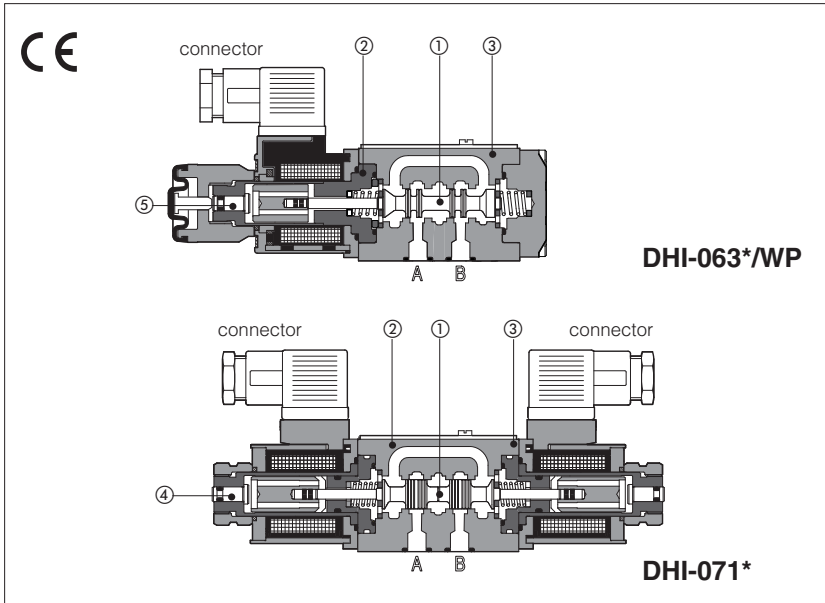


Solenoid directional valves type DHI

direct, spool type



Spool type, two or three position, direct operated valves with solenoids certified according the North American standard **cURus**.

Solenoids ② are made by:

- wet type flanged tube, same for AC and DC power supply, with integrated manual override pin ④
- interchangeable coils, specific for AC or DC power supply, easily replaceable without tools - see section 5 for available voltages

Standard coils protection **IP65**, optional coils with IP67 AMP Junior Timer, XK Deutsch or Lead Wire connections.

Wide range of interchangeable spools ①, see section 2

The valve body ③ is 3 chamber type made by shell-moulding casting with wide internal passages.

Mounting surface: **ISO 4401 size 06**

Max flow: **60 l/min**

Max pressure: **350 bar**

1 MODEL CODE

| | | | | | | | | | | |
|---|-----------|----------|----------|----------|----------|----------|--------------|---|----------|--|
| DHI - 0 | 61 | 1 | / | A | - | X | 24 DC | * | / | * |
| Directional control valves size 06 | | | | | | | | Series number | | Seals material, see section 3: - = NBR PE = FKM BT = HNBR |
| Valve configuration, see section 2 | | | | | | | | Voltage code, see section 5 | | |
| <p>61 = single solenoid, center plus external position, spring centered</p> <p>63 = single solenoid, 2 external positions, spring offset</p> <p>67 = single solenoid, center plus external position, spring offset</p> <p>70 = double solenoid, 2 external positions, without springs</p> <p>71 = double solenoid, 3 positions, spring centered</p> <p>75 = double solenoid, 2 external positions, with detent</p> <p>77 = double solenoid, center plus external position, without springs</p> | | | | | | | | <p>00 = valve without coils</p> <p>X = without connector</p> <p>See section 13 for available connectors, to be ordered separately</p> <p>Coils with special connectors, see section 10</p> <p>XJ = AMP Junior Timer connector</p> <p>XK = Deutsch connector</p> <p>XS = Lead Wire connection</p> | | |

Spool type, see section 2

Options, see note 1 at section 4

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)

| Configurations | Spools | Configurations | Spools |
|---|---|---|---|
| <p>61</p> <p>61/A</p> <p>67</p> <p>67/A</p> <p>71</p> <p>77</p> | <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>1 0 2</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>90</p> <p>09</p> <p>91</p> <p>19</p> <p>93</p> <p>39</p> <p>94</p> <p>49</p> <p>16</p> <p>17</p> <p>58</p> <p>6/7 (1)</p> <p>1/9</p> <p>(1): spool type 6/7 available only for configuration 61, not available for version /A</p> | <p>63</p> <p>63/A</p> <p>70</p> <p>75</p> | <p>1 0 2</p> <p>0/2</p> <p>1/2</p> <p>2/2</p> |

Note: see also section 4, note 3, for special shaped spools

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

| | | | |
|--|---|-----------------------------------|-----------------------------------|
| Assembly position / location | Any position for all valves except for type - 70 and 77 (without springs) that must be installed with horizontal axis if operated by impulses | | |
| Subplate surface finishing | Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101) | | |
| MTTFd values according to EN ISO 13849 | 150 years, for further details see technical table P007 | | |
| Ambient temperature | Standard = -30°C ÷ +70°C | /PE option = -20°C ÷ +70°C | /BT option = -40°C ÷ +70°C |
| Storage temperature | Standard = -30°C ÷ +80°C | /PE option = -20°C ÷ +80°C | /BT option = -40°C ÷ +80°C |
| Surface protection | Body: zinc coating with black passivation | Coil: plastic incapsulation | |
| Corrosion resistance | Salt spray test (EN ISO 9227) > 200 h | | |
| Compliance | CE to Low Voltage Directive 2014/35/EU RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006 | | |
| Seals, recommended fluid temperature | NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C | | |
| Recommended viscosity | 15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s | | |
| Max fluid contamination level | ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog | | |
| Hydraulic fluid | Suitable seals type | Classification | Ref. Standard |
| Mineral oils | NBR, FKM, HNBR | HL, HLP, HLPD, HVLP, HVLPD | DIN 51524 |
| Flame resistant without water | FKM | HFDU, HFDR | ISO 12922 |
| Flame resistant with water | NBR, HNBR | HFC | |
| Flow direction | As shown in the symbols of table 2 | | |
| Operating pressure | Ports P,A,B: 350 bar ; Port T 120 bar | | |
| Rated flow | See diagrams Q/Δp at section 6 | | |
| Maximum flow | 60 l/min , see operating limits at section 7 | | |


3.1 Coils characteristics

| | |
|--------------------------------|--|
| Insulation class | H (180°C) Due to the occurring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 and EN ISO 4413 must be taken into account |
| Protection degree DIN EN 60529 | IP 65 (with connectors 666, 667, 669 or E-SD correctly assembled) |
| Relative duty factor | 100% |
| Supply voltage and frequency | See electric feature 6 |
| Supply voltage tolerance | ± 10% |
| Certification | cURus |

4 NOTES

1 Options

- A** = Solenoid mounted at side of port B (only for single solenoid valves). In standard versions, solenoid is mounted at side of port A.
- WP** = prolonged manual override protected by rubber cap - see section 11.

MV, MO  The manual override operation can be possible only if the pressure at T port is lower than 50 bar.
MV, MO = auxiliary hand lever positioned vertically (MV) or horizontally (MO). For available configuration and dimensions see table E138.

2 Accessories

WPD/H = manual override with detent, to be ordered separately, see tab. K150

3 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** and **58** are also available as **1/1, 4/8, 5/1** and **58/1**. They are properly shaped to reduce water-hammer shocks during the swiching.
- spools type **1, 3, 8** and **1/2** are available as **1P, 3P, 8P** and **1/2P** to limit valve internal leakages.
- spool type **1/9** has closed center in rest position but it avoids the pressurization of A and B ports due to the internal leakages.
- Other types of spools can be supplied on request.

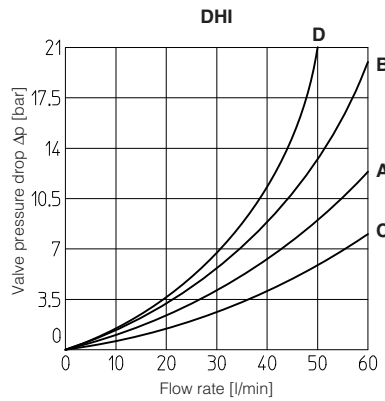
5 ELECTRIC FEATURES

| External supply nominal voltage ± 10% | Voltage code | Type of connector | Power consumption (2) | Code of spare coil | Colour of coil label | | |
|---------------------------------------|-----------------------------------|---|-----------------------|--------------------|----------------------|---|-----------------|
| | | | | DHI | | | |
| 6 DC | 6 DC | 666 or 667 | 33 W | COU-6DC / 80 | brown | | |
| 9 DC | 9 DC | | | COU-9DC / 80 | light blue | | |
| 12 DC | 12 DC | | | COU-12DC / 80 | green | | |
| 14 DC | 14 DC | | | COU-14DC / 80 | brown | | |
| 18 DC | 18 DC | | | COU-18DC / 80 | blue | | |
| 24 DC | 24 DC | | | COU-24DC / 80 | red | | |
| 28 DC | 28 DC | | | COU-28DC / 80 | silver | | |
| 48 DC | 48 DC | | | COU-48DC / 80 | silver | | |
| 110 DC | 110 DC | | | COU-110DC / 80 | black | | |
| 125 DC | 125 DC | | | COU-125DC / 80 | silver | | |
| 220 DC | 220 DC | | | COU-220DC / 80 | black | | |
| 24/50 AC 24/60 AC | 24/50/60 AC | | | 669 | 60 VA (3) | COI-24/50/60AC / 80 (1) | pink |
| 48/50 AC 48/60 AC | 48/50/60 AC | | | | | COI-48/50/60AC / 80 (1) | white |
| 110/50 AC 120/60 AC | 110/50/60 AC 120/60 AC | | | | | COI-110/50/60AC / 80 (1) COI-120/60AC / 80 | yellow white |
| 230/50 AC 230/60 AC | 230/50/60 AC 230/60 AC | COI-230/50/60AC / 80 (1) COI-230/60AC / 80 | light blue silver | | | | |
| 110/50 AC 120/60 AC | 110RC | COU-110RC / 80 | gold | | | | |
| 230/50 AC 230/60 AC | 230RC | COU-230RC / 80 | blue | | | | |

(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
(2) Average values based on tests preformed 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.

6 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

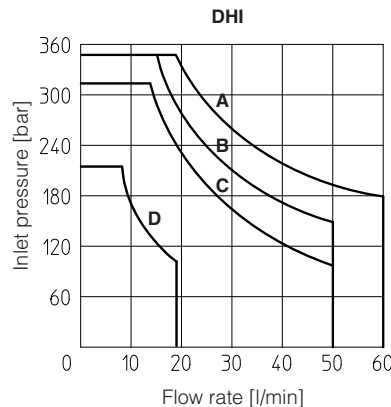
| Flow direction Spool type | P→A | P→B | A→T | B→T | P→T |
|-----------------------------------|--------|-----|-----|-----|-----|
| | 0, 0/1 | C | C | C | C |
| 0/2, 1, 1/1, 1/2 | A | A | A | A | |
| 2, 3, 3/1 | A | A | C | C | |
| 2/2, 4, 4/8, 5, 5/1, 58, 58/1, 94 | D | D | D | D | A |
| 6, 7, 16, 17 | A | A | C | A | |
| 8 | C | C | B | B | |
| 9, 19, 90, 91 | B | B | A | A | |
| 1/9, 39, 93 | D | D | D | D | |



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

The diagrams have been obtained with warm solenoids and power supply at lowest value ($V_{nom} = 10\%$). The curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T). In case of asymmetric flow and if the valves have the devices for controlling the switching times the operating limits must be reduced.

| Curve | Spool type |
|----------|--|
| A | 0, 1, 1/2, 8 |
| B | 0/1, 0/2, 1/1, 1/9, 3, 3/1 |
| C | 4, 4/8, 5, 5/1, 6, 7, 16, 17, 19, 39, 49, 58, 58/1, 09, 90, 91, 93, 94 |
| D | 2, 2/2 |



8 SWITCHING TIMES (average values in msec)

| Valve | Switch-on AC | Switch-on DC | Switch-off |
|-----------------|--------------|--------------|------------|
| DHI + 666 / 667 | 30 | 45 | 20 |
| DHI + 669 | 45 | — | 80 |
| DHI + E-SD | 30 | 45 | 50 |

Test conditions:

- 36 l/min; 150 bar
- nominal voltage
- 2 bar of counter pressure on port T
- mineral oil: ISO VG 46 at 50°C.

The elasticity of the hydraulic circuit and the variations of the hydraulic characteristics and temperature affect the response time.

9 SWITCHING FREQUENCY

| Valve | AC (cycles/h) | DC (cycles/h) |
|-----------------|---------------|---------------|
| DHI + 666 / 667 | 7200 | 15000 |

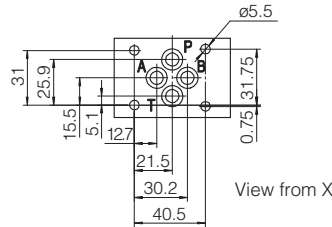
10 COILS WITH SPECIAL CONNECTORS only for voltage supply 12, 14, 24, 28 VDC

| AMP Junior timer connector | Deutsch connector DT-04-2P | Lead Wire connection |
|--|---|--|
| <p>Options -XJ Coil type COUJ, AMP Junior Timer connector Protection degree IP67</p> | <p>Options -XK Coil type COURK Deutsch connector DT-04-2P male Protection degree IP67</p> | <p>Options -XS Coil type COUS, Lead Wire connection Cable length = 180 mm</p> |

Note: For the electric characteristics refer to standard coils features - see section 5

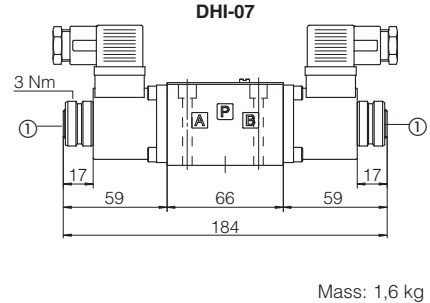
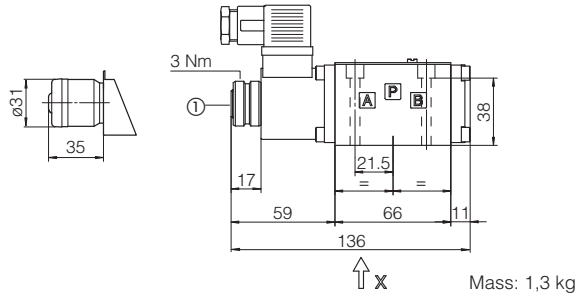
11 DIMENSIONS [mm]

ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
 Fastening bolts:
 4 socket head screws M5x50 class 12.9
 Tightening torque = 8 Nm
 Seals: 4 OR 108
 Ports P,A,B,T: $\varnothing = 7.5$ mm (max).



P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

OPTION /WP



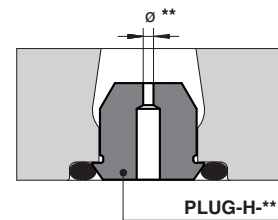
① Standard manual override PIN
 ⚠ The manual override operation can be possible only if the pressure at T ports is lower than 50 bar

Overall dimensions refer to valves with connectors type 666

12 PLUG-IN RESTRICTOR (to be ordered separately)

The use of plug-in restrictors in valve's ports P or A or B may be necessary in case of particular conditions as long flexible hoses or the presence of accumulators which could cause at the valve switching instantaneous high flow peaks over the max valve's operating limits.

| | | | |
|---|---|-----------|----------|
| PLUG-H | - | ** | A |
| <p>08, 10, 12, 15 calibrated orifice diameter in tenths of mm Example PLUG-H-12 = orifice diameter 1,2 mm Other orifice dimensions are available on request</p> | | | |
| <p>Short calibrated orifice</p> | | | |



13 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 (to be ordered separately, see tech table K500)

666 = standard connector IP-65, suitable for direct connection to electric supply source
667 = as 666, but with built-in signal led. Available for power supply voltage 24 AC or DC, 110 AC or DC, 220 AC or DC
669 = with built-in rectifier bridge for supplying DC coils by alternate current (AC 110V and 230V - I_{max} 1A)
E-SD = electronic connector which eliminates electric disturbances when solenoid valves are de-energized

14 MOUNTING SUBPLATES

| Model | Ports location | GAS Ports A-B-P-T | Ø Counterbore [mm] A-B-P-T | Mass [kg] |
|--------|---|-------------------|----------------------------|-----------|
| BA-202 | Ports A, B, P, T underneath; | 3/8" | - | 1,2 |
| BA-204 | Ports P, T underneath; ports A, B on lateral side | 3/8" | 25,5 | 1,8 |
| BA-302 | Ports A, B, P, T underneath | 1/2" | 30 | 1,8 |

The subplates are supplied with 4 fastening bolts M5x50. Also available are multi-station subplates and modular subplates. For further details see table K280.