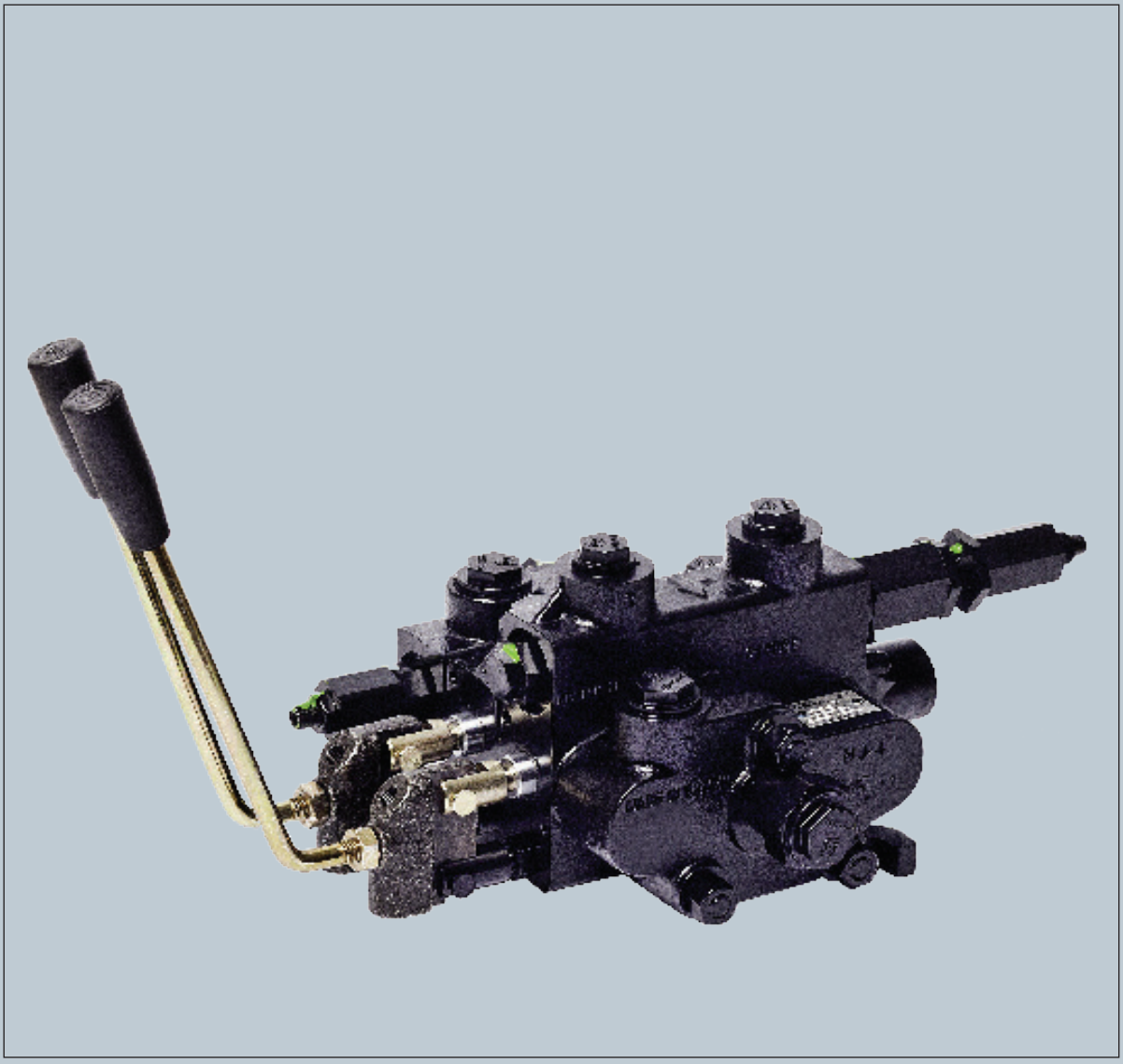
ENGINEERING
TOMORROW

Directional Control Valve

Technical Information



PRODUCT OVERVIEW
Flexibility of design ... 3
Circuit options ... 3
Capability ... 3
Actuation options ... 3
Modular valves ... 4

FLUIDS AND FILTRATION
Fluids ... 5
Base stock and additives ... 5
Viscosity ... 5
Filtration ... 5
Return line filtration ... 5
Cleanliness ... 5

CDS 60 AND 100
Specifications ... 6
Typical performance ... 7
Inlet covers order code ... 8
Inlet porting and relief valve options ... 9
Mid-inlet flow dividers and combiners order code ... 10
Mid-inlet flow dividers and combiners ... 11
Outlet covers order code ... 12
Outlet porting and plug options ... 13
Work section order code ... 14-17
Circuit types ... 18
Spool types ... 19
Actuation options ... 20-21
Cabling and electrical options for actuator types G, H, and J ... 22
Actuation mounting side ... 22
Spool centering and detent options ... 23-24
Auxiliary valves ... 25-26
Dimensions CDS 100 ... 26
Dimensions CDS 60 ... 27

APPENDIX 1 — ORDER FORMS
Spool valve order form ... 28
CDS60 and CDS100 specification worksheet ... 28
CDS60 and CDS100 price worksheet ... 28

FLEXIBILITY OF DESIGN

The Danfoss directional control valves are designed to give customer flexibility over a broad range of flow and pressure capabilities. Actuator options include a range of levers, cable actuators, hydraulic and pneumatic pilot controls, two-axis joysticks, and electrohydraulic solenoids. Flow rates range from 0 to 100 l/min [26 US gal/min].

CIRCUIT OPTIONS

- Parallel circuits
- Series circuits
- Tandem circuits
- Prioritay circuits
- Regenerative circuits
- Power beyond

CAPABILITY

- Flow rates from 0 to 100 l/.min [26 US gal/min]
- System pressure up to 250 BAR
- Up to 12 work sections
- 12 cm^3/min [0.7 in^3/min] leakage

ACTUATION OPTIONS

- Handles and levers
- Mechanical two-axis joystick
- Spool ends
- **E**lectro**H**ydraulic **C**ontrol (**EHC**) on/off solenoid
- Cable control
- Pneumatic pilot control
- Dual spool ends

MODULAR VALVES

Valve model	l/min [US gal/min]						Number of Spools	Circuit	Page
	20 [5]	40 [11]	60 [16]	80 [21]	100 [26]				
CDS-100	■	■	■	■	■	100 [26]	1 to 12	Parallel Tandem Series	
CDS-60	■	■	■	60 [16]			1 to 12	Parallel Tandem Series	

■ Indicates Maximum Working Pressure Rated At 210 bar [3000 psi]

FLUIDS

Hydraulic fluid performs three basic functions in a hydraulic system: It transfers energy, lubricates moving components, and transports heat and contaminants out of the system.

Base stock and additives
Danfoss valves are designed to operate with mineral-based fluids containing oxidation, rust, and foam inhibitors, compatible with fluoroelastomer seals. Consult your fluid supplier for information on seal compatibility.

Viscosity
Viscosity is the most important property of a hydraulic fluid. It is a measurement of how the fluid resists flow. Low viscosity fluids increase internal leakage; high viscosity fluids increase pressure drop through the valve. Use a fluid that meets the viscosity limits published in this catalog. For specific requirements, see technical data in each section.

Temperature
Temperature affects a fluid's viscosity. Higher temperature fluid has lower viscosity. Operating at excessive temperatures may have other detrimental effects on your hydraulic fluid. Design your hydraulic system to operate within the specified temperature range. Specific requirements are published in each section.

For more information
For more information on hydraulic fluid selection refer to *Hydraulic Fluids and Lubricants Technical Information*, Danfoss publication **520L0463**.

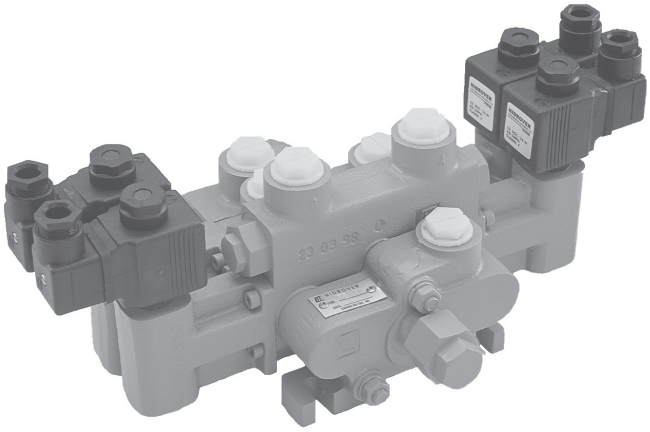
FILTRATION

Effective filtration is critical to a hydraulic system's performance and working life. Employ system filtration capable of meeting the published requirements in each valve section. Be aware that other components in the system may have more stringent requirements. Design your filtration system to satisfy the requirements of the most sensitive component.

Return line filtration
Return line filtration is generally adequate for Danfoss valves. We recommend a 10 micron nominal (20 micron absolute) or finer filter. Insure the filter in your system is properly sized and maintained. To facilitate proper filter maintenance, use a pressure gauge or other indicator to signal when it is necessary to change the filter. Never allow filter to reach its bypass condition. Follow the filter manufacturer's maintenance recommendations.

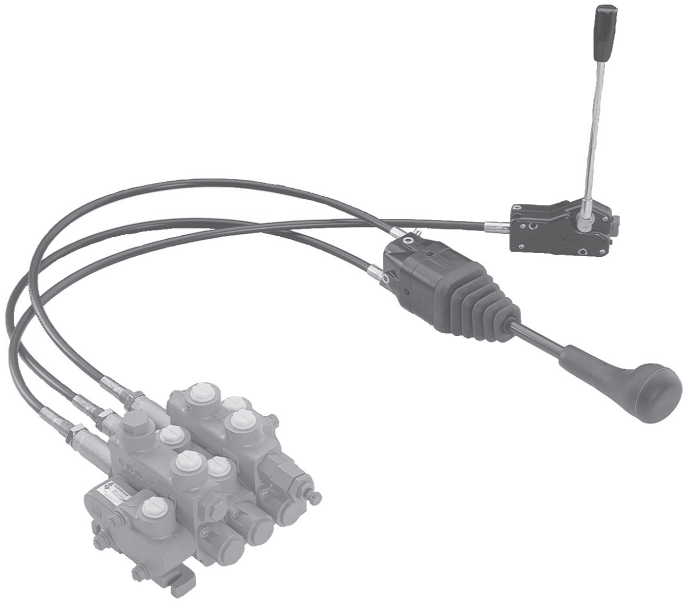
Cleanliness
Hydraulic system contamination must not exceed the limits published for each valve. Limits are specified per ISO 4406 (1999). When measuring system contamination, calibrate test equipment in accordance with the ACFTD method.

For more information
For more information on system filtration, refer to *Design Guidelines for hydraulic fluid cleanliness*, Danfoss publication **520L0467**.



CDS 100

CDS 60



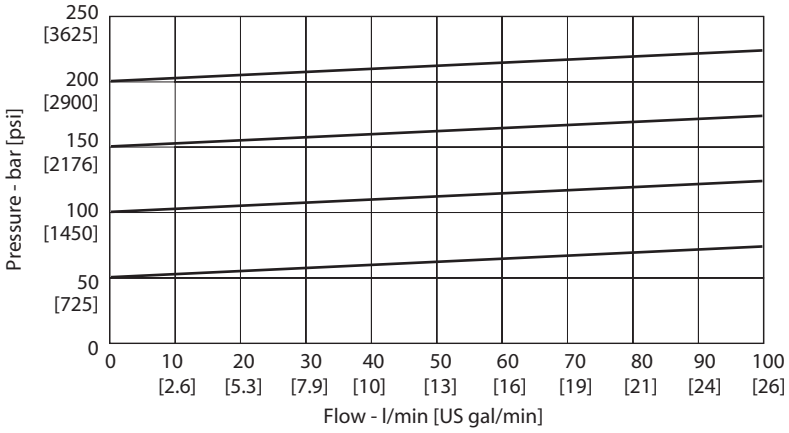
SPECIFICATIONS

Maximum flow (CDS 100)	100 l/min [26.4 US gal/min]
Maximum flow (CDS 60)	60 l/min [15.8 US gal/min]
Work pressure	210 bar [3050 psi]
Maximum pressure	250 bar [3625 psi]
Maximum pressure (outlet section)	40 bar [580 psi]
Temperature range	-40° to 80° C [-40 to 176° F]
Recommended fluid type	Mineral based hydraulic oil
Recommended viscosity	26-55 mm^2/sec (cSt) [123-255 SUS]
Minimum fluid cleanliness (per ISO 4406)	19/16

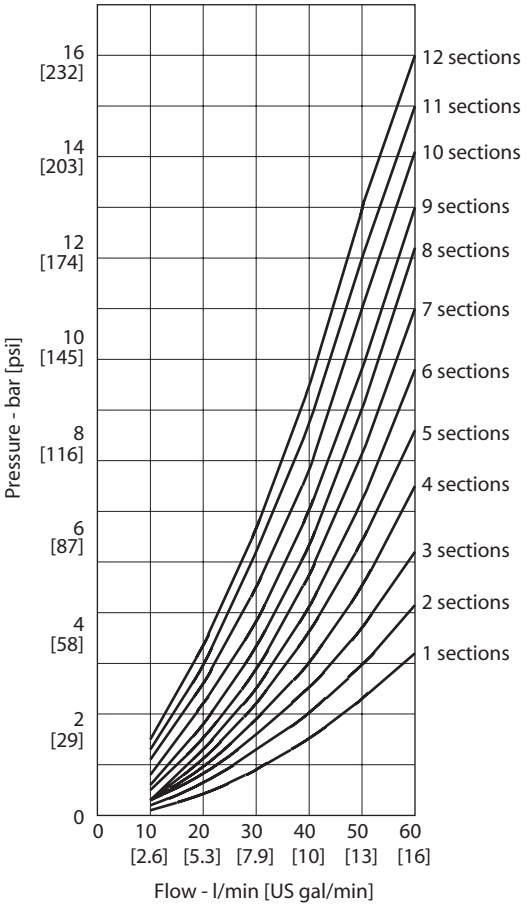
TYPICAL PERFORMANCE

Based on oil temperature of 45°–50°C [113°–122° F]. Viscosity 32 mm^2/sec (cSt) [151 SUS]. CDS spool leakage (standard) at 70 bar [1015 psi], 50°C [122°F], ISO VG46: 10 cm^3/min [0.61 in^3/min]

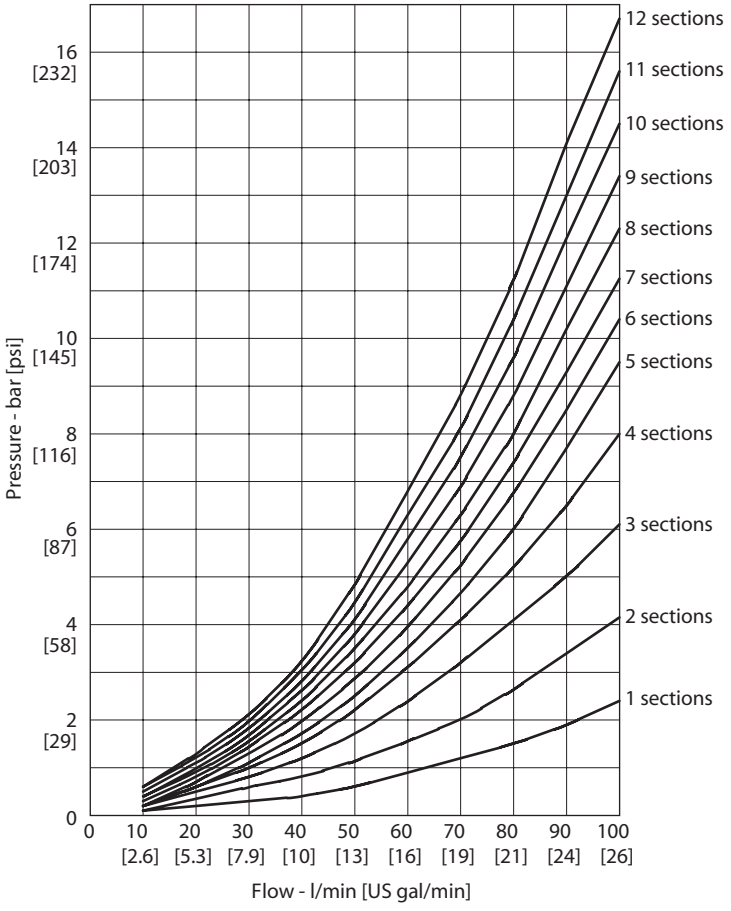
Pressure vs. flow curves for main relief valve



Pressure drop (P-T) CDS 60



Pressure drop (P-T) CDS 100



INLET COVERS ORDER CODE

Inlet covers order code (example)

E60	A	C	2	140/40*

Models

Code	Description
E100	CDS100
E60	CDS60

Port locations

Code	Description
A	Top port
B	Side port, top port plugged
C	Top port, with side gauge port (9/16-18UNF)
D	Top inlet and outlet ports (use H, I, J on outlet)

Main relief valves

Code	Description
A	No valve, with plastic plug
B	No valve, with special plug
C	Valve, with direct valve and external adjustment
D	Valve, with direct valve and internal adjustment
E*	Valve, pilot operated and external adjustment

* on request

Port types

Code		1	2	3	4	5	7	8	X
Threads		SAE - ORB			BSP - Parallel		Metric - ISO 6149		Special porting, specify
		#8 3/4 -16UNF	#10 7/8 -14UNF	#12 1 1/16-12UNF	3/8 -19	1/2 -14	M18x1.5	M22x1.5	
Model CDS100	Inlet outlet		●	●		❍		❍	
	Section		●	●		❍		❍	
Model CDS60	Inlet outlet	●	●		❍	❍	❍	❍	
	Section	●	●		❍	❍	❍	❍	

● available

❍ on request

INLET PORTING AND RELIEF VALVE OPTIONS

Inlet covers order code (example)

E60	A	C	2	140/40*

Port location

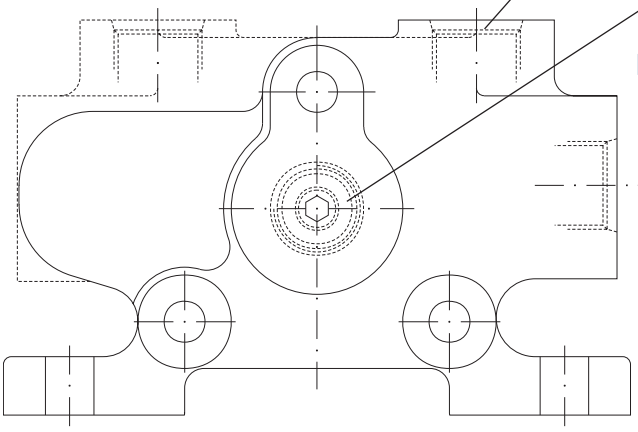
D* Top inlet and outlet (use with H,I,J, and L outlet covers)

A Top inlet

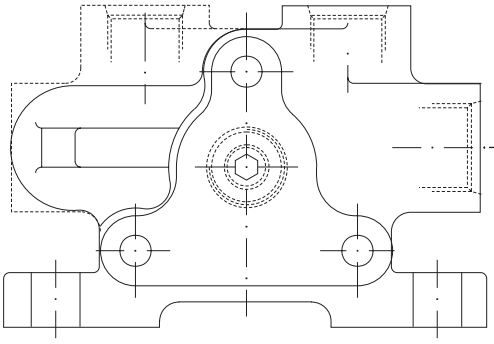
C Top inlet, gauge port side (9/16 - 18 UNF)

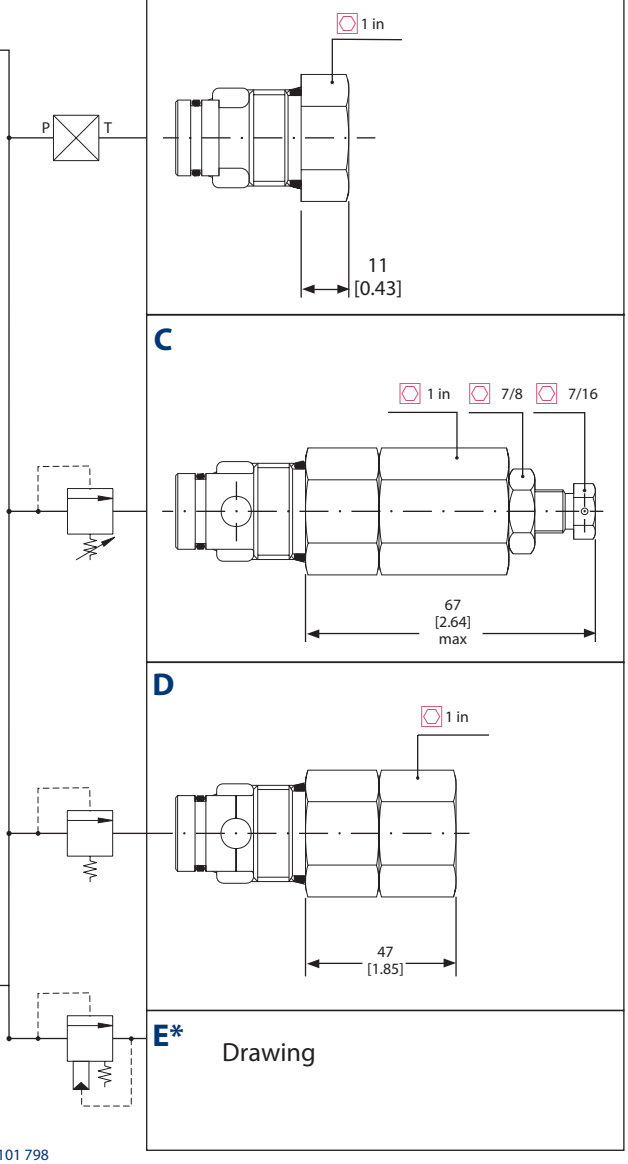
B Side inlet (top plugged)

E100 inlet cover



E60 inlet cover





P101 798

* On request

mm [in]

OUTLET COVERS ORDER CODE

Outlet covers order code (example)

S60 | **A** | **2**

Models

Code	Description
S100	CDS 100
S60	CDS 60

Ports

Code	Description
A	Top outlet
B	Side outlet, top plugged
C	Side outlet for power beyond (top to tank)
D	Top outlet (with closed bypass)
E	Top outlet (for electrical control)
F	Top outlet (for electrical control, with power beyond)
G	Side outlet (for electrical control, top plugged)
H*	Top plugged
I*	Top plugged, use with power beyond
J*	Top plugged for electrical control
L*	Top plugged for electrical control, use with power beyond

* On request (use D on inlet)

Port types

Code		1	2	3	4	5	7	8	X
Threads		**SAE - ORB**			**BSP - Parallel**		**Metric - ISO 6149**		Special porting, specify
		#8 3/4 -16UNF	#10 7/8 -14UNF	#12 1 1/16-12UNF	3/8 -19	1/2 -14	M18x1.5	M22x1.5	
Model CDS100	**outlet**		●	●		❍		❍	
Model CDS60	**outlet**	●	●		❍	❍	❍	❍	

● available

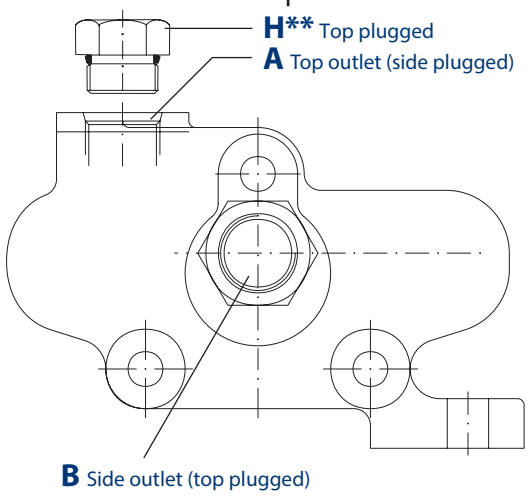
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OUTLET PORTING AND PLUG OPTIONS

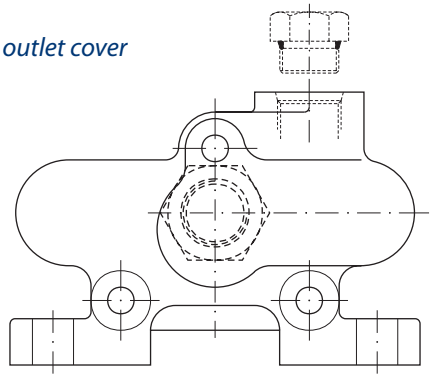
Outlet covers order code (example)

S60	A	2

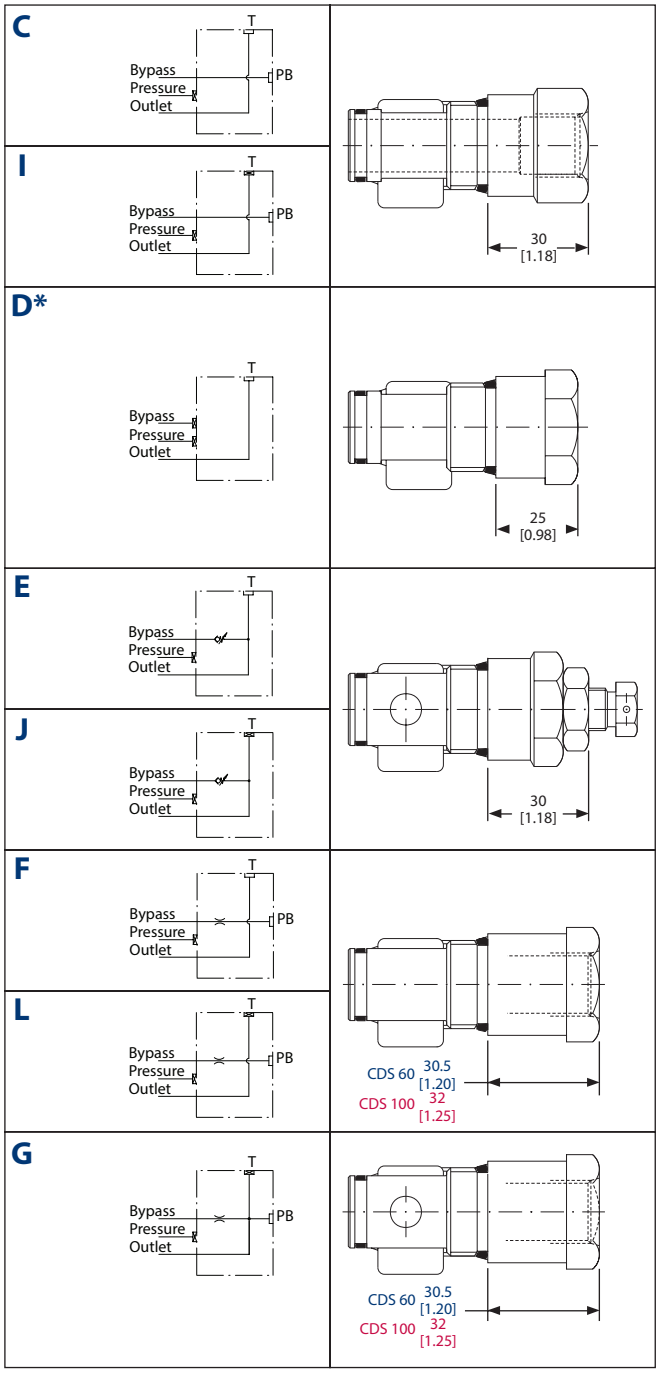
S100 outlet cover



S60 outlet cover



P101 799E



*Typically used for high pressure standby.
** On request

mm [in]

WORK SECTION ORDER CODE

Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

See cabling and electrical options, page 22.

Model

A100	CDS 100 body for supporting valves
B100	CDS 100 normal body (no valves)
A60	CDS 60 body for supporting valves
B60	CDS 60 normal body (no valves)

Circuit types, page 15

1	Parallel (no priority)
2*	Tandem (priority)
3*	Series (no priority)

Spool types, page 16

A	4-way, closed center
B	4-way, open center
C	4-way, closed center, port A plugged
D	4-way, closed center, port B plugged
E	3-way, closed center, port A plugged
F	3-way, closed center, port B plugged
G	4-way, open center, port A plugged
H	4-way, open center, port B plugged
I	Float-spool in (use centering option J)
J	Float-spool out (use centering option J)

Spool actuation, pages 17–18

A	No extension
B	Female spool end + Clevis
C	Male spool end + Tang
D	With support (no lever)
E	With lever
F	Pneumatic (use centering option A)
G	Cable with lever
H	Cable with joystick (use A for the adjacent body)
I/M	With mechanical joystick (use A for the adjacent body)
J	Electrical
R	Female spool end
S	Male spool end
T	Female Spool end with adjust

Spool actuation mounting side, page 20

1	Actuator mounted on A port side
2	Actuator mounted on B port side
3	Electrical A and B (use L centering type)

* On request

WORK SECTION ORDER CODE (continued)

Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

Spool centering and detents, page 20-21

A	Spring centered
B	3 position detent
C	Spring centered, detent in A
D	Spring centered, detent in B
E	Spring centered, detent in A and B
F	Spring centered, hydraulic kickout
H	Spring centered, female extension
I	Spring centered, male extension
J	Spring centered, detent in float: use for floatation spool
L	Spring centered, use for electrical command
N	2-position detent, spool in
O	2-position detent, spool out
P*	With switch, activates spool in
Q*	With switch, activates spool in and out
R*	With switch, activates two motors

* on request

Port types

Code		**1**	**2**	**3**	**4**	**5**	**7**	**8**	**X**
Threads		**SAE - ORB**			**BSP - Parallel**		**Metric - ISO 6149**		Special porting, specify
		#8 3/4 -16UNF	#10 7/8 -14UNF	#12 1 1/16-12UNF	3/8 -19	1/2 -14	M18x1.5	M22x1.5	
Model CDS100	**Section**		●	●		❍		❍	
Model CDS60	**Section**	●	●			❍	❍	❍	

● available
❍ on request

Auxiliary valves, page 22-23

A	Plug
B	Direct relief with external adjustment (except electrical actuation)
C	Direct relief with internal adjustment
D	Pilot check valve
E*	Flow control valve (Except electrical actuation)
F	Anti-cavitation
G	Direct relief with anti-cavitation and external adjustment (except electrical actuation)
I	Direct relief with anti-cavitation and internal adjustment (electrical only)
J	Plug, for 3-way spools
K	Plug, for valves D and E
For valves B, C, G, and I, specify pressure and flow Example: **B(140/40)** Pressure 140 bar flow 40 l/min	

Work port side A

Work port side B

* On request

ACTINGS AND CENTERING COMBINATIONS AVAILABLE

Actings

Centerings

	A	B	C	D	E	F	G	H	I/M	J
A	●	●	●	●	●	●	●	●	●	
B	●	●	●	●	●		●	●	●	
C	●	●	●	●	●		●	●	●	
D	●	●	●	●	●		●	●	●	
E	●	●	●	●	●		●	●	●	
F	●	●	●	●	●		●	●	●	
G	●	●	●	●	●	●	●	●	●	
H	●	●	●	●	●	●		●	●	
I	●	●	●	●	●	●	●	●	●	
J	●	●	●	●	●		●	●	●	
L										●
N	●	●	●	●	●		●	●	●	
O	●	●	●	●	●		●	●	●	
P	●	●	●	●	●	●	●	●	●	
Q	●	●	●	●	●	●	●	●	●	
R	●	●	●	●	●	●	●	●	●	

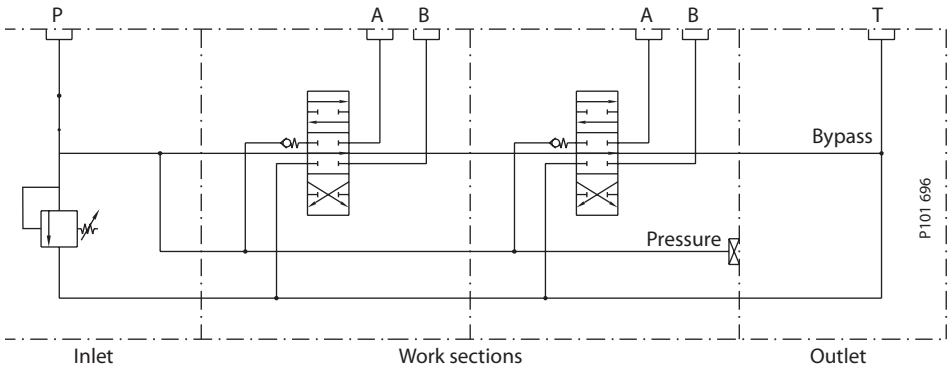
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CIRCUIT TYPES

Work section order code (example)

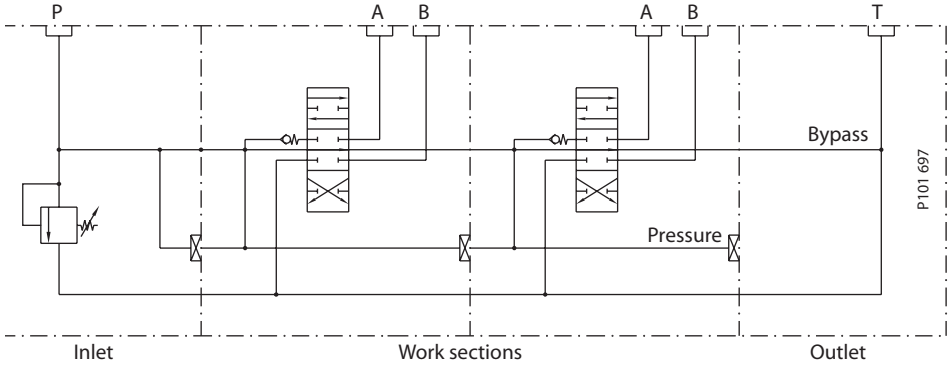
A100	1	A	E	2	A	1	A	B	A100	140/40*

1 *Parallel circuit (no priority)*



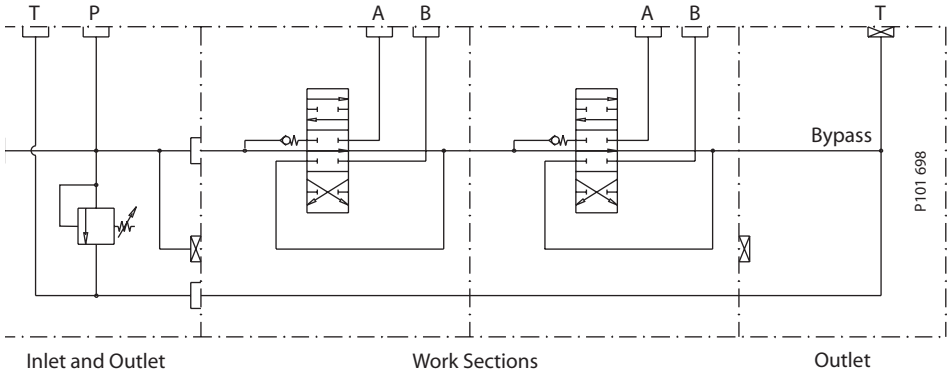
When two or more sections operate simultaneously, flow favors the lowest pressure.

2 *Tandem circuit (priority)**



When two or more sections operate simultaneously, only the section closest to the inlet receives flow.

3 *Series circuit (no priority)**

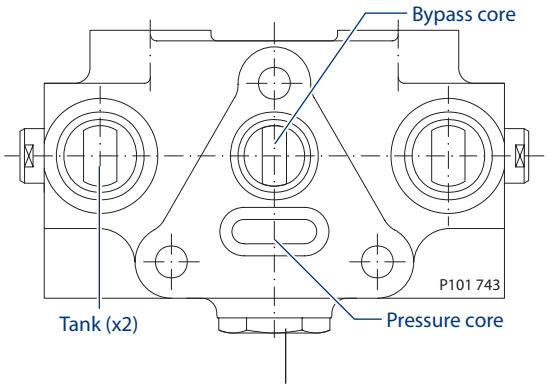


When two or more sections operate simultaneously, the section closest to the inlet receives flow. Return flow feeds the sections downstream.

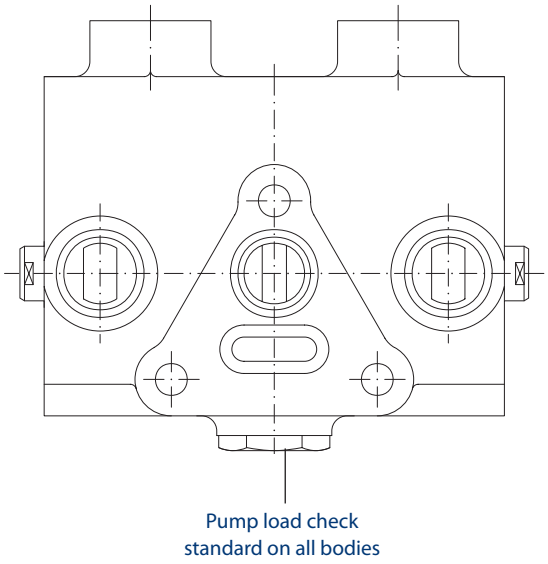
* on request

SPOOL TYPES

Standard central body

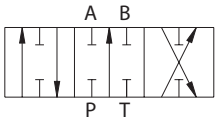
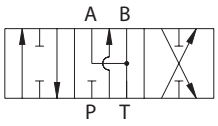
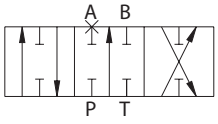
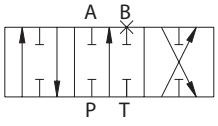
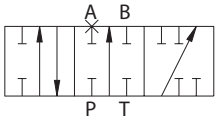
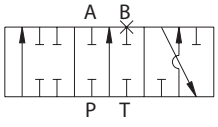
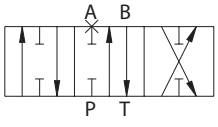
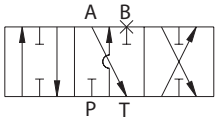
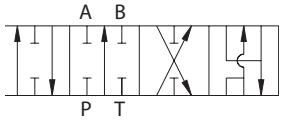
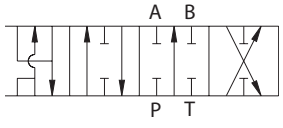


Central body for use with auxiliary valves



Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

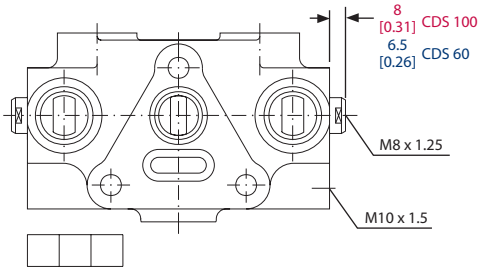
Ref.	Description	Symbol
A	4-way closed center	
B	4-way open center	
C	4-way closed center port A plugged	
D	4-way closed center port B plugged	
E	3-way closed center port A plugged	
F	3-way closed center port B plugged	
G	4-way open center port A plugged	
H	4-way open center port B plugged	
I	Float spool in (inner inverter)	
J	Float spool out (outer inverter)	

ACTUATION OPTIONS

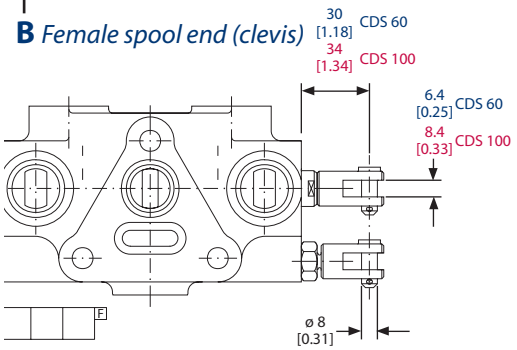
Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

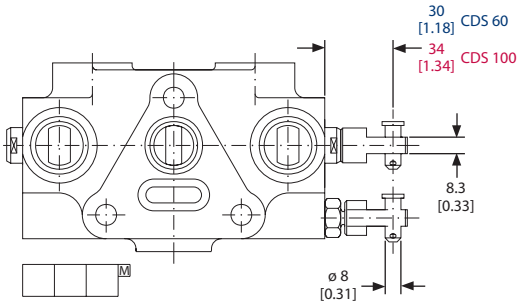
A *Without spool end*



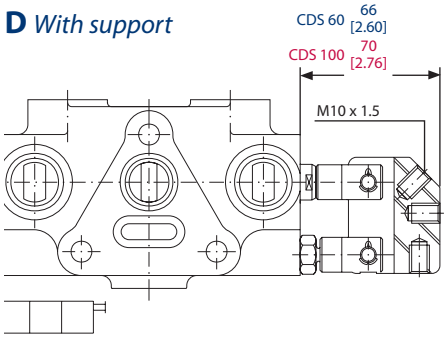
B *Female spool end (clevis)*



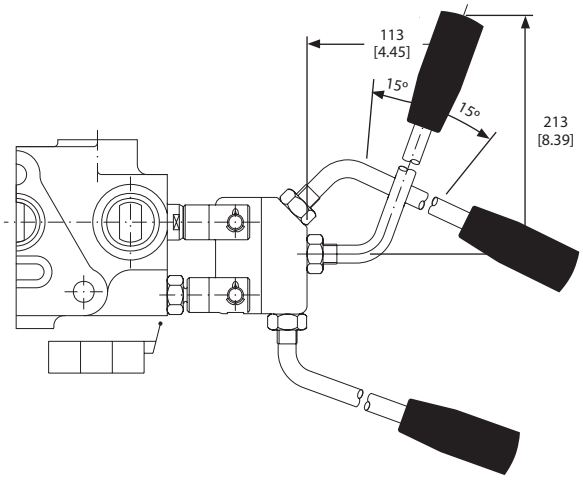
C *Male spool end (tang)*



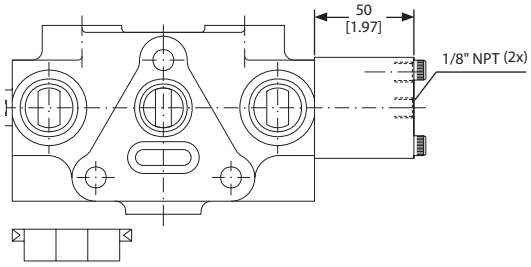
D *With support*



E *With lever*



F *Pneumatic*



Minimum air pressure CDS 60: 5 bar [73 psi]
Minimum air pressure CDS 100: 8 bar [116 psi]
Maximum air pressure: 12 bar [174 psi]

mm [in]

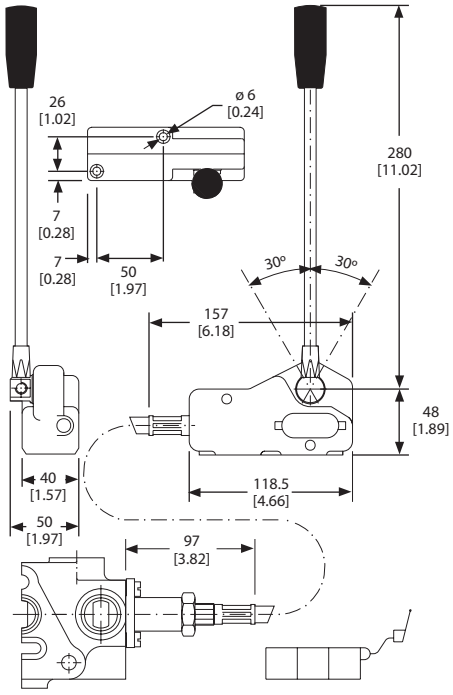
* Default relief setting if not specified

ACTUATION OPTIONS (continued)

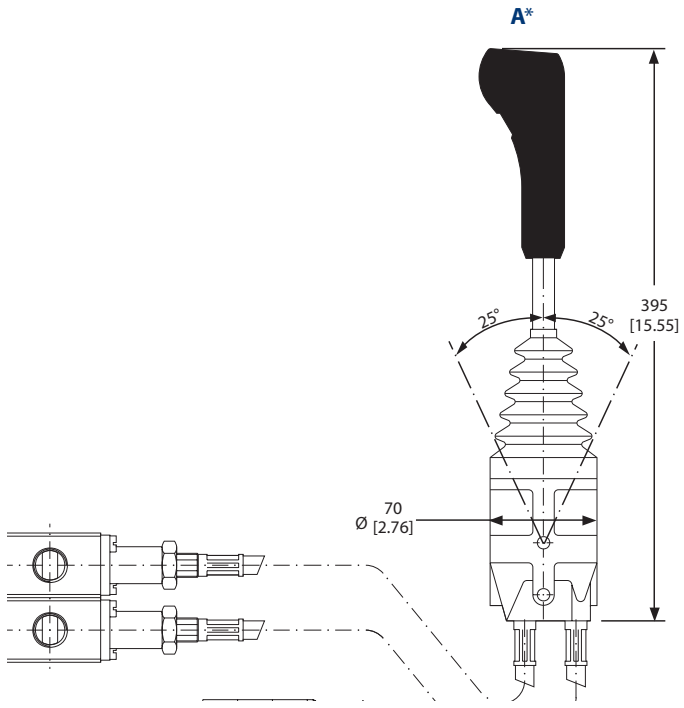
Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

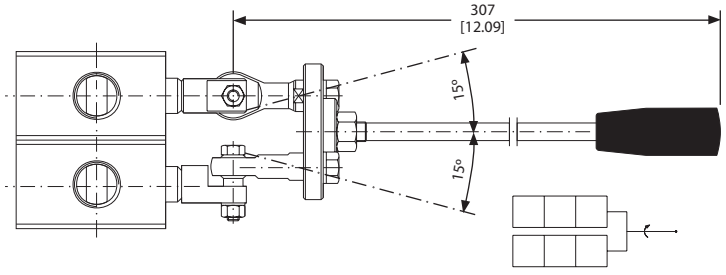
G *Cable with lever***

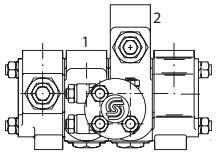


H *Cable with joystick***

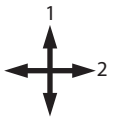


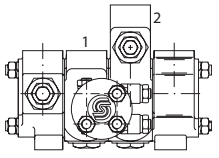
I/M *Mechanical joystick*



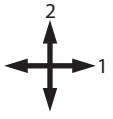


I

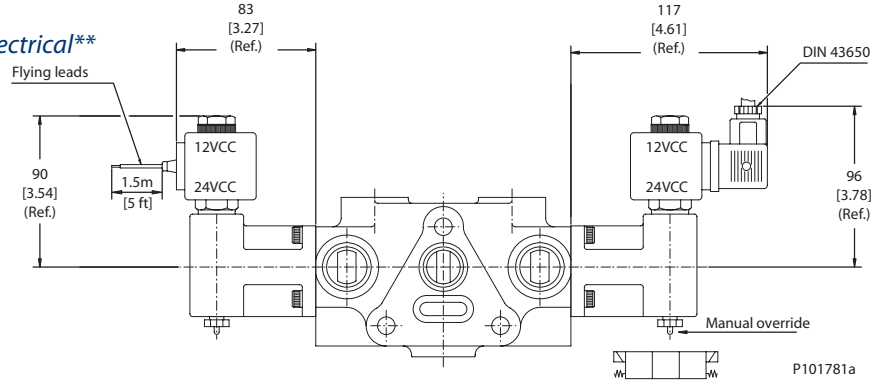




M



J *Electrical***



***See cabling and electrical options, page 20.*
Standard sections cannot be converted to electrical due to internal pilot.
Minimum pilot pressure to actuate: 35 bar [500 psi]

mm [in]

CABLING AND ELECTRICAL OPTIONS FOR ACTUATOR TYPES G, H, AND J

Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

G: *Flexible cable and lock options for spool control lever*

	A	B	C
Lever lock options	Without lock	Lock in **A** and/or **B**	Lock in central position
Standard cables	100 - 125 - 150 - 175 - 200- 250 - 275- 300 - 325 - 350 - 400 - 450 - 500 cm (other: consult)		
Example: how to order	A60 - 1AG2A1 - AB - **A100** - 140/40 (lever without lock, 100 cm cable)		

H: *Flexible cable and handle options controls for joystick*

	A	
Joystick handle options	Without switches	
Standard cables	100 - 125 - 150 - 175 - 200 - 250 - 275 - 300 - 325 - 350 - 400 - 450 - 500 cm (other: consult)	
Example: how to order	A60 - 1AH2A1 - AB - **A100** - 140/40 (handle without switches, 100 cm cable)	

J: *Electrical spool voltage and termination options*

Voltage	**A**	12 VDC -lead wires	**B**	24 VDC - lead wires	**E**	12 VDC - DIN 43650 conn.	**F**	24 VDC - DIN 43650 conn.
Example: how to order	A60 - 1AJ3L1 - AC - **A** 140/40 (12 VDC coil with lead wires)							

Force requirements

kgf [lbf]	CDS 60	CDS 100
Push/pull min.	2 [4.4]	3.5 [7.7]
Max. tension	250 [551]	250 [551]

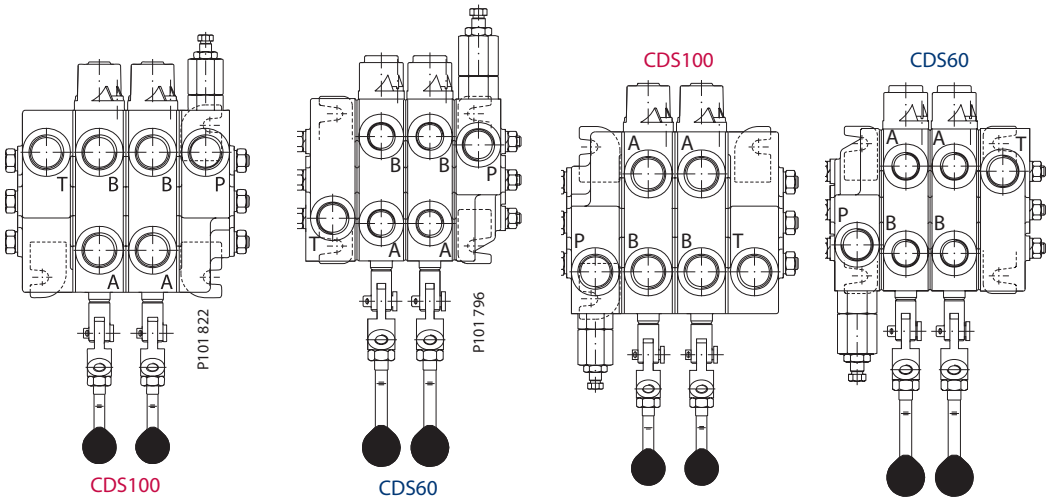
Electrical specifications

Voltage	Amperage (A)	Resistance (Ω)
12 VDC	1.75	6.85
24 VDC	0.88	27
Power: 21 W		

ACTUATION MOUNTING SIDE

1 *Actuation on A port side (RH inlet shown)*

2 *Actuation on B port side (LH inlet shown)*

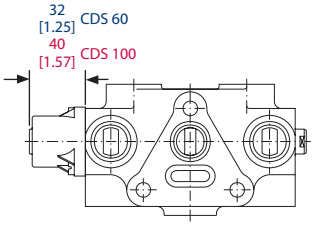


SPOOL CENTERING AND DETENT OPTIONS

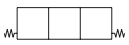
Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

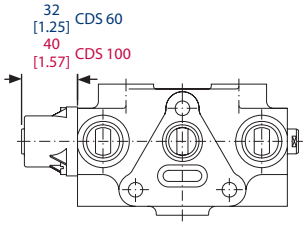
A *Spring centered*

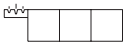


Spring force
CDS 60: 145-155 N [32-35 lbf]
CDS 100: 240-245 N [54-55 lbf]

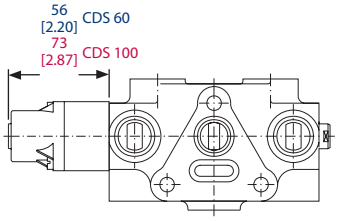


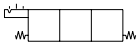
B *3 position detent*



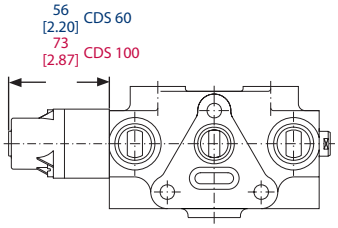


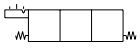
C *Spring center in, detent out*



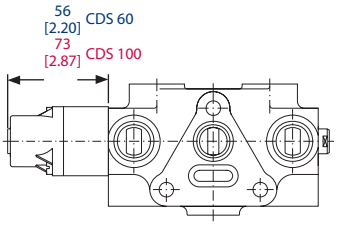


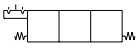
D *Spring center out, detent in*



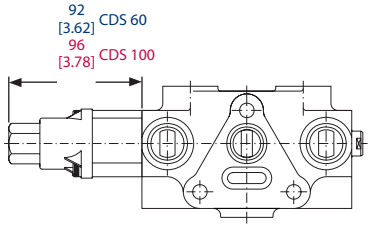


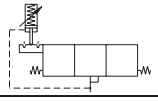
E *Spring centered, detent in A and B*





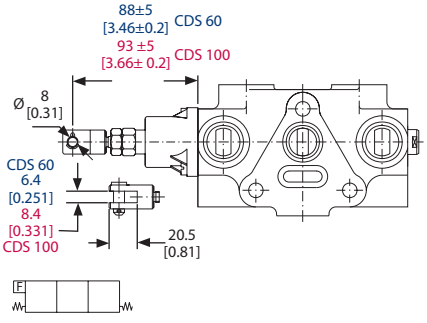
F *Spring centered, hydraulic kickout*



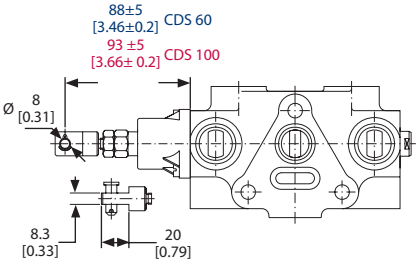


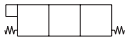
Note: Unlock body section required for use with hydraulic unlock kit.

H *Spring centered, female extension*



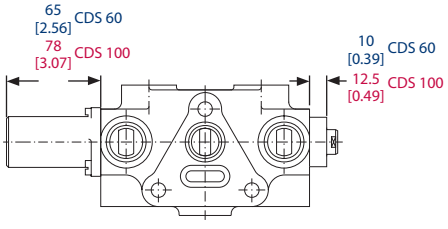
I *Spring centered, male extension*





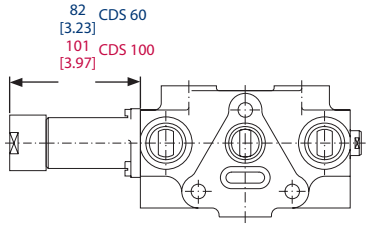
J *Spring centered, floatation spool*

Note: Float body section required

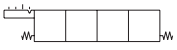


Float in





Float out



mm [in]

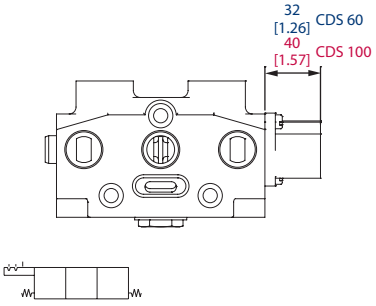
* Default relief setting if not specified

SPOOL CENTERING AND DETENT OPTIONS (continued)

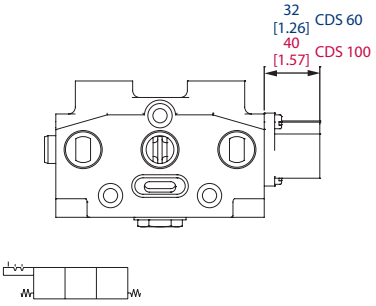
Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

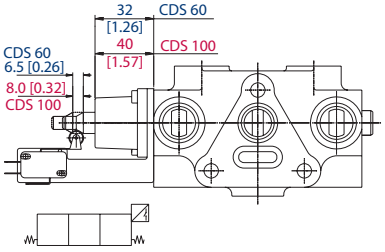
N *Two-position detent: neutral and spool in*



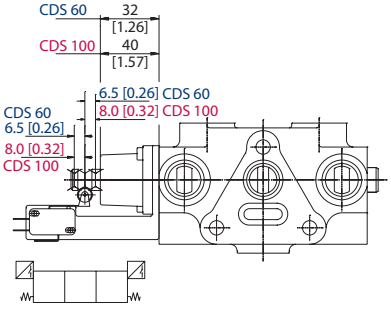
O *Two-position detent: neutral and spool out*



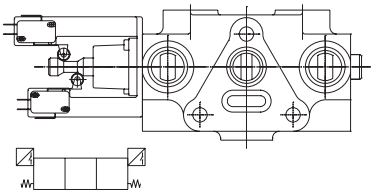
P* *Spring centered with switch: activates on spool in*



Q* *Spring centered with switch: activates on spool in and out*



R* *Spring centered with switch: activates two motors*



P106 330E

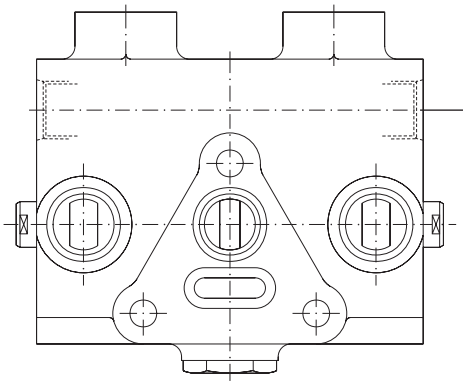
*on request

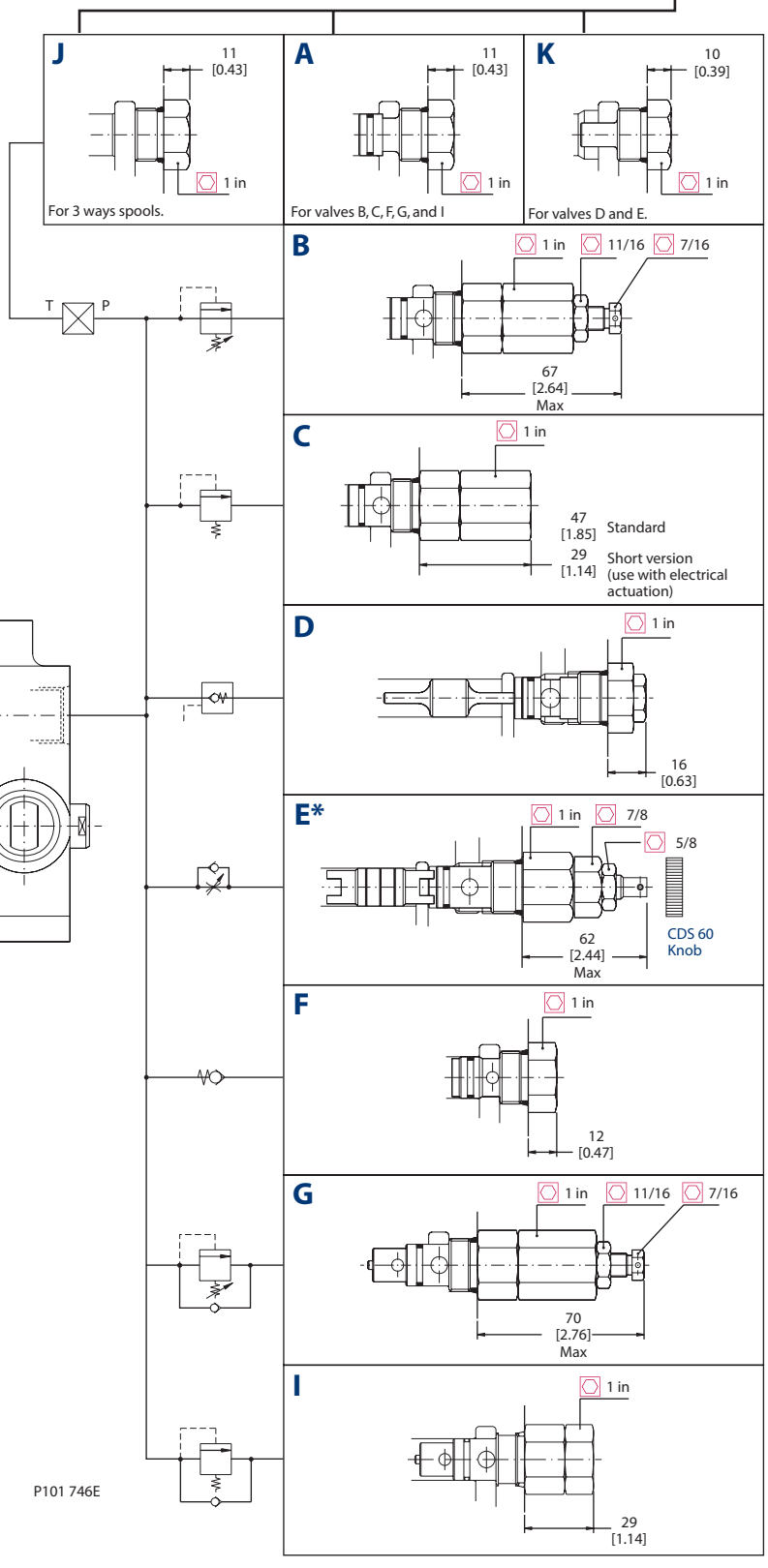
AUXILIARY VALVES

Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

Central body for use with auxiliary valves





mm [in]

AUXILIARY VALVES (continued)

Work section order code (example)

A100	1	A	E	2	A	1	A	B	A100	140/40*

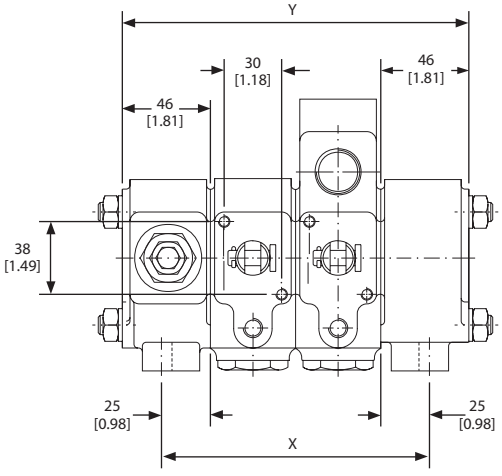
Auxiliary valves compatibility

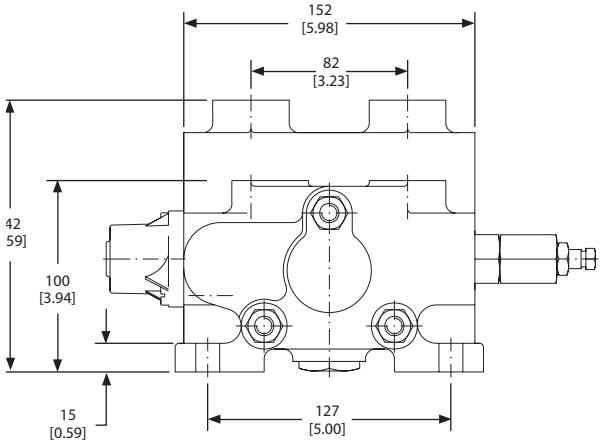
	A	B	C	D	E	F	G	I	J	K
A	■	●	■	—	—	■	●	▲	—	—
B	●	●	●	—	—	●	●	—	●	—
C	■	●	■	—	—	■	●	▲	●	—
D	—	—	—	■	—	—	—	—	—	■
E	—	—	—	—	■	—	—	—	—	■
F	■	●	■	—	—	■	●	▲	●	—
G	●	●	●	—	—	●	●	—	●	—
I	▲	—	▲	—	—	▲	—	▲	▲	—
J	—	●	●	—	—	●	●	▲	—	—
K	—	—	—	■	■	—	—	—	—	■

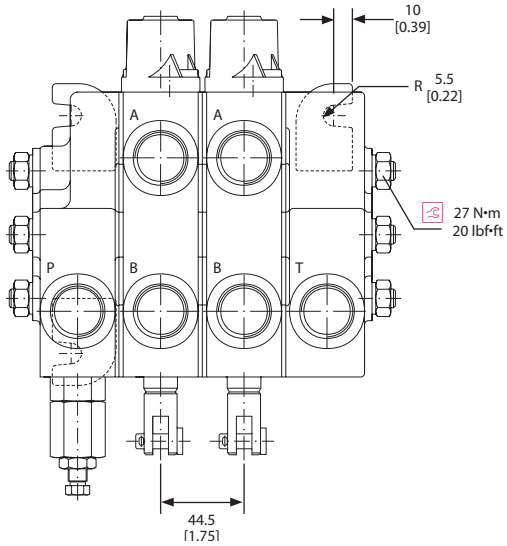
— Not compatible ■ Compatible

● Compatible (EXCEPT electrical) ▲ Compatible (ONLY electrical)

DIMENSIONS CDS 100





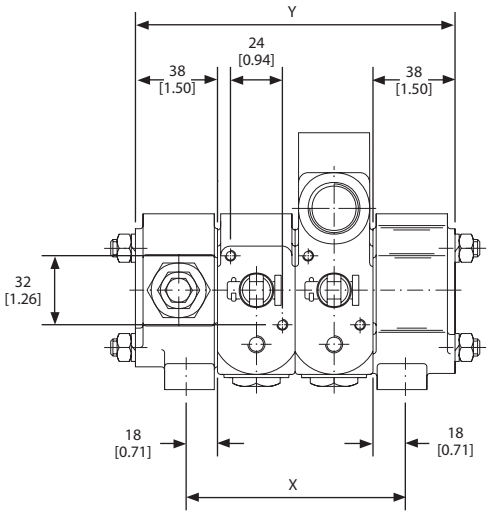


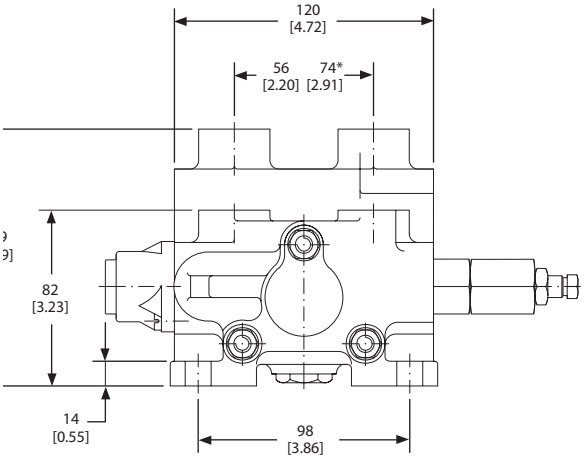
Reference dimensions

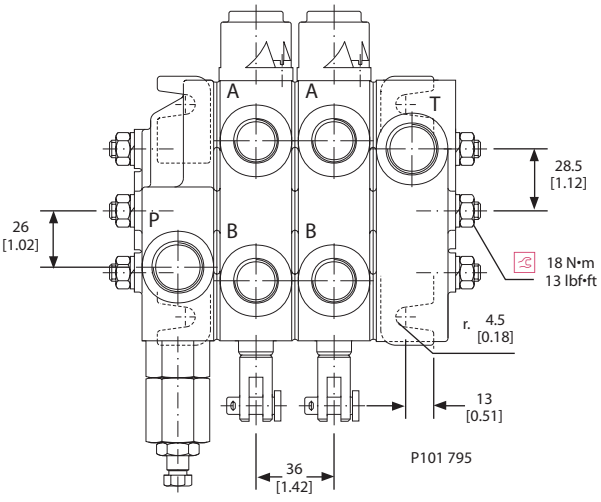
Number of sections	X		Y	
1	95	[3.74]	137	[5.39]
2	139	[5.47]	181	[7.13]
3	184	[7.24]	226	[8.89]
4	229	[9.02]	270	[10.63]
5	273	[10.75]	314	[12.36]
6	318	[12.52]	359	[14.13]
7	362	[14.25]	403	[15.87]
8	406	[15.98]	448	[17.64]
9	451	[17.76]	492	[19.37]
10	495	[19.49]	537	[21.14]
11	540	[21.26]	581	[22.87]
12	584	[22.99]	626	[24.65]

mm [in]

DIMENSIONS CDS 60



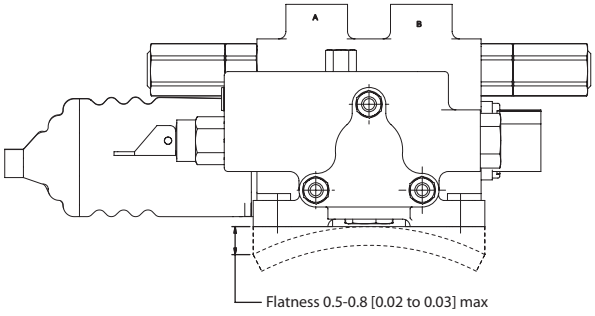


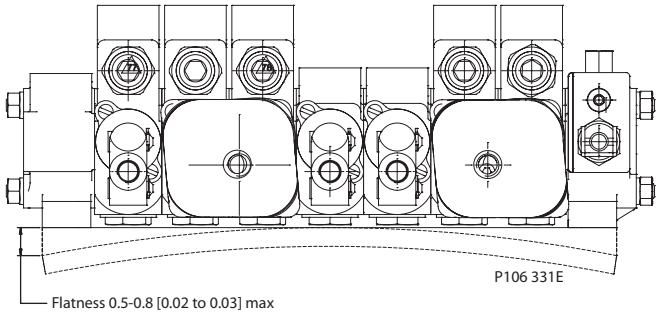


Reference dimensions

Number of sections	X		Y	
1	72	[2.83]	112	[4.41]
2	108	[4.25]	148	[5.83]
3	144	[5.67]	184	[7.42]
4	180	[7.09]	220	[8.66]
5	216	[8.50]	256	[10.08]
6	252	[9.92]	292	[11.50]
7	288	[11.34]	328	[12.91]
8	324	[12.76]	364	[14.33]
9	360	[14.17]	400	[15.75]
10	396	[15.59]	436	[17.17]
11	432	[17.01]	472	[18.58]
12	468	[18.43]	508	[20.00]

Mounting requirements





Directional Control Valves CDS60 and CDS100 Specification Order Form

Control No.

Subsidiary/Dealer

Customer

Application

Inlet Section

Model	Model Side	Port Size	Main relief Valves	Threads	Port Side Pressure	Port Side Flow

Paint

	None
	Black Primer
	Black Paint

Outlet Section

Model	Model Size	Ports Options	Threads

Work Sections

Work section	Model	Model Size	Circuit Type	Spool Types	Spool Controls	Spool Control Side	Center Type	Threads	Aux Valves "A"	Aux Valves "B"	Cable or Electrical Control Options	Cable Length Centi-meters	"A" Port Side Pressure (Bar)	"A" Port Side Flow (l/min)	"B" Port Side Pressure (Bar)	"B" Port Side Flow (l/min)
1st																
2nd																
3rd																
4th																
5th																
6th																
7th																
8th																
9th																
10th																
11th																
12th																

Number of sections =

Price US $: Delivery: Date:

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