Universal On-Board and Stand-Alone Digital Amplifier and Controller

**ODC-22-01/03/04/06**

**VERSIONS FOR OPEN AND CLOSED LOOP APPLICATIONS**

- On-board or stand-alone digital amplifier and controller in IPx5/IPx9
- Wide ambient temperature range - 25° .... + 80° C (- 13° F ... 175° F)
- For one valve w/wo feedback and/or process value feedback
- Housing parts aluminium EN AW-6060 (AlMgSi, seawater resistant)
- Corrosion protection by surface treatment Alutin
- Adaptation possible to all kinds of valves
- M12 connectors as preferred standard. Other connectors, cable glands or flying leads on request
- Highly versatile and adaptable - all kinds of customization possible
- Full digital PI current controller and multifunctional controller for valve or process control systems
- Optional bus interface (CANopen)
- Analogue inputs with high resolution / accuracy
- Easy usage and operation by means of WINDOWS program **HCSTool**

**NEW:** Now including oscilloscope function!
1 Applications and usage

General:
ODC is a digital control unit to be used with proportional solenoids, e.g. hydraulic valves with a current draw of up to 800 mA (or 2500 mA on request).
It can be controlled by a number of different command signals - analogue and digital (BUS) - and has sensor inputs for valve and/or process feedback signals (closed loop applications).
The unit has a modular design and can easily be adapted to a very wide range of interfaces and applications.
It is also prepared and adjusted for direct mounting (on-board) on Hawe PSL/PSV series and Servi HSV 600 series proportion.
valves.
ODC is fit for purpose for outdoor usage, including marine environments, and has a extreme robust design to withstand vibrations, temperature fluctuations and electronic noise (EMC).

ODC amplifier and controller units are used for:
- proportional valves with/without feedback as
  - directional / direct and pilot operated
  - flow control valves
  - pressure reducing/regulating valves
  - cartridge valves
  - servo valves (on request)
- valves without feedback used in applications with process value feedback (e.g. position, pressure, velocity, rpm, etc.)

2 Features (electronic part)

- Fully digitized amplifier and controller
- Optional available with bus interfaces - CANopen
- Flexible and CANopen, use of a modern 16 bit CPU with high power reserve
- Flexibility due to possible software and hardware extensions and multiple options for customer specific requirements e.g. connector selection
- Flash-EPROM technology for easy software update or modifications from PC via USB interface
- Variable settings for all kinds of solenoid systems
- Change of selected parameters “on-the-fly” without interference of function; monitoring of display values and 4-channel oscilloscope with HCSTool via PC
- High resolution and accuracy for analogue signals due to 12-Bit A/D-converter
- All kinds of customer specific adaptations possible. Just ask us and we provide the right solution

3 Technical data (electronic part)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Range, characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>12 V - 10 % ... 24 V + 20 %, residual ripple &lt; 10 % (max. 50 VA power draw)</td>
</tr>
<tr>
<td>Power consumption</td>
<td>approx. 150 mA @ 24 V (solenoids deactivated)</td>
</tr>
<tr>
<td>Solenoid system selection</td>
<td>0.15 A; 0.24 A; 0.50 A; 0.63 A; 0.80 A (intermediate values adjustable; 2.5 A on request)</td>
</tr>
<tr>
<td>Control voltage for digital input</td>
<td>(12) 24 V +/- 10 %, residual ripple &lt; 10 %, current draw &lt; 20 mA</td>
</tr>
<tr>
<td>Temperature ranges</td>
<td>Ambient: - 25° to + 80° C (-13° to 175° F); storage: - 40° to + 105° C (-40° to 220° F)</td>
</tr>
<tr>
<td>EMC</td>
<td>In accordance with applicable standards (CE); Germanischer Lloyd VI-7-2 on request</td>
</tr>
<tr>
<td></td>
<td>IEC 60533: 11/2010 EMC, Civil ship (General Zone)</td>
</tr>
<tr>
<td></td>
<td>EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-16</td>
</tr>
<tr>
<td></td>
<td>Surge: 55 V 30ms</td>
</tr>
<tr>
<td></td>
<td>Isolation between housing and connector terminals &gt; 10 MΩ (50 V DC)</td>
</tr>
<tr>
<td>Analogue inputs (set values and/or feedback values)</td>
<td>Analogue1, Analogue2, Analogue 3 (valve feedback); Differential voltage and current input applicable with 12 bit resolution 0 … +/- 10 V, 5 V +/- 5 V; 5 V +/- 4,5 V, 0 … 20 mA, 4 … 20 mA; also poss.: 12 V +/- 6 V Voltage input resistance 240 kΩ; current meas. shunt 205 Ω With or without cable fracture detection – selectable by parameter when applicable</td>
</tr>
<tr>
<td>Digital input</td>
<td>1 digital input (Enable)</td>
</tr>
<tr>
<td>Solenoid current (output)</td>
<td>2 output stages, each for up to max. 1.0 A (with over-energ. and quick de-energization)</td>
</tr>
<tr>
<td>Digital output</td>
<td>1 output, voltage level 0 V / 24 V, 10 mA (ERROR)</td>
</tr>
<tr>
<td>Reference output</td>
<td>1 Reference output 10 V (max. 20 mA), short circuit protected</td>
</tr>
<tr>
<td>Analogue output</td>
<td>1 Analogue output 0 … + - 10 V (max. 5 mA)</td>
</tr>
<tr>
<td>Supply output f. (external) sensor</td>
<td>24 V / 100 mA; overload protected (Multifuse). Can also be used as error indication</td>
</tr>
<tr>
<td>Interface 1</td>
<td>USB 2.0 with USB micro connector</td>
</tr>
<tr>
<td>Interface 2 (Versions with Bus-Interf. only!)</td>
<td>CAN field bus interface provides a connection to the amplifier using standard CAN frames according to ISO 11898-1…3 and ISO 11898-5 (CiA 301; CiA 202-1; CiA 305; ISO 11898-1; ISO 11898-2; ISO 11898-3; ISO 11898-5); baudrate and CAN address defined by parameter. For details refer to document: ODC CANopen Specification Rxx</td>
</tr>
<tr>
<td></td>
<td>Device Profile: VDMA Profile Fluid Power; CiA 408 or Device Profile Fluid Power</td>
</tr>
<tr>
<td>Status signals</td>
<td>1 status LED’s 2 colors at top lid (Run/OK; Enable, Error)</td>
</tr>
<tr>
<td>PWM frequency, cycle times</td>
<td>Approx. 22 kHz PWM frequency, cycle time 0.255 msec</td>
</tr>
</tbody>
</table>

*1: higher temperatures (storage or during operation) will reduce the life cycle of the product
4 Features (mechanical part)

- Housing made from extruded profile for main part of housing with machined bottom plate and lid
- Very rigid and high mechanical strength due to special design and usage of high quality aluminum
- Very good corrosion protection
  - aluminum sea water resistant
  - additional surface treatment „Alutin“
  - all screws in stainless steel
- Housing height can be adapted to specific requirements
- Bottom plate depending on requirements for mounting can be customized to customers requirements. Version available for specific twin solenoid for Hawe PSL/PSV valves
- Lid adaptable to all kinds of connectors. Standard are M12 connectors
- Due to symmetrical design very versatile and universal adaptable to all kinds of applications, mounting and connection situations (all on request)
- Bottom plate and lid with special groove for form seal for high protection classification --> up to IP69k possible
- Very wide variety of connection versions possible (e.g.):
  - M12 connectors (top side in lid mounted or small side)
  - AMP junior timer (top side lid mounted)
  - Deutsch (top side lid mounted)
  - EN 175301-803 /Ex DIN 43650 (top side lid mounted)
  - cable glands M12 or M16 also in stainless steel (small side mounted)
  - flying leads

5 Technical data (mechanical part)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Range, characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Aluminum EN AW-6060 [AlMgSi] - sea water resistant</td>
</tr>
<tr>
<td></td>
<td>Additional protected with surface treatment by anodizing (Alutin)</td>
</tr>
<tr>
<td></td>
<td>Main housing extruded profile cut to length and machined</td>
</tr>
<tr>
<td></td>
<td>Bottom plate and top lid machined from blocks including form seals</td>
</tr>
<tr>
<td></td>
<td>All screws in stainless steel (quality A4)</td>
</tr>
<tr>
<td>Main dimensions</td>
<td>I = 89,8; h = 53,5; w = 47 [mm] standard version without connectors</td>
</tr>
<tr>
<td>Sealing</td>
<td>Viton / HNBR</td>
</tr>
<tr>
<td>LED lens</td>
<td>UV and oil resistant</td>
</tr>
<tr>
<td>Vibration</td>
<td>EN 60068-2-6: vibration sinusoidal 10g rms</td>
</tr>
<tr>
<td></td>
<td>(10 -2000Hz; test 3 x 100h per axis)</td>
</tr>
<tr>
<td>Shock</td>
<td>EN 60068-2-27: shock 30g, 11ms, half sine</td>
</tr>
<tr>
<td>IP protection</td>
<td>EN 60529: max. IPx9k (depending on connectors)</td>
</tr>
<tr>
<td>Salt spray</td>
<td>EN 60068-2-52 (IEC68-2-52) Level 1</td>
</tr>
<tr>
<td>Connection to application</td>
<td>M12 connectors (standard version); depending on configuration up to 6 connectors</td>
</tr>
<tr>
<td></td>
<td>Position of connectors: 4 / 5 x M12 connectors top side; 2 x 2 connectors small side</td>
</tr>
<tr>
<td></td>
<td>all depending on configuration or application requirements</td>
</tr>
<tr>
<td></td>
<td>Other possible connectors (on request): AMP junior timer; Deutsch; EN 175301-803 /Ex DIN</td>
</tr>
<tr>
<td></td>
<td>43650 (top side lid mounted)</td>
</tr>
<tr>
<td></td>
<td>Cable glands M12 or M16 also available in stainless steel (small side mounted)</td>
</tr>
<tr>
<td></td>
<td>Flying leads</td>
</tr>
<tr>
<td>Direct mounting on solenoid</td>
<td>Version „Hawe PSL/PSV“ --&gt; direct mounting on twin solenoid and internally connected</td>
</tr>
<tr>
<td></td>
<td>Mounting on other solenoids on request</td>
</tr>
<tr>
<td></td>
<td>Cable connection via cable glands, M12 connectors or flying lead possible</td>
</tr>
</tbody>
</table>

Connection examples:
- CANopen and top connectors
- CANopen and side connectors
5 Application examples
Example: Connector position and orientation; for version with M12 connectors and CAN-Bus interface
Block diagram of software functions

Example version: ODC-22-01-xxx-S0 / Operation Mode: 01; 1 valve with 2 solenoids without feedback

Data Sheet
24.07.2018
Block diagram of software functions

Example version: ODC-22-03-xxx-S0 / Operation Mode: 03; 1 valve with 2 solenoids and feedback
Example version: ODC-22-04.xxx-S0 / Operation Mode: 04; 1 valve with 2 solen. and process feedback
12  ODC with Bus Interface

CANopen Features:

- CANopen protocol
- Baudrate and CAN address defined by parameter
- 1 CAN-Bus according to ISO11898
- CAN-Baudraten adjustable up to 1 Mbit
- node number adjustable from 1 .. 127
- CANopen draft standard DS301 V4.0 / DS401 V2.1
- 1 receive / 1 transmit PDOs
- 1 SDO server
- PDO event timer
- PDO inhibit timer
- PDO transmit modes: event triggered, synchronous, asynchronous, cyclic, anticyclic
- variable PDO identifier
- dynamic PDO mapping
- emergencies
- nodeguarding / lifeguarding / heartbeat
- EDS file

The CAN field bus interface provides a connection to the amplifier using standard CAN frames according to ISO 11898-1…3 and ISO 11898-5:

<table>
<thead>
<tr>
<th>CIA 301</th>
<th>CANopen application layer and communication profile CIA 303</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIA 303-1</td>
<td>Cabling and connector pin assignment</td>
</tr>
<tr>
<td>CIA 305</td>
<td>Layer setting services (LSS) and protocols</td>
</tr>
<tr>
<td>ISO 11898-1</td>
<td>Road vehicles -- Controller area network (CAN) -- Part 1: Data link layer and physical unit</td>
</tr>
<tr>
<td>ISO 11898-2</td>
<td>Road vehicles -- Controller area network (CAN) -- Part 2: High-speed medium access unit</td>
</tr>
<tr>
<td>ISO 11898-3</td>
<td>Road vehicles -- Controller area network (CAN) -- Part 3: Low-speed, fault-tolerant, medium-dependent interface</td>
</tr>
<tr>
<td>ISO 11898-5</td>
<td>Road vehicles -- Controller area network (CAN) -- Part 5: High-speed medium access unit with low-power mode</td>
</tr>
</tbody>
</table>

Device profile:

<table>
<thead>
<tr>
<th>VDMA Profile Fluid Power</th>
<th>Device profile for Proportional Valves and Hydrostatic Transmissions VDMA Profile Fluid Power Technology Version 1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIA 408 or Device Profile Fluid Power</td>
<td>CIA 408 Device profile for fluid power technology proportional valves and hydrostatic transmissions, Version 2.0</td>
</tr>
</tbody>
</table>
## Accessory 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. In English, French and German on CD (free download available). Please follow this link in order to download the most recent version of HCSTool: <a href="http://www.h-c-s-gmbh.de/download/">http://www.h-c-s-gmbh.de/download/</a></td>
</tr>
<tr>
<td>USB-USB2-USBmicro</td>
<td>USB connection cable, type A - micro.USB 2.0 Compatible</td>
</tr>
<tr>
<td>TBD</td>
<td>To be determined</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/DMA</td>
<td>Commissioning unit for DMA also applicable to ODC with according cable set. For adaptation of one ODC. For Commissioning, serviceing, testing and trouble shooting etc. at machines, systems, for laboratories and for training</td>
</tr>
</tbody>
</table>

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**Not to scale!**

<table>
<thead>
<tr>
<th>CU/DMA</th>
<th>Interface Cable</th>
<th><strong>HCSTool</strong></th>
<th>EKB-04</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="CU/DMA" /></td>
<td><img src="image2.png" alt="Interface Cable" /></td>
<td><img src="image3.png" alt="HCSTool" /></td>
<td><img src="image4.png" alt="EKB-04" /></td>
</tr>
</tbody>
</table>
### Ordering code example:

Version for closed loop operation for valve control and 630 mA solenoid

**ODC-22-03-630-Sxxxxx**
EC Declaration of Conformity in accordance with EMC Directive 2014/30/EU

HCS Hydraulic Control Systems GmbH
Neuffener Str. 29
D-72636 Frickenhausen

hereby declares that the product described as follows complies in terms of its design, as well as in the version placed in the stream of commerce by us, with the relevant requirements of the directive. This declaration is void in the event of any changes to the product without our written agreement.

Product: Onboard Digital Amplifier and Controller
Intended use: Automation systems (industrial applications)
Model: ODC-2
Rated voltage: 24 V DC; SELV
Rated power: max. 20 W
Protection class: III
Protection degree: IP65 (IP67 or IP69 on request and depending on connectors)
Relevant EU Directive: EMC Directive 2014/30/EU
Applicable EU Standards:
               EN 61000-6-4:2007 + A1:2011
               Germanischer Lloyd VI-7-2 (EN 60945) on request
   Immunity: EN 61000-6-2: 2005

Date/manufacturer’s signature
01.01.2018
Details of signatory: Dipl.-Ing. (FH) Peter Deuschle (General Manager)
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