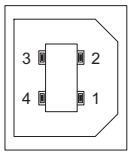


## DIMENSIONS




## CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

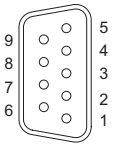
### USB-interface, USB Type B X2



1 = VBUS
2 = D -
3 = D +
4 = GND

**REMARK!**
The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

### Device receptacle Profibus DP (female) X4

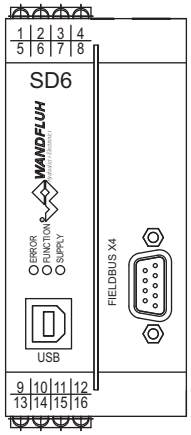


**PROFIBUS**

| | |
|---|---|
| 1 = Reserved | 6 = VP |
| 2 = Reserved | 7 = Reserved |
| 3 = RxD/TxD-P | 8 = RxD/TxD-N |
| 4 = Reserved | 9 = Reserved |
| 5 = DGND | |

The mating connector (plug male, DSUB, 9-poles) is not included in the delivery.

### PIN-assignment X1




1 = Digital input 1
2 = Digital input 2
3 = Digital output 1
4 = Digital output 2
5 = Supply Analogue input +
6 = Supply voltage 0 VDC
7 = Stabilised output voltage
8 = Analogue ground
9 = Analogue input 1 +
10 = Analogue input 1 -
11 = Analogue input 2 +
12 = Analogue input 2 -
13 = Output solenoid B +
14 = Output solenoid B -
15 = Output solenoid A +
16 = Output solenoid A -

### Configuration Analogue input

| Type description | Analogue input 1 | Analogue input 2 |
|---|---|---|
| SD6332D. **0**-AB | voltage | current |
| SD6332D. **1**-AB | voltage | voltage (0...10 V only) |
| SD6332D. **2**-AB | current | current |

## START-UP

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.

Additional information can be found on our website:
**«www.wandfluh.com»**

Free-of-charge download:
• «PASO-DSV/SD6» Parameterisation software
• Operating instructions (*.pdf)
• GSD-file «WAGOB8E.gsd»

## ADDITIONAL INFORMATION

| | Wandfluh documentation | |
|---|---|---|
| Wandfluh electronics general | register | 1.13 |
| Accessories | register | 1.13 |
| Proportional directional valves | register | 1.10 |
| Proportional pressure valves | register | 2.3 |
| Proportional flow control valves | register | 2.6 |

**DESCRIPTION** of Controller module basic «SD6» with Profibus DP-interface

## Design

The controller module can be parameterised by means of the parameterisation software «PASO-DSV/SD6» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-DSV/SD6» is supported by Windows 2000 and Windows XP.

## Description of Function
## Hardware - Configuration with Analogue Signal

With the controller module «SD6» different control circuits can be built-up; positional -, speed -, pressure - or volume flow controllers. They can optionally be adjusted in the form of a controller mode. Additionally an amplifier part is integrated, with which the valve, resp. its solenoids are directly driven. In addition an amplifier part is integrated; with this the valve, resp. its solenoids are directly driven. The set-point value is brought to the controller as an electric signal or through the Profibus DP; a sensor records the effective actual value, and this signal is also brought to the controller. In correspondence with the control difference (set-point value - actual value), a control signal (solenoid current) is output to the valve. By means of the scaling of set-point value and actual value, all further inputs can be made in the required, resp. selectable physical unit (e.g., bar or mm, etc.). Once the set-point value has been reached, the controller module «SD6» can output a digital signal.

The controller module «SD6» has a set-point value generator, with which the up- and down ramp of the internal set-point value can be preset. The controller is designed as a PID-controller. Because of this, the control characteristics can be correspondingly adjusted, resp. adapted to the control circuit. Furthermore it is also possible to switch the control system off completely for testing and adjustment purposes. The controller module «SD6» then function corresponding to normal amplifier electronics.

In addition the controller module «SD6» are equipped with two digital inputs for the enabling, and for changing over to solenoid B (only in operating mode 5) as well as with two digital outputs, which output the conditions «Error» or «Target window reached».

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

**Signal Recording**
The controller module «SD6» furthermore have a signal recording function. This by means of PASO makes possible a recording of various system signals, such as set-point value, actual value, control difference, solenoid currents, etc., which can graphically be depicted on a common time axis.

**Analogue Inputs**
The analogue signal present is digitalised in the 10-bit A/D-converter.
**Attention:**
When selecting the range 4...20 mA, the resolution is <10-bit! All analogue inputs are executed as differential inputs. Differential inputs are utilised, when the potential of the mass of the external transmitters does not correspond to the mass from the controller module «SD6». If the differential input is to be utilised like an analogue input to mass, then the - (minus) connection if the differential input has to be connected to mass.

**Cable Break Monitoring at the Analogue Input**
The analogue input 2 can be monitored for cable breaks. If a cable break is detected, the solenoid output is blocked and the output «Error» is activated. For the monitoring to be effective, the following conditions have to be fulfilled:
• The input signal has to be a current signal of 4...20.
• The cable break monitoring has to be activated.

**Attention:**
Up until the identification of a cable break approx. 100 ms elapse. During this time, the axis may carry out unintended movements or unintendedly modified forces!

**Analogue input voltage**
Input voltage range 0…±10 V, analogue input 2: 0...10 V.
If in case of the version 12 VDC, the stabilised voltage (0…8 V) is utilised, then in the PASO the scaling [%/V] has to be correspondingly adapted.

**Analogue input current**
Input current range 0…20 mA/4…20 mA

**Digital input 1 «Enable control»**
Enables the controller module «SD6» in general. Without this enabling, no solenoid current is output. The digital input 1 as standard setting is high-active (refer to electrical characteristic values).

**Digital input 2 «Solenoid B»**
In the operating mode 5 «Preset value unipolar (2-sol. with DigInp2)» (refer to data sheet 1.11-100, page 5), the solenoid B is active, when the digital input 2 is «active». When the digital input 2 is «inactive», then solenoid A is active.

All digital inputs are low-side switches (refer to characteristics electrical values).
The digital inputs 1-2 can only be utilised with local device control (db.local=1).

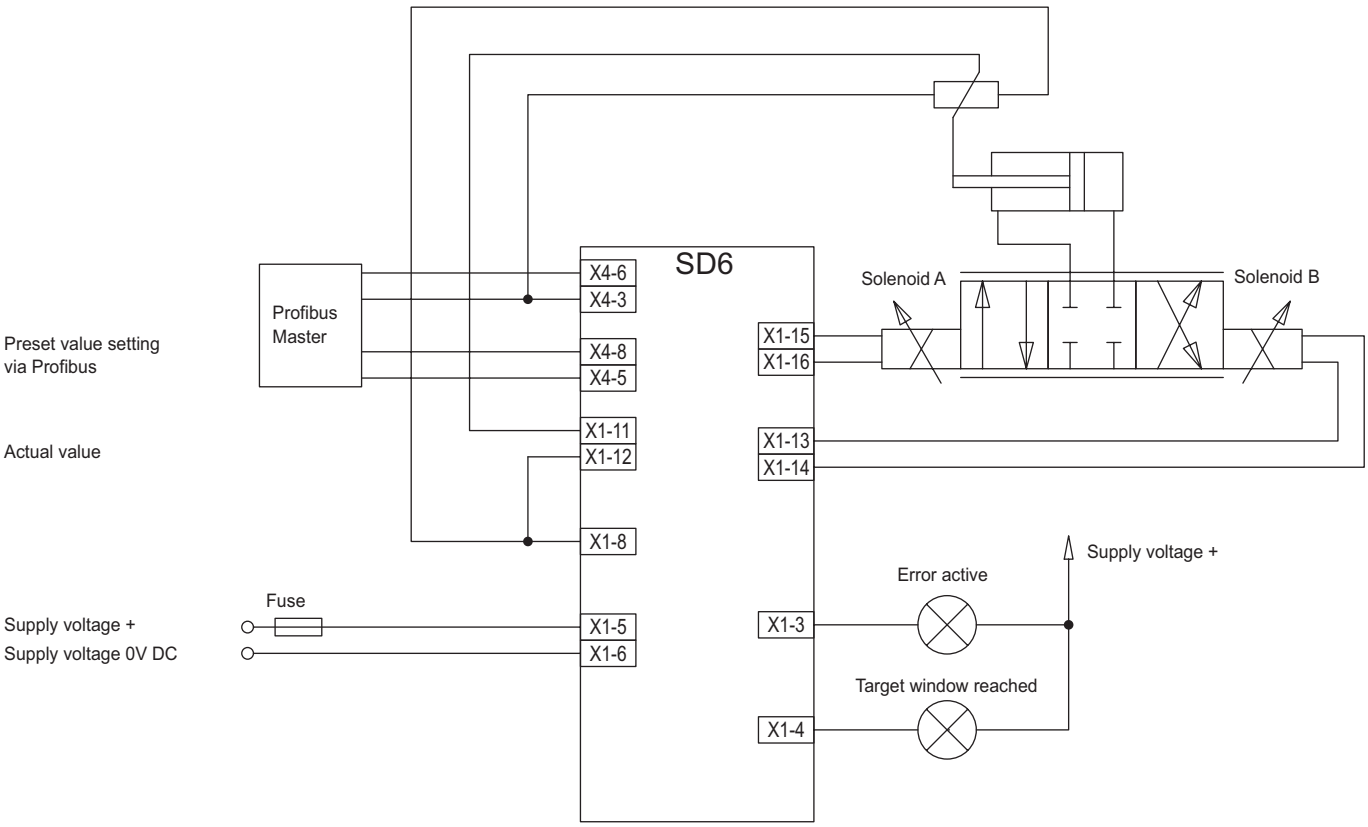
**Digital Output 1 «Error»**
This output becomes active, when an error is detected. An error once detected is indicated until the «SD6»-controller module is disabled through the digital input «Enable control» and enabled once again.

**Digital Output 2 «Target Window Reached»**
This output becomes active, when the control difference is within the target window.

**Ramps**
Per solenoid, two linear ramps for Up and Down can be adjusted separately. The ramps are only available in the amplifier mode.

**CONNECTION EXAMPLE** («SD6»-Controller module Basic with Profibus DP-interface)

Position control (Set-point value and actual value 10-bit, 16-bit not possible in case of «SD6»-Controller Module Basic)

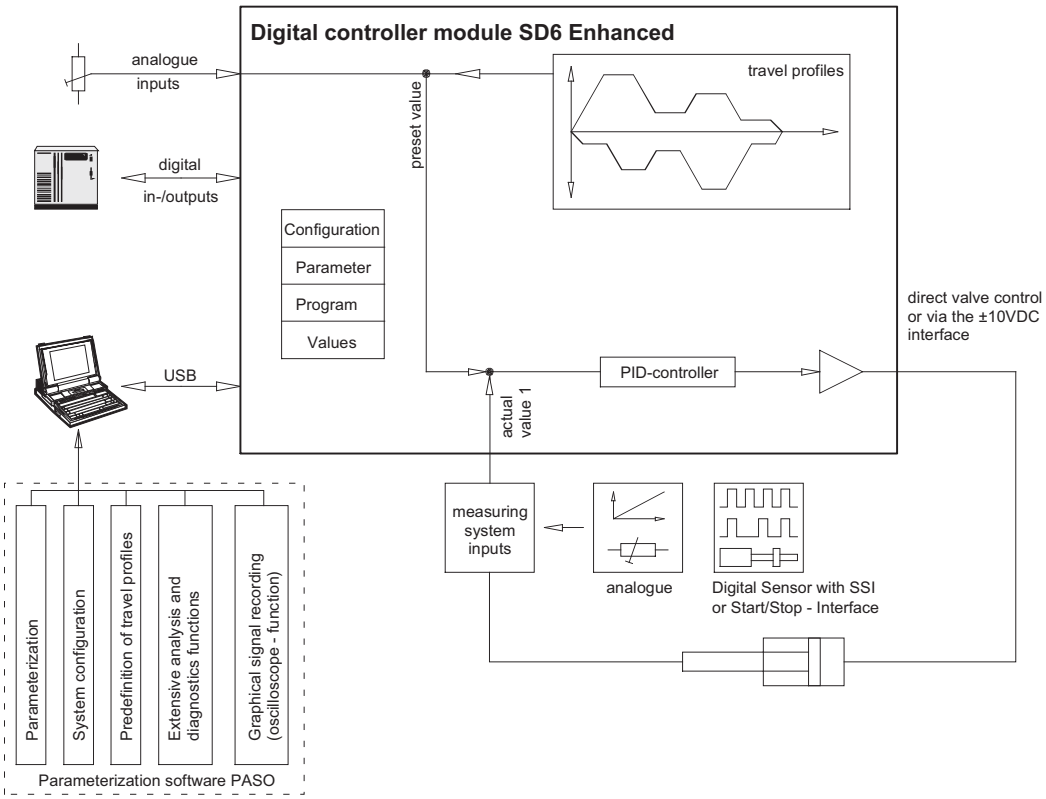


# Controller Module Enhanced with analogue interface

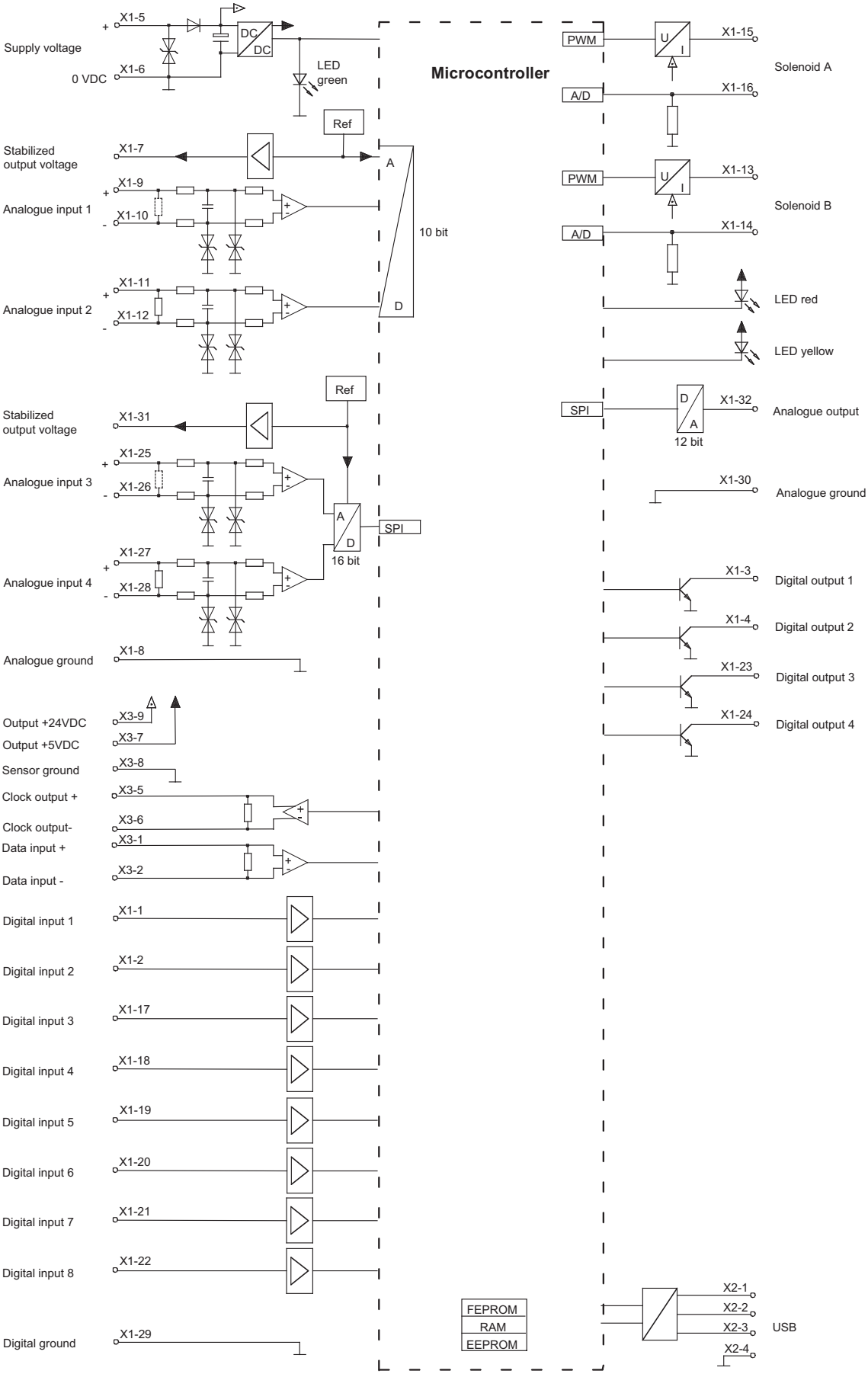
## ELECTRICAL SPECIFICATIONS

| | |
|---|---|
| Protection class | IP 30 acc. to EN 60 529 |
| Device receptacle | |
| Sensor (female) | DSUB, 9-poles |
| Mating connector | Plug (male)<br>DSUB, 9-poles |
| Supply voltage | 24 VDC or 12 VDC |
| *Voltage range:* | |
| • 24 VDC | 21…30 V |
| • 12 VDC | 10,5…15 V |
| Ripple on supply vol. | <10 % |
| Fuse | slow |
| *Current consumption:* | |
| • No-load current | approx. 60 mA |
| • Maximum current consumption | no-load current + 1,8 A per solenoid (with 24 VDC)<br>no-load current + 2,3 A per solenoid (with 12 VDC) |
| Preset and actual value signal: | Selectable with software<br>Diff. inputs not galvanically separated, for earth potential differences up to 1,5 V<br>4…+20 mA / 0…+20 mA<br>0…+10 V<br>-10…+10 V |
| *Analogue inputs:* | |
| • 1 and 2 | 10-bit-resolution |
| • 3 and 4 | 16-bit-resolution |
| Input resistance | Voltage input >18 kΩ<br>Load for current input = 250 Ω |
| Measuring system input | D-Sub plug-in connector 9-pole female on front plate<br>in accordance with RS422-standard<br>selectable by means of software<br>Absolut via Start / Stop<br>Absolut via SSI (1...32 bit, gray or binary) |
| *Analogue output:* | Output voltage ± 10 V<br>max. output current ± 3 mA |
| Stabilised output voltage | 10 VDC (with version 24 VDC)<br>8 VDC (with version 12 VDC)<br>max. load 30 mA |
| *Solenoid current:* | |
| • Minimal current $I_{min}$ | Adjustable 0…950 mA<br>Factory-preset 150 mA |
| • Maximal current $I_{max}$ | Adjustable $I_{min}$…1,8A (with 24 VDC)<br>$I_{min}$…2,3A (with 12 VDC)<br>Factory-preset 700 mA |
| Dither | Frequency adjustable 20…500 Hz<br>Factory-preset 100 Hz<br>Amplitude adjustable 0…400 mA<br>Factory-preset 100 mA |
| Temperature drift | <1 % at ΔT = 40 °C |
| Digital inputs | Switching threshold high 6…30 VDC<br>Switching threshold low 0…1 VDC<br>Signal active at 6…30 VDC (active high) |
| Digital outputs | Low-Side-Switch:<br>$U_{max}$ = 40 VDC<br>$I_{max}$ = -700 mA |
| Serial interface | USB (receptacle type B)<br>to set parameters with «PASO» |
| EMV | |
| Immunity | EN 61 000-6-2 |
| Emission | EN 61 000-6-4 |

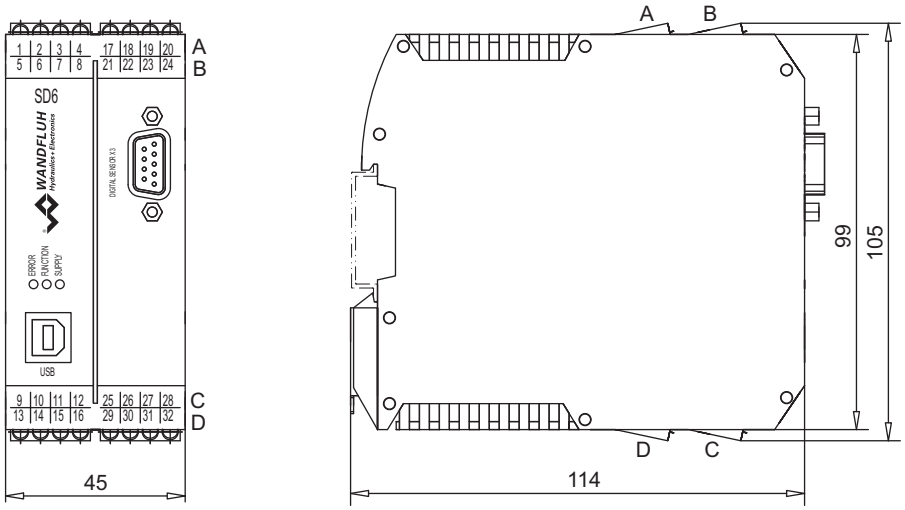
## FUNCTION DIAGRAM



## BLOCK DIAGRAM

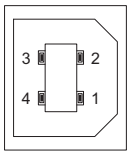


## DIMENSIONS




## CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

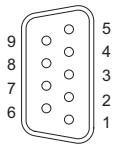
### USB-interface, USB Type B X2



1 = VBUS
2 = D -
3 = D +
4 = GND

**REMARK!**
The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

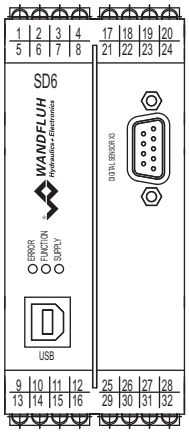
### Device receptacle Sensor (female) X3



1 = Digital input +
2 = Digital input -
3 = Reserved
4 = Reserved
5 = Clock output +
6 = Clock output -
7 = Output +5VDC
8 = Sensor-mass
9 = Output +24VDC

The mating connector (plug male, DSUB, 9-poles) is not included in the delivery.

### PIN-assignment X1



1 = Digital input 1
2 = Digital input 2
3 = Digital output 1
4 = Digital output 2
5 = Supply Analogue input +
6 = Supply voltage 0 VDC
7 = Stabilised output voltage
8 = Analogue ground
9 = Analogue input 1 +
10 = Analogue input 1 -
11 = Analogue input 2 +
12 = Analogue input 2 -
13 = Output solenoid B +
14 = Output solenoid B -
15 = Output solenoid A +
16 = Output solenoid A -
17 = Digital input 3
18 = Digital input 4
19 = Digital input 5
20 = Digital input 6
21 = Digital input 7
22 = Digital input 8
23 = Digital output 3
24 = Digital output 4
25 = Analogue input 3 +
26 = Analogue input 3 -
27 = Analogue input 4 +
28 = Analogue input 4 -
29 = Digital ground
30 = Analogue ground
31 = Stabilised output voltage
32 = Analogue output

## START-UP

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.

Additional information can be found on our website:
**«www.wandfluh.com»**

Free-of-charge download:
• «PASO-DSV / SD6» Parameterisation software
• Operating instructions (*.pdf)

## ADDITIONAL INFORMATION

| | Wandfluh documentation | |
|---|---|---|
| Wandfluh electronics gerneral | register | 1.13 |
| Accessories | register | 1.13 |
| Proportional directional valves | register | 1.10 |
| Proportional pressure valves | register | 2.3 |
| Proportional flow control valves | register | 2.6 |

### Configuration Analogue input

| Type description | Analogue input | | | |
|---|---|---|---|---|
| | No. 1 | No. 2 | No. 3 | No. 4 |
| SD6362D. **4**-BA | voltage | current | voltage | current |
| SD6362D. **5**-BA | voltage | voltage | voltage | voltage |
| SD6362D. **6**-BA | current | current | current | current |

**DESCRIPTION** of «SD6»-Controller module Enhanced with analogue interface

**Design**

The controller module can be parameterised by means of the parameterisation software «PASO-DSV / SD6» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-DSV / SD6» is supported by Windows 2000 and Windows XP.

**Description of Function**
**Hardware-Configuration with Analogue Signal**

With the controller module «SD6» different control circuits can be built-up; positional -, speed -, pressure - or volume flow controllers. They can optionally be adjusted in the form of a controller mode. Additionally an amplifier part is integrated, with which the valve, resp. its solenoids are directly driven. Through the analogue output it is also possible to drive a valve with integrated amplifier (e.g. DSV). The set-point value is brought to the controller as an electric signal, or internally by means of freely adjustable travelling profiles; an analogue or digital sensor records the effective actual value, and this signal is also brought to the controller. In correspondence with the control difference (set-point value - actual value), a control signal (solenoid current) is output to the valve. By means of the scaling of set-point value and actual value, all further inputs can be made in the required, resp. selectable physical unit (e.g., bar or mm, etc.). Once the set-point value has been reached, the controller module «SD6» can output a digital signal.

The controller module «SD6» Enhanced has an adjustable travelling speed, if the set-point value is preset in an analogue manner. The controller is designed as a PID-controller. Because of this, the control characteristics can be correspondingly adjusted, resp. adapted to the control circuit. Furthermore it is also possible to switch the control system off completely for testing and adjustment purposes. The controller mo-dule «SD6» then function corresponding to normal amplifier electronics.

Furthermore the controller module «SD6» comprises digital inputs for the enabling, for controlling the manual operation and for the profile generator as well as digital outputs, which output the conditions «Error» or «Target window reached».

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

**Signal Recording**
The controller module «SD6» furthermore have a signal recording function. This by means of PASO makes possible a recording of various system signals, such as set-point value, actual value, control difference, solenoid currents, etc., which can graphically be depicted on a common time axis.

The manual operating mode makes available commands such as Forwards, Backwards, Rapid Speed and Creep Speed. With this it is possible to put the connected hydraulics into operation without a superordinate control system.

**Analogue Inputs**
The applied analogue signal is digitalised at the analogue inputs 1 and 2 with 10-bits, and at the analogue inputs 3 and 4 with 16-bits.

**Attention:**
When selecting the range 4...20 mA, the resolution is <10-bit! All analogue inputs are executed as differential inputs. Differential inputs are utilised, when the potential of the mass of the external transmitters does not correspond to the mass from the controller module «SD6». If the differential input is to be utilised like an analogue input to mass, then the - (minus) connection if the differential input has to be connected to mass.

**Cable Break Monitoring at the Analogue Input**
The analogue input 2 can be monitored for cable breaks. If a cable break is detected, the solenoid output is blocked and the output «Error» is activated. For the monitoring to be effective, the following conditions have to be fulfilled:
• The input signal has to be a current signal of 4...20.
• The cable break monitoring has to be activated.

**Attention:**
Up until the identification of a cable break approx. 100 ms elapse. During this time, the axis may carry out unintended movements or unintendedly modified forces!

**Analogue input voltage**
Input voltage range 0…±10 V
If in case of the version 12 VDC, the stabilised voltage (0…8 V) is utilised, then in the PASO the scaling [% / V] has to be correspondingly adapted.

**Analogue input current**
Input current range 0…20 mA / 4…20 mA

**Digital input 1 «Enable control»**
Enables the controller module «SD6» in general. Without this enabling, no solenoid current is output. The digital input 1 as standard setting is high-active (refer to electrical characteristic values).

**Digital Input 2 «Solenoid B» or «Automatic - / Manual Operation»**
In the operating mode 5 «Set-point value unipolar (2 - solenoid with DigOn2)» (refer to data sheet 1.11-100 / page 5), the solenoid B is active, when the digital input 2 is «active». When the digital input 2 is «inactive», the solenoid A is active. In all «closed-loop» - controller modes, with digital input 2 it is possible to changeover between automatic - and manual operation.

**Digital Input 3 «Manual Forwards» or «Profile / Sequence»**
In the manual operating mode, the digital input 3 issues the command 3 Forwards. In the automatic operating mode, the digital input 3 changes over between Profile and Sequence.

**Digital Input 4 «Manual Reverse» or «Start»**
In the manual operating mode, the digital input 4 issues the command Reverse. In the automatic operating mode, the digital input 4 issues the command Start for the profile generator.

**Digital Input 5 «Rapid Speed / Creep Speed» or «Stop»**
In the manual operating mode, the digital input 5 changes over between Rapid speed and Creep speed. In the automatic operating mode, the digital input 5 issues the command Stop for the profile generator.

**Digital Inputs 6...8 «Profile Selection»**
In the automatic operating mode, with the digital inputs 6...8 it is possible to select the travelling profile. In the manual operating mode, the digital inputs 6...8 have no function.

All digital inputs are low-side switches (refer to characteristics electrical values).

**Digital Output 1 «Error»**
This output becomes active, when an error is detected. An error once detected is indicated until the «SD6»-controller module is disabled through the digital input «Enable control» and enabled once again.

**Digital Output 2 «Target Window Reached»**
This output becomes active, when the control difference is within the target window.

**Digital Output 3 «Contouring Error»**
This output becomes active, when the contouring error is outside the contouring error window.

**Digital Output 4 «Profile End»**
This output becomes active, when the travelling profile has been finished.

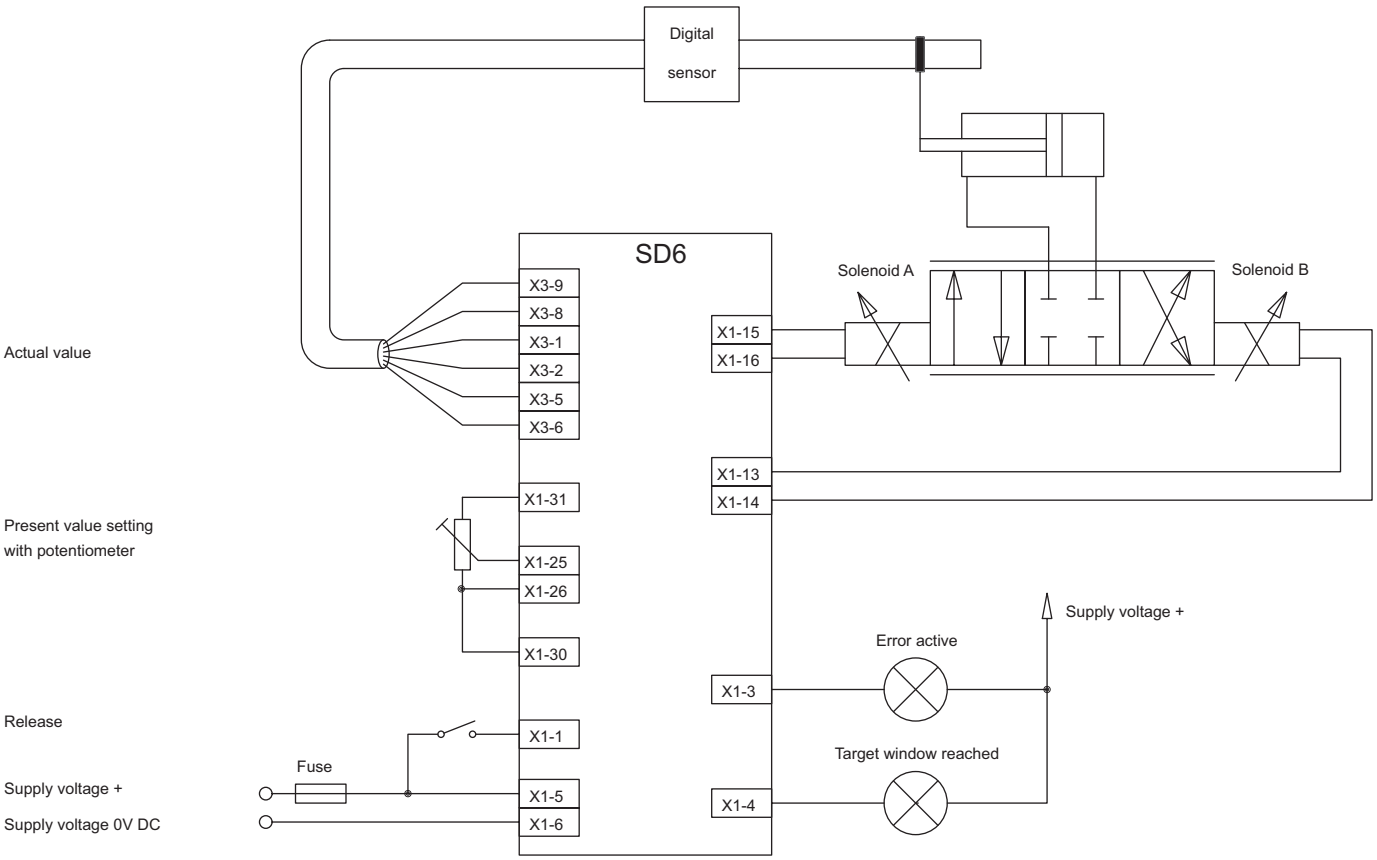
**Travel profiles**
The axis controller is in a position to save and to run through complete travel profiles, which have been preset by the user. A travel profile is a sequence of individual profiles (sequences). The travel command data of each sequence consist of:
- preset position (sequence target or endposition)
- speed (travelling preset speed value)
- acceleration (acceleration or deceleration, necessary for reaching travelling speed, starting from a given initial speed value)
- deceleration (deceleration or acceleration necessary for reaching the sequence end speed)
- stop time
- function «profile end reached» output

A travel profile as a minimum consists of one - and as a maximum of 100 sequences. As a maximum there are 16 travel profiles possible. A travel profile can be run through either completely or else step by step (sequence by sequence).
In the travel profile generator, the travel profiles can be adjusted and graphically displayed. This graphic display gives a good overview on the adjusted travel profiles.

**Ramps**
Per solenoid, two linear ramps for Up and Down can be adjusted separately. The ramps are only available in the amplifier mode.

**CONNECTION EXAMPLE** («SD6»-Controller module Enhanced)

Positional control with a digital sensor and 16-bit set-point value preset



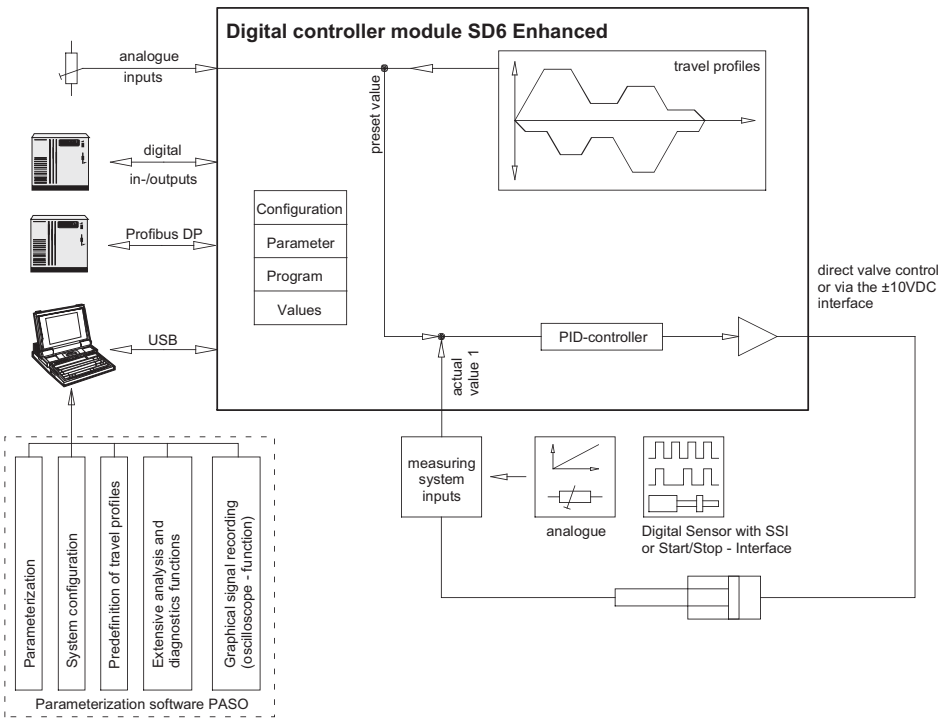
# Controller Module Enhanced with Profibus interface

## ELECTRICAL SPECIFICATIONS

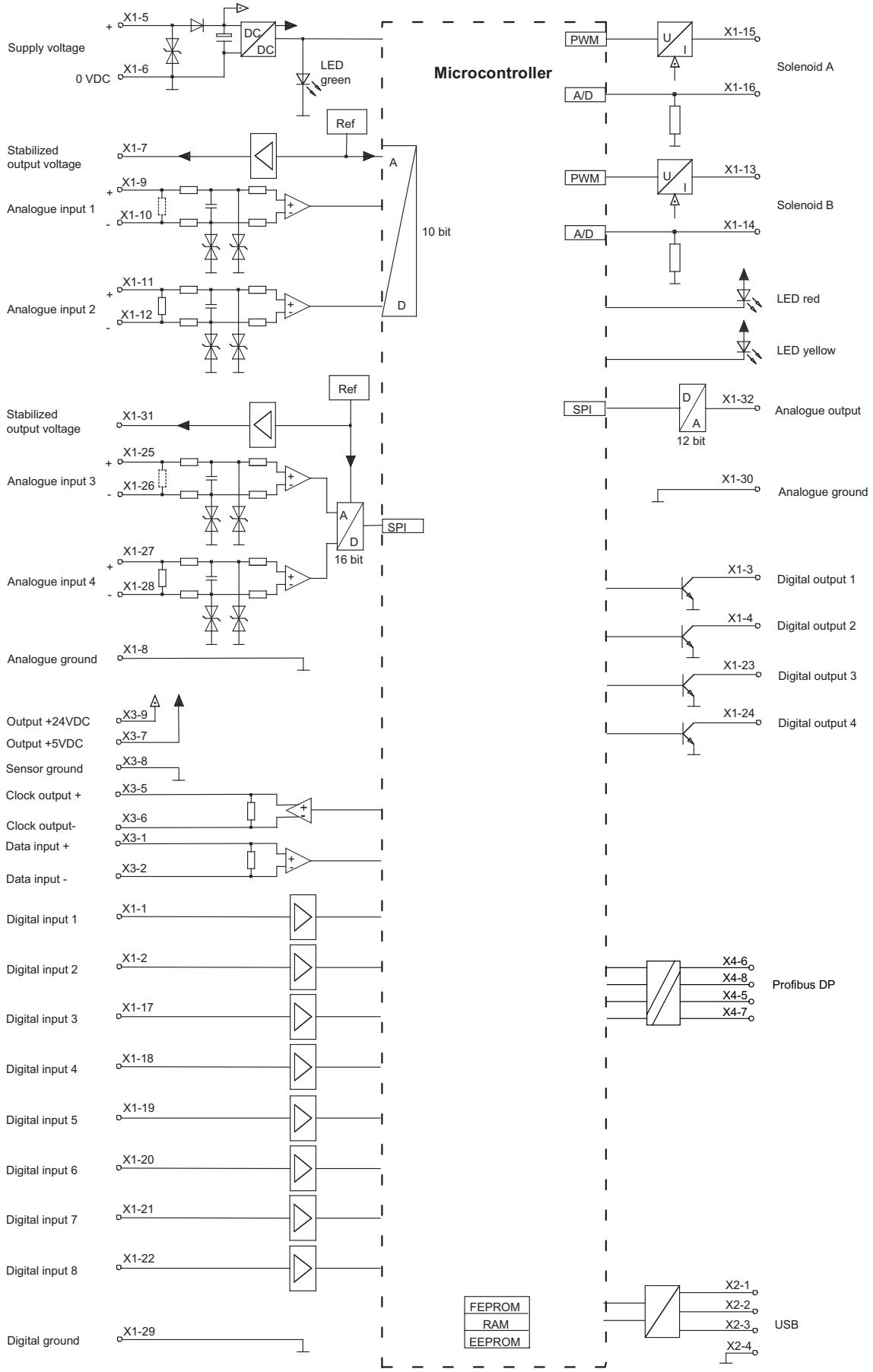
| | |
|---|---|
| Protection class | IP30 acc. to EN 60 529 |
| Device receptacle | |
| Sensor (female) | DSUB, 9-poles |
| Mating connector | Plug (male) DSUB, 9-poles |
| Device receptacle | |
| Profibus (female) | DSUB, 9-poles |
| Mating connector | Plug (male) DSUB, 9-poles |
| Supply voltage | 24 VDC or 12 VDC |
| *Voltage range:* | |
| • 24 VDC | 21…30 V |
| • 12 VDC | 10,5…15 V |
| Ripple on supply vol. | <10 % |
| Fuse | slow |
| *Current consumption:* | |
| • No-load current | approx. 70 mA |
| • Maximum current consumption | no-load current + 1,8 A per solenoid (with 24 VDC)<br>no-load current + 2,3 A per solenoid (with 12 VDC) |
| Preset and actual value signal: | Selectable with software<br>Diff. inputs not galvanically separated, for earth potential differences up to 1,5 V<br>4…+20 mA / 0…+20 mA<br>0…+10 V<br>-10…+10 V (not with analogue input 2) |
| *Analogue inputs* | |
| • 1 and 2 | 10-bit-resolution |
| • 3 and 4 | 16-bit-resolution |
| Input resistance | Voltage input >18 kΩ<br>Load for current input = 250 Ω |
| Measuring system input | D-Sub plug-in connector 9-pole female on front plate<br>in accordance with RS422-standard<br>selectable by means of software<br>Absolute via Start / Stop<br>Absolute via SSI (1...32 bit, gray or binary) |

| | |
|---|---|
| Profibus interface | D-Sub-Plug-in coupling 9-poles, female on front plate, differential signal transmission |
| Bus topology | Line |
| Potential separation | Profibus to «SD6»-electronics 500 VDC |
| *Analogue output:* | Output voltage ± 10 V<br>max. output current ± 3 mA |
| Stabilised output voltage | 10 VDC (with version 24 VDC)<br>8 VDC (with version 12 VDC)<br>max. load 30 mA |
| *Solenoid current:* | |
| • Minimal current $I_{min}$ | Adjustable 0…950 mA<br>Factory-preset 150 mA |
| • Minimal current $I_{max}$ | Adjustable $I_{min}$…1,8 A (with 24 VDC)<br>$I_{min}$…2,3 A (with 12 VDC)<br>Factory-preset 700 mA |
| Dither | Frequency adjustable 20…500 Hz<br>Factory-preset 100 Hz<br>Amplitude adjustable 0…400 mA<br>Factory-preset 100 mA |
| Temperature drift | <1 % at ΔT = 40 °C |
| Digital inputs | Switching threshold high 6…30 VDC<br>Switching threshold low 0…1 VDC<br>Signal active at 6…30 VDC (active high) |
| Digital outputs | Low-Side-Switch:<br>$U_{max}$ = 40 VDC<br>$I_{max}$ = -700 mA |
| Serial interface | USB (receptacle type B)<br>to set parameters with «PASO» |
| EMV | |
| Immunity | EN 61 000-6-2 |
| Emission | EN 61 000-6-4 |

## FUNCTION DIAGRAM

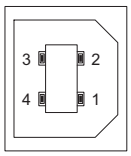


## BLOCK DIAGRAM



## CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

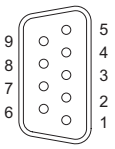
### USB-interface, USB Type B X2




1 = VBUS
2 = D -
3 = D +
4 = GND

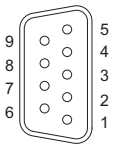
**Remark!**
The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

### Device receptacle Sensor (female) X3




1 = Digital input +
2 = Digital input -
3 = Reserved
4 = Reserved
5 = Clock output +
6 = Clock output -
7 = Output +5VDC
8 = Sensor-Masse
9 = Output +24VDC

### Device receptacle Profibus DP (female) X4

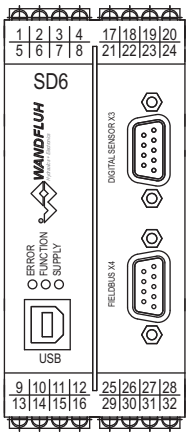



**PROFIBUS**

1 = Reserved
2 = Reserved
3 = RxD/TxD-P
4 = Reserved
5 = DGND
6 = VP
7 = Reserved
8 = RxD/TxD-N
9 = Reserved

The mating connector (plug male DSUB, 9-poles) is not included in the delivery.

### PIN-assignment X1




1 = Digital input 1
2 = Digital input 2
3 = Digital output 1
4 = Digital output 2
5 = Supply Analogue input +
6 = Supply voltage 0 VDC
7 = Stabilised output voltage
8 = Analogue ground
9 = Analogue input 1 +
10 = Analogue input 1 -
11 = Analogue input 2 +
12 = Analogue input 2 -
13 = Output solenoid B +
14 = Output solenoid B -
15 = Output solenoid A +
16 = Output solenoid A -
17 = Digital input 3
18 = Digital input 4
19 = Digital input 5
20 = Digital input 6
21 = Digital input 7
22 = Digital input 8
23 = Digital output 3
24 = Digital output 4
25 = Analogue input 3 +
26 = Analogue input 3 -
27 = Analogue input 4 +
28 = Analogue input 4 -
29 = Digital ground
30 = Analogue ground
31 = Stabilised output voltage
32 = Analogue output

## START-UP

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.

Additional information can be found on our website:
**«www.wandfluh.com»**

Free-of-charge download:
• «PASO-DSV/SD6» Parameterisation software
• Operating instructions (*.pdf)
• GSD-file «WAGOB8E.gsd»

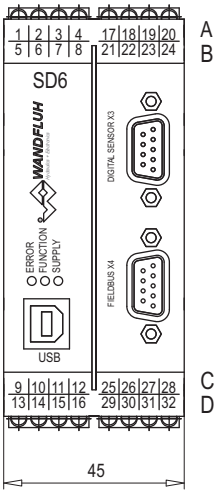
## ADDITIONAL INFORMATION

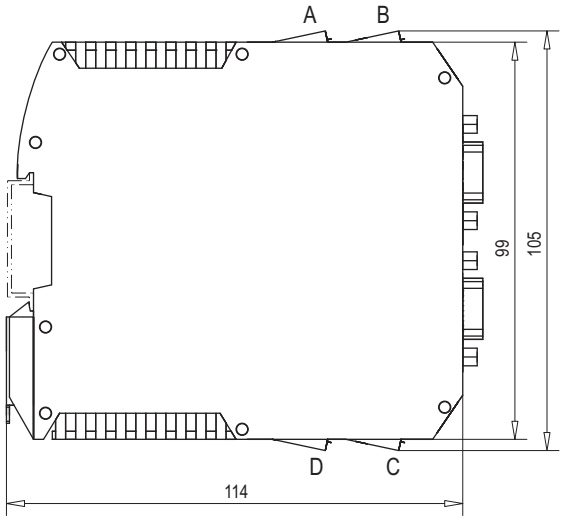
| | Wandfluh documentation | |
|---|---|---|
| Wandfluh electronics general | register | 1.13 |
| Accessories | register | 1.13 |
| Proportional directional valves | register | 1.10 |
| Proportional pressure valves | register | 2.3 |
| Proportional flow control valves | register | 2.6 |

### Configuration Analogue input

| Type description | Analogue input | | | |
|---|---|---|---|---|
| | No. 1 | No. 2 | No. 3 | No. 4 |
| SD6362D. **4**-BB | voltage | current | voltage | current |
| SD6362D. **5**-BB | voltage | voltage (0...10 V only) | voltage | voltage |
| SD6362D. **6**-BB | current | current | current | current |

## DIMENSIONS


1 2 3 4 17 18 19 20
5 6 7 8 21 22 23 24
A
B
SD6
WANDFLUH
DIGITAL SENSOR X3
FIELDBUS X4
ERROR
FUNCTION
SUPPLY
USB
9 10 11 12 25 26 27 28
13 14 15 16 29 30 31 32
C
D
45


A
B
99
105
D
C
114

**DESCRIPTION** of «SD6»-Controller module Enhanced with Profibus DP interface

## Design

The controller module can be parameterised by means of the parameterisation software «PASO-DSV / SD6» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-DSV / SD6» is supported by Windows 2000 and Windows XP.

## Description of Function
## Hardware-Configuration with Analogue Signal

With the controller module «SD6» different control circuits can be built-up; positional -, speed -, pressure - or volume flow controllers. They can optionally be adjusted in the form of a controller mode. Additionally an amplifier part is integrated, with which the valve, resp. its solenoids are directly driven. Through the analogue output it is also possible to drive a valve with integrated amplifier (e.g. DSV). The set-point value is applied by means of an electric signal or through the Profibus DP and brought to the controller internally by means of freely adjustable travelling profiles; an analogue or digital sensor records the effective actual value, and this signal is also brought to the controller. In correspondence with the control difference (set-point value - actual value), a control signal (solenoid current) is output to the valve. By means of the scaling of set-point value and actual value, all further inputs can be made in the required, resp. selectable physical unit (e.g., bar or mm, etc.). Once the set-point value has been reached, the controller module «SD6» can output a digital signal.

The controller module «SD6» Enhanced has an adjustable travelling speed, if the set-point value is preset in an analogue manner. The controller is designed as a PID-controller. Because of this, the control characteristics can be correspondingly adjusted, resp. adapted to the control circuit. Furthermore it is also possible to switch the control system off completely for testing and adjustment purposes. The controller mo-dule «SD6» then function corresponding to normal amplifier electronics.

Furthermore the controller module «SD6» comprises digital inputs for the enabling, for controlling the manual operation and for the profile generator as well as digital outputs, which output the conditions «Error» or «Target window reached».

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

**Signal Recording**
The controller module «SD6» furthermore have a signal recording function. This by means of PASO makes possible a recording of various system signals, such as set-point value, actual value, control difference, solenoid currents, etc., which can graphically be depicted on a common time axis.

The manual operating mode makes available commands such as Forwards, Backwards, Rapid Speed and Creep Speed. With this it is possible to put the connected hydraulics into operation without a superordinate control system.

**Analogue Inputs**
The applied analogue signal is digitalised at the analogue inputs 1 and 2 with 10-bits, and at the analogue inputs 3 and 4 with 16-bits.

**Attention:**
When selecting the range 4...20 mA, the resolution is <10-bit! All analogue inputs are executed as differential inputs. Differential inputs are utilised, when the potential of the mass of the external transmitters does not correspond to the mass from the controller module «SD6». If the differential input is to be utilised like an analogue input to mass, then the - (minus) connection if the differential input has to be connected to mass.

**Cable Break Monitoring at the Analogue Input**
The analogue input 2 can be monitored for cable breaks. If a cable break is detected, the solenoid output is blocked and the output «Error» is activated. For the monitoring to be effective, the following conditions have to be fulfilled:
• The input signal has to be a current signal of 4...20.
• The cable break monitoring has to be activated.

**Attention:**
Up until the identification of a cable break approx. 100 ms elapse. During this time, the axis may carry out unintended movements or unintendedly modified forces!

**Analogue input voltage**
Input voltage range 0…±10 V, analogue input 2: 0...10 V.
If in case of the version 12 VDC, the stabilised voltage (0…8 V) is utilised, then in the PASO the scaling [% / V] has to be correspondingly adapted.

**Analogue input current**
Input current range 0…20 mA / 4…20 mA

**Digital input 1 «Enable control»**
Enables the controller module «SD6» in general. Without this enabling, no solenoid current is output. The digital input 1 as standard setting is high-active (refer to electrical characteristic values).

**Digital Input 2 «Solenoid B» or «Automatic - / Manual Operation»**
In the operating mode 5 «Set-point value unipolar (2 - solenoid with DigOn2)» (refer to data sheet 1.11-100 / page 5), the solenoid B is active, when the digital input 2 is «active». When the digital input 2 is «inactive», the solenoid A is active. In all «closed-loop» - controller modes, with digital input 2 it is possible to changeover between automatic - and manual operation.

**Digital Input 3 «Manual Forwards» or «Profile / Sequence»**
In the manual operating mode, the digital input 3 issues the command 3 Forwards. In the automatic operating mode, the digital input 3 changes over between Profile and Sequence.

**Digital Input 4 «Manual Reverse» or «Start»**
In the manual operating mode, the digital input 4 issues the command Reverse. In the automatic operating mode, the digital input 4 issues the command Start for the profile generator.

**Digital Input 5 «Rapid Speed / Creep Speed» or «Stop»**
In the manual operating mode, the digital input 5 changes over between Rapid speed and Creep speed. In the automatic operating mode, the digital input 5 issues the command Stop for the profile generator.

**Digital Inputs 6...8 «Profile Selection»**
In the automatic operating mode, with the digital inputs 6...8 it is possible to select the travelling profile. In the manual operating mode, the digital inputs 6...8 have no function.

All digital inputs are low-side switches (refer to characteristics electrical values).
The digital inputs 1-2 can only be utilised with local device control (db.local=1).

**Digital Output 1 «Error»**
This output becomes active, when an error is detected. An error once detected is indicated until the «SD6»-controller module is disabled through the digital input «Enable control» and enabled once again.

**Digital Output 2 «Target Window Reached»**
This output becomes active, when the control difference is within the target window.

**Digital Output 3 «Contouring Error»**
This output becomes active, when the contouring error is outside the contouring error window.

**Digital Output 4 «Profile End»**
This output becomes active, when the travelling profile has been finished.

**Travel profiles**
The axis controller is in a position to save and to run through complete travel profiles, which have been preset by the user. A travel profile is a sequence of individual profiles (sequences). The travel command data of each sequence consist of:
- preset position (sequence target or endposition)
- speed (travelling preset speed value)
- acceleration (acceleration or deceleration, necessary for reaching travelling speed, starting from a given initial speed value)
- deceleration (deceleration or acceleration necessary for reaching the sequence end speed)
- stop time
- function «profile end reached» output

A travel profile as a minimum consists of one - and as a maximum of 100 sequences. As a maximum there are 16 travel profiles possible. A travel profile can be run through either completely or else step by step (sequence by sequence).
In the travel profile generator, the travel profiles can be adjusted and graphically displayed. This graphic display gives a good overview on the adjusted travel profiles.

**Ramps**
Per solenoid, two linear ramps for Up and Down can be adjusted separately. The ramps are only available in the amplifier mode.

**CONNECTION EXAMPLE** («SD6»-Controller module Enhanced with Profibus DP interface)

Positional control with a digital sensor and 16-bit set-point value preset