

ELECTRO-PROPORTIONAL VALVES



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In the follow of this chapter, NEM presents the electro-proportional flow control cartridges, the flow regulator cartridges and the pressure regulator cartridges.

The flow control valves, equipped with proportional solenoid, provide the adjustment of the efflux area by imposing energy to the electric coils.

The proportional cartridges are seat in standard cavities and can be connected to pressure compensators in order to obtain flow regulator circuits.

Below, a glossary of technical terms, which have been used in this catalogue, has been reported.

Current: electrons flow produced by voltage across a coil. whose power is proportional to the crossing current and the number of coils. Common abbreviation is I.

No load current: power consumed by the proportional controller when no coil output is available.

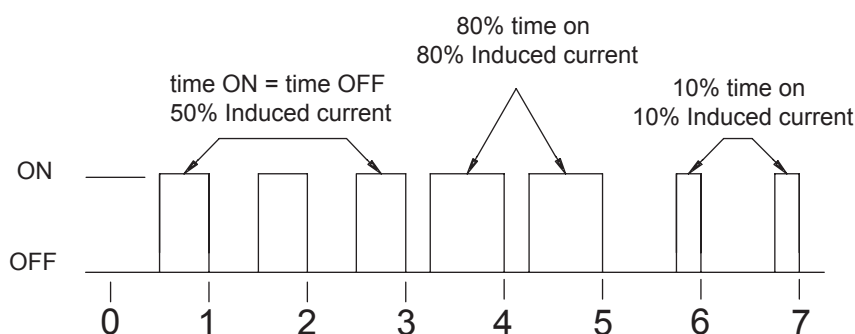
Threshold current (or polarization): point where increasing input current causes a flow or pressure variation

Maximum working current: is the point where input current no longer results into a flow pressure variation.

I min - I max: is the minimum and maximum control current fed to the solenoid of the proportional cartridge.

Hysteresis: is the measure of the output current difference between increasing and decreasing current in the solenoid. Example: when current is increasing you need 1200 mA current to produce a 3L/min flow. When current is decreasing, you need 1140 mA current to get the same flow. So there is a 60 mA difference in input current to achieve 3 gpm flow depending on whether current is increasing or decreasing. If I max = 1600mA, and Imin = 350 mA the total input difference is = 1250 mA. $Hysteresis = (60/1250)100 = 4.8\%$.

Pulse with modulation (PWM): amount method used to vary the average current induced in a coil by a square wave of fixed frequency and variable time ratios.



Proportional controller or amplifier: electronic device converting a low - power input signal into an output signal capable of operating the valve. This output signal can be modified to include PWM ramping or dither.

Ramping: a system for adjustment of output current variation of a proportional control.

Compensator: hydraulic device combined to proportional control valves to provide fixed outlet flow when pressure change.

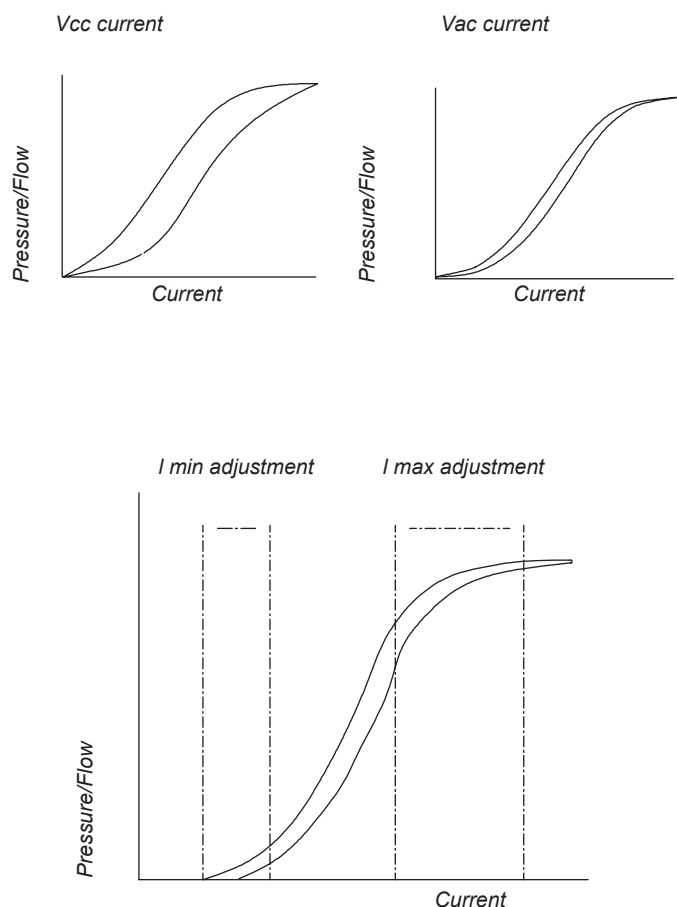
Voltage: current flow potential in an electric circuit. It is measured in units called volts (and is sometimes abbreviated V). Generally, higher voltage will induce a higher current.

ELECTRO-PROPORTIONAL VALVES

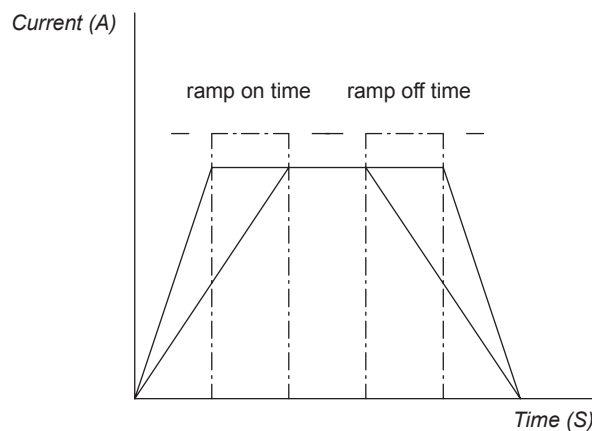
ELECTRIC CONTROL REQUIREMENTS

NEM spa offers a range of electro proportional controls equipped with 12 and 24 Vcc coils. On going test indicates that a current from 110 to 150 Hz significantly improves the valve performance, as against operation with straight Vcc. The graphs on the side show how the addition of PWM noticeably reduces hysteresis. This feature is available from virtually all standard controls manufacturers at low cost. For valves, hysteresis is represented by a double tracking curve where as the lower and upper track show decreasing and increasing current respectively. These valves are not designed for rapid operation rates. Please consult the factory if relatively fast valve response is required. One way of enhancing operation rates is to add a control function for (I min - I max) adjustment. This function will allow control across the full range. Again, this feature is widely available on commercial products. Many commercially available controllers also include ramping control.

TYPICAL HYSTERESIS

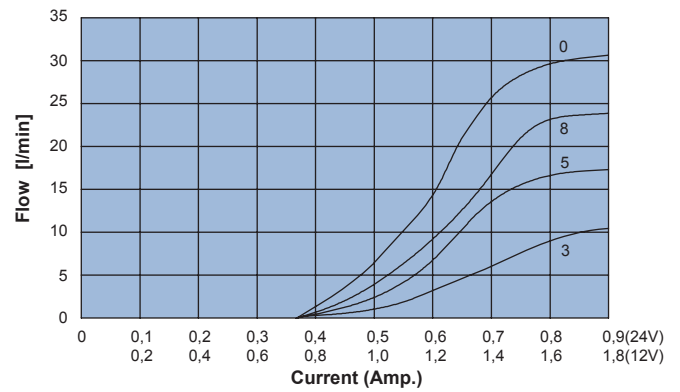
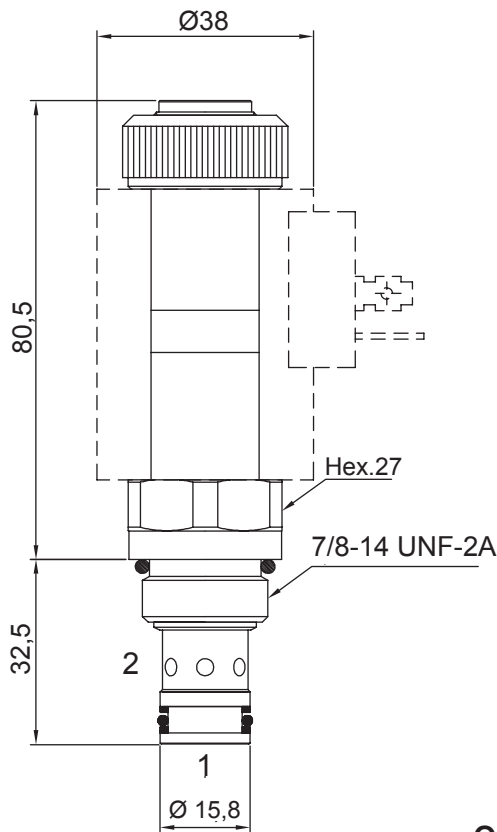
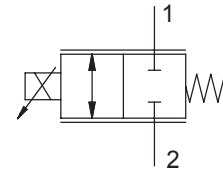


RAMP SLOPE CONTROL

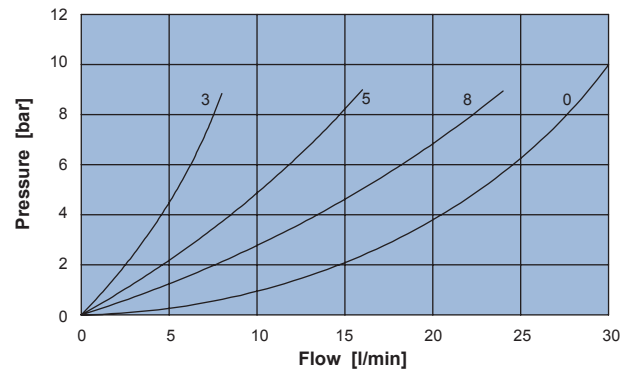


2 WAY NORMALLY CLOSED SPOOL VALVE, ELECTRO-PROPORTIONAL FLOW CONTROL

- Flow **30 l/min**
- Max working pressure in 1:2 **350 bar**
- Application limits with Δp max from 1 to 2 **15 bar**
- Leakage **150 cc/min**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis **5%**
- Cartridge tightening torque **40 Nm**
- Ring nut tightening torque **4 Nm**
- Weight (with coil) **0,48 Kg**
- Cavity **C230000** page 210
- Body **171302** page 191
- Coil (to be ordered separately) **09800** page 180



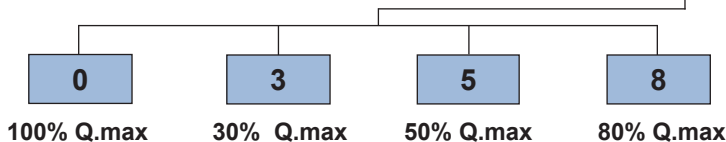
Graph flow/current with Δp from 1 to 2 of 7 bar



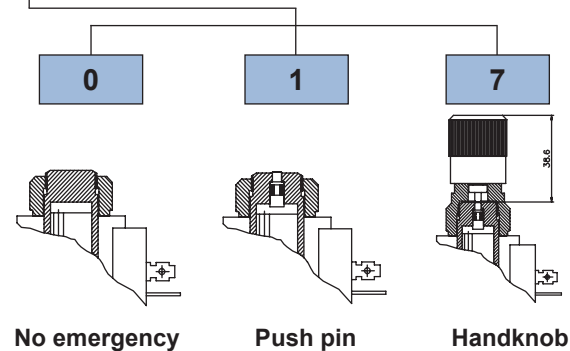
Pressure drop with energized coil

Ordering code

0 3 4 3 1 [] 0 [] 0 1



Flow range



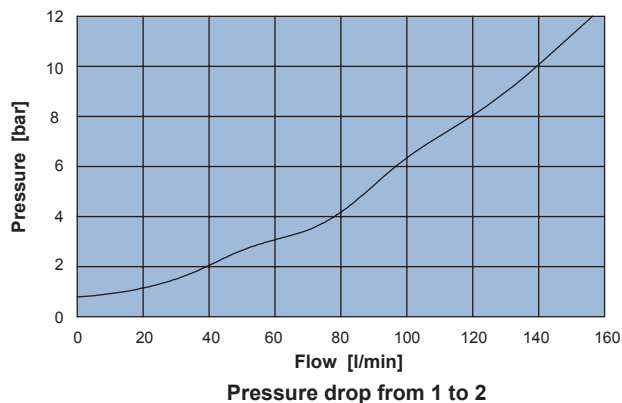
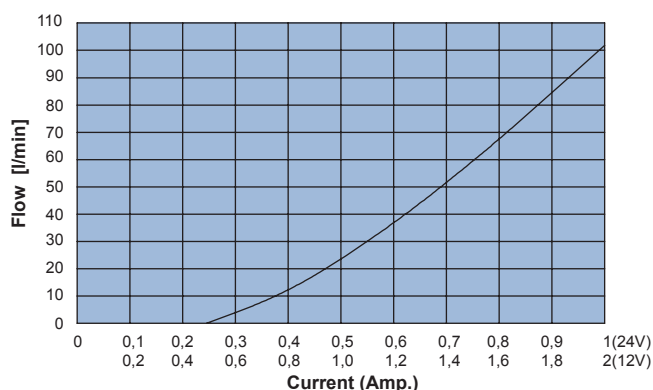
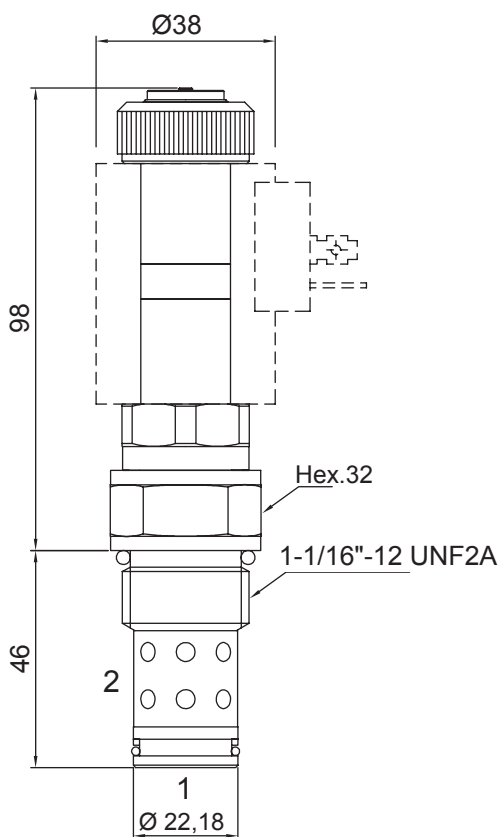
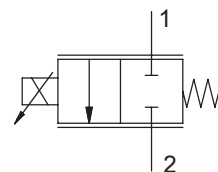
No emergency

Push pin

Handknob

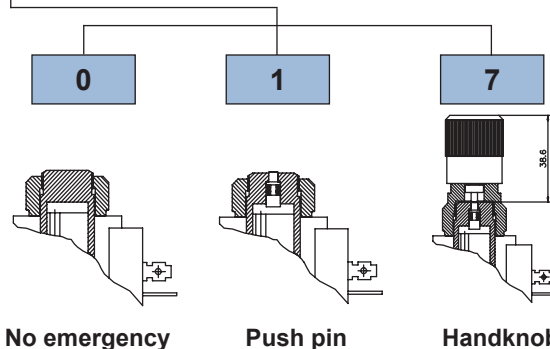
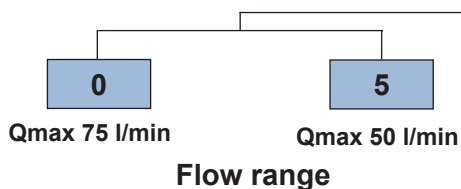
2 WAY NORMALLY CLOSED SPOOL VALVE, ELECTRO-PROPORTIONAL FLOW CONTROL

- Flow **75 l/min**
- Max working pressure in 1:2 **.350 bar**
- Application limits with Δp max from 1 to 2 **10 bar**
- Leakage **150 cc/min**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis **5%**
- Cartridge tightening torque **.50 Nm**
- Ring nut tightening torque **.4 Nm**
- Weight (with coil) **0,61 Kg**
- Cavity **C240001** page 214
- Coil (to be ordered separately) **09800** page 180



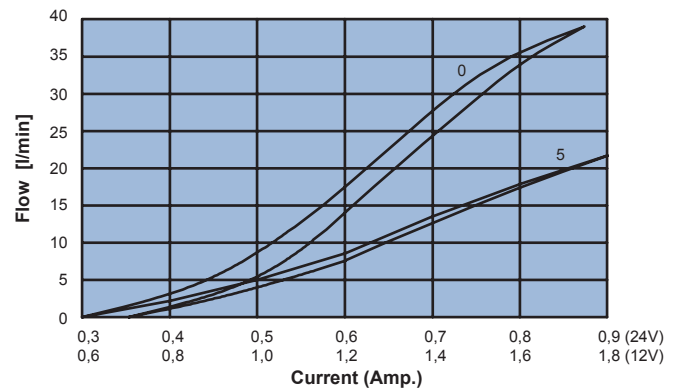
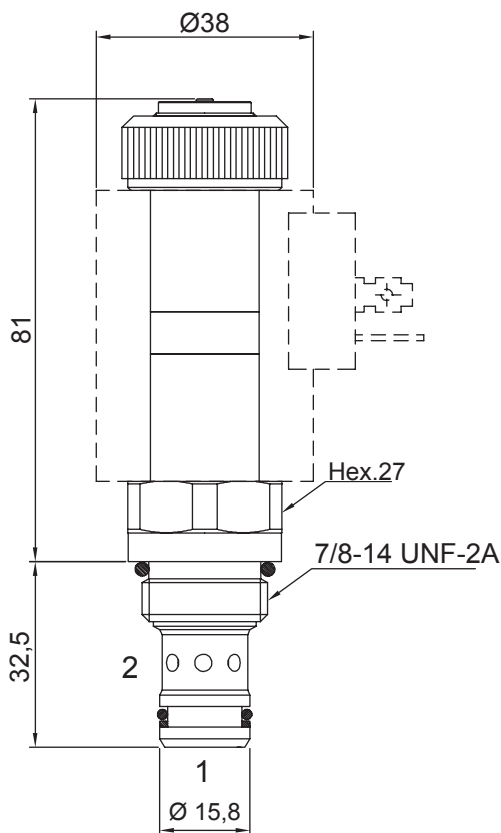
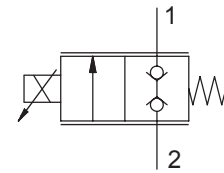
Ordering code

0 3 4 4 1 [] 0 [] 0 1

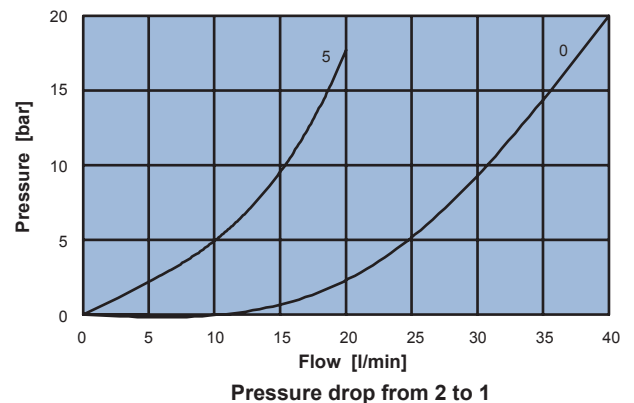


2 WAY NORMALLY CLOSED POPPET VALVE, ELECTRO-PROPORTIONAL FLOW CONTROL

- Flow **40 l/min**
- Max working pressure in 1:2 **250 bar**
- Leakage **0,25 cc/min**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis **5%**
- Cartridge tightening torque **40 Nm**
- Ring nut tightening torque **5 Nm**
- Weight (with coil) **0,53 Kg**
- Cavity **C230000** page 210
- Body **171302** page 191
- Coil (to be ordered separately) **09800** page 180



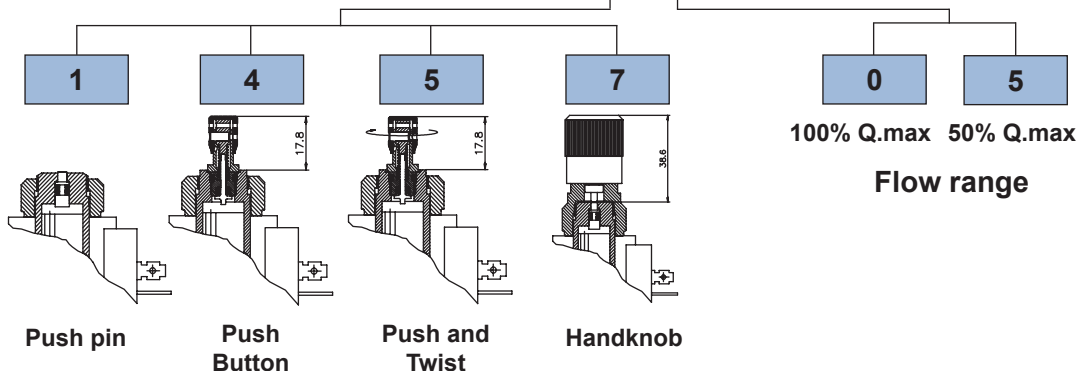
Graph flow/current with Δp from 2 to 1



Pressure drop from 2 to 1

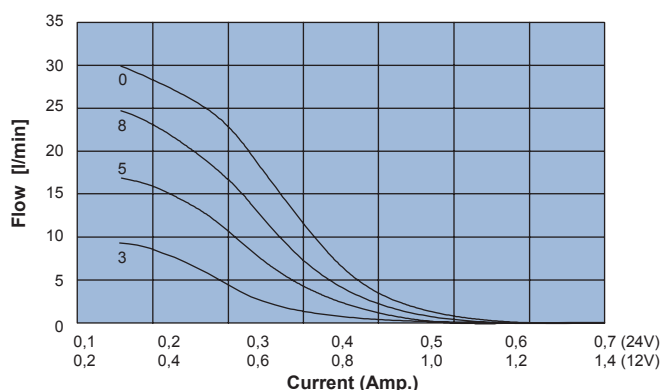
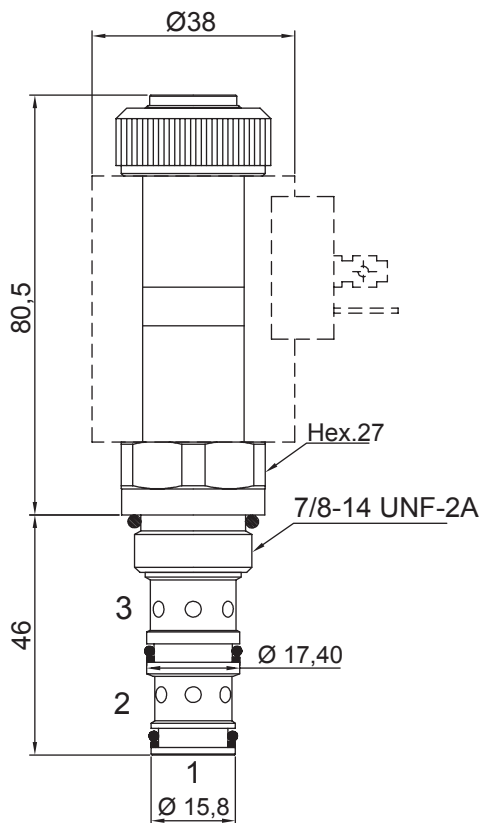
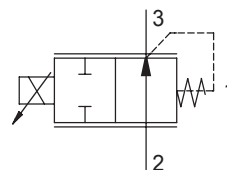
Ordering code

0 5 2 3 1 0 0 **0**

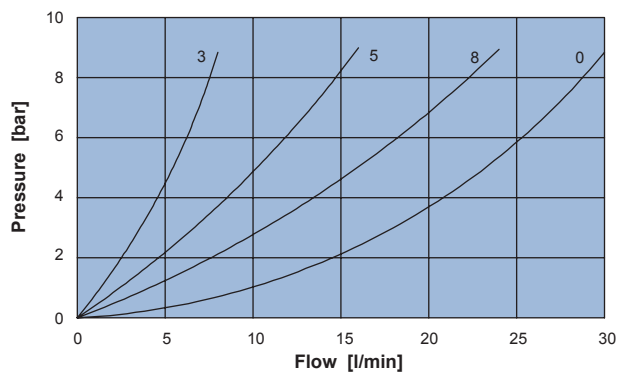


3 WAY NORMALLY OPEN SPOOL VALVE, ELECTRO-PROPORTIONAL FLOW CONTROL

- Flow **30 l/min**
- Max working pressure in 1:2:3..... **350 bar**
- Application limits with Δp max from 2 to 3..... **15 bar**
- Leakage **150 cc/min**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis..... **5%**
- Cartridge tightening torque **.40 Nm**
- Ring nut tightening torque **.4 Nm**
- Weight (with coil)..... **0,56 Kg**
- Cavity **C330000** page **220**
- Body..... **171312** page **192**
- Coil (to be ordered separately) **09800** page **180**



Graph flow/current with Δp from 2 to 3 of 7 bar



Pressure drop with de-energized coil

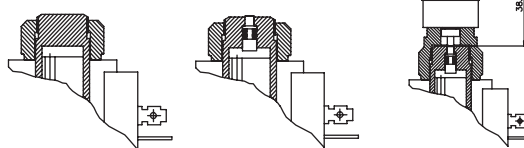
Ordering code

0 3 5 3 4 **0** **0 1**



100% Q.max 30% Q.max 50% Q.max 80% Q.max

Flow range

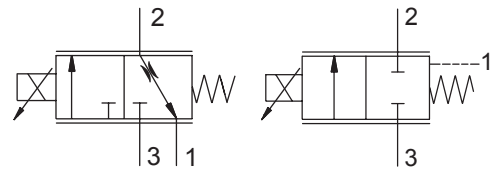


No emergency Push pin Handknob

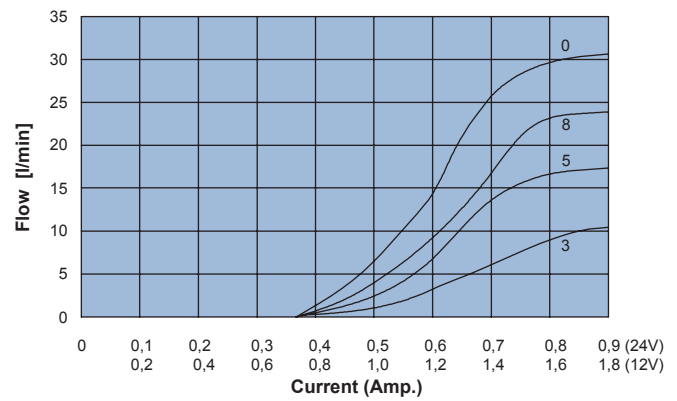
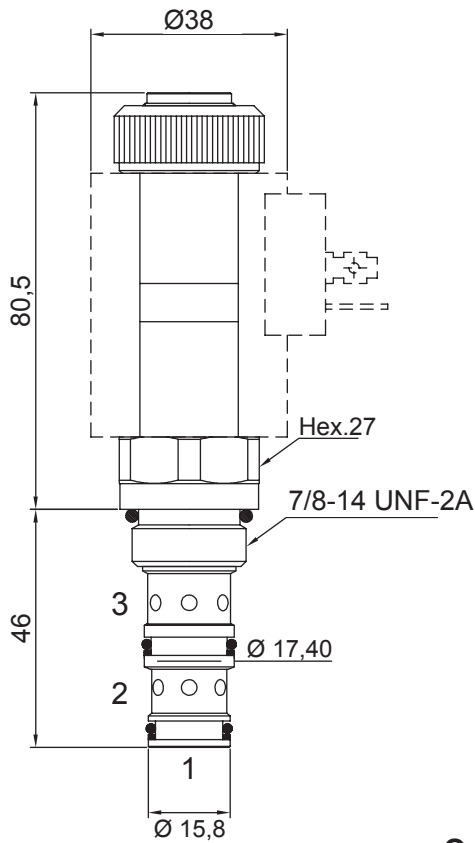


3 WAY NORMALLY CLOSED SPOOL VALVE, ELECTRO-PROPORTIONAL FLOW CONTROL

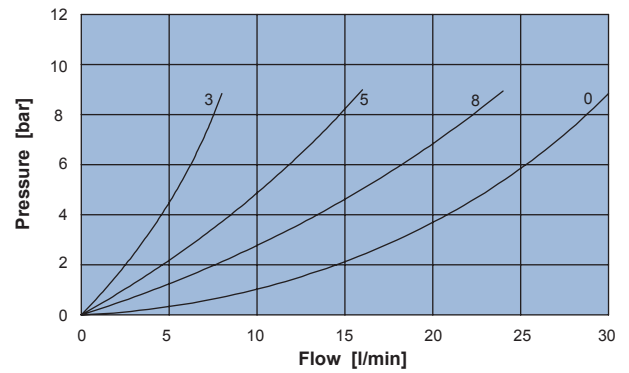
- Flow **30 l/min**
- Max working pressure in 1:2:3. **350 bar**
- Application limits with Δp max from 3 to 2. **15 bar**
- Leakage **150 cc/min**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis. **5%**
- Cartridge tightening torque **.40 Nm**
- Ring nut tightening torque **.5 Nm**
- Weight (with coil). **0,56 Kg**
- Cavity **C330000** page 220
- Body. **171312** page 192
- Coil (to be ordered separately) **09800** page 180



Scheme 0 Scheme 1



Graph flow/current with Δp from 3 to 2 of 7 bar



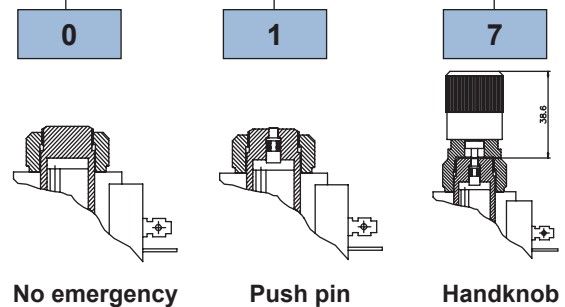
Pressure drop with de-energized coil

Ordering code

0 3 5 3 [] [] 0 [] 0 1

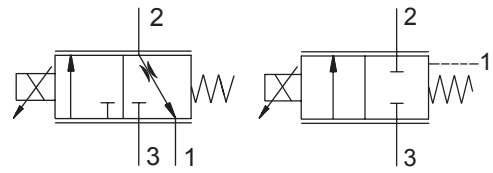
0 1
Hydraulic scheme

0 3 5 8
100% Q.max 30% Q.max 50% Q.max 80% Q.max
Flow range

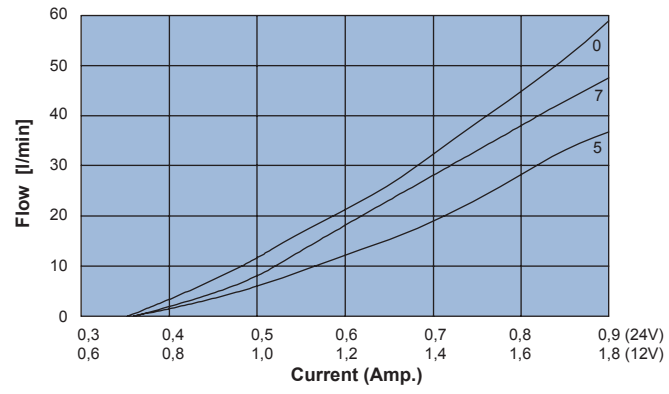
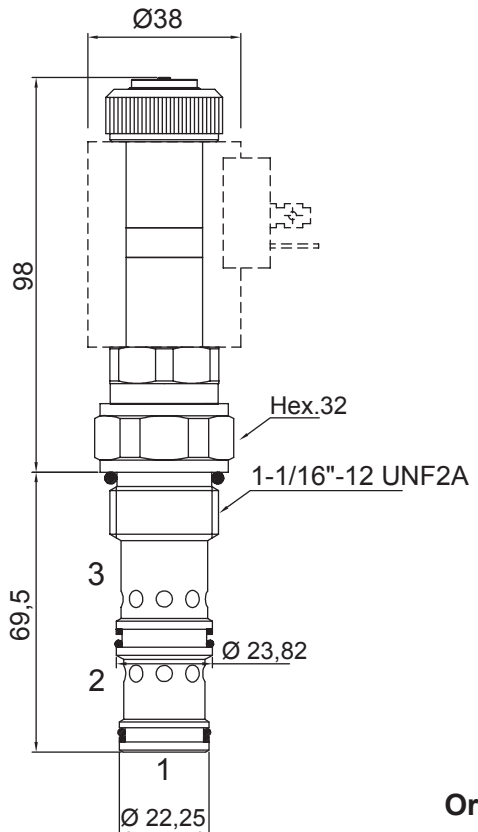


3 WAY NORMALLY CLOSED SPOOL VALVE, ELECTRO-PROPORTIONAL FLOW CONTROL

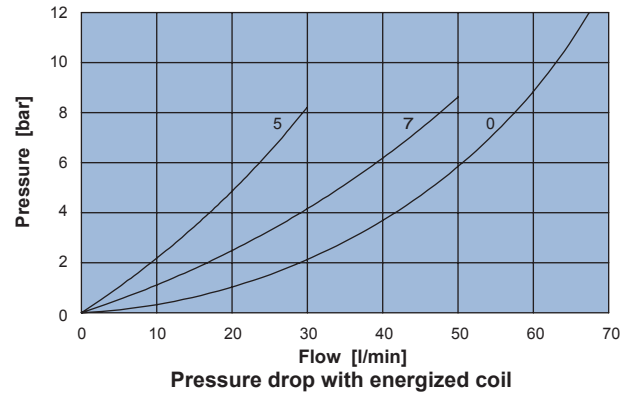
- Flow **70 l/min**
- Max working pressure..... **350 bar**
- Max working pressure in 1..... **10 bar**
- Application limits with Δp max from 3 to 2..... **15 bar**
- Leakage **250 cc/min**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis..... **5%**
- Cartridge tightening torque **50 Nm**
- Ring nut tightening torque **5 Nm**
- Weight (with coil)..... **0,70 Kg**
- Cavity **C340000** page 222
- Body..... **171412** page 197
- Coil (to be ordered separately) **09800** page 180



Scheme 0 **Scheme 1**



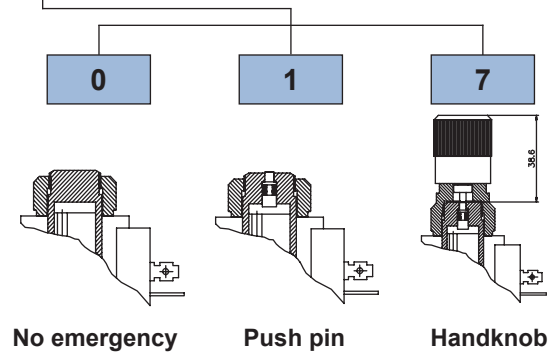
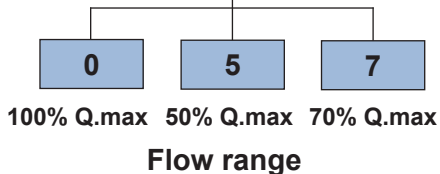
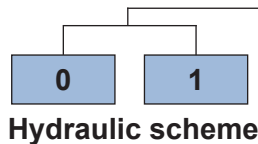
Graph flow/current with Δp from 3 to 2 of 7 bar
Graph 0 with Δp from 3 to 2 of 11 bar



Pressure drop with energized coil

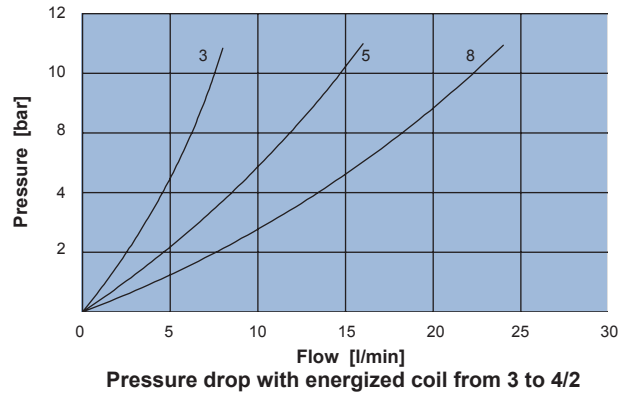
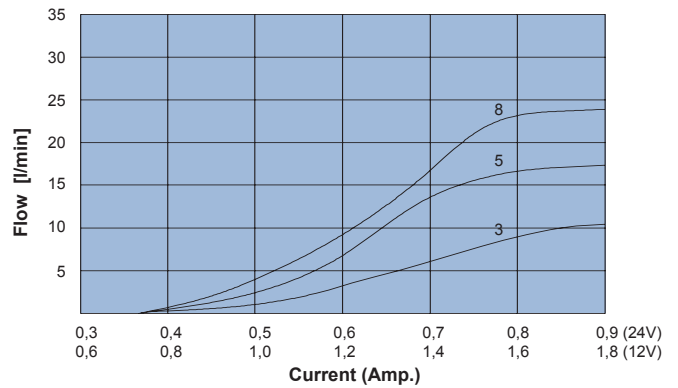
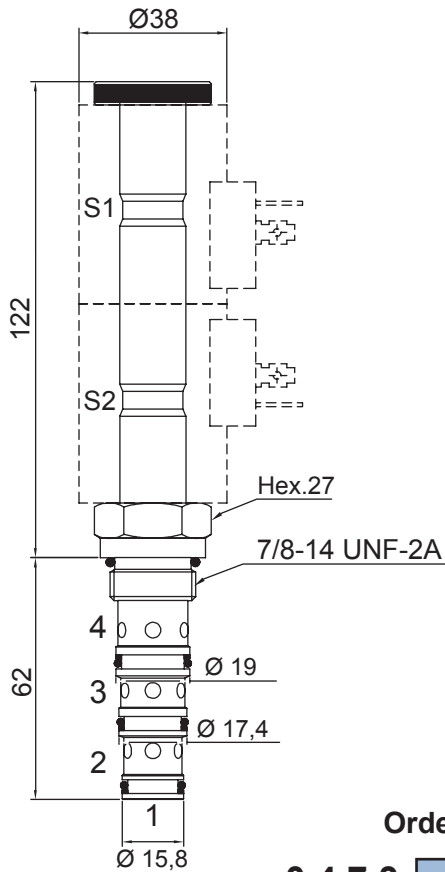
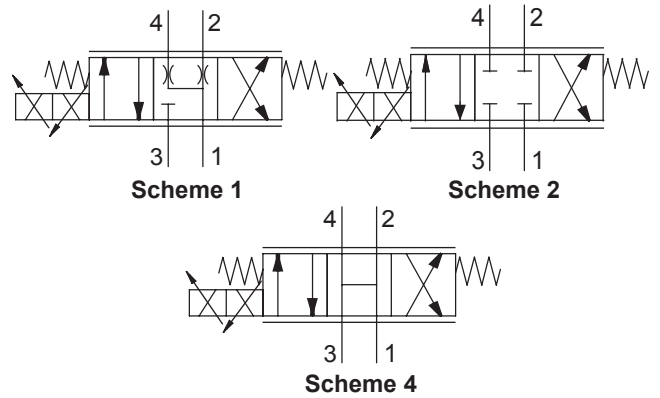
Ordering code

0 3 5 4 **0** **0 1**



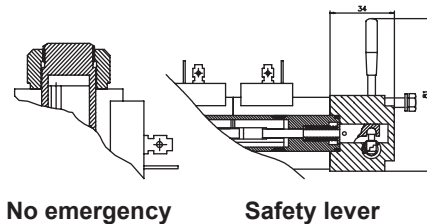
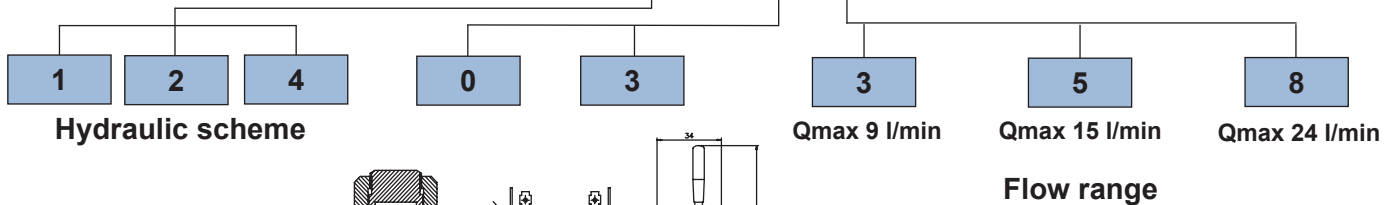
4 WAY SPOOL VALVE, ELECTRO-PROPORTIONAL FLOW CONTROL

- Maximum flow **24 l/min**
- Max working pressure in 2:3:4. **250 bar**
- Max working pressure in 1. **20 bar**
- Application limits with Δp max from 3 to 4/2 **15 bar**
- Leakage **100 cc/min**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis. **5%**
- Cartridge tightening torque **40 Nm**
- Ring nut tightening torque **5 Nm**
- Weight (with coil). **0,9 Kg**
- Cavity **C430000** page 226
- Body. **171322** page 195
- Coil (to be ordered separately) **09800** page 180



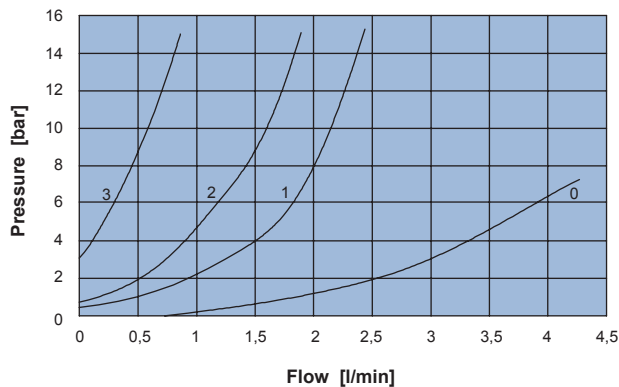
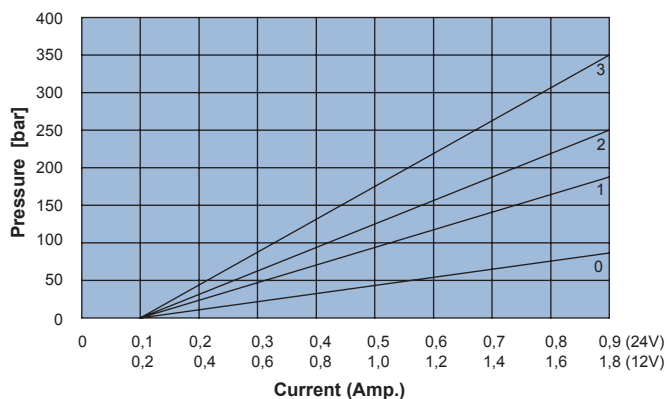
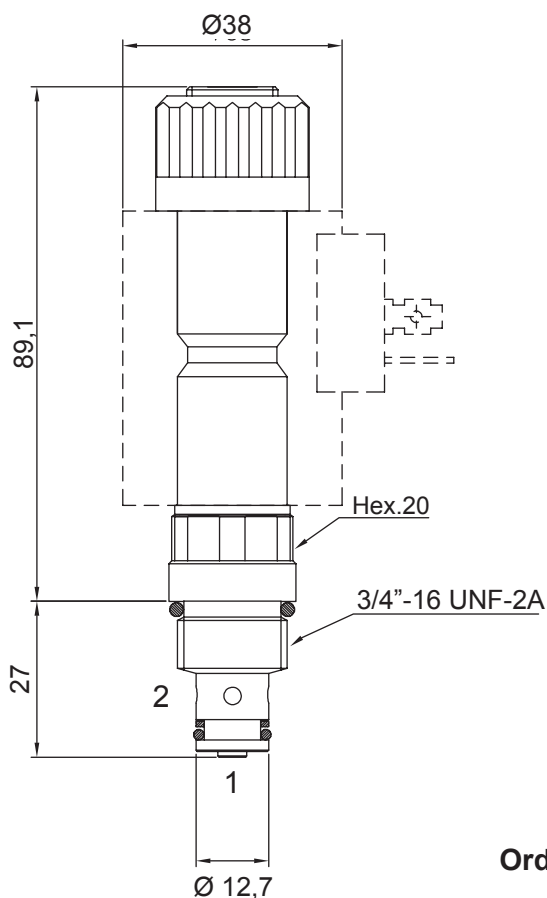
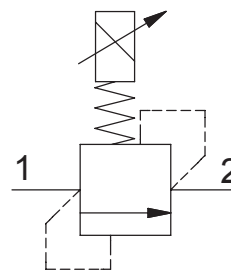
Ordering code

0 4 7 3 **0**



ELECTRO-PROPORTIONAL PRESSURE RELIEF VALVE, DIRECT ACTING

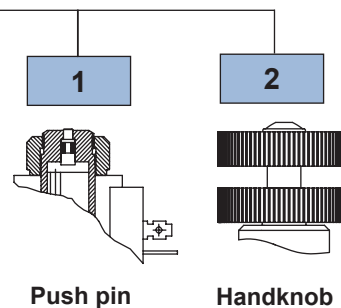
- Flow **2 l/min**
- Max working pressure in 1. **350 bar**
- Max working pressure in 2. **20 bar**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis. **5%**
- Cartridge tightening torque **30 Nm**
- Ring nut tightening torque **4 Nm**
- Weight (with coil). **0,46 Kg**
- Cavity **C220000** page **208**
- Body. **171202** page **186**
- Coil (to be ordered separately) **09800** page **180**



Ordering code

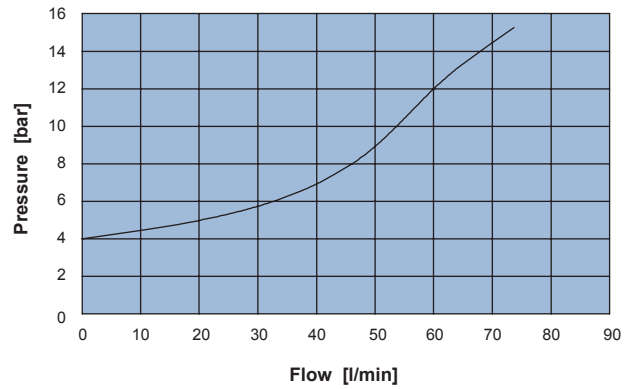
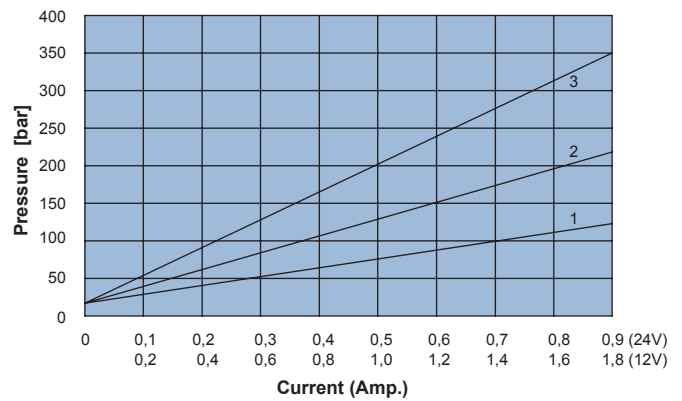
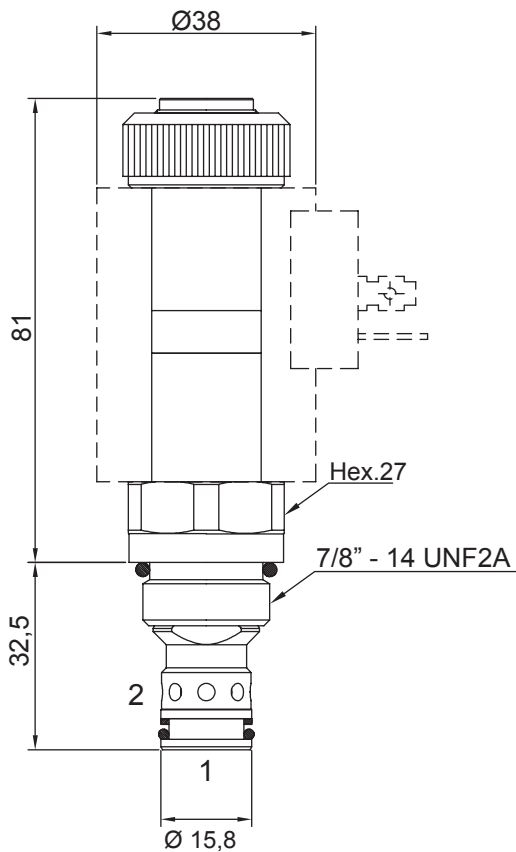
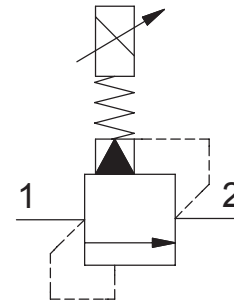
0 0 5 2 0 [] 0 [] 0 0

SETTING RANGE	0	1	2	3
Min - Max [bar]	10 ÷ 80	30 ÷ 150	40 ÷ 250	70 ÷ 350



ELECTRO-PROPORTIONAL PRESSURE RELIEF VALVE, PILOT OPERATED

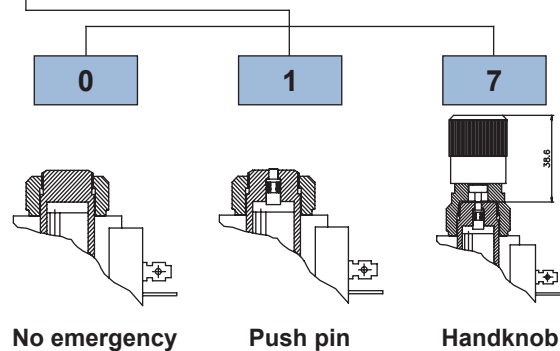
- Flow **60 l/min**
- Max working pressure **350 bar**
- Seals **NBR and PTFE**
- Max current at 12 Vcc **1800mA**
- Max current at 24 Vcc **900mA**
- PWM **120 Hz**
- Hysteresis **5%**
- Cartridge tightening torque **40 Nm**
- Ring nut tightening torque **4 Nm**
- Weight (with coil) **0,48 Kg**
- Cavity **C230000** page 210
- Body **171302** page 191
- Coil (to be ordered separately) **09800** page 180



Ordering code

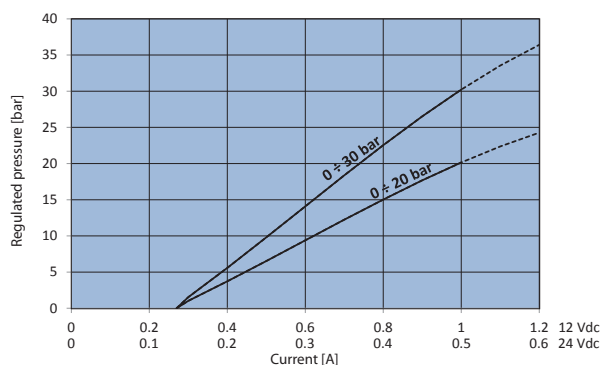
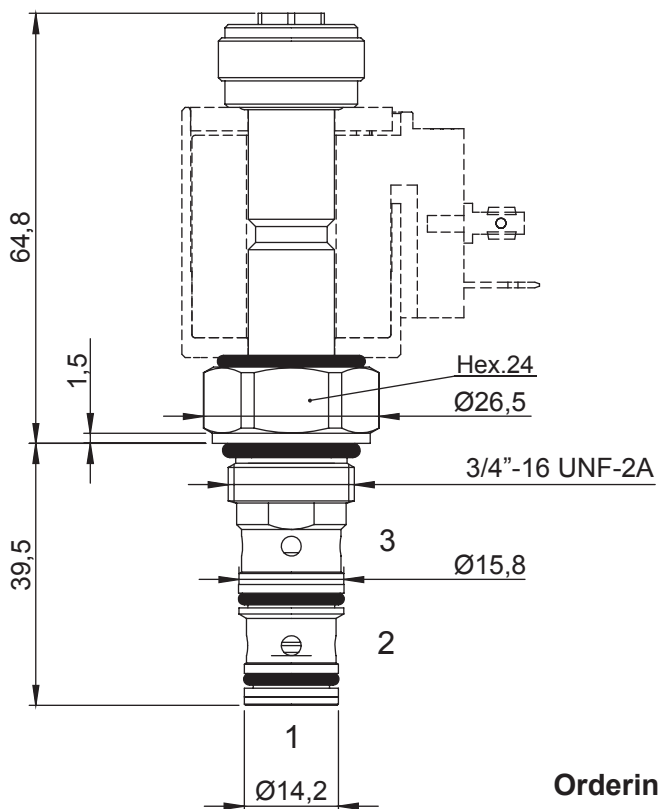
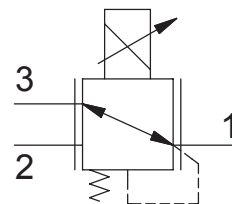
0 0 6 3 0 **0** **0 0**

SETTING RANGE	1	2	3
Min - Max [bar]	0 ÷ 150	0 ÷ 250	0 ÷ 350



ELECTRO-PROPORTIONAL PRESSURE REDUCING VALVE

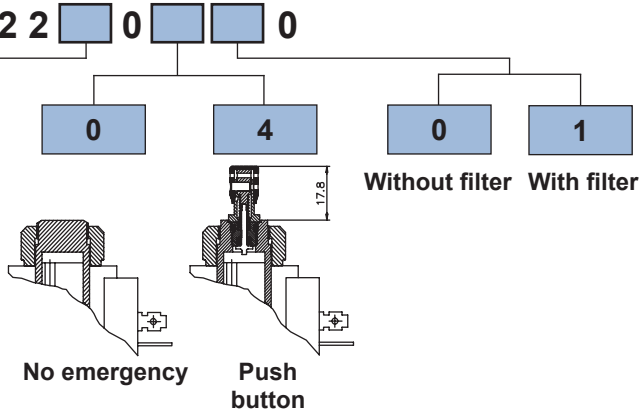
- Flow **4 l/min**
- Max working pressure in 2 **210 bar**
- Max working pressure in 1 **30 bar**
- Max working pressure in 3 **1 bar**
- Seals **NBR and PTFE**
- Leakage **150 cc/min**
- Max current at 12 Vcc **1200mA**
- Max current at 24 Vcc **600mA**
- PWM **120 Hz**
- Hysteresis **5%**
- Cartridge tightening torque **30 Nm**
- Ring nut tightening torque **5 Nm**
- Weight (with coil) **0,4 Kg**
- Cavity **C320000** page 218
- Body **171212** page 187
- Coil (to be ordered separately) **09400** page 179



Ordering code

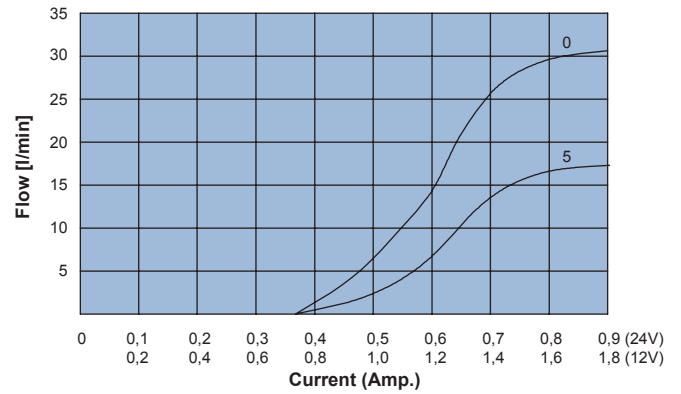
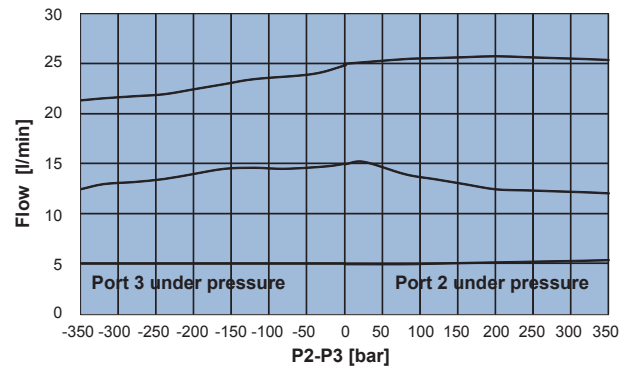
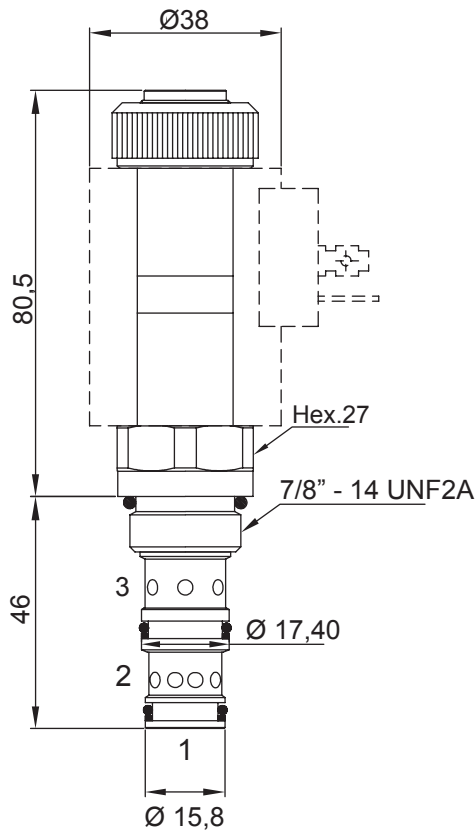
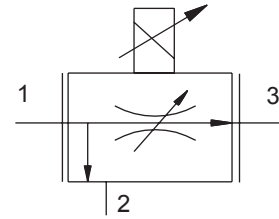
0 1 7 2 2 **0**

SETTING RANGE	0	1
Min - Max [bar]	0 ÷ 20	0 ÷ 30



3 WAY FLOW REGULATOR VALVE

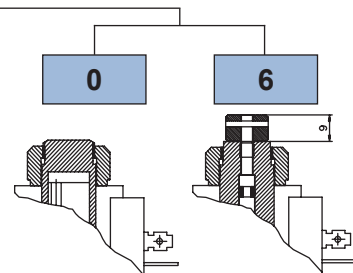
- Max working flow in 1 **50 l/min**
- Max working pressure in 1:2:3 **250 bar**
- Leakage **150 cc/min**
- Seals **NBR and PTFE**
- Cartridge tightening torque **.40 Nm**
- Ring nut tightening torque **5 Nm**
- Weight (with coil) **0,56 Kg**
- PWM **120 Hz**
- Hysteresis **5%**
- Max current at 24 Vcc **900mA**
- Max current at 12 Vcc **1800mA**
- Cavity **C330000** page **220**
- Body **171312** page **192**
- Coil (to be ordered separately) **09800** page **180**



Ordering code

0 3 6 3 1 **0 1**

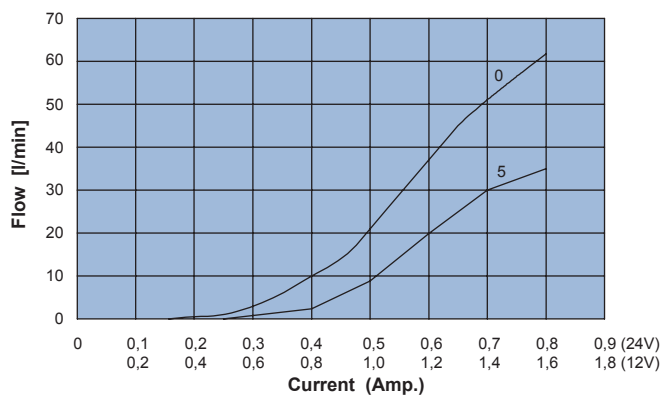
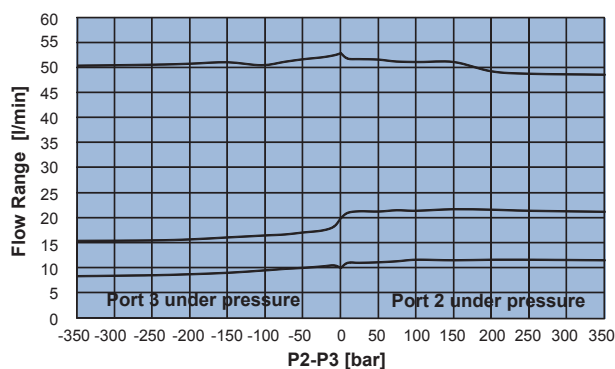
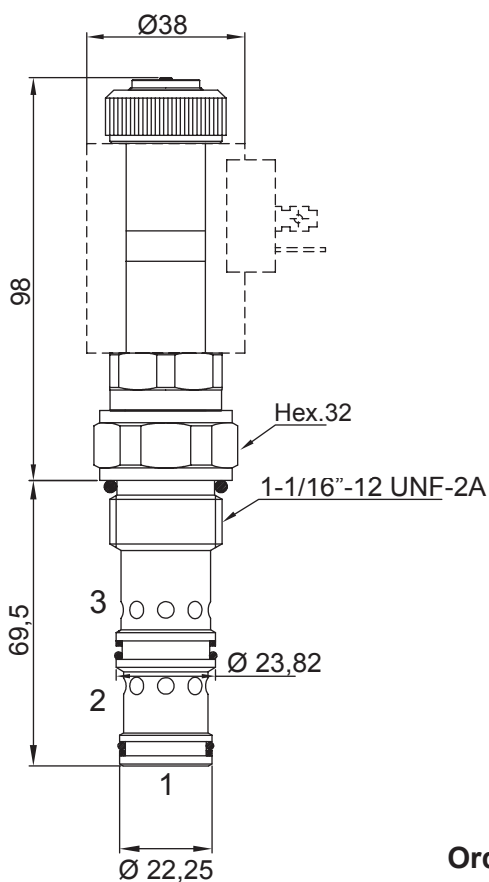
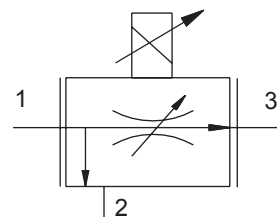
FLOW RANGE	0	5
Min - Max [l/min]	0÷25	0÷15



No emergency Unscrew type

3 WAY FLOW REGULATOR VALVE

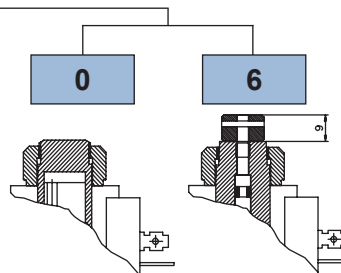
- Max flow range in 1 **80 l/min**
- Max working pressure in 1:2:3 **250 bar**
- Leakage **150 cc/min**
- Seals **NBR and PTFE**
- Cartridge tightening torque **50 Nm**
- Ring nut tightening torque **5 Nm**
- Weight (with coil) **0,7 Kg**
- PWM **120 Hz**
- Hysteresis **5%**
- Max current at 24 Vcc **900mA**
- Max current at 12 Vcc **1800mA**
- Cavity **C340000** page 222
- Body **171412** page 197
- Coil (to be ordered separately) **09800** page 180



Ordering code

0 3 6 4 1 0 0 1

FLOW RANGE	0	5
Min - Max [l/min]	0÷50	0÷35



No emergency Unscrew type

