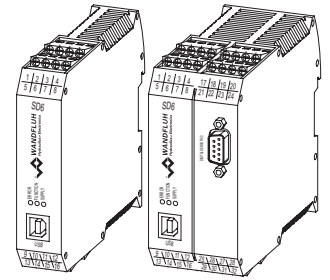# WANDFLUH
Hydraulics + Electronics

Digital Controller Module SD6
- ## For position-, pressure-, pQ- and alternating control
- ## Interface: - analogue
    - ## - programmable
    - ## - Profibus DP
- ## Analogue or SSI sensors for the feedback value
- ## 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. Apart from controls for pressure, volume flow or position, also pQ- and alternating controls can be implemented. 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.

FUNCTION

The driving takes place through an analogue or a fieldbus interface (Profibus DP). In case of the Enhanced controller, in addition the command value (position, pressure, force, etc.) can be predefined by means of the adjustable travel profiles. As feedback value generators, it is possible to connect analogue measuring systems (in case of the Enhanced controller also digital measuring systems) directly to the controller module. The Basic controller has two analogue inputs with 10-bit resolution. The Enhanced controller in addition has two analogue inputs with 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 super-ordinate machine control system. With the Enhanced controller, solenoids can be directly driven, or also valves with integrated amplifier (e.g., DSV, servo-valves, etc.).

CONTENT

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
- Analogue input 1 and 2: both voltage — 7
  Analogue input 3 and 4: both current
- Analogue input 1 and 2: both voltage — 8
  Analogue input 3 and 4: both current

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

Digital controller module 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
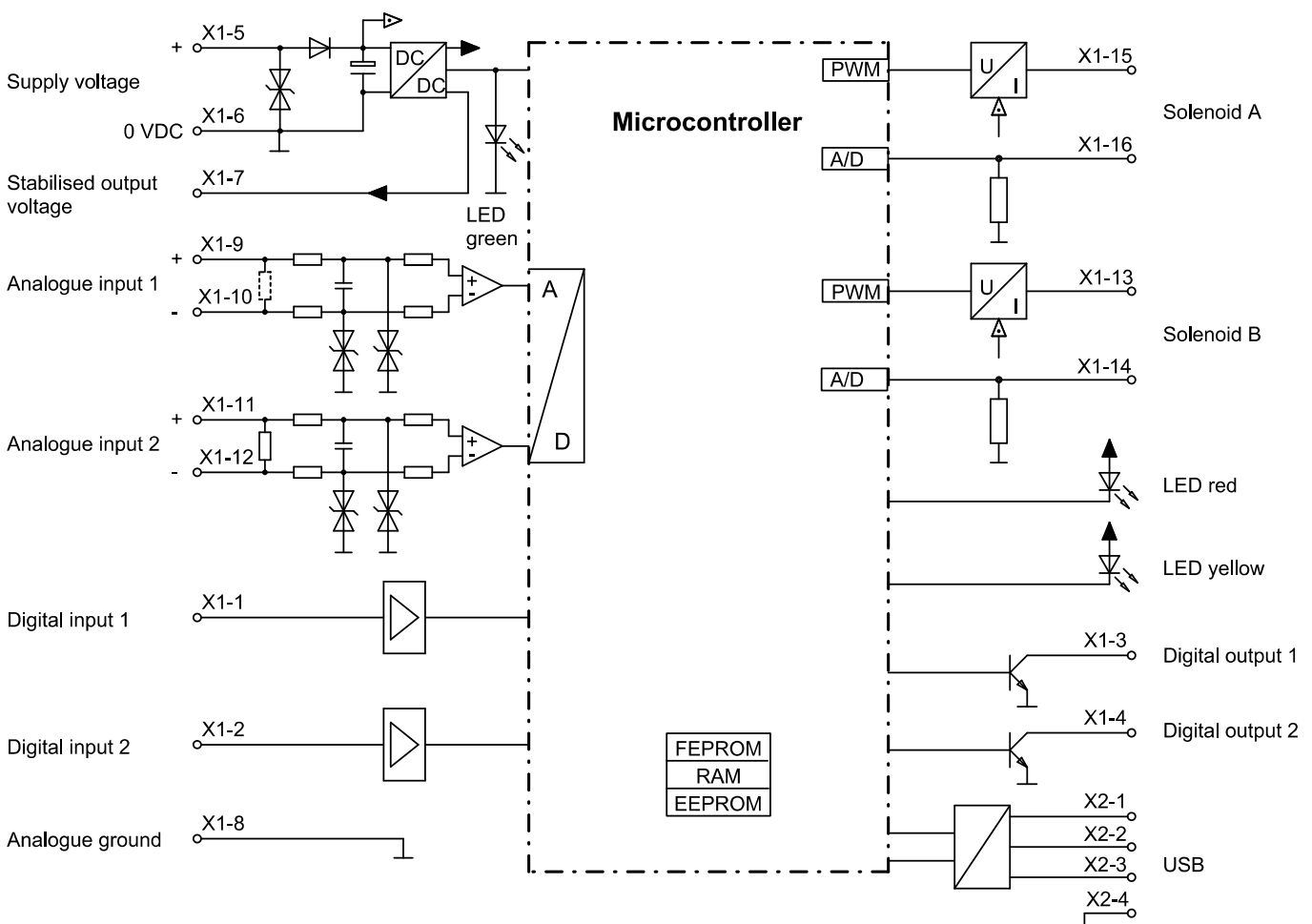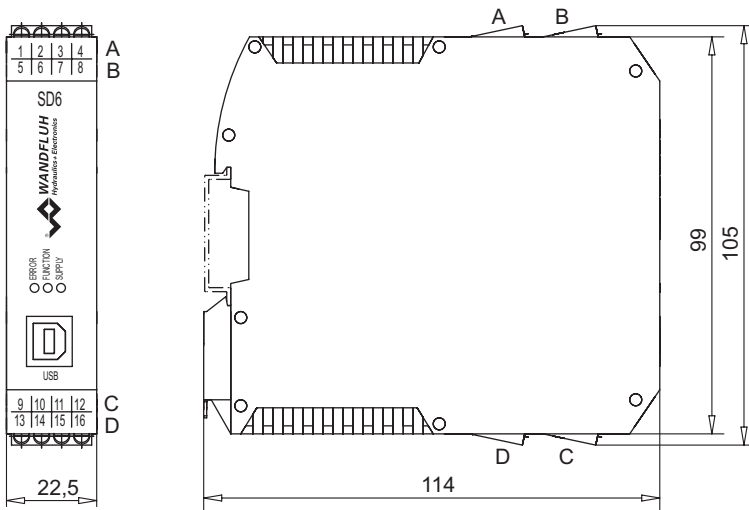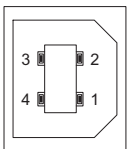
Design-Index (Subject to change)

GENERAL SPECIFICATIONS

Execution	Module for electrical control cubicle, housing made of plastic	Working temperature: -20…+70 °C
Dimensions:		The total current of the simultaneously driven solenoids is dependent on the ambient temperature.
• 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)	Further information can be found in the operating instructions.
Installation	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-section 2,5 mm²	

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Controller Module Basic with analogue interface

ELECTRICAL SPECIFICATIONS

Protection class	IP30 acc. to EN 60 529		max. load 30 mA
Supply voltage	24 VDC or 12 VDC	*Solenoid current:*	
Voltage range:		• Minimum current I_{min}	Adjustable 0…950 mA
• 24 VDC	21…30 V		Factory-preset 150 mA
• 12 VDC	10,5…15 V	• Maximum current I_{max}	Adjustable I_{min}…1,8A (with 24 VDC)
Ripple on supply vol.	<10 %		I_{min}…2,3A (with 12 VDC)
Fuse	slow		Factory-preset 700 mA
Current consumption:		Dither	Frequency adjustable 20…500 Hz
• No-load current	approx. 40 mA		Factory-preset 100 Hz
• Maximum current	no-load current + 1,8 A per solenoid (with 24 VDC)		Amplitude adjustable 0…400 mA
consumption	no-load current + 2,3 A per solenoid (with 12 VDC)		Factory-preset 100 mA
		Temperature drift	<1 % at ΔT = 40 °C
Command and feedback value signal:	Selectable with software	Digital inputs	Switching threshold high 6…30 VDC
	Diff. inputs not galvanically separated,		Switching threshold low 0…1 VDC
	for ground potential differences up to 1,5 V		Signal active at 6…30 VDC (active high)
	4…+20 mA / 0…+20 mA	Digital outputs	Low-Side-Switch:
	0…+10 V		U_{max} = 40 VDC
	-10…+10 V		I_{max} = -700 mA
Input resistance	Voltage input >18 kΩ	Serial interface	USB (receptacle type B)
	Load for current input = 250 Ω		for parameterisation «PASO»
Stabilised output	10 VDC (with version 24 VDC)	EMV	
voltage	8 VDC (with version 12 VDC)	Immunity	EN 61 000-6-2
		Emission	EN 61 000-6-4

BLOCK DIAGRAM

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DIMENSIONS

99 105

22,5 114

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 voltage +
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 inputs

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
Proportional directional valves	register 1.10
Proportional pressure valves	register 2.3
Proportional flow control valves	register 2.6

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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: position -, 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. The command value is brought to the controller as an electric signal; a sensor records the effective feedback value, and this signal is also brought to the controller. In correspondence with the control difference (command value - feedback value), a control signal (solenoid current) is output to the valve. By means of the scaling of command value and feedback value, all further inputs can be made in the required, resp. selectable physical unit (e.g., bar or mm, etc.). Once the command value has been reached, the controller module «SD6» can output a digital signal.

The controller module «SD6» has a command value generator, with which the up- and down ramp of the internal command 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» is 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 has a signal recording function. This by means of PASO makes possible a recording of various system signals, such as command value, feedback value, control difference, solenoid currents, etc., which can graphically be depicted on a common time axis.

Optimisation of characteristic curve

A characteristic curve adjustable per solenoid «Command value input-solenoid current output» enables an optimised (e.g., linearised) characteristic of the hydraulic system.

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 ground of the external generator does not correspond to the ground from the controller module «SD6». If the differential input is to be utilised like an analogue input to ground, then the - (minus) connection of the differential input has to be connected to ground.

Cable break monitoring at the analogue inputs

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:
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 with 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 specifications).

Digital input 2 «Solenoid B»
In the operating mode 5 «Command 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 electrical specifications).

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. Die Inverting the output is possible.

Digital output 2 «Target window reached»
This output becomes active, when the control difference is within the target window. Inverting the output is possible.

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

Controller modes
The following controller modes can be set:

Controller mode 3 «Pressure / flow valve open loop»
Driving of a pressure relief-, pressure control-, throttle- or volume flow control valve in open loop control circuit (without feedback value return).

Controller mode 4 «Pressure / flow valve closed loop (1-sol)»
Driving of a 1-solenoid-, pressure relief-, pressure reducing-, throttle-
or volume flow control valve in closed loop control circuit (with feed-
back value return).

Controller mode 6 «Position open loop»
Driving of a direction control valve in open control loop circuit (without
feedback value return).

Controller mode 7 «Speed control closed loop (2-sol)»
Driving of a 2-solenoid direction-, throttle- or volume flow control valve
in closed loop control circuit (with feedback value return).
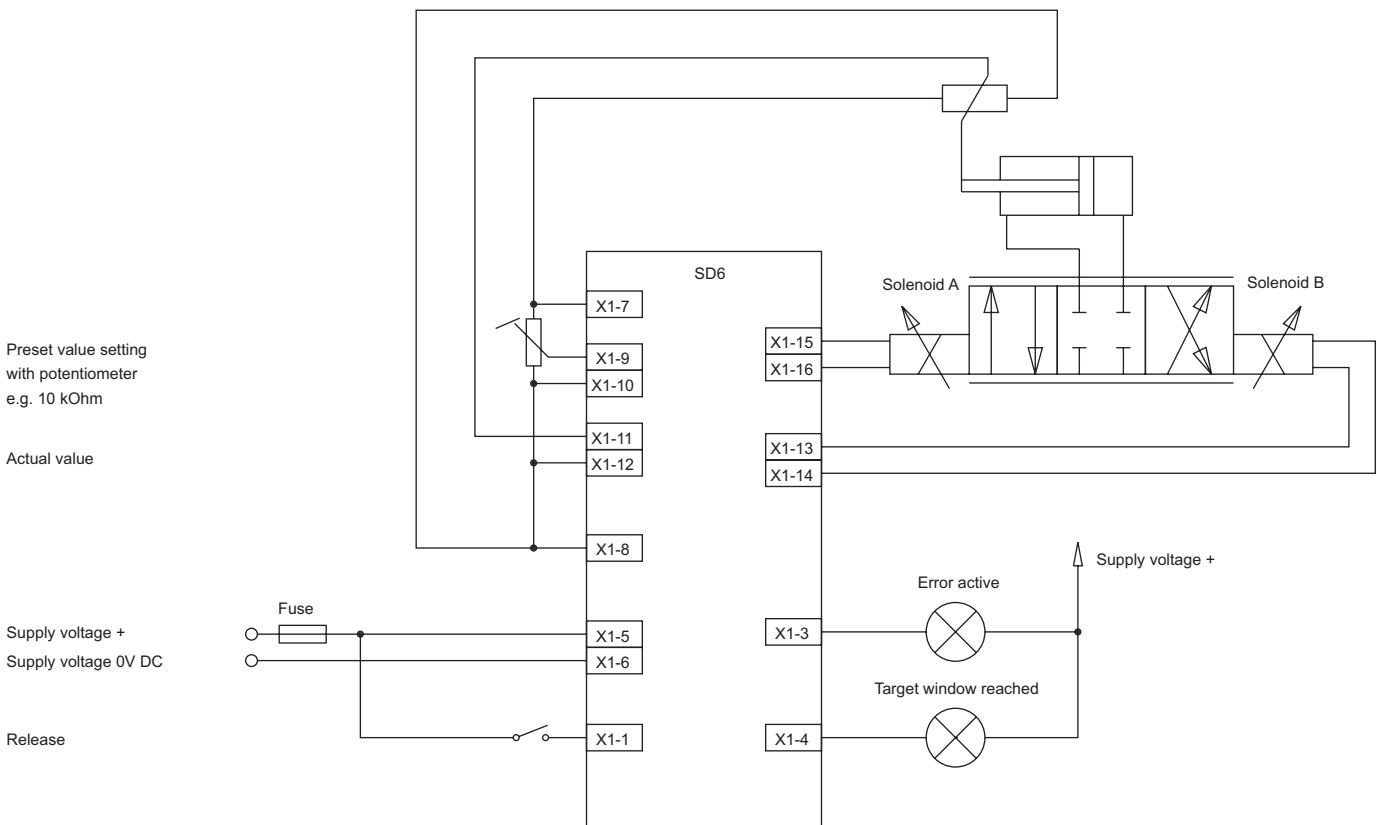
Controller mode 9 «Position closed loop (2-sol)»
Driving of a 2-solenoid direction control valve in closed loop control
circuit (with feedback value return).

Controller mode -5 «Position closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in closed loop control circuit
(with feedback value return) as pressure reduction.

CONNECTION EXAMPLE «SD6»-Controller module with analogue interface

Position control (Command value and feedback value 10-bit, 16-bit not possible in case of «SD6»-Controller module Basic)

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Controller module Basic with Profibus interface

ELECTRICAL SPECIFICATIONS

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

BLOCK DIAGRAM

Supply voltage	X1-5 + / X1-6 −
Stabilised output voltage	X1-7
	LED green
Analogue input 1 voltage	X1-9 + / X1-10 −
Analogue input 2 current	X1-11 + / X1-12 −
Digital input 1	X1-1
Digital input 2	X1-2
Analogue ground	X1-8

Microcontroller

A D

FEPROM
RAM
EEPROM

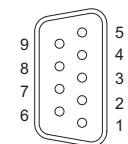|	
PWM — U/I	X1-15 — Solenoid A
A/D	X1-16
PWM — U/I	X1-13 — Solenoid B
A/D	X1-14
	LED red
	LED yellow
	X1-3 — Digital output 1
	X1-4 — Digital output 2
	X2-1 / X2-2 / X2-3 / X2-4 — USB
	X4-6 / X4-8 / X4-5 / X4-7 — Profibus DP

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 inputs

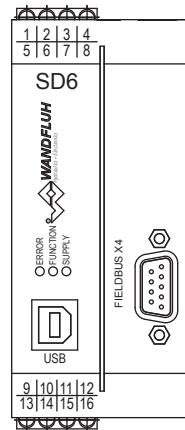| Type description	Analogue input 1	Analogue input 2
SD6332D. **0**-AB	voltage	current
SD6332D. **1**-AB	voltage	voltage (0...10 V only)
SD6332D. **2**-AB	current	current

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
Proportional directional valves	register 1.10
Proportional pressure valves	register 2.3
Proportional flow control valves	register 2.6

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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: position -, 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. The command value is brought to the controller as an electric signal or through the Profibus DP; a sensor records the effective feedback value, and this signal is also brought to the controller. In correspondence with the control difference (command value - feedback value), a control signal (solenoid current) is output to the valve. By means of the scaling of command value and feedback value, all further inputs can be made in the required, resp. selectable physical unit (e.g., bar or mm, etc.). Once the command value has been reached, the controller module «SD6» can output a digital signal.

The controller module «SD6» has a command value generator, with which the up- and down ramp of the internal command 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» is 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 has a signal recording function. This by means of PASO makes possible a recording of various system signals, such as command value, feedback value, control difference, solenoid currents, etc., which can graphically be depicted on a common time axis.

Optimisation of characteristic curve

A characteristic curve adjustable per solenoid «Command value input-solenoid current output» enables an optimised (e.g., linearised) characteristic of the hydraulic system.

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 ground of the external generator does not correspond to the ground from the controller module «SD6». If the differential input is to be utilised like an analogue input to ground, then the - (minus) connection of the differential input has to be connected to ground.

Cable break monitoring at the analogue inputs

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:

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 with 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 specifications).

Digital input 2 «Solenoid B»

In the operating mode 5 «Command 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 electrical specifications).
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. Inverting the output is possible.

Digital output 2 «Target window reached»

This output becomes active, when the control difference is within the target window. Inverting the output is possible.

Ramps

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

Controller modes

The following controller modes can be set:

Controller mode 3 «Pressure / flow valve open loop»

Driving of a pressure relief-, pressure control-, throttle- or volume flow control valve in open loop control circuit (without feedback value return).

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Controller mode 4 «Pressure / flow valve closed loop (1-sol)»

Driving of a 1-solenoid-, pressure relief-, pressure reducing-, throttle- or volume flow control valve in closed loop control circuit (with feedback value return).

Controller mode 6 «Position open loop»

Driving of a direction control valve in open control loop circuit (without feedback value return).

Controller mode 7 «Speed control closed loop (2-sol)»

Driving of a 2-solenoid direction-, throttle- or volume flow control valve in closed loop control circuit (with feedback value return).
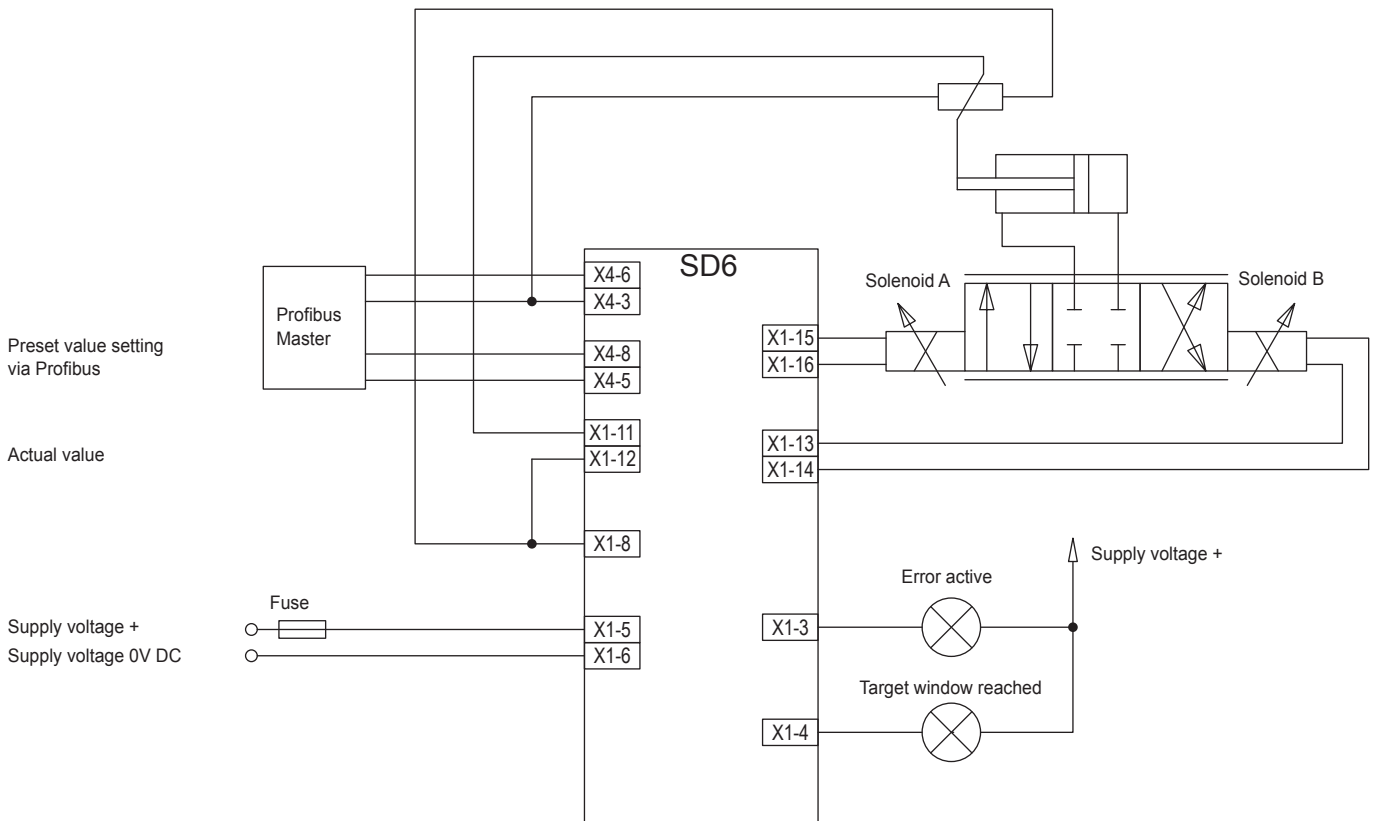
Controller mode 9 «Position closed loop (2-sol)»

Driving of a 2-solenoid direction control valve in closed loop control circuit (with feedback value return).

Controller mode -5 «Position closed loop (2-sol)»

Driving of two 1-solenoid throttle valves in closed loop control circuit (with feedback value return) as pressure reduction.

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

Position control (Command value and feedback value 10-bit, 16-bit not possible in case of «SD6»-Controller module Basic)
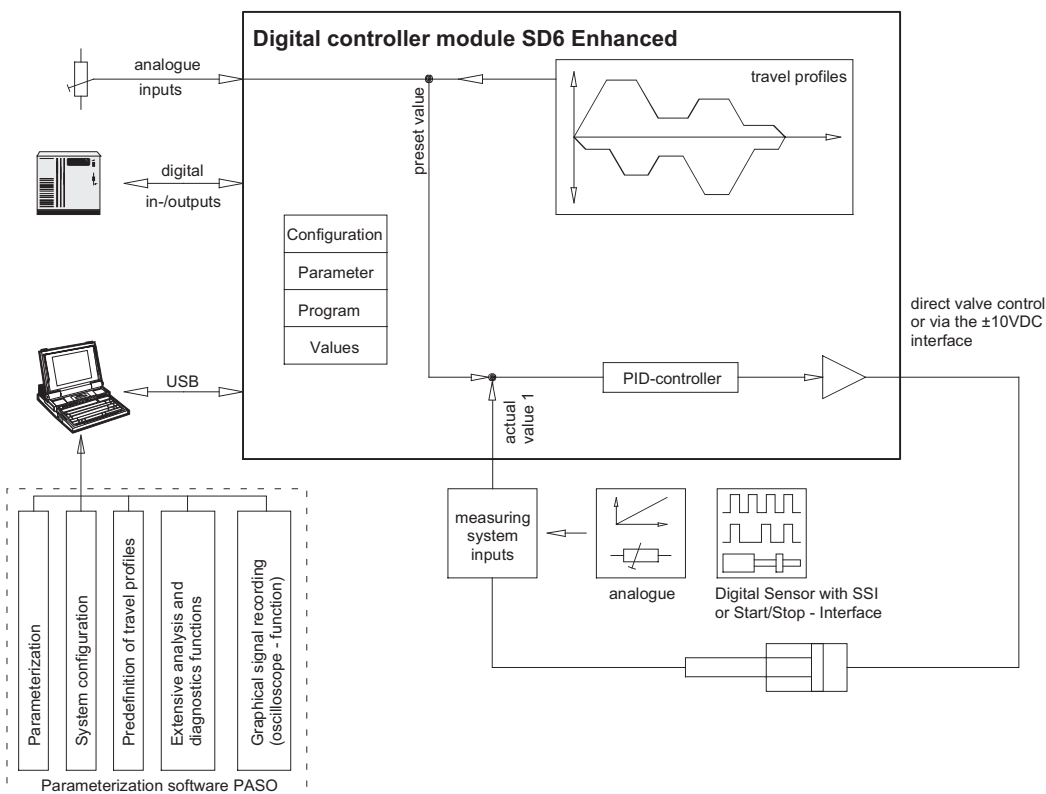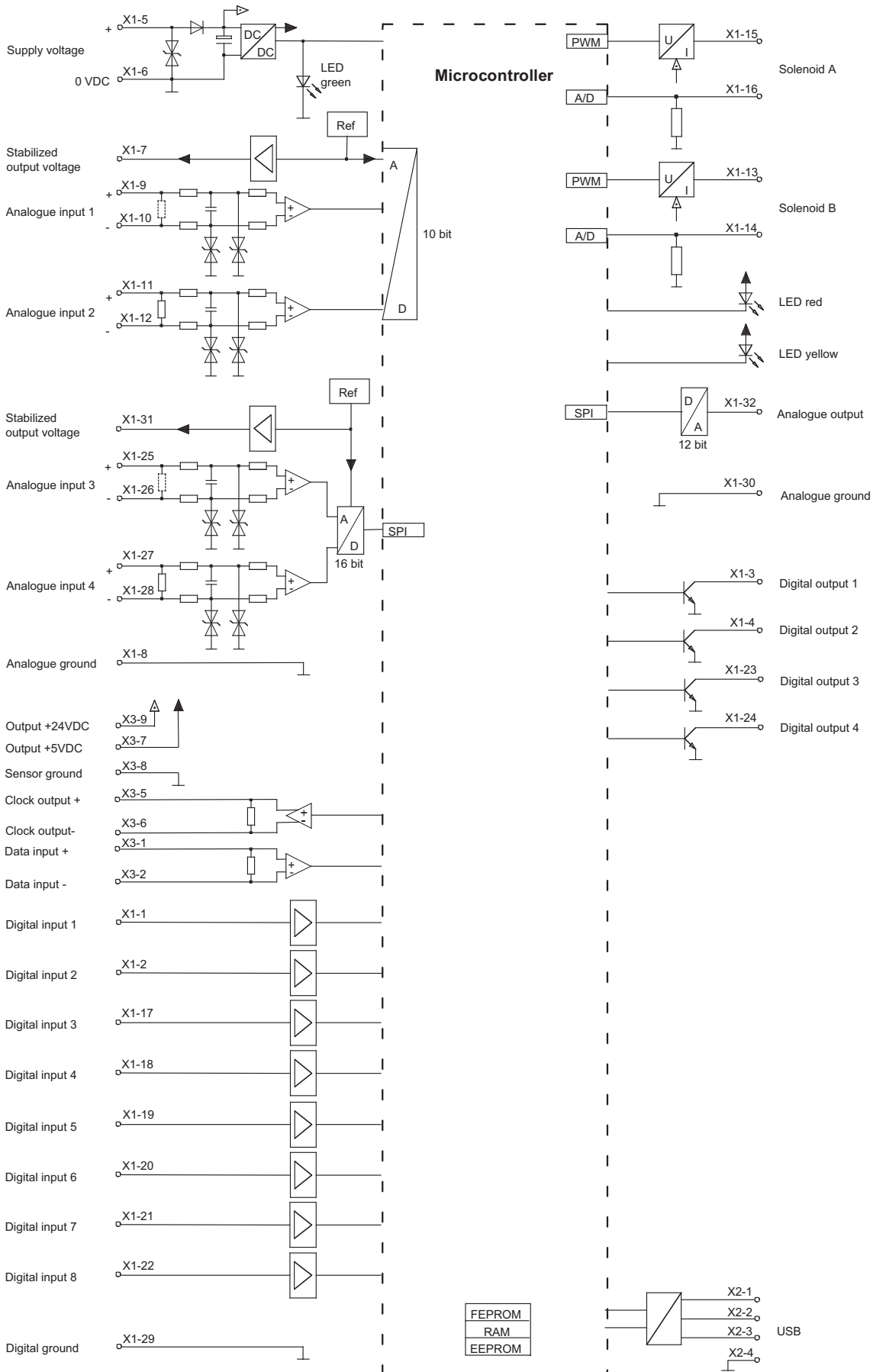
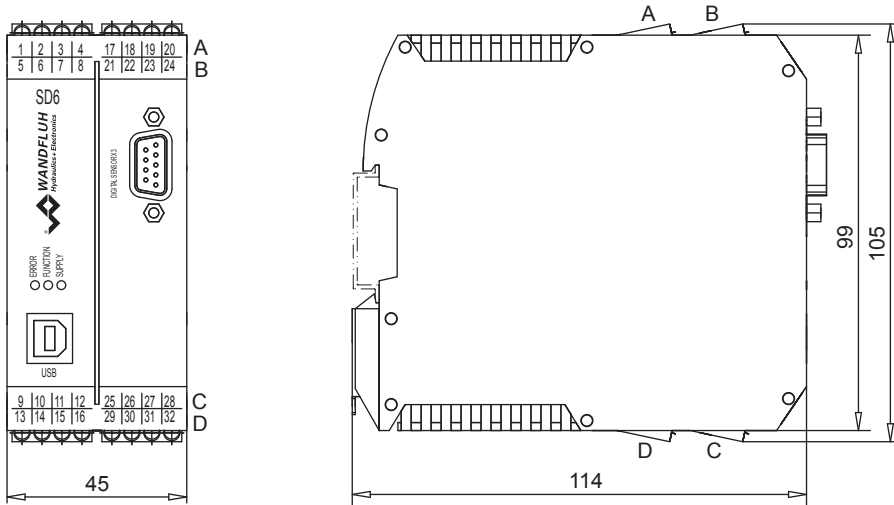## Controller Module Enhanced with analogue interface
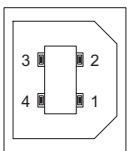
ELECTRICAL SPECIFICATIONS

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

FUNCTION DIAGRAM

BLOCK DIAGRAM

Supply voltage — X1-5 +
0 VDC — X1-6
DC/DC
LED green
Microcontroller

Stabilized output voltage — X1-7 — A
Analogue input 1 — + X1-9 / − X1-10
Analogue input 2 — + X1-11 / − X1-12 — D
10 bit

Ref

Stabilized output voltage — X1-31
Analogue input 3 — + X1-25 / − X1-26
Analogue input 4 — + X1-27 / − X1-28
A/D 16 bit — SPI

Analogue ground — X1-8

Output +24VDC — X3-9
Output +5VDC — X3-7
Sensor ground — X3-8
Clock output + — X3-5
Clock output − — X3-6
Data input + — X3-1
Data input − — X3-2

Digital input 1 — X1-1
Digital input 2 — X1-2
Digital input 3 — X1-17
Digital input 4 — X1-18
Digital input 5 — X1-19
Digital input 6 — X1-20
Digital input 7 — X1-21
Digital input 8 — X1-22

Digital ground — X1-29

PWM — U/I — X1-15 — Solenoid A
A/D — X1-16
PWM — U/I — X1-13 — Solenoid B
A/D — X1-14
LED red
LED yellow
SPI — D/A — X1-32 — Analogue output
12 bit
X1-30 — Analogue ground
X1-3 — Digital output 1
X1-4 — Digital output 2
X1-23 — Digital output 3
X1-24 — Digital output 4

FEPROM
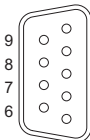RAM
EEPROM

X2-1
X2-2
X2-3
X2-4
USB

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

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

START-UP

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.
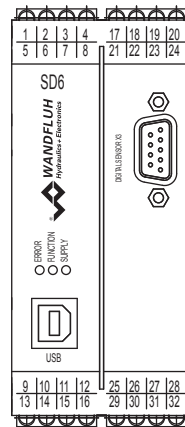
Additional information can be found on our website:
«www.wandfluh.com»

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

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
```

ADDITIONAL INFORMATION

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

Configuration analogue inputs

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: position -, 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 command 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 feedback value, and this signal is also brought to the controller. In correspondence with the control difference (command value - feedback value), a control signal (solenoid current) is output to the valve. By means of the scaling of command value and feedback value, all further inputs can be made in the required, resp. selectable physical unit (e.g., bar or mm, etc.). Once the command 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 command 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 module «SD6» then function corresponding to normal amplifier electronics.

Furthermore the controller module «SD6» is equipped with 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 has a signal recording function. This by means of PASO makes possible a recording of various system signals, such as command value, feedback 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.

Optimisation of characteristic curve

A characteristic curve adjustable per solenoid «Command value input-solenoid current output» enables an optimised (e.g., linearised) characteristic of the hydraulic 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 ground of the external generator does not correspond to the ground from the controller module «SD6». If the differential input is to be utilised like an analogue input to ground, then the - (minus) connection of the differential input has to be connected to ground.

Cable break monitoring at the analogue inputs

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:

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 with 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

Analogue output

The analogue output is converted with a 12-Bit D/A converter. This provides the possibility of outputting different signals, such as, e.g., command - or feedback values as analogue value.

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 specifications).

Digital input 2 «Solenoid B» or «Automatic - / Manual operation»

In the operating mode 5 «Command 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. For changing over, the digital controller module SD6 has to be blocked by means of the digital input 1.

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.

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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 electrical specifications).

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. Inverting the output is possible.

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

Digital Output 3 «Trailing Error»
This output becomes active, when the contouring error is outside the trailing error window. Inverting the output is possible.

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

Controller modes
The following controller modes can be set:

Controller mode 3 «Pressure / flow valve open loop»
Driving of a pressure relief-, pressure control-, throttle- or volume flow control valve in open loop control circuit (without feedback value return).

Controller mode 4 «Pressure / flow valve closed loop (1-sol)»
Driving of a 1-solenoid-, pressure relief-, pressure reducing-, throttle- or volume flow control valve in closed loop control circuit (with feedback value return).

Controller mode 6 «Position open loop»
Driving of a direction control valve in open control loop circuit (without feedback value return).

Controller mode 7 «Speed control closed loop (2-sol)»
Driving of a 2-solenoid direction-, throttle- or volume flow control valve in closed loop control circuit (with feedback value return).

Controller mode 9 «Position closed loop (2-sol)»
Driving of a 2-solenoid direction control valve in closed loop control circuit (with feedback value return).

Controller mode -5 «Position closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in closed loop control circuit (with feedback value return) as pressure reduction.

Controller mode -9 «pQ control (2-sol)»
There is a Q and a p command value. With the Q command value, the cylinder can move in open loop in both directions. The p command value defines the maximum permissible pressure. If this pressure is ex-

ceeded, the controller reduces the output signal to the valve, so that the preset pressure is not exceeded. A return movement (cylinder moves backwards, resp."gives way") is then possible. The p feedback value can be provided either as an absolute signal (V or mA) from a pressure or force sensor, or can be formed as a differential pressure built of two pressure or force sensors (V or mA).

With this controller mode, the choice of the proportioal valve has a great influence on the system behaviour. More details about this are available from the works.

Controller mode -10 «Alternating control (2-sol)»
There is a position and a p command value. With the position command value, the cylinder can be moved in closed loop in both directions. The p command value defines the maximum permissible pressure. If this pressure is exceeded, the position controller is switched off and the controller reduces the output signal to the valve, so that the preset pressure is not exceeded. If the feedback pressure becomes lower than the command pressure again, the position controller switches on again. A return movement (cylinder moves backwards, resp. "gives way") is then possible. The p feedback value can be provided either as an absolute signal (V or mA) from a pressure or force sensor, or can be formed as a differential pressure built of two pressure or force sensors (V or mA).

With this controller mode, the choice of the proportional valve has a great influence on the system behaviour. More details about this are available from the works.

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Travel profiles

The «SD6» controller module Enhanced 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). Each sequence consists of the following data:
- command position (sequence target or endposition)
- speed (travelling speed)
- acceleration (acceleration for reaching the travelling speed)
- deceleration (deceleration, departing from the travelling speed)
- stop time (waiting time after reaching the end position of the sequence)
- function «sequence reached» (setting a digital output when reaching the end position of the sequence)

A travel profile as a minimum consists of 1 - and as a maximum of 100 sequences. As a maximum there are 7 travel profiles possible. A travel profile can be run through either completely or else step by step (sequence by sequence).
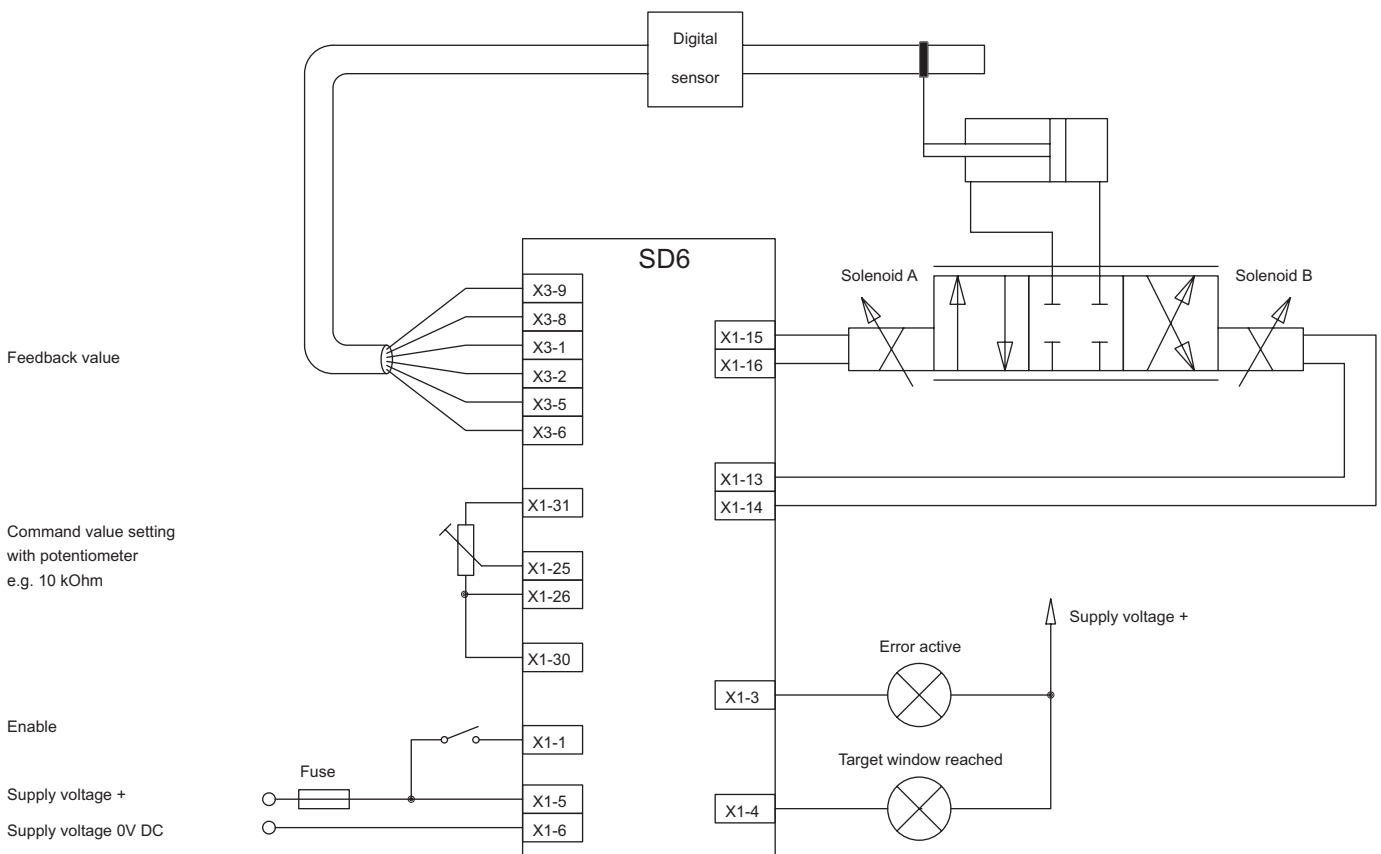
In the travel profile generator, the travel profiles can be defined and graphically displayed. With this, a good overview is assured, because all inputs are immediately graphically visible.

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)

Position control with a digital sensor and 16-bit command value preset

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Controller Module Enhanced with Profibus interface

ELECTRICAL SPECIFICATIONS

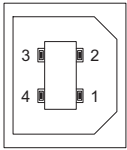|			
Protection class	IP 30 acc. to EN 60 529		
Device receptacle		Profibus interface	Absolute via SSI (1...32 bit, gray or binary)
Sensor (female)	DSUB, 9-poles		D-Sub-Plug-in coupling 9-poles,
Mating connector	Plug (male)		female on front plate,
	DSUB, 9-poles		differential signal transmission
		Bus topology	Line
Device receptacle		Potential separation	Profibus to «SD6»-electronics 500 VDC
Profibus (female)	DSUB, 9-poles	*Analogue output:*	Output voltage ± 10 V
Mating connector	Plug (male)		max. output current ± 3 mA
	DSUB, 9-poles	Stabilised output	10 VDC (with version 24 VDC)
Supply voltage	24 VDC or 12 VDC	voltage	8 VDC (with version 12 VDC)
Voltage range:			max. load 30 mA

Voltage range:
- 24 VDC — 21…30 V
- 12 VDC — 10,5…15 V

Ripple on supply vol. — <10 %
Fuse — slow

Solenoid current:
- Minimum current I_{min} — Adjustable 0…950 mA — Factory-preset 150 mA
- Maximum current I_{max} — Adjustable I_{min}…1,8 A (with 24 VDC) / I_{min}…2,3 A (with 12 VDC) — Factory-preset 700 mA

Current consumption:
- No-load current — approx. 70 mA
- Maximum current (with 24 VDC) — no-load current +1,8 A per solenoid
- consumption (with 12 VDC) — no-load current +2,3 A per solenoid

Dither — Frequency adjustable 20…500 Hz — Factory-preset 100 Hz — Amplitude adjustable 0…400 mA — Factory-preset 100 mA

Command and feedback value signal: — Selectable with software — Diff. inputs not galvanically separated, for ground potential differences up to 1,5 V — 4…+20 mA / 0…+20 mA — 0…+10 V — -10…+10 V (not with analogue input 2)

Temperature drift — <1 % at $\Delta T = 40\,°C$

Digital inputs — Switching threshold high 6…30 VDC — Switching threshold low 0…1 VDC — Signal active at 6…30 VDC (active high)

Analogue inputs
- 1 and 2 — 10-bit-resolution
- 3 and 4 — 16-bit-resolution

Digital outputs — Low-Side-Switch: $U_{max} = +40$ VDC $I_{max} = -700$ mA

Input resistance — Voltage input >18 kΩ — Load for current input = 250 Ω

Serial interface — USB (receptacle type B) — for parameterisation «PASO»

Measuring system input — D-Sub plug-in connector 9-pole female on front plate in accordance with RS422-standard selectable by means of software Absolute via Start / Stop

EMV
Immunity — EN 61 000-6-2
Emission — EN 61 000-6-4

FUNCTION DIAGRAM

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BLOCK DIAGRAM

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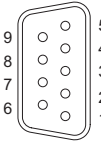
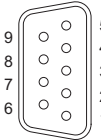# CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

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

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-pole) 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.
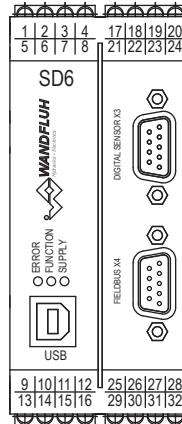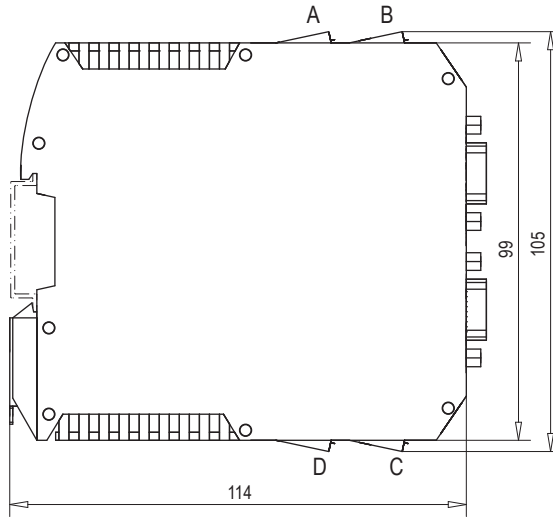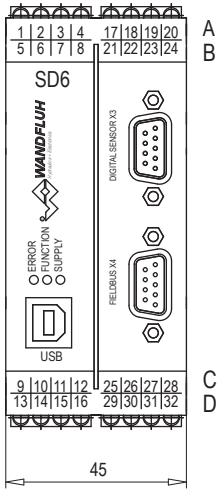
Additional information can be found on our website:
«www.wandfluh.com»

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
Proportional directional valves	register 1.10
Proportional pressure valves	register 2.3
Proportional flow control valves	register 2.6

Configuration analogue inputs

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

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DIMENSIONS

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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: position -, 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 command 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 feedback value, and this signal is also brought to the controller. In correspondence with the control difference (command value - feedback value), a control signal (solenoid current) is output to the valve. By means of the scaling of command value and feedback value, all further inputs can be made in the required, resp. selectable physical unit (e.g., bar or mm, etc.). Once the command 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 command 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 module «SD6» then function corresponding to normal amplifier electronics.

Furthermore the controller module «SD6» is equipped with 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 has a signal recording function. This by means of PASO makes possible a recording of various system signals, such as command value, feedback 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.

Optimisation of characteristic curve

A characteristic curve adjustable per solenoid «Command value input-solenoid current output» enables an optimised (e.g., linearised) characteristic of the hydraulic 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 command value inputs are executed as differential inputs. Differential inputs are utilised, when the potential of the ground of the external command generator does not correspond to the ground from the controller module «SD6». If the differential input is to be utilised like an analogue input to ground, then the - (minus) connection of the differential input has to be connected to ground.

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:

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 with 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

Analogue output

The analogue output is converted with a 12-Bit D/A converter. This provides the possibility of outputting different signals, such as, e.g., command - or feedback values as analogue value.

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 specifications).

Digital input 2 «Solenoid B» or «Automatic -/ Manual operation»

In the operating mode 5 «Command 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. For changing over, the digital controller module SD6 has to be blocked by means of the digital input 1.

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.

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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 electric specifications).
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. Inverting the output is possible.

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

Digital Output 3 «Trailing Error»
This output becomes active, when the contouring error is outside the trailing error window.
Inverting the output is possible.

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

Travel profiles
The «SD6» controller module Enhanced 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). Each sequence consists of the following data:
• command position (sequence target or endposition)
• speed (travelling speed)
• acceleration (acceleration for reaching the travelling speed)
• deceleration (deceleration, departing from the travelling speed)
• stop time (waiting time after reaching the end position of the sequence)
• function «sequence reached» (setting a digital output when reaching the end position of the sequence)
A travel profile as a minimum consists of 1 - and as a maximum of 100 sequences. As a maximum there are 7 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 defined and graphically displayed. With this, a good overview is assured, because all inputs are immediately graphically visible.

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

Controller modes
The following controller modes can be set:

Controller mode 3 «Pressure / flow valve open loop»
Driving of a pressure relief-, pressure control-, throttle- or volume flow control valve in open loop control circuit (without feedback value return).

Controller mode 4 «Pressure / flow valve closed loop (1-sol)»
Driving of a 1-solenoid-, pressure relief-, pressure reducing-, throttle- or volume flow control valve in closed loop control circuit (with feedback value return).

Controller mode 6 «Position open loop»
Driving of a direction control valve in open control loop circuit (without feedback value return).

Controller mode 7 «Speed control closed loop (2-sol)»
Driving of a 2-solenoid direction-, throttle- or volume flow control valve in closed loop control circuit (with feedback value return).

Controller mode 9 «Position closed loop (2-sol)»
Driving of a 2-solenoid direction control valve in closed loop control circuit (with feedback value return).

Controller mode -5 «Position closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in closed loop control circuit (with feedback value return) as pressure reduction.

Controller mode -9 «pQ control (2-sol)»
There is a Q and a p command value. With the Q command value, the cylinder can move in open loop in both directions. The p command value defines the maximum permissible pressure. If this pressure is exceeded, the controller reduces the output signal to the valve, so that the preset pressure is not exceeded. A return movement (cylinder moves backwards, resp."gives way") is then possible. The p feedback value can be provided either as an absolute signal (V or mA) from a pressure or force sensor, or can be formed as a differential pressure built of two pressure or force sensors (V or mA).

With this controller mode, the choice of the proportioal valve has a great influence on the system behaviour. More details about this are available from the works.

Controller mode -10 «Alternating control (2-sol)»
There is a position and a p command value. With the position command value, the cylinder can be moved in closed loop in both directions. The p command value defines the maximum permissible pressure. If this pressure is exceeded, the position controller is switched off and the controller reduces the output signal to the valve, so that the preset pressure is not exceeded. If the feedback pressure becomes lower than the command pressure again, the position controller switches on again. A return movement (cylinder moves backwards, resp. "gives way") is then possible. The p feedback value can be provided either as an absolute signal (V or mA) from a pressure or force sensor, or can be formed as a differential pressure built of two pressure or force sensors (V or mA).

With this controller mode, the choice of the proportional valve has a great influence on the system behaviour. More details about this are available from the works.

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

Position control with a digital sensor and 16-bit command value preset

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