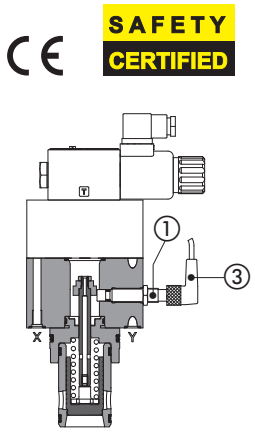
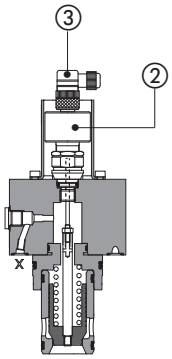
# Safety cartridge valves with poppet position monitoring

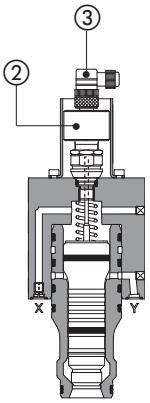
ISO standard, on-off, poppet type, conforming to Machine Directive 2006/42/EC - certified by TÜV




LIFI-3242*/NC




LIDA-3243*/FV




LIDAS-3243*/FV

① Inductive proximity sensor **FI**
② Inductive position switch **FV**
③ Sensor electric connector (supplied with the valve)

Safety cartridge valves with poppet position monitoring, **CE** marked and certified by **TÜV,** in accordance with safety requirements of Machine Directive 2006/42/EC.

**LIFI**: intermediate safety element with **FI** inductive proximity sensor, to be coupled with functional covers

**LIDA**: safety valve with integral cover design and with **FV** inductive position switch, available with optional solenoid pilot valve (LIDAH)

**LIDAS**: active pilot operated safety valve with **FV** inductive position switch, available with optional solenoid pilot valve (LIDASH), see section 12 for sensors technical characteristics.

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.

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

Mounting surface & cavity:
ISO 7368 size **16** to **50**
Max flow: **1800 l/min** at Δp = 5 bar
Max pressure: up to **420 bar**

## 1 RANGE OF VALVE'S MODELS

| Valve code | Size | Description | DC solenoids | | AC solenoids | |
|---|---|---|---|---|---|---|
| | | | Sensor type | | | |
| | | | /FI | /FV | /FI | /FV |
| **LIFI** | 16÷50 | intermediate elements with cartridge, to be coupled with a functional cover | • | | • | |
| **LIDA(H)** | 16÷50 | cartridges valve | | • | | • |
| **LIDAS(H)** | 16÷50 | active cartridges valve | | • | | • |

**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 12 for sensor's characteristics

## 2 MODEL CODE OF LIFI INTERMEDIATE SAFETY ELEMENT - to be coupled with covers in section 3

| LIF | I | - | 25 | 42 | 1 | / | NC | ** | / | * |
|---|---|---|---|---|---|---|---|---|---|---|

**LIF**: Intermediate saferty element and cartridge according to ISO 7368

**Poppet position monitor**:
**I** = inductive proximity switch

**Size ISO 7368**
**16; 25; 32; 40; 50**
Other dimensions available on request

**Type of poppet**, see sect. 9 for Q/Δp diagrams
**42** = with damping nose, area ratio 1:1,1
**43** = with damping nose, area ratio 1:1,6

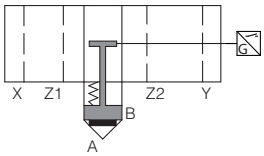
**/NC** = closed contact with poppet in resting position

Series number

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

**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

### 2.1 Hydraulic symbols of LIFI




**Note: in LIFI safety valves the cartridge and the intermediate element with poppet position sensor cannot be separated**

## 3 MODEL CODE OF FUNCTIONAL COVERS TO BE COUPLED WITH LIFI SAFETY VALVES

| LID | A | - | 2 | / | * | F | - | I | X | 24DC | ** | / | * | / | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**LID**
Cover according to ISO 7368

**Cover type**, see section 3.1 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;

**Size ISO 7368**
**1** = 16; **2** = 25; **3** = 32; **4** = 40; **5**= 50;

**Options:**
- **B** = cartridge piloted via port B of solenoid valve (only for LIDEW* and LIDBH**)
- **E** = with external attachment X (1/4" GAS) and underneath port X plugged
- **F** = prearranged for coupling with LIFI cover

**Type of pilot solenoid valve** only for LIDBH** and LIDEW*:
- **I** = DHI Pmax **350 bar**
- **E** = DHE Pmax **350 bar**
- **EP** = DHEP Pmax **420 bar**

Only for LIDEW* and LIDBH**:
**X** = without connector, to be order separately see section 11

**Voltage code** only for LIDEW* and LIDBH**: see section 10

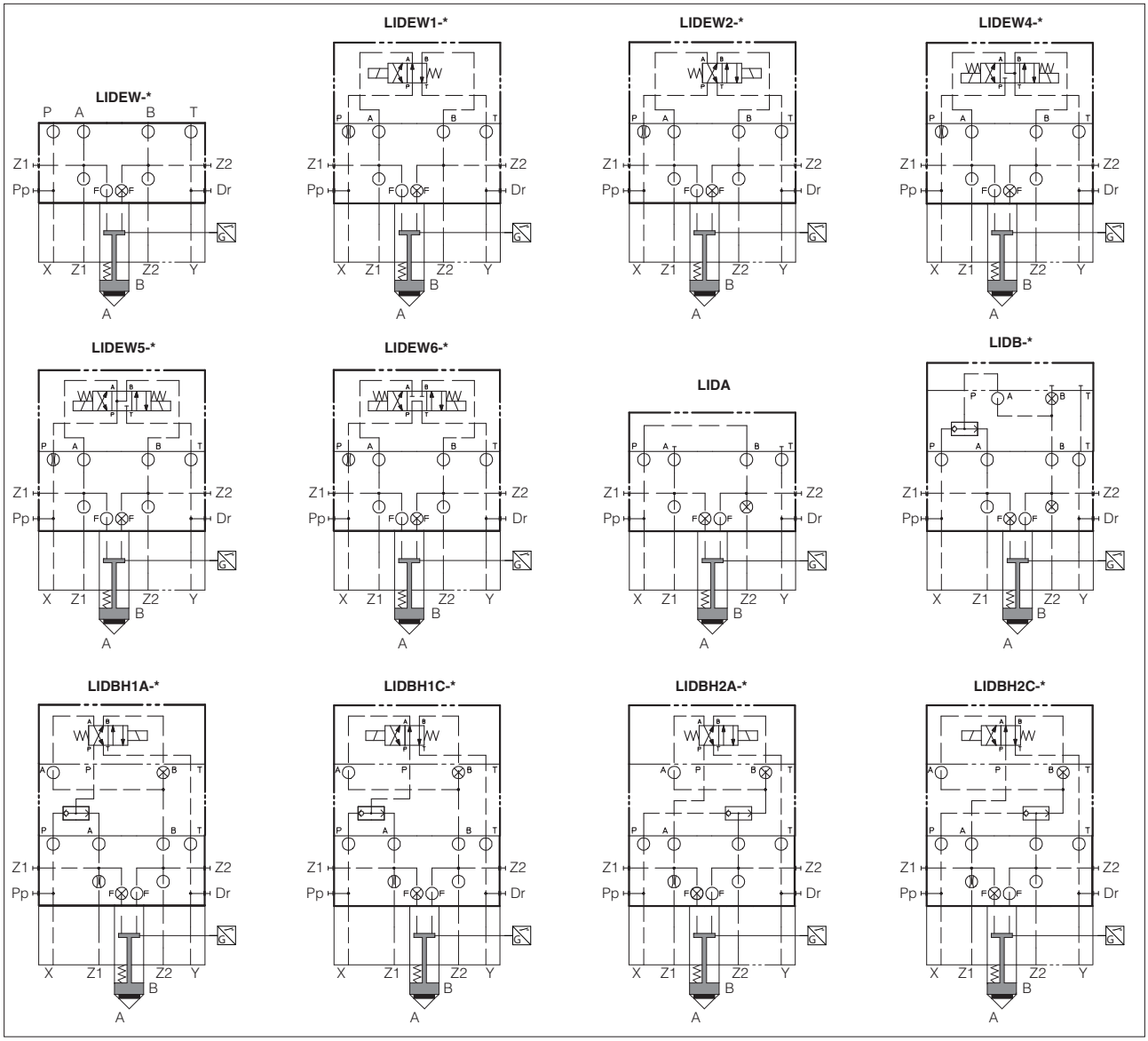
Series number

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

Optional different setting of calibrated plugs in the pilot channels (see tech. tables H030, H040)

For valve type LIDB, LIDEW (in the configuration with external pilot line) Atos can supply leak free poppet type directional pilot valves type DLEH-3*. Consult our technical office for detailed information.

### 3.1 HYDRAULIC SYMBOLS OF FUNCTIONAL COVERS
the following symbols show the functional covers coupled with intermediate safety element type LIFI



## 4 MODEL CODE OF LIDA SAFETY VALVES (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 ISO 7368**:
**16**; **25**; **32**; **40**; **50**

**poppet type**:
**43** = with damping nose area ratio 1:1,6

**spring cracking pressure**:
**1** = 0,6 bar **3** = 3 bar **6** = 5,5 bar

**Poppet position monitor**:
**FV** = inductive position switch (double contact)

Only for LIDAH
**X** = without connector, to be order separately see section 11

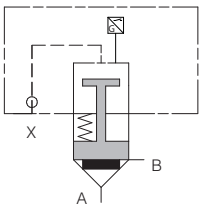
Only for LIDAH
Voltage code, see section 10

Series number

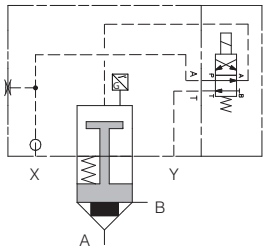
Seals material: omit for NBR (mineral oil & water glycol)
**PE** = FKM

**Pilot solenoid valve** only for LIDAH
**I** = DHI Pmax **350 bar**
**E** = DHE Pmax **350 bar**
**EP** = DHEP Pmax **420 bar**

### 4.1 HYDRAULIC SYMBOLS OF LIDA /FV




**LIDA-**43/FV**



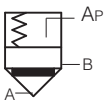
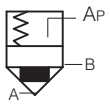

**LIDAH-**43/FV**

## 5 MAIN CHARACTERISTICS OF LIFI AND LIDA(H)/FV

| | | |
|---|---|---|
| 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 | | 75 years, for further details see technical table P007 |
| Compliance | | CE to Machine Directive 2006/42/EC.<br>-EC type-examination certificate for safety components **(1)**<br>-ISO 13849 category 1, PLC in high demand mode<br>CE to Low Voltage Directive 2014/35/EU and Machine Directive 2006/42/EC.<br>RoHS Directive 2011/65/EU as last update by 2015/65/EU<br>REACH Regulation (EC) n°1907/2006 |
| Ambient temperature | | **Standard** = -30°C ÷ +70°C<br>**/PE** option = -20°C ÷ +70°C |
| Flow direction | | A→B or B→A |
| **Operating pressure** | **LIFI** | A, B, X, Z1, Z2 = **420 bar** |
| | **LIDA/FV** | A, B, X = **420 bar**; |
| | **LIDAH/FV** | A, B, X = LIDAH-I = **350 bar**; LIDAH-E = **350 bar**; LIDAH-EP = **420 bar** |
| | | Y = LIDAH-I = **120 bar**; LIDAH-E, -EP (DC) = **210 bar**; LIDAH-E, -EP (AC) = **160 bar** |

**(1)** The type-examination certificate can be download from www.atos.com

### 5.1 poppet characteristics of LIFI and LIDA(H)/FV

| Poppet type | | **42** (only LIFI) | **43** |
|---|---|---|---|
| Functional sketch (Hydraulic symbol) | |   |   |
| **Operating pressure** | | **420 bar** | |
| **Nominal flow** at Δp 5bar (l/min) see diagrams Q/Δp at section 15 | Size **16** | 140 | 120 |
| | **25** | 300 | 280 |
| | **32** | 550 | 440 |
| | **40** | 1150 | 860 |
| | **50** | 1800 | 1370 |
| Area ratio A:Ap | | **1:1,1** | **1:2** for size 16, 25 **1:1,6** for size 32, 40,50 |

## 6 MODEL CODE OF LIDAS ACTIVE SAFETY PILOT OPERATED VALVES

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

Active safety cartridges, according to ISO 7368

**Optional pilot valve**:
- = without pilot solenoid valve
**H** = with pilot solenoid valve

**Size ISO 7368**:
**16**; **25**; **32**; **40**; **50**

**Poppet type**:
**43** = with damping nose

**Spring cracking pressure**
**3** = 3 bar

**Poppet position monitor**:
**FV** = inductive position switch (double contact)

**Pilot solenoid valve** only for LIDASH
**I** = DHI Pmax **350 bar**
**E** = DHE Pmax **350 bar**
**EP** = DHEP Pmax **420 bar**

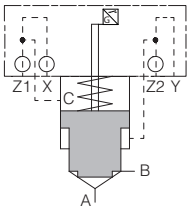
Only for LIDASH
**X** = without connector, to be order separately see section 11

Only for LIDASH voltage code, see section 10

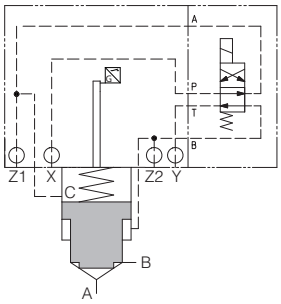
Series number

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

### 6.1 HYDRAULIC SYMBOLS OF LIDAS




**LIDAS/FV**



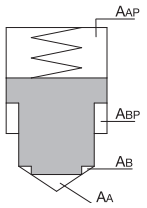

**LIDASH-*/FV**

## 7 MAIN CHARACTERISTICS OF LIDAS/FV

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 | | | | |
| Compliance | | CE to Machine Directive 2006/42/EC.<br>-EC type-examination certificate for safety components **(1)**<br>-ISO 13849 category 1, PLC in high demand mode<br>CE to Low Voltage Directive 2014/35/EU and Machine Directive 2006/42/EC.<br>RoHS Directive 2011/65/EU as last update by 2015/65/EU<br>REACH Regulation (EC) n°1907/2006 | | | | |
| Ambient temperature | | **Standard** = -30°C ÷ +70°C **/PE** option = -20°C ÷ +70°C | | | | |
| Flow direction | | A→B or B→A | | | | |
| **Operating pressure** | **LIDAS/FV** | A, B, X, Z1, Z2 = **420 bar** | | | | |
| | **LIDASH/FV** | A, B, X, Z1, Z2 = LIDASH-I **350** bar; LIDASH-E **350** bar; LIDASH-EP **420** bar<br>Y = LIDASH-I **120** bar; LIDASH-E, -EP (DC) = **210** bar; LIDASH-E, -EP (AC) = **160** bar; | | | | |
| **Size** | | **16** | **25** | **32** | **40** | **50** |
| **Maximum flow** at Δp = 5 bar [l/min] | | 200 | 360 | 550 | 1100 | 1800 |
| **Poppet characteristics** [cm²] | | | | | | |
| $A_A$ | | 1,43 | 3,46 | 5,30 | 8,04 | 13,85 |
| $A_B$ (% of $A_A$) | | 58,6 | 41,7 | 51,5 | 56,3 | 41,7 |
| $A_{BP}$ (% of $A_A$) | | 107,0 | 90,5 | 85,2 | 87,9 | 97,8 |
| $A_{AP}$ (% of $A_A$) | | 265,6 | 232,2 | 236,7 | 244,1 | 239,2 |
| $A_A$ / ($A_A$ + $A_B$) poppet ratio | | 0,6 | | | | |
| $A_{AP}$ / ($A_A$ + $A_B$) piloting ratio | | 1,6 | | | | |

**(1)** The type-examination certificate can be download from www.atos.com

### 7.1 Poppet areas of LIDAS/FV




**Poppet areas**

**AA** = main flow (side A)
**AB** = main flow (side B)
**AAP** = piloting area (close)
**ABP** = piloting area (open)

Thanks to the areas ratio $A_{AP}/(A_A+A_B)$, the valve closing is always ensured with a piloting pressure (X port) equal to the line pressure (A or B line).

## 8 COILS CHARACTERISTICS

| | |
|---|---|
| Insulation class | Pilot valve **E**, **EP: H** (180°C) for DC coils **F** (155°C) for AC coils<br>Pilot valve **I: H** (180°C) for DC or AC coils<br>Due to the occuring 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 666, 667, 669 correctly assembled) |
| Relative duty factor | 100% |
| Supply voltage and frequency | See electric feature 10 |
| Supply voltage tolerance | ± 10% |
| Certification | **cURus** North American Standard |

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

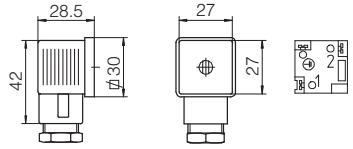
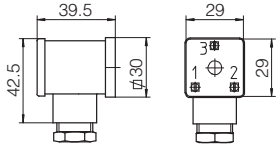
| | | | |
|---|---|---|---|
| Seals, recommended fluid temperature | NBR seals (standard) = -20°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C<br>FKM seals (/PE option) = -20°C ÷ +80°C | | |
| Recommended viscosity | 15÷100 mm²/s - max allowed range 2,8 ÷ 500 mm²/s | | |
| Max fluid contamination 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 | HL, HLP, HLPD, HVLP, HVLPD | DIN 51524 |
| Flame resistant without water | FKM | HFDU, HFDR | ISO 12922 |
| Flame resistant with water | NBR | HFC | |

## 10 ELECTRIC FEATURES - coils for pilot solenoid valves

| Valve | External supply nominal voltage ± 10% | **Voltage code** | Type of connector | Power consumption **(3)** | | Code of spare coil | | |
|---|---|---|---|---|---|---|---|---|
| | | | | **DHI** | **DHEP** | **DHI** | Colour of coil label **DHI** | **DHE, DHEP** |
| DHI DHE DHEP | 6 DC | **6 DC** (4) | 666 or 667 | 33 W | 30 W | COU-6DC | brown | - |
| | 12 DC | **12 DC** | | | | COU-12DC | green | COE-12DC |
| | 14 DC | **14 DC** | | | | COU-14DC | brown | COE-14DC |
| | 24 DC | **24 DC** | | | | COU-24DC | red | COE-24DC |
| | 28 DC | **28 DC** | | | | COU-28DC | silver | COE-28DC |
| | 48 DC | **48 DC** | | | | COU-48DC | silver | COE-48DC |
| | 110 DC | **110 DC** | | | | COU-110DC | gold | COE-110DC |
| | 125 DC | **125 DC** | | | | COU-125DC | blue | COE-125DC |
| | 220 DC | **220 DC** | | | | COU-220DC | black | COE-220DC |
| | 24/50 AC<br>24/60 AC | **24/50/60 AC** (4) | | 60 VA | - | COI-24/50/60AC (1) | pink | - |
| | 48/50 AC<br>48/60 AC | **48/50/60 AC** (4) | | | | COI-48/50/60AC (1) | white | - |
| | 110/50 AC | **110/50/60 AC** | | | 58 VA | COI-110/50/60AC (1) | yellow | COE-110/50/60AC |
| | 115/60 AC (5) | **115/60 AC** | | - | 80 VA | - | | COE-115/60AC |
| | 120/60 AC (4) | **120/60 AC** | | 60 VA | - | COI-120/60AC | white | - |
| | 230/50 AC | **230/50/60 AC** | | | 58 VA | COI-230/50/60AC (1) | light blue | COE-230/50/60AC |
| | 230/60 AC | **230/60 AC** | | | 80 VA | COI-230/60AC | silver | COE-230/60AC |
| | 110/50 AC<br>120/60 AC | **110RC** | 669 | 33 W | 30 W | COU-110RC | gold | COE-110RC |
| | 230/50 AC<br>230/60 AC | **230RC** | | | | COU-230RC | blue | COE-230RC |

(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 (DHI) and 58 VA (DHE and DHEP)
(2) Average values based on tests performed at nominal hydraulic condition and ambient/coil temperature of 20°C.
(3) When solenoid is energized, the inrush current is approx 3 times the holding current. Inrush current values correspond to a power consumption of about 150 VA.
(4) Only for pilot valve DHI
(5) Only for pilot valve DHE and DHEP

## 11 COILS ELECTRIC CONNECTORS FOR PILOT SOLENOID VALVES according to DIN 43650 (to be ordered separately)

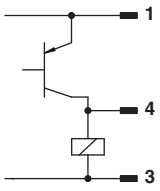
| **666, 667** (for AC or DC supply) | **669** (for AC supply) | **CONNECTOR WIRING** | |
|---|---|---|---|
|  |  | **666, 667**<br>1 = Positive ⊕<br>2 = Negative ⊖<br>⊕ = Coil ground | **669**<br>1,2= Supply voltage VAC<br>3 = Coil ground |

| **SUPPLY VOLTAGES** | | |
|---|---|---|
| **666** | **667** | **669** |
| All voltages | 24 AC or DC<br>110 AC or DC<br>220 AC or DC | 110/50 AC<br>110/60 AC<br>230/50 AC<br>230/60 AC |

## 12 TECHNICAL CHARACTERISTICS OF INDUCTIVE PROXIMITY AND POSITION SWITCHES

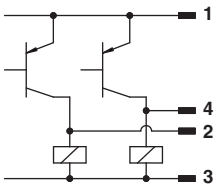
| Valve type | | **LIFI** | **LIDA*/FV, LIDAS*/FV** |
|---|---|---|---|
| Type of switch | | **/FI** proximity sensor | **/FV** position switch |
| Supply voltage | [V] | 10÷30 | 20÷32 |
| Ripple max | [%] | ≤ 20 | ≤ 10 |
| Max current | [mA] | 200 | 400 |
| Max peak pressure | [bar] | 500 | 400 |
| Mechanical life | | virtually infinite | virtually infinite |
| Switch logic | | PNP | PNP |

**/FI** scheme



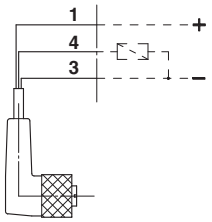
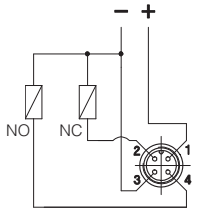

**1** supply +24 VDC
**3** GND
**4** output signal

**/FV** scheme




**1** supply +24 VDC
**2** output signal
**3** GND
**4** output signal

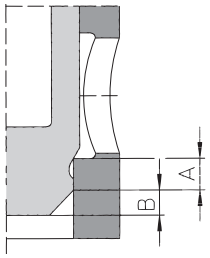
## 13 CONNECTING SCHEMES OF FI INDUCTIVE PROXIMITY AND FV POSITION SWITCHES

| **LIFI** | **LIDA*/FV, LIDAS*/FV** |
|---|---|
| Connector type **BKS-B-20-4-03** | Connector type **ZBE-06** IP65 |
|  |  |
| 1 (brown) = supply +24 VDC<br>3 (blue) = GND<br>4 (black) = output signal<br>CABLE LENGHT = 3 m | 1 = supply +24 VDC<br>2 = output signal NC<br>3 = GND<br>4 = output signal NO |

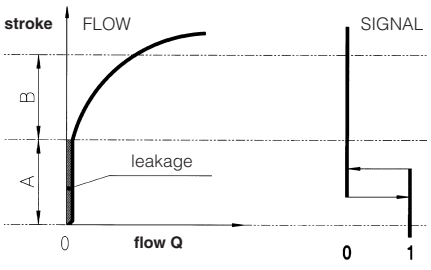
**Notes:**
- FI and FV sensor's connector are always supplied with the valve
- The /FI and /FV sensors are not provided with a protective earth connection

## 14 STATUS OF OUTPUT SIGNALS

A: overlapping stroke
B: damping stroke




According the criteria of safety specifications, the poppet position signal must change its status inside the overlapping stroke (before the effective valve opening).

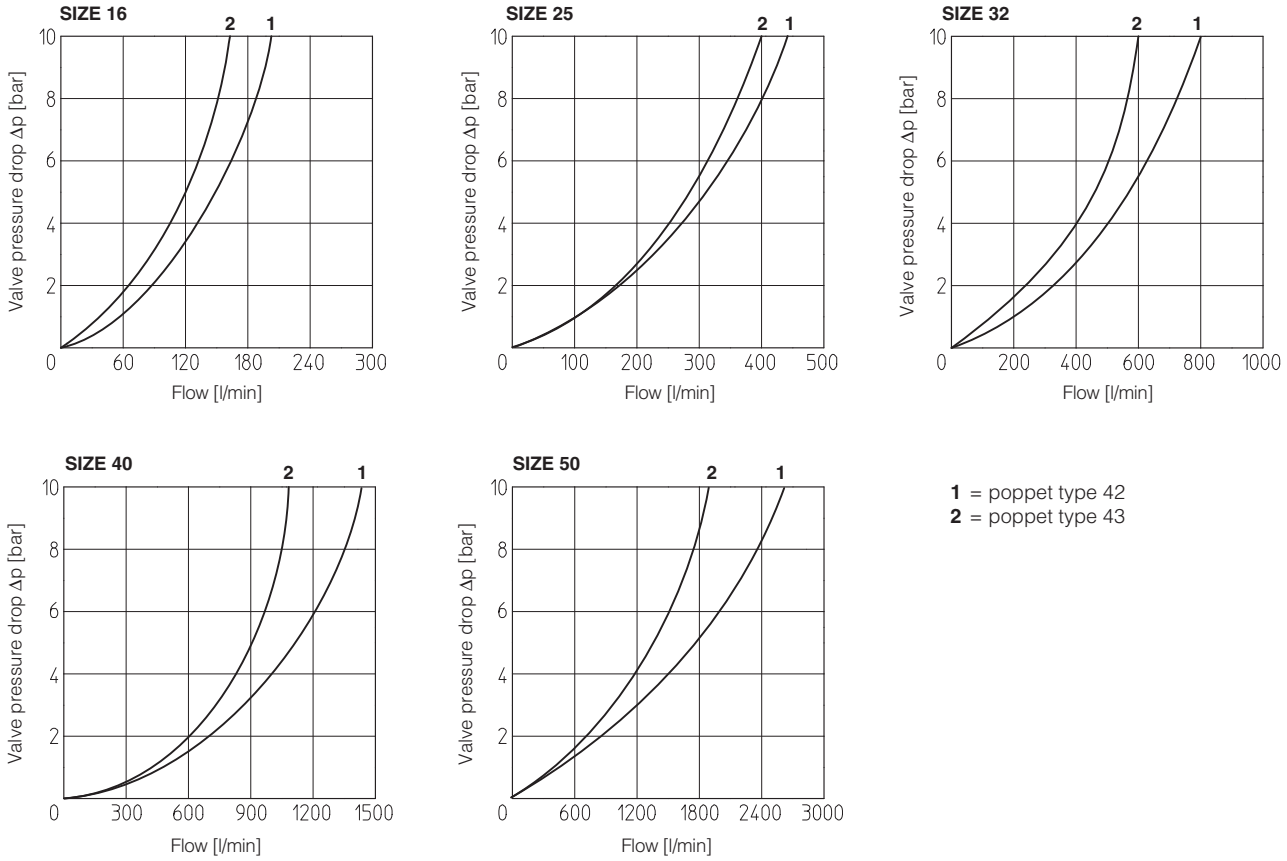



**WARNING**: the inobservance of following prescriptions invalidates the certification and may represent a risk for personnel injury

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

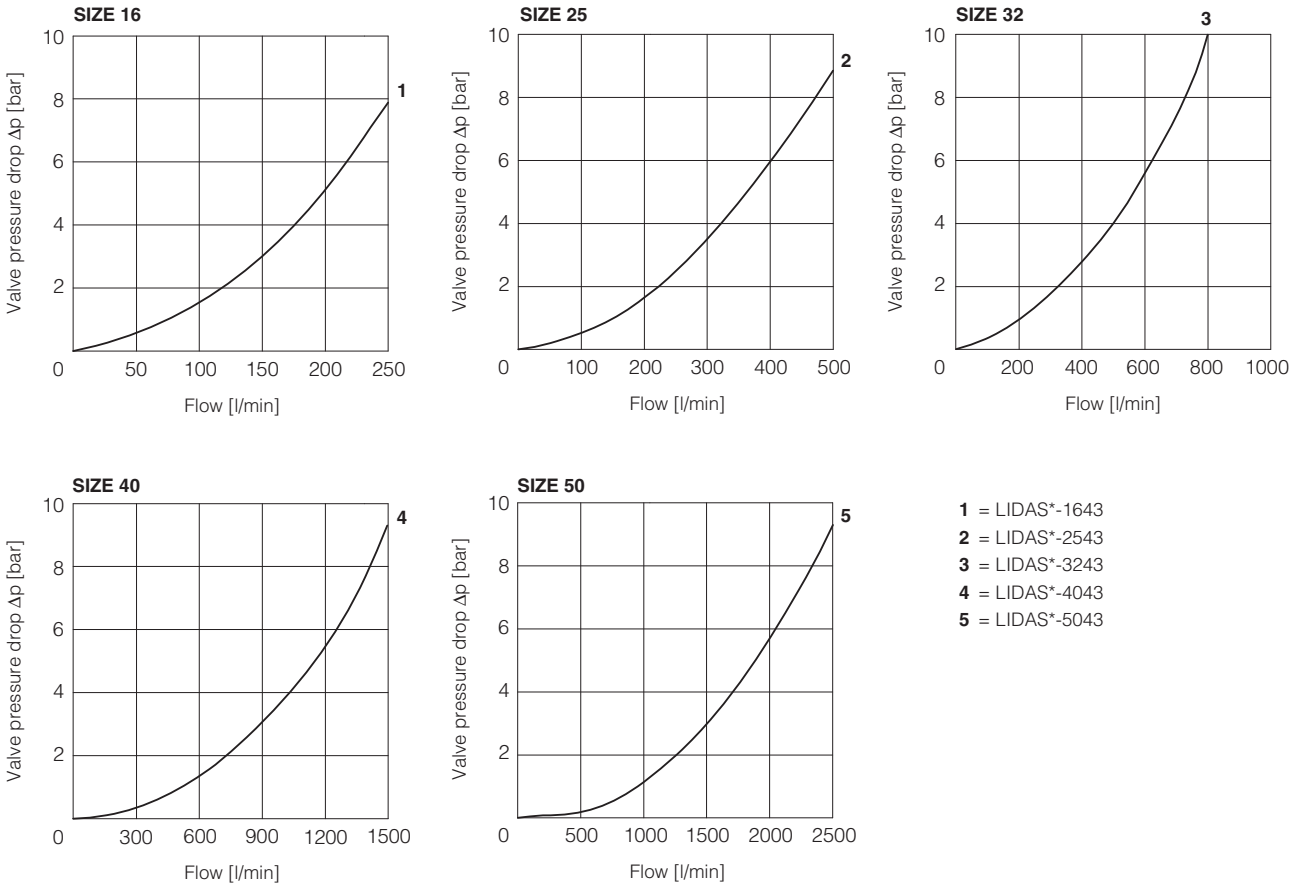
## 15 Q/Δp DIAGRAMS based on mineral oil ISO VG 46 at 50 °C

### 15.1 Q/Δp DIAGRAMS of LIFI and LIDA(H)/FV



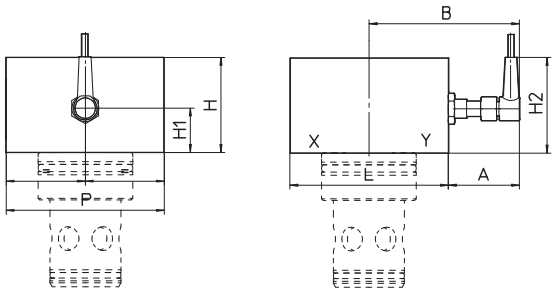

**1** = poppet type 42
**2** = poppet type 43

### 15.2 Q/Δp DIAGRAMS OF LIDAS/FV




**1** = LIDAS*-1643
**2** = LIDAS*-2543
**3** = LIDAS*-3243
**4** = LIDAS*-4043
**5** = LIDAS*-5043

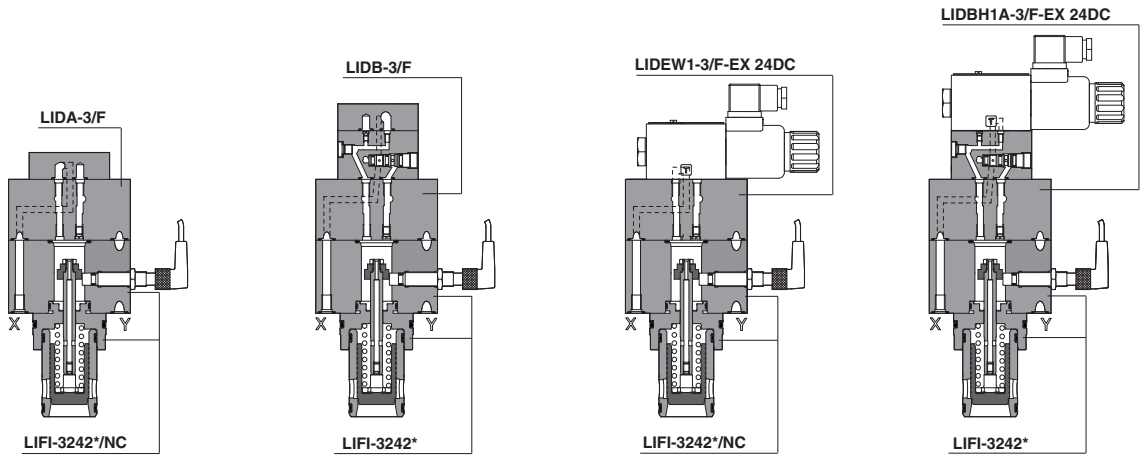
## 16 DIMENSIONS of LIFI SAFETY COVERS [mm]




| | 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 |

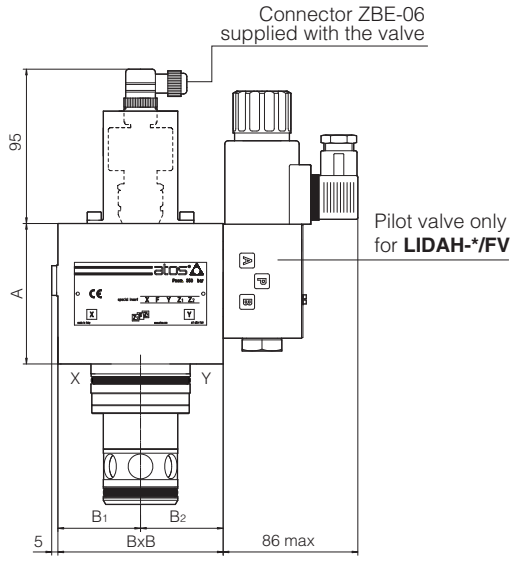
**Note**: for cover interface and cavity dimensions ISO 7368, see table P006

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

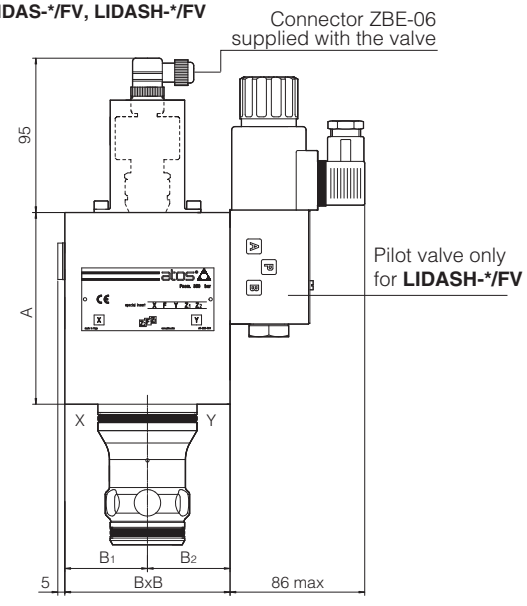



## 18 INSTALLATION DIMENSIONS of LIDA*/FV and LIDAS*/FV SAFETY CARTRIDGES [mm] (examples in size 32)

**LIDA-*/FV, LIDAH-*/FV**




**LIDAS-*/FV, LIDASH-*/FV**




**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 | B1 | B2 | A | B | B1 | B2 | A | B | B1 | B2 | A | B | B1 | B2 | LIDA | OTHER | LIDA | LIDAH | LIDAS, LIDASH | |
| **16** | 50 | 65x85 | 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 | 4 OR 108 | 4 M8x50 | 4 M8x70 | 4 M8x80 | 35 |
| **25** | 50 | 85 | 42.5 | 42.5 | 85 | 85 | 42.5 | 42.5 | 102 | 85 | 42.5 | 42.5 | 115 | 85 | 42.5 | 42.5 | 1 OR 108 | 4 OR 108 | 4 M12x55 | 4 M12x80 | 4 M12x95 | 125 |
| **32** | 65 | 100 | 50 | 50 | 85 | 100 | 50 | 50 | 104 | 100 | 50 | 50 | 116 | 100 | 50 | 50 | 1 OR 2043 | 4 OR 2043 | 4 M16x70 | 4 M16x70 | 4 M16x90 | 300 |
| **40** | 65 | 125 | 62.5 | 62.5 | 85 | 125 | 62.5 | 62.5 | 111 | 125 | 62.5 | 62.5 | 125 | 125 | 62.5 | 62.5 | 1 OR 3043 | 4 OR 3043 | 4 M20x80 | 4 M20x80 | 4 M20x70 | 600 |
| **50** | 65 | 140 | 70 | 70 | 85 | 140 | 70 | 70 | 50 | 140 | 70 | 70 | 135 | 140 | 70 | 70 | 1 OR 3043 | 4 OR 3043 | 4 M20x80 | 4 M20x80 | 4 M20x80 | 600 |