Universal Digital Amplifier and Controller

DAC-4

Versions for Open and Closed Loop Applications

For all kinds of Valves w/wo Feedback Systems

- Amplifier for 1 or 2 proportional valves with or without feedback
- Full digital P-PID-Controller for 1 or 2 closed loop systems
- Universal usage for hydraulic, pneumatic and other kinds of applications
- Multiple analoge and digital in- and outputs
- Controlling made easy: Position, pressure, velocity, force, rpm, acceleration, temperature, etc.
- Easy usage / operation by means of WINDOWS program HCSTool

- NEW: Now also with LVDT interface
- NEW: Now also with PROFIBUS interface

1 BOARD WITH 11 DIFFERENT ARCHITECTURES (OPERATION MODES)
FOR ALL KINDS OF APPLICATIONS IN HYDRAULIC AND PNEUMATIC AND FOR OTHER AUTOMATION APPLICATIONS
1 Applications and usage
The amplifier and controller boards series DAC-4 are used for:
- Control of proportional valves of all kinds with and without electrical feedback: propotional directionvalves, direct and pilot operated; flow control valves; pressure limiting and pressure reduction valves; cartridge- and servovalves
- Control of process values within hydraulic and other machines or systems: position, velocity, pressure, rpm, torque, force or load, temperature, etc.
- Flow and pressure control for pumps (load limiting function and feedback for spool position of control valve optional) on request
- Simultaneous control of two process values: e.g. P/Q-control and pump controller, control of two pressures, control of pilot and mainstage spool position, cascaded controllers, control von process values without usage of valves (subsequent electronics, e.g F/U converters)

2 Features
- Fully digitized amplifier and controller
- All adjustments and parameter setting possible by means of keypad and display --> no on-board potentiometers or jumpers
- Flexible and reliable system; use of a modern 16 Bit CPU with high power reserve
- Flash-EPROM technology for easy software update or modifications from PC via RS232 interface
- Multiple version with and without keypad and different functions are available
- All kinds of customer specific adaptations of hardware and software for special applications are possible. Just ask us and we provide the right solution
- NOW: now also available with LVDT interface (1 or 2) for special feedback applications
- NOW: now also available with PROFIBUS DP interface

3 Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Range, characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>(12 V DC) *1 18 … 30 V DC, residual ripple &lt; 10 % (max. 50 VA power draw)</td>
</tr>
<tr>
<td>Solenoid system selection</td>
<td>0,8 A; 1,1 A; 1,3 A; 1,6 A; 2,4 A; 2,7 A and 3,5 A</td>
</tr>
<tr>
<td>Control voltage for digital inputs</td>
<td>24 V +/- 10 %, residual ripple &lt; 10 %, current draw per input &lt; 20 mA</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>0° C ...50° C (others on request); storage - 20° C ... 60° C</td>
</tr>
<tr>
<td>Connector</td>
<td>In accordance with DIN 41612, 48 pin form F gold plated</td>
</tr>
<tr>
<td>EMC</td>
<td>In accordance with the applicable industrial standards (CE - conformity) *3</td>
</tr>
<tr>
<td>Dimensions front panel / PCB</td>
<td>50,5 x 128,4 mm; 10 TE / 3 HE; 100 x 160 mm euro format</td>
</tr>
<tr>
<td>Analogue set values (inputs)</td>
<td>3 inputs with 14 Bit resolution (1 x differential; 2 x single ended; 0 … 10 V, 0 … 20 mA)</td>
</tr>
<tr>
<td>Analogue feedback U/I</td>
<td>2 inputs with 14 Bit resolution (current and voltage with wide range)</td>
</tr>
<tr>
<td>Analogue feedback LVDT *2</td>
<td>1 or 2 inputs with; detailed information on request</td>
</tr>
<tr>
<td>Digital inputs</td>
<td>8 inputs (S1.01 … S1.04, ENABLE, RAMP 0, DIRECTION +, DIRECTION -)</td>
</tr>
<tr>
<td>Solenoid current (output)</td>
<td>2 output stages, each for up to max. 3,5 A (with over-energ. and quick de-energization)</td>
</tr>
<tr>
<td>Analogue / monitor output</td>
<td>Each with 12 Bit resolution, 0 … 10 V</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>2 outputs, voltage level 0 V / 24 V, 10 mA (ERROR, COMPARATOR)</td>
</tr>
<tr>
<td>Test jacks</td>
<td>Current A and B, sensor 1 (Fb1) set value (S1.06), Monitor and GND</td>
</tr>
<tr>
<td>Auxiliary voltage</td>
<td>+/- 10 V, max. Output 10 mA</td>
</tr>
<tr>
<td>Optional digital I/O signals</td>
<td>3 for variable usage, voltage level 24 V or 5 V</td>
</tr>
<tr>
<td>Interface 1</td>
<td>RS232, 9-pol SUB-D-connector at face plate (also available at rear connector)</td>
</tr>
<tr>
<td>Interface 2 *2</td>
<td>PROFIBUS DP; details see next page</td>
</tr>
<tr>
<td>Display and keypad *2</td>
<td>4-digit 7-segment display, 6 keys, status LED’s</td>
</tr>
<tr>
<td>PWM frequency, cycle times</td>
<td>18 kHz for current controller, inner closed loop 0,22 msec, outer closed loop 0,44 msec</td>
</tr>
</tbody>
</table>

\*1: on request \*2: limited to some versions \*3: details on request

DAC-4
Version: R13

Data sheet
05.10.2015
### Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Range, characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>Via DAC</td>
</tr>
<tr>
<td>Temperature ranges, EMC, Mounting/housing</td>
<td>Refer to page 2</td>
</tr>
<tr>
<td>PROFIBUS-DP</td>
<td>- Approved by PNO</td>
</tr>
<tr>
<td></td>
<td>- Supports PROFIBUS-DP Slave in accordance with IEC 61158</td>
</tr>
<tr>
<td></td>
<td>- Supports PROFIBUS DPV1</td>
</tr>
<tr>
<td>Connection / Type of connector</td>
<td>RS485, Sub-D 9-pole female</td>
</tr>
<tr>
<td>Status signals</td>
<td>LED „Buserror“ (red); DAC-4 error LED is used</td>
</tr>
<tr>
<td>Address selection</td>
<td>DIP switch 1- 8, each on/off</td>
</tr>
</tbody>
</table>

### Block diagram Hardware

![Block diagram Hardware](image-url)
5 Operation Modes

6 Example for Block Diagrams of Software Functions
6.1 Operation Mode 1; one valve, open loop
6.2 Operation Mode 6; Valve and process controller

6.3 Operation Mode 11; cascaded controller without valve
Board Versions: General Features and Equipment
For details of hardware features and functions see page 7
## Board Versions: Hardware Features and Functions
(Features for special versions not included)

<table>
<thead>
<tr>
<th>Features / Functions</th>
<th>DAC-44 or DAC-42</th>
<th>DAC-44-x-SLVDT-x</th>
<th>DAC-44-x-PBDB</th>
<th>DAC-44-XLT or DAC-42-XLT</th>
<th>DAC-42-XXLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogue SW 5</td>
<td>Yes *1</td>
<td>Yes *1</td>
<td>Yes *1</td>
<td>Yes *1</td>
<td>No</td>
</tr>
<tr>
<td>Analogue SW 6</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Analogue SW 7</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Analogue Actual value 1</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Analogue Actual value 2</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Analogue Actual value 3</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>LVDT actual value 1</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>LVDT actual value 1 (only for &quot;-2x&quot;)</td>
<td>No</td>
<td>(Yes)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input +</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input -</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input S1</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input S2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input S3</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input S4</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input DIO1</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input DIO 2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input DIO 3</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input Reset Ramp</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Digital Input Enable</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Digital Output Error</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Digital Output Comparator</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Digital Output Break (24 V max. 1 A)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>5 V Transistor for ABG</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Test Jacks</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Piggy-Back-Connector for options</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Connector for Faceplate</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>RS232 Interface</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PPROFIBUS Interface</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ref. Output + - 10 V</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Analogue Output</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Monitor Output</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Operation by means of PC</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Plastic faceplate (3 TE)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Aluminium faceplate only (10 TE)</td>
<td>For DAC-42</td>
<td>No</td>
<td>No</td>
<td>For DAC-42</td>
<td>No</td>
</tr>
<tr>
<td>7-Segment-Display / Keypad (10 TE)</td>
<td>For DAC-44</td>
<td>Yes</td>
<td>Yes</td>
<td>For DAC-44</td>
<td>No</td>
</tr>
</tbody>
</table>

*1: Current Input: optional on request
## Ordering code (not all combinations available!)

<table>
<thead>
<tr>
<th>DAC</th>
<th>44</th>
<th>03</th>
<th>270</th>
<th>PBDP</th>
<th>XXXX</th>
</tr>
</thead>
</table>

### Digital Amplifier Controller

- **Board Version**
  - 42 = DAC-42 (with keypad and display)
  - 44 = DAC-44 (with keypad and display)

### Operation modes

- 01 = one valve, open loop (2 solenoids)
- 02 = two valves, open loop (1 solenoid each)
- 03 = one valve (spool position feedback) (2 solenoids)
- 04 = one process control loop system (2 solenoids)
- 05 = reserved
- 06 = one valve with one spool and one process control loop system (2 solenoids)
- 07 = two valves with spool position feedback each (1 solenoid each)
- 08 = two valves with one process control loop each (2 solenoids)
- 09 = reserved
- 10 = single process controller without valve
- 11 = cascade controller without valve

### Solenoid Current

- 080 = 800 mA systems

### Bus Interface

- = no bus interface
- PBDP = PROFIBUS

### Special options

- _XLT = version for open loop applications only (reduced I/O features)
- _XXLT = version for open loop applications only (reduced I/O features)
- SCC = Conformal coating
- SVP = vibration protection (in accordance with DIN EN 60068-2-6 / DIN EN 60068-2-27)
- SLVDT-1x = for one feedback system with LVDT sensor (direct AC signal)
- SLVDT-2x = for two feedback systems with LVDT sensors (direct AC signal)

### Ordering code examples:

1. Version with keypad and display for a closed loop application (process loop control) with 2.7 A solenoid and conformal coating

   **DAC-44-04-270-SCC**

2. Version without keypad and display for an open loop (only) application 0.8 A solenoid

   **DAC-42-01-080-XLT**
## 10 Accessories and Options

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HCSTool</strong></td>
<td>Software for parameterization, operation, monitoring, storage and documentation of adjustments. With 4-channel oscilloscope function. In E / F / DE on CD. Download from internet: <a href="http://www.h-c-s-gmbh.de/download/">http://www.h-c-s-gmbh.de/download/</a></td>
</tr>
<tr>
<td>DAC-4-PC-2xDS9F-2m</td>
<td>Interface cable for communication between PC and DAC-4 for Rs232 interface. 2 x Sub-D 9-pole connector female with approx. 2,5 m cable</td>
</tr>
<tr>
<td>USB-RS232-DS9F-2,5m</td>
<td>As above but w. USB-adaptor. Sub-D 9-pole connector fem. w. approx. 2,5 m cable</td>
</tr>
<tr>
<td>EKB-04</td>
<td>EKB-04 Handheld keypad and display unit for parameter setting and copying</td>
</tr>
<tr>
<td>CU/DAC-4</td>
<td>Commissioning unit for DAC-4. For adaptation of one DAC-4 board. For Commissioning, servicing, testing and trouble shooting etc. at machines, systems, for laboratories and for training. In metal case with handles including power supply</td>
</tr>
<tr>
<td>SKT48F</td>
<td>Card holder for mounting of single board; with connector form F, 48-pole</td>
</tr>
<tr>
<td>BP48F</td>
<td>Back-Plane for easy and quick wiring; with connector female form F 48-pole For usage in 19&quot;-Rack systems</td>
</tr>
<tr>
<td>MR</td>
<td>Modul-Rack for protected mounting of single boards (10TE)</td>
</tr>
<tr>
<td>MR/BP48F</td>
<td>Modul-Rack completly mounted with Back-Plane</td>
</tr>
<tr>
<td><strong>DAC-4 customer specific and special versions</strong></td>
<td>Brand-Labeling of face plates, special software for application specific functions; special hardware options and versions; on request</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>Customer specific documentation and program HCSTool; on request</td>
</tr>
</tbody>
</table>

### Not to scale!

<table>
<thead>
<tr>
<th>Card Holder</th>
<th>Back-Plane</th>
<th>Module-Rack</th>
<th>Commissioning Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Card Holder" /></td>
<td><img src="image2.png" alt="Back-Plane" /></td>
<td><img src="image3.png" alt="Module-Rack" /></td>
<td><img src="image4.png" alt="Commissioning Unit" /></td>
</tr>
</tbody>
</table>

**EKB-4** Interface Cable   **Interface Cable**   **Interface Cable**   **HCSTool**

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**DAC-4**

Version: R13  
Data sheet  
05.10.2015
# Our partners and distributors

## Europe

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**DAC-4**  
Version: R13  
Data sheet  
05.10.2015
Our partners and distributors

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