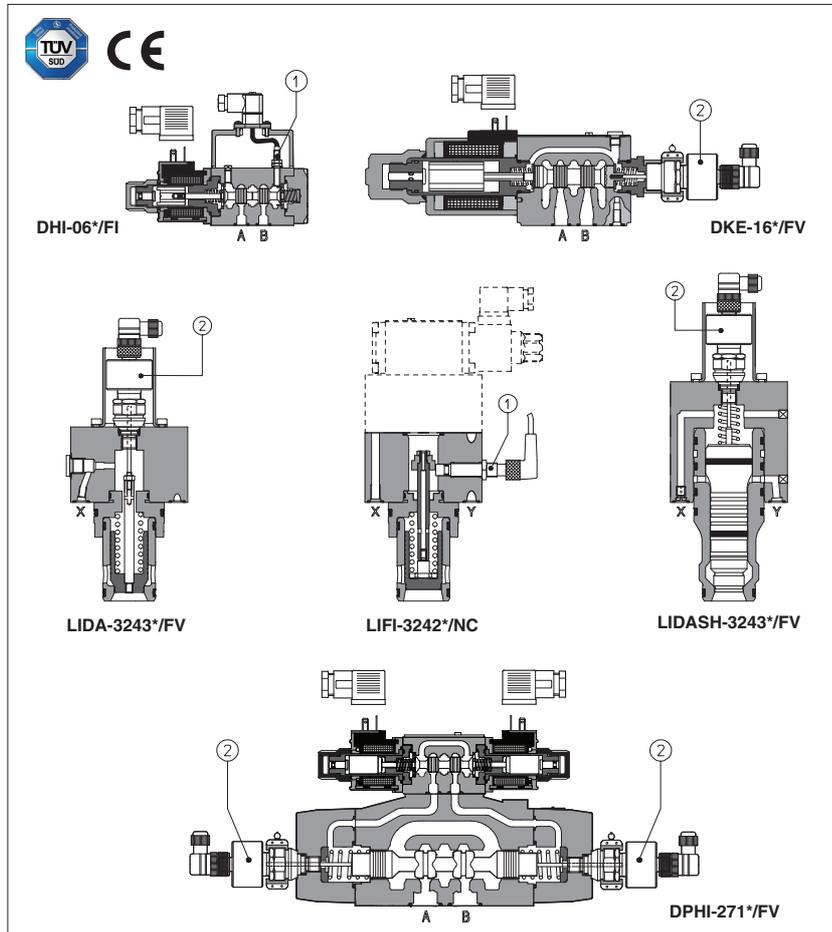


Safety valves

direct, pilot operated and cartridge execution with inductive position or proximity switches conforming to Machine Directive 2006/42/CE



Safety valves are designed to fulfil the safety criteria imposed to machine manufacturers by the European Machine Directive. They are **CE marked and certified by TÜV**, in accordance with the technical safety requirements provided in the **Machine Directive 2006/42/CE** but not included in the safety components of annex IV.

In addition to the normal hydraulic function they are equipped with inductive or proximity switches; with the on/off switch indicates the position of the spool/poppet of the valve. These valves are normally used to cut off the hydraulic power line in case of emergency condition, thus avoiding dangerous movements of the machines actuators. By checking the switch status, corresponding to "open" or "intercepted" hydraulic line, the machine controller can perform the safety function.

Two versions are available:

- **FI** inductive proximity switch (1);
 - **FV** inductive position switch (double contacts) (2);
- see section 14 for technical characteristics.

Safety valves are available in direct, piloted and cartridge executions, with same hydraulic and electric characteristics of standard products from which they are derived.

Typical application is on vertical and horizontal presses to shut off the fluid energy to one or more actuators as a consequence of the opening of the machine "gate" or as a consequence of an "emergency stop" command.

For details about the applicable EN standards, see www.atos.com, catalog on line, section P, table P004.

1 RANGE OF VALVE'S MODELS

Valve code	Size	Description	DC solenoids		AC solenoids	
			Switch type			
			/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	•	•	•	
DKER-16	10	direct operated solenoid valves, on-off, single solenoid	•		•	
DKER-17	10	direct operated solenoid valves, on-off, double solenoid	•		•	
DPH*	16; 25	piloted operated solenoid valves, on-off, with DHE or DHI pilot		•		•
LIFI	16÷50	intermediate elements with cartridge, to be coupled with a specific cover	•		•	
LIDA(H)	16÷50	on-off cartridges		•		•
LIDAS(H)	16÷50	on-off active cartridges		•		•

4 SAFETY VALVES IN CARTRIDGE EXECUTION (MADE BY INTERMEDIATE ELEMENT AND COVER)

4.1 MODEL CODE FOR INTERMEDIATE ELEMENT INCLUSIVE OF THE CARTRIDGE

<p>LIF</p> <p>Intermediate element (with poppet position detector) including the cartridge</p> <p>Type of switch: I = inductive proximity switch</p> <p>Size (ISO 7368), the same of the cover - see section 20 16; 25; 32; 40; 50 Other dimensions available on request</p> <p>Type of poppet, see tab. H030 for Q/Δp diagrams 42 = With damping nose, area ratio 1:1,1 43 = With damping nose, area ratio 1:2 (for size 16 and 25) 1:1,6 (for size 32, 40 and 50) normally closed, to be coupled with covers type LIDA, LIDB, LIDBH**, LIDEW* see section 5.2</p>	<p>I - 25 42 1</p>	<p>/NC</p>	<p>**</p>	<p>/*</p>
<p>Seals material: omit for NBR (mineral oil & water glycol) PE = FPM</p> <p>Series number</p> <p>/NC = closed contact with poppet in resting position</p> <p>Spring cracking pressure: 1 = 0,3 bar for poppet 42; 0,6 bar for poppet 43 2 = 1,5 bar for poppet 42 3 = 3 bar for all poppets 6 = 5,5 bar for all poppets</p>				

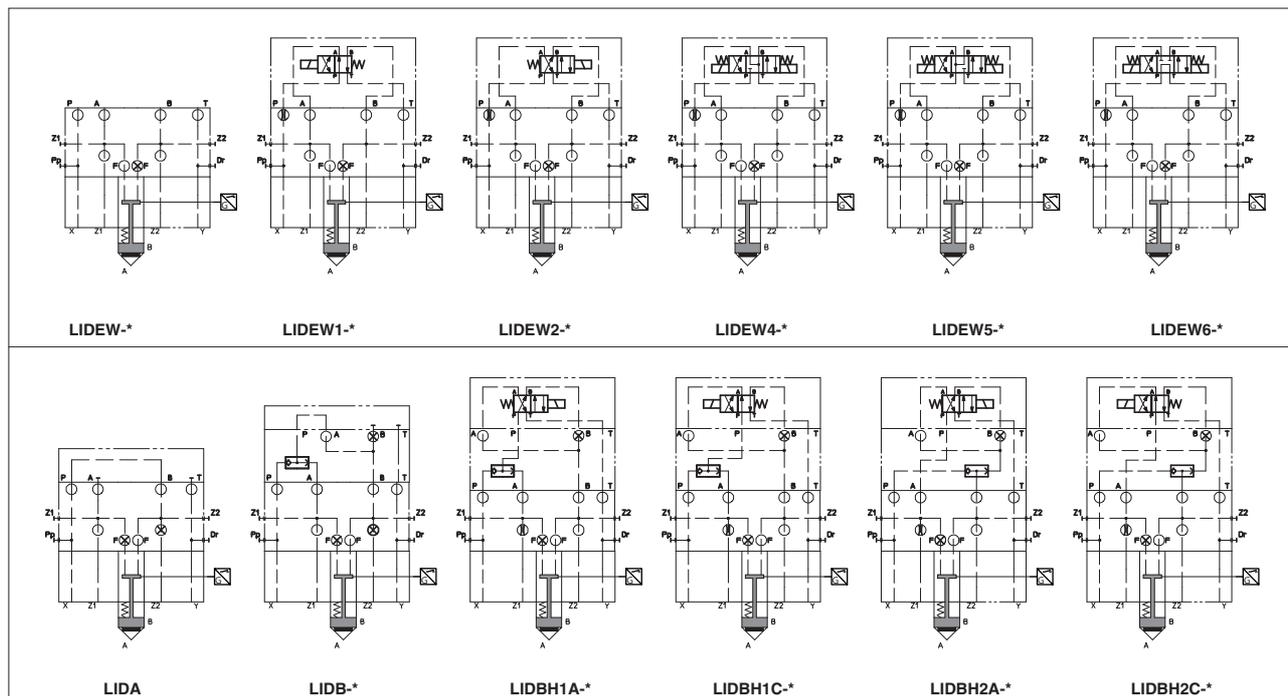
Note: in these safety valves the cartridge and the intermediate element with poppet position detector cannot be separated.

4.2 COVER MODEL CODE

<p>LID</p> <p>Cover according to ISO 7368 to be coupled with LIFI safety valves</p> <p>Cover type, see section 7 for hydraulic configuration: A = direct pilot B = with shuttle valve for pilot selection; EW* = with solenoid valve for pilot selection BH** = as EW* but with shuttle valve for pilot selection;</p> <p>Size 1 = 16; 2 = 25; 3 = 32; 4 = 40; 5 = 50; Other sizes available on request</p> <p>F = prearranged for coupling with LIFI cover</p> <p>E = with external attachment X (1/4" GAS) and underneath port X plugged</p>	<p>A - 2 / F E</p>	<p>-I X</p>	<p>24DC</p>	<p>**</p>	<p>/*</p>
<p>Special execution of the calibrated plugs in the pilot channels (see tables H030, H040)</p> <p>Seals material: omit for NBR (mineral oil & water glycol) PE = FPM</p> <p>Series number</p> <p>Voltage code (only for LIDBH** and LIDEW*) see section 11</p> <p>Only for LIDBH** and LIDEW*: X = without connector, to be order separately (see tab. K500)</p> <p>Type of pilot solenoid valve (only for LIDBH** and LIDEW*): -I = DHI for AC and DC supply with cURus certified solenoids -E = DHE for AC and DC supply high performances</p>					

According to the machinery safety requirements, in particular applications at least two safety valves (redundancy) will be provided (the first one leak free type). For valve type LIDB, LIDEW (in the configuration with external pilot line) Atos can supply leak free poppet type directional pilot valves type DLOH-3*. Consult our technical office for detailed information.

5 HYDRAULIC SYMBOLS (the following symbols shown the covers function coupled with safety valve type LIFI)



6 MODEL CODE OF SAFETY VALVES IN CARTRIDGE EXECUTION (INTEGRAL DESIGN COVER)

LIDA H - 25 43 3 / FV / I X 24DC ** /*

Safety cartridge valve according to ISO 7368

optional pilot valve:
 - = omit if not required
H = with NG 6 pilot valve

Size: **16 25 32 40 50**

poppet type:

43 = with damping nose, area ratio
 1:2 (size 16 and 25)
 1:1,6 (size 32,40 and 50)

spring cracking pressure:

1 = 0,6 bar **3** = 3 bar **6** = 5,5 bar

Type of switch:

FV = inductive position switch

Seals material:
 omit for NBR (mineral oil & water glycol)
PE = FPM

Series number

Only for LIDAH

X = Voltage code see section 11

Only for LIDAH

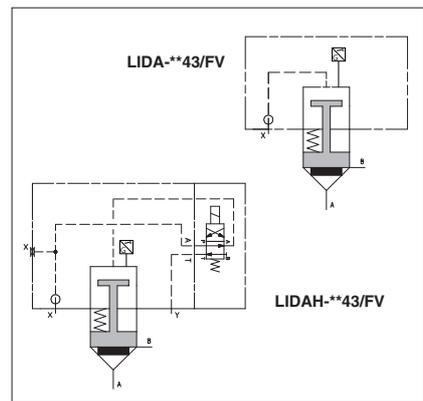
without solenoid connectors to be ordered separately (see tab. K500)

Pilot solenoid valve

-I = DHI for AC and DC supply, with **cURus** certified solenoids

-E = DHE for AC and DC supply, high performances

7 HYDRAULIC SYMBOLS OF LIDA



8 MODEL CODE OF SAFETY VALVES IN CARTRIDGE EXECUTION (INTEGRAL DESIGN COVER)

LIDAS H - 40 43 3 / FV - I X 24DC ** /*

On-off active cartridges, according to ISO 7368

Pilot control
 - = without pilot solenoid valve
H = with pilot solenoid valve

Size: **16 25 32 40 50**

Poppet type: see section 9

31 } Not available for
33 } option /FV
43 (with dumping nose)

3 = spring cracking pressure 3 bar

Optional poppet sensor

FV = inductive proximity switch

Seals material:
 omit for NBR (mineral oil & water glycol)
PE = FPM

series number

Only for LIDAS

Voltage code, see section 11

Only for LIDAS

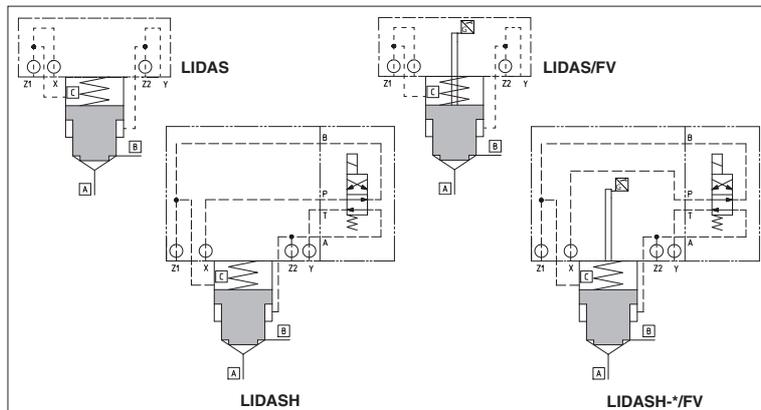
X = without connector, see section 11

Pilot valve only for LIDAH:

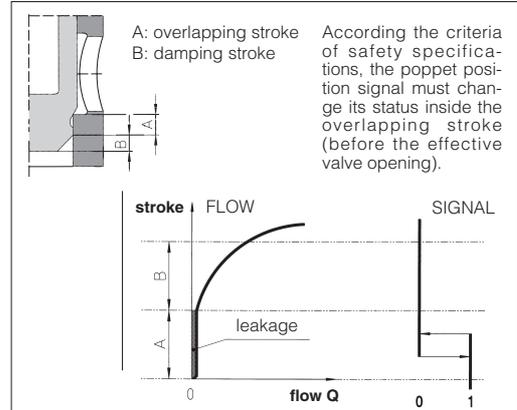
-I = DHI for AC and DC supply with **cURus** certified solenoids

-E = DHE for AC and DC supply high performances

9 HYDRAULIC SYMBOLS OF LIDAS



10 STATUS OF OUTPUT SIGNALS for cartridge valves LIFI, LIDA*/FV and LIDAS*/FV



11 VOLTAGE CODE

Valve	External supply nominal voltage ± 10%	Voltage code	Type of connector	Power consumption
DHI DPHI LIDAH-I LIDAS-H	6 DC	6 DC	666 or 667	33 W
	9 DC	9 DC		
	12 DC	12 DC		
	14 DC	14 DC		
	18 DC	18 DC		
	24 DC	24 DC		
	28 DC	28 DC		
	48 DC	48 DC		
	110 DC	110 DC		
	125 DC	125 DC		
	220 DC	220 DC		
	24/50 AC	24/50/60 AC (1)		
24/60 AC	24/60/60 AC (1)			
48/50 AC	48/50/60 AC (1)			
48/60 AC	48/60/60 AC (1)			
110/50 AC	110/50/60 AC (1)			
120/60 AC	120/60/60 AC (1)			
230/50 AC	230/50/60 AC (1)			
230/60 AC	230/60/60 AC (1)			
110/50 AC	110RC			
120/60 AC	110RC			
230/50 AC	230RC			
230/60 AC	230RC			

Valve	External supply nominal voltage ± 10%	Voltage code	Type of connector	Power consumption		
DHE DHER DPHE LIDAH-E LIDAS-H-E	12 DC	12 DC	666 or 667	30 W		
	14 DC	14 DC				
	24 DC	24 DC				
	28 DC	28 DC				
	48 DC	48 DC				
	110 DC	110 DC				
	125 DC	125 DC				
	220 DC	220 DC				
	110/50 AC	110/50/60 AC				
	230/50 AC	230/50/60 AC				
	115/60 AC	115/60 AC				
	230/60 AC	230/60 AC				
DKE DKER	110/50 AC	110 RC	669	58 VA		
	120/60 AC	110 RC				
	230/50 AC	230 RC				
	230/60 AC	230 RC				
	12 DC	12 DC			666 or 667	36 W (DKE) 39 W (DKER)
	24 DC	24 DC				
	110 DC	110 DC				
	220 DC	220 DC				
	110/50/60 AC	110/50/60 AC				
	230/50/60 AC	230/50/60 AC				
	110/50/60 AC	110 DC				
	230/50/60 AC	230 DC				
110/50/60 AC	110 DC					
230/50/60 AC	220 DC					

12 MAIN CHARACTERISTICS

Installation position	Any position	
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)	
Ambient temperature	from -20°C to +70°C	
Fluid	Hydraulic oil as per DIN 51524 535; for other fluids see specific model code	
Recommended viscosity	15 ÷ 100 mm ² /s at 40°C (ISO VG 15 ÷ 100)	
Fluid contamination class	ISO 4406 class 21/19/16 NAS 1638 class 10, in line filters of 25 µm (β ₁₀ ≥ 75 recommended)	
Fluid temperature	-20°C +60°C (standard seals) -20°C +80°C (/PE seals)	
Flow direction	As shown in the symbols of tables 8	
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
	DKER	P, A, B = 350 bar T = (with Y port not connected to tank) 100 bar (version /FI); 210 bar (DC solenoid - version /FV); 160 bar (AC solenoid - version /FV) T = (with Y port drained to tank) 250 bar
	DPH*	P, A, B, X = 350 bar T = 250 bar for external drain (standard) T with internal drain (option /D) = 120 bar DPPI; 210 bar DPHE (DC); 160 bar DPHE (AC) Ports Y = 0 bar Minimum pilot pressure for correct operation is 8 bar
	LIFI LIDA/FV LIDAS(H)	A, B, X = 315 bar Y = see port T of selected pilot valve (DHI, DHE or DHER) A, B, X = 350 bar - Y = 2 bar (for LIDASH)
Maximum flow	DHI	60 l/min see technical table E010, section 8, operating limits
	DHE, DHER	80 l/min see technical table E015, section 9, operating limits
	DKE	150 l/min see technical table E025, section 9, operating limits
	DPH*	DPH*-2: 300 l/min ; DPH*-4: 700 l/min ;
	LIFI (at ΔP = 6 bar)	poppet 42 size 16 = 150 l/min ; size 25 = 320 l/min ; size 32 = 600 l/min ; size 40 = 1250 l/min ; size 50 = 2000 l/min poppet 43 size 16 = 130 l/min ; size 25 = 300 l/min ; size 32 = 480 l/min ; size 40 = 940 l/min ; size 50 = 1500 l/min
	LIDA/FV (at ΔP = 6 bar)	poppet 43 size 16 = 130 l/min ; size 25 = 300 l/min ; size 32 = 480 l/min ; size 40 = 940 l/min ; size 50 = 1500 l/min
	LIDAS(H) (at ΔP = 5 bar)	poppet 43 size 16 = 220 l/min ; size 25 = 400 l/min ; size 32 = 600 l/min ; size 40 = 1300 l/min ; size 50 = 2000 l/min

12.1 Coils characteristics

Insulation class	H (180°C) for all valves with DC coils and DHI, DPPI with AC coils F (155°C) for DHE, DHER, DKE, DKER, DPHE with AC coils Due to the occurring surface temperatures of the solenoid coils, the European standards EN ISO 13732-1 EN ISO 4413 must be taken into account
Connector protection degree	IP 65
Relative duty factor	100%
Supply voltage and frequency	See electric feature 11
Supply voltage tolerance	± 10%
Certification (only DHI, DKER, DPPI)	cURus North American standard

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 switch or the position switch can be adjusted only by the manufacturer
Valve's components cannot be interchanged
The valves must operate without switching shocks and spool / poppet vibrations

13 STATUS OF OUTPUT SIGNAL FOR DIRECTIONAL VALVES

	Configuration 61			Configuration 63			Configuration 67			Configuration 71			Configuration 75				
ISO 4401 size 06 and 10																	
HYDRAULIC CONFIGURATION	1	INT. POS.	0	1	INT. POS.	2	0	INT. POS.	2	1	INT. POS.	0	INT. POS.	2	1	INT. POS.	2
SIGNAL S																	
SIGNAL SA																	
SIGNAL SB																	

Diagrams show the behaviour of the output signal for inductive switches type **FI/NO**. For inductive switches type **FI/NC** the behaviour is opposite (high level signal instead of low level signal and viceversa)

(1) According to the criteria of safety specifications, the spool position signal must change its status during the intermediate position between two hydraulic configurations.

Note: FV versions 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

14 TECHNICAL CHARACTERISTICS OF INDUCTIVE PROXIMITY AND POSITION SWITCHES

Type of switch		inductive proximity /FI	position switch /FV	inductive proximity - only for LIFI
Supply voltage	[V]	10÷30	20÷32	10÷30
Ripple max	[%]	≤ 10	≤ 10	≤ 5
Max current	[mA]	100	400	200
Power consumption	[mA]	10	-	8
Voltage drop	[V]	≤ 3	-	≤ 1,5
Max switching frequency	[Hz]	1000	-	1000
Max peak pressure	[bar]	20	400	350
Mechanical life		virtually infinite		
Switch logic		PNP		

15 CONNECTING SCHEMES OF INDUCTIVE PROXIMITY AND POSITION SWITCHES

DH*/FI single solenoid / double solenoid (dotted line)	/FV (all valves) single and double solenoid	DKE*/FI single solenoid	DKE*/FI double solenoid	LIFI
Connector type 345	Connector type ZBE-06	Connector type 666	Connector type 664	Connector type BKS-B-20-4-03
1 = output signal S (SA for double solenoid) 2 = supply +24 Vcc 3 = not connected (output signal SB for double solenoid) 4 = GND	1 = supply +24 Vcc 2 = output signal NC 3 = GND 4 = output signal NO	1 = output signal S 2 = supply +24 Vcc ⊕ = GND	1 = output signal SA 2 = supply +24 Vcc 3 = output signal SB ⊕ = GND	black = output signal brown = supply +24 Vcc blue = GND CABLE LENGTH = 3 m

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

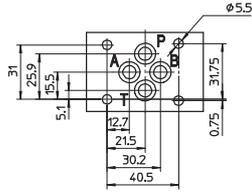
16 CONNECTORS FOR INDUCTIVE PROXIMITY AND POSITION SWITCHES

The connector for proximity switch and mechanical microswitches are always supplied with the valves

VALVE TYPE	CONNECTOR TYPE	protection degree
DHI/FI, DHE/FI	345	IP65
DHI/FV, DHE/FV, DKE/FV	ZBE-06	IP65
DKE/FI, DKER/FI	666 (single solenoid) - 664 (double solenoid)	IP65
DPH*/FV	ZBE-06	IP65
LIDA*/FV	ZBE-06	IP65
LIFI	BKS-B-20-4-03 Special connector with 3 mt molded cable (included)	IP67
LIDAS*/FV	ZBE-06	IP65

NOTE: valve type DKE*/FI double solenoid, configuration 75, use connector **666**

17 DIMENSIONS for DH* 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, DHU)

M5x30 class 12.9 (DHE, DHER)

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

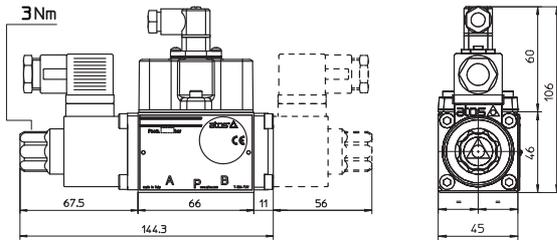
T = TANK PORT

For the max pressures on ports,

see section 12

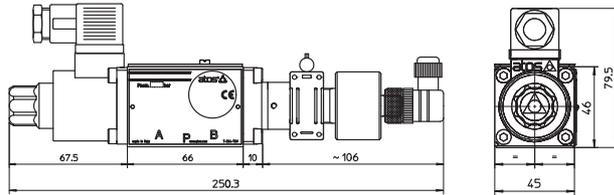
DHI-06*/FI (DC, AC)

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



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

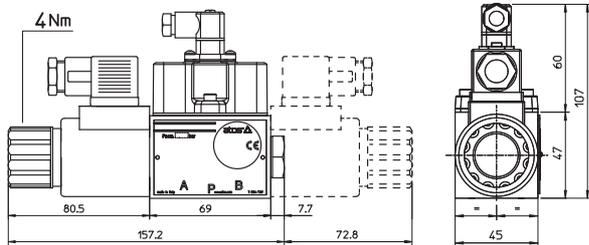
DHI-06*/FV (DC, AC)



Mass: kg 1,7

DHE-06*/FI (DC)

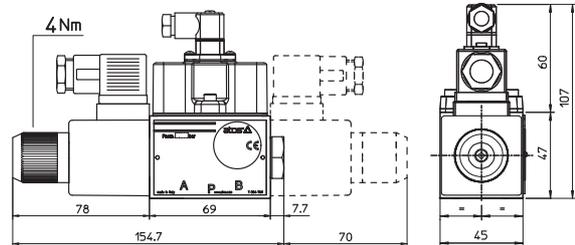
DHE-07*/FI (DC) dotted line



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

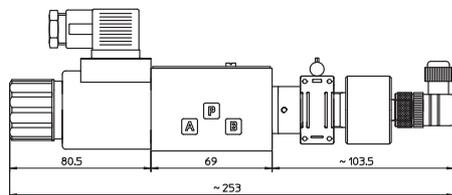
DHE-06*/FI (AC)

DHE-07*/FI (AC) dotted line



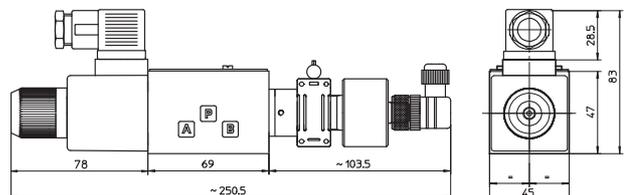
Mass:
kg 1,85 (one solenoid)
kg 2,1 (two solenoids)

DHE-06*/FV (DC)



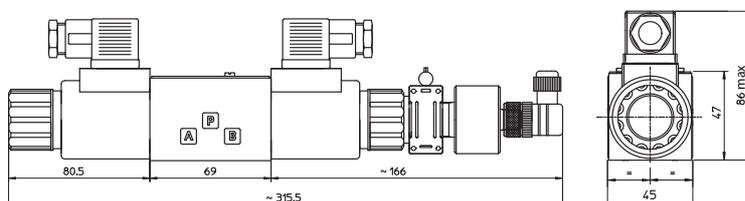
Mass: kg 1,95

DHE-06*/FV (AC)

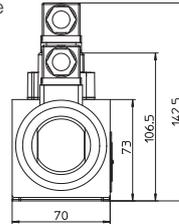
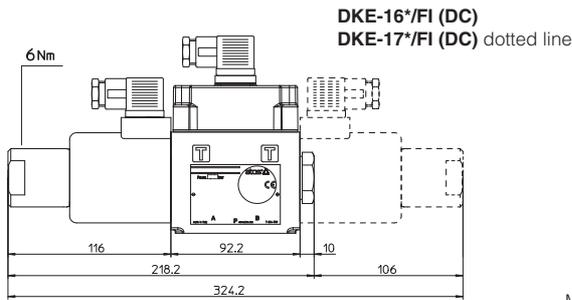


Mass: kg 1,8

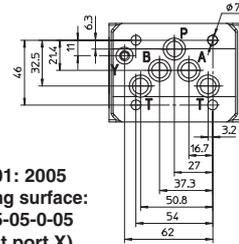
DHE-07*/FV (DC)



Mass: kg 2,2



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

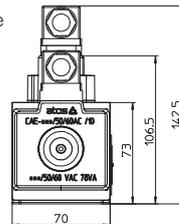
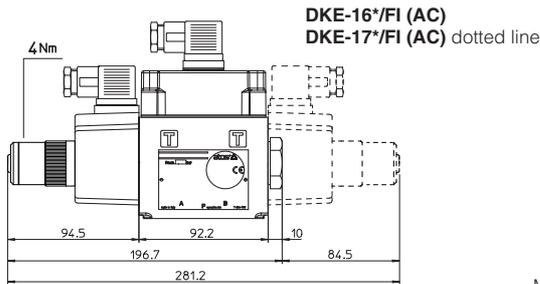


ISO 4401: 2005
Mounting surface:
4401-05-05-0-05
(without port X)

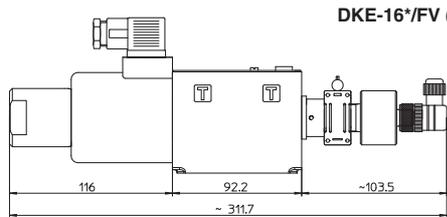
Fastening bolts:
 4 socket head screws M6x40 class 12.9
 Tightening torque = 15 Nm
 Seals: 5 OR 2050. 1 OR 108
 Ports P,A,B,T: $\phi = 11.5$ mm (max)
 Ports Y: $\phi = 5$ mm

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

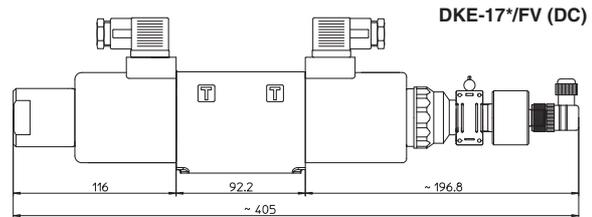
For the max pressures on ports,
 see section 20



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

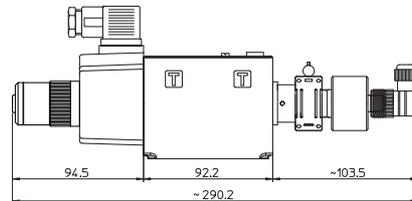


Mass: kg 4,4



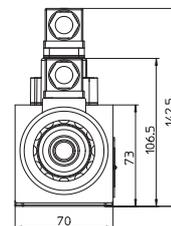
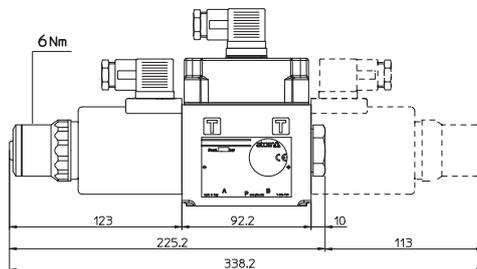
Mass: kg 5,9

DKE-16*/FI (AC)



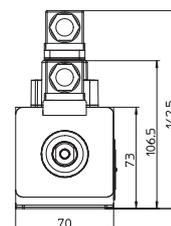
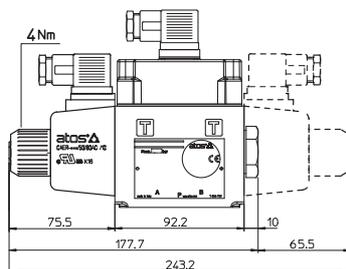
Mass: kg 3,8

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



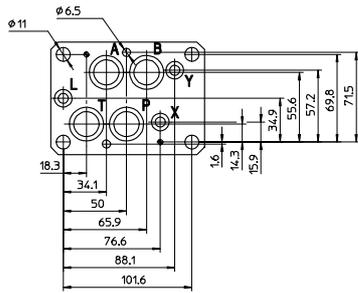
Mass:
 kg 4,5 (one solenoid)
 kg 6,0 (two solenoids)

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



Mass:
 kg 3,7 (one solenoid)
 kg 4,5 (two solenoids)

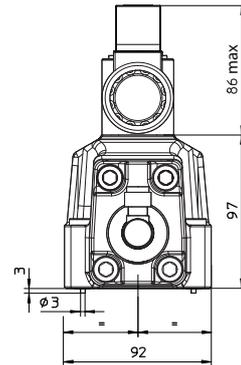
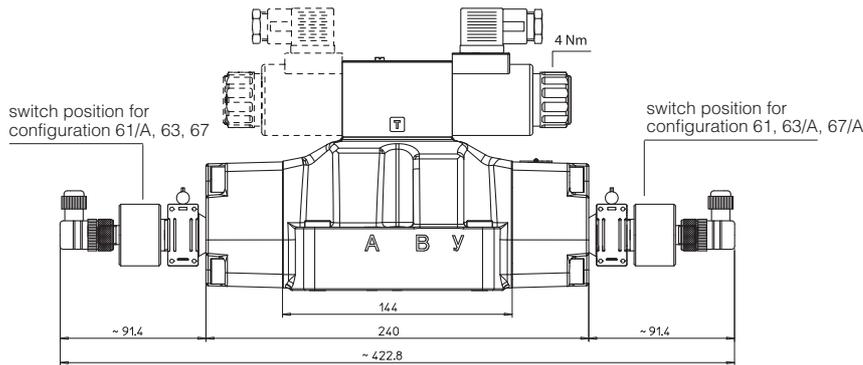
19 DIMENSIONS of DPH* PILOT OPERATED SAFETY VALVES [mm]



DPH*-2*/FV
ISO 4401: 2005
Mounting surface: 4401-07-07-0-05

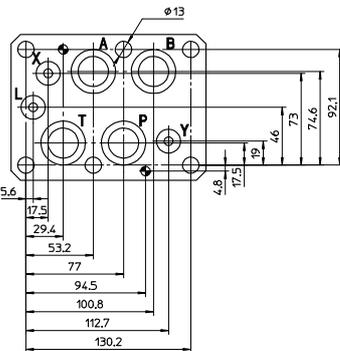
Fastening bolts:
 4 socket head screws M10x50 class 12.9
 Tightening torque = 70 Nm
 2 socket head screws M6x45 class 12.9
 Tightening torque = 15 Nm
 Diameter of ports A, B, P, T; $\varnothing = 20$ mm;
 Diameter of ports X, Y; $\varnothing = 7$ mm;
 Seals: 4 OR 130, 2 OR 2043

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT
 For the max pressures on ports,
 see section 12



Mass:
 kg 9,6 (one solenoid)
 kg 10,5 (two solenoids)

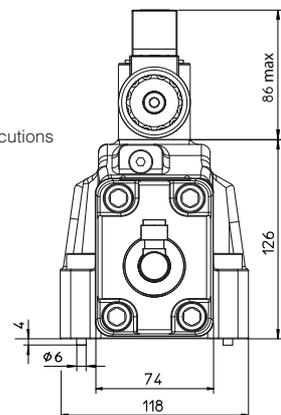
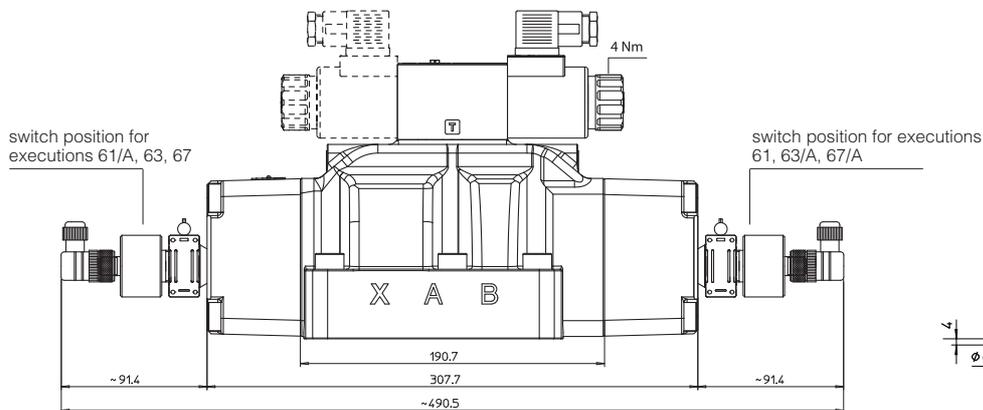
Note: for configurations 71 and 75 the switch position in on both sides of the valve



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; $\varnothing = 24$ mm;
 Diameter of ports X, Y; $\varnothing = 7$ mm;
 Seals: 4 OR 4112, 2 OR 3056

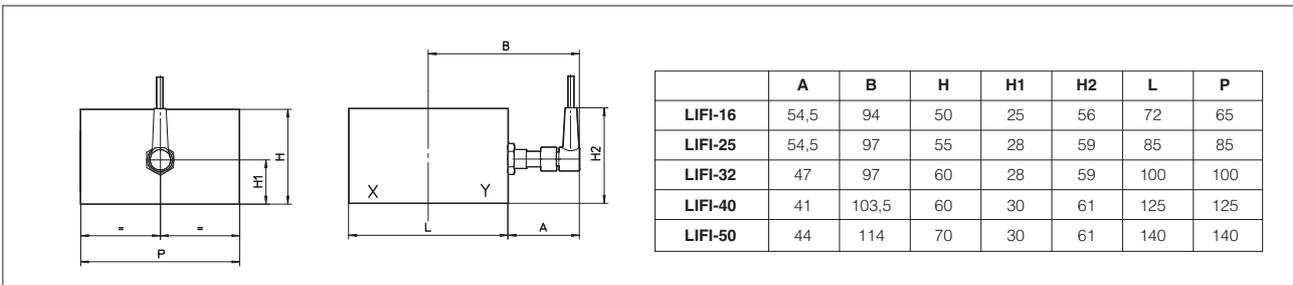
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT
 For the max pressures on ports,
 see section 12



Mass:
 kg 17,7 (one solenoid)
 kg 18,6 (two solenoids)

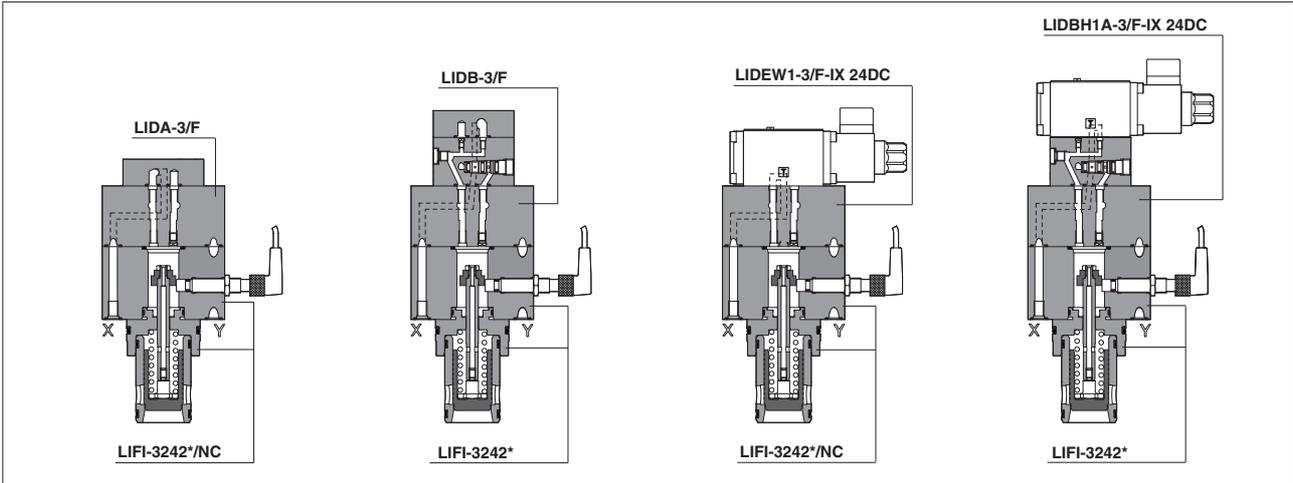
Note: for configurations 71 and 75 the switch position in on both sides of the valve

20 DIMENSIONS of LIFI SAFETY COVERS [mm]

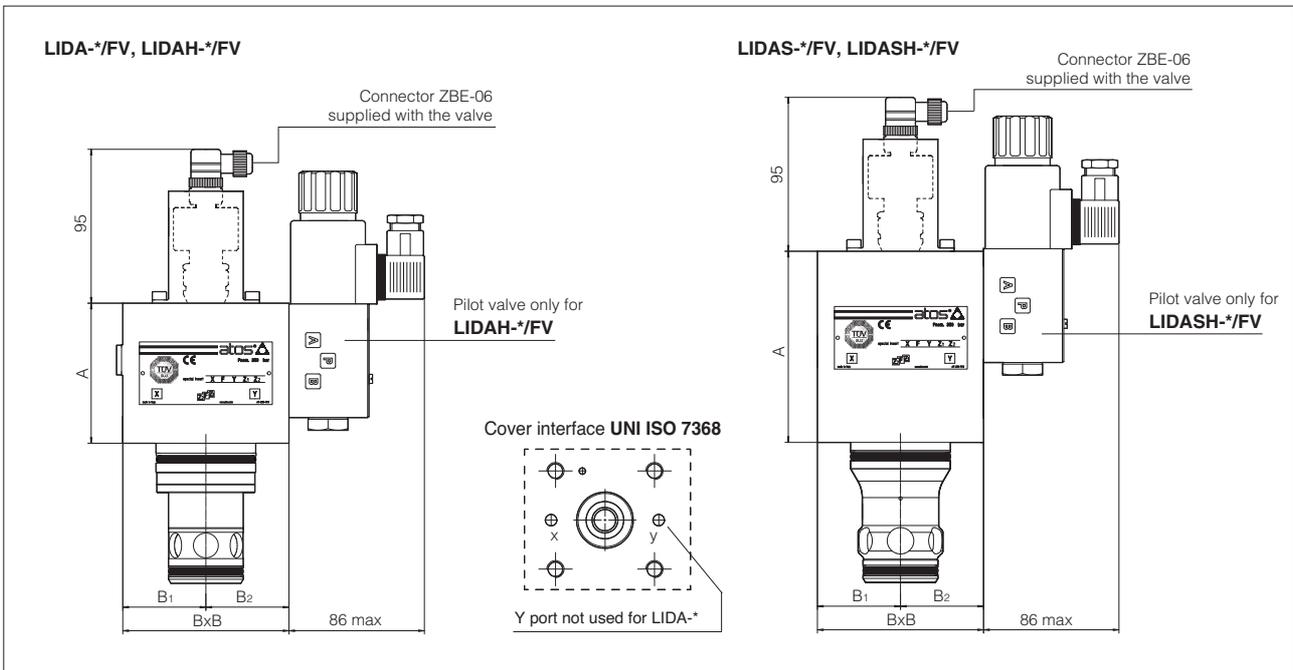


Note: for cover interface and cavity dimensions ISO 7368, see table P006

21 EXAMPLES OF LIFI COUPLED WITH OTHER COVERS (examples in size 32)



22 INSTALLATION DIMENSIONS of LIDA*/FV and LIDAS*/FV SAFETY CARTRIDGES [mm] (examples in size 32)



Note: for cover interface and cavity dimensions ISO 7368, see table P006

Size	LIDA				LIDAH				LIDAS				LIDASH				Seal		Fastening bolts				Tightening torque (Nm)
	A	B	B ₁	B ₂	A	B	B ₁	B ₂	A	B	B ₁	B ₂	A	B	B ₁	B ₂	LIDA	OTHER	LIDA	LIDAH	LIDAS, LIDASH		
16	50	65x80	40.5	39.5	85	65x80	40.5	39.5	85	65	39.5	39.5	95	65x72	32.5	39.5	1 OR 108	2 OR 108	4 M8x50	4 M8x70	4 M8x80	35	
25	50	85	42.5	42.5	85	85	42.5	42.5	98	85	42.5	42.5	115	85	42.5	42.5	1 OR 108	2 OR 108	4 M12x55	4 M12x80	4 M12x95	125	
32	65	100	50	50	85	100	50	50	107	100	50	50	116	100	50	50	1 OR 2043	2 OR 2043	4 M16x70	4 M16x70	4 M16x105	300	
40	65	125	62.5	62.5	85	125	62.5	62.5	110	125	62.5	62.5	125	125	62.5	62.5	1 OR 2050	2 OR 2050	4 M20x80	4 M20x80	4 M20x70	600	
50	65	140	70	70	85	140	70	70	130	140	70	70	135	140	70	70	1 OR 2050	2 OR 2050	4 M20x80	4 M20x80	4 M20x80	600	