Digital amplifier module SD7

- For 1 or 2 proportional solenoids
- Interface: - analog
  - CANopen / J1939
  - Profibus DP
  - HART
- Max. 4 analog differential inputs
- Max. 8 digital inputs
- Fixed command values
- Adjustable via PC
- (optionally with manual operation on front panel)
- For snapping on to dome rail
- Also available as controller module (see data sheet 1.13-106)

**DESCRIPTION**
Digital amplifier module for installation on dome rail for controlling proportional or switching valves with one or two solenoids. The parameterisation takes place by means of menu-controlled parameterisation and diagnostics software «PASO» from Wandfluh (USB interface) or optionally with a manual operation on the front panel. Separate ramps for up and down as well as fixed adjustable command values are integrated in the amplifier module as standard. The electronics are optionally available with different fieldbus interfaces.

**FUNCTION**
The amplifier module has one, resp., two Pulse-Width-Modulated current outputs with superimposed dither signal. The solenoid outputs can also be parameterised for switching solenoids. The analog and digital inputs as well as the digital outputs can be programmed individually. With this device control tasks can be solved in a very simple manner. The fieldbus connection enables reading the command value signal as well as the parameterisation directly via the fieldbus.

**APPLICATION**
As snap-on module, the amplifier module is mainly utilised in the industrial field. The module can be mounted on dome-rails. The connection with terminal screws enables commissioning without special tools in a short time. The amplifier module is particularly suitable for applications with additional functions such as ramps, fixed command values, etc. Customer specific requirements can be implemented in a simple manner.

**GENERAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execution</td>
<td>Module for control cubicle, housing made of plastic</td>
</tr>
<tr>
<td>Installation</td>
<td>on 35 mm dome rail according to EN 60715</td>
</tr>
<tr>
<td>Weight</td>
<td>• Basic amplifier analog 130 g</td>
</tr>
<tr>
<td></td>
<td>• Basic amplifier fieldbus 220 g</td>
</tr>
<tr>
<td></td>
<td>• Enhanced amplifier analog 220 g</td>
</tr>
<tr>
<td></td>
<td>• Enhanced amplifier fieldbus 240 g</td>
</tr>
<tr>
<td>Connections</td>
<td>Screw terminals, max. cable cross-section 2.5 mm²</td>
</tr>
<tr>
<td>Working temperature</td>
<td>-20...+70 °C</td>
</tr>
</tbody>
</table>

Further information can be found in the Operating instructions.

**COMMISSIONING**
Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the Operating instructions. Further information can be found on our website: [www.wandfluh.com](http://www.wandfluh.com)

Free-of-charge download:
- «PASO» Parameterisation software
- Operating instructions (.pdf)
- Device description data: (EDS file «WAGSD7C1.eds»)
  (GSD file «SD7-0B8E.gsd»)

**ADDITIONAL INFORMATION**

<table>
<thead>
<tr>
<th>Information</th>
<th>Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wandfluh electronics general</td>
<td>1.13</td>
</tr>
<tr>
<td>Proportional spool valves</td>
<td>1.10</td>
</tr>
<tr>
<td>Proportional pressure valves</td>
<td>2.3</td>
</tr>
<tr>
<td>Proportional flow valves</td>
<td>2.6</td>
</tr>
</tbody>
</table>

### TYPE CODE

<table>
<thead>
<tr>
<th>Control cubicle</th>
<th>Digital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable with</td>
<td></td>
</tr>
<tr>
<td>• PASO and manual operation (Basic amplifier only, without fieldbus)</td>
<td>2</td>
</tr>
<tr>
<td>• PASO without manual operation</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Software configuration (function of card):

<table>
<thead>
<tr>
<th>Basic amplifier</th>
<th>Enhanced amplifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1-solenoid version</th>
<th>2-solenoid version</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Supply voltage:

<table>
<thead>
<tr>
<th>Basic amplifier</th>
<th>Enhanced amplifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 VDC</td>
<td>12 VDC</td>
</tr>
</tbody>
</table>

#### Analog input:

<table>
<thead>
<tr>
<th>Basic amplifier without HART</th>
<th>Basic amplifier with HART</th>
<th>Enhanced amplifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input 1 and 2: voltage</td>
<td>Analog input 1 and 2: voltage</td>
<td>Analog input 1 and 2: voltage</td>
</tr>
<tr>
<td>Analog input 1 and 2: both voltage</td>
<td>Analog input 1 and 2: both voltage</td>
<td>Analog input 1 and 2: both voltage</td>
</tr>
<tr>
<td>Analog input 1 and 2: both current</td>
<td>Analog input 1 and 2: both current</td>
<td>Analog input 1 and 2: both current</td>
</tr>
</tbody>
</table>

#### Option fieldbus:

<table>
<thead>
<tr>
<th>Basic amplifier without HART</th>
<th>Basic amplifier with HART</th>
<th>Enhanced amplifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input 1 and 2: 10-bit resolution</td>
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<td>Analog input 1 and 2: 10-bit resolution</td>
</tr>
<tr>
<td>Analog input 1 and 2: 10-bit resolution</td>
<td>Analog input 1 and 2: 10-bit resolution</td>
<td>Analog input 1 and 2: 10-bit resolution</td>
</tr>
</tbody>
</table>

#### Design-index (Subject to change)
ELECTRICAL SPECIFICATIONS

Protection class: IP 30 according 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:
  - No-load current + 1,8 A per solenoid (with 24 VDC)
  - No-load current + 2,3 A per solenoid (with 12 VDC)

Command value signal: Selectable by means of software
  Input 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)
  -10...+10 V (2-solenoid version only)
  Input 3 (option):
  Galvanically separated for HART signal
  Resolution: 10-bit (analog inputs 1 and 2)
  16-bit (analog inputs 3 and 4)
Input resistance:
  Voltage input >18 kΩ
  Load for current input = 250 Ω
Analog output:
  Enhanced amplifier:
  Voltage output ± 10 VDC
  Max. output current ± 3 mA
  Enhanced amplifier with HART:
  Current output 0...20 mA
  Max. output voltage 12 VDC
Stabilised output voltage:
  10 VDC (with 24 VDC)
  8 VDC (with 12 VDC)
  Max. load 30 mA

Fieldbus (option):
  Device receptacle: DSUB, 9-pole, CANopen, J1939, Profibus
  Screw terminals: HART
  Bus topology: Line, differential signal transmission
  Potential separation: 500 VDC

Solenoid current:
  - Minimal current \( I_{\text{min}} \): Adjustable 0...950 mA
  - Maximal current \( I_{\text{max}} \): Adjustable \( I_{\text{max}} = -1,8 \, \text{A} \) (with 24 VDC)
  - Maximal current \( I_{\text{max}} = -2,3 \, \text{A} \) (with 12 VDC)
  Factory setting: 150 mA

Accumulated current limitation
  The accumulated current of the simultaneously controlled 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

Temperature drift:
  Level adjustable 0...400 mA
  Factory setting: 100 mA
  <1 % at \( \Delta T = 40 \, ^\circ \text{C} \)

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:
  \( U_{\text{max}} = 40 \, \text{VDC} \)
  \( I_{\text{max}} = -700 \, \text{mA} \)
  Ramps adjustable 0...500 s

Serial interface:
  USB (plug type B) for parameterising with «PASO»

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

DIMENSIONS

Type: SD730
- Fieldbus:
  - Type: Fieldbus

Type: SD720
- Type: Fieldbus

Type: SD735
**FUNCTION DESCRIPTION**

The amplifier module can be parameterised by means of the parameterisation software «PASO» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. Optionally the amplifier module is equipped with a manual operation, which enables the setting of the most important parameters by means of rotary selector switch and push-buttons and therefore makes a commissioning of the amplifier module possible without a PC.
Command value scaling
The command value can be applied as a voltage, current or digital signal, or via fieldbus. 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
- For the Basic amplifier, 3 fixed command values are available, which can be selected via 2 digital inputs.
- For the Enhanced amplifier, 7 fixed command values are available, which can be selected via 3 digital inputs.

Command value generator
For each solenoid output two linear ramps for up and down are available which can be controlled separately.

HOLD command value (fieldbus only)
If via Profibus DP the device is put into the «HOLD» state, the respective command value is activated.

Valve type
Here the mode of operation is set. It is also possible to select whether proportional or switching solenoids are to be controlled.

Mode of operation «Command value unipolar (1-sol)»
Dependent on a unipolar command value signal (voltage, current), the solenoid is driven (e.g. 0....10V correspond to 0....100 % command value, 0....100 % command value correspond to Imax solenoid driver 1).

Mode of operation «Command value unipolar (2-sol)»
Dependent on a unipolar command value signal (voltage, current), according to the signal level one of the two solenoids is driven. The switching threshold between the two solenoids as standard is in the middle of the values range of the command value signal (e.g. 0....10V correspond to 0....100 % command value, -100....0 % command value correspond to Imax solenoid driver 1 or 2).

Mode of operation «Command value unipolar (2-sol with DigInp)»
Dependent on a unipolar command value signal (voltage, current), the solenoid is driven by solenoid driver 1, when the selected digital input is «not activated», resp. the solenoid by the solenoid driver 2, when the selected digital input is «activated» (e.g. 0….10V correspond to 0….100 % command value, 0….100 % command value correspond to Imax solenoid driver 1 and/or 2).

Mode of operation «Command value bipolar (2-sol)»
Dependent on a bipolar command value signal (voltage), according to the signal level one of the two solenoids is driven. The switching threshold between the two solenoids as standard is at 0V (e.g. -10….+10V correspond to -100….+100 % command value, -100….0 % command value correspond to Imax solenoid driver 2, 0….+100 % command value correspond to Imax command value correspond to Imax solenoid driver 1).

Signal recording
The SD7 amplifier 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.
**Digital amplifier module SD7**

**Configuration Analog inputs Basic amplifier**

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Analog input 1</th>
<th>Analog input 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD7x0xDx-0-Ax</td>
<td>Voltage</td>
<td>Current</td>
</tr>
<tr>
<td>SD7x0xDx1-Ax</td>
<td>Voltage</td>
<td>Voltage*</td>
</tr>
<tr>
<td>SD7x0xDx2-Ax</td>
<td>Current</td>
<td>Current</td>
</tr>
</tbody>
</table>

* x = P only 0...10VDC possible

**Configuration Analog inputs Enhanced amplifier**

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Analog inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD735xDx-4-Bx</td>
<td>Voltage, Current, Voltage, Current</td>
</tr>
<tr>
<td>SD735xDx5-Bx</td>
<td>Voltage, Voltage*, Voltage, Voltage</td>
</tr>
<tr>
<td>SD735xDx6-Bx</td>
<td>Current, Current, Current, Current</td>
</tr>
<tr>
<td>SD735xDx7-Bx</td>
<td>Voltage, Voltage*, Current, Current</td>
</tr>
<tr>
<td>SD735xDx8-Bx</td>
<td>Current, Current, Voltage, Voltage</td>
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</tbody>
</table>

**Configuration Analog inputs Basic amplifier HART**

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Analog inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD7x0xDx0-BH</td>
<td>Voltage, Current, Current</td>
</tr>
<tr>
<td>SD7x0xDx1-BH</td>
<td>Voltage, Voltage, Current</td>
</tr>
<tr>
<td>SD7x0xDx2-BH</td>
<td>Current, Current, Current</td>
</tr>
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</table>

**Configuration Analog inputs Enhanced amplifier HART**

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Analog inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD735xDx4-BH</td>
<td>Voltage, Current, Current</td>
</tr>
<tr>
<td>SD735xDx6-BH</td>
<td>Current, Current, Current</td>
</tr>
<tr>
<td>SD735xDx7-BH</td>
<td>Voltage, Voltage, Current</td>
</tr>
</tbody>
</table>

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**WANDFLUH**

Hydraulics + Electronics

Digital amplifier module SD7

**BLOCK DIAGRAM BASIC AMPLIFIER**
Mode of operation „Command value unipolar (2-sol)” or „Command value unipolar (2-sol with DigInp)”

- Supply voltage +
- Supply voltage -
- Command value preset with potentiometer on analogue input 1
- Enable on digital input 1
- Solenoid B active
  - Only with mode of operation „command value unipolar (2-Sol with DigInp)” on digital input 2

Option
  - Command value preset and enable via fieldbus
  - Command value preset and enable via HART

Mode of operation „Command value unipolar (1-sol)”

- Supply voltage +
- Supply voltage -
- Command value preset 1 with potentiometer on analogue input 1
- Command value preset 2 with potentiometer on analogue input 2
- Enable on Digital input 1

Option
  - Command value preset and enable via fieldbus
  - Command value preset and enable via HART
CONNECTION EXAMPLE ENHANCED AMPLIFIER

Mode of operation „Command value unipolar (2-sol)” or „Command value unipolar (2-sol with DigInp)”

CONNECTION EXAMPLE ENHANCED AMPLIFIER WITH HART

Mode of operation „Command value unipolar (2-sol)” or „Command value unipolar (2-sol with DigInp)”