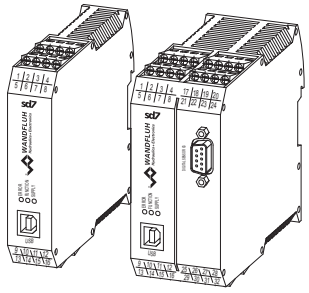

Digital Controller Module SD7

- **For position, pressure and volume flow controls**
- **Interface: - analogue**
  - CANopen / J1939
  - Profibus DP
  - HART
- **Analogue or SSI sensors for the feedback signal**
- **Integrated final power stage**
- **Adjustment via PC**
- **for snapping on to dome rail**
- **also available as controller module** **(see data sheet 1.13-101)**

DESCRIPTION

Digital amplifier module for installation on dome rail for driving proportional or black/white valves with one or two solenoids. Pressure, volume flow or position control can be realised. The parameterisation takes place by means of menu-controlled parameterisation- and diagnostics software «PASO» from Wandfluh (USB-interface). Optionally, the electronics are available with different field bus interfaces.

FUNCTION

The controller module has two **P**ulse-**W**idth-**M**odulated current outputs with superimposed dither signal. The analogue and digital inputs as well as the digital outputs can be programmed individually. In case of the Enhanced controller, the command value (position, pressure, force, etc.) in addition can be predefined by means of freely adjustable travel profiles.
The field bus connection enables reading the command value resp. the feedback value signal as well as the parameterisation directly via the field bus.

APPLICATION

As snap-on module, the controller module is mainly utilised in the industrial field. The module can be mounted on dome-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 an integrated controller (e.g. DSV, servo valves, etc.) can alternatively be driven via the analogue output.

CONTENT

GENERAL SPECIFICATIONS 1

BASIC CONTROLLER
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WITH CANopen INTERFACE 32

ENHANCED CONTROLLER
WITH PROFIBUS INTERFACE 39

ENHANCED CONTROLLER
WITH HART INTERFACE 46

GENERAL SPECIFICATIONS

Execution	Module for electrical control cubicle, housing made of plastic
Dimensions:	
• Basic controller analogue	105 x 114 x 22.5 mm
• Basic controller Profibus DP	105 x 114 x 45 mm
• Basic controller HART	105 x 114 x 45 mm
• Enhanced controller analogue	105 x 114 x 45 mm
• Enhanced controller Profibus DP	105 x 114 x 45 mm
• Enhanced controller HART	105 x 114 x 45 mm
Installation	for 35 mm dome rail acc. to EN 60715
Weight	
• Basic controller analogue	130 g
• Basic controller Profibus DP	220 g
• Basic controller HART	220 g
• Enhanced controller analogue	220 g
• Enhanced controller Profibus DP	240 g
• Enhanced controller HART	240 g
Connections	Screw terminals, max. cable cross-section 2.5 mm².
Working temperature:	-20…+70 °C The accummulated current of the simultaneously powered solenoid depends on the ambient temperature.
	Further information can be found in the operating instructions.

TYPE CODE

S D7 3 ☐ 2 ☐ ☐ - ☐☐ # ☐

Module for electrical control cubicle

Digital

Adjustable with PASO

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

2-solenoid version

Supply voltage:
- 24 VDC D2
- 12 VDC D3

Basic controller:
- Analogue input 1: voltage, 2: current 0
- Analogue input 1 and 2: both voltage 1
- Analogue input 1 and 2: both current 2

  Analogue input 3: always current (only with HART)

Enhanced controller:
- Analogue input 1 and 3: both voltage, Analogue input 2 and 4: both current 4
- Analogue input 1 to 4: all voltage 5
- Analogue input 1 to 4: all current 6
- Analogue input 1 and 2: both voltage, Analogue input 3 and 4: both current 7
- Analogue input 1 and 2: both current, Analogue input 3 and 4: both voltage 8

Basic controller without HART
- Analogue input 1 and 2: 10-Bit resolution A

Basic controller with HART
- Analogue input 1 and 2: 10-Bit resolution B
- Analogue input 3: 16-Bit resolution

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

Option field bus:
- without field bus A
- with Profibus DP P
- with CANopen C
- with J1939 J
- with HART H

Design-Index (Subject to change)

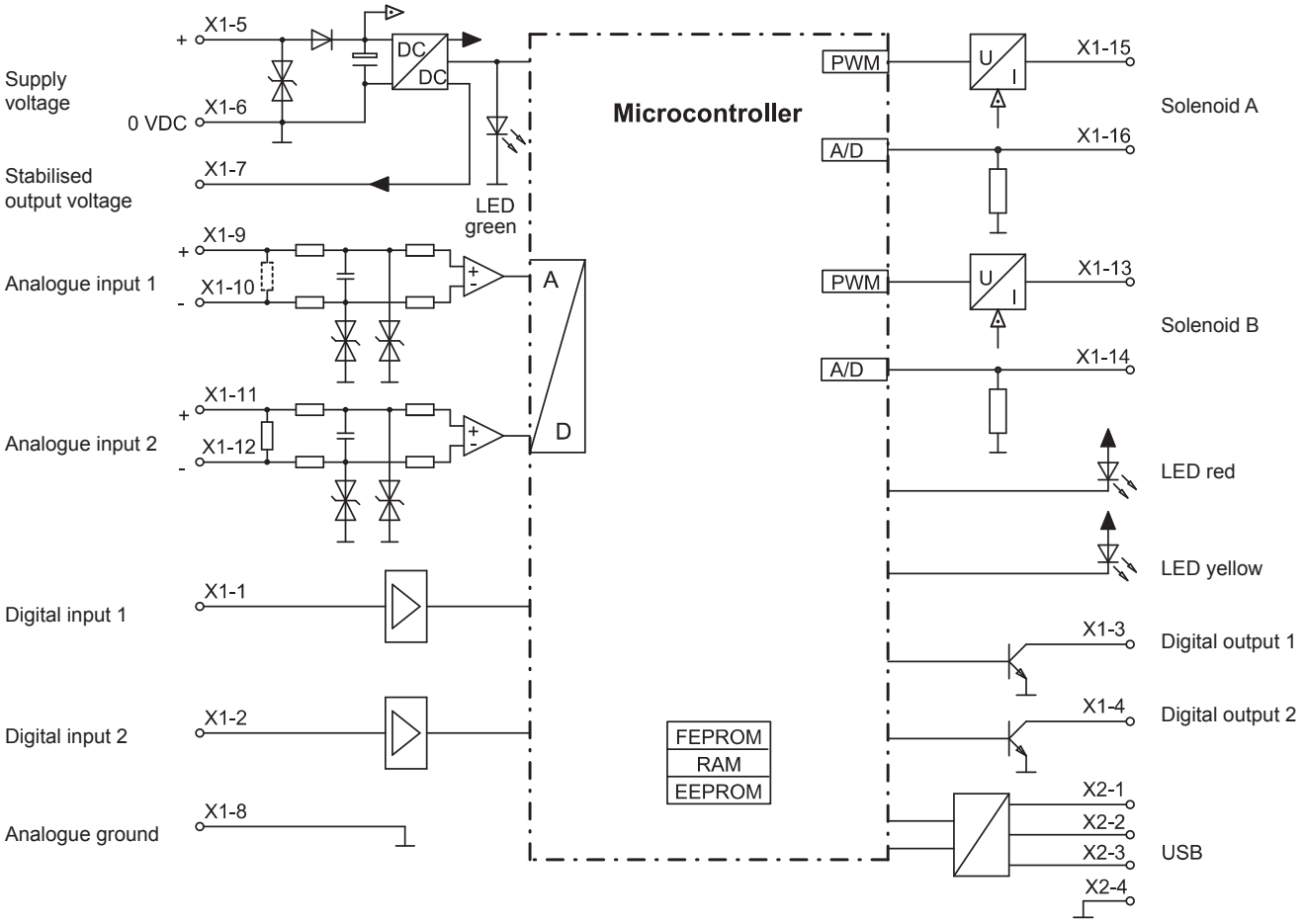
Basic controller with analogue interface

ELECTRICAL SPECIFICATIONS

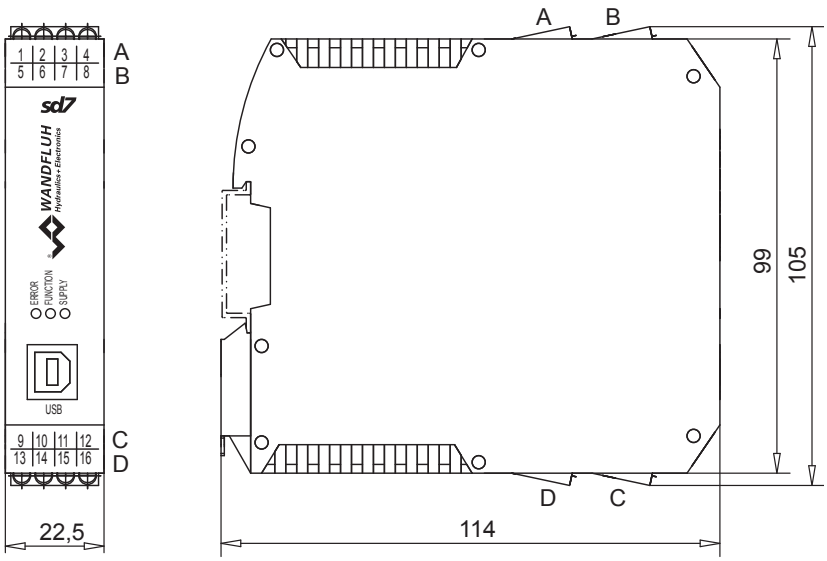
Protection class	IP30 acc. to EN 60 529
Supply voltage	24 VDC or 12 VDC
Voltage range:	
• 24 VDC	21…30 V
• 12 VDC	10,5…15 V
Residual ripple	<10 %
Fuse	low
Current consumption:	
• No-load current	approx. 40 mA
• Maximum current consumption	non-load current + 1,8 A per solenoid (with 24 VDC) non-load current + 2,3 A per solenoid (with 12 VDC)
Analogue inputs	Selectable with software Differential input not galvanically separated, for ground potential difference up to 1,5 V 4…+20 mA / 0…+20 mA 0…+10 V (1- or 2-solenoid version) -10…+10 V (only 2-solenoid version)
Resolution	10-Bit
Input resistance	Voltage input >18 kΩ Load for current input = 250 Ω
Stabilised output voltage	10 VDC (with 24 VDC) 8 VDC (with 12 VDC) max. load 30 mA

Solenoid current:	
• Minimal current I_{min}	Adjustable 0…950 mA Factory setting 150 mA
• Maximal current I_{max}	Adjustable I_{min}…1,8 A (with 24 VDC) I_{min}…2,3 A (with 12 VDC) Factory setting 700 mA
• Accumulated current limitation	The accummulated current of the simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions.
Dither	Frequency adjustable 20…500 Hz Factory setting 100 Hz Level adjustable 0…400 mA Factory setting 100 mA
Temperature drift	<1 % at ΔT = 40 °C
Digital inputs	Switching threshold high 6…30 VDC Switching threshold low 0…1 VDC
Digital outputs	Low-Side-Switch: U_{max} = 40 VDC I_{max} = -700 mA
Ramps adjustable	Adjustable 0…500 s
Serial interface	USB (receptacle type B)
EMV	
Immunity	EN 61 000-6-2
Emission	EN 61 000-6-4

BLOCK DIAGRAM

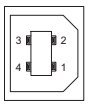


DIMENSIONS



CONNECTOR WIRING / 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 driver 2 +
14 = Output solenoid driver 2 -
15 = Output solenoid driver 1 +
16 = Output solenoid driver 1 -

Configuration analogue inputs

Type description	Analogue input 1	Analogue input 2
SD7332Dx**0**-AA	Voltage	Current
SD7332Dx**1**-AA	Voltage	Voltage
SD7332Dx**2**-AA	Current	Current

START-UP

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

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

Free-of-charge download:
• «PASO-SD7» Parameterisation software
• Operating instructions (*pdf)

ADDITIONAL INFORMATION

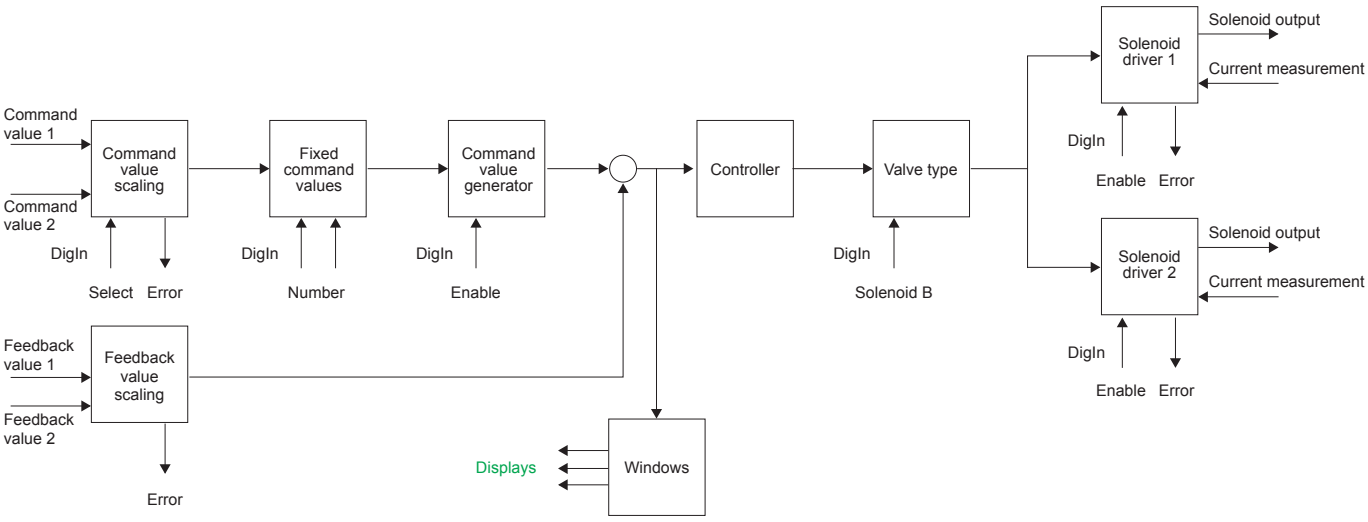
	Wandfluh documentation	
Wandfluh electronics general	register	1.13
Proportional spool valves	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

DESIGN

The controller module can be parameterised by means of the parameterisation software «PASO-SD7» through the USB-interface. In addition, the parameterisation software makes a data analysis possible.

The software «PASO-SD7» is supported by Windows 2000 and Windows XP, Windows Vista and Windows 7 with 32/64-Bit.

FUNCTION DESCRIPTION



SD7 BASIC CONTROLLER WITH ANALOGUE INTERFACE

Command value scaling
The command value can be applied as a voltage, current or digital signal. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for voltage and digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

Fixed command values
There are 3 fixed command values available, which can be selected via 2 digital inputs.

Command value generator
In the open-loop controller modes, two linear ramps separately adjustable for Up and Down are available per solenoid output. In the closed-loop controller modes, a positive and a negative travelling speed are available.

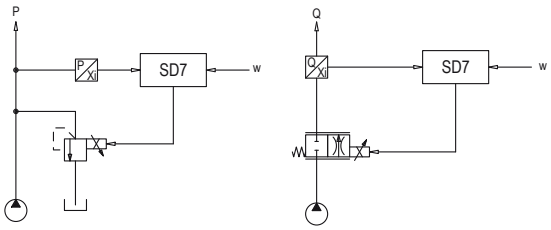
Feedback value scaling
The feedback value can be applied as a voltage or current signal. For the feedback value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the command value can be monitored for a cable break (except for voltage signal).

Windows
Available are a target, contouring error and solenoid-off window. In each window, the threshold and the delay time can be adjusted.

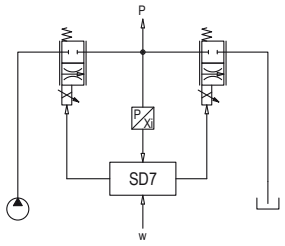
Controller
The SD7 controller module has a controller circuit. It is designed as PID controller. The following controller modes can be selected

Controller mode «Pressure/flow valve open loop»
Driving of a pressure relief, pressure reducing, throttle or flow control valve in the open control circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

Controller mode «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 circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).

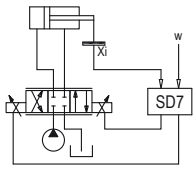


Controller mode «Pressure control closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in the closed loop circuit (with feedback signal) as pressure reduction. In doing so, one ot the throttle valves serves as the loading, the other one as the unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve to the solenoid driver 2 (graphics on the following page).

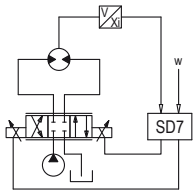


Controller mode «Position open loop»
Driving of a spool valve in the open loop circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

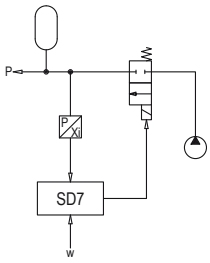
Controller mode «Position closed loop (2-sol)»
Driving of a 2-solenoid spool valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



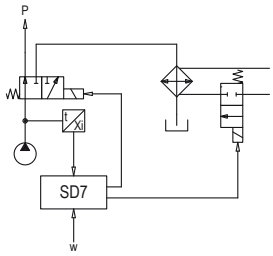
Controller mode «Speed control closed loop (2-sol)»
Driving of a 2-solenoid spool, throttle or volume flow control valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



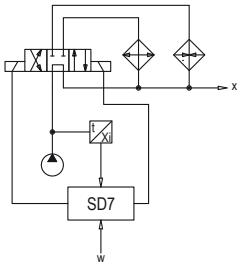
Controller mode «2-point controller (1-sol)»
Driving of a 1-solenoid valve with switching solenoid in the closed loop circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



Controller mode «2-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.

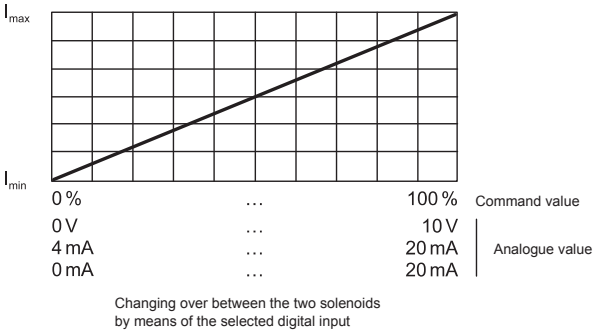


Controller mode «3-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



Valve type
Here the mode of operation is set when in open-loop mode. In addition, it can be selected, whether proportional or switching solenoids are to be driven.

Solenoid driver
Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configurated as switching outputs. Therewith for each output a power reduction can be adjusted separately.

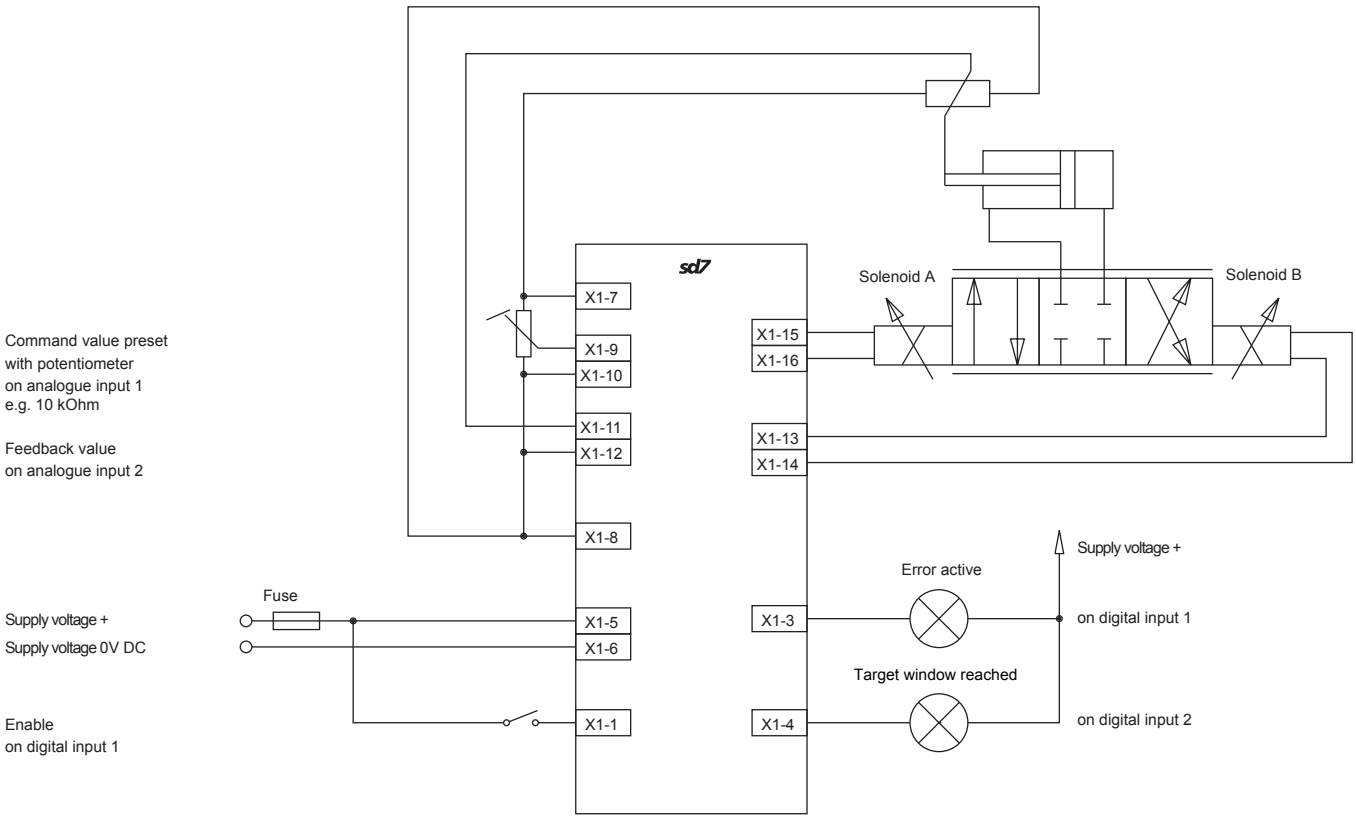


Signal recording
The SD7 controller module has a signal recording function, This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

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.

CONNECTION EXAMPLE

Position control (command value and feedback value as voltage signal)



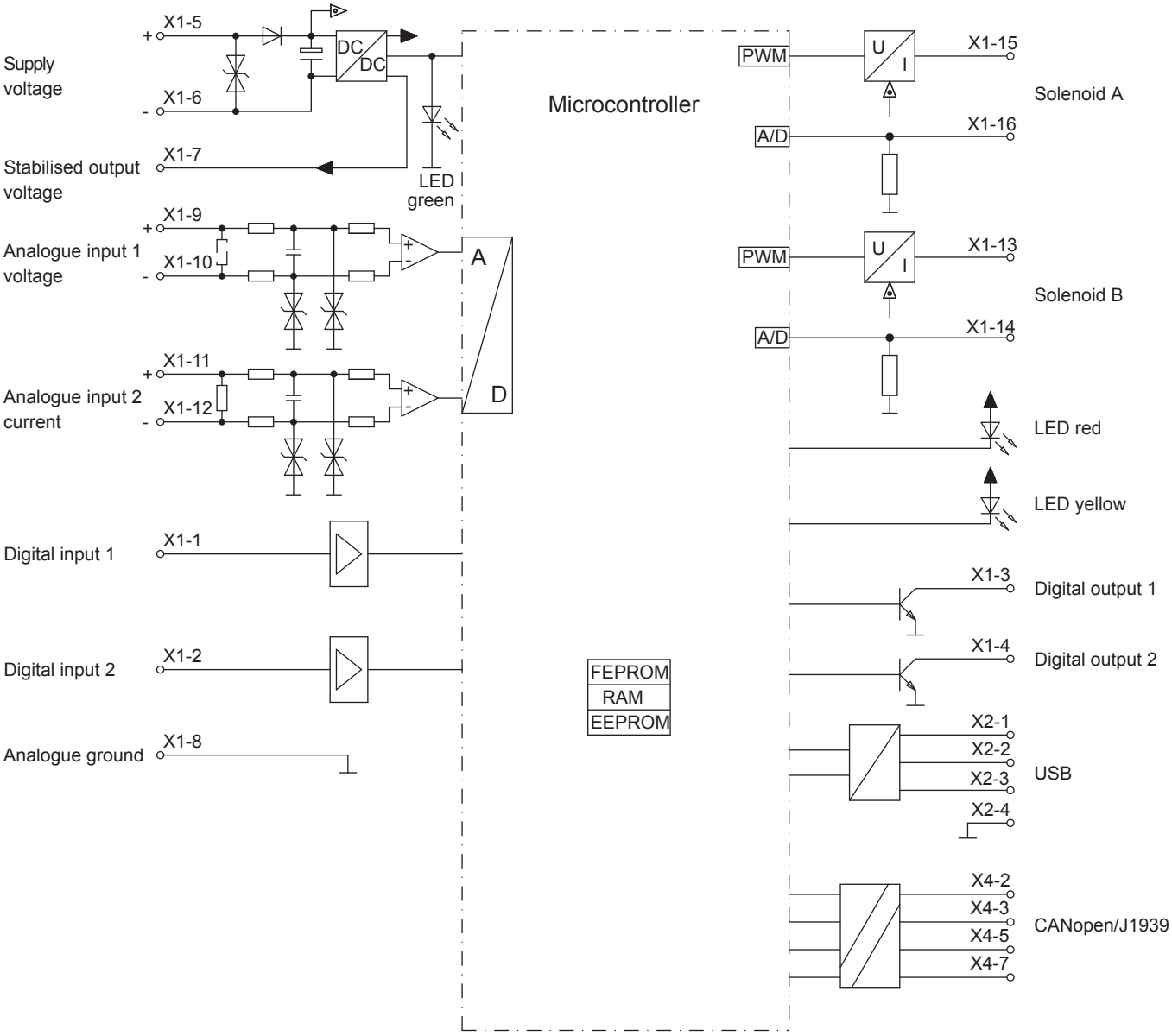
Basic controller with CANopen/J1939 interface

ELECTRICAL SPECIFICATIONS

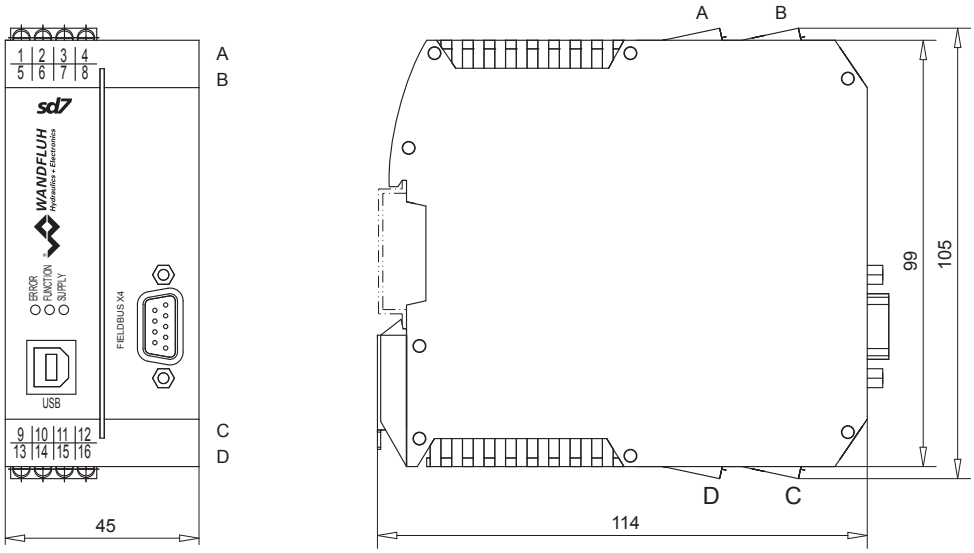
Protection class	IP 30 acc. to EN 60 529
Device receptacle	
CANopen (male)	DSUB, 9-pole
Mating connector	Plug (female) DSUB, 9-pole
Supply voltage	24 VDC or 12 VDC
Voltage range:	
• 24 VDC	21,0…30,0 VDC
• 12 VDC	10,5…15,0 VDC
Residual ripple	<10 %
Fuse	low
Current consumption:	
• Non-load current	approx. 40 mA
• Maximum current consumption	non-load current + 1,8 A per solenoid (with 24 VDC) non-load current + 2,3 A per solenoid (with 12 VDC)
Analogue inputs:	Selectable with software Differential input not galvanically separated, for ground potential difference up to 1,5 V 4…+20 mA / 0…+20 mA 0…+10 V (1- or 2-solenoid version) -10…+10 V (only 2-solenoid version)
Resolution	10-Bit
Input resistance	Voltage input >18 kΩ Load for current input = 250 Ω
Stabilised output voltage	10 VDC (with 24 VDC) 8 VDC (with 12 VDC) max. load 30 mA
Bus topology	Line, differential signal transmission
Potential separation	CANopen/J1939 to «SD7»-electronics 500 VDC

Solenoid current:	
• Minimal current I_{min}	Adjustable 0…950 mA Factory setting 150 mA
• Maximal current I_{max}	Adjustable I_{min}…1,8 A (with 24 VDC) I_{min}…2,3 A (with 12 VDC) Factory setting 700 mA
• Accumulated current limitation	The accummulated current of the simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions.
Dither	Frequency adjustable 2…500 Hz Factory setting 100 Hz Level adjustable 0…400 mA Factory setting 100 mA
Temperature drift	<1 % at ΔT = 40 °C
Digital inputs	Switching threshold high 6…30 VDC Switching threshold low 0…1 VDC
Digital outputs	Low-Side-Switch: U_{max} = 40 VDC I_{max} = -700 mA
Ramps adjustable	0…500 s
Serial interface	USB (receptacle type B)
EMV	
Immunity	EN 61 000-6-2
Emission	EN 61 000-6-4

BLOCK DIAGRAM

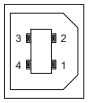


DIMENSIONS



CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

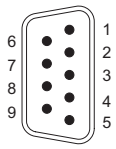
USB interface, USB-Typ B X2



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 CANopen (male) X4

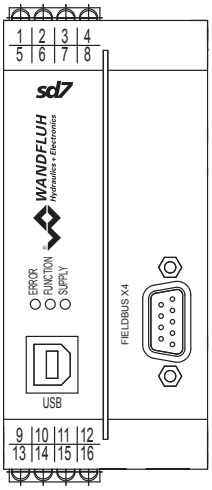


CANOPEN/J1939

1 = Reserved
2 = CANLow
3 = CANGnd
4 = Reserved
5 = CANShield
6 = Reserved
7 = CANHigh
8 = Reserved
9 = Reserved

The mating connector (plug female, 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 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 driver 2 +
14 = Output solenoid driver 2 -
15 = Output solenoid driver 1 +
16 = Output solenoid driver 1 -

Configuration Analogue input

Type description	Analogue input 1	Analogue input 2
SD7303Dx**0**-AC	Voltage	Current
SD7303Dx**1**-AC	Voltage	Voltage (only 0...10 V possible)
SD7303Dx**2**-AC	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-SD7» Parameterisation software
• Operating instructions (*.pdf)
• EDS-file «WAGOB8E.eds»

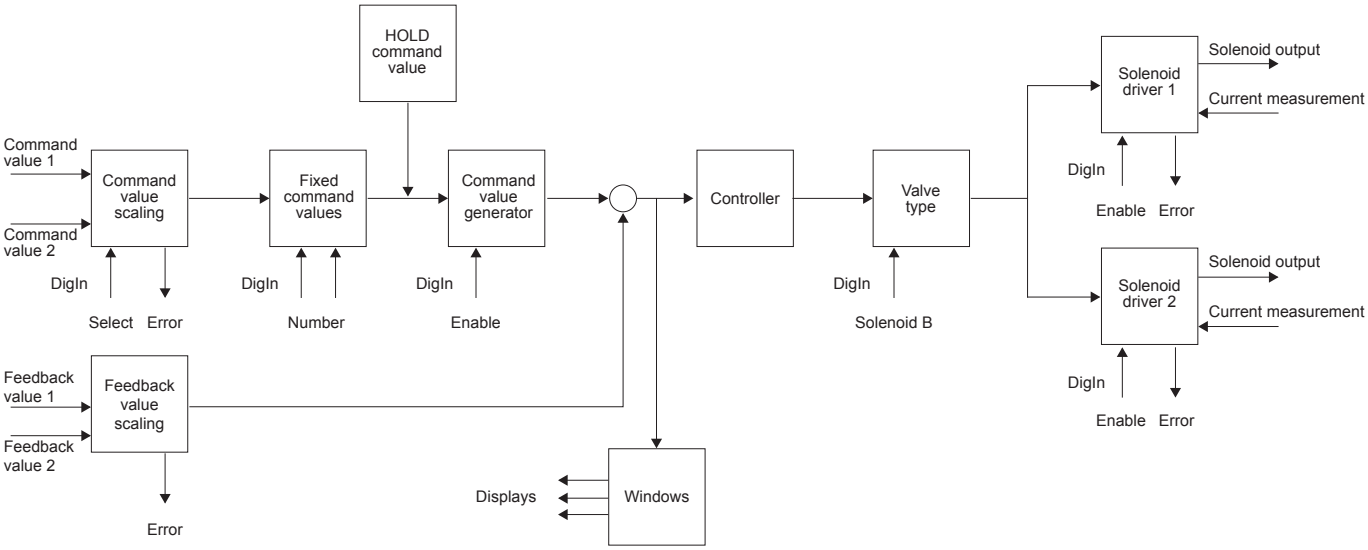
ADDITIONAL INFORMATION

	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

DESIGN

The controller module can be parameterised by means of the parameterisation software «PASO-SD7» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-SD7» is supported by Windows 2000 and Windows XP, Windows Vista and Windows 7 with 32/64-Bit. The device control (enable, etc.) as well as the command value setting can be preset via the CANopen/J1939 or locally via digital, resp. analogue inputs. Furthermore the parameterisation as well as an analysis/diagnostic are possible via the CANopen (with J1939 on request).

FUNCTION DESCRIPTION



SD7 BASIC CONTROLLER WITH CANopen/J1939 INTERFACE

Command value scaling

The command value can be applied via the CANopen/J1939 or as a voltage, current or digital signal. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for CANopen/J1939, voltage and digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

Fixed command values

There are 3 fixed command values available, which can be selected via 2 digital inputs.

Command value generator

In the open-loop controller modes, two linear ramps separately adjustable for Up and Down are available per solenoid output. In the closed-loop controller modes, a positive and a negative travelling speed are available.

HOLD command value

If via CANopen/J1939 the device is put into the “HOLD” condition, the respective command value is activated.

Feedback value scaling

The feedback value can be applied via the CANopen/J1939 or as a voltage or current signal. For the command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the command value can be monitored for a cable break (except CANopen/J1939 and voltage signal).

Windows

Available are a target, contouring error and solenoid-off window. In each window, the threshold and the delay time can be adjusted.

Controller

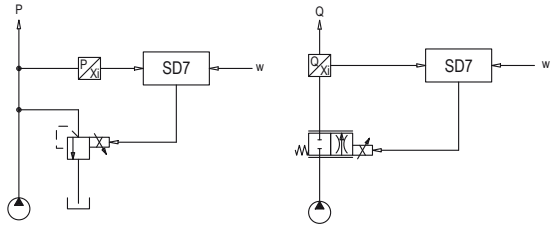
The SD7 controller module has a controller circuit. It is designed as PID controller. The following controller modes can be selected:

Controller mode «Pressure/flow valve open loop»

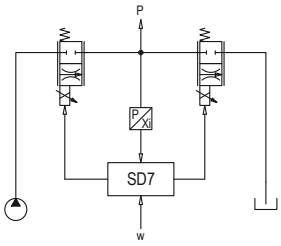
Driving of a pressure relief, pressure reducing, throttle or flow control valve in the open control circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

Controller mode «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 circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).

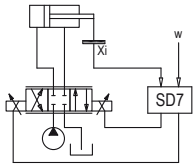


Controller mode «Pressure control closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in the closed loop circuit (with feedback signal) as pressure reduction. In doing so, one ot the throttle valves serves as the loading, the other one as the unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve to the solenoid driver 2.

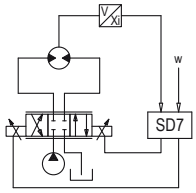


Controller mode «Position open loop»
Driving of a spool valve in the open loop circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

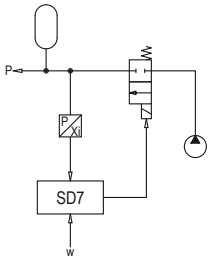
Controller mode «Position closed loop (2-sol)»
Driving of a 2-solenoid spool valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



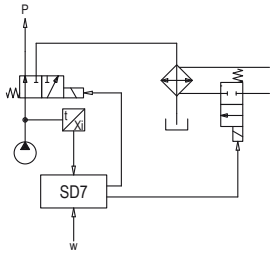
Controller mode «Speed control closed loop (2-sol)»
Driving of a 2-solenoid spool, throttle or volume flow control valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



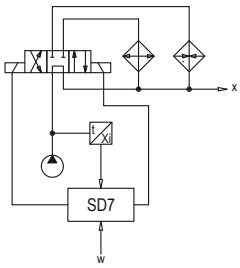
Controller mode «2-point controller (1-sol)»
Driving of a 1-solenoid valve with switching solenoid in the closed loop circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



Controller mode «2-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.

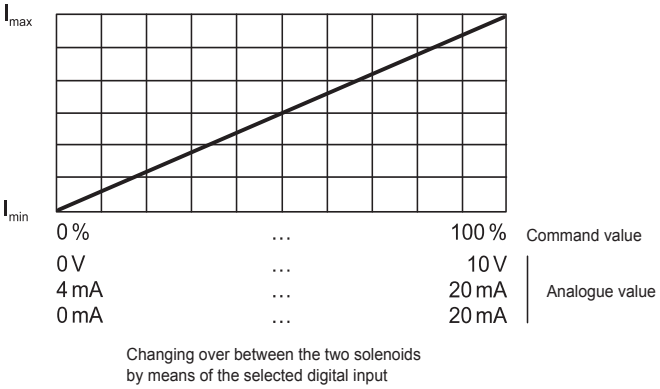


Controller mode «3-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



Valve type
Here the mode of operation is set when in open-loop mode. In addition, it can be selected, whether proportional or switching solenoids are to be driven.

Solenoid driver
Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configurated as switching outputs. Therewith for each output a power reduction can be adjusted separately.

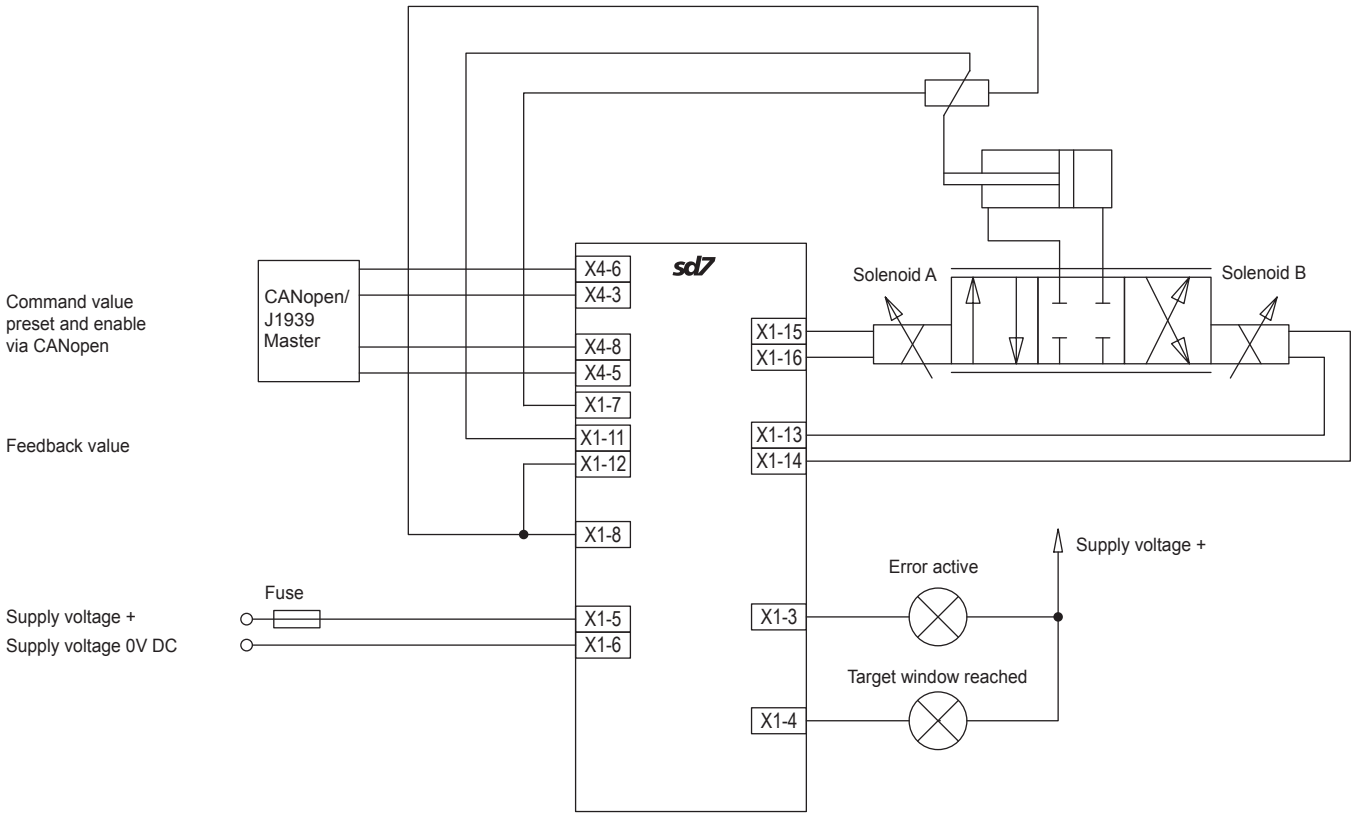


Signal recording
The SD7 controller module has a signal recording function, This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

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.

CONNECTION EXAMPLE

Position control (command value and enable via CANopen/J1939, feedback value as voltage signal)



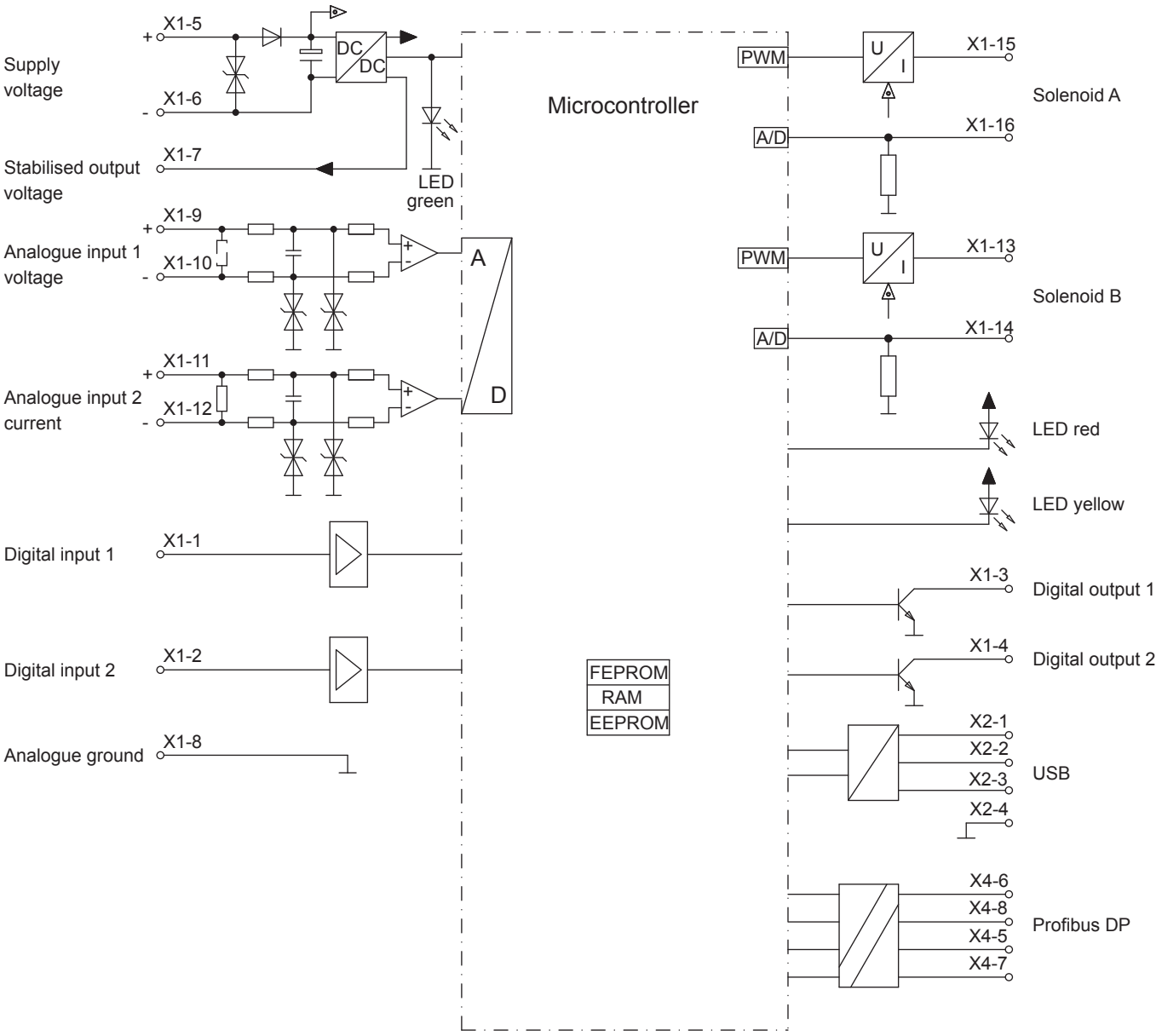
Basic controller with Profibus DP interface

ELECTRICAL SPECIFICATIONS

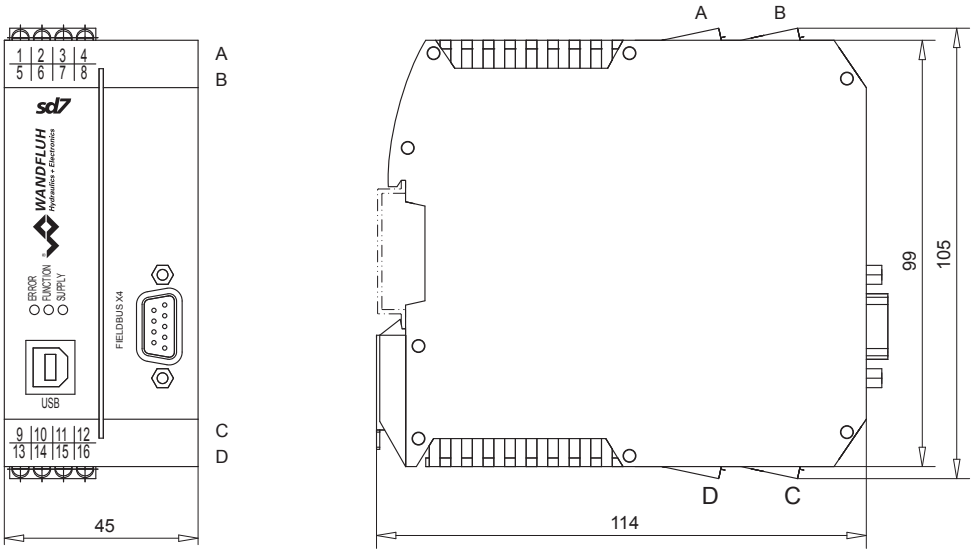
Protection class	IP 30 acc. to EN 60 529
Device receptacle	
Profibus (female)	DSUB, 9-pole
Mating connector	Plug (male) DSUB, 9-pole
Supply voltage	24 VDC or 12 VDC
Voltage range:	
• 24 VDC	21…30 V
• 12 VDC	10,5…15 V
Residual ripple	<10 %
Fuse	low
Current consumption:	
• No-load current	approx. 40 mA
• Maximum current-consumption	non-load current + 1,8 A per solenoid (with 24 VDC) non-load current + 2,3 A per solenoid (with 12 VDC)
Command value signal:	Selectable with software Differential input not galvanically separated, for ground potential difference up to 1,5 V 4…+20 mA / 0…+20 mA 0…+10 V (1- or 2-solenoid version) -10…+10 V (only 2-solenoid version)
Resolution	10-Bit
Eingangswiderstand	Voltage input >18 kΩ Load for current input = 250 Ω
Stabilised output voltage	10 VDC (with 24 VDC) 8 VDC (with 12 VDC) max. load 30 mA
Bus topology	Line, differential signal transmission
Potential separation	Profibus to «SD7» electronics 500 VDC

Solenoid current:	
• Minimal current I_{min}	Adjustable 0…950 mA Factory setting 150 mA
• Maximal current I_{max}	Adjustable I_{min}…1,8 A (with 24 VDC) I_{min}…2,3 A (with 12 VDC) Factory setting 700 mA
• Accumulated current limitation	The accummulated current of the simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions.
Dither	Frequency adjustable 20…500 Hz Factory setting 100 Hz Level adjustable 0…400 mA Factory setting 100 mA
Temperature drift	<1 % at ΔT = 40 °C
Digital inputs	Switching threshold high 6…30 VDC Switching threshold low 0…1 VDC
Digital outputs	Low-Side-Switch: U_{max} = 40 VDC I_{max} = -700 mA
Ramps adjustable	0…500 s
Serial interface	USB (receptacle type B)
EMV	
Immunity	EN 61 000-6-2
Emission	EN 61 000-6-4

BLOCK DIAGRAM

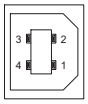


DIMENSIONS



CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

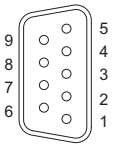
USB interface, USB type B X2



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

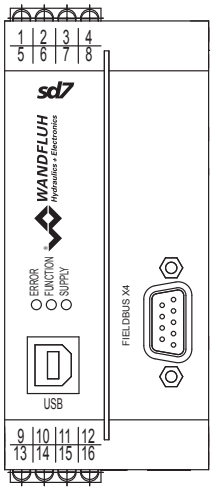


PROFIBUS

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-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 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 driver 2 +
14 = Output solenoid driver 2 -
15 = Output solenoid driver 1 +
16 = Output solenoid driver 1 -

Configuration Analogue input

Type description	Analogue input 1	Analogue input 2
SD7303Dx**0**-AP	Voltage	Current
SD7303Dx**1**-AP	Voltage	Voltage (only 0...10 V possible)
SD7303Dx**2**-AP	Current	Current

START-UP

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

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

Free-of-charge download:
• «PASO-SD7» Parameterisation software
• Operating instructions (*.pdf)
• GSD-file «WAGOB8E.gsd»

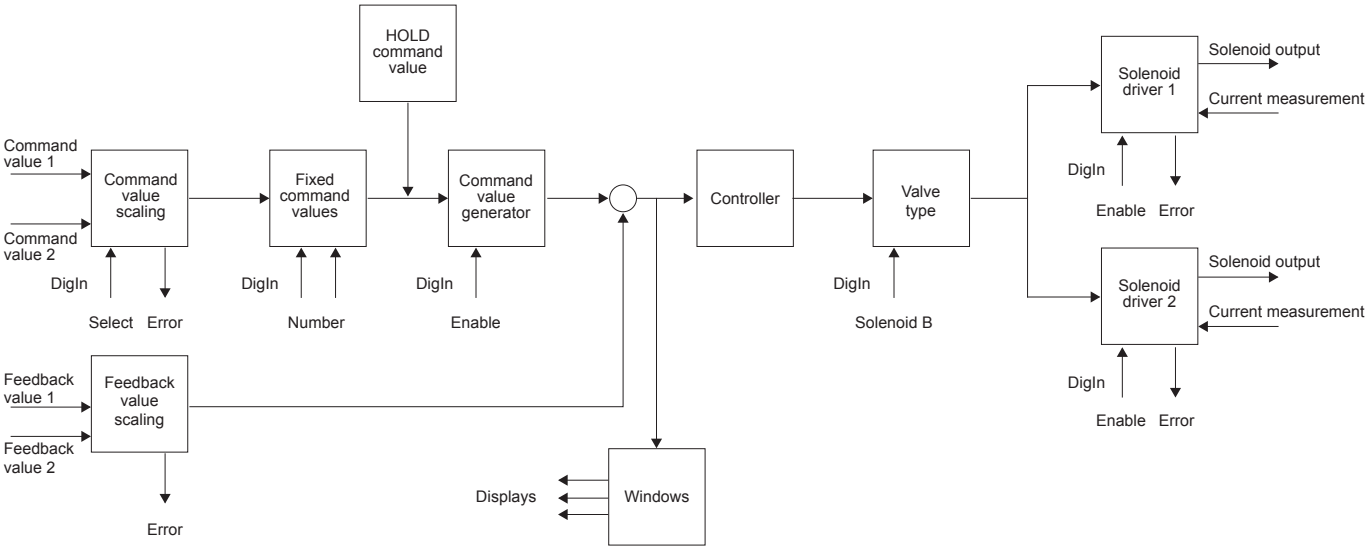
ADDITIONAL INFORMATION

	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

DESIGN

The controller module can be parameterised by means of the parameterisation software «PASO-SD7» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO-SD7» is supported by Windows 2000 and Windows XP, Windows Vista and Windows 7 with 32/64-Bit. The device control (enable, etc.) as well as the command value setting can be preset via the Profibus DP or locally via digital, resp. analogue inputs. Furthermore the parameterisation as well as an analysis/diagnostic are possible via the Profibus DP.

FUNCTION DESCRIPTION



SD7 BASIC CONTROLLER WITH PROFIBUS DP INTERFACE

Command value scaling

The command value can be applied via the Profibus DP or as a voltage, current or digital signal. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for Profibus DP, voltage and digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

Fixed command values

There are 3 fixed command values available, which can be selected via 2 digital inputs.

Command value generator

In the open-loop controller modes, two linear ramps separately adjustable for Up and Down are available per solenoid output. In the closed-loop controller modes, a positive and a negative travelling speed are available.

HOLD command value

If via Profibus DP the device is put into the “HOLD” condition, the respective command value is activated.

Feedback value scaling

The feedback value can be applied via the Profibus DP or as a voltage or current signal. For the command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the command value can be monitored for a cable break (except Profibus DP and voltage signal).

Windows

Available are a target, contouring error and solenoid-off window. In each window, the threshold and the delay time can be adjusted.

Controller

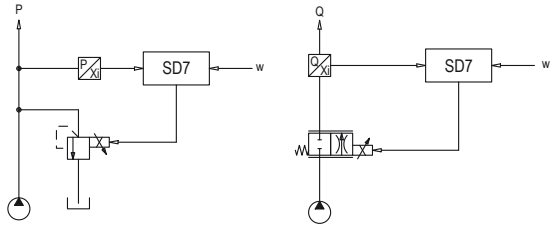
The SD7 controller module has a controller circuit. It is designed as PID controller. The following controller modes can be selected:

Controller mode «Pressure/flow valve open loop»

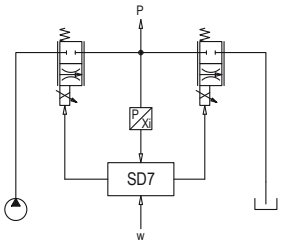
Driving of a pressure relief, pressure reducing, throttle or flow control valve in the open control circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

Controller mode «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 circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).

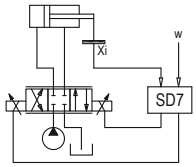


Controller mode «Pressure control closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in the closed loop circuit (with feedback signal) as pressure reduction. In doing so, one ot the throttle valves serves as the loading, the other one as the unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve to the solenoid driver 2.

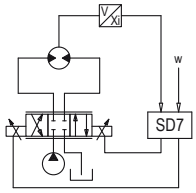


Controller mode «Position open loop»
Driving of a spool valve in the open loop circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

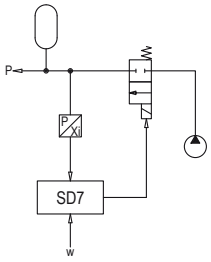
Controller mode «Position closed loop (2-sol)»
Driving of a 2-solenoid spool valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



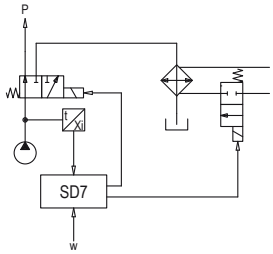
Controller mode «Speed control closed loop (2-sol)»
Driving of a 2-solenoid spool, throttle or volume flow control valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



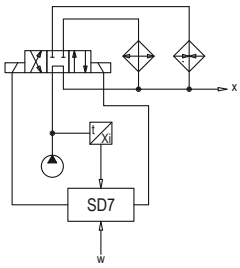
Controller mode «2-point controller (1-sol)»
Driving of a 1-solenoid valve with switching solenoid in the closed loop circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



Controller mode «2-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.

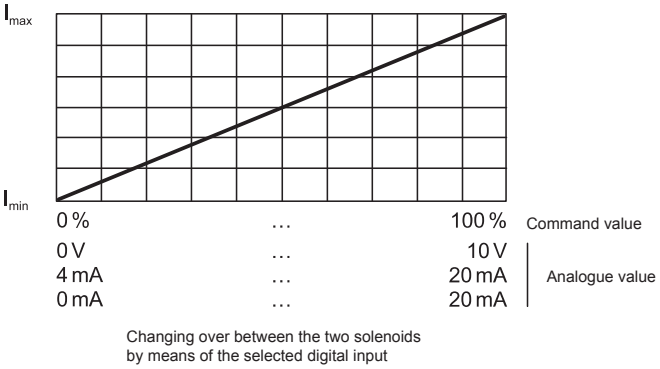


Controller mode «3-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



Valve type
Here the mode of operation is set when in open-loop mode. In addition, it can be selected, whether proportional or switching solenoids are to be driven.

Solenoid driver
Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configurated as switching outputs. Therewith for each output a power reduction can be adjusted separately.

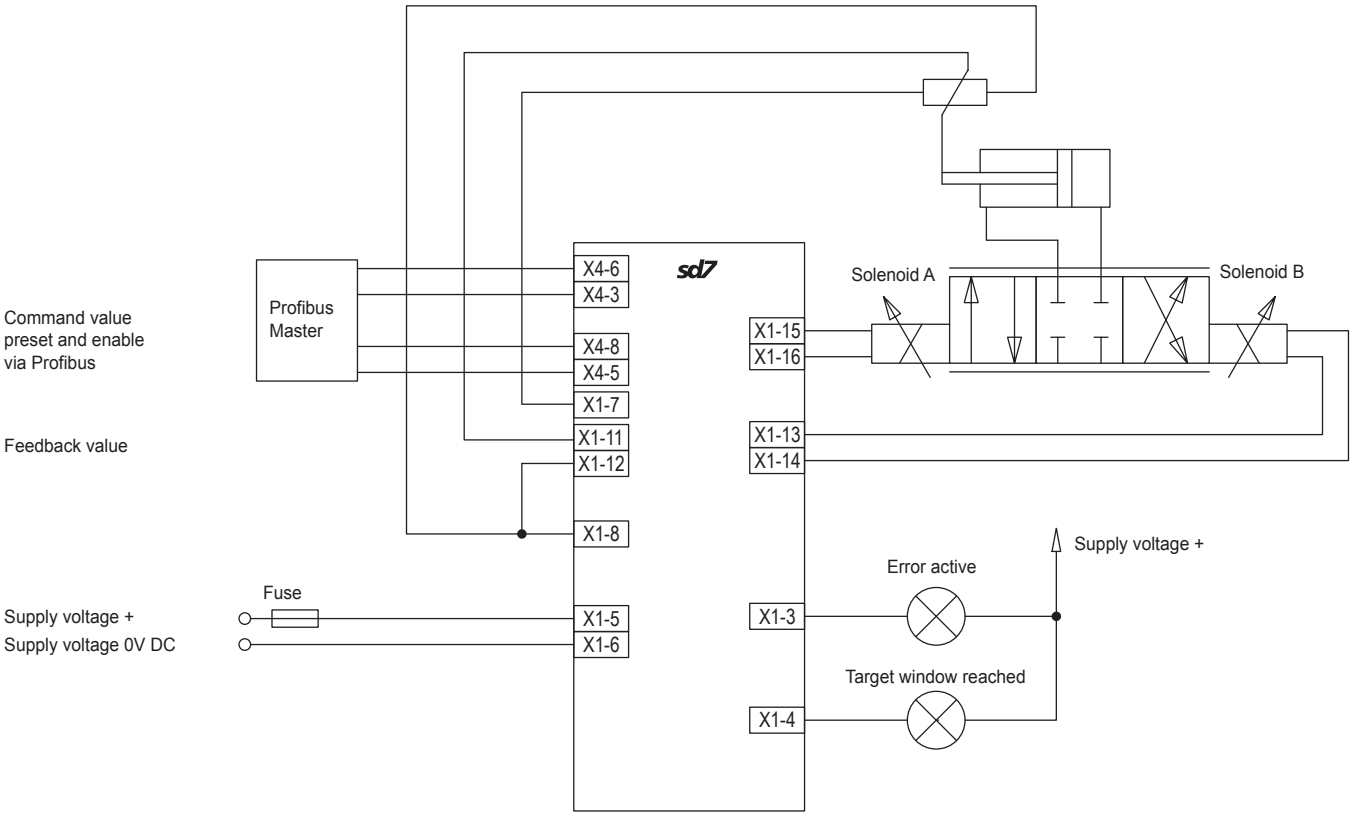


Signal recording
The SD7 controller module has a signal recording function, This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

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.

CONNECTION EXAMPLE

Position control (command value and enable via Profibus DP, feedback value as voltage signal)



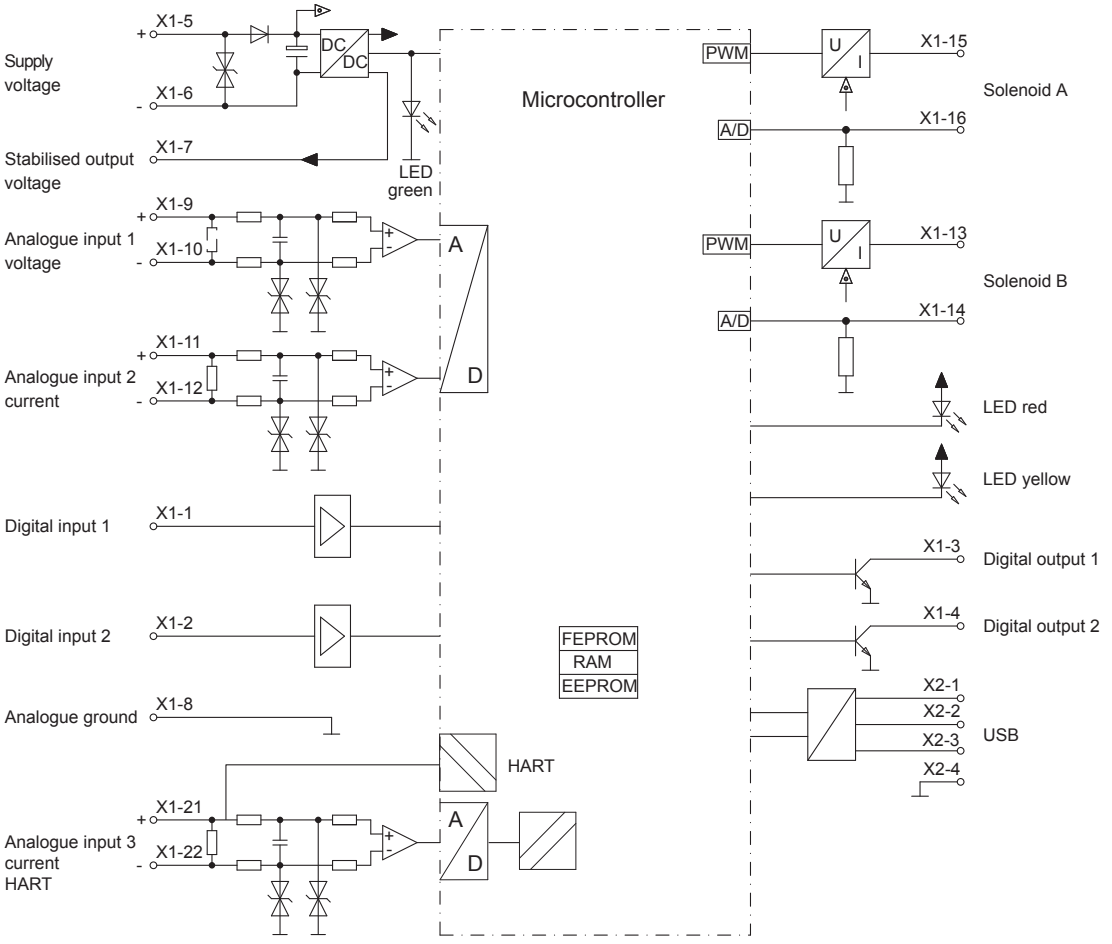
Basic controller with HART interface

ELECTRICAL SPECIFICATIONS

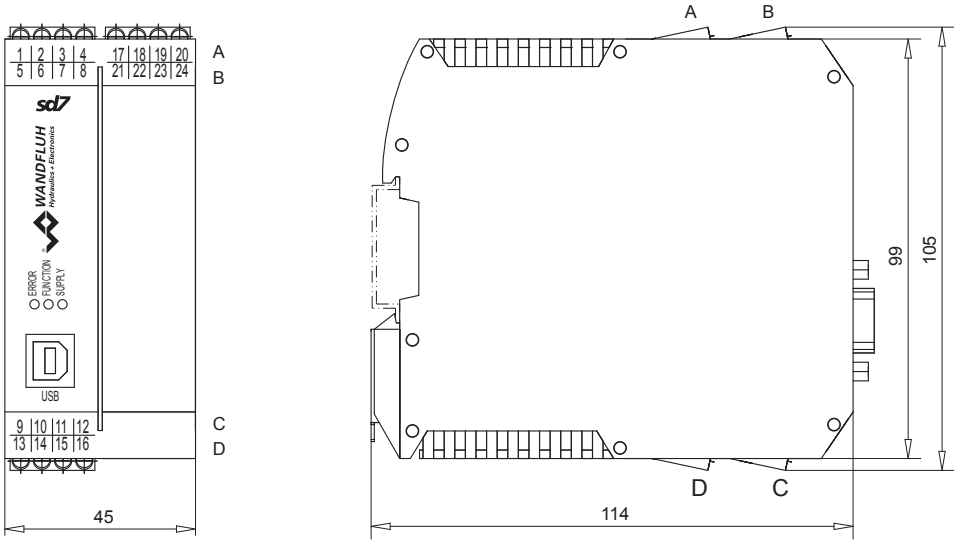
Protection class	IP30 acc. to EN 60 529
Supply voltage	24 VDC or 12 VDC
Voltage range:	
• 24 VDC	21…30 V
• 12 VDC	10,5…15 V
Residual ripple	<10 %
Fuse	low
Current consumption:	
• No-load current	approx. 40 mA
• Maximum current-consumption	non-load current + 1,8 A per solenoid (with 24 VDC) non-load current + 2,3 A per solenoid (with 12 VDC)
Command value signal:	Selectable with software
	Inputs 1 and 2: Differential input not galvanically separated, for ground potential difference up to 1,5 V 4…+20 mA / 0…+20 mA 0…+10 V (1- or 2-solenoid version, not input 3) -10…+10 V (only 2-solenoid version, not input 3)
	Input 3: galvanically separated for HART Signal 4 ... +20 mA / 0 ... +20 mA
Resolution	10-Bit (Analogue inputs 1 and 2) 16-Bit (Analogue inputs 3)
Input resistance	Voltage input >18 kΩ Load for current input = 250 Ω
Stabilised output-voltage	10 VDC (with Version 24 VDC) 8 VDC (with version 12 VDC) max. load 30 mA

HART input	via analogue inputs 3
Solenoid current:	
• Minimal current I_{min}	Adjustable 0…950 mA Factory setting 150 mA
• Maximal current I_{max}	Adjustable I_{min}…1,8A (with 24 VDC) I_{min}…2,3A (with 12 VDC) Factory setting 700 mA
• Accumulated current limitation	The accummulated current of the simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions.
Dither	Frequency adjustable 20…500 Hz Factory setting 100 Hz Level adjustable 0…400 mA Factory setting 100 mA
Temperature drift	<1 % at ΔT = 40 °C
Digital inputs	Switching threshold high 6…30 VDC Switching threshold low 0…1 VDC
Digital outputs	Low-Side-Switch: U_{max} = 40 VDC I_{max} = -700 mA
Ramps adjustable	0…500 s
Serial interface	USB (receptacle type B)
EMV	
Immunity	EN 61 000-6-2
Emission	EN 61 000-6-4

BLOCK DIAGRAM

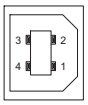


DIMENSIONS



CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

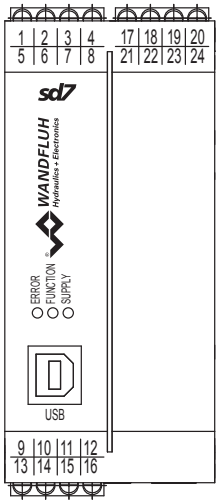
USB interface, USB type B X2



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)

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 driver 2+
14 = Output solenoid driver 2-
15 = Output solenoid driver 1+
16 = Output solenoid driver 1-
21 = Analogue input 3 + HART
22 = Analogue input 3 - HART

Configuration Analogue input

Type description	Analogue input 1	Analogue input 2	Analogue input 3
SD7332Dx**0**-BH	Voltage	Current	Current
SD7332Dx**1**-BH	Voltage	Voltage	Current
SD7332Dx**2**-BH	Current	Current	Current

START-UP

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

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

Free-of-charge download:
• «PASO-SD7» Parameterisation software
• Operating instructions (*pdf)

ADDITIONAL INFORMATION

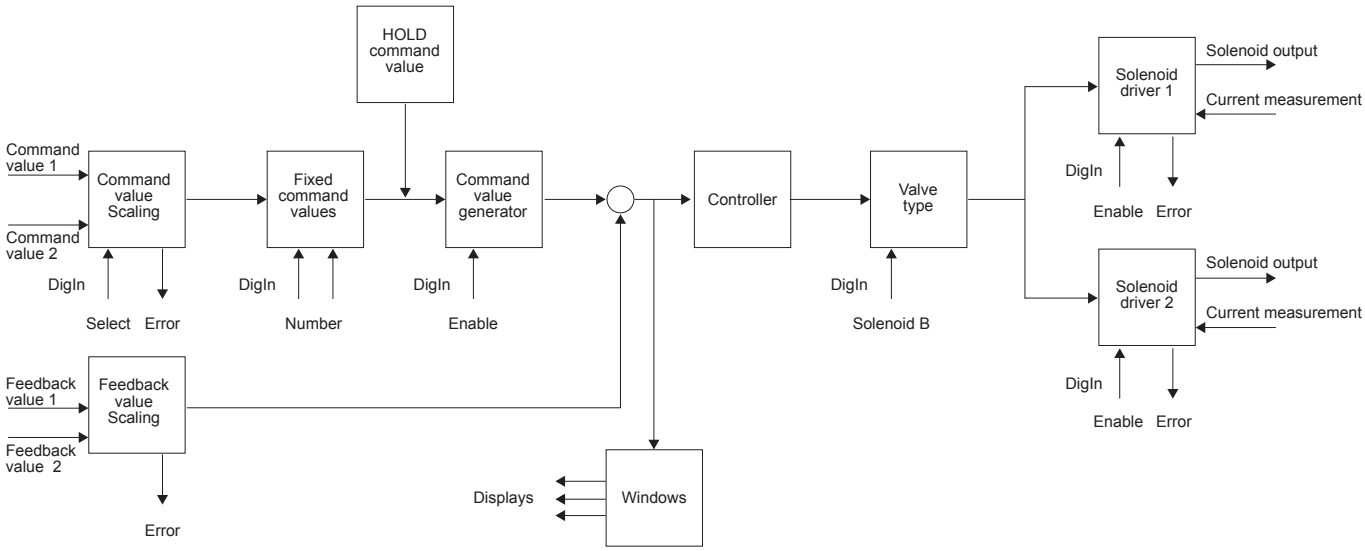
	Wandfluh documentation	
Wandfluh electronics general	register	1.13
Proportional directional valves	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

Design

The controller module can be parameterised by means of the parameterisation software «PASO-SD7» through the USB-interface. In addition, the parameterisation software makes a data analysis possible.

The software «PASO-SD7» is supported by Windows 2000 and Windows XP, Windows Vista and Windows 7 with 32/64-Bit.

FUNCTION DESCRIPTION



SD7 BASIC CONTROLLER WITH HART INTERFACE

Command value scaling

The command value can be applied via HART or as a voltage, current, or digital signal. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for HART, voltage and digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

Fixed command values

There are 3 fixed command values available, which can be selected via 2 digital inputs.

Command value generator

In the open-loop controller modes, two linear ramps separately adjustable for Up and Down are available per solenoid output. In the closed-loop controller modes, a positive and a negative travelling speed are available.

HOLD command value

If via HART the device is put into the “HOLD” condition, the respective command value is activated.

Feedback value scaling

The feedback value can be applied via HART or as a voltage or current signal. For the command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the command value can be monitored for a cable break (except HART and voltage signal).

Windows

Available are a target, contouring error and solenoid-off window. In each window, the threshold and the delay time can be adjusted.

Controller

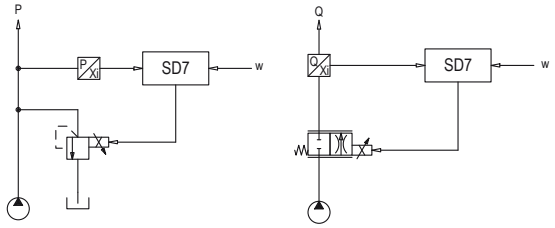
The SD7 controller module has a controller circuit. It is designed as PID controller. The following controller modes can be selected:

Controller mode «Pressure/flow valve open loop»

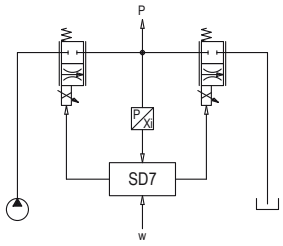
Driving of a pressure relief, pressure reducing, throttle or flow control valve in the open control circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

Controller mode «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 circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).

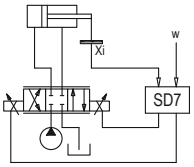


Controller mode «Pressure control closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in the closed loop circuit (with feedback signal) as pressure reduction. In doing so, one ot the throttle valves serves as the loading, the other one as the unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve to the solenoid driver 2.

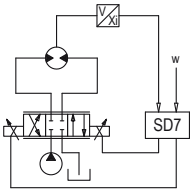


Controller mode «Position open loop»
Driving of a spool valve in the open loop circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

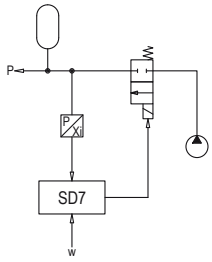
Controller mode «Position closed loop (2-sol)»
Driving of a 2-solenoid spool valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



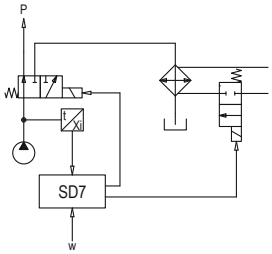
Controller mode «Speed control closed loop (2-sol)»
Driving of a 2-solenoid spool, throttle or volume flow control valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



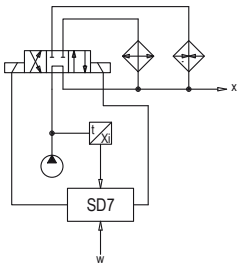
Controller mode «2-point controller (1-sol)»
Driving of a 1-solenoid valve with switching solenoid in the closed loop circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



Controller mode «2-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.

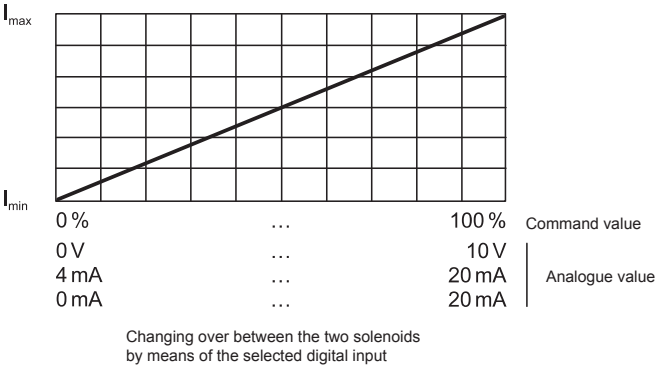


Controller mode «3-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



Valve type
Here the mode of operation is set when in open-loop mode. In addition, it can be selected, whether proportional or switching solenoids are to be driven.

Solenoid driver
Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configurated as switching outputs. Therewith for each output a power reduction can be adjusted separately.

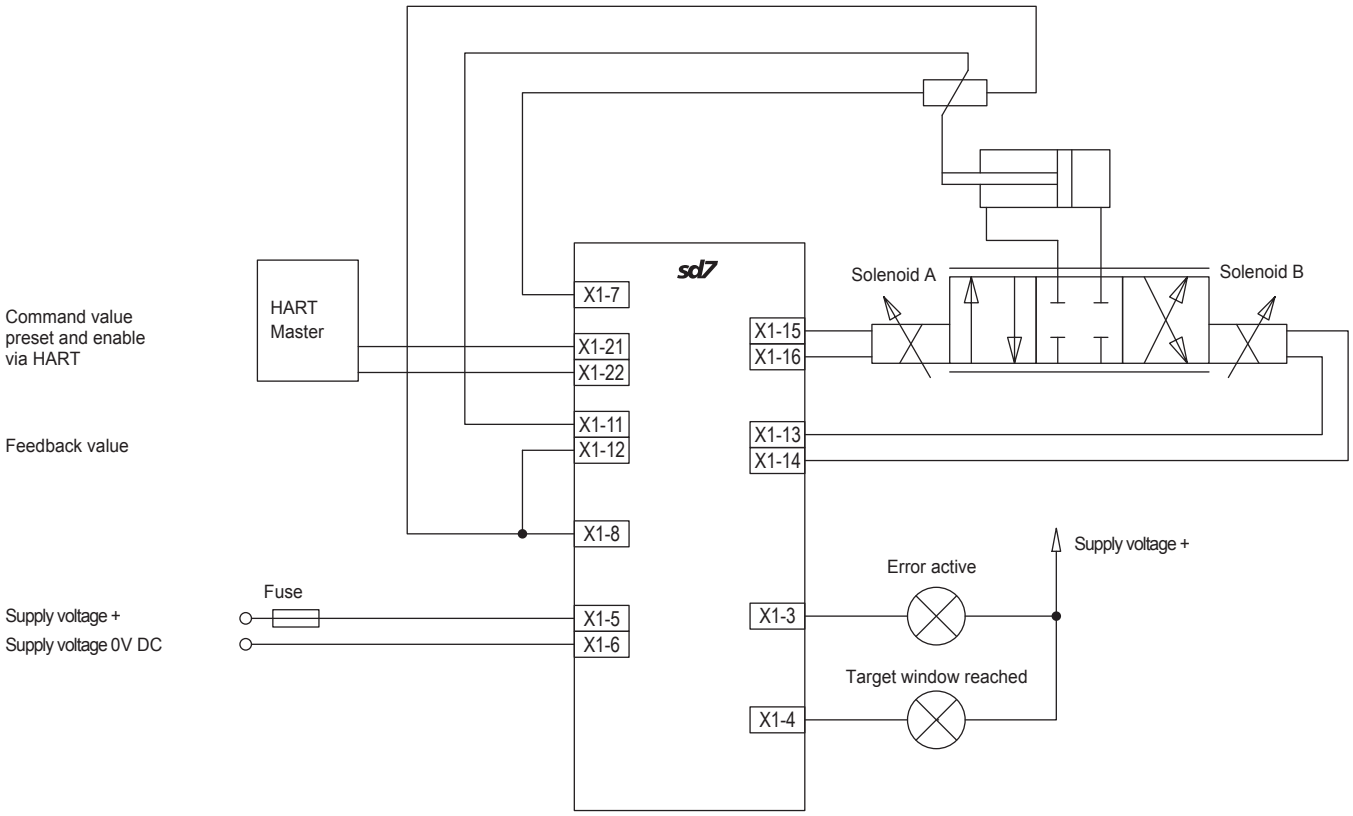


Signal recording
The SD7 controller module has a signal recording function, This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

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.

CONNECTION EXAMPLE

Position control (command value via HART, feedback value as voltage signal)



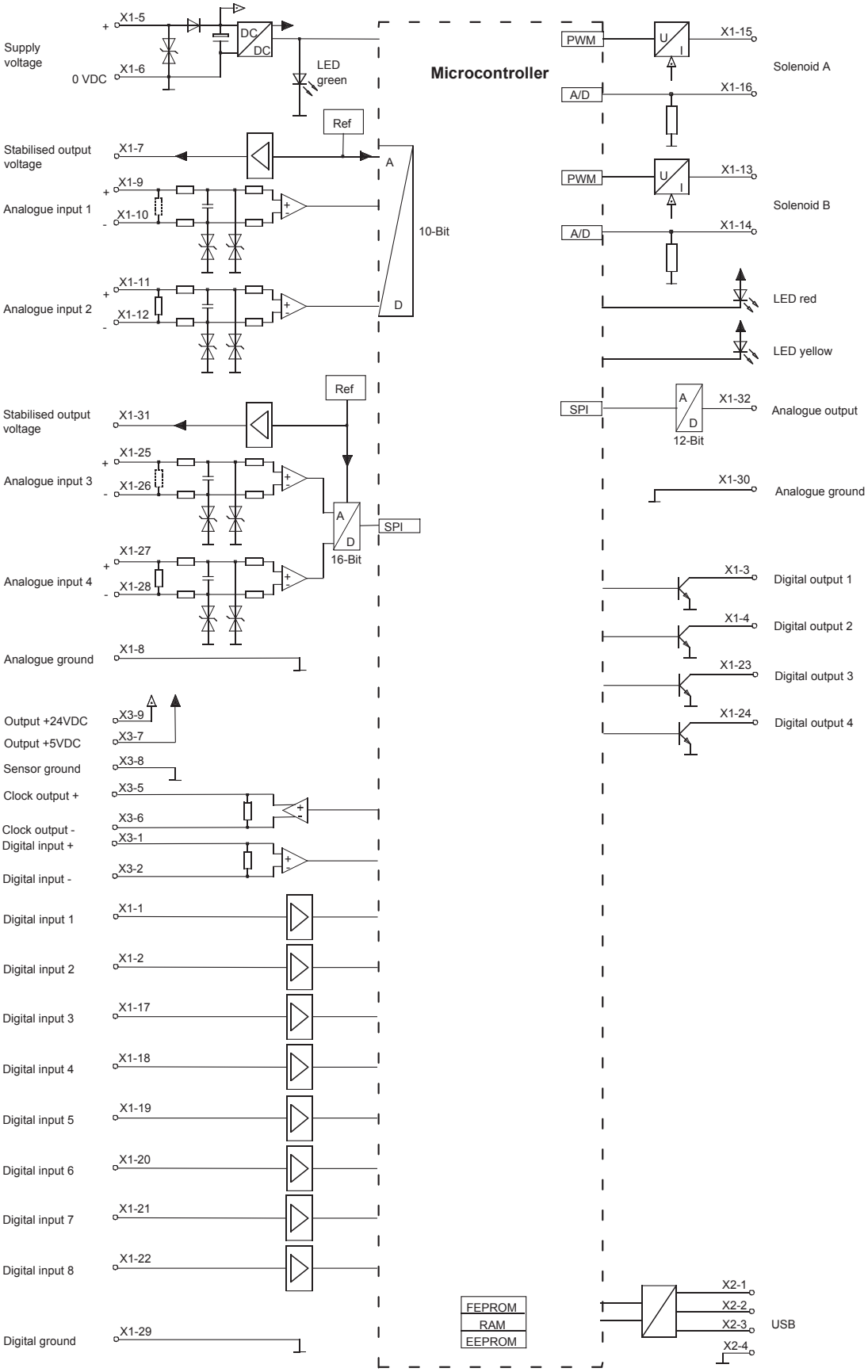
Enhanced controller with analogue interface

ELECTRICAL SPECIFICATIONS

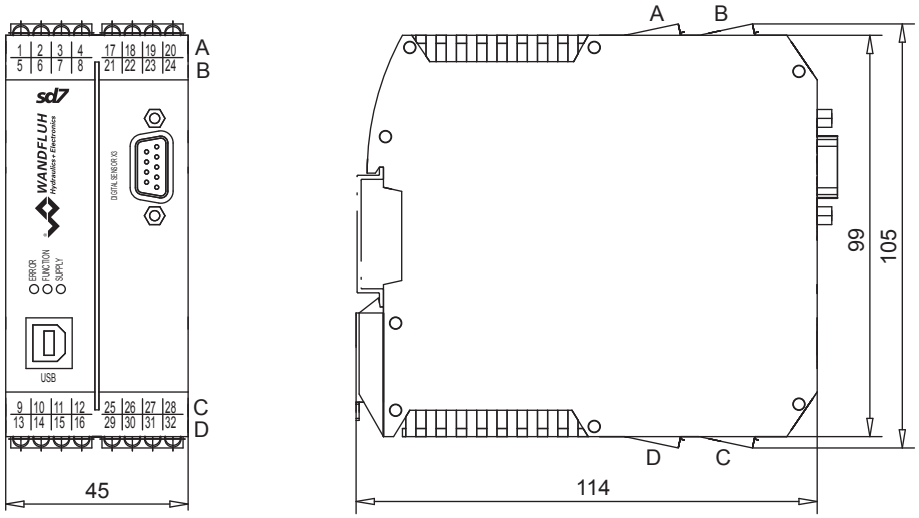
Protection class	IP 30 acc. to EN 60 529
Device receptacle	
Sensor (female)	DSUB, 9-pole
Mating connector	Plug (male) DSUB, 9-pole
Supply voltage	24 VDC or 12 VDC
Voltage range:	
• 24 VDC	21…30 V
• 12 VDC	10,5…15 V
Residual ripple	<10 %
Fuse	low
Current consumption:	
• No-load current	approx. 40 mA
• Maximum current consumption	non-load current + 1,8 A per solenoid (with 24 VDC) non-load current + 2,3 A per solenoid (with 12 VDC)
Analogue inputs:	Selectable with software Differential input not galvanically separated, for ground potential difference up to 1,5 V 4…+20 mA / 0…+20 mA 0…+10 V (1- or 2-solenoid version) -10…+10 V (only 2-solenoid version)
Resolution	10-Bit (Analogue inputs 1 and 2) 16-Bit (Analogue inputs 3 and 4)
Input resistance	Voltage input >18 kΩ Load for current input = 250 Ω
Measuring system input	DSUB Plug 9-pole (female) on front plate acc. to RS422 standard selectable with software absolute via start / stop absolute via SSI (1...32 Bit, gray or binary)
Analogue output	Voltage output ± 10 VDC max. Current output ± 3 mA
Stabilised output voltage	10 VDC (with 24 VDC) 8 VDC (with 12 VDC) max. load 30 mA

Solenoid current:	
• Minimal current I_{min}	Adjustable 0…950 mA Factory setting 150 mA
• Maximal current I_{max}	Adjustable I_{min}…1,8 A (with 24 VDC) I_{min}…2,3 A (with 12 VDC) Factory setting 700 mA
• Accumulated current limitation	The accummulated current of the simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions.
Dither	Frequency adjustable 20…500 Hz Factory setting 100 Hz Level adjustable 0…400 mA Factory setting 100 mA
Temperature drift	<1 % at ΔT = 40 °C
Digital inputs	Switching threshold high 6…30 VDC Switching threshold low 0…1 VDC Digital input 5 – 7 can be used as frequency input (frequencies 0…5 kHz) and as PWM input (automatic frequency recognition)
Digital outputs	Low-Side-Switch: U_{max} = 40 VDC I_{max} = -700 mA
Ramps adjustable	0…500 s
Serial interface	USB (receptacle type B)
EMV	
Immunity	EN 61 000-6-2
Emission	EN 61 000-6-4

BLOCK DIAGRAM

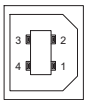


DIMENSIONS



CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

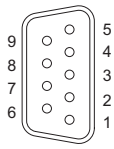
USB interface, USB type B X2



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)

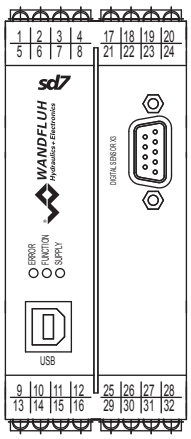
Device receptacle sensor (female) X3



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

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 driver 2 +
14 = Output solenoid driver 2 -
15 = Output solenoid driver 1 +
16 = Output solenoid driver 1 -
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 controller module and in the operating instructions.

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

Free-of-charge download:
• «PASO-DSV / SD7» Parameterisation software
• Operating instructions (*.pdf)

Configuration Analogue input

Type description	Analogue inputs			
	No. 1	No. 2	No. 3	No. 4
SD7362D. **4**-BA	Voltage	Current	Voltage	Current
SD7362D. **5**-BA	Voltage	Voltage	Voltage	Voltage
SD7362D. **6**-BA	Current	Current	Current	Current
SD7362D. **7**-BA	Voltage	Voltage	Current	Current
SD7362D. **8**-BA	Current	Current	Voltage	Voltage

ADDITIONAL INFORMATION

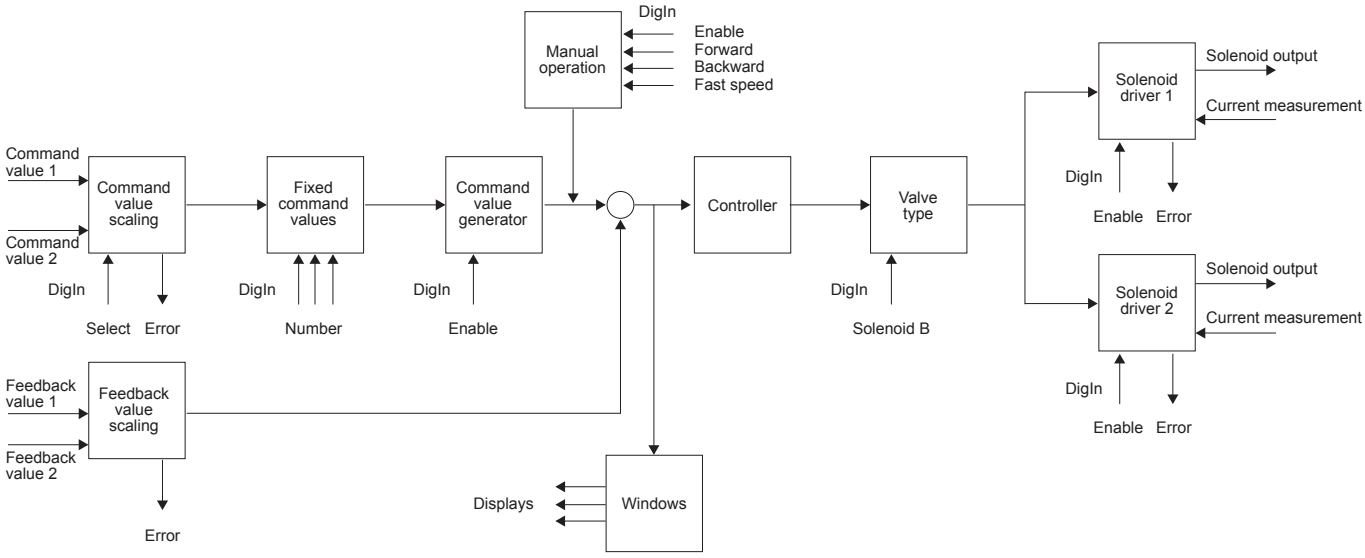
	Wandfluh documentation	
Wandfluh electronics general	register	1.13
Proportional directional valves	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

DESIGN

The controller module can be parameterised by means of the parameterisation software «PASO-SD7» through the USB-interface. In addition, the parameterisation software makes a data analysis possible.

The software «PASO-SD7» is supported by Windows 2000 and Windows XP, Windows Vista and Windows 7 with 32/64-Bit.

FUNCTION DESCRIPTION



SD7 ENHANCED CONTOLLER WITH ANALOGUE INTERFACE

Command value scaling
The command value can be applied as a voltage, current, digital, frequency or PWM-signal. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for voltage and digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

Profile / Fixed command values
There are 7 fixed command values available, which can be selected via 3 digital inputs. Also travel profiles can be used. The SD7 controller module is in a position to save and to travel entire travel profiles which have been adjusted before by the user in the profile generator. A travel profile consists of the following data:

- Command value (target or end position of the sequence)
- Speed (target speed of travelling)
- Acceleration (acceleration to reach the target speed of travelling)
- Deceleration (deceleration departing from the target speed of travelling)
- Stop time (waiting period after reaching the end position of the sequence)
- Setting a digital output when reaching the end position of the sequence
- Adjusting, if for the sequence end the command command value or the feedback value is to be output.

Command value generator
In the open-loop controller modes, two linear ramps separately adjustable for Up and Down are available per solenoid output. In the closed-loop controller modes, a positive and a negative travelling speed are available.

Feedback value scaling
The feedback value can be applied as a voltage, current, frequency or PWM-signal. For the command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the command value can be monitored for a cable break (except voltage signal).

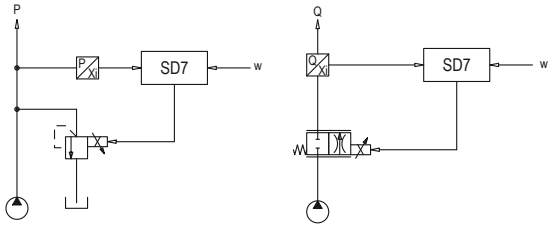
Manual operation
The commands Enable, Forward, Backward and Fast speed are available. With this, it is possible to move the cylinders without a preset command value by a superimposed control.

Windows
Available are a target, contouring error and solenoid-off window. In each window, the threshold and the delay time can be adjusted.

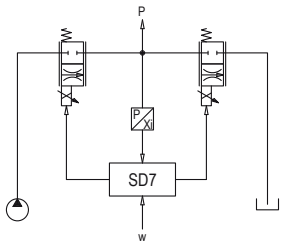
Controller
The SD7 controller module has a controller circuit. It is designed as PID controller. The following controller modes can be selected:

Controller mode «Pressure/flow valve open loop»
Driving of a pressure relief, pressure reducing, throttle or flow control valve in the open control circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

Controller mode «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 circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).

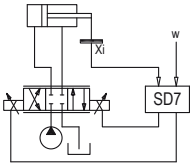


Controller mode «Pressure control closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in the closed loop circuit (with feedback signal) as pressure reduction. In doing so, one ot the throttle valves serves as the loading, the other one as the unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve to the solenoid driver 2.

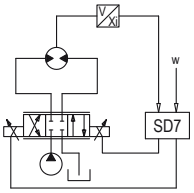


Controller mode «Position open loop»
Driving of a spool valve in the open loop circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

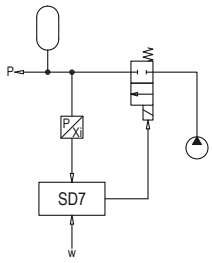
Controller mode «Position closed loop (2-sol)»
Driving of a 2-solenoid spool valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



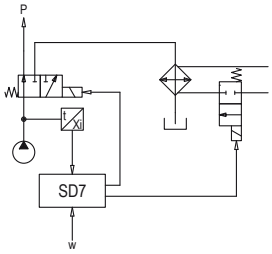
Controller mode «Speed control closed loop (2-sol)»
Driving of a 2-solenoid spool, throttle or volume flow control valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



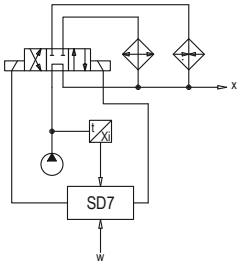
Controller mode «2-point controller (1-sol)»
Driving of a 1-solenoid valve with switching solenoid in the closed loop circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



Controller mode «2-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.

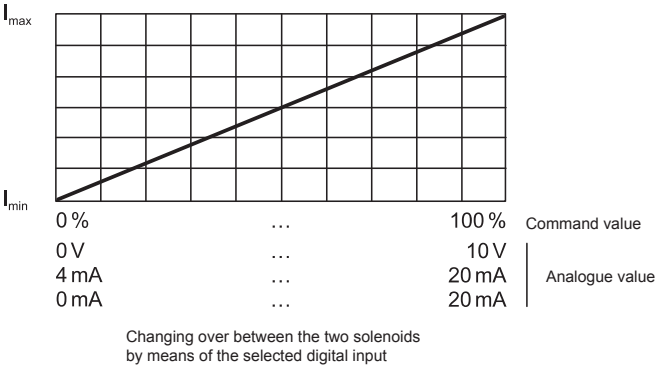


Controller mode «3-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



Valve type
Here the mode of operation is set when in open-loop mode. In addition, it can be selected, whether proportional or switching solenoids are to be driven.

Solenoid driver
Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configurated as switching outputs. Therewith for each output a power reduction can be adjusted separately.

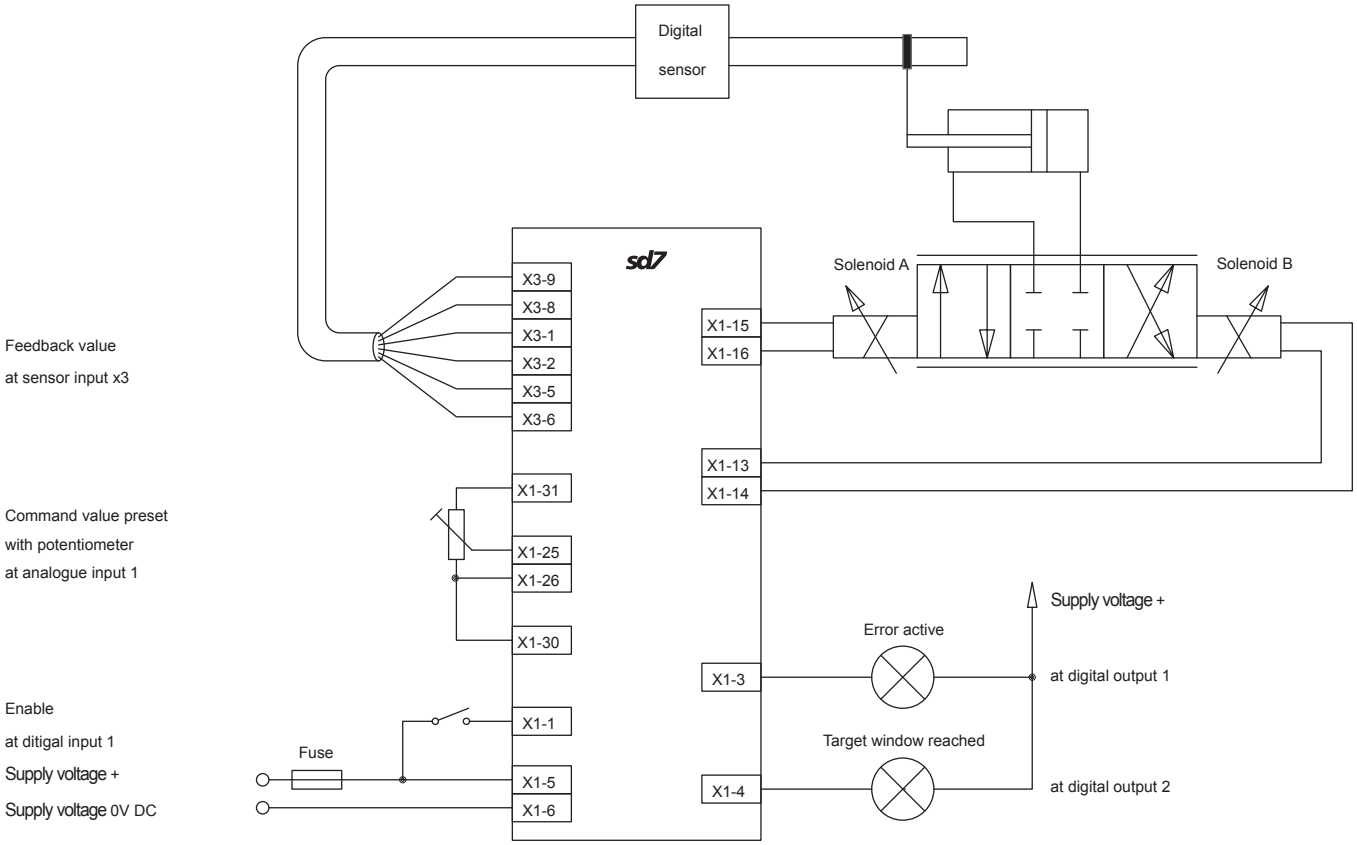


Signal recording
The SD7 controller module has a signal recording function, This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

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.

CONNECTION EXAMPLE

Position control (command value voltage signal, feedback value via digital sensor)



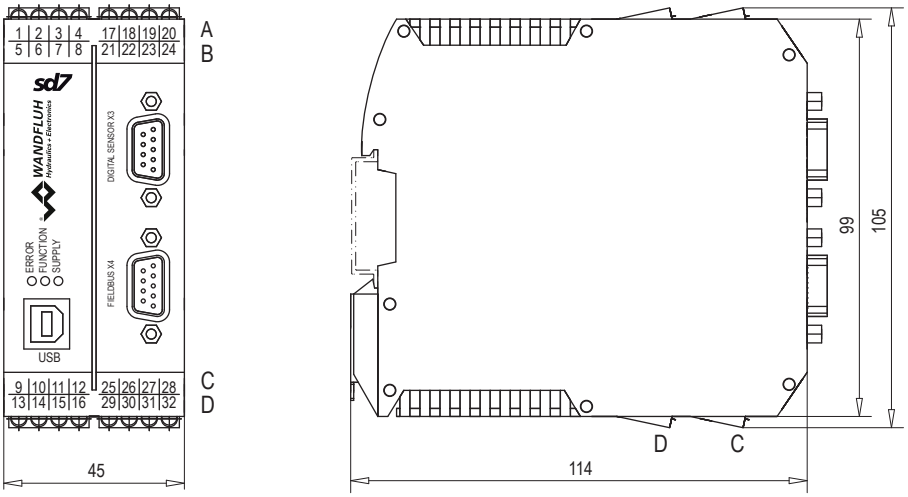
Enhanced controller with CANopen/J1939 interface

ELEKTRISCHE KENNGRÖSSEN

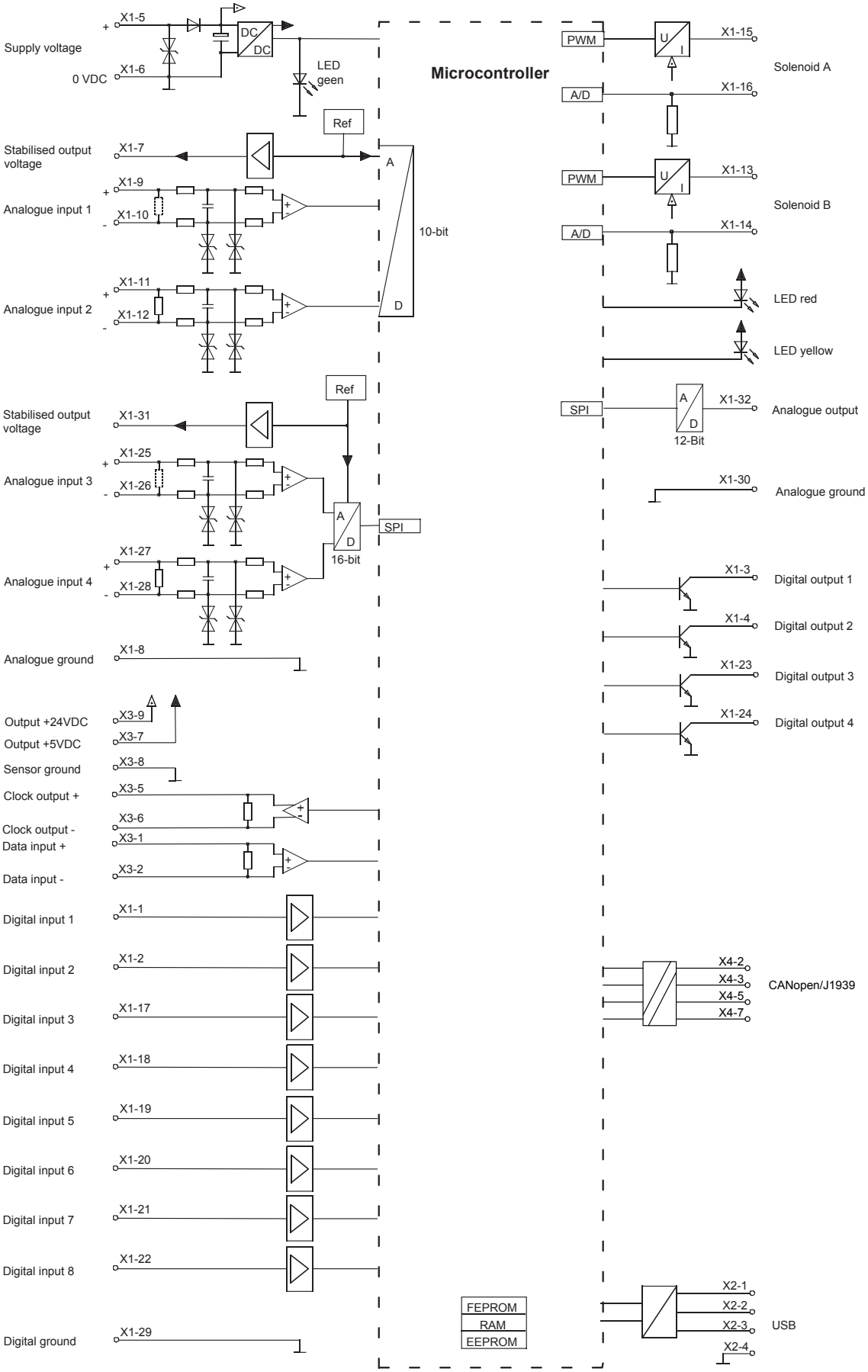
Protection class	IP30 acc. to EN 60 529
Device receptacle	
Sensor (female)	DSUB, 9-pole
Mating connector	Plug (male) DSUB, 9-pole
Device receptacle	
CANopen (male)	DSUB, 9-pole
Mating connector	Plug (female) DSUB, 9-pole
Supply voltage	24 VDC or 12 VDC
Voltage range:	
• 24 VDC	21,0…30,0 VDC
• 12 VDC	10,5…15,0 VDC
Residual ripple	<10 %
Fuse	low
Current consumption:	
• Non-load current	approx. 40 mA
• Maximum current consumption	non-load current + 1,8 A per solenoid (with 24 VDC) non-load current + 2,3 A per solenoid (with 12 VDC)
Analogue inputs:	Selectable with software Differential input not galvanically separated, for ground potential difference up to 1,5 V 4…+20 mA / 0…+20 mA 0…+10 V (1- or 2-solenoid version) -10…+10 V (only 2-solenoid version)
Resolution	10-Bit (Analogue inputs 1 and 2) 16-Bit (Analogue inputs 3 and 4)
Input resistance	Voltage input >18 kΩ Load for current input = 250 Ω
Measuring system input	DSUB Plug 9-pole (female) on front plate acc. to RS422 standard selectable with software absolute via start / stop absolute via SSI (1...32 Bit, gray or binary)
Analogue output	Voltage output ± 10 VDC max. current output ± 3 mA
Stabilised output voltage	10 VDC (with 24 VDC) 8 VDC (with 12 VDC) max. load 30 mA

Bus topology	Line, differential signal transmission
Potential separation	CANopen/J1939 to «SD7» electronics 500 VDC
Solenoid current:	
• Minimal current I_{min}	Adjustable 0…950 mA Factory setting 150 mA
• Maximal current I_{max}	Adjustable I_{min}…1,8 A (with 24 VDC) I_{min}…2,3 A (with 12 VDC) Factory setting 700 mA
• Accumulated current limitation	The accummulated current of the simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions..
Dither	Frequenz adjustable 2…500 Hz Factory setting 100 Hz Level adjustable 0…400 mA Factory setting 100 mA
Temperaturdrift	<1 % at ΔT = 40 °C
Digital inputs	Switching threshold high 6…30 VDC Switching threshold low 0…1 VDC Digital input 5–7 can be used as frequency input (frequencies 0…5 kHz) and as PWM input (automatic frequency recognition)
Digital outputs	Low-Side-Switch: U_{max} = 40 VDC I_{max} = -700 mA
Ramps adjustable	Adjustable 0…500 s
Serial interface	USB (receptacle type B)
EMV	
• Immunity	EN 61 000-6-2
• Emission	EN 61 000-6-4

DIMENSIONS

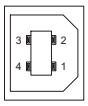


BLOCK DIAGRAM



CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

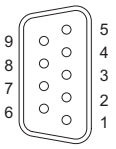
USB interface, USB type B X2



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

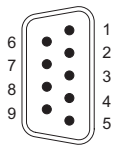
REMARK!
The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

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 ground
9 = Output +24VDC

Device receptacle CANopen (male) X4

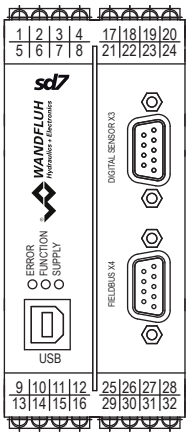


CANOPEN/J1939

1 = Reserved
2 = CANLow
3 = CANGnd
4 = Reserved
5 = CANShield
6 = Reserved
7 = CANHigh
8 = Reserved
9 = Reserved

The mating connectors (plug male and plug female, DSUB, 9-pole) are 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 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 driver 2 +
14 = Output solenoid driver 2 -
15 = Output solenoid driver 1 +
16 = Output solenoid driver 1 -
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

Configuration Analogue input

Type description	Analogue inputs			
	No. 1	No. 2	No. 3	No. 4
SD7362Dx**4**-BC	Voltage	Current	Voltage	Current
SD7362Dx**5**-BC	Voltage	Voltage	Voltage	Voltage
SD7362Dx**6**-BC	Current	Current	Current	Current
SD7362Dx**7**-BC	Voltage	Voltage	Current	Current
SD7362Dx**8**-BC	Current	Current	Voltage	Voltage

START-UP

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

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

Free-of-charge download:
• «PASO-SD7» Parameterisation software
• Operating instructions (*.pdf)
• EDS-file «WAGOB8E.eds»

ADDITIONAL INFORMATION

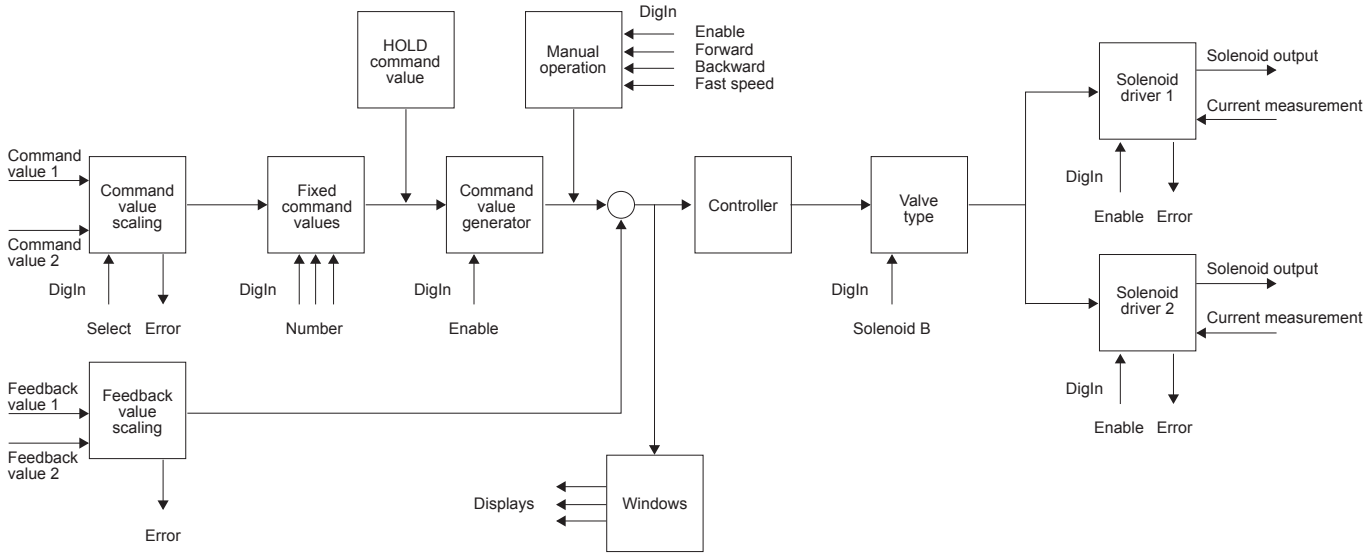
	Wandfluh documentation	
Wandfluh electronics general	register	1.13
Proportional directional valves	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

DESIGN

The controller module can be parameterised by means of the parameterisation software «PASO-SD7» through the USB-interface. In addition, the parameterisation software makes a data analysis possible.

The software «PASO-SD7» is supported by Windows 2000 and Windows XP, Windows Vista and Windows 7 with 32/64-Bit.

FUNCTION DESCRIPTION



SD7 ENHANCED-CONTROLLER WITH CANopen/J1939 INTERFACE

Command value scaling
The command value can be applied via the CANopen/J1939 or as a voltage, current, digital, frequency or PWM-signal. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for CANopen/J1939, voltage and digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

Profile / Fixed command values
There are 7 fixed command values available, which can be selected via 3 digital inputs. Also travel profiles can be used. The SD7 controller module is in a position to save and to travel entire travel profiles which have been adjusted before by the user in the profile generator. A travel profile consists of the following data:

- Command value (target or end position of the sequence)
- Speed (target speed of travelling)
- Acceleration (acceleration to reach the target speed of travelling)
- Deceleration (deceleration departing from the target speed of travelling)
- Stop time (waiting period after reaching the end position of the sequence)
- Setting a digital output when reaching the end position of the sequence
- Adjusting, if for the sequence end the command command value or the feedback value is to be output.

Command value generator
In the open-loop controller modes, two linear ramps separately adjustable for Up and Down are available per solenoid output. In the closed-loop controller modes, a positive and a negative travelling speed are available.

HOLD command value
If via CANopen/J1939 the device is put into the “HOLD” condition, the respective command value is activated.

Feedback value scaling
The feedback value can be applied via the CANopen/J1939 or as a voltage, current, frequency or digital signal. For the command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the command value can be monitored for a cable break (except CANopen/J1939 and voltage signal).

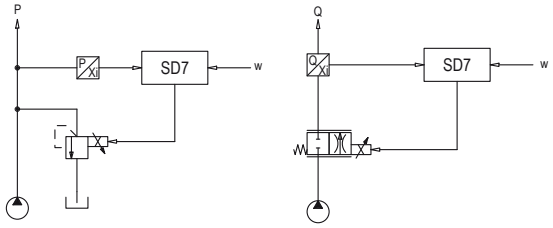
Manual operation
The commands Enable, Forward, Backward and Fast speed are available. With this, it is possible to move the cylinders without a preset command value by a superimposed control.

Windows
Available are a target, contouring error and solenoid-off window. In each window, the threshold and the delay time can be adjusted.

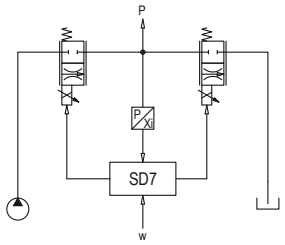
Controller
The SD7 controller module has a controller circuit. It is designed as PID controller. The following controller modes can be selected:

Controller mode «Pressure/flow valve open loop»
Driving of a pressure relief, pressure reducing, throttle or flow control valve in the open control circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

Controller mode «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 circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).

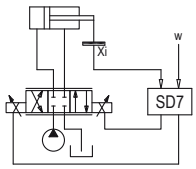


Controller mode «Pressure control closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in the closed loop circuit (with feedback signal) as pressure reduction. In doing so, one ot the throttle valves serves as the loading, the other one as the unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve to the solenoid driver 2.

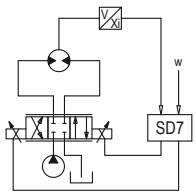


Controller mode «Position open loop»
Driving of a spool valve in the open loop circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

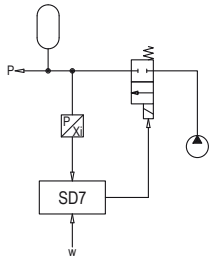
Controller mode «Position closed loop (2-sol)»
Driving of a 2-solenoid spool valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



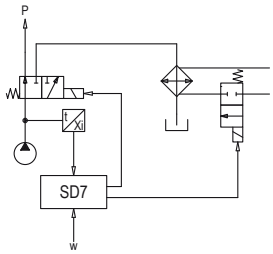
Controller mode «Speed control closed loop (2-sol)»
Driving of a 2-solenoid spool, throttle or volume flow control valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



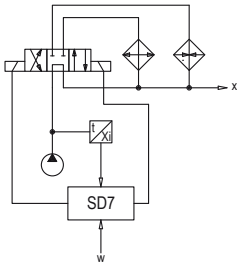
Controller mode «2-point controller (1-sol)»
Driving of a 1-solenoid valve with switching solenoid in the closed loop circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



Controller mode «2-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.

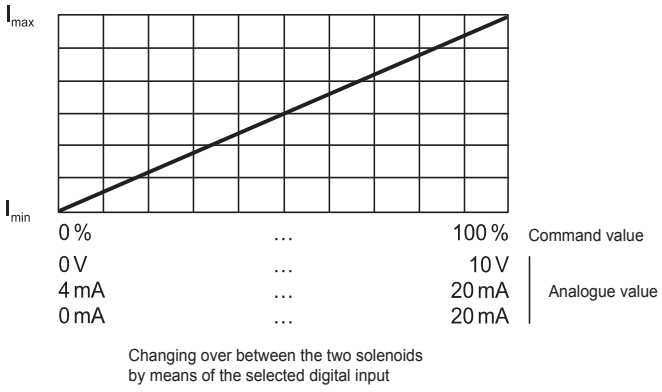


Controller mode «3-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



Valve type
Here the mode of operation is set when in open-loop mode. In addition, it can be selected, whether proportional or switching solenoids are to be driven.

Solenoid driver
Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configurated as switching outputs. Therewith for each output a power reduction can be adjusted separately.



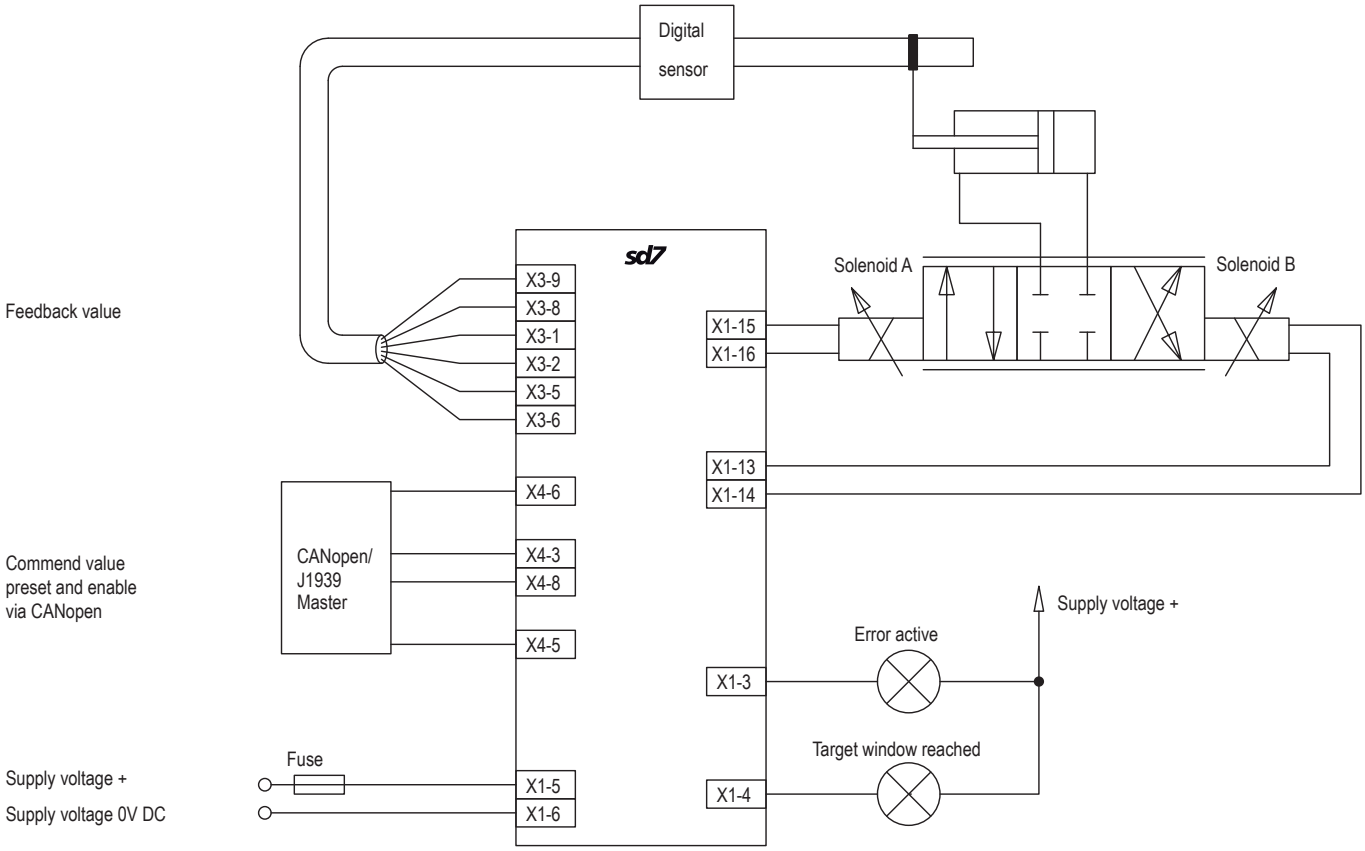
Changing over between the two solenoids
by means of the selected digital input

Signal recording
The SD7 controller module has a signal recording function, This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented 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.

CONNECTION EXAMPLE

Position control (command value voltage signal, feedback value via digital sensor)

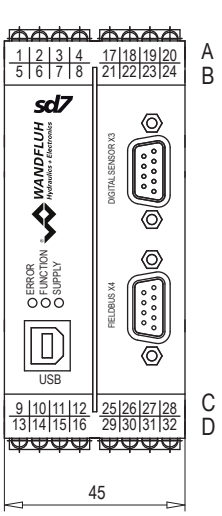


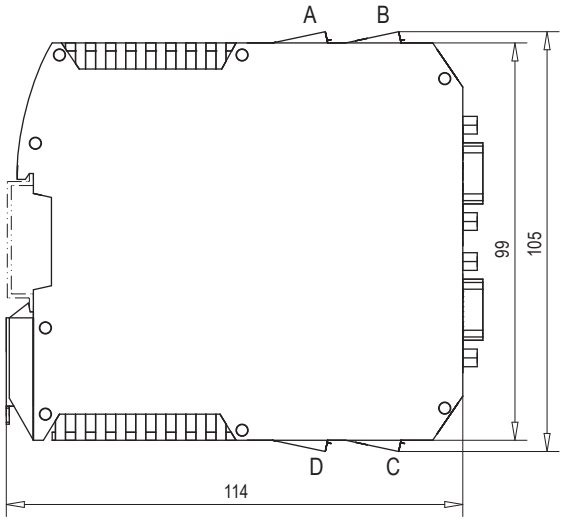
Enhanced controller with Profibus DP interface

ELECTRICAL SPECIFICATIONS

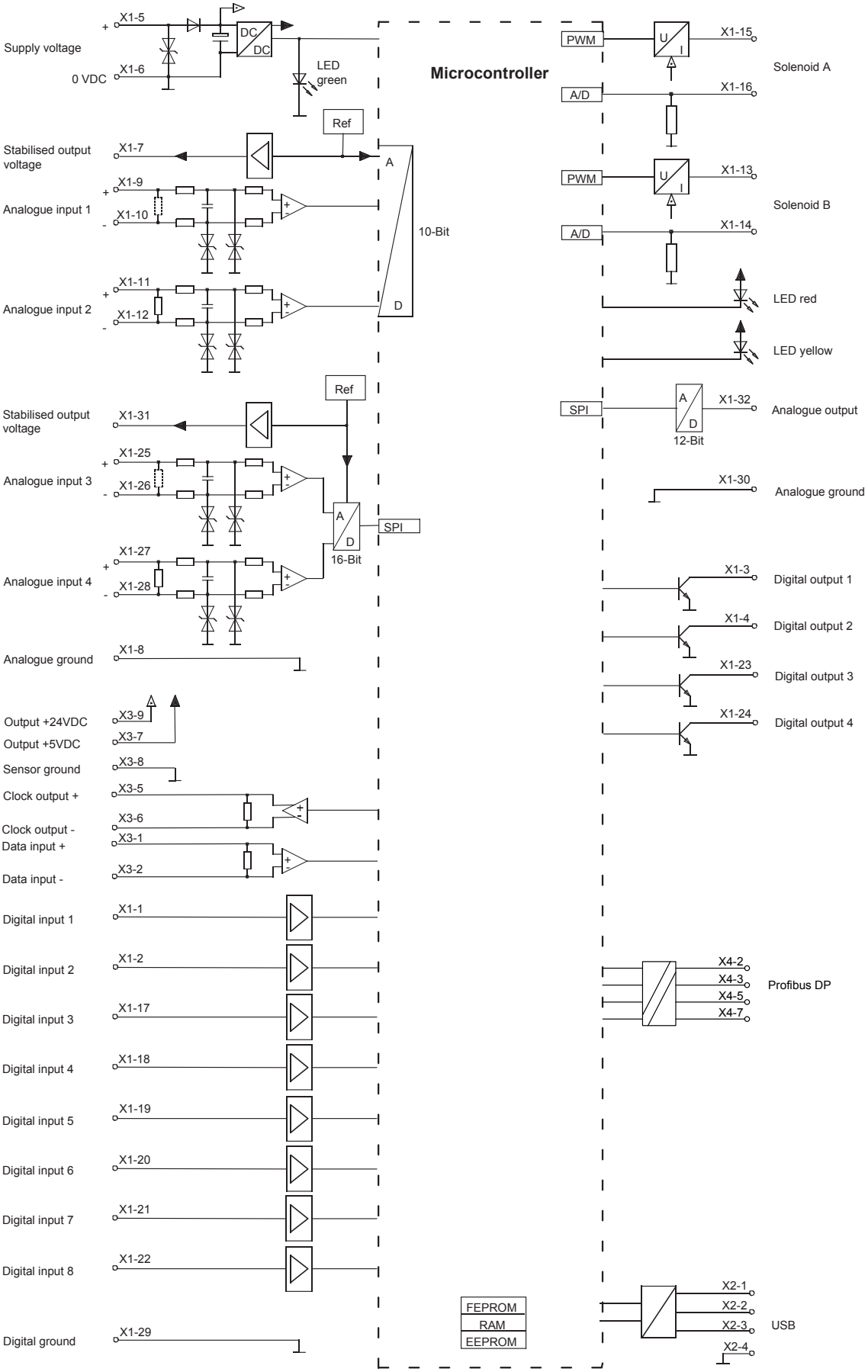
Protection class	IP30 acc. to EN 60 529
Device receptacle	
Sensor (female)	DSUB, 9-pole
Mating connector	Plug (male) DSUB, 9-pole
Device receptacle	
Profibus (female)	DSUB, 9-pole
Mating connector	Plug (male), DSUB, 9-pole
Supply voltage	24 VDC or 12 VDC
Voltage range:	
• 24 VDC	21…30 V
• 12 VDC	10,5…15 V
Residual ripple	<10 %
Fuse	low
Current consumption:	
• Non-load current	approx. 40 mA
• Maximum current consumption	non-load current + 1,8 A per solenoid (with 24 VDC) non-load current + 2,3 A per solenoid (with 12 VDC)
Command value and analogue inputs:	Selectable with software Differential input not galvanically separated, for ground potential difference up to 1,5 V 4…+20 mA / 0…+20 mA 0…+10 V (1- or 2-solenoid version) -10…+10 V (only 2-solenoid version)
Resolution	10-Bit (Analogue inputs 1 and 2) 16-Bit (Analogue inputs 3 and 4)
Input resistance	Voltage input >18 kΩ Load for current input = 250 Ω
Measuring system input	DSUB Plug 9-pole (female) on front plate acc. to RS422 standard selectable with software - absolute via start / stop - absolute via SSI (1...32 Bit, gray or binary)
Analogue output	Voltage output ± 10 VDC max. current output ± 3 mA
Stabilised output voltage	10 VDC (with 24 VDC) 8 VDC (with 12 VDC) max. load 30 mA
Bus topology	Line, differential signal transmission
Potential separation	Profibus to «SD7» electronics 500 VDC
Solenoid current:	
• Minimal current I_{min}	Adjustable 0…950 mA Factory setting 150 mA
• Maximal current I_{max}	Adjustable I_{min}…1,8 A (with 24 VDC) I_{min}…2,3 A (with 12 VDC) Factory setting 700 mA
• Accumulated current limitation	The accummulated current of the simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions.
Dither	Frequency adjustable 20…500 Hz Factory setting 100 Hz Level adjustable 0…400 mA Factory setting 100 mA
Temperature drift	<1 % at ΔT = 40 °C
Digital inputs	Switching threshold high 6…30 VDC Switching threshold low 0…1 VDC Digital input 5 – 7 can be used as frequency input (frequencies 0…5 kHz) and as PWM input (automatic frequency recognition)
Digital outputs	Low-Side-Switch: U_{max} = 40 VDC I_{max} = -700 mA
Ramps adjustable	0…500 s
Serial interface	USB (receptacle type B)
EMV	
Immunity	EN 61 000-6-2
Emission	EN 61 000-6-4

DIMENSIONS



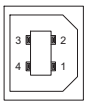


BLOCK DIAGRAM



CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

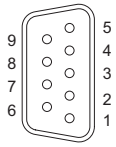
USB interface, USB type B X2



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

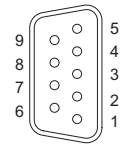
REMARK!
The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

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 ground
9 = Output +24VDC

Device receptacle Profibus DP (female) X4

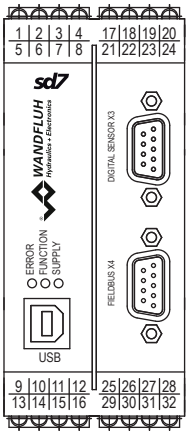


PROFIBUS

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

The mating connectors (Plug male DSUB, 9-pole) are 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 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 driver 2 +
14 = Output solenoid driver 2 -
15 = Output solenoid driver 1 +
16 = Output solenoid driver 1 -
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 = Analogausgang

Configuration Analogue input

Type description	Analogue inputs			
	No. 1	No. 2	No. 3	No. 4
SD7362Dx**4**-BP	Voltage	Current	Voltage	Current
SD7362Dx**5**-BP	Voltage	Voltage	Voltage	Voltage
SD7362Dx**6**-BP	Current	Current	Current	Current
SD7362Dx**7**-BP	Voltage	Voltage	Current	Current
SD7362Dx**8**-BP	Current	Current	Voltage	Voltage

START-UP

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

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

Free-of-charge download:
• «PASO-SD7» 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

DESIGN

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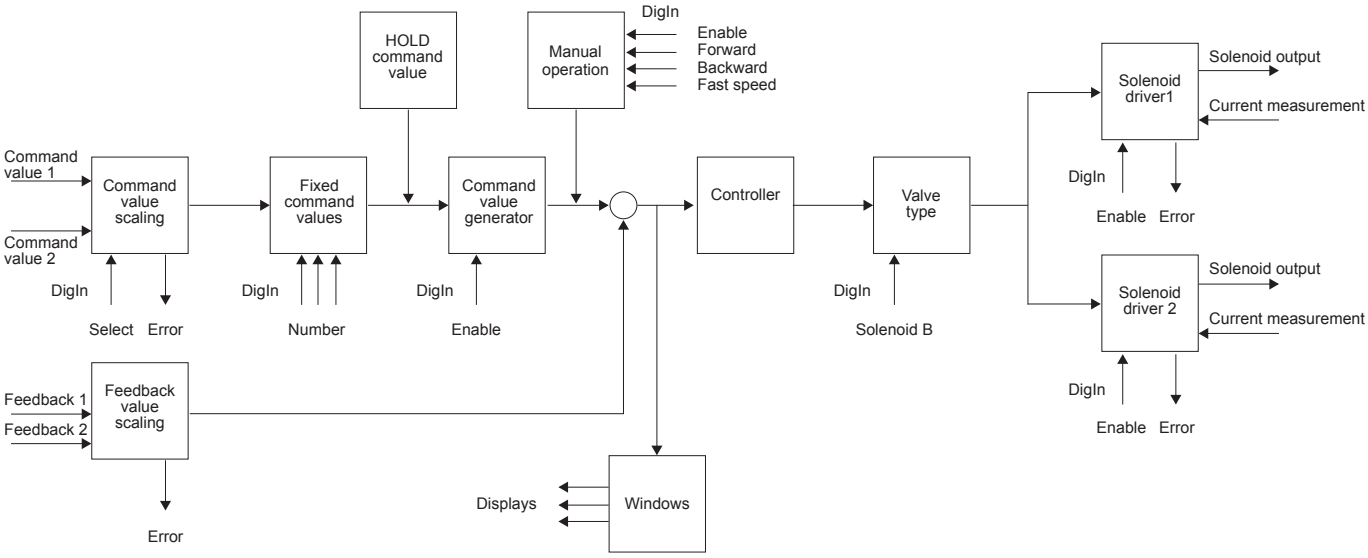
The software «PASO-SD7» is supported by Windows 2000 and Windows XP, Windows Vista and Windows 7 with 32/64-Bit.

FUNCTION DESCRIPTION



SD7 ENHANCED-CONTROLLER WITH PROFIBUS DP INTERFACE

Command value scaling
The command value can be applied via Profibus DP or as a voltage, current, digital, frequency or PWM-signal. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for Profibus DP, voltage and digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

Profile / Fixed command values
There are 7 fixed command values available, which can be selected via 3 digital inputs. Also travel profiles can be used. The SD7 controller module is in a position to save and to travel entire travel profiles which have been adjusted before by the user in the profile generator. A travel profile consists of the following data:

- Command value (target or end position of the sequence)
- Speed (target speed of travelling)
- Acceleration (acceleration to reach the target speed of travelling)
- Deceleration (deceleration departing from the target speed of travelling)
- Stop time (waiting period after reaching the end position of the sequence)
- Setting a digital output when reaching the end position of the sequence
- Adjusting, if for the sequence end the command command value or the feedback value is to be output.

Command value generator
In the open-loop controller modes, two linear ramps separately adjustable for Up and Down are available per solenoid output. In the closed-loop controller modes, a positive and a negative travelling speed are available.

HOLD command value
If via Profibus DP the device is put into the “HOLD” condition, the respective command value is activated.

Feedback value scaling
The feedback value can be applied via Profibus DP or as a voltage, current, frequency or PWM-signal. For the command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the command value can be monitored for a cable break (except Profibus DP and voltage signal).

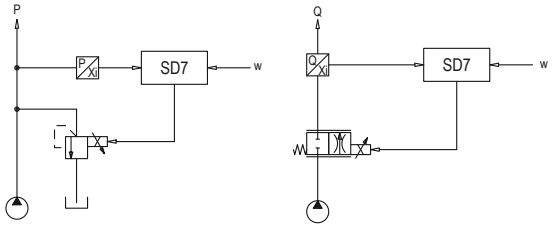
Manual operation
The commands Enable, Forward, Backward and Fast speed are available. With this, it is possible to move the cylinders without a preset command value by a superimposed control.

Windows
Available are a target, contouring error and solenoid-off window. In each window, the threshold and the delay time can be adjusted.

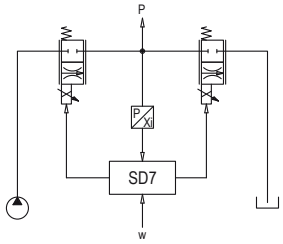
Controller
The SD7 controller module has a controller circuit. It is designed as PID controller. The following controller modes can be selected:

Controller mode «Pressure/flow valve open loop»
Driving of a pressure relief, pressure reducing, throttle or flow control valve in the open control circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

Controller mode «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 circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).

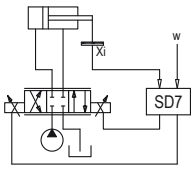


Controller mode «Pressure control closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in the closed loop circuit (with feedback signal) as pressure reduction. In doing so, one ot the throttle valves serves as the loading, the other one as the unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve to the solenoid driver 2.

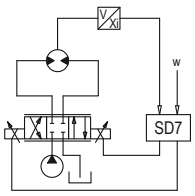


Controller mode «Position open loop»
Driving of a spool valve in the open loop circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

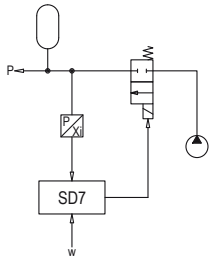
Controller mode «Position closed loop (2-sol)»
Driving of a 2-solenoid spool valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



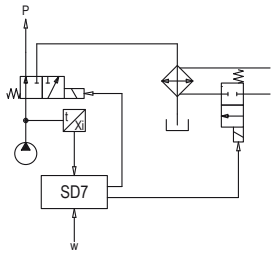
Controller mode «Speed control closed loop (2-sol)»
Driving of a 2-solenoid spool, throttle or volume flow control valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



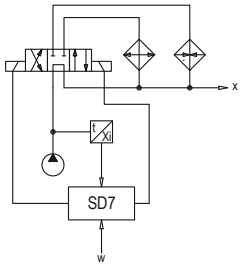
Controller mode «2-point controller (1-sol)»
Driving of a 1-solenoid valve with switching solenoid in the closed loop circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



Controller mode «2-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.

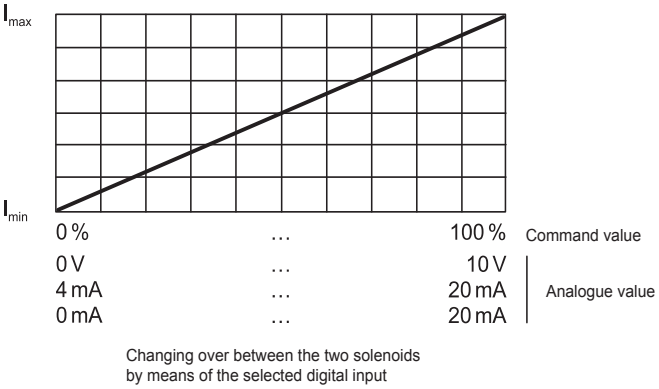


Controller mode «3-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



Valve type
Here the mode of operation is set when in open-loop mode. In addition, it can be selected, whether proportional or switching solenoids are to be driven.

Solenoid driver
Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configurated as switching outputs. Therewith for each output a power reduction can be adjusted separately.

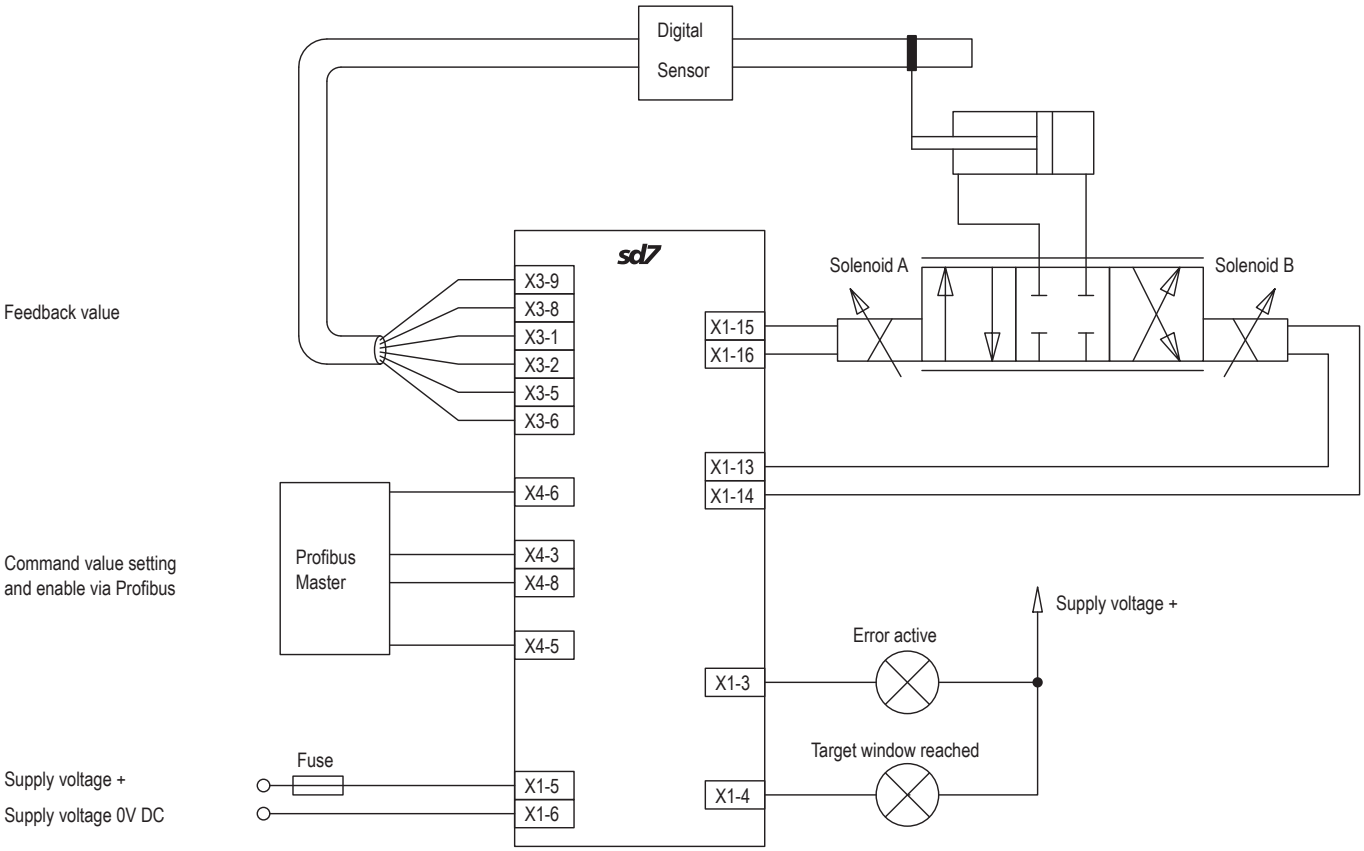


Signal recording
The SD7 controller module has a signal recording function, This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

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.

CONNECTION EXAMPLE

Position control (command value via Profibus, feedback value via digital sensor)



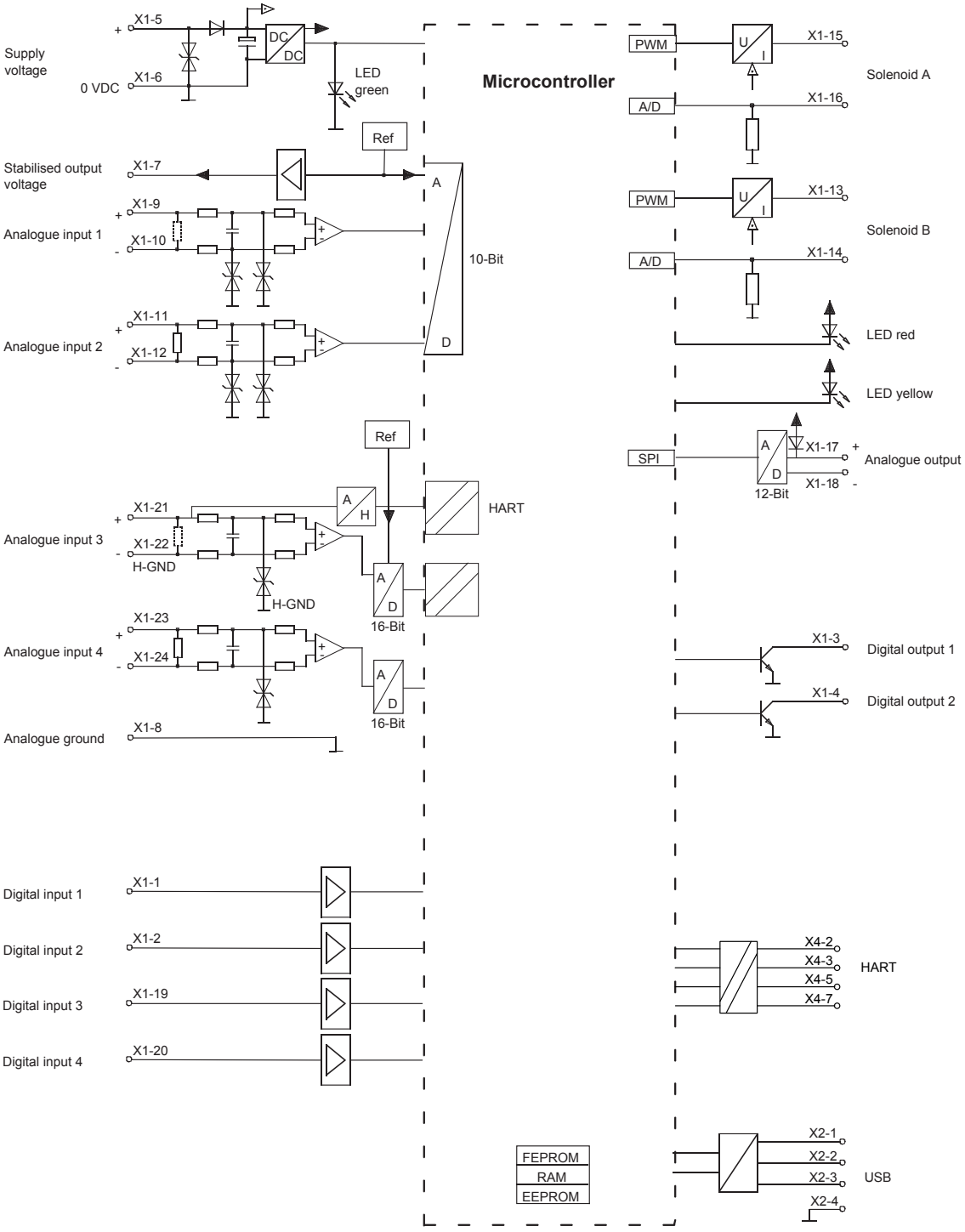
Enhanced controller with HART interface

ELECTRICAL SPECIFICATIONS

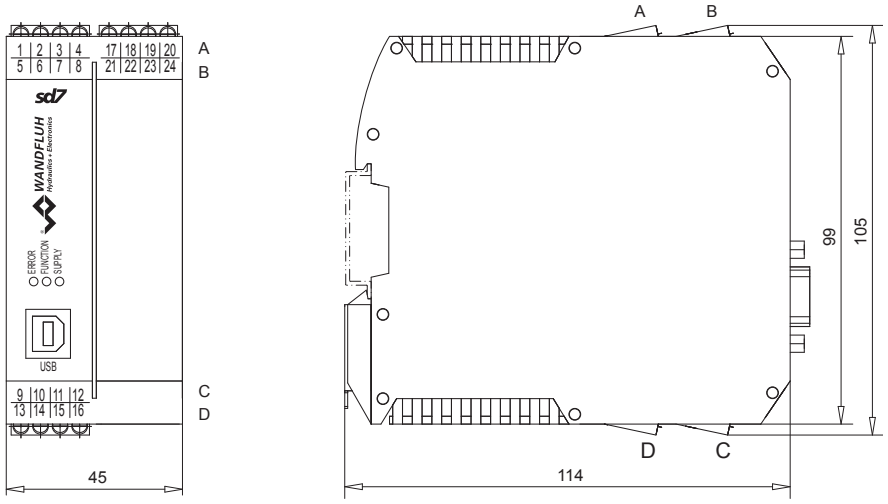
Protection class	IP 30 acc. to EN 60 529
Supply voltage	24 VDC or 12 VDC
Voltage range:	
• 24 VDC	21,0…30,0 VDC
• 12 VDC	10,5…15,0 VDC
Residual ripple	<10 %
Fuse	low
Current consumption:	
• Non-load current	approx. 40 mA
• Maximum current consumption	non-load current + 1,8 A per solenoid (with 24 VDC) non-load current + 2,3 A per solenoid (with 12 VDC)
Analogue inputs:	Selectable with software Input 1, 2 and 4: Differential input not galvanically separated, for ground potential difference up to 1,5 V 4…+20 mA / 0…+20 mA 0…+10 V (1- or 2-solenoid version) -10…+10 V (only 2-solenoid version) Input 3: galvanically separated for HART Signal 4…+20 mA / 0…+20 mA
Resolution	10-Bit (Analogue inputs 1 and 2) 16-Bit (Analogue inputs 3 and 4)
Input resistance	Voltage input >18 kΩ Load for current input = 250 Ω
Analogue output	Current output 0…20 mA max. Voltage output 12 V
Stabilised output voltage	10 VDC (with 24 VDC) 8 VDC (with 12 VDC) max. load 30 mA
HART interface	via analogue input 3

Solenoid current:	
• Minimal current I_{min}	Adjustable 0…950 mA Factory setting 150 mA
• Maximal current I_{max}	Adjustable I_{min}…1,8 A (with 24 VDC) I_{min}…2,3 A (with 12 VDC) Factory setting 700 mA
• Accumulated current limitation	The accummulated current of the simultaneously powered solenoids depends on the ambient temperature. Further information can be found in the operating instructions..
Dither	Frequency adjustable 2…500 Hz Factory setting 100 Hz Level adjustable 0…400 mA Factory setting 100 mA
Temperature drift	<1 % at ΔT = 40 °C
Digital inputs	Switching threshold high 6…30 VDC Switching threshold low 0…1 VDC
Digital outputs	Low-Side-Switch: U_{max} = 40 VDC I_{max} = -700 mA
Ramps adjustable	Adjustable 0…500 s
Serial interface	USB (receptacle type B)
EMV	
• Immunity	EN 61 000-6-2
• Emission	EN 61 000-6-4

BLOCK DIAGRAM

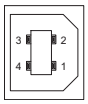


DIMENSIONS



CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT

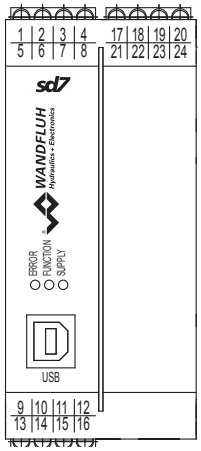
USB interface, USB type B X2



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)

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 driver 2 +
14 = Output solenoid driver 2 -
15 = Output solenoid driver 1 +
16 = Output solenoid driver 1 -
17 = Analogue output +
18 = Analogue output -
19 = Digital input 3
20 = Digital input 4
21 = Analogue input 3 + HART
22 = Analogue input 3 - HART
23 = Analogue input 4 +
24 = Analogue input 4 -

START-UP

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

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

Free-of-charge download:
• «PASO-SD7» Parametriersoftware
• Operating instructions (*.pdf)
• EDD-file «WAGSD7.ddl»

Configuration Analogue input

Type description	Analogue inputs			
	No. 1	No. 2	No. 3	No. 4
SD7362Dx**4**-BH	Voltage	Current	Current	Current
SD7362Dx**5**-BH	Voltage	Voltage	Current	Voltage
SD7362Dx**6**-BH	Current	Current	Current	Current
SD7362Dx**7**-BH	Voltage	Voltage	Current	Current
SD7362Dx**8**-BH	Current	Current	Current	Voltage

ADDITIONAL INFORMATION

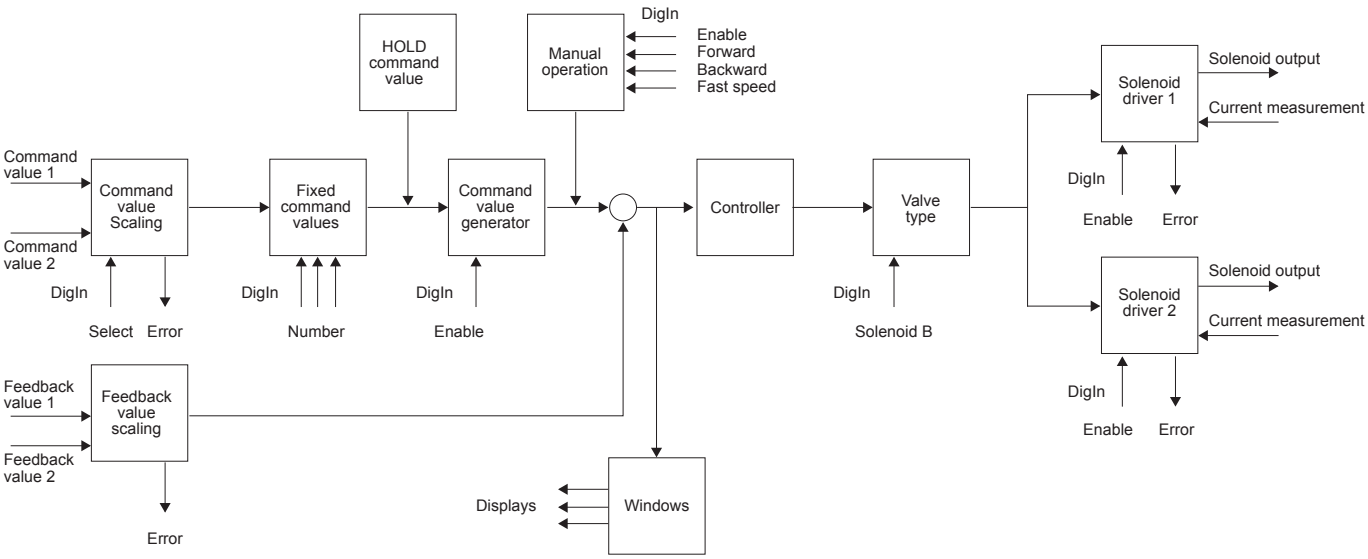
	Wandfluh documentation	
Wandfluh electronics general	register	1.13
Proportional directional valves	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

DESIGN

The controller module can be parameterised by means of the parameterisation software «PASO-SD7» through the USB-interface. In addition, the parameterisation software makes a data analysis possible.

The software «PASO-SD7» is supported by Windows 2000 and Windows XP, Windows Vista and Windows 7 with 32/64-Bit.

FUNCTION DESCRIPTION



SD7 ENHANCED CONTROLLER WITH HART INTERFACE

Command value scaling
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Profile / Fixed command values
There are 7 fixed command values available, which can be selected via 3 digital inputs. Also travel profiles can be used. The SD7 controller module is in a position to save and to travel entire travel profiles which have been adjusted before by the user in the profile generator. A travel profile consists of the following data:

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Command value generator
In the open-loop controller modes, two linear ramps separately adjustable for Up and Down are available per solenoid output. In the closed-loop controller modes, a positive and a negative travelling speed are available.

HOLD command value
If via HART the device is put into the “HOLD” condition, the respective command value is activated.

Feedback value scaling
The feedback value can be applied via HART or as a voltage, current, frequency or digital signal. For the command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the command value can be monitored for a cable break (except HART and voltage signal).

Manual operation
The commands Enable, Forward, Backward and Fast speed are available. With this, it is possible to move the cylinders without a preset command value by a superimposed control.

Windows
Available are a target, contouring error and solenoid-off window. In each window, the threshold and the delay time can be adjusted.

Controller
The SD7 controller module has a controller circuit. It is designed as PID controller. The following controller modes can be selected:

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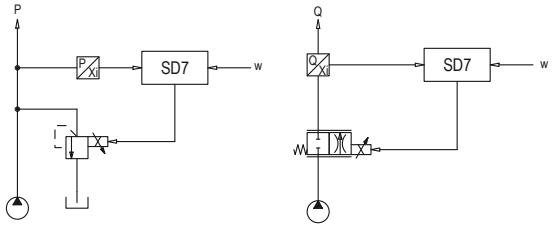
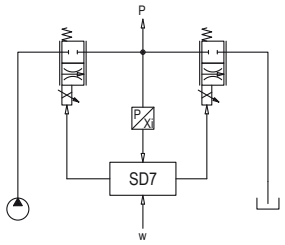
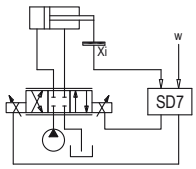


Controller mode «Pressure control closed loop (2-sol)»
Driving of two 1-solenoid throttle valves in the closed loop circuit (with feedback signal) as pressure reduction. In doing so, one ot the throttle valves serves as the loading, the other one as the unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve to the solenoid driver 2.

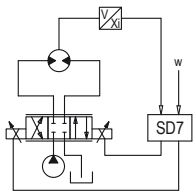


Controller mode «Position open loop»
Driving of a spool valve in the open loop circuit (without feedback signal). The number of solenoids that are driven is dependent on the selected mode of operation.

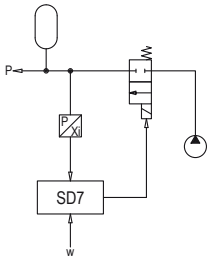
Controller mode «Position closed loop (2-sol)»
Driving of a 2-solenoid spool valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



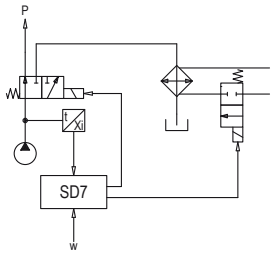
Controller mode «Speed control closed loop (2-sol)»
Driving of a 2-solenoid spool, throttle or volume flow control valve in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



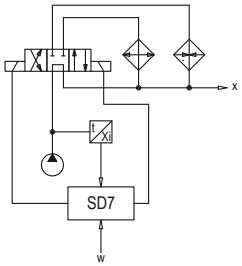
Controller mode «2-point controller (1-sol)»
Driving of a 1-solenoid valve with switching solenoid in the closed loop circuit (with feedback signal). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



Controller mode «2-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.

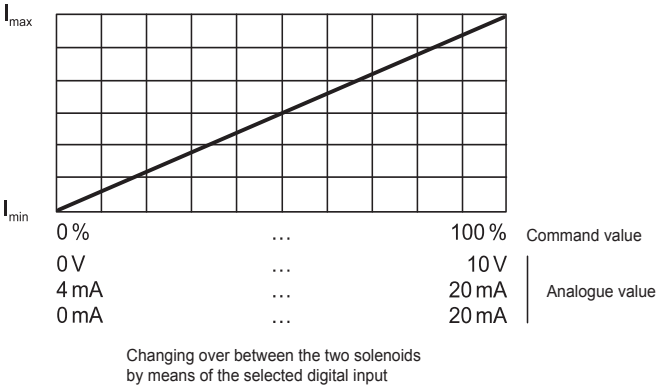


Controller mode «3-point controller (2-sol)»
Driving of a 2-solenoid valve with switching solenoid resp. of two 1-solenoid valves with switching solenoid in the closed loop circuit (with feedback signal). With it, two solenoids can be driven.



Valve type
Here the mode of operation is set when in open-loop mode. In addition, it can be selected, whether proportional or switching solenoids are to be driven.

Solenoid driver
Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configurated as switching outputs. Therewith for each output a power reduction can be adjusted separately.



Signal recording
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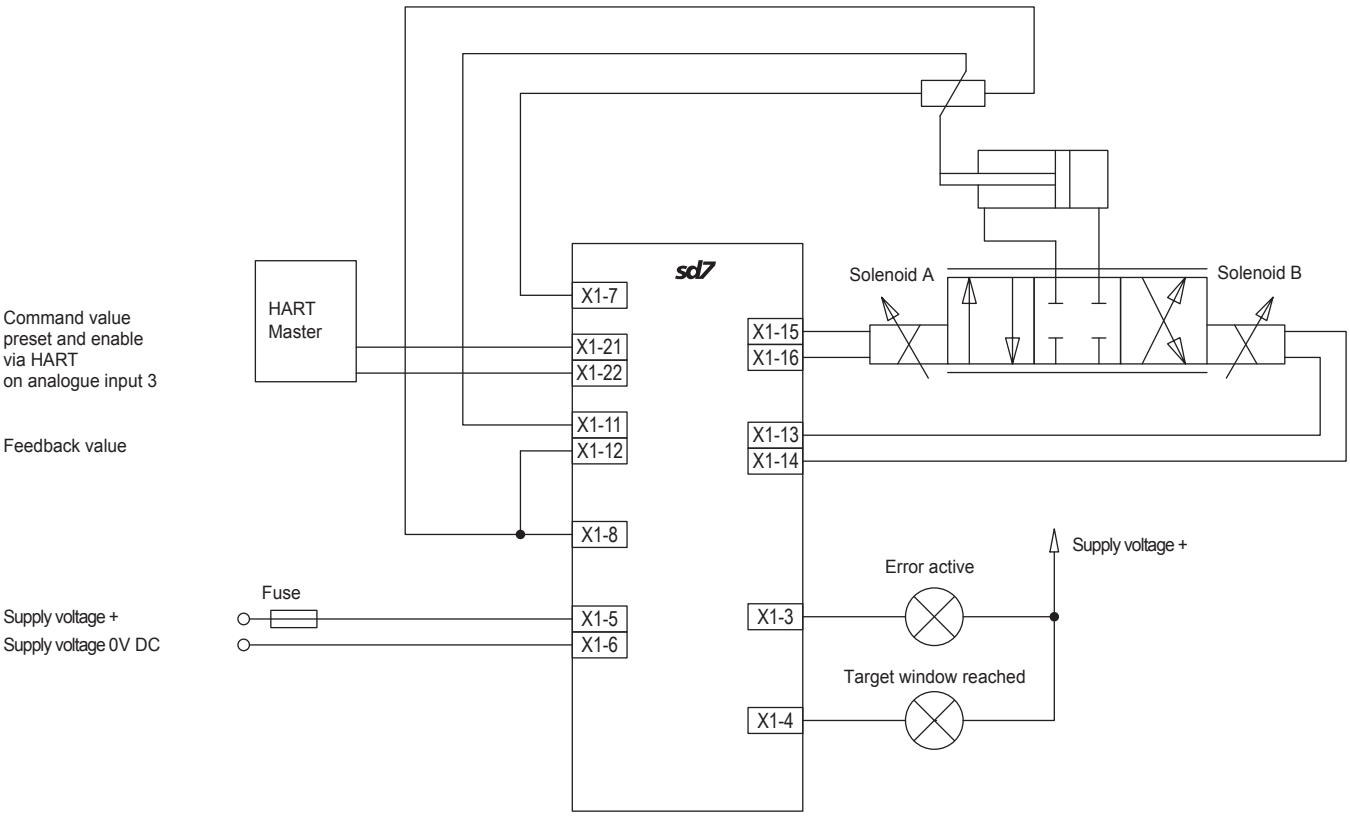
Optimisation of characteristic curve
A characteristic curve adjustable per solenoid „Command value input – solenoid current output“ enables an optimised (e.g., linearised) characteristic of the hydraulic system.

CONNECTION EXAMPLE

Position control (command value via HART, feedback value via digital sensor)