

Proportional directional valve

A.3.1



The built-in 4/2- and 4/3-way directly operated proportional solenoid valves
 direct operated spool without electrical position feedback
 Type BFW and BFWN
 Nominal sizes 6 and 10
 Series 2X
 Maximum operating pressure 315bar
 Maximum flow 42L/min (DN6)
 Maximum flow 75L/min (DN10)

Technical data (Please consult with us when the application needs higher requirement than the parameter shown below)

| Model | | BFW | BFWN |
|----------------------------------|------|---------------------------------|--------|
| Installation position | | optional, preferably horizontal | |
| Storage temperature range (°C) | | -20~80 | |
| Ambient temperature range (°C) | | -20~70 | -20~50 |
| Weight (kg) | DN6 | 2.0 | 2.2 |
| | DN10 | 6.6 | 6.8 |

Hydraulic

| | | |
|--|---|--|
| 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 | 42 (with double flow 42) 80 |
| | DN10 | 75 (with double flow 75) 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 ² /s) | | 20~380(30~46 is preference) |
| Hysteresis (%) | | ≤ 5 |
| Reversal span (%) | | ≤ 1 |
| Response sensitivity (%) | | ≤ 0.5 |
| Cleanliness | Maximum permissible degree of pressure fluid contamination to NAS 1638 to class 9 Recommended filter $\beta \times > 75$ X=10 | |

Electrical

| Model | | BFW ¹⁾ | BFWN |
|-------------------------------------|---------------------------|--|------|
| Voltage type | | Direct voltage | |
| BFWN | Voltage input "A1" (V) | ± 10 | ± 10 |
| Command signal | Current input "F1" (mA) | 4~20 | 4~20 |
| Max. current per solenoid (A) | | 2.5 | 2.5 |
| Solenoid coil Resistance (Ω) | Cold value at 20 °C | 2 | 2 |
| | Max. warm value | 3 | 3 |
| Duty cycle (%) | | 100 | |
| Max. Coil temperature ²⁾ | | up to 150 | |
| Electrical connection | BFW | Plug-in connector to DIN EN 175301-803 and ISO 4400 | |
| | BFWN | Plug-in connector to DIN EN 175301-803 and ISO 4400 Plug-in connector to DIN 43563-AM-3 | |
| Insulation of valve to DIN 40 050 | | IP 65 | |

A.3.1

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Control electronics

| | | | |
|-------------------------------|---|---|-------|
| BFW (type) | Analogue amplifier in Eurocard format ²⁾ | Details refer to proportional amplifier | |
| | Digital amplifier in Eurocard format ²⁾ | Details refer to proportional amplifier | |
| BFWN (type) | Analogue command value module | Integrated into the valves | |
| Supply voltage | Nominal voltage | VDC | 24 |
| | BFWN Lower limiting value | V | 21/22 |
| | BFW ¹⁾ Upper limiting value | V | 35 |
| Amplifier current consumption | / max | A | 1.8 |
| | Max. impulse current | A | 3 |

Due to the occurring surface temperature of the solenoid coils, the European Standards DIN EN 563 and DIN EN 982 must be taken into account! With HOYEA Machinery Manufacture CO. LTD. control electronics

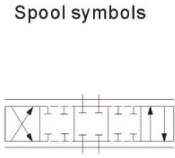
Model description

Directional proportional valve

No code Without integrated electronics
N With integrated electronics

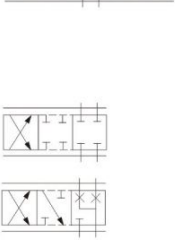
02 DN 6
03 DN 10

Spool symbols



=3C2
3C2(1)

=3C40
3C40(1)



=2B2B

=2B40B

With spool symbols: 3C2(1) and 3C40(1)
P→A: qvmax B→T: qv/2
P→B: qv/2 A→T: qvmax

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

Further details in clear text

Omit Nitrile rubber sealing
V NBR seals suitable for mineral oil (HL, HLP) to DIN 51 524

No code BFW BFWN
A1 Command value input ±10V
F1 Command value input 4~20mA

²⁾K4 Electrical connection For BFW (type) with plug component DIN EN 175301-803 See page A.3.3
²⁾K31 with plug component DIN 43 650-AM2 See page A.3.4

Special protection
No code Without special protection
¹⁾J Seawater-resistant (only for DN6)

24V 24 VDC

2X Component series 20 to 29 (20 to 29 unchanged installation and connection dimensions)

Nominal flow at valve pressure differential $\Delta p = 10$ bar

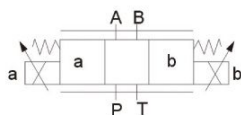
| DN 6 | DN 10 |
|-------------|-------------|
| 07 7 L/min | 30 30 L/min |
| 15 15 L/min | 60 60 L/min |

1. Other types of electrical protection on request 2. Only available with DN6: We can only supply "31" in sea water resistant design "J" !

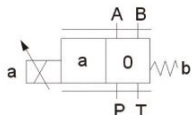
Proportional directional valve

Model description

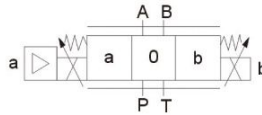
Model BFW...



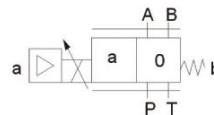
Model BFW...2B2B (2B40B)



Model BFWN...



Model BFWN...2B2B (2B40B)



Structure and function description, section

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:

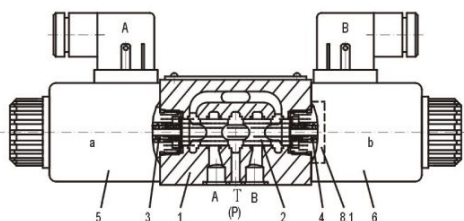
The valves basically consist of:

- 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)

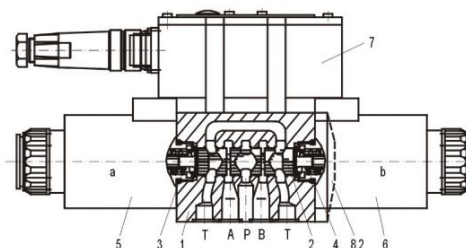
Model BFW-02...2x/...



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.

Model BFWN-03...2x/...



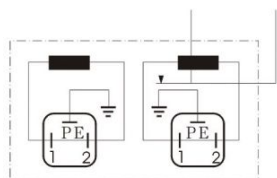
Note for type BFW-02...2X/...:

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).

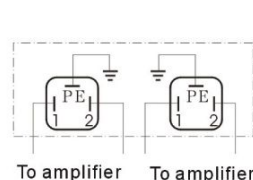
Electrical connection, plug-in connectors

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

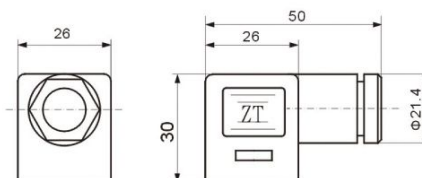
Connection on component plug



Connection on plug-in connector



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

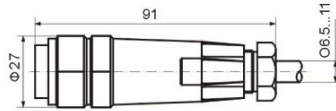


Proportional directional valve

HOYE

Electrical connection, plug-in connectors

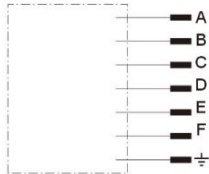
For type BFWN (with integrated electronics (OBE) and for version "J" = sea water-resistant) Plug-in connector see the block circuit diagram below



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. ⁽¹⁾ |
| Differential amplifier input | D | Com. value ($\pm 10V/4-20mA$) |
| | E | reference potential |
| | F | n.c. ⁽¹⁾ |

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 EA and WA) 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:

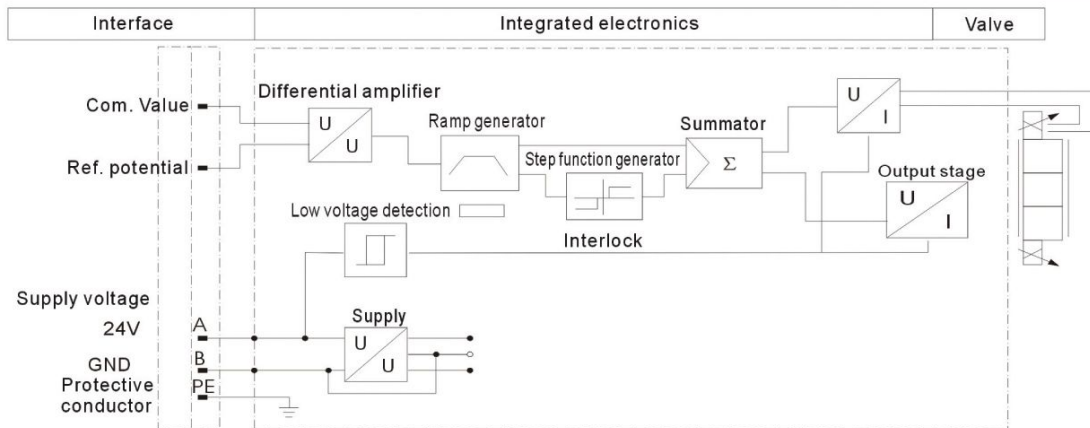
-up to 25 m cable length type LiYCY 5 x 0.75 mm²

-up to 50 m cable length type LiYCY 5 x 1.0 mm²

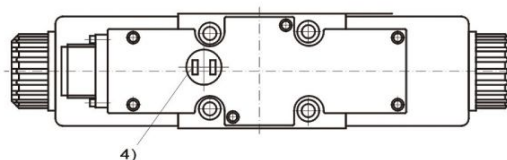
External diameter 6.5 to 11 mm

Connect screen to PE only on the supply side

Block circuit diagram / connection allocation



- 1) Contacts C and F must not be connected!
Block circuit diagram / connection allocation
- 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_{up} and T_{down}
- 5) Output stages current regulated
- 6) Low voltage detection is not carried out for component type BFWN-03-2X



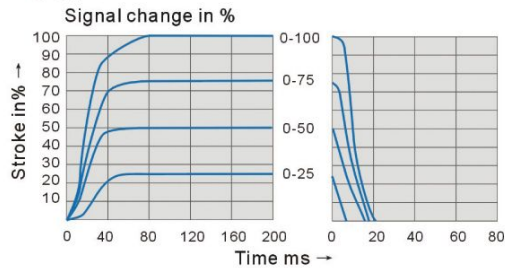
Proportional directional valve

Transition functions with electrical step input signals

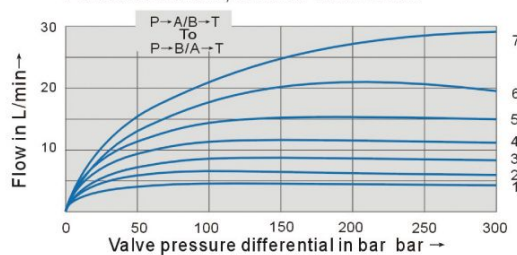
BFW and BFWN type

A.3.5

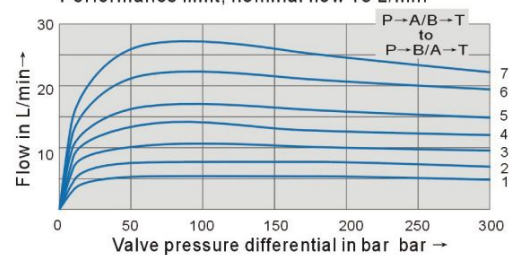
6DN



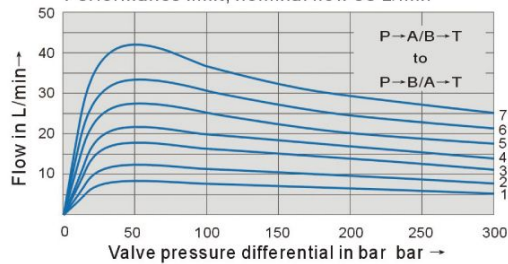
Performance limit, nominal flow 7 L/min



Performance limit, nominal flow 15 L/min



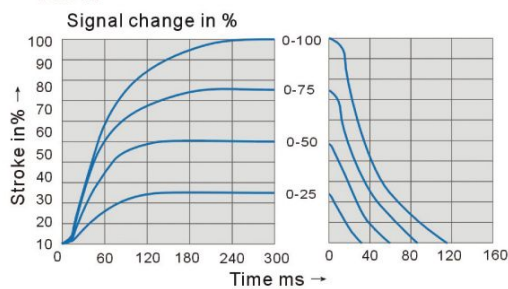
Performance limit, nominal flow 30 L/min



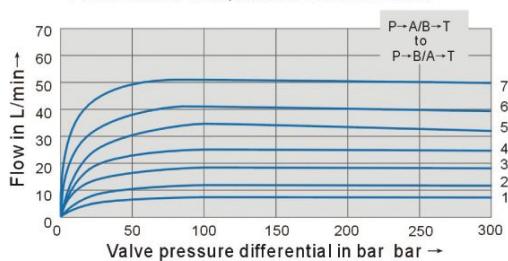
- 1 Com. Value=40%
- 2 Com. Value=50%
- 3 Com. Value=60%
- 4 Com. Value=70%
- 5 Com. Value=80%
- 6 Com. Value=90%
- 7 Com. Value=100%

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

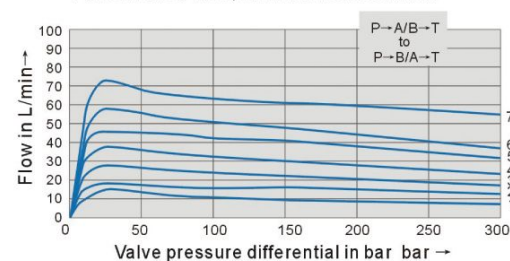
10DN



Performance limit, nominal flow 30 L/min

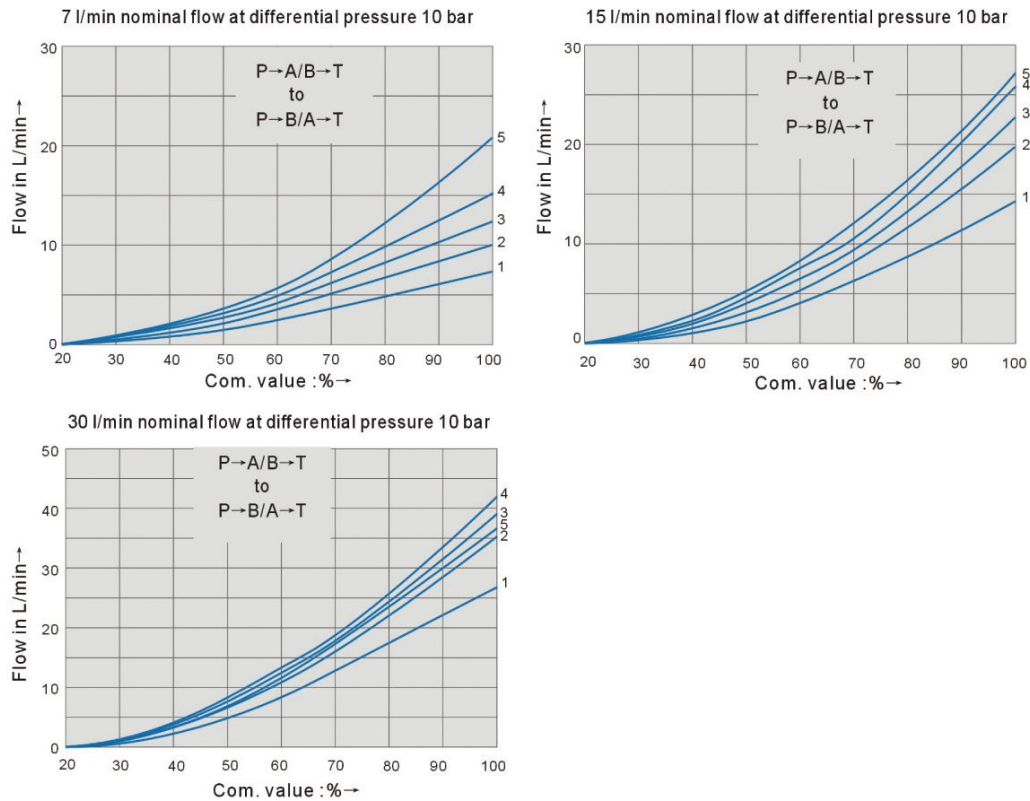


Performance limit, nominal flow 60 L/min

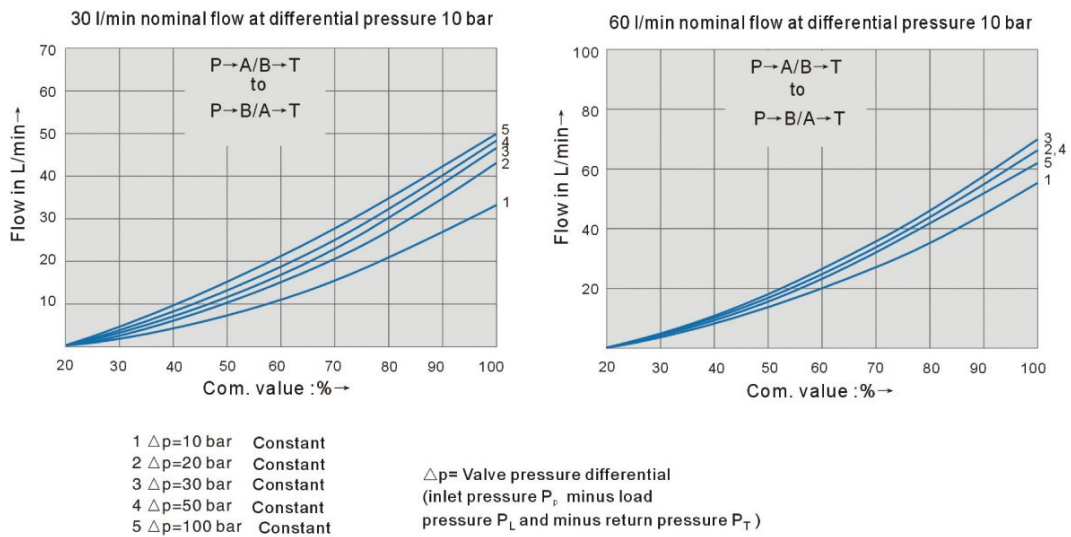


Proportional directional valve

Characteristic curves (measured with HLP46, Qoil = 40 ± 5 °C) DN6



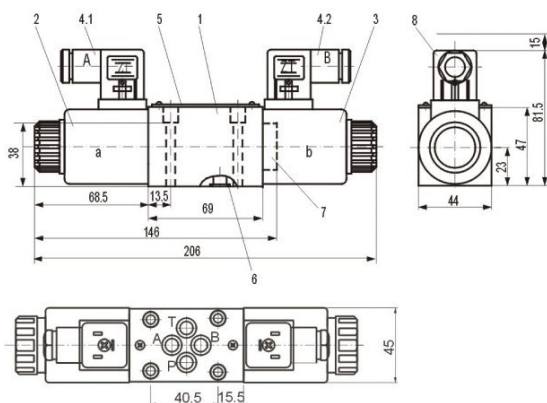
Characteristic curves (measured with HLP46, Qoil = 40 ± 5 °C) DN10



Proportional directional valve

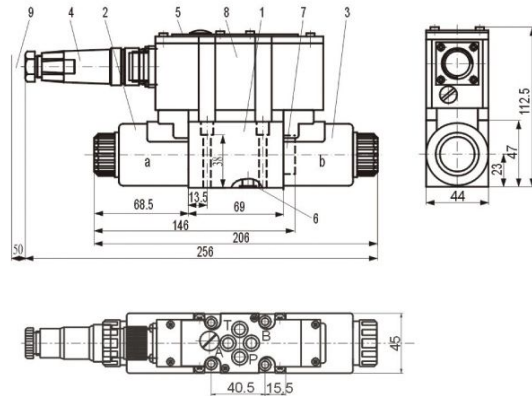
Unit dimensions

BFW-02 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, ISO4401 (and) CETOP-RP 121 H
Valve fixing screws: 4-M5x 45 DIN 912-12.9; $M_s=8.9$ Nm
Subplates :

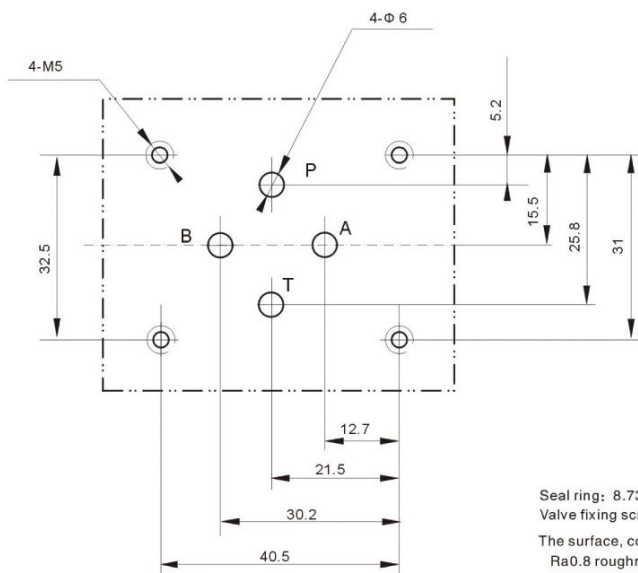
BFWN-02.../...K31...V type



- 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

Subplate Size

BFW-02



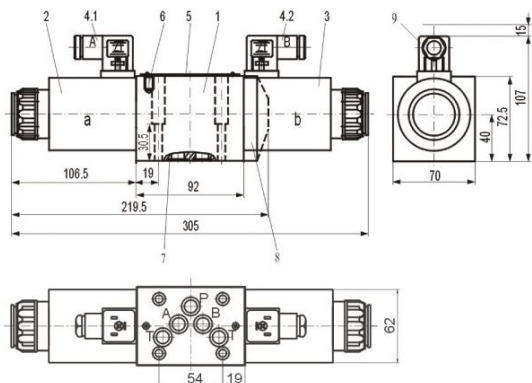
Seal ring: 8.73 x 1.78
Valve fixing screw: 4-M5 x 45-12.9(GB70-85)
The surface, connecting with the valve, should be Ra0.8 roughness, and 0.01/100mm flatness.

Proportional directional valve

HOYE

Unit dimensions

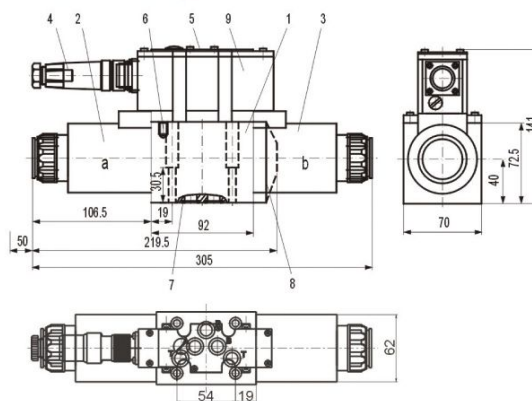
BFW-03 type



- 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, ISO4401 (and) CETOP-RP 121 H

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

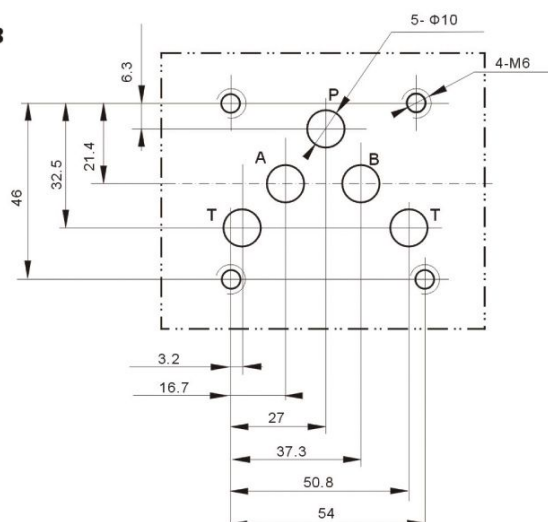
BFWN-03 type



- 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, ISO4401 (and) CETOP-RP 121 H

Subplate Size

BFWN-03



Seal ring: 8.73 x 1.78
Valve fixing screw: 4-M5 x 45-12.9(GB70-85)
The surface, connecting with the valve, should be Ra0.8 roughness, and 0.01/100mm flatness.