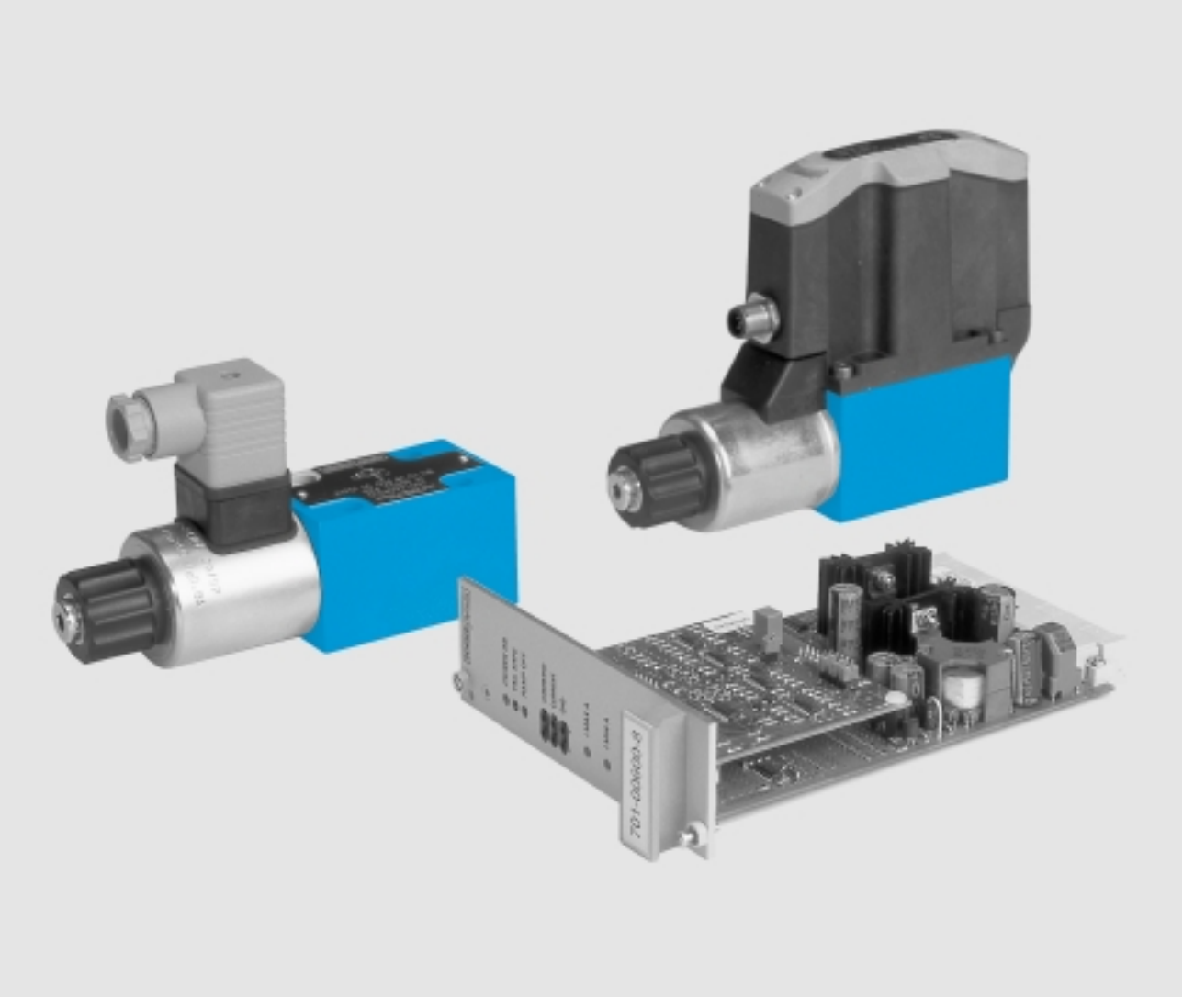
DENISON HYDRAULICS
Proportional Pressure Control Valves

Series 4VP01 – Cetop 03



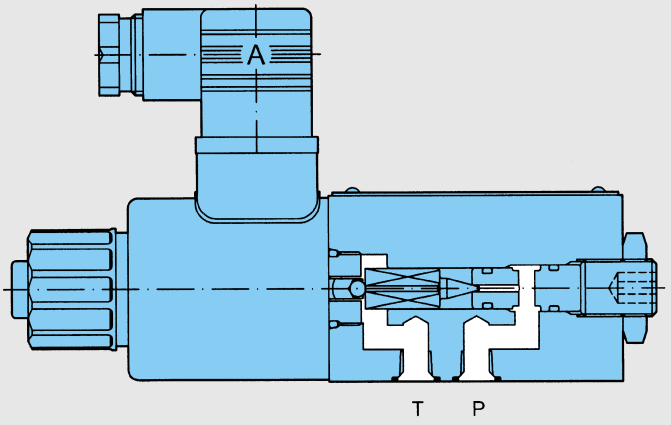
Publ. 3-EN 2200-B, replaces 3-EN 2200-A

DENISON Hydraulics

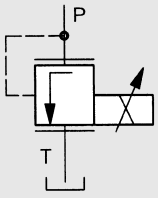
FEATURES

- Direct operated pressure relief valve for flow up-to max. 5 l/min.
- Operation by proportional solenoid.
- Low hysteresis ± 1.5 %.
- Four pressure ranges 50 / 105 / 210 or 350 bar available.
- Valve with Subplate configuration conform to ISO 4401.
- Amplifier EC01 available as rack mount board 3U, conforming to IEC 297.

4VP01



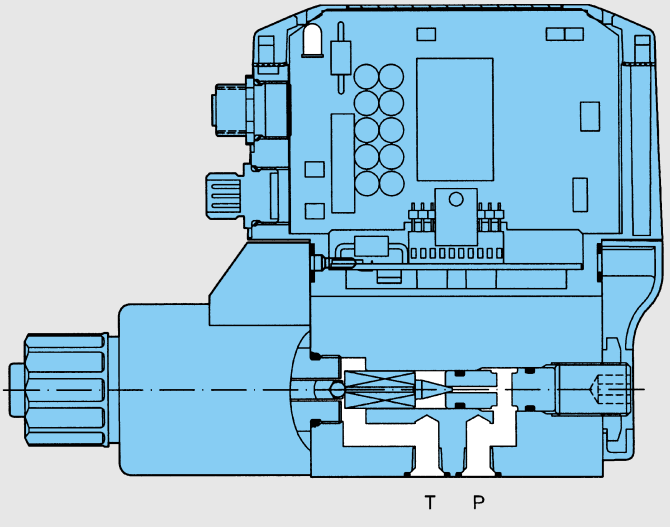
SYMBOL



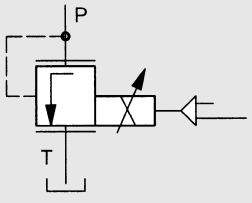
Option with integrated electronics:

- Linearised command-pressure characteristics.
- Integrated electronics (on-board) with three colour diagnostic LED.
- Factory-set and sealed.
  High grade of reproducibility from valve to valve (≤ 1 %).
- Response time adjustable by integrated ramp time generators.

4VP01 with integrated electronics



SYMBOL



DESCRIPTION

Pressure relief valves of the series 4VP01 are direct operated by proportional solenoids. They can be applied as direct acting control valve for electrical remote functions and so also as pilot valve for larger sizes of pressure relief valve systems (e. g. DIN cartridges).
The valve consists of essential parts as body with the ports P and T, seat, cone and proportional solenoid. The electrical input to the solenoid produces a corresponding holding force on the valve cone. If the pressure in the working port exceeds the holding force, the proportional cone is lifted from its seat, releasing flow to tank. This maintains the pressure in the working port proportional to the electrical input to the solenoid.
In case the given command signal to the valve is reduced to null, a minimum setting pressure can be reached, see also page 5.
The drain port T should be connected to a pressureless tank line with low pressure variation.

INTEGRATED ELECTRONICS

This valve series consists also of an amplifier-module located on top of the body. The integrated electronics are factory-set and sealed to ensure high grade of reproducibility from valve to valve. The response time of the valve is separately adjustable for pressure-rise and -fall. By selection of a second connector the integrated electronics optionally offer the functions “stop/fail-safe” and “ramps on/off” (see also page 12 and 13).

Model Number: **4VP01** . . ... **B** . .. ...

[1] [2] [3] [4] [5] [6] [7] [8]

[1] **Series**

[2] **Pressure Range**
1 = 50 bar
2 = 105 bar
3 = 210 bar
5 = 350 bar

[3] **Orifice in P** (optional)
0 = without orifice (standard)
1 = 0.6 mm dia.
2 = 0.8 mm dia.
3 = 1.0 mm dia.
4 = 1.2 mm dia.

[4] **Electrical Data**

with integrated electronics:	without integrated electronics:
4MA = 4...20 mA	G12 = 12 VDC
10V = 0...10 V	

[5] **Design Letter**

[6] **Seal Class**
1 = NBR-seals (standard)
4 = EPDM-seals
5 = FPM-seals (Viton®)

[7] **Electrical Connection**
w/o code = solenoid connector not supplied
C1 = with plug-in connector PG 11 for 12 V DC
CA = one connector-socket M12 (standard) for integrated electronics
CB = two connector-sockets M12 (second connector for external emergency stop and ramp on/off function)
(Plug-in connectors must be ordered separately, see page 13)

[8] **Modification**

GENERAL

• Type of unit	Proportional pressure relief valve, direct operated
• Design	Seat valve
• Type of mounting	Subplate mounting
• Mounting position	Horizontal mounting preferred, or vertical with the solenoid at underside
• Direction of flow	P → T
• Ambient temperature range	– 20 . . . + 50 °C

HYDRAULIC CHARACTERISTICS

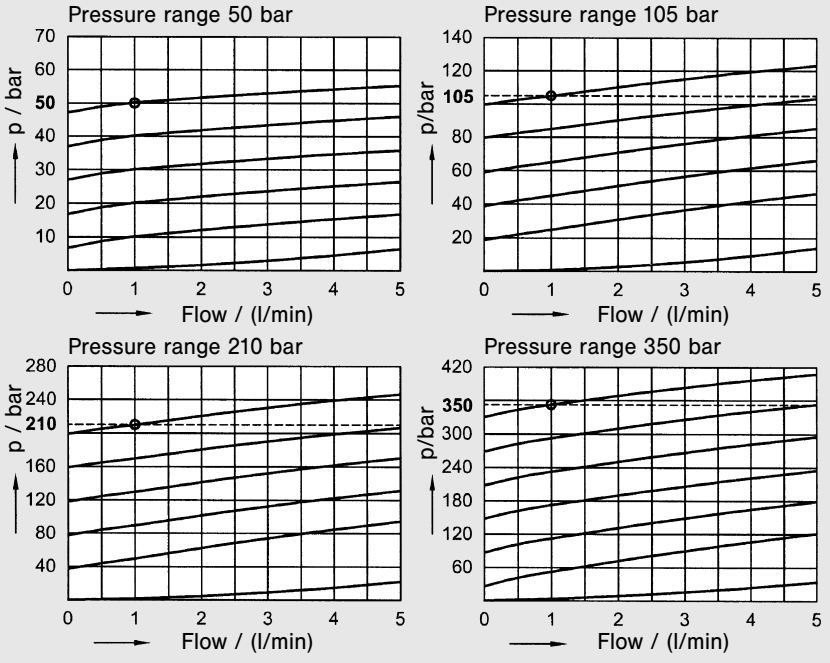
• Operating pressure	
– min.	see curves on page 5
– max.	350 / 210 / 105 / 50 bar
– on port T	30 bar max.
• Max. flow	
– w/o integrated electronics	5 l/min
– integrated electronics	5 l/min (optimum linearisation up to 3 l/min)
• Linearity	2.8 %
• Hysteresis	± 1.5 %
• Fluid	Mineral oil conform to DIN 51524/25 (other fluids on request)
• Contamination level	Fluid must be cleaned before and continuously during operation by filters that maintain a cleanliness level of NAS 1638 Class 8 (Class 9 for 15 Micron and smaller). This approximately corresponds to ISO 17/14. Better cleanliness levels will siginificantly extend the life of the components. As contaminant entrainment and contaminant generation may vary with each application, each must be analysed to determine proper filtration to maintain the required cleanliness level.
• Recommended filtration	20 µm or better
• Fluid temperature	– 20 . . . + 80 °C
• Fluid viscosity	10 . . . 650 cSt; optimal 30 cSt

ELECTRIC CHARACTERISTICS

	w/o integrated electronics	integrated electronics
• Max. coil temperature (temperature class H)	+ 180 °C	
• Type of protection (DIN 40050)	IP 65	
• Relative operating period	100 %	
• Supply voltage (DC)	24 V	
• Min. current	300 mA	Factory-set
• Max. current	2400 mA	”
• Dither frequency	270 Hz (recommended)	”
• Dither amplitude	120 mA (recommended)	”
• Coil resistance	4 Ω	
• Ramp time		Up to 10 s

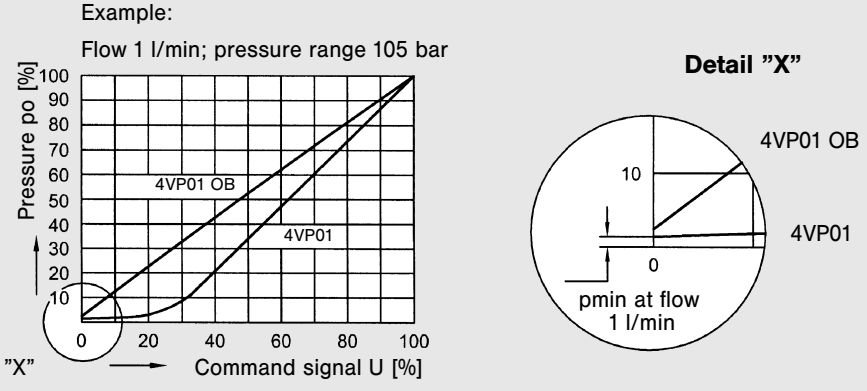
p-Q-CURVES

Operating pressure is factory set at flow 1 l/min.



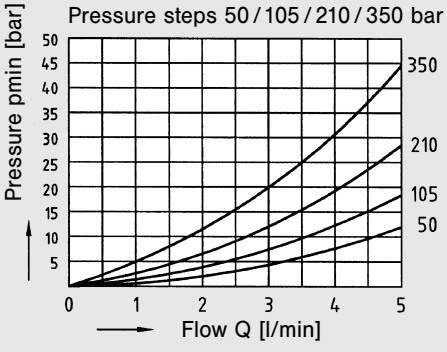
p-U-CURVES

4VP01 (w/o integrated electronics)
4VP01 OB (integrated electronics)

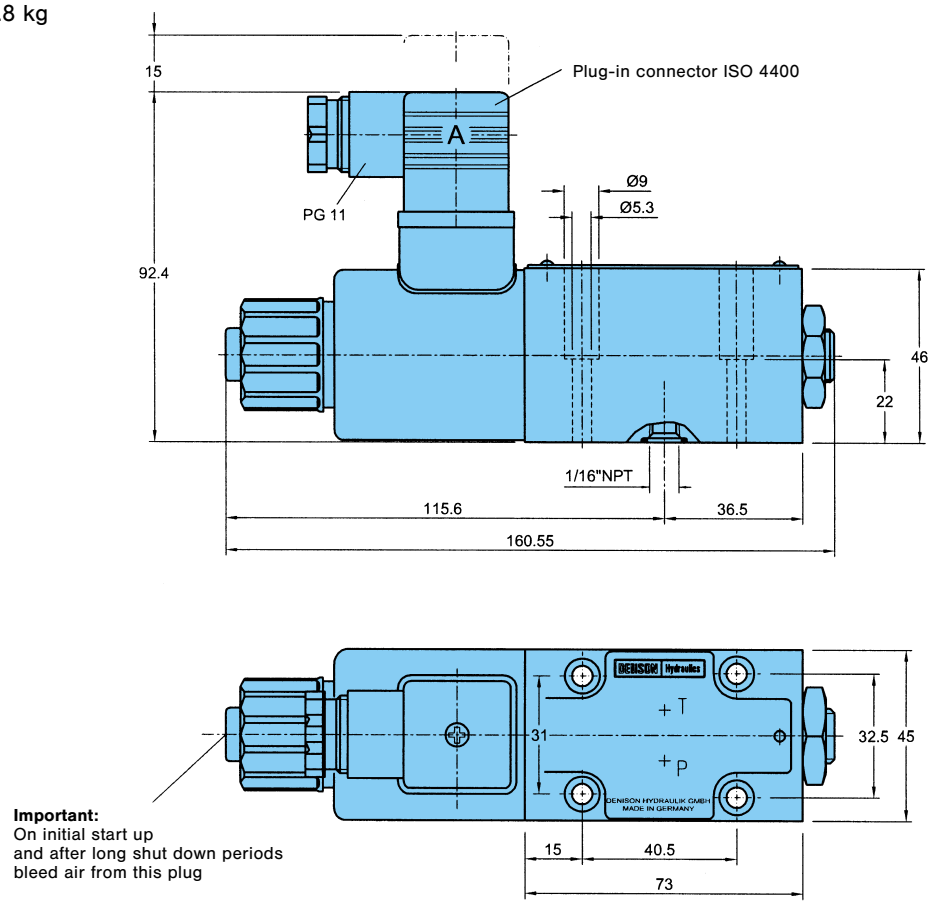


pmin-CURVES

The lowest pmin value can be achieved with the version w/o integrated electronics.

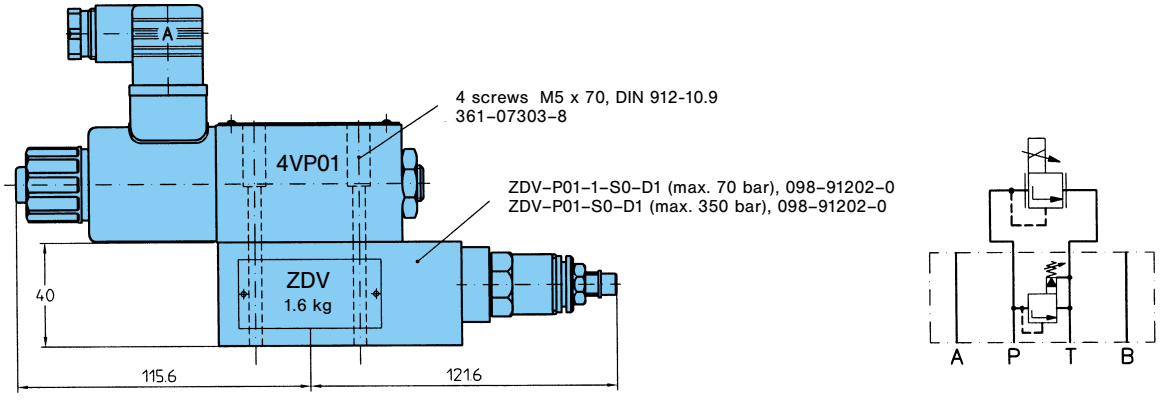


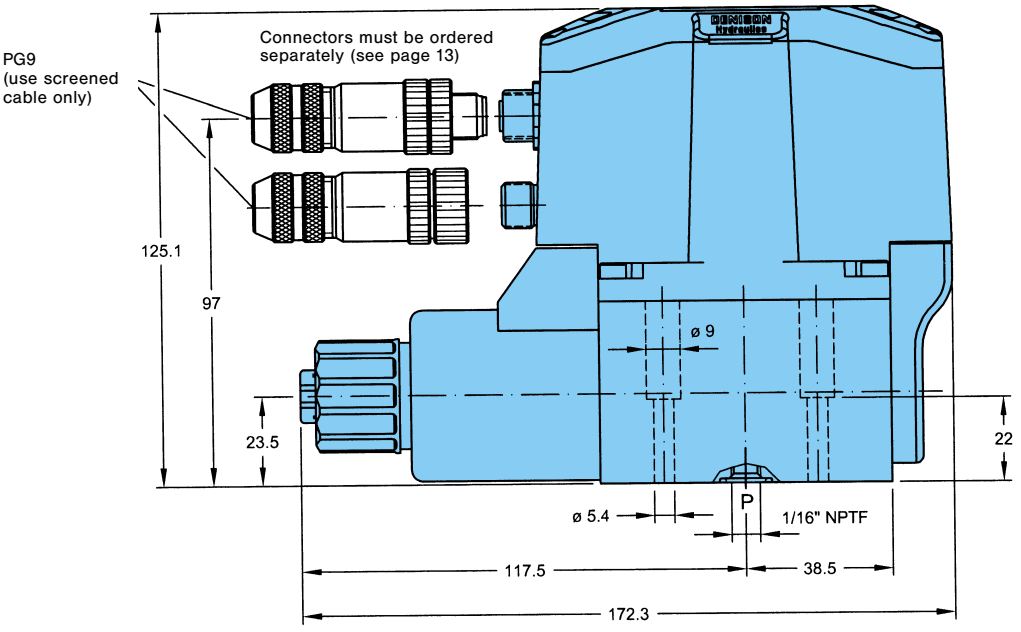
Weight: 1.8 kg



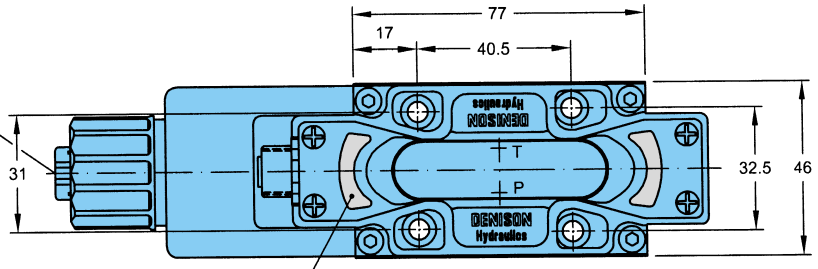
Important:
On initial start up
and after long shut down periods
bleed air from this plug

In Combination with max. pressure adjustment ZDV-P01 (to be ordered separately):



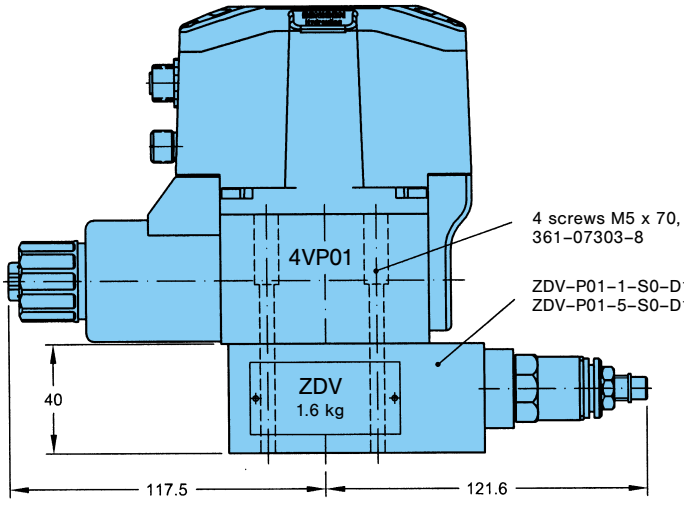


Important:
On initial start up
and after long shut down periods
bleed air from this plug



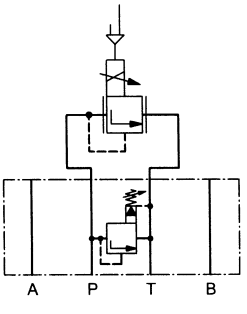
Three colour diagnostic light
(details see page 12)

In Combination with max. pressure adjustment ZDV–P01 (to be ordered separately):



4 screws M5 x 70, DIN 912-10.9
361–07303–8

ZDV–P01–1–S0–D1 (max. 70 bar), 098–91201–0
ZDV–P01–5–S0–D1 (max. 350 bar), 098–91202–0



Order No.: 701–00600–8
Weight: 0.25 kg

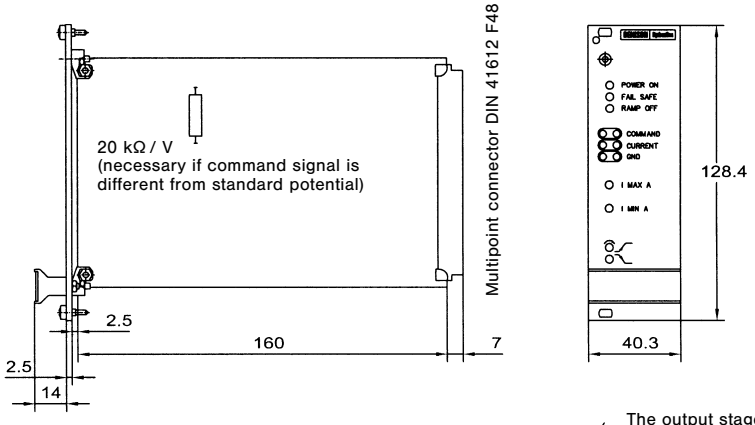
This proportional amplifier is designed to control directly operated pressure valves. It proportionally converts electrical input signals into solenoid current.
This amplifier has reverse polarity protection and one short circuit protected PWM-output stage with max. current limit.
The command signal is always connected to the same input line. The different command signals are set by DIP-switches on the main board. Potentiometers are available for the adjustment of ramp circuits up/down (independently from each other), max. pressure (Imax) and min. pressure (Imin).
By changing the input signal from 0...2 % of max. command signal, the amplifier passes over to the "Imin-leap"-function.
There are diagnostic LED's to display the working condition (POWER ON), ramp function (RAMP OFF) and "FAIL SAFE" in case of short circuit or external STOP of the card. Two measuring sockets are provided to measure either the nominal solenoid current or the command voltage.

Characteristics – Proportional Amplifiers

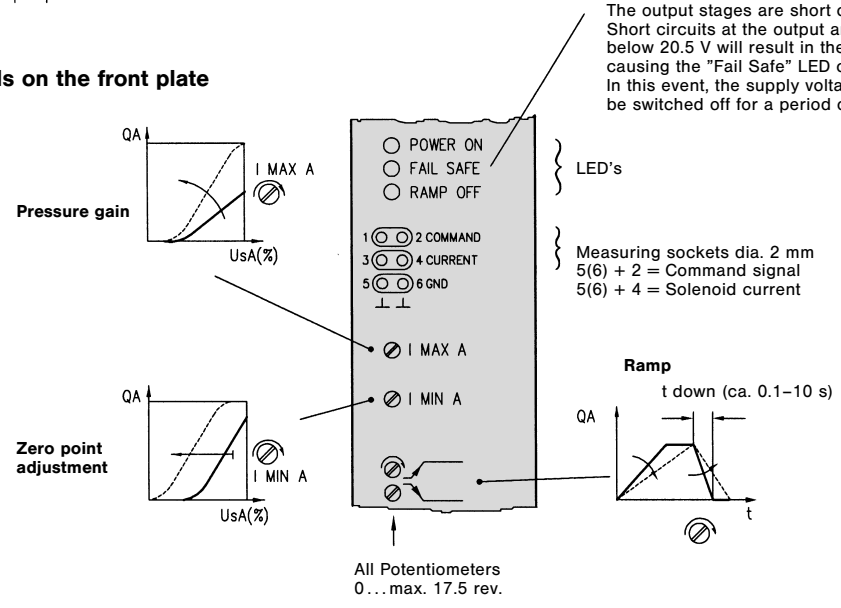
• Supply voltage	
– nominal	24 V DC
– smoothed battery voltage	20...32 V DC
• Reference voltage	± 15 V / 25 mA ± 5 %
	± 10 V / 10 mA ± 0.5 % stabilised
• Solenoid nominal current	Imax = 2.3 A
• Current consumption max.	
– 12 V solenoid	approx. 2.5 A
• Short circuit protection	for solenoid
• Inputs	1. 0 . . . 20 mA, 100 Ω input impedance
	2. 4 . . . 20 mA, 100 Ω input impedance
	3. 0 . . . 5 V, 50 kΩ input impedance
	4. 0 . . . 10 V, 100 kΩ input impedance
• Outputs	+ = solenoid A
• External stop	illuminates on "Fail Safe", implement as NC (normally closed circuit)
	connection with an input voltage of 24 V; input impedance 3.3 kΩ
• Ramp off	illuminates when "Ramp off", implement as NO (normally open circuit)
	connection with an input voltage of 24 V; input impedance 3.3 kΩ
• Potentiometer for	
– max. pressure (Imax)	... 2.3 A
– min. pressure (Imin)	0 . . . 50 % of Imax; 20 % factory set
– ramp up	0.1 . . . 10 s ± 20 % ≙ 1 . . . 100 V/s
– ramp down	0.1 . . . 10 s ± 20 % ≙ 1 . . . 100 V/s
• PWM-frequency	6.2 kHz ± 20 %
• Dither frequency	270 Hz
• Measuring socket	
– solenoid current	1 V ≙ 1 A ± 5 %
– command voltage	approx. 0 . . . 10 V at 100 % command signal (depends on Imax-adjustment)

Note:
Power supply, Potentiometer, Card holder see page 14.
See publication 9–EN 6010 for further detail information on Proportional Amplifier 701–00600–8.

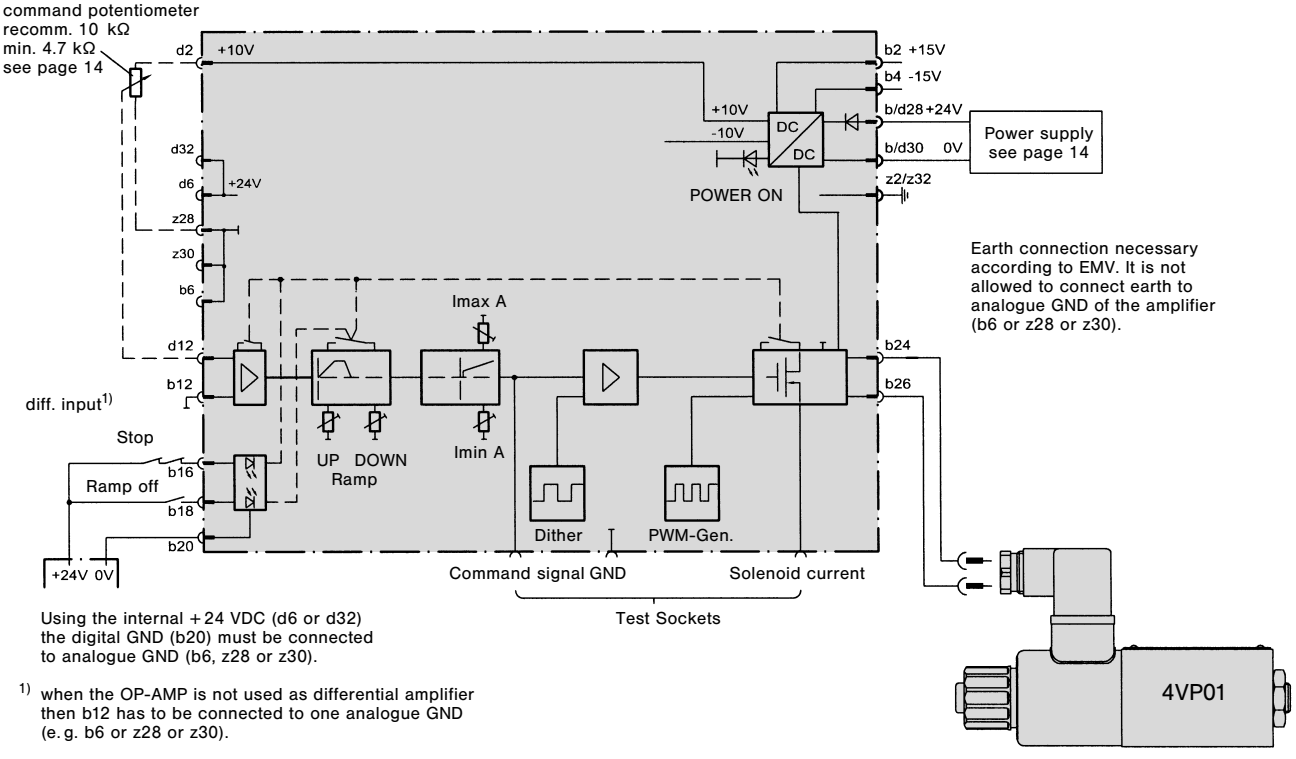
Dimensions Plug-in module 3U/8HP according to IEC 297



Details on the front plate



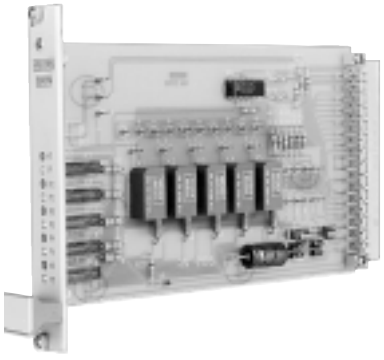
Schematic block diagram and terminal assignment



Using the internal +24 VDC (d6 or d32) the digital GND (b20) must be connected to analogue GND (b6, z28 or z30).

1) when the OP-AMP is not used as differential amplifier then b12 has to be connected to one analogue GND (e.g. b6 or z28 or z30).

Order No.: 701–00028–8
Weight: 0.15 kg



This command card is designed to interface with all proportional amplifiers for DENISON proportional valves.
Five multiturn-potentiometers (P1...P5) allow different command signals. Selection is made by external energizing of the five selector relays on the command card. By moving the soldered bridges (+/–) it is possible to preset positive or negative commands for the desired level and direction.
In addition, the command card has a summing amplifier which enables the monitoring of the internal commands (soldered bridges 1...5), or additional external resistor array.
These inputs (e.g. a 4) also make it possible to cascade further command cards if required.
The output signal to the servo amplifier is available "not inverted" (a 2) and "inverted" (c 2).
The command card has a power rectifier with a 24 V DC output (input 24 V AC). Via the output c 30/32, the command relays can be energized.
All potentiometers are adjustable on the front panel.
The operating status of the corresponding command is indicated by an LED display on the front panel (K1...K5).
LED on = Command level selected.

Characteristics – Command Card

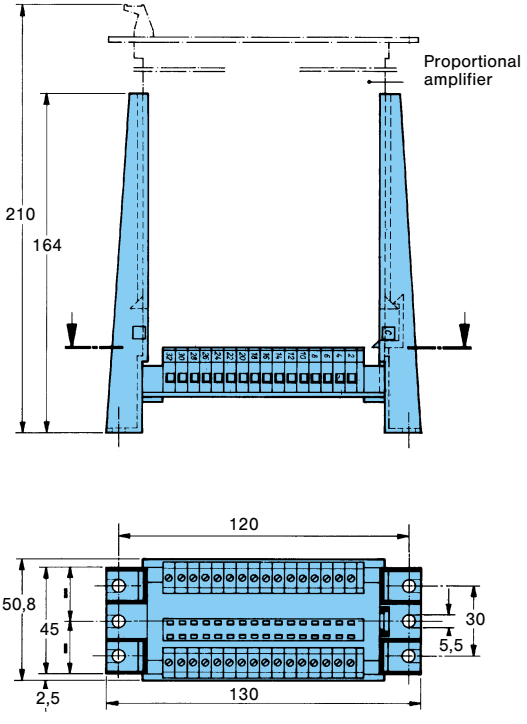
• Supply voltage:	
– command card	supply from proportional amplifier
– rectifier	24 V AC (min. 19 V AC)
• Command potentiometer	5 potentiometers 0 . . . 10 V
• Command relays	5 potential free contacts
• Relay contacts:	
– max. current on contact (resistive load)	100 mA
– max. switching voltage	30 V
– coil voltage	24 V DC, approx. 30 mA incl. LED-display

Euro-Card-Holder

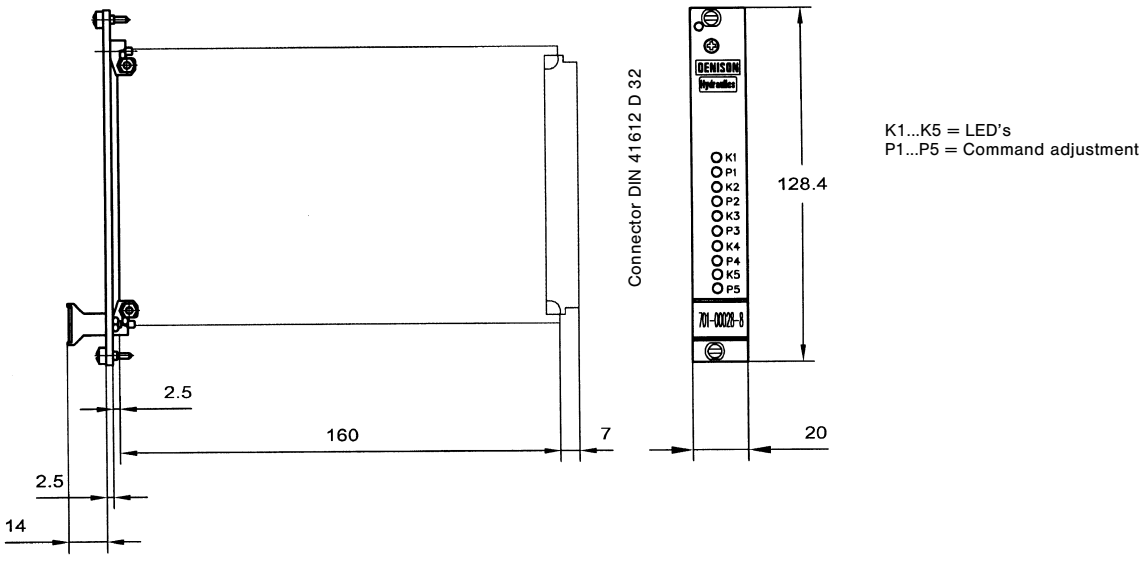
Order No. 701–00007–8

Holder for individual mounting according to DIN 41612

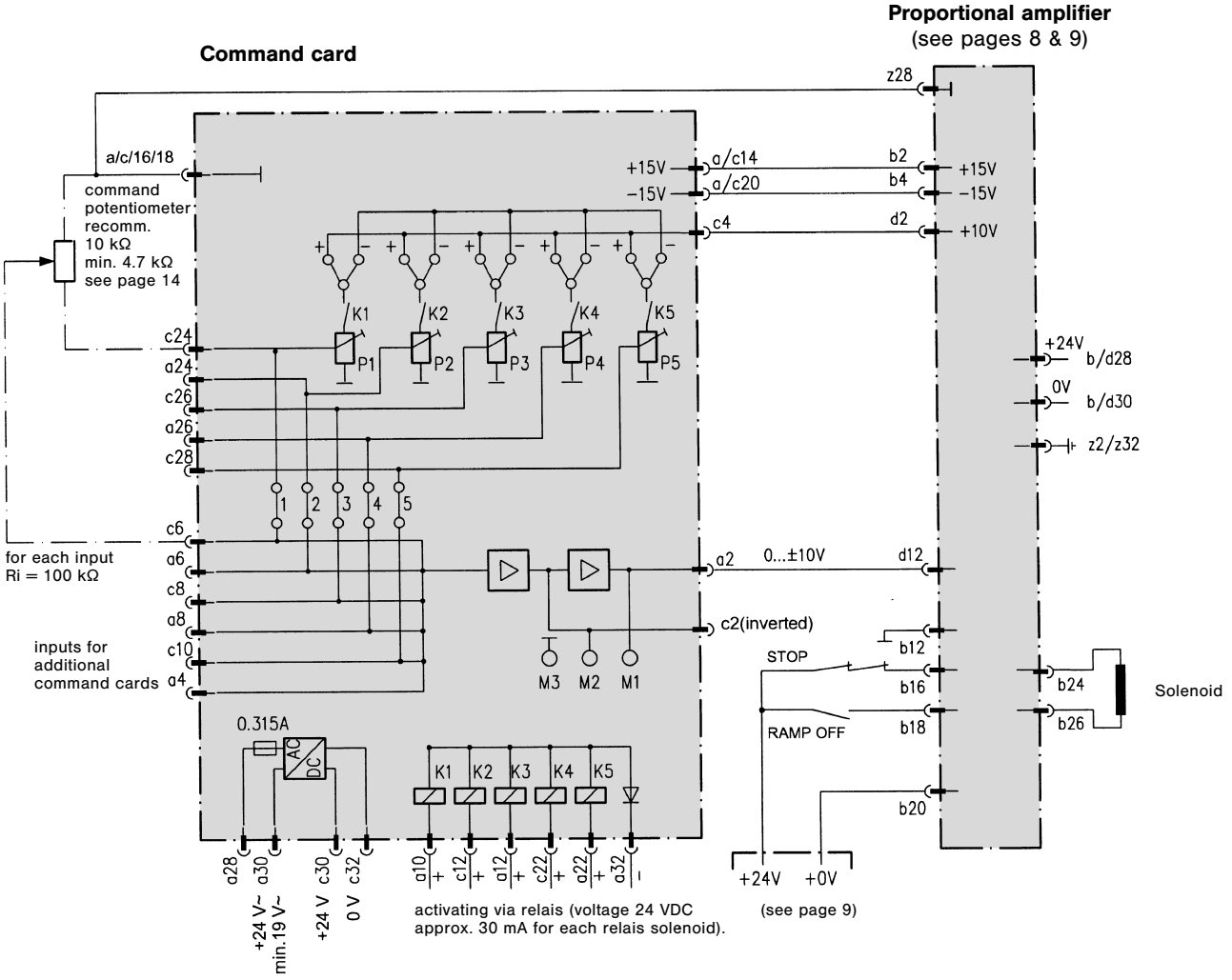
design D32

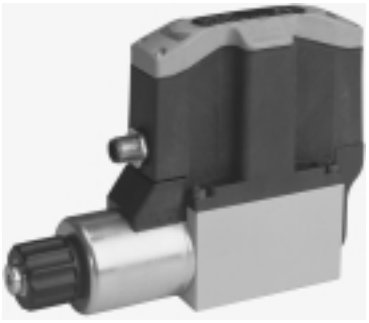


Dimensions Plug-in module 3U/4HP according to IEC 297



Schematic block diagram and terminal assignment





Example: 4VP01 5010VB1CA

The proportional amplifier located on top of the valve is specially adapted to control proportional pressure relief valves type 4VP01. It proportionally converts electrical input signals into adapted solenoid current to achieve a proportionality between command signal and pressure.
The amplifier has a reverse polarity protection and one short circuit protected PWM-output stage with max. current limit.
Electronics for two different types of command signals are available – see ordering code on page 3 and below.
The ramp up/down potentiometers can be adjusted after removing the top cap (see page 13 for details).
The valves in combination with the electronics are factory set and sealed.
The main board is equipped with a diagnostic LED to display the operational condition, “power on”, “valve energised” and “fail-safe” – please see below.

Characteristics – Proportional Amplifiers

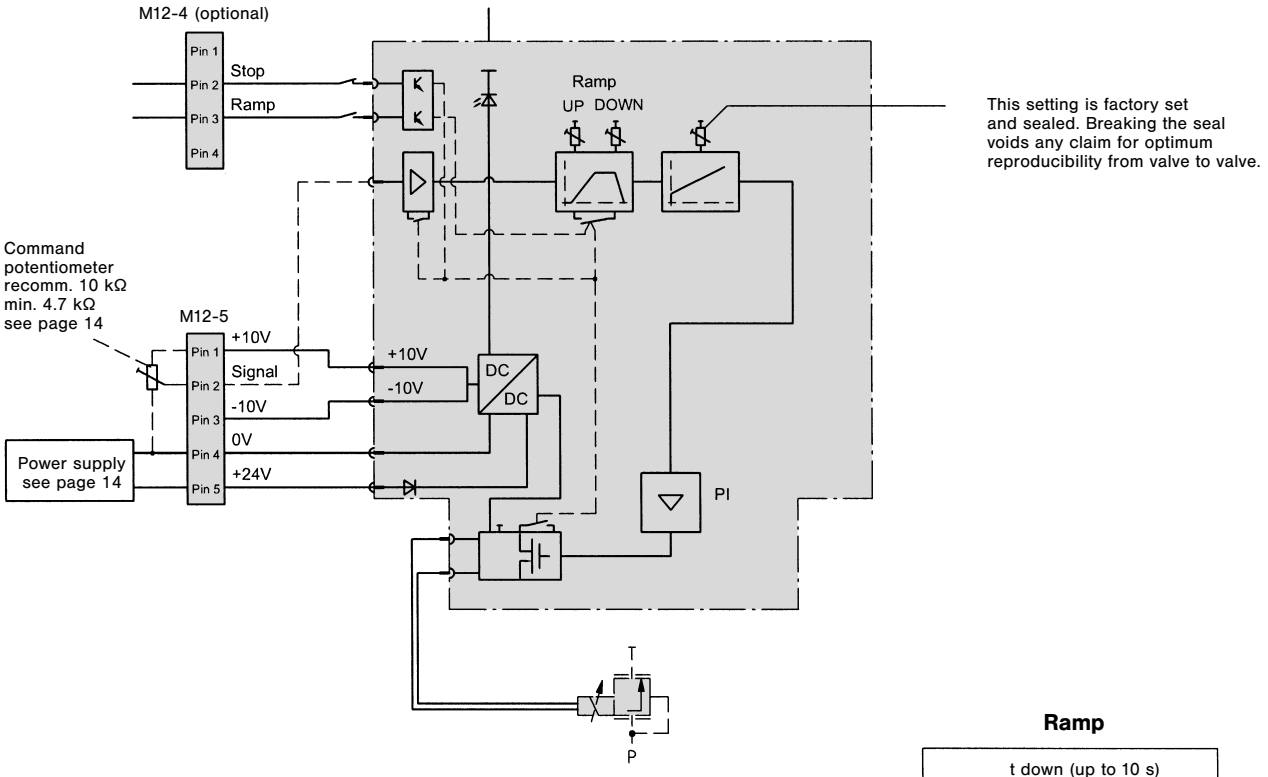
• Supply voltage	
– nominal	24 V DC
– smoothed battery voltage	18...32 V DC
• Reference voltage from amplifier	± 10 V (± 0.5%) @ 10 mA stabilised
• Current consumption I_{nom}	approx. 2.0 A at 100 % command signal (140 mA quiescent)
• Short circuit protection	for the solenoid
• Command signals	0...+10 V, 200 kΩ input impedance 4...20 mA, 100 Ω input impedance (4...20 mA command = 0...100 % current at the solenoid)
• External stop (nominal 24 V)	implement as NC (normally closed circuit) connection with an input voltage of 2.5...24 V DC; input impedance 22 kΩ (for electrical connector code CB only)
• Potentiometer for	
– ramp up	up to 10s ± 20 % (1...50 V/s)
– ramp down	up to 10s ± 20 % (1...50 V/s)
• Ramp off (nominal 24 V)	implement as NO (normally open circuit) connection with an input voltage of 4...32 V DC; input impedance 22 kΩ (for electrical connector code CB only)
• PWM	190 Hz ± 10 %
• Diagnostic LED	red: power on + fail safe with ext. emergency stop (valves with second connector) green: power on + solenoid de-energised (command signal setting zero) yellow: power on + solenoid energised (with increasing command signal)
• Wiring	due to EMC shielded cables are required

Note:
Power supply and potentiometer see page 14.

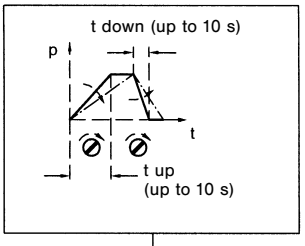
Schematic block diagram and terminal assignment

Colour	Condition
red	Power On + Stop*
green	Power On + enabled
yellow	Power On + Solenoid energised

* for valves with optional second connector

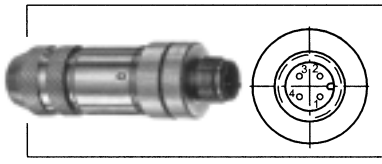


Ramp



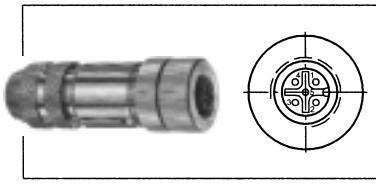
Details of potentiometers and connectors

Plug-in Connector B (male) Ordering No. 167–01116–8

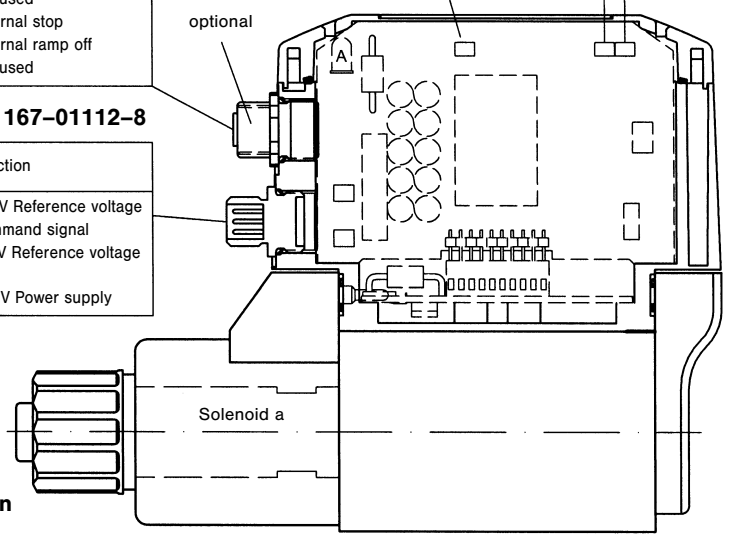


Pin	Function
1	Not used
2	External stop
3	External ramp off
4	Not used

Plug-in Connector A (female) Ordering No. 167–01112–8



Pin	Function
1	+10 V Reference voltage
2	Command signal
3	–10 V Reference voltage
4	0 V
5	+24 V Power supply

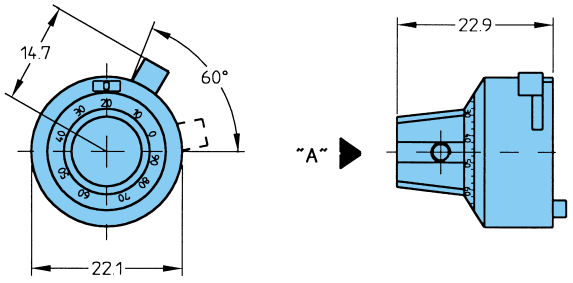


Note:
– Use screened cable only!
– Plug in connectors to be ordered separately.

Example: “CB” version

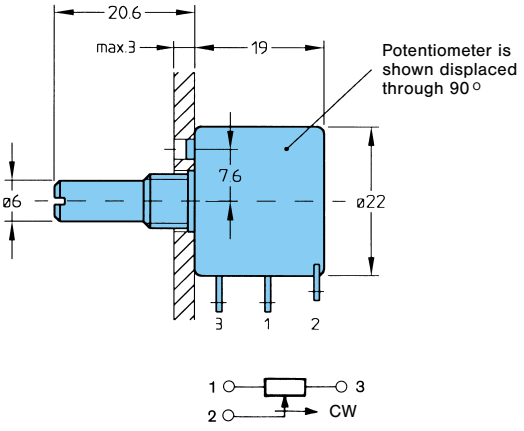
Potentiometer-Adjusting knob
Order No. 701–00014–8

View „A“

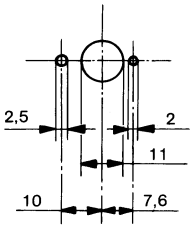


Adjusting knob with scale 0...100
and with revolution counter.
Adjustment is lockable.

Potentiometer

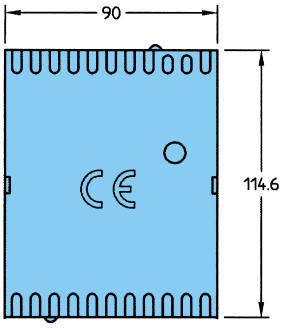


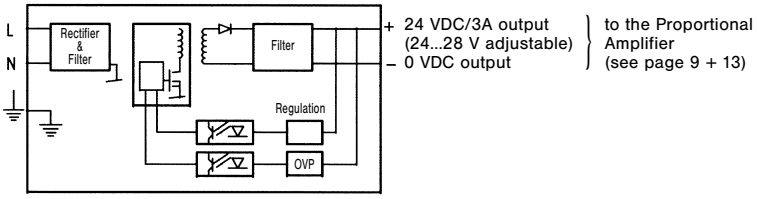
Panel opening



Potentiometer Characteristics	Potentiometer Order No.	
	701–00012–8	701–00013–8
Angle of rotation	360°	3600°
Linearity	± 0.5 %	± 0.25 %
Resolution-Drift	0.11% of 360°	0.02 % of 3600°
Resistance	5 kΩ	5 kΩ

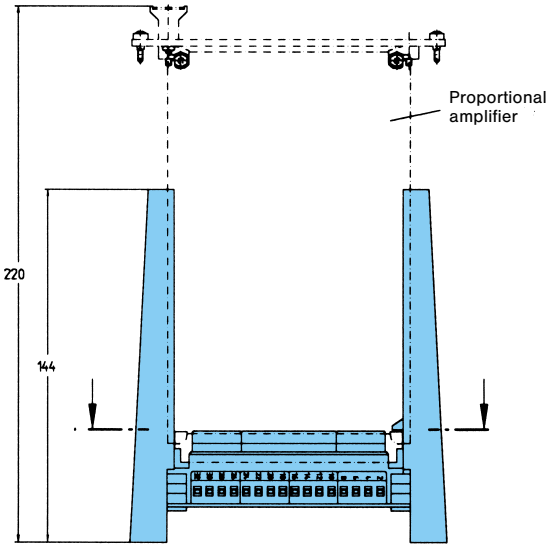
Power supply
Order No. 701–00023–8
Weight: 0.25 kg

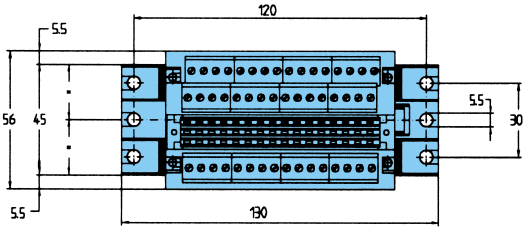




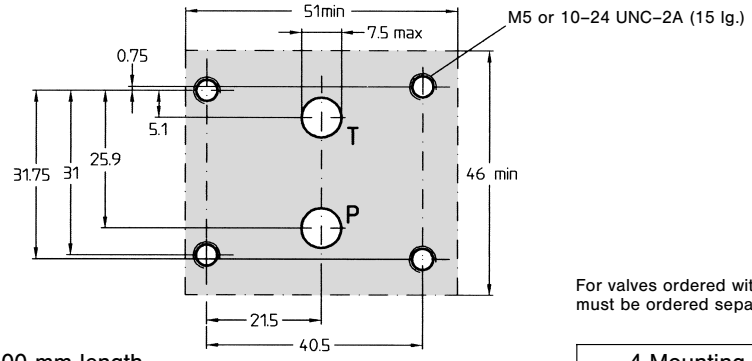
L = Nominal frequency 50/60 Hz
Nominal voltage 230 VAC or 115 VAC (pay attention to voltage selector switch setting)
N = Neutral line

Euro-Card-Holder
Order No. 701–00066–8
Holder for individual mounting according to DIN 41612, design F48





MOUNTING CONFIGURATION (according to CETOP, ISO and DIN)



Block mounting face

Flatness 0.01 mm / 100 mm length

Surface finish 0,8

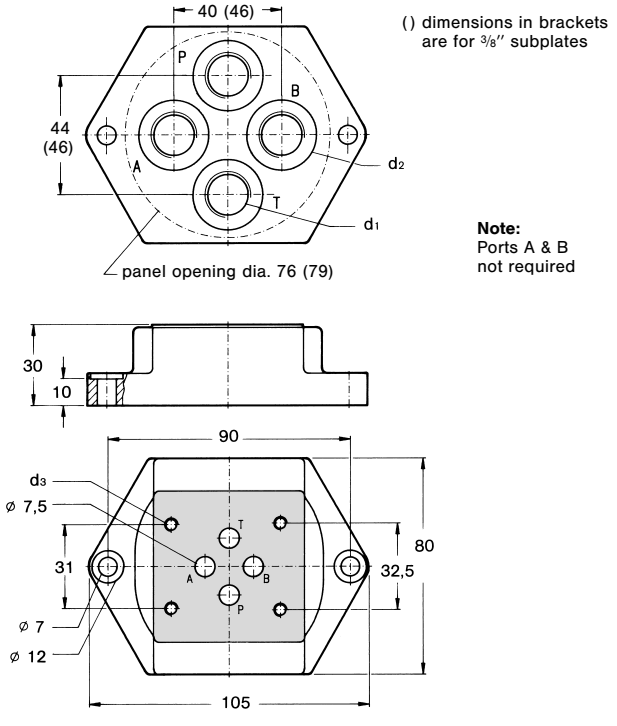
For valves ordered without subplate, mounting screws must be ordered separately.

4 Mounting screws	Order-No.
M 5 x 30, DIN 912; 10.9	700–70834–8
or	
10–24 UNC–2A x 1¼" (SAE)	358–10183–8

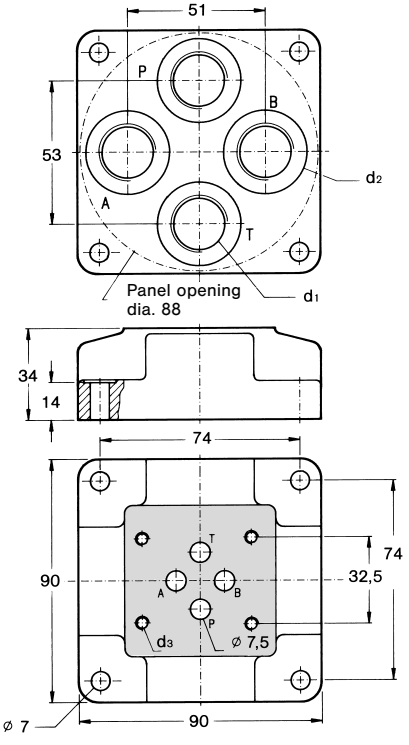
Torque 8.3 Nm

SUBPLATES

¼" & ⅜" Subplates



½" Subplate



Model No.	Order No.	Weight	d_1 (A, B, P, T)	d_2	Thread for mount. screws d_3
SS–B–04–G 136	S26–32959–0	1.4 kg	G ¼"	ø 23 x 1	M 5
SS–B–06–G 136	S26–32960–0	1.4 kg	G ⅜"	ø 26 x 1	M 5
SS–B–08–G 136	S26–32961–0	1.7 kg	G ½"	ø 31 x 1	M 5

Mounting screws are included in subplate order.