Safety directional valves with spool position monitoring
On-off, pilot operated, conforming to Machine Directive 2006/42/EC - certified by TÜV

Two models are available depending on the pilot valve execution:
- **DPHI** for AC and DC supply, solenoid pilot valve I type DHI, with cURus certified solenoids, see tech. table E010
- **DPHE** for AC and DC supply, solenoid pilot valve E type DHE, with cURus certified solenoids, see tech. table E015

The valves are equipped with FV inductive position switch for the main spool position monitoring, see section 9 for sensor’s technical characteristics.

**Certification**
The TÜV certificate can be downloaded from www.atos.com, catalog on line, technical information section.

**Mounting surface:** ISO 4401, size 10, 16, 25
Max flow: 160, 300, 700 l/min
Max pressure: 350 bar

### MODEL CODE

<table>
<thead>
<tr>
<th>DPH</th>
<th>I</th>
<th>2</th>
<th>71</th>
<th>A</th>
<th>FV</th>
<th>X</th>
<th>24DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot operated directional control valve</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solenoid pilot valve:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I = DHI for AC and DC supply with cURus certified solenoids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E = DHE for AC and DC supply, high performances with cURus certified solenoids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve size, ISO 4401:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = 10</td>
<td>2 = 16</td>
<td>4 = 25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

**Spool type**, see section 2

**Notes:**
- FV = inductive position switch providing both NO and NC contacts to be wired on the electric connector
- The FV inductive position switch is directly connected to the valve main spool
- In pilot operated valves only the main spool position is monitored; the pilot solenoid valve is not monitored
3 MAIN CHARACTERISTICS

- Operating pressure
- Assembly position / location
- Subplate surface finishing
  Roughness index Ra 0.4 - flatness ratio 0.01/100 (ISO 1101)
- MTTFd values according to EN ISO 13849
  75 years, for further details see technical table P007
- Flow direction
- Maximum flow

2.1 Standard spools availability
- DPH*-1 are available only with spools 0, 0/2, 1, 1/2, 3, 4, 5, 58, 6, 7
- DPH*-2 and DPH*-4 are available with all spools shown in the above table

2.2 Special shaped spools
- Spools type 0 and 3 are also available as 0/1 and 3/1 with restricted oil passages in central position, from user ports to tank.
- Spools type 1, 4, 5, 58, 6 and 7 are also available as 1/1, 4/8, 5/1, 58/1, 6/1 and 7/1 that are properly shaped to reduce water-hammer shocks during the switching.

2.3 Special spool availability

<table>
<thead>
<tr>
<th>Valve size</th>
<th>0/1</th>
<th>3/1</th>
<th>1/1</th>
<th>4/8</th>
<th>5/1</th>
<th>58/1</th>
<th>6/1</th>
<th>7/1</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPH*-1</td>
<td>•</td>
<td>•</td>
<td></td>
<td>•</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPH*-2, DPH*-4</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

3 MAIN CHARACTERISTICS

- Assembly position / location
- Subplate surface finishing
  Roughness index Ra 0.4 - flatness ratio 0.01/100 (ISO 1101)
- MTTFd values according to EN ISO 13849
  75 years, for further details see technical table P007

Compliance
- CE to Machine Directive 2006/42/EC:
  - EC type-examination certificate for safety components (1)
  - ISO 13849 category 1, PLC in high demand mode
- RoHS Directive 2011/65/EU as last update by 2015/65/EU
- REACH Regulation (EC) n°1907/2006

Ambient temperature
- Standard = -30°C ÷ +70°C
- PE option = -20°C ÷ +70°C

Flow direction
- As shown in the symbols of table 8

Operating pressure
- P, A, B, X = 350 bar (for pilot pressure see also option /9 at section 8)
- T = 250 bar for external drain (standard)
- T with internal drain (option /D) = 120 bar DPH*-1; 210 bar DPH*-2; 160 bar DPH*-4
- Y = 0 bar
- Minimum pilot pressure for correct operation is 8 bar

Maximum flow
- DPH*-1: 160 l/min; DPH*-2: 300 l/min; DPH*-4: 700 l/min
- (see Q/Δp diagrams at section P007 and operating limits at section P007)

(1) The type-examination certificate can be downloaded from www.atos.com
5 HYDRAULIC OPTIONS

5.1 option /A = Solenoid mounted at side of port A of main body (only for single solenoid valves) 
In standard version the solenoid is mounted at side of port B 
For sensor position, see sect 5.2

5.2 option /D = Internal drain (standard configuration is external drain)

5.3 option /E = External pilot pressure (standard configuration is internal pilot pressure)

5.4 option /R = Pilot pressure generator (4 bar on port P - not for DPH*-1)
The device /R generates an additional pressure drop, in order to ensure the minimum pilot pressure, for correct operation of the valves with internal pilot and fitted with spools type 0, 0/1, 4, 4/8, 5, 5/8, 09, 90, 94, 49.
The device /R has to be fitted when the pressure drop in the valve, verified on flow versus pressure diagrams, is lower than the minimum pilot pressure value.

### Pressure drop through the pilot pressure generator /R

**WARNING:** the manual operation is not permitted for safety valves, than the valve is provided with solenoid blind rings to prevent the access to the manual override. The manual override protected by rubber cup (option WP) is not available

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4 SEALS AND HYDRAULIC FLUID - for other fluids not included in below table, consult our technical office

<table>
<thead>
<tr>
<th>Seals, recommended fluid temperature</th>
<th>Suitable seals type</th>
<th>Classification</th>
<th>Ref. Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral oils</td>
<td>NBR, FKM</td>
<td>HL, HLP, HLPD, HVL, HVLDP</td>
<td>DIN 51524</td>
</tr>
<tr>
<td>Flame resistant without water</td>
<td>FKM</td>
<td>HFDU, HFDR</td>
<td>ISO 12922</td>
</tr>
<tr>
<td>Flame resistant with water</td>
<td>NBR</td>
<td>HFC</td>
<td></td>
</tr>
</tbody>
</table>

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5 HYDRAULIC OPTIONS

5.1 option /A = Solenoid mounted at side of port A of main body (only for single solenoid valves) 

5.2 option /D = Internal drain (standard configuration is external drain)

5.3 option /E = External pilot pressure (standard configuration is internal pilot pressure)

5.4 option /R = Pilot pressure generator (4 bar on port P - not for DPH*-1)

---

### Pressure drop through the pilot pressure generator /R

**WARNING:** the inobservance of following prescriptions invalidates the certification and may represent a risk for personnel injury

Safety valves must be installed and commissioned only by qualified personnel

Safety valves must not be disassembled

The inductive position switch FV can be adjusted only by the valve’s manufacturer or Atos authorized service centers

Valve’s components cannot be interchanged

The valves must operate without switching shocks and spool vibrations

---

EY030
6 ELECTRIC FEATURES

(1) Coil can be supplied also with 60 Hz of voltage frequency: in this case the performances are reduced by 10÷15% and the power consumption is 55 VA (DPHI) and 58 VA (DPHE).

(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 150 VA.

(4) Only for DPHI

(5) Only for DPHE

8 COILS ELECTRIC CONNECTORS according to DIN 43650 (to be ordered separately)
10 CONNECTING SCHEME OF FV INDUCTIVE POSITION SWITCH

Connector type ZBE-06 (supplied with the valve)

1 = supply +24 Vdc
2 = output signal NC
3 = GND
4 = output signal NO

Note: the FV position switch is not provided with a protective earth connection

11 STATUS OF OUTPUT SIGNAL

<table>
<thead>
<tr>
<th>DPHI - DPHE</th>
<th>Configuration 61 monitored position '0'</th>
<th>Configuration 63 monitored position '2'</th>
<th>Configuration 67 monitored position '2'</th>
<th>Configuration 71 monitored position '0'</th>
<th>Configuration 75 monitored position '2'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic configuration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>spool position</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>pin 2 sensor</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pin 4 sensor</td>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pin 2 sensor side #1</td>
<td></td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pin 4 sensor side #1</td>
<td></td>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pin 2 sensor side #2</td>
<td></td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pin 4 sensor side #2</td>
<td></td>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
FV position switch can be electrically wired by the customer as NO or NC and then the status of the output signal will be in accordance to the selected configuration

= intermediate spool position corresponding to the hydraulic configuration change
Q/Δp DIAGRAMS based on mineral oil ISO VG 46 at 50°C

For a correct valve operation do not exceed the max recommended flow rates (l/min) shown in the below tables.

### OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

For a correct valve operation do not exceed the max recommended flow rates (l/min) shown in the below tables.
SWITCHING TIMES (average values in m sec)

TEST CONDITIONS:
- Nominal voltage supply DC (direct) and AC (alternating) with connector type SP-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

<table>
<thead>
<tr>
<th>Valve model</th>
<th>70 bar</th>
<th>140 bar</th>
<th>250 bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPH*-1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Switch ON</td>
<td>35–50</td>
<td>50–75</td>
<td>30–40</td>
</tr>
<tr>
<td>Direct current</td>
<td>45–65</td>
<td>20–30</td>
<td>35–50</td>
</tr>
<tr>
<td>Switch OFF</td>
<td>50–80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPH*-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch ON</td>
<td>40–55</td>
<td>55–80</td>
<td>30–45</td>
</tr>
<tr>
<td>Direct current</td>
<td>50–70</td>
<td>20–35</td>
<td>40–55</td>
</tr>
<tr>
<td>Switch OFF</td>
<td>60–95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPH*-4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch ON</td>
<td>60–95</td>
<td>80–115</td>
<td>45–75</td>
</tr>
<tr>
<td>Direct current</td>
<td>60–95</td>
<td>30–50</td>
<td>45–65</td>
</tr>
<tr>
<td>Switch OFF</td>
<td>80–130</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PLUGS 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 270.

Standard valves configuration provides internal pilot and external drain

**Option L9**

This option provides a calibrated restrictor PLUG-H-12A (Ø 1.2 mm) in the P port of the pilot valve

**Option L9**

This option provides a calibrated restrictor PLUG-H-15A (Ø 1.5 mm) in the P port of the pilot valve
DPH*-1/FV

ISO 4401: 2005
Mounting surface:
4401-05-05-0-05

Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050, 2 OR 108
Ports P,A,B,T: Ø = 11 mm (max)
Ports X, Y: Ø = 5 mm

<table>
<thead>
<tr>
<th>Mass (Kg)</th>
<th>DPH*-16</th>
<th>7.1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DPH*-17</td>
<td>7.7</td>
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<tr>
<td></td>
<td>DPH*-18</td>
<td>7.9</td>
</tr>
<tr>
<td>Option H9</td>
<td>+1.0</td>
<td></td>
</tr>
</tbody>
</table>

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

DIMENSIONS of DPH* PILOT OPERATED SAFETY VALVES [mm]
DPH*-2*/FV
ISO 4401: 2005
Mounting surface: 4401-07-07-0-05

Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T, Ø = 20 mm;
Diameter of ports X, Y, Ø = 7 mm;
Seals: 4 OR 130, 2 OR 2043

Mass (Kg):
- DPH-26: 10.1
- DPH-27: 10.7
- DPH-26: 10.2
- DPH-27: 10.9
- Option H, H9: +1.0

**Symbols:**
- **P** = PRESSURE PORT
- **A, B** = USE PORT
- **T** = TANK PORT
- **X** = EXTERNAL OIL PILOT PORT
- **Y** = DRAIN PORT
DPH*-4*/FV
ISO 4401: 2005
Mounting surface: 4401-08-08-0-05

Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 4112, 2 OR 3056

**P = PRESSURE PORT**
**A, B = USE PORT**
**T = TANK PORT**
**X = EXTERNAL OIL PILOT PORT**
**Y = DRAIN PORT**

<table>
<thead>
<tr>
<th>Mass (Kg)</th>
<th>DPH*-46</th>
<th>17.6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DPH*-47</td>
<td>18.2</td>
</tr>
<tr>
<td></td>
<td>DPH*-48</td>
<td>17.7</td>
</tr>
<tr>
<td></td>
<td>DPH*-49</td>
<td>18.4</td>
</tr>
<tr>
<td>Option H, H9</td>
<td>+1.0</td>
<td></td>
</tr>
</tbody>
</table>

DPH*-4*/FV specifications:
- Mounting surface: 4401-08-08-0-05
- Fastening bolts: 6 socket head screws M12x60 class 12.9
- Tightening torque: 125 Nm
- Port diameters:
  - Ports A, B, P, T: Ø = 24 mm
  - Ports X, Y: Ø = 7 mm
- Seals: 4 OR 4112, 2 OR 3056

Diagram showing various configurations of DPH*-4*/FV with different angles and orientations.

Mass table:
- DPH*-46: 17.6 Kg
- DPH*-47: 18.2 Kg
- DPH*-48: 17.7 Kg
- DPH*-49: 18.4 Kg

Option H, H9: +1.0 Kg