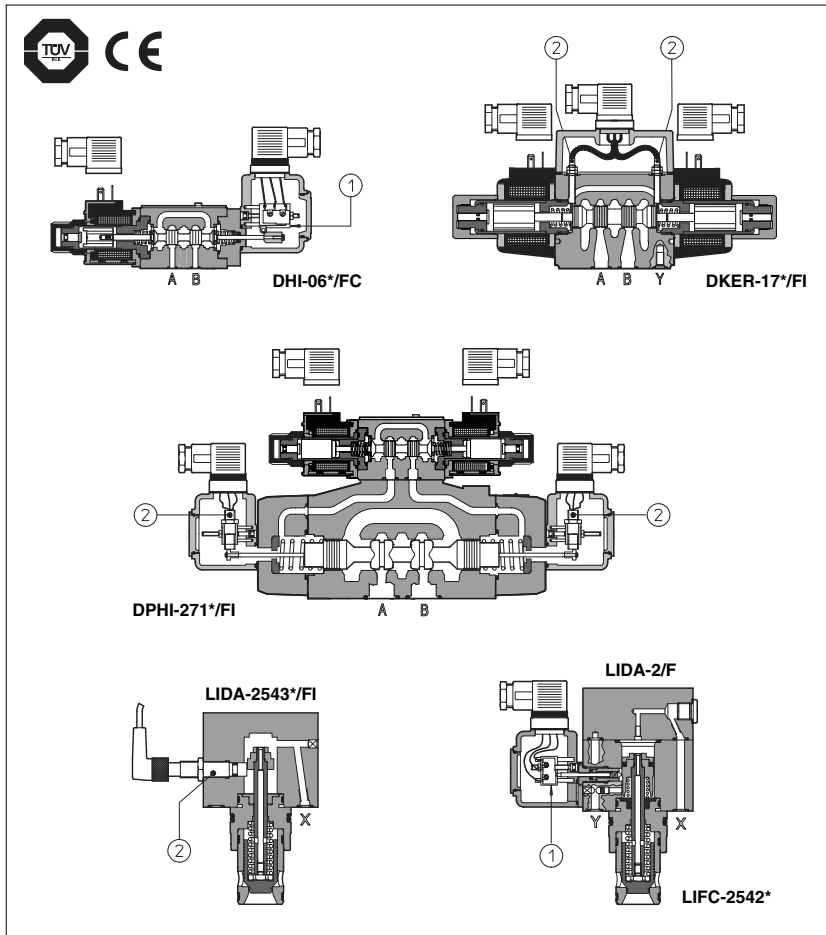


Safety valves

direct, pilot operated and cartridge execution with mechanical microswitches or inductive proximity sensors conforming to Machine Directive 2006/42/CE



These valves are designed to fulfil the safety criteria imposed to machine manufacturers by the European Machine Directive.

In addition to the normal function they supplies an electrical on-off output signal indicating the position of the spool/pop-pet of the valve.

The safety function performed by the valve is to cut off the hydraulic power line in case of emergency condition, avoiding dangerous movements of the machines actuators. The spool position signal informs the machine controller about the "open" or "intercepted" status of the hydraulic line.

Two versions are provided:
 - with mechanical microswitch ①;
 - with inductive proximity sensor ②;
 see section 12 for technical characteristics.

These valves are available in direct, piloted and cartridge execution and they keep the same hydraulic and electric characteristics of standard products from which they are derived.

Classic example of application: on presses or on blow moulding machines the safety valves are used to shut off the fluid energy to one or more actuators as a consequence of the opening of a mechanical safety device ("gate") or as a consequence of an "emergency stop" command.

The components shown on this technical table 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.

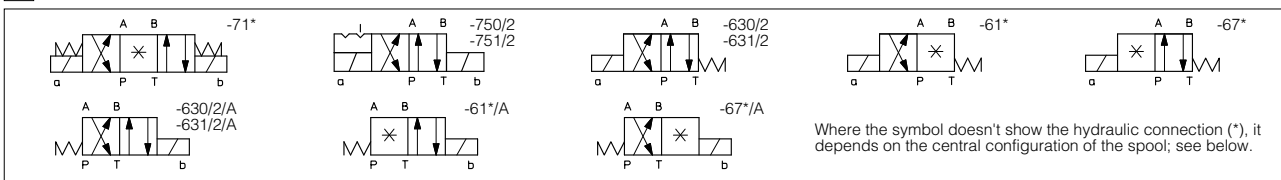
For details about the applicable EN standards, see www.atos.com, catalog on line page, section P, table P004.

1 MODEL CODE OF DIRECTIONAL CONTROL SAFETY SOLENOID VALVES

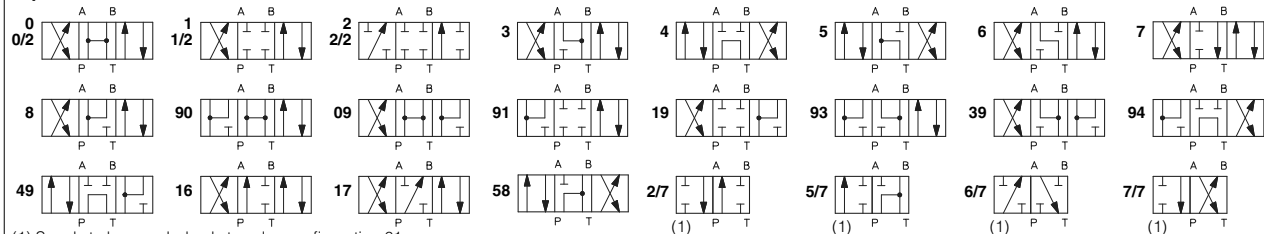
DHI	- 0	63	1/2	/A	FI	/NC - X	24DC	**	/*
<p>Type of solenoid valve DHI, DHU, DHO = direct, size 06 (see tab. E010) DKE, DKER = direct, size 10 (see tab E025) DPHI, DPHU = piloted, size 16 and 25 (see tab.E080) size 10 on request</p> <p>Size ISO 4401 0 = size 06 1 = size 10 2 = size 16 3 = size 25</p> <p>Valve configuration, see section 2 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 2</p> <p>Options (WP not available for safety valves) (1)</p>									
<p>Synthetic fluids: WG = water glycol PE = phosphate ester</p> <p>Series number</p> <p>Voltage code, see section 11</p> <p>X = without solenoid connector, to be order separately (see tab. K500)</p> <p>Electrical signal (only for /FI and /FIE versions): /NC = electric contact is closed when the valve is de-energized /NO = electric contact is open when the valve is de-energized For /FC version both the normally open contact and the normally closed contact are already available on the connector.</p> <p>Type of sensor FC = mechanical microswitch - DH* and DKE* with mechanical microswitch are available only in single solenoid version FI = inductive proximity sensor FIE = (only for DH* and DKE*) external inductive proximity sensor available only for single solenoid version</p>									

(1) See tab. E010 for DH*, tab. E025 for DKE*, tab. E080 for DPH*.

2 CONFIGURATION

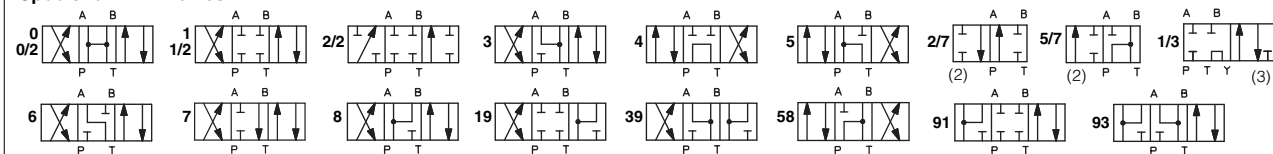


Spools for DH* valves



(1) Spools to be coupled only to valve configuration 61

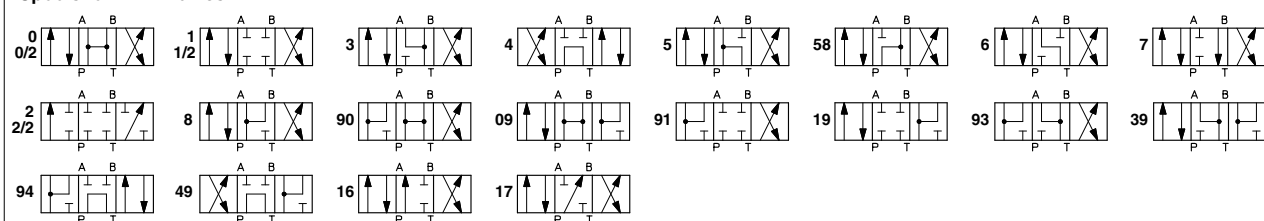
Spools for DKE* valves



(2) Spools to be coupled only to valve configuration 61

(3) Only for execution DKE(R)-1611/3/A

Spools for DPH* valves



3 STATUS OF OUTPUT SIGNAL FOR DIRECTIONAL VALVES WITH INDUCTIVE SENSORS TYPE /FI

	Configuration 61	Configuration 63	Configuration 67	Configuration 71	Configuration 75
ISO 4401 size 06 and 10					
ISO 4401 size 16 and 25					
HYDRAULIC CONFIGURATION					
SIGNAL S					
SIGNAL SA					
SIGNAL SB					

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

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

4 OPERATING LIMITS

Max pressure P port: **315 bar** (for DKE, DKER)
350 bar (for DH*, DPH*)

Max pressure T port: see next table

P/Q characteristics: DH see tab. E010, section 8
DK see tab. E025, section 8
DPH see tab. E080, section 9

MAX PRESSURE T PORT (bar), peaks included:

	DH*	DKE*	DPH*
/FC	20	20 (1)	250
/FI	5	5 (1)	250
/FIE	20	20 (1)	250

(1) 315 bar if the Y drain port is connected to the tank

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

5.1 MODEL CODE FOR INTERMEDIATE ELEMENT INCLUSIVE OF THE CARTRIDGE

LIF	I - 25 42 1	/NC	**	/*
Intermediate element (with poppet position detector) including the cartridge				Synthetic fluid: WG = water-glycol PE = phosphate ester
Type of sensor: C = mechanical microswitch I = inductive proximity sensor				Series number
Size (ISO 7368), the same of the cover (see section 21) 16; 25; 32; 40; 50 Other dimensions available on request				Only for LIFI: /NC = closed contact with poppet in resting position
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)				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
normally closed, to be coupled with covers type LIDA, LIDB, LIDBH**, LIDEW* see section 5.2				

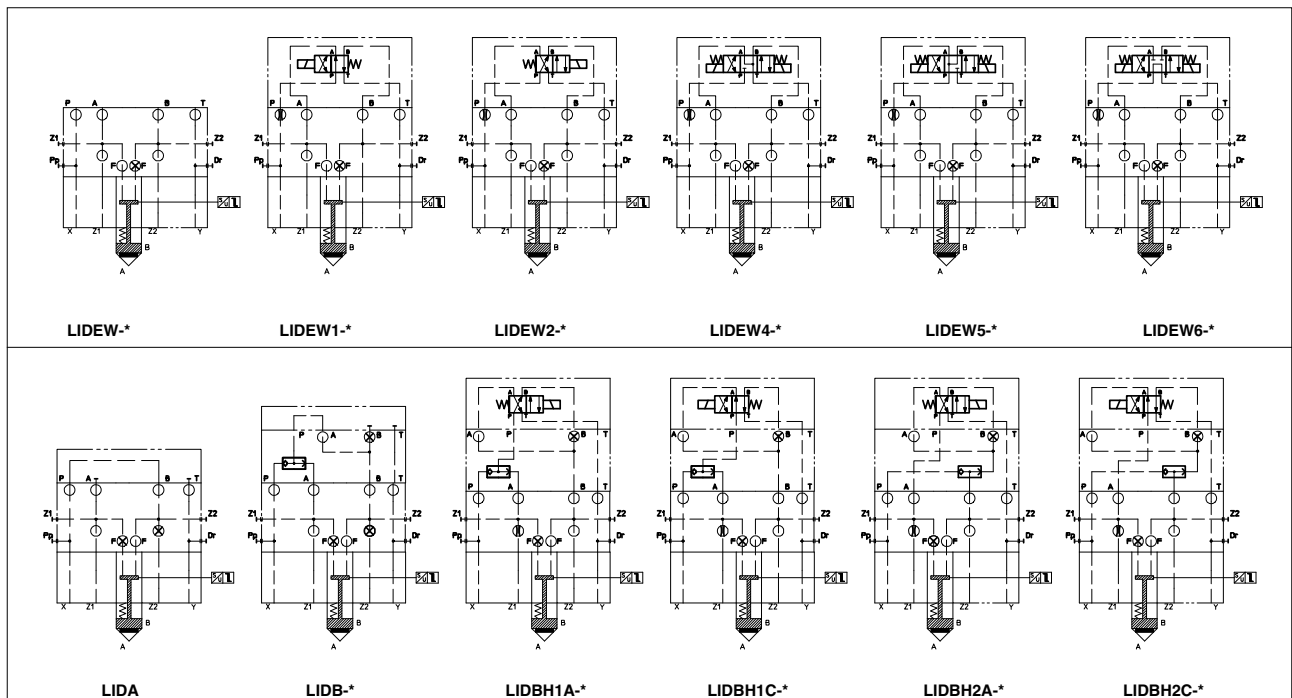
Note: in these safety valves the cartridge and the intermediate element with poppet position detector cannot be separated.

5.2 COVER MODEL CODE

LID	A - 2 / F E - I X 24DC	**	/*	/*
Cover according to ISO 7368 to be coupled with LIFI or LIFC safety valves				Special execution of the calibrated plugs in the pilot channels (see tables H030, H040)
Cover type, see section 4 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;				Synthetic fluid: WG = water-glycol PE = phosphate ester
Size 1 = 16; 2 = 25; 3 = 32; 4 = 40; 5 = 50; Other sizes available on request				Series number
F = prearranged for coupling with LIFI or LIFC cover, see section 4				Voltage code (only for LIDBH** and LIDEW*) see section 11
E = with external attachment X (1/4" GAS) and underneath port X plugged				Only for LIDBH** and LIDEW*: X = without connector, to be order separately (See tab. K500)
				Type of pilot solenoid valve (only for LIDBH** and LIDEW*): -I = DHI for AC and DC supply -O = DHO for DC supply

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.

6 HYDRAULIC SYMBOLS (the following symbols shown the covers function coupled with safety valve LIFI or LIFC)

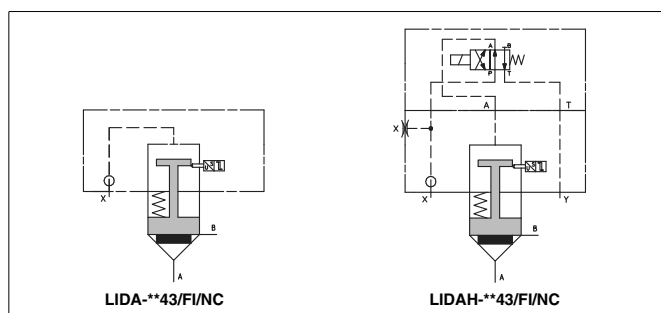


7 MODEL CODE OF SAFETY VALVES IN CARTRIDGE EXECUTION (INTEGRAL DESIGN COVER)

LIDA H - 25 43 3 / FI / NC - IX 24DC ** /*

<p>Safety cartridge valve according to ISO 7368</p> <p>optional pilot valve: - = omit if not required H = with NG 6 pilot valve</p> <p>size: 16 25 32 40 50</p> <p>poppet type: 43 = with damping nose, area ratio 1:2 (size 16 and 25) 1:1,6 (size 32,40 and 50)</p> <p>spring cracking pressure: 1 = 0,6 bar 3 = 3 bar 6 = 5,5 bar</p> <p>FI = inductive proximity sensor</p>	<p>synthetic fluids: WG = water glycol PE = phosphate esters</p> <p>series number</p> <p>only for LIDAH: Voltage code see section 11</p> <p>only for LIDAH: IX = without solenoid connectors to be ordered separately (See tab. K500)</p>	<p>only for LIDAH: Voltage code see section 11</p> <p>only for LIDAH: IX = without solenoid connectors to be ordered separately (See tab. K500)</p> <p>NC = normally closed contact</p>
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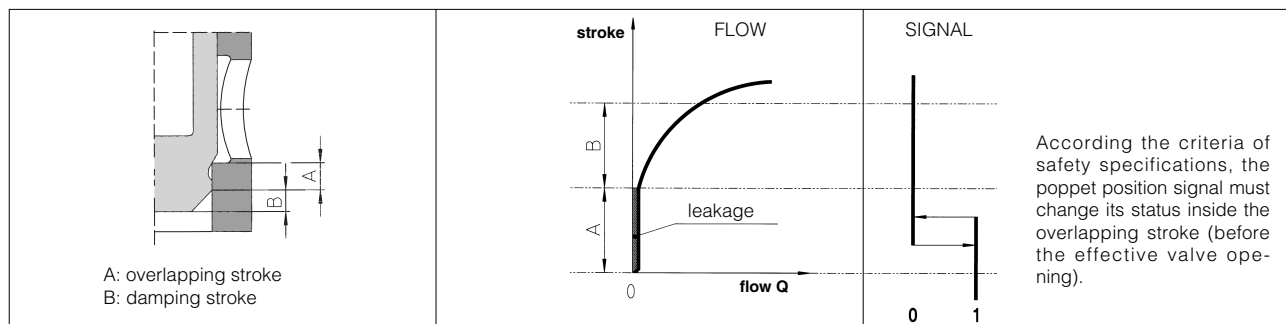
8 HYDRAULIC SYMBOLS



9 TECHNICAL CHARACTERISTIC

Sizes	16	25	32	40	50	
Max flow ($\Delta p = 6$ bar)	[l/min]	130	300	480	940	1500
Max pressure	[bar]	350 bar at ports A, B and X				

10 STATUS OF OUTPUT SIGNALS for cartridge valves (for LIFI, LIFC and LIDA*/FI)



11 VOLTAGE CODE

Valve	External supply nominal voltage $\pm 10\%$	Voltage code	Type of connector	Power consumption		
DHI	6 DC	6 DC	SP-666 or SP-667	33 W		
	9 DC	9 DC				
	12 DC	12 DC				
	14 DC	14 DC				
	18 DC	18 DC				
	24 DC	24 DC				
DHU	28 DC	28 DC		60 VA		
	48 DC	48 DC				
DPHI	110 DC	110 DC			SP-669	40 VA
	125 DC	125 DC				
DPHU	220 DC	220 DC				35 VA
	230/50 AC	230/50/60 AC				
LIDAH	24/60 AC	24/50/60 AC	40 VA			
	48/60 AC	48/50/60 AC				
LIDEW	110/50 AC	110/50/60 AC	35 VA			
	120/60 AC	120/60 AC				
LIDBH	230/50 AC	230/50/60 AC	35 VA			
	230/60 AC	230/60 AC				
	110/50 AC	110RC				
	230/60 AC	230RC				

Valve	External supply nominal voltage $\pm 10\%$	Voltage code	Type of connector	Power consumption
DHO	12 DC	12 DC	SP-666	32 W
	24 DC	24 DC		
	110 DC	110 DC	SP-667	40W
	220 DC	220 DC		

Valve	External supply nominal voltage $\pm 10\%$	Voltage code	Type of connector	Power consumption
DKE	12 DC	12 DC	SP-666	36 W (DKE)
	24 DC	24 DC		
	110 DC	110 DC	or	39W (DKER)
	220 DC	220 DC		
DKER	110/50/60 AC	110/50/60 AC	SP-667	85 VA (DKE) 105 VA (DKER)
	230/50/60 AC	230/50/60 AC		
	110/50/60 AC	110 DC	SP-669	36 W (DKE) 39 W (DKER)
	230/50/60 AC	220 DC		

12 TECHNICAL CHARACTERISTICS OF INDUCTIVE PROXIMITY SENSORS AND MECHANICAL MICROSWITCHES

INDUCTIVE PROXIMITY SENSORS (/FI, /FIE)				
Type of valves	DH*	DKE*	DPH*	LIFI
Supply voltage [V]	10±30	10±30	10±30	10±30
Ripple max [%]	10	10	15	
Max current [mA]	100	100	100	
Power consumption [mA]	10	8	8	
Voltage drop [V]	1,8	3	3	
Max switching frequency [Hz]	1500	1500	1000	
Max peak pressure [bar]	20	8	350	
Mechanical life	infinite			

MECHANICAL MICROSWITCHES (/FC)				
Max switching power	AC	125 V	5 A	5 A
		250 V	5 A	5 A
	DC	30 V	5 A	3 A
		50 V	1 A	1 A
		125 V	0,5 A	0,03 A
	250V	0,25 A	0,03 A	
Mechanical life	Min 100 millions cycles			

13 CONNECTORS FOR INDUCTIVE PROXIMITY SENSORS AND MECHANICAL MICROSWITCHES

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

VALVE TYPE	CONNECTOR TYPE	VALVE TYPE	CONNECTOR TYPE
DH*/FI	SP-345	DKE*/FC	SP-666
DH*/FIE	SP-666	DPH*/FI	SP-666
DH*/FC	SP-666	DPH*/FC	SP-666
DKE*/FI	SP-666 (single solenoid) SP-664 (double solenoid)	LIFI, LIDA*/FI	Special connector with 3m molded cable (included)
DKE*/FIE	SP-666	LIFC	SP-666

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

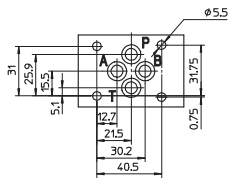
14 CONNECTING SCHEMES OF INDUCTIVE PROXIMITY SENSORS AND MECHANICAL MICROSWITCHES

VERSIONS WITH INDUCTIVE PROXIMITY (/FI, /FIE)					
DH*/FI single solenoid	DH*/FI double solenoid	DH*/FIE; DKE*/FIE DKE*/FI single solenoid DPH*-2/FI DPH*-3/FI single and double solenoid	DKE*/FI double solenoid	LIFI LIDA*/FI	ALL VALVES WITH MECHANICAL MICROSWITCH (/FC)
Connector type SP-345	Connector type SP-345	Connector type SP-666	Connector type SP-664		Connector type SP-664 The drawing shows the switch in closed position
1 = output signal S 2 = supply +24 Vdc 3 = not connected 4 = GND	1 = output signal SA 2 = supply +24 Vdc 3 = output signal SB 4 = GND	1 = output signal S 2 = supply +24 Vdc 3 = output signal SB ⊕ = GND	1 = output signal SA 2 = supply +24 Vdc 3 = output signal SB ⊕ = GND	black = output signal brown = supply +24 Vdc blue = GND CABLE LENGHT = 3 m	1 = common (C) 2 = normally open contact (NO) 3 = normally closed contact (NC) ⊕ = EARTH

For the signal status see section 9 and section 10

15 OPTIONAL CONNECTOR TYPE SP-666/M12 the connector has to be ordered separately

Optional connector type SP-666/M12	CONNECTING SCHEMES		
	VERSIONS WITH INDUCTIVE PROXIMITY (/FI, /FIE)		
	DH*/FIE DKE*/FI single solenoid DPH*-2/FI DPH*-3/FI single and double solenoid	DKE*/FI double solenoid	ALL VALVES WITH MECHANICAL MICROSWITCH (/FC)
The optional connector type SP-666/M12 provides the standard interface DIN 43650 for connection to sensor type /FI, FC or FIE and the M12 standard interface to the user side.		The drawing shows the switch in closed position	
	1 = supply +24 Vdc 2 = output signal S 3 = supply GND 4 = not connected	1 = supply +24 Vdc 2 = output signal SA 3 = supply GND 4 = output signal SB	1 = normally open contact (NO) 2 = common (C) 3 = EARTH 4 = normally closed contact (NC)



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).

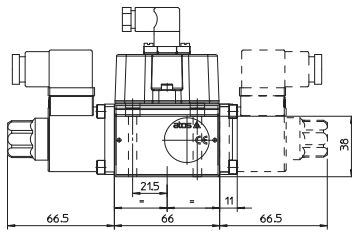
P = PRESSURE PORT

A, B = USE PORT

T = TANK PORT

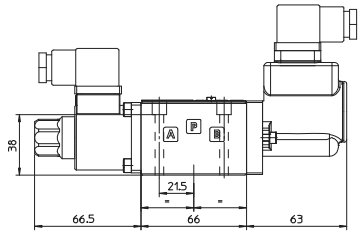
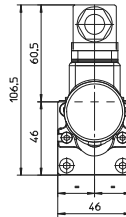
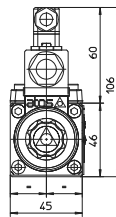
For the max pressures on ports, see section 4

DHI-*/FI



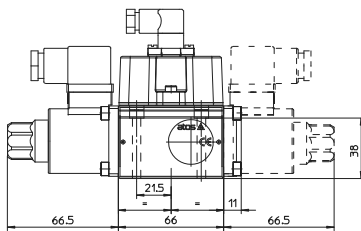
Mass:
kg 1,6 (one solenoid)
kg 1,9 (two solenoids)

**DHI-*/FC
DHI-*/FIE**



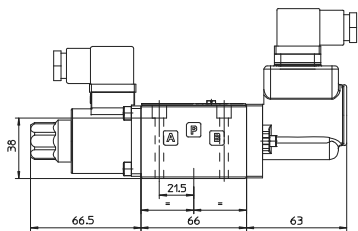
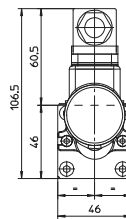
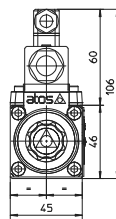
Mass: kg 1,6

DHU-*/FI



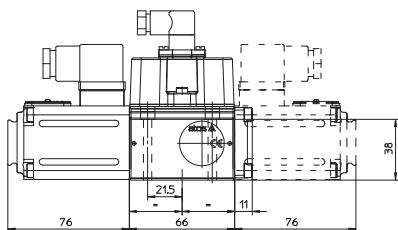
Mass:
kg 1,6 (one solenoid)
kg 1,9 (two solenoids)

**DHU-*/FC
DHU-*/FIE**



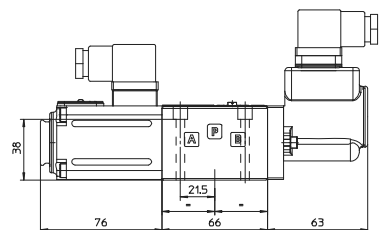
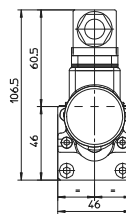
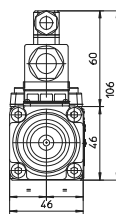
Mass: kg 1,6

DHO-*/FI



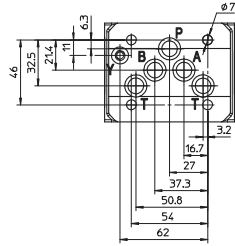
Mass:
kg 2 (one solenoid)
kg 2,7 (two solenoids)

**DHO-*/FC
DHO-*/FIE**



Mass: kg 2

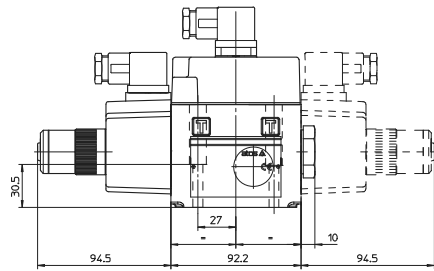
17 **DKE-*/FI, /FC and /FIE DIMENSIONS [mm]**



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: Ø = 11.5 mm (max)
 Ports Y: Ø = 5 mm

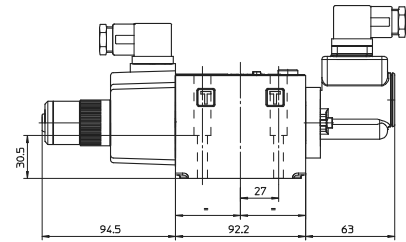
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
Y = DRAIN PORT
 For the max pressures on ports, see section 4

DKE-*/FI-AC



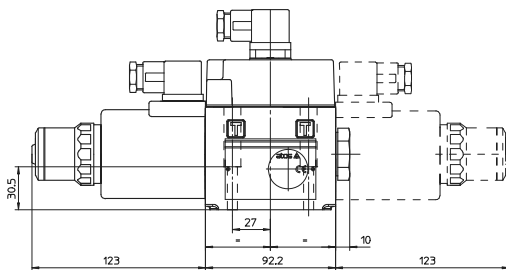
Mass:
 kg 3,7 (one solenoid)
 kg 4,4 (two solenoids)

DKE-*/FC-AC
DKE-*/FIE-AC



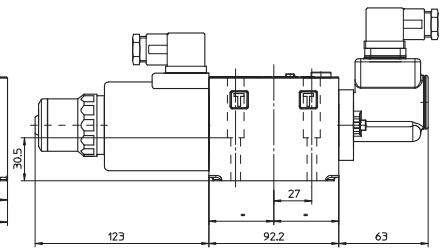
Mass: kg 3,9

DKE-*/FI-DC



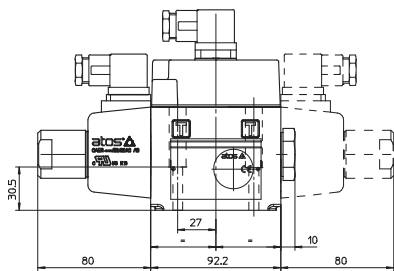
Mass:
 kg 4,3 (one solenoid)
 kg 5,8 (two solenoids)

DKE-*/FC-DC
DKE-*/FIE-DC



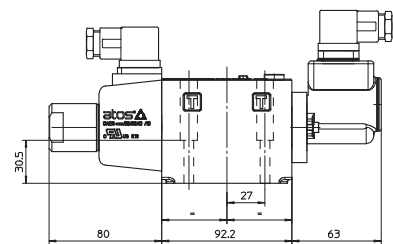
Mass: kg 4,3

DKER-*/FI-AC



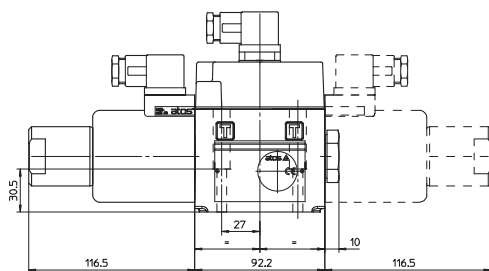
Mass:
 kg 3,7 (one solenoid)
 kg 4,4 (two solenoids)

DKER-*/FC-AC
DKER-*/FIE-AC



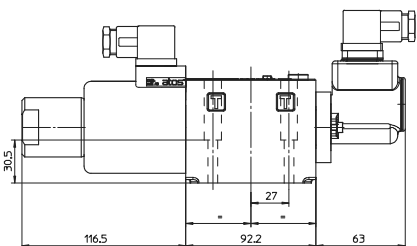
Mass: kg 3,7

DKER-*/FI-DC

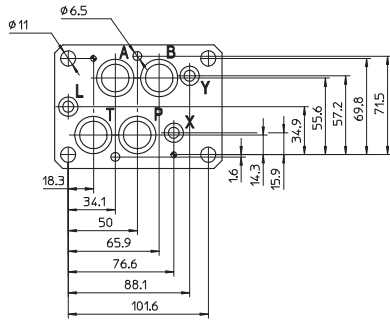


Mass:
 kg 4,5 (one solenoid)
 kg 6,0 (two solenoids)

DKER-*/FC-DC
DKER-*/FIE-DC



Mass: kg 4,5

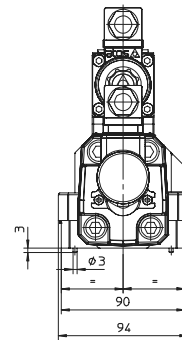
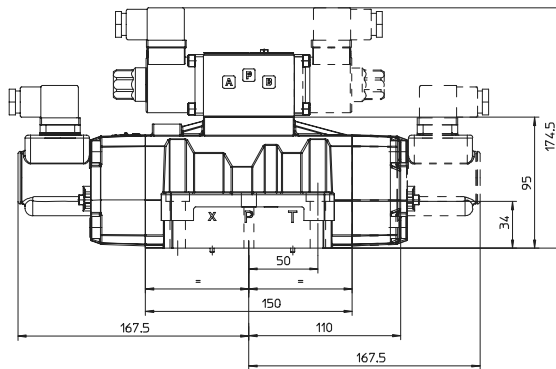


DPH*-2*
ISO 4401: 2005
Mounting surface: 4401-07-07-0-05

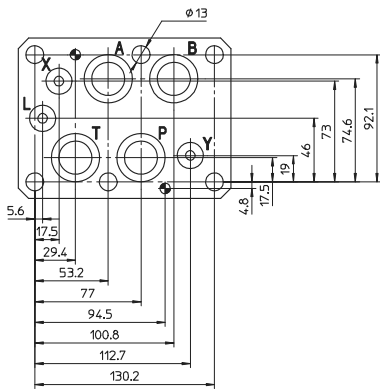
Fastening bolts:
 4 socket head screws M10x50 class 12.9
 Tightening torque = 70 Nm
 2 socket head screws M6x40 class 12.9
 Tightening torque = 15 Nm
 Diameter of ports A, B, P, T: $\phi = 20$ mm;
 Diameter of ports X, Y: $\phi = 7$ mm;
 Diameter of ports L: $\phi = 5$ mm;
 Seals: 4 OR 130, 3 OR 109/70

P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT
L = NOT USED
 For the max pressures on ports,
 see section 4

DPH*-2*/FI
DPH*-2*/FC



Mass:
 kg 9,6 (one solenoid)
 kg 10,3 (two solenoids)

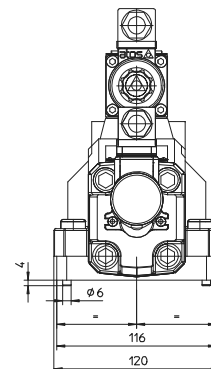
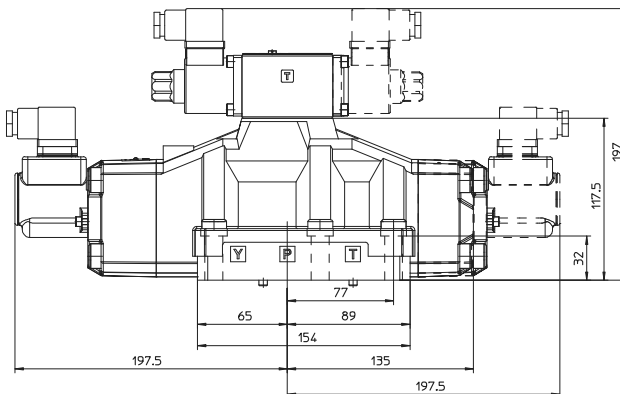


DPH*-3*
ISO 4401: 2005
Mounting surface: 4401-08-08-0-05

Fastening bolts:
 6 socket head screws M12x50 class 12.9
 Tightening torque = 125 Nm
 Diameter of ports A, B, P, T: $\phi = 24$ mm;
 Diameter of ports X, Y: $\phi = 7$ mm;
 Diameter of port L: $\phi = 5$ mm;
 Seals: 4 OR 4112, 3 OR 3056

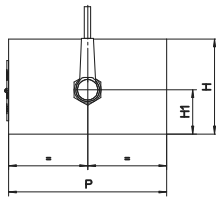
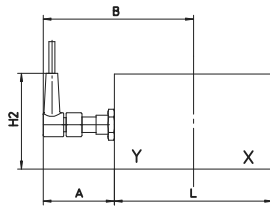
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT
L = NOT USED
 For the max pressures on ports,
 see section 4

DPH*-3*/FI
DPH*-3*/FC



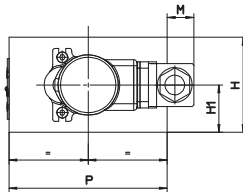
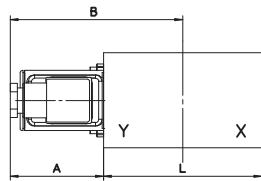
Mass:
 kg 14,6 (one solenoid)
 kg 15,3 (two solenoids)

19 LIFI AND LIFC DIMENSIONS [mm]



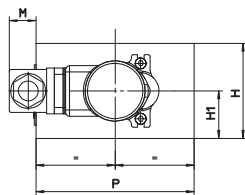
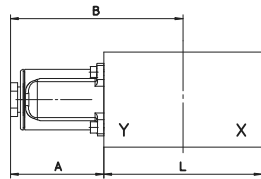
LIFI-16
LIFI-25
LIFI-32
LIFI-40
LIFI-50

	A	B	H	H1	H2	L	P
LIFI-16	54,5	94	50	25	56	72	65
LIFI-25	54,5	97	55	28	59	85	85
LIFI-32	47	97	60	28	59	100	100
LIFI-40	41	103,5	60	30	61	125	125
LIFI-50	44	114	70	30	61	140	140



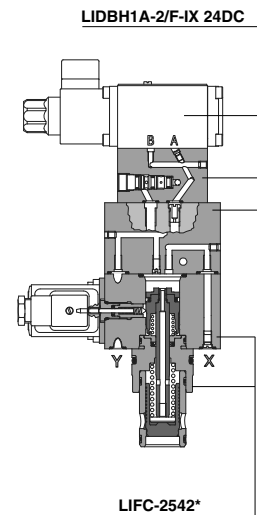
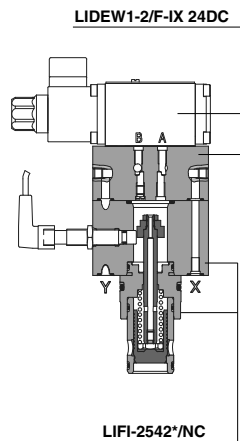
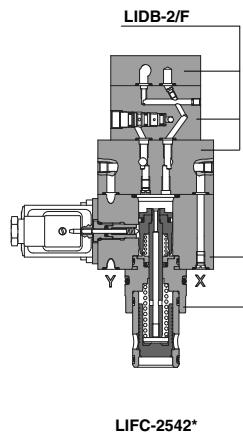
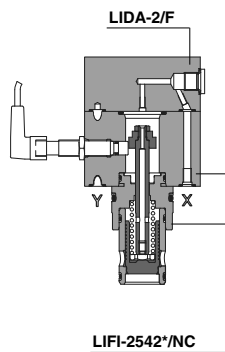
LIFC-16
LIFC-25

	A	B	H	H1	L	M	P
LIFC-16	64	103,5	50	25	72	37	65
LIFC-25	64	106,5	55	28	85	27	85
LIFC-32	64	114	60	28	100	19	100
LIFC-40	64	126,5	60	30	125	6,5	125
LIFC-50	64	134	70	30	140	/	140

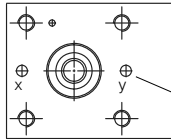


LIFC-32
LIFC-40
LIFC-50

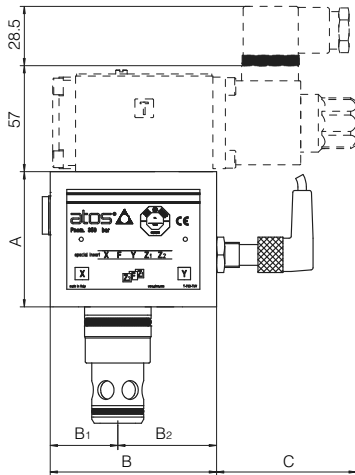
20 EXAMPLES OF LIFI AND LIFC COUPLED WITH OTHER COVERS (examples with cartridges size 25)



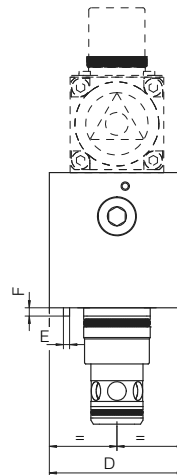
21 LIDA*/FI DIMENSIONS [mm]



Cover interface of LIDA*/FI and LIDAH*/FI
UNI ISO 7368
 For dimensions of cover interface and cartridge recess, see section 22
 Y port only for LIDAH*/FI

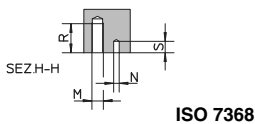
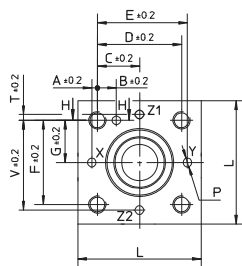


LIDA*/FI
 LIDAH*/FI (dotted line)

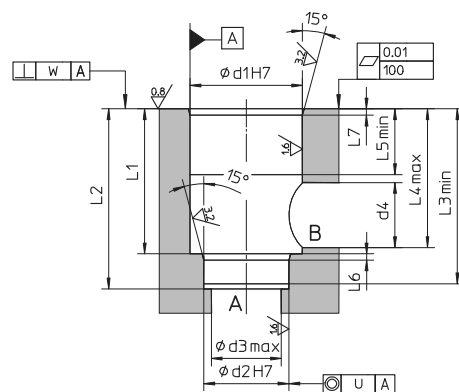


Size	A	B	B1	B2	C	D	E	F	Seal (for LIDA)	Seal (for LIDAH)	Fastening bolts	Tightening torque (Nm)
16	65	80	32.5	47.5	54.5	65	3	4	1 OR 108	2 OR 108	4 M8x60	35
25	70	85	42.5	42.5	62.5	85	5	4	1 OR 108	2 OR 108	4 M12x60	125
32	75	100	50	50	55	100	5	6	1 OR 2043	2 OR 2043	4 M16x70	300
40	75	125	62.5	62.5	49	125	5	6	1 OR 2050	2 OR 2050	4 M20x80	600
50	80	140	70	70	52	140	6	4	1 OR 2050	2 OR 2050	4 M20x90	600

22 COVER INTERFACE AND RECESS DIMENSIONS [mm]



ISO 7368



ISO 7368

Size	COVER INTERFACE													RECESS												
	A	B	C	D	E	F	G	L	M	ØN	P _{max}	R	S _{min}	ød1	ød2	ød3	ød4	L1	L2	L3	L4	L5	L6	L7	U	W
16	2	12.5	23	46	48	46	23	65	M8	4	4	20	6	32	25	16	16	43 ^{+0.1} ₀	56 ^{+0.1} ₀	54	42.5	20	2	2	0.03	0.05
25	4	13	29	58	62	58	29	85	M12	6	6	30	8	45	34	25	25	58 ^{+0.1} ₀	72 ^{+0.1} ₀	70	57	30	2.5	2.5	0.03	0.05
32	6	18	35	70	76	70	35	102	M16	6	8	38	8	60	45	32	32	70 ^{+0.1} ₀	85 ^{+0.1} ₀	83	68.5	30	2.5	2.5	0.03	0.1
40	7.5	19.5	42.5	85	92.5	85	42.5	125	M20	6	10	46	8	75	55	40	40	87 ^{+0.1} ₀	105 ^{+0.1} ₀	102	84.5	30	3	3	0.05	0.1
50	8	20	50	100	108	100	50	140	M20	8	10	46	8	90	68	50	50	100 ^{+0.1} ₀	122 ^{+0.1} ₀	117	97.5	35	3	4	0.05	0.1