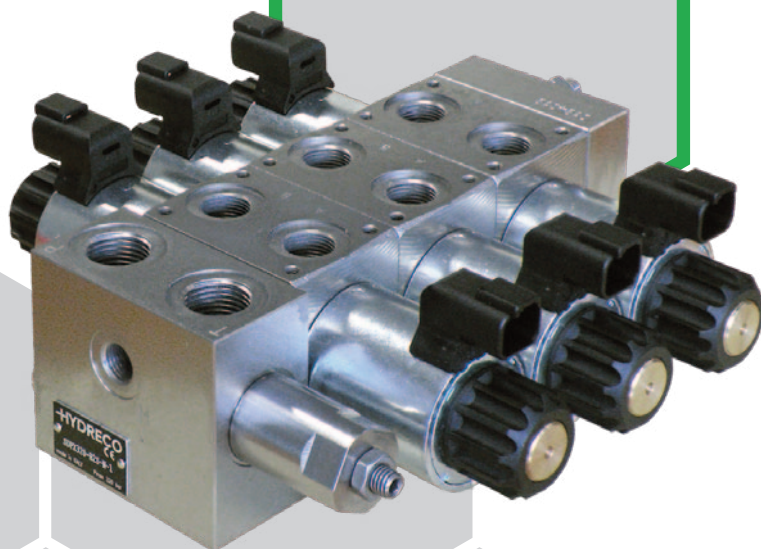




SD*

SECTIONAL DIRECTIONAL VALVE

SDL	280 bar	40 l/min
SDM	320 bar	50 l/min
SDS	320 bar	60 l/min



TECHNICAL CATALOGUE

INTRODUCTION

SDL, SDM and SDS are sectional directional control valves. They can be assembled in parallel with up to 10 working sections. The same components allow creating series circuits by inserting plugs in order to modify the oil path.

Working elements are available in two thicknesses with working ports 3/8" BSP, 1/2" BSP, SAE-06 or SAE-08 threads.

Specific components for series circuits are available upon request.

FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C (180 °F) causes the accelerated degradation of seals as well as the fluid physical and chemical properties.

From a safety standpoint, temperatures above 55 °C (130 °F) are not recommended.

SDL OPERATING PARAMETERS

MAXIMUM OPERATING PRESSURE	P - A - B ports	280 bar	4000 psi
	P1 and P2 ports	280 bar	4000 psi
FLOW CAPACITY	parallel	40 l/min	10.6 gpm
	series	40 l/min	10.6 gpm

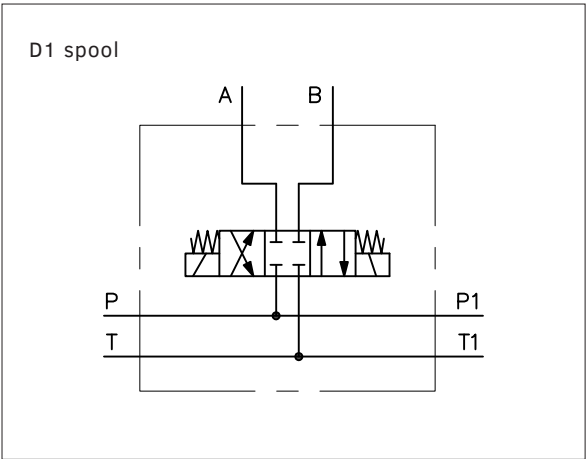
SDM OPERATING PARAMETERS

MAXIMUM OPERATING PRESSURE	P - A - B ports	320 bar	4600 psi
	P1 and P2 ports	250 bar	3600 psi
FLOW CAPACITY	parallel	50 l/min	13.2 gpm
	series	40 l/min	10.6 gpm

SDS OPERATING PARAMETERS

MAXIMUM OPERATING PRESSURE	P - A - B ports	320 bar	4600 psi
	P1 and P2 ports	250 bar	3600 psi
FLOW CAPACITY	parallel	60 l/min	15.9 gpm
	series	50 l/min	13.2 gpm

WORKING SECTION HYDRAULIC SYMBOL



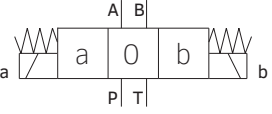
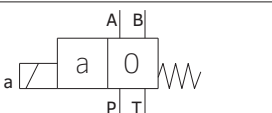
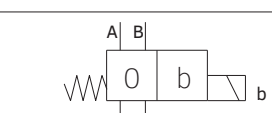
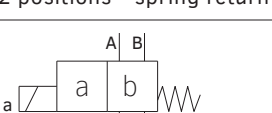
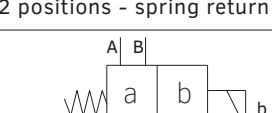
STEP RESPONSE	0 → 100%	25 ms	
	100 → 0%	75 ms	
VOLTAGE		12V DC 24V DC 28V DC 48V DC	
RANGE TEMPERATURES:	ambient	-20 to +60 °C	- 4 to +140 °F
	fluid	-20 to +82 °C	- 4 to +180 °F
FLUID VISCOSITY	range	10 - 400 cSt	60 - 1900 SUS
	recommended	25 cSt	120 SUS
FLUID CONTAMINATION		ISO 4406:1999 class 18/16/13	

SD - - - - - 1

design mark

MAX FLOWRATE	
L	40 l/min
M	50 l/min
S	60 l/min

PORTS SIZE	
B15	3/8" BSPP
S15	9/16 - 18 UNF
B2	1/2" BSPP (SDS only)
S2	3/4"-16 UNF (SDS only)

FUNCTION	
D	 double solenoid 3 positions - spring centred
A	 single solenoid at side A 2 positions - spring return
B	 single solenoid at side B 2 positions - spring return
TA	 single solenoid at side A 2 positions - spring return
TB	 single solenoid at side B 2 positions - spring return

SEAL	
N	NBR
V	Viton

COIL	
see availability table below	
K1	DIN 43650
K7	DT04-2P 'deutsch'
WK1	DIN 43650 zinc-nickel plated
WK7	DT04-2P 'deutsch' zinc-nickel plated
WK7D	DT04-2P 'deutsch' zinc-nickel plated with diode
K2	AMP Junior

VOLTAGE	
D12	12 V DC solenoid
D24	24 V DC solenoid
D28	28 V DC solenoid
D48	48 V DC solenoid
D00	without coil

MANUAL OVERRIDE	
M	built-in with the tube, pin. Standard for SDM and SDS (not available for SDL and SDS with coils typy WK*)
B	built-in with the tube, boot protected (standard for SDL and SDS with coils typy WK*)
L	hand lever
K	knob, turning

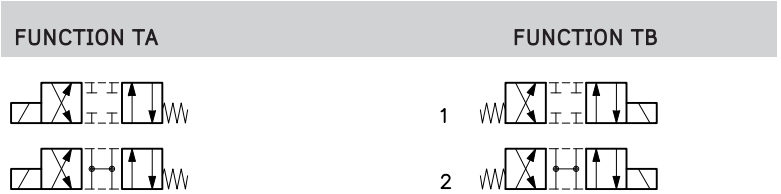
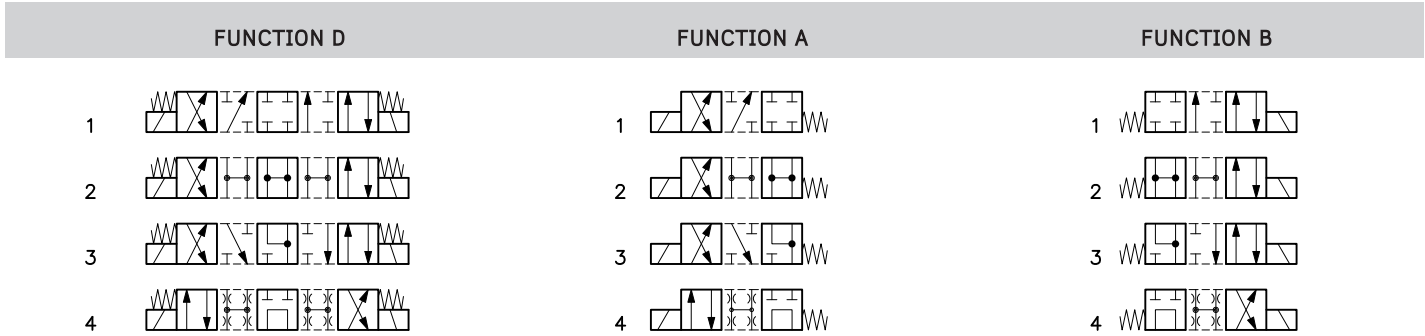
SPOOL
see table at page 4

CODE EXAMPLES:

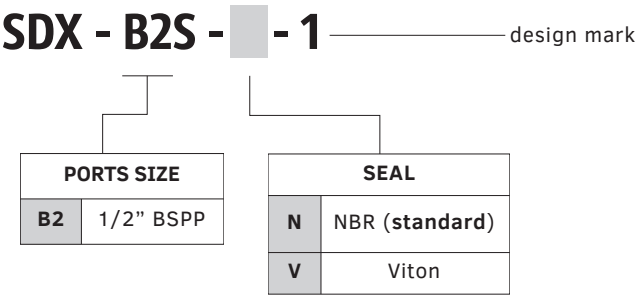
SDL - B15D1 - D12K7 - NB - 1
SDS - S2D4 - D12K7 - NM - 1

COILS AVAILABILITY												
	SDL			SDM			SDS					
	K1	K2	K7	K1	K2	K7	K1	K2	K7	WK1	WK7	WK7D
D12	■	■	■	■	■	■	■	□	■	■	■	■
D24	■	■	■	■	■	■	■	□	■	■	■	■
D28	■	-	-	-	-	-	■	-	-	-	-	-
D48	■	-	-	-	-	-	■	-	-	-	-	-

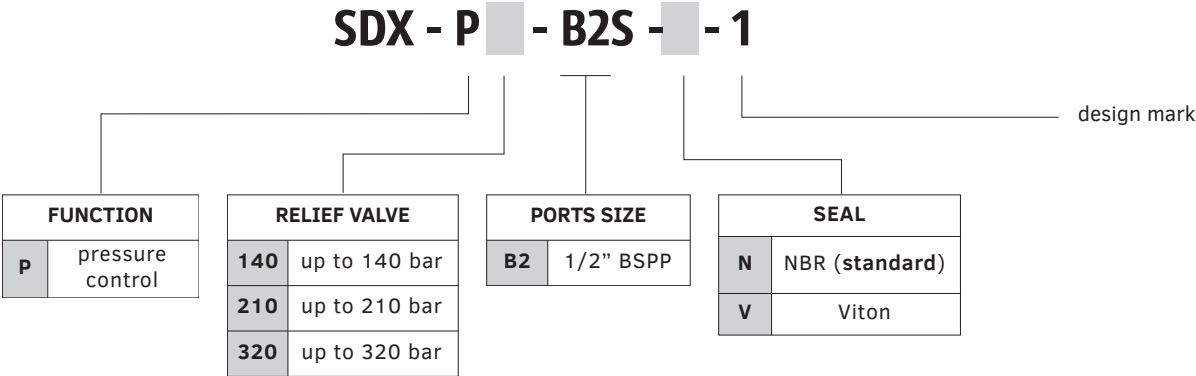
■ available
□ upon request



INLET SECTIONS: BASIC

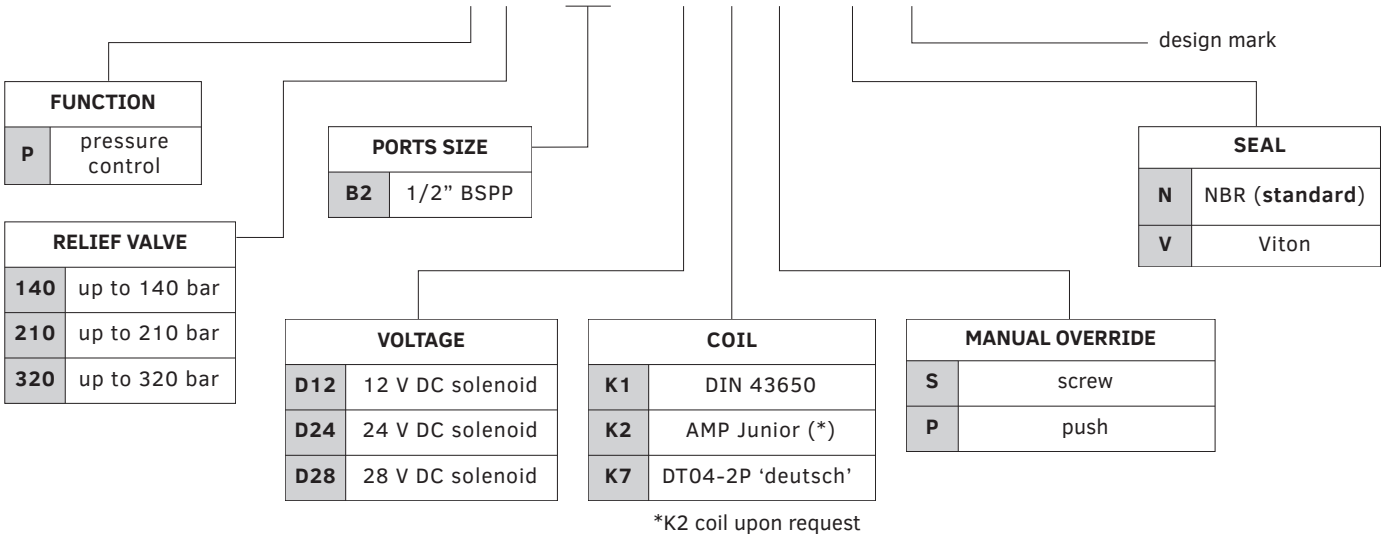


INLET SECTIONS: PRESSURE CONTROL



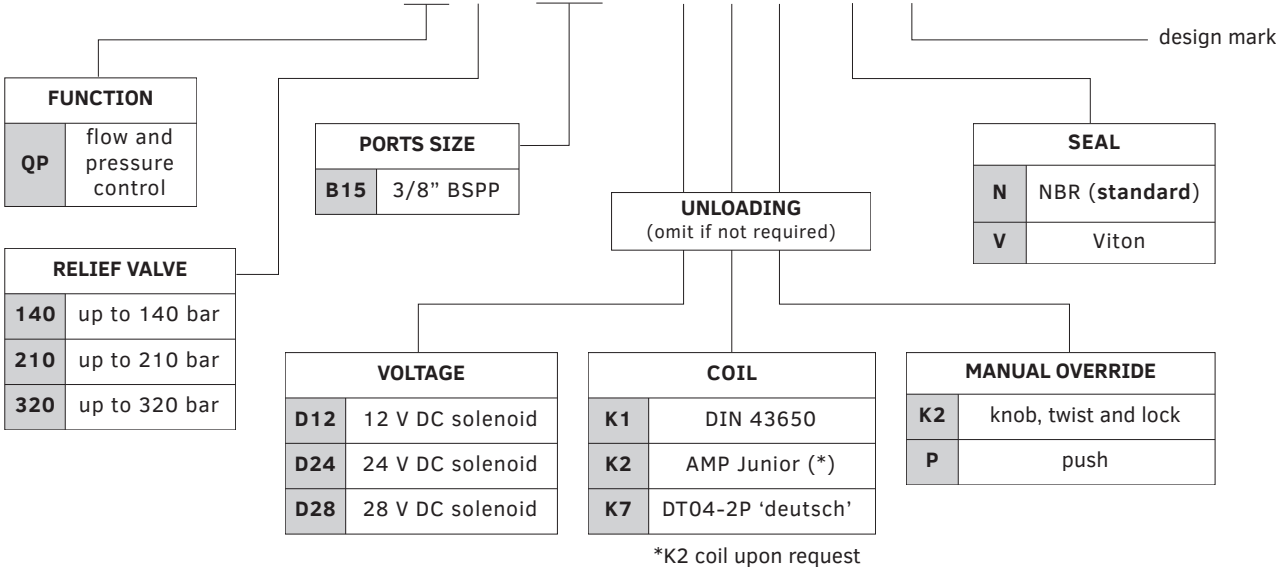
INLET SECTION: PRESSURE CONTROL WITH UNLOADING VALVE

SDX - P - B2S - - -2



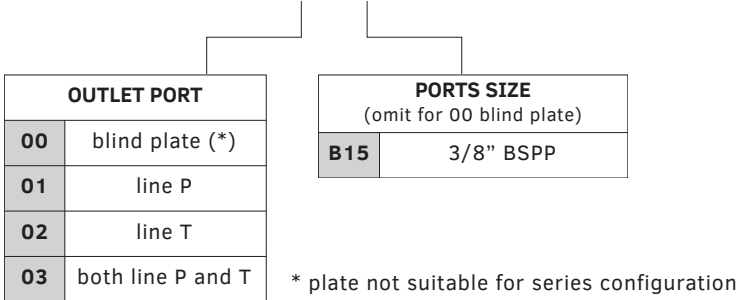
INLET SECTION: FLOW AND PRESSURE CONTROL WITH OR WITHOUT UNLOADING VALVE

SDX - QP - B15S - - -1

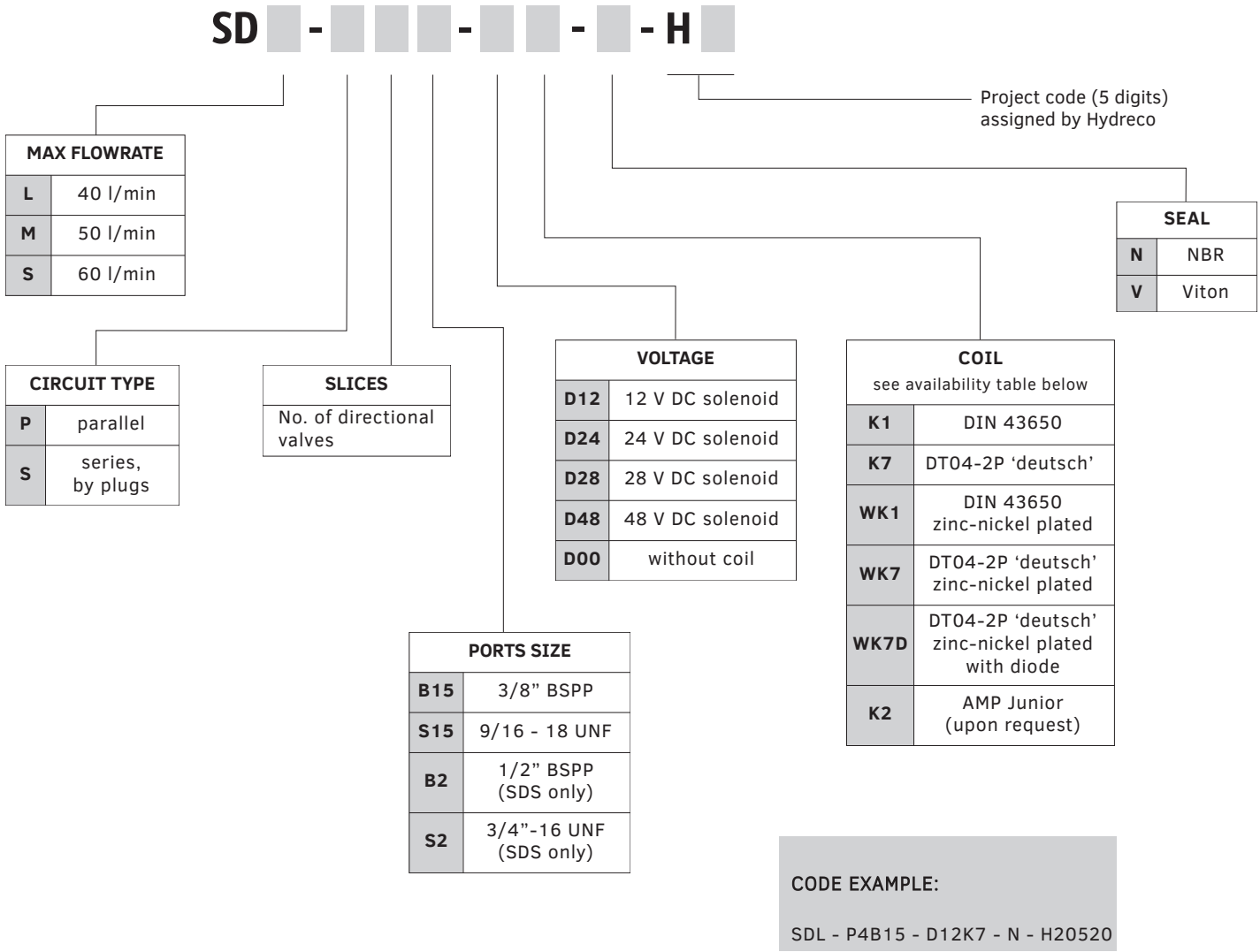


OUTLET SECTIONS

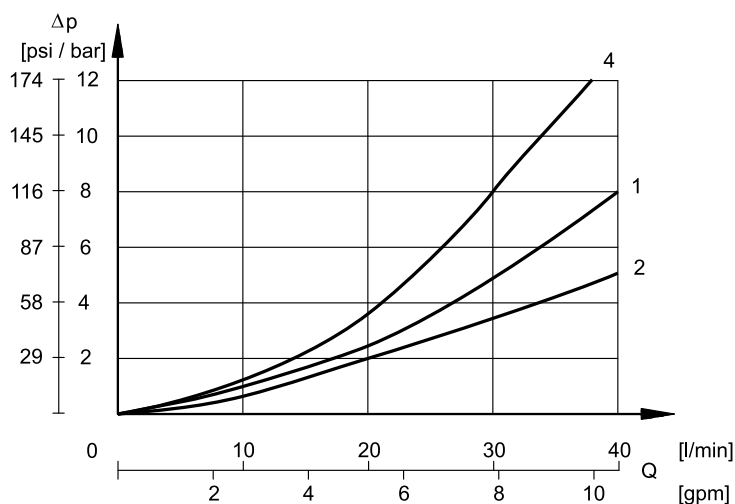
SDX - - S-1



ASSEMBLED VALVE

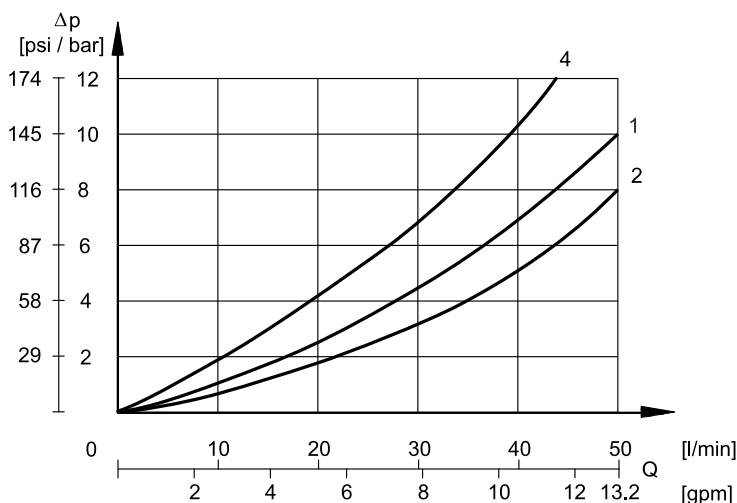


SDL PRESSURE DROPS Δp -Q



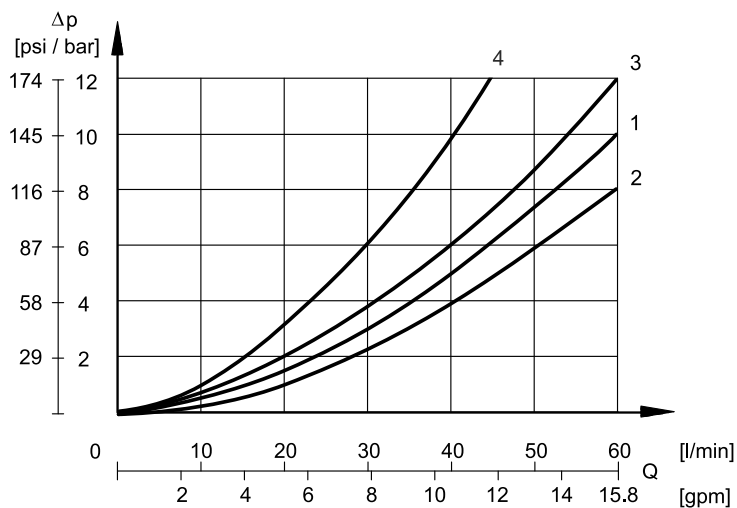
TYPE	CURVE				
	P→A	P→B	A→T	B→T	P→T
D1, A1, B1	1	1	1	1	-
D2, A2, B2	2	2	2	2	2
D3, A3, B3	1	1	2	2	-
D4, A4, B4	4	4	4	4	1
TA1, TB1	1	1	1	1	-
TA2, TB2	1	1	1	1	-

SDM PRESSURE DROPS Δp -Q



TYPE	CURVE				
	P→A	P→B	A→T	B→T	P→T
D1, A1, B1	1	1	1	1	-
D2, A2, B2	2	2	2	2	2
D3, A3, B3	1	1	2	2	-
D4, A4, B4	4	4	4	4	1
TA1, TB1	2	2	2	2	-
TA2, TB2	1	1	1	1	-

SDS PRESSURE DROPS Δp -Q

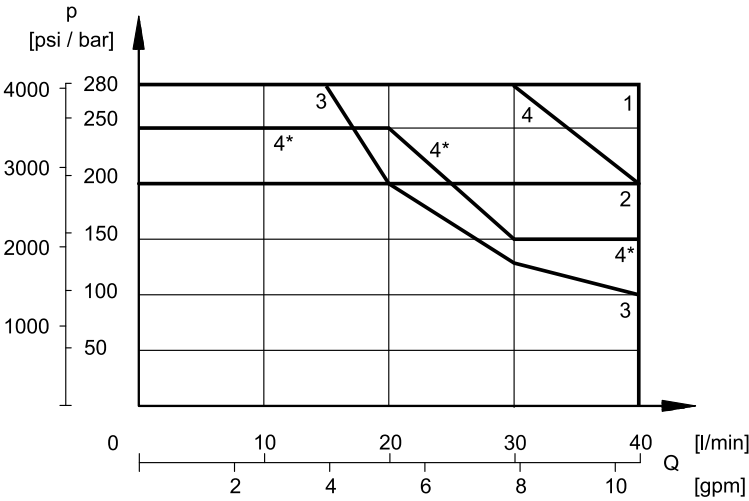


SPOOL TYPE	CURVE				
	P→A	P→B	A→T	B→T	P→T
D1, A1, B1	1	1	3	3	-
D2, A2, B2	2	2	1	1	2
D3, A3, B3	3	3	2	2	-
D4, A4, B4	4	4	4	4	1
TA1, TB1	3	3	3	3	-
TA2, TB2					

The curves define the flow rate operating fields according to the valve pressure. The values have been obtained according to ISO 6403 standards, with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.

Values obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

SDL PERFORMANCE CURVES

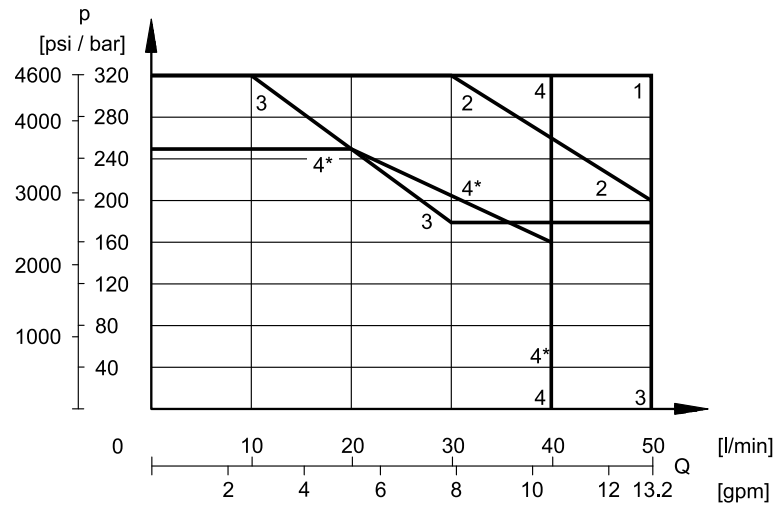


NOTE: The reverse flow condition occurs in series circuits made with elements for parallel connection and plugs, in even-position elements only.

Look at the hydraulic diagram at page 22.

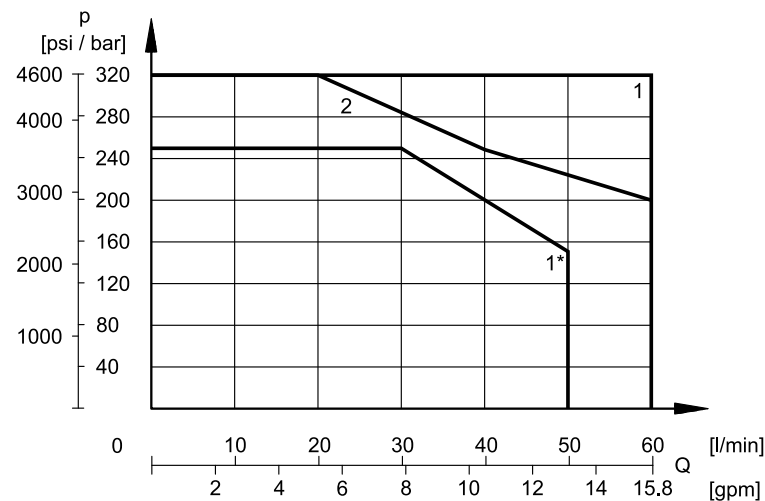
D1, A1, B1	1
D2, A2, B2	2
D3, A3, B3	3
D4, A4, B4	4
D4, A4, B4 reverse flow	4*
TA1, TB1	4
TA2, TB2	1

SDM PERFORMANCE CURVES



D1, A1, B1	1
D2, A2, B2	2
D3, A3, B3	3
D4, A4, B4	4
D4, A4, B4 reverse flow	4*
TA1, TB1	2
TA2, TB2	1

SDS PERFORMANCE CURVES



D1, A1, B1	1
D2, A2, B2	1
D3, A3, B3	2
D4, A4, B4	1
D4, A4, B4 reverse flow	1*
TA1, TB1	1
TA2, TB2	1

The solenoid consists of tube and coil. The coil is mounted on the tube and fastened to it by a ring retainer.

The WK7D coil includes a suppressor diode of pulses for protection from voltage peaks. During the switching the diode significantly reduces the energy released by the winding, by limiting the voltage to 31.4V in the D12 coil and to 58.9 V in the D24 coil.

Contact us to order coils as spare parts.

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	according to European directive 2014/30/EU
PROTECTION CLASS FOR INSULATION copper wire	class H (180 °C)
coil	class F (155 °C)

	Absorbed power [W]	Resistance at 20 °C [Ω]	Current at 20 °C. [A]
SDL WORKING SECTION			
D12	26.5	5.4	2.2
D24	27.8	20.7	1.16
D28	28.5	27.5	1.02
D48	28	82	0.58

SDM WORKING SECTION			
D12	28.9	4.98	2.41
D24	28	21	1.15

SDS WORKING SECTION			
D12	32.7	4.4	2.72
D24	31	18.6	1.29
D28	31	26	1.11
D48	29.5	78.6	0.61

UNLOADING VALVE FOR INLET SDX-P (see page 19)			
D12	20	7.2	1.67
D24	20	28.8	0.83

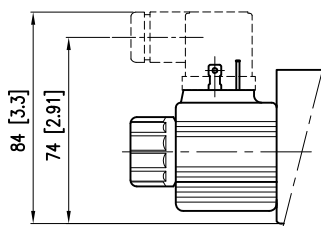
UNLOADING VALVE FOR INLET SDX-QP (see page 20)			
D12	20.5	7	1.2
D24	20.5	28	0.6

ELECTRICAL CONNECTIONS AND IP DEGREES

Declared IP degrees are intended according to EMC 2014/30/EU, only for both valve and connectors of an equivalent IP degree, installed properly. Mating connectors are not included in solenoid valves delivery. Connectors for K1 coils can be ordered separately.

WK1, WK7 and WK7D coils reach a better IP degree than standard metal coils thanks to the zinc-nickel plating and to some constructive measures.

SDL - K1



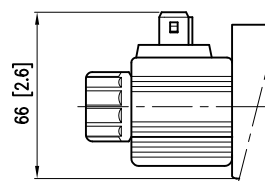
DIN 43650 (EN 175301-803)

Mating connectors type ISO 4400 / DIN 43650 (EN 175301-803).

IP degree of electrical connection: IP66

IP degree of whole valve: IP 66

SDL - K2



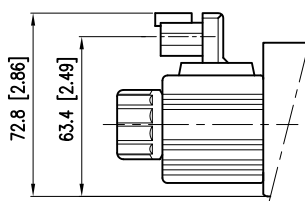
AMP Junior

Upon request only.

IP degree of electrical connection: IP65/IP67

IP degree of whole valve: IP65/IP67

SDL - K7



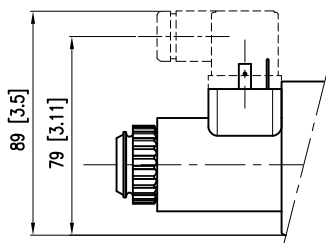
DEUTSCH DT04 MALE

IP degree of electrical connection: IP65/IP68/IP69

IP degree of whole valve: IP65/IP68/IP69

IP degree according to ISO 20653: IP69K

SDM - K1



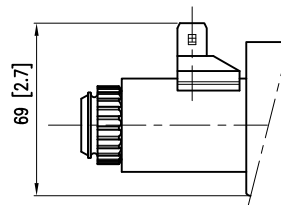
DIN 43650 (EN 175301-803)

Mating connectors type ISO 4400 / DIN 43650 (EN 175301-803).

IP degree of electrical connection: IP65

IP degree of whole valve: IP 65

SDM - K2



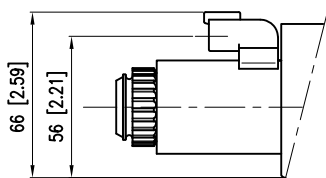
AMP Junior

Upon request only.

IP degree of electrical connection: IP65

IP degree of whole valve: IP65

SDM - K7

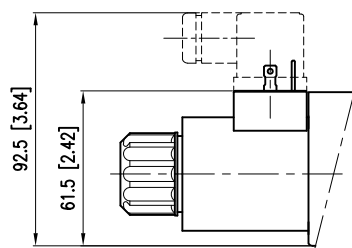


DEUTSCH DT04 MALE

IP degree of electrical connection: IP65

IP degree of whole valve: IP65

K1



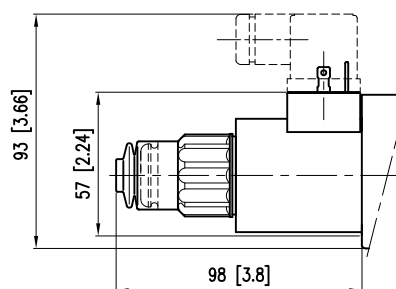
DIN 43650 (EN 175301-803)

Mating connectors type ISO 4400 / DIN 43650 (EN 175301-803).

IP degree of electrical connection: IP65

IP degree of whole valve: IP 65

WK1



DIN 43650 (EN 175301-803)

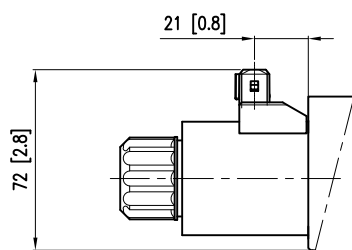
Zinc-nickel plated coil.

IP degree of electrical connection: IP66

IP degree of whole valve: IP66

The pin for manual override is boot-protected (code B).

K2



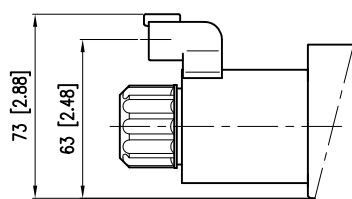
AMP Junior

Upon request only.

IP degree of electrical connection: IP65/IP67

IP degree of whole valve: IP 65

K7

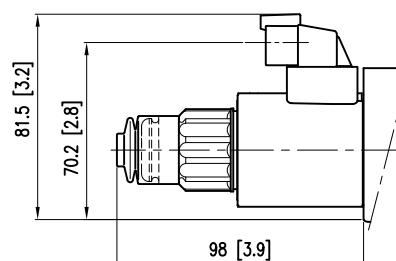


DEUTSCH DT04 MALE

IP degree of electrical connection: IP65/IP67

IP degree of whole valve: IP 65

WK7 / WK7D



DEUTSCH DT04 MALE

Zinc-nickel plated coil.

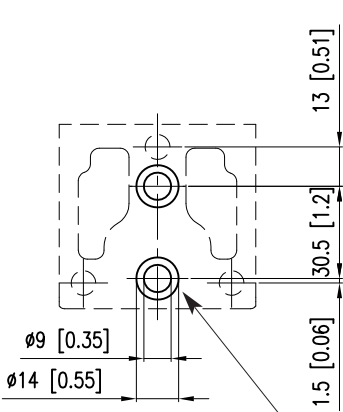
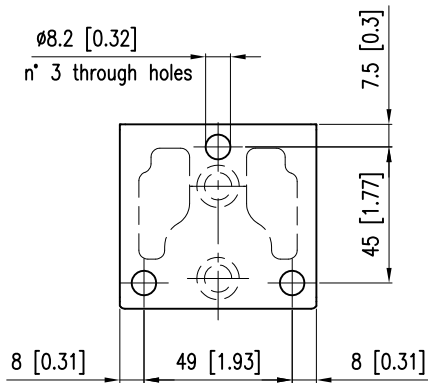
IP degree of electrical connection: IP66/IP68/IP69 -

IP degree of whole valve: IP66/IP68/IP69

IP degree according to ISO 20653: IP69K

The pin for manual override is boot-protected (code B).

SECTIONAL MOUNTING INTERFACE



dimensions in mm [in]

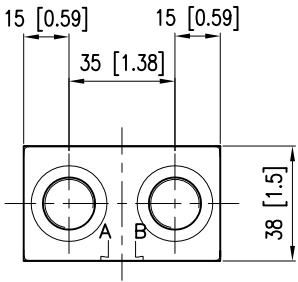
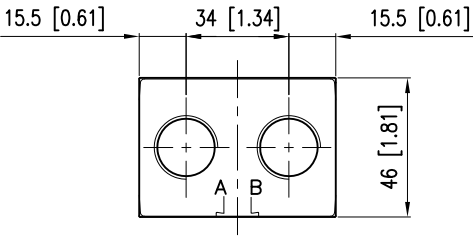
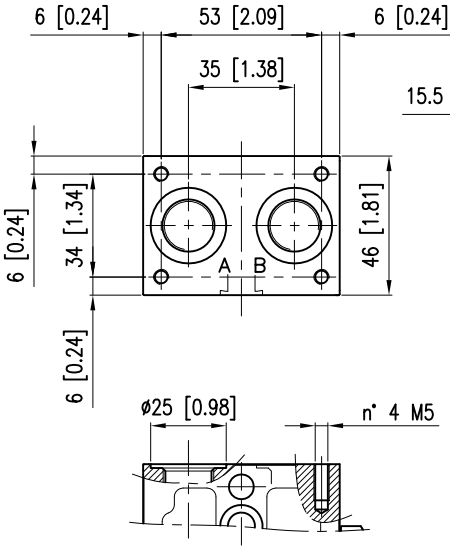
Seals:
no. 2 O-Ring
type 2043 (10.82x1.78)

MOUNTING INTERFACE - WORKING PORTS

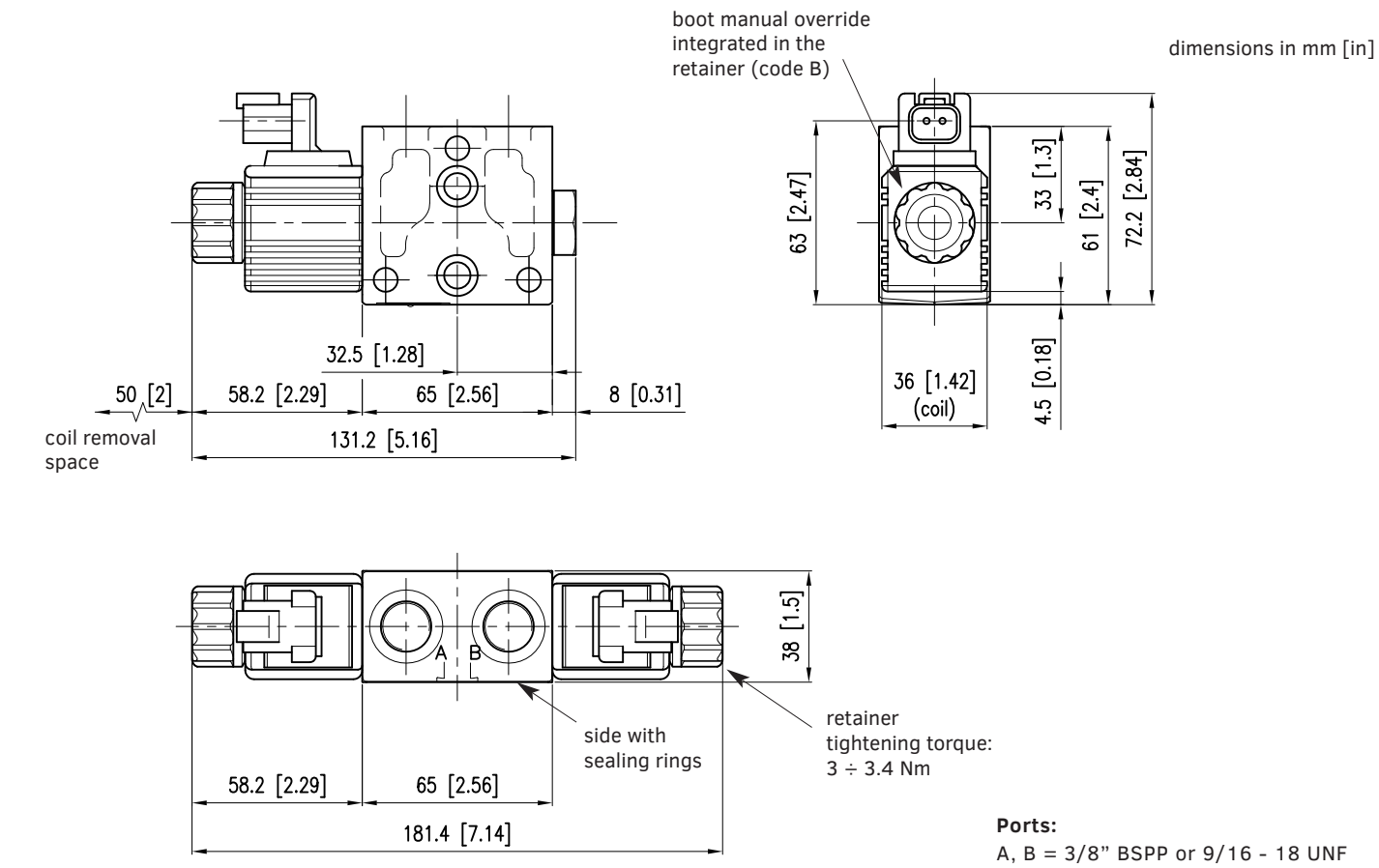
SDS
with mounting surface
for flangeable component
available ports:
B15 or S15

SDS
available ports:
B2 or S2

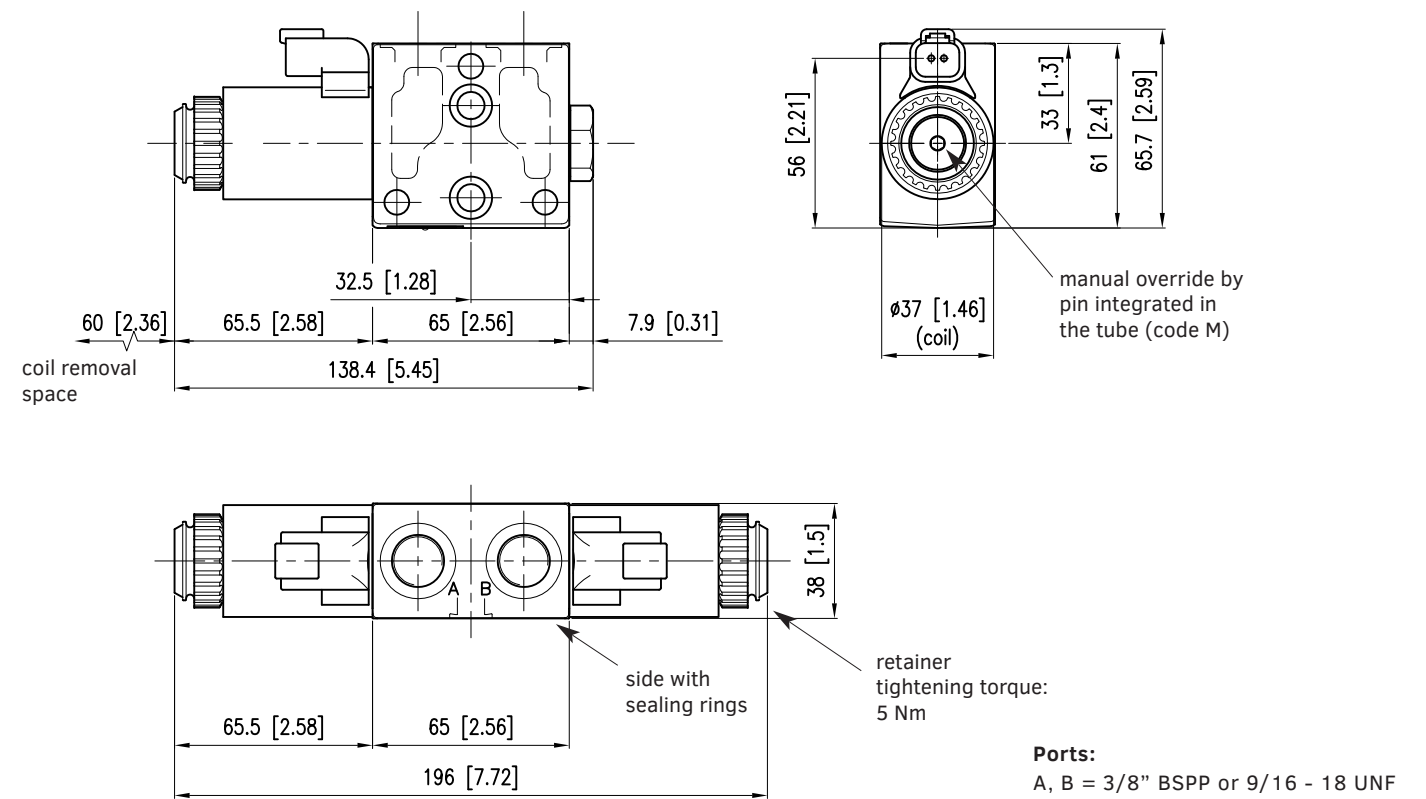
SDL and SDM
available ports:
B15 or S15



SDL (K7 COIL)

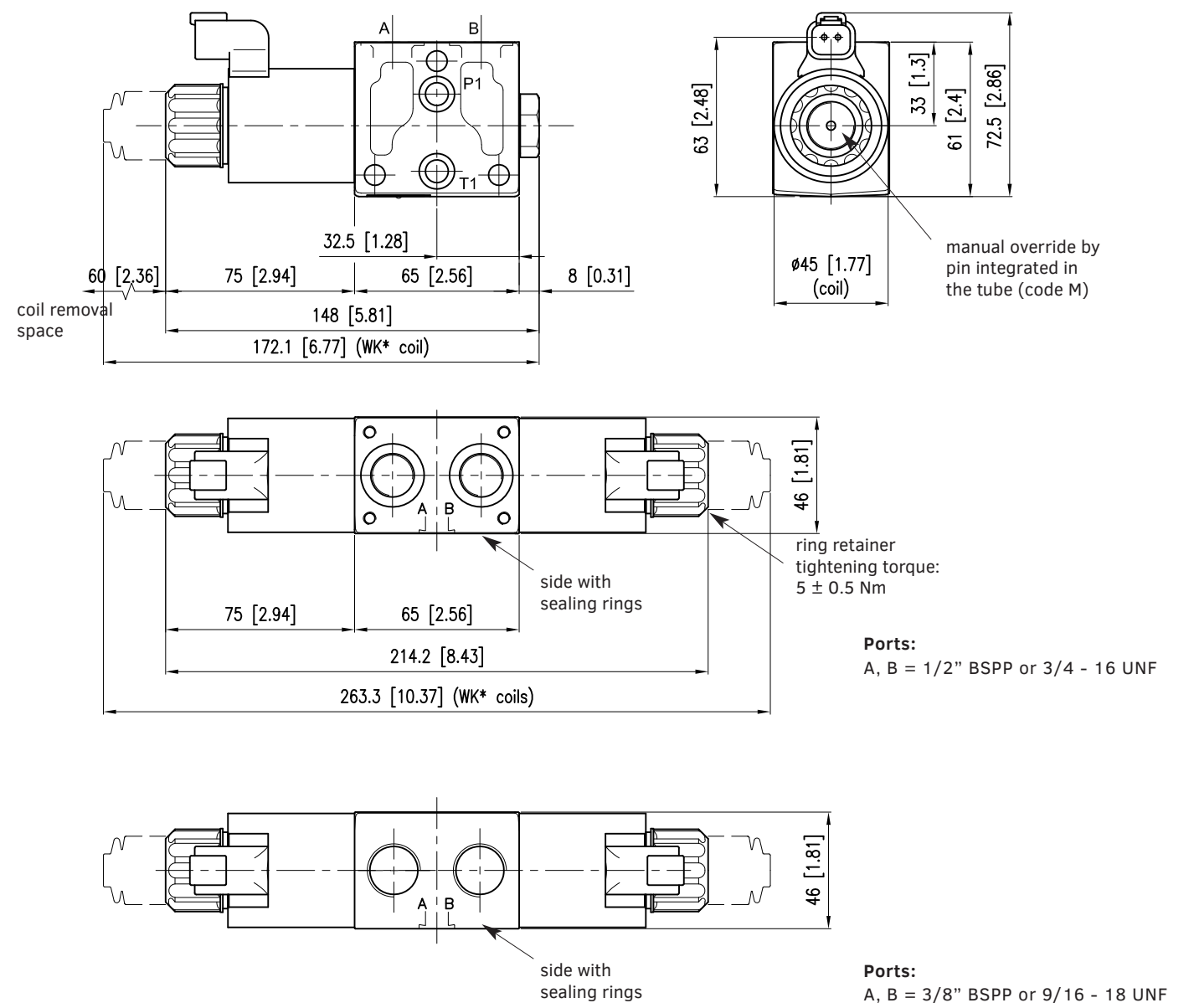


SDM (K7 COIL)



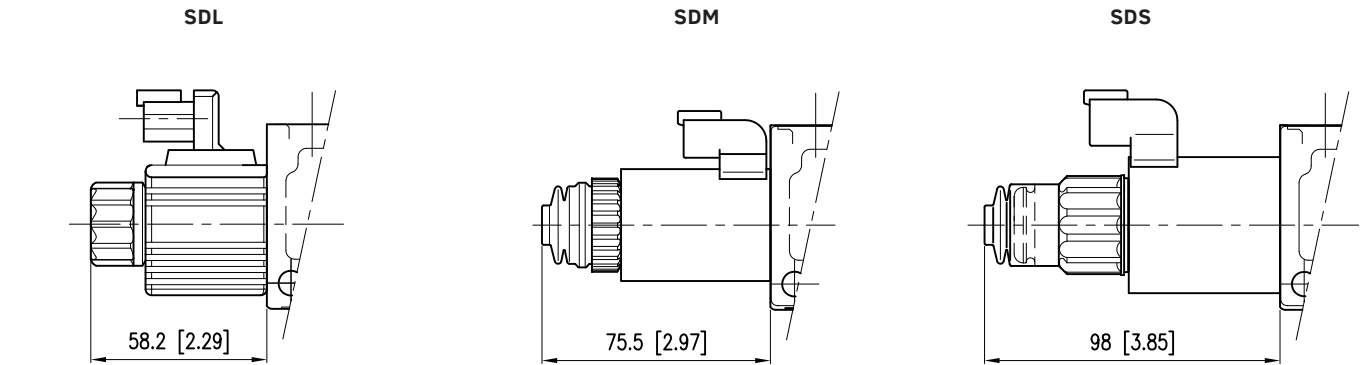
SDS (K7 COIL)

dimensions in mm [in]

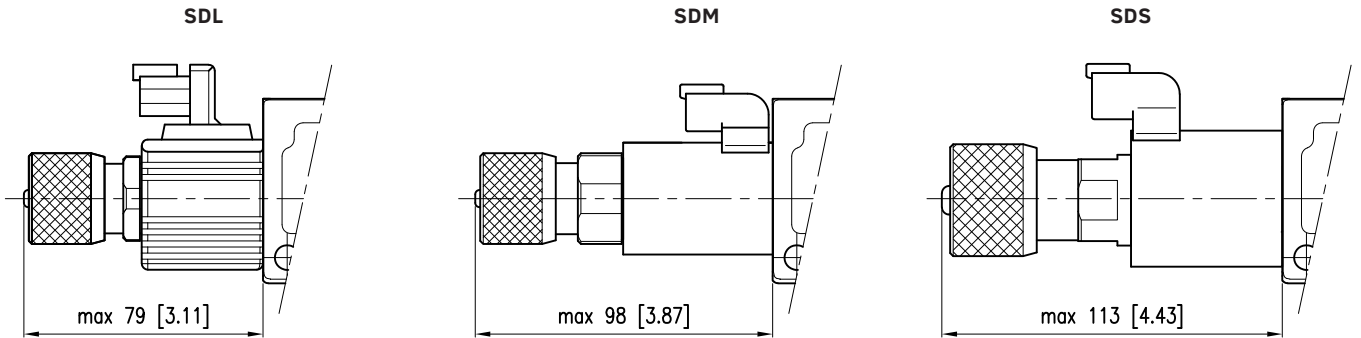


VERRIDE PINS INTEGRATED THE TUBE, BOOT PROTECTED: Code B

The SDL standard element is already equipped with boot protection of the solenoid tube. dimensions in mm [in]



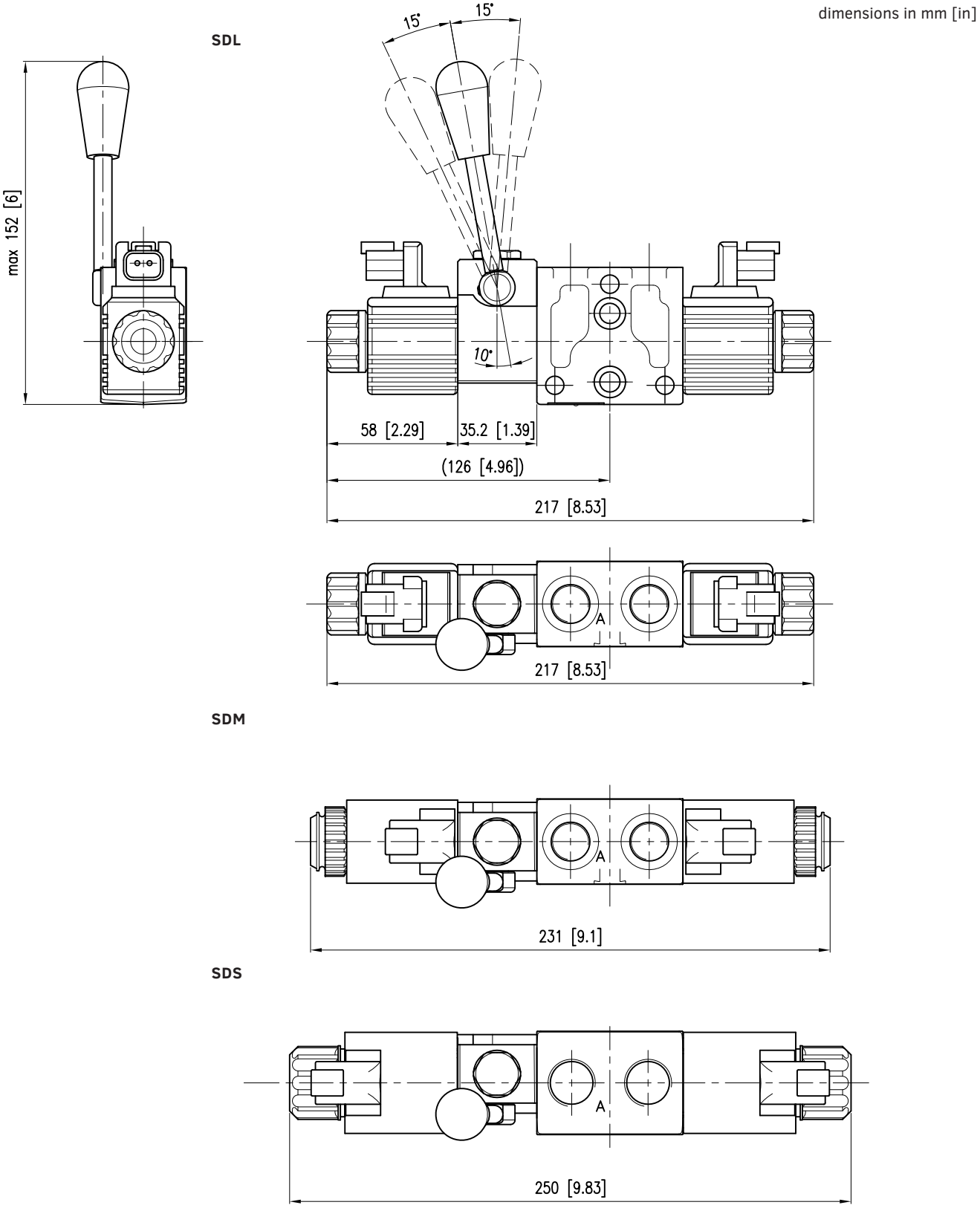
NOB, TURNING: Code K



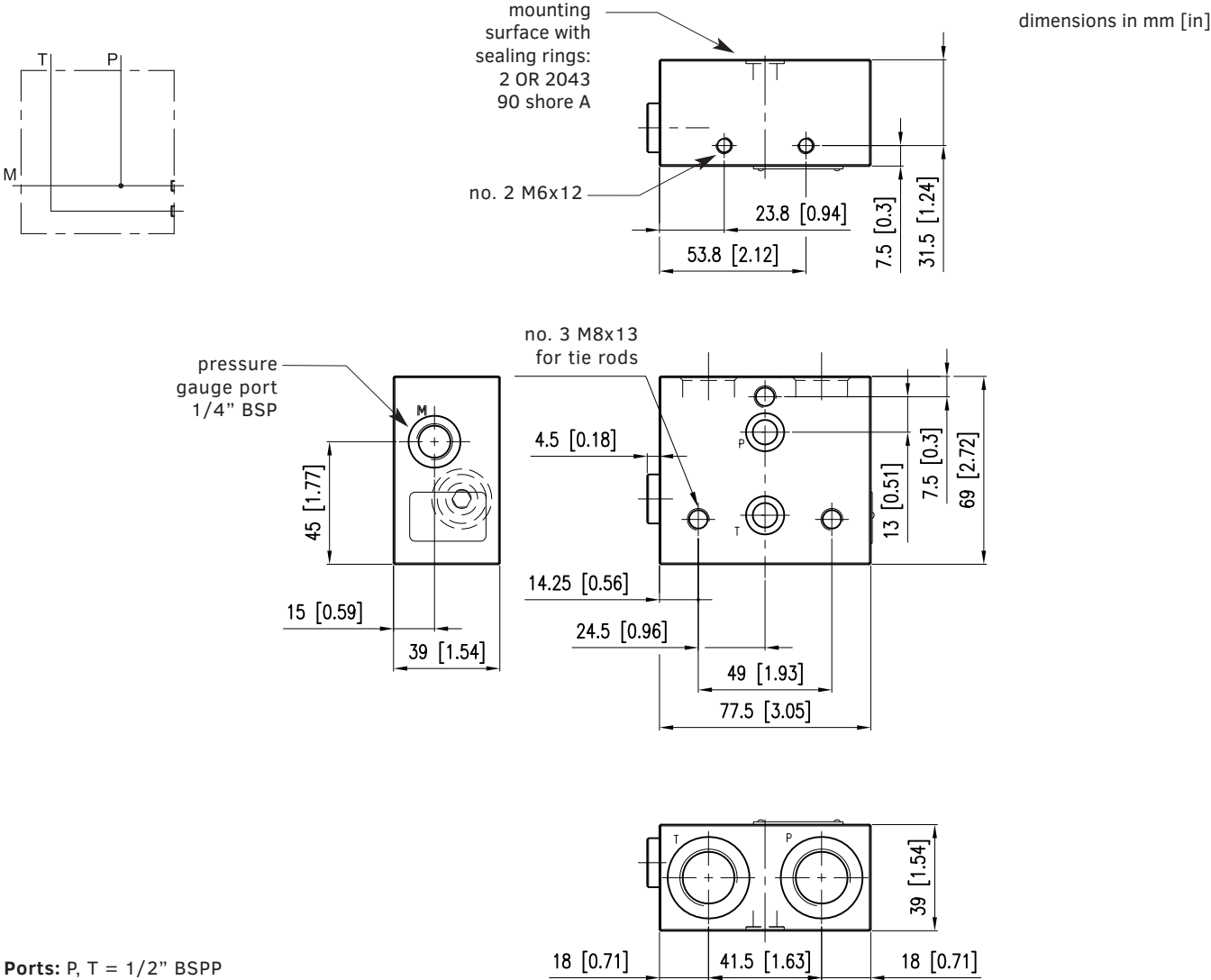
HAND LEVER: Code L

Devices are placed on side A. Please contact our technical depth for other positions. Please refer to the overall drawings in the previous pages for non-quoted dimensions.

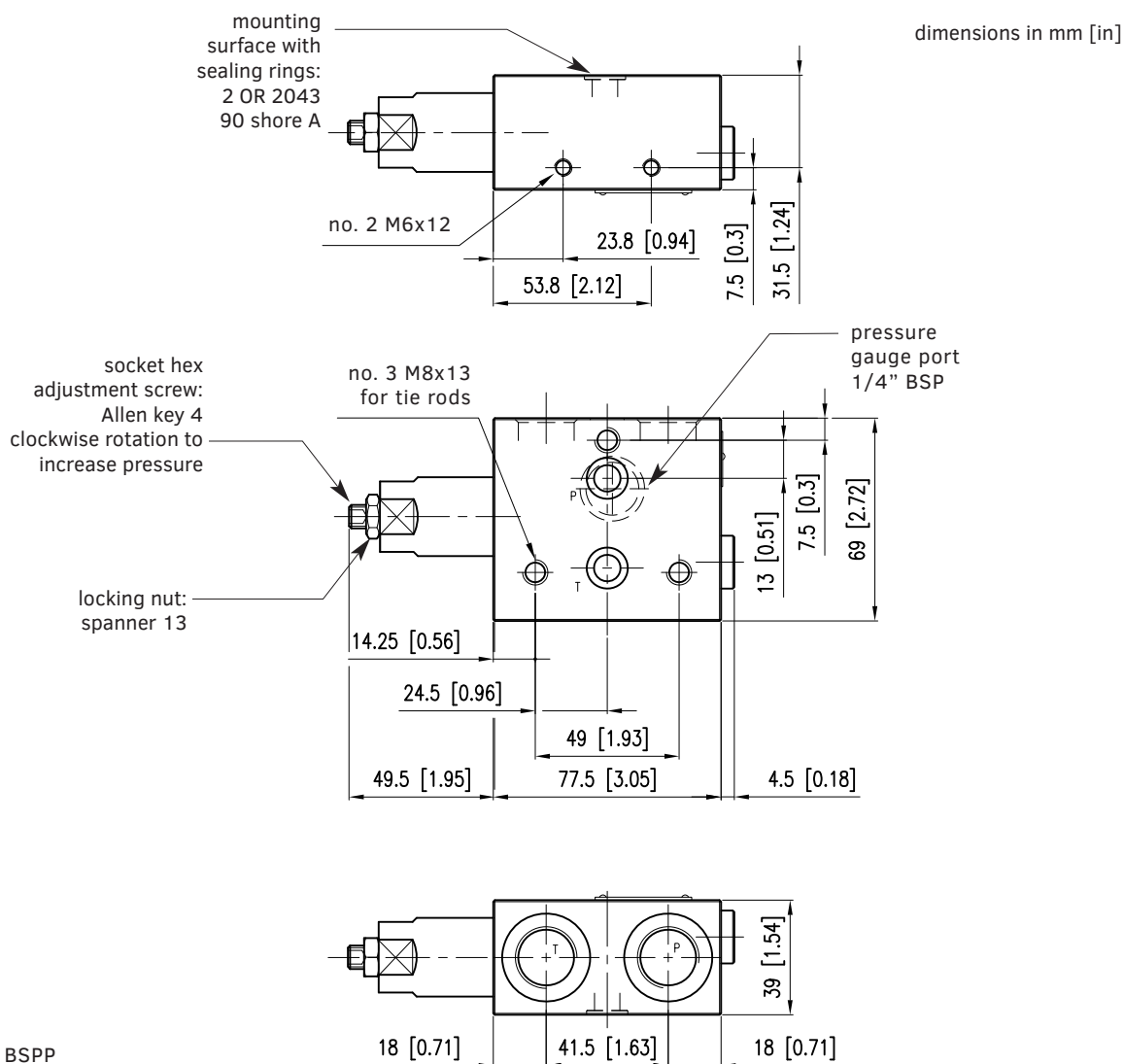
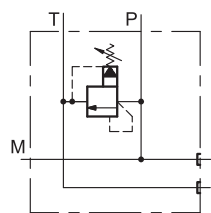
The CHL lever device can work with a maximum pressure in line T up to 50 bar, therefore it is not suitable for series circuits.



BASIC INLET SDX-B2S-*-1



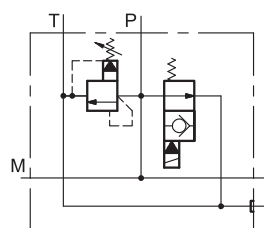
INLET WITH PRESSURE CONTROL VALVE SDX-P***-B2S-*-1



Ports: P, T = 1/2" BSPP

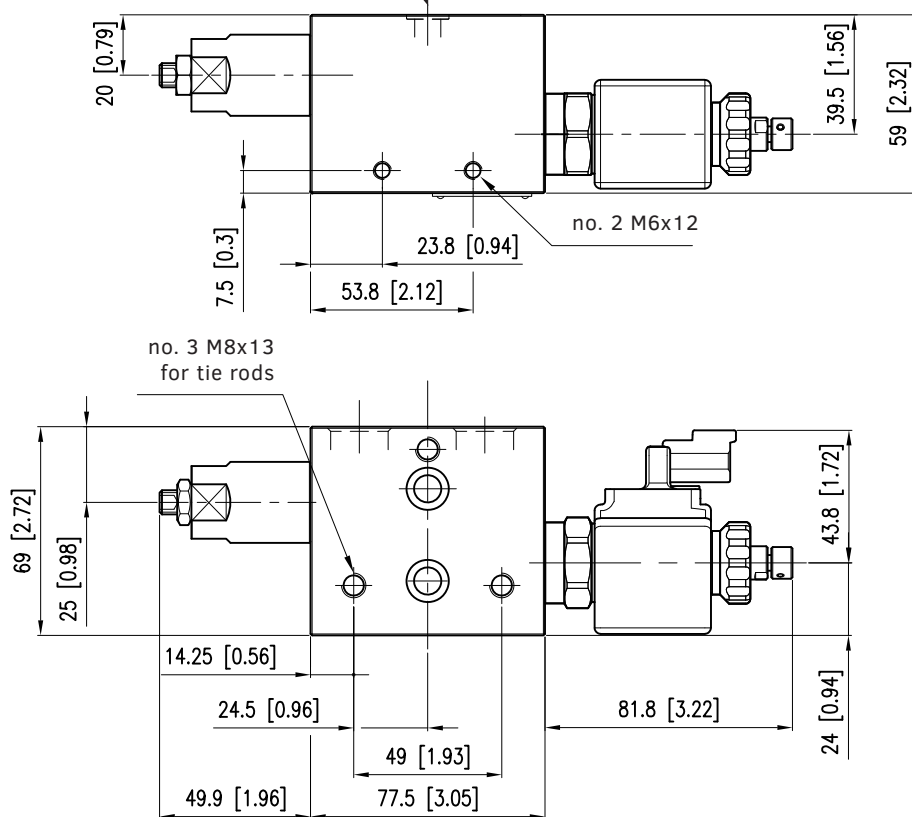
NOTE: please refer to page 12 for missing dimensions of the mounting interface

INLET WITH PRESSURE CONTROL VALVE AND UNLOADING SDX-P***-B2S-D**K7P-*-2



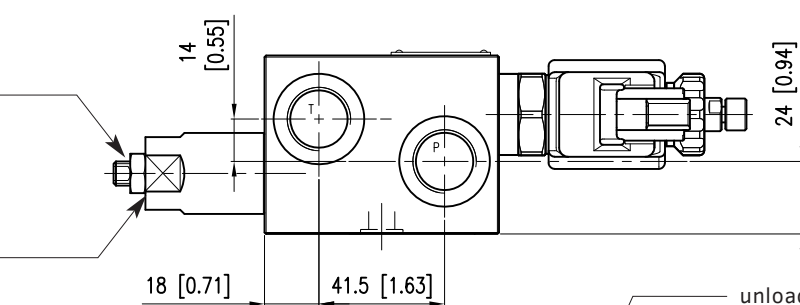
mounting
surface with
sealing rings:
2 OR 2043
90 shore A

dimensions in mm [in]



socket hex
adjustment screw:
Allen key 4
clockwise rotation to
increase pressure

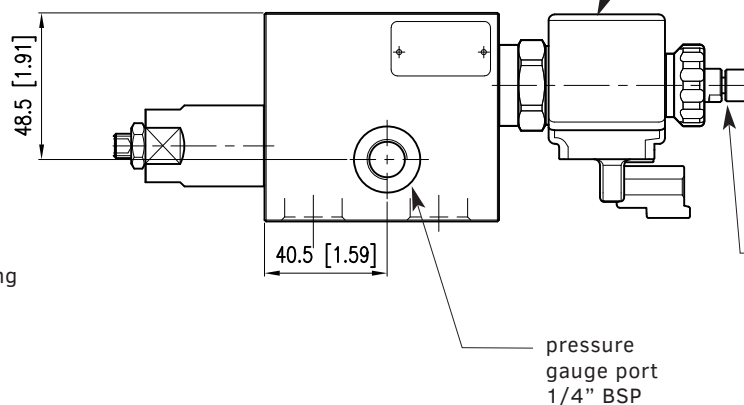
locking nut:
spanner 13



unloading valve
here shown with
K7 connection

Ports: P, T = 1/2" BSPP

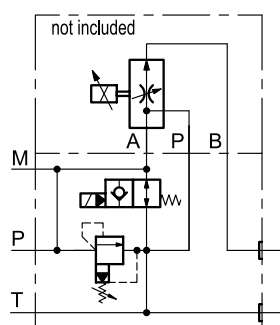
NOTE: please refer to page 12 for missing
dimensions of the mounting interface



pressure
gauge port
1/4" BSP

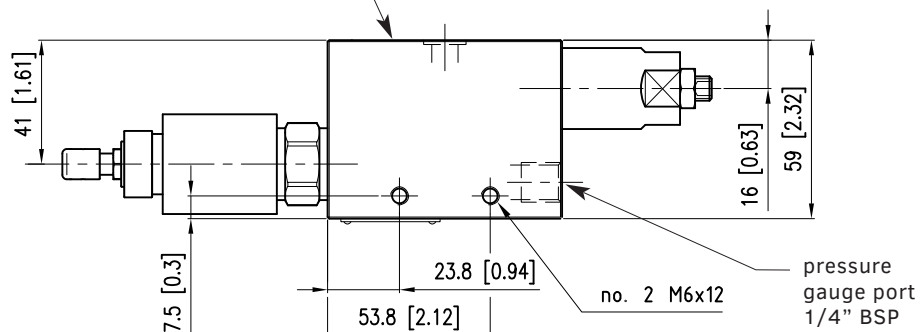
push manual over-
ride: look at the
model number for
further choices.

INLET WITH PRESSURE CONTROL VALVE AND UNLOADING SDX-QP***-B15S-D**K7P-*-1

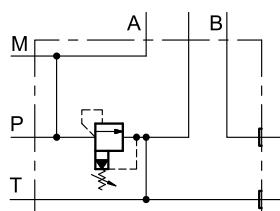


mounting
surface with
sealing rings:
2 OR 2043
90 shore A

dimensions in mm [in]



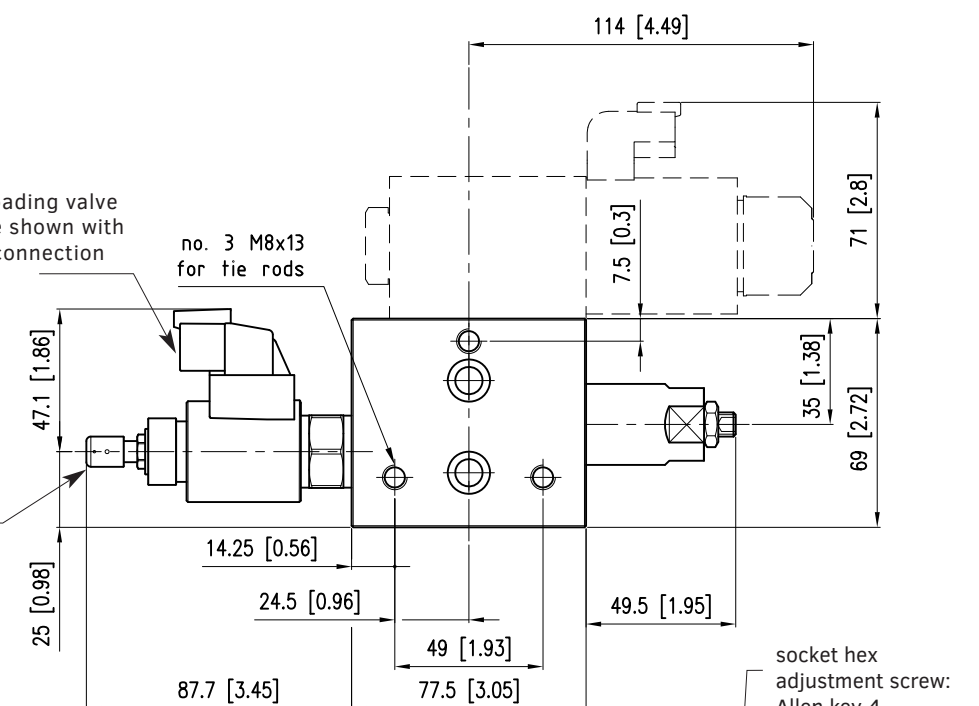
NOTE :The same component
without the unloading valve is:
SDX-PQ***-B15S-*-1



unloading valve
here shown with
K7 connection

no. 3 M8x13
for tie rods

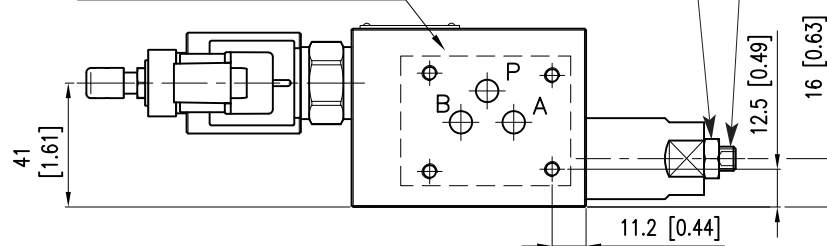
push manual
override: look at
the model number
for further
choices.



mounting pattern ISO 6263-03
(CETOP 03) without T port

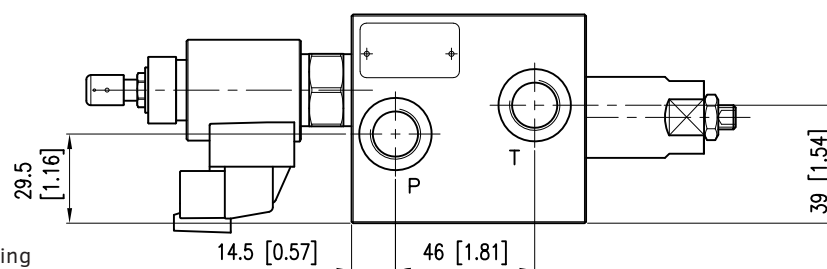
locking nut:
spanner 13

socket hex
adjustment screw:
Allen key 4
clockwise rotation to
increase pressure

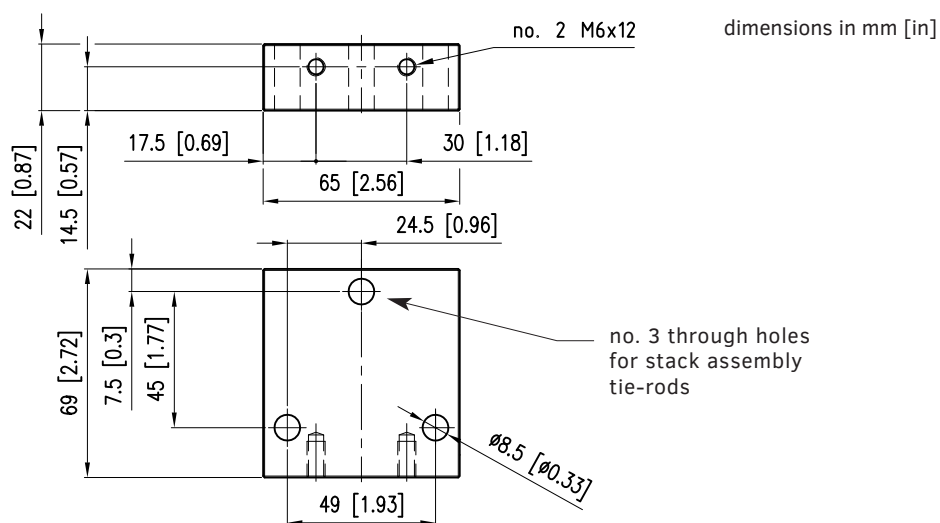


Ports: P, T = 3/8" BSPP

NOTE: please refer to page 12 for missing
dimensions of the mounting interface



1000

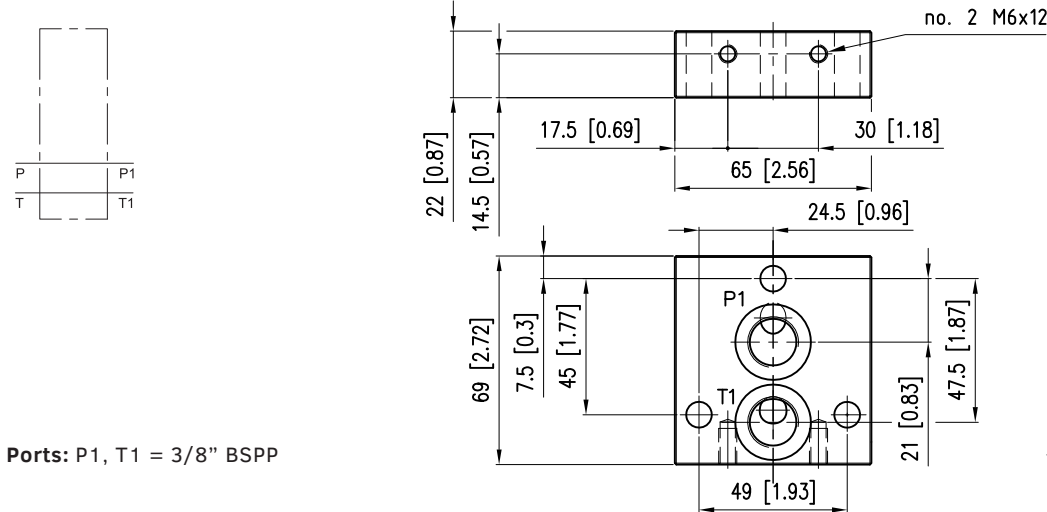


A diagram showing a rectangular structure. A horizontal line passes through the middle of the rectangle, with the label 'P' on the left and 'P1' on the right. The rectangle is defined by solid vertical lines and dashed horizontal lines at the top and bottom.

A diagram of a rectangular pulse function $T(t)$. The horizontal axis is labeled t and has two points marked: T and T_1 . The pulse is represented by a solid line at a constant height from $t = 0$ to $t = T_1$. Dashed lines extend vertically from $t = 0$ and $t = T_1$ to the top of the pulse, and a dashed line connects the top of these two vertical lines, forming a rectangle.

NOTE: please refer to page 12 for missing dimensions of the mounting interface

OUTLET SECTION 03: BOTH P AND T PORTS

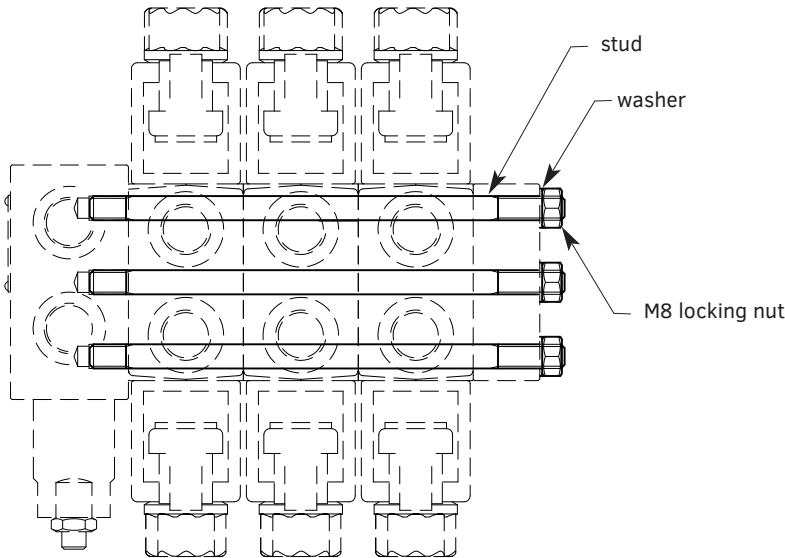


INSTALLATION

The stacked valve assembly can be installed in any position without impair the proper functioning.

Ensure that there is no air in the hydraulic circuit.

Assembly kits are available and can be ordered by codes in the tables below. Please contact the technical dept. for dimensional check of special assemblies before order.



ASSEMBLY KIT

The assembly kit includes:

- no. 3 studs,
- no. 3 self locking nuts
- no. 3 washers

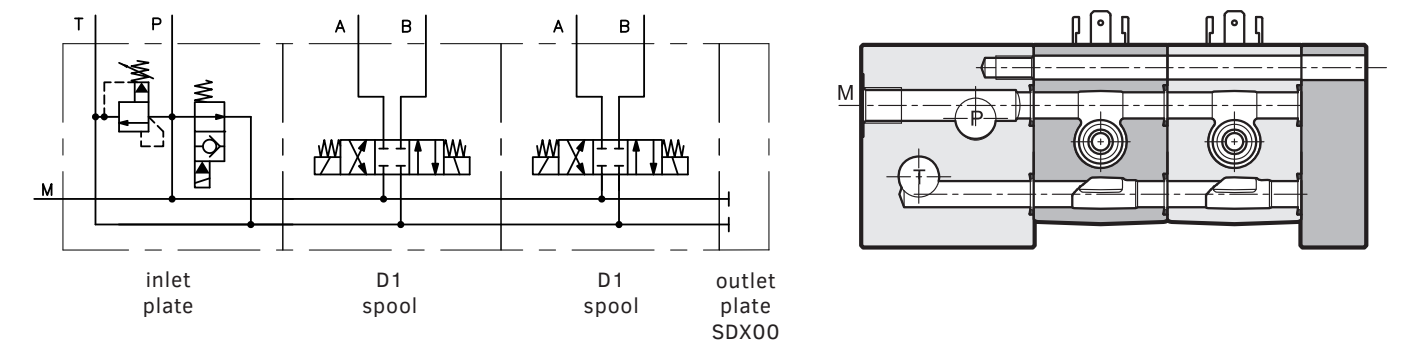
All parts are zinc-coated.

Please use these codes to order the kit:

Valve type	Sectional valves	Code
SDL-B15 SDL-S15 SDM-B15 SDM-S15	3	3404100100
	4	3404100101
	5	3404100102
	6	3404100103
	7	3404100104
	8	3404100105
SDS-B15 SDS-S15 SDS-B2 SDS-S2	9	3404100106
	3	3404100108
	4	3404100109
	5	3404100110
	6	3404100111

Tightening torque: 20 (0 / +3) Nm

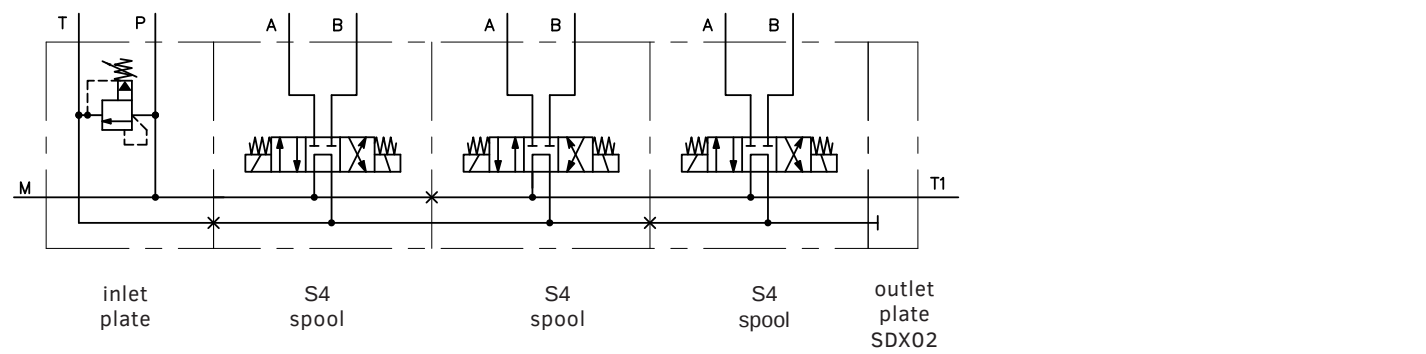
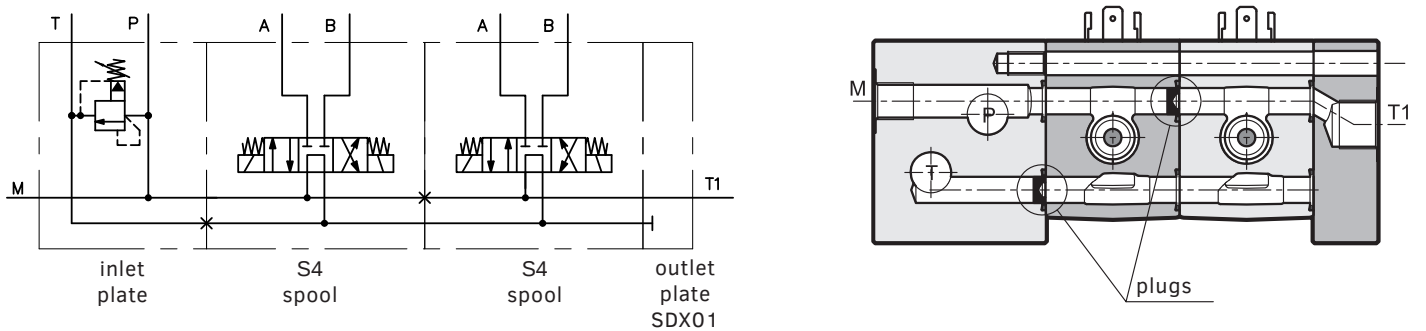
CIRCUIT EXAMPLE: PARALLEL CIRCUIT



CIRCUIT EXAMPLES : SERIES CIRCUITS

Series circuits are made with sectional valves with D4 spools, by inserting plugs between elements. The oil path is diverted from P to T line alternatively.

Please note that this kind of configuration requires a different outlet plate depending on the number (even or odd) of sectional directional valves in the assembly.



plug Ø9 - ordering code: 0612253

IP DEGREE TIPS

The technical reference standard for IP degree is IEC 60529, which classifies and rates the degree of protection provided by equipments and electrical enclosures against intrusions.

The first digit (6) concerns the protection from solid particles (body parts to dust).

The second digit of the IP rating concerns the liquid ingress protection. It indicates three different types of atmospheric agents from which protection is provided:

Values from 1 to 6 → water jets.

Values 7 and 8 → immersion.

Value 9 → high pressure and high temperature water jets.

This means that IP66 covers all the lower steps, rating IP68 covers IP67 but not IP66 and lower. Instead, IP69 does not cover any of them. Whether a device meets two types of protection requirements it must be indicated by listing both separated by a slash. (E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

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APAC

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