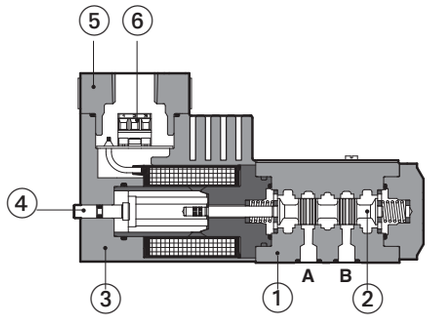
On-off ex-proof solenoid valves

multicertification ATEX, IECEx, EAC



DHA-06*

① valve body
② spool
③ ex-proof solenoid
④ manual override
⑤ threaded connections for cable gland or conduit pipe
⑥ internal terminal board for cable connection

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

Multicertification 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

Multicertification for solenoids group I for surface, tunnels or mining plants

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

DHA and DLAH 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				
Solenoid code	Multicertification for Group II		ON/OFF	
	Multicertification for Group I (mining)		OA	
Voltage code	VDC	±10%	OAM	
	VAC 50/60 Hz	±10%	**12DC, 24DC, 28DC, 48DC, 110DC, 125DC, 220DC**	
Power consumption			**12AC, 24AC, 110-120AC, 230-240AC (1)**	
Coil insulation			8W	
Protection degree			Class H	
Duty factor			IP 66/67 According to IEC 144 when correctly coupled with the relevant cable gland PA*, see section 16	
Mechanical construction			100%	
Cable entrance and electrical wiring			Flame proof housing classified Ex d, according to EN 60079-0: 2006, EN 60079-1: 2007	
Method of protection			Internal terminal board for cable connection. Threaded connection for cable entrance, vertical (standard) or horizontal (option /O). See section 16 for cable gland and wiring	
Temperature class (only for Group II)			Ex d	
Surface temperature	Multicertification for Group II		**T6**	**T4**
	Multicertification for Group I (mining)		≤ 85 °C	≤135 °C
Ambient temperature	Multicertification for Group II		150 °C	
	Multicertification for Group I (mining)		-40 ÷ +45 °C **(2)**	-40 ÷ +70 °C **(2)**
			-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 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Fluid contamination class	ISO 4406 class 21/19/16 NAS 1638 class 10, in line filters of 25 μm (β10 ≥75 recommended)		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
	NBR, FKM, HNBR	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
	FKM	HFDU, HFDR	ISO 12922
	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

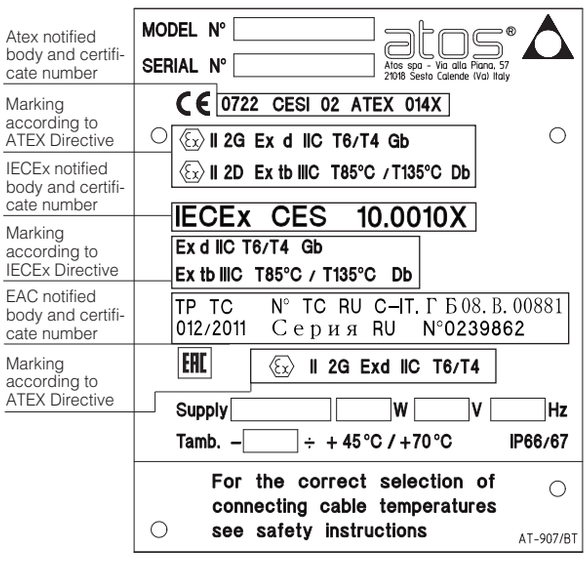
3.4 GROUP I, ATEX (mining)

Ex = ATEX identification for explosive atmospheres equipments
I = Group I for mines and surface plants
M2 = High protection (equipment category)
Ex db = 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)

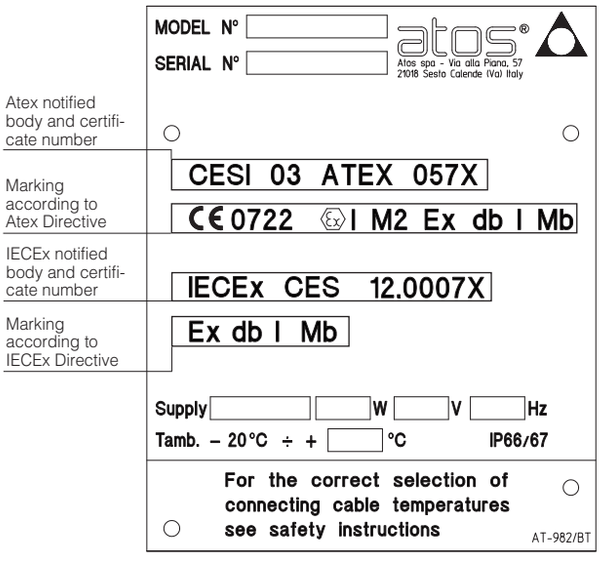
Ex db = Explosion-proof equipment
I = Gas group (Methane)
Mb = Equipment protection level, high level protection for explosive atmospheres
IP66/67 = Protection degree

EXAMPLE OF NAMEPLATE MARKING



Note:
According to EN60079-0 the valves with Atex certification can be coated with a non-metallic material (for ex. paintened), observing the maximum thickness:
Group IIC = 0,2 mm max

EXAMPLE OF NAMEPLATE MARKING



3.6 SIL compliance with IEC 61508: 2010

DHA and DLAH (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)

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

DHA	/	*	-	0	63	1/2	/	GK	/	*	24DC	**	/	*

DHA = spool type - direct

Optional multicertifications
- = omit for Group II
M = Group I (mining)

Valve size (ISO 4401)
for DHA **0** = 06

Valve configuration, see section 5

Spool type, see section 5

Solenoid threaded connection for cable gland:
GK = GK-1/2" ISO/UNI-6125 (tapered)
NPT = 1/2" NPT ANSI B2.1 (tapered)
M = M20x1,5 UNI-4535 (6H/6g)

Options:
A = solenoid at side of port B (for single solenoid valves)
MV = vertical hand lever **(2)**
O = horizontal cable entrance **(1)**
WP = prolongued manual override protected by metallic cap

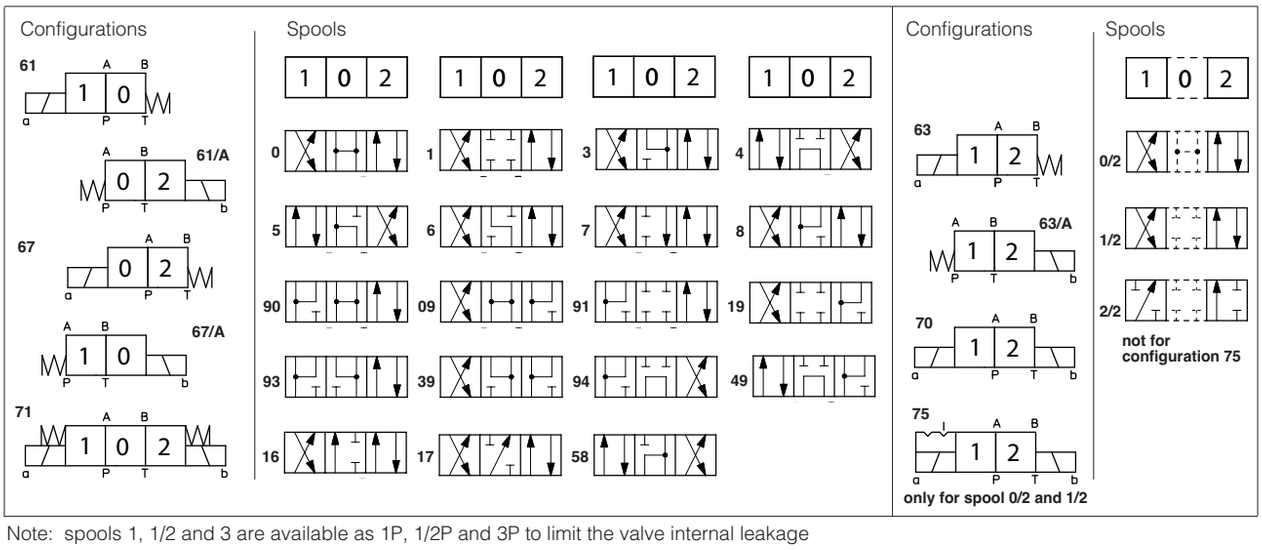
Voltage code - see section 1

Series number

Seals material, see section 2:
- = NBR
PE = FKM
BT = HNBR

(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

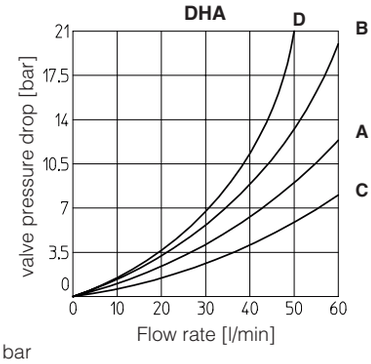
5 CONFIGURATIONS and SPOOLS for DHA valves

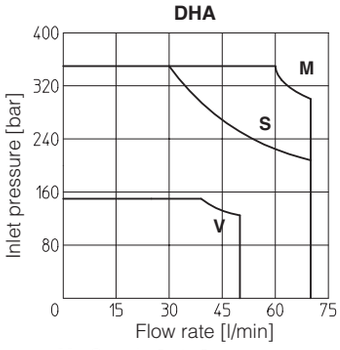


Note: spools 1, 1/2 and 3 are available as 1P, 1/2P and 3P to limit the valve internal leakage

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

DPHA	/	*	-	2	63	1/2	/	GK	/	*	24DC	**	/	*

DPHA = spool type - piloted

Optional multicertifications
- = omit for Group II
M = Group I (mining)

Valve size (ISO 4401)
for DPHA **1** = 10 **2** = 16
4 = 25 **6** = 32

Valve configuration, see section 8

Spool type, see section 8

Solenoid threaded connection for cable gland:
GK = GK-1/2" ISO/UNI-6125 (tapered)
NPT = 1/2" NPT ANSI B2.1 (tapered)
M = M20x1,5 UNI-4535 (6H/6g)

Options:
A = solenoid at side of port B (for single solenoid valves)
O = horizontal cable entrance **(1)**
WP = prolongued manual override protected by metallic cap
/D = Internal drain
/E = external pilot pressure
/H = adjustable chokes (meter-out to the pilot chambers of the main valve)
/H9 = adjustable chokes (meter-in to the pilot chambers of the main valve)
/L9 = (only for DPHA-2 and DPHA-4) plug with calibrated restrictor on port P of pilot valve
/R = pilot pressure generator (not for DPHA-1)
/S = main spool stroke adjustment (not for DPHA-1)

Voltage code - see section 1

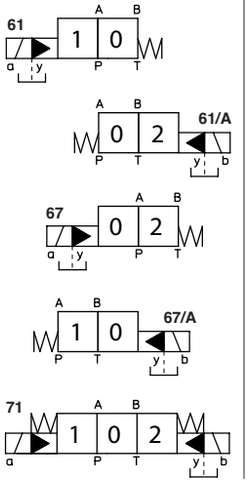
Series number

Seals material, see section 2:
- = NBR
PE = FKM
BT = HNBR

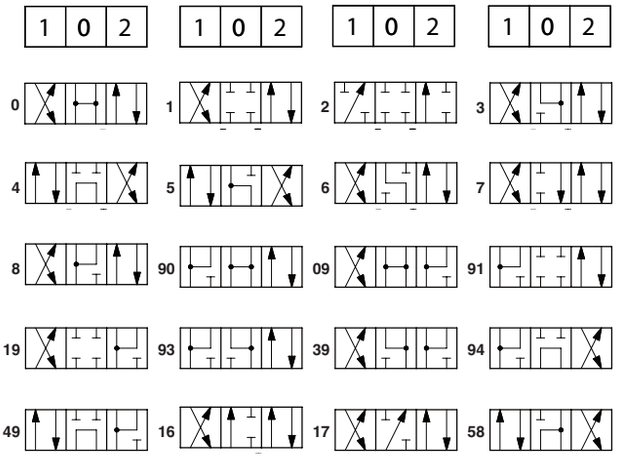
(1) Not for multicertification **M** group I (mining)

8 CONFIGURATIONS and SPOOLS for DPHA valves

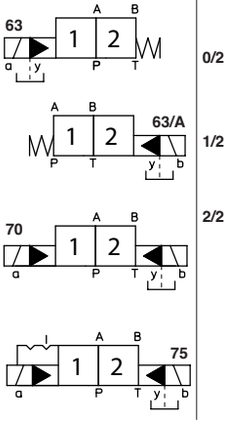
Configurations



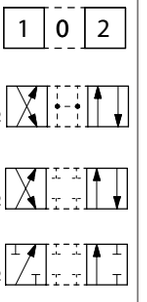
Spools



Configurations



Spools



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

DLAH / * - **2** **A** / **GK** / * **24DC** / ** / *

Directional control valve poppet type, size 06
DLAH = max flow 12 l/min
DLAHM = max flow 30 l/min

Optional multicertifications
- = omit for Group II
M = Group I (mining)

2 = two way (only for DLAH)
3 = three way

Valve configuration, see section 10
A = open in rest position
C = closed in rest position

Solenoid threaded connection for cable gland:
GK = GK-1/2" ISO/UNI-6125 (tapered)
NPT = 1/2" NPT ANSI B2.1 (tapered)
M = M20x1,5 UNI-4535 (6H/6g)

Options:
O = horizontal cable entrance **(1)**
R = with check valve on port P (only for DLAH)
WP = prolongued manual override protected by metallic cap

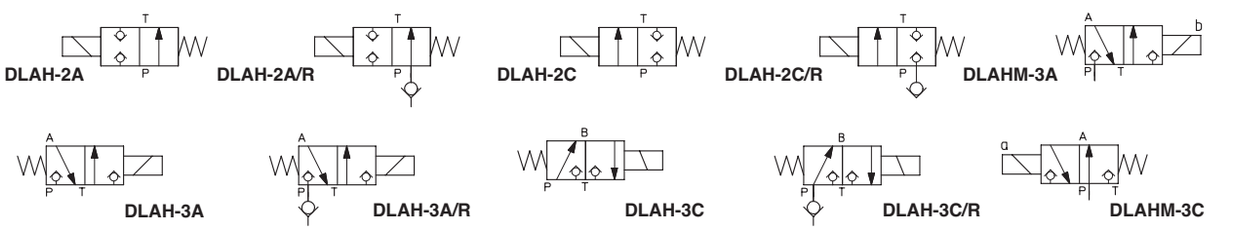
Voltage code - see section 1

Series number

Seals material, see section 2:
- = NBR
PE = FKM
BT = HNBR

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

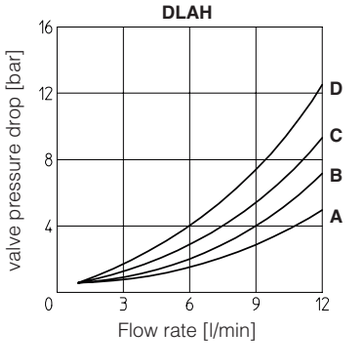
10 CONFIGURATION OF DLAH AND DLAHM

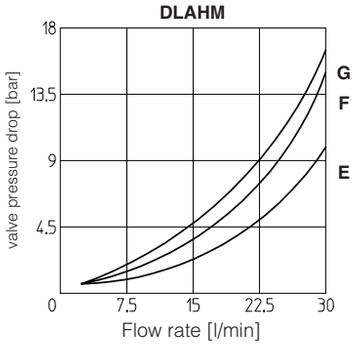


11 Q/Δp DIAGRAMS AND OPERATING LIMITS OF DLAH AND DLAHM (based on mineral oil ISO VG 46 at 50°C)

Flow direction / Valve type	P→A (1) (P→B)	A→T (B →T)
DLAH-2A	B	–
DLAH-2C	C	–
DLAH-3A	D	C
DLAH-3C	C	A
DLAHM-3A	G	F
DLAHM-3C	F	E

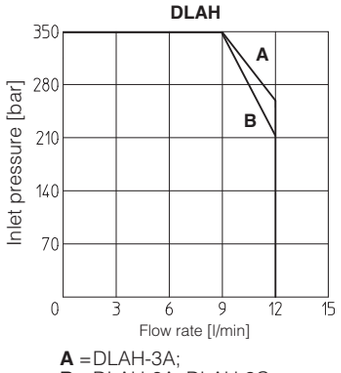
(1) For two-way valves pressure drop refers to P→T



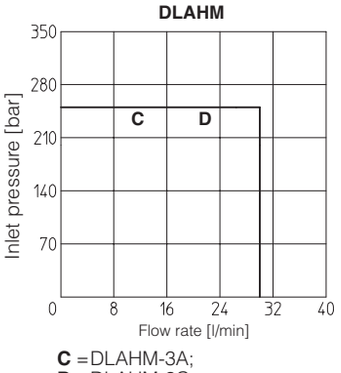


INTERNAL LEAKAGE of DLAH and DLAHM less than 5 drops/min (0,36 cm³/min) at max pressure

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



A = DLAH-3A;
B = DLAH-2A, DLAH-3C



C = DLAHM-3A;
D = DLAHM-3C

12 MODEL CODE OF PRESSURE RELIEF VALVES

AGAM	-	20	/	2	0	/	210/100/100	/	NPT	-	AO	/	*	24DC	**	/	*

AGAM = pressure relief valve: subplate mounting, see tab. C066
ARAM = pressure relief valve: threated connections, see tab. C045

Valve size
for AGAM: **10** (ISO 6264)
20 (ISO 6264)
32 (ISO 6264)
for ARAM: **20** = G 3/4”
32 = G 1 1/4”

Number of the different setting pressure values:
1 = one setting pressure
2 = two setting pressure
3 = three setting pressure

Valve configuration
0 = venting with de-energized solenoid
1 = venting with energized solenoid
2 = without venting

Max regulated pressure of first (second / third) setting see sect. 13

Solenoid threated connection for cable gland:
GK = GK-1/2” ISO/UNI-6125 (tapered)
NPT = 1/2” NPT ANSI B2.1 (tapered)
M = M20x1,5 UNI-4535 (6H/6g)

Certification type
AO = Multicertification for Group II
AO/M = Multicertification for Group I (mining)

Options:
E = external pilot
O = horizontal cable entrance **(1)**
V = regulating handweel
WP = prolongued manual override protected by metallic cap
Y = external drain

Voltage code - see section 1

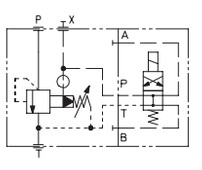
Series number

Seals material, see section 2:
- = NBR
PE = FKM
BT = HNBR

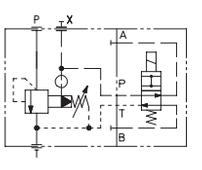
(1) Not for multicertification **M** group I (mining)

13 HYDRAULIC CHARACTERISTICS

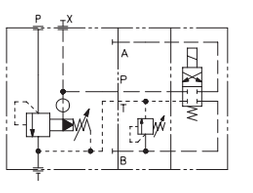
AGAM-/10**
ARAM-/10**



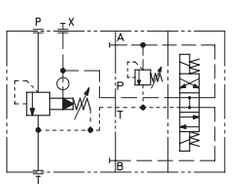
ARAM-/10**
AGAM-/11**



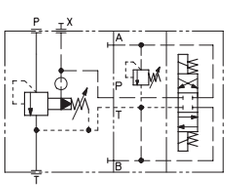
AGAM-/22**
ARAM-/22**



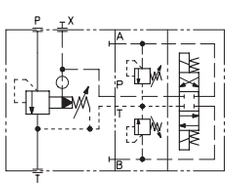
AGAM-/20**
ARAM-/20**



AGAM-/21**
ARAM-/21**



AGAM-/32**
ARAM-/32**



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 **AGAM**	[l/min]	200	400	600
Max flow **ARAM**	[l/min]	-	350	500

14 MODEL CODE OF COVERS FOR CARTRIDGE VALVES

LIDEW	-	1	/	GK	-	AO	/	*	24DC	**	/	*	*

Cover type:
LIDBH* = with solenoid valve and shuttle valve for pilot selection
LIDEW* = with solenoid valve for pilot selection
* = valve configuration (see H030 section 2)

Size (ISO 7368)
1 = 16; **4** = 40;
2 = 25; **5** = 50;
3 = 32; **6** = 63;

Solenoid threaded connection for cable gland:
GK = GK-1/2" ISO/UNI-6125 (tapered)
NPT = 1/2" NPT ANSI B2.1 (tapered)
M = M20x1,5 UNI-4535 (6H/6g)

Certification type
AO = Multicertifications for Group II,
AO/M = Multicertifications for Group I, ATEX (mining)

Options:
B = cartridge piloted via port "B" of solenoid pilot valve
E = external attachments X (1/4" GAS) and underneath port X supplied plugged (only for sizes 40...63)
O = horizontal cable entrance **(1)**
WP = prolongued manual override protected by metallic cap

Voltage code - see section 1

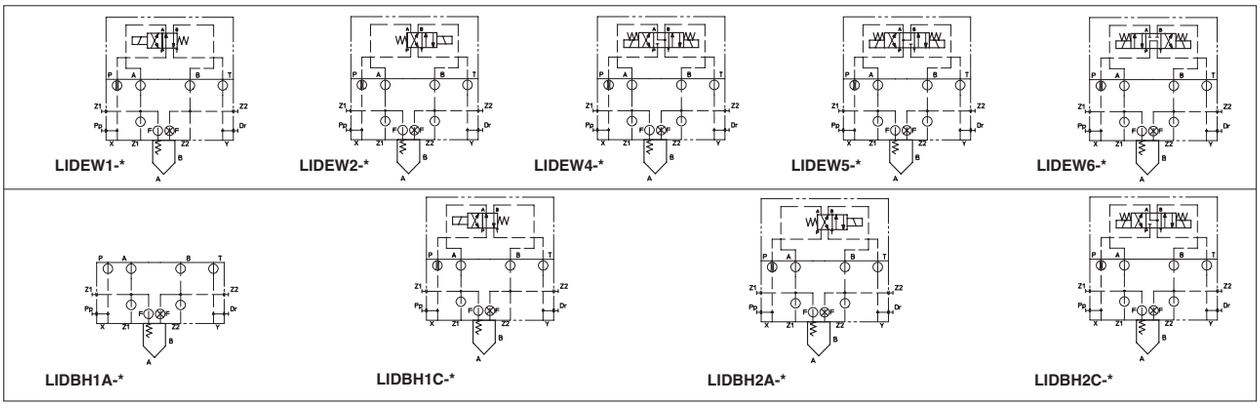
Series number

Seals material, see section 2:
- = NBR
PE = FKM
BT = HNBR

Optional different provision or setting of the calibrated plugs in the pilot channels see table H030 sect. 6

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 AND WIRING

16.1 Cable glands

Cable glands with threaded connections GK-1/2", 1/2"NPT or M20x1,5 for standard or armoured cables have to be ordered separately, see tech. table **K600**

16.2 Terminal board for cable connection

PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)

1 = Coil
2 = GND
3 = Coil

16.3 Wiring specifications

Power supply: section of coil connection wires = 2,5 mm²

Grounding: section of internal ground wire = 2,5 mm²

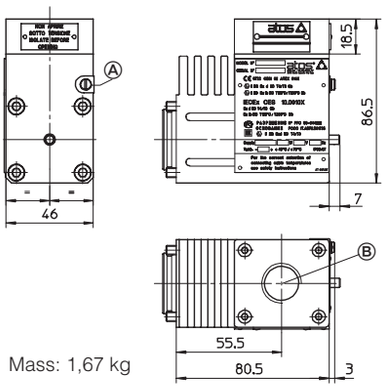
additional equipotential grounding can be also performed by the user on the external facility provided on the solenoid case. section of external ground wire = 4 mm²

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

Max ambient temperature [°C]	Temperature class	Surface temperature [°C]	Cable temperature
45 °C	T6	85 °C	not prescribed
70 °C	T4	135 °C	90 °C

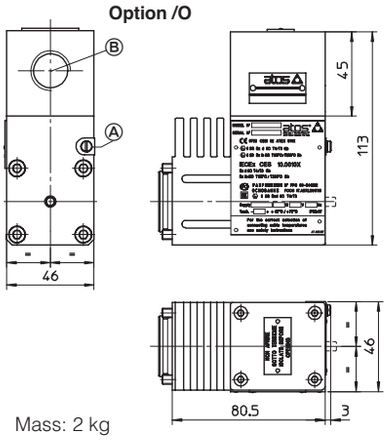
17 SOLENOIDS DIMENSIONS AND WIRING

OA; **OA/M**



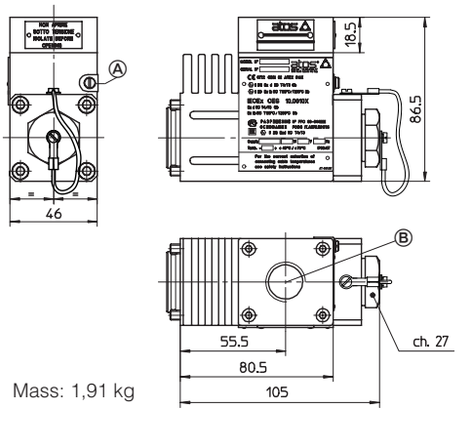
Mass: 1,67 kg

Option /O



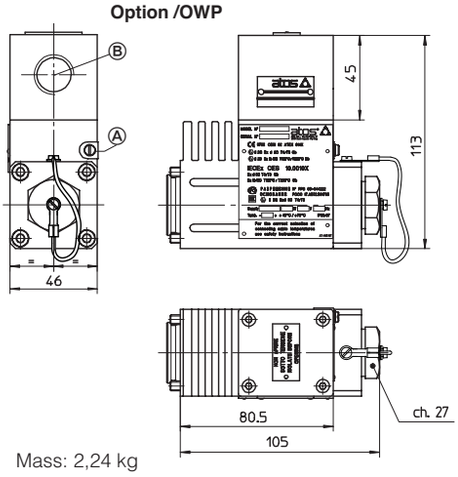
Mass: 2 kg

Option /WP



Mass: 1,91 kg

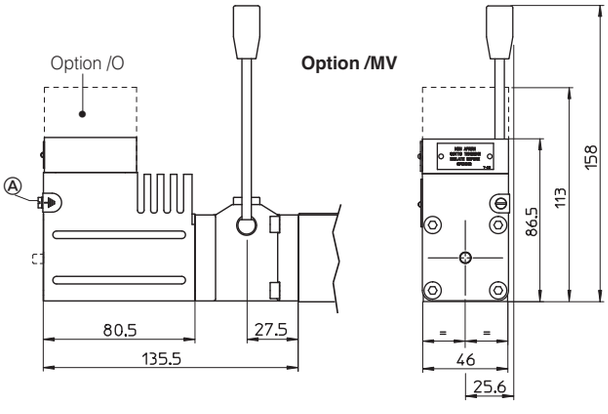
Option /OWP



Mass: 2,24 kg

Option /O

Option /MV



Ⓐ = screw terminal for additional equipotential grounding

Ⓑ = Cable entrance for solenoid wiring