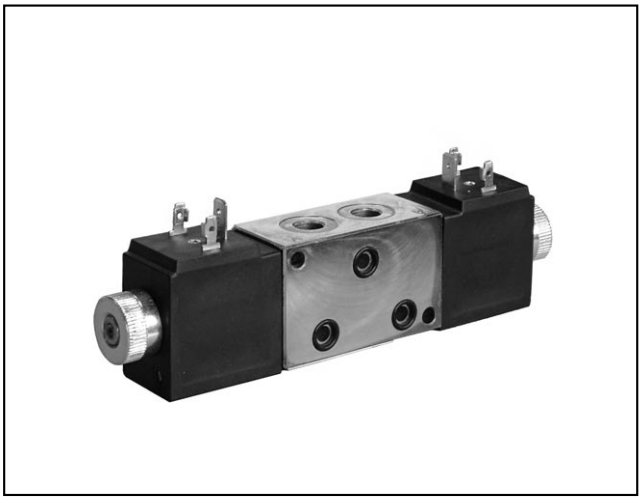
Содержание



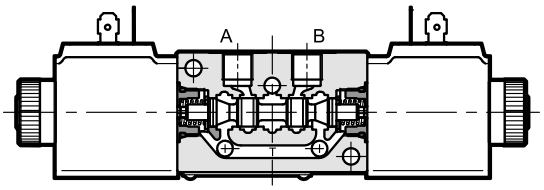
BDL1

STACKABLE DIRECTIONAL CONTROL VALVES

SERIES 10

p max **350** bar
Q max **15** l/min

OPERATING PRINCIPLE



— BDL1 is an assemblage of stackable valves, very versatile thanks to the modular design.

— Stackable elements have been designed to be assembled in parallel connection, mounting up to 8 stackable directional alves.

— BD* assemblies are suitable for compact applications, mainly in mobile industries and in mini-power packs.

— The directional valves have a thickness of 28 mm and 1/8" BSP connections on working ports.

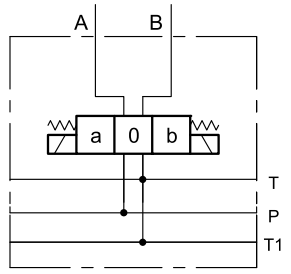
— Inlet elements have P and T ports 1/4" BSP.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Maximum operating pressure: - P-A-B ports - T / T1 ports	bar	 350 280
Maximum flowrate	l/min	15
Pressure drops Δp - Q	see paragraph 3	
Electrical characteristics	see paragraph 6	
Operating limits	see paragraph 4	
Electrical connections	see paragraph 7	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15	
Recommended viscosity	cSt	25
Mass (directional valve)	kg	0.8
Surface treatment of inlet and outlet elements and of valve body	zinc-nickel	

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES OF SEPARATE ELEMENTS

Here below are shown the identification codes for the separate elements of the stackable valve.

1.1 - Directional valve element

BD	L	1	-	B18	-		/	10		-			/	

Stack directional valve element, on-off

13 mm solenoid tube

Size : thickness 28 mm

Ports 1/8” BSP

Spool type
(see point 1.2)

Series no.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil type:
DC coils
D12 = 12 V
D24 = 24 V
D00 = valve without coil supplied with locking ring

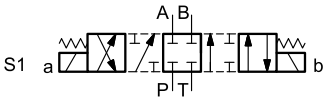
Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K2 = plug for connector type AMP JUNIOR
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

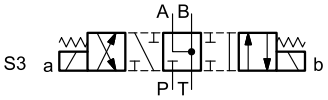
Manual override:
Omit for pin manual override integrated in the tube (**standard**).
CM = manual override boot protected

NOTE: A galvanic surface treatment zinc-nickel is applied to body elements and plates, making the assembly suitable to withstand a salt spray exposure time of **600** hours (test carried out according to the UNI EN ISO 9227 and assessment test carried out according to UNI EN ISO 10289).

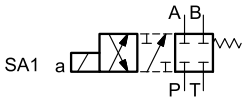
1.2 - Available spools

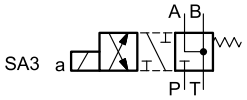
Type **S**:
2 solenoids - 3 positions
spring centreing



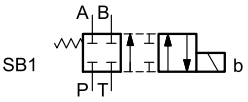


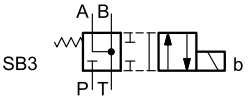
Type **SA***: 1 solenoid side A
2 positions (central + external)
spring centreing



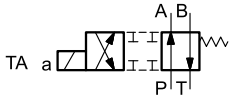


Type **SB***: 1 solenoid side B
2 positions (central + external)
spring centreing

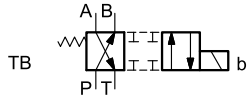




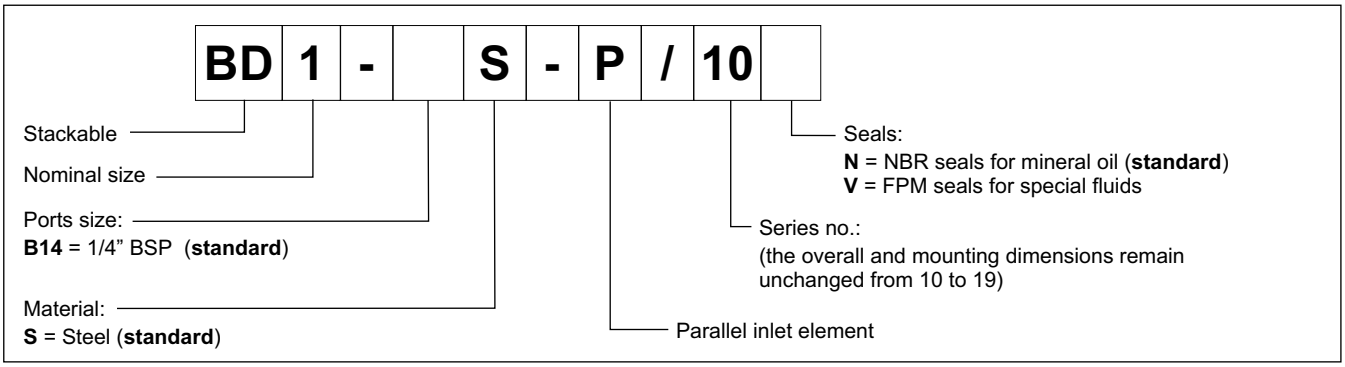
Type **TA***:
1 solenoid side A
2 external positions
with return spring



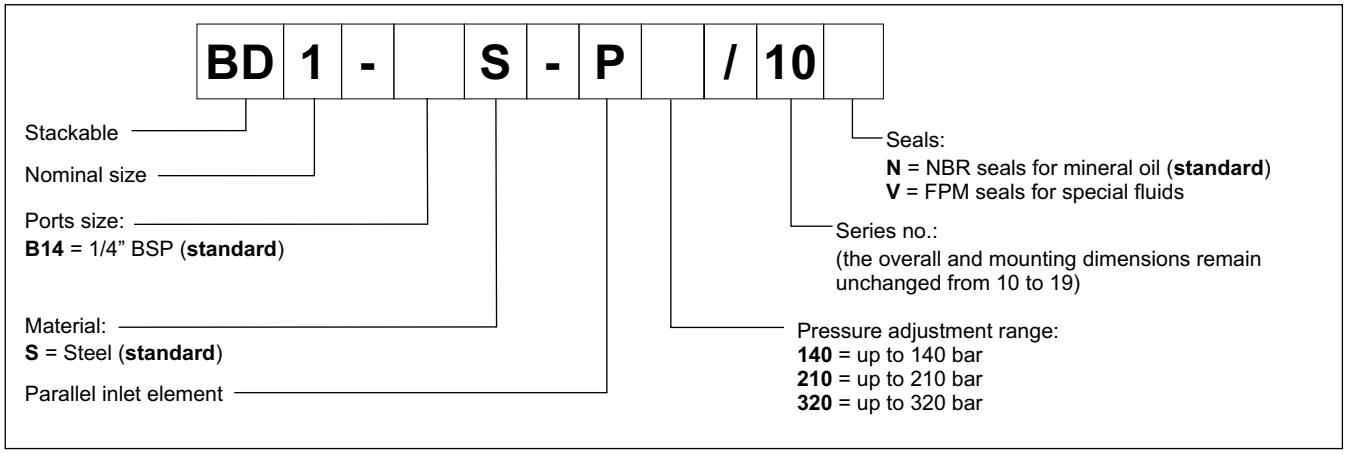
Type **TB***:
1 solenoid side B
2 external positions
with return spring



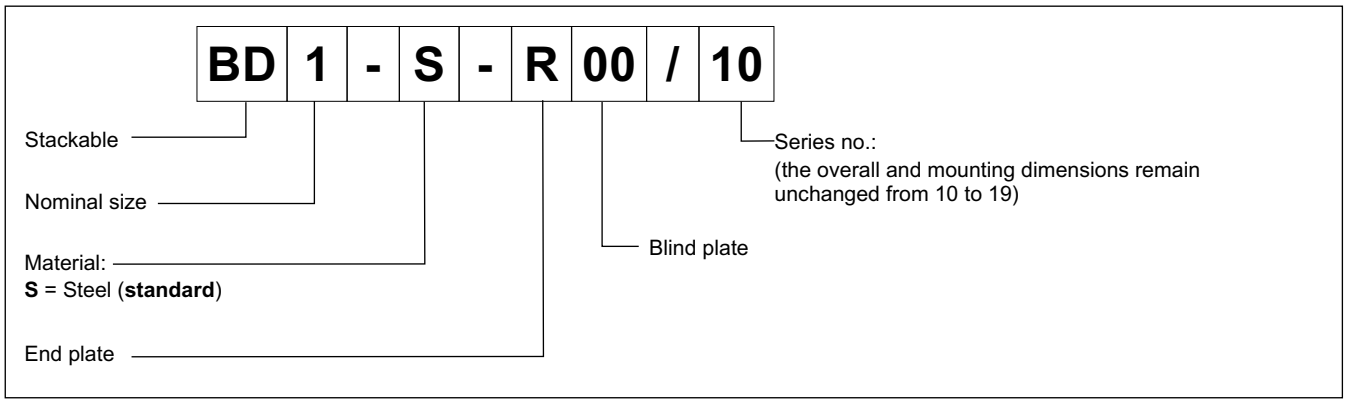
1.3 - Inlet element without pressure control valve



1.4 - Inlet element with pressure control valve



1.5 - End plate



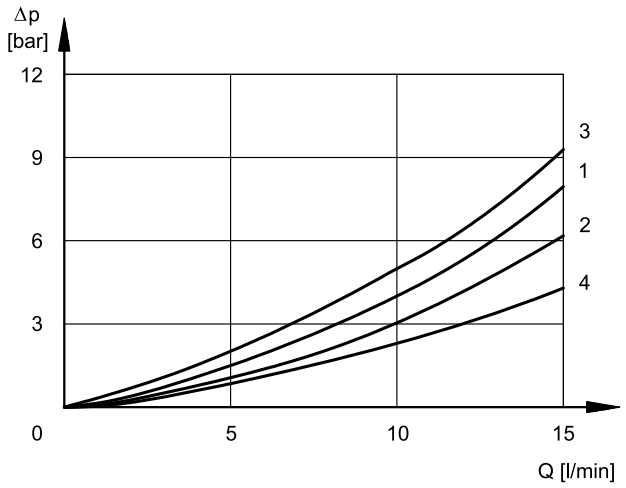
2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). 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 causes a faster degradation of the fluid and of the seals characteristics.The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

(values obtained with viscosity 36 cSt at 50 °C)



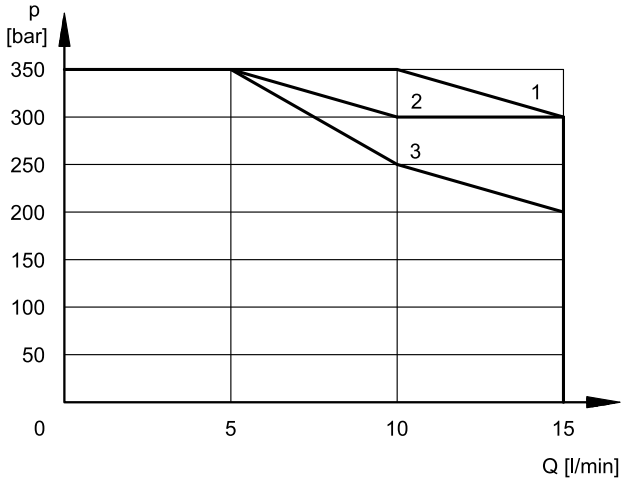
SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPHS			
S1, SA1, SB1	1	1	2	2
S3, SA3, SB3	3	3	4	4
TA, TB	1	1	2	2

Please refer to the curve 2 for pressure drops of S3 spool in central position.

4 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions. The values have been obtained according to ISO 6403 norm 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.



SPOOL TYPE	
S1	1
S3	3
TA, TB	2

5 - SWITCHING TIMES

Values obtained according to ISO 6403, with mineral oil with viscosity 36 cSt at 50°C.

TIMES [ms] (±10%)	ENERGIZING	DE-ENERGIZING
BDL1	25 ÷ 75	15 ÷ 25

6 - ELECTRICAL FEATURES

6.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated to suit the available space.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class H

6.2 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

The protection degree IP69K is not taken into account in IEC 60529 but it is included in ISO 20653.

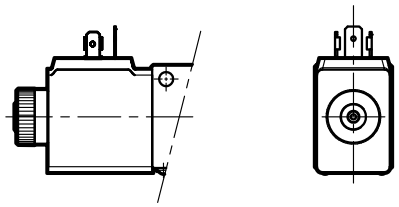
protection referred to	electrical connection		whole valve
	IP65	IP69 IP69K	IP65
K1 EN 175301-803	x		x
K2 AMP JUNIOR	x		x
K7 DEUTSCH DT04 male	x	x	x

Current and absorbed power
(values ±5 %)

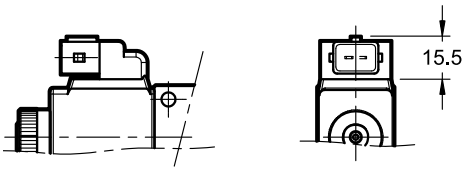
	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]	Coil code K1	K2	K7
D12	6.6	1.8	21.8	1903710	1903720	1903730
D24	27	0.9	21.6	1903711	1903721	1903731

7 - ELECTRICAL CONNECTIONS

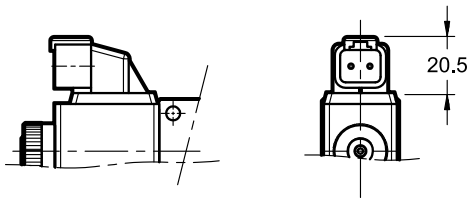
connection for EN 175301-803
(ex DIN 43650) connector
code **K1 (standard)**



connection for AMP JUNIOR connector
code **K2**



DEUTSCH DT04-2P connection for DEUTSCH
DT06-2S male connector
code **WK7**



8 - ELECTRICAL CONNECTORS

The solenoid valves are supplied without connectors. Connectors for electrical connections K1 (EN 175301-803, ex DIN 43650) can be ordered separately with code 0672129.

9 - INSTALLATION

The stack valve assembly can be installed in any position without impair the proper operation.

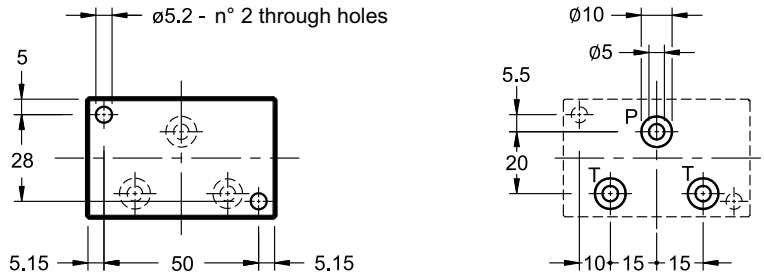
9.1 - Fixing and tie-rods

Fixing kit are available. Please contact the technical dept. for dimensional check and ordering codes.

10 - OVERALL AND MOUNTING DIMENSIONS OF DIRECTIONAL VALVES

10.1 - Mounting surface

dimensions in mm

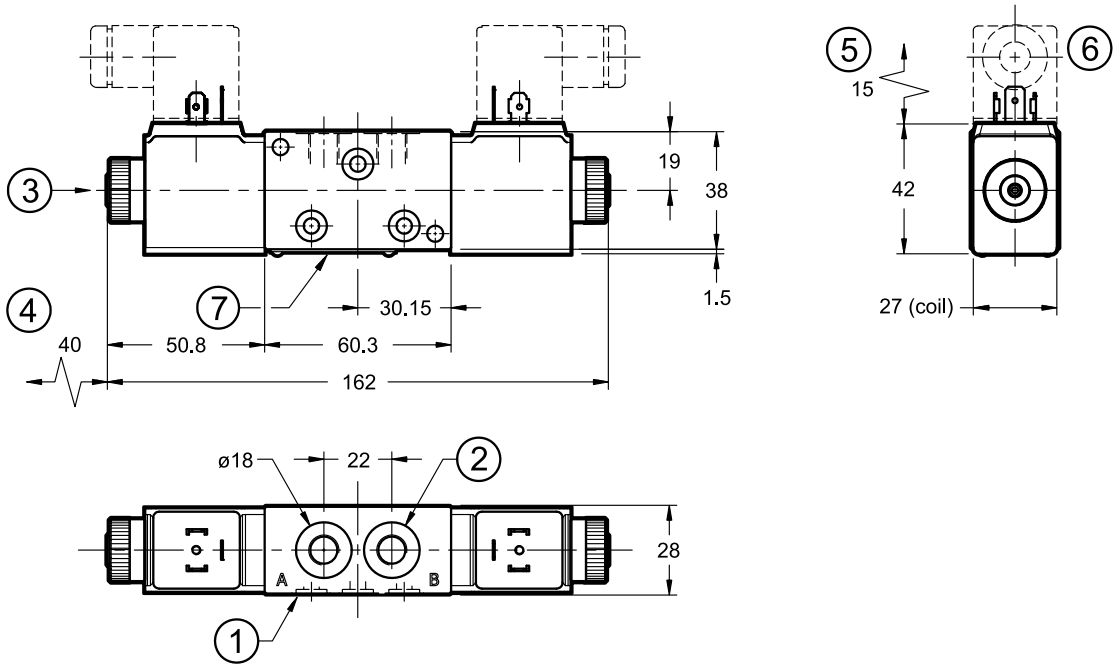


Seals: 3 OR type 106 (7.66x1.78)

10.2 - Directional valve element - solenoid tube ø13

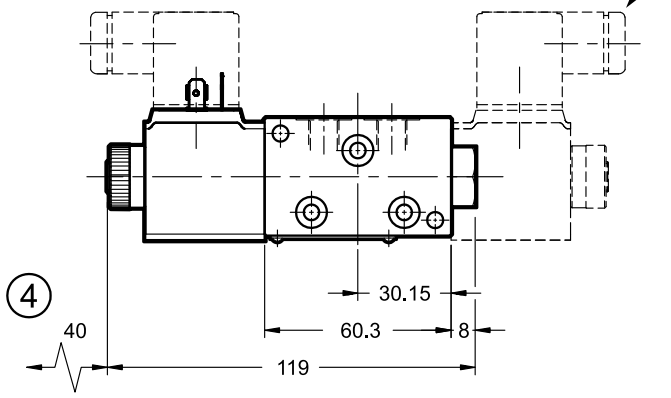
dimensions in mm

BDL1 - B18-S*



solenoid position for SB* and TB configurations

BDL1 - B18-SA
BDL1 - B18-TA

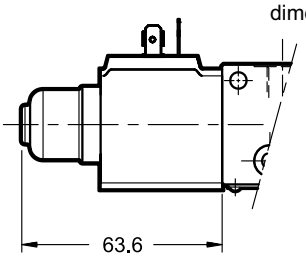


1	Mounting surface with sealing rings
2	A and B ports: 1/8” BSP
3	Locking ring with embedded manual override. Ring tightening torque: 3 Nm
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) connector removal space
6	EN 175301-803 (ex DIN 43650) connector for K1 coil connection To be ordered separately.
7	Element label

10.3 - CM - Boot protected manual override

The version with boot protected manual override is available.
To order it, add **/CM** at the end of the identification code

dimensions in mm

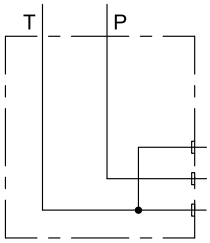


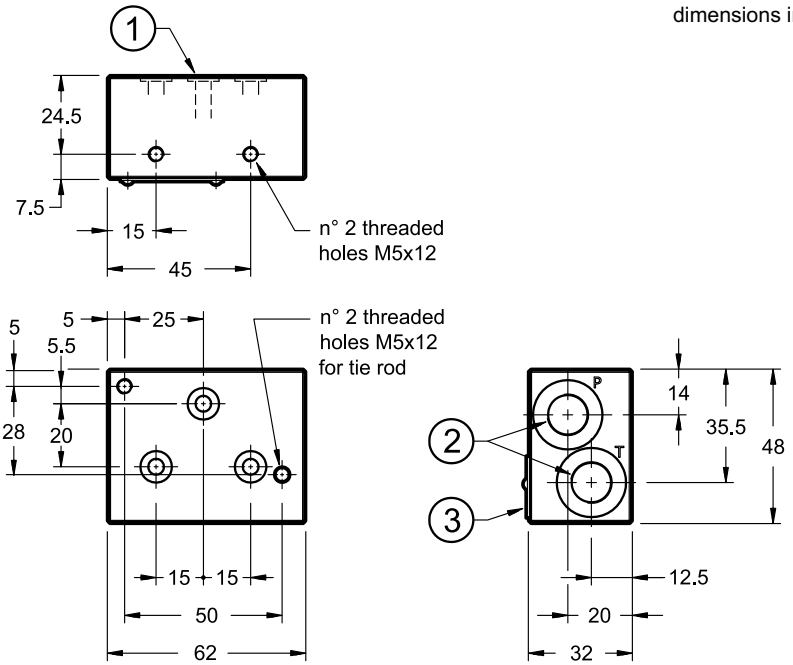
11 - DIMENSIONS OF INLET AND OUTLET ELEMENTS

11.1 - Inlet elements

dimensions in mm

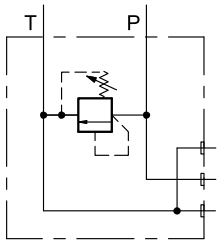
BD1-B14S-P
without pressure control valve

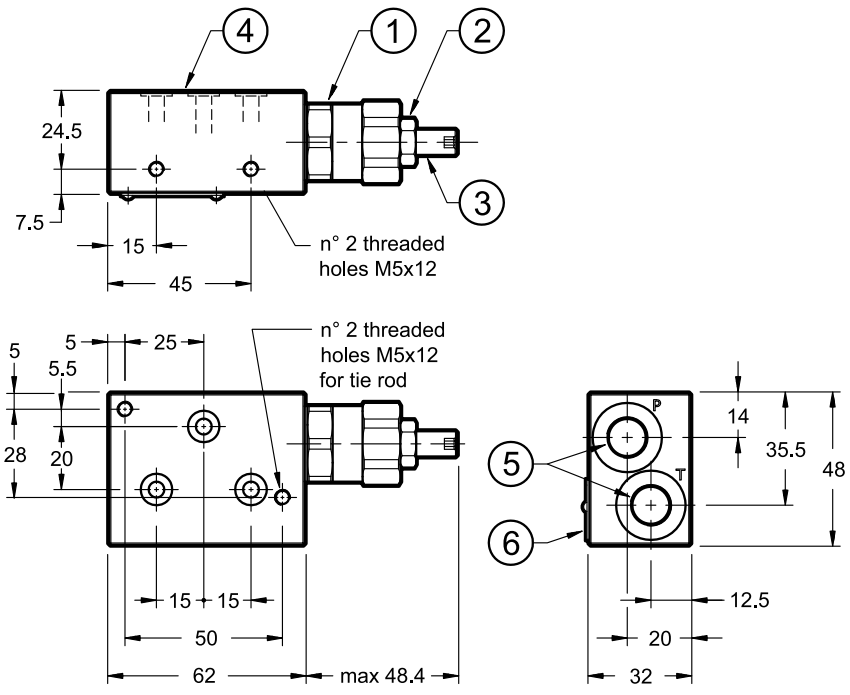




1	Mounting surface with sealing rings: 3 OR type 106 (6.75x1.78)
2	P and T ports: 1/4” BSP
3	Element label

BD1-B14S-P***
with pressure control valve



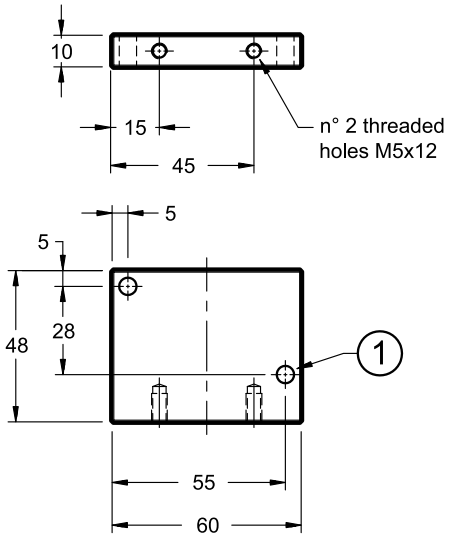


1	Pressure control valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Mounting surface with sealing rings: 3 OR type 106 (6.75x1.78)
5	P and T ports: 1/4” BSP
6	Element label

11.3 - End plate

BD1-S-R00
blind plate

dimensions in mm



1	n° 2 through holes for stack assembly tie-rods

12 - IDENTIFICATION CODE FOR STACK VALVE ASSEMBLY

BD	L	1	-	P		/	10		-			/	XXXXX

Solenoid stack valve assembly

13 mm solenoid tube

Size: thickness 28 mm

Parallel circuit

Qty. of directional valves

Configuration code (5 digits), assigned by Duplomatic

Coil electrical connection:

K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)

K2 = plug for connector type AMP JUNIOR

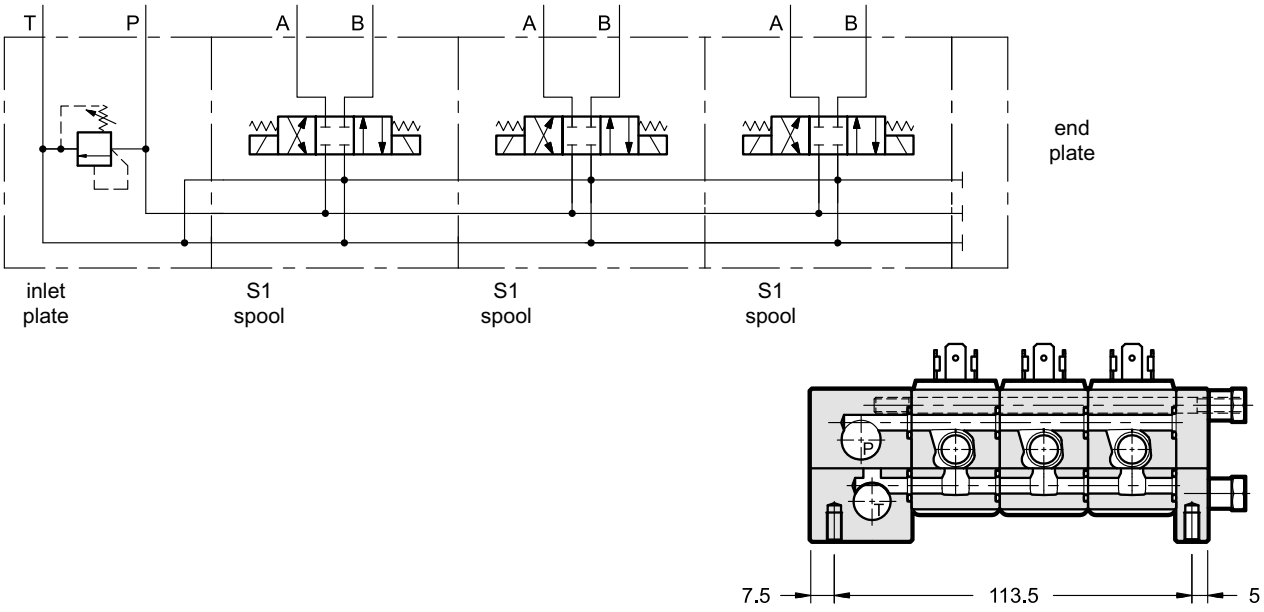
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

Coil type:
DC coils
D12 = 12 V
D24 = 24 V
D00 = valve without coil supplied with locking ring

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

13 - ASSEMBLY EXAMPLE AND HYDRAULIC DIAGRAM



DUPLOMATIC MOTION SOLUTIONS

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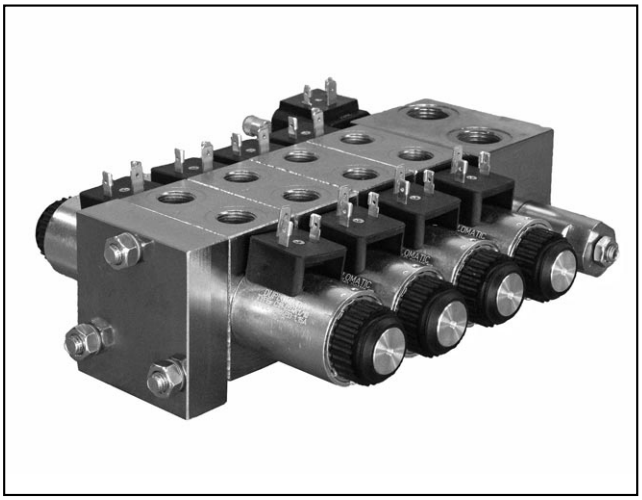
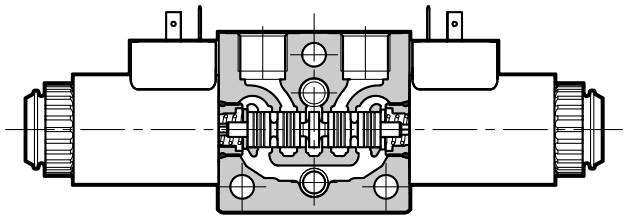


BD*
STACKABLE DIRECTIONAL CONTROL VALVE
SERIES 10

p max (see table of performances)
Q max (see table of performances)

OPERATING PRINCIPLE



— BDL, BDM and BDS are stacked valve assemblies, very well-rounded thanks to their modular design.

— Elements have been designed to be assembled in parallel connection, mounting up to 10 stackable valves. The same elements allow to create series circuits by inserting plugs in order to divert the oil path.

— Elements specifically designed for BD*2 series circuits complete the BD* range.

— BD* assemblies are suitable for compact applications in the mobile and in mini-power pack industries.

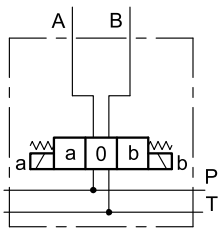
— Directional valve elements are available in two thicknesses, with working ports 3/8” BSP, 1/2” BSP, SAE–06 and SAE–08 threaded.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		BDL	BDM	BDS
Maximum operating pressure: - P-A-B ports - T / T1 ports	bar	 280 280	 320 250	 320 250
Maximum flowrate: - parallel - series	l/min	 40 40	 50 40	 60 50
Pressure drops Δp - Q	see paragraph 3			
Electrical characteristics	see paragraph 6			
Operating limits	see paragraph 4			
Electrical connections	see paragraph 7			
Ambient temperature range	°C	-20 / +50		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15			
Recommended viscosity	cSt	25		
Mass (BDS3-B38-S)	kg	1,57	1,73	2,1
Surface treatment of inlet and outlet elements and valves bodies	zinc-nickel			

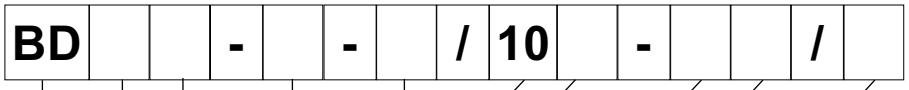
HYDRAULIC SYMBOL



1 - IDENTIFICATION CODES OF SEPARATE ELEMENTS

Here below are shown the identification codes for the separate elements of the stackable valve. Parallel circuits can be assembled with these elements. The same elements allow to create series circuits by inserting plugs in order to divert the oil path.

1.1 - Directional valve element



Stack directional valve element, on-off

Solenoid tube (mm):
L = 14
M = 19
S = 22 (only size 3)

Size :
2 = thickness 38 mm
3 = thickness 46 mm

Ports:
B38 = 3/8" BSP
B12 = 1/2" BSP (only for size 3)
S06 = 9/16" 18 UNF (SAE 06)
S08 = 3/4" 16 UNF (SAE 08) (only for size 3)

Spool type
(see point 1.2)

Series no.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil type:
DC coils
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D00 = valve without coil supplied with locking ring

Coil electrical connection:
See below for availability, see par. 6 and 7 for details
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7, WK7, WK7D = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

The electrical connection K2 (AMP JUNIOR type) is available upon request

Manual override (see par. 10.6 - 10.8):
for **BDL**:
omit for manual override boot protected integrated in the coil locking ring (**standard**)
for **BDM** and **BDS:**
omit for pin manual override integrated in the tube (**standard**).
CM = manual override boot protected
for **BDL**, **BDM** and **BDS**
CK1 = turning knob override
CHL = light duty hand lever. p max 50 bar in T line (not available for series circuits)

NOTE: Variants are available. See paragraph 10.1

Available coils

	BDL			BDM			BDS					
	K1	K2	WK7	K1	K2	K7	K1	K2	K7	WK1	WK7	WK7D
D12	■	□	■	■	□	■	■	□	■	■	■	■
D24	■	□	■	■	□	■	■	□	■	■	■	■
D28	■	-	-	-	-	-	■	-	-	-	-	-
D48	■	-	-	-	-	-	■	-	-	-	-	-

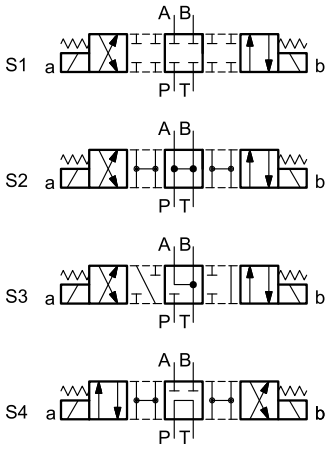
■ available
□ upon request

The letter 'W' identifies coils with an high IP degree. This IP degree is reached by specific surface treatments and / or design adaptations.

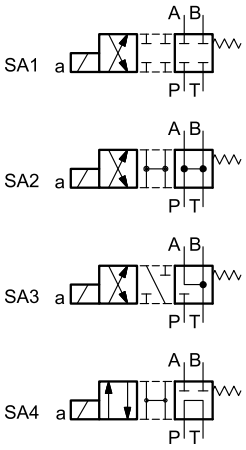
NOTE: A galvanic surface treatment zinc-nickel is applied to body elements and plates, so BDS valves with WK* type coils and the BDL type valves suitable to withstand a salt spray exposure time of 600 hours. BDS valves with K* type coils and BDM valves are suitable to withstand a salt spray exposure time of 240 hours (test carried out according to the UNI EN ISO 9227 and assessment test carried out according to UNI EN ISO 10289).

1.2 - Available spools

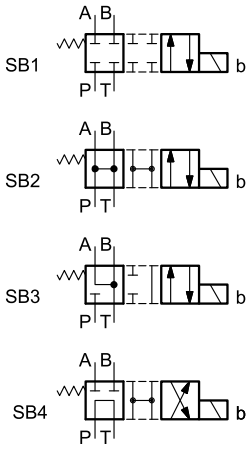
Type **S**:
2 solenoids - 3 positions
spring centreing



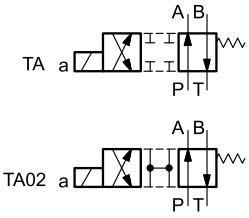
Type **SA***: 1 solenoid side A
2 positions (central + external)
spring centreing



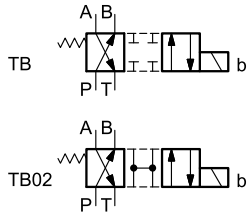
Type **SB***: 1 solenoid side B
2 positions (central + external)
spring centreing



Type **TA***:
1 solenoid side A
2 external positions
with return spring



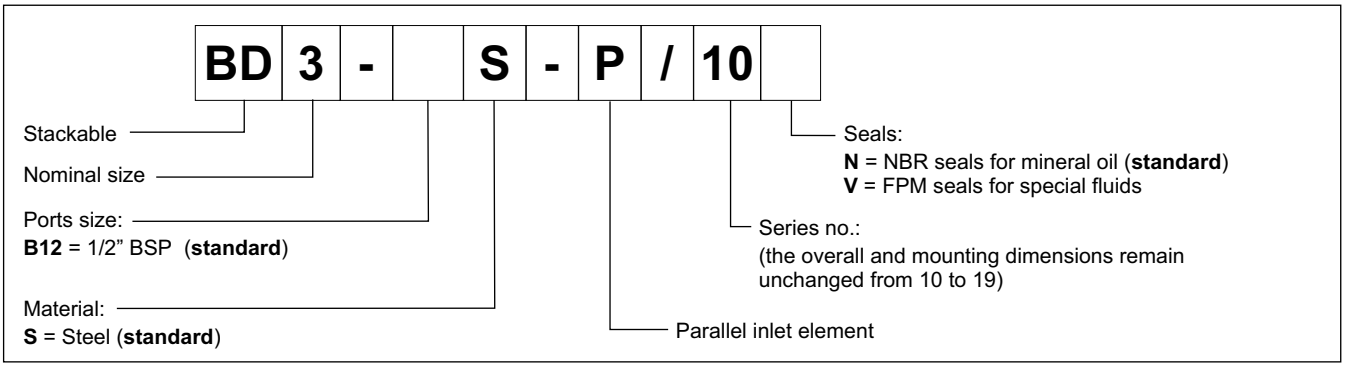
Type **TB***:
1 solenoid side B
2 external positions
with return spring



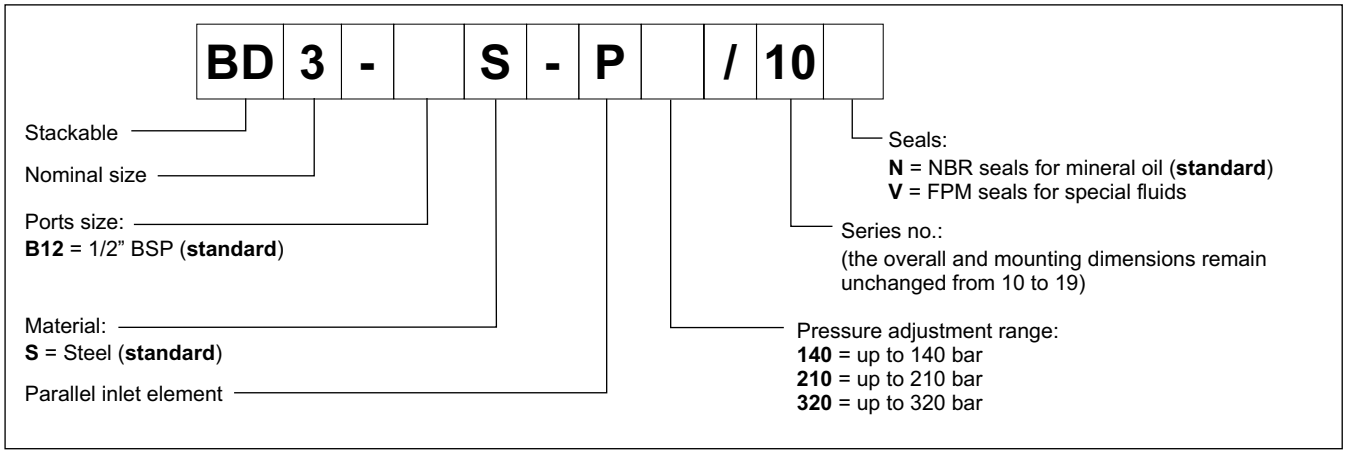
NOTE 1: BDS valves use spools of DS3 solenoid valve. Please refer to catalogue 41150 for others spools.

NOTE 2: Further spools for BDL and BDM are upon request. Please contact our technical department.

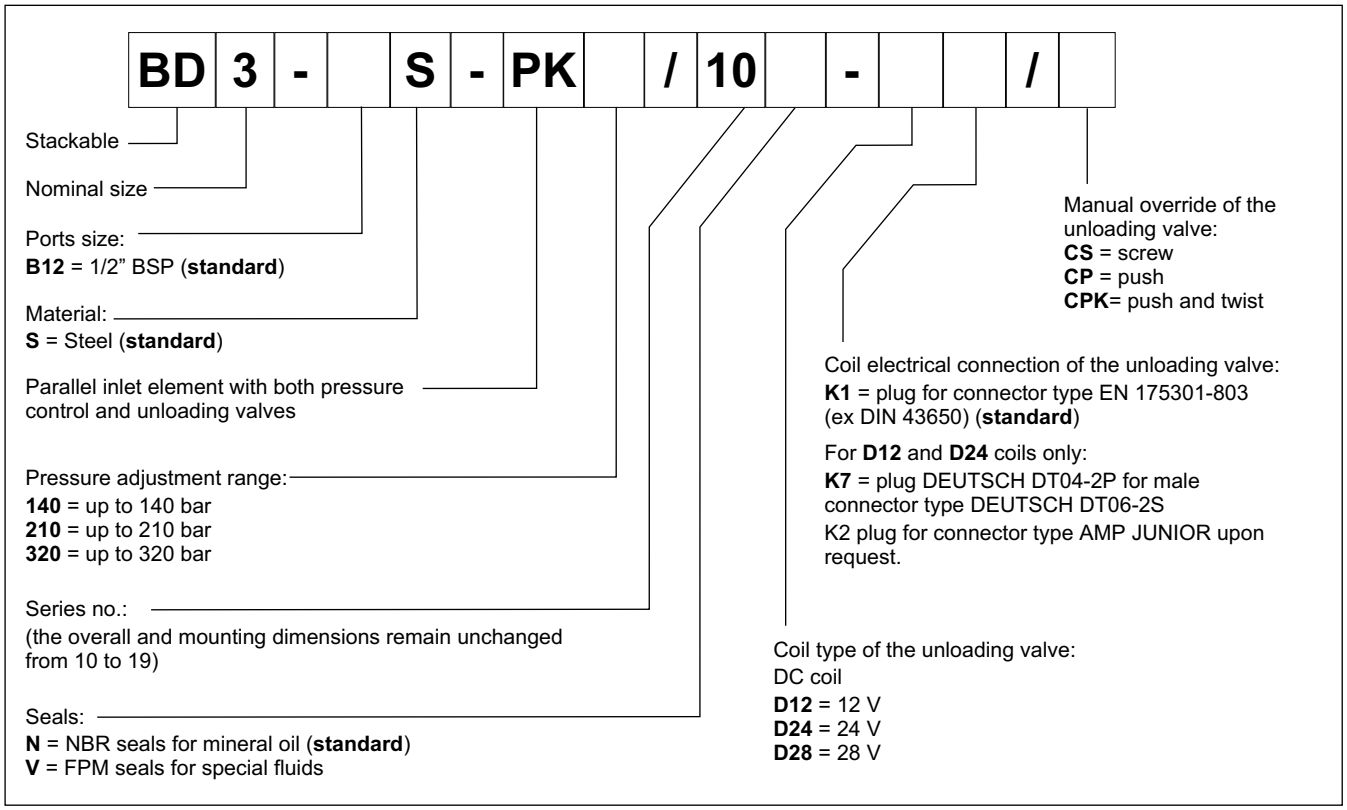
1.3 - Inlet element without pressure control valve



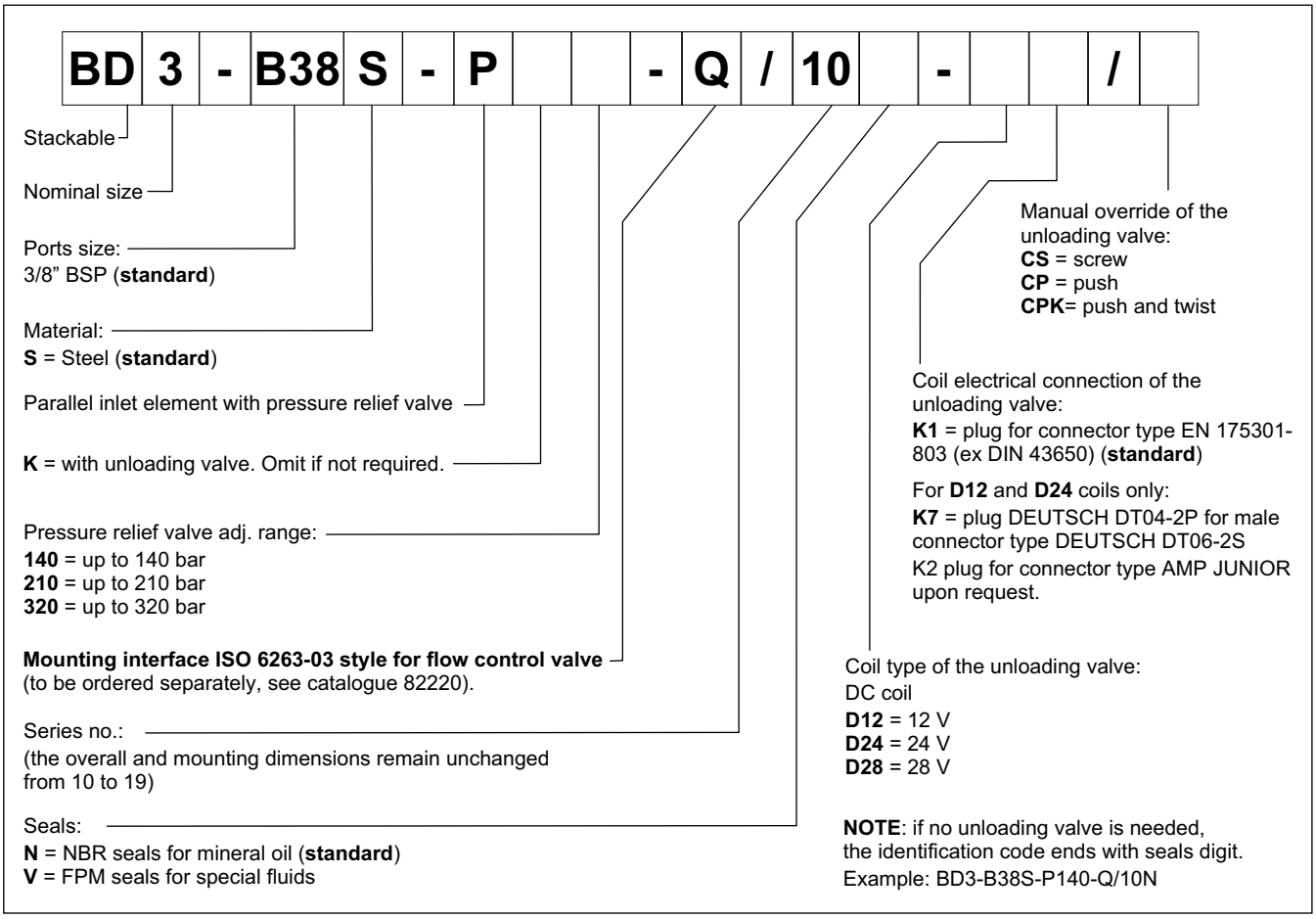
1.4 - Inlet element with pressure control valve



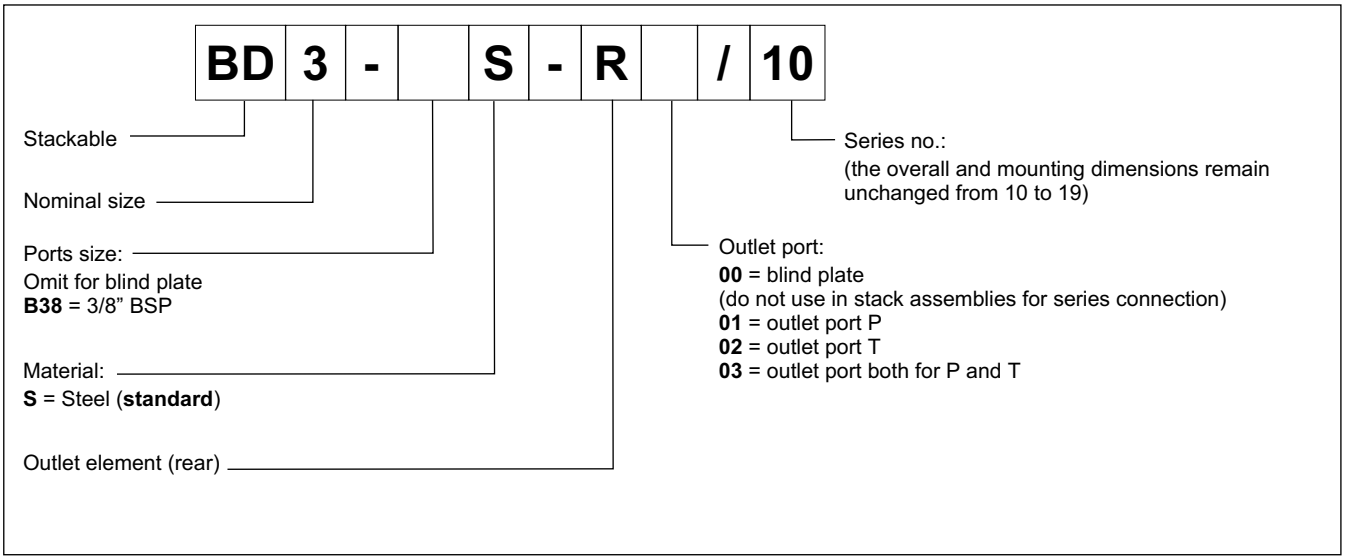
1.5 - Inlet element with both pressure control and unloading valves



1.6 - Inlet element for flow control valve



1.7 - Outlet elements



2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). 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.

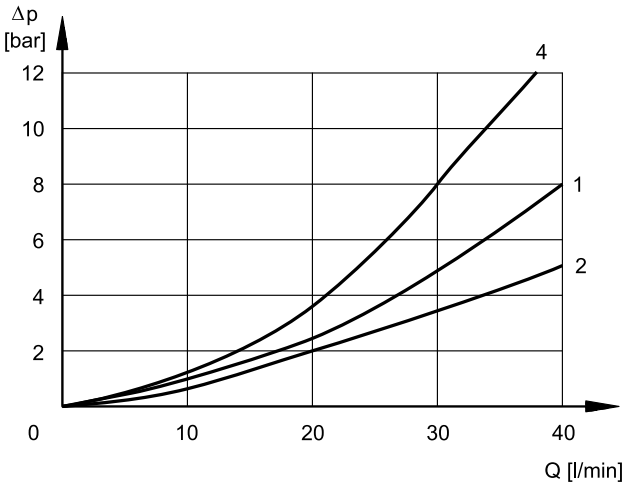
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

(values obtained with viscosity 36 cSt at 50 °C)

3.1 - BDL

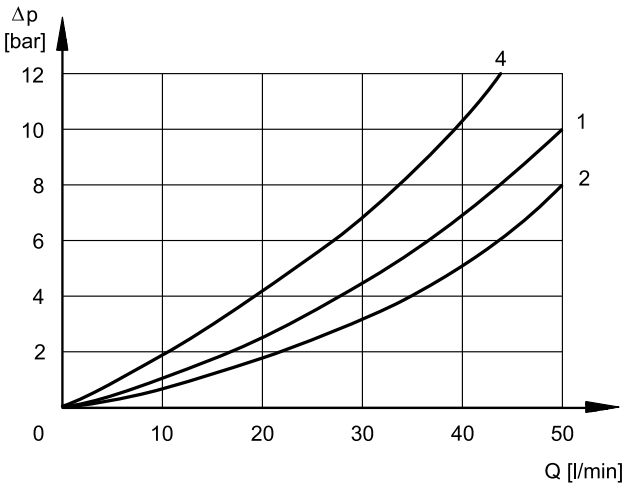
Values obtained with one element BDL2-B38A (thickness 38, ports 3/8" BSP)



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1, SA1, SB1	1	1	1	1	-
S2, SA2, SB2	2	2	2	2	2
S3, SA3, SB3	1	1	2	2	-
S4, SA4, SB4	4	4	4	4	1
TA, TB	1	1	1	1	-
TA02, TB02	1	1	1	1	-

3.2 - BDM

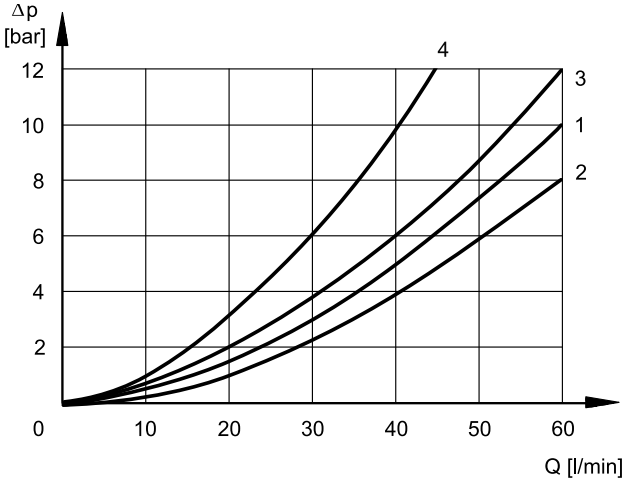
Values obtained with one element BDM3-B38 (thickness 46, ports 3/8" BSP)



SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1, SA1, SB1	1	1	1	1	-
S2, SA2, SB2	2	2	2	2	2
S3, SA3, SB3	1	1	2	2	-
S4, SA4, SB4	4	4	4	4	1
TA, TB	2	2	2	2	-
TA02, TB02	1	1	1	1	-

3.3 - BDS

Values obtained with one element BDS3-B12 (thickness 46, ports 1/2" BSP)



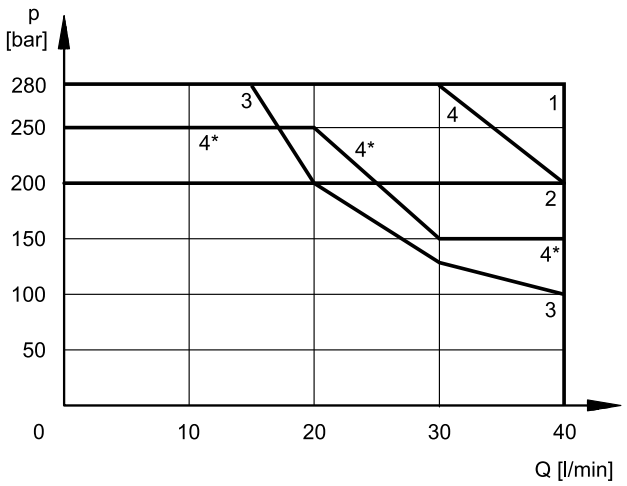
SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1, SA1, SB1	1	1	3	3	-
S2, SA2, SB2	2	2	1	1	2
S3, SA3, SB3	3	3	2	2	-
S4, SA4, SB4	4	4	4	4	1
TA, TB	3	3	3	3	-
TA02, TB02					

4 - OPERATING LIMITS

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

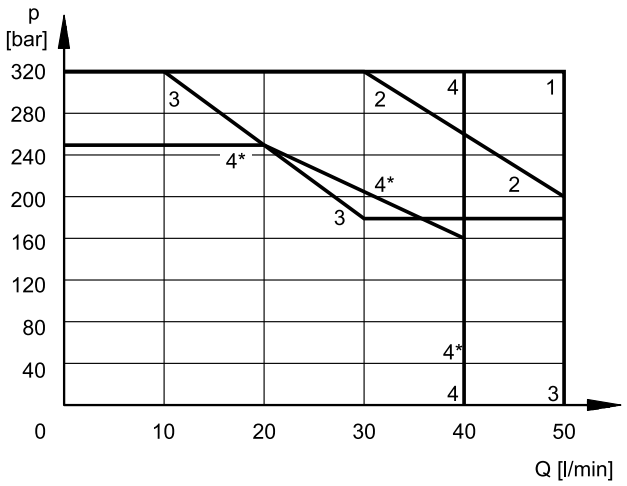
Values obtained with mineral oil, viscosity 36 cSt, temperature 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

4.1 - BDL



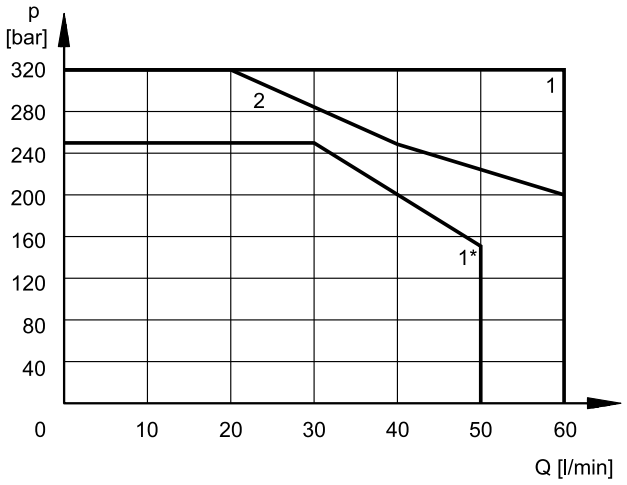
SPOOL TYPE	
S1, SA1, SB1	1
S2, SA2, SB2	2
S3, SA3, SB3	3
S4, SA4, SB4	4
S4, SA4, SB4 reverse flow	4*
TA, TB	4
TA02, TB02	1

4.2 - BDM



SPOOL TYPE	
S1, SA1, SB1	1
S2, SA2, SB2	2
S3, SA3, SB3	3
S4, SA4, SB4	4
S4, SA4, SB4 reverse flow	4*
TA, TB	2
TA02, TB02	1

4.3 - BDS



SPOOL TYPE	
S1, SA1, SB1	1
S2, SA2, SB2	1
S3, SA3, SB3	2
S4, SA4, SB4	1
S4, SA4, SB4 reverse flow	1*
TA, TB	1
TA02, TB02	1

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

See scheme at par. 13.2

5 - SWITCHING TIMES

Values obtained according to ISO 6403, with mineral oil with viscosity 36 cSt at 50°C.

TIMES [ms] (±10%)	ENERGIZING	DE-ENERGIZING
BDL	25 ÷ 75	15 ÷ 25
BDM	25 ÷ 75	15 ÷ 25
BDS	25 ÷ 75	15 ÷ 25

6 - ELECTRICAL FEATURES

6.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation. The coil is fastened to the tube by a threaded ring, and can be rotated to suit the available space.

6.2 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree, correctly connected and installed.

The protection degree IP69K is not taken into account in IEC 60529 but it is included in ISO 20653.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class F

6.3 - BDL (solenoid tube Ø14)

IP degrees

protection referred to	electrical connection / whole valve				
	IP65	IP66	IP67	IP68	IP69 IP69K
K1 EN 175301-803	x	x			
WK7 DEUTSCH DT04 male	x		x	x	x

Current and absorbed power
(values ±5 %)

	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]	Coil code	
				K1	**WK7**
D12	5,4	2,2	26,5	1902740	1903510
D24	20,7	1,16	27,8	1902741	1903511
D28	27,5	1,02	28,5	1902744	-
D48	82	0,58	28	1902745	-

6.4 - BDM (solenoid tube Ø19)

IP degrees

protection referred to	electrical connection whole valve
	IP65
K1 EN 175301-803	x
K7 DEUTSCH DT04 male	x

Current and absorbed power
(values ±10 %)

	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]	Coil code	
				K1	**K7**
D12	4.98	2.41	28.9	1903560	1903650
D24	21	1.15	28	1903561	1903651

6.5 - BDS (solenoid tube Ø22)

Coils with letter 'W' feature a zinc-nickel surface treatment, that makes them resistant to exposure to the salt spray for 600 hours (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

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

IP degrees

protection referred to	electrical connection					whole valve				
	IP65	IP66	IP67	IP68	IP69 IP69K	IP65	IP66	IP67	IP68	IP69 IP69K
K1 EN 175301-803 (ex DIN 43650)	x					x				
WK1 EN 175301-803 (ex DIN 43650)	x	x				x	x			
K7 DEUTSCH DT04 male	x		x			x				
WK7 / WK7D DEUTSCH DT04 male	x	x	x	x	x	x	x	x	x	x

Current and absorbed power
(values ±10 %)

	Resistance at 20°C [Ω]	Absorbed current [A]	Absorbed power [W]	Coil code				
				K1	**K7**	**WK1**	**WK7**	**WK7D**
D12	4,4	2,72	32,7	1903080	1902940	1903050	1903580	1903600
D24	18,6	1,29	31	1903081	1902941	1903051	1903581	1903601
D28	26	1,11	31	1903082	-	-	-	-
D48	78,6	0,61	29,5	1903083	-	-	-	-

6.6 - Unloading valve, solenoid operated (inlet plates)

Current and absorbed power
(values ±10 %)

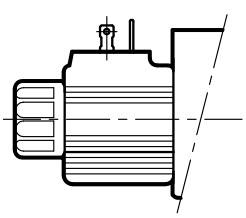
	Resistance 20°C [Ω]	Absorbed current [A]	Absorbed power [W]
D12	7	1.2	20.5
D24	28	0.6	20.5

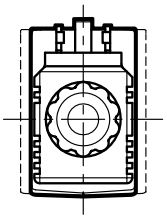
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION atmospheric agents (EN 60529) coil insulation (VDE 0580) Impregnation	 IP65 class H class H

7 - ELECTRICAL CONNECTIONS

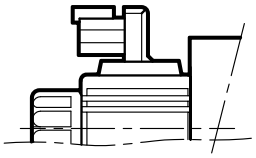
7.1 - BDL

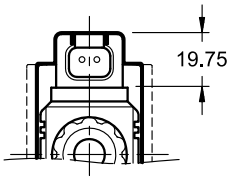
connection for EN 175301-803
(ex DIN 43650) connector
code **K1 (standard)**





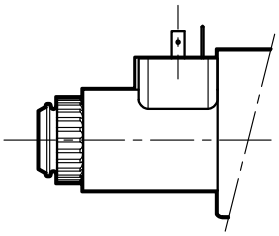
DEUTSCH DT04-2P connection for DEUTSCH
DT06-2S male connector
code **WK7**

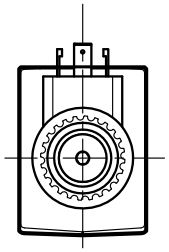




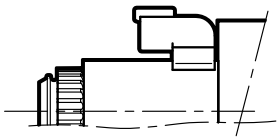
7.2 - BDM

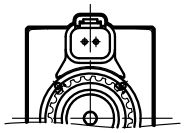
connection for EN 175301-803
(ex DIN 43650) connector
code **K1 (standard)**





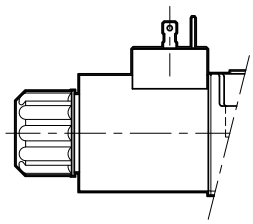
DEUTSCH DT04-2P connection for DEUTSCH
DT06-2S male connector
code **K7**

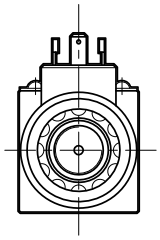




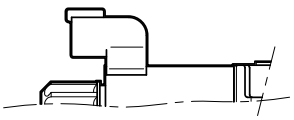
7.3 - BDS

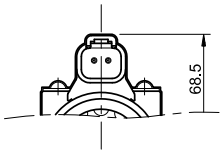
connection for EN 175301-803 (ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



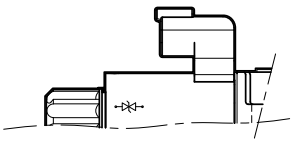


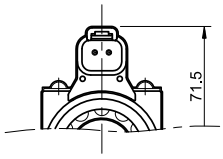
connection for DEUTSCH DT06-2S male connector
code **K7**





connection for DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)
code **WK7D** (W7 version only - coil with diode)





8 - ELECTRICAL CONNECTORS

The solenoid valves are supplied without connectors. Connectors for electrical connections K1 and WK1 (EN 175301-803, ex DIN 43650) can be ordered separately. See catalogue 49 000.

9 - INSTALLATION

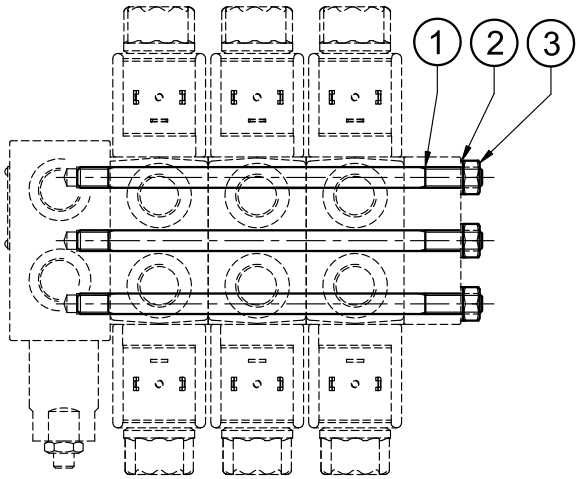
The stacked valve assembly can be installed in any position without impair the proper functioning.

9.1 - Fixing and tie-rods

Please contact the technical dept. for dimensional check of special assemblies before order.

Tightening torque: 20 (0 / +3) Nm

Valve type	Valve qty.	**KIT code**
BDL2 BDM2	3	3404100100
	4	3404100101
	5	3404100102
	6	3404100103
	7	3404100104
	8	3404100105
	9	3404100106
BDL3 BDM3 BDS3	3	3404100108
	4	3404100109
	5	3404100110
	6	3404100111

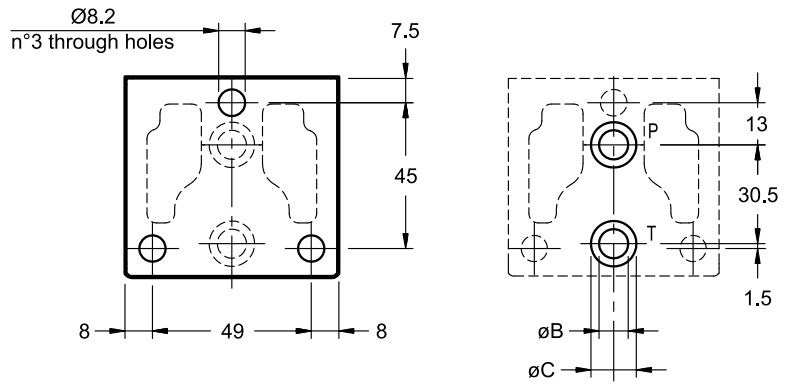


1	galvanized trapped screw
2	galvanized nut
3	galvanized safety washer

10 - OVERALL AND MOUNTING DIMENSIONS OF DIRECTIONAL VALVES

10.1 - BD* - mounting surfaces

dimensions in mm



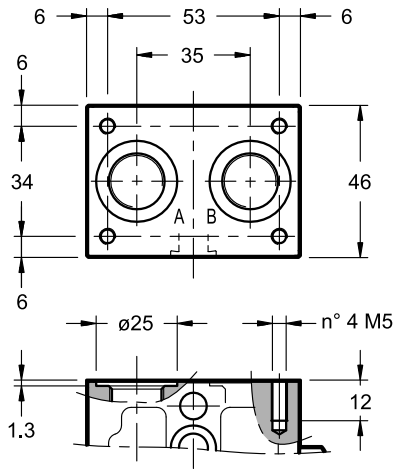
NOTE: the variant is available adding **A** after ports size in the identification code.
Example: BDL3-B38**A**-S1/10

	ØB	ØC	Seals
standard	9	14	2 OR type 2043 (10.82x1.78)
A variant	7.5	12	2 OR type 2037 (9.25x1.78)

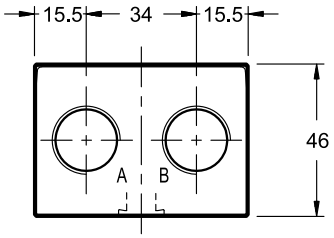
10.2 - BD* directional valve element - bodies

dimensions in mm

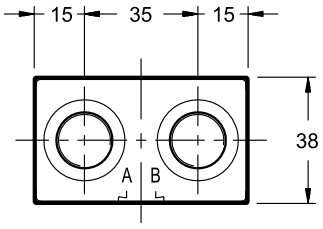
picture A - BD*3
with mounting surface
for flangeable element
available ports:
B38 or **S06**



picture B - BD*3
available ports:
B12 or **S08**



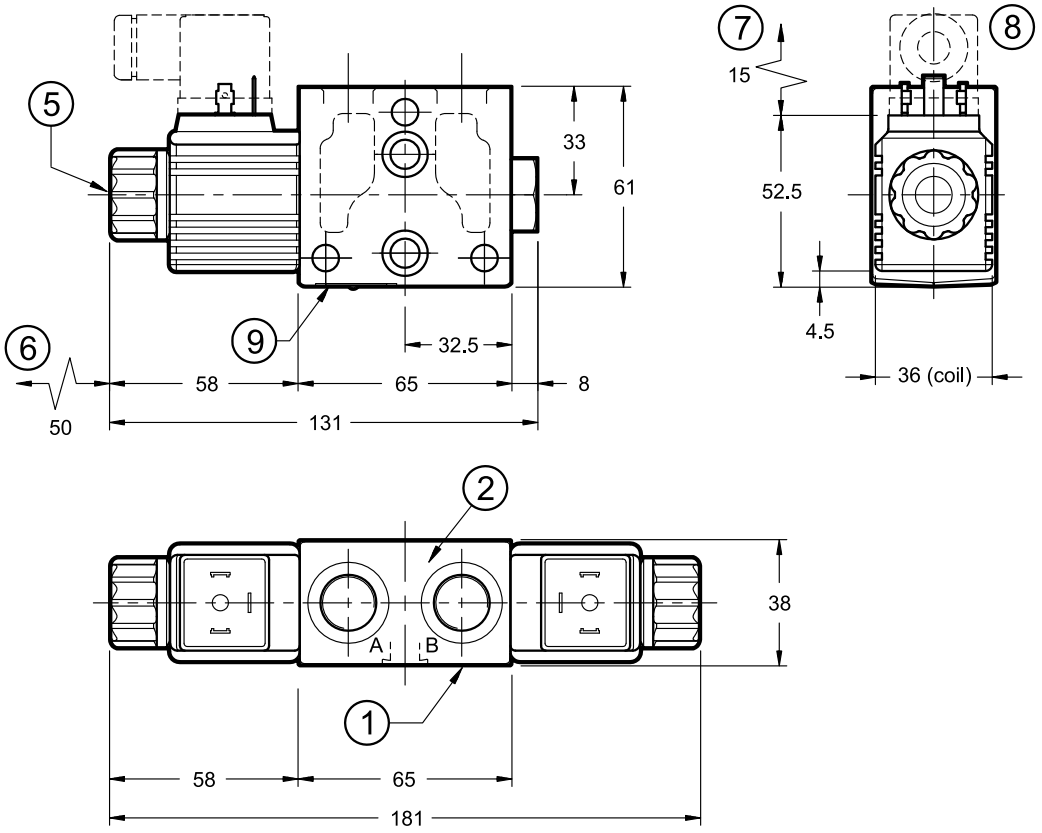
picture C - BD*2
available ports:
B38 or **S06**



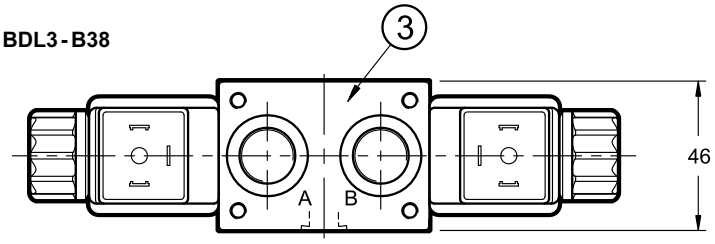
10.3 - BDL - Directional valve element - solenoid tube ø14

dimensions in mm

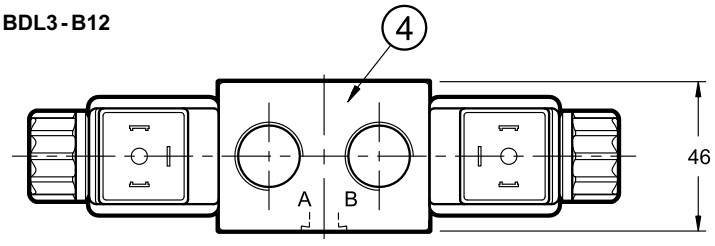
BDL2 - B38



BDL3 - B38



BDL3 - B12

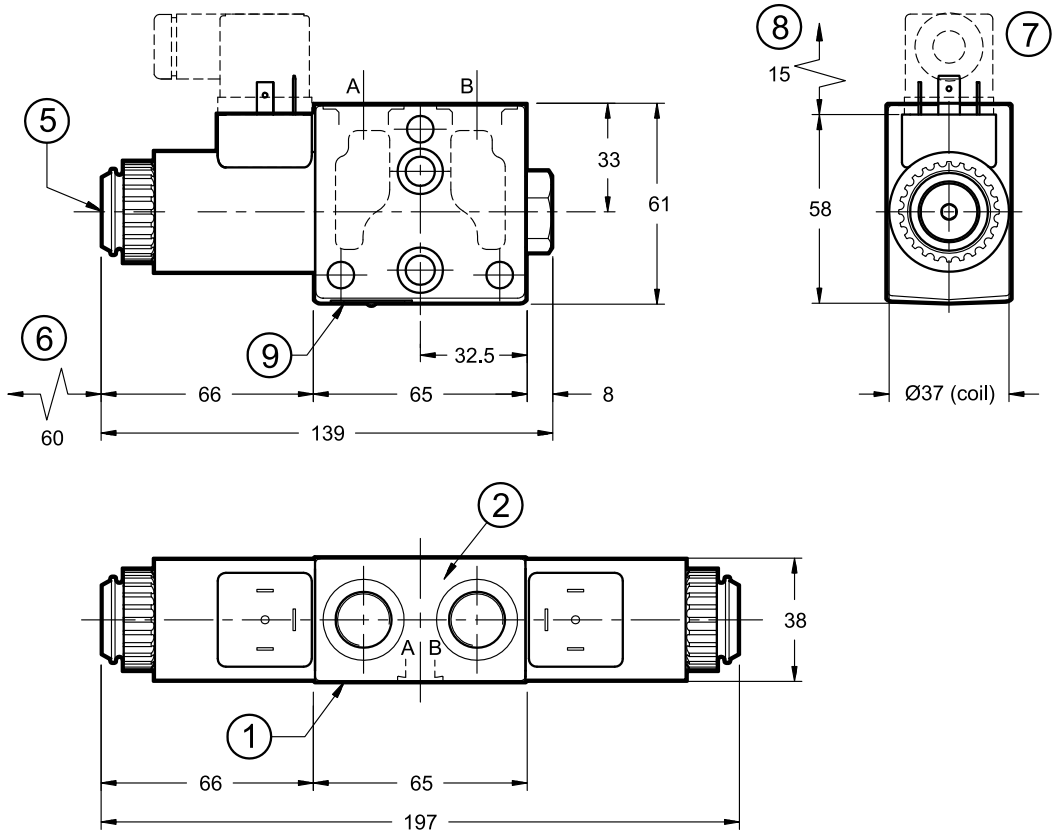


1	Mounting surface with sealing rings
2	A and B ports: 3/8” BSP
3	A and B ports: 3/8” BSP with mounting interface for flangeable elements
4	A and B ports: 1/2” BSP
5	Locking ring with embedded boot manual override. ring tightening torque: 3 Nm
6	Coil removal space
7	EN 175301-803 (ex DIN 43650) connector removal space
8	EN 175301-803 (ex DIN 43650) connector for K1 coil connection To be ordered separately.
9	Element label

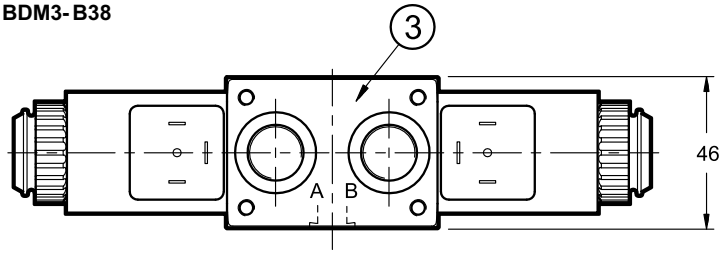
10.4 - BDM - Directional valve element - solenoid tube ø19

dimensions in mm

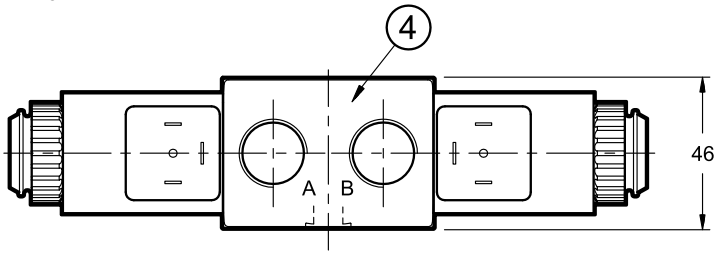
BDM2-B38



BDM3-B38



BDM3-B12

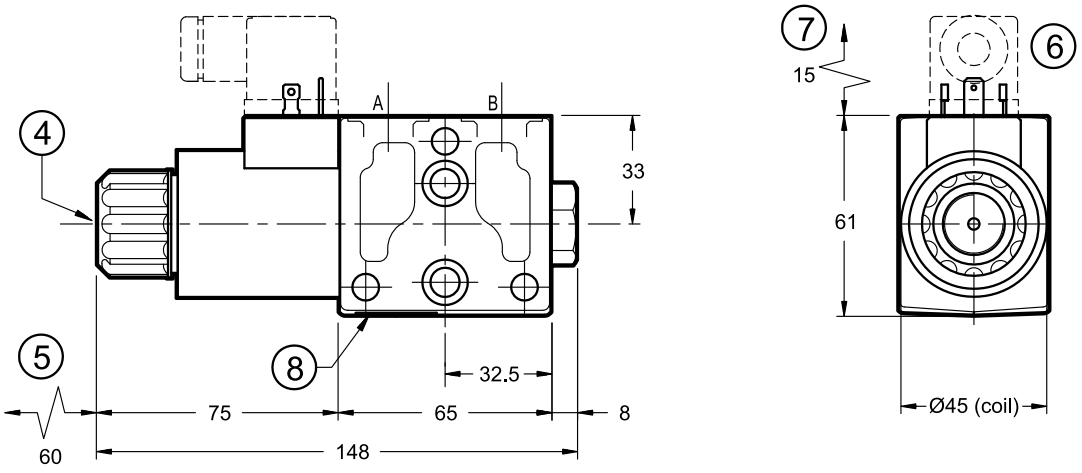


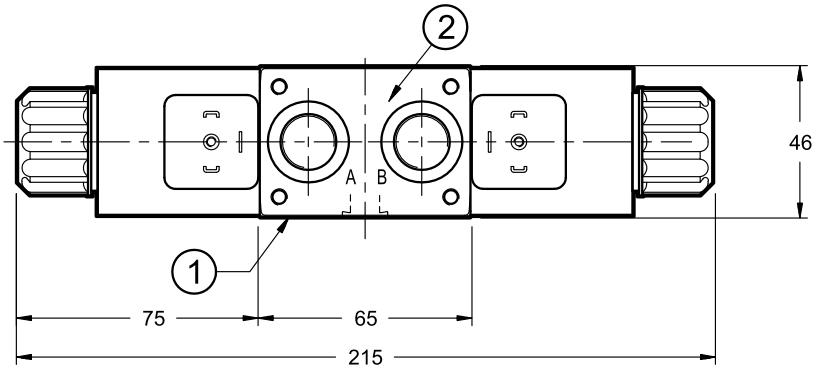
1	Mounting surface with sealing rings
2	A and B ports: 3/8” BSP
3	A and B ports: 3/8” BSP with mounting interface for flangeable elements
4	A and B ports: 1/2” BSP
5	Locking ring with manual override (pin) embedded in the tube. Ring tightening torque: 5 Nm
6	Coil removal space
7	EN 175301-803 (ex DIN 43650) connector removal space
8	EN 175301-803 (ex DIN 43650) connector for K1 coil connection To be ordered separately.
9	Element label

10.5 - BDS - Directional valve element - solenoid tube ø22

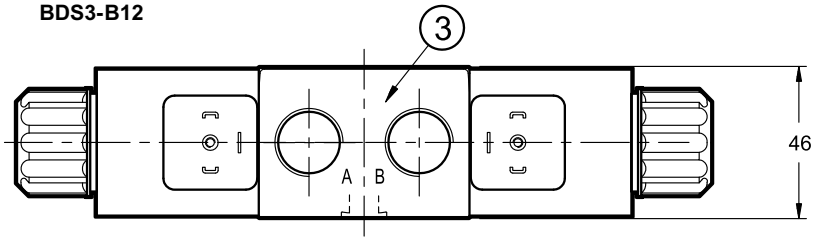
dimensions in mm

BDS3-B38





BDS3-B12



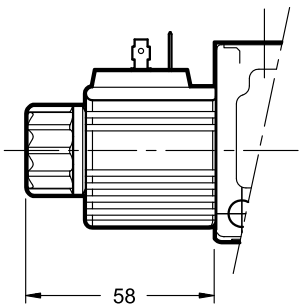
1	Mounting surface with sealing rings
2	A and B ports: 3/8” BSP with mounting interface for flangeable elements
3	A and B ports: 1/2” BSP
4	Locking ring with manual override (pin) embedded in the tube. Ring tightening torque: 5 Nm
5	Coil removal space
6	EN 175301-803 (ex DIN 43650) connector removal space
7	EN 175301-803 (ex DIN 43650) connector for K1 coil connection To be ordered separately.
8	Element label

10.6 - CM - boot protected

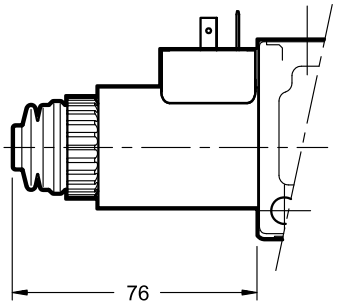
The BDL standard element is already equipped with boot protection of the solenoid tube. For both BDM and BDL elements add **/CM** at the end of the code.

dimensions in mm

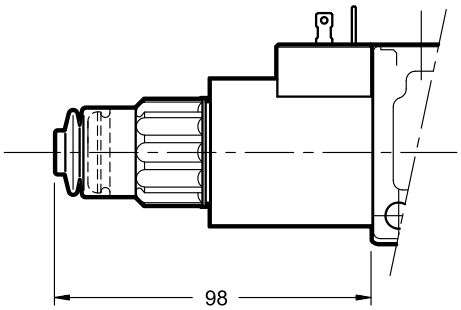
BDL



BDM* /CM



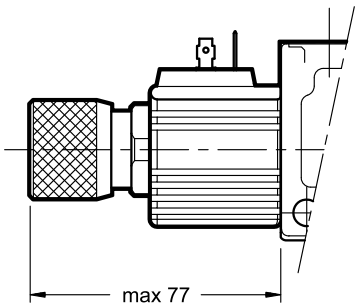
BDS* /CM



10.7 - CK1 - knob manual override, turning

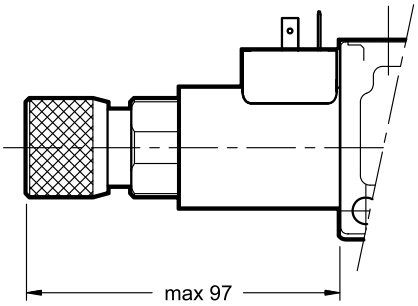
dimensions in mm

BDL* /CK1



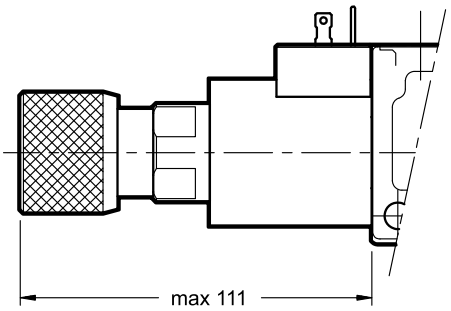
Max stroke: 4.5 mm
mm per turn: 1

BDM* /CK1



Max stroke: 5.5 mm
mm per turn: 1

BDS* /CK1



Max stroke: 6.5 mm
mm per turn: 1.25

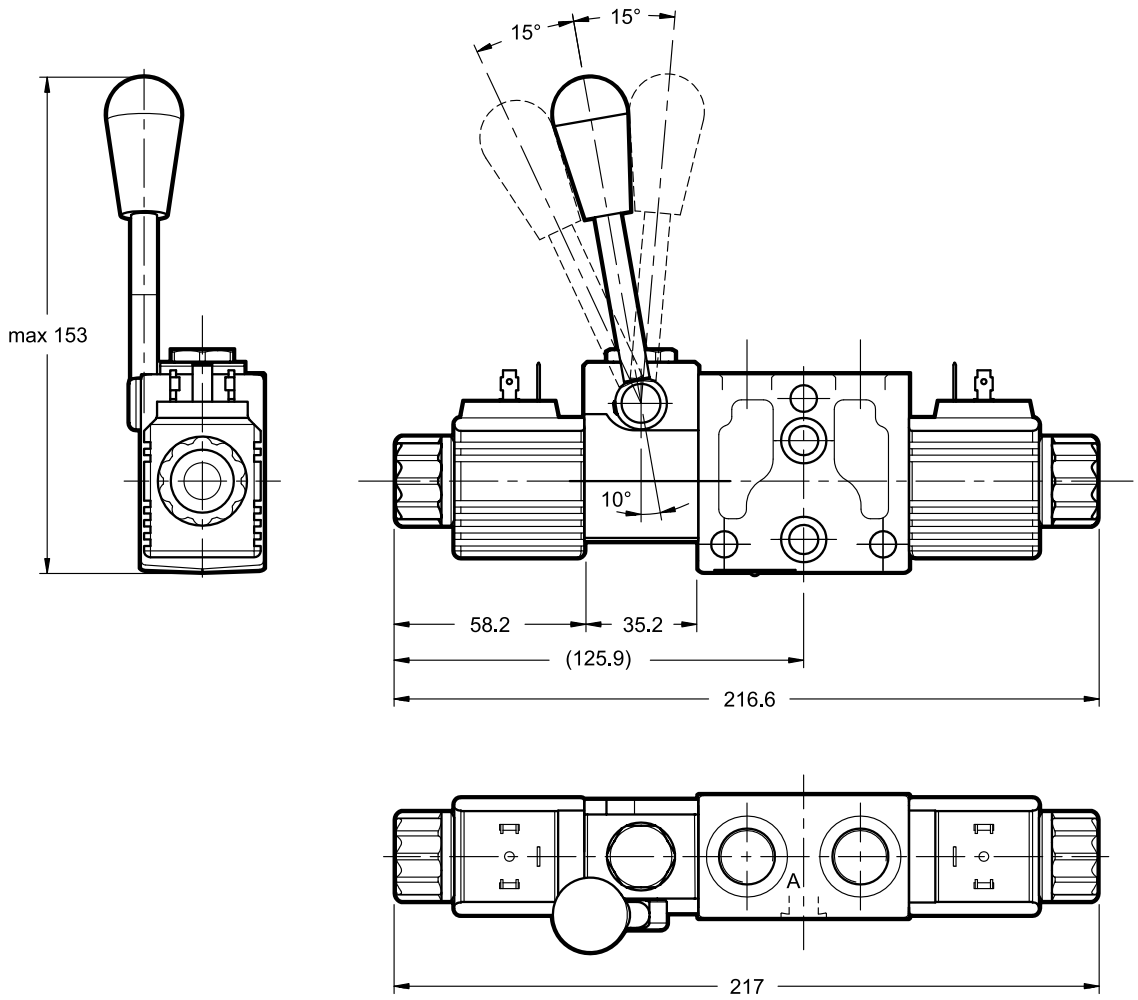
10.8 - CHL light duty lever manual override

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

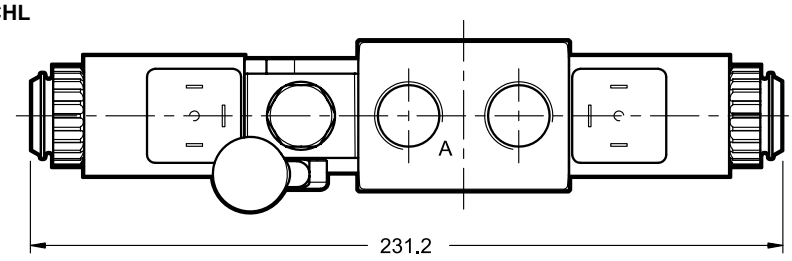
The CHL lever device can work with a maximum pressure in line T up to 50 bar, therefore it is not suitable for series circuits.

dimensions in mm

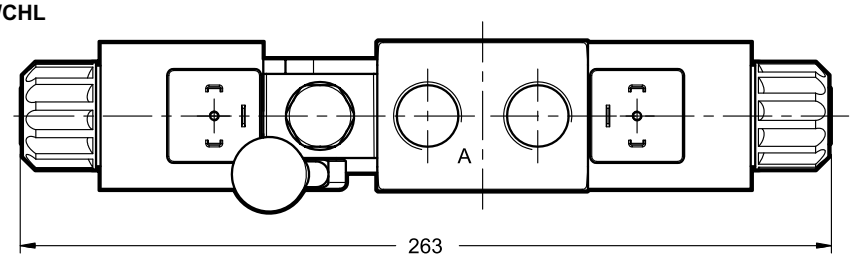
BDL2-* /CHL



BDM3-* /CHL



BDS3-* /CHL

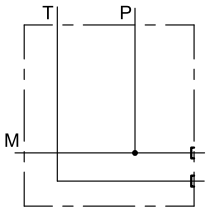


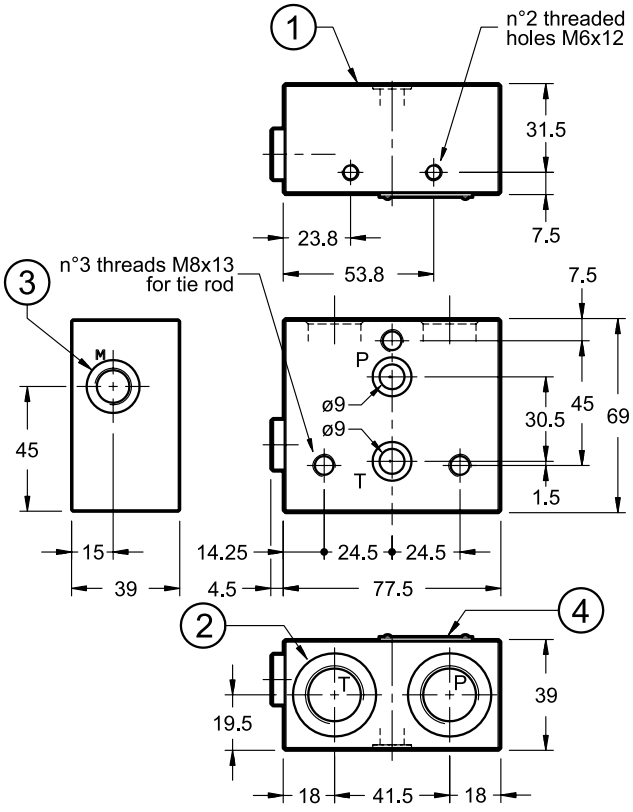
11 - DIMENSIONS OF INLET AND OUTLET ELEMENTS FOR PARALLEL CIRCUITS

11.1 - Inlet elements

BD3-B12S-P
without pressure control valve

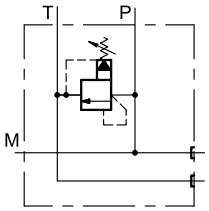
dimensions in mm

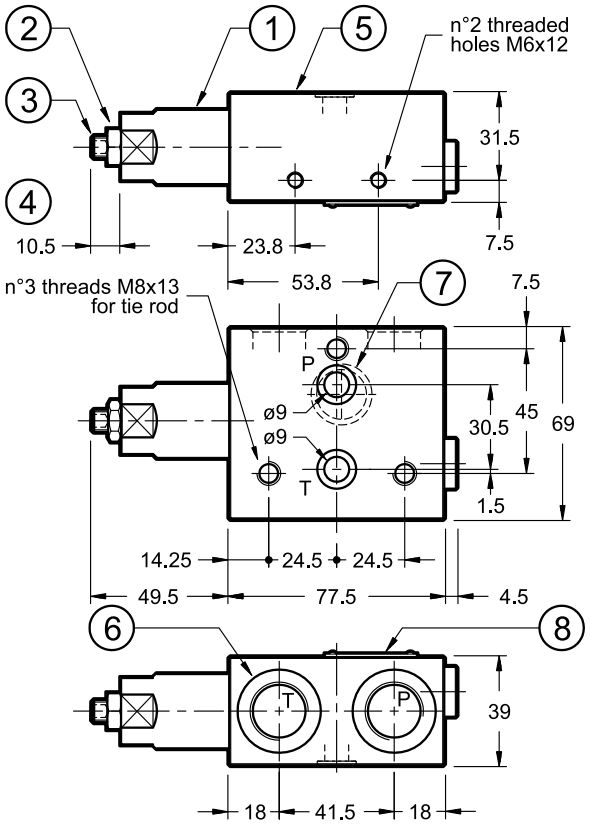




1	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
2	P and T ports: 1/2” BSP
3	Pressure gauge port: 1/4” BSP
4	Element label

BD3-B12S-P*
with pressure control valve

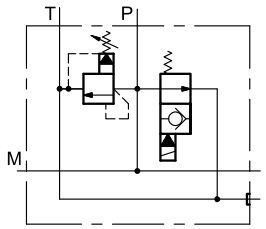


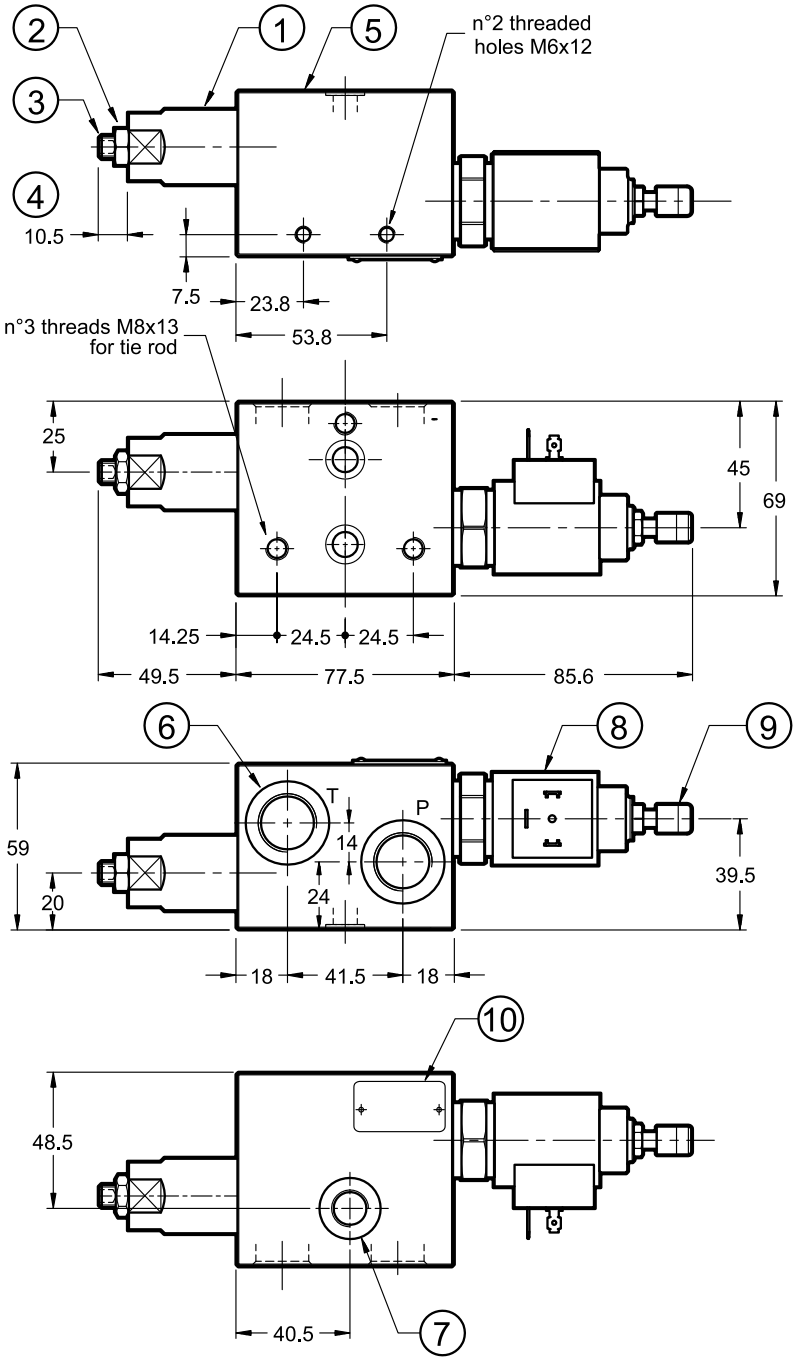


1	Pressure control valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Maximum screw stroke
5	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
6	P and T ports: 1/2” BSP
7	Pressure gauge port:1/4” BSP
8	Element label

BD3-B12S-PK***
with pressure control and unloading valve

dimensions in mm





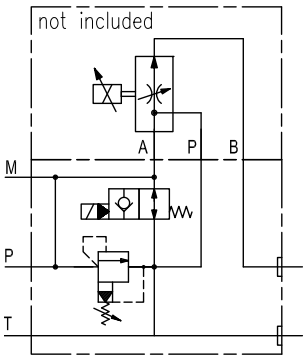
1	Pressure control valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Maximum stroke
5	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
6	P and T ports: 1/2” BSP
7	Pressure gauge port:1/4” BSP
8	Unloading valve Here shown with K1 connection
9	Push and twist manual override: see identification codes for further choices.
10	Element label

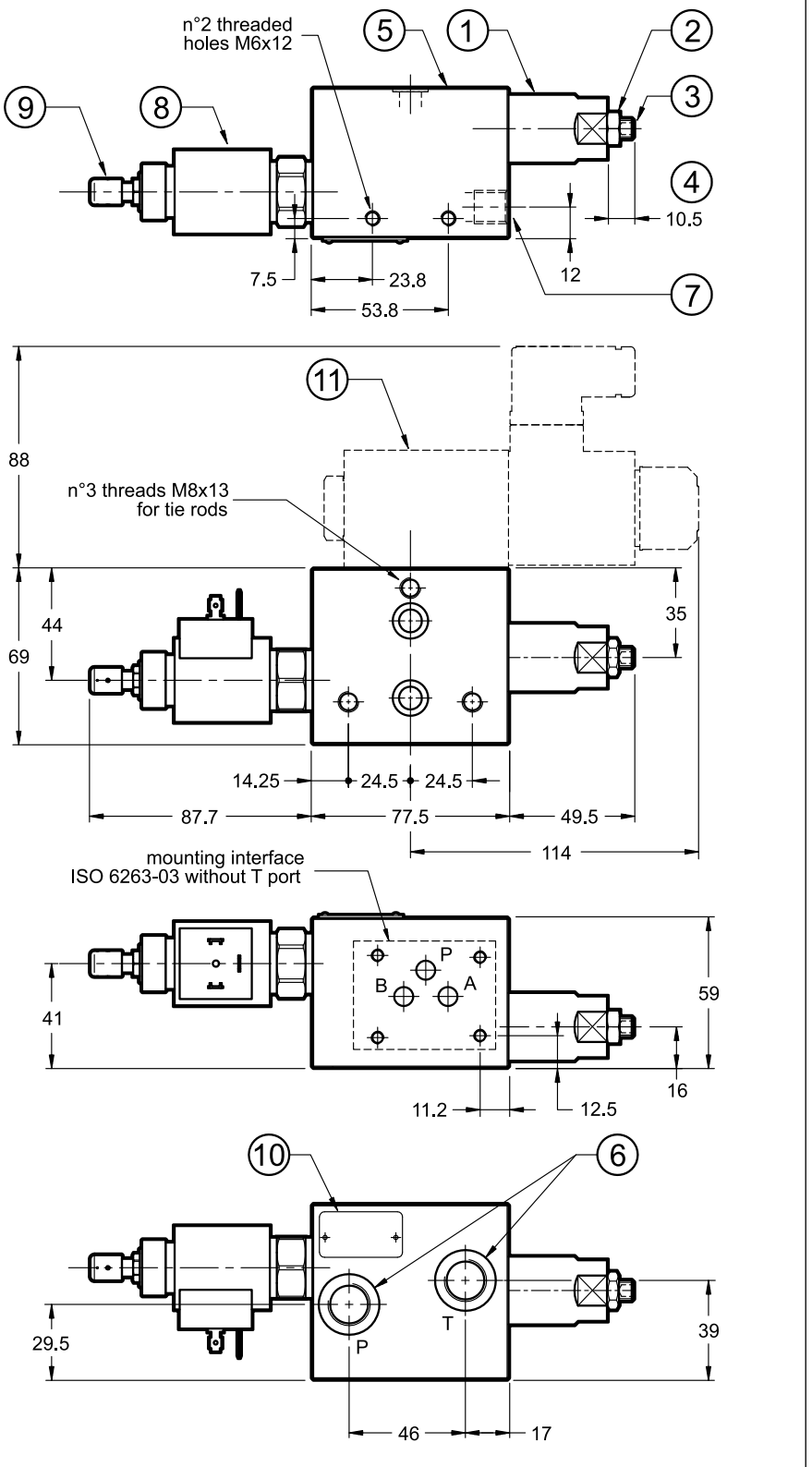
NOTE: for missing dimensions of mounting interface please refer to par. 10.1 ’mounting surfaces’.

11.2 - Inlet elements for flow control valve

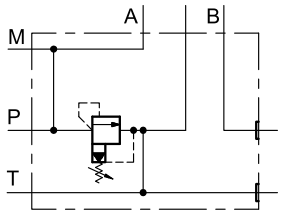
BD3-B38S-PK*-Q**
with pressure control and unloading valves

dimensions in mm





NOTE :The same component without part no. 8 is:
BD3-B38S-P*-Q**
with pressure control
without unloading valve



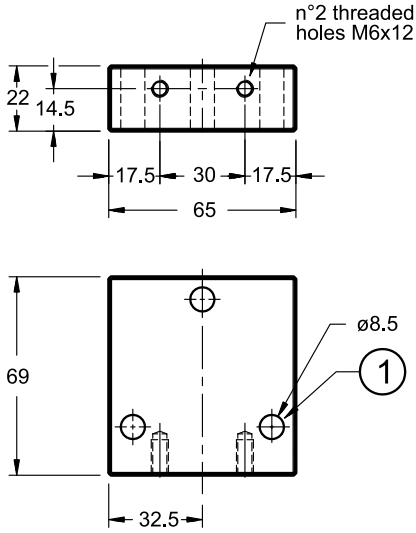
1	Pressure control valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Maximum stroke
5	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
6	P and T ports: 3/8” BSP
7	Pressure gauge port: 1/4” BSP
8	Unloading valve Here shown with K1 connection
9	Push and twist manual override: see identification codes for further choices.
10	Element label
11	Encumbrance of flow control valve. To be ordered separately. See catalogue 82 220

NOTE: for missing dimensions of mounting interface please refer to par. 10.1 ’mounting surfaces’.

11.3 - Outlet elements

dimensions in mm

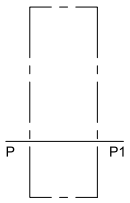
BD3-S-R00
blind plate
Code **0194019**

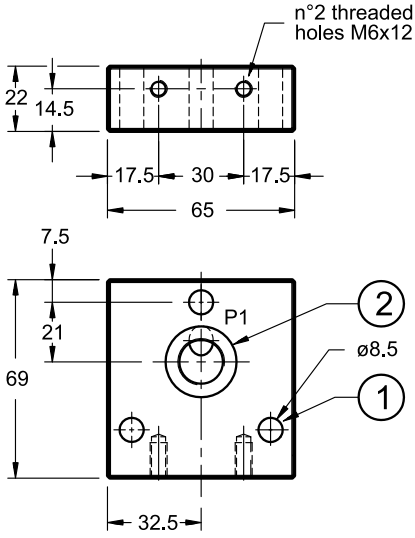


1	n° 3 through holes for stack assembly tie-rods

NOTE: for missing dimensions of mounting interface please refer to par. 10.1 'mounting surfaces'.

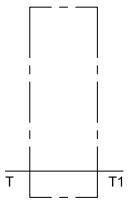
BD3-B38S-R01
plate with P1 outlet
Code **0194062**

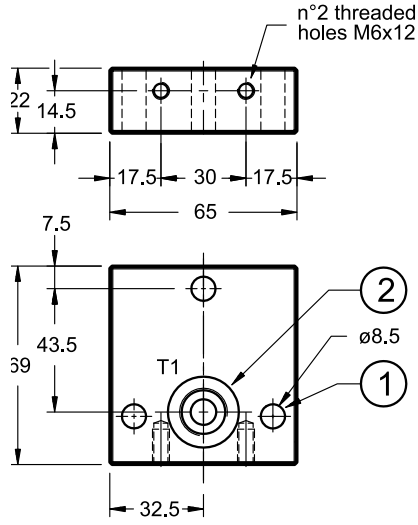




1	n° 3 through holes for stack assembly tie-rods
2	P1 port: 3/8 BSP

BD3-B38S-R02
plate with T1 outlet
Code **0194055**

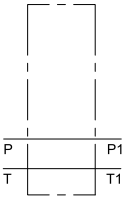


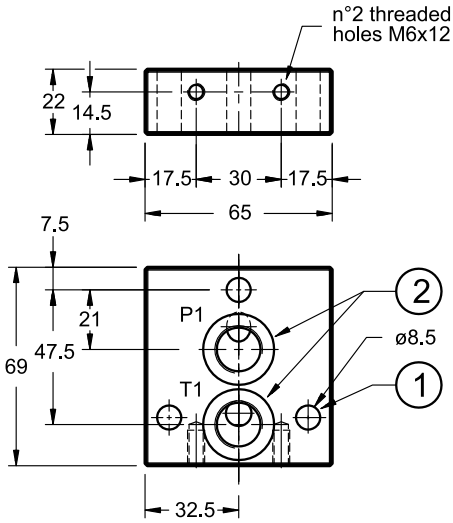


1	n° 3 through holes for stack assembly tie-rods
2	T1 port: 3/8 BSP

BD3-B38S-R03
plate with P1 and T1 outlet
Code **0194063**

dimensions in mm





1	n° 3 through holes for stack assembly tie-rods
2	P1 and T1 ports: 3/8" BSP

NOTE: for missing dimensions of mounting interface please refer to par. 10.1 'mounting surfaces'.

12 - IDENTIFICATION CODE FOR STACKED VALVE ASSEMBLY

BD			-			/	10		-			/	XXXXX

Stacked valve assembly

Solenoid tube (mm):
L = 14
M = 19
S = 22 (only size 3)

Size:
2 = thickness 38 mm
3 = thickness 46 mm

Circuit type:
P = parallel
S = series (parallel elements with plugs)
C = series (series elements)
Available for size 2 only

No. of directional valves

Series no.:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Coil type:
DC coils
D12 = 12 V
D24 = 24 V
D28 = 28 V
D00 = valve without coil supplied with locking ring

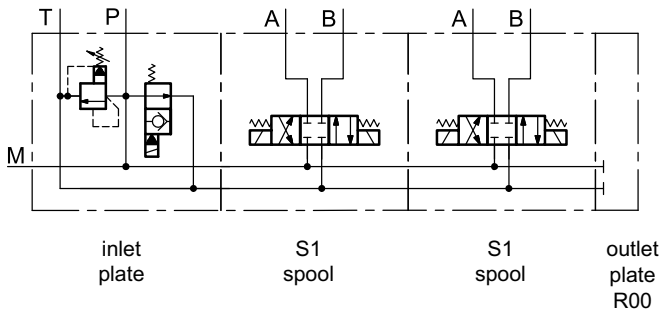
Coil electrical connection:
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

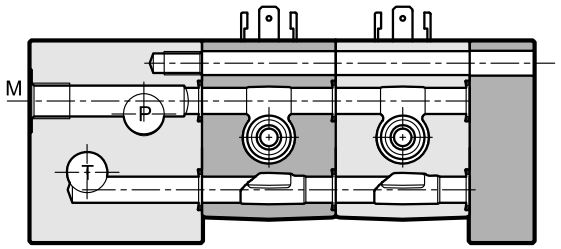
Configuration code (5 digits), assigned by Duplomatic

13 - CONNECTION SCHEMES EXAMPLES

13.1 - BD**-P parallel connection

Parallel circuit is obtained with elements for parallel connection (see par. 1).

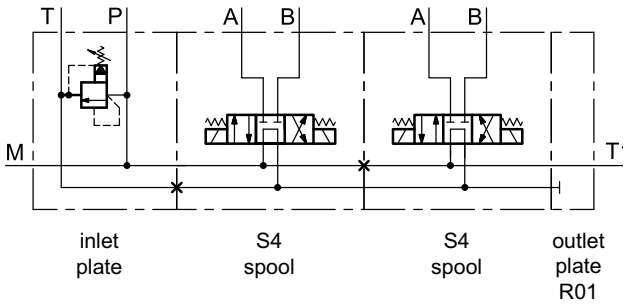


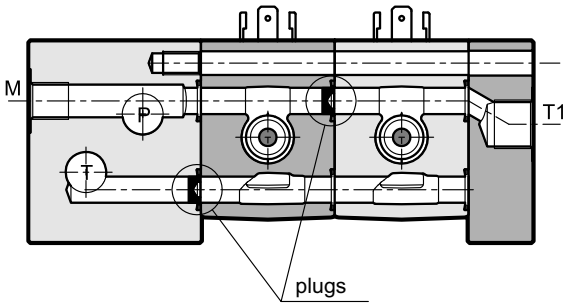


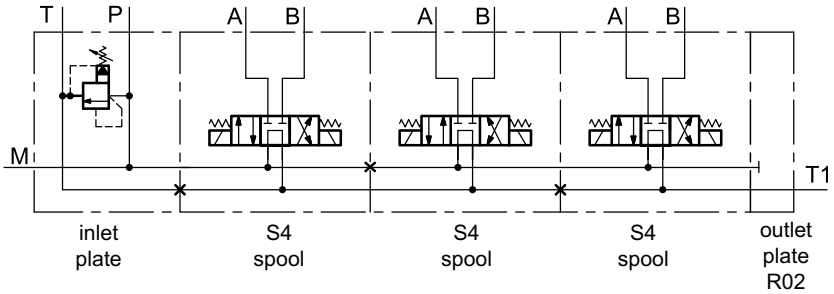
13.2 - BD-S series connection**

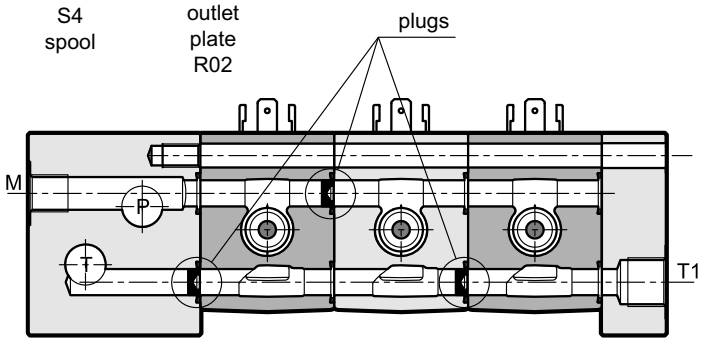
Series circuit is obtained by inserting plugs in elements for parallel connection (see par. 1).

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





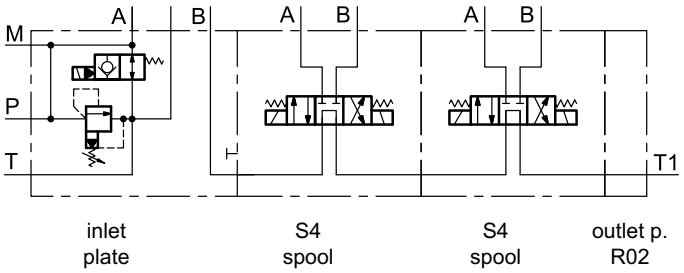


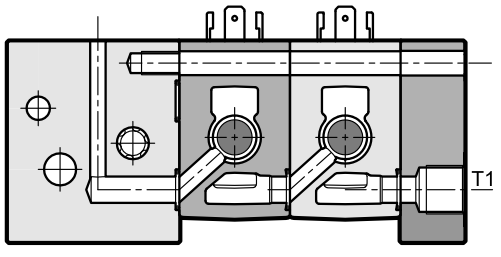


plug Ø9 - ordering code: **0612253**

13.3 - BDL2-C and BDM2-C series connection

BD*2-C series connection is obtained with elements designed for series (see par. 14). The series elements are available in size 2 only.

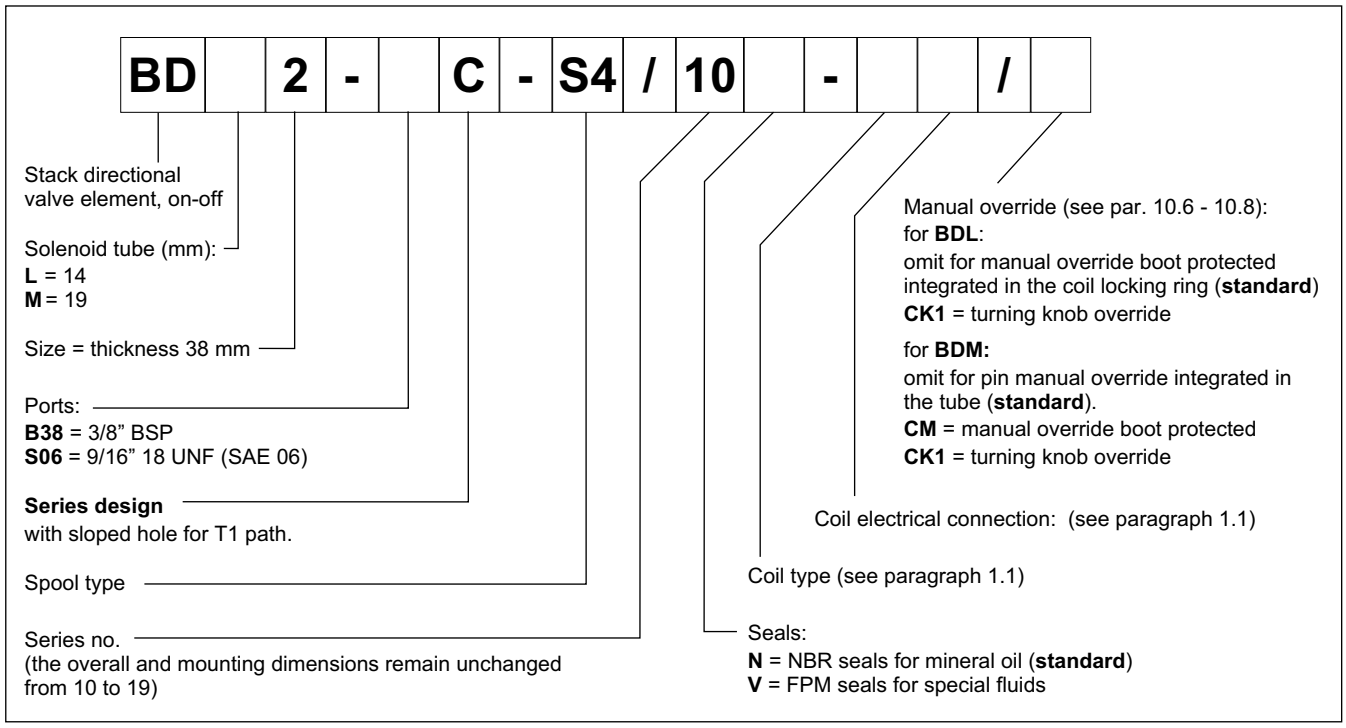




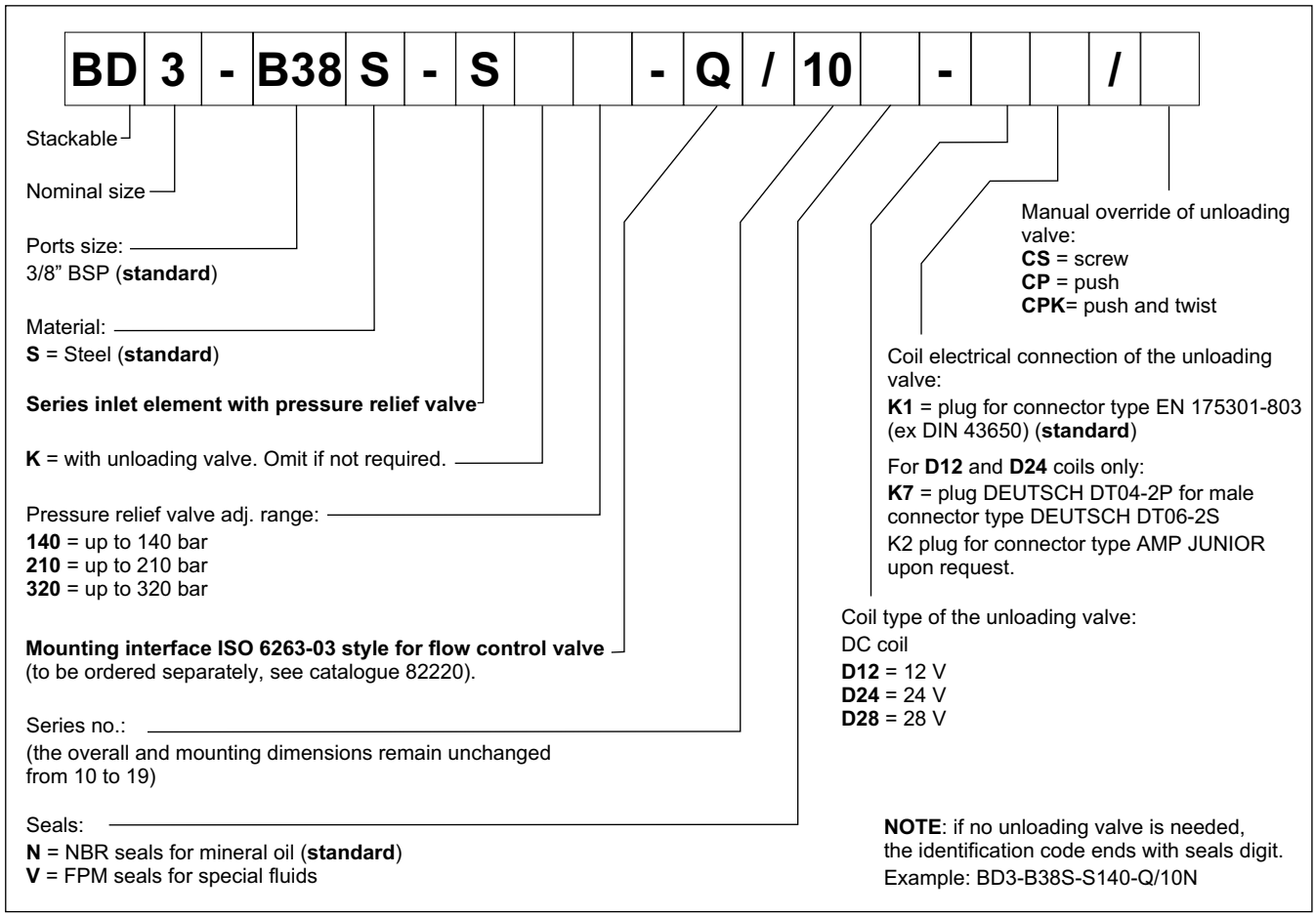
14 - IDENTIFICATION CODES OF SEPARATE ELEMENTS FOR BDL2 AND BDM2 SERIES CIRCUITS

14.1 - Directional valve element

This code identifies BD*2 elements, designed for series connection. Series circuits with BD*3 modules are feasible by inserting plugs to divert the oil path (see paragraph 13.2).



14.2 - Inlet elements for flow control valve



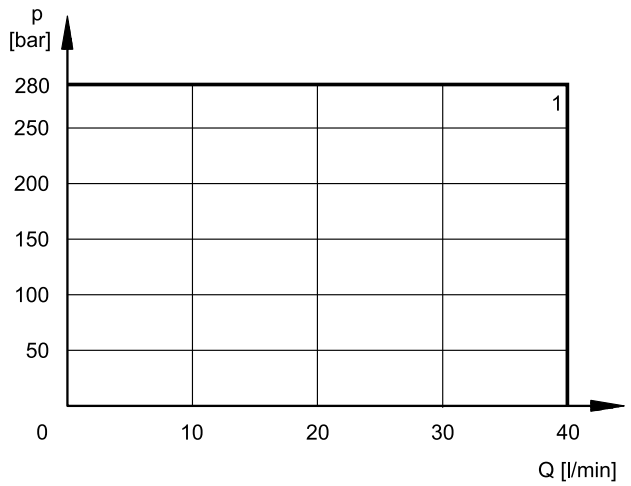
14.3 - Outlet elements

Please choose the proper outlet element amongst those in paragraph 1.7. Overall dimensions are at paragraph 11.3.

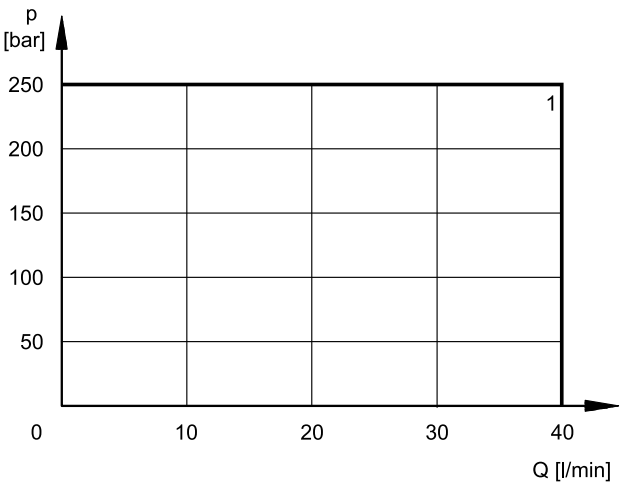
15 - CHARACTERISTIC CURVES AND OPERATING LIMITS FOR SERIES

Please refer to diagrams at par. 3 for pressure drops, whereas operating limits are here below.

15.1 - BDL2-B38C-S4



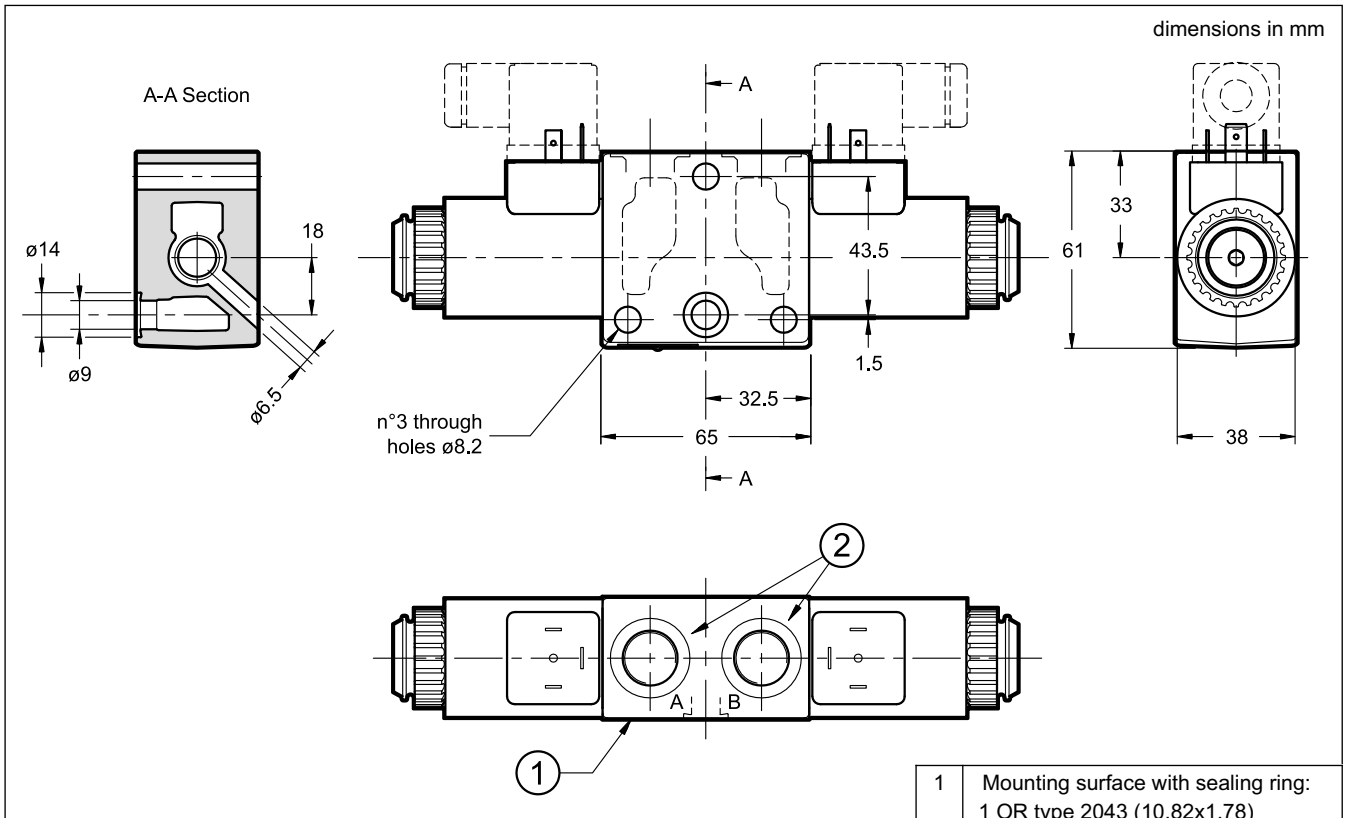
15.2 - BDM2-B38C-S4



16 - DIMENSIONS OF ELEMENTS FOR SERIES CONNECTION

16.1 - BD*2-B38C-S4/10* - directional valve element

The BDM2 configuration is showed here. The same directional valve is available as BDL2. For non-quoted dimensions, please refer to the drawings for parallel circuits. Overall dimensions are the same.

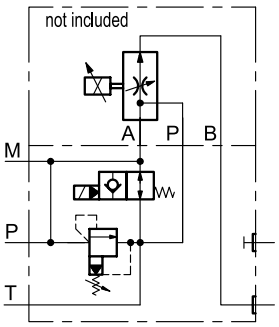


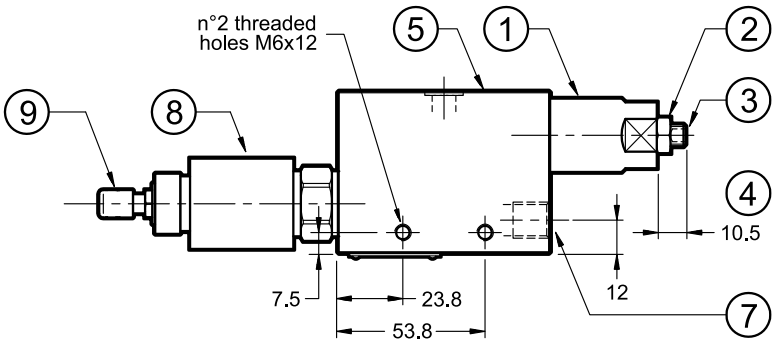
1	Mounting surface with sealing ring: 1 OR type 2043 (10.82x1.78)
2	A and B ports: 3/8" BSP

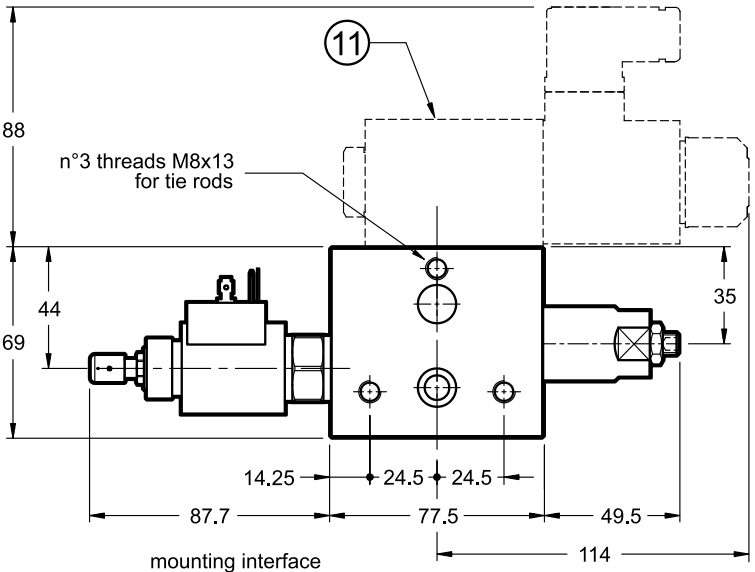
16.2 - Inlet elements for flow control valve

BD3-B38S-SK*-Q**
with pressure control and unloading valves

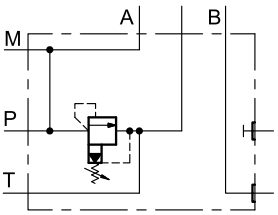
dimensions in mm

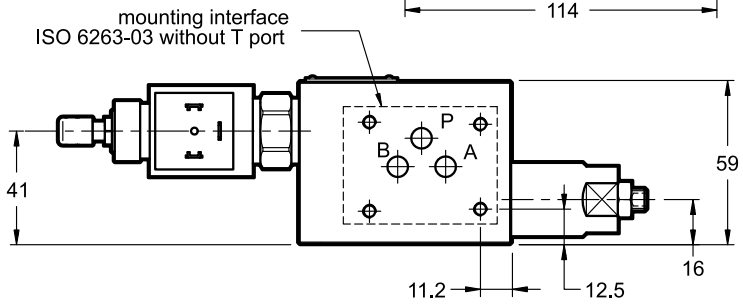


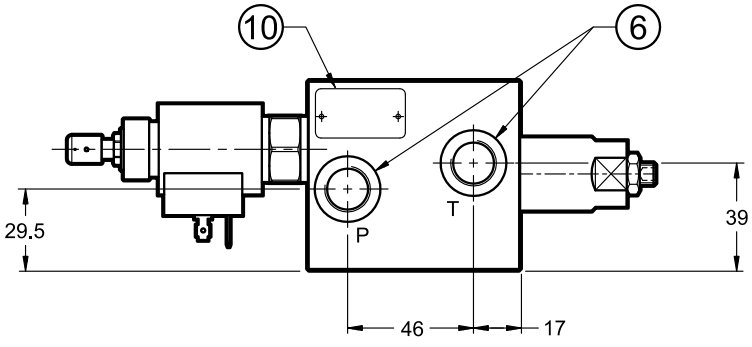




NOTE :The same component without part no. 8 is:
BD3-B38S-S*-Q**
with pressure control
without unloading valve







1	Pressure control valve
2	Locking nut: spanner 13
3	Socket hex adjustment screw: Allen key 4 Clockwise rotation to increase pressure
4	Maximum screw stroke
5	Mounting surface with sealing rings: 2 OR type 2043 (10.82x1.78)
6	P and T ports: 3/8” BSP
7	Pressure gauge port:1/4” BSP
8	Unloading valve Here shown with K1 connection
9	Push and twist manual override: see identification codes for further choices.
10	Element label
11	Encumbrance of flow control valve. To be ordered separately. See catalog 82220

NOTE: for missing dimensions of mounting interface please refer to the par 10.1 ’mounting surfaces’.

DUPLOMATIC MOTION SOLUTIONS

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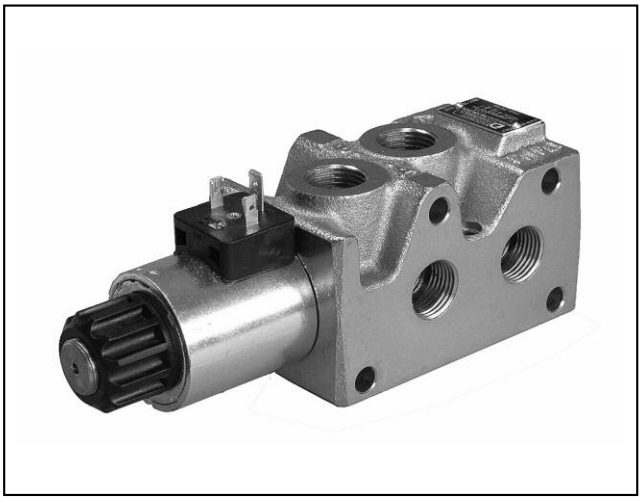
DUPLOMATIC OLEODINAMICA



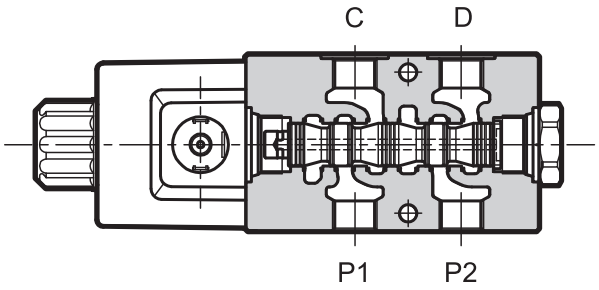
BFD*

SIX WAYS BANKABLE FLOW DIVERTER

SERIES 10

p max **320** bar
Q max **90** l/min

OPERATING PRINCIPLE



— BFD* is a 6 ways bankable flow diverter that allows the simultaneous connection of two utilities, alternating the direction of flow through a solenoid operated directional valve.

— It is available in two sizes, depending on the requested flow, and is used mainly for compact applications for the mobile sector.

— The BFD* valve is also suitable for series mounting, lining up to max 5 modules.

— The external drain is available as an option on both sizes.

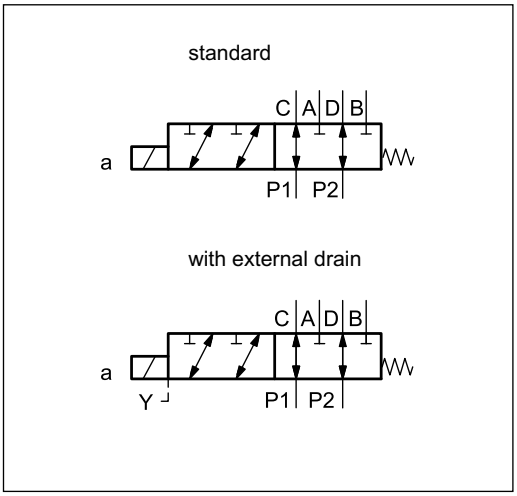
— The BFD* diverters are supplied with a finishing surface treatment zinc-nickel, suitable to ensure a salt spray resistance up to 240 hours. Versions with plastic coil or with zinc-nickel finished coil reach 600 hour resistance.

PERFORMANCES

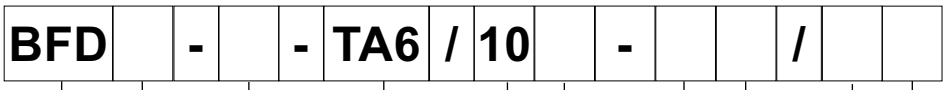
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

		BFD06	BFD10
Maximum operating pressure: - with drain Y	bar	250 320	
Maximum flow	l/min	60	90
Pressure drops Δp - Q	see paragraph 3		
Electrical features	see paragraph 6		
Operating limits	see paragraph 4		
Electrical connections	see paragraph 11		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	According to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Mass	kg	3	4,2
Surface treatment	zinc-nickel		

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



Bankable 6 ways flow diverter

Nominal size
06 = 60 l/min
10 = 90 l/min

Ports: (see **NOTE 1**)
G038 = 3/8" BSP (for BFD06 only)
G012 = 1/2" BSP

Spool type

Series:
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Option:
Y = External drain (see par. 13.1)

Manual override: (see par. 14)
Omit for override integrated in the tube (**standard**)
CM = boot protected
CK = knob

Coil electrical connection
K1 = plug for DIN 43650 connector (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S (available only for BFD06)
NOTE fo BFD06: to obtain a salt spray resistance up to 600 hours buy coil type:
WK1 = plug for DIN 43650 connector
WK7D = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S, with diode.
These versions include the CM manual override to protect the solenoid tube.
WK1 e WK7D connections are available for D12 and S24 coils only.
(see sections 6 and 11)

Coil type
D12 = 12 V
D24 = 24 V
D28 = 28 V (BFD06 only)
D00 = valve without coils (see **NOTE 2**)

NOTE 1: On BFD06 are available upon request for the threads 3/4" 16 UNF (**S08**).
NOTE 2: The locking rings of the coils and the relevant O-Rings are supplied together with valves.

2 - HYDRAULIC FLUIDS

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

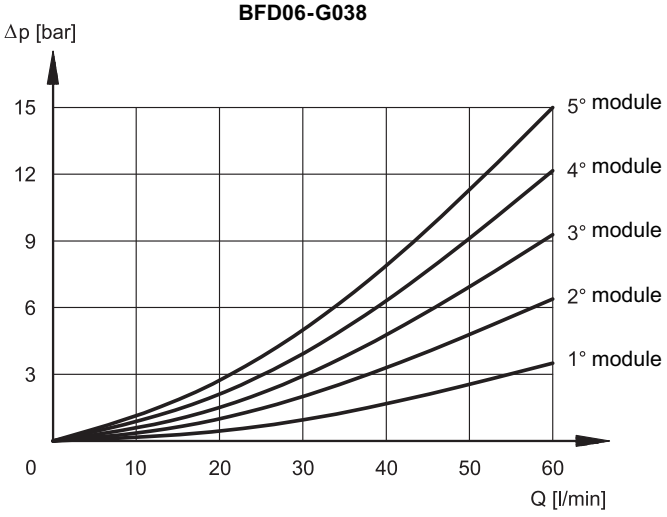
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

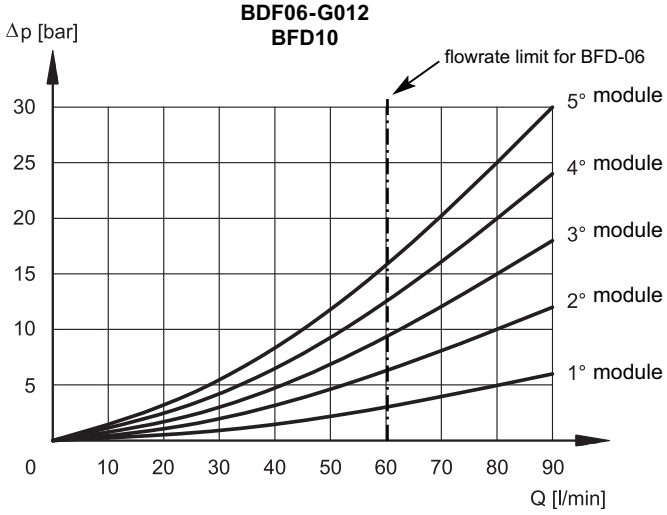
(obtained with viscosity 36 cSt at 50 °C)

3.1 - Pressure drops Δp-Q at initial position

BFD06-G038



BDF06-G012
BFD10

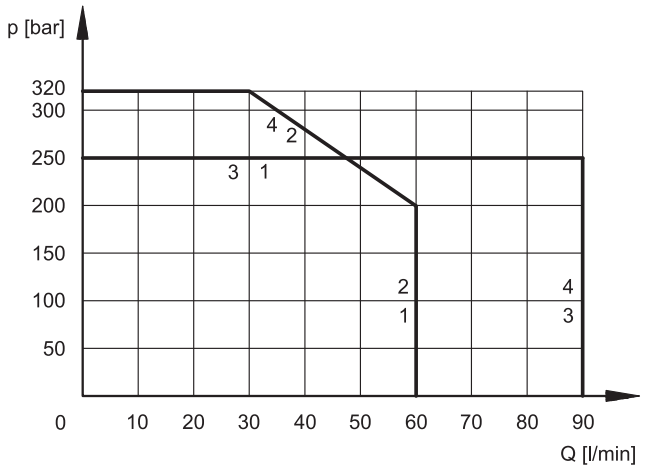


4 - OPERATING LIMITS

The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403 norm with solenoids at rated temperature and supplied with voltage equal to 90% of the nominal voltage.

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



VALVE	CURVE
BFD06	1
BFD06*/Y	2
BFD10	3
BFD10*/Y	4

5 - SWITCHING TIMES

The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

TIMES ms (±10%)	ENERGIZING	DE-ENERGIZING
BFD06	25 ÷ 75	20 ÷ 50
BFD10	50 ÷ 100	20 ÷ 40

6 - ELECTRICAL CHARACTERISTICS

6.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

Protection from atmospheric agents EN 60529

Plug-in type	IP
K1 DIN 43650	IP 65
K7 DEUTSCH DT04 male	IP 69 K

NOTE: The protection degree is guaranteed only with the connector correctly connected and installed.

NOTE 2: In order to further reduce the emissions, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (**NOTE 2**)	In compliance with 2004/108/EC
LOW VOLTAGE	In compliance with 2006/95/EC
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation	 class H class F (BFD06) class H (BFD10)

6.2 - Current and absorbed power

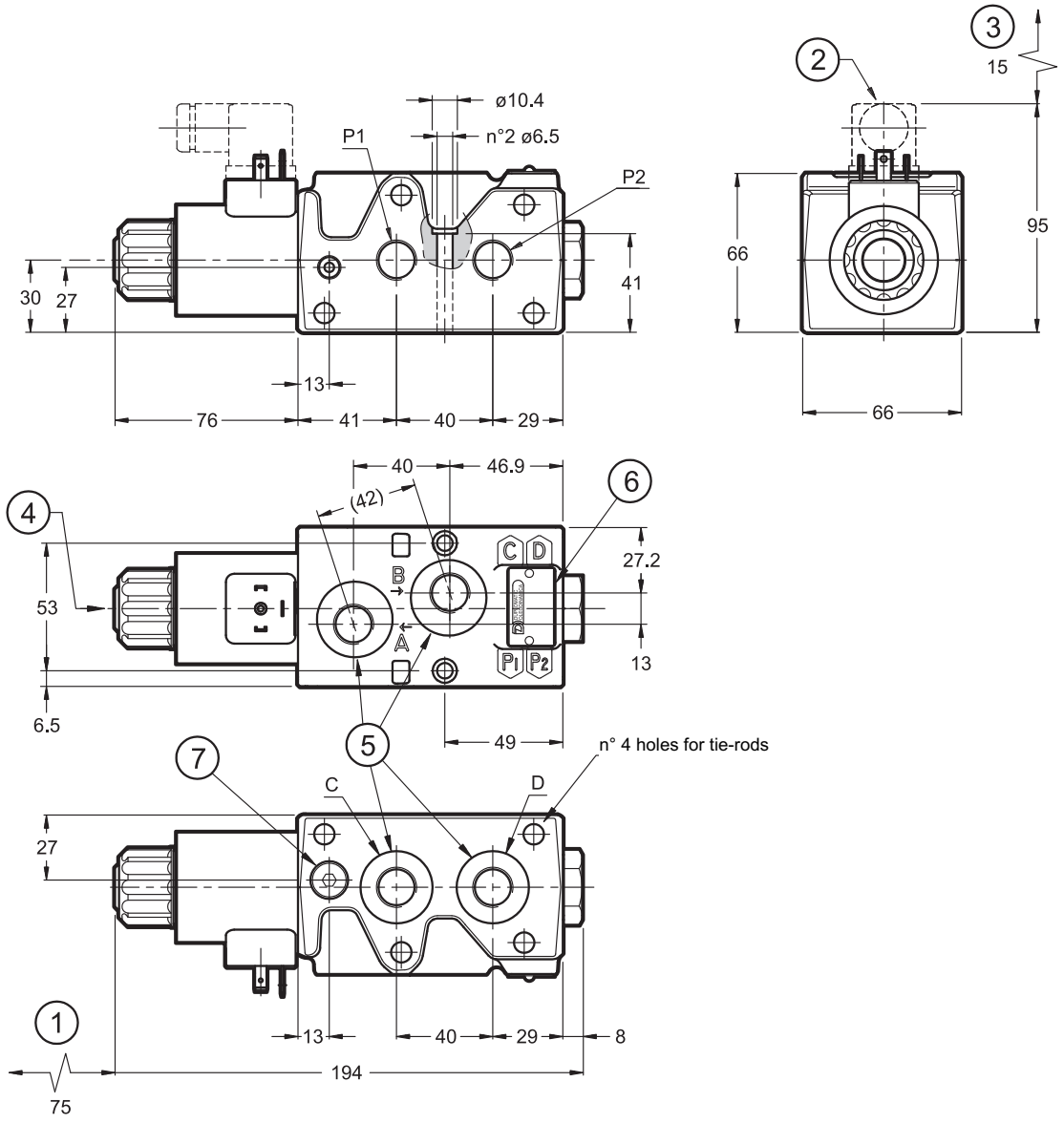
WK1 and WK7D coils have a zinc-nickel surface treatment and are specific for the high resistant version to salt spray.

The WK7D coil includes a suppressor diode of pulses for protection from voltage peaks during switching. 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.

Valve	Coil	Resistance at 20°C [Ω] (±5%)	Current consumption [A] (±10%)	Absorbed power [W] (±10%)	Coil code K1	WK1	K7	WK7D
BFD06*	**D12**	4 ÷ 5	2,72	32,7	1903080	1903050	1902940	1903400
	D24	18 ÷ 19,5	1,29	31	1903081	1903051	1902941	1903401
	D28	24,5 ÷ 27	1,11	31	1903082	-		
BFD10*	**D12**	2,9	4,14	50	1903150	-		
	D24	12,3	1,95	47	1903151	-		

7 - BFD06-G038 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

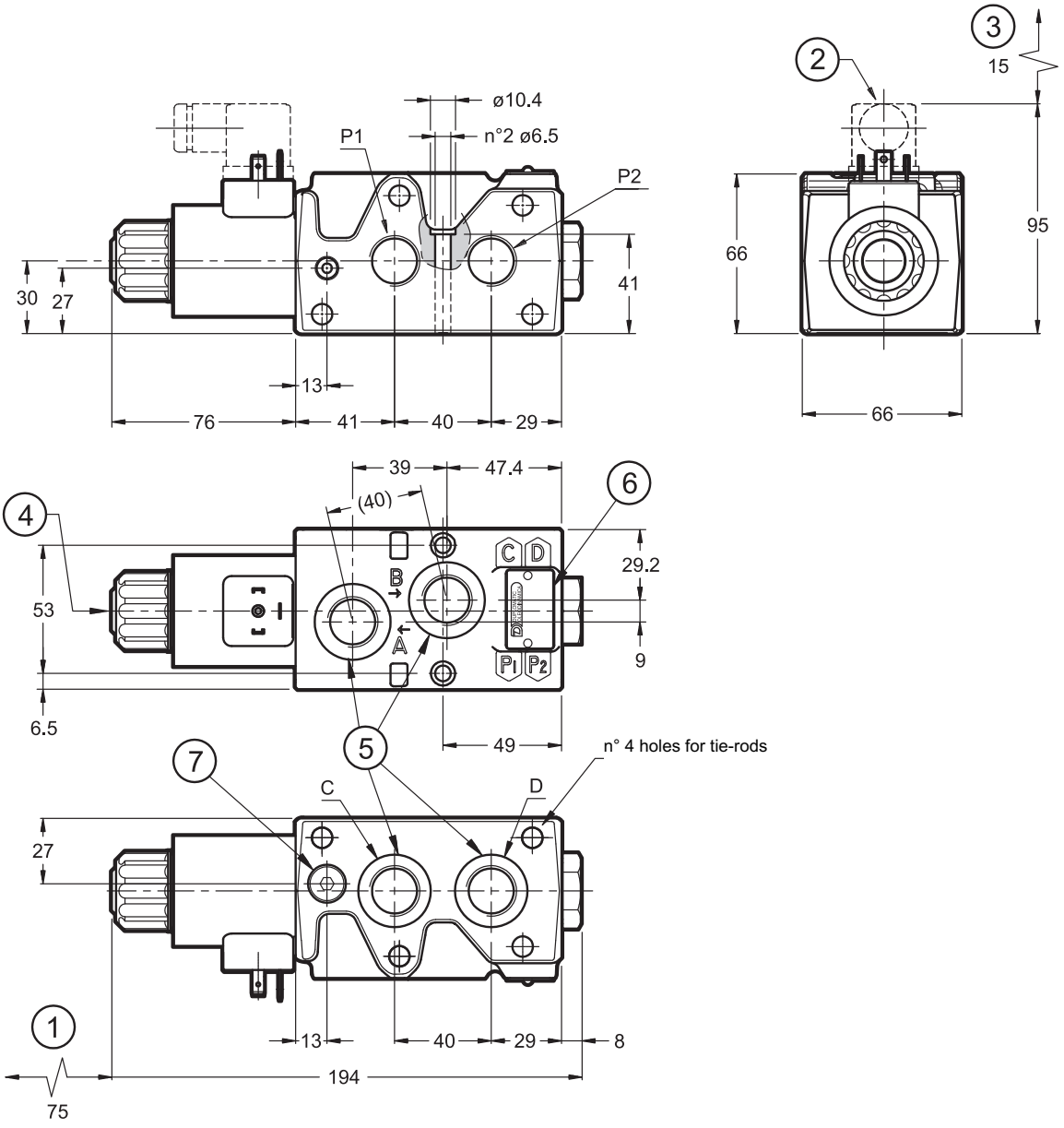


1	Coil removal space
2	DIN 43650 electrical connector
3	Connector removal space (representation with standard connection type K1 - for connection K7 see par. 11)
4	Standard manual override included in the solenoid tube
5	Ports: 3/8” BSP
6	Identification label
7	Option: external drain port Y 1/8” BSP

Fastening of single valve: 4 SHC screws ISO 4762 M6x50
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x12

8 - BFD06-G012 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

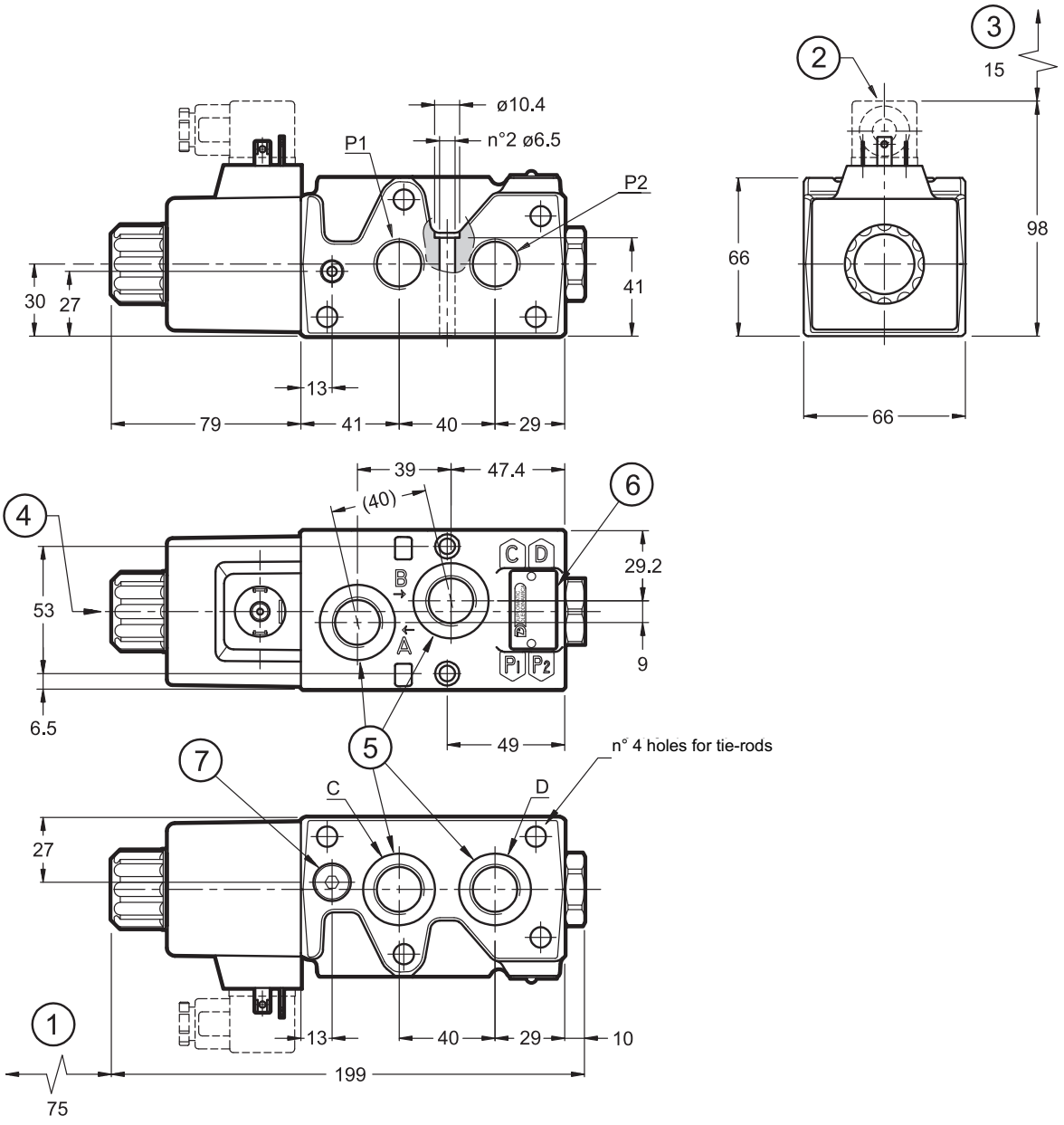


1	Coil removal space
2	DIN 43650 electrical connector
3	Connector removal space (representation with standard connection type K1 - for connection K7 see par. 11)
4	Standard manual override included in the solenoid tube
5	Ports: 1/2” BSP
6	Identification label
7	Option: external drain port Y 1/8” BSP

Fastening of single valve: 4 SHC screws ISO 4762 M6x50
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x12

9 - BFD10 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Coil removal space
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override included in the solenoid tube
5	Ports: 1/2” BSP
6	Identification label
7	Option: external drain port Y 1/8” BSP

Fastening of single valve: 4 SHC screws ISO 4762 M6x50
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x12

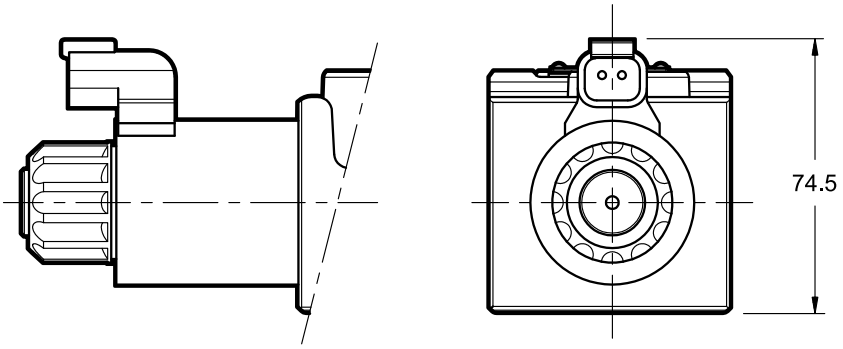
10 - INSTALLATION

The solenoid operated valve can be installed in any position without undermining the proper functioning.

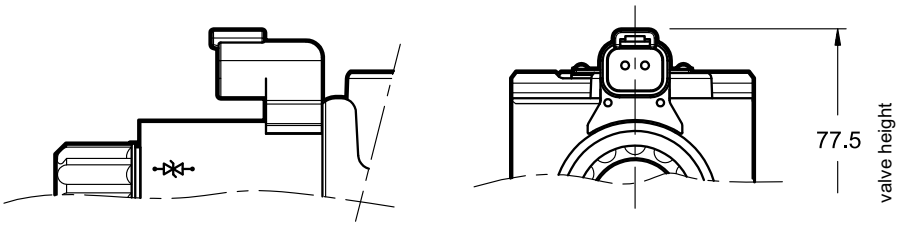
11 - ELECTRICAL CONNECTIONS

The standard connection K1 (for connector DIN 43650) is described in the dimension drawings. The K7 and WK7D connections are only available for BFD06* valves.

connection for plug DEUTSCH DT04-2P
for male connector type DEUTSCH
DT06-2S
code **K7**



connection for plug DEUTSCH DT04-2P
for male connector type DEUTSCH
DT06-2S
code **WK7D** (W7 version only)



12 - ELECTRICAL CONNECTORS

The solenoid valves are supplied without connectors. For coils with standard electrical connection K1 type (DIN 43650) the connectors can be ordered separately: see catalogue 49 000.

13 - OPTIONS

13.1 - Subplate external drain port (option Y)

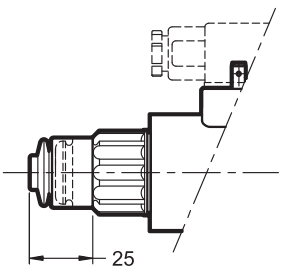
This version allows the operation with pressures up to 320 bar on the ports.

It consists in a Y drain hole realized on the valve coupling interface, where the Y port is connected with the solenoid tubes: in this way the tubes are not stressed by the pressure operating on the valve ports.

14 - MANUAL OVERRIDES

14.1 - Boot manual override

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface. Option is available on both versions.

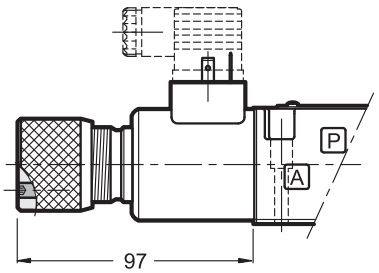


Code: 3401150006

14.2 - Knob

When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

Spanner: 3 mm

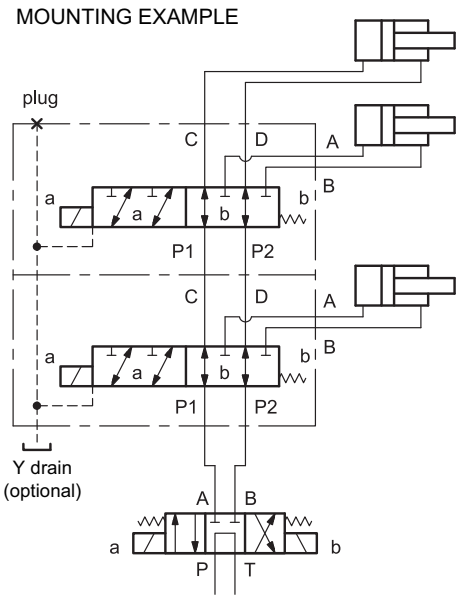


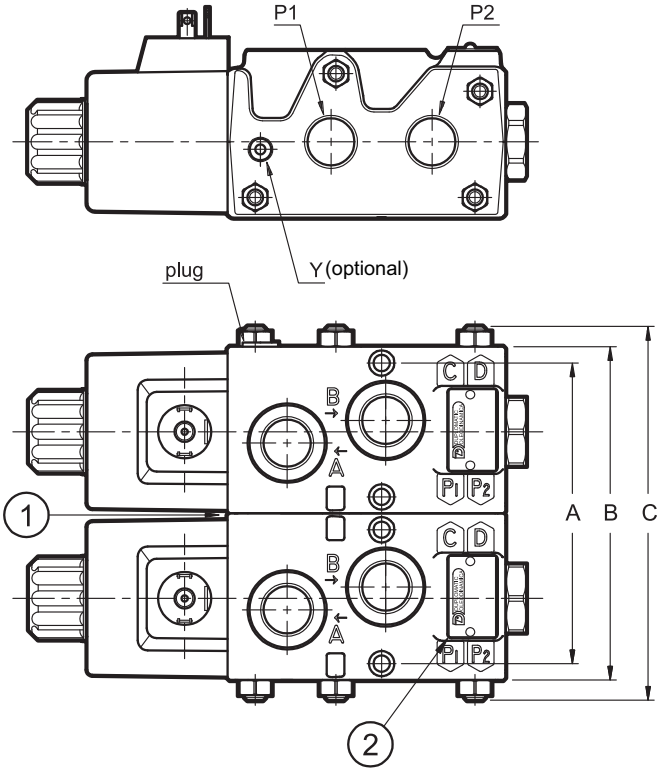
Code: 3401150009

15 - SERIES CONFIGURATION

The BFD* valve can also be assembled in series, bundled up to 5 individual modules. The fixing kit must be ordered separately.
It includes: rods and screws, nuts, security washers and OR, as indicated in the table below.

15.1 - Hydraulic scheme, dimensions and installation





1	Mounting surface with sealing rings: OR 2106 (26.7x1.78) 90 shore additional just for Y version: OR 2050 (12,42x1,78) 90 shore
2	Identification label

Tightening torque: 17 Nm

modules no.	ways no.	A	B	C	bolts or tie-rods	nuts & washers	Qty. OR 2106	Qty. OR 2050	kit BFD*/10N	kit BFD*/10V
2	8	119	132	156	4 bolts M8x145	4+4	2	1	3404200002	3404200012
3	10	185	198	220	4 tie-rods M8x200	8+8	4	2	3404200003	3404200013
4	12	251	264	285	4 tie-rods M8x265	8+8	6	3	3404200004	3404200014
5	14	317	330	350	4 tie-rods M8x330	8+8	8	4	3404200005	3404200015

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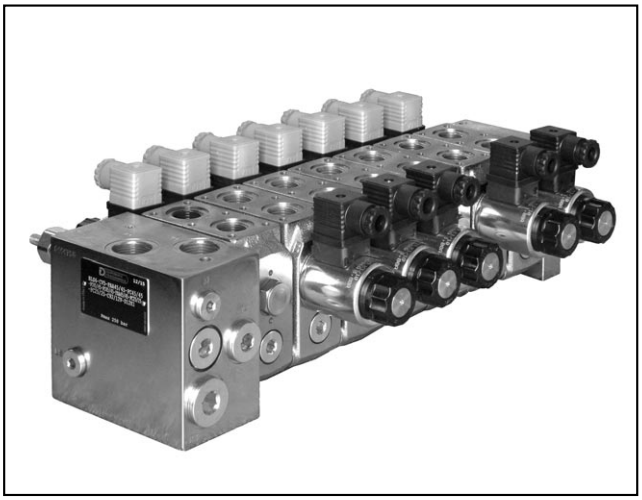


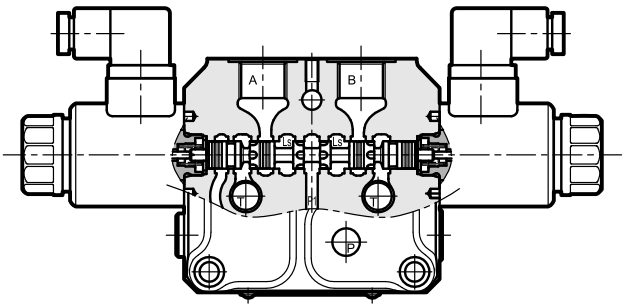
BLS6

PROPORTIONAL STACKABLE VALVE ASSEMBLY WITH LOAD SENSING

SERIES 12

p max **315** bar
Q max **120** l/min

OPERATING PRINCIPLE



— The BLS6 is a stackable valve assembly. It can be assembled with up to 8 working sections (proportional and solenoid directional valves together)

— Each module is equipped with a meter-in compensator that keep costant the flow, independently from load changes.

— Sections with pressure compensator are not influenced in any way by other operated functions, provided that sufficient pump capacity is available. In order to work correctly, the sum of the flows contemporarily used must not overcome the 90% of the inlet flow.

— Working ports A and B are threaded 1/2" BSP. Ports P1, P2 and T1 of the inlet module are threaded 3/4" BSP.

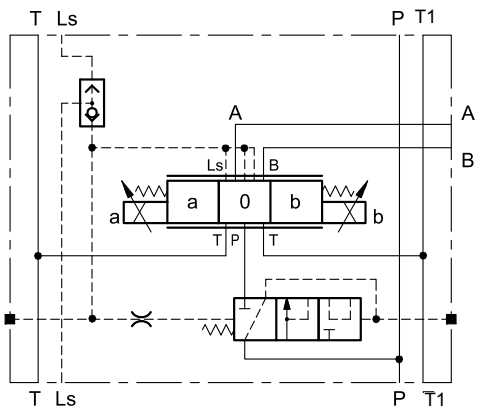
— The lever override is available as option.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Maximum operating pressure: - A, B, P1 and P2 ports - T1 port	bar	315 20
Maximum flowrate: - A and B ports - P1 and P2 ports - T1 port	l/min	45 100 120
Electrical characteristics	see paragraph 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Single body mass	kg	4,5
Surface treatment of body and plates	galvanic, zinc-nickel	

HYDRAULIC SYMBOL

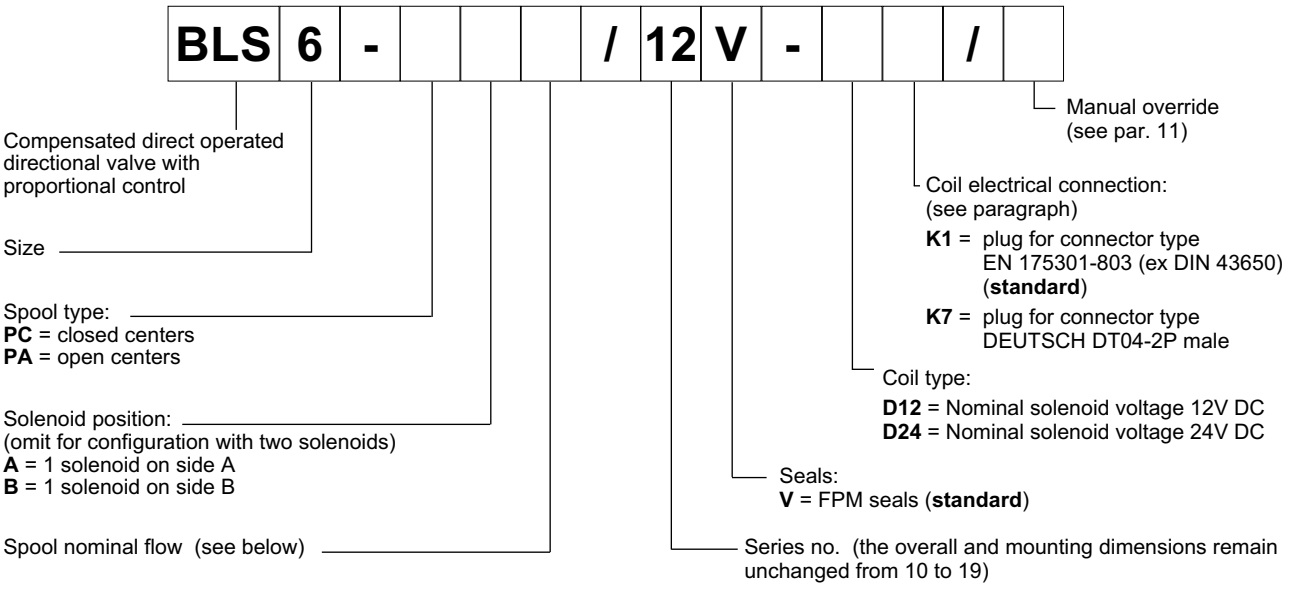


1 - IDENTIFICATION CODES FOR LOOSE MODULES

Here below are shown the identification codes of all the loose components of the bankable valve. To order a whole assembled valve, please use the codes at paragraphs 9 and 10.

The inlet section is available in different versions for fixed pumps and for systems with Load Sensing pump.

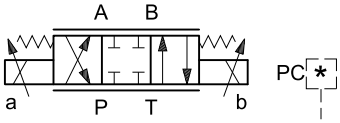
1.1 - Proportional module

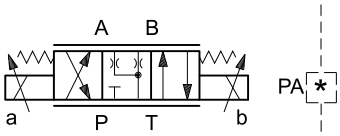


SPOOLS

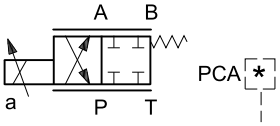
Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

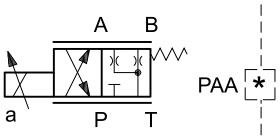
2 solenoids configuration:
3 positions with spring centering



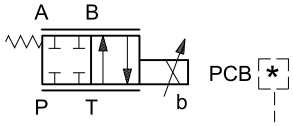


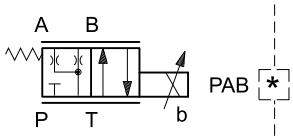
1 solenoid on side A.
2 positions (central + external) with spring centering





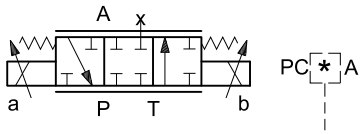
1 solenoid on side B.
2 positions (central + external) with spring centering

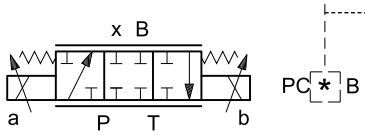




SYMMETRICAL	
max flow	Δp
05/05	4
09/09	8
15/15	4
25/25	8
30/30	4
45/45	8

ASYMMETRICAL	
max flow	Δp
15/10	4
25/15	8
30/20	4
45/30	8





SINGLE FLOW	
max flow	Δp
30	4
45	8

1.2 - On-off modules

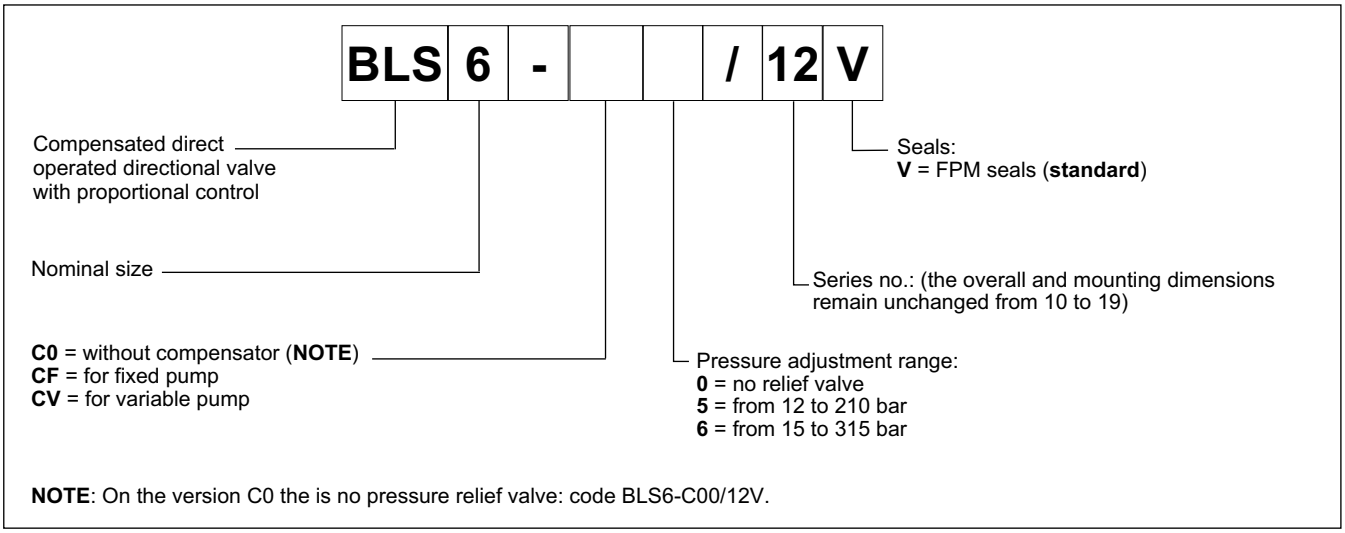
Proportional and on-off modules can be used together. In this case, the description for the spool type in the identification code has to be as follow:

SC = closed center with on-off solenoid
SA = open center with on-off solenoid

Two spools for high flow rates are available: SC60/60 and SA60/60.

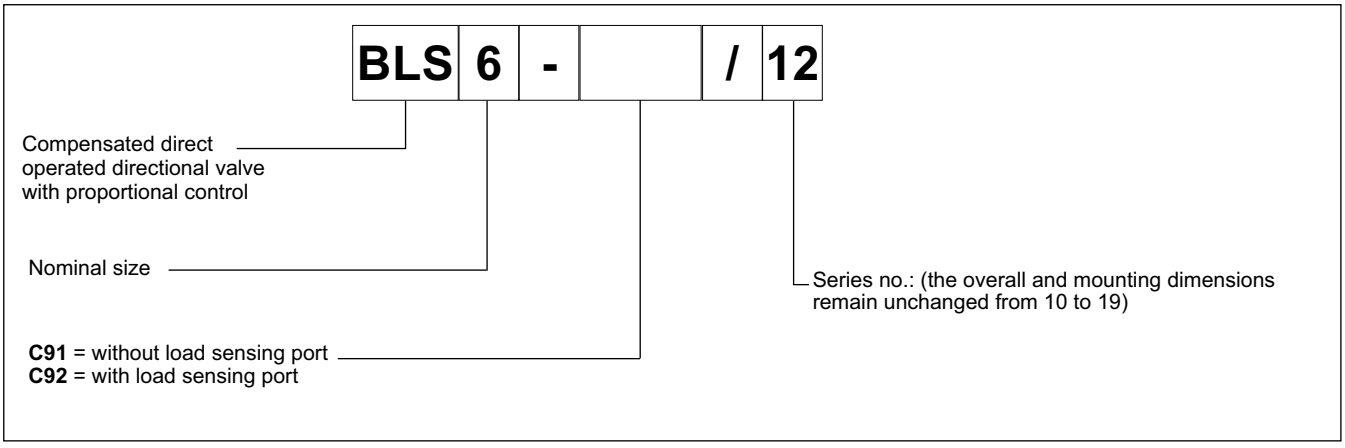
1.3 - Inlet plates

The inlet section is available in different versions, for fixed and for variable pumps with load sensing. The version for fixed pump can be easily converted to work with variable pumps and vice versa.



NOTE: On the version C0 the is no pressure relief valve: code BLS6-C00/12V.

1.4 - End plates



2 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4 or fluids HFDR type. 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 causes a faster degradation of the fluid and of the seals characteristics.

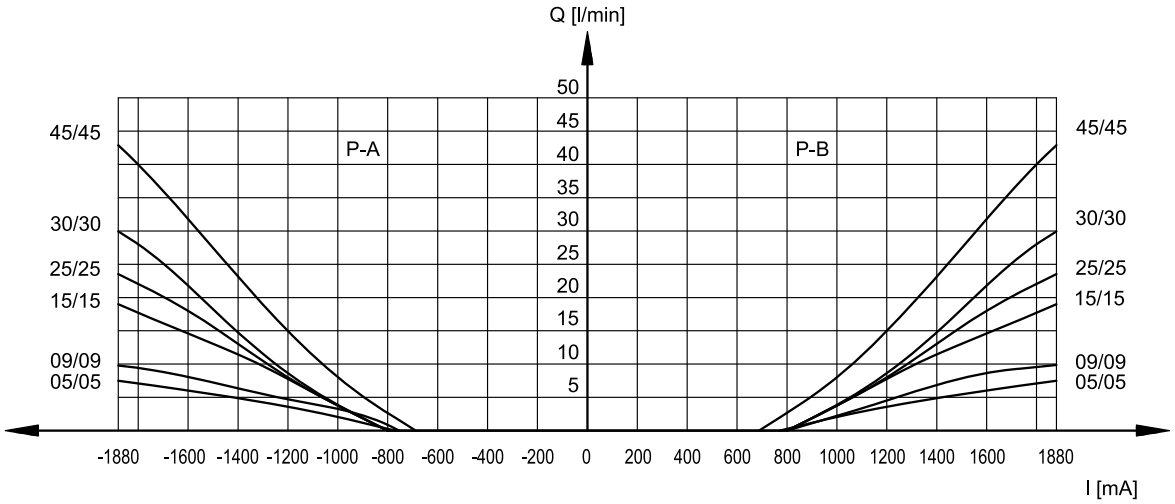
The fluid must be preserved in its physical and chemical characteristics.

3 - CHARACTERISTIC CURVES

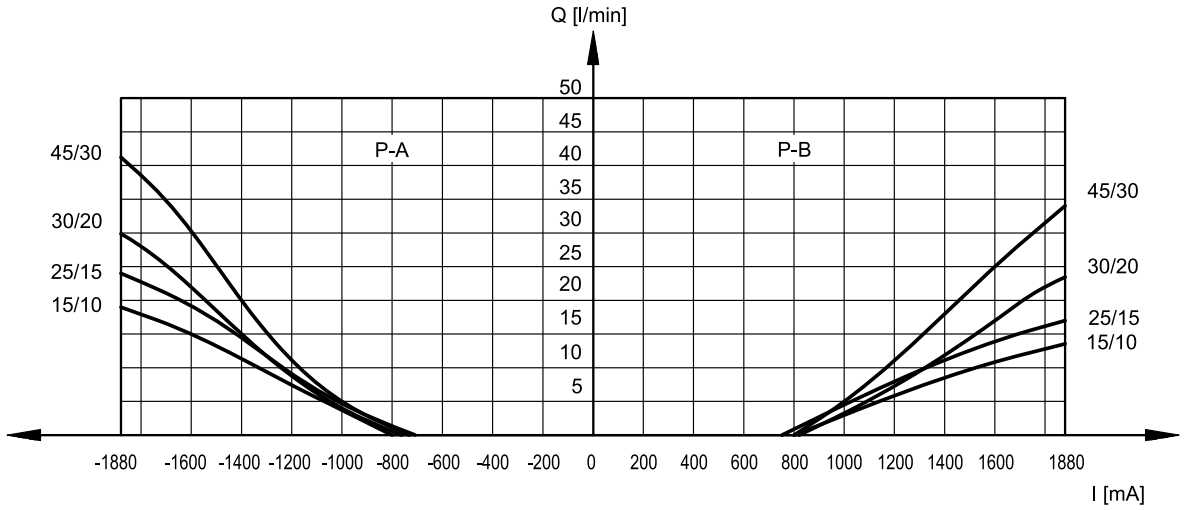
(values obtained with viscosity 36 cSt at 50 °C)

Typical constant flow rate obtained through the embedded compensator, and current with 12V solenoid type (for D24 version the maximum current is 860 mA), measured for the various spool types available.

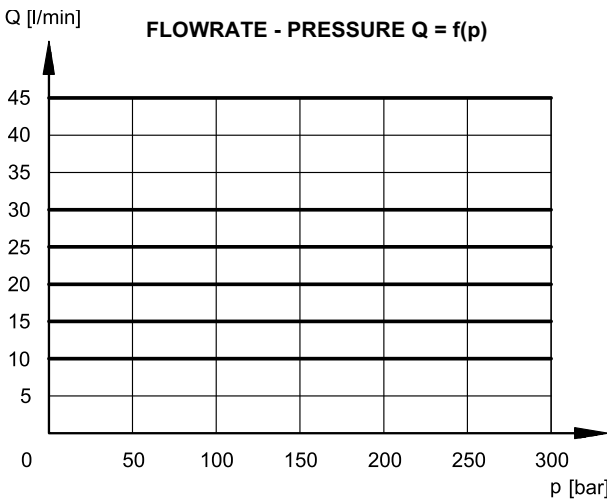
PROPORTIONAL MODULES PRESSURE DROPS Δp-Q
SYMMETRICAL FLOWS - PC AND PA SPOOLS



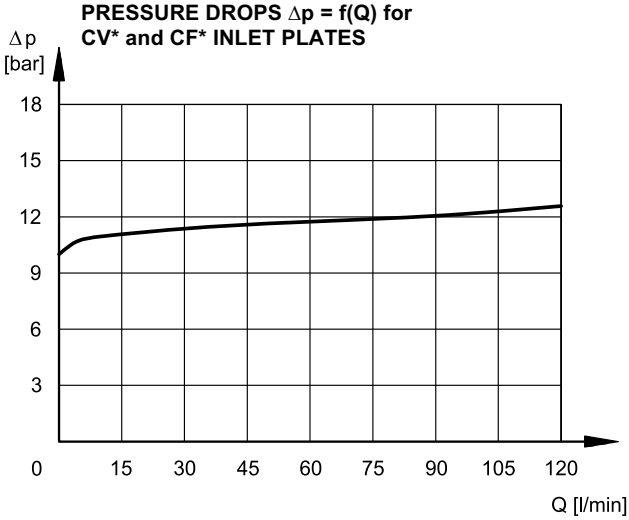
ASYMMETRICAL FLOWS - PC and PA SPOOLS



FLOWRATE - PRESSURE Q = f(p)



PRESSURE DROPS Δp = f(Q) for CV* and CF* INLET PLATES



4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE		V DC	**12**	**24**
RESISTANCE (at 20°C)	K1 coil K7 coil	Ohm	3.66 4	17.6 19
NOMINAL CURRENT		A	1.88	0.86
DUTY CYCLE			100%	
PWM FREQUENCY		Hz	200	100
ELECTROMAGNETIC COMPATIBILITY (EMC)		According to 2014/30/EU		
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation:		class H class F		

Protection from atmospheric agents IEC EN 60529

Plug-in type	IP 65	IP 69 K
K1 EN 175301-803 (ex DIN 43650)	x (*)	
K7 DEUTSCH DT04 male	x	x (*)

(*) The protection degree is guaranteed only with the connector correctly connected and installed

5 - STEP RESPONSE

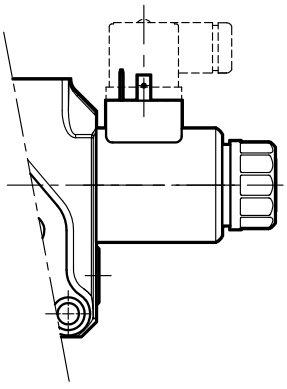
(measured with mineral oil with viscosity of 36 cSt at 50°C with electronic control card)

Step response is the time (delay) taken for the valve to reach 90% of the set position value following a step change of the reference signal.

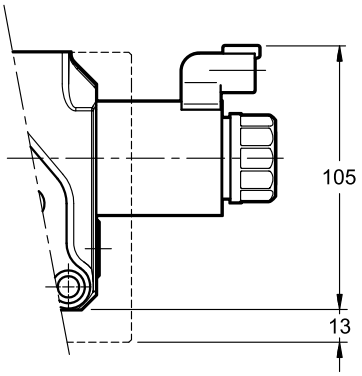
Reference signal step	0 →100%	100 →0%
STEP RESPONSE [ms]		
BLS6	50	40

6 - ELECTRICAL CONNECTIONS

connection for EN 175301-803 (ex DIN 43650) connector code **K1** (**standard**)



connection for DEUTSCH DT04-2P connector type code **K7**



7 - ELECTRICAL CONNECTORS

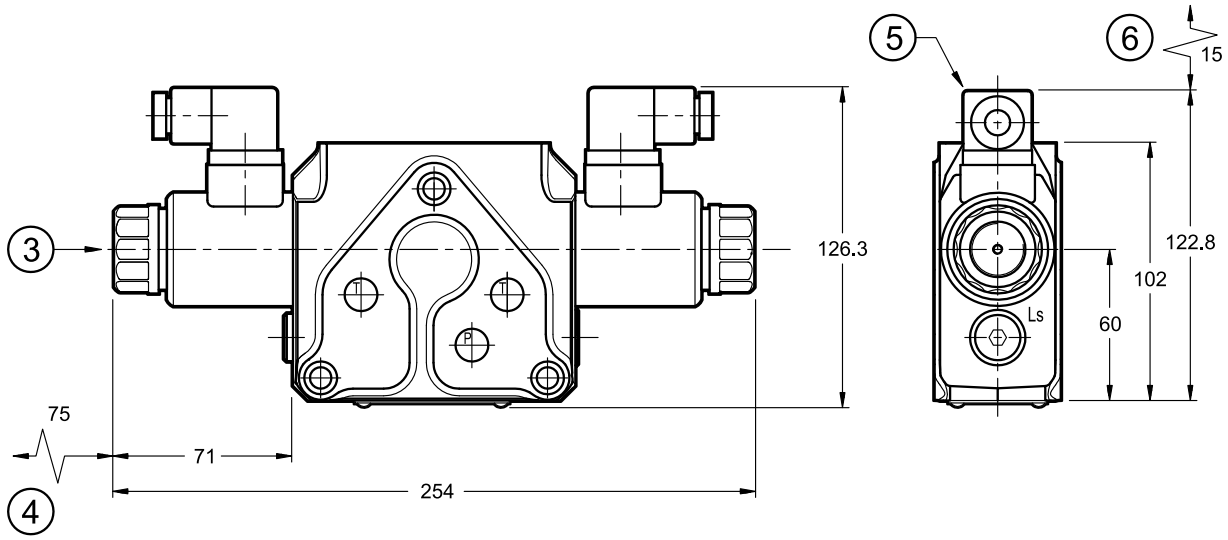
The on-off modules are supplied without connectors. For on-off coils with standard electrical connection K1 type EN 175301-803 (ex DIN 43650) connectors can be ordered separately: see catalogue 49 000.

8 - OVERALL AND MOUNTING DIMENSIONS

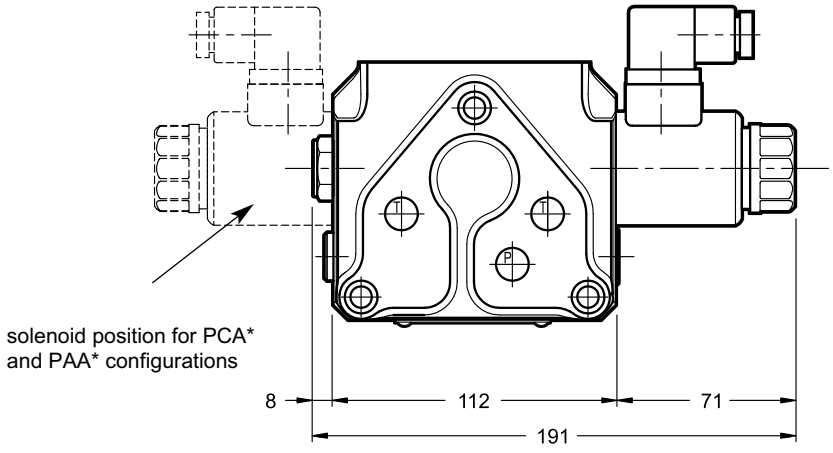
8.1 - Proportional module

dimensions in mm

2 SOLENOIDS **BLS6-PC***
BLS6-PA*



1 SOLENOID **BLS6-PCB***
BLS6-PAB*

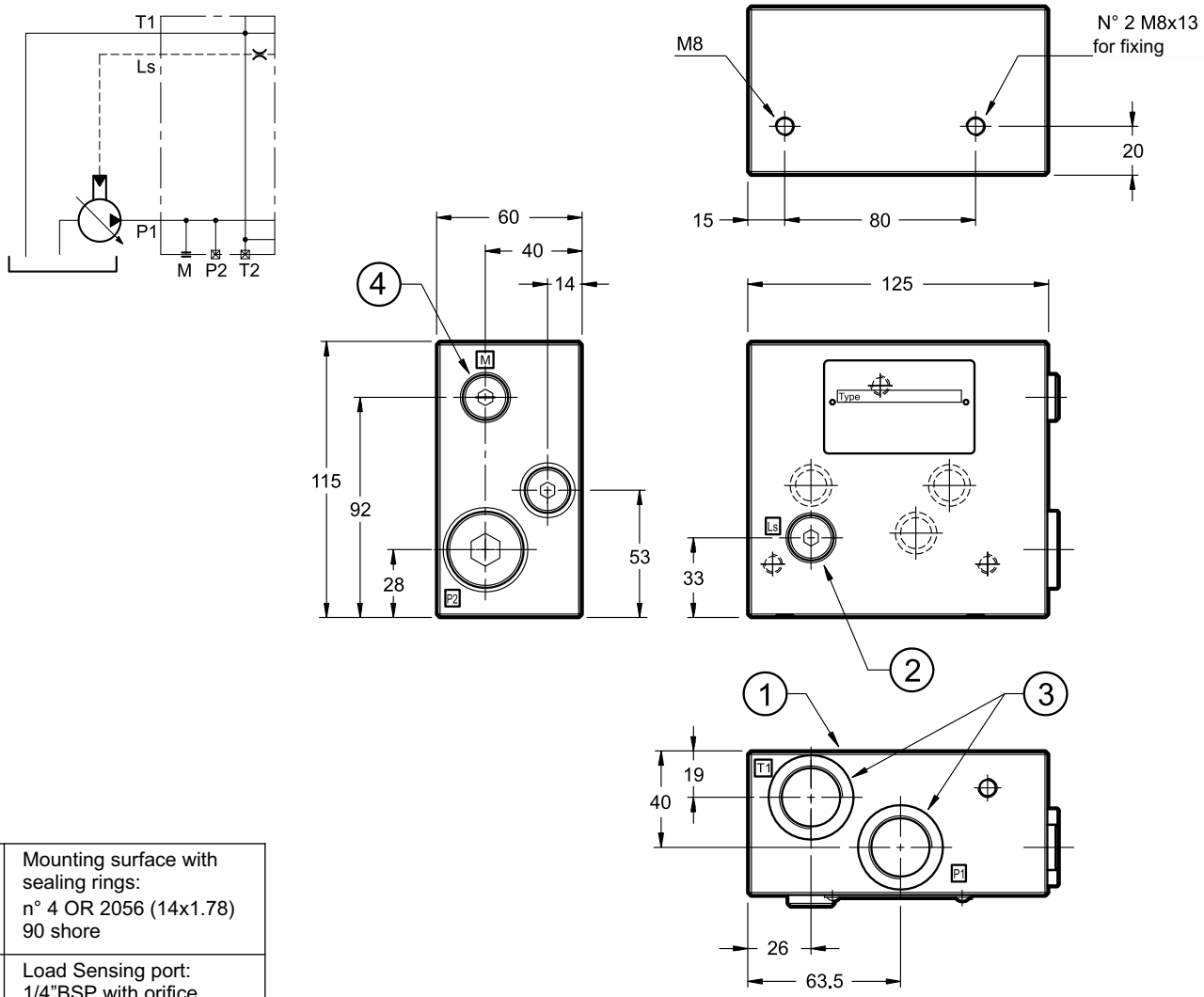


1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	A and B ports: 1/2” BSP
3	Locking ring with standard manual override
4	Coil removal space
5	Electrical connector type EN 175301-803 (ex DIN 43650) (drawing with standard type K1 - for other connections see par. 6)
6	Connector removal space

8.2 - Inlet plates

dimensions in mm

BLS6-C00

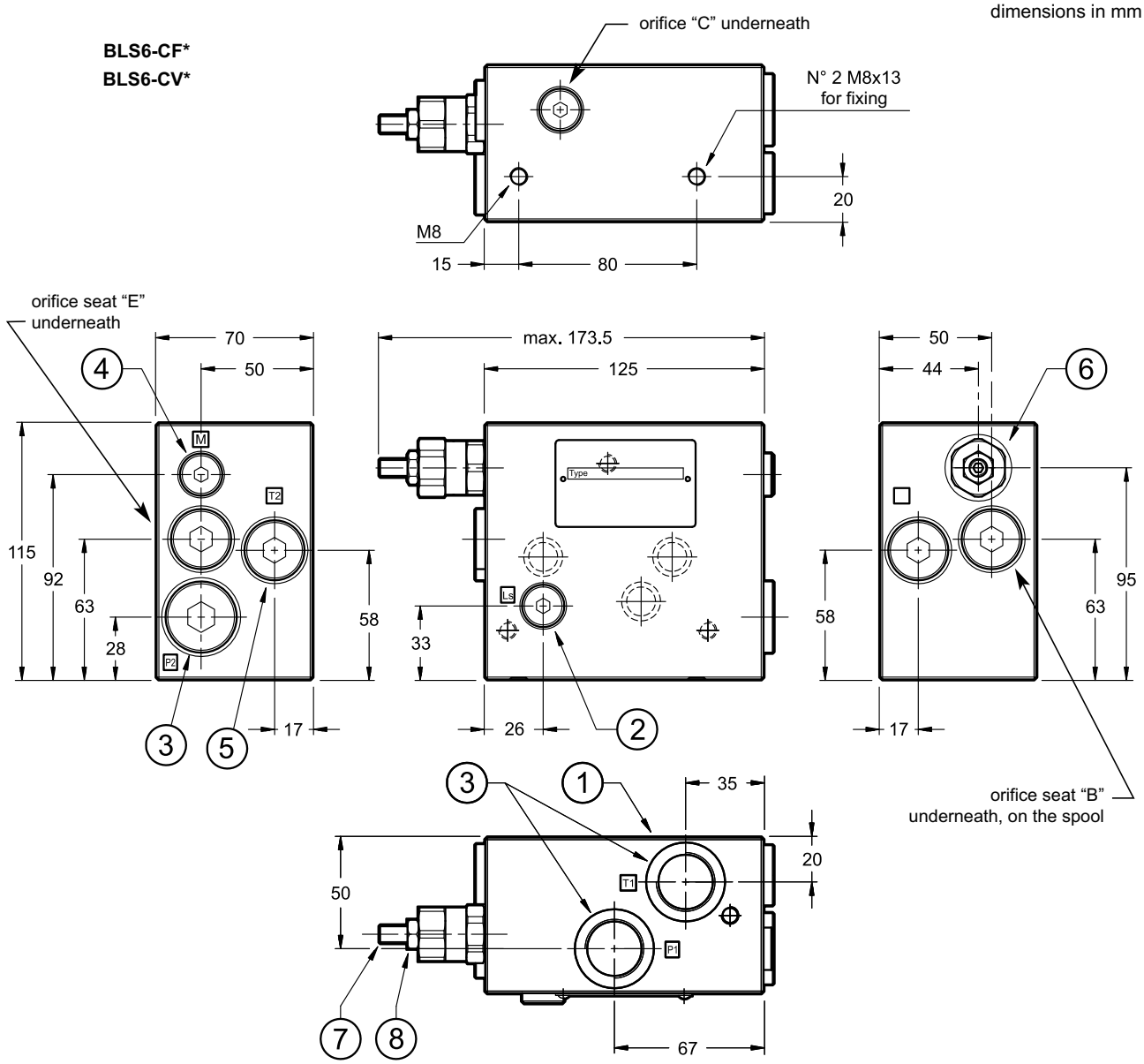


1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	Load Sensing port: 1/4"BSP with orifice
3	P1, P2 and T1 ports: 3/4" BSP
4	Pressure gauge port: 1/4" BSP

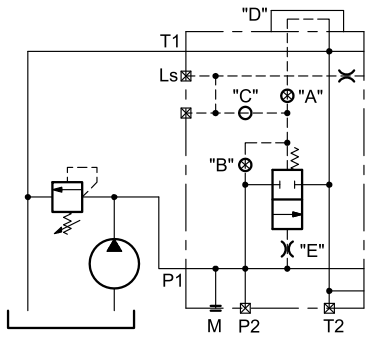
8.2 - Inlet plates

dimensions in mm

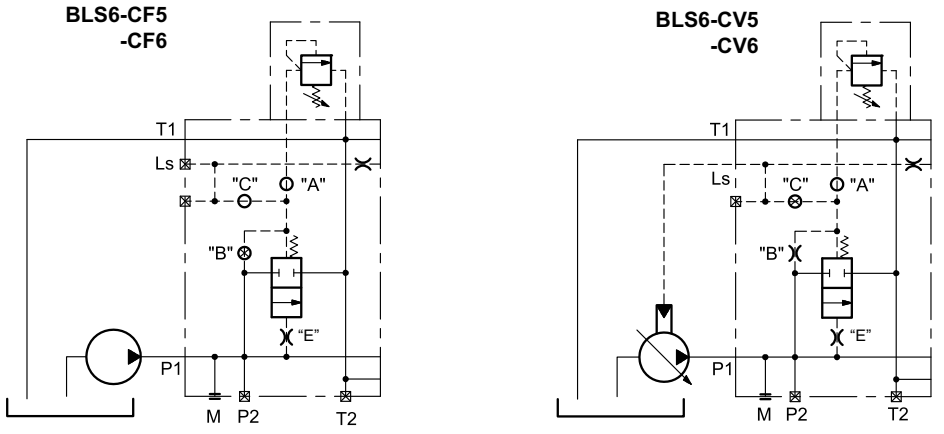
BLS6-CF*
BLS6-CV*



BLS6-CF0



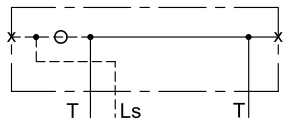
1	Mounting surface with sealing rings: n° 4 OR 2056 (14x1.78) 90 shore
2	Load Sensing port: 1/4" BSP
3	P1, P2 and T1 ports: 3/4" BSP
4	Pressure gauge port: 1/4" BSP
5	T2 port: 1/2" BSP
6	Pressure relief valve 'D'. **For BLS6-CF0 only:** plug 3/4"-16 UNF. Orifice seat "A" underneath.
7	Socket hex adjustment screw: Hex key 4.
8	Locking nut: spanner 13 Tightening torque: 12 ÷ 17 Nm



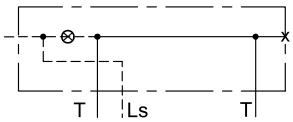
8.3 - End plates

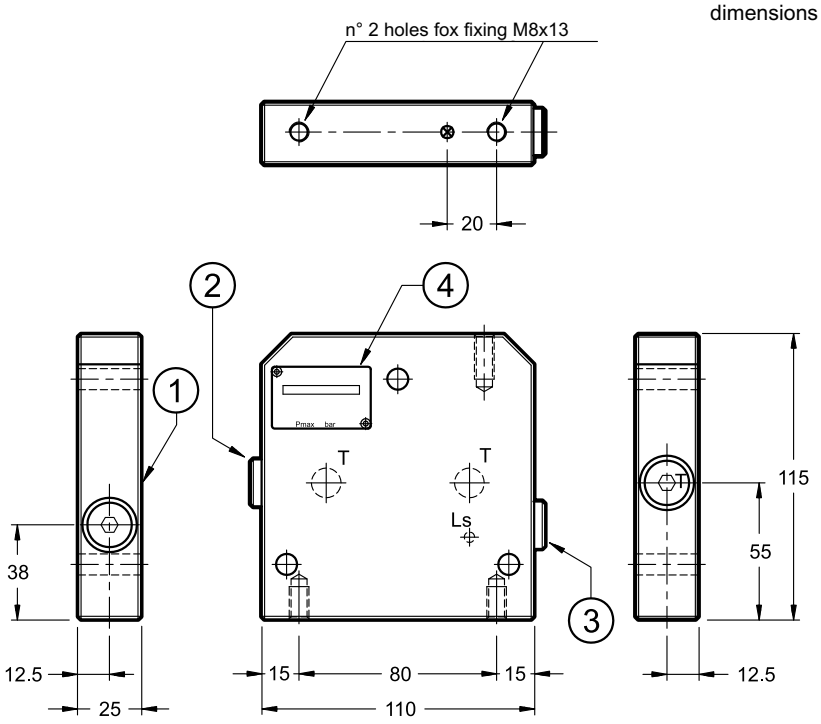
dimensions in mm

BLS6-C91



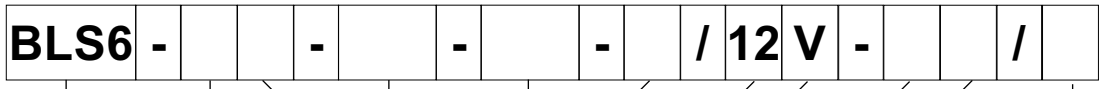
BLS6-C92





1	Mounting surface with no sealing rings
2	T1 outlet: 3/8” BSP
3	Load Sensing port: 1/4” BSP
4	Identification label

9 - IDENTIFICATION CODE OF ASSEMBLED VALVE



Compensated direct operated directional valve with proportional control

Inlet module:
C0 = without compensator (**NOTE**)
CF = for fixed pump
CV = for variable pump

Pressure adjustment range:
0 = no relief valve
5 = from 12 to 210 bar
6 = from 15 to 315 bar

Proportional module:
Choose open or closed centre, and then the spool type, like code in par. 1.1
Repeat for each proportional module required, max 8 modules.

End plate:
C91 = without load sensing port
C92 = with load sensing port

Series no.: (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
V = FPM seals (**standard**)

Coil type:
D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
(see paragraph 6)
K1 = plug for connector type EN 175301-803 (ex DIN 43650) (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male

Manual override on all the working sections (see par. 11)

NOTE: The version C0 is available only without the pressure relief valve, with code BLS6-C00/12V.

Coding example:

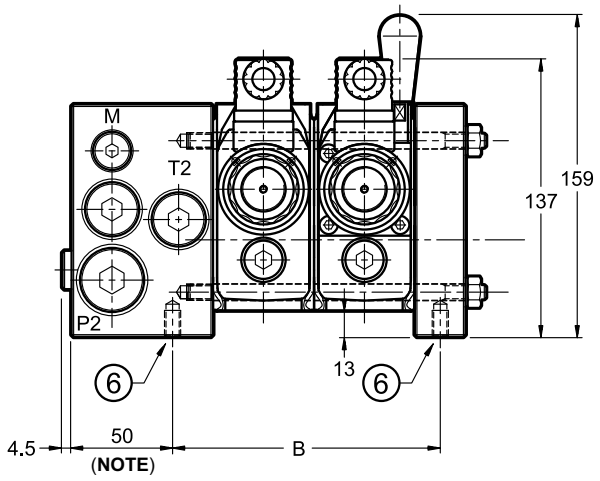
BLS6-C00-PC30/30-PC30/30-C92/12V-D24K1: assembled valve includes: inlet module without 3 way compensator; 2 prop. modules with closed center flow 30/30; end plate without load sensing port; FPM seals, 24V DC coils and K1 connection.

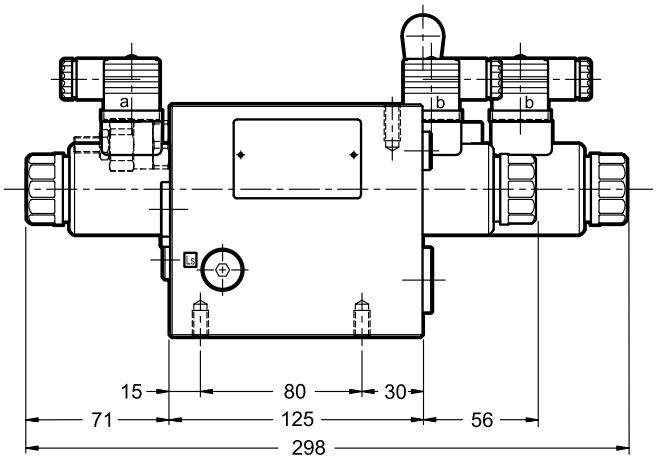
BLS6-CF5-PA45/30-PA45/30-PC30/30-PAB15/15-C91/12V-D12K1: assembled valve includes: inlet module for fixed pump, with pressure max 210 bar; 2 prop. modules with open center flow 45/30, 1 prop. module with close center, flow 30/30 and 1 prop. module with open center and solenoid only on side B, flow 15/15; end plate with load sensing port; FPM seals, 12V DC coils and K1 connection.

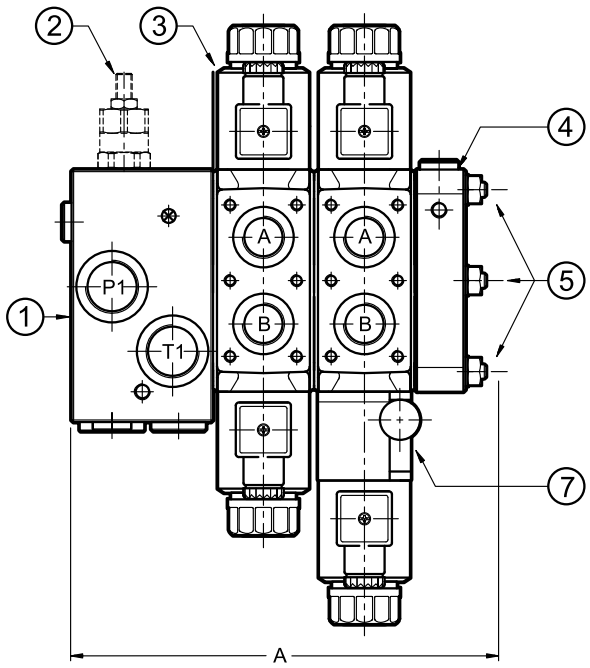
NOTE: To obtain the best performances, we suggest that the spool with the higher flowrate should be the first, and then the others in descending order.

10 - INSTALLATION AND OVERALL DIMENSIONS OF THE ASSEMBLED VALVE

dimensions in mm







Modules	A (**NOTE**)	B
2	212	132,5
3	262	182,5
4	312	232,5
5	362	282,5
6	412	332,5
7	462	382,5
8	512	432,5

NOTE: with the inlet plate BLS6-C00 the dimension is 10 mm shorter.

1	Inlet module
2	Pressure relief valve
3	Proportional modules
4	End plate
5	Fixing studs
6	Fixing holes
7	Manual lever override module

Fixing kit

The fixing kit includes,
all zinc-coated

3 studs,
3 self locking nuts
3 washers

Please use the following codes to order it :

No. of body modules	**Code**
2	3404150010
3	3404150011
4	3404150012
5	3404150013
6	3404150014
7	3404150015
8	3404150016

Tightening torque: 25 Nm

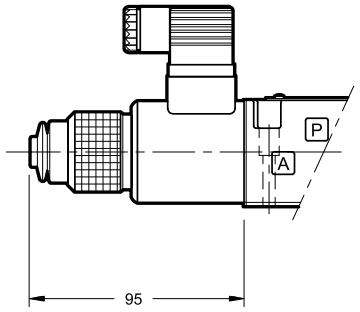
11 - MANUAL OVERRIDES

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

The following manual overrides are available:

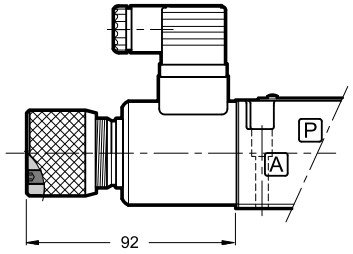
- **CM** manual override, boot protected.
- **CK** knob for proportional valves: When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.
- **CK1** knob for solenoid valves: the device is actuated by screwing it.
- **CH** lever manual override.

CM Version



Proportional valve code: 3803210003
Solenoid valvecode: 3401150006

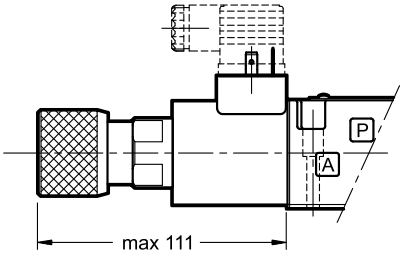
CK Version



Allen key for set screw: 3 mm.

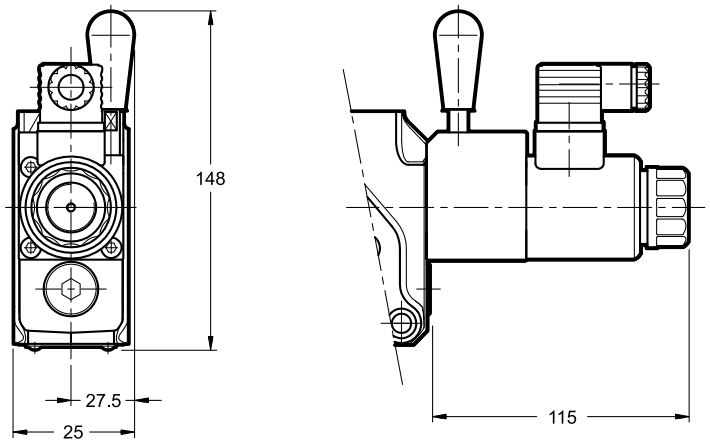
For proportional valves only
Code: 3803210005

CK1 Version



For solenoid valves only
Code: 3401150024

CH Version



NOTE: The overall dimension shown in the drawings is for the proportional modules; In ON-OFF modules consider an increase of 5 mm compared to the reported dimensions.

12 - ELECTRONIC CONTROL UNITS

One solenoid

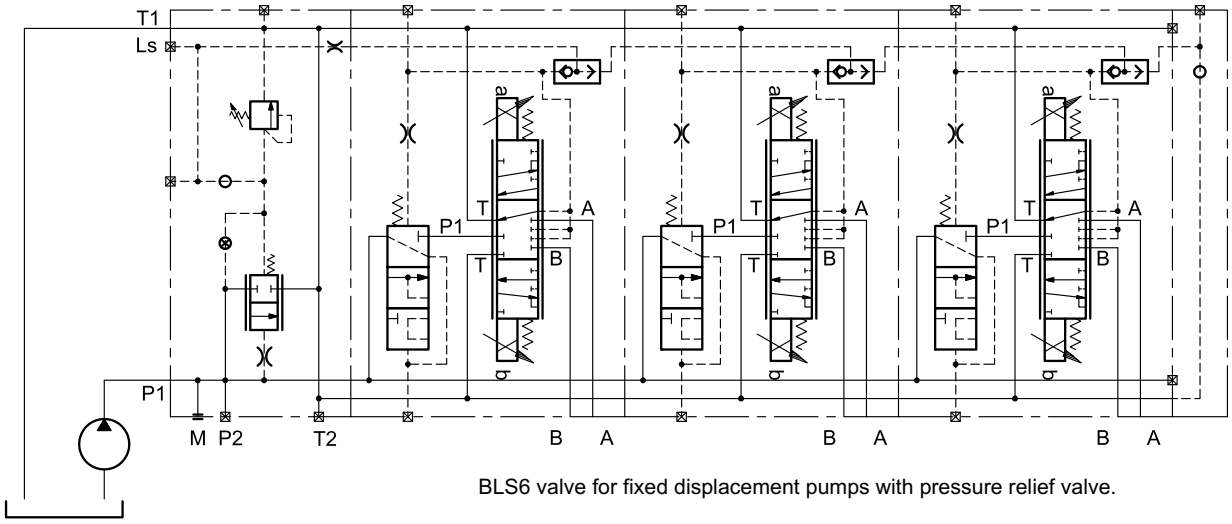
EDC-111	for solenoid 24V DC	plug version	see cat. 89 120
EDC-141	for solenoid 12V DC		
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 251
EDM-M141	for solenoid 12V DC		

Two solenoids

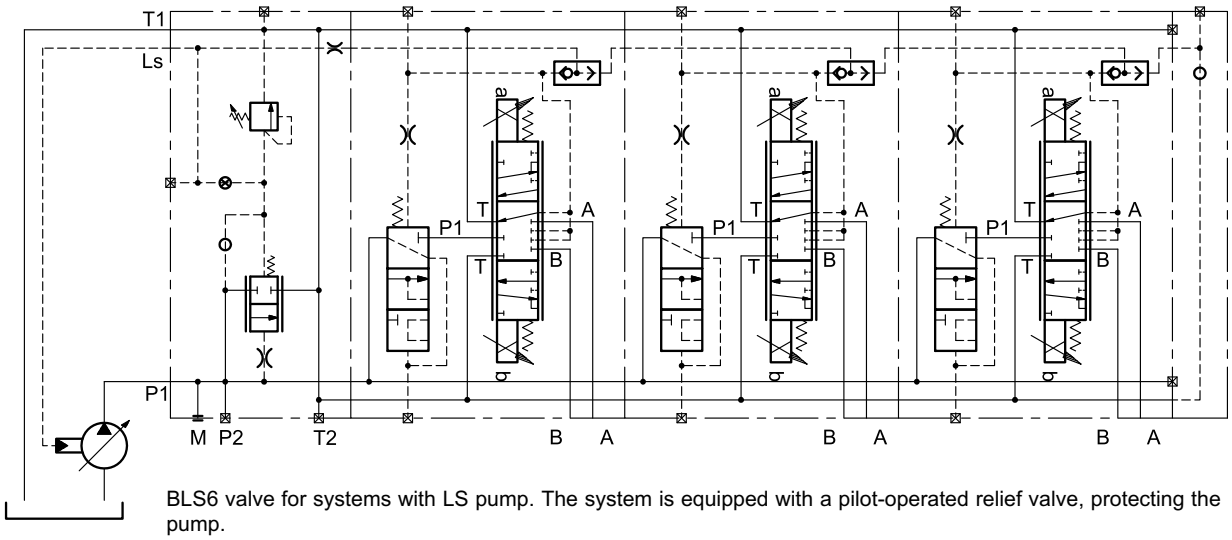
EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 251
EDM-M241	for solenoid 12V DC		

These cards drive only a valve at once.
Every module to be driven with electronic card must have its own.

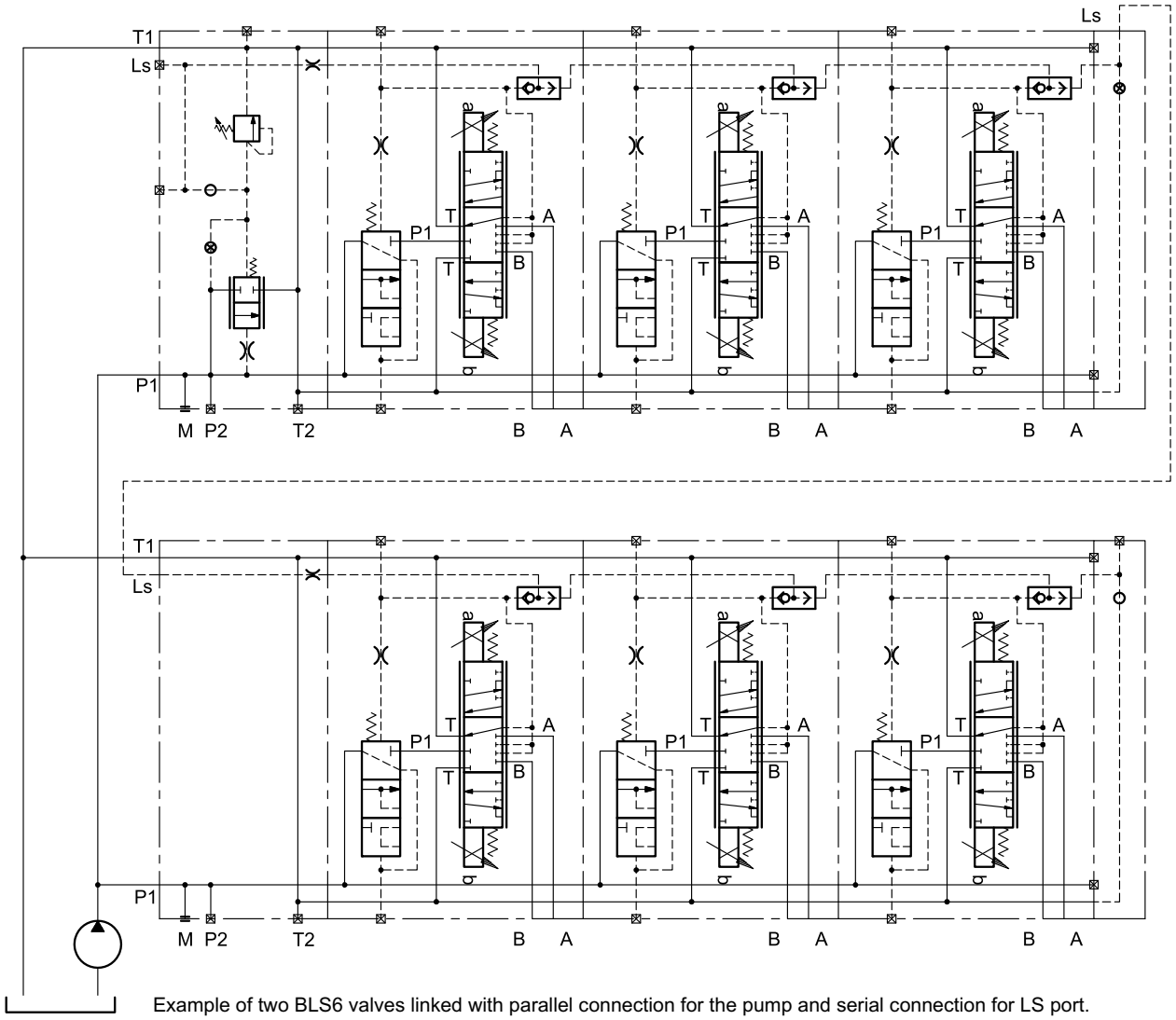
13 - EXAMPLES OF APPLICATION



BLS6 valve for fixed displacement pumps with pressure relief valve.



BLS6 valve for systems with LS pump. The system is equipped with a pilot-operated relief valve, protecting the pump.



Example of two BLS6 valves linked with parallel connection for the pump and serial connection for LS port.

DUPLOMATIC MOTION SOLUTIONS

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