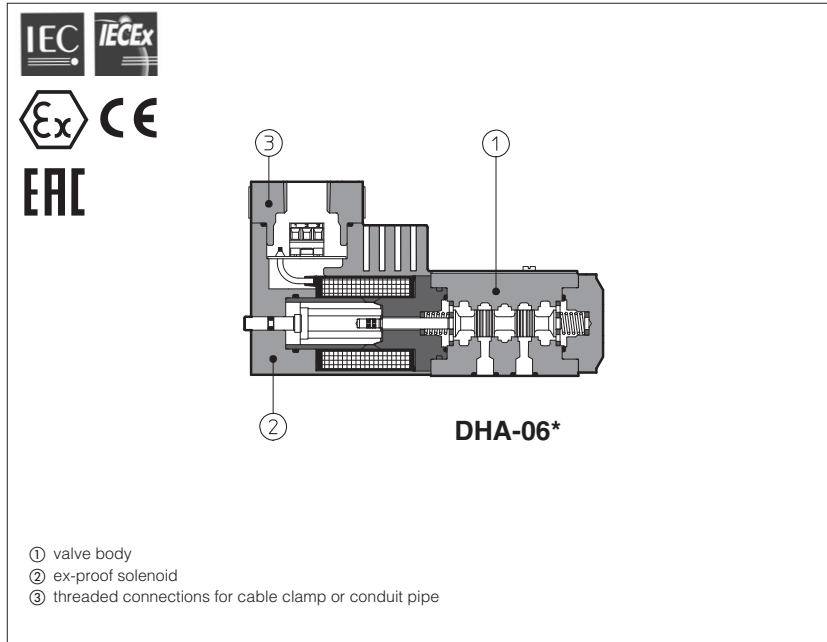


# On-off ex-proof solenoid valves

multicertification ATEX, IECEx, EAC



On/off valves equipped with explosion-proof solenoids available with following multicertifications:

Multicertifications for **solenoids group II** for surface plants with gas, vapours and dust environment

- ATEX 94/9/EC  
Ex II 2G Ex d IIC T6/T4 Gb  
Ex II 2D Ex tb IIIC T85°C/T135°C Db
- IECEx worldwide recognized certification  
Ex d IIC T6/T4 Gb  
Ex tb IIIC T85°C/T135°C Db
- EAC EurAsian Certification  
Ex II 2G Exd IIC T6/T4

Multicertifications for **solenoids group I** for surface, tunnels or mining plants

- ATEX 94/9/EC: Ex I M2 Ex d I Mb
- IECEx: I M2 Ex d I Mb

DHA and DLOH are **SIL** compliance with IEC 61508 (TÜV certified) - see section 3.6

The solenoid case is designed to contain the possible explosion which could be caused by the presence of the gas mixture inside the housing, thus avoiding dangerous propagation in the external environment. They are also designed to limit the external temperature according to the certified class to avoid the self ignition of the explosive mixture present in the environment.

## 1 EX-PROOF SOLENOIDS: MAIN DATA

SOLENOID TYPE		ON/OFF	
Solenoid code	Multicertification for Group II	OA	
	Multicertification for Group I (mining)	OAM	
<b>Voltage code</b>	VDC ±10%	<b>12DC, 24DC, 28DC, 48DC, 110DC, 125DC, 220DC</b>	
	VAC 50/60 Hz ±10%	<b>12AC, 24AC, 110-120AC, 230-240AC (1)</b>	
Power consumption		8W	
Coil insulation		Class H	
Protection degree		IP 66/67 According to IEC 144 when correctly coupled with the relevant cable gland PA*, see section 16	
Duty factor		100%	
Mechanical construction		Flame proof housing classified Ex d, according to EN 60079-0: 2006, EN 60079-1: 2007	
Cable entrance and electrical wiring		Internal terminal board for cable connection. Threaded connection for cable entrance, vertical (standard) or horizontal (option /O). See section 20 for cable gland	
Method of protection		Ex d	
Temperature class (only for Group II)		<b>T6</b>	<b>T4</b>
Surface temperature	Multicertification for Group II	≤ 85 °C	≤ 135 °C
	Multicertification for Group I (mining)	150 °C	
Ambient temperature	Multicertification for Group II	-40 ÷ +45 °C <b>(2)</b>	-40 ÷ +70 °C <b>(2)</b>
	Multicertification for Group I (mining)	-20 ÷ +70	

(1) For alternating current supply a rectifier bridge is provided built-in the solenoid

(2) The Group II solenoids are certified according to ATEX and IECEx for minimum ambient temperature -40°C.

In case the complete valve must withstand with minimum ambient temperature of -40°C, select **/BT** in the model code

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

Assembly position / location	Any position for all valves		
Subplate surface finishing	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)		
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 HNBR seals (/BT option) = -40°C ÷ +60°C, with HFC hydraulic fluids = -40°C ÷ +50°C		
Recommended viscosity	15 ÷ 100 mm <sup>2</sup> /s - max allowed range 2.8 ÷ 500 mm <sup>2</sup> /s		
Fluid contamination class	ISO 4406 class 21/19/16 NAS 1638 class 10, in line filters of 25 µm (β10 ≥ 75 recommended)		
<b>Hydraulic fluid</b>	<b>Suitable seals type</b>	<b>Classification</b>	<b>Ref. Standard</b>
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water	NBR, HNBR	HFC	

### 3 MULTICERTIFICATIONS

In the following are resumed the valves marking according to multicertifications for Group II and Group I (mining)

#### 3.1 GROUP II, ATEX marking

- II 2 G** = Solenoid for surface plants with gas and vapors environment, category 2, suitable for zone 1 and zone 2
- Ex d** = Explosion-proof equipment
- II C** = Equipment of group IIC suitable for substances (gas) of group IIC
- T6/T4** = Solenoid temperature class (maximum surface temperature)
- Gb** = Equipment protection level, high level protection for explosive Gas atmospheres
- CE** = Mark of conformity to the applicable European directives
- II 2 D** = Solenoid for surface plants with dust environment, category 2, suitable for zone 21 and zone 22
- Ex d** = Explosion-proof equipment
- III C** = Suitable for conductive dust (applicable also IIIB and/or IIIA)
- IP66/67** = Protection degree
- T85/T135** = Maximum surface temperature (Dust)
- Db** = Equipment protection level, high level protection for explosive Dust atmospheres
- Ex** = Mark of conformity to the 94/9/CE directive and to the technical norms

#### 3.2 GROUP II, IECEx marking

- Ex d** = Explosion-proof equipment
- IIC** = Equipment of group IIC suitable for substances (gas) of group IIC
- T6/T4** = Solenoid temperature classes (Gas)
- Gb** = Equipment protection level, high level protection for explosive Gas atmospheres
- Ex tb** = Equipment protection by enclosure "tb"
- IIIC** = Suitable for conductive dust (applicable also IIIB and/or IIIA)
- T85°C/T135°C** = Maximum surface temperature (Dust)
- Db** = Equipment protection level, high level protection for explosive Dust atmospheres
- IP66/67** = Protection degree

#### 3.3 EAC marking

EAC (EurAsian certification) acknowledges the whole ATEX Directive 94/9/EC.

This certification is available only for gas environment (not for dust).

**II 2 G** = Solenoid for surface plants with gas and vapors environment, category 2, suitable for zone 1 and zone 2

**Ex d** = Explosion-proof equipment

**II C** = Equipment of group IIC suitable for substances (gas) of group IIC

**T6/T4** = Solenoid temperature class (maximum surface temperature)

**Ex** = Mark of conformity to the 94/9/CE directive and to the technical norms

#### 3.4 GROUP I, ATEX (mining)

- Ex** = ATEX identification for explosive atmospheres equipments
- I** = Group I for mines and surface plants
- M2** = High protection (equipment category)
- Ex d** = Explosion-proof equipment
- I** = Gas group (Methane)
- Mb** = Equipment protection level, high level protection for explosive atmospheres
- IP66/67** = Protection degree

#### 3.5 GROUP I, IECEx (mining)


- I** = Group I for mines and surface plants
- M2** = High protection (equipment category)
- Ex d** = Explosion-proof equipment
- I** = Gas group (Methane)
- Mb** = Equipment protection level, high level protection for explosive atmospheres
- IP66/67** = Protection degree

#### 3.6 SIL compliance with IEC 61508: 2010

DHA and DLOH (multicertified for surface and mining) meets the requirements of:

- **SC3** (systematic capability)
- max **SIL 2** (HFT = 0 if the hydraulic system does not provide the redundancy for the specific safety function where the component is applied)
- max **SIL 3** (HFT = 1 if the hydraulic system provides the redundancy for the specific safety function where the component is applied)

#### EXAMPLE OF NAMEPLATE MARKING


Atex notified body and certificate number	MODEL N° <input type="text"/>	atos® 	
	SERIAL N° <input type="text"/>	Atos spa - Via alla Piana, 57 21018 Sesto Calende (V) Italy	
Marking according to ATEX Directive	CE 0722 CESI 02 ATEX 014X		
IECEx notified body and certificate number	Ex II 2G Ex d IIC T6/T4 Gb		
Marking according to IECEx Directive	IECEx CES 10.0010X		
Russian notified body and certificate number	Ex tb IIC T85°C / T135°C Db		
Marking according to ATEX Directive	TP TC N° TC RU C-IT, Г Б 08. В. 00881 012/2011 Серия RU N°0239862		
Marking according to ATEX Directive	EAC Ex II 2G Exd IIC T6/T4		
	Supply	<input type="text"/> W	<input type="text"/> V <input type="text"/> Hz
	Tamb.	- <input type="text"/> ÷ + 45°C / +70°C	IP66/67
	For the correct selection of connecting cable temperatures see safety instructions		
	AT-907/BT		

#### Note:

According to EN60079-0 the valves with Atex certification can be coated with a non-metallic material (for ex. painted), observing the maximum thickness:

**Group IIC** = 0,2 mm max

#### EXAMPLE OF NAMEPLATE MARKING

Atex notified body and certificate number	MODEL N° <input type="text"/>	atos® 	
	SERIAL N° <input type="text"/>	Atos spa - Via alla Piana, 57 21018 Sesto Calende (V) Italy	
Marking according to ATEX Directive	CE 0722 CESI 03 ATEX 057X		
IECEx notified body and certificate number	Ex I M2 Ex d I Mb		
Marking according to IECEx Directive	IECEx CES 12.007X		
	I M2 Ex d I Mb		
	Supply	<input type="text"/> W	<input type="text"/> V <input type="text"/> Hz
	Tamb.	- <input type="text"/> ÷ + 45°C / +70°C	IP66/67
	For the correct selection of connecting cable temperatures see safety instructions		
	AT-904/BT		



**WARNING:** service work provided on the valve by the end users or not qualified personnel invalidates the certification

**4 MODEL CODE OF SPOOL TYPE, DIRECT SOLENOID VALVES**

<p><b>DHA</b> / * - <b>0</b>    <b>63</b>    <b>1/2</b> - <b>GK</b> / *    <b>24DC</b>    ** / *</p> <p><b>DHA</b> = spool type - direct</p> <p>Optional multicertifications          - = omit for Group II  <b>M</b> = Group I (mining)</p> <p>Valve size (ISO 4401) for DHA    <b>0</b> = 06</p> <p>Valve configuration, see section 5</p> <p>Spool type, see section 5</p> <p>Solenoid threaded connection for cable gland:  <b>GK</b> = GK-1/2" ISO/UNI-6125 (tapered)  <b>NPT</b> = 1/2" NPT ANSI B2.1 (tapered)  <b>M</b> = M20x1,5 UNI-4535 (6H/6g)</p>	<p>Seals material, see section 2:          - = NBR  <b>PE</b> = FKM  <b>BT</b> = HNBR</p> <p>Series number</p> <p>Voltage code - see section 1</p>	<p>Options:  <b>A</b> = solenoid at side of port B (for single solenoid valves)  <b>MV</b> = vertical hand lever (2)  <b>O</b> = horizontal cable entrance (1)  <b>WP</b> = prolonged manual override protected by metallic cap</p>
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(1) Not for multicertification **M** group I (mining)  
 (2) Available only for DHA, configuration 61, 63, 71 and spool type 0, 0/2, 1, 1P, 1/2, 1/2P, 3, 3P, 4, 7

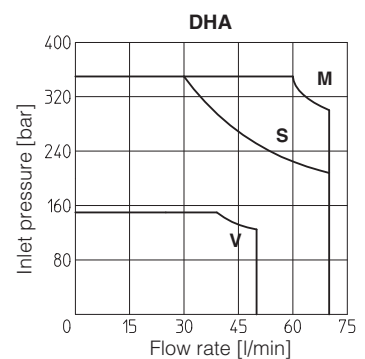
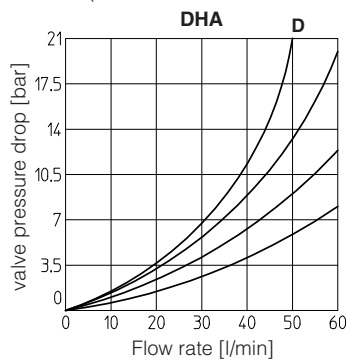
**5 CONFIGURATIONS and SPOOLS for DHA valves**

<p><b>Configurations</b></p> <p>61 </p> <p>61/A </p> <p>67 </p> <p>67/A </p> <p>71 </p> <p><b>Spoils</b></p> <p>1 0 2    1 0 2    1 0 2    1 0 2</p> <p>0  1  3  4 </p> <p>5  6  7  8 </p> <p>90  09  91  19 </p> <p>93  39  94  49 </p> <p>16  17  58 </p>	<p><b>Configurations</b></p> <p>63 </p> <p>63/A </p> <p>70 </p> <p>75 </p> <p><b>Spoils</b></p> <p>1 0 2</p> <p>0/2 </p> <p>1/2 </p> <p>2/2 </p> <p>not for configuration 75</p> <p>only for spool 0/2 and 1/2</p>
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Note: spoils 1, 1/2 and 3 are available as 1P, 1/2P and 3P to limit the valve internal leakage

**6 Q/Δp DIAGRAMS AND OPERATING LIMITS OF DHA (based on mineral oil ISO VG 46 at 50°C)**

Flow direction \ Spool type	P→A	P→B	A→T	B→T	P→T
	0	C	C	C	C
0/2, 1, 1/2	A	A	A	A	
3	A	A	C	C	
4, 5	D	D	D	D	A
6	A	A	C	A	
7	A	A	A	C	
8	C	C	B	B	



**PRESSURE LIMITS:** P, A, B = 350 bar; T = 210 bar

**M** = Spools 0, 1, 8;  
**S** = Spools 0/2, 1/2, 3, 6, 7;  
**V** = Spools 4, 5

**7 MODEL CODE OF SPOOL TYPE, PILOTED SOLENOID VALVES**

<p><b>DPHA</b> / * - <b>2</b>      <b>63</b>      <b>1/2</b> - <b>GK</b> / *      <b>24DC</b>      ** / *</p> <p><b>DPHA</b> = spool type - piloted</p> <p>Optional multicertifications          - = omit for Group II  <b>M</b> = Group I (mining)</p> <p>Valve size (ISO 4401)          for DPHA <b>1</b> = 10   <b>2</b> = 16                        <b>4</b> = 25   <b>6</b> = 32</p> <p>Valve configuration, see section 8</p> <p>Spool type, see section 8</p> <p>Solenoid threaded connection for cable gland:  <b>GK</b> = GK-1/2" ISO/UNI-6125 (tapered)  <b>NPT</b> = 1/2" NPT ANSI B2.1 (tapered)  <b>M</b> = M20x1,5 UNI-4535 (6H/6g)</p>	<p>Seals material, see section 2:          - = NBR  <b>PE</b> = FKM  <b>BT</b> = HNBR</p> <p>Series number</p> <p>Voltage code - see section 1</p>	<p>Options:</p> <p><b>A</b> = solenoid at side of port B (for single solenoid valves)  <b>O</b> = horizontal cable entrance (1)  <b>WP</b> = prolonged manual override protected by metallic cap  <b>/D</b> = Internal drain  <b>/E</b> = external pilot pressure  <b>/H</b> = adjustable chokes (meter-out to the pilot chambers of the main valve)  <b>/H9</b> = adjustable chokes (meter-in to the pilot chambers of the main valve)  <b>/L9</b> = (only for DPHA-2 and DPHA-4) plug with calibrated restrictor on port P of pilot valve  <b>/R</b> = pilot pressure generator (not for DPHA-1)  <b>/S</b> = main spool stroke adjustment (not for DPHA-1)</p>
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(1) Not for multicertification **M** group I (mining)

**8 CONFIGURATIONS and SPOOLS for DPHA valves**

Configurations	Spools	Configurations	Spools
	<p>1 0 2    1 0 2    1 0 2    1 0 2</p> <p>0    1    2    3</p> <p>4    5    6    7</p> <p>8    90    09    91</p> <p>19    93    39    94</p> <p>49    16    17    58</p>		<p>1 0 2</p> <p>0/2</p> <p>1/2</p> <p>2/2</p>

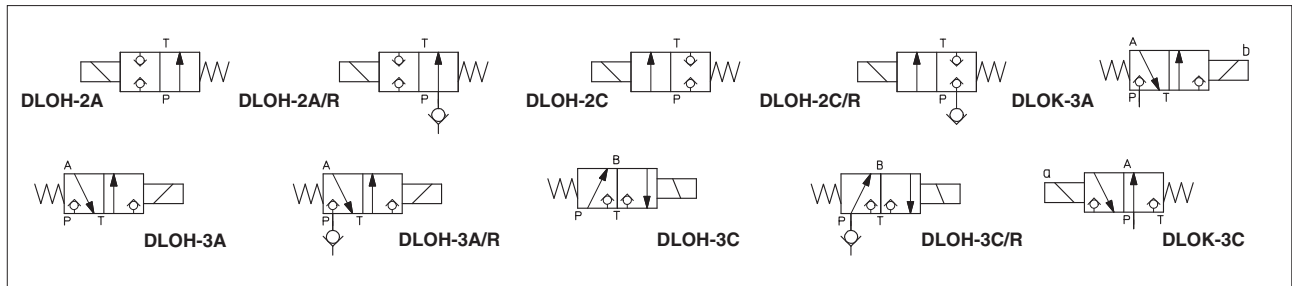
**NOTES:** - For **DP\*-1** are available only spools: **0, 0/2, 1, 1/2, 3, 4, 5, 58, 6, 7**  
 - For **DP\*-6** are available only spools: **0, 1, 2, 3, 4, 5, 58, 6, 7, 8, 19, 91**

**9 MODEL CODE OF POPPET TYPE LEAK FREE DIRECTIONAL SOLENOID VALVES**

<b>DLO</b>	<b>H</b> -	<b>2</b>	<b>A</b> -	<b>GK</b> -	<b>AO</b> /	<b>*</b>	<b>24DC</b> /	<b>**</b> /	<b>*</b>
Directional control valve poppet type, size 06									
<b>H</b> = max flow 12 l/min <b>K</b> = max flow 30 l/min									Seals material, see section 2: - = NBR <b>PE</b> = FKM <b>BT</b> = HNBR
<b>2</b> = two way (only for DLOH) <b>3</b> = three way									Series number
Valve configuration, see section 10 <b>A</b> = open in rest position <b>C</b> = closed in rest position									Voltage code - see section 11
Solenoid threaded connection for cable gland: <b>GK</b> = GK-1/2" ISO/UNI-6125 (tapered) <b>NPT</b> = 1/2" NPT ANSI B2.1 (tapered) <b>M</b> = M20x1,5 UNI-4535 (6H/6g)									Options: <b>O</b> = horizontal cable entrance (1) <b>R</b> = with check valve on port P (only for DLOH) <b>WP</b> = prolonged manual override protected by metallic cap
									Certification type <b>AO</b> = Multicertification for Group II <b>AO/M</b> = Multicertification for Group I (mining)

(1) Not for multicertification **M** group I (mining)

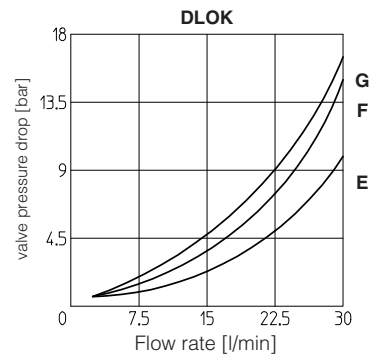
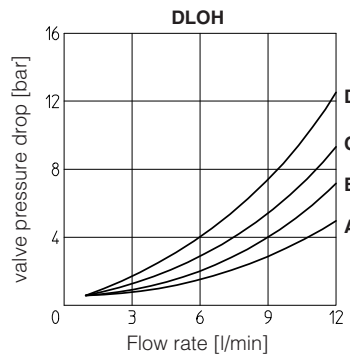
**10 CONFIGURATION OF DLOH/AO/\* AND DLOK/AO/\***



**11 Q/Δp DIAGRAMS AND OPERATING LIMITS OF DLOH AND DLOK (based on mineral oil ISO VG 46 at 50°C)**

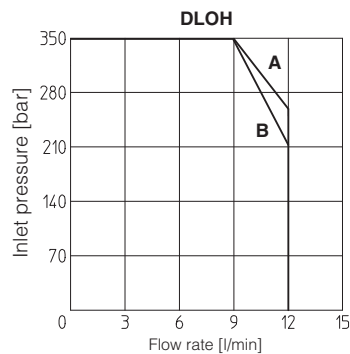
Flow direction Valve type	P → A (1) (P → B)	A → T (B → T)
	<b>DLOH-2A</b>	B
<b>DLOH-2C</b>	C	-
<b>DLOH-3A</b>	D	C
<b>DLOH-3C</b>	C	A
<b>DLOK-3A</b>	G	F
<b>DLOK-3C</b>	F	E

(1) For two-way valves pressure drop refers to P→T

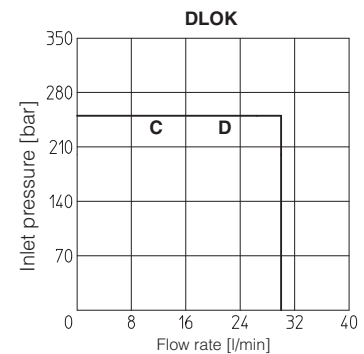


**INTERNAL LEAKAGE** of DLOH and DLOK less than 5 drops/min (0,36 cm³/min) at max pressure

**PRESSURE LIMITS:**  
P, A, B = 350 bar; T = 210 bar



**A** = DLOH-3A;  
**B** = DLOH-2A, DLOH-3C



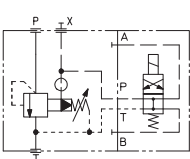
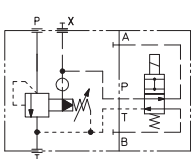
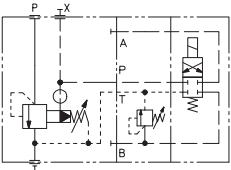
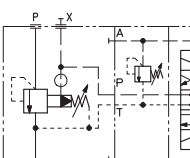
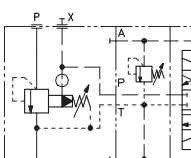
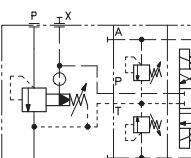
**C** = DLOK-3A;  
**D** = DLOK-3C

**12 MODEL CODE OF PRESSURE RELIEF VALVES**

<p><b>AGAM</b></p> <p><b>AGAM</b> = pressure relief valve: subplate mounting, see tab. C066  <b>ARAM</b> = pressure relief valve: threaded connections, see tab. C045</p> <p>Valve size  for AGAM: <b>10</b> (ISO 6264)  <b>20</b> (ISO 6264)  <b>32</b> (ISO 6264)</p> <p>for ARAM: <b>20</b> = G 3/4"  <b>32</b> = G 1 1/4"</p> <p>Number of the different setting pressure values:  <b>1</b> = one setting pressure  <b>2</b> = two setting pressure  <b>3</b> = three setting pressure</p> <p>Valve configuration  <b>0</b> = venting with de-energized solenoid  <b>1</b> = venting with energized solenoid  <b>2</b> = without venting</p>	-	20	/	2	/	0	/	210/100/100	-	NPT	-	AO	*	24DC	**	/	*
<p>Seals material, see section 2:  - = NBR  <b>PE</b> = FKM  <b>BT</b> = HNBR</p> <p>Series number</p> <p>Voltage code - see section 1</p> <p>Options:  <b>E</b> = external pilot  <b>O</b> = horizontal cable entrance (1)  <b>V</b> = regulating handwheel  <b>WP</b> = prolonged manual override protected by metallic cap  <b>Y</b> = external drain</p> <p>Certification type  <b>AO</b> = Multicertification for Group II  <b>AO/M</b> = Multicertification for Group I (mining)</p> <p>Solenoid threaded connection for cable gland:  <b>GK</b> = GK-1/2" ISO/UNI-6125 (tapered)  <b>NPT</b> = 1/2" NPT ANSI B2.1 (tapered)  <b>M</b> = M20x1,5 UNI-4535 (6H/6g)</p>																	
<p>Max regulated pressure of first (second / third) setting see sect. 13</p>																	

(1) Not for multicertification M group I (mining)

**13 HYDRAULIC CHARACTERISTICS**

 <p><b>AGAM-*/10</b> <b>ARAM-*/10</b></p>	 <p><b>ARAM-*/10</b> <b>AGAM-*/11</b></p>	 <p><b>AGAM-*/22</b> <b>ARAM-*/22</b></p>
 <p><b>AGAM-*/20</b> <b>ARAM-*/20</b></p>	 <p><b>AGAM-*/21</b> <b>ARAM-*/21</b></p>	 <p><b>AGAM-*/32</b> <b>ARAM-*/32</b></p>

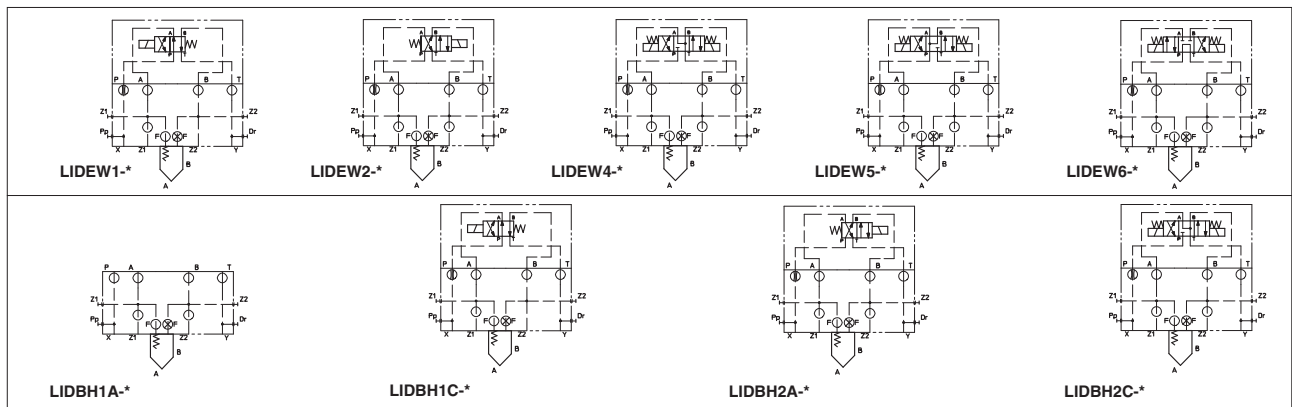
Valve model	Size 10	Size 20	Size 32
Setting	50; 100; 210; 350		
Max pressure port P [bar]	350		
Pressure range [bar]	4÷50; 6÷100; 7÷210; 8÷350		
Max flow <b>AGAM</b> [l/min]	200	400	600
Max flow <b>ARAM</b> [l/min]	-	350	500

**14 MODEL CODE OF COVERS FOR CARTRIDGE VALVES**

<b>LIDEW</b>	-	<b>1</b>	-	<b>GK</b>	-	<b>AO</b>	/	<b>*</b>	<b>24DC</b>	/	<b>**</b>	/	<b>*</b>	<b>*</b>
<p>Cover type:  <b>LIDBH*</b> = with solenoid valve and shuttle valve for pilot selection  <b>LIDEW*</b> = with solenoid valve for pilot selection  <b>*</b> = valve configuration (see H030 section 2)</p> <p>Size (ISO 7368)  <b>1</b> = 16;    <b>4</b> = 40;  <b>2</b> = 25;    <b>5</b> = 50;  <b>3</b> = 32;    <b>6</b> = 63;</p> <p>Solenoid threaded connection for cable gland:  <b>GK</b> = GK-1/2" ISO/UNI-6125 (tapered)  <b>NPT</b> = 1/2" NPT ANSI B2.1 (tapered)  <b>M</b> = M20x1,5 UNI-4535 (6H/6g)</p> <p>Certification type  <b>AO</b> = Multicertifications for Group II,  <b>AO/M</b> = Multicertifications for Group I, ATEX (mining)</p>														
<p>Options:  <b>B</b> = cartridge piloted via port "B" of solenoid pilot valve  <b>E</b> = external attachments X (1/4" GAS) and underneath port X supplied plugged (only for sizes 40...63)  <b>O</b> = horizontal cable entrance (1)  <b>WP</b> = prolonged manual override protected by metallic cap</p>														
<p>Optional different provision or setting of the calibrated plugs in the pilot channels see table H030 sect. 6</p> <p>Seals material, see section 2:  <b>-</b> = NBR  <b>PE</b> = FKM  <b>BT</b> = HNBR</p> <p>Series number</p> <p>Voltage code - see section 1</p>														

**Note:** for the code of the ISO cartridge to use with the above covers see tab. H003, section 2 and tab. H030, section 3  
**(1)** Not for multicertification **M** group I (mining)

**15 HYDRAULIC SYMBOLS**



**16 CABLE GLANDS - only for Group II - to be ordered separately - see technical table K600**

**Wiring specifications**

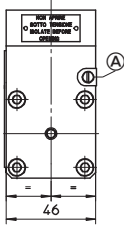
**The cable must be suitable for the working temperature as specified in the "safety instructions" delivered with the first supply of the products.**

Additional equipotential grounding can be also performed by the user on the external facility provided on the solenoid case.

Minimum section of external ground wire = 4 mm<sup>2</sup>.

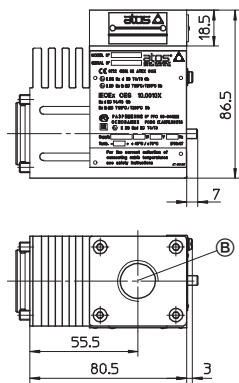
Minimum section of internal ground wire = the same of supply wire.

OA;

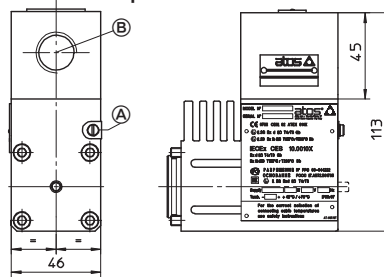


Mass: 1,67 kg

OA/M

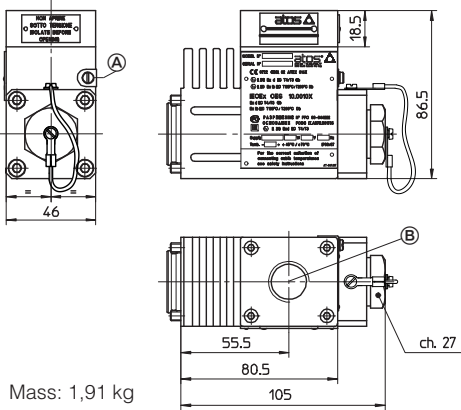


Option /O



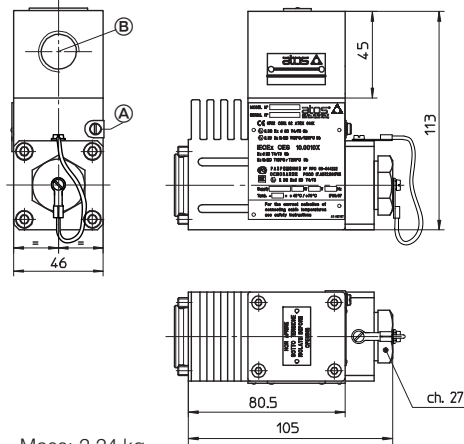
Mass: 2 kg

Option /WP

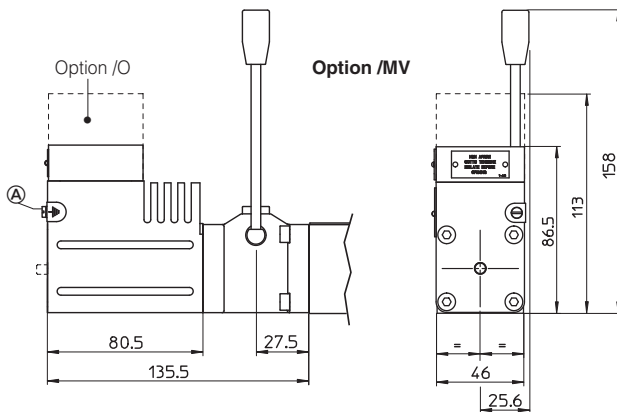


Mass: 1,91 kg

Option /OWP



Mass: 2,24 kg



- (A) = screw terminal for additional equipotential grounding
- (B) = Solenoid wiring

