

**THE ART OF
CONTROL**

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HCS
HYDRAULIC CONTROL SYSTEMS

In cooperation with:

SERVI
GROUP™

*1

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

DMA-22(A)-01/05

VERSIONS FOR OPEN AND CLOSED LOOP APPLICATIONS FOR HAWE^{*2} VALVES WITH/WO FEEDBACK SYSTEM (HIGH PERFORMANCE RANGE)

- For one valve with/wo feedback or process value feedback
- With 10 V supply output for feedback sensor and optional analogue output 0.... +/- 10 V
- Optional with bus interface (PROFIBUS DP, PROFINET, ETHERNET/IP, CANopen) multi module configurations available
- High performance 32 bit floating point CPU with superfast cycle time for best dynamic behavior
- Supply voltage range nom. 10 - 32 V DC
- Operating temperature range - 40° C - + 70° C
- Adaptation possible to all kinds of Hawe proportional valves (e.g. PSL/PSV, PMVE, etc.)
- Optimised for current range of existing twin solenoids and feedback signals
- Full digital multifunctional controller for valve or process control systems
- Analogue inputs with highresolution and accuracy (16 bit!)
- Easy usage and operation by means of WINDOWS program **HCSTool** including oscilloscope function!

PROFI[®]
BUS **PROFI[®]**
NET



*1: Servi AS, N-1423 Ski, www.servi.no

*2: HAWE HYDRAULIK GMBH & CO. KG, D- 81673 MÜNCHEN, www.hawe.com

1 Applications and usage

Amplifier modules DMA-22(A) are generally used for:

- proportional valves with/wo 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.)

- Power supply via USB-C for parameter setting
- Optional available with certified PROFIBUS or PROFINET bus interface
- Optional available with ETHERNET/IP and CANopen bus interface. Other bus interfaces on request
- Multi module bus versions available for up to 5 DMA-22(A) @ one bus interface

2 Features

- Adapted version for Hawe valves series PSL/PSV
- Fully digitized amplifier and controller module
- All adjustments and parameter setting possible by means of USB-C interface and HCSTool --> no on-board potentiometers or jumpers
- Flexible and reliable system, use of a modern high performance 32 bit floating point CPU for best in class performance

Software update possible via PC by means of USB-C interface

Optional available with analogue output 0 ... +/- 10 V

- Variable settings for different Hawe solenoid systems
- Adaptation to different valve sizes and versions available
- Switch-over from closed-loop to open-loop operation possible by means of digital input
- Change of selected parameters "on-the-fly" without interference of function; monitoring of display values and 4-channel oscilloscope with **HCSTool** via PC (USB-C interface)
- Very high resolution and accuracy for analog set points and feedback signals due to 16-bit A/D-converter

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
Model	Modular digital amplifier in snap-on mounting technology
Supply voltage	10 V DC - 32 V DC; residual ripple < 10 % (max. 50 VA power draw) ^{*1}
Duty cycle	100 %
Preliminary fuse	3.15 A; quick blowing
Ambiant operating temperature	- 40 °C ... + 70 °C
Storage temperature	- 45 °C ... + 85 °C
Humidity (relative air humidity)	max. 95 % non condensing
Max. elevation	2,000 m (mamsl)
Class of protection	IP20 (EN60529)
EMC	In accordance with the applicable industrial standards (CE - conformity) ^{*2}
Connection, type of connector	16 pole (4 x 4); screw terminals for 0.2 - 2.5 mm ² (AWG 24 -12) Phoenix Combicon connector with screw terminals, type: MSTBT 2,5/ 4-ST for detailed technical data refer to Phoenix Contact Combicon Product Catalog
Cable specification	1.5 mm ² (AWG16) for supply and solenoids, shielding recommended, max length: 50 m 0.5 mm ² (AWG20) for analog and digital signals, shielding mandatory, max length: 50 m
Mounting/housing	Mounting: top-hat rail (mounting rail) in accord. with EN50022 with integrated PE contact Housing configuration: ventilated (IP20) Material: PA 66 - FR (blue); flammability in accordance with UL94V0 Dimensions approx.: (w x h x d) 22,5 x 100 x 114 mm Weight: approx. 0.13 kg (including mating connectors)
Mounting position	Any; preferably vertical for better heat dissipation through convection

3 Technical data continued

Feature	Range, characteristics
Analog inputs	2 inputs with 16 Bit resolution (differential; 0 ... ± 10 V, 0 / 4 ... 20 mA) Special feedback selection for Hawe hall sensor: 5 V $\pm$ 2.6 V
Digital inputs	2 (3) inputs; S1.02, ENABLE (S1.01 optional for special versions)
Solenoid current (output)	2 PWM output stages, each for up to 3.5 A (with over-energ. and quick de-energization) Max. 800 mA for this specific version!
Digital output	1 voltage output e.g. for signaling error, comparator status
Reference output (option)	+ 10 V output, e.g. for potentiometer application
Analog output (option)	1 output with 12 Bit resolution, 0 ... ± 10 V, for monitoring or forwarding to other devices
Status signals	1 multi color „STATUS“ LED at front. Run/OK = green; Enable = yellow; Error = red
Interface	USB-C at front
Interface 2 (only one available per module) Versions with Bus-Interface only!	PROFIBUS-DP: RS485, Sub-D 9-pole female PROFINET (in/out): 2 x RJ45 (integrated switch) ETHERNET/IP: RJ45 CAN-OPEN: Sub-D 9-pole male  
Dither frequency range	1 ... 300 Hz - independant from PWM frequency (other frequency range on request)

*1: limitations for solenoid current may apply

*2: details on request

Remark:

all values nominal if not stated otherwise!

4 Detailed electrical data

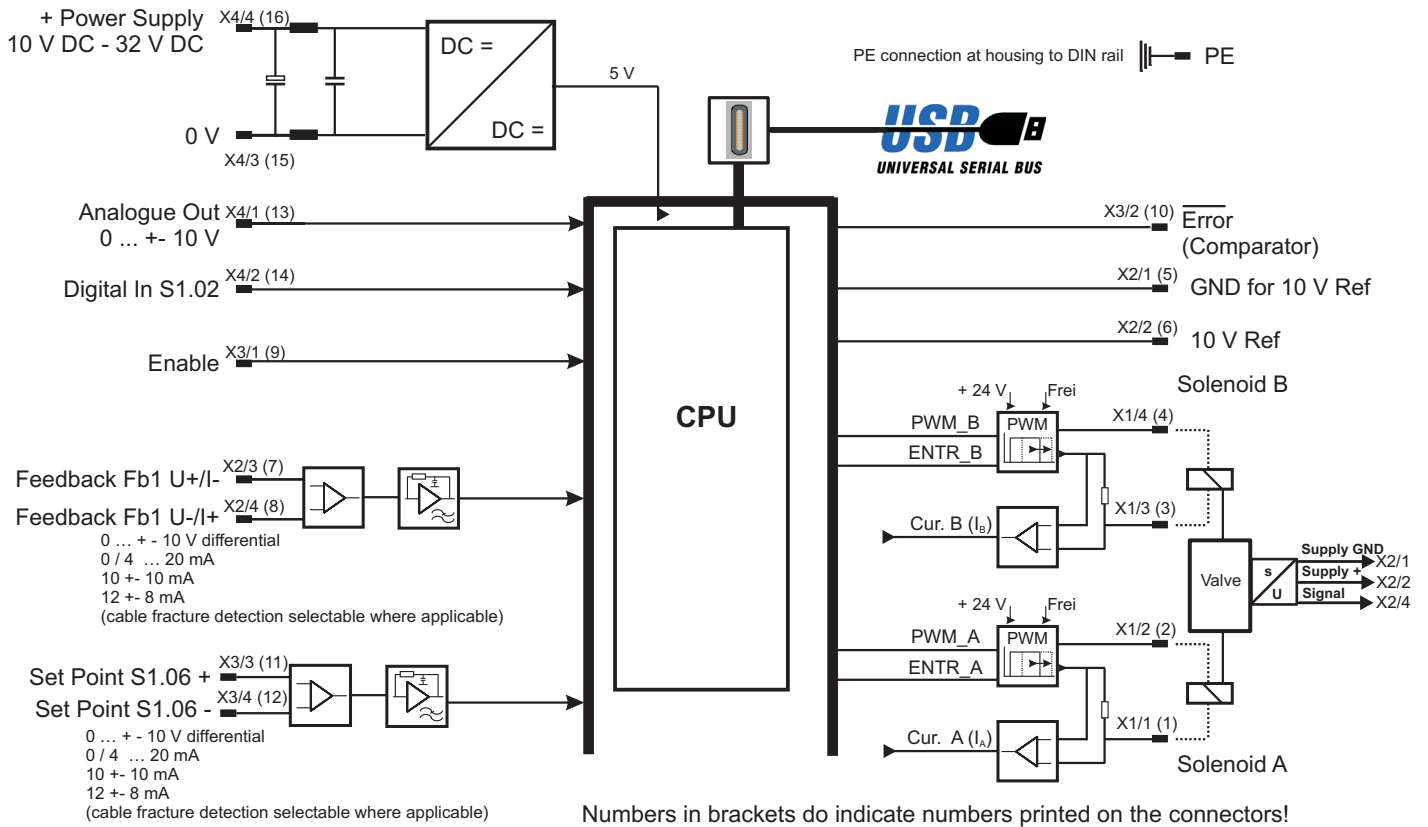
Feature	Range, characteristics
Power consumption	1.2 VA, solenoid not energized 41 VA, one solenoid energized with 3,5 A 81 VA, both solenoids energized with 3,5 A (not applicable for this mode 5 version!)
Solenoid output Possible max. I _{outPeak} PWM frequency Cycle time current controller	Rectangular voltage, pulse-modulated, with over-energization and quick de-energization Output stages are released on the hardware side by enable signal I _{max} = 4.5 A 22 kHz 45 μ s
Analog input Voltage is selected Current is selected over current protection	U _{max} = +28 V U _{min} = -15V Typ. R _{in} = 200 k Ω Differential Typ. R _{in} = 5 M Ω Input Fb1, Fb2 Typ. R _{in} = 255 Ω All inputs Typ. > 23 mA
Digital input Supply 10 V Supply 24 V Low level High level	U _{max} = +28 V Typ. I _{in} = 0.5 mA Typ. I _{in} = 1.1 mA U _{in} < 2.6 V U _{in} > 9.2 V
Digital Output Supply 24 V Supply 12 V	Protected at I _{outmax} typ. 40 mA Typ. U _{out} > 18 V @ I _{out} 2 mA Typ. U _{out} > 15 V @ I _{out} 10 mA, Protected at I _{outmax} typ. 20 mA Typ. U _{out} > 8 V @ I _{out} 2 mA Typ. U _{out} > 5 V @ I _{out} 10 mA
Analog output (option)	The analog output is released on the hardware side by the CPU -10 V ... + 10 V, tol. $\pm$ 0.020 V
Reference output (option)	+ 10 V, tol. $\pm$ 0.1 V - 10 V, tol. $\pm$ 0.1 V I _{outmax} < 10 mA

5 Technical data for optional bus interfaces

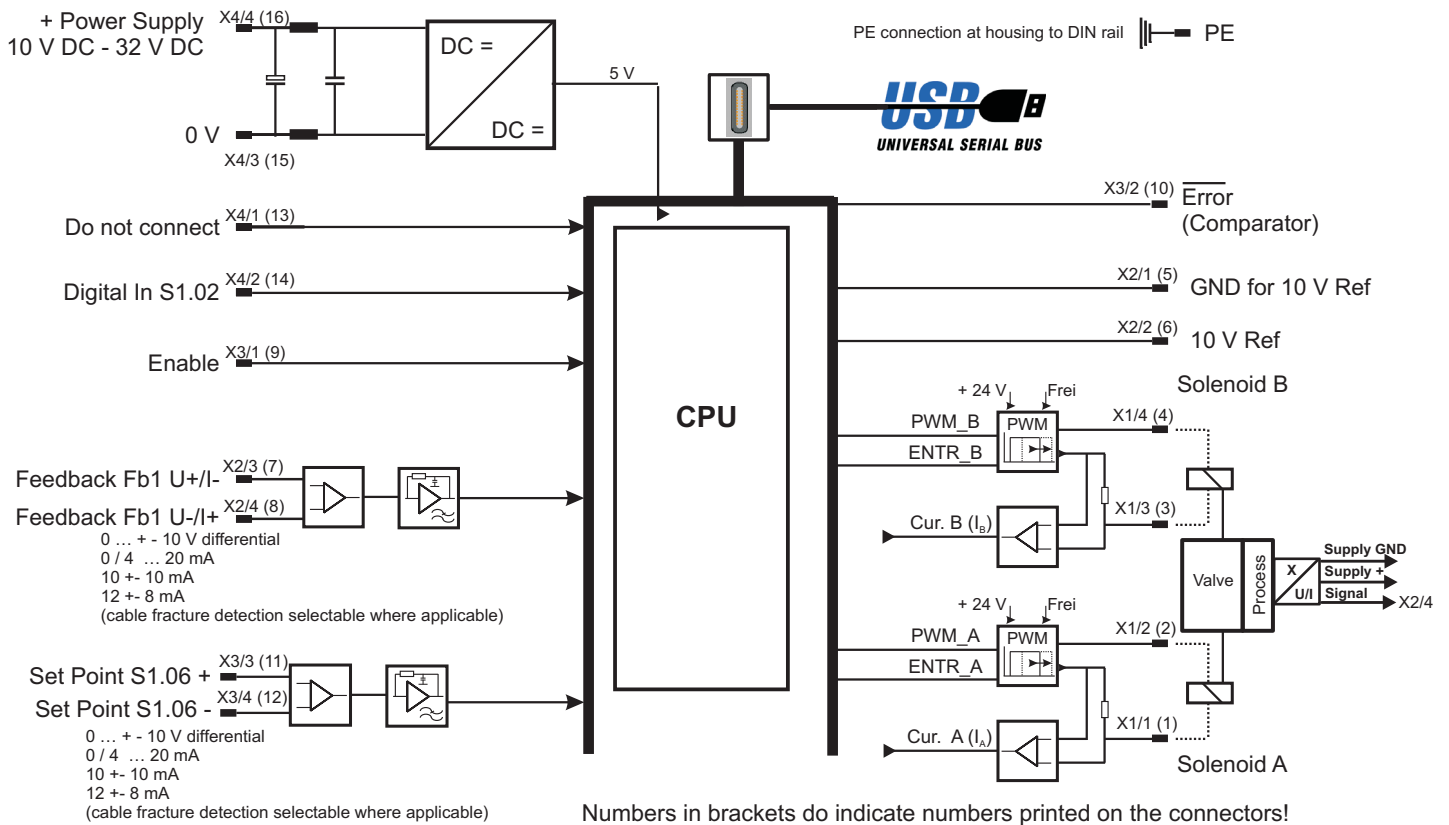
Feature PROFIBUS	Range, characteristics	
Supply voltage	Via DMA-22(A)	
Temperature ranges, EMC, Mounting/housing	Refer to page 3	
PROFIBUS-DP 	- Certified by PNO - Supports PROFIBUS-DP Slave in accordance with IEC 61158 - Supports PROFIBUS DPV1	- Maximum 244 Byte in-/output data - Supports up to 12 Mbaud (autodetect) - Electrical isolated and opto-decoupled
Connection / Type of connector	RS485, Sub-D 9-pole female	
Status signals	LED „Buserror“ (red): DMA-22(A) LED is used as „ERROR“ indicated in „red“	
Address selection	DIP switch 1- 8, each on/off	
Feature PROFINET	Range, characteristics	
Supply voltage	Via DMA-22(A)	
Temperature ranges, EMC, Mounting/housing	Refer to page 2 and 3	
PROFINET 	Approved by PNO - 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 support. - Electrical isolated interface
Connection / Type of connector	In/Out: 2 x RJ45 (integrated switch)	
Status signals	Power (green), Error (red), Maint (yellow), Sync (yellow), Status (yellow)	
Future usage	DIP switch 1- 3, each on/off	
Feature ETHERNET/IP	Range, characteristics	
Supply voltage	Via DMA-22(A)	
Temperature ranges, EMC, Mounting/housing	Refer to page 2 and 3	
ETHERNET/IP	Approved by PNO - 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 support. - Electrical isolated interface
Connection / Type of connector	In/Out: 2 x RJ45 (integrated switch)	
Status signals	Power (green), Error (red), Maint (yellow), Sync (yellow), Status (yellow)	
Future usage	DIP switch 1- 3, each on/off	
Feature CANopen	Range, characteristics	
Temperature ranges, EMC, Mounting/housing	Refer to page 2 and 3	
CANopen	- Complete CANopen slave in accordance with standard CIA 301 / V4 - Supports all import Baud rates u.t. 2 Mbit - Node number and baud rate by means of vendor specific object	- External bus termin.120 R required - One receive PDO - One transmit PDO - One SDO channel - Node guarding
Connection / Type of connector	Sub-D 9-pole male	
Status signals	Status (red), Maint (yellow), Link/Act (yellow)	
Address selection	DIP switch 1- 10, each on/off	

6 Hardware block diagram

Example diagram for version: DMA-22(A)-**05**-xxx-SHPR-ANAOut; Operation Mode: **05**

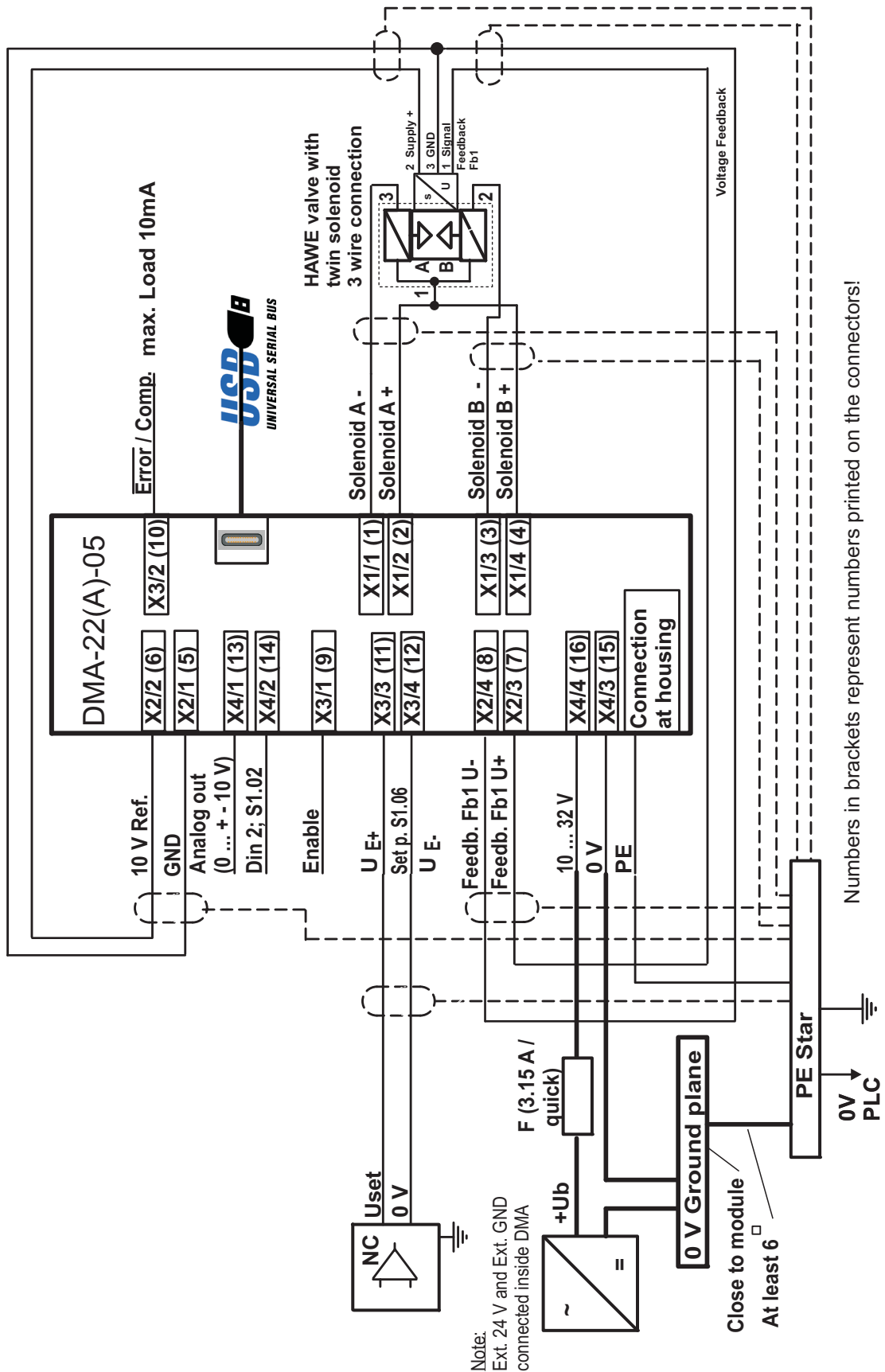


Example diagram for version: DMA-22(A)-**04**-xxx-SHPR; here for Operation Mode: **04**



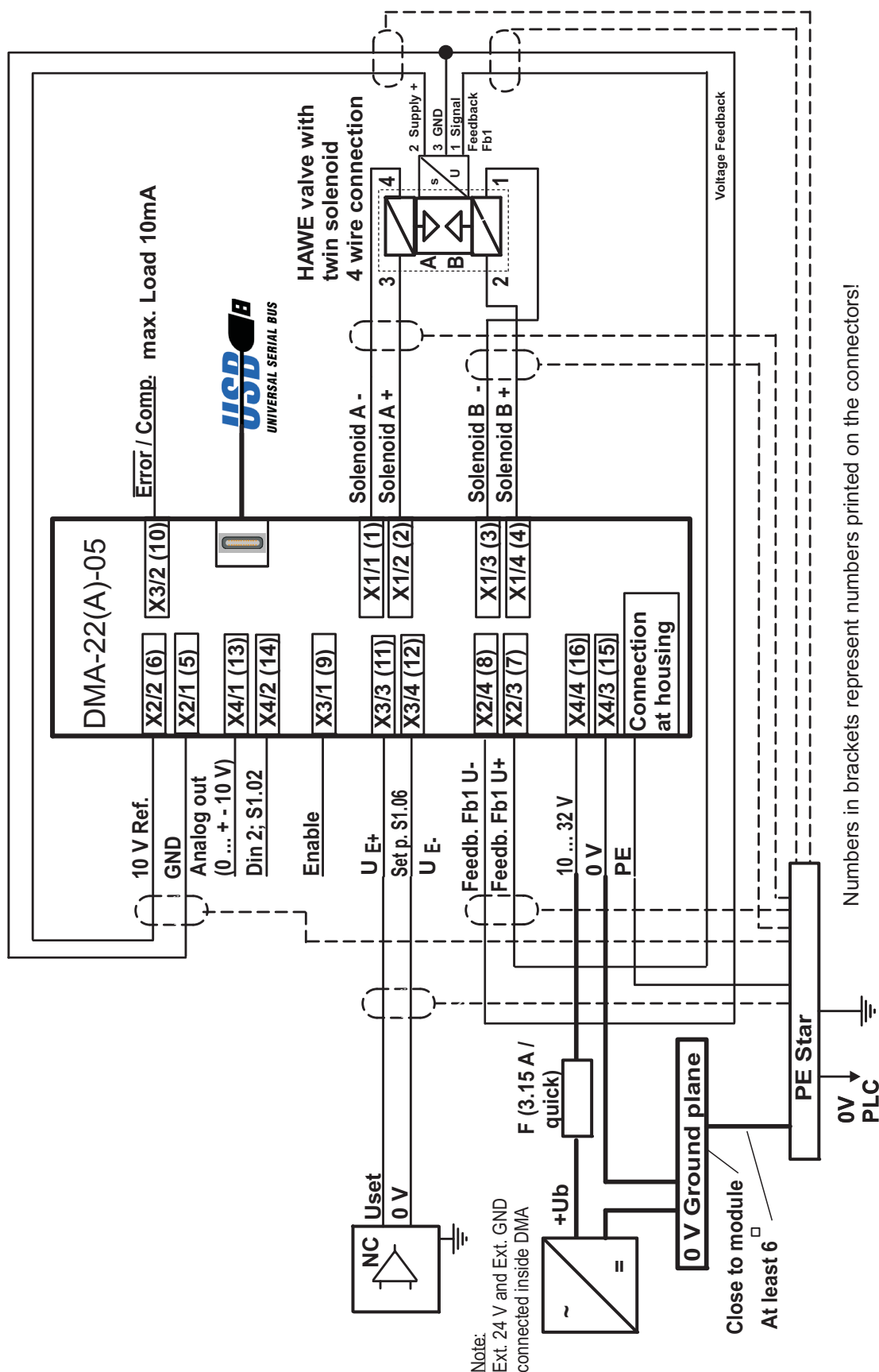
7 Wiring diagram

Version: DMA-22(A)-**05**-xxx-SHPR-ANAOout; Software Versions V39.xx
 Operation Mode: **05**, with 10 Vref out and Analog Output,
 Hall spool position sensor and 3-wire solenoid connection



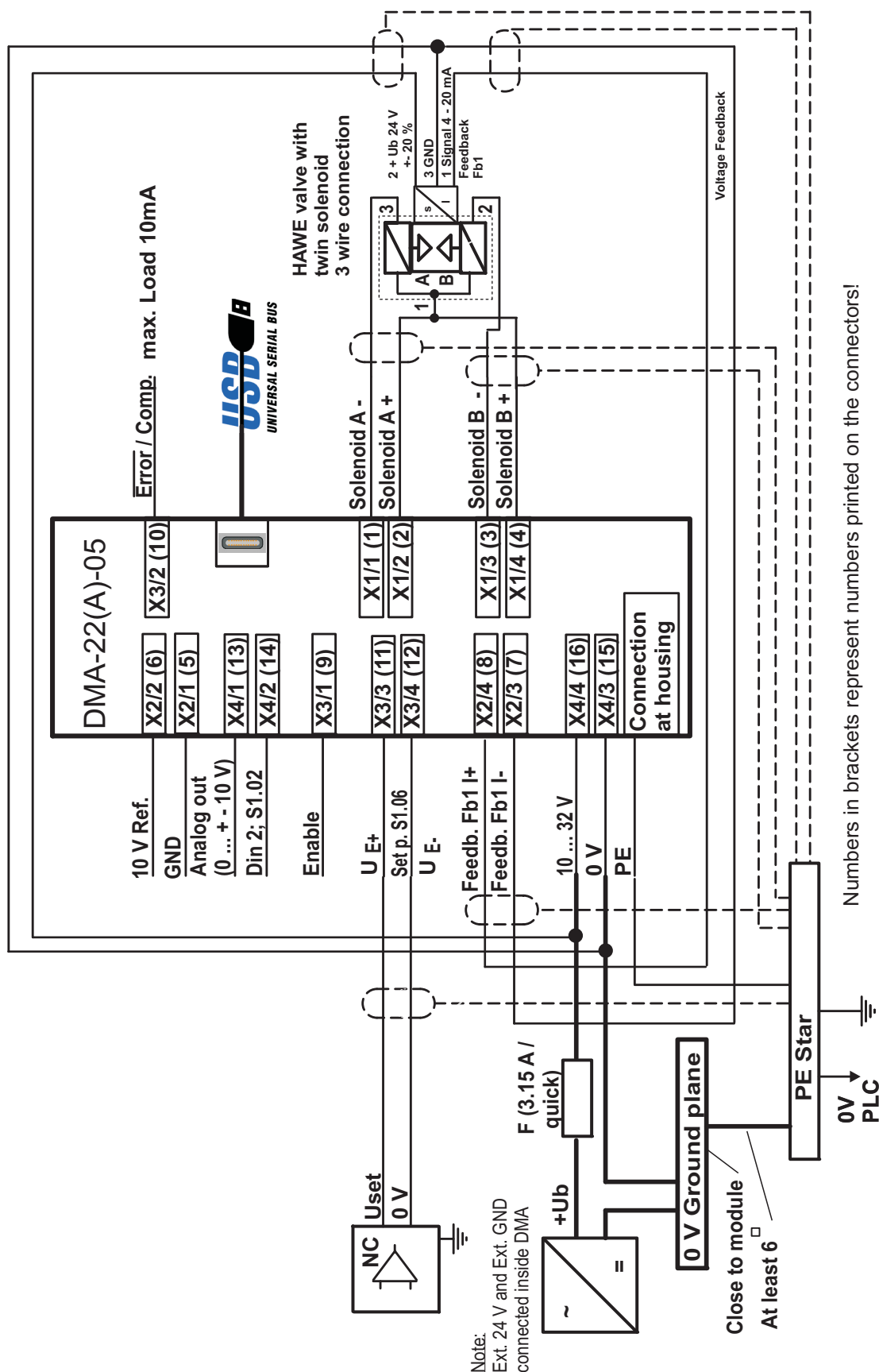
7 Wiring diagram

Version: DMA-22(A)-**05**-xxx-SHPR-ANAOut; Software Versions V39.xx
 Operation Mode: **05**, with 10 Vref out and Analog Output
 Hall spool position sensor and 4-wire solenoid connection



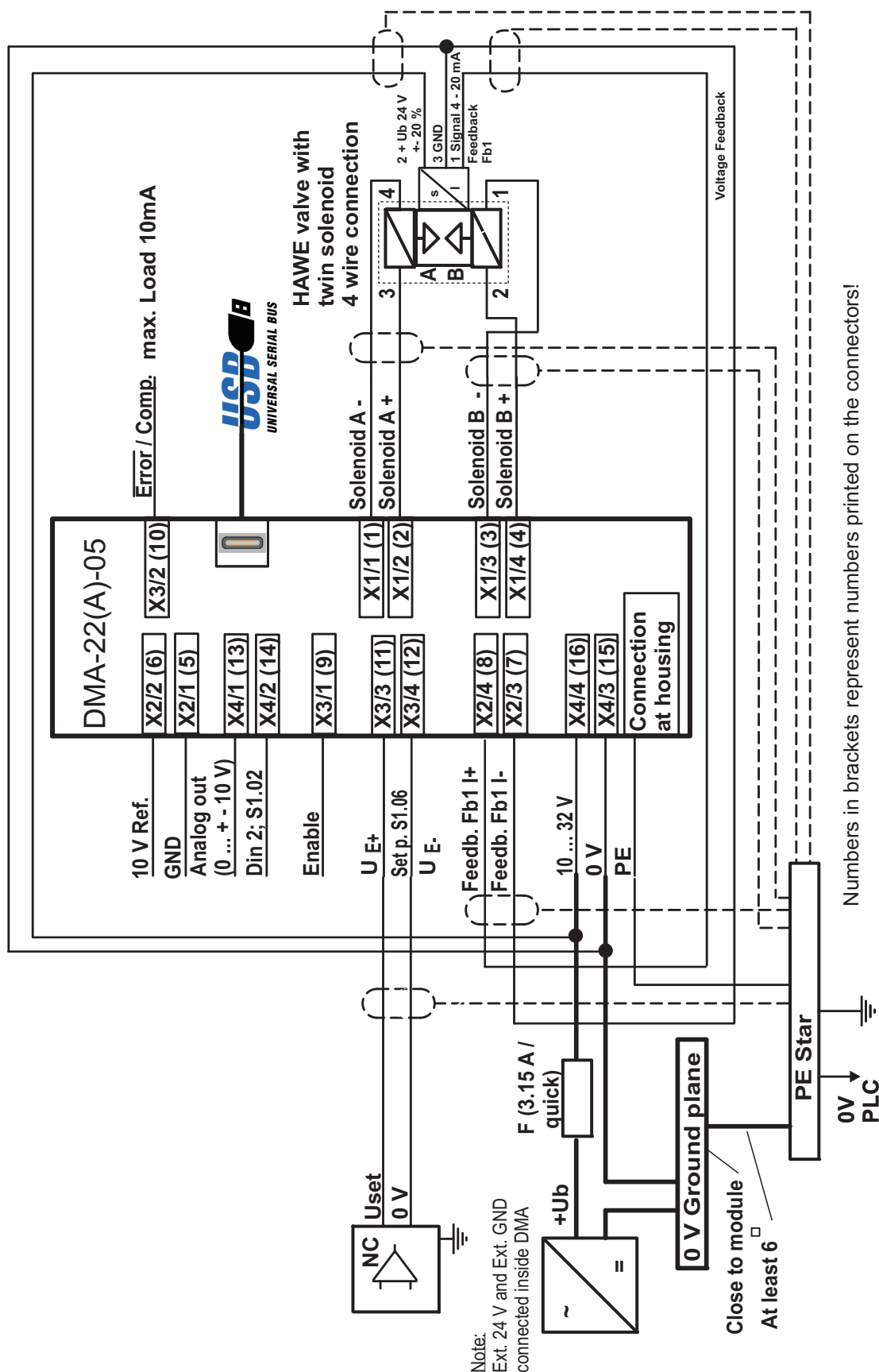
7 Wiring diagram

Version: DMA-22(A)-**05**-xxx-SHPR-ANAOout; Software Versions V39.xx
 Operation Mode: **05**, with 10 Vref out and Analog Output
 Servi spool position sensor (4...20 mA) and 3-wire solenoid connection



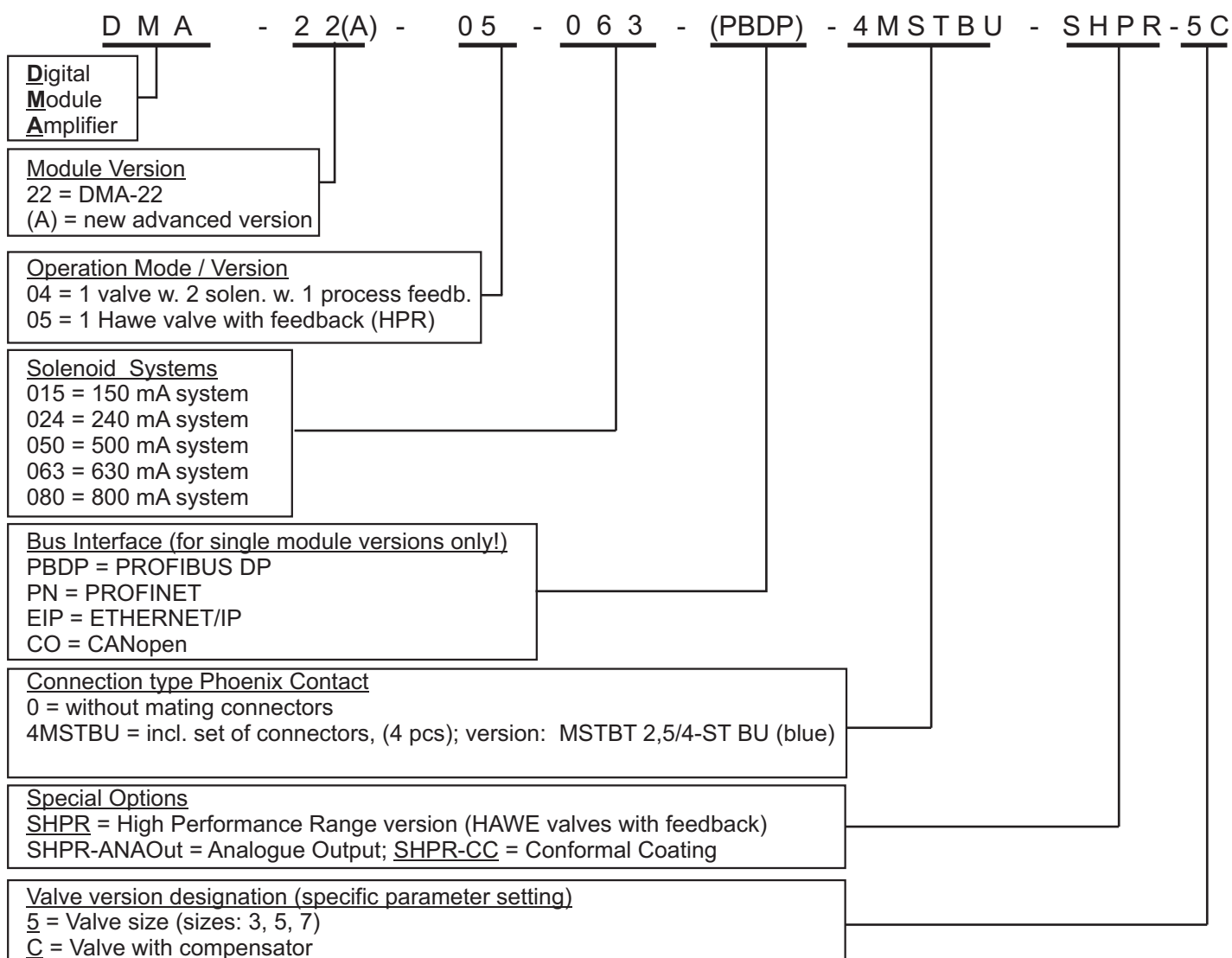
7 Wiring diagram

Version: DMA-22(A)-**05**-xxx-SHPR-ANAOOut; Software Versions V39.xx
 Operation Mode: **05**, with 10 Vref out and Analog Output
 Servi spool position sensor (4...20 mA) and 4-wire solenoid connection





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



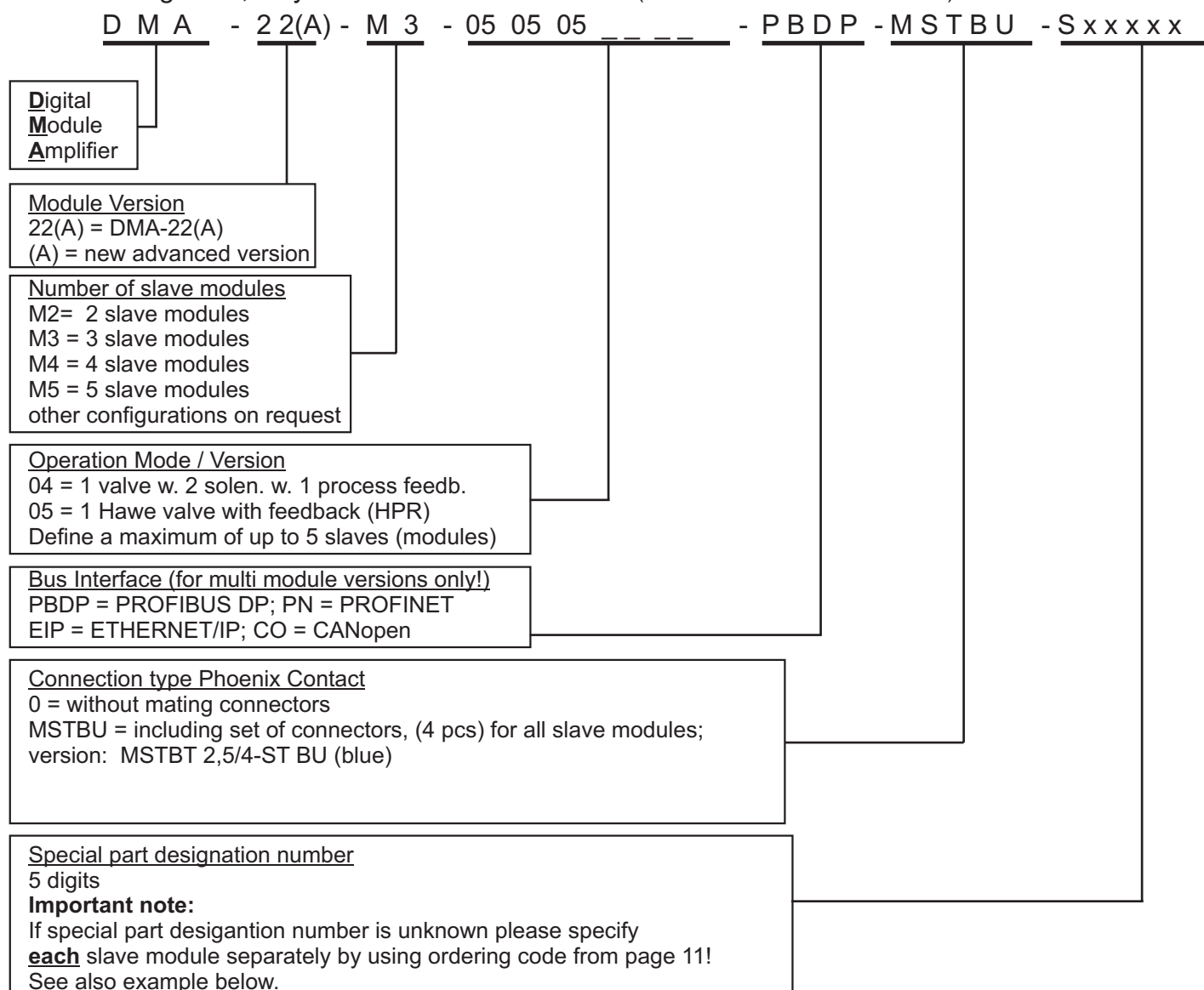
Important note: for ordering of multi-module bus versions please refer to ordering code on page 12

Ordering code example:

Version with PROFIBUS is a closed loop version (for HPR valve size 5 with compensator) and has a 0.63 A coil including the set of mating connectors.

DMA-22(A)-05-063-PBDP-4MSTBU-SHPR-5C

10 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 11

Ordering code example:

PROFIBUS version with 3 slaves (DMA-22(A) modules). Each of the 3 slaves (modules) is the same version in mode 5 including the connectors.
Please specify each of the modules.

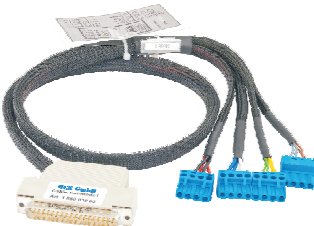
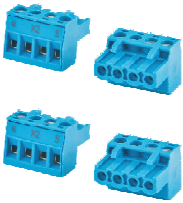
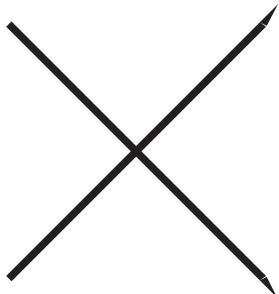
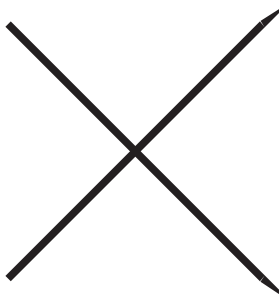
DMA-22(A)-M3-010101-PBDP-MSTBU-Sxxxxx containing:

DMA-22(A)-05-063-4MSTBU-SHPR (slave 1; module in operation mode 5)
DMA-22(A)-05-063-4MSTBU-SHPR (slave 2; module in operation mode 5)
DMA-22(A)-05-063-4MSTBU-SHPR (slave 3; module in operation mode 5)

11 Accessories and Options

Name	Description
HCSTool	Software for parameterization, operation, monitoring, storage and documentation of adjustments. With 4-channel oscilloscope function. In E / F / DE. Download from internet free of charge: http://www.h-c-s-gmbh.de/download/
USB-A-USB-C-3m	Interface cable for communication between PC and DMA-22(A) for USB-C interface. 1 x USB-A connector (PC side), 1 x USB-C connector (DMA side) approx. 2 m cable
USB-C-USB-C-2m	Interface cable for communication between PC and DMA-22(A) for USB-C interface. 2 x USB-C connector (PC and DMA side), approx. 2 m cable
CU/DMA-2 Connection cable f. DMA	Commissioning unit for DMA-22(A). For adaptation of one DMA. For commissioning, servicing, testing and trouble shooting etc. at machines, systems, for laboratories and for training. Cables ordered separately depending on DMA version
4MSTBU	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

Not to scale!

Commissioning Unit	Cable for Comm. Unit DMA version dependent	Interface Cable USB-A-USB-C-2m	Interface Cable USB-C-USB-C-2m
			
HCSTool	Connectors 4MSTBU	—	—
			

12 Our distributors and partners

<https://www.h-c-s-gmbh.de/en/sales-partners>

13 Confirmation of conformity

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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 change to the product without our written agreement.

Product:	Digital Amplifier and Controller Module
Intended use:	Automation systems (industrial applications)
Model:	<u>DMA-22-x</u>
Rated voltage:	24 V DC; SELV
Rated power:	max. 100 W
Protection class:	III
Protection degree:	IP00 (IP20 on request)
Relevant EU Directive:	EMC Directive 2014/30/EU
Applicable EU Standards:	
Emissions:	EN 61000-6-3:2007 + A1:2011 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

01.01.2024

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
Sitz / Head Quarter: D-72636 Frickenhausen Amstgericht / Register Court: AG Stuttgart HRB 224899

14 CiA Membership

