

**THE (A)DVANCED
ART OF CONTROL
NEXT GENERATION**

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**NEW UPGRADED
VERSION!**

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

DMA-22(A)-03/04/10

VERSIONS FOR CLOSED LOOP APPLICATIONS

- Amplifier and controller module for 1 proportional valve with feedback or process value feedback or stand-alone controller
- High performance 32 bit floating point CPU
- Superfast cycle time --> best dynamic behavior
- Supply voltage range nom. 10 - 32 V DC
- Operating temperature range - 40° C - + 70° C
- Very wide range of output currents and also servo valve versions available
- Analog inputs U/I selectable (16 bit resolution)
- USB-C interface
- Easy usage / operation by means of **HCSTool** - with 4-channel oscilloscope
- Optional with 0 ... +/- 10 V analog output to control subsequent electronics (process value feedback)
- Optional bus interface (PROFIBUS, PROFINET, CANopen, ETHERNET/IP, multi module configurations)
- Adaptation possible to all kinds and makes of proportional valves
- Full digital PI current controller for both output stages
- Universal usage for hydraulic, pneumatic and other applications



1 Applications and usage

Amplifier and controller boards series DMA-22(A) 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.)
 - stand-alone controller function with analog output
- Change of selected parameters “on-the-fly” without interference or interruption of function; monitoring of display values and visualization of dynamic processes with 4-channel oscilloscope by means of **HCSTool**
- Very high resolution and accuracy for analog set points and feedback signals due to 16-bit A/D-converter
- Optional D/A-converter with 1 analog output to enable subsequent electronic devices and monitoring (0 ± 10 V, 12 bit resolution) also for ease of commissioning and trouble shooting (monitor signal for internal values)

2 Features

- 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
- Power supply via USB-C for parameter setting
- Flexibility due to possible hardware and software extensions and options for customer and application specific requirements (e.g. bus interface, special output stages, etc.)
- Variable settings for all kinds of solenoid systems and also for servo valves depending on hardware version. Very wide output current range (not for all modes possible):
 - Servo valve version: 20 - 550 mA
 - Proportional valve version: 800 - 3500 mA
- All kinds of customer specific adaptations of hardware and software for special applications are possible. Just ask us and we provide the right solution!
- LVDT interface (1 or 2 channel) for special feedback applications on request
- 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
- 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 New generation „DMA-22(A)“ replacing DMA-22

The predecessor board „DMA-22“ (more than 45,000 devices are being used world wide), which has been used very successfully to date, with all kinds of variants and versions, will be fully replaced by the new generation. Naming of the new generation remains the same, except for the suffix (A). The new version is thus called "DMA-22(A)".

Key target points for introduction of the successor generation are:

- Provide a basically 100% function and pin-compatible successor
- Ensure availability for the next decade to come
- Extend general functionality
- Improve functionality for all analog inputs
- Boost performance to a significant higher level
- Advanced computational power due to usage of 32 bit floating point CPU
- 6-fold increased resolution for analog inputs (16 bit vs 12 bit for the A/D converter)
- Extended temperature range from - 40° C to + 70° C
- Introduction of an USB-C interface instead of RS232

4 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
Analog inputs	2 inputs with 16 Bit resolution (differential; 0 ... ± 10 V, 0/4 ... 20 mA)
Digital inputs	3 inputs (S1.01, S1.02, ENABLE);
Solenoid current (output)	2 PWM output stages, each for up to 3.5 A (with over-energ. and quick de-energization) Servo valves current ranges from 20 mA to 550 mA also available on request
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 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!



5 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
Solenoid output I _{out} 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 µs
Analog input Voltage is selected Current is selected over current protection	U _{max} = + 28 V U _{min} = - 15 V Typ. R _{in} = 200 kΩ Differential Typ. R _{in} = 5 MΩ 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. ± 0.020 V
Reference output (option)	+ 10 V, tol. ± 0.1 V - 10 V, tol. ± 0.1 V I _{outmax} < 10 mA

6 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) error LED is used
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 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 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
Supply voltage	Via DMA-22(A)
Temperature ranges, EMC, Mounting/housing	Refer to page 3
CANopen	- 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

7 Block diagram hardware

Diagram for version: DMA(A)-22-03-xxx-S0; Operation Mode: 03

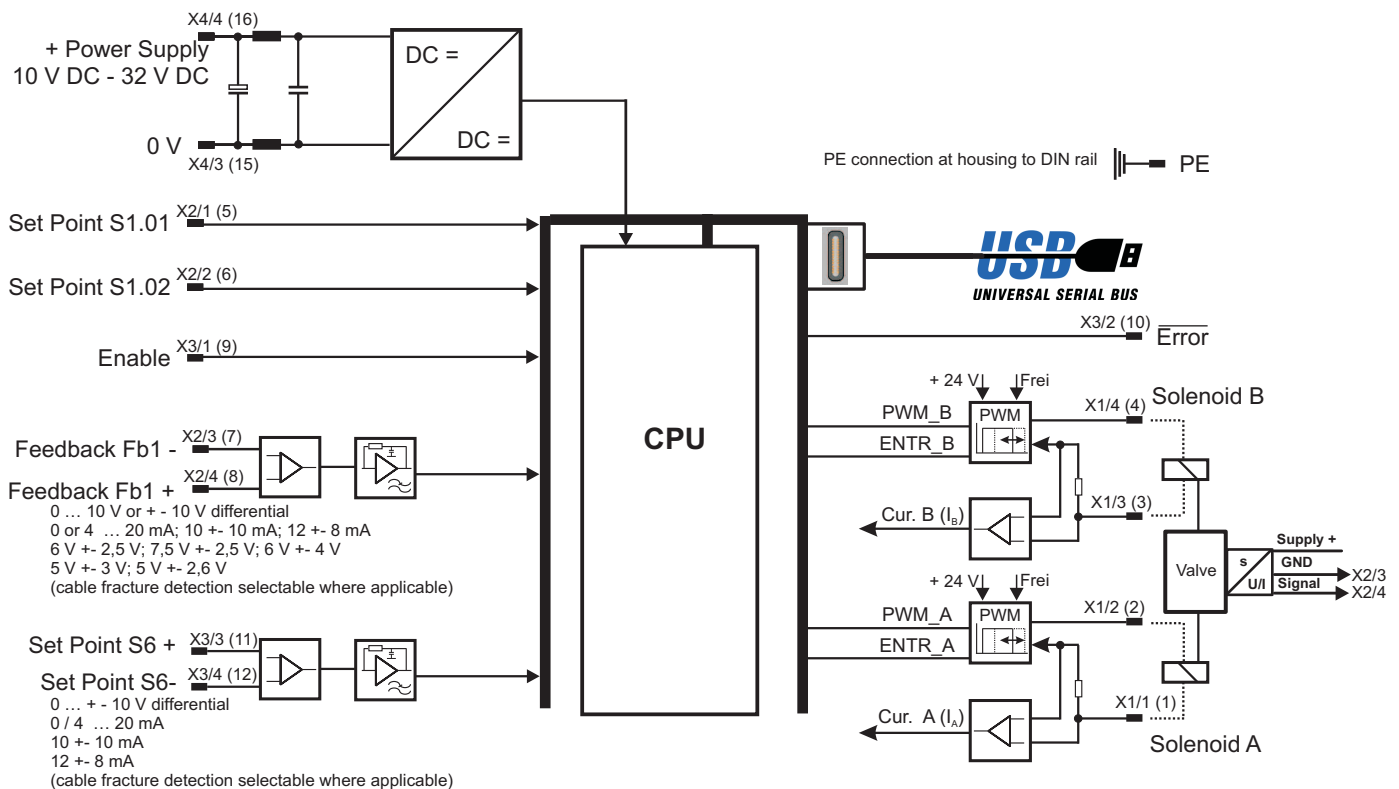
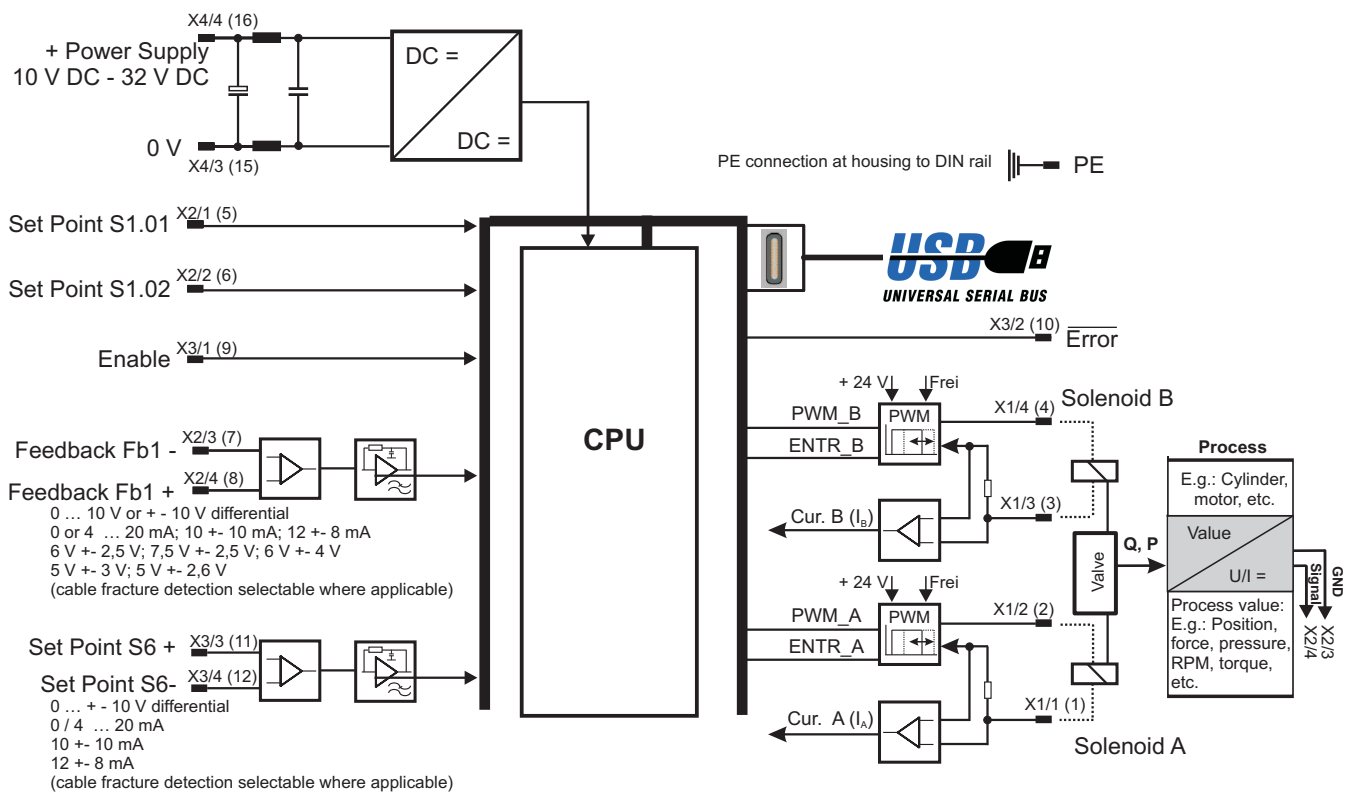
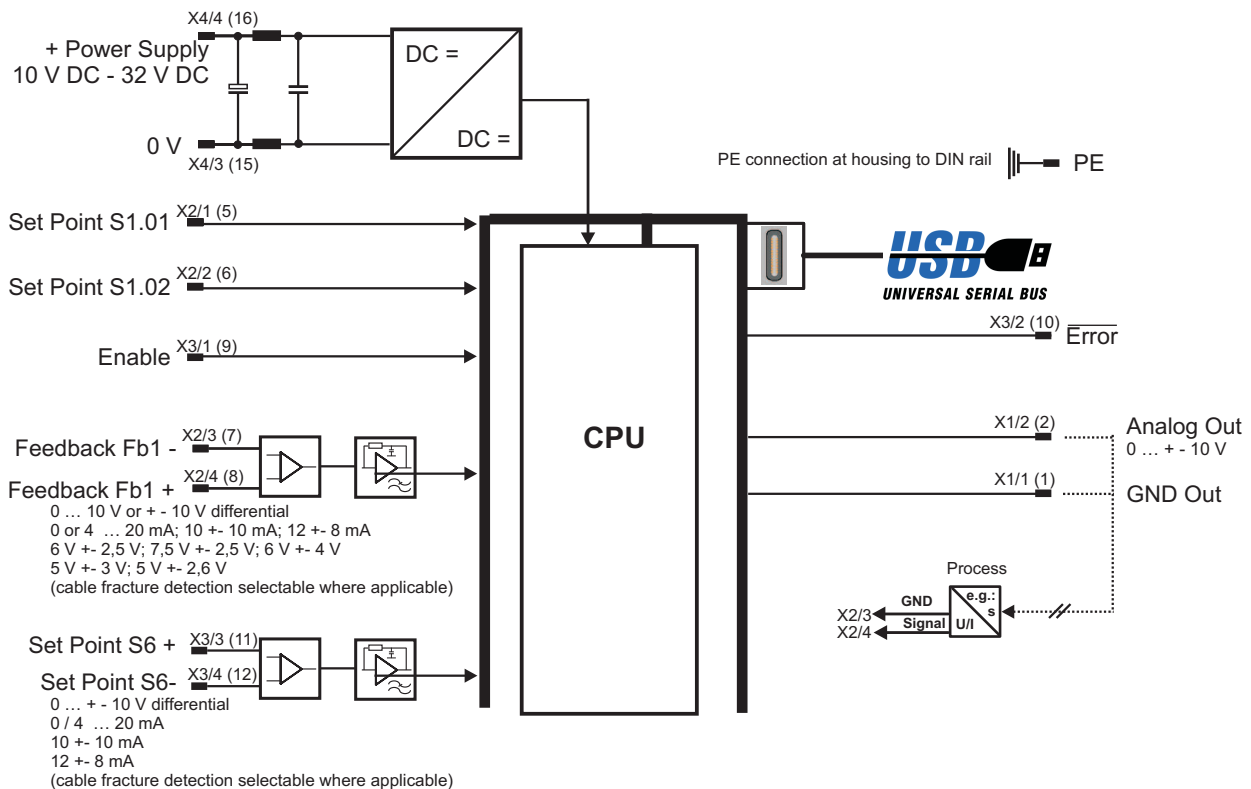


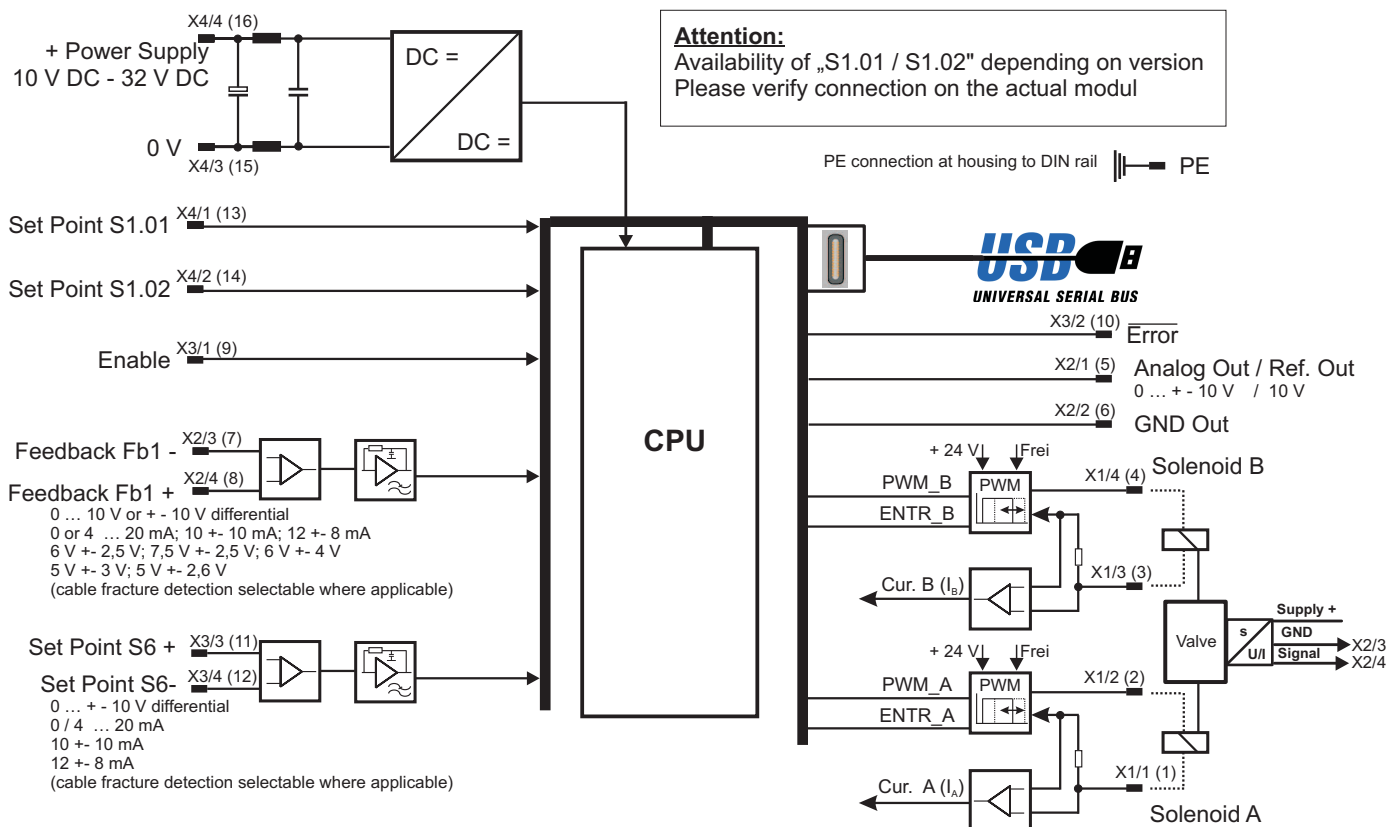
Diagram for version: DMA(A)-22-04-xxx-S0; Operation Mode: 04



7 Block diagram hardware continued

Diagram for version: DMA(A)-22-**10**-xxx-S0; Operation Mode: **10**

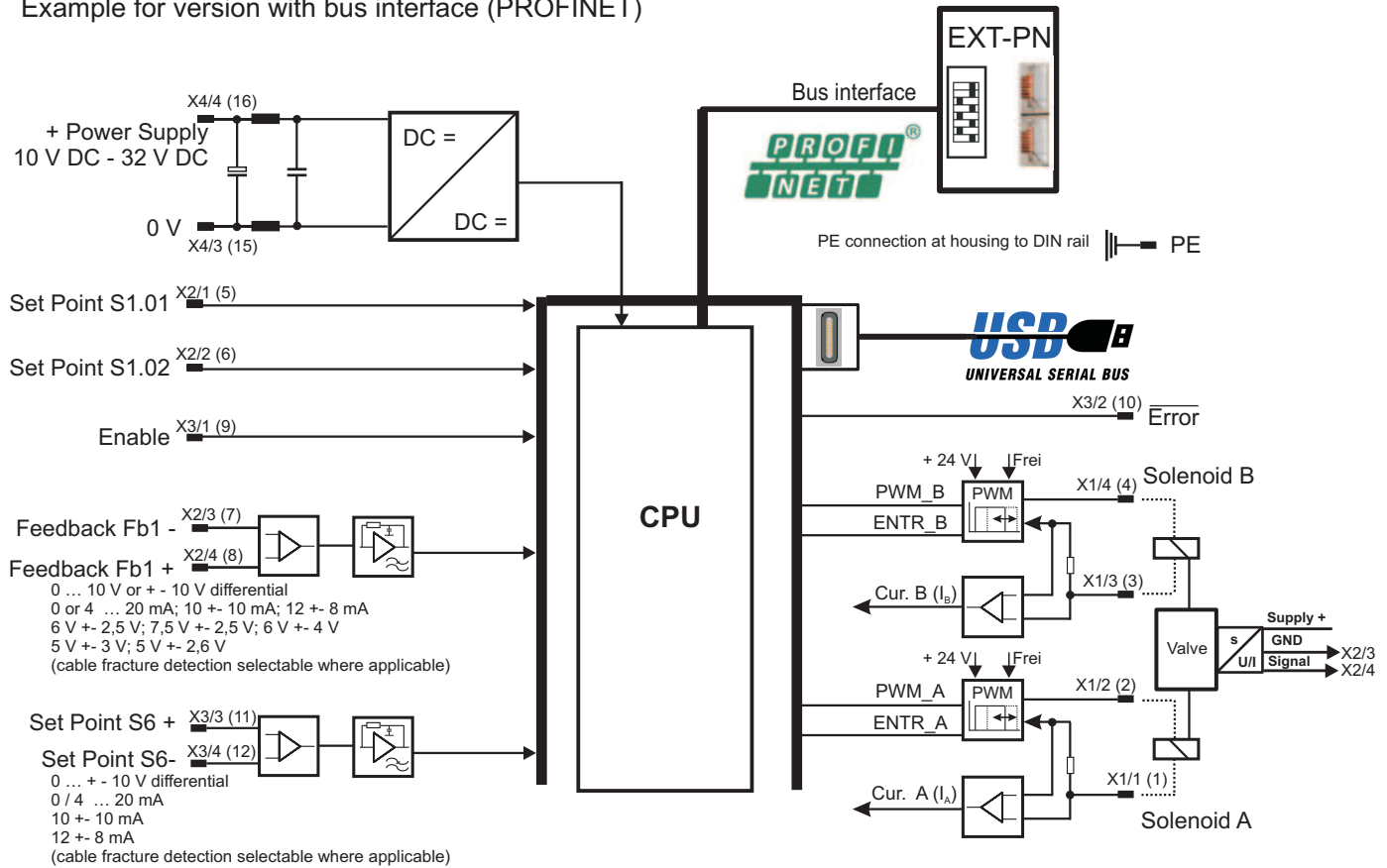
Remark: Numbers in brackets do indicate numbers printed on the connectors

Example Diagram for version: DMA(A)-22-**03**-xxx-SANAout; Operation Mode: **03** with option „Analog Output“
or: DMA(A)-22-**03**-xxx-S10V Ref; Operation Mode: **03** with option „10 V Reference Output“**Attention:**Availability of „S1.01 / S1.02“ depending on version
Please verify connection on the actual modul

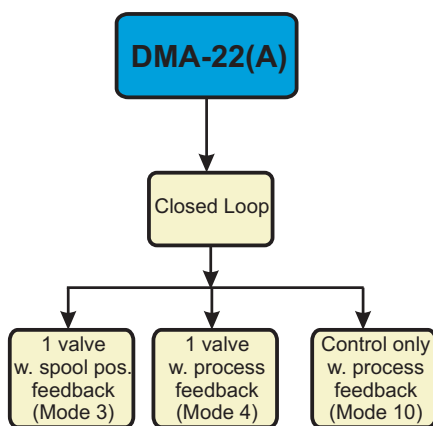
Remark: Numbers in brackets do indicate numbers printed on the connectors

9 Block diagram hardware continued

Diagram for version: DMA(A)-22-**03**-PN-xxx-S0; Operation Mode: **03**
 Example for version with bus interface (PROFINET)

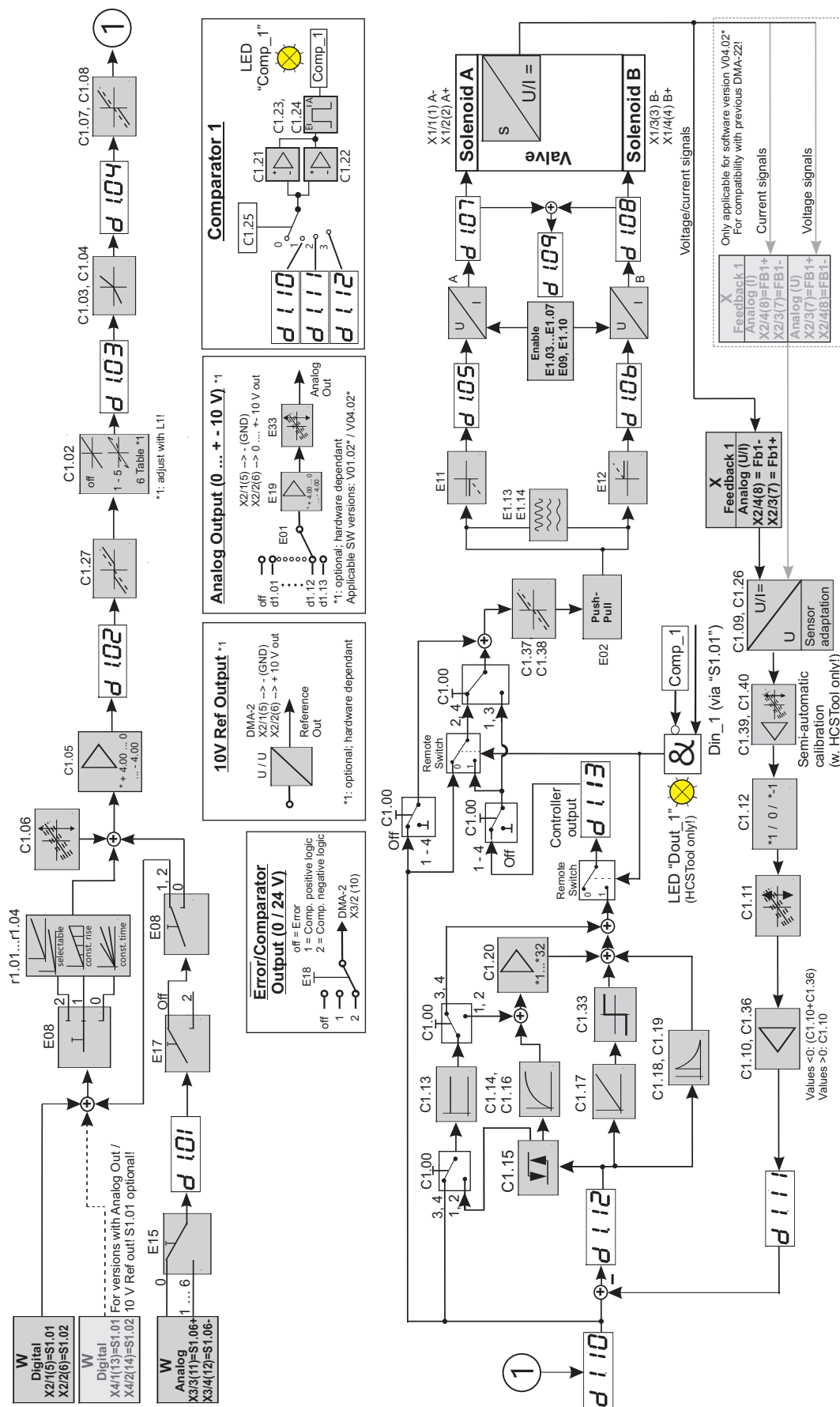


10 Available Operation Modes

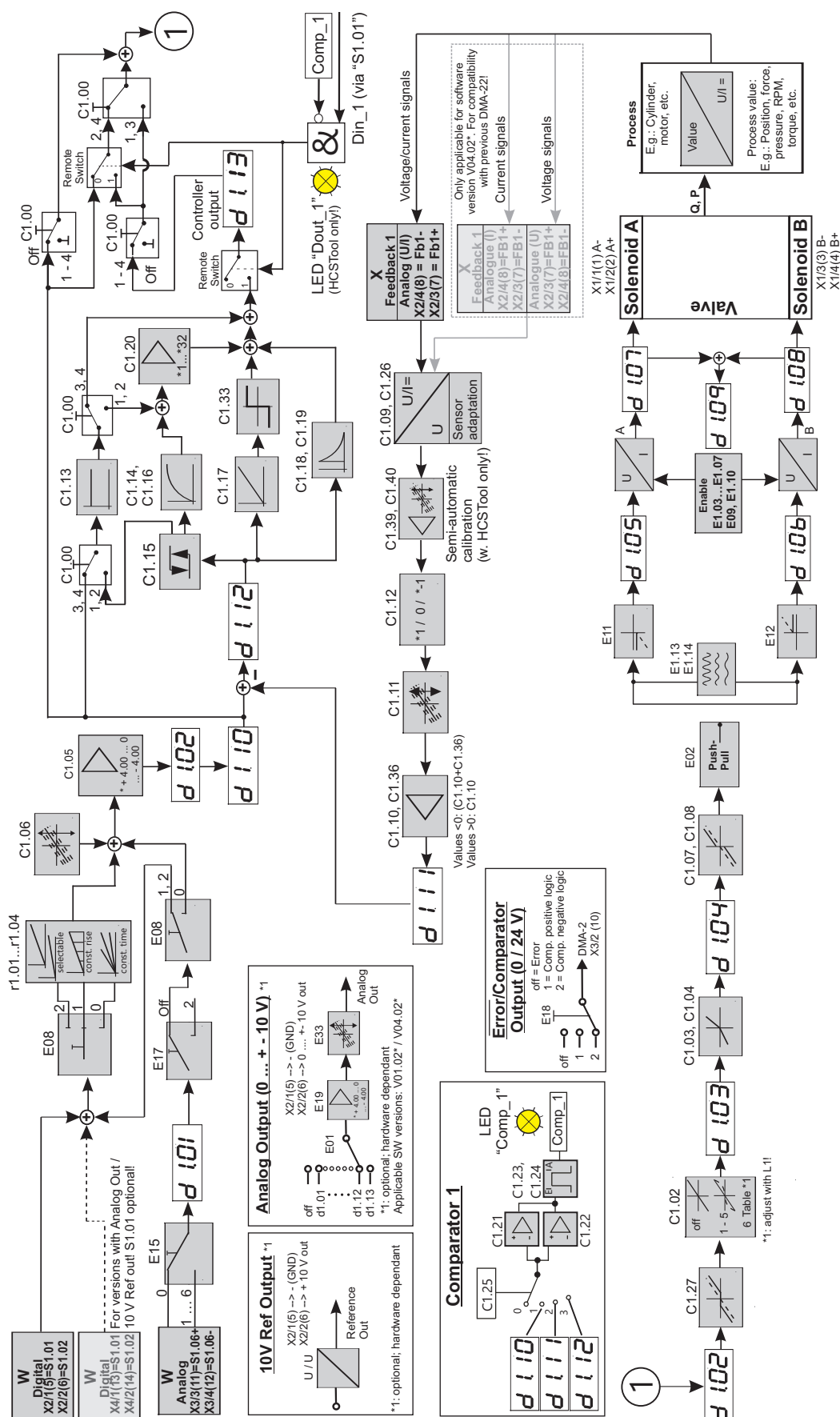


11 Example for Block Diagrams of Software Functions

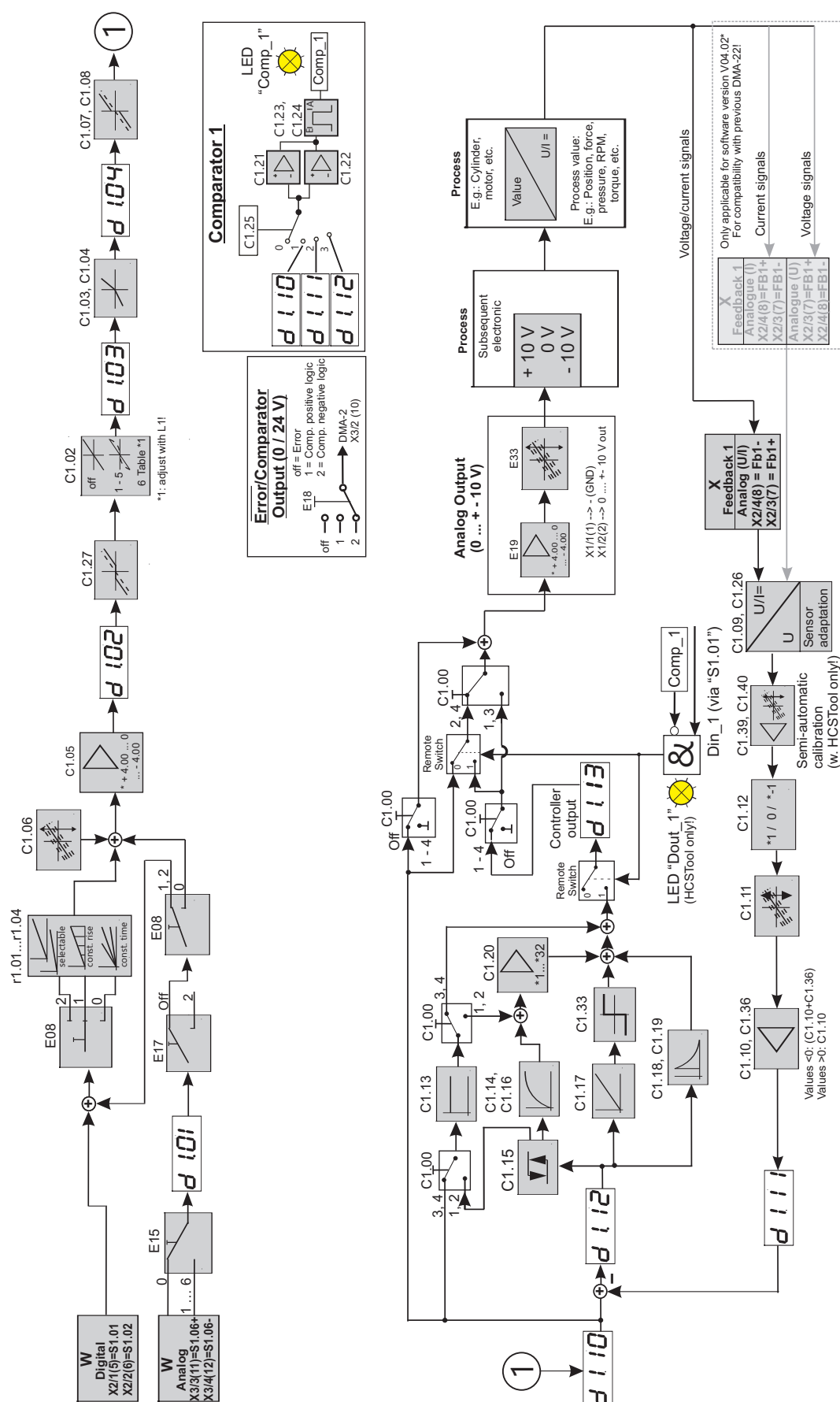
11.1 DMA(A)-22-03-xxx-S0 / Mode: 03 ; 1 valve with 2 solenoids and spool position feedback



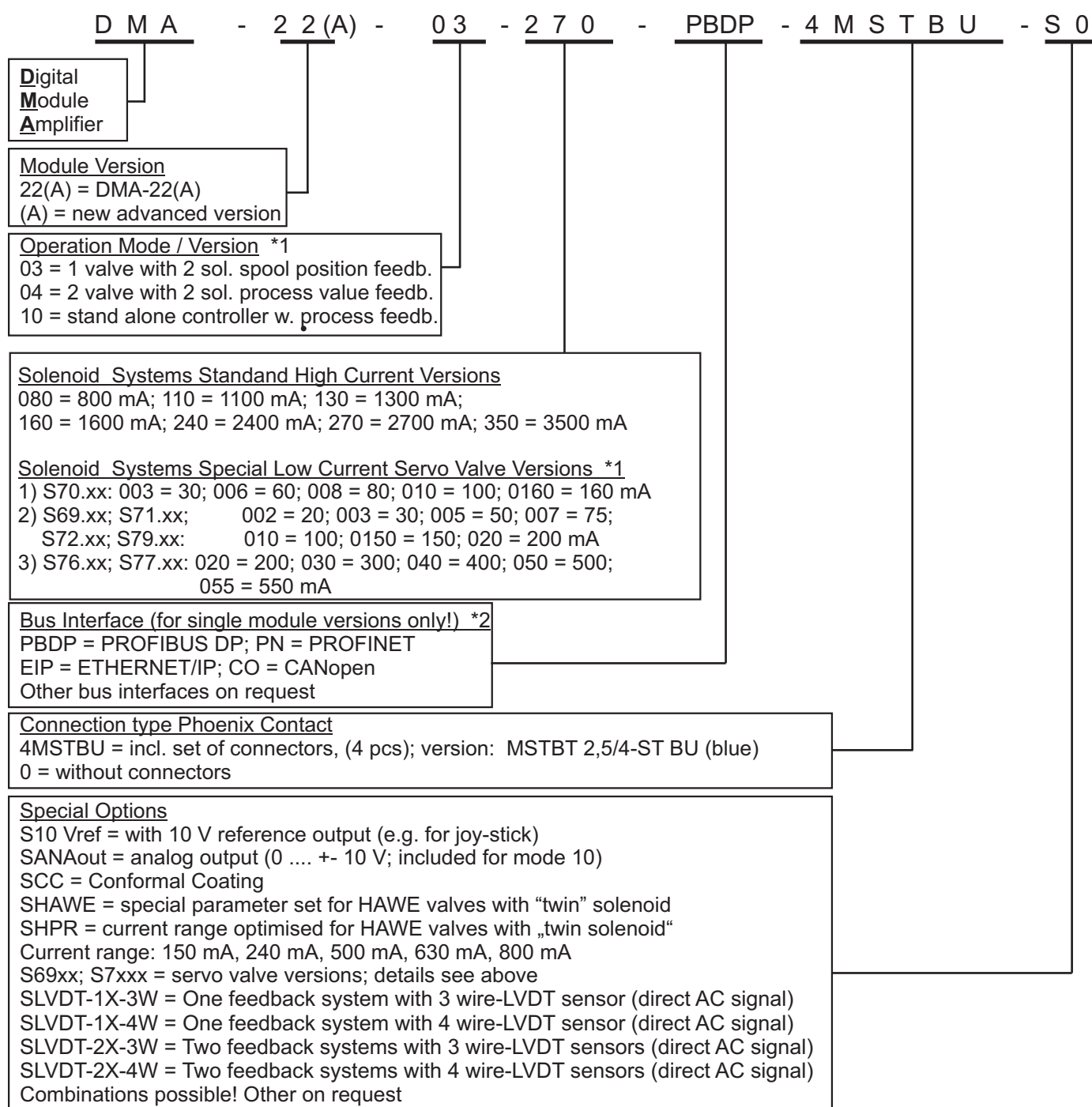
11.2 DMA(A)-22-04-xxx-S0 / Mode: 04 ; 1 valve with 2 solenoids and process value feedback



11.3 DMA(A)-22-10-xxx-S0 / Mode: 10 ; stand alone controller with process feedback



12 Model Code; including single module bus versions (not all combinations available!)



*1: all servo versions @ 50 kHz current controller frequency

Version S70.xx --> analog/linear output stage and SANAout included.

Version S69.xx / S71.xx / S72.xx / S76.xx / S77.xx / S79.xx: PWM output stage; S71.xx / S77.xx / S79.xx: SANAout included

Version S72.xx: for PROFINET applications; S79.xx: for PROFIBUS applications

*2: For versions with bus interfaces following modes on request:

06 = double closed loop, 1 x spool a. 1 x process control loop system, 08 = double closed loop, 2 x valves with process control loop

11 = stand alone controller double closed loop

Important note: for ordering of multi-module bus versions refer to according ordering code on page 13

Ordering code examples:

Version for one valve with 2.7 A solenoid;
operation in mode 3, including connectors
DMA-22(A)-03-270-4MSTBU-S0

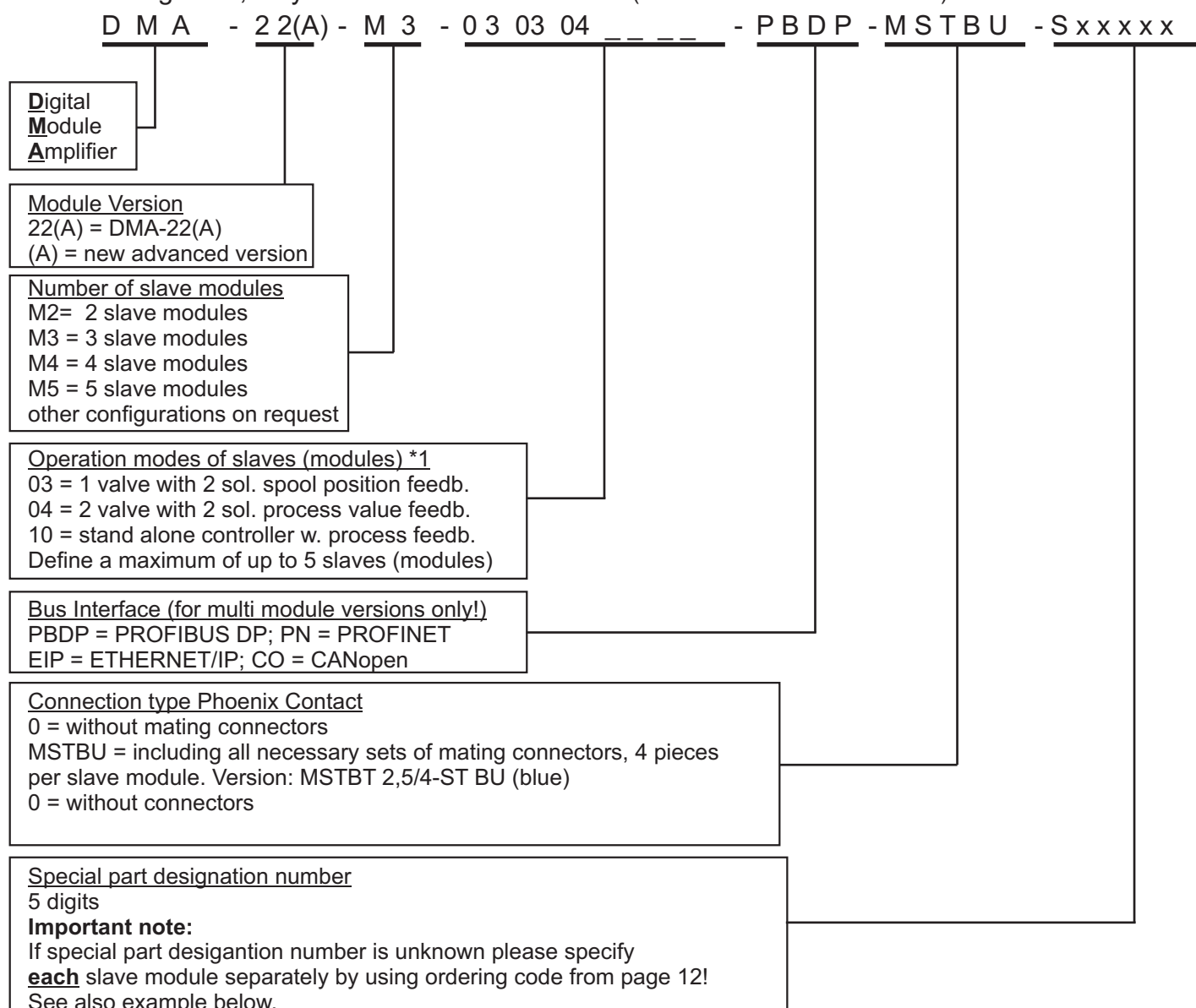
Version with PROFIBUS for process control and 0.8 A
solenoids; operation in mode 4, including connectors
DMA-22(A)-04-080-PBDP-4MSTBU-S0

DMA-22(A)-03/04/10

Version: R04

Data sheet
05.08.2024

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



*1:

For versions with bus interfaces following modes on request:

06 = double closed loop, one spool and one process control loop system

08 = double closed loop, two valves with a process control loop system

11 = stand alone controller double closed loop

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

Ordering code example:

PROFIBUS version with 3 slaves (DMA-22(A) modules). Each of the 3 slaves (modules) is the same version for valves with two coils each with 2.7 A and spool position feedback and including the connectors.

Please specify each of the modules.

DMA-22(A)-M3-030303-PBDP-MSTBU-Sxxxxx containing

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

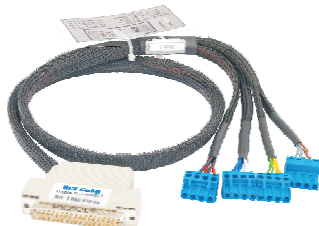
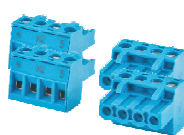
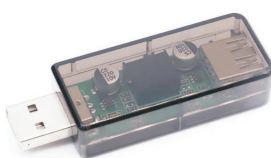
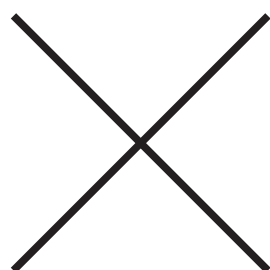
DMA-22(A)-03-270-x-S0 (module in operation mode 3)

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

14 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-2m	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
Galvanically Isolated USB Adapter	Adapter for communication between PC and DMA-22(A) for USB interface with galvanic isolation. Isolation voltage 1,500 V RMS. USB Type-A male to USB Type-A female. Bus-powered, no external supply required.
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	Galvanically Isolated USB Adapter	—
			

15 Our distributors and partners

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

16 Declaration 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(A)-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
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

17 CiA Membership

