



**PATRIOT**

**Proportional Directional Valve**

**PHDBFW / PHDBFWN**



**Driven by Innovation**  
**Power Precision Performance**  
734-479-9641 [patriothyd.com](http://patriothyd.com)





# PHDBFW / PHDBFWN Model Codes

**Directional Proportional Valve**

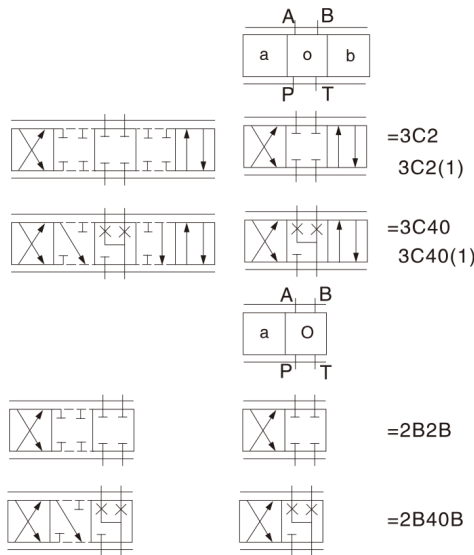
**Electronics Type**

Omit - Standard  
 N - intergrated electronics

**Frame Size**

02 - DN 6  
 03 - DN 10

**Spools**



With spool symbols: 3C2(1) and 3C40(1)  
 $P \rightarrow A: q_{vmax}$      $B \rightarrow T: q_{vmax}/2$   
 $P \rightarrow B: q_{vmax}/2$      $A \rightarrow T: q_{vmax}$

**Note:**  
 With spools 3C40 and 2B40B, in the neutral position, there is a connection from A to T and B to T with approx. 3% of the relevant nominal cross section.

**Seals**  
 Omit - Buna  
 V - Mineral oil rated seals

**Input Setting**

Omit - PHDBFW  
 PHDBFWN  
 A1 - Command value input  $\pm 10V$   
 F1 - Command value input 4~20mA

**Connection Type**

PHDBFW  
 K4 with plug component DIN EN 175301-803  
 PHDBFWN  
 K31 with plug component DIN 43 650-AM2

**Special Protection**

Omit - without protection  
 J - Seawater - resistant (only DN6)

G24 - 24 VDC

2X - Series 20-29

**Nominal Flow @ P=10 bar**

DN6  
 07 - 7 L/min  
 15 - 15 L/min  
 30 - 26 L/min  
 DN10  
 30 - 30 L/min  
 60 - 60 L/min





# PHDBFW Technical Specifications

Model	PHDBFW	PHDBFWN
Installation position	optional, preferably horizontal	
Storage temperature range ( °C )	-20~80	
Ambient temperature range ( °C )	-20~70	-20~50

## Hydraulic Specifications

Operating pressure ( bar )	Ports A, B, P	315
	Port T	210
Nominal flow When $q_{vnom}$ at $\Delta p=10$ bar ( L/min )	DN6	7, 15 and 26
	DN10	30, 60
Flow (Max. Permissible) ( L/min )	DN6	80 ( with double flow 80 ) 80
	DN10	140 ( with double flow 140 ) 140
Pressure fluid	Mineral oil (HL, HLP) to DIN 51 524; For other fluid please consult with us.	
Fluid temp. Range ( °C )	-20~80(+40~+50 is preference)	
Viscosity range ( mm <sup>2</sup> /s )	20~380(30~46 is preference)	
Hysteresis ( % )	≤5	
Reversal error ( % )	≤1	
Response sensitivity ( % )	≤0.5	
Cleanliness	Maximum permissible degree of pressure fluid contamination to NAS 1638 to class 9 Recommended filter $\beta_{10} \geq 75$ .	

## Electrical Specifications

Model	PHDBFW	PHDBFWN
Voltage type	Direct voltage	
BFWN Command signal	Voltage input "A1" ( V )	± 10
	Current input "F1" ( mA )	4~20
Max. current per solenoid ( A )	2.5	2.5
Solenoid coil Resistance ( Ω )	Cold value at 20 °C	6DN2
	Max. warm value	6DN3
Duty cycle ( % )	100	
Max. Coil temperature <sup>2)</sup> ( °C )	up to 150	
Electrical connection	socket as per DIN EN 175 301-803 and ISO 4400 with component plug to DIN EN 175301-803 and ISO 4400	socket as per DIN EN 43 563-AM6-3 with component plug to DIN 43 563-BF6-3/Pg11
Insulation of valve to DIN 40 050	IP 65	



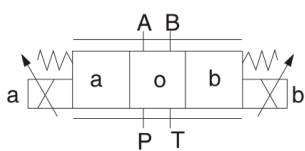


## Electronic Control Data

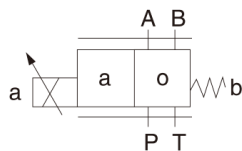
PHDBFW (type)	Analogue amplifier in Eurocard format <sup>3)</sup>		Details refer to proportional amplifier	
	Digital amplifier in Eurocard format <sup>3)</sup>		Details refer to proportional amplifier	
PHDBFVN (type)	Analogue command value module		Integrated into the valves	
Supply voltage	Nominal voltage	VDC	24	
	BFWN Lower limiting value	V	21/22	19
	BFW <sup>1)</sup> Upper limiting value	V	35	
Amplifier current consumption	$I_{max}$	A	1.8	1.8
	Max. impulse current	A	3	3

## Model Descriptions

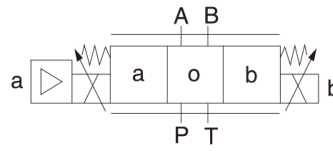
Model PHDBFW...



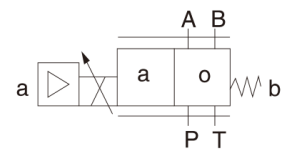
Model PHDBFW...2B2B (2B40B).



Model PHDBFVN...



Model PHDBFVN...2B2B (2B40B)



## Function Description

The 4/2-way and 4/3-way proportional directional valves are designed as direct operated components for subplate mounting. They are actuated by means of proportional solenoid with central removable coil. The solenoid are controlled either by external control electronics (type BFW) or integrated control electronics (type BFWN).

### Design:

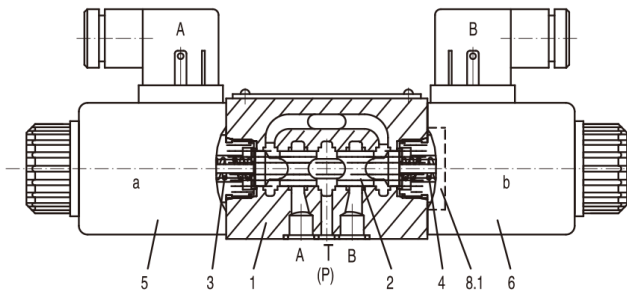
The valves basically consist of:

- Body (1) with mounting surface
- Control spool (2) with compression springs (3 and 4)
- Solenoids (5 and 6) with central coil
- Optional integrated electronics (7)

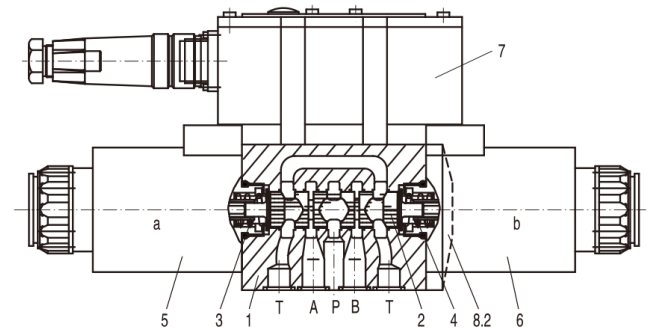
### Function:

- When solenoids (5 and 6) do not work, the control spool (2) is held in the central position by compression springs (3 and 4)
- Direct actuation of the control spool (2) by energising a proportional solenoid E.g. When the solenoid "b" power is on (6)
  - The control spool (2) is moved to the left in proportion to the electrical input signal
  - connection from P to A and B to T via orifice-like crosssections with progressive flow characteristics
- When the solenoid power is off (6)
  - The control spool (2) is returned to the central position by compression spring (3)

Model PHDBFW-02...2x/...



Model PHDBFWN-03...2x/...



In theory, the function of this valve is the same to the valve with 3 positions. However, the valves with 2 positions are only fitted with solenoid "a".

For DN6 valve, there is a plug (8.1) fixed in the second solenoid, but for DN10, it is a cover (8.2) instead.

Note for type PHDBFW-02...2x/...

Draining of tank line is to be avoided. With the appropriate installation conditions, a back pressure valve is to be installed (back pressure approx. 2 bar).



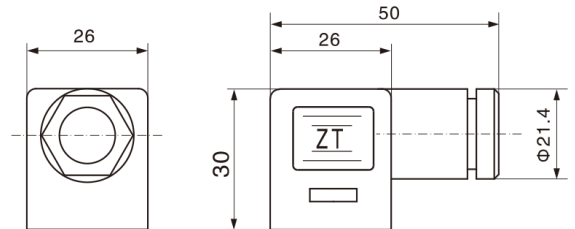
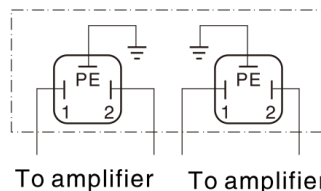
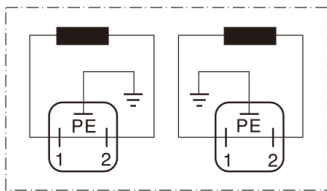
## Plug Types

PHDBFW (Without integrated electronics not for version "J"=sea water-resistant)

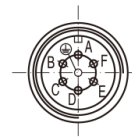
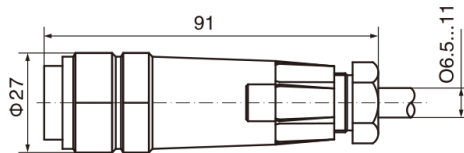
Connection on component plug

Connection on plug-in connector

Plug-in connector: CECC 75 301-803-A002FA-H3D08-G/DIN EN 175 301-803 and ISO 4400



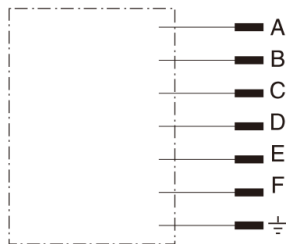
For type BFWN (with integrated electronics (OBE) and for version "J" = sea water-resistant) Plug-in connector see the block circuit diagram below



Plug-in connector:  
DIN 43 563-BF6-3/Pg11

### Integrated electronics for type BFWN

Pin allocation of the component plug



	Contact	Signal
Supply voltage	A	24VDC (19~35VDC)
	B	GND
	C	n.c. <sup>(1)</sup>
Differential amplifier input	D	Com. value ( ± 10V/4-20mA ) reference potential
	E	
	F	n.c. <sup>(1)</sup>

Com. value: Positive command value (0 to 10 V or 12 to 20 mA) at D and reference potential to E causes flow from P to A and B to T.

Negative command value (0 to 10 V or 12 to 4 mA) at D and reference potential to E causes flow from P to B and A to T.

For valves with a solenoid on side "a" (spool variants 2B2B and 2B40B) a positive command value at D and reference potential to E (NS 6: 4 to 20 mA and NS 10: 12 to 20 mA) causes flow from P to B and A to T.

Recommendation:

-up to 25 m cable length type LiYCY 5 x 0.75 mm<sup>2</sup>

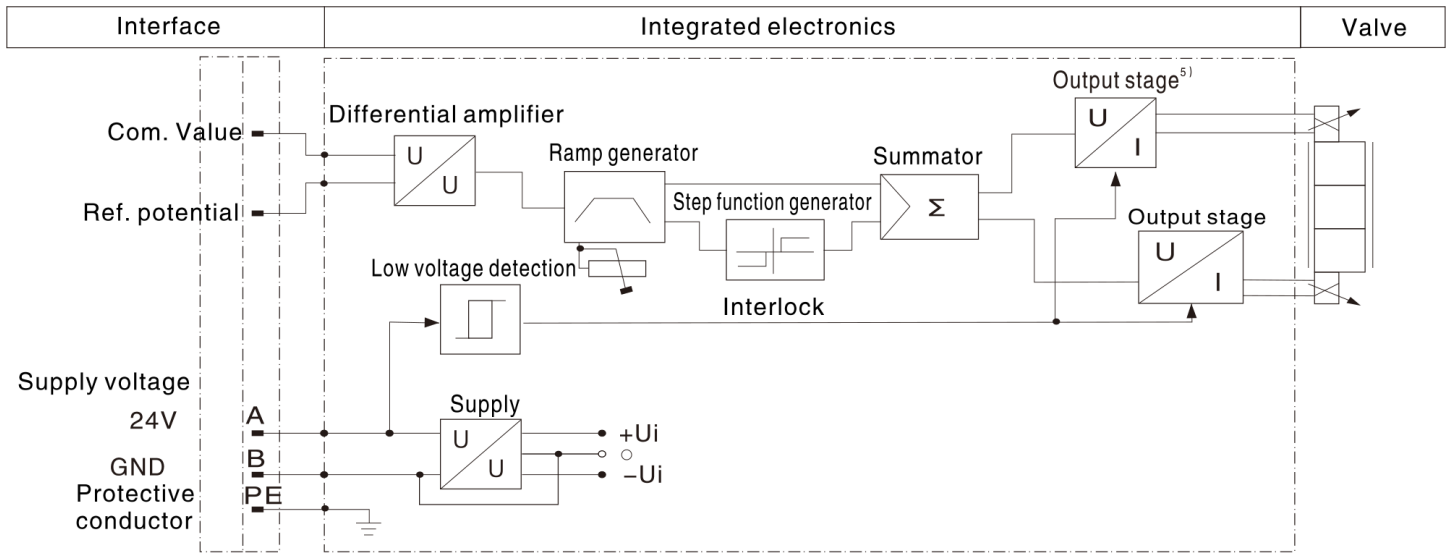
-up to 50 m cable length type LiYCY 5 x 1.0 mm<sup>2</sup>

External diameter 6.5 to 11 mm

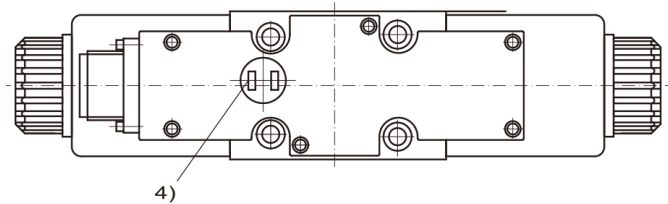
Connect screen to PE only on the supply side



# Block Circuit Diagram



- 1) Contacts C and F must not be connected!
- 2) PE is connected to the cooling body and the valve housing
- 3) Protective conductor screwed to the valve housing and cover
- 4) Ramp can be externally adjusted from 0 to 2.5 s; the same applies for T<sub>up</sub> and T<sub>down</sub>
- 5) Output stages current regulated
- 6) Low voltage detection is not carried out for component type BFWN-03-2X



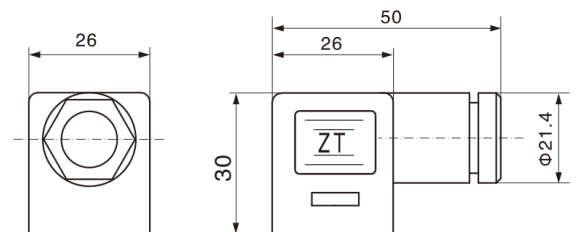
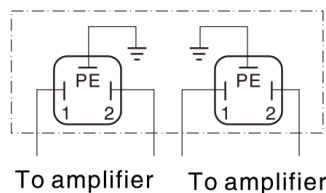
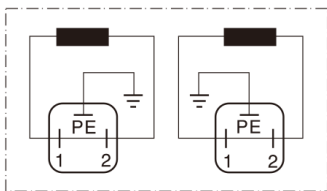
## Plug Types

PHDBFW (Without integrated electronics not for version "J"=sea water-resistant)

Connection on component plug

Connection on plug-in connector

Plug-in connector: CECC 75 301-803-A002FA-H3D08-G/DIN EN 175 301-803 and ISO 4400

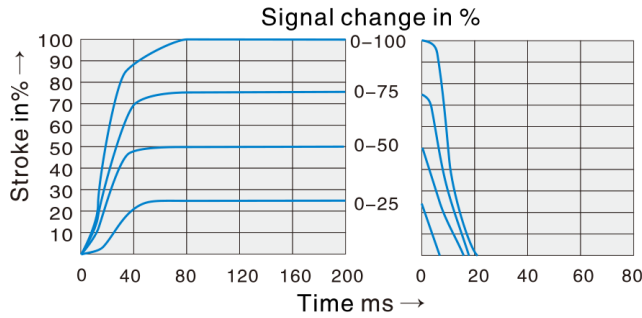




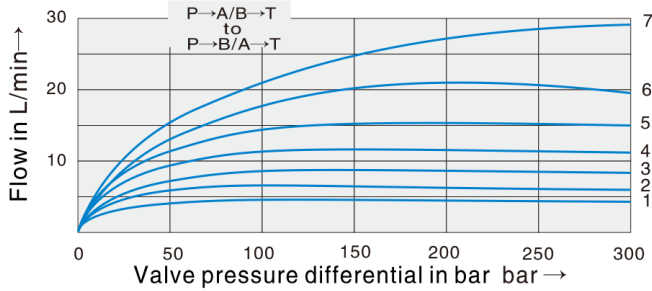
# Performance Data

## DN6

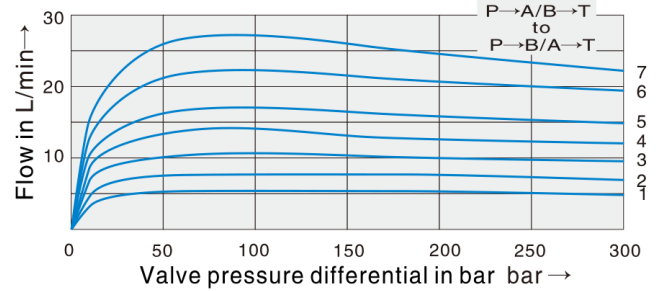
Transient functions with stepped form of electrical input signa



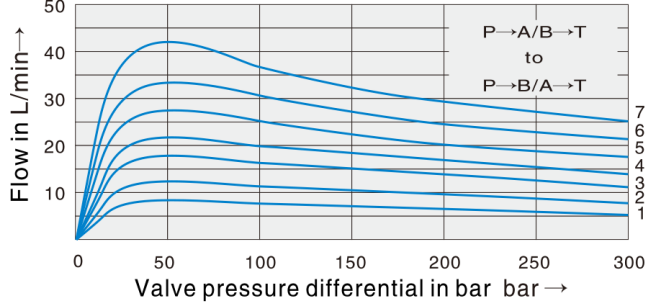
Performance limit, nominal flow 7 L/min



Performance limit, nominal flow 15 L/min



Performance limit, nominal flow 30 L/min



- 1 Com. Value=40%
- 2 Com. Value=50%
- 3 Com. Value=60%
- 4 Com. Value=70%
- 5 Com. Value=80%
- 6 Com. Value=90%
- 7 Com. Value=100%

If the performance limits are exceeded, then the movement of spool will be unstable.

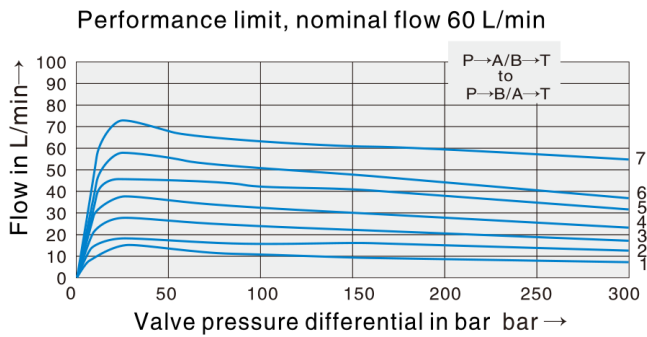
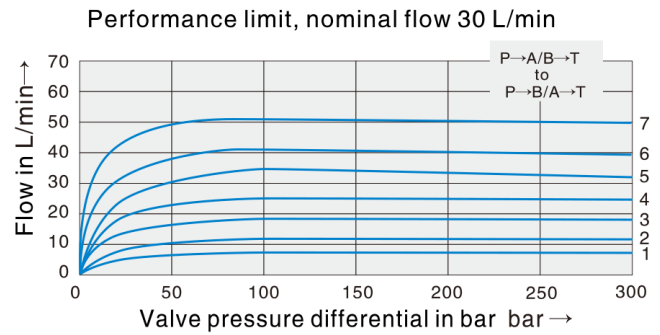
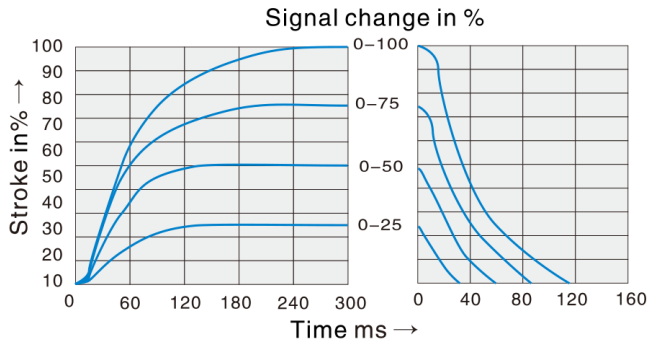




# Performance Data

## DN10

Transient functions with stepped form of electrical input signa



- 1 Com. Value=40%
- 2 Com. Value=50%
- 3 Com. Value=60%
- 4 Com. Value=70%
- 5 Com. Value=80%
- 6 Com. Value=90%
- 7 Com. Value=100%

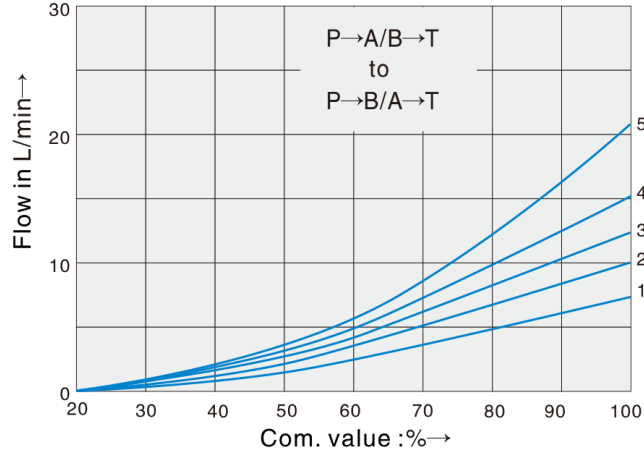
If the performance limits are exceeded, then the movement of spool will be unstable.



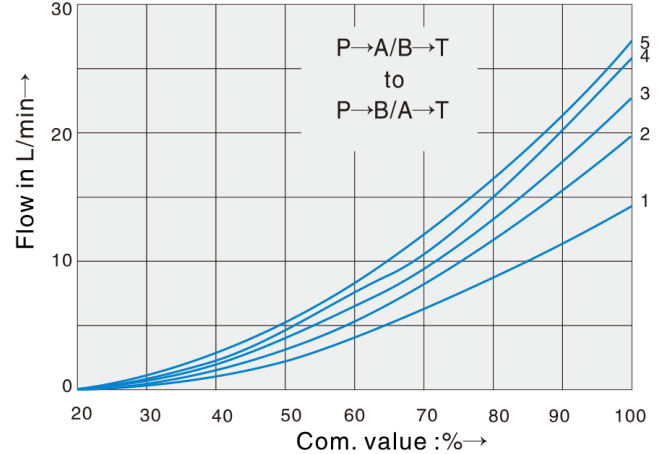


# Performance Data

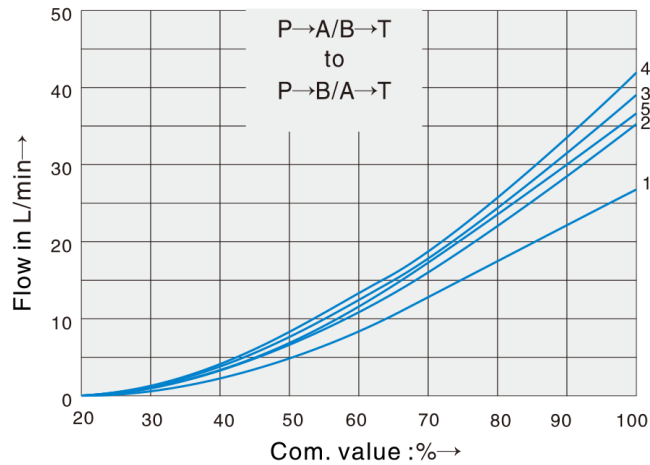
7 l/min nominal flow at differential pressure 10 bar



15 l/min nominal flow at differential pressure 10 bar



30 l/min nominal flow at differential pressure 10 bar



- 1  $\Delta p=10$  bar Constant
- 2  $\Delta p=20$  bar Constant
- 3  $\Delta p=30$  bar Constant
- 4  $\Delta p=50$  bar Constant
- 5  $\Delta p=100$  bar Constant

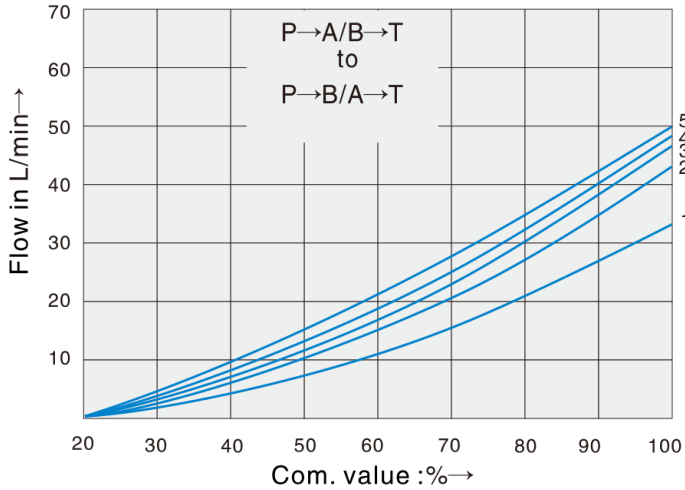
$\Delta p$  = Valve pressure differential  
(inlet pressure  $P_p$  minus load  
pressure  $P_L$  and minus return pressure  $P_T$ )



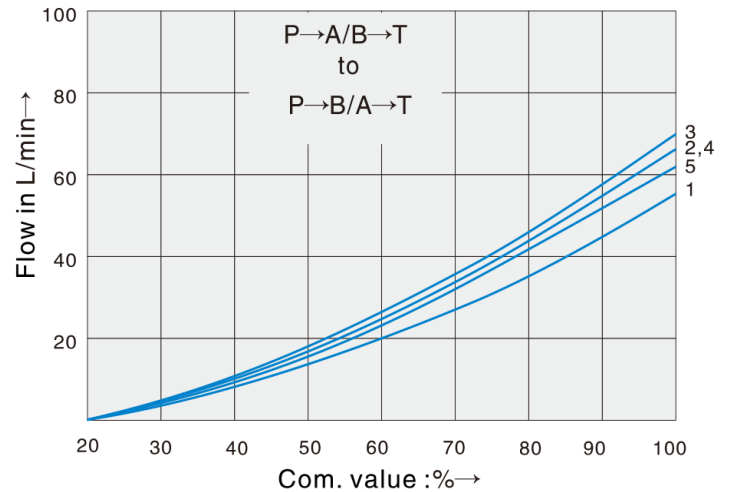


## Performance Data

30 l/min nominal flow at differential pressure 10 bar



60 l/min nominal flow at differential pressure 10 bar



- 1  $\Delta p=10$  bar Constant
- 2  $\Delta p=20$  bar Constant
- 3  $\Delta p=30$  bar Constant
- 4  $\Delta p=50$  bar Constant
- 5  $\Delta p=100$  bar Constant

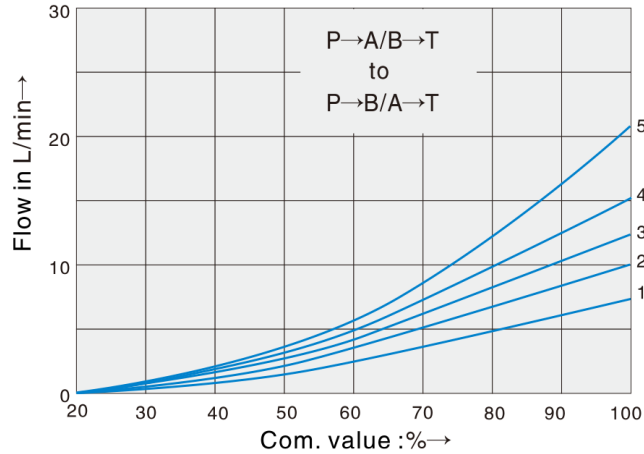
$\Delta p$  = Valve pressure differential  
(inlet pressure  $P_p$  minus load  
pressure  $P_L$  and minus return pressure  $P_T$ )



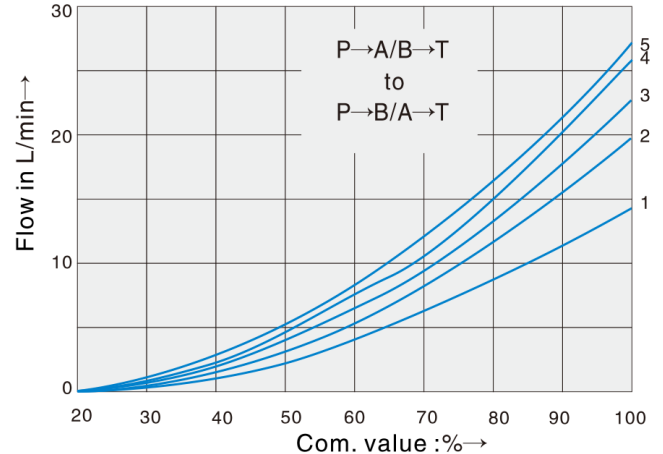


# Performance Data

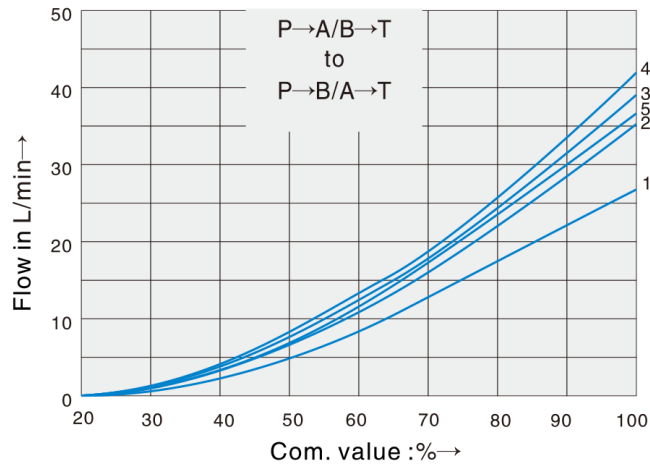
7 l/min nominal flow at differential pressure 10 bar



15 l/min nominal flow at differential pressure 10 bar



30 l/min nominal flow at differential pressure 10 bar



- 1  $\Delta p=10$  bar Constant
- 2  $\Delta p=20$  bar Constant
- 3  $\Delta p=30$  bar Constant
- 4  $\Delta p=50$  bar Constant
- 5  $\Delta p=100$  bar Constant

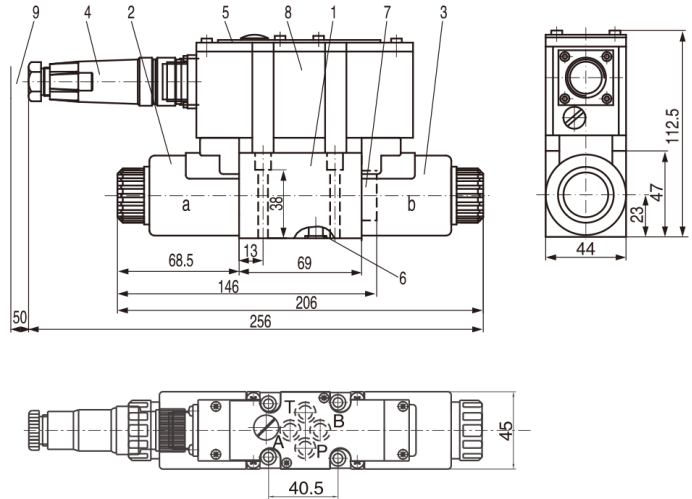
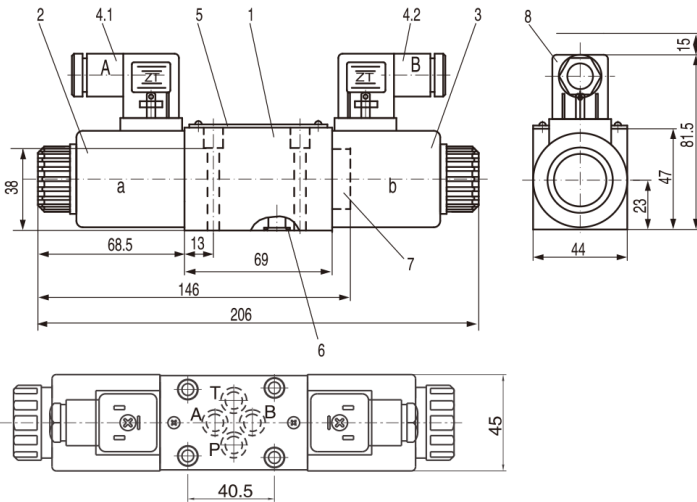
$\Delta p$ = Valve pressure differential  
(inlet pressure  $P_p$  minus load  
pressure  $P_L$  and minus return pressure  $P_T$ )



## Unit Dimensions - 02 Type

PHDBFW-02 type

PHDBFW-02.../...K31...V type



- 1 Valve body
- 2 Proportional solenoid "a"
- 3 Proportional solenoid "b"
- 4.1 4.2 Plug-in connector, colour black, separate order
- 5 Nameplate
- 6 8.73 x 1.78 I seal rings for ports A, B, P and T
- 7 Plug for valves with one solenoid ( 2 positions spool type 2B2B or 2B40B)
- 8 Space required to remove the plug-in connector
- 9 Machined valve mounting surface, connection location to DIN 24 340A, IS04401 (and) CETOP-RP 121 H

- 1 Valve body
- 2 Proportional solenoid "a"
- 3 Proportional solenoid "b"
- 4 Plug-in connector to E DIN 43 563-BF6-3/Pg11
- 5 Nameplate
- 6 8.73 x 1.78 O Identical seal rings for ports A, B, P and T
- 7 Plug for valves with one solenoid ( 2 switched positions, spool type 2B2B or 2B40B)
- 8 Integrated electronics
- 9 Space required for the connection cable and to remove the plug-in connector
- 10 Machined valve mounting surface, connection location to DIN 24 340A, ISO 440 and CETOP-RP 121 H

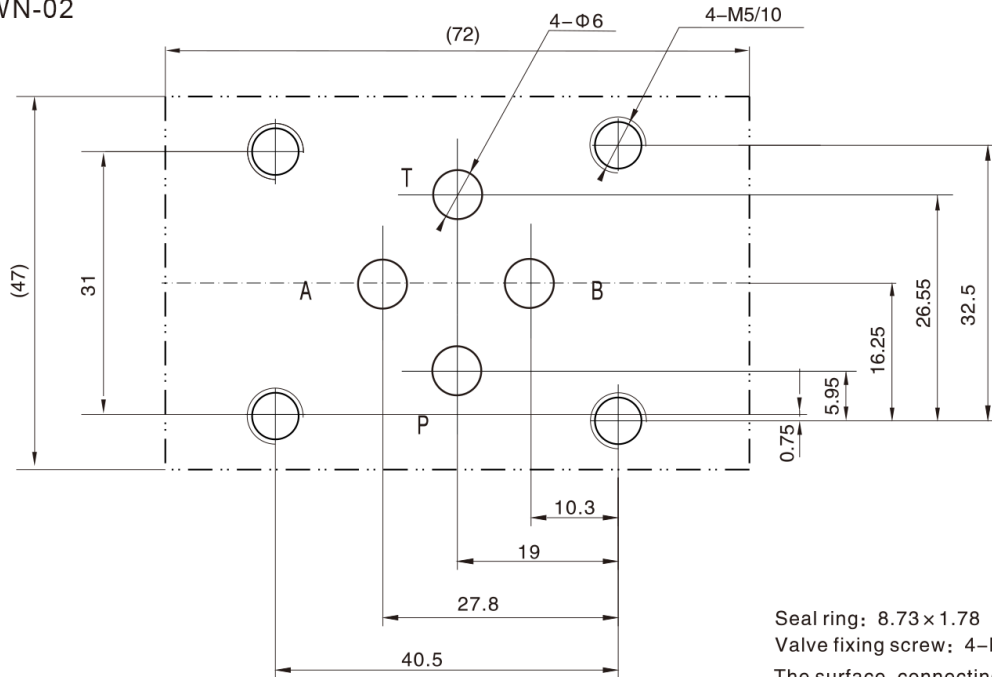
Mounting plate: please refer to below drawing

Subplates: Valve fixing screws :4-M5x 45 DIN 912-12.9;  $M_A=8.9$  Nm



## Unit Dimensions - 02 Type

PHDBFW-02  
PHDBFWN-02



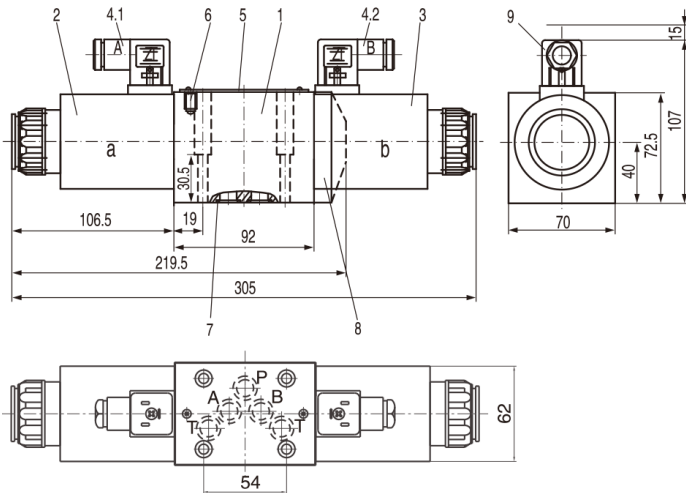
Seal ring: 8.73 × 1.78

Valve fixing screw: 4-M5 × 45-12.9(GB70-85)

The surface, connecting with the valve, should be Ra0.8 roughness, and 0.01/100mm flatness.

## Unit Dimensions - 03 Type

PHDBFW-03 type

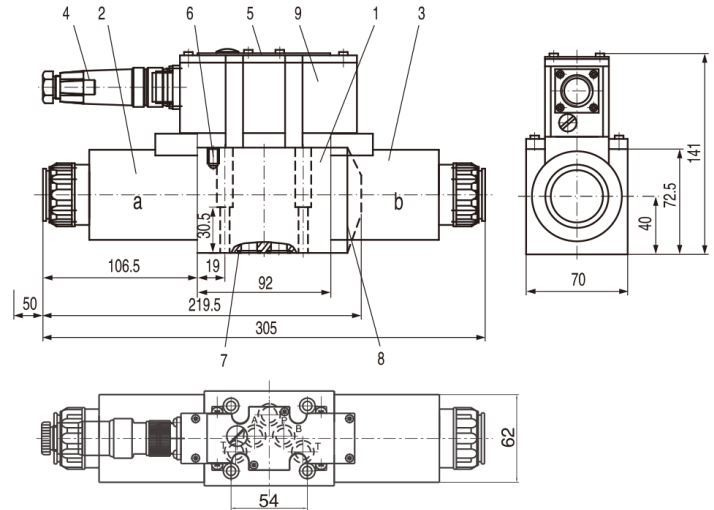


- 1 Valve body
- 2 Proportional solenoid "a"
- 3 Proportional solenoid "b"
- 4.1 4.2 Plug-in connector , colour black, separate order
- 5 Nameplate
- 6 Valve deflation screw
- 7 12 x 2 seal rings for ports A, B, P and T
- 8 Plug for valves with one solenoid ( 2 positions, spool type 2B2B or 2B40B)
- 9 Space required to remove the plug-in connector
- 10 Machined valve mounting surface, connection location to DIN 24 340A, IS04401 (and) CETOP-RP 121 H

Mounting plate: please refer to below drawing

Subplates : Valve fixing screws: 4 M6x 40 DIN 912-12.9;  $M_A=15.5$  Nm

PHDBFW-03 type

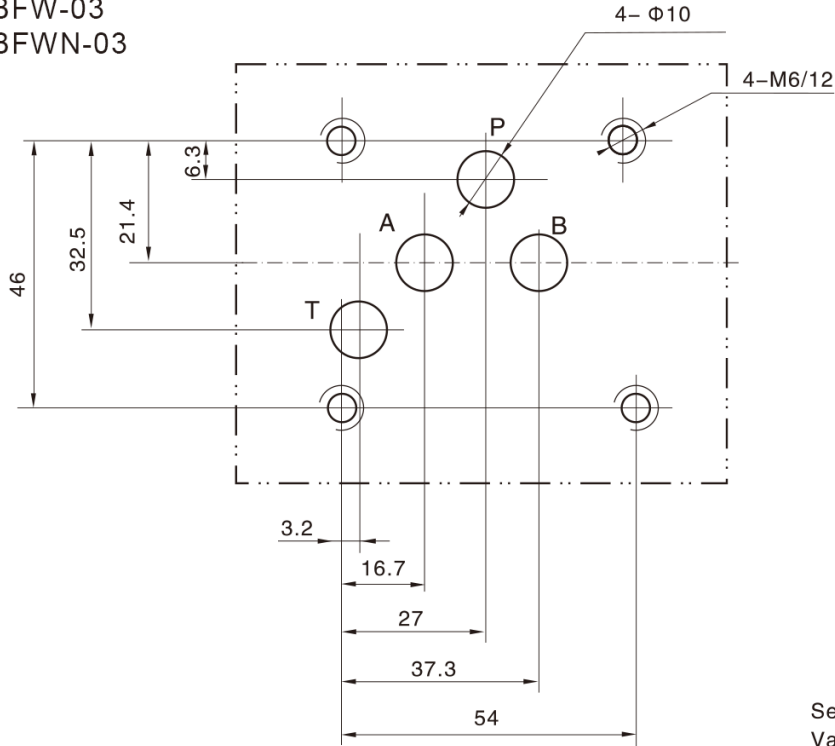


- 1 Valve body
- 2 Proportional solenoid "a"
- 3 Proportional solenoid "b"
- 4 Plug-in connector, to E DIN43563-BF6-3/Pg11
- 5 Nameplate
- 6 Valve deflation screw
- 7 12 x 2 identical seal rings for ports A, B, P and T
- 8 Plug for valves with one solenoid ( 2 positions, spool type 2B2B or 2B40B)
- 9 Integrated electronics
- 10 Space required for the connection cable and to remove the plug-in connector
- 11 Machined valve mounting surface, connection location to DIN 24 340A, IS04401 (and) CETOP-RP 121 H



## Unit Dimensions - 03 Type

PHDBFW-03  
PHDBFWN-03



Seal ring: 8.73 × 1.78

Valve fixing screw: 4-M5 × 45-12.9(GB70-85)

The surface, connecting with the valve, should be  
Ra0.8 roughness, and 0.01/100mm flatness.