

**THE ART OF  
CONTROL**

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**HCS**  
HYDRAULIC CONTROL SYSTEMS

Universal Digital Module Amplifier  
for DIN Mounting Rail (Top-Hat Rail)

# DMA-22- 03/04/06/08/10

## VERSIONS FOR CLOSED LOOP APPLICATIONS

- ◆ For one valve with feedback or process value feedback
- ◆ Optional with 0 ... +/- 10 V output to control subsequent electronics (process value feedback)
- ◆ Optional with bus interface (PROFIBUS DP, PROFINET, ETHERNET/IP, CAN-OPEN) multi module configurations available
- ◆ Adaptation possible to all kind of proportional valves
- ◆ Full digital PI current controller
- ◆ Full digital multifunctional controller for valve or process control systems
- ◆ Analogue inputs with high resolution and accuracy
- ◆ Easy usage and operation by means of WINDOWS program **HCSTool**  
**NEW:** Now including oscilloscope function!
- ◆ Extreme short cycle time for best dynamic behaviour (best in class)



**PROFI<sup>®</sup>**  
**BUS**

**PROFI<sup>®</sup>**  
**NET**

## 1 Applications and usage

The amplifier modules DMA-2 are used for:

- proportional valves with feedback as
  - directional / direct and pilot operated
  - flow control valves
  - pressure reducing valves
  - pressure 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.)

- Flexibility due to possible software and hardware extensions and options for customer specific requirements
- Flash-EPROM technology for easy software update or modifications from PC via RS232 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 (RS232 interface)

## 2 Features

- Fully digitized amplifier modul
- All adjustments and parameter settings possible by means of PC --> no on board potentiometers
- Flexible and reliable system, use of a modern 16 bit CPU with high power reserve
- Optional available with several bus interfaces
- High resolution and accuracy for analogue signal due to 12-Bit A/D-converter
- All kinds of customer specific adaptations of hardware and software for specific applications possible. Just ask us and we provide the right solution
- Fast and easy mounting, installation and exchange due to top-hat rail (DIN mounting rail) in accordance with EN50022 and connectors with screw terminals or optional cage clamp technology system COMBICON

## 3 Technical data

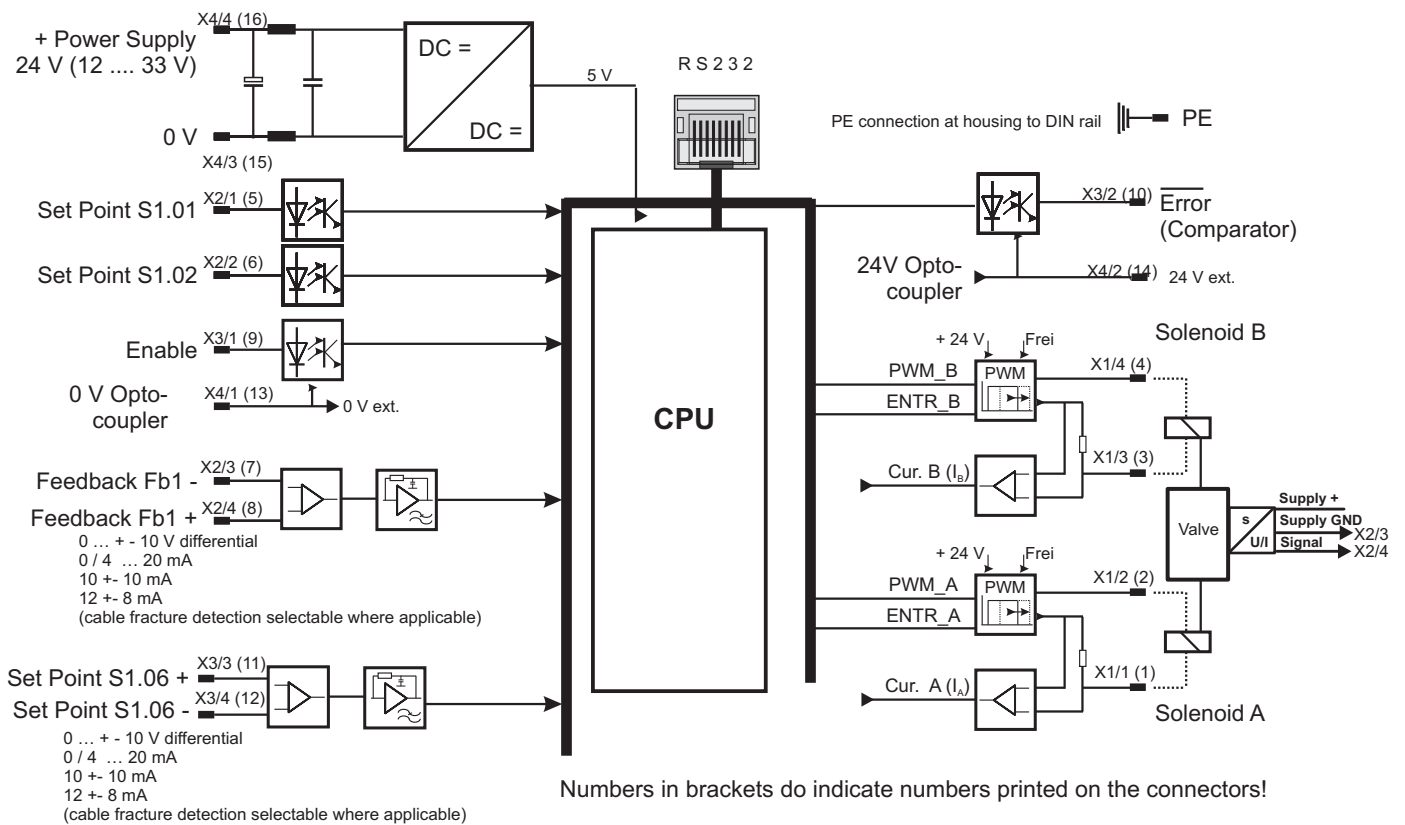
| Feature   | Range, characteristics  |
|---|---|
| Supply voltage  | Unom = 24 V (12 ... 33V) DC, residual ripple < 10 % (max. 50 VA power draw)<br>The modul can also be used on supply voltage of Unominal = 12 V (> 9,5 V)  |
| Solenoid system selection   | 0,8 A; 1,1 A; 1,3 A; 1,6 A; 2,4 A; 2,7 A and 3,5 A (intermediate values adjustable)   |
| Control voltage for digital inputs  | (12) 24 V +/- 10 %, residual ripple < 10 %, current draw per input < 20 mA  |
| Temperature ranges  | Ambient: 0° C ...50° C (other on request) storage- 20° C ... 60° C  |
| Connection  | 16 pole (4 x 4); screw terminals for 0.2 - 2.5 mm <sup>2</sup> (AWG 24 -12) or cage clamps;<br>for detailed technical data refer to Phoenix Contact Combicon Product Catalog  |
| Type of connector   | Phoenix Combicon connector with screw terminals, type: MSTBT 2,5/ 4-ST<br>Also available on request: terminals with cage clamp, type: FKCT 2,5/4-ST   |
| EMC   | In accordance with applicable standards (CE); Germanischer Lloyd VI-7-2 on request  |
| Analogue set value and feedback value (input)                                       | 2 differential signal inputs with 12 bit resolution,<br>0 ... +/- 10 V, 0 ... 20 mA, 4 ... 20 mA (one command, one feedback)  |
| Digital inputs  | Depending on version: Up to 3 digital inputs, opto-coupled  |
| Solenoid current (output) (not for DMA-22-10!)                                      | 2 output stages, each for up to max. 3,5 A (with over-energ. and quick de-energization);<br>max. combined current = 4,5 A   |
| Digital output  | 1 output opto-coupled, voltage level 0 V / 24 V, 10 mA (ERROR)  |
| Reference output (optional)   | 1 Reference output 10 V (max. 20 mA), short circuit protected   |
| Analogue output (optional)  | 1 Analogue output 0 ... +/- 10 V (max. 5 mA)  |
| Interface 1   | RS232, 6-pole female RJ45/6 connector   |
| Interface 2 *1 (only one available per module)<br>Versions with Bus-Interface only! | PROFIBUS-DP: RS485, Sub-D 9-pole female<br>PROFINET (in/out): 2 x RJ45 (integrated switch)<br>ETHERNET/IP: RJ45<br>CAN-OPEN: Sub-D 9-pole male<br>PROFIBUS and PROFINET: PNO certified!   |
| Status signals  | 3 status LED's at front (Run/OK; Enable, Error)   |
| PWM frequency, cycle times  | Approx. 22 kHz PWM frequency, cycle time 0,255 msec   |
| Mounting/housing  | Mounting: top-hat rail (mounting rail) in accord. with EN50022 with inetgrated PE contact<br>Housing configuration: ventilated (IP20)<br>Material: PA 66 - FR (blue); flammability in accordance with UL94V0<br>Dimensions approx.: (w x h x d) 22,5 x 100 x 114 mm<br>Bus single module version: dimensions approx.: (w x h x d) 45 x 100 x 114 mm<br>Bus multi module version: dimensions approx.:<br>(w x h x d) ((n+1)x22,5) x 100 x 114 mm; n = number of slaves (modules) |



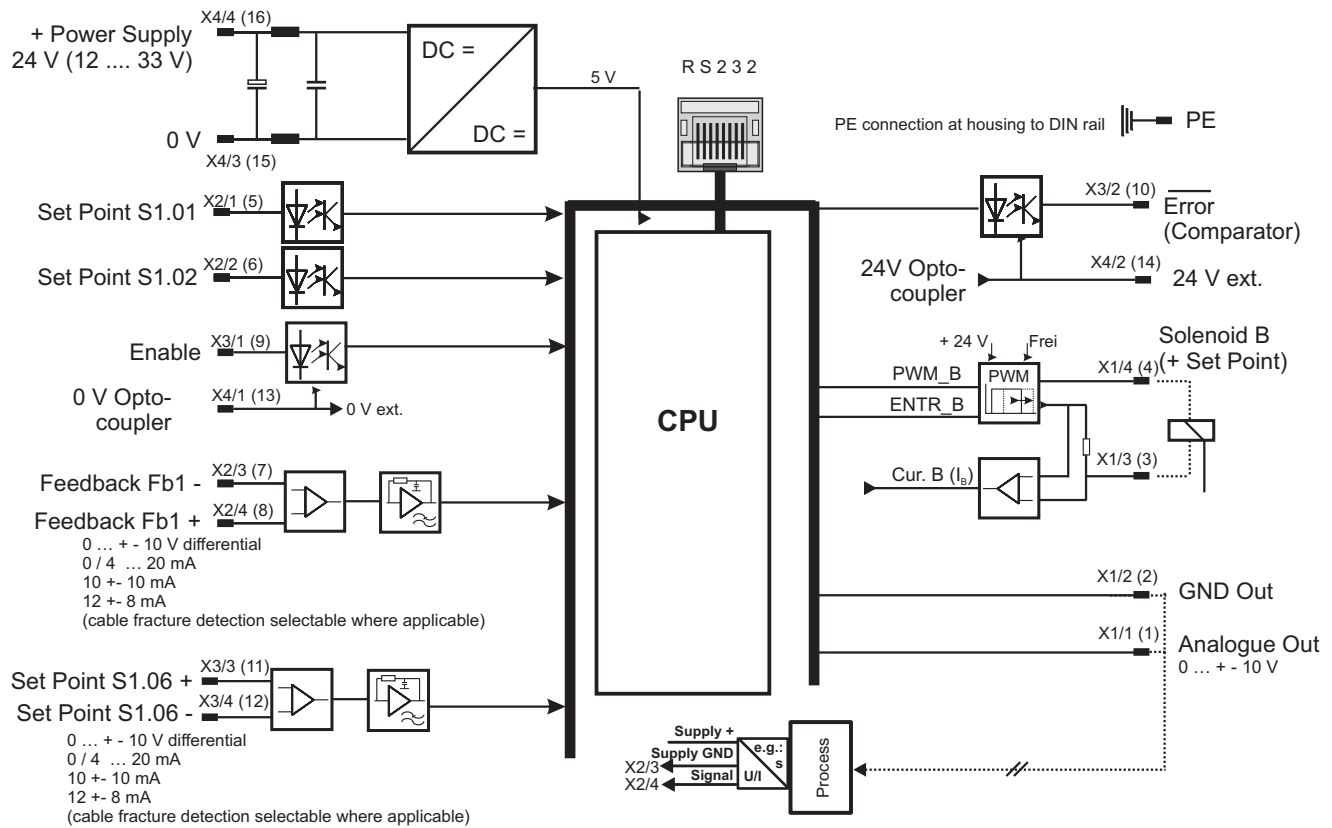
\*1: For more detailed information regarding DMA with bus-interfaces please refer to the accoding data sheet!

### 4 Hardware block diagram

Example diagram for version: DMA-22-03-xxx-S0; Operation Mode: 03

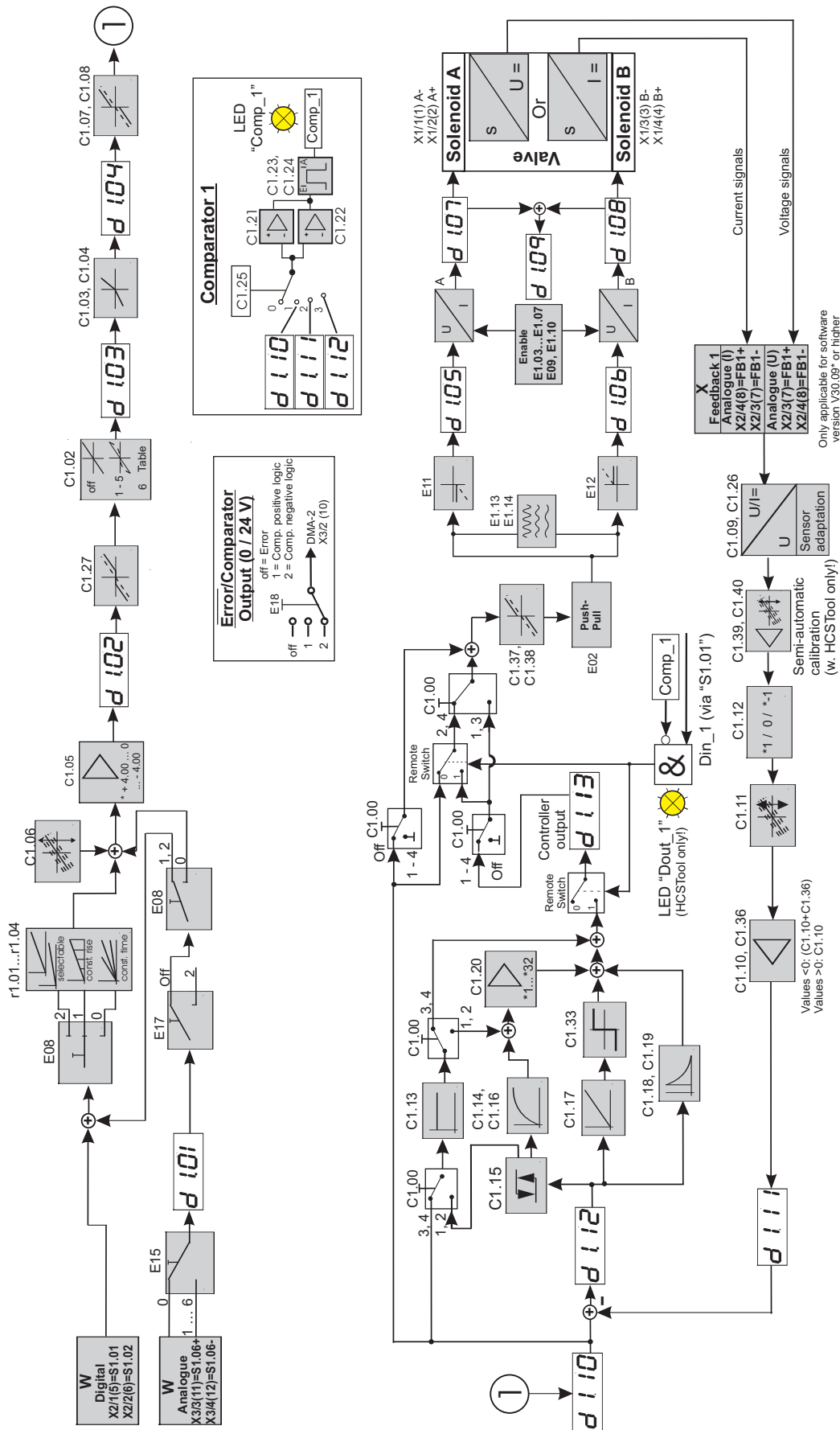


Example diagram for version: DMA-22-10-xxx-S0; Operation Mode: 10



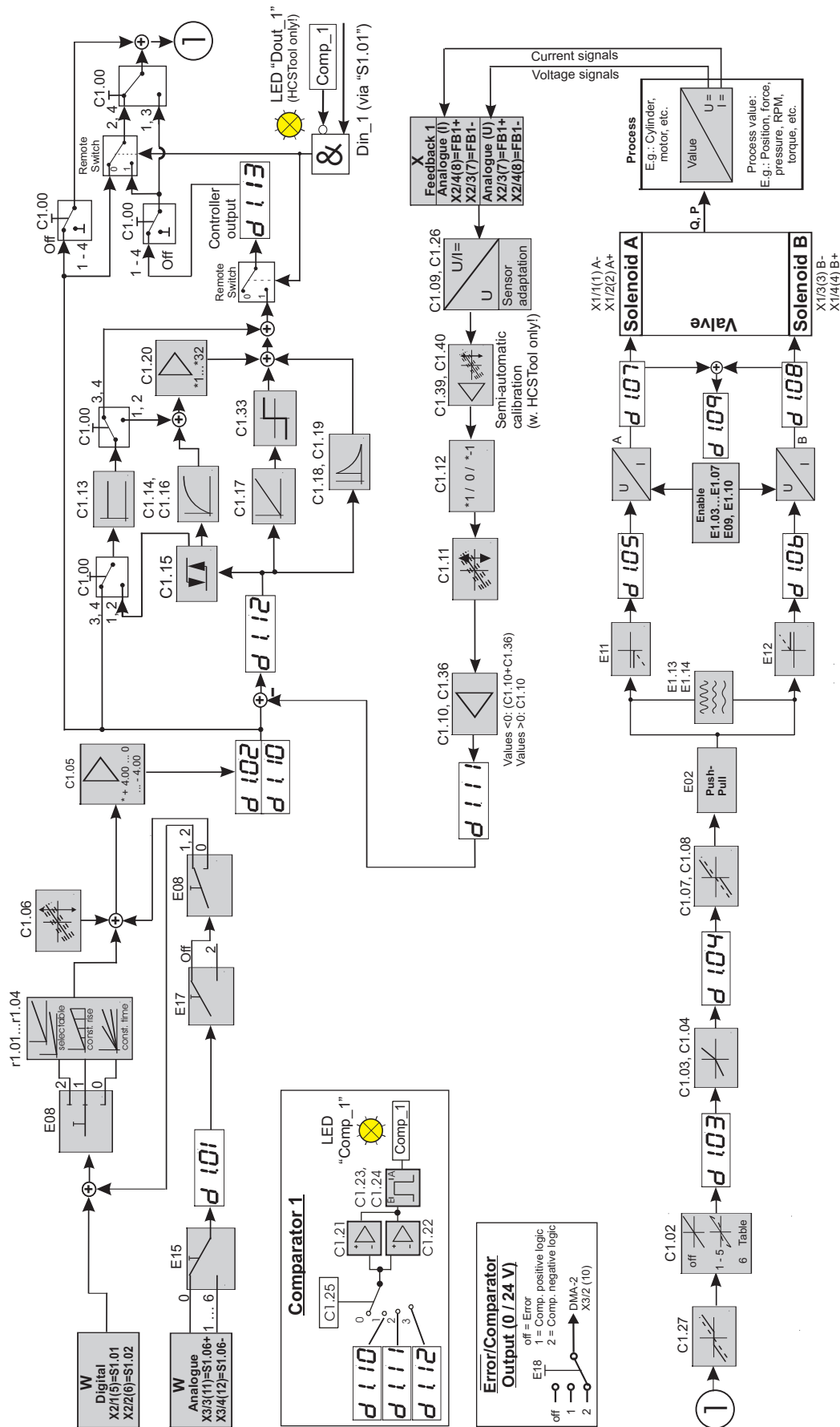
5 Block diagram of software functions

Example version: DMA-22-03-xxx-S0 / Operation Mode: 03 ; 1 valve with 2 solenoids and feedback



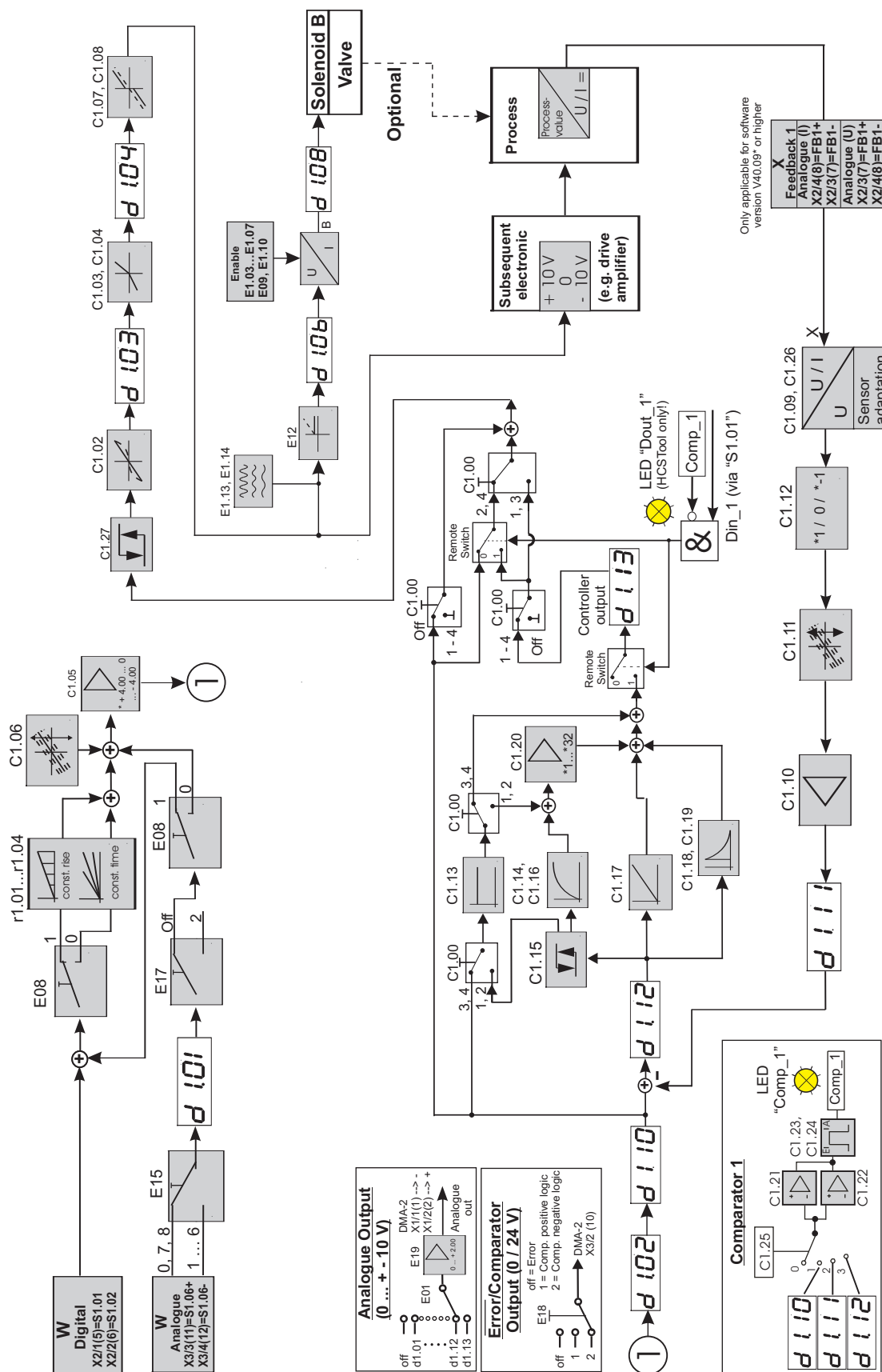
6 Block diagram of software functions

Example version: DMA-22-04-xxx-S0 / Operation Mode: 04 ; 1 valve with 2 solen. and process feedback



7 Block diagram of software functions

Exampe version: DMA-22-10-xxx-S0 / Operation Mode: 10 ; 1 valve (one solen.) with process feedback



## 8 DMA with Bus Interfaces

### a) PROFIBUS. Features:

- Supports PROFIBUS-DP Slave in accordance with IEC 61158
- Supports PROFIBUS DPV1
- Maximum 244 Byte in-/output data
- Supports up to 12 Mbaud (autodetect)
- Electrical isolated and opto-decoupled



**Approved by PNO!**  
Certificate no.: Z01871

### b) PROFINET. Features:

- Meets the standard IEC 61158 and IEC 61784
- LAN 10/100Base-T(X)
- 2 x RJ-45 LAN (Daisy Chain)
- Cycling data exchange RT and IRT with ProfiNet IO-Controller
- Sending and receiving of diagnostic- and process alarms
- I&M0...4-data available
- Supporting of PROFINET Naming (device name) and TCP/IP addressing
- Fast Startup functionality supported
- Shared Device supported
- Media Redundancy Protocol (MRP) supported
- Electrical isolated interface



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### c) ETHERNET I/P. Features:

- Supports ETHERNET I/P
- Maximum 32 Byte in-/output data
- Supports 10 and 100 MBit/s (autodetect)
- IP address setting by means of parameter
- Electrical isolated interface
- Software update of Ethernet node via DMA serial interface
- Supports assembly instances 100 and 101
- Additional assembly instances 200, 201, 210, 211 to directly communicate with multi fold modules

### d) CAN-OPEN. Features:







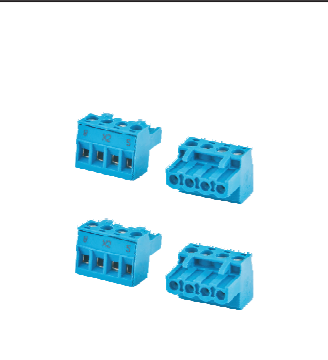
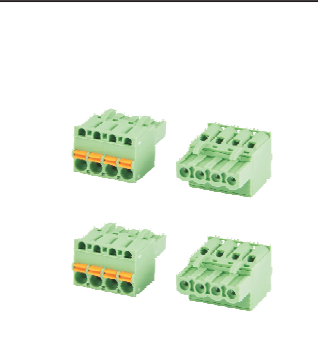
- Complete CAN-OPEN slave in accordance with standard CIA 301 / V4
- Supports all import Baud rates up to 2 Mbit
- Node number and baud rate by means of vendor specific object
- External bus termination 120 R required
- One receive PDO
- One transmit PDO
- One SDO channel
- Node guarding

**For more detailed information regarding DMA with bus-interfaces please refer to the accoding data sheet!**

## 9 Accessories and Options

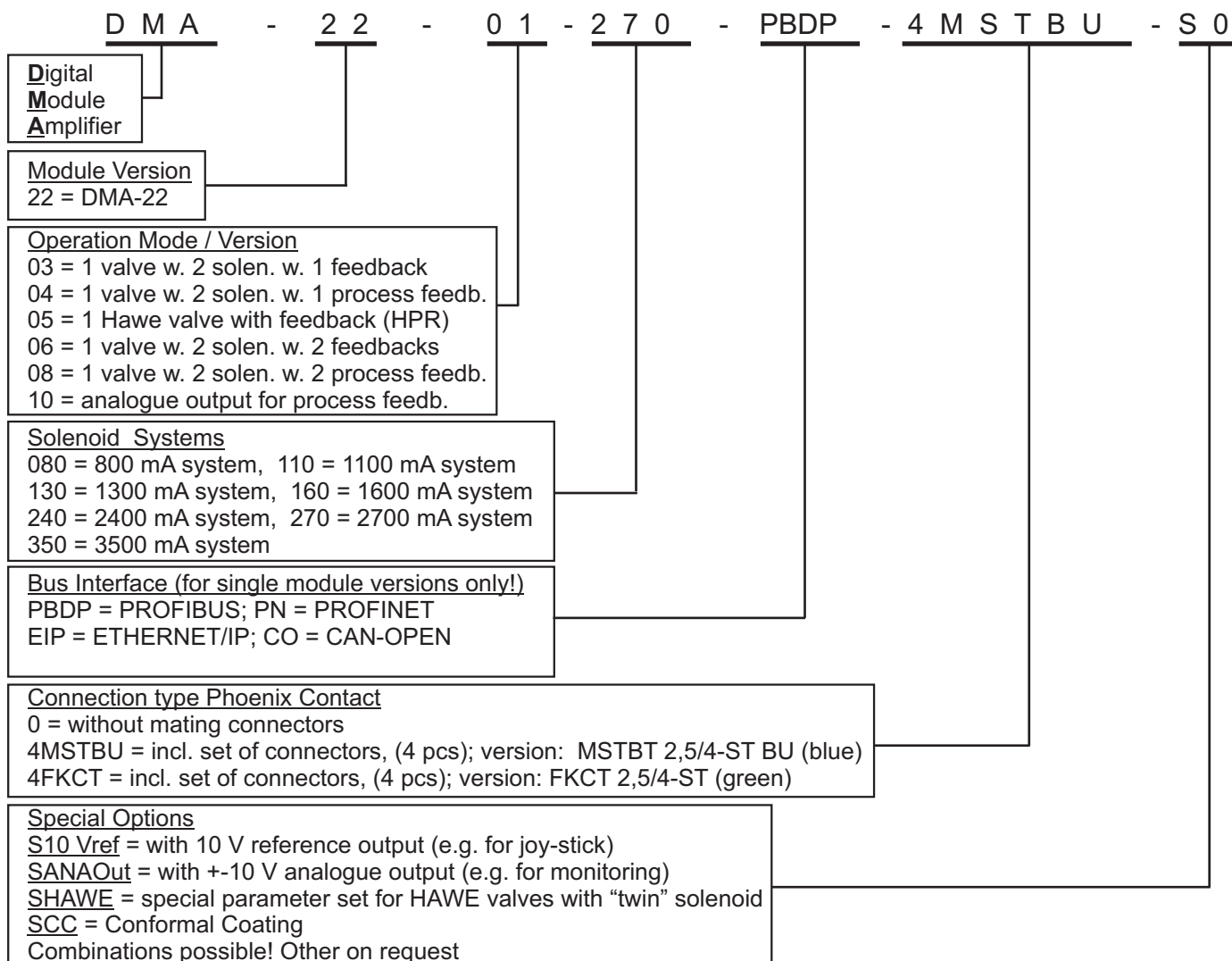
| Name  | Description   |
|---|---|
| <b>HCSTool</b>                                  | Software for parameterization, operation, monitoring, storage and documentation of adjustments. In English, French and German on CD (free download available). Please follow this link in order to download the most recent version of HCSTool: <a href="http://www.h-c-s-gmbh.de/download/">http://www.h-c-s-gmbh.de/download/</a> |
| <b>DMA-RS232-DS9F-RJ45</b>                      | Interface cable for communication between PC and DMA-2 for RS232 interface. 1 x Sub-D 9-pole connector female, 1 connector Western-Digital 6-pole, w. 2,5 m cable   |
| <b>USB-RS232-RJ45</b>                           | As above but w. USB-adaptor. 1 x connector Western-Digital 6-pole, w. 2,5 or 10 m cable   |
| <b>EKB-04</b>                                   | EKB-04 Handheld keypad and display unit for parameter setting and copying   |
| <b>CU/DMA</b>                                   | Commissioning unit for DMA. For adaptation of one DMA. For Commissioning, serviceing, testing and trouble shooting etc. at machines, systems, for laboratories and for training   |
| <b>4MSTBU</b>                                   | Set of 4 connectors for DMA; Phoenix Combicon connectors with screw terminals, type: MSTBT 2,5/ 4-ST - special HCS version with printed on reference numbers  |
| <b>4FKCT</b>                                    | Set of 4 connectors for DMA; Phoenix Combicon connectors with cage clamp terminals, type: FKCT 2,5/4-ST   |
| <b>Coding for connectors (order separately)</b> | Coding section (CR-MSTB), inserted into the recess in the header and keying profile (CP-MSTB), inserted into the slot on the plug (red); packages with 100 pcs each   |

Not to scale!

| Commissioning Unit  | Cable for comm. unit  | Interface Cable  | Interface Cable   |
|---|---|--|---|
|  |  |  |  |
| <b>HCSTool</b>  | <b>EKB-04</b>   | <b>Connectors 4MSTBU</b>   | <b>Connectors 4FKCT</b>   |
|  |  |  |  |



## 10 Ordering code, including single module bus versions (not all combinations available!)



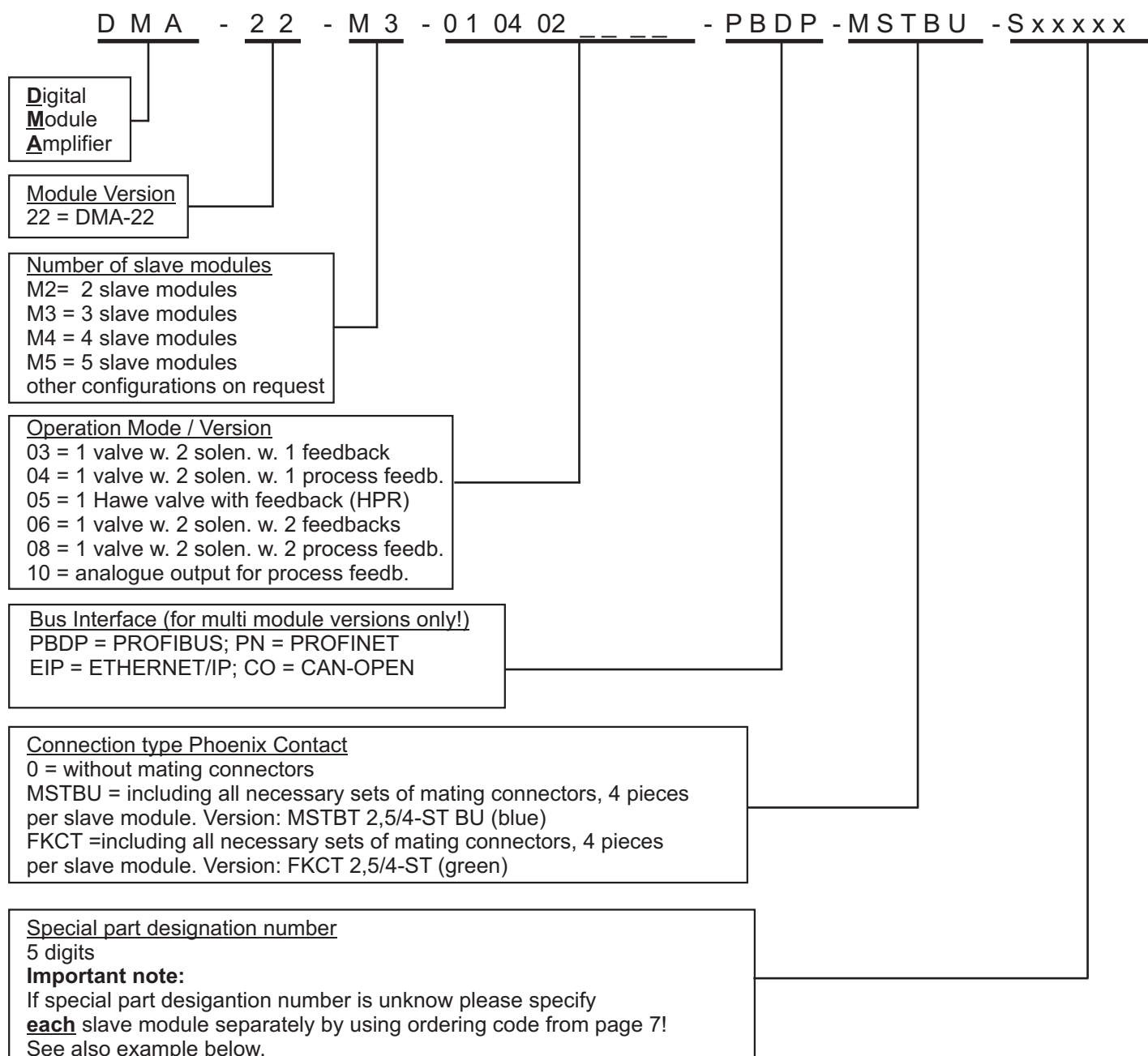
Important note: for ordering of multi-module bus versions refer to ordering code on page 10

**Ordering code example:**

Version with PROFIBUS and for closed loop operation for process control and 2.7 A solenoid including the set of mating connectors

***DMA-22-04-270-PBDP-4MSTBU-S0***

## 11 Ordering code, only multi module bus versions (not all combinations available!)



Important note: for ordering single multi-module bus versions refer to ordering code on page 9

**Ordering code example:**

PROFIBUS Version with 3 slaves (DMA modules). Each of the 3 slaves (modules) is the same version and is a closed open loop configuration for a 2.7 A coil including the set of mating connectors. Please specify each of the modules.

***DMA-22-M3-030304-PBDP-MSTBU-Sxxxxx*** containing

- DMA-22-03-270-x-S0 (module in operation mode 3)
- DMA-22-03-270-x-S0 (module in operation mode 3)
- DMA-22-04-270-x-S0 (module in operation mode 4)

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**EC Declaration of Conformity in accordance  
with EMC Directive 2004/108/EG**

**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:                 | Digital Amplifier and Controller Module   |
| Intended use:            | Automation systems (industrial applications)  |
| Model:                   | DMA-2   |
| Rated voltage:           | 24 V DC; SELV   |
| Rated power:             | max. 100 W  |
| Protection class:        | III   |
| Protection degree:       | IP00 (IP20 on request)  |
| Relevant EC Directive:   | EMC Directive 2004/108/EG   |
| Applicable EU Standards: |   |
| Emissions:               | EN 61000-6-3:2007 + A1:2011<br>EN 61000-6-4:2007 + A1:2011<br>Germanischer Lloyd VI-7-2 (EN 60945) on request |
| Immunity:                | EN 61000-6-2: 2005  |

Date/manufacturer's signature

01.01.2015

Details of signatory:

Dipl.-Ing. (FH) Peter Deuschle (General Manager)

Hydraulic Control Systems GmbH Geschäftsführer / General Manager: Dipl.-Ing. (FH) Peter Deuschle + Dipl.-Ing. (FH) Volker Bremauer  
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