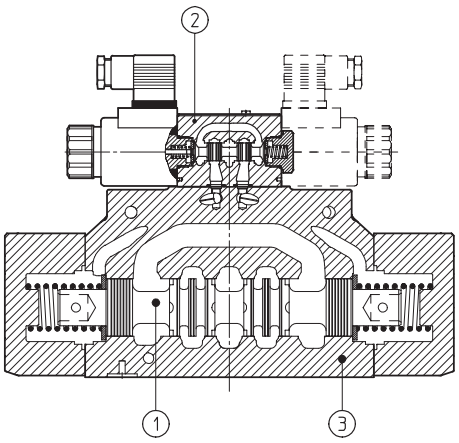
Solenoid directional valves type WDPHE

two stage, pilot operated, ISO 4401 size 16 and 25



WDPHI-371*

WDPHE are spool ① type, two or three position directional piloted solenoid valves designed to operate in oil hydraulic systems.

They are actuated by a direct solenoid valve ②:

Shell-moulding castings ③ machined by transfer lines and then cleaned by thermal deburring. Optimized flow paths largely cored with extrawide channels to tank for low pressure drops.

In WDPHE, coils are easily re- placeable without aid of tools.

Rugged execution suitable for outdoor use.

Mounting interface: ISO 4401, size 16 and 25.

Max flow up to 300 and 650 l/min.

Pressure up to 350 bar.

1 MODEL CODE

WDPHE	-	2	71	1	/A	–	N	24DC	**	/*

Piloted directional control valve

Valve size:
2 = 16 **3** = 25

Valve configuration, see section 2:
61 = 1 single solenoid, center plus external position, spring centered
63 = 1 single solenoid, 2 external positions, spring offset
67 = 1 single solenoid, center plus external position, spring offset
71 = 2 double solenoid, 3 positions, spring centered
75 = 2 double solenoid, 2 external positions, with detent

Spool type, see section 3

Options, see note 1 at section 5

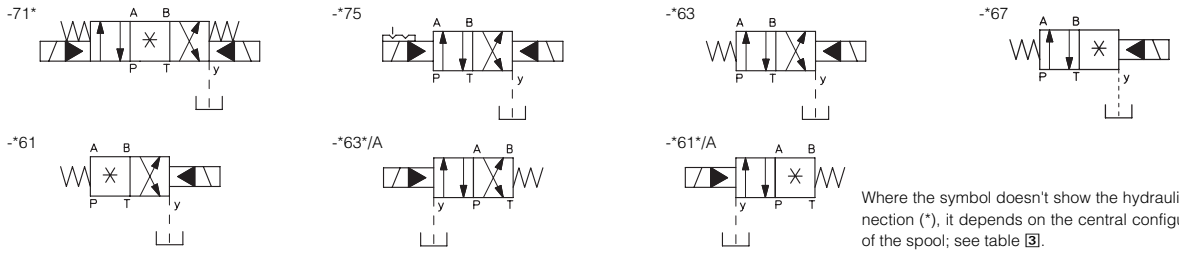
Connector type, see section 5, note 2
N = standard connector WP-666
P = connector with signal led WP-667
Q = connector with built-in rectifier bridge WP-669

External supply voltage, see section 6

Design number

Syntethic fluids:
PE = phosphate ester

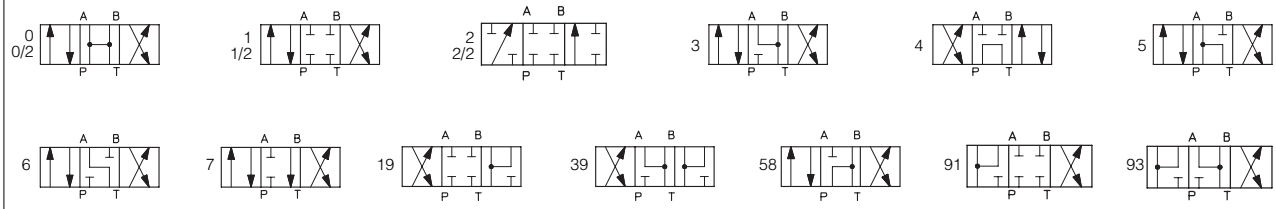
2 CONFIGURATION



Where the symbol doesn't show the hydraulic connection (*), it depends on the central configuration of the spool; see table 3.

3 SPOOLS - for intermediate passages, see tab. E001.

For all size



See note 2 at section 5.

4 MAIN CHARACTERISTICS OF WDPHE SOLENOID DIRECTIONAL VALVES

Installation position	Any position
Subplate surface finishing	Roughness index $\sqrt{}^{0.4}$ flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	from -20°C to +70°C
Fluid	Hydraulic oil as per DIN 51524 .... 535; for other fluids see section 1
Recommended viscosity	15 ÷ 100 mm²/s at 40°C (ISO VG 15 ÷ 100)
Fluid contamination class	ISO 19/16, achieved with in line filters at 25 μm value to $\beta_{25} \geq 75$ (recommended)
Fluid temperature	-20°C +60°C (standard seals) -20°C +80°C (/PE seals)
Flow direction	As shown in the symbols of tables 2 and 3
Operating pressure	Ports P, A, B, X: 350 bar; Port T: 250 bar (0 bar for option /D); Ports Y and L (if required): 0 bar Minimum pilot pressure for correct operation is 8 bar (10 bar with hydraulic centering device - option /M)
Rated flow	See diagrams Q/Δp at section 8
Maximum flow	WDPHE-2: 300 l/min; WDPHE-3: 650 l/min (see rated flow at section 8 and operating limits at section 9)

4.1 Coils characteristics

Insulation class	H (180°C) Due to the occuring surface temperatures of the solenoid coils, the European standards EN563 and EN982 must be taken into account
Connector protection degree	IP 65
Relative duty factor	100%
Supply voltage and frequency	See electric feature 7
Supply voltage tolerance	± 10%

5 NOTES

5.1 Options

/A = Solenoid mounted at side of port A of main body (only for single solenoid valves). In standard version, solenoid is mounted at side of port B.
/D = Internal drain.
/E = External pilot pressure.
/H = Adjustable chokes (meter-out to the pilot chambers of the main valve).

5.2 Type of electric connectors DIN 43650, to be ordered separately

WP-666 (option **-N**) = standard connector IP-65 for direct connection to electric supply source.
WP-667 (option **-P**) = as WP-666, but with built-in signal led.
WP-669 (option **-Q**) = with built-in rectifier bridge for supplying DC coils by alternate current (AC 110V and 220V - Imax 1A).

5.3 Spools

- spools type 0 and 3 are also available as 0/1 and 3/1. Restricted, oil passages in central position, from user ports to tank.
- spool type 4 is also available as 4/8 properly shaped to reduce water-hammer shocks during the switching.
- other types of spools can be supplied on request.

6 ELECTRIC FEATURES

External supply nominal voltage ± 10%	Type of connector	Power consumption (2)	Code of spare coil **WDPHE**
12 DC	WP-666 or WP-667	36 W	SP-WCOE-12DC
24 DC			SP-WCOE-24DC
110/50/60 AC		100 VA	SP-WCOE-110/50/60AC (1)
220/50/60 AC			SP-WCOE-220/50/60AC (1)
110/50/60 AC	WP-669	36 W	SP-WCOE-110DC
220/50/60 AC			SP-WCOE-220DC

(1) In case of 60 Hz voltage frequency the performances are reduced by 10÷15% and the power consumption is 90 VA.

(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.

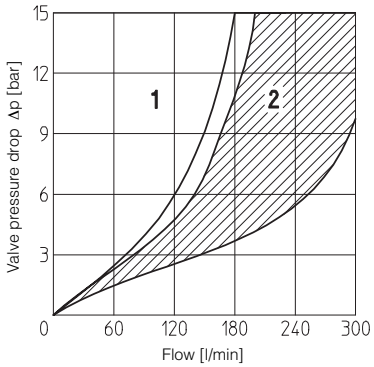
(3) When solenoid is energized, the inrush current is approx 3 times the holding current. Inrush current values correspond to a power consumption of about 280 VA.

8 FLOW VERSUS PRESSURE DIAGRAMS

Based on mineral oil ISO VG 46 at 50°C

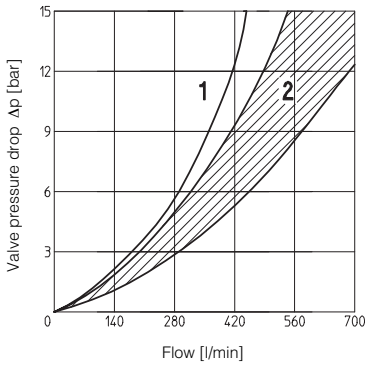
WDPHE-2

Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
4. 4/8	-	-	-	-	1
Other	2	2	2	2	-



WDPHE-3

Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
4. 4/8	-	-	-	-	1
Other	2	2	2	2	-



9 OPERATING LIMITS

The max recommended flow rates - l/min - for a correct operation are shown in the tables below for some typical spools and inlet pressure.

WDPHE-2

Spool	Inlet pressure			
	70	140	210	350
0, 0/2, 1, 1/2, 3, 3/1, 6, 7	300	300	300	250
2, 2/2, 4, 4/8	300	300	240	140
5	260	220	180	100
0/1	300	250	210	180
19, 39, 91, 93	300	300	270	200

WDPHE-3

Spool	Inlet pressure			
	70	140	210	350
1, 1/2, 6, 7	650	650	650	600
2, 2/2, 4, 4/8	500	500	450	400
5, 0/1, 0/2	600	520	400	300
0, 3, 3/1	650	650	600	540
19, 39, 91, 93	500	500	500	450

10 SWITCHING TIMES (average values in m sec)

WDPHE-2

Configuration		Piloting pressure 70 bar Alternating current	70 bar Direct current	140 bar Alternating current	140 bar Direct current	210 bar Alternating current	210 bar Direct current	250 bar Alternating current	250 bar Direct current
71, 61, 61*/A	Switch ON	40	55	30	50	25	45	20	40
	Switch OFF	60							
63, 63*/A	Switch ON	55	80	45	70	40	60	35	55
	Switch OFF	95							

WDPHE-3

Configuration		Piloting pressure 70 bar Alternating current	70 bar Direct current	140 bar Alternating current	140 bar Direct current	210 bar Alternating current	210 bar Direct current	250 bar Alternating current	250 bar Direct current
71, 61, 61*/A	Switch ON	60	80	45	60	35	50	30	45
	Switch OFF	80							
63, 63*/A	Switch ON	95	115	75	95	65	75	50	65
	Switch OFF	130							

Notes:

1) For configuration 75, times of switching ON and switching OFF are the same: this value is equal to time of switch ON of configuration 63.
2) TEST CONDITIONS
   - Nominal voltage supply DC (direct) and AC (alternating) with connector type WP-666. The use of other connectors can affect the switching time;
   - 2 bar of counter pressure on port T;
   - mineral oil: ISO VG 46 at 50°C
3) The response time is affected by elasticity of the hydraulic circuit, by variation of hydraulic characteristics and temperature.

11 ORIFICE LOCATION FOR PILOT/DRAIN CHANNELS

Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration proper plugs must only be interchanged. The plugs have to be sealed using Loctite 242.
Standard valves have internal pilot and external drain.

WDPH*-2

Pilot channels

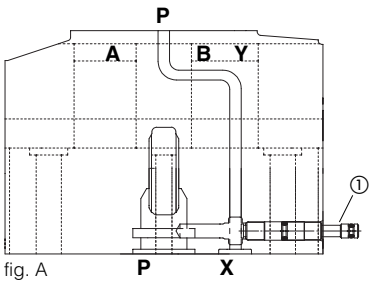


fig. A

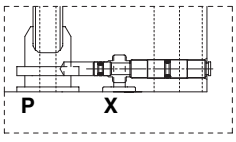
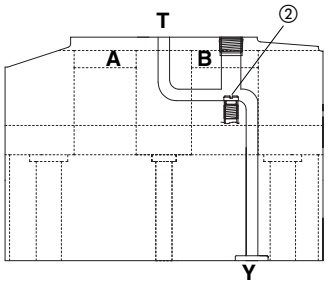


fig. B

Drain channels



Internal piloting: plug ① installed as fig. A

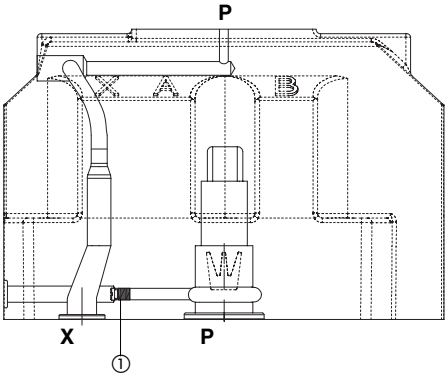
External piloting: reverse plug ① as fig. B

Internal drain: remove plug ②

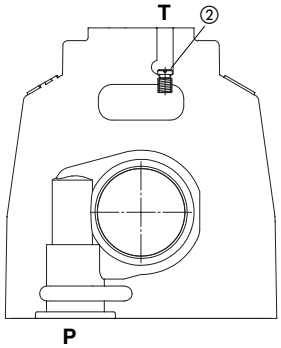
External drain: install plug ②

WDPH*-3

Pilot channels



Drain channels



Internal piloting: remove plug ①

External piloting: install plug ①

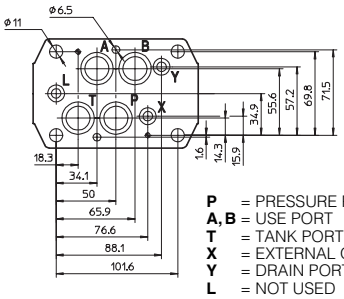
Internal drain: remove plug ②

External drain: install plug ②

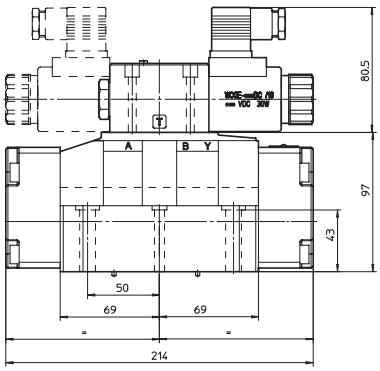
WDPHE-2

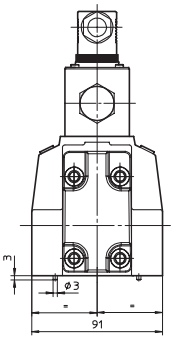
Mounting surface
ISO 4401-AD-07-4 size 16

Fastening bolts:
4 socket head screws M10x50
2 socket head screws M6x40
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;
Diameter of ports L: Ø = 5 mm;
Seals: 4 OR 130, 3 OR 109



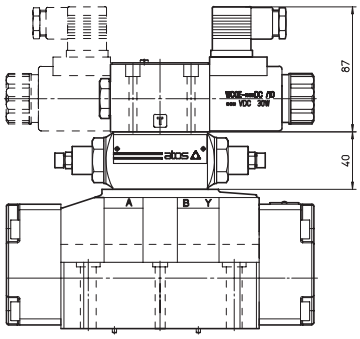
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT
L = NOT USED





Mass of basic versions:
kg 9 (one solenoid)
kg 9,3 (two solenoids)

Option /H

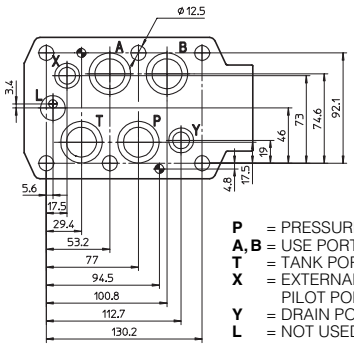


Mass of basic versions:
kg 9,4 (one solenoid)
kg 9,7 (two solenoids)

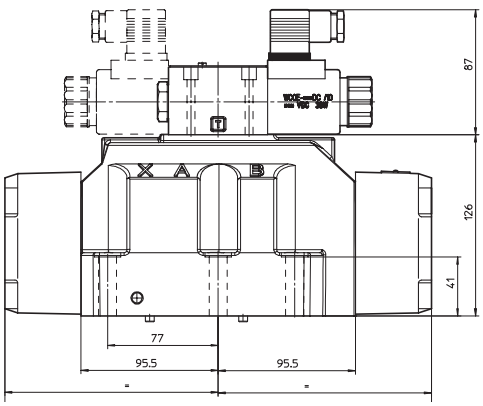
WDPHE-3

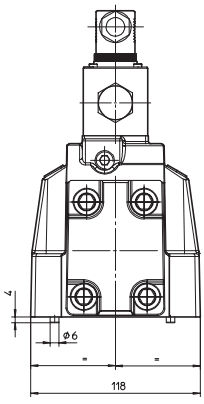
Mounting surface
ISO 4401-AE-08-4 size 25

Fastening bolts:
6 socket head screws M12x50
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;
Diameter of port L: Ø = 5 mm;
Seals: 4 OR 4112, 3 OR 3056



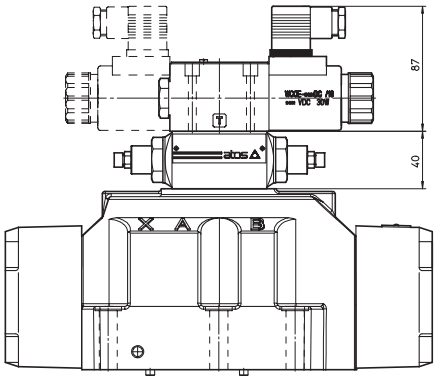
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT
L = NOT USED





Mass of basic versions:
kg 14 (one solenoid)
kg 14,3 (two solenoids)

Option /H



Mass of basic versions:
kg 14,4 (one solenoid)
kg 14,7 (two solenoids)

Overall dimensions refer to valves with connectors type WP-666