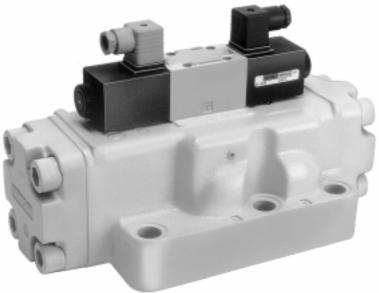
# Directional Control Valve CETOP 10

Series 2D10



Example:

2D10-3(5)-C03-04-03

## **Features**

- direct or pilot operated directional control valve with solenoid, lever, stem or hydraulic operation.
- with or without manual override for solenoid operated valves.
- 6 standard spools.
- Mounting configuration according to CETOP, ISO and DIN.
- Spring centering, pressure centering or spring offset for spool return to neutral position, or detent version for mechanical operation.
- Wet pin solenoids for direct or alternating current.
- leakproof construction up to 140 bars.
- Solenoid coil can be positioned at 90° intervals in relation to body.
- Shifting time adjustment.

- Electrical connection is by a standard plug-in connector according to DIN 43650.
- Orifice to reduce the pilot oil flow.
- End position control by proximity switch.
- Normal position control by inductive detector.
- high shifting performance.
- smooth shifting-resulting in extended life.
- easy assembly no dynamic loaded seals.
- each valve is factory tested prior to delivery.
- full interchangeability of spools with close tolerances.
- worldwide Denison-Service.

Publ. 4-EN 3850-A Replaces 4-EN 385-B

Image: constraint of the second se	Item	Characteristics	Symbol of quantity	Symbol of SI unit	Technical data					
12       Model number       -       -       Refer to ordering code pages 4, 5, 6         13       Design       -       -       Subplat         14       Type of mounting       -       -       Threads in subplate         15       Type of port connections       -       -       Threads in subplate         16       Port sizes       -       -       -       Threads in subplate         17       Dimensions of unit       -       -       -       Threads in subplate         18       Weight       -       -       -       -       Optical but horzontal recommended         19       Mounting position       -       -       -       Optical but horzontal recommended         10       Direction of flow       -       -       -       Optical but horzontal recommended         21       Optical prossure range: Intel (A, B, X)       p, max       bar       350       further information required         23       Viscosity range       9 min       CS       6       -       10         23.1       Recomp. operating viscosity       y n       cSt       650       -       10         24       Max.flow       -       -       -       - <t< th=""><th>1.</th><th>General</th><th>quantity</th><th>0.0</th><th></th><th></th><th></th></t<>	1.	General	quantity	0.0						
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1.4       Type of mounting       -       -       Subplate         1.5       Type of port connections       -       -       Threads in subplate         1.6       Port sizes       -       -       Threads in subplate         1.8       Weight       -       -       -       Threads in subplate         1.8       Weight       -       -       -       Netter to page 8-14         1.9       Mounting position       -       -       -       Optional but horizontal recommended         1.0       Direction of flow       -       -       -       Refer to page 8-14         1.0       Direction of flow       -       -       -       Optional but horizontal recommended         1.11       Ambient temperature range       0       -       -       -       Further information required         2.1       Idea S.P.X       p       pmax       bar       350       -       -         2.2       Fluid temperature range       0       -       -       Barn       350       -       -       Barn       -       160       -       -       -       -       -       Barn       -       -       -       -       -       -       -<				_			5, 0			
1.5       Type of port connections       -       -       Threads in subplate         1.6       Port sizes       -       -       Threads in subplate         1.7       Dimensions of unit       -       mm       Refer to pages 8-14         1.8       Weight       -       -       Refer to pages 8-14         1.9       Mounting position       -       -       Refer to page 7         1.10       Direction of flow       -       -       Refer to page 8-14         1.11       Ambient temperature range       0       -       -       20 min         1.12       Suitability for special working conditions       -       -       -       20 min         2.1       Operating pressure range: intel (A, B, P, Y)       p max       bar       350       10       -         2.1       Stoody range $\gamma$ min       cSt       60       -       -       18 min         2.2       Fluid temperature range $\theta$ °C       + 80 max       350       for pressure centred version more than 800 l/m dependent on allowable system pressure drop.         2.3       Viscosity range $\gamma$ min       cSt       65       10       -       10       for pressure centred version more than 800 l/m dependent on all		-	_	_		aive				
16       Port sizes       -       -       1%" nominal         17       Dimensions of unit       -       mm       Refer to pages 8-14         18       Weight       -       -       Refer to pages 8-14         18       Mounting position       -       -       -         110       Direction of flow       -       -       -         111       Ambient temperature range $\theta$ °C       + 50 max         111       Ambient temperature range:       -       -       -         111       Operating pressure range:       -       -       -         111       Ambient (T, Y)       po max       bar       350 for sxt. drain; 140 for int. drain         2.1       Outlet (T, Y)       po max       cSt       650       -         2.3       Vacosity range       y max       cSt       650       -         2.4       Max. flow       qr       Vmin       For pressure carent?       For pressure carent?         2.4       p-C-Characteristics $\perp$ p = f (q.)       -       Refer to page 5       10         2.5 $\perp$ po-Characteristics $\perp$ p = f (q.)       -       Refer to page 5       140 (solenoid operation)      1				-		oloto				
17       Dimensions of unit       -       mm       Refer to pages 8-14         19       Mounting position       -       -       Refer to pages 8-14         19       Mounting position       -       -       Refer to pages 8-14         19       Direction of flow       -       -       Refer to pages 8-14         110       Direction of flow       -       -       Refer to pages 8-14         111       Ambient temperature range       0       °C       -       20 min         111       Suitability for special working conditions       -       -       Further information required         2.1       Doperating pressure range: inlet (A, B, P, X)       p. max bar       350       350 for set. drain; 140 for int. drain         2.2       Fluid temperature range       0       °C       +       80 (refer to page 7)         2.3       Viscosity range       v min       cSt       650       30       800 (refer to page 7)         2.4       Max. flow       q.       I/min       800 (refer to page 7)       For pressure centred version more than 800 I/m dependent on allowable system pressure dop.         2.5       // p-Q-Characteristics       // p = f (q_i)       -       -       140 (solenoid operation)         2.1 <td< td=""><td></td><td></td><td>_</td><td>-</td><td></td><td>Jiale</td><td></td></td<>			_	-		Jiale				
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2.6 2.6.1 Leakage max.Pi Leakage max.pi mbar ml/min ml/min140 (solenoid operation) 19006900 (depends on spool type) Refer to spool type page 73.Type of actuator3.1 3.1.2 3.1.2 3.1.5Manual (Lever) Position of actuators3.2 3.1.2 3.1.5Operating force Position of actuatorsFN3.2 3.2 3.2 3.2 4.10Image movement Permissible voltage difference1mm3.3.1 3.3.1 3.3.2 3.3.1Nominal voltage Permissible voltage difference3.3.2 3.3.3 3.3.4 3.3.4 3.4.1 3.4.1 0perating pressure range3.4.2 3.4.4 3.4.4Spool displacement voltasies3.4.4 4.4Response times (solenoid)4.1 Lenergizingtems204630					dependent on a	allowable system p	pressure drop.			
2.6.1 2.7Leakage max. Overlap, underlapml/min -19006900 (depends on spool type) Refer to spool type page 73.Type of actuator3.1 3.1.2Manual (Lever)3.1.2 3.1.5Operating forceFN65 at lever3.1.3 3.2Mechanical3.2 3.2.1Mechanical3.2.1 3.2.2Operating forceFmaxN6003.3 3.3.1 3.3.1Nominal voltageUnVRefer to ordering code pages 4 and 5+103.3.2 3.3.1Type of current3.3.4 3.3.4 3.4 3.4Relative operating periodOPrel%31100 3.3.4Operating pressure rangePp, min pp max19 653.4.1 3.4.4Operating pressure rangePp, max p barbar350 3.3.33.4.2 3.4.4Spool displacementVml33.33.3.33.4.4 3.4.4Port sizes X, Y, L (subplate)GV/4''4.1Energizingtems2.04630	2.5	⊿ p-Q-Characteristics	$\triangle p = f(q_v)$	-	Refer to page 5	6				
2.7Overlap, underlapRefer to spool type page 73.Type of actuator3.1Manual (Lever)3.1.2Operating forceFN3.1.5Position of actuators3.2Mechanical3.2.1Total linear movementImm3.2.2Operating force $F_{max}$ N600S3Electric3.3.1Nominal voltageUnVPermissible voltage difference0%+73.3.2Type of current-3.3.3Input powerP203.3.4Relative operating periodOPrel3.4.1Operating pressure range $p_p$ min $p_p$ maxbar3503.4.2Spool displacementV $q_{4.4}$ Response times (solenoid)- $q_{4.4}$ Response times (solenoid)- $q_{4.4}$ Response times (solenoid)- $q_{4.1}$ Energizing $t_e$ ms $20$ 4630	2.6	Permissible drain pressure	pi	bar	140 (solenoid o	peration)				
3.       Type of actuator         3.1       Manual (Lever)       -         3.1.2       Operating force       F       N         3.1.5       Position of actuators       -       -         3.2       Mechanical       -       -         3.2.1       Total linear movement       I       mm       34.8         3.2.2       Operating force       Fmax       N       600         3.3       Electric       -       -       by solenoids         3.3.1       Nominal voltage       Un       V       Refer to ordering code pages 4 and 5         Permissible voltage difference       -       -       Alternating current (AC) or direct current (DC)         3.3.3       Input power       P20       W       31         3.3.4       Relative operating period $OP_{rel}$ %       100         3.3.5       Type of protection       -       -       -         3.4.1       Operating pressure range $p_p$ max       bar       350         3.4.2       Spool displacement       V       ml       33.3         3.4.3       Connections       -       -       Giv/"         3.4.4       Port sizes X, Y, L (subplate)	2.6.1	Leakage max.		ml/min	19006900 (de	epends on spool t	ype)			
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3.4.2       Spool displacement       V       ml       33.3         3.4.3       Connections       -       -       X, Y         3.4.4       Port sizes X, Y, L (subplate)       -       -       G 1/4"         4.       Response times (solenoid)       Ke       Ms       20       A6       30         4.1       Energizing       te       ms       20       46       30						sure centred)				
3.4.3 3.4.4Connections Port sizes X, Y, L (subplate) $-$ $ -$ $-$ X, Y G $^{1}/4''$ 4.Response times (solenoid)ACDC DC-quick energiz4.1Energizingtems204630	<b>.</b>									
3.4.4       Port sizes X, Y, L (subplate)       -       -       G ¼"         4.       Response times (solenoid)       AC       DC       DC-quick energiz         4.1       Energizing       te       ms       20       46       30			V	ml						
4.     Response times (solenoid)     AC     DC     DC-quick energiz       4.1     Energizing     te     ms     20     46     30			-	-						
4.1         Energizing         te         ms         20         46         30	3.4.4	Port sizes X, Y, L (subplate)	-	-	G 1/4″	1				
		Response times (solenoid)			AC	DC	DC-quick energizi			
4.2 De-energizing t <sub>a</sub> ms 18 27 30	4.		1				1			
	<b>4.</b> 4.1	Energizing	te	ms	20	46	30			

If the performance characteristics outlined above do not meet your requirements, please consult your local Denison Office.

### Description

The Denison 2D10 is a direct or pilot operated spool valve controlled by solenoids, lever, hydraulic pressure or stem. Subplate or manifold mounting is standard. The 2D10 is used for directing fluid flow in hydraulic systems.

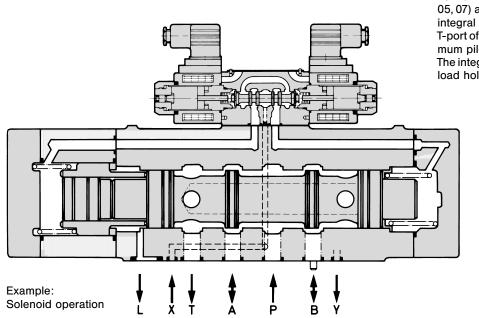
The necessary pilot pressure for the pilot operated versions can be obtained from system pressure or from a separate pilot pressure source. Operational life is improved by the use of wet pin solenoids which are immersed in the system fluid and assist heat dissipation. The solenoids are available with a built in manual override device, and they are continuously rated for standard AC-or-DC supply.

Valves with manual override on the pilot control can also be operated mechanically in case of power failure. Electrical connection is by a standard plug-in connector.

Manual or stem operated valves are available with detents to hold the spool in the selected position. Hydraulically operated valves may be remotely controlled by separate pilot valves. A light weight modular design, with a short spool travel, results in a fast response. When used for rapid cycling duties the 2D10 valve offers outstanding performance. Streamlined internal passages ensure minimum pressure drop at maximum flows. All bodies are manufactured from quality controlled cast iron, with spools of high quality steel. Every valve is subjected to a closely monitored functional test before delivery.

Economical manufacture to close tolerance ensures interchangeability or circuit modification without the necessity for selective assembly. This is also true for spare parts, which can be ordered independently from manufacturing sources through the world-wide service network.

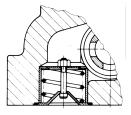
For special applications, for instance fire resistant fluids or sea water protection special seal kits and solenoids are available. For applications not mentioned on the ordering code please use the free advisory service of your local Denison Office.



#### **Integral Check**

For valves with no-load flow (spools 01, 05, 07) and internal PP or external PD an integral check is recommended in the T-port of the main valve to obtain the minimum pilot pressure.

The integral check should not be used for load holding.



T (main valve)

### Operation

The solenoid operated 4-way valve 2D10 consists of a main body with spool and a solenoid operated pilot control valve. The solenoid when energized shifts the pilot control spool, thus directing fluid to one end of the main spool, and moving it into the desired position. So fluid can pass from the main port P to the system ports A or B whilst the opposite port (B or A) is free to the tank port. De-energizing the solenoid allows both the pilot control and the main spool to return to their original positions.

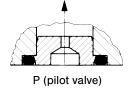
The main spool of the direct operated valves can be moved mechanically by means of a lever or stem, or hydraulically from a remote pilot source.

### **Pilot Valve Orifice**

In certain operating conditions a higher flow-volume can take place than the valve permits.

Then an orifice is recommended in the P-port of the pilot valve.

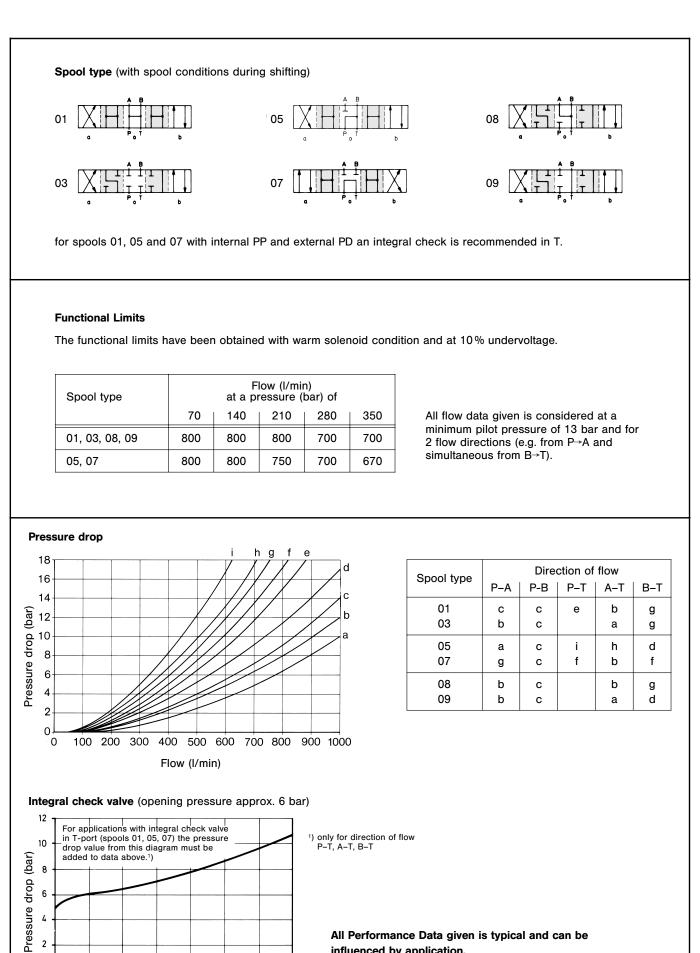
For order details refer to pages 4 & 5 pilot accessories.



Or	lering Code 2D10 with DC-Solenoid
	Model No.: $2D10$ $-3$ $$ $$ $$ $C$ $1$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$
1	Series         1         2         3         4         5         6         7         8         9         10         11         12           10 = CETOP 10         1
2	Control
3	Spool Type
4	<b>Spool Position</b> 01 = 2 (a, b), spring offset pos. "b" 02 = 2 (a, b), spring offset pos. "a" 03 = 3 (a, o, b), pressure centred A3 = 3 (a, o, b), spring centred 04 = 2 (a, b), without spring, without detent (pilot with detent) 05 = 2 (o, b), pressure offset pos. "o" 06 = 2 (o, a), pressure offset pos. "o" 11 = 2 (b, o), spring offset pos. "b"; pos. "o" spool stop (blocked) 12 = 2 (a, o), spring offset pos. "a"; pos. "o" spool stop (blocked)
5	End Cap 03 = for spring offset spool pos. (01/02, 11/12) and without spring (04) 06 = for pressure centred and offset spool pos. (03, 05 and 06) 0A = for spring centred spool pos. (A3) AD = with proximity switch on A-side AE = with proximity switch on B-side AF = with proximity switch on both sides SA = with inductive detector
6	Pilot Connection
7	Main Valve Accessories 0 = None 1 = Shifting time adjustment (meter-in control) 2 = Shifting time adjustment (meter-out control) 4 = Integral check valve in "T" 1) 6 = Shifting time adjustment (meter-in control) & integral check in "T" 1) 8 = Shifting time adjustment (meter-out control) & integral check in "T" 1)
9	Design Letter
	Seal Class       1 $1 = NBR$ (Standard)       1 $4 = EPR$ 1 $5 = Viton^{\ensuremath{\mathbb{S}}}$ 1
10	Solenoid Voltage
1*	Pilot Accessories / Modifications 10 = orifice 1.0 mm dia. in P-port, with manual override 1032 = orifice 1.0 mm dia. in P-port, without manual override 1052 = orifice 1.0 mm dia. in P-port, with manual override and rubber cover
	<sup>1</sup> ) For valves with no-load flow and internal PP or external PD an integral check valve is recommended to obtain the minimum pilot pressure.
	<sup>2</sup> ) For valves with no-load flow, internal PP and internal PD is <b>not</b> possible.
	Attention: Integral check valve not to be used for load holding.

			0040						-		•	
	Model No.:		<u>2D10</u> – 3	$\bot$	<u>+</u> - <u>+</u>	л. Т	• 	İ	Т		3 	
1	<b>Series</b> 10 = CETOP 10		1	2	3 4	5	6	7	8	9	10 11	_   <u>1</u> 2
2	Control 0 = Direct hydraulic A = Pilot operated, 1 B = Pilot operated, 2 C = Pilot operated, 2 2 pos. detent	solenoid (4D01) solenoids (4D01)										
3	Spool Type (see page 7)											
4	06 = 2 (o, a), pre 11 = 2 (b, o), spr 12 = 2 (a, o), spr	ing offset pos. "b" ing offset pos. "a" ssure centred ing centred	ut detent (pilot v o" o" ; ; plocked)									
5	End Cap 03 = for spring offse 06 = for pressure of 0A = for spring cent AD = with proximity AE = with proximity AF = with proximity SA = with inductive	entred and offset s red spool pos. (A3 switch on A-side switch on B-side switch on both sid	spool pos. (03, 3)									
6	<b>Pilot Connection</b> 0 = for control 0, hy 1 = internal PP, inte 2 = internal PP, extend 3 = external PP, inter 4 = external PP, extended	draulically operate rnal PD <sup>2</sup> ) ernal PD <sup>1</sup> ) rnal PD	d									
7	Main Valve Accesso 0 = None 1 = Shifting time adj 2 = Shifting time adj 4 = Integral check v 6 = Shifting time adj 8 = Shifting time adj	ustment (meter-in ustment (meter-ou alve in "T" <sup>1</sup> ) ustment (meter-in	t control)	gral check egral check	in "T" <sup>1</sup> ) ( in "T" <sup>1</sup> )							
8	Design Letter											
9	Seal Class 1 = NBR (Standard) 4 = EPR 5 = Viton ®											
10	1 -	z z z AC										
11	3 = Wet pin solenoid	l (140 bar perm. d ls are available or										
12	<b>Pilot Accessories</b> 38 = Plug-in connect 44 = Plug-in connect 54 = Plug-in connect	tor; orifice 1.0 mm tor; orifice 1.0 mm	ı dia. in P-port, ı dia. in P-port,	with manu- without ma	al overrid anual over	e rride						
	<sup>1</sup> ) For valves with no	-load flow and int	PP or ext. PD a	an integral	2	<sup>2</sup> ) For v	alves v	with no	o-load	flow.		

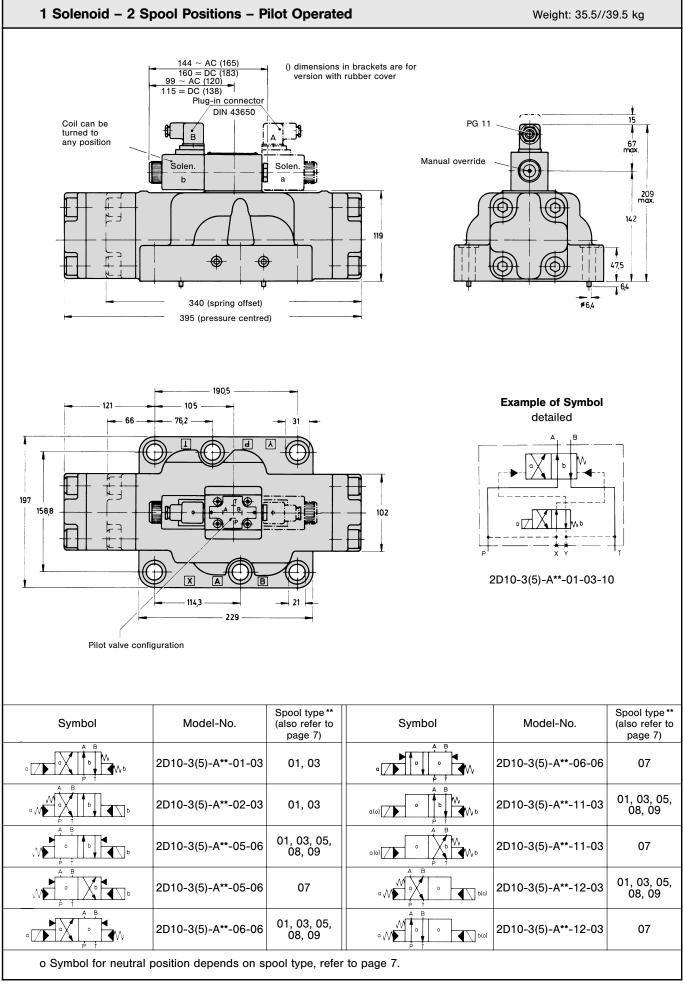
Ordering Code 2D10 Lever and Stem Operation										
	Model No.:	<u>2D10</u> – 35 –	<b>- −</b>	<del>.</del> .	+	0	B	1		
1	Series 10 = CETOP 10		3	4 5	6	7	8	9		
2	Control	ا لــــــــــــــــــــــــــــــــــــ			   		   			
3	Spool Type (see page 7)									
4	<b>Spool Position</b> 01 = 2 (a, b), spring offset pos. "b" 02 = 2 (a, b), spring offset pos. "a" 03 = 3 (a, o, b), spring centred 07 = 3 (a, o, b), 3 pos. detents			 						
5	End Cap 04 = for spring centred/offset versions 05 = for version with detent									
6	Pilot Connection5 = internal PD (max. 10 bar) 6 = external PD				 					
7	Main Valve Accessories 0 = None						 			
89	Design Letter Seal Class 1 = NBR (Standard) 4 = EPR 5 = Viton ®									

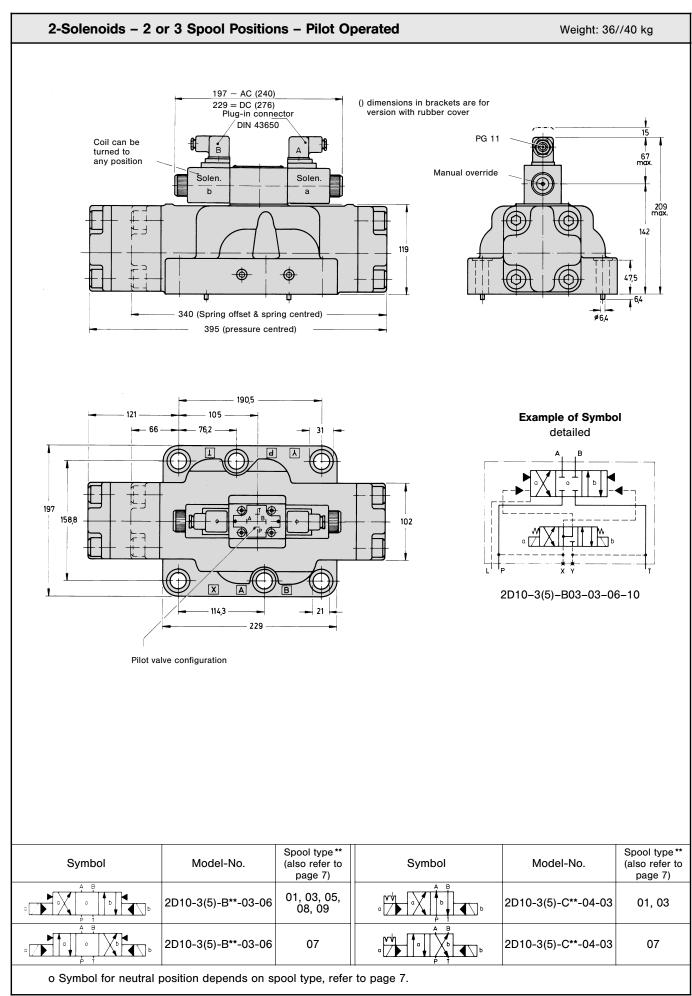


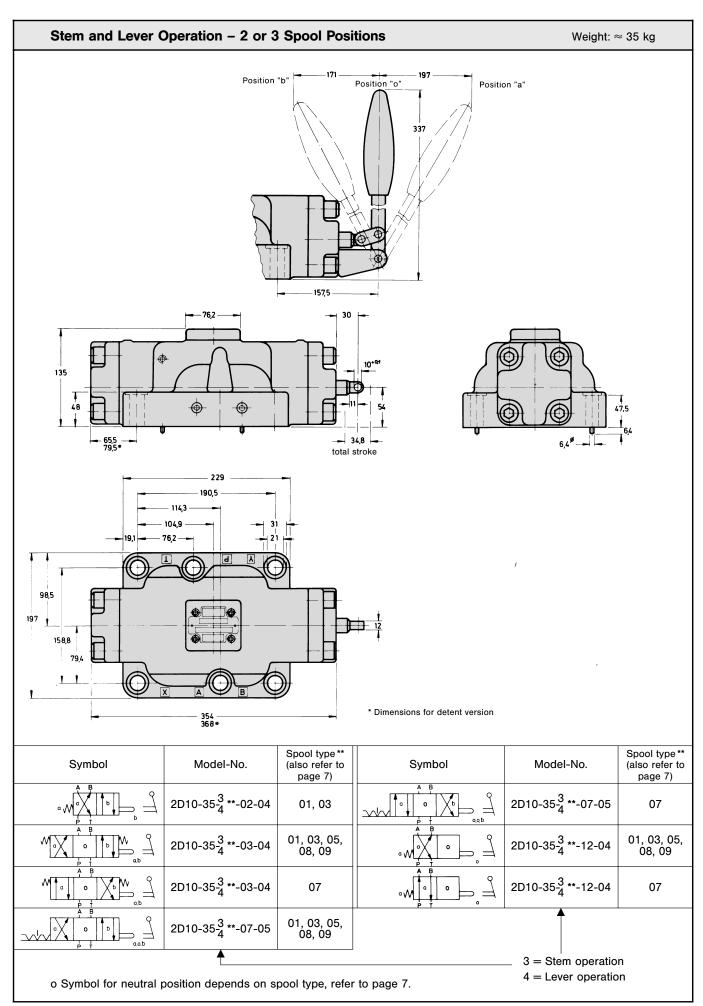
All Performance Data given is typical and can be influenced by application. Oil temperature 50°C;

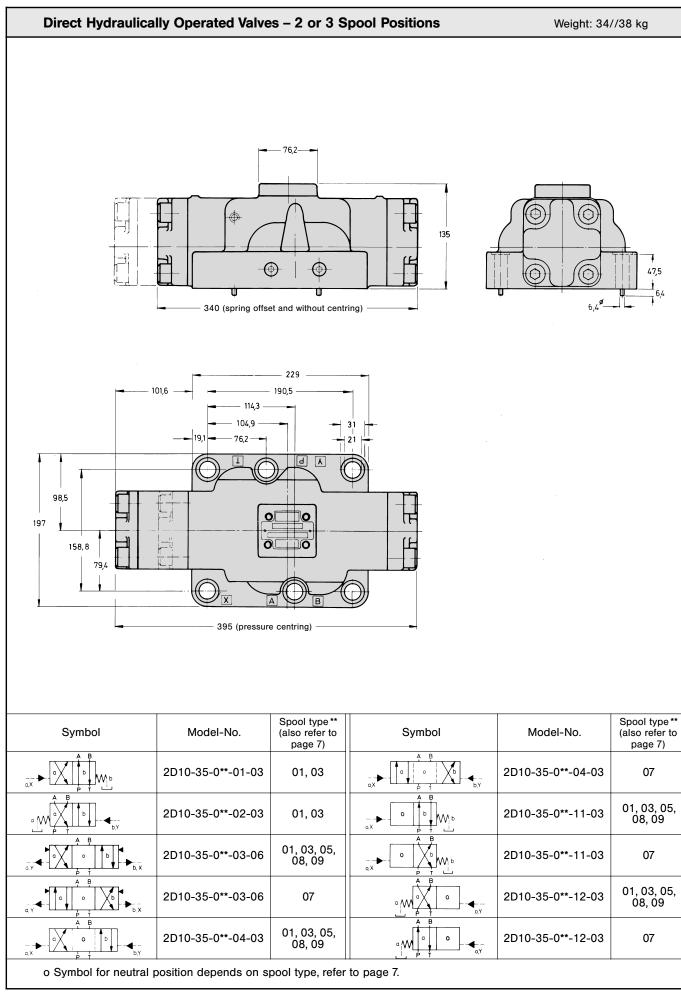
oil viscosity 36 cSt.

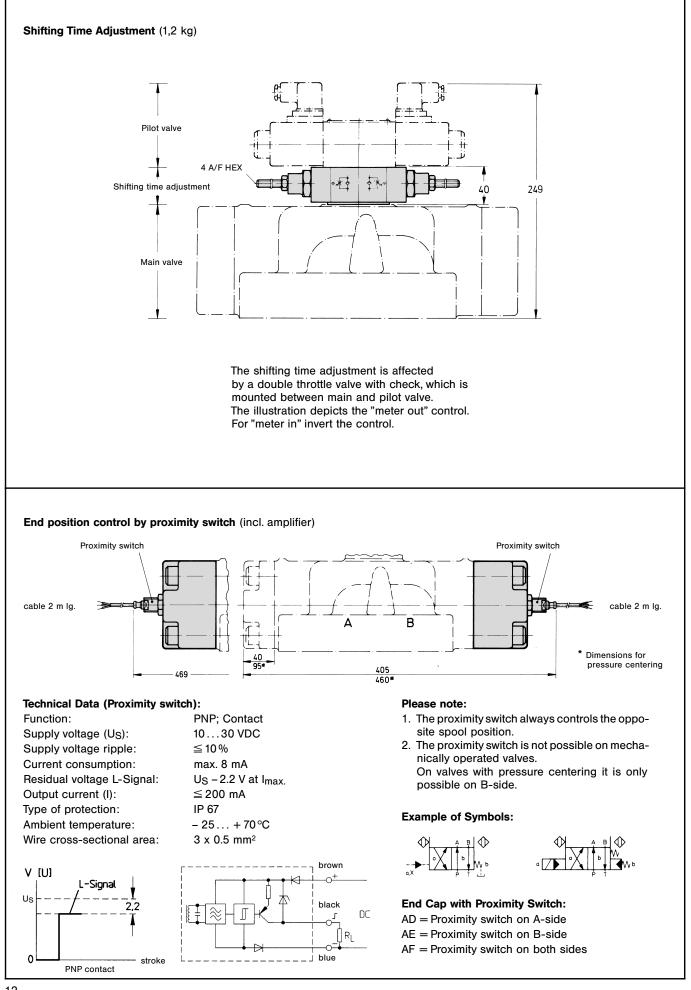
Flow (l/min)



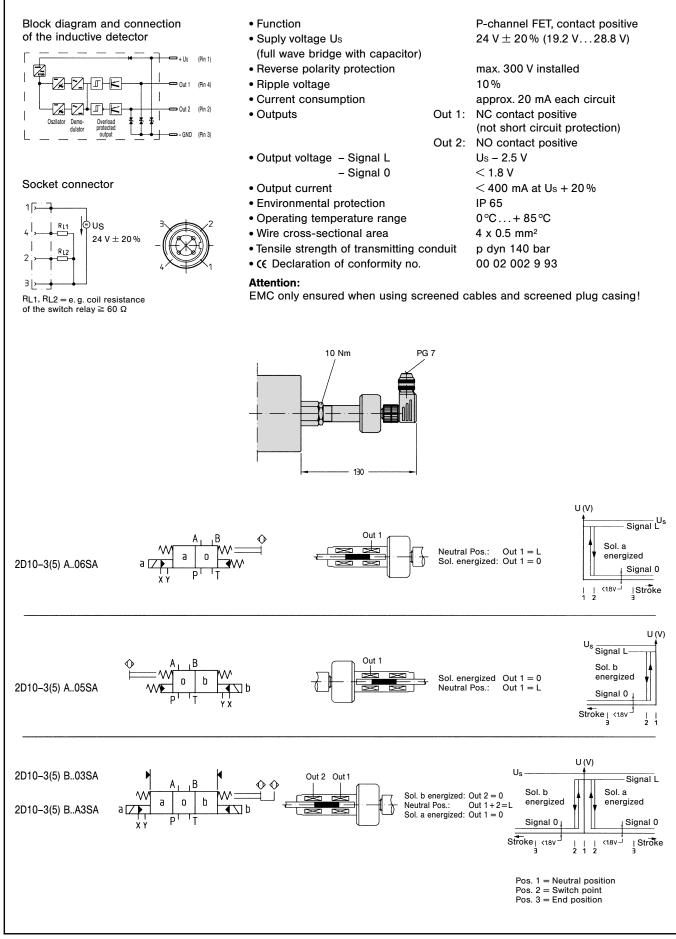


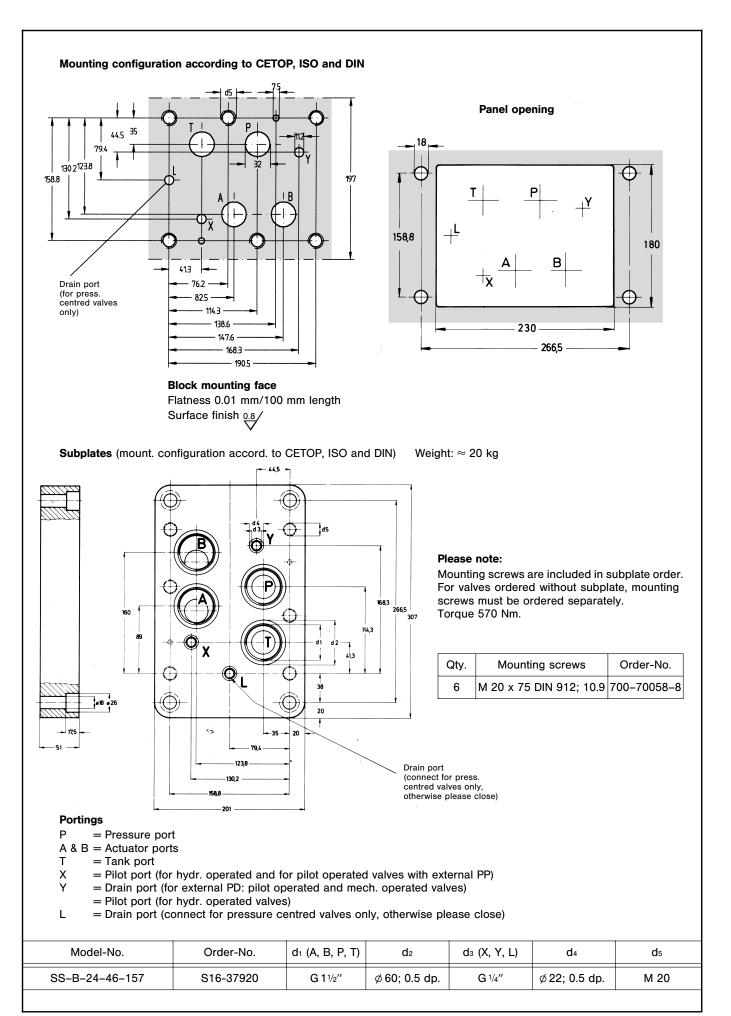






#### **Neutral Position Control by Inductive Detector**





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The product described is subject to continual development and the manufacturer reserves the right to change the specifications without notice.