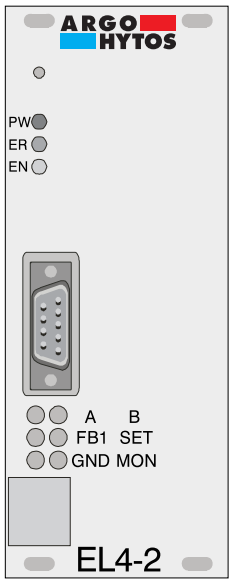
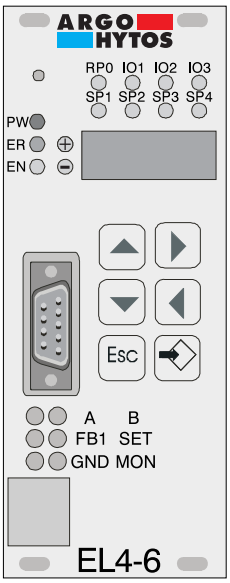
Digital Amplifier and Controller for Proportional Valves

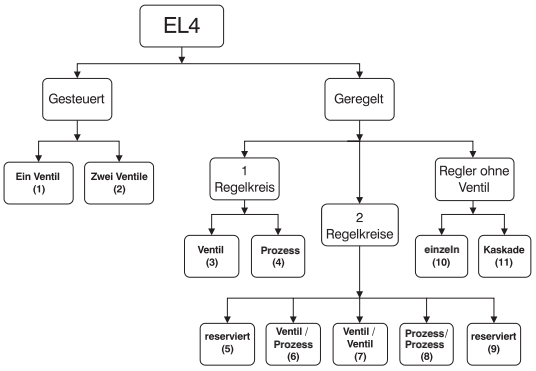
EL4

HA 9140
7/2012

Replaces
HA 9140 4/2004







General Applications

The amplifier card EL4 is used for:

- With or without electrical feedback transducers:
  - proportional directional valves direct and pilot operated
  - proportional flow control valves
  - proportional pressure reducing valves
  - proportional pressure regulating valves
  - cartridge valves
  - servo valves with torque motors

- Controlling of hydraulic motors, installations and systems, e.g.:
  - position
  - speed
  - pressure
  - revolutions per minute
  - torque
  - power etc.

- Volume flow control and pressure control of pumps (if the occasion arrives: limitation in weight, controlling valve spool position)

- Controlling of different process values:
  - P/Q controlling
  - pump controlling
  - controlling of pressures
  - controlling of pilot- and main stage
  - cascade controlling of components etc.

Features

- Fully digitized amplifier and controller with the advantage of:
  - no on-board potentiometer
  - no jumpers settings required
  - digital setting and display of all parameters
  - user safety when programming
  - no potentiometer adjustment for measurement of solenoid current

- Flexible and reliable system:
  - use of a modern 16 Bit µC
  - high power reserve
  - hardware and software extensions available following client's needs (e.g. bus interface, special output stages like H-bridges for servo valves or direct current motors, optional RAM on request)
  - easy software update by use of a Flash-EPROM; adaptations and extensions can be made without change to EPROM (download from PC via RS232)
  - high reliability and safety through the use of a hardware watch-dog and reset module
  - variable settings for magnetic systems and sensor signals making high flexibility possible

- Functional use of the interface (partly still in development):
  - change of selected parameters "on-the-fly" without interference or interrupting the controller
  - analyzation of system performance through selection of display parameters with the PC
  - a monitoring program allows direct access to amplifier with the use of external system controllers (e.g. programmable logic controllers / PLC)
  - in development: accessing different amplifiers from a PC or a controller by addressing them (using option RS485) and sending data from amplifier to amplifier (copy parameter settings)

Ordering Code

EL4- □ **-** □ **-** □ **-S000**

Amplifier card

Board Version

no display	**2**
with display	**6**

Operation mode

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

Specific options

Solenoid type

004	size 04
006	size 06
010	size 10

Technical Data

Parameters	**Range, characteristics**
Supply voltage	DC (12) 18 ... 30 V, residual ripple < 10 %, (12 V on request)
Solenoid systems selection	0.8 A / 1.1A / 1.3 A / 1.6 A / 2.4 A / 2.7 A / 3.5 A (others on request)
Power input	Max. 50 VA
Applicable fuse (quick)	3.15 A
Auxiliary voltage	± 10 V, max. load 10 mA.
Control voltage for external recallable set point	24 V ± 10 %, residual ripple ≤ 10 % current input ≤ 20 mA each
Ambient temperature	32 °F ... 122 °F (0 °C ... 50 °C) (other range on request)
Storage temperature	-4 °F ... 140 °F (- 20 °C ... 60 °C)
Plug connection	DIN 41 612, 48 pol. form F gold plated
EMC	
Protection	Burst on wires as per EN 61000-4-4 HF-Field as per EN 61000-4-3 ESD as per EN 61000-4-2
Emissions	Emissions depending on power as per EN 50011 Radiated emissions as per EN 55011
Dimensions	
Front panel/ PCB	1.988 x 5.055 in. (50.5 x 128.4 mm); 10 TE / 3 HE / 3.937 x 6.299 in. (100 x 160 mm) Euro format

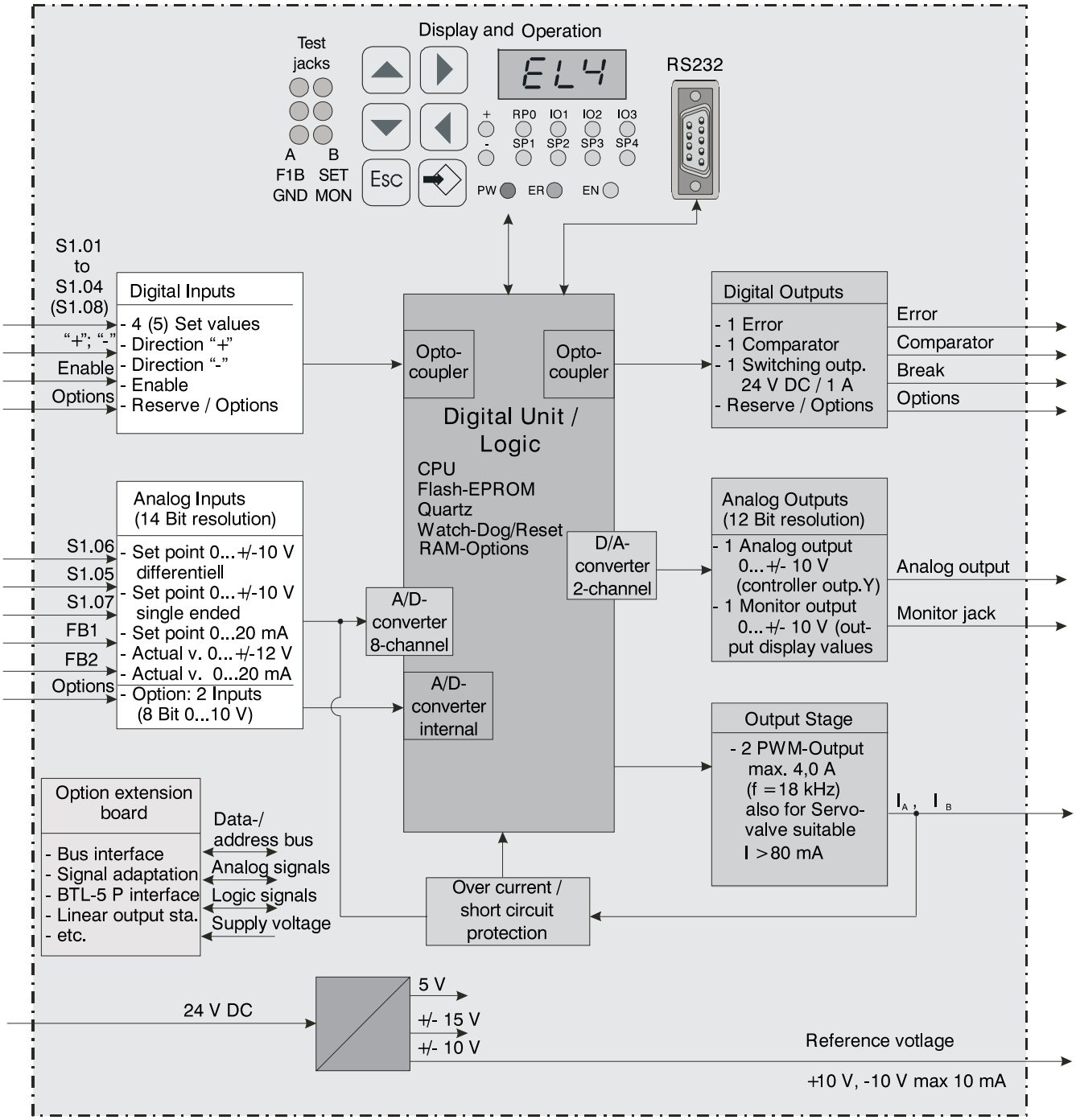
Technical Data

Parameters	Range, characteristics
Input signals	
Analogue set values	1 input, differential 14 Bit resolution, 0 ... ± 10 V 1 input, single ended 14 Bit resolution, 0 ... ± 10 V 1 input, single ended 14 Bit resolution, 0 or 4 ... 20 mA (R = 250 Ohm)
Analogue feedback (sensor input)	1 input, 14 Bit resolution, 0 ... ± 12 V, 0 ... 20 mA / 4 ... 20 mA, Offset: 3 ... 10 V, Gain: ca. 0 ...14 (R=100 Ohm) 1 input, 14 Bit resolution, 0 ... ± 10 V
Digital inputs	8 inputs, voltage level 0 V / 24 V, 10 mA (Set point 1 ... 4, ENABLE, RAMP, SIGN +, SIGN -)
Output signals	
Solenoid current	2 output stages for up to 3.5 A; with over-energization and quick de-energization
Analog output	1 output, 12 Bit resolution, 0 ... ± 10 V; for controlling of subsequent electronic
Monitor output	1 output, 12 Bit resolution, 0 ... ± 10 V; for monitoring of internal values
Digital outputs	2 outputs, voltage level 0 V / 24 V, 10 mA (Error, Comparator)
Test jacks	Solenoid current, sensor 1, set value, Monitor and GND
Auxiliary voltage	± 10 V, max. load 10 mA
Optional I/O signals	3 in or outputs, output level 24 V, input level 5 V or 24 V (5 V level for incremental sensors on request)
Interface	RS232 or RS485 with 9-pol Sub-D connector at front panel; RS485 also at back connector available (RS485 functions in preparation)
Display and operation	
Only at EL4-6	4 digit display, 6 buttons (up, down, left, right, enter and Esc) Status-LED's: PW (Power), ER (Error), EN (Enable), SP1 ... SP4 (S1.01 ... S1.04), RP0 (Ramp = 0), IO1 ... IO3
Only at EL4-2	Status-LED's: PW (Power), ER (Error), EN (Enable)
Frequencies and cycle times	
PWM Frequency	18 kHz
Cycle times	Current controller ca. 0.22 msec, inner closed loop controller ca. 0.22 msec (for valve feedback), external closed loop controller 2 ca. 0.44 msec

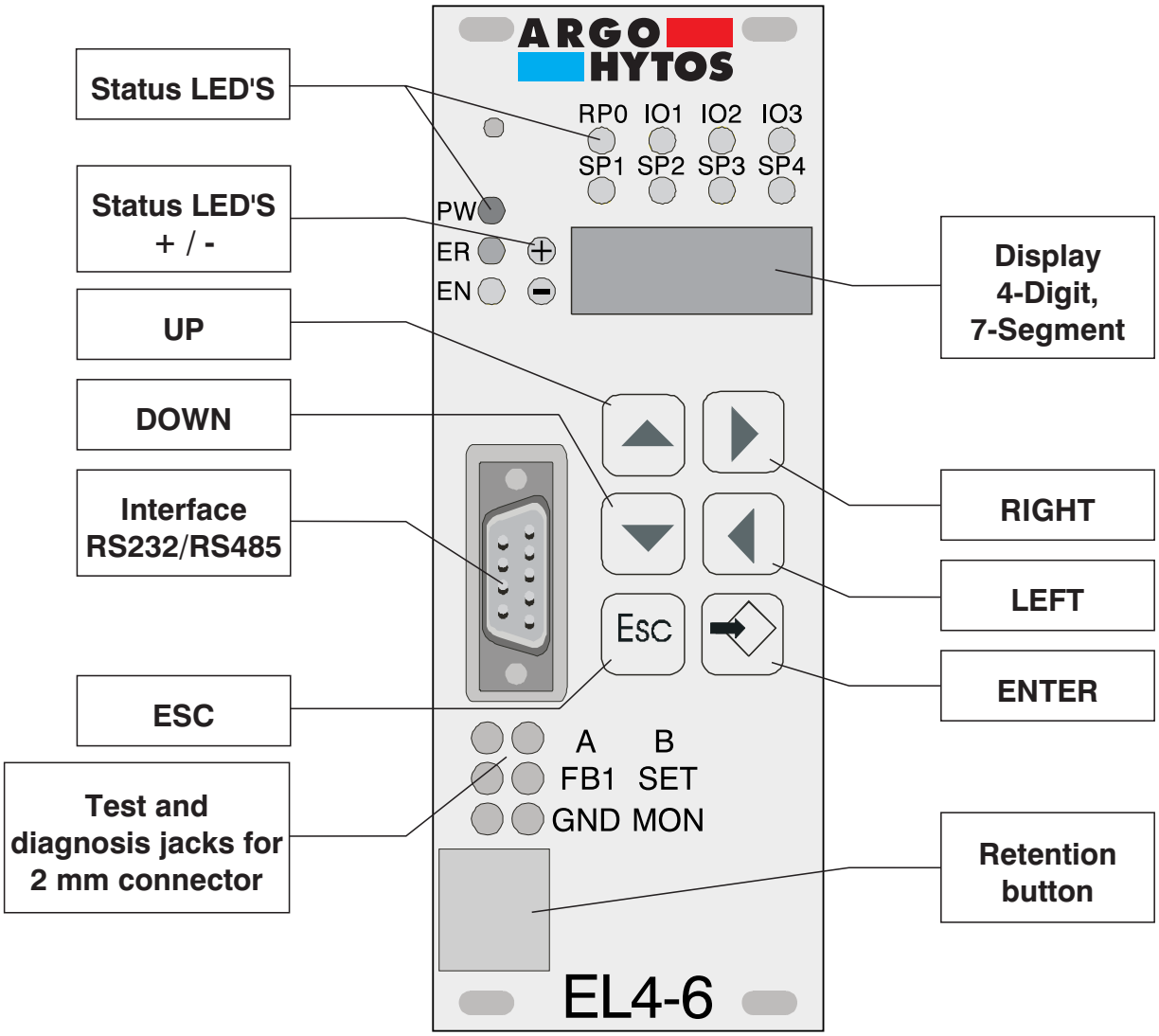
Accessories

Ordering number	Content
23144700	Connecting cable to PC and EL4 - 98.42 in (2.5 m)
23144800	Connecting cable to PC and EL4 - 196.85 in (5 m)
23144600	CD - ROM with software and manual (hd, ha version), connecting cable - 196.85 in (5 m)

Hardware-Block Diagram

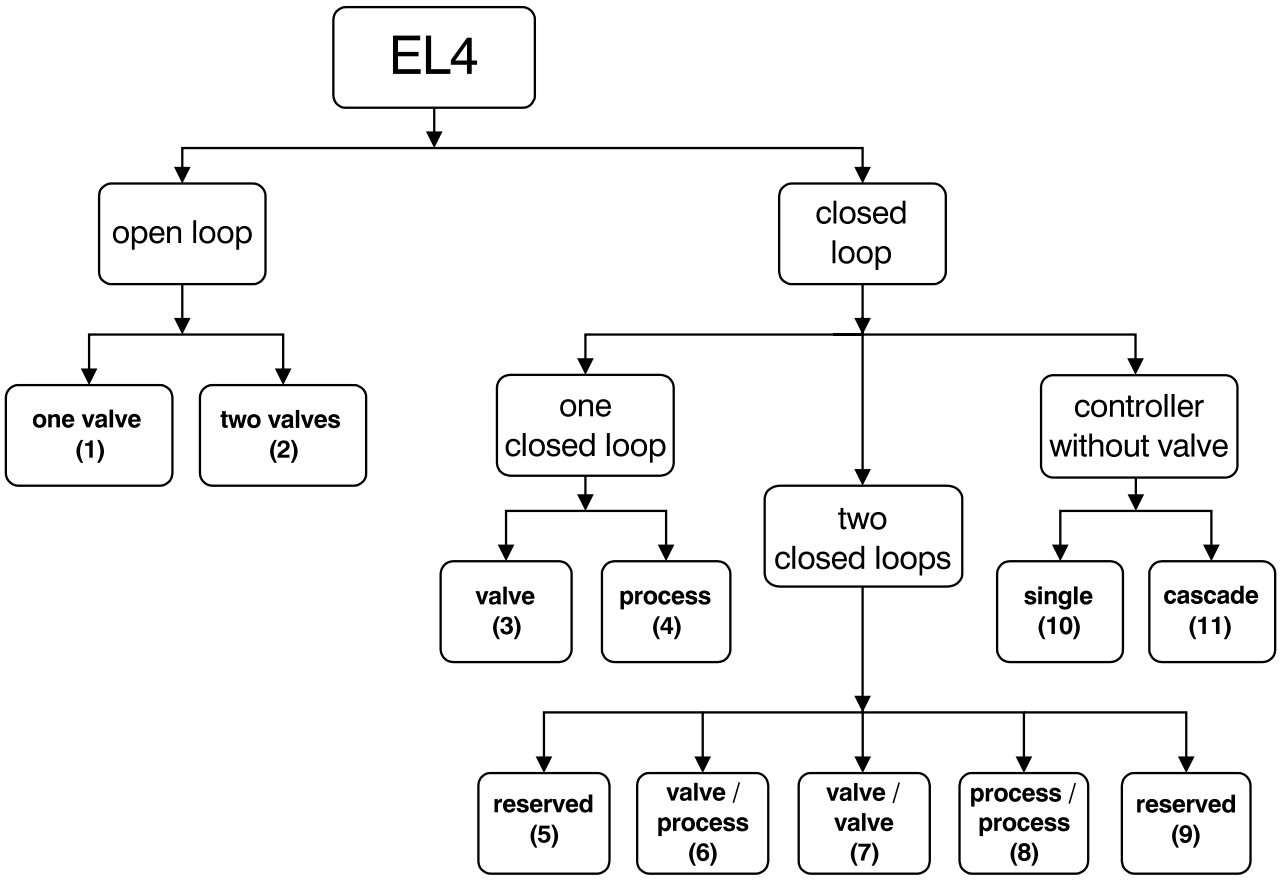


Display and Keypad



Element	Function
Status LED's	display of status and signals at the digital inputs and outputs
Status LED's + / -	display of set point direction through polarity signs for parameters and measured values
Display	4-digit display of parameters and measured values
Buttons UP, DOWN, LEFT, RIGHT, ESC and ENTER	all operating, programming and saving may be performed with the buttons UP, DOWN, LEFT, RIGHT, ESC and ENTER
Serial interface	RS232/RS485 (optional), trough which programming and accessing parameters via PC or communications to machine, or from amplifier to amplifier
Measuring and test jacks	direct measurement of set point, actual value, solenoid currents and internal values via the monitor output. Use 2 mm sockets (S1.06, FB1, A, B, d1.01 ... d2.13)

Diagram of Operation Modes

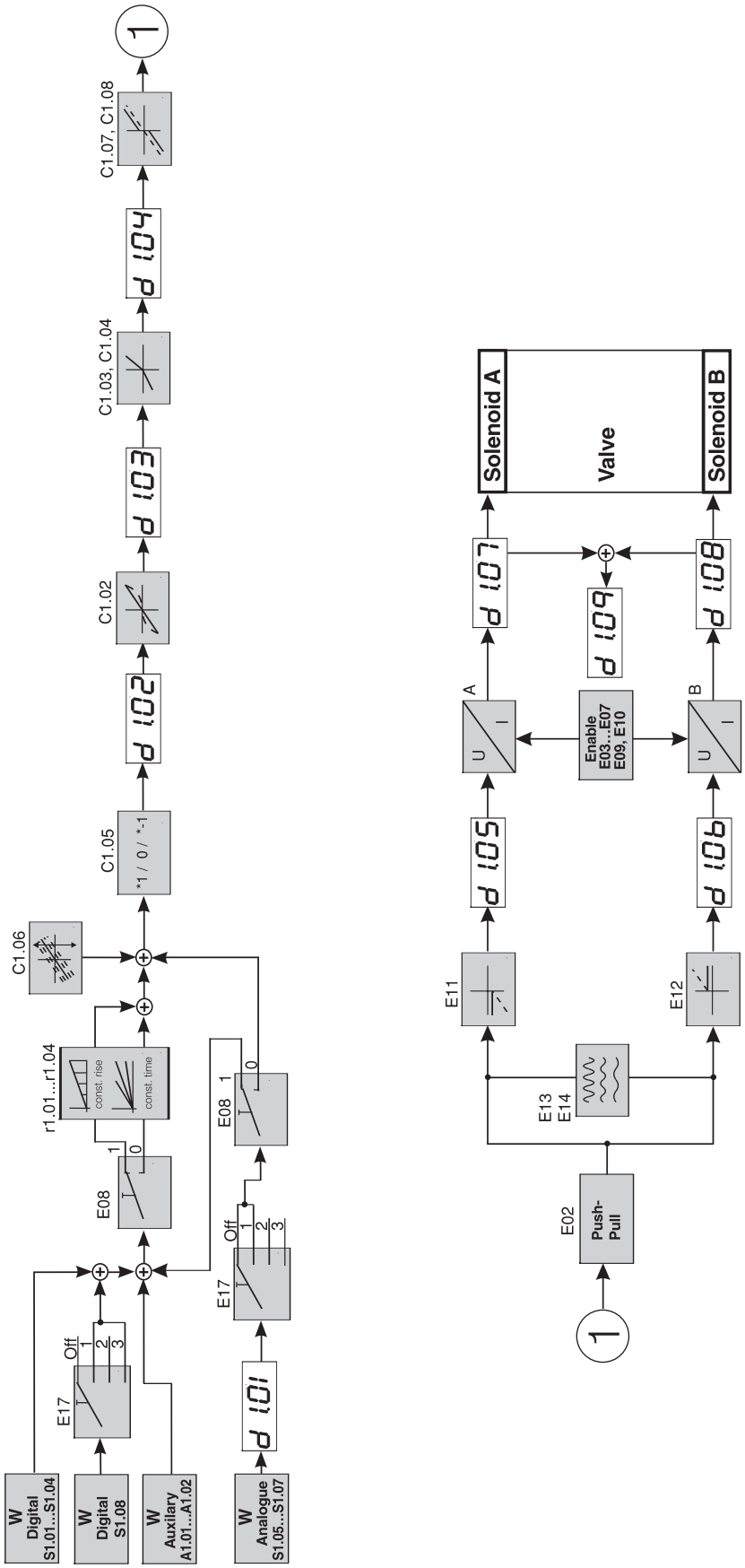


Mode	Description
1	Open loop, 1 proportional valve with 2 solenoids without feedback
2	Open loop, 2 proportional valves with 1 solenoid each without feedback
3	Closed loop valve, single, 1 proportional valve with 2 solenoids and feedback of spool position
4	Closed loop process, single, 1 proportional valve with 2 solenoids and feedback of process value (position, velocity, pressure, force, torque etc.)
5	Reserved
6	Closed loop valve and process, double, 1 proportional valve with 2 solenoids and feedback of spool position and additional feedback of process value (cascaded controller)
7	Closed loop valves, double, 2 independent proportional valve with 1 solenoid each and feedback of spool position of each valve
8	Closed loop processes, double, 2 independent proportional valve with 1 solenoid each and feedback of two independent process values (e.g. two pressure control systems)
9	Reserved
10	Controller function without valve, control of 1 process value; provide set value to follow up electronics (e.g. valve with integrated electronics, frequency converter for AC motor etc.)
11	Controller function without valve, control of 2 process values (cascaded controller, e.g. position and velocity controller); provide set value to follow up electronics (e.g. valve with integrated electronics, frequency converter for AC motor etc.)

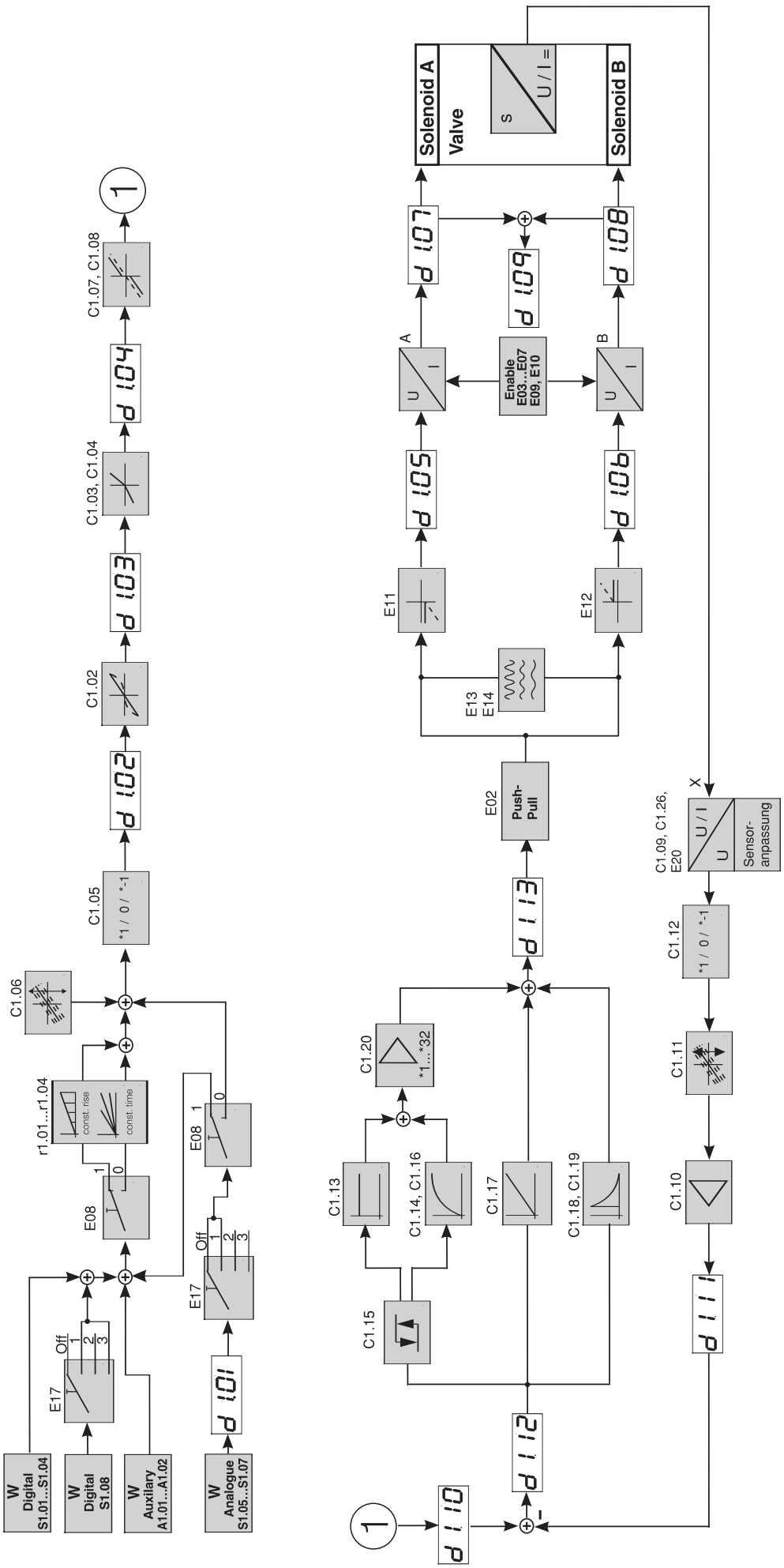
Software Structure Diagrams

Parameter setting	
d *.** : **d**isplay	A *.** : **A**uxiliary
S *.** : **S**et point	C *.** : **C**ontroller
r *.** : **r**amps	E ** : **E**xtended

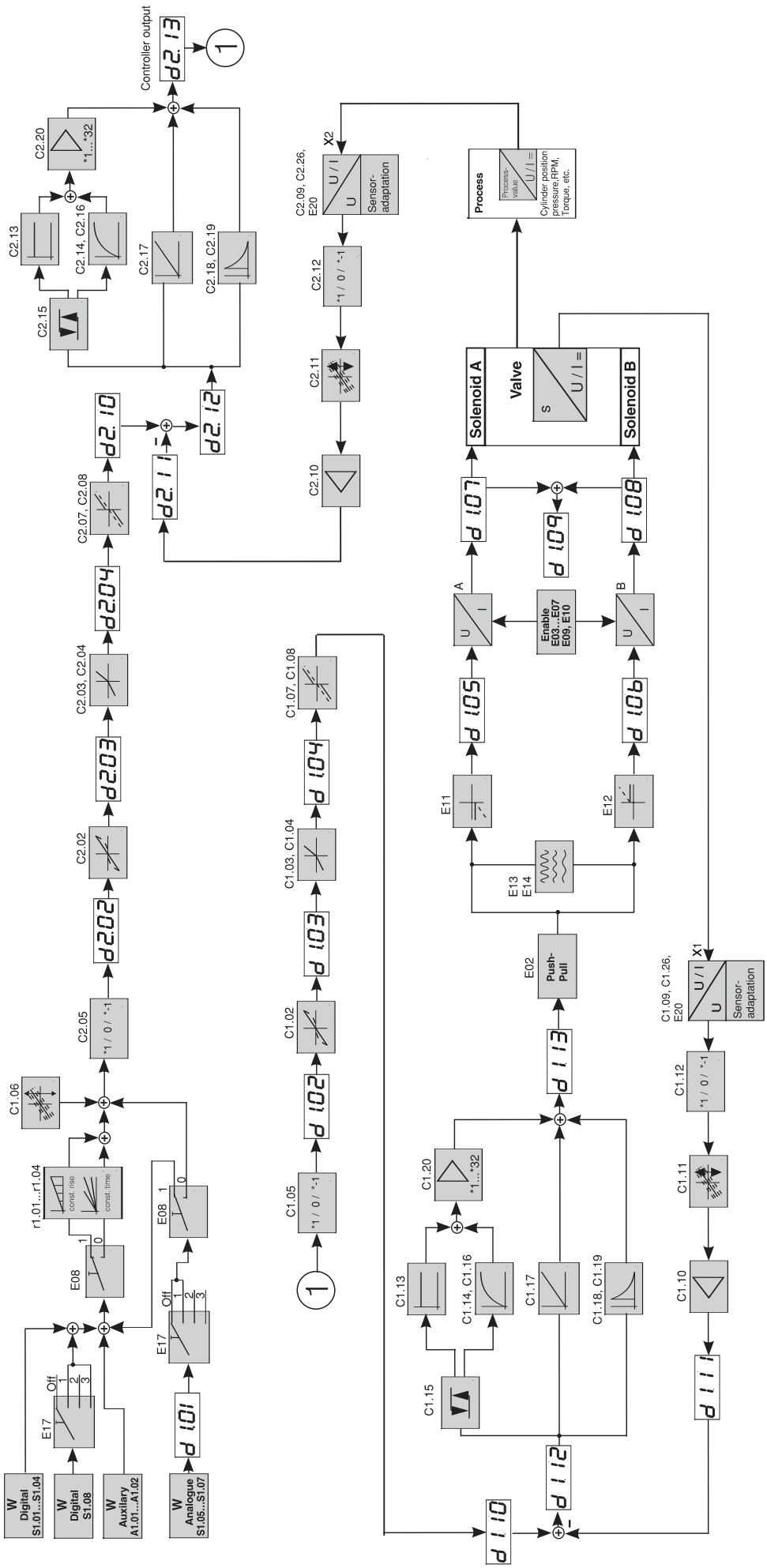
Mode 1; Open Loop, One Valve



Mode 3, Single Closed Loop, Valve Feedback (spool position feedback)



Mode 6, Double Closed Loop, One Spool and One Process Control Loop System



Caution!

- The packing foil is recyclable.
- The technical information regarding the product presented in this catalogue is for descriptive purposes only. It should not be construed in any case as a guaranteed representation of the product properties in the sense of the law.

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