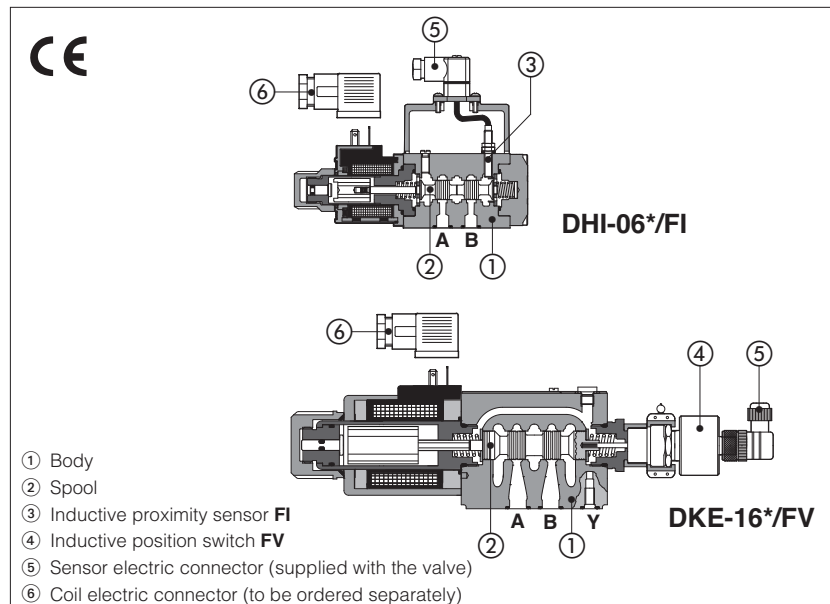


Safety directional valves with spool position monitoring

On-off, direct operated, conforming to Machine Directive 2006/42/EC - certified by



Direct operated safety directional valves with spool position monitoring, **CE** marked and certified by **TÜV** in accordance with safety requirements of Machine Directive 2006/42/EC.

DHI, size 06, for AC and DC supply, with cURus certified solenoids

DHE, size 06, high performances, for AC and DC supply with cURus certified solenoids

DKE, size 10, for AC and DC supply with cURus certified solenoids

The valves are equipped with **FI** inductive proximity sensor or **FV** inductive position switch for the spool position monitoring, see section [1] and [1] for sensors availability and technical characteristics.

Certification

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

Mounting surface: **ISO 4401**, size **06** and **10**

Max flow: **DHI 60 l/min**
DHE 80 l/min
DKE 150 l/min

Max pressure: **350 bar**

1 RANGE OF VALVE'S MODELS

Valve code	Size	Description	DC solenoids		AC solenoids	
			/FI	/FV	/FI	/FV
DHI-06	06	direct operated solenoid valves, on-off, single solenoid	•	•	•	•
DHI-07	06	direct operated solenoid valves, on-off, double solenoid	•		•	
DHE-06	06	direct operated solenoid valves, on-off, single solenoid	•	•	•	•
DHE-07	06	direct operated solenoid valves, on-off, double solenoid	•	•	•	
DKE-16	10	direct operated solenoid valves, on-off, single solenoid	•	•	•	•
DKE-17	10	direct operated solenoid valves, on-off, double solenoid	•	•	•	

Notes:

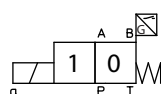
FI = inductive proximity sensor, type NO (normally open) or NC (normally closed)

FV = inductive position switch providing both NO and NC contacts to be wired on the electric connector

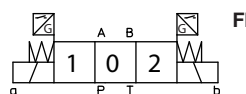
See section [1] for sensor's characteristics

1.1 FI sensor & FV switch configurations

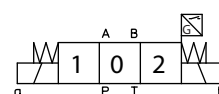
Single solenoid valves size 06 & 10 are provided with n°1 FI sensor or n° 1 FV switch for the spool position monitoring



FI or FV

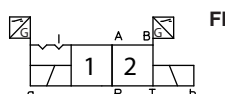


FI

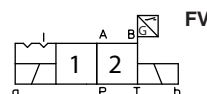


FV

Double solenoid valves size 06 with detent are provided with n°2 FI sensors or n° 1 FV switch for the spool position monitoring

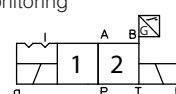


FI



FV

Double solenoid valves size 10 with detent are provided with n° 1 FI sensor or n° 1 FV switch for the spool position monitoring



FI or FV

For model code of **DHI** and **DHE** safety valves, see section [2]

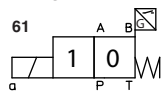
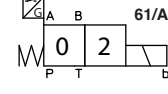
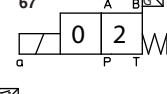
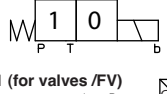
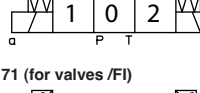
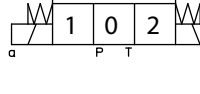
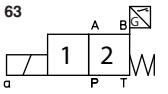
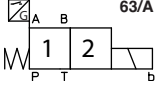
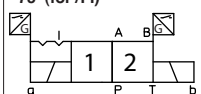
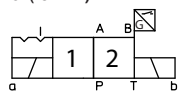
For model code of **DKE** safety valves, see section [4]

2 MODEL CODE OF DHI AND DHE

<p style="text-align: center;">DHI</p> <p>Directional control valve size 06 DHI = max flow 60 l/min DHE = max flow 80 l/min</p> <p>Size ISO 4401 0 = size 06</p> <p>Valve configuration, see section 3</p> <p>61 = single solenoid, central plus external position, spring centered 63 = single solenoid, 2 external positions, spring offset 67 = single solenoid, external plus central position, spring offset 71 = double solenoid, 3 positions, spring centered 75 = double solenoid, 2 external positions, with detent</p> <p>Spool type, see section 3</p> <p>Options, see section 8</p>	-	0	63	1/2	/	A	/	FV	*	-	X	24DC	**	/	*
<p style="text-align: right;">Seals material see sect. 6, 7 - = NBR PE = FKM</p> <p style="text-align: right;">Series number</p> <p style="text-align: right;">Voltage code, see section 9</p> <p>X = without connector, see section 10 for available connectors, to be ordered separately</p> <p>Electrical signal - only for FI version (1): /NC = electric contact is closed when the valve is de-energized /NO = electric contact is open when the valve is de-energized</p> <p>Spool position monitor: FI = inductive proximity switch FV = inductive position switch (double contact)</p>															

(1) the **FV** inductive position switch provides both NC and NO contacts

3 CONFIGURATIONS AND SPOOLS FOR DHI AND DHE (representation according to ISO 1219-1)

Configurations	Spools																																
<p>61</p>  <p>61/A</p>  <p>67</p>  <p>67/A</p>  <p>71 (for valves /FV)</p>  <p>71 (for valves /FI)</p> 	<table style="width: 100%; text-align: center;"> <tr> <td>1 0 2</td> <td>1 0 2</td> <td>1 0 2</td> <td>1 0 2</td> </tr> <tr> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td>8</td> <td>90 <small>only for /FI</small></td> <td>09 <small>only for /FI</small></td> <td>91</td> </tr> <tr> <td>19</td> <td>93 <small>only for /FI</small></td> <td>39 <small>only for /FI</small></td> <td>94 <small>only for /FI</small></td> </tr> <tr> <td>49 <small>only for /FI</small></td> <td>16</td> <td>17</td> <td>58</td> </tr> <tr> <td>1/9 <small>(2)</small></td> <td>2/7 <small>(1)</small></td> <td>5/7 <small>(1)</small></td> <td>6/7 <small>(1)</small></td> </tr> <tr> <td>7/7 <small>(1)</small></td> <td></td> <td></td> <td></td> </tr> </table> <p><small>(1) only for configuration 61, not available for configuration 61/A (2) only for DHI-0711/9/FI and DHE-0711/9/FI</small></p>	1 0 2	1 0 2	1 0 2	1 0 2	0	1	2	3	4	5	6	7	8	90 <small>only for /FI</small>	09 <small>only for /FI</small>	91	19	93 <small>only for /FI</small>	39 <small>only for /FI</small>	94 <small>only for /FI</small>	49 <small>only for /FI</small>	16	17	58	1/9 <small>(2)</small>	2/7 <small>(1)</small>	5/7 <small>(1)</small>	6/7 <small>(1)</small>	7/7 <small>(1)</small>			
1 0 2	1 0 2	1 0 2	1 0 2																														
0	1	2	3																														
4	5	6	7																														
8	90 <small>only for /FI</small>	09 <small>only for /FI</small>	91																														
19	93 <small>only for /FI</small>	39 <small>only for /FI</small>	94 <small>only for /FI</small>																														
49 <small>only for /FI</small>	16	17	58																														
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7/7 <small>(1)</small>																																	
Configurations	Spools																																
<p>63</p>  <p>63/A</p>  <p>75 (for /FI)</p>  <p>75 (for /FV)</p> 	<table style="width: 100%; text-align: center;"> <tr> <td>1 0 2</td> </tr> <tr> <td>0/2</td> </tr> <tr> <td>1/2</td> </tr> <tr> <td>2/2</td> </tr> <tr> <td>1 0 2</td> </tr> <tr> <td>0/2</td> </tr> <tr> <td>1/2</td> </tr> </table>	1 0 2	0/2	1/2	2/2	1 0 2	0/2	1/2																									
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3.2 Special shaped spools for DHI and DHE

- 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 switching.
- spools type **1**, **1/2**, **3**, **8** are available as **1P**, **1/2P**, **3P**, **8P** to limit valve internal leakages.
- Other types of spools can be supplied on request.

3.1 Standard spool availability for DHI and DHE - spools not listed in the table are available for all valves models

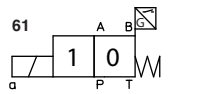
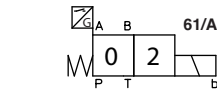
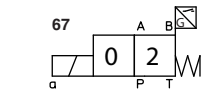
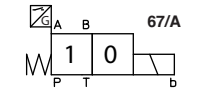
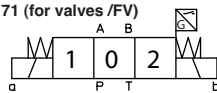
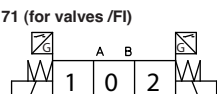

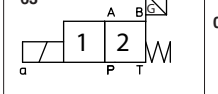
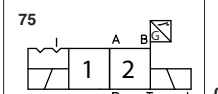
Valve type	standard spool						
	09	90	39	93	49	94	1/9
DHI/FI	•	•	•	•	•	•	•
DHI/FV							
DHE/FI	•	•	•	•	•	•	•
DHE/FV							

4 MODEL CODE OF DKE

<p>DKE</p> <p>Directional control valve size 10</p> <p>Size ISO 4401 1 = size 10</p> <p>Valve configuration, see section 5</p> <p>61 = single solenoid, central plus external position, spring centered</p> <p>63 = single solenoid, 2 external positions, spring offset</p> <p>67 = single solenoid, external plus central position, spring offset</p> <p>71 = double solenoid, 3 positions, spring centered</p> <p>75 = double solenoid, 2 external positions, with detent</p> <p>Spool type, see section 5</p> <p>Options, see section 8</p>	-	1	63	1/2	/	A	/	FV	*	-	X	24DC	**	/	*
<p style="text-align: right; margin-right: 50px;">Seals material see sect. 6, 7 - = NBR PE = FKM</p> <p style="text-align: right; margin-right: 50px;">Series number</p> <p style="text-align: right; margin-right: 50px;">Voltage code, see section 9</p> <p style="text-align: right; margin-right: 50px;">X = without connector, see section 10 for available connectors, to be ordered separately</p> <p>Electrical signal - only for FI version (1): /NC = electric contact is closed when the valve is de-energized /NO = electric contact is open when the valve is de-energized</p> <p>Spool position monitor: FI = inductive proximity switch FV = inductive position switch (double contact)</p>															

DKE/FI and /FV are always provided with Y drain port
(1) the **FV** inductive position switch provides both NC and NO contacts

5 CONFIGURATIONS AND SPOOLS FOR DKE (representation according to ISO 1219-1)

Configurations	Spools																				
<p>61</p>  <p>61/A</p>  <p>67</p>  <p>67/A</p>  <p>71 (for valves /FV)</p>  <p>71 (for valves /FI)</p> 	<table style="width: 100%; text-align: center;"> <tr> <td>1 0 2</td> <td>1 0 2</td> <td>1 0 2</td> <td>1 0 2</td> </tr> <tr> <td>0</td> <td>1</td> <td>3</td> <td>4</td> </tr> <tr> <td>5</td> <td>6</td> <td>7</td> <td>8</td> </tr> <tr> <td>91</td> <td>19</td> <td>93</td> <td>39</td> </tr> <tr> <td>58</td> <td>1/9 (2)</td> <td>1/3 (1)</td> <td>7/7</td> </tr> </table>	1 0 2	1 0 2	1 0 2	1 0 2	0	1	3	4	5	6	7	8	91	19	93	39	58	1/9 (2)	1/3 (1)	7/7
1 0 2	1 0 2	1 0 2	1 0 2																		
0	1	3	4																		
5	6	7	8																		
91	19	93	39																		
58	1/9 (2)	1/3 (1)	7/7																		
<p>63</p>  <p>63/A</p>  <p>75</p> 	<table style="width: 100%; text-align: center;"> <tr> <td>1 0 2</td> </tr> <tr> <td>0/2</td> </tr> <tr> <td>1/2</td> </tr> <tr> <td>2/2</td> </tr> <tr> <td>2/7 (3)</td> </tr> <tr> <td>5/7 (3)</td> </tr> <tr> <td>1 0 2</td> </tr> <tr> <td>0/2</td> </tr> <tr> <td>1/2</td> </tr> </table>	1 0 2	0/2	1/2	2/2	2/7 (3)	5/7 (3)	1 0 2	0/2	1/2											
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(1) only for DKE-1611/3/*DC
(2) only for DKE-1711/9/FI
(3) only for configuration 63, not available for configuration 63/A

5.1 Special shaped spools for DKE

- 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** is also available as **1/1**, properly shaped to reduce the water-hammer shocks during the switching.
- 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.

6 MAIN CHARACTERISTICS

Assembly position / location	Any position	
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	
Flow direction	As shown in the symbols of table 3 and 5	
Operating pressure	DHI	P, A, B = 350 bar T = 100 bar (version /FI); 120 bar (version /FV)
	DHE	P, A, B = 350 bar T = 100 bar (version /FI); 210 bar (DC solenoid - version /FV); 160 bar (AC solenoid - version /FV)
	DKE	P, A, B = 350 bar T = (with Y port not connected to tank) 100 bar (version /FI); 210 bar (DC solenoid - version /FV); 120 bar (AC solenoid - version /FV) T = (with Y port drained to tank) 250 bar
Rated flow	see diagrams Q/Δp at section 14	
Maximum flow	DHI	60 l/min see section 15
	DHE	80 l/min see section 15
	DKE	150 l/min see section 15

6.1 Coils characteristics

Insulation class	H (180°C) for DC coils (all versions) and AC coils (only DHI) F (155°C) for AC coils (DHE, DKE) 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 to DIN EN 60529	IP 65 (with connectors correctly assembled)
Relative duty factor	100%
Supply voltage and frequency	See electric features 9
Supply voltage tolerance	± 10%
Certification	cURus North American standard

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

Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C			
Recommended viscosity	15÷100 mm ² /s - max allowed range 2,8 ÷ 500 mm ² /s			
Fluid contamination class	ISO 4406 class 21/19/16 NAS 1638 class 10, in line filters of 25 μm (β ₂₅ ≥75 recommended)			
	Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
	Mineral oils	NBR, FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
	Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
	Flame resistant with water	NBR	HFC	

8 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.

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



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 proximity FI or 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

11 TECHNICAL CHARACTERISTICS OF INDUCTIVE PROXIMITY AND POSITION SWITCHES

Type of switch	/FI proximity sensor	/FI scheme	/FV position switch	/FV scheme
Supply voltage [V]	10÷30		20÷32	
Ripple max [%]	≤ 20		≤ 10	
Max current [mA]	200		400	
Max peak pressure [bar]	100		400	
Mechanical life	virtually infinite		virtually infinite	
Switch logic	PNP		PNP	
	1 output signal 2 supply +24 Vdc	4 GND	1 supply +24 Vdc 2 output signal	3 GND 4 output signal

12 CONNECTING SCHEMES OF INDUCTIVE PROXIMITY AND POSITION SWITCHES - FI and FV sensor's connector are always supplied with the valve

DH*/FI single solenoid / double solenoid (dotted line)	/FV (all valves) single solenoid	/FV (all valves) double solenoid	DKE/FI single solenoid	DKE/FI double solenoid
Connector type 345 IP65	Connector type ZBE-06 IP65	Connector type ZBE-06 IP65	Connector type 666 IP65	Connector type 664 IP65
1 = output signal 2 = supply +24 Vdc 3 = output signal for double solenoid 4 = GND	1 = supply +24 Vdc 2 = output signal NC 3 = GND 4 = output signal NO	1 = supply +24 Vdc 2 = output signal sol. b 3 = GND 4 = output signal sol. a	1 = output signal S 2 = supply +24 Vdc ⊕ = GND	1 = output signal sol. a 2 = supply +24 Vdc 3 = output signal sol. b ⊕ = GND

NOTE: the /FI proximity and /FV position switch are not provided with a protective earth connection

13 STATUS OF OUTPUT SIGNAL

13.1 Signal status for FI versions

	Configuration 61 monitored position "0"	Configuration 63 monitored position "1"	Configuration 67 monitored position "2"	Configuration 71 monitored position "0"	Configuration 75 monitored position "2"
HYDRAULIC CONFIGURATION					
spool position	1 0	1 2	0 2	1 0 2	1 2
sensor signal	ON: low, OFF: high	ON: low, OFF: high	ON: low, OFF: high	ON: high, OFF: low	ON: high, OFF: low
sensor a signal	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low
sensor b signal	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low

Diagrams show the behaviour of the output signal for inductive switches type **F/NO**.

For inductive switches type **F/NC** the behaviour is opposite (high level signal instead of low level signal and viceversa)

13.2 Signal status for FV versions

DH - DK	Configuration 61	Configuration 63	Configuration 67	Configuration 71	Configuration 75
Hydraulic configuration					
spool position	1 0	1 2	0 2	1 0 2	1 2
pin 2	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low
pin 4	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low	ON: high, OFF: low

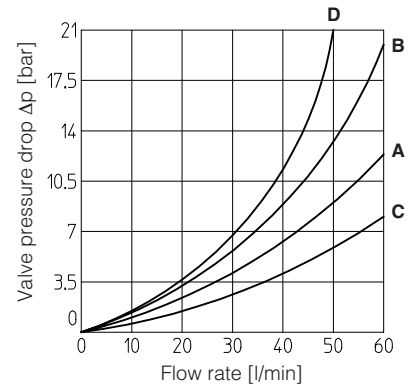
Note: FV position switch can be electrically wired by the customer as NO or NC and then the status of the output signal will be in accordance to the selected configuration

= intermediate spool position corresponding to the hydraulic configuration change

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

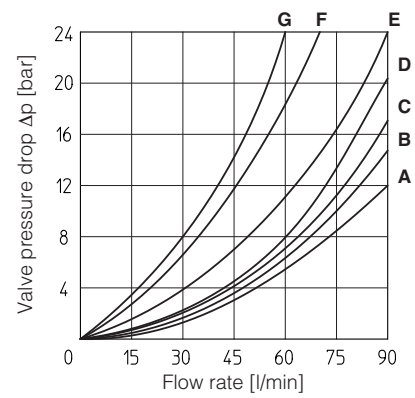
DHI

Spool type	Flow direction				
	P→A	P→B	A→T	B→T	P→T
0, 0/1	C	C	C	C	
0/2, 1, 1/1, 1/2, 1/9	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	
09, 19, 90, 91	B	B	A	A	
39, 93	D	D	D	D	



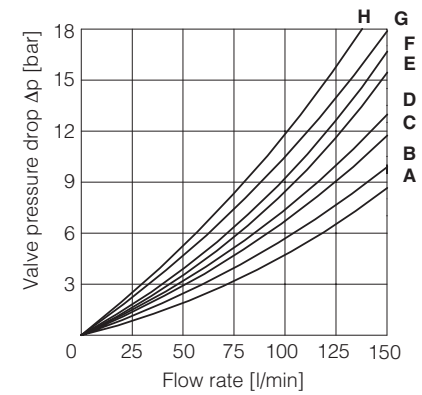
DHE

Spool type	Flow direction				
	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1, 1/9	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 49, 58, 58/1, 94	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7, 16, 17	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			
09, 19, 90, 91	E	E	D	D	
39, 93	F	F	G	G	



DKE

Spool type	Flow direction					
	P→A	P→B	A→T	B→T	P→T	B→A
0, 0/1, 0/2, 2/2	A	A	B	B		
1, 1/1, 1/9, 6, 8	A	A	D	C		
3, 3/1, 7	A	A	C	D		
4	B	B	B	B	F	
5, 58	A	B	C	C	G	
1/2	B	C	C	B		
19, 91	E	E	G	G		H
39, 93	F	F	G	G		H

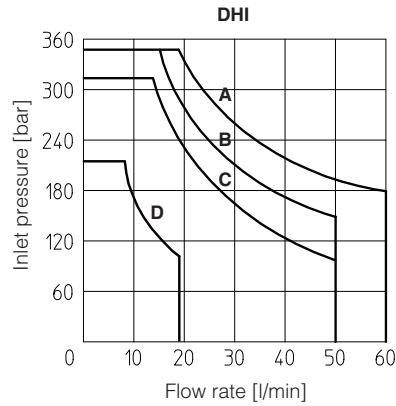


15 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

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.

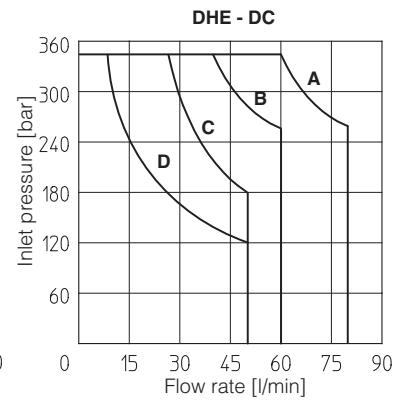
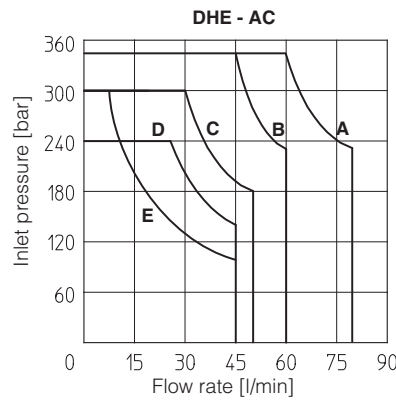
DHI

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



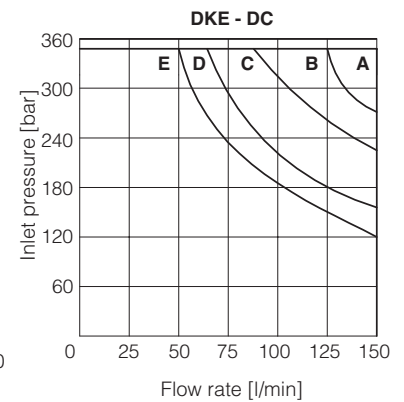
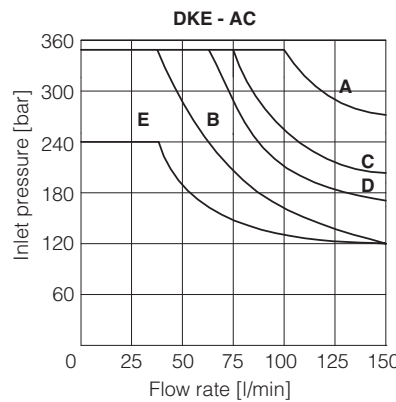
DHE

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

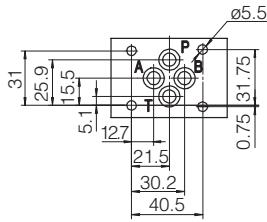


DKE

Curve	Spool type	
	AC	DC
A	0/1	0, 0/1, 1, 1/1, 3, 3/1, 1/2, 0/2, 8
B	4, 5, 19, 91	6, 7
C	0, 1/1, 3, 3/1	19, 91
D	1, 1/2, 0/2	4, 5
E	6, 7, 8, 2/2	2/2



16 DIMENSIONS FOR DHI AND DHE SOLENOID SAFETY VALVES [mm]



ISO 4401: 2005

Mounting surface: 4401-03-02-0-05

Fastening bolts:

4 socket head screws: M5x50 class 12.9 (DHI)
M5x30 class 12.9 (DHE)

Tightening torque = 8 Nm

Seals: 4 OR 108

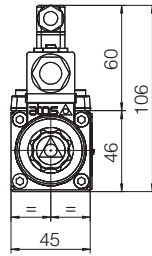
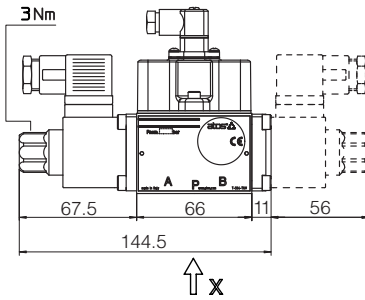
Ports P,A,B,T: \varnothing = 7.5 mm (max)

P = PRESSURE PORT

A, B = USE PORT

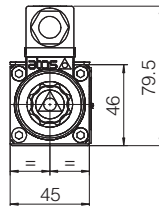
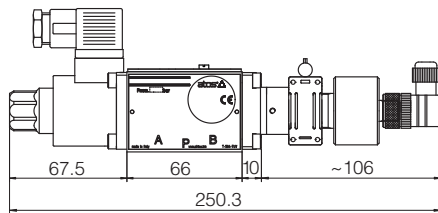
T = TANK PORT

DHI-06*/FI (DC, AC)
DHI-07*/FI (DC, AC) dotted line



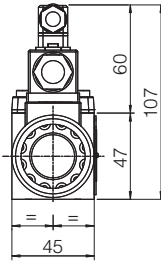
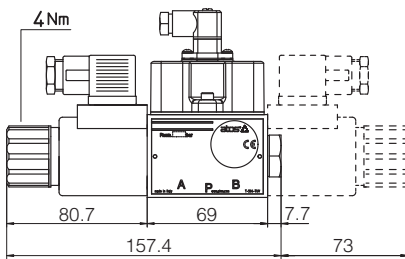
Mass:
kg 1,6 (one solenoid)
kg 1,9 (two solenoids)

DHI-06*/FV (DC, AC)



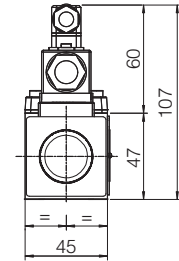
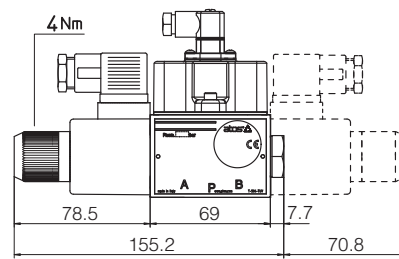
Mass: kg 1,7

DHE-06*/FI (DC)
DHE-07*/FI (DC) dotted line



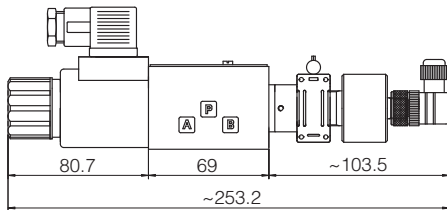
Mass:
kg 1,85 (one solenoid)
kg 2,1 (two solenoids)

DHE-06*/FI (AC)
DHE-07*/FI (AC) dotted line



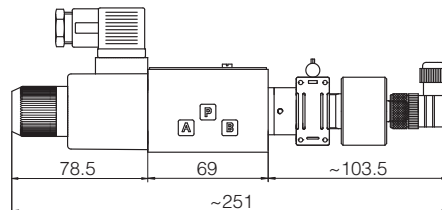
Mass:
kg 1,85 (one solenoid)
kg 2,1 (two solenoids)

DHE-06*/FV (DC)

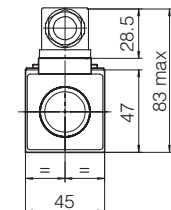


Mass: kg 1,95

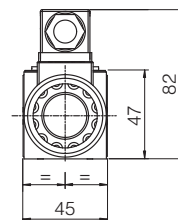
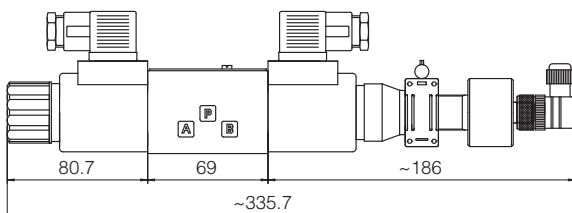
DHE-06*/FV (AC)



Mass: kg 1,8

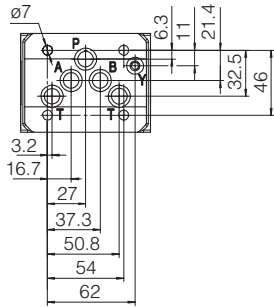


DHE-07*/FV (DC)



Mass: kg 2,2

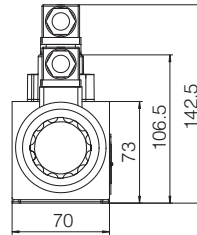
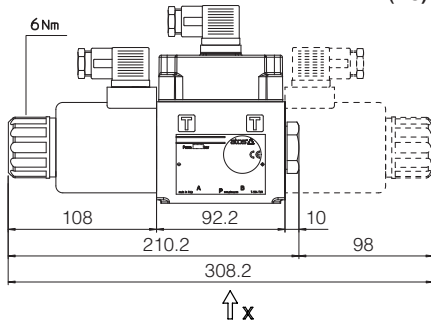
17 DIMENSIONS OF DKE SOLENOID SAFETY VALVES [mm]



ISO 4401: 2005
Mounting surface:
4401-05-05-0-05
(without port X)
 Fastening bolts:
 4 socket head screws M6x40 class 12.9
 Tightening torque = 15 Nm
 Seals: 5 OR 2050. 1 OR 108
 Ports P,A,B,T: $\varnothing = 11.5$ mm (max)
 Ports Y: $\varnothing = 5$ mm

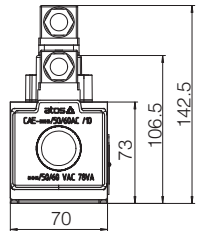
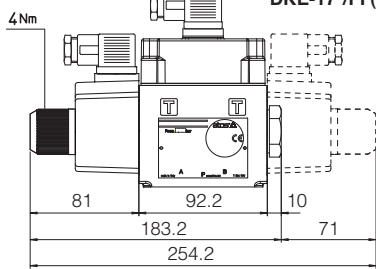
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
Y = DRAIN PORT

DKE-16*/FI (DC)
DKE-17*/FI (DC) dotted line



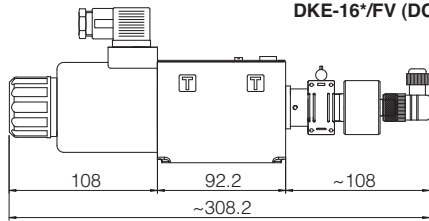
Mass:
 kg 4,4 (one solenoid)
 kg 5,8 (two solenoids)

DKE-16*/FI (AC)
DKE-17*/FI (AC) dotted line



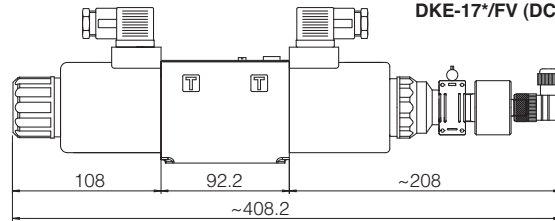
Mass:
 kg 3,7 (one solenoid)
 kg 4,4 (two solenoids)

DKE-16*/FV (DC)



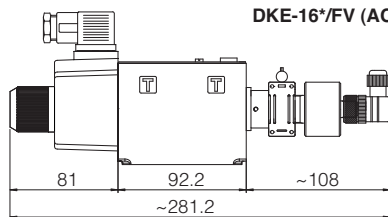
Mass: kg 4,4

DKE-17*/FV (DC)



Mass: kg 5,9

DKE-16*/FV (AC)



Mass: kg 3,8