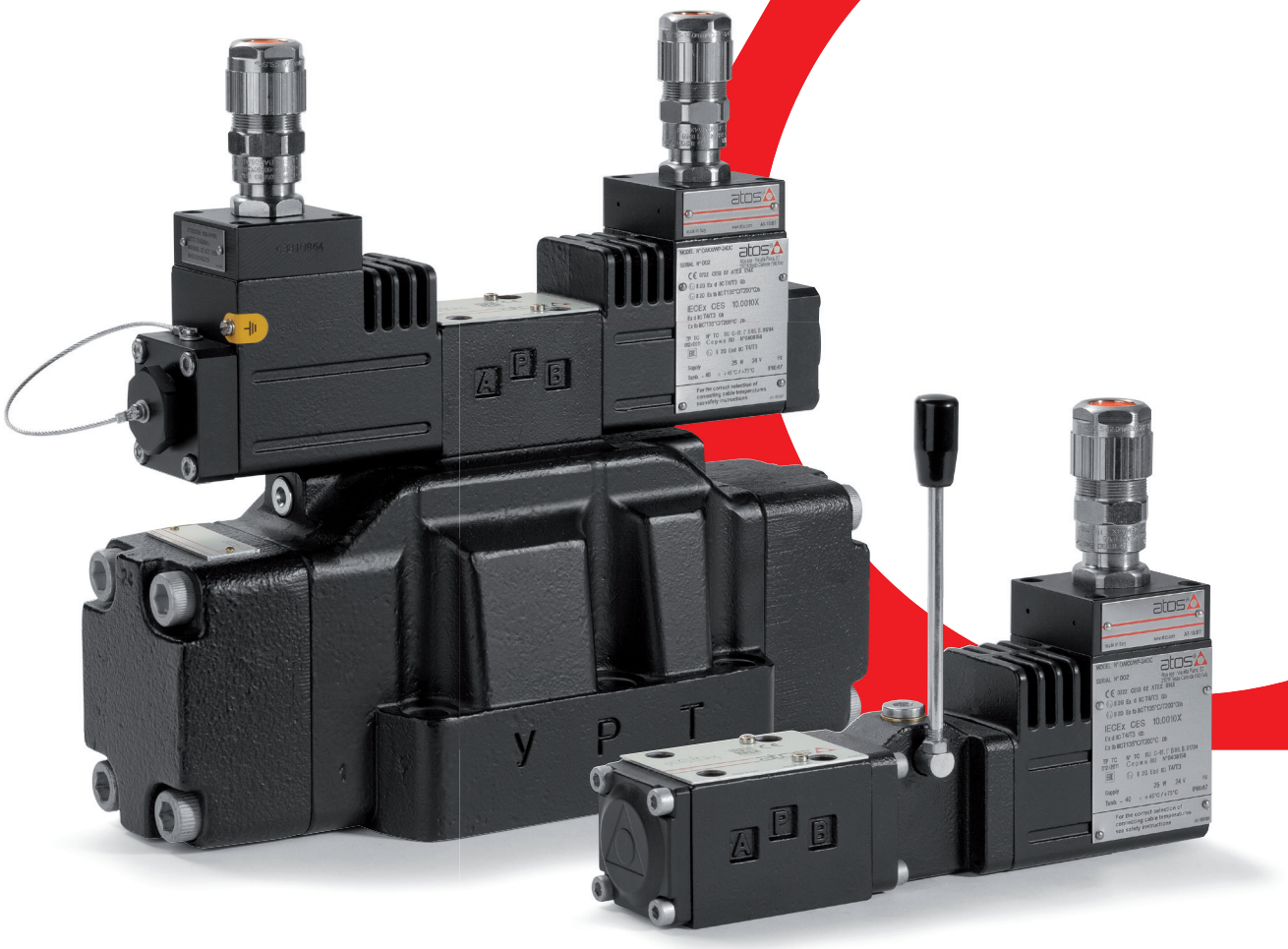
Гидрораспределители, клапаны взрывозащищенные ATOS

Технические характеристики



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Астрахань (8512)99-46-04
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INDEX

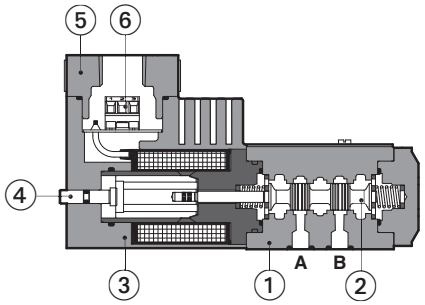
ON-OFF VALVES

Ex-ia

		Size	Qmax [l/min]	Table	Pag
DIRECTIONAL VALVES					
solenoid operated					
DHW	direct, spool type, subplate	06	25	EX100	459
DPHW	piloted, spool type, subplate	10 ÷ 25	160 ÷ 700	EX130	463
leak free, solenoid operated					
DLWH	direct, poppet type, subplate	06	12	EX120	471
PRESSURE VALVES					
relief					
ARAM-WO	piloted, in line	G3/4" ÷ G1 1/4"	350 ÷ 500	CX030	475
AGAM-WO	piloted, subplate	10 ÷ 32	200 ÷ 600		
ISO CARTRIDGES					
directional					
LIDEW-WO, LIDBH-WO	functional covers	16 ÷ 63	240 ÷ 4000	EX150	485
ELECTRONICS					
Y-BXNE	power supply barrier, single or double channel			GX010	491

Ex-proof solenoid directional valves

on-off, direct, spool type - **ATEX, IECEx, EAC, PESO** or **cULus**



DHA-06*

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

DHA

On-off, spool type directional valves equipped with ex-proof solenoids certified for safe operation in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX**, **IECEx**, **EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

DHA valves are **SIL** compliance with IEC 61508 (TÜV certified)

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.

The solenoid is also designed to limit the surface temperature within the classified limits.

Size: **06** - ISO 4401
Max flow: **70 l/min**
Max pressure: **350 bar**

1 MODEL CODE

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

DHA: Ex-proof solenoid directional valve, direct, spool type

Certification type:
Multicertification ATEX, IECEx, EAC:
- = omit for Group II 2G / II 2D **(1)**
M = Group I M2 (mining)
North American Certification:
UL = cULus

Valve size (ISO 4401)
0 = 06

Configuration, see section 2 :

Spool type, see section 2 :

Solenoid threaded connection for cable gland fitting:
GK = GK-1/2" - not for **cULus (5)**
M = M20x1,5 - not for **cULus**
NPT = 1/2" NPT

Options (3):
A = solenoid at side of port B (for single solenoid valves)
O = horizontal cable entrance **(2)**
WP = ⚠ manual override protected by metallic cap
Hand lever options (4):
MV = vertical hand lever
AMV = vertical hand lever installed at side of port B

Voltage code, see section 5

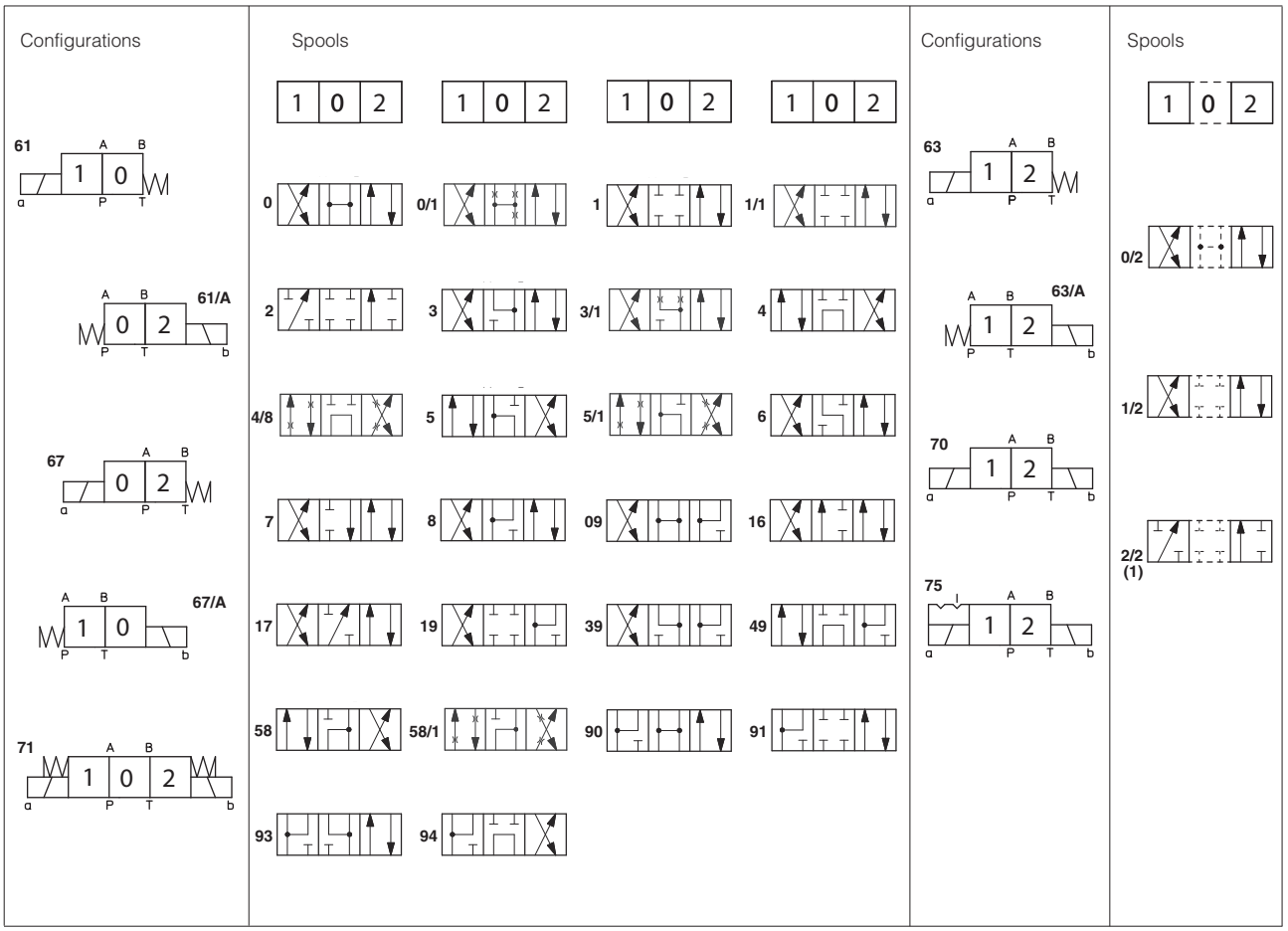
Series number

Seals material, see section 6 :
- = NBR
PE = FKM
BT = HNBR **(1)**

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from
(2) Not for multicertification **M** group I (mining)
(3) For possible combined options, see 12.1
(4) Options MV and AMV are available only for configuration **61, 61/A, 63, 63/A, 71** and with spool type **0, 0/2, 1, 1P, 1/2, 1/2P, 3, 3P, 4, 7**. Not available in combination with option **WP**
(5) Approved only for the Italian market

⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 CONFIGURATIONS AND SPOOLS (representation according to ISO 1219-1)



For spool type 2 and 2/2 port T of the valve must be connected to tank if the operating pressure exceed the max T pressure reported at section 4
(1): not available for configuration 75

2.1 Special shaped spools

- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1, 4**, **5** and **58** are also available as **1/1, 4/8, 5/1** and **58/1**.
  They are properly shaped to reduce water-hammer shocks during the swiching.
- spools type **1, 1/2, 3, 8** are available as **1P, 1/2P, 3P, 8P** to limit valve internal leakages.

3 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure “Ex d” -Dust ignition protection by enclosure “Ex t” RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

4 HYDRAULIC CHARACTERISTICS

Operating pressure	Ports P,A,B: **350** bar; Port T **210** bar
Rated flow	See diagrams Q/Δp at section 13
Maximum flow	**70 l/min**, see operating limits at section 14

5 ELECTRICAL CHARACTERISTICS

Valve type		DHA	DHA/M	DHA/UL
Voltage code **(1)**	VDC ±10%	**12DC, 24DC, 28DC, 48DC, 110DC, 125DC, 220DC**		**12DC, 24DC, 110DC, 125DC, 220DC**
	VAC 50/60 Hz ±10%	**12AC, 24AC, 110AC, 230AC**		**12AC, 24AC, 110AC, 230AC**
Power consumption at 20°C		8W		12W
Coil insulation		class H		
Protection degree with relevant cable gland		IP66/67 to DIN EN60529		raintight enclosure, UL approved
Duty factor		100%		

(1) For alternating current supply a rectifier bridge is provided built-in the solenoid
For power supply frequency 60 Hz, the nominal supply voltage of solenoids 110AC and 230AC must be 115/60 and 240/60 respectively

6 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature.

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar
-max fluid temperature = 50°C

7 CERTIFICATION DATA

Valve type	DHA		DHA/M	DHA/UL	
Certifications	Multicertification Group II **ATEX IECEx EAC PESO**		Multicertification Group I **ATEX IECEx**	North American cULus **cULus**	
Solenoid certified code	**OA**		**OA/M**	**OA/EC**	
Type examination certificate **(1)**	ATEX: CESI 02 ATEX 014 IECEx: IECEx CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEx: IECEx CES 12.0007x	20170324 - E366100	
Method of protection	• ATEX, EAC Ex II 2G Ex d IIC T6/T4/T3 Gb Ex II 2D Ex tb IIIC T85°C/T200°C Db • IECEx Ex d IIC T6/T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • PESO Ex II 2G Ex d IIC T6/T4 Gb		• ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb	• UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB	
Temperature class	**T6**	**T4**	**-**	**T6**	**T5**
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 150 °C	≤ 85 °C	≤ 100 °C
Ambient temperature **(2)**	-40 ÷ +45 °C	-40 ÷ +70 °C	-20 ÷ +70 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	**GK** = GK-1/2" **M** = M20x1,5 **NPT** = 1/2" NPT			1/2" NPT ANSI/ASME B46.1	

(1) The type examinator certificates can be downloaded from
(2) The solenoids **Group II** and **cULus** are certified 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

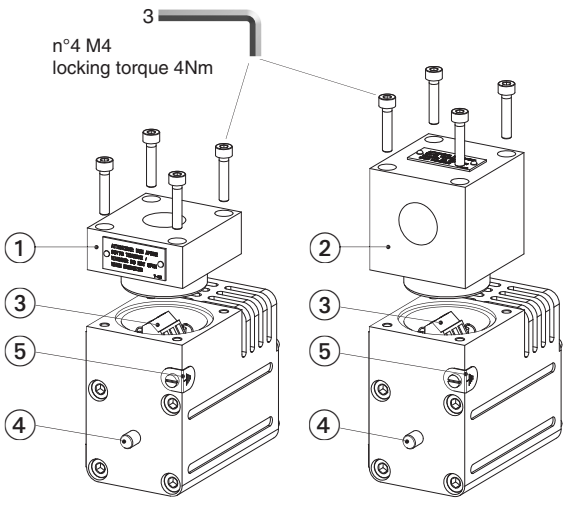
⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

8 SIL compliance with IEC 61508: 2010

DHA (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)

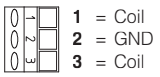
9 EX PROOF SOLENOIDS WIRING

Multicertification



Standard version **Option /O**

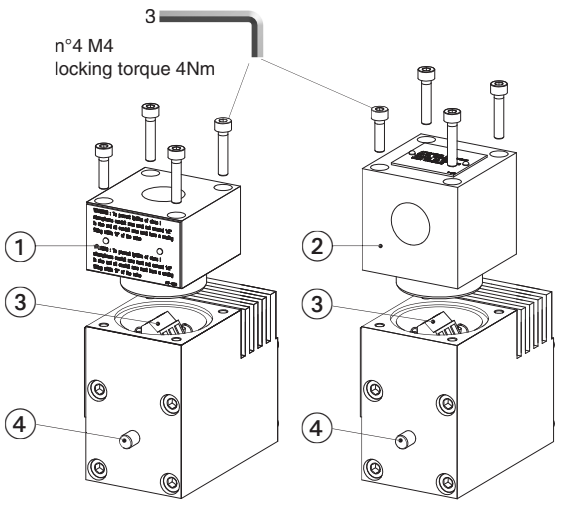
① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override
⑤ screw terminal for additional equipotential grounding



1 = Coil
2 = GND
3 = Coil

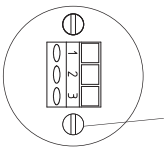
PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)

cULus certification



Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override



⚠ **Pay attention to coil polarity**

1 = Coil **+**
2 = GND
3 = Coil **-**

PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 10 note 1

alternative GND screw terminal connected to solenoid housing

10 CABLE SPECIFICATION AND TEMPERATURE - Power supply and grounding cables have to comply with following characteristics:

Multicertification Group I and Group II

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

Grounding: section of internal ground wire = 2,5 mm²
section of external ground wire = 4 mm²

cULus certification:

- Suitable for use in Class I Division 1, Gas Groups C
- Armored Marine Shipboard Cable which meets UL 1309
- Tinned Stranded Copper Conductors
- Bronze braided armor
- Overall impervious sheath over the armor

Any Listed (UBVZ/ UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("/BT" Models require a temperature range from -40°C to +110°C)

Note 1: For Class I wiring the 3C 1,5 mm² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.

10.1 Cable temperature

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

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min cable temperature
	Group I	Group II	Group I	Group II	
45 °C	-	T6	150 °C	85 °C	not prescribed
70 °C	-	T4	150 °C	135 °C	90 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min cable temperature
55 °C	T6	85 °C	100 °C
70 °C	T5	100 °C	100 °C

11 CABLE GLANDS only for Multicertification

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 **KX800**

Note: a Loctite sealant type 545, should be used on the cable gland entry threads

12 OPTIONS

A = solenoid at side of port B (for single solenoid valves)

O = Horizontal cable entrance , to be selected in case of limited verical space

WP = Manual override protected by metallic cap

Hand lever option:

MV = Auxiliary vertical hand levers

This option allows to operate the valves in absence of electrical power supply, i.e. during commissioning, maintenance or in case of emergency.
When the valve is electrically operated the hand lever remains stopped in its rest position
The hand lever execution does not affect the performances of the original valves

Total angle stroke	[°deg]	± 28°	Lever actuating force	[N]	1 ÷ 8
Working angle stroke	[°deg]	± 15°	Lever device weight	[g]	880

AMV= Vertical hand lever installed at side of port B

Notes:

Options **MV** and **AMV** are available only for configuration **61, 61/A, 63, 63/A, 71** and with spool type **0, 0/2, 1, 1P, 1/2, 1/2P, 3, 3P, 4, 7**

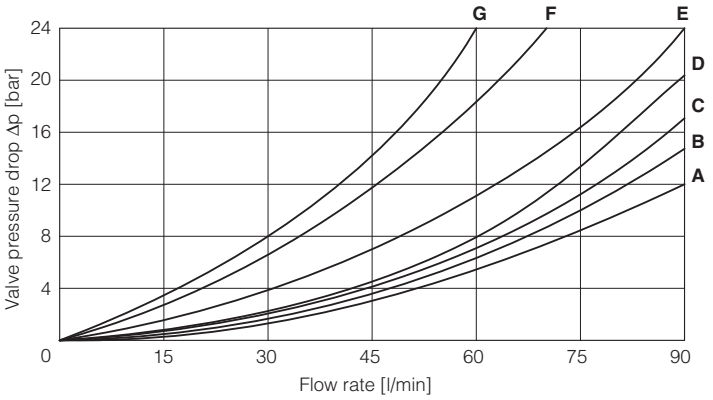
Not available in combination with option **WP**

MV option and **AMV** allow to operate the valve in absence of electrical power supply.
For detailed description of DHA with hand lever option see tech. table **E138**

12.1 Possible combined options: /AO, /AWP, /OWP, /AMV, /OMV, /AOWP, /AOMV

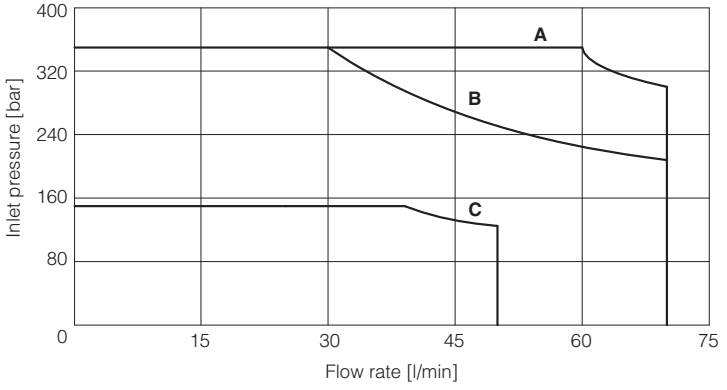
13 Q/Δp DIAGRAMS (based on mineral oil ISO VG 46 at 50°C)

Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 49, 58, 58/1, 94	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7, 16, 17	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			
09, 19, 90, 91	E	E	D	D	
39, 93	F	F	G	G	



14 OPERATING LIMITS (based on mineral oil ISO VG 46 at 50°C)

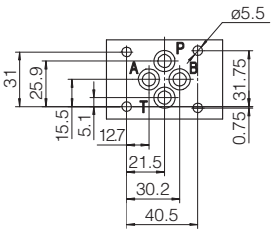
Spool type	diagram
0, 0/1, 1, 1/1, 8	**A**
0/2,1/2, 3, 6, 7	**B**
2, 2/2, 3/1, 4, 4/8, 5, 5/1, 16, 17, 19, 39 49, 58, 58/1, 09, 90, 91, 93, 94	**C**



15 INSTALLATION DIMENSIONS [mm] - Multicertified and UL

ISO 4401: 2005 (see table P005)
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: Ø = 7.5 mm (max)

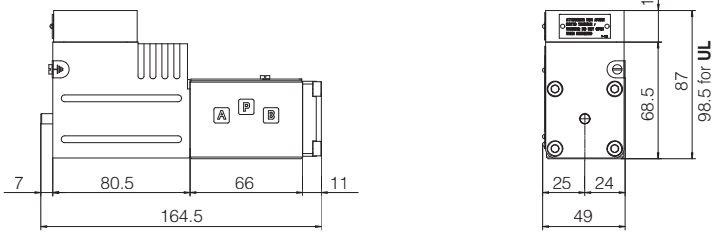
Valve's bottom view



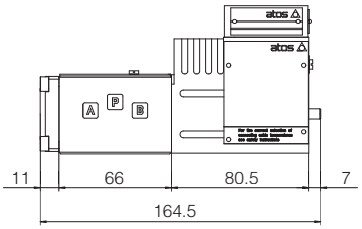
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

Mass [kg]	
DHA-06	2,65
DHA-07	4,3
Option /O	+0,35
Option /WP	+0,25

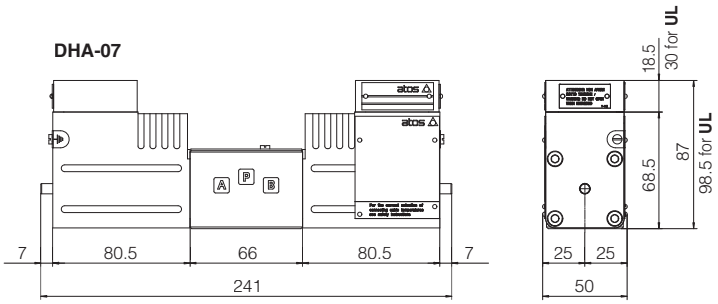
DHA-06



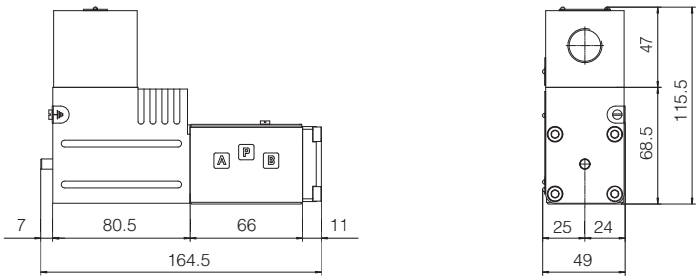
DHA-06 /A



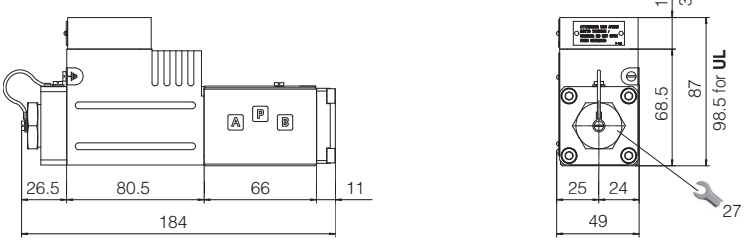
DHA-07



DHA-06 /O

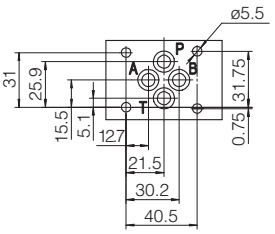


DHA-06 /WP



ISO 4401: 2005 (see table P005)
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)

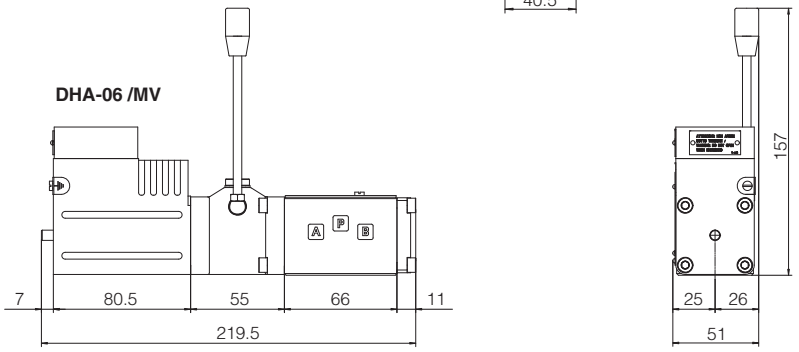
Valve's bottom view



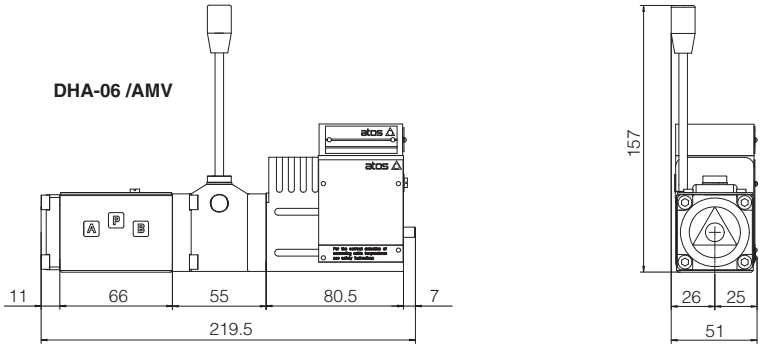
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

Mass [kg]	
DHA-06/MV	2,9
DHA-07/MV	4,55

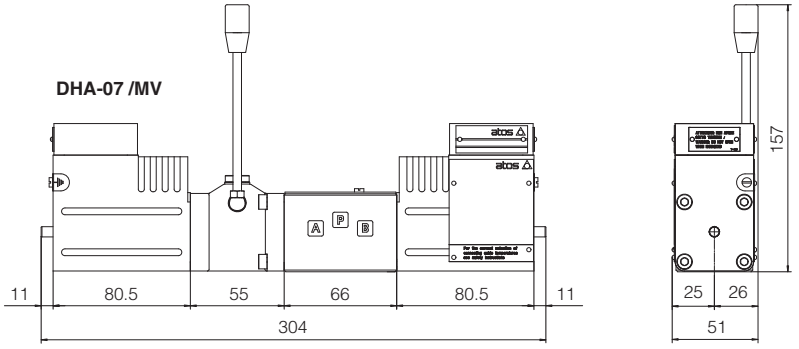
DHA-06 /MV



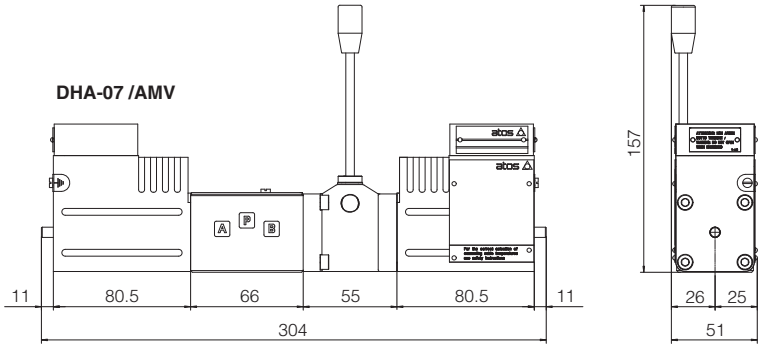
DHA-06 /AMV



DHA-07 /MV



DHA-07 /AMV

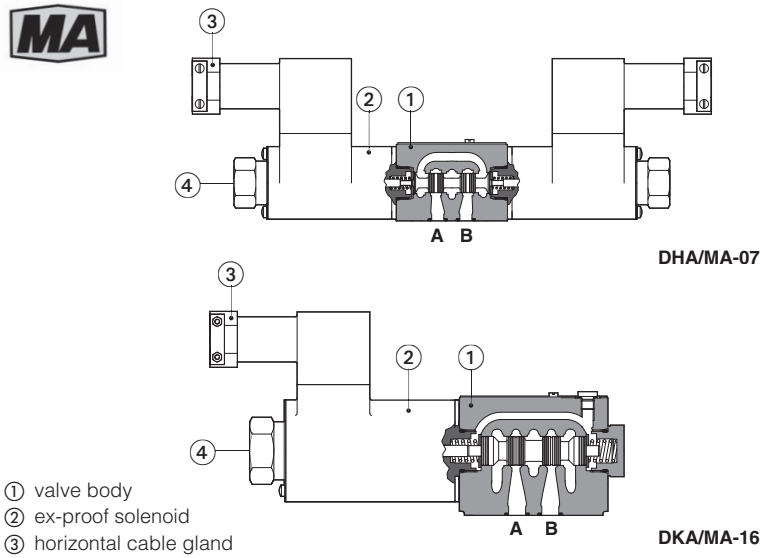


16 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	**EX900**	Operating and manintenance information for ex-proof on-off valves
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	**KX800**	Cable glands for ex-proof valves
X030	Summary of Atos ex-proof components certified to cULus	**P005**	Mounting surfaces for electrohydraulic valves

Ex-proof solenoid directional valves

On-off, direct, spool type - **MA certification**



① valve body
② ex-proof solenoid
③ horizontal cable gland
④ manual override

On-off directional valves equipped with explosion-proof solenoids certified according to **MA** Chinese mining certification, protection mode:

Ex d I Mb for surface, tunnel or mine plants

The solenoids are provided with cable glands (horizontally oriented) for cable entrance and internal terminal board for power supply coils connections.

The solenoid case classified **Ex d** 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.

DHA/MA:	**DKA/MA**:
Size: **06** - ISO 4401	Size: **10** - ISO 4401
Max flow: **80 l/min**	Max flow: **120 l/min**
Max pressure: **350 bar**	Max pressure: **315 bar**

1 MODEL CODE

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

DHA = spool type - direct, size 06
DKA = spool type - direct, size 10

MA = Ex-proof Ma Chinese mining certification

Valve size (ISO 4401)
0 = 06 for DHA
1 = 10 for DKA

Configuration, see section 2

Spool type, see section 2

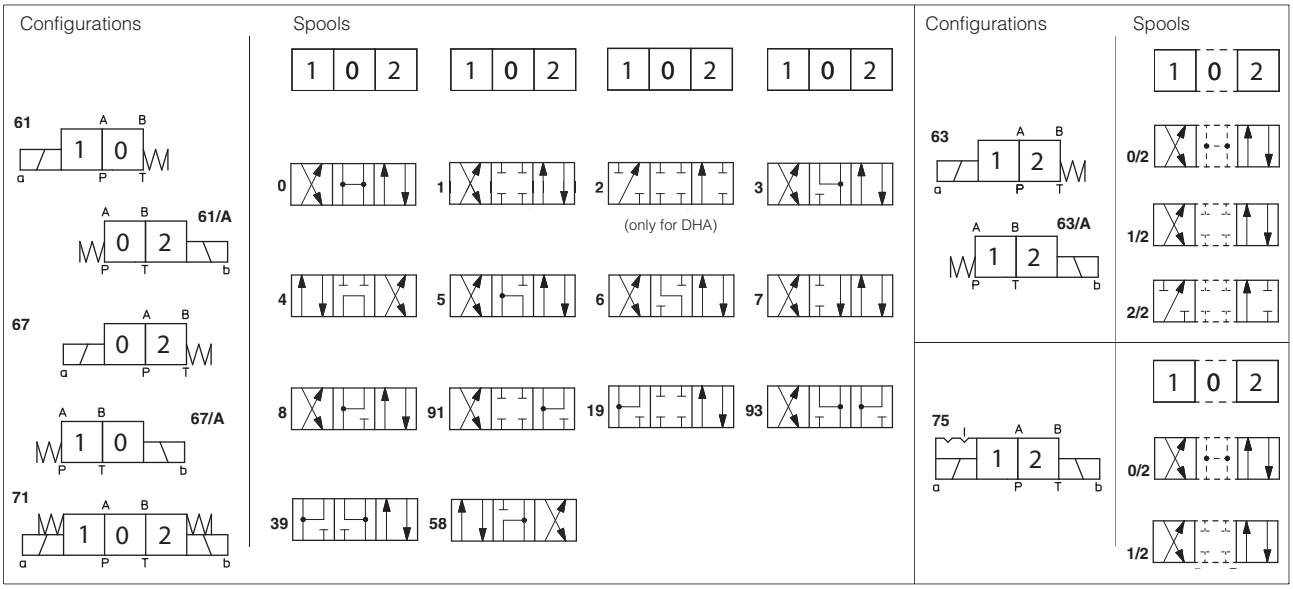
Option:
A = solenoid at side of port B (for single solenoid valves)

Voltage code, see section 5

Series number

Seals material, see sect. 6:
- = NBR
PE = FKM

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)



DHA spools **1, 4**, **5** and **58** are also available as **1/1, 4/8, 5/1** and **58/1.** They are properly shaped to reduce water-hammer shocks during the swiching.
DKA spool **1** is also available as **1/1.** It is properly shaped to reduce water-hammer shocks during the swiching.

3 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure Ex-d

4 HYDRAULIC CHARACTERISTICS

Operating pressure	**DHA/MA**	P, A, B = **350 bar**	T = **210 bar**
	DKA/MA	P, A, B = **315 bar**	T = **210 bar**
Maximuim flow	**DHA/MA**	**80 l/min**	
	DKA/MA	**120 l/min**	

5 ELECTRICAL CHARACTERISTICS

SOLENOID TYPE	ON/OFF	
Voltage code VDC ±10%	**12DC, 24DC, 110DC**	
Power consumption	16,5 W (DHA)	18W (DKA)
Protection degree	IP 65 to DIN EN 60529	
Duty factor	100%	

6 SEALS AND HYDRAULIC FLUID

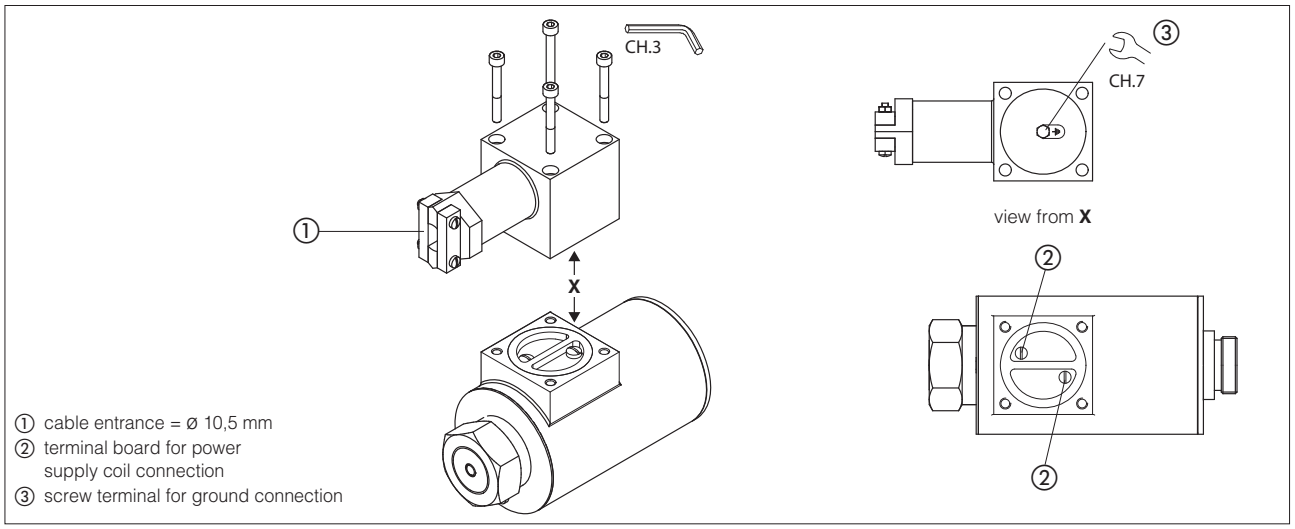
Seals, recommended fluid temperature	NBR seals (standard) = -20°C ÷ +60°C, with HFC hydraulic fluids = -20°C ÷ +50°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

7 CERTIFICATION DATA

Valve type	DHA**/MA**	DKA**/MA**
Certification	MA mining	
Solenoid certified code	**DTBZ12 - 37 FYC**	**DTB29 - 90FYC**
Type examination certificate	CNEx 17.4187	CNEx 17.4190
Method of protection	Ex d I Mb	
Ambient temperature	≤ 135 °C	
Ambient temperature	-20 ÷ +40 °C	
Cable entrance:	cable entrance Ø =10.5mm	

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

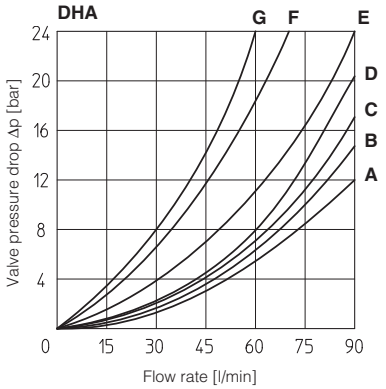
8 EX-PROOF SOLENOID WIRING



9 Q/ΔP DIAGRAMS based on mineral oil ISO VG 46 at 50°C

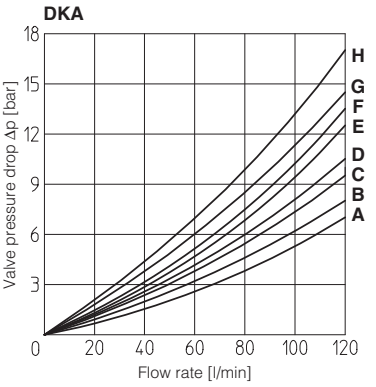
DHA

Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0, 0/1	A	A	C	C	D
1, 1/1	D	C	C	C	
3, 3/1	D	D	A	A	
4, 4/8, 5, 5/1, 58, 58/1 19, 91, 93, 39	F	F	G	C	E
1/2, 0/2	D	D	D	D	
6, 7	D	D	D	D	
8	A	A	E	E	
2	D	D			
2/2	F	F			



DKA

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



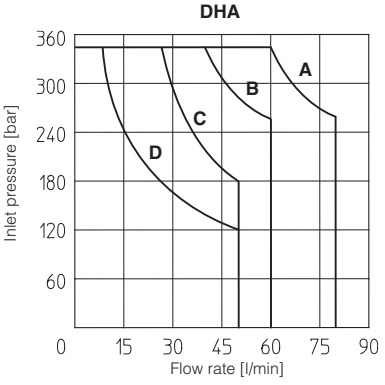
10 OPERATING LIMITS For a correct valve operation do not exceed the max recommended flow rates (l/min) shown in the below tables

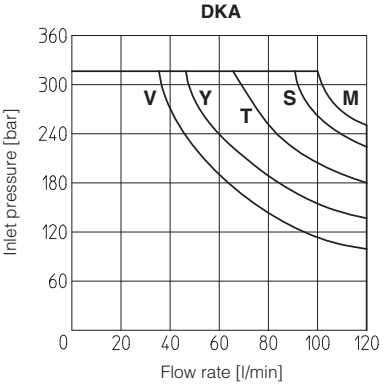
DHA

A = Spools 0, 0/1, 1, 1/2, 3, 8
B = Spools 0/2, 1/1, 6, 7
C = Spools 3/1, 4, 4/8, 5, 5/1, 19, 39, 58, 58/1, 09, 90, 91, 93, 94
D = Spools 2, 2/2

DKA

M = Spools 0, 0/1, 1, 1/1, 3, 3/1, 1/2, 0/2, 8
S = Spools 1/3, 6, 7
Y = Spools 4, 5
V = Spools 2/2
T = Spools 19

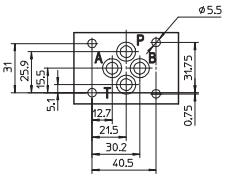




11 INSTALLATION DIMENSIONS FOR DHA/MA AND DKA/MA

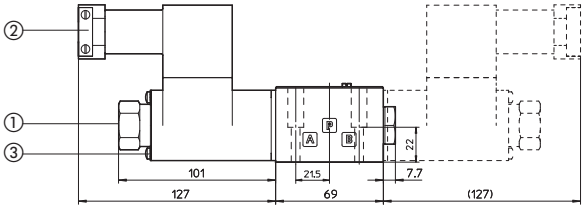
DHA/MA

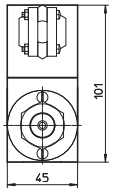
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5x30 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)



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

DHA/MA-06
DHA/MA-07 (dotted line)



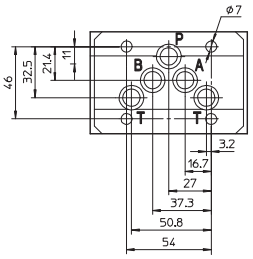


Mass of basic versions:
DHA/MA-06: 3,2 kg
DHA/MA-07: 4,9 kg

① manual override
② horizontal cable gland, cable entrance = ø 10,5 mm
③ screw terminal for additional equipotential grounding

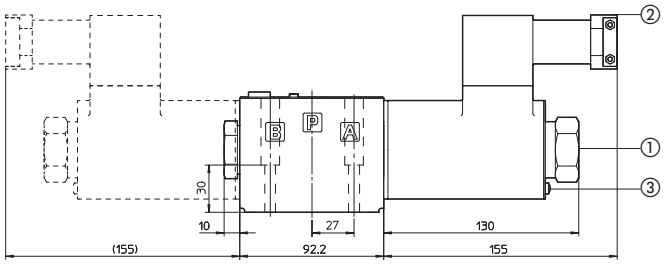
DKA/MA

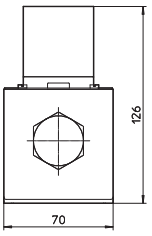
ISO 4401: 2005
Mounting surface according to 4401-05-05-0-05
(without X port, Y port optional)
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Seals: 5 OR 2050 and 1 OR 108
Ports P,A,B,T: Ø = 11.5 mm (max)
Ports Y: Ø = 5 mm



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

DKA/MA-16
DKA/MA-07 (dotted line)





Mass of basic versions:
DKA/MA-16: 5,7 kg
DKA/MA-17: 8,7 kg

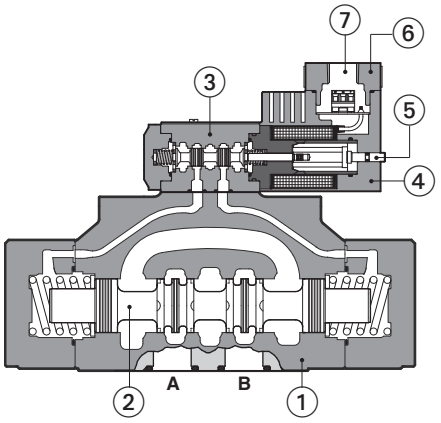
① manual override
② horizontal cable gland, cable entrance = ø 10,5 mm
③ screw terminal for additional equipotential grounding

12 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	**EX900**	Operating and manintenance information for ex-proof on-off valves
X040	Summary of Atos ex-proof components certified to MA	**P005**	Mounting surfaces for electrohydraulic valves

Ex-proof solenoid directional valves

on-off, piloted - **ATEX, IECEx, EAC, PESO** or **cULus**



DPHA-461*

① main body
② main spool
③ pilot valve
④ ex-proof solenoid
⑤ manual override
⑥ threaded connection for cable gland
⑦ internal terminal board fr cable connection

DPHA

On-off spool type, piloted directional valves equipped with ex-proof solenoids certified for safe operation in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX**, **IECEx**, **EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.
The solenoid is also designed to limit the surface temperature within the classified limits.

Size: **10 ÷ 32** - ISO 4401
Max flow: **160 ÷ 1000 l/min**
Max pressure: **350 bar**

1 **MODEL CODE**

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

DPHA: Ex-proof directional valve, piloted

Certification type:
Multicertification ATEX, IECEx, EAC, PESO:
- = omit for Group II 2G / II 2D **(1)**
M = Group I M2 (mining)
North American certification
UL = cULus

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

Configuration, see section 2

Spool type, see section 2

Solenoid threaded connection for cable gland fitting:
GK = GK-1/2" - not for **cULus (3)**
M = M20x1,5 - not for **cULus**
NPT = 1/2" NPT

Voltage code, see section 7

Series number

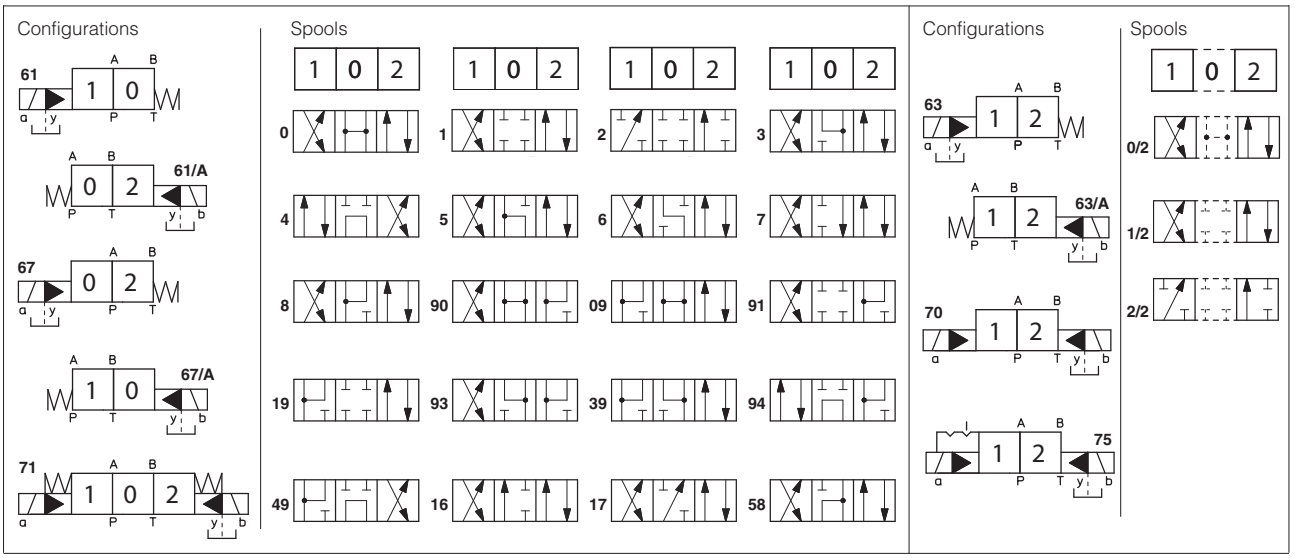
Seals material, see section 8 :
- = NBR
PE = FKM
BT = HNBR **(3)**

Options (4):
A = solenoid at side of port B (for single solenoid valves)
O = horizontal cable entrance **(3)**
/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)
L1, L2, L3 = calibrated restrictors in A and B ports of pilot 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)
WP = ⚠ manual override protected by metallic cap

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from
(2) Approved only for the Italian market
(3) Not for multicertification **M** group I (mining)
(4) For possible combined options, see 10

⚠ For valves with external drain (option /D), the pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar.

2 CONFIGURATIONS AND SPOOLS



2.1 Standard spools availability

- DPHA-1 are available only with spools **0, 0/2, 1, 1/2, 3, 4, 5, 58, 6, 7**
- DPHA-2 and DPHA-4 are available with all spools shown in the above table
- DPHA-6 are available only with spools **0, 1, 1/2, 2, 3, 4, 5, 58, 6, 7, 8, 19, 91**

2.2 Special shaped spools

- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1, 4, 5, 58, 6** and **7** are also available as **1/1, 4/8, 5/1, 58/1, 6/1** and **7/1** that are properly shaped to reduce water-hammer shocks during the switching (to use with option /L*).

2.3 Special spool availability

Valve size	standard spools							
	0/1	3/1	1/1	4/8	5/1	58/1	6/1	7/1
DPHA-1	•	•		•				
DPHA-2, DPHA-4	•	•	•	•	•	•	•	•
DPHA-6		•	•	•				

3 DEVICES FOR MAIN SPOOL SWITCHING CONTROL

Folowing options are suggested to reduce the hydraulic shocks at the valve operation

/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).

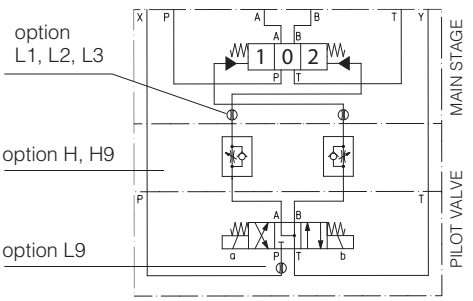
/L1, /L2, /L3 = calibrated restrictors on A and B ports of the pilot valve:

L1 = 0,8 mm, **L2** = 1 mm, **L3** = 1,25 mm

/L9 (only for DPHA-2 and DPHA-4) plug with calibrated restictor in P port of pilot valve see section 16

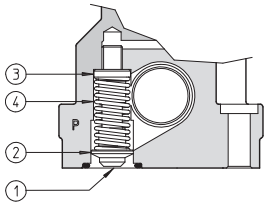
Suggested for pilot pressure higher than 210 bar or to limit the hydraulics shocks caused by the fast main spool switching

FUNCTIONAL SCHEME (config. 71)
example of switching control options



4 PILOT PRESSURE GENERATOR (OPTION /R)

The device **/R** generates an additional pressure drop, in order to ensure the minimum pilot pressure, for correct operation of the valves with internal pilot and fitted with spools type **0, 0/1, 4, 4/8, 5, 58, 09, 90, 94, 49.** The device **/R** has to be fitted when the pressure drop in the valve, verified on flow versus pressure diagrams, is lower than the minimum pilot pressure value.

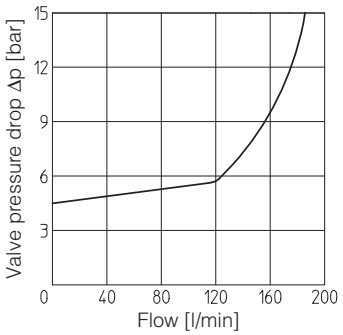


① Flapper-guide
② Flapper
③ Spring stop-washer
④ Spring

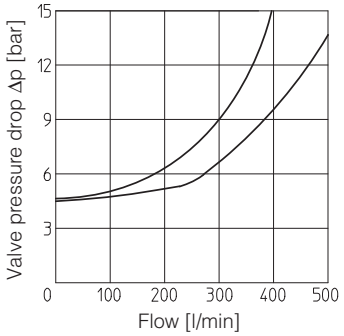
Ordering code of spare pilot pressure generator

R/DP	-	*
Pilot pressure generator		Size: **2** for DPHA-2 **4** for DPHA-4 **6** for DPHA-6 Not available for DPHA-1

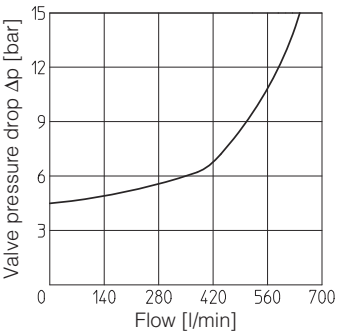
DPHA-2



DPHA-4



DPHA-6



5 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 9 -Flame proof enclosure “Ex d” -Dust ignition protection by enclosure “Ex t” RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

6 HYDRAULIC CHARACTERISTICS

Operating pressure	P, A, B, X = **350 bar** T = **250 bar** with external drain (standard) T and Y = **210 bar** with internal drain (option /D) Minimum pilot pressure for correct operation is = **8 bar**
Rated flow	See diagrams Q/Δp at section 14
Maximum flow	DPHA-1: **160 l/min;** DPHA-2: **300 l/min;** DPHA-4: **700 l/min;** DPHA-6: **1000 l/min** see Q/Δp diagrams at section 14 and operating limits at section 15

7 ELECTRICAL CHARACTERISTICS

Valve type		DPHA	DPHA**/M**	DPHA**/UL**
Voltage code **(1)**	VDC ±10%	**12DC, 24DC, 28DC, 48DC, 110DC, 125DC, 220DC**		**12DC, 24DC, 110DC, 125DC, 220DC**
	VAC 50/60 Hz ±10%	**12AC, 24AC, 110AC, 230AC**		**12AC, 24AC, 110AC, 230AC**
Power consumption at 20°C		8W		12W
Coil insulation		class H		
Protection degree with relevant cable gland		IP66/67 to DIN EN60529		raintight enclosure, UL approved
Duty factor		100%		

(1) For alternating current supply a rectifier bridge is provided built-in the solenoid
For power supply frequency 60 Hz, the nominal supply voltage of solenoids 110AC and 230AC must be 115/60 and 240/60 respectively

8 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar
-max fluid temperature = 50°C

9 CERTIFICATION DATA

Valve type	DPHA		DPHA**/M**	DPHA**/UL**	
Certifications	Multicertification Group II **ATEX IECEx EAC PESO**		Multicertification Group I **ATEX IECEx**	North American cULus **cULus**	
Solenoid certified code	**OA**		**OA/M**	**OA/EC**	
Type examination certificate **(1)**	ATEX: CESI 02 ATEX 014 IECEx: IECEx CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEx: IECEx CES 12.0007x	20170324 - E366100	
Method of protection	• ATEX, EAC Ex II 2G Ex d IIC T6/T4/T3 Gb Ex II 2D Ex tb IIIC T85°C/T200°C Db • IECEx Ex d IIC T6/T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • PESO Ex II 2G Ex d IIC T6/T4 Gb		• ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb	• UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB	
Temperature class	**T6**	**T4**	**-**	**T6**	**T5**
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 150 °C	≤ 85 °C	≤ 100 °C
Ambient temperature **(2)**	-40 ÷ +45 °C	-40 ÷ +70 °C	-20 ÷ +70 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0: EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	**GK** = GK-1/2" **M** = M20x1,5 **NPT** = 1/2" NPT			1/2" NPT ANSI/ASME B46.1	

(1) The type examinator certificates can be downloaded from
(2) The solenoids **Group II** and **cULus** are certified 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

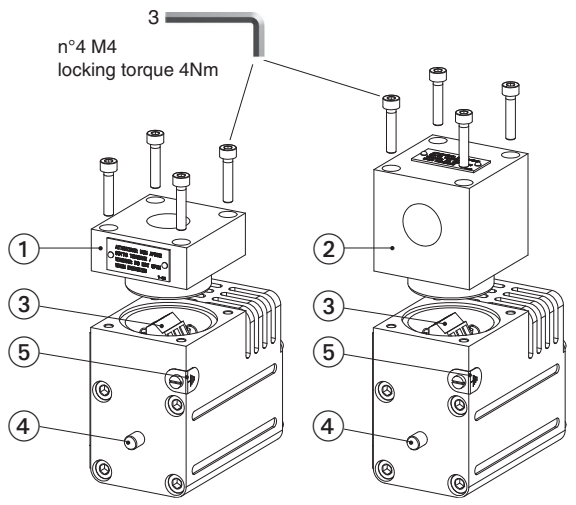
⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

10 OPTIONS

A = Solenoid at side of port B of the main stage (for single solenoid valves)
O = Horizontal cable entrance, to be selected in case of limited vertical space
/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)
L1, L2, L3 = Calibrated restrictors in A and B ports of pilot 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)
WP = Manual override protected by metallic cap

11 EX PROOF SOLENOIDS WIRING

Multicertification



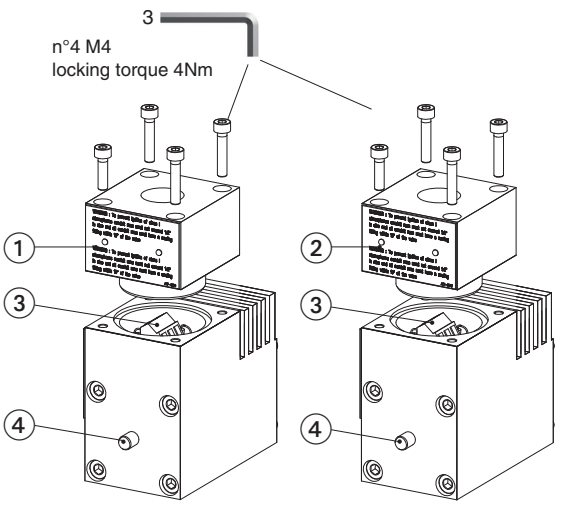
Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override
⑤ screw terminal for additional equipotential grounding

1 = Coil
2 = GND
3 = Coil

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

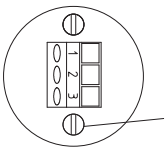
cULus certification



Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override

⚠ **Pay attention to coil polarity**



1 = Coil **+**
2 = GND
3 = Coil **-**

PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 12 note 1

alternative GND screw terminal connected to solenoid housing

12 CABLE SPECIFICATION AND TEMPERATURE - Power supply and grounding cables have to comply with following characteristics:

Multicertification Group I and Group II

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

Grounding: section of internal ground wire = 2,5 mm²
section of external ground wire = 4 mm²

cULus certification:

- Suitable for use in Class I Division 1, Gas Groups C
- Armored Marine Shipboard Cable which meets UL 1309
- Tinned Stranded Copper Conductors
- Bronze braided armor
- Overall impervious sheath over the armor

Any Listed (UBVZ/ UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("/BT" Models require a temperature range from -40°C to +110°C)

Note 1: For Class I wiring the 3C 1,5 mm² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.

12.1 Cable temperature

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

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min cable temperature
	Group I	Group II	Group I	Group II	
45 °C	-	T6	150 °C	85 °C	not prescribed
70 °C	-	T4	150 °C	135 °C	90 °C

cULus certification

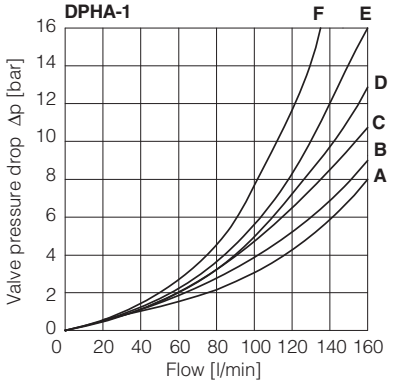
Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min cable temperature
55 °C	T6	85 °C	100 °C
70 °C	T5	100 °C	100 °C

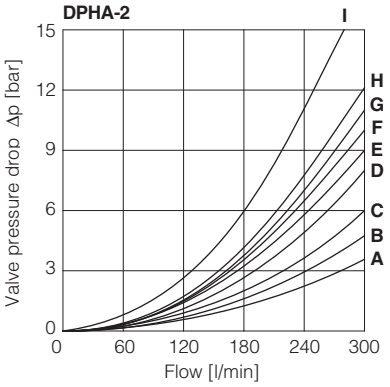
13 CABLE GLANDS only for Multicertification

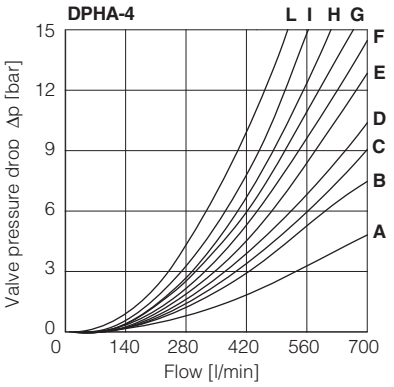
Cable glands with threaded connections GK-1/2", 1/2"NPT or M20x1,5 for standard or armoured cables have to be ordered separately, see tech. table **KX800**

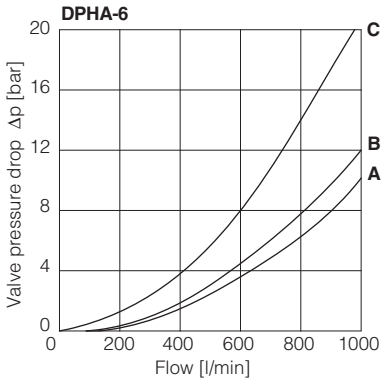
Note: a Loctite sealant type 545, should be used on the cable gland entry threads

14 FLOW VERSUS PRESSURE DIAGRAMS Based on mineral oil ISO VG 46 at 50°C









DPHA-1

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0/2, 1/2	D	E	D	C	-
0	D	E	C	C	E
1	A	B	D	C	-
3, 6, 7	A	B	C	C	-
4, 4/8	B	C	D	D	-
5, 58	A	E	C	C	F

DPHA-6

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0	A	A	B	B	B
1	A	A	A	B	-
3	A	-	A	B	-
4	A	A	C	C	C

DPHA-2

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0/2, 1, 3, 6, 7, 8	A	A	D	A	-
1/1, 1/2, 7/1	B	B	D	E	-
0	A	A	D	E	C
0/1	A	A	D	-	-
2	A	A	-	-	-
2/2	B	B	-	-	-
3/1	A	A	D	D	-
4	C	C	H	I	F
4/8	C	C	G	I	F
5	A	B	F	H	G
5/1	A	B	D	F	-
6/1	B	B	C	E	-
09	A	-	-	G	-
16	A	C	D	F	-
17	C	A	E	F	-
19	C	-	-	G	-
39	C	-	-	H	-
49	-	D	-	-	-
58	B	A	F	H	H
58/1	B	A	D	F	-
90	A	A	E	-	D
91	C	C	E	-	-
93	-	C	D	-	-
94	D	-	-	-	-

DPHA-4

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
1	B	B	B	D	-
1/1	D	E	E	F	-
1/2	E	D	B	C	-
0	D	C	D	E	F
0/1, 3/1, 5/1, 6, 7	D	D	D	F	-
0/2	D	D	D	E	-
2	B	B	-	-	-
2/2	E	D	-	-	-
3	B	B	D	F	-
4	C	C	H	L	L
5	A	D	D	D	H
6/1	D	E	D	F	-
7/1	D	E	F	F	-
8	D	D	E	F	-
09	D	-	-	F	F
16	C	D	E	F	-
17	E	D	E	F	-
19	F	-	-	E	-
39	G	F	-	F	-
58	E	A	B	F	H
58/1	E	D	D	F	-
90	D	D	D	-	F
91	F	F	D		
93	-	G	D	-	-

15 OPERATING LIMITS For a correct valve operation do not exceed the max recommended flow rates (l/min) shown in the below tables

DPHA-1

Spool type	Inlet pressure [bar]			
	70	160	210	350
	Flow rate [l/min]			
0, 1, 3, 6, 7	160	160	160	145
4, 4/8	160	160	135	100
5, 58	160	160	145	110
0/1, 0/2, 1/2	160	160	145	135

DPHA-2

Spool type	Inlet pressure [bar]			
	70	140	210	350
	Flow rate [l/min]			
0, 1, 3, 6, 7, 8	300	300	300	300
2, 4, 4/8	300	300	240	140
5	260	220	180	100
0/1, 0/2, 1/2	300	250	210	180
16, 17, 56, *9, 9*	300	300	270	200

DPHA-4

Spool type	Inlet pressure [bar]			
	70	140	210	350
	Flow rate [l/min]			
1, 6, 7, 8	700	700	700	600
2, 4, 4/8	500	500	450	400
5, 0/1, 0/2, 1/2	600	520	400	300
0, 3	700	700	600	540
16, 17, 58, *9, 9*	500	500	500	450

DPHA-6

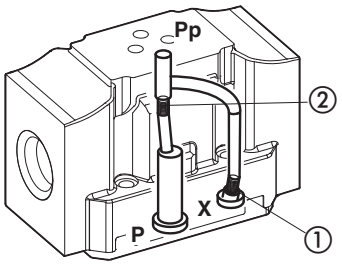
Spool type	Inlet pressure [bar]			
	70	140	210	350
	Flow rate [l/min]			
1, 3, 6, 7, 8	1000	950	850	700
0	950	900	800	650
2, 4, 4/8, 5	850	800	700	450
0/1, 58, 19, 91	950	850	650	450

16 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

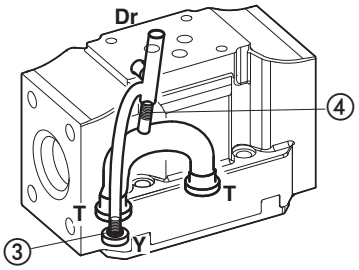
Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external drain

DPHA-1

Pilot channels



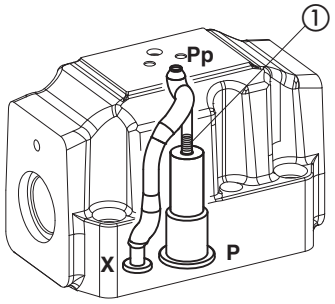
Drain channels



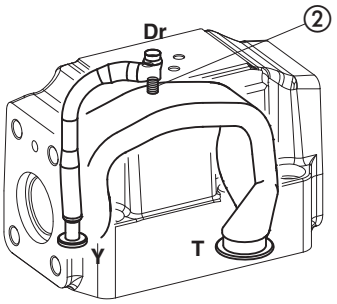
Internal piloting: blinded plug SP-X300F ① in X;
plug SP-X310F ② in Pp;
External piloting: blinded plug SP-X300F ② in Pp;
plug SP-X310F ① in X;
Internal drain: blinded plug SP-X300F ③ in Y;
External drain: blinded plug SP-X300F ④ in Dr.

DPHA-2

Pilot channels

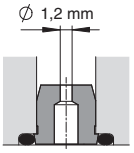


Drain channels



Internal piloting: Without blinded plug SP-X300F ①;
External piloting: Add blinded plug SP-X300F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

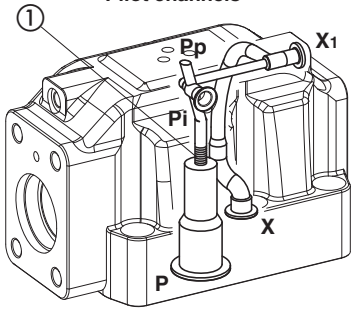
Option L9
This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve



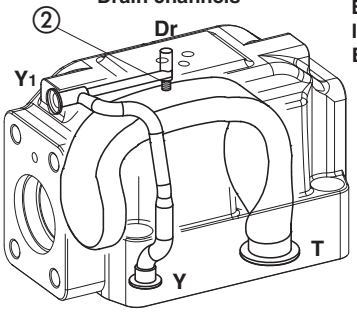
PLUG-12A

DPHA-4

Pilot channels

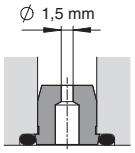


Drain channels



Internal piloting: Without blinded plug SP-X500F ①;
External piloting: Add blinded plug SP-X500F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

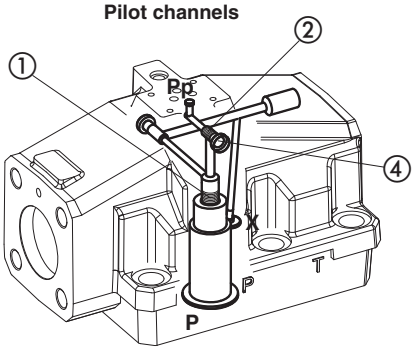
Option L9
This option provides a a calibrated restrictor PLUG-H-15A (Ø 1,5 mm) in the P port of the pilot valve



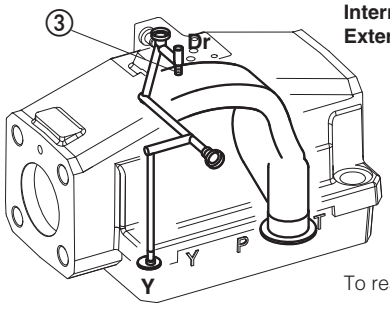
PLUG-15A

DPHA-6

Pilot channels



Drain channels



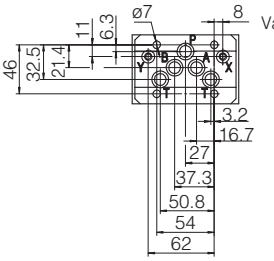
Internal piloting: Without plug ①;
External piloting: Add DIN-908 M16x1,5 in pos ①;
plug SP-X325A in pos ②;
Internal drain: Without blinded plug SP-X300F ③;
External drain: Add blinded plug SP-X300F ③.

To reach the orifice ②, remove plug ④ = G 1/8”

17 INSTALLATION DIMENSIONS [mm] - Multicertified and UL

DPHA-1*

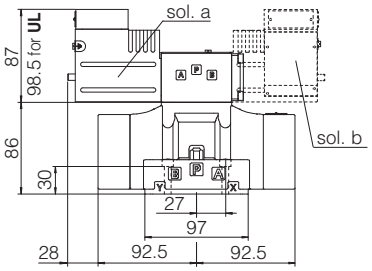
ISO 4401: 2005
Mounting surface: 4401-05-05-0-05
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Diameter of ports A,B, P, T: Ø = 11 mm;
Diameter of ports X, Y: Ø = 5 mm;
Seals: 5 OR 2050, 2 OR 108

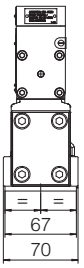


P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL PILOT PORT
Y = DRAIN PORT

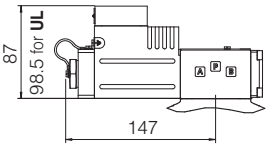
Mass [kg]	
DPHA-16	8,0
DPHA-17	9,5
Option /WP	+0,25
Option /O	+0,35
Option /H, /H9	+1,0

DPHA-16
DPHA-17 (dotted line)

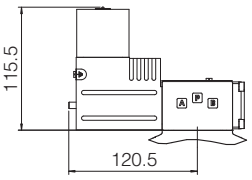




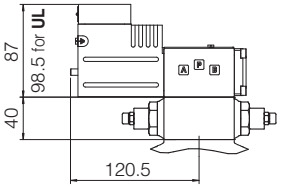
Option /WP



Option /O

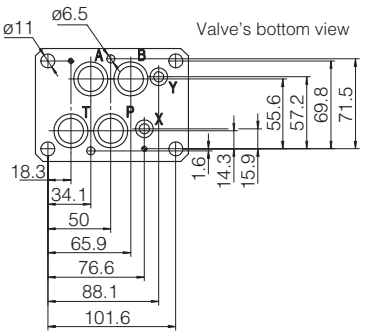


Option /H; /H9



DPHA-2*

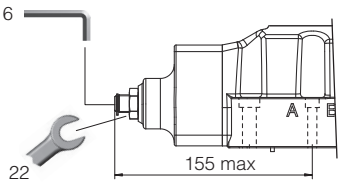
ISO 4401: 2005
Mounting surface: 4401-07-07-0-05
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 130, 2 OR 2043



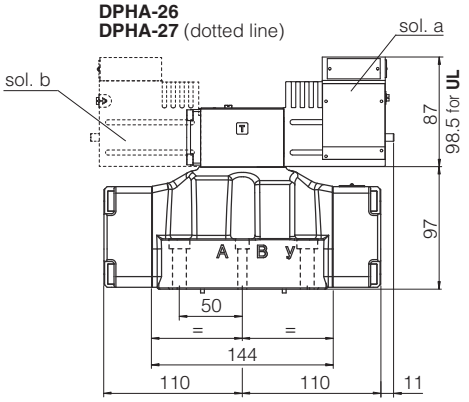
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL PILOT PORT
Y = DRAIN PORT

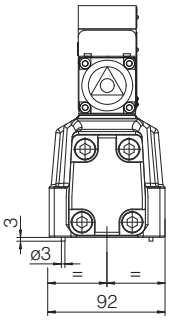
Mass [kg]	
DPHA-26	11
DPHA-27	12,5
Option /WP	+0,25
Option /O	+0,35
Option /S	+1,0
Option /H, /H9	+1,0

Option /S

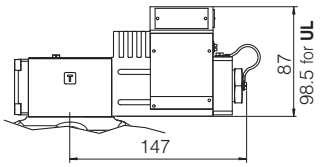


DPHA-26
DPHA-27 (dotted line)

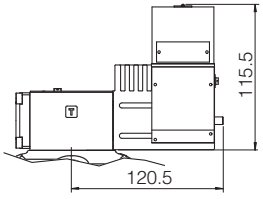




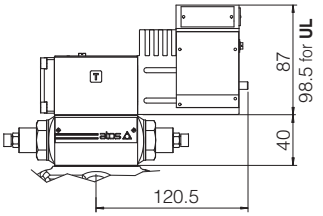
Option /WP



Option /O



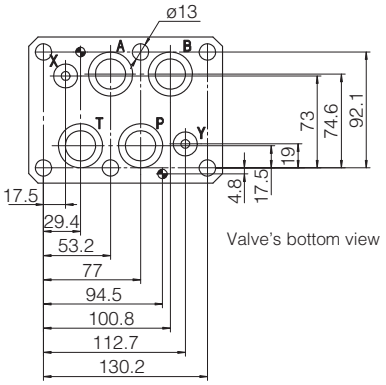
Option /H; /H9



DPHA-4*

ISO 4401: 2005 (see table P005)
Mounting surface: 4401-08-08-0-05
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Seals: 4 OR 4112; 2 OR 3056
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;

Mass [kg]	
DPHA-46	18,5
DPHA-47	20,0
Option /WP	+0,25
Option /O	+0,35
Option /S	+1,5
Option /H, /H9	+1,0

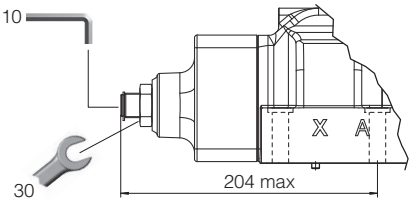


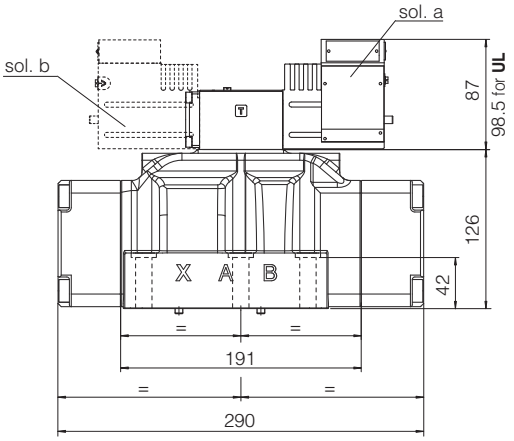
Valve's bottom view

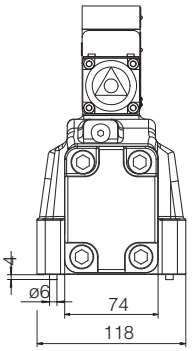
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL PILOT PORT
Y = DRAIN PORT

DPHA-46
DPHA-47 (dotted line)

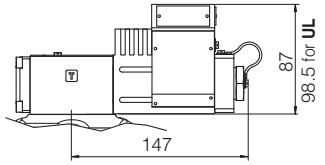
Option /S



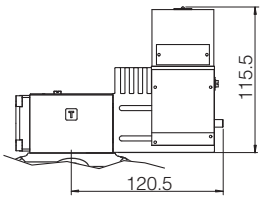




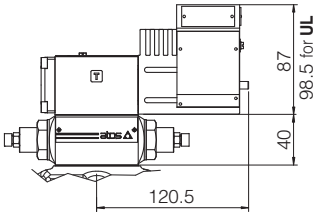
Option /WP



Option /O



Option /H; /H9



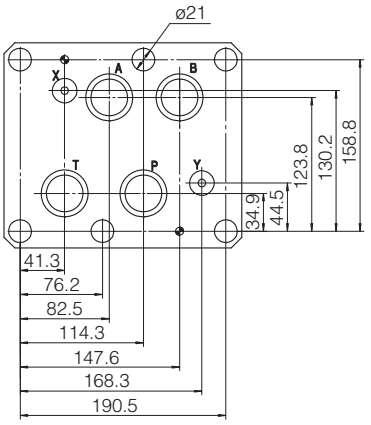
DPHA-6*

ISO 4401: 2005
Mounting surface: 4401-10-09-0-05

Fastening bolts:
6 socket head screws M20x80 class 12.9
Tightening torque = 600 Nm
Diameter of ports A, B, P, T: Ø = 34 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 144, 2 OR 3056

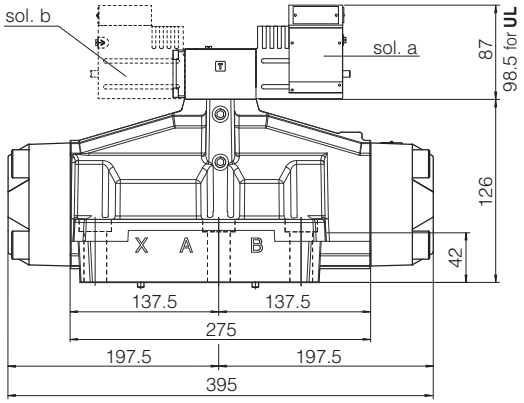
Mass [kg]	
DPHA-66	45,0
DPHA-67	46,5
Option /WP	+0,25
Option /O	+0,35
Option /S	+3,5
Option /H, /H9	+1,0

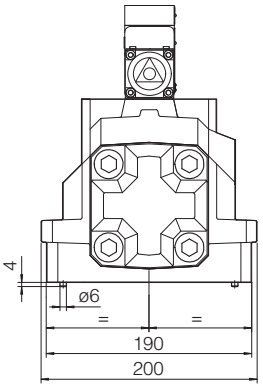
Valve's bottom view



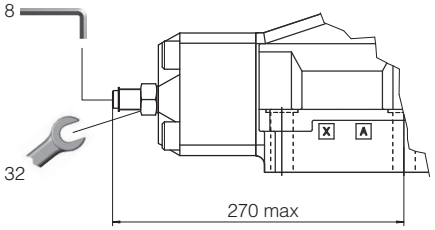
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL OIL PILOT PORT
Y = DRAIN PORT

DPHA-66
DPHA-67 (dotted line)

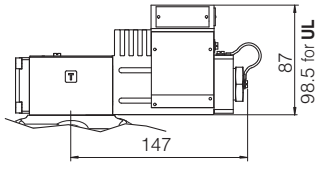




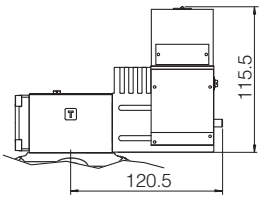
Option /S



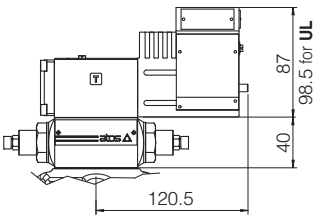
Option /WP



Option /O



Option /H; /H9

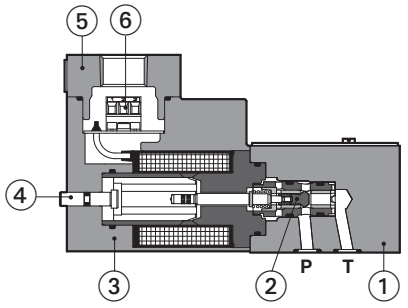


18 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
X030	Summary of Atos ex-proof components certified to cULus
EX900	Operating and manintenance information for ex-proof on-off valves
KX800	Cable glands for ex-proof valves
P005	Mounting surfaces for electrohydraulic valves

Ex-proof solenoid directional valves

on-off, direct, poppet type leak free - **ATEX, IECEx, EAC, PESO** or **cULus**



DLAH-2A

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

DLAH, DLAHM, CART LAH, CART LAHM

On-off oppet type, directional valves equipped with ex-proof solenoids certified for safe operation in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX**, **IECEx**, **EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

They are **SIL** compliance with IEC 61508 (TÜV certified)

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.
The solenoid is also designed to limit the surface temperature within the classified limits.

DLAH subplate, **CART LAH** screw-in
Size: **06** - ISO 4401 (only for DLAH)
Max flow: **12 l/min**
Max pressure: **350 bar**

DLAHM subplate, **CART LAHM** screw-in
Size: **06** - ISO 4401 (only for DLAHM)
Max flow: **30 l/min**
Max pressure: **315 bar**

1 MODEL CODE

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

DLAH
Ex-proof solenoid directional valves, poppet type
Subplate mounting
DLAH = max flow 12 l/min
DLAHM = max flow 30 l/min
Screw-in mounting
CART LAH = max flow 12 l/min
CART LAHM = max flow 30 l/min

Certification type:
Multicertification ATEX, IECEx, EAC, PESO:
- = omit for Group II 2G / II 2D **(1)**
M = Group I M2 (mining)
North American Certification:
UL = cULus

2 = two way (only for DLAH and CART LAH)
3 = three way

Configuration, see section 2
A C

Solenoid threaded connection for cable gland fitting:
GK = GK-1/2" - not for **cULus (4)**
M = M20x1,5 - not for **cULus**
NPT = 1/2" NPT

Options (3):
O = horizontal cable entrance **(2)**
R = with check valve on port P (only for DLAH)
WP = ⚠ manual override protected by metallic cap

Voltage code, see section 5

Series number

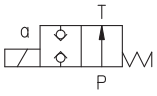
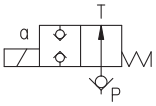
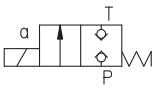
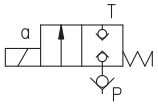
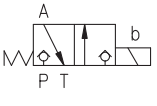
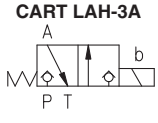
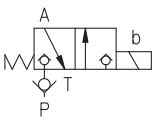
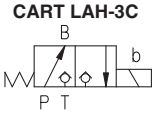
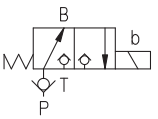
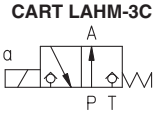
Seals material, see section 6:
- = NBR
PE = FKM
BT = HNBR **(1)**

(1) The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from

(2) Not for multicertification **M** group I (mining) **(3)** For possible combined options, see 12.1 **(4)** Approved only for the Italian market

⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS (representation according to ISO 1219-1)

DLAH-2A **CART LAH-2A** 	**DLAH-2A/R** 	**DLAH-2C** **CART LAH-2C** 	**DLAH-2C/R** 	**DLAHM-3A** **CART LAHM-3A** 
DLAH-3A **CART LAH-3A** 	**DLAH-3A/R** 	**DLAH-3C** **CART LAH-3C** 	**DLAH-3C/R** 	**DLAHM-3C** **CART LAHM-3C** 

3 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure “Ex d” -Dust ignition protection by enclosure “Ex t” RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

4 HYDRAULIC CHARACTERISTICS

Operating pressure	DLAH, CART LAH, ports P,A,B: **350** bar; DLAHM, CART LAHM ports P,A: **315** bar; Port T **210** bar
Rated flow	See diagrams Q/Δp at section 13
Maximum flow	DLAH, CART LAH: **12 l/min**, DLAHM, CART LAHM: **30 l/min**, see operating limits at section 14

5 ELECTRICAL CHARACTERISTICS

Valve type		DLAH, DLAHM CART LAH, LAHM	DLAH**/M**, DLAHM**/M** CART LAH**/M**, LAHM**/M**	DLAH**/UL**, DLAHM**/UL** CART LAH**/UL**, LAHM**/UL**
Voltage code **(1)**	VDC ±10%	**12DC, 24DC, 28DC, 48DC, 110DC, 125DC, 220DC**		**12DC, 24DC, 110DC, 125DC, 220DC**
	VAC 50/60 Hz ±10%	**12AC, 24AC, 110AC, 230AC**		**12AC, 24AC, 110AC, 230AC**
Power consumption at 20°C		8W		12W
Coil insulation		class H		
Protection degree with relevant cable gland		IP66/67 to DIN EN60529		raintight enclosure, UL approved
Duty factor		100%		

(1) For alternating current supply a rectifier bridge is provided built-in the solenoid
For power supply frequency 60 Hz, the nominal supply voltage of solenoids 110AC and 230AC must be 115/60 and 240/60 respectively

6 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature.

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar
-max fluid temperature = 50°C

7 CERTIFICATION DATA

Valve type	DLAH, DLAHM CART LAH, LAHM		DLAH**/M**, DLAHM**/M** CART LAH**/M**, LAHM**/M**	DLAH**/UL**, DLAHM**/UL** CART LAH**/UL**, LAHM**/UL**	
Certifications	Multicertification Group II **ATEX IECEx EAC PESO**		Multicertification Group I **ATEX IECEx**	North American cULus **cULus**	
Solenoid certified code	**OA**		**OA/M**	**OA/EC**	
Type examination certificate **(1)**	ATEX: CESI 02 ATEX 014 IECEx: IECEx CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEx: IECEx CES 12.0007x	20170324 - E366100	
Method of protection	• ATEX, EAC Ex II 2G Ex d IIC T6/T4/T3 Gb Ex II 2D Ex tb IIIC T85°C/T200°C Db • IECEx Ex d IIC T6/T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • PESO Ex II 2G Ex d IIC T6/T4 Gb		• ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb	• UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB	
Temperature class	**T6**	**T4**	**-**	**T6**	**T5**
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 150 °C	≤ 85 °C	≤ 100 °C
Ambient temperature **(2)**	-40 ÷ +45 °C	-40 ÷ +70 °C	-20 ÷ +70 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	**GK** = GK-1/2" **M** = M20x1,5 **NPT** = 1/2" NPT			1/2" NPT ANSI/ASME B46.1	

(1) The type examinator certificates can be downloaded from
(2) The solenoids **Group II** and **cULus** are certified 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

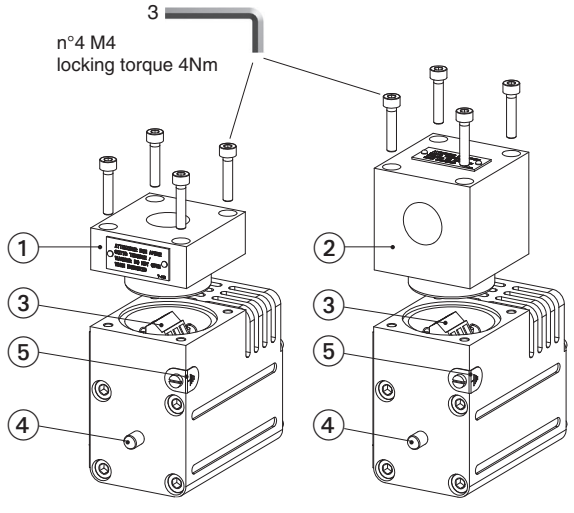
⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

8 SIL compliance with IEC 61508: 2010 - only subplate version DLAH and DLAHM

DLAH and DLAHM (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)

9 EX PROOF SOLENOIDS WIRING

Multicertification



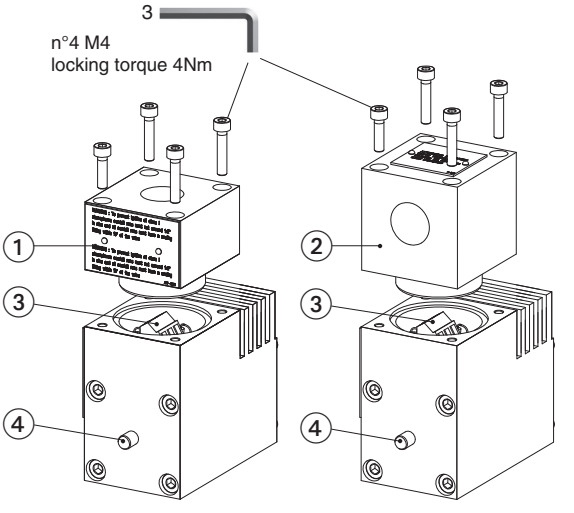
Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override
⑤ screw terminal for additional equipotential grounding

1 = Coil
2 = GND
3 = Coil

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

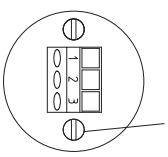
cULus certification



Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override

⚠ **Pay attention to coil polarity**



1 = Coil **+**
2 = GND
3 = Coil **-**

PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 10 note 1

alternative GND screw terminal connected to solenoid housing

10 CABLE SPECIFICATION AND TEMPERATURE - Power supply and grounding cables have to comply with following characteristics:

Multicertification Group I and Group II

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

Grounding: section of internal ground wire = 2,5 mm²
section of external ground wire = 4 mm²

cULus certification:

- Suitable for use in Class I Division 1, Gas Groups C
- Armored Marine Shipboard Cable which meets UL 1309
- Tinned Stranded Copper Conductors
- Bronze braided armor
- Overall impervious sheath over the armor

Any Listed (UBVZ/ UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("/BT" Models require a temperature range from -40°C to +110°C)

Note 1: For Class I wiring the 3C 1,5 mm² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.

10.1 Cable temperature

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

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min cable temperature
	Group I	Group II	Group I	Group II	
45 °C	-	T6	150 °C	85 °C	not prescribed
70 °C	-	T4	150 °C	135 °C	90 °C

cULus

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min cable temperature
55 °C	T6	85 °C	100 °C
70 °C	T5	100 °C	100 °C

11 CABLE GLANDS only for Multicertification

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 **KX800**

Note: a Loctite sealant type 545, should be used on the cable gland entry threads

12 OPTIONS

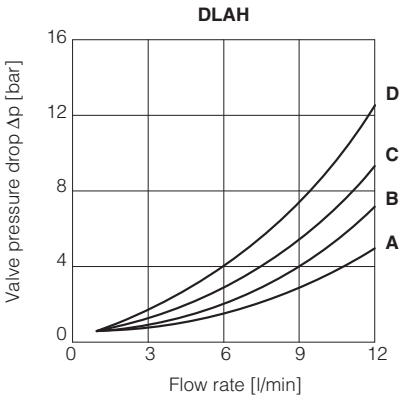
O = Horizontal cable entrance, to be selected in case of limited vertical space
R = Only for DLAH: integral check valve for free reverse flow
The DLAH-***/R** are provided with integral check valve for free reverse flow A→B
WP = Manual override protect by metallic cap

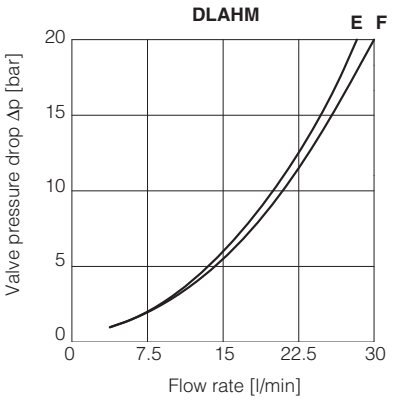
12.1 Possible combined options: /OP, /OR, /PR, /OPR

13 Q/Δp DIAGRAMS (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 CART LAH-2A	B	–
DLAH-2C CART LAH-2C	C	–
DLAH-3A CART LAH-3A	D	C
DLAH-3C CART LAH-3C	C	A
DLAHM-3A CART LAHM-3A	F	E
DLAHM-3C CART LAHM-3C	F	E

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





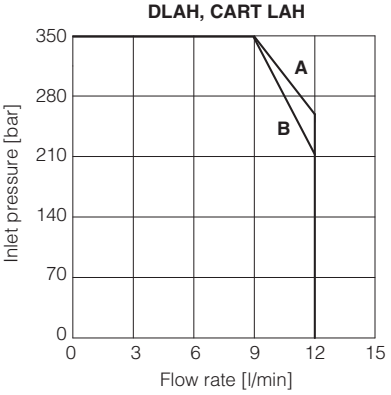
14 OPERATING LIMITS (based on mineral oil ISO VG 46 at 50°C)

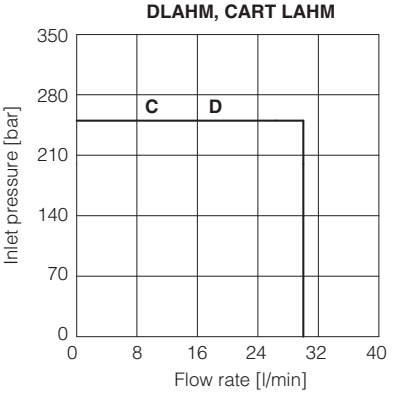
DLAH, CART LAH

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

DLAHM, CART LAHM

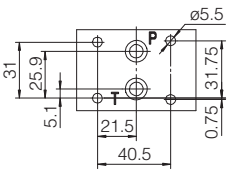
C =CART LAHM-3A, DLAHM-3A;
D =CART LAHM-3C, DLAHM-3C





15 INSTALLATION DIMENSIONS FOR SUBPLATE VERSION [mm] - Multicertified and UL

DLAH-2*

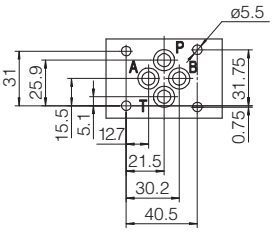


ISO 4401: 2005 (see table P005)
Mounting surface: 4401-03-02-0-05
without A and B ports
Fastening bolts:
4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 2 OR 108
Ports P, T: Ø = 7,5 mm (max)

P = PRESSURE PORT
T = USE PORT

Mass [kg]	
DLAH-2*	2,65
DLAH-3*	2,65
Option /O	+0,35
Option /WP	+0,25

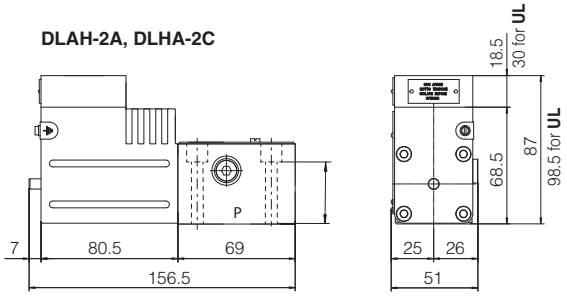
DLAH-3*



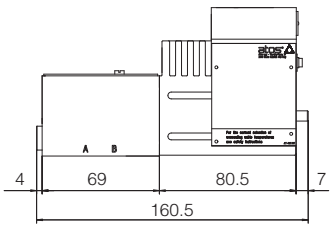
ISO 4401: 2005 (see table P005)
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5X50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)

P = PRESSURE PORT
A = USE PORT (not used for DLAH-3C version)
B = USE PORT (not used for DLAH-3A version)
T = TANK PORT

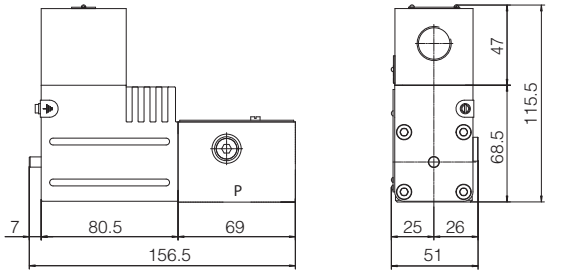
DLAH-2A, DLHA-2C



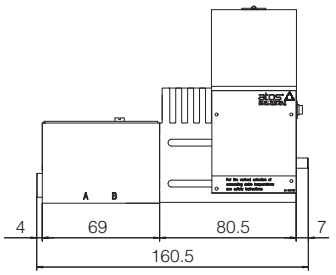
DLAH-3A ,DLAH-3C



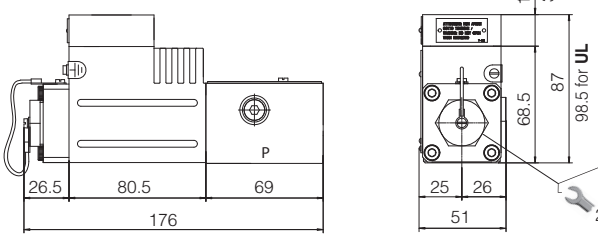
DLAH-2A /O, DLHA-2C /O



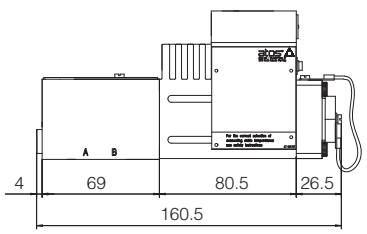
DLAH-3A /O ,DLAH-3C /O



DLAH-2A /WP, DLHA-2C /WP

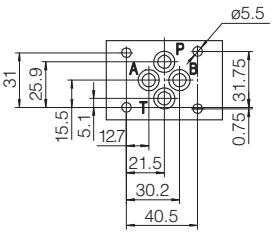


DLAH-3A /WP, DLAH-3C



DLAHM-3*

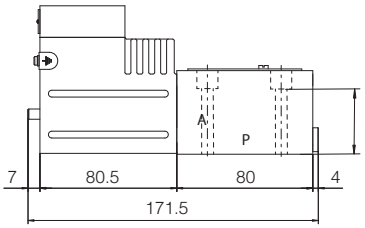
ISO 4401: 2005 (see table P005)
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5X50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)

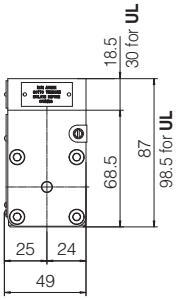


Mass [kg]	
DLAHM-3*	2,85
Option /O	+0,35
Option /WP	+0,25

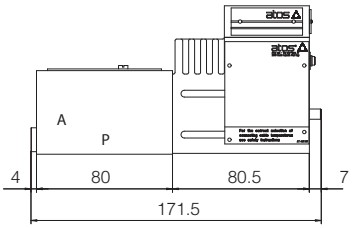
P = PRESSURE PORT
A = USE PORT
B = not used
T = TANK PORT

DLAHM-3C

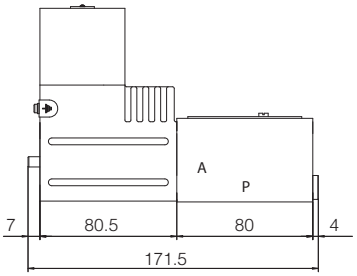


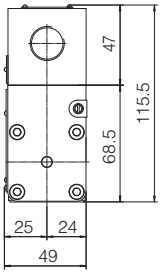


DLAHM-3A

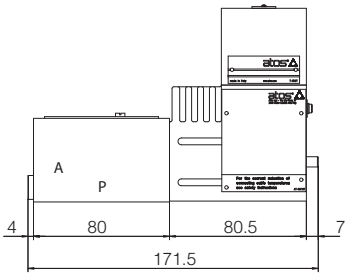


DLAHM-3C /O

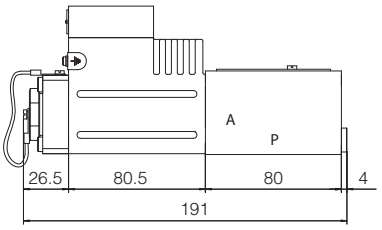


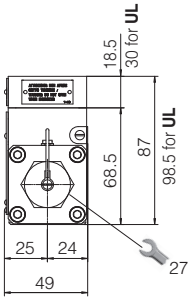


DLAHM-3A /O

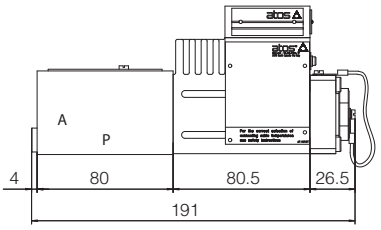


DLAHM-3C /WP



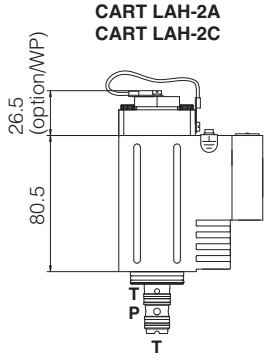


DLAHM-3A /WP

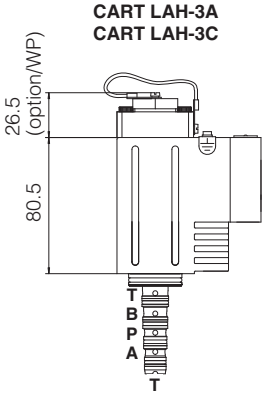


16 INSTALLATION DIMENSIONS FOR SCREW-IN VERSION [mm] - Multicertified and UL

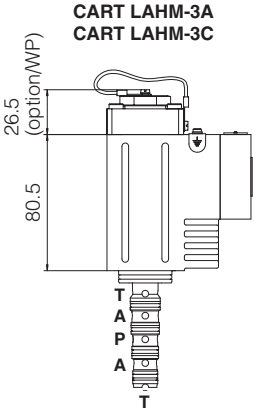
CART LAH-2A
CART LAH-2C



CART LAH-3A
CART LAH-3C



CART LAHM-3A
CART LAHM-3C

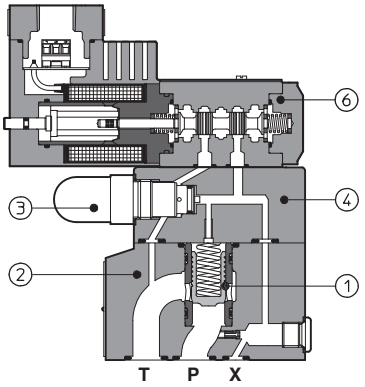


17 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO
X030	Summary of Atos ex-proof components certified to cULus
EX900	Operating and manintenance information for ex-proof on-off valves
KX800	Cable glands for ex-proof valves
P005	Mounting surfaces for electrohydraulic valves
P006	Mounting surfaces and cavities for cartridge valves

Ex-proof pressure relief valves

piloted, subplate or in line mounting - **ATEX, IECEx, EAC, PESO** or **cULus**



① main poppet
② valve main body
③ mechanical pressure limiter
④ cover
⑤ ex proof pilot valve

AGAM-10/10/-AO**

AGAM, ARAM

Ex-proof pressure relief valves equipped with solenoid pilot valve for venting or multiple pressure selection, certified for safe operation in hazardous environments with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX**, **IECEx**, **EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.
The solenoid is also designed to limit the surface temperature within the classified limits.

AGAM: pressure relief, subplate mounting
Size: **10, 20, 32** - ISO 6264
Max flow: **200, 400, 600 l/min**

ARAM: pressure relief, threaded connections
Size: **G 3/4"** and **G 1 1/4"**
Max flow: **350** and **500 l/min**

Max pressure: **350 bar**

1 **MODEL CODE**

AGAM	-	20	/	20	/	210/100/100	/	M	-	AO	/	*	/	24DC	*	/	*

AGAM
Ex-proof pressure relief valves, piloted
AGAM
subplate mounting
ARAM
threated connections

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

Configuration, see section 2 :

10	**20**	**22**
11	**21**	**32**

Max regulated pressure
of first (second / third) setting, see section 4 :

50 = 50 bar	**100** = 100 bar
210 = 210 bar	**350** = 350 bar

Solenoid threaded connection for cable gland fitting:
GK = GK-1/2" - not for **cULus (4)**
M = M20x1,5 - not for **cULus**
NPT = 1/2" NPT

Certification type:
AO = Multicertification for Group II 2G / II 2D **(3)**
AO/M = Multicertification for Group I M2 (mining)
AO/UL = cULus North American certification

Options (2):
E = external pilot
O = horizontal cable entrance **(1)**
V = regulating handweel for pressure adjustment
WP = ⚠ manual override protected by metallic cap
Y = external drain

Voltage code, see section 5

Series number

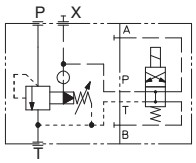
Seals material, see section 6 :
- = NBR
PE = FKM
BT = HNBR **(1)**

(1) Not for multicertification **M** group I (mining) **(2)** For possible combined options, see 11.1 **(3)** The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from **(4)** Approved only for the Italian market

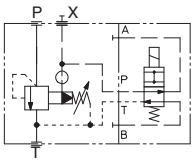
⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS

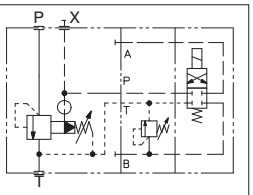
AGAM-/10**
ARAM-/10**
one setting pressure
+ venting with
de-energized solenoid



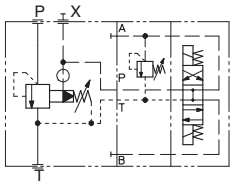
ARAM-/11**
AGAM-/11**
one setting pressure
+ venting with
energized solenoid



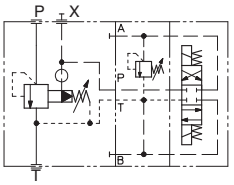
AGAM-/22**
ARAM-/22**
two setting pressure
without venting



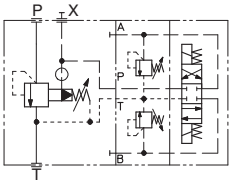
AGAM-/20**
ARAM-/20**
two setting pressure
+ venting with
de-energized solenoid



AGAM-/21**
ARAM-/21**
two setting pressure
+ venting with
energized solenoid



AGAM-/32**
ARAM-/32**
three setting pressure
without venting



3 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation -salt spray test (EN ISO9227) > 200h
Compliance	Explosion proof protection, see section 7 -Flame proof enclosure “Ex d” -Dust ignition protection by enclosure “Ex t” RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

4 HYDRAULIC CHARACTERISTICS

Valve size		**10**	**20**	**32**
Max operating pressure	[bar]	port P = **350** port T, Y = **210**		
Max regulated pressure	[bar]	**50**	**100** **210**	**350**
Pressure range	[bar]	4÷50;	6÷100; 7÷210;	8÷350
Max flow **AGAM (1)**	[l/min]	200	400	600
Max flow **ARAM (1)**	[l/min]	-	350	500

(1) see Q/Δp diagrams at section 12 and 13

5 ELECTRICAL CHARACTERISTICS

Valve type		AGAM-*/**AO** ARAM-*/**AO**	AGAM-*/**AO/M** ARAM-*/**AO/M**	AGAM-*/**AO/UL** ARAM-*/**AO/UL**
Voltage code **(1)**	VDC ±10%	**12DC, 24DC, 28DC, 48DC, 110DC, 125DC, 220DC**		**12DC, 24DC, 110DC, 125DC, 220DC**
	VAC 50/60 Hz ±10%	**12AC, 24AC, 110AC, 230AC**		**12AC, 24AC, 110AC, 230AC**
Power consumption at 20°C		8W		12W
Coil insulation		class H		
Protection degree with relevant cable gland		IP66/67 to DIN EN60529		raintight enclosure, UL approved
Duty factor		100%		

(1) For alternating current supply a rectifier bridge is provided built-in the solenoid
For power supply frequency 60 Hz, the nominal supply voltage of solenoids 110AC and 230AC must be 115/60 and 240/60 respectively

6 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar -max fluid temperature = 50°C

7 CERTIFICATION DATA

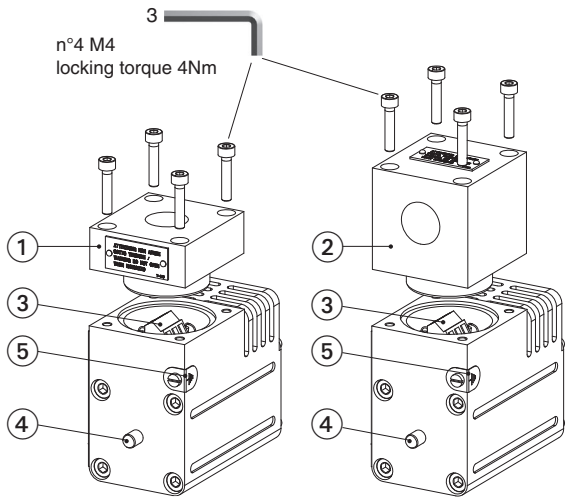
Valve type	AGAM-*/**AO** ARAM-*/**AO**		AGAM-*/**AO/M** ARAM-*/**AO/M**	AGAM-*/**AO/UL** ARAM-*/**AO/UL**	
Certifications	Multicertification Group II **ATEX IECEx EAC PESO**		Multicertification Group I **ATEX IECEx**	North American cULus **cULus**	
Solenoid certified code	**OA**		**OA/M**	**OA/EC**	
Type examination certificate **(1)**	ATEX: CESI 02 ATEX 014 IECEx: IECEx CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEx: IECEx CES 12.0007x	20170324 - E366100	
Method of protection	• ATEX, EAC Ex II 2G Ex d IIC T6/T4/T3 Gb Ex II 2D Ex tb IIIC T85°C/T200°C Db • IECEx Ex d IIC T6/T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • PESO Ex II 2G Ex d IIC T6/T4 Gb		• ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb	• UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB	
Temperature class	**T6**	**T4**	**-**	**T6**	**T5**
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 150 °C	≤ 85 °C	≤ 100 °C
Ambient temperature **(2)**	-40 ÷ +45 °C	-40 ÷ +70 °C	-20 ÷ +70 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	**GK** = GK-1/2" **M** = M20x1,5 **NPT** = 1/2" NPT			1/2" NPT ANSI/ASME B46.1	

(1) The type examinator certificates can be downloaded from
(2) The solenoids **Group II** and **cULus** are certified 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

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

8 EX PROOF SOLENOIDS WIRING

Multicertification



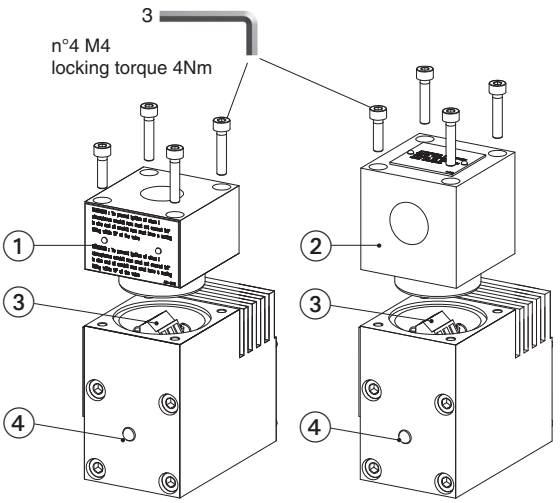
Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override
⑤ screw terminal for additional equipotential grounding

1 = Coil
2 = GND
3 = Coil

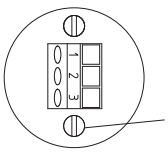
PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)

cULus certification



Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override



⚠ **Pay attention to coil polarity**

1 = Coil **+**
2 = GND
3 = Coil **-**

PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 9 note 1

alternative GND screw terminal connected to solenoid housing

9 **CABLE SPECIFICATION AND TEMPERATURE** - Power supply and grounding cables have to comply with following characteristics:

Multicertification Group I and Group II

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

Grounding: section of internal ground wire = 2,5 mm²
section of external ground wire = 4 mm²

cULus certification:

- Suitable for use in Class I Division 1, Gas Groups C
- Armored Marine Shipboard Cable which meets UL 1309
- Tinned Stranded Copper Conductors
- Bronze braided armor
- Overall impervious sheath over the armor

Any Listed (UBVZ/ UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("/BT" Models require a temperature range from -40°C to +110°C)

Note 1: For Class I wiring the 3C 1,5 mm² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.

9.1 Cable temperature

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

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min cable temperature
	Group I	Group II	Group I	Group II	
45 °C	-	T6	150 °C	85 °C	not prescribed
70 °C	-	T4	150 °C	135 °C	90 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min cable temperature
55 °C	T6	85 °C	100 °C
70 °C	T5	100 °C	100 °C

10 **CABLE GLANDS only for Multicertification**

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 **KX800**

Note: a Loctite sealant type 545, should be used on the cable gland entry threads

11 **OPTIONS**

E = External pilot option to be selected when the pilot pressure is supplied from a different line respect to the P main line.
With option E the internal connection between port P and X of the valve is plugged.
The pilot pressure must be connected to the X port available on the valve's mounting surface or on main body (threaded pipe connection G ¼").

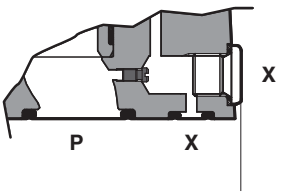
O = Horizontal cable entrance, to be selected in case of limited vertical space

V = Regulating handweel for pressure adjustment

WP = Manual override protect by metallic cap

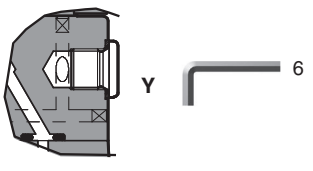
Y = The external drain is mandatory in case the main line T is subjected to pressure peaks or it is pressurized.
The Y drain port has a threaded connection G ¼" available on the pilot stage body.

E option



Blinded plug SP-X100A

Y option

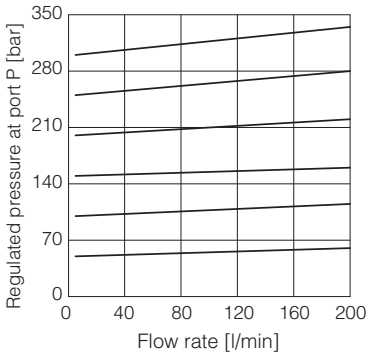


11.1 Possible combined options:

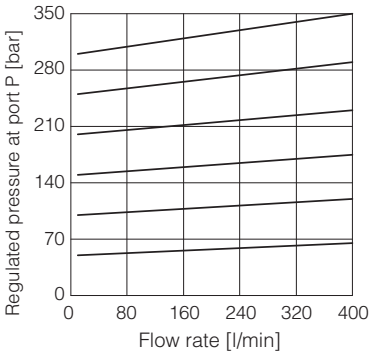
/EO, /EV, /EY, /EW, /EWP, /EOV, /EOY, /EVY
/EOWP, /EWPY, /EOVY, /EOVWP, /EVWPY, /EOVWPY
/OV, /OY, /OWP, /OVY, /OVWP, /OWPY, /OVWPY,
/VY, /VWP, /VWPY
/WPY

12 REGULATED PRESSURE VERSUS FLOW DIAGRAMS based on mineral oil ISO VG 46 at 50°C

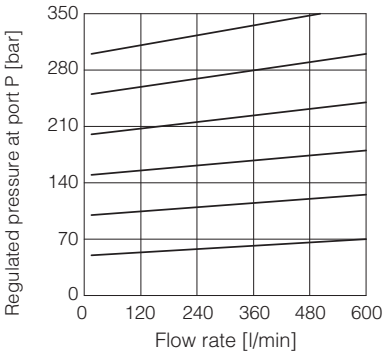
AGAM-10



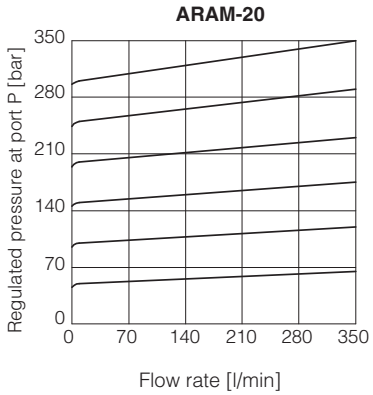
AGAM-20



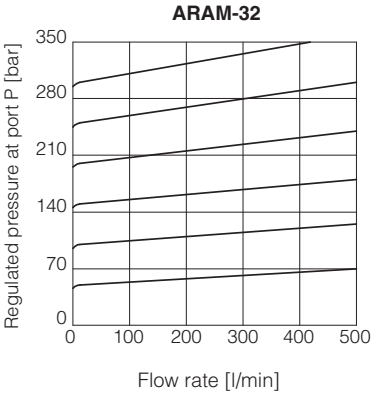
AGAM-32



ARAM-20

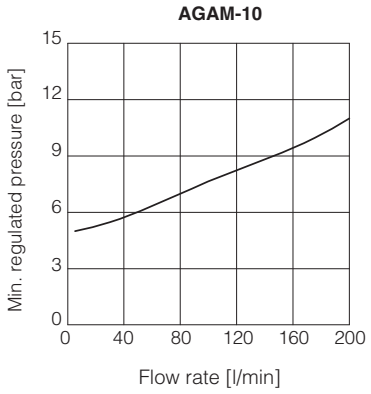


ARAM-32

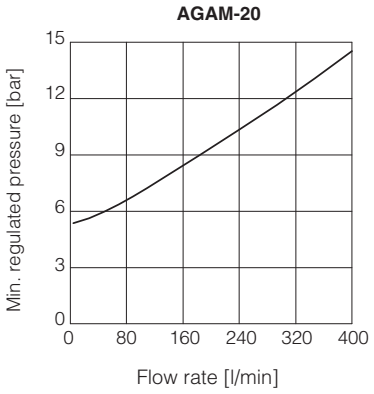


13 MINIMUM PRESSURE VERSUS FLOW DIAGRAMS based on mineral oil ISO VG 46 at 50°C

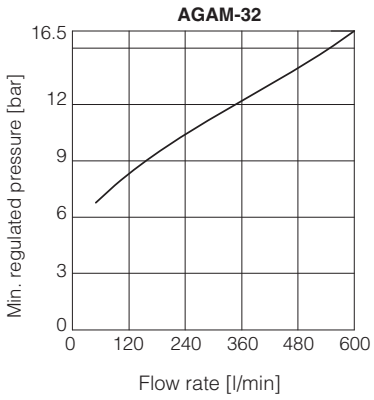
AGAM-10



AGAM-20



AGAM-32



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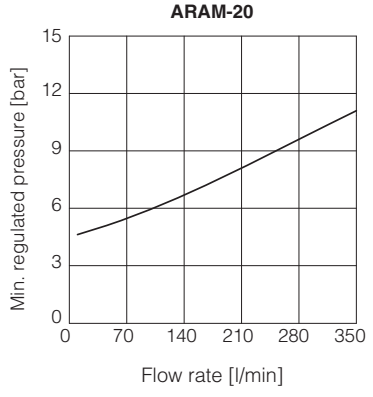
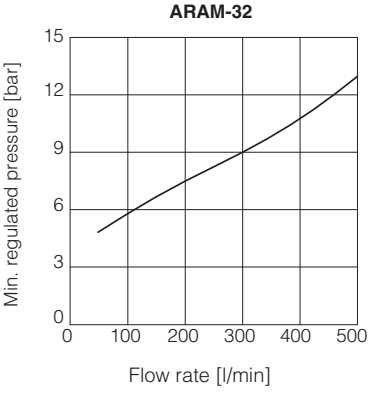
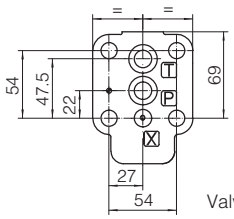


ARAM-32



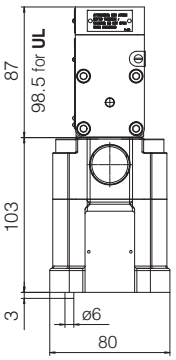
AGAM-10



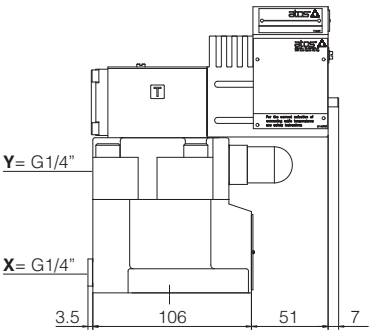
Valve's bottom view

ISO 6264: 2007 (see table P005)
Mounting surface: 6264-06-09-1-97
Fastening bolts:
4 socket head screws M12x35 class 12.9
Tightening torque = 125 Nm
Seals: 2 OR 123; 1 OR 109/70
Ports P, T: Ø = 14,5 mm
Ports X: Ø = 3,2 mm

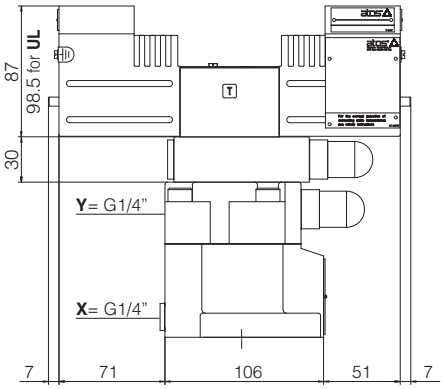
Mass [kg]	
AGAM-10/10 10/11	6,45
AGAM-10/20 10/21	7,55
AGAM-10/22 10/32	7,25 9
option /V	-
option /O	+0,35
option /WP	+0,25



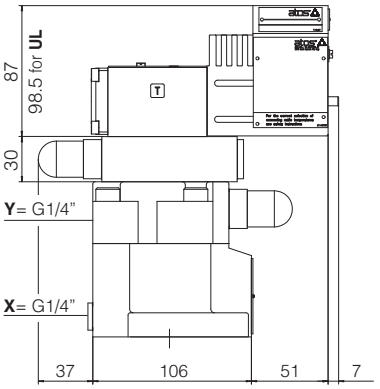
AGAM-10/10/-AO**
AGAM-10/11/-AO**



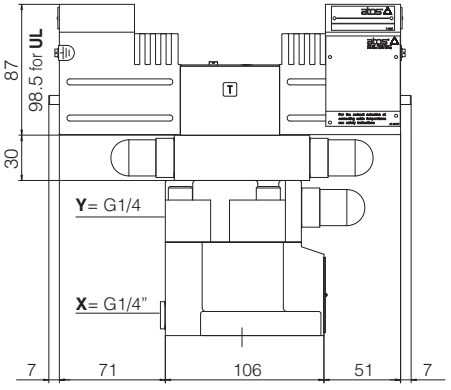
AGAM-10/20/-AO**
AGAM-10/21/-AO**



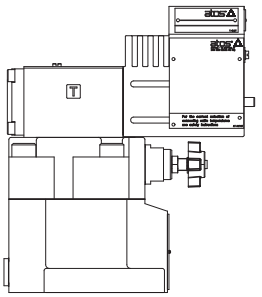
AGAM-10/22/-AO**



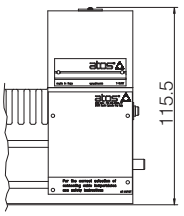
AGAM-10/32/-AO**



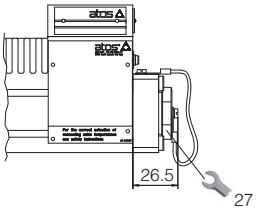
Option /V



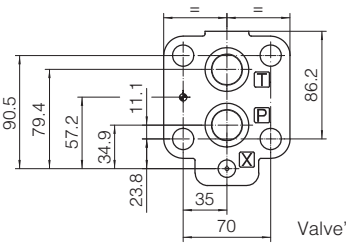
Option /O



Option /WP



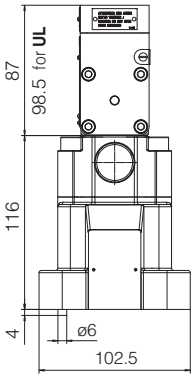
AGAM-20



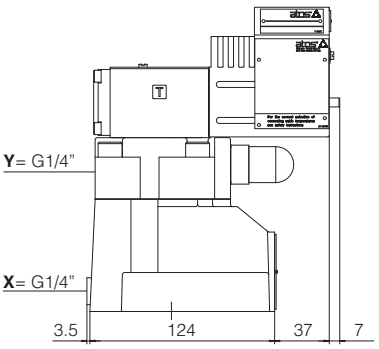
Valve's bottom view

ISO 6264: 2007 (see table P005)
Mounting surface: 6264-08-11-1-97
Fastening bolts:
4 socket head screws M16x50 class 12.9
Tightening torque = 300 Nm
Seals: 2 OR 4112; 1 OR 109/70
Ports P, T: Ø = 24 mm
Ports X: Ø = 3,2 mm

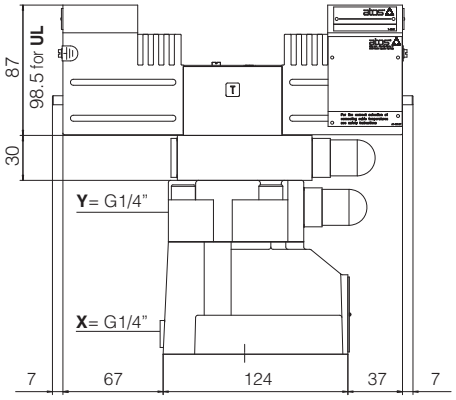
Mass [kg]	
AGAM-20/10 20/11	7,65
AGAM-20/20 20/21	8,75
AGAM-20/22 20/32	8,45 10,2
Option /V	-
Option /O	+0,35
Option /WP	+0,25



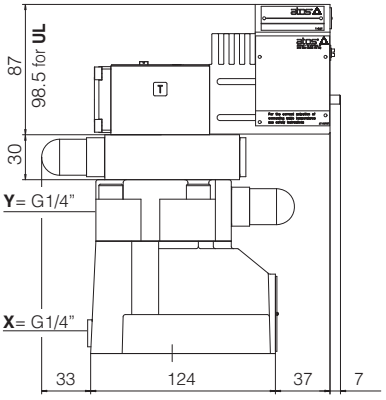
AGAM-20/10/-AO**
AGAM-20/11/-AO**



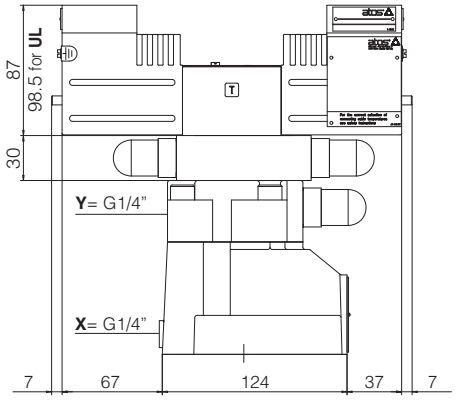
AGAM-20/20/-AO**
AGAM-20/21/-AO**



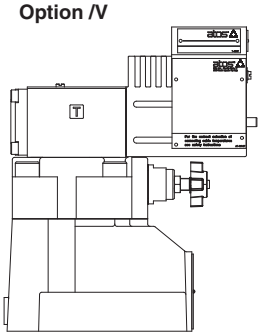
AGAM-20/22/-AO**



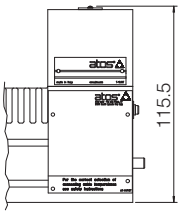
AGAM-20/32/-AO**



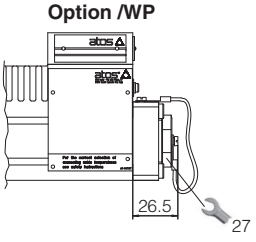
Option /V



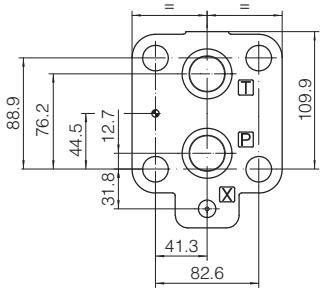
Option /O



Option /WP



AGAM-32

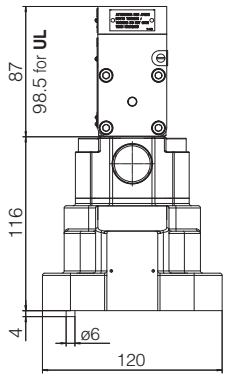


Valve's bottom view

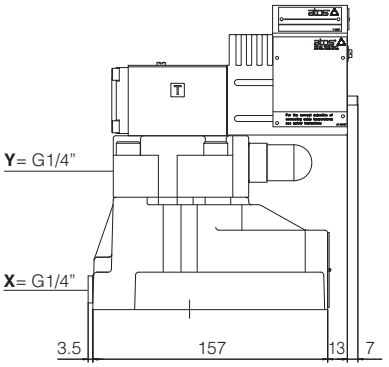
ISO 6264: 2007 (see table P005)
Mounting surface: 6264-10-17-1-97
(with M20 fixing holes instead of standard M18)
Fastening bolts:
4 socket head screws M20x60 class 12.9
Tightening torque = 600 Nm
Seals: 2 OR 4131; 1 OR 109/70
Ports P, T: Ø = 28,5 mm
Ports X: Ø = 3,2 mm

X = port connection for external pilot
Y = port connection for external drain

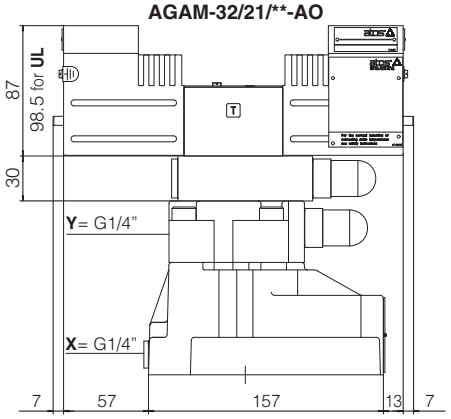
Mass [kg]	
AGAM-32/10 32/11	9,05
AGAM-32/20 32/21	10,05
AGAM-32/22 32/32	9,85 11,6
Option /V	-
Option /O	+0,35
Option /WP	+0,25



AGAM-32/10/-AO**
AGAM-32/11/-AO**



AGAM-32/20/-AO**
AGAM-32/21/-AO**



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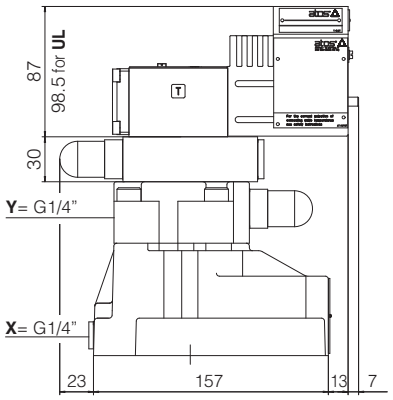

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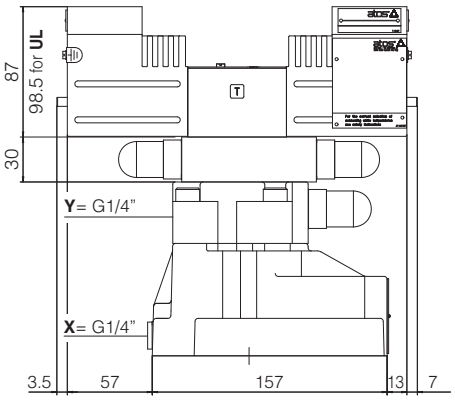
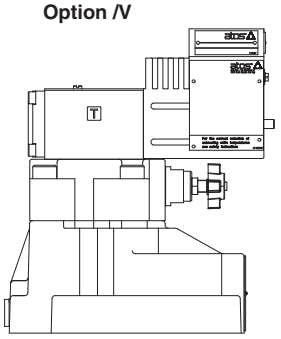
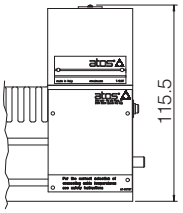


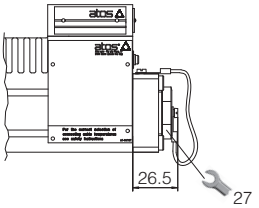
Option /V



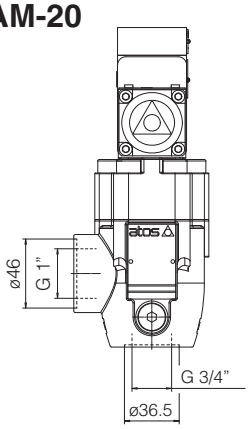
Option /O

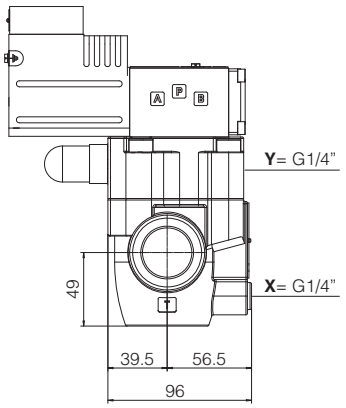


Option /WP



ARAM-20

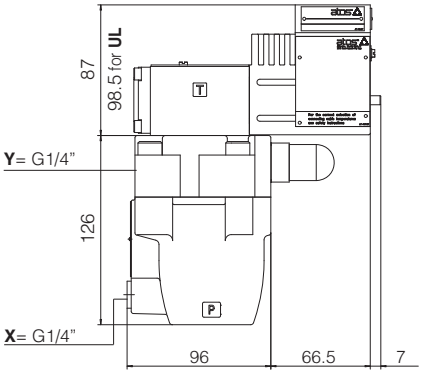




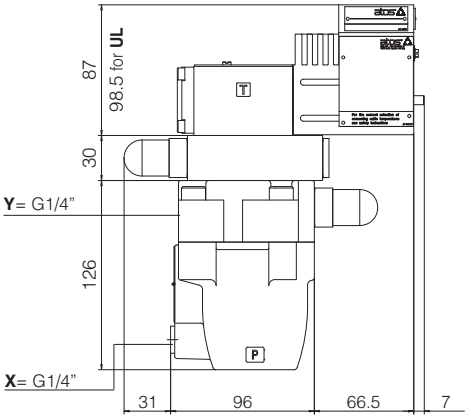
Mass [kg]	
ARAM-20/10 20/11	6,75
ARAM-20/20 20/21	8,45
ARAM-20/22 20/32	8,15 10,1
Option /V	-
Option /O	+0,35
Option /WP	+0,25

X = port connection for external pilot
Y = port connection for external drain

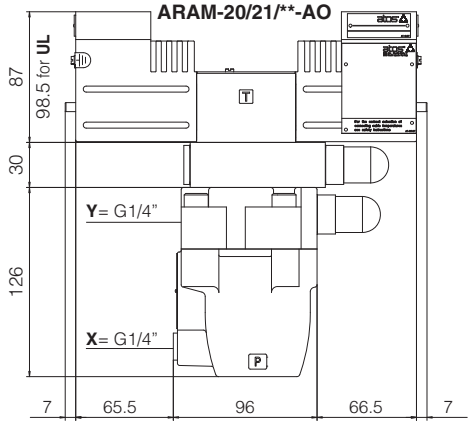
ARAM-20/10/-AO**
ARAM-20/11/-AO**



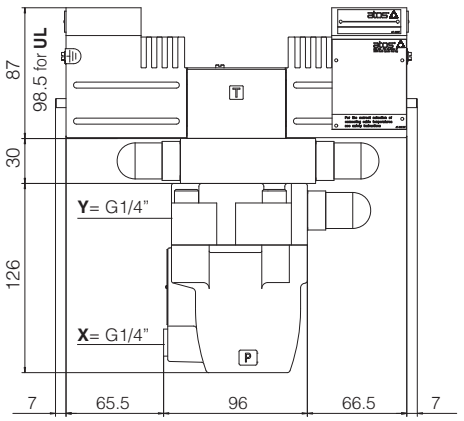
ARAM-20/22/-AO**



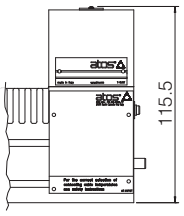
ARAM-20/20/-AO**
ARAM-20/21/-AO**



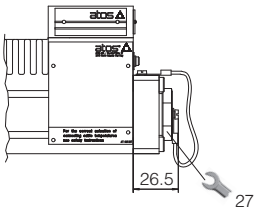
ARAM-20/32/-AO**



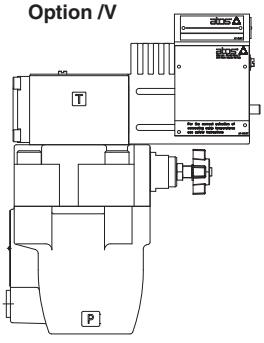
Option /O



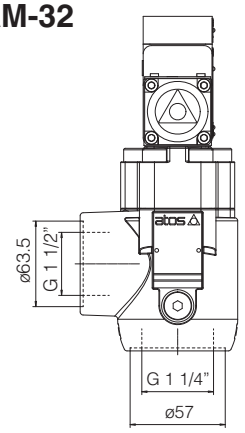
Option /WP

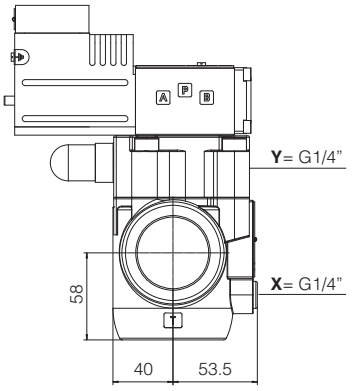


Option /V



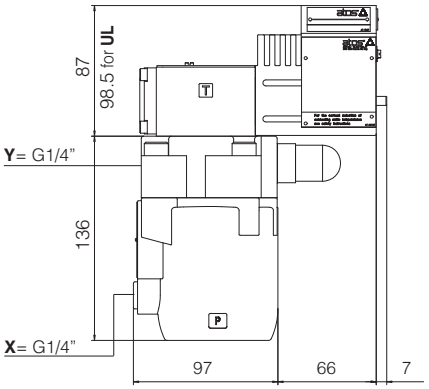
ARAM-32



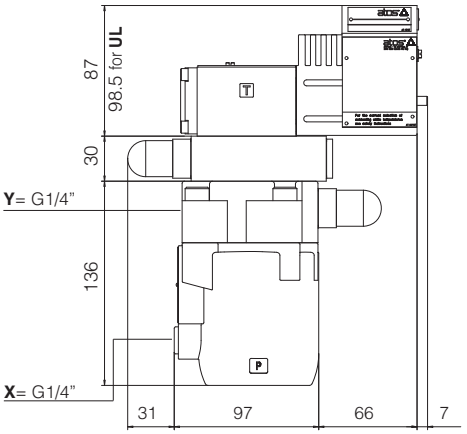


Mass [kg]	
ARAM-32/10 32/11	7,05
ARAM-32/20 32/21	9,05
ARAM-32/22 32/32	8,55 10,7
Option /V	-
Option /O	+0,35
Option /WP	+0,25

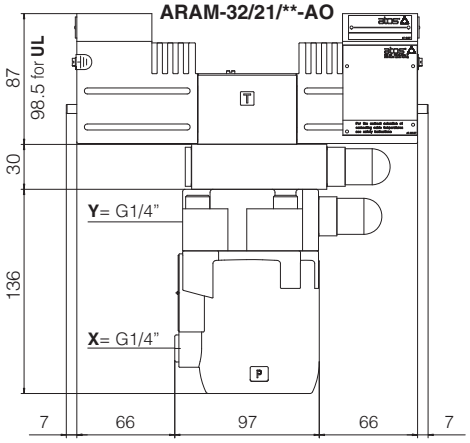
ARAM-32/10/-AO**
ARAM-32/11/-AO**



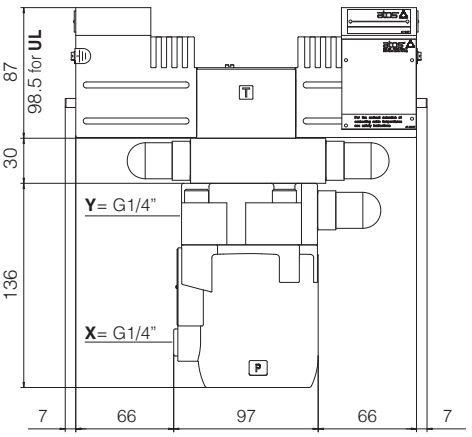
ARAM-32/22/-AO**



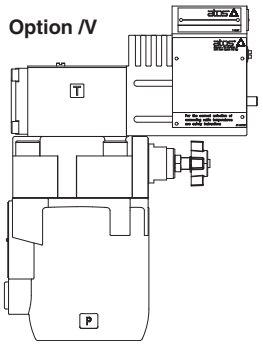
ARAM-32/20/-AO**
ARAM-32/21/-AO**



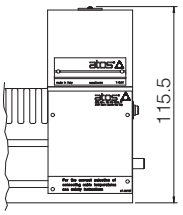
ARAM-32/32/-AO**



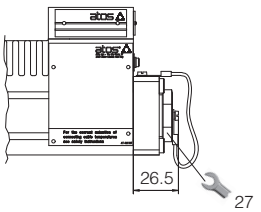
Option /V



Option /O



Option /WP

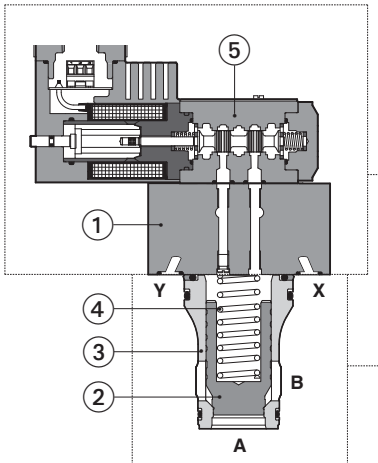


16 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	**EX900**	Operating and manintenance information for ex-proof on-off valves
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	**KX800**	Cable glands for ex-proof valves
X030	Summary of Atos ex-proof components certified to cULus	**P005**	Mounting surfaces for electrohydraulic valves

Ex-proof ISO cartridges

directional control - **ATEX, IECEx, EAC, PESO** or **cULus**



LIDEW1-4/*-AO

SC LI-4043*

① Functional cover
② Poppet
③ Sleeve
④ Spring
⑤ Ex proof pilot valve

LIDEW, LIDBH

Directional ISO cartridgs equipped with ex-proof solenoid pilot valve, certified for safe operation in hazardous environments, with potentially explosive atmosphere.

Certifications:

- Multicertification **ATEX**, **IECEx, EAC** and **PESO** for gas group **II 2G** and dust category **II 2D**
- Multicertification **ATEX** and **IECEx** for gas group **I M2** (mining)
- **cULus** North American certification for gas group **C&D**

The flameproof enclosure of solenoid prevents the propagation of accidental internal sparks or fire to the external environment.
The solenoid is also designed to limit the surface temperature within the classified limits.

LIDEW: directional control with ex-proof solenoid valve for pilot selection

LIDBH: directional control with ex-proof solenoid valve and shuttle valve for pilot selection

Size: **16** ÷ **63** - ISO 7368
Flow: **240** ÷ **4000 l/min** at Δp 5 bar
Max pressure: **350 bar**

1 **MODEL CODE OF COVERS** - to be coupled with cartridge in section **5**

LI	D	EW	1	-	1	/	M	-	AO	/	*	24DC	*	/	*	*

Cover according to ISO 7368

D = directional function

EW = with pilot solenoid valve
BH = as EW plus shuttle valve for pilot selection

Cover configuration see section **2** :
LIDEW: **-**, **1**, **2**, **4**, **5**, **6**
LIDBH: **1A**, **1C**, **2A**, **2C**

Valve size (ISO 7368):
1 = 16 **3** = 32 **5** = 50
2 = 25 **4** = 40 **6** = 63

Solenoid threaded connection for cable gland fitting:
GK = GK-1/2" - not for **cULus (1)**
M = M20x1,5 - not for **cULus**
NPT = 1/2" NPT

Certification type:
AO = Multicertifications for Group II 2G / II 2D **(2)**
AO/M = Multicertifications for Group I M2, ATEX (mining)
AO/UL = cULus North American certification

Options (4):
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 **(2)**
WP = ⚠ manual override protected by metallic cap

Voltage code - see section **9**

Series number

Seals material, see section **10** :
- = NBR
PE = FKM
BT = HNBR **(3)**

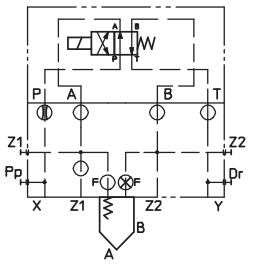
Optional different setting of the calibrated plugs in the pilot channels see section **3**

(1) Approved only for the Italian market **(2)** The valves with Multicertification for Group II are also certified for Indian market according to **PESO** (Petroleum and Explosives Safety Organization). The PESO certificate can be downloaded from
(3) Not for multicertification **M** group I (mining) **(4)** For possible combined options, see 3.1

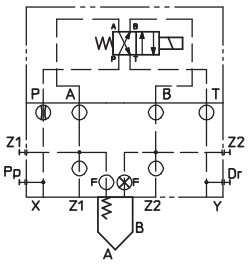
⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 VALVES CONFIGURATIONS AND HYDRAULIC SYMBOLS

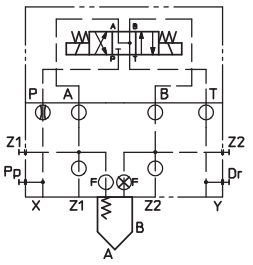
LIDEW



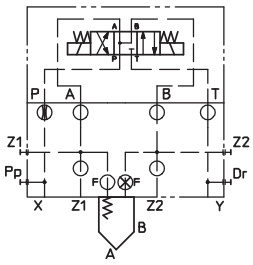
LIDEW1-*



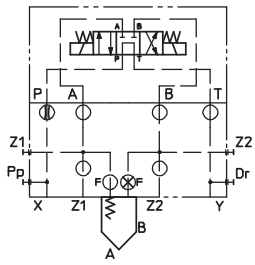
LIDEW2-*



LIDEW4-*

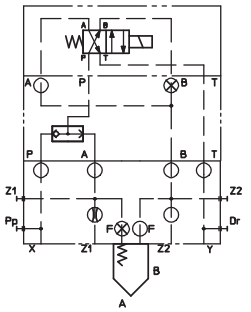


LIDEW5-*

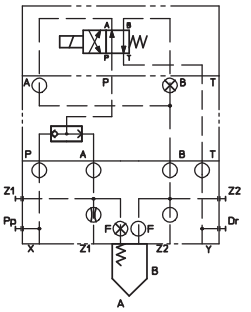


LIDEW6-*

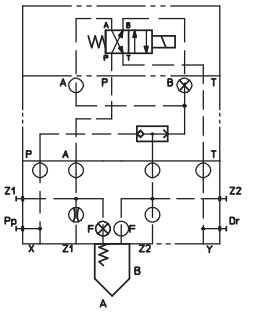
LIDBH



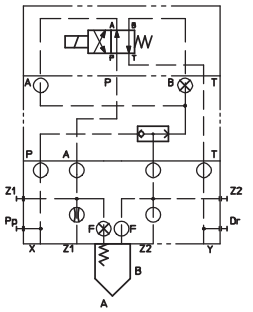
LIDBH1A-*



LIDBH1C-*



LIDBH2A-*



LIDBH2C-*

3 OPTIONS

For LIDEW*, LIDBH* covers (sizes 40…63):

/E = with external attachments Pp and underneath port X supplied plugged;

For all the models:

/B = cartridge piloted via port "B" of solenoid pilot valve;

/F = prearranged for coupling to an intermediate element with poppet position detector for safety function. See tab. EY120.

/WP = prolonged manual override protected by rubber cap for solenoid pilot valve. See table K150.

******* = Calibrated plugs different from standard ones reported in section 4. The restrictors configuration (if different from the standard) must be indicated at the end of the model code:

3.1 Possible combined options:

All combinations are available

LIDEW2	-	1	/*	-	AO	24DC	**

P
Channel where the orifice has to be provided: **P** = channel X, port P **Z1** = channel Z1 **F** = channel F **Z2** = channel Z2

06
Size of the throttling hole in teths of millimeters: **05** = 0,5 mm **10** = 1 mm **17** = 1,7 mm **06** = 0,6 mm **12** = 1,2 mm **20** = 2 mm **08** = 0,8 mm **15** = 1,5 mm

4 STANDARD ORIFICES CONFIGURATION

Port \ Cover	LIDEW*-1 LIDBH*-1	LIDEW*-2 LIDBH*-2	LIDEW*-3 LIDBH*-3	LIDEW*-4 LIDBH*-4	LIDEW*-5 LIDBH*-5	LIDEW*-6 LIDBH*-6
Z1 (only for LIDBH*-*)	M4 12A	M4 12A	M6 15A	M6 17A	M6 20A	M6 20A
P	M6 12A	M6 12A	M6 15A	M6 17A	M6 20A	M6 20A

M4 ÷ M8 = screw size; **12A ÷ 20A** = calibrated orifices diameter in tenths of mm; **A** = short calibrated hole

5 MODEL CODE OF SLIP-IN CARTRIDGES, to be coupled with covers in section 1

SC LI	-	16	43	1	40	/*

SC LI – Cartridge valve

16 – **Size** (ISO 7368): **16 25 32 40 50 63**

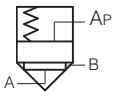
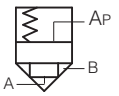
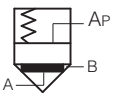
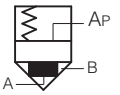
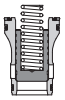
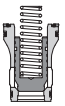
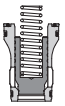
43 – **Type of poppet**, see section 6 for maximum flow
32, 33
42 = as 32 but with dumping nose
43 = as 33 but with dumping nose

1 – **Spring cracking pressure**:
1 = 0,3 bar for poppet 32, 42;
1 = 0,6 bar for poppet 33, 43;
2 = 1,5 bar for poppet 32, 42;
3 = 3 bar for all poppets
6 = 5,5 bar for all poppets

40 – **High flow:**
40 = all sizes

/* – Seals material:
- = NBR
PE = FKM
BT = HNBR

6 TYPE OF POPPET

Type of poppet		**32**	**33**	**42**	**43**
Functional sketch (Hydraulic symbol)					
Operating pressure		**420 bar max** (only SCLI cartridge)			
Nominal flow at Δp 5bar (l/min) see diagrams Q/Δp at section 9	Size **16**	270	270	240	240
	25	550	550	500	500
	32	1000	1000	800	800
	40	1700	1700	1400	1400
	50	2500	2500	2200	2200
	63	4000	4000	3300	3300
Typical section					
Area ratio A:Ap		**1:1,1**	**1:1,5**	**1:1,1**	**1:1,5**
Cracking pressure A→B	Spring **1**	0,3 bar	0,6 bar	0,3 bar	0,6 bar
	2	1,5 bar	-	1,5 bar	-
	3	3 bar	3 bar	3 bar	3 bar
	6	5,5 bar	5,5 bar	5,5 bar	5,5 bar
Cracking pressure B→A	Spring **1**	3 bar	1,2 bar	3 bar	1,2 bar
	2	12,8 bar	-	12,8 bar	-
	3	32,5 bar	6 bar	32,5 bar	6 bar
	6	54,5 bar	11 bar	54,5 bar	11 bar

7 GENERAL CHARACTERISTICS

Assembly position / location	Any position
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200 h
Compliance	Explosion proof protection, see section 11 -Flame proof enclosure “Ex d” -Dust ignition protection by enclosure “Ex t” RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

8 HYDRAULIC CHARACTERISTICS

Functional cover operating pressure	port A, B, X, Z1, Z2 = **350**; port Y = **210**
Rated flow	see section 6

9 ELECTRICAL CHARACTERISTICS

Valve type		LIDEW*/**AO** LIDBH*/**AO**	LIDEW*/**AO/M** LIDBH*/**AO/M**	LIDEW*/**AO/UL** LIDBH*/**AO/UL**
Voltage code **(1)**	VDC ±10%	**12DC, 24DC, 28DC, 48DC, 110DC, 125DC, 220DC**		**12DC, 24DC, 110DC, 125DC, 220DC**
	VAC 50/60 Hz ±10%	**12AC, 24AC, 110AC, 230AC**		**12AC, 24AC, 110AC, 230AC**
Power consumption at 20°C		8W		12W
Coil insulation		class H		
Protection degree with relevant cable gland		IP66/67 to DIN EN60529		raintight enclosure, UL approved
Duty factor		100%		

(1) For alternating current supply a rectifier bridge is provided built-in the solenoid
For power supply frequency 60 Hz, the nominal supply voltage of solenoids 110AC and 230AC must be 115/60 and 240/60 respectively

10 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO 4406 class 20/18/15 NAS 1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar
-max fluid temperature = 50°C

11 EX-PROOF SOLENOIDS CERTIFICATION DATA

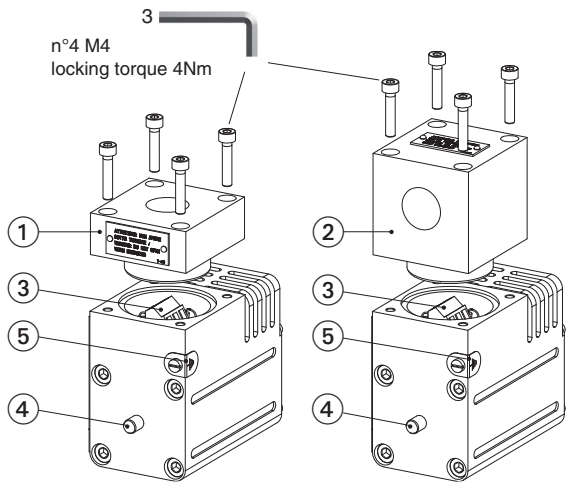
Valve type	LIDEW*/**AO** LIDBH*/**AO**		LIDEW*/**AO/M** LIDBH*/**AO/M**	LIDEW*/**AO/UL** LIDBH*/**AO/UL**	
Certifications	**ATEX IECEx EAC PESO** Multicertification Group II		**ATEX IECEx** Multicertification Group I	**cULus** North American cULus	
Solenoid certified code	**OA**		**OA/M**	**OA/EC**	
Type examination certificate **(1)**	ATEX: CESI 02 ATEX 014 IECEx: IECEx CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P338131		ATEX: CESI 03 ATEX 057x IECEx: IECEx CES 12.0007x	2017324 - E366100	
Method of protection	• ATEX, EAC Ex II 2G Ex d IIC T6/T4/T3 Gb Ex II 2D Ex tb IIIC T85°C/T200°C Db • IECEx Ex d IIC T6/T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • PESO Ex II 2G Ex d IIC T6/T4 Gb		• ATEX Ex I M2 Ex db I Mb • IECEx Ex db I Mb	• UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB	
Temperature class	**T6**	**T4**	**-**	**T6**	**T5**
Surface temperature	≤ 85 °C	≤ 135 °C	≤ 150 °C	≤ 85 °C	≤ 100 °C
Ambient temperature **(2)**	-40 ÷ +45 °C	-40 ÷ +70 °C	-20 ÷ +70 °C	-40 ÷ +55 °C	-40 ÷ +70 °C
Applicable standards	EN 60079-0 EN 60079-1 EN 60079-31		IEC 60079-0 IEC 60079-1 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13	
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	**GK** = GK-1/2" **M** = M20x1,5 **NPT** = 1/2" NPT			1/2" NPT ANSI/ASME B46.1	

(1) The type examinator certificates can be downloaded from
(2) The solenoids **Group II** and **cULus** are certified 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

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

12 EX PROOF SOLENOIDS WIRING

Multicertification



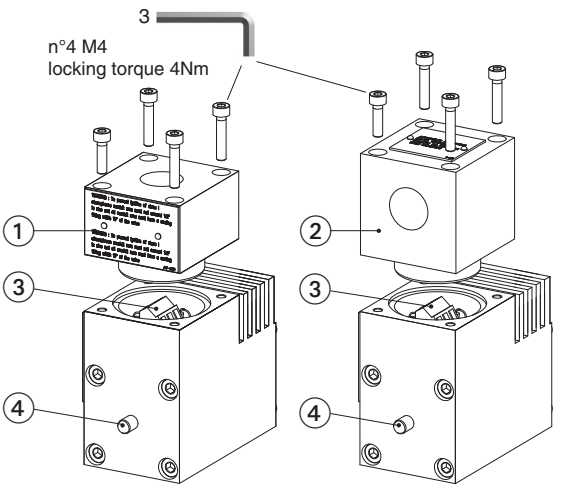
Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override
⑤ screw terminal for additional equipotential grounding

1 = Coil
2 = GND
3 = Coil

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

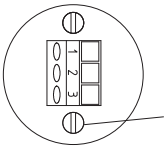
cULus certification



Standard version **Option /O**

① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override

⚠ Pay attention to coil polarity



1 = Coil **+**
2 = GND
3 = Coil **-**

PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 13 note 1

alternative GND screw terminal connected to solenoid housing

13 CABLE SPECIFICATION AND TEMPERATURE - Power supply and grounding cables have to comply with following characteristics:

Multicertification Group I and Group II

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

Grounding: section of internal ground wire = 2,5 mm²
section of external ground wire = 4 mm²

cULus certification:

- Suitable for use in Class I Division 1, Gas Groups C
- Armored Marine Shipboard Cable which meets UL 1309
- Tinned Stranded Copper Conductors
- Bronze braided armor
- Overall impervious sheath over the armor

Any Listed (UBVZ/ UBVZ7) Marine Shipboard Cable rated 300 V min, 15A min. 3C 2,5 mm² (14 AWG) having a suitable service temperature range of at least -25°C to +110°C ("/BT" Models require a temperature range from -40°C to +110°C)

Note 1: For Class I wiring the 3C 1,5 mm² AWG 16 cable size is admitted only if a fuse lower than 10 A is connected to the load side of the solenoid wiring.

13.1 Cable temperature

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

Multicertification

Max ambient temperature [°C]	Temperature class		Max surface temperature [°C]		Min cable temperature
	Group I	Group II	Group I	Group II	
45 °C	-	T6	150 °C	85 °C	not prescribed
70 °C	-	T4	150 °C	135 °C	90 °C

cULus certification

Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min cable temperature
55 °C	T6	85 °C	100 °C
70 °C	T5	100 °C	100 °C

14 CABLE GLANDS only for Multicertification

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 **KX800**

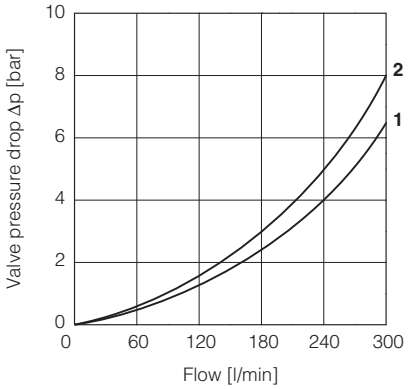
Note: a Loctite sealant type 545, should be used on the cable gland entry threads

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

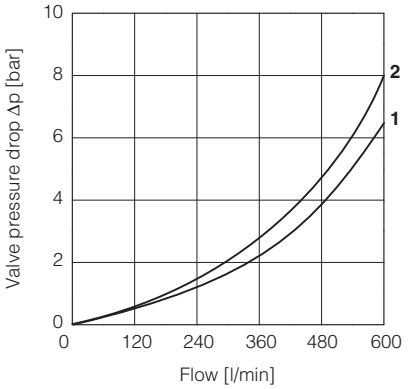
SC LI High flow - series 40

1 = poppet type 32 and 33 **2** = poppet type 42 and 43

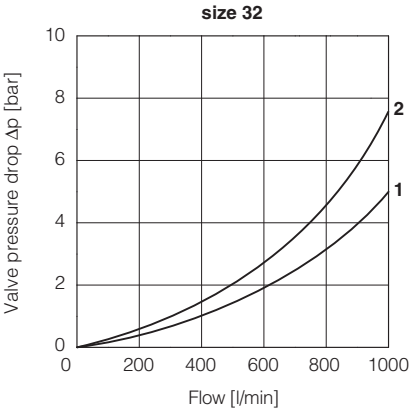
size 16



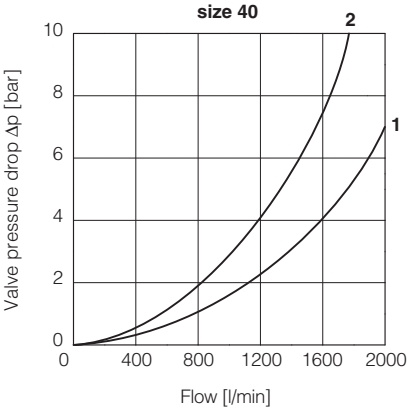
size 25



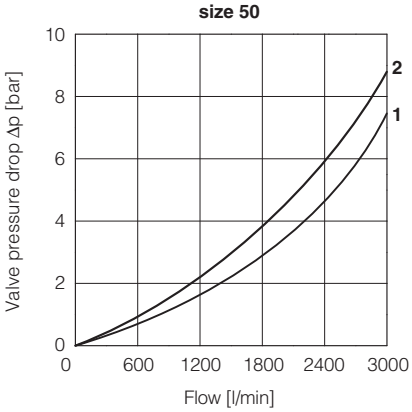
size 32



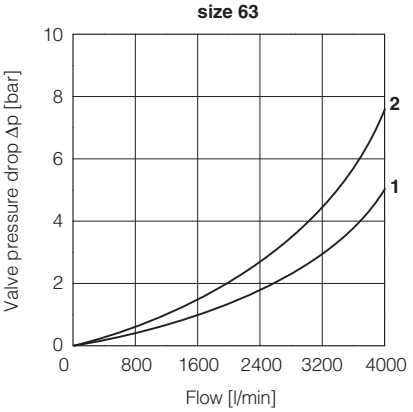
size 40



size 50

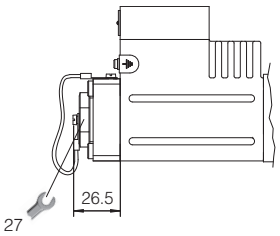


size 63



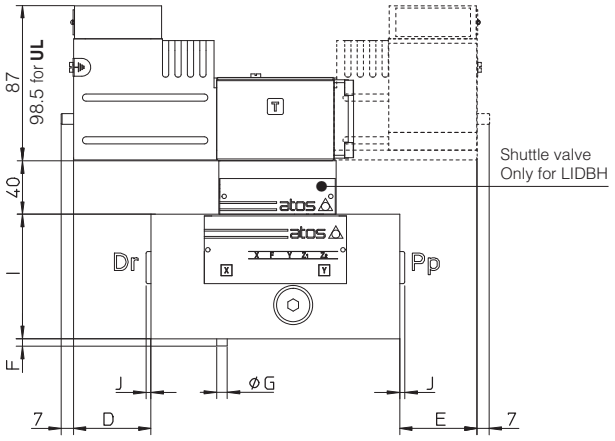
16 COVER INSTALLATION DIMENSIONS [mm] - Multicertified and UL - for cartridge cavity dimensions see tech table P006

Option /WP

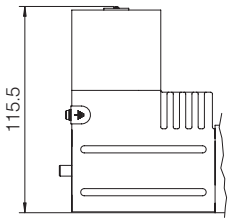


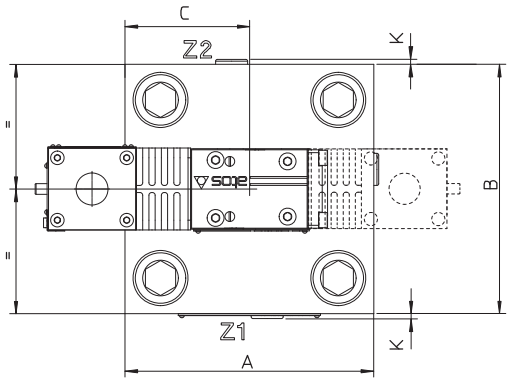
Size 16 ÷ 63

Drawing of size 50
dotted line: example of double solenoid version



Option /O





Notes referred to the below table:

(1) LIDEW1* - LIDBH*A: solenoid at side of port Y of cover
LIDEW2* - LIDBH*C: solenoid at side of port X of cover

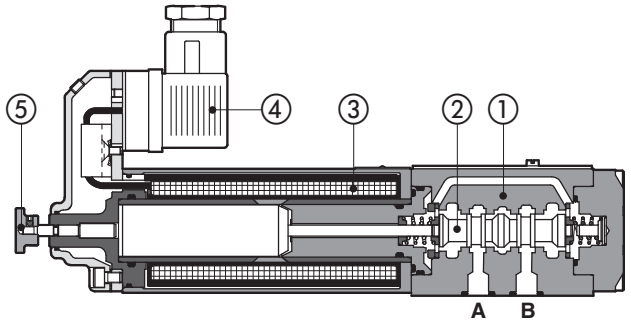
Size (1)	A	B	C	D max	E max	F	G	I	J	K	Ports Pp-Dr	Ports Z_1-Z_2	Seals	Fastening bolts (3)	Tightening torque [Nm]	Mass [Kg]
16	70	65	41	80	92	4	3	40	-	-	-	-	4 OR-108	Nr. 4 M8x45	35	3,95 ÷ 5,7
25	85	85	42,5	78	78	6	5	40	-	-	-	-	4 OR-108	Nr. 4 M12x45	125	4,35 ÷ 6,1
32	100	100	50	71	71	6	5	50	-	-	-	-	4 OR-2043	Nr. 4 M16x55	300	4,85 ÷ 6,7
40	125	125	62,5	58	58	6	5	60	3,5	-	G 1/4	-	4 OR-3043	Nr. 4 M20x70	600	7,75 ÷ 9,6
50	140	140	70	51	51	4	6	70	3,5	3,5	G 1/4	G 1/4	4 OR-3043	Nr. 4 M20x80	600	10,85 ÷ 12,7
63	180	180	90	31	31	4	6	80	3,5	3,5	G 3/8	G 3/8	4 OR-3050	Nr. 4 M30x90	2100	18,65 ÷ 20,4

17 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments	**EX900**	Operating and manintenance information for ex-proof on-off valves
X020	Summary of Atos ex-proof components certified to ATEX, IECEx, EAC, PESO	**KX800**	Cable glands for ex-proof valves
X030	Summary of Atos ex-proof components certified to cULus	**P006**	Mounting surfaces and cavities for cartridge valves

Intrinsically safe solenoid directional valves

on-off spool type, direct - **ATEX** or **IECEx**



DHW-0611/WP/6

① valve body
② valve spool
③ intrinsically safe solenoid
④ electrical connector
⑤ manual override

DHW

On-off, spool type, directional valves equipped with intrinsically safe solenoids certified for safe operation in hazardous environment with potentially explosive atmosphere.

Certifications:
- **ATEX** or **IECEx**:
  II 1G Ex ia IIC, IIB, IIA
  surface plants zone 0, 1 and 2
- **ATEX** or **IECEx**:
  IM2 Ex ia IMb, Ex ib IMb
  surface, tunnels or mining plants

DHW are **SIL** compliance with IEC 61508

See section 7 for certification data

The valves must be electrically powered through specific "safety barriers" limiting the max current to the solenoid, see section 13

Size: **06**
Max flow: up to **25 l/min**
Max pressure: **350 bar**

1 MODEL CODE

DHW	/	*	-	0	71	3H	/	*	/	6	*	/	*

Intrinsically safe valve, spool type, direct

Certification type:
- = Omit for Atex Group II
M = Atex Group I (mining)
IE = IECEx Group II
IEM = IECEx Group I (mining)

Valve size (ISO 4401):
0 = size 06

Configuration, see section 2 :

Spool type, see section 2 :

Options (2):
A = solenoid at side of port B
WP = prolunged manual override

Connector type
6 = DIN 43650 (standard)

Series number

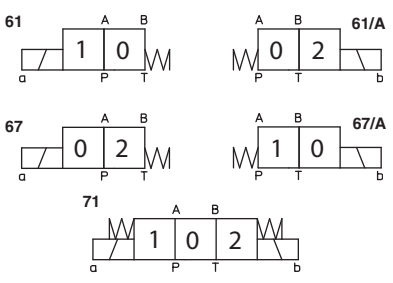
Seals material, see section 6 :
- = NBR
PE = FKM
BT = HNBR **(1)**

(1) Not for certification **M** and **IEM**, Group I (mining)
(2) Possible combined options: all combinations are available

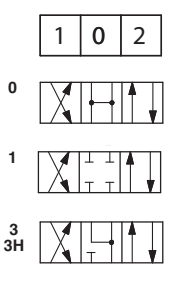
⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 CONFIGURATION and SPOOLS (representation according to ISO 1219-1)

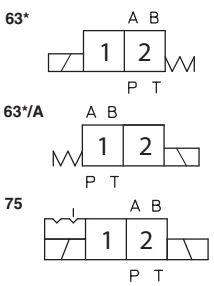
Configuration for DHW



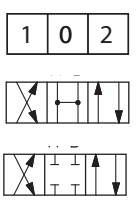
Spools for DHW



Configuration for DHW



Spools for DHW



Note: Spool type 3H is available only for configuration 71. It is similar to spool type 3 but with highetr flow capability A-B → T in central position, see section 10

3 GENERAL CHARACTERISTICS

Assembly position / location	Horizontal position only
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100)
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +80°C **/PE** option = -20°C ÷ +80°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Intrinsically safe protection "Ex ia", see section 7 RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

4 HYDRAULIC CHARACTERISTICS

Operating pressure	Ports P,A,B: **350** bar; Port T **160** bar
Rated flow	See Q/Δp diagrams at section 10
Maximum flow	**25 l/min**, see operating limits at section 11

5 ELECTRICAL CHARACTERISTICS - see also section 7

Nominal resistance at 20°C	150 Ω
Coil insulation	Class H
Working voltage	12 ÷ 26 V
Minimum supply current	65mA, from I.S. barriers
Protection degree	IP66
Duty factor	100%
Electrical connector	DIN 43650 2 pin+GND

6 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO 4406 class 20/18/15 NAS 1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar -max fluid temperature = 50°C

7 CERTIFICATION DATA

Valve type		DHW		DHW/**IE**			DHW/**M**			DHW/**IEM**		
Certification		**ATEX** (Group II)		**IECEx** (Group II)			**ATEX (mining)** (Group I)			**IECEx (mining)** (Group I)		
Solenoid code		**OW-18/6**		**OWI-18/6**			**OWM-18/6**			**OWIM-18/6**		
Type examination certificate **(1)**		CESI 02 ATEX 013		IECEx CES 12.0017			CESI 02 ATEX 013			IECEx CES 12.0017		
Method of protection		**Ex II 1G Ex ia**					**Ex I M2**		**Ex ia I Mb**		**Ex ib I Mb**	
		IIA T5 Ga	**IIB T6 Ga**	**IIC T6 Ga**								
Electrical characteristics (max values)	Ui [V]	28	28	27	19,5	19,11	28	28	27	19,5	19,11	12,4
	Ii [mA]	396	250	130	360	360	396	250	130	360	360	2200
	Pi [W]	2,8	1,8	0,9	1,64	1,72	2,8	1,8	0,9	1,64	1,72	6,82
	Ci , Li	≅ 0	≅ 0				≅ 0					
Temperature class		**T5**	**T6**				–					
Surface temperature (ambient temp. +60°C)		≤ 100°C	≤ 85°C				≤ 150°C					
Ambient temperature		-20 ÷ +60°C -40 ÷ +60°C **(2)**					-20 ÷ +60°C					
Applicable standards		EN 60079-0 EN 60079-11 EN 60079-26		IEC 60079-0 IEC 60079-11 IEC 60079-26								

(1) The type examinator certificates can be downloaded from **(2)** Only for **/BT** option

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

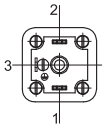
8 SIL compliance with IEC 61508: 2010

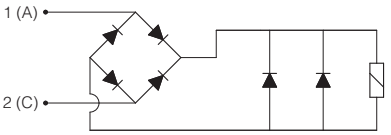
- **SC3** (systematic capability)
- max **SIL 2** (HFT = 0 if the hydraulic system does not provide the redundancy for the specific safety function where the component is applied)
- max **SIL 3** (HFT = 1 if the hydraulic system provides the redundancy for the specific safety function where the component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

9 EX PROOF SOLENOIDS WIRING

Connector wiring	
/6	Connections
1	Coil
2	Coil
3	GND

DIN 43650



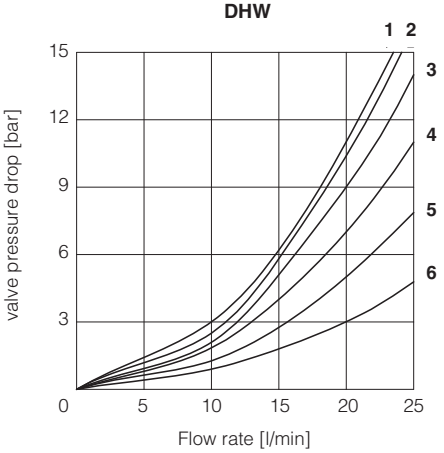


10 Q/Δp DIAGRAMS based on mineral oil ISO VG 46 at 50°C

DHW

spool type / Flow direction	0	0/2	1/2	1	3	3H
P→A / P→B	4	5	5	3	3	3
A→T / B→T	6	2	1	2	4	5
A - B→T						4

DHW

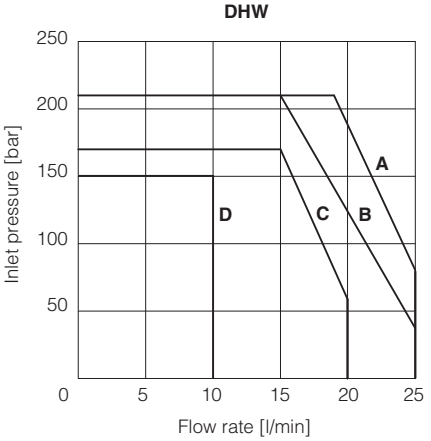


11 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

The diagrams refer to warm solenoids and power supply provided by the Atos barrier type **Y-BXNE-412**.
For DHW valves the curves refer to application with symmetrical flow through the valve (i.e. P→A and B→T).
In case of asymmetric flow the operating limits must be reduced.

DHW type	0	0/2	1/2	1	3	3H
Diagram	B	B	C	C	A	D

DHW



12 INTERNAL LEAKAGES

DHW internal leakages based on mineral oil ISO VG 46 at 50°C
18 cm³/min with P=100 bar - fluid viscosity = 43 cSt at 40 °C
30 cm³/min with P=140 bar - fluid viscosity = 22 cSt at 45 °C

13 INTRINSICALLY SAFE BARRIERS - see tech. table **GX010**

Intrinsically safe valves must be powered through safety barriers certified according to Ex-ie protection mode, limiting the energy to the solenoid.

To select the proper intrinsically safe barriers following data must be considered:
1) Vmax and Imax of the solenoid as specified in section 7 must not be exceeded also in fault conditions;
2) the resistance of the solenoid is 150 Ω and the current supplied by the barrier, in normal operation condition, must be over the min. limit (65 mA) to ensure the valve correct operation (over 70 mA for max performances).

The barriers type **Y-BXNE 412** are galvanically isolated electronic devices, complying with European Norms EN60079-0/06, EN60079-11/07 and ATEX certified according to protection mode Ex ia IIC.
These barriers ensure the optimized functioning of the Atos valves up to the max operating limits specified in section 4 .

The barriers Y-BXNE-412 are double channel type, suitable to operate valves with double or single solenoid. Two single solenoid valves can be connected to the barrier (one to each channel) but they cannot be contemporary operated.

MODEL CODE OF I.S. BARRIER

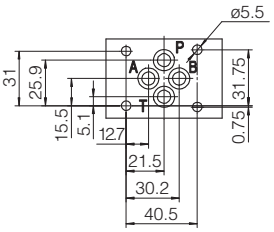
Y-BXNE 412 00	*

Supply voltage
E = 110/230 VAC
2 = 24÷48 VDC

14 INSTALLATION DIMENSIONS [mm]

ISO 4401: 2005 (see table P005)
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: Ø = 7.5 mm (max)

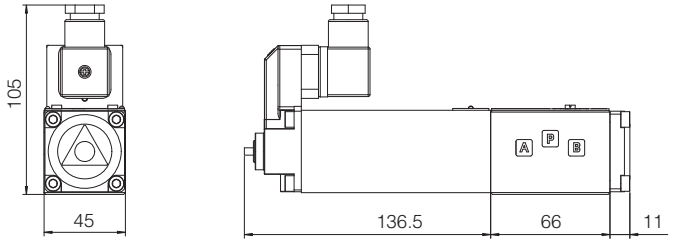
Valve's bottom view



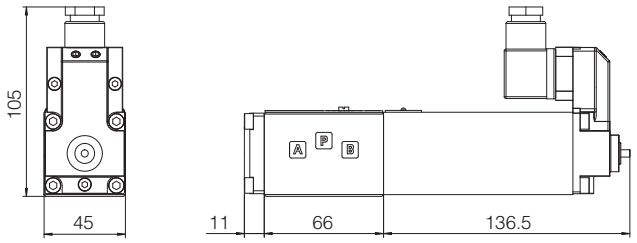
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

Mass [kg]	
DHW-06	2,4
DHW-06*/A	2,4
DHW-07*	4

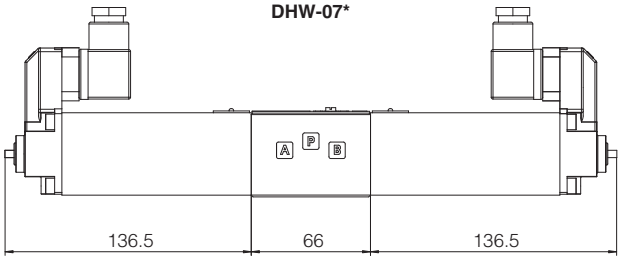
DHW-06



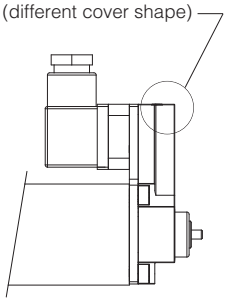
DHW-06*/A



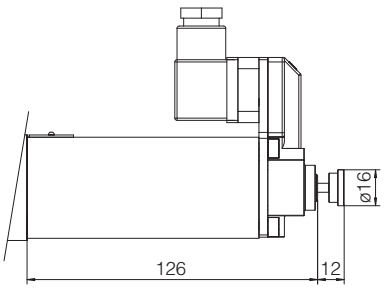
DHW-07*



DHW/M
(different cover shape)



Option **/WP**



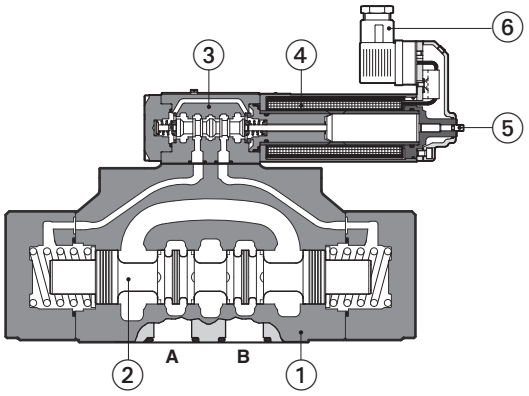
Note: the connector is supplied with the valve

15 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments
X050	Summary of Atos intrinsically safe components certified to ATEX, IECEx
EX950	Operating and maintenance information for intrinsically safe valves
P005	Mounting surfaces for electrohydraulic valves

Intrinsically safe solenoid directional valves

on-off spool type, piloted - **ATEX** or **IECEx**



DPHW-461*

① main body
② main spool
③ pilot valve
④ intrinsically safe solenoid
⑤ manual override
⑥ electrical connector

DPHW

On-off spool type, piloted directional valves equipped with intrinsically safe solenoids certified for safe operation in hazardous environment with potentially explosive atmosphere.

Certifications:
- **ATEX** or **IECEx**:
  II 1G Ex ia IIC, IIB, IIA
  surface plants zone 0, 1 and 2
- **ATEX** or **IECEx**:
  IM2 Ex ia IMb, Ex ib IMb
  surface, tunnels or mining plants

See section 7 for certification data

The valves must be electrically powered through specific “safety barriers” limiting the max current to the solenoid, see section 12

Size: **10, 16** and **25**
Max flow: up to **160, 300** and **700 l/min**
Max pressure: **350 bar**

1 MODEL CODE

DPHW	/	*	-	2	61	1	/	*	/	6	*	/	*

Intrinsically safe directional valve, piloted

Certification type:
- = Omit for Atex Group II
M = Atex Group I (mining)
IE = IECEx Group II
IEM = IECEx Group I (mining)

Valve size (ISO 4401):
1 = 10 **2** = 16 **4** = 25

Configuration, see section 2

Spool type, see section 2

Options (2):
A = solenoid at side of port B (for single solenoid valves)
WP = ⚠ 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)
L9 = (only for DPHW-2 and DPHW-4) plug with calibrated restrictor on port P of pilot valve

Series number

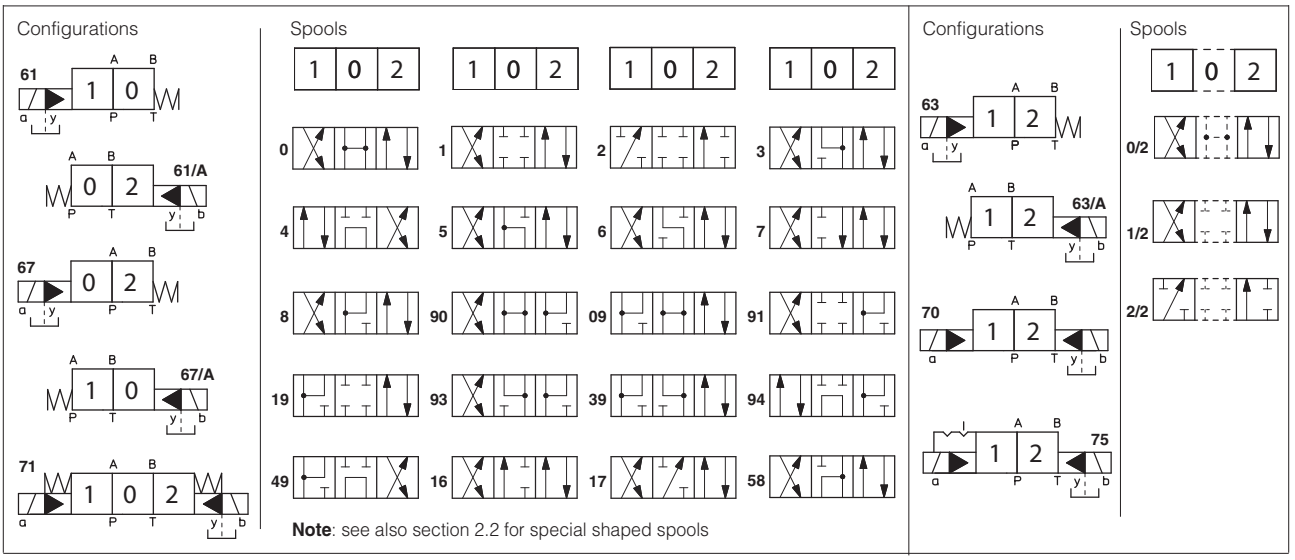
Connector type
6 = DIN 43650 (standard)

Seals material, see section 7:
- = NBR
PE = FKM
BT = HNBR **(1)**

(1) Not for certification **M** and **IEM**, Group I (mining)
(2) Possible combined options: all combinations are available

⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 CONFIGURATIONS and SPOOLS (representation according to ISO 1219-1)



2.1 Standard spools availability

- DPHW-1 are available only with spools **0, 0/2, 1, 1/2, 3, 4, 5, 58, 6, 7**
- DPHW-2 and DPHW-4 are available with all spools shown in the above table

2.2 Special shaped spools

- spools type **0** and **3** are also available as **0/1** and **3/1** with restricted oil passages in central position, from user ports to tank.
- spools type **1, 4, 5, 58, 6** and **7** are also available as **1/1, 4/8, 5/1, 58/1, 6/1** and **7/1** that are properly shaped to reduce water-hammer shocks during the switching.

2.3 Special spool availability

Valve size	standard spools							
	0/1	3/1	1/1	4/8	5/1	58/1	6/1	7/1
DPHW-1	•	•		•				
DPHW-2, DPHW-4	•	•	•	•	•	•	•	•

3 DEVICES FOR MAIN SPOOL SWITCHING CONTROL

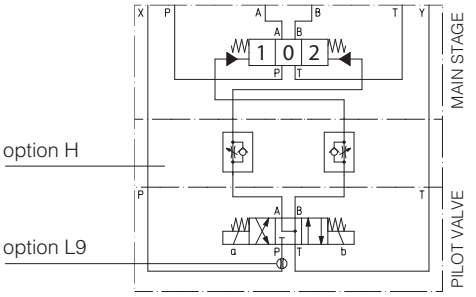
Folowing options are suggested to reduce the hydraulic shocks at the valve operation

/H = Adjustable chokes (meter-out to the pilot chambers of the main valve).

/L9 (only for DPHW-2 and DPHW-4) plug with calibrated restictor in P port of pilot valve

Suggested for pilot pressure higher than 210 bar or to limit the hydraulics shocks caused by the fast main spool switching

FUNCTIONAL SCHEME (config. 71)
example of switching control options



4 GENERAL CHARACTERISTICS

Assembly position / location	Horizontal position only
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +60°C **/BT** option = -40°C ÷ +60°C
Storage temperature range	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Intrinsically safe protection "Ex ia", see section 8 RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

5 HYDRAULIC CHARACTERISTICS

Operating pressure	P, A, B, X = **350 bar** T = **250 bar** with external drain (standard) T and Y = **160 bar** with internal drain (option /D) Minimum pilot pressure for correct operation is = **8 bar**
Rated flow	See diagrams Q/Δp at section 10
Maximum flow	DPHW-1: **160 l/min;** DPHW-2: **300 l/min;** DPHW-4: **700 l/min;** see Q/Δp diagrams at section 10 and operating limits at section 11

6 ELECTRICAL CHARACTERISTICS - see also section 8

Nominal resistance at 20°C	150 Ω
Coil insulation	Class H
Working voltage	12 ÷ 26 V
Minimum supply current	65mA, from I.S. barriers
Protection degree	IP66
Duty factor	100%
Electrical connector	DIN 43650 2 pin+GND

7 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar
-max fluid temperature = 50°C

8 CERTIFICATION DATA

Valve type		DPHW		DPHW/**IE**			DPHW/**M**			DPHW/**IEM**		
Certification		**ATEX** (Group II)		**IECEx** (Group II)			**ATEX (mining)** (Group I)			**IECEx (mining)** (Group I)		
Solenoid code		**OW-18/6**		**OWI-18/6**			**OWM-18/6**			**OWIM-18/6**		
Type examination certificate **(1)**		CESI 02 ATEX 013		IECEx CES 12.0017			CESI 02 ATEX 013			IECEx CES 12.0017		
Method of protection		**Ex II 1G Ex ia**					**Ex I M2 Ex ia I Mb Ex ib I Mb**					
		IIA T5 Ga	**IIB T6 Ga**	**IIC T6 Ga**								
Electrical characteristics (max values)	Ui [V]	28	28	27	19,5	19,11	28	28	27	19,5	19,11	12,4
	Ii [mA]	396	250	130	360	360	396	250	130	360	360	2200
	Pi [W]	2,8	1,8	0,9	1,64	1,72	2,8	1,8	0,9	1,64	1,72	6,82
	Ci , Li	≅ 0	≅ 0				≅ 0					
Temperature class		**T5**	**T6**				–					
Surface temperature (ambient temp. +60°C)		≤ 100°C	≤ 85°C				≤ 150°C					
Ambient temperature		-20 ÷ +60°C	-40 ÷ +60°C **(2)**				-20 ÷ +60°C					
Applicable standards		EN 60079-0 EN 60079-11 EN 60079-26		IEC 60079-0 IEC 60079-11 IEC 60079-26								

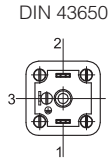
(1) The type examinator certificates can be downloaded from

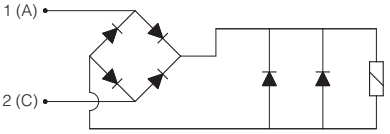
(2) Only for **/BT** option

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

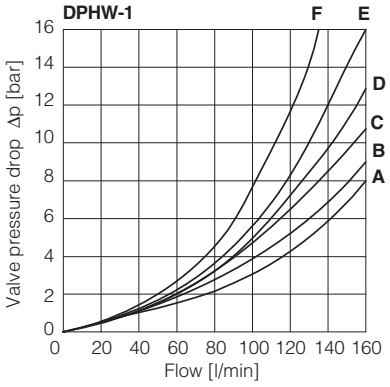
9 SOLENOIDS WIRING

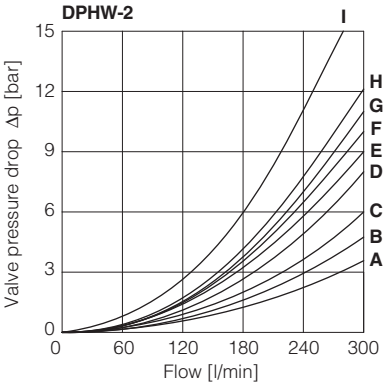
Connector wiring	
/6	Connections
1	Coil
2	Coil
3	GND

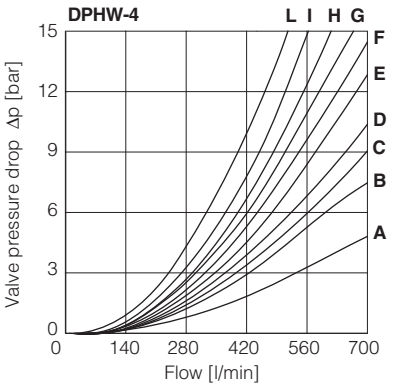




10 FLOW VERSUS PRESSURE DIAGRAMS Based on mineral oil ISO VG 46 at 50°C







DPHW-1

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0/2, 1/2	D	E	D	C	-
0	D	E	C	C	E
1	A	B	D	C	-
3, 6, 7	A	B	C	C	-
4, 4/8	B	C	D	D	-
5, 58	A	E	C	C	F

DPHW-2

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
0/2, 1, 3, 6, 7, 8	A	A	D	A	-
1/1, 1/2, 7/1	B	B	D	E	-
0	A	A	D	E	C
0/1	A	A	D	-	-
2	A	A	-	-	-
2/2	B	B	-	-	-
3/1	A	A	D	D	-
4	C	C	H	I	F
4/8	C	C	G	I	F
5	A	B	F	H	G
5/1	A	B	D	F	-
6/1	B	B	C	E	-
09	A	-	-	G	-
16	A	C	D	F	-
17	C	A	E	F	-
19	C	-	-	G	-
39	C	-	-	H	-
49	-	D	-	-	-
58	B	A	F	H	H
58/1	B	A	D	F	-
90	A	A	E	-	D
91	C	C	E	-	-
93	-	C	D	-	-
94	D	-	-	-	-

DPHW-4

Spool type \ Flow direction	P→A	P→B	A→T	B→T	P→T
1	B	B	B	D	-
1/1	D	E	E	F	-
1/2	E	D	B	C	-
0	D	C	D	E	F
0/1, 3/1, 5/1, 6, 7	D	D	D	F	-
0/2	D	D	D	E	-
2	B	B	-	-	-
2/2	E	D	-	-	-
3	B	B	D	F	-
4	C	C	H	L	L
5	A	D	D	D	H
6/1	D	E	D	F	-
7/1	D	E	F	F	-
8	D	D	E	F	-
09	D	-	-	F	F
16	C	D	E	F	-
17	E	D	E	F	-
19	F	-	-	E	-
39	G	F	-	F	-
58	E	A	B	F	H
58/1	E	D	D	F	-
90	D	D	D	-	F
91	F	F	D		
93	-	G	D	-	-

11 OPERATING LIMITS

For a correct valve operation do not exceed the max recommended flow rates (l/min) shown in the below tables

DPHW-1

Spool type	Inlet pressure [bar]			
	70	160	210	350
	Flow rate [l/min]			
0, 1, 3, 6, 7	160	160	160	145
4, 4/8	160	160	135	100
5, 58	160	160	145	110
0/1, 0/2, 1/2	160	160	145	135

DPHW-4

Spool type	Inlet pressure [bar]			
	70	140	210	350
	Flow rate [l/min]			
1, 6, 7, 8	700	700	700	600
2, 4, 4/8	500	500	450	400
5, 0/1, 0/2, 1/2	600	520	400	300
0, 3	700	700	600	540
16, 17, 58, *9, 9*	500	500	500	450

DPHW-2

Spool type	Inlet pressure [bar]			
	70	140	210	350
	Flow rate [l/min]			
0, 1, 3, 6, 7, 8	300	300	300	300
2, 4, 4/8	300	300	240	140
5	260	220	180	100
0/1, 0/2, 1/2	300	250	210	180
16, 17, 56, *9, 9*	300	300	270	200

12 INTRINSICALLY SAFE BARRIERS - see tech. table **GX010**

Intrinsically safe valves must be powered through safety barriers certified according to Ex-ie protection mode, limiting the energy to the solenoid.

To select the proper intrinsically safe barriers following data must be considered:
1) Vmax and Imax of the solenoid as specified in section 8 must not be exceeded also in fault conditions;
2) the resistance of the solenoid is 150 Ω and the current supplied by the barrier, in normal operation condition, must be over the min. limit (65 mA) to ensure the valve correct operation (over 70 mA for max performances).

The barriers type **Y-BXNE 412** are galvanically isolated electronic devices, complying with European Norms EN60079-0/06, EN60079-11/07 and ATEX certified according to protection mode Ex ia IIC.
These barriers ensure the optimized functioning of the Atos valves up to the max operating limits specified in section 11

The barriers Y-BXNE-412 are double channel type, suitable to operate valves with double or single solenoid. Two single solenoid valves can be connected to the barrier (one to each channel) but they cannot be contemporary operated.

MODEL CODE OF I.S. BARRIER

Y-BXNE 412 00	*

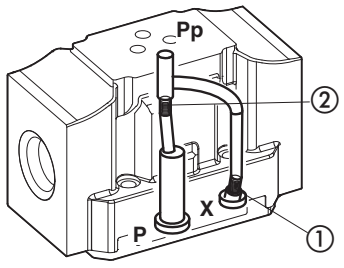
Supply voltage
E = 110/230 VAC
2 = 24÷48 VDC

13 PLUGS LOCATION FOR PILOT/DRAIN CHANNELS

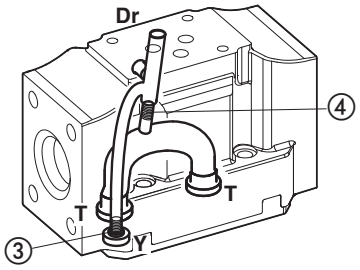
Depending on the position of internal plugs, different pilot/drain configurations can be obtained as shown below.
To modify the pilot/drain configuration, proper plugs must only be interchanged. The plugs have to be sealed using loctite 270.
Standard valves configuration provides internal pilot and external drain

DPHW-1

Pilot channels



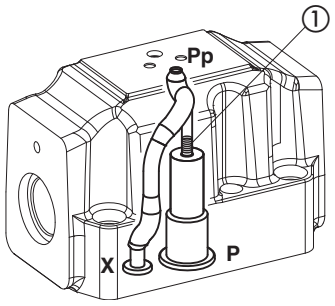
Drain channels



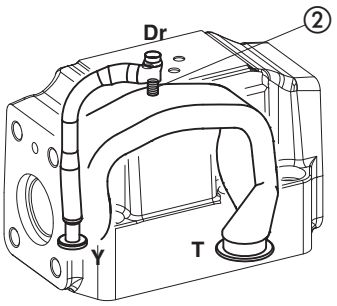
Internal piloting: blinded plug SP-X300F ① in X;
plug SP-X310F ② in Pp;
External piloting: blinded plug SP-X300F ② in Pp;
plug SP-X310F ① in X;
Internal drain: blinded plug SP-X300F ③ in Y;
External drain: blinded plug SP-X300F ④ in Dr.

DPHW-2

Pilot channels

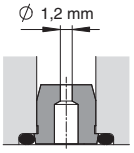


Drain channels



Internal piloting: Without blinded plug SP-X300F ①;
External piloting: Add blinded plug SP-X300F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

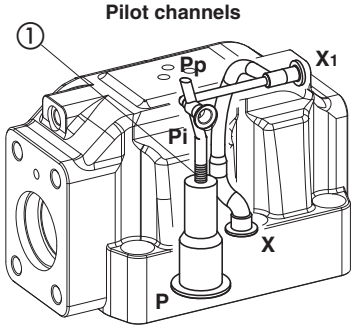
Option L9
This option provides a calibrated restrictor PLUG-H-12A (Ø 1,2 mm) in the P port of the pilot valve



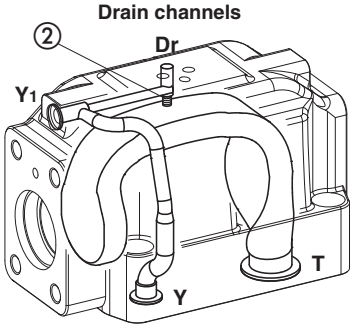
PLUG-12A

DPHW-4

Pilot channels

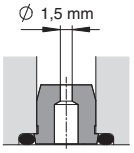


Drain channels



Internal piloting: Without blinded plug SP-X500F ①;
External piloting: Add blinded plug SP-X500F ①;
Internal drain: Without blinded plug SP-X300F ②;
External drain: Add blinded plug SP-X300F ②.

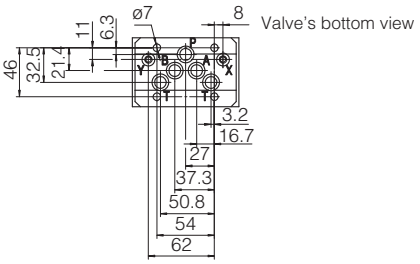
Option L9
This option provides a a calibrated restrictor PLUG-H-15A (Ø 1,5 mm) in the P port of the pilot valve



PLUG-15A

DPHW-1*

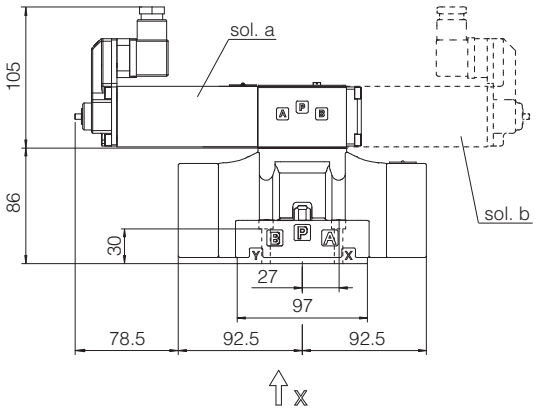
ISO 4401: 2005 (see table P005)
Mounting surface: 4401-05-05-0-05
Fastening bolts:
4 socket head screws M6x40 class 12.9
Tightening torque = 15 Nm
Diameter of ports A,B, P, T: Ø = 11 mm;
Diameter of ports X, Y: Ø = 5 mm;
Seals: 5 OR 2050, 2 OR 108

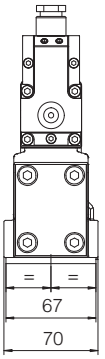


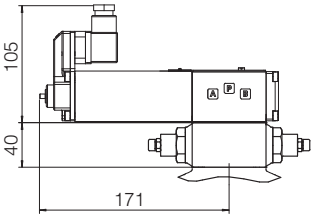
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL PILOT PORT
Y = DRAIN PORT

Mass [kg]	
DPHW-16	8,0
DPHW-17	9,5
Option /H	+1,0

DPHW-16
DPHW-17 (dotted line)

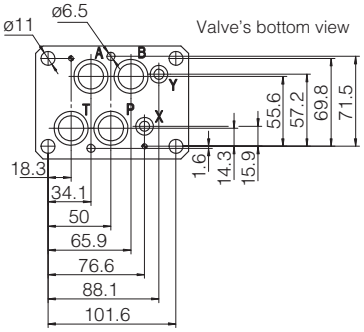






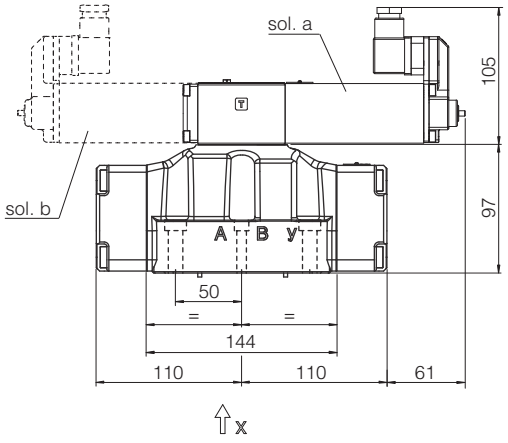
DPHW-2*

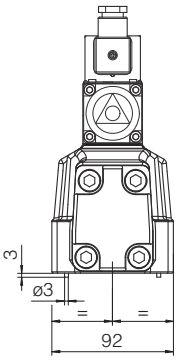
ISO 4401: 2005 (see table P005)
Mounting surface: 4401-07-07-0-05
Fastening bolts:
4 socket head screws M10x50 class 12.9
Tightening torque = 70 Nm
2 socket head screws M6x45 class 12.9
Tightening torque = 15 Nm
Diameter of ports A, B, P, T: Ø = 20 mm;
Diameter of ports X, Y: Ø = 7 mm;
Seals: 4 OR 130, 2 OR 2043

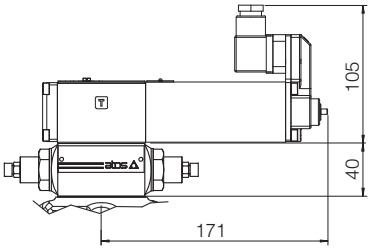


P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
X = EXTERNAL PILOT PORT
Y = DRAIN PORT

Mass [kg]	
DPHW-26	11
DPHW-27	12,5
Option /H	+1,0

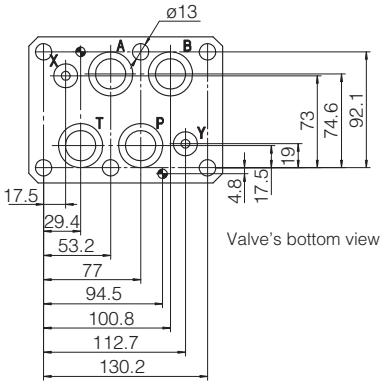






DPHW-4*

ISO 4401: 2005 (see table P005)
Mounting surface: 4401-08-08-0-05
Fastening bolts:
6 socket head screws M12x60 class 12.9
Tightening torque = 125 Nm
Seals: 4 OR 4112; 2 OR 3056
Diameter of ports A, B, P, T: Ø = 24 mm;
Diameter of ports X, Y: Ø = 7 mm;

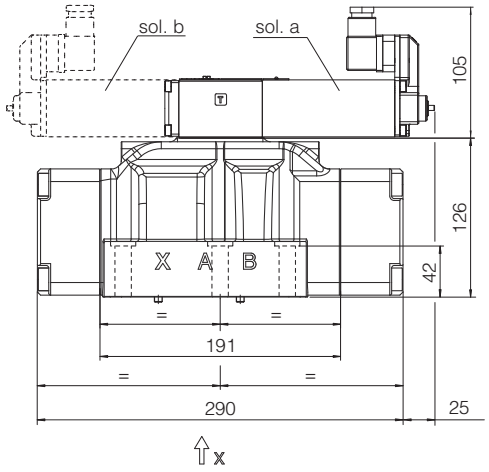


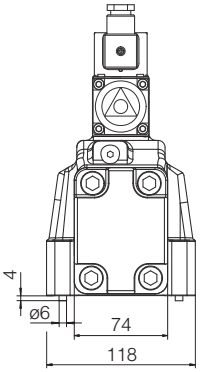
Valve's bottom view

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

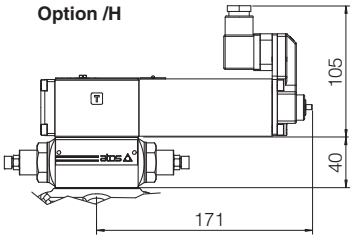
Mass [kg]	
DPHW-46	18,5
DPHW-47	20
Option /H	+1,0

DPHW-46
DPHW-47 (dotted line)



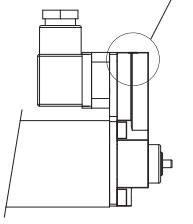


Option /H

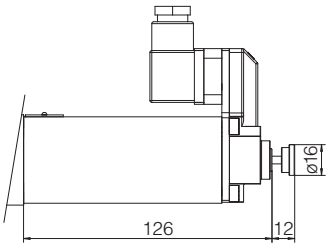


Options for all sizes of DPHW

Pilot of DPHW **/M** and **/IEM**
(different cover shape)



Pilot of DPHW **/WP**



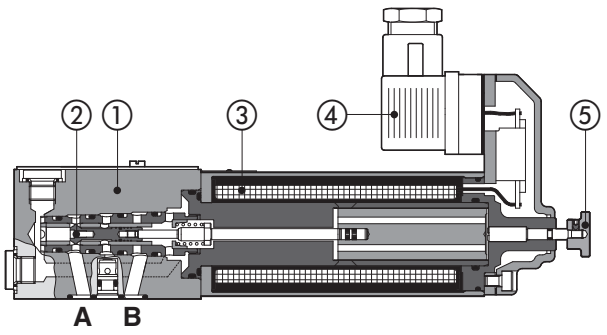
Note: the connector is supplied with the valve

15 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments
X050	Summary of Atos intrinsically safe components certified to ATEX, IECEx
EX950	Operating and maintenance information for intrinsically safe valves
P005	Mounting surfaces for electrohydraulic valves

Intrinsically safe solenoid directional valves

on-off poppet type, leak free, direct - **ATEX** or **IECEx**



DLWH-3A/6

① valve body
② poppet
③ intrinsically safe solenoid
④ electrical connector
⑤ manual override

DLWH

On-off poppet type, directional valves designed for application in hydraulic systems with leak-free requirements and equipped with intrinsically safe solenoids certified for safe operation in hazardous environment with potentially explosive atmosphere.

Certifications:
- **ATEX** or **IECEx**:
  II 1G Ex ia IIC, IIB, IIA
  surface plants zone 0, 1 and 2
- **ATEX** or **IECEx**:
  IM2 Ex ia IMb, Ex ib IMb
  surface, tunnels or mining plants

See section 7 for certification data

The valves must be electrically powered through specific “safety barriers” limiting the max current to the solenoid, see section 12

Size: **06**
Max flow: up to **12 l/min**
Max pressure: **350 bar**

1 MODEL CODE

DLWH	/	*	-	2A	/	*	/	6	*	/	*

DLWH: Intrinsically safe valve, poppet type, direct

Certification type:
- = Omit for Atex Group II
M = Atex Group I (mining)
IE = IECEx Group II
IEM = IECEx Group I (mining)

Configuration:
2A = 2 way, open in rest position
2C = 2 way, closed in rest position
3A = 3 way, A-T connection in rest position
3C = 3 way, P-B connection in rest position

Options (2):
R = with check valve on port P
WP = prolunged manual override

6: **Connector type**
6 = DIN 43650 (standard)

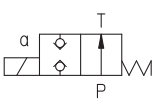
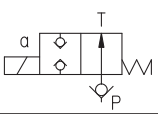
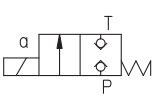
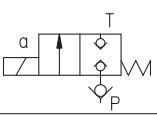
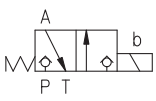
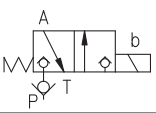
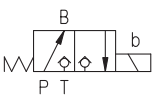
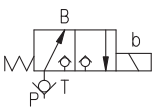
Series number

Seals material, see section 6 :
- = NBR
PE = FKM
BT = HNBR **(1)**

(1) Not for certification **M** and **IEM**, Group I (mining)
(2) Possible combined options: all combinations are available

⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 VALVE CONFIGURATION

DLWH-2A	DLWH-2A/R	DLWH-2C	DLWH-2C/R
			
DLWH-3A	**DLWH-3A/R**	**DLWH-3C**	**DLWH-3C/R**
			

3 GENERAL CHARACTERISTICS

Assembly position / location	Horizontal position only
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Storage temperature range	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation
Compliance	Intrinsically safe protection "Ex ia", see section 7 RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

4 HYDRAULIC CHARACTERISTICS

Operating pressure	Ports P,A,B: **350** bar; Port T **160** bar
Rated flow	See Q/Δp diagrams at section 9
Maximum flow	**12 l/min**, see operating limits at section 10

5 ELECTRICAL CHARACTERISTICS - see also section 7

Nominal resistance at 20°C	150 Ω
Coil insulation	Class H
Working voltage	12 ÷ 26 V
Minimum supply current	65mA, from I.S. barriers
Protection degree	IP66
Duty factor	100%
Electrical connector	DIN 43650 2 pin+GND

6 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO 4406 class 20/18/15 NAS 1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar -max fluid temperature = 50°C

7 CERTIFICATION DATA

Valve type		DLWH		DLWH**/IE**			DLWH**/M**			DLWH**/IEM**		
Certification		**ATEX** (Group II)		**IECEx** (Group II)			**ATEX (mining)** (Group I)			**IECEx (mining)** (Group I)		
Solenoid code		**OW-18/6**		**OWI-18/6**			**OWM-18/6**			**OWIM-18/6**		
Type examination certificate **(1)**		CESI 02 ATEX 013		IECEx CES 12.0017			CESI 02 ATEX 013			IECEx CES 12.0017		
Method of protection		**Ex II 1G Ex ia**					**Ex I M2 Ex ia I Mb Ex ib I Mb**					
		IIA T5 Ga	**IIB T6 Ga**	**IIC T6 Ga**								
Electrical characteristics (max values)	Ui [V]	28	28	27	19,5	19,11	28	28	27	19,5	19,11	12,4
	Ii [mA]	396	250	130	360	360	396	250	130	360	360	2200
	Pi [W]	2,8	1,8	0,9	1,64	1,72	2,8	1,8	0,9	1,64	1,72	6,82
	Ci , Li	≅ 0	≅ 0				≅ 0					
Temperature class		**T5**	**T6**				–					
Surface temperature (ambient temp. +60°C)		≤ 100°C	≤ 85°C				≤ 150°C					
Ambient temperature		-20 ÷ +60°C -40 ÷ +60°C **(2)**					-20 ÷ +60°C					
Applicable standards		EN 60079-0 EN 60079-11 EN 60079-26		IEC 60079-0 IEC 60079-11 IEC 60079-26								

(1) The type examinator certificates can be downloaded from

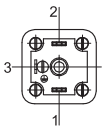
(2) Only for **/BT** option

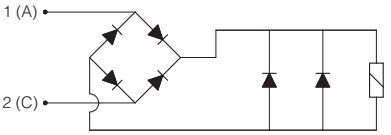
⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

8 SOLENOIDS WIRING

Connector wiring	
/6	Connections
1	Coil
2	Coil
3	GND

DIN 43650



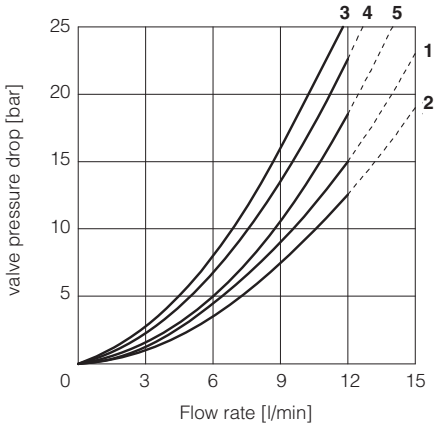


9 Q/Δp DIAGRAMS based on mineral oil ISO VG 46 at 50°C

configuration / Flow direction	2A	2C	3A	3C
P→A / P→B (1)	1	2	4	3
A→T / B→T	-	-	5	4

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

DLWH

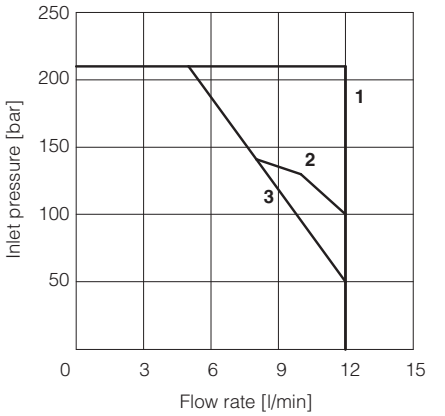


10 OPERATING LIMITS based on mineral oil ISO VG 46 at 50°C

The diagrams refer to warm solenoids and power supply provided by the Atos barrier type **Y-BXNE-412**.
In case of asymmetric flow the operating limits must be reduced.

configuration	2A	2C	3A	3C
Diagram	1	1	2	3

DLWH



11 INTERNAL LEAKAGES

DLWH internal leakages based on mineral oil ISO VG 46 at 50°C
less than 5 drops/min (0,36 cm³/min) at max pressure.

12 INTRINSICALLY SAFE BARRIERS - see tech. table **GX010**

The electric supply to these valves must be done through intrinsically safe barriers situated out of potentially flammable environment (i.e. in safe zone), which limit the electric current to the intrinsically safe solenoid. The "intrinsically safe" circuit is virtually unable to produce electrical surges or thermic effects able to cause explosion in hazardous environments also in presence of specific break-down situations. The intrinsically safe barriers must be approved and certified according to the Ex ia protection mode.

To select the proper intrinsically safe barriers following data must be considered:
1) Vmax and Imax of the solenoid as specified in section 7 must not be exceeded also in fault conditions;
2) the resistance of the solenoid is 150 Ω and the current supplied by the barrier, in normal operation condition, must be over the min. limit (65 mA) to ensure the valve correct operation (over 70 mA for max performances).

The barriers type **Y-BXNE 412** are galvanically isolated electronic devices, complying with European Norms EN60079-0/06, EN60079-11/07 and ATEX certified according to protection mode Ex ia IIC.
These barriers ensure the optimized functioning of the Atos valves up to the max operating limits specified in section 10.

The barriers Y-BXNE-412 are double channel type, suitable to operate valves with double or single solenoid. Two single solenoid valves can be connected to the barrier (one to each channel) but they cannot be contemporary operated.

MODEL CODE OF I.S. BARRIER

Y-BXNE 412 00	*

Supply voltage
E = 110/230 VAC
2 = 24÷48 VDC

13 INSTALLATION DIMENSIONS [mm]

DLWH-2A, DLWH-2C

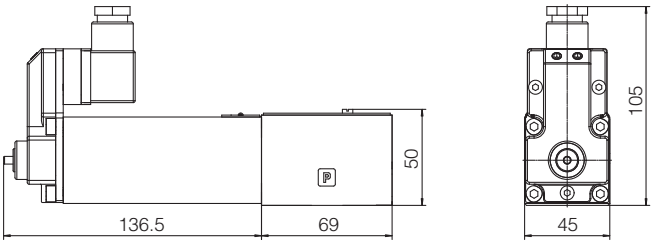
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
(see table P005)

Fastening bolts:
4 socket head screws M5x50 class 12.9

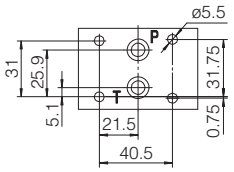
Tightening torque = 8 Nm

Seals: 2 OR 108

Diameter of ports P, T: Ø 7,5 mm (max)



Valve's bottom view



P = PRESSURE PORT
T = USE PORT

DLWH-3A, DLWH-3C

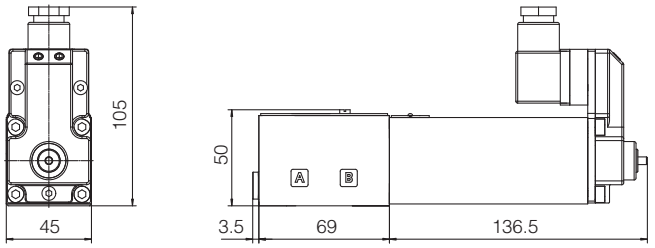
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
(see table P005)

Fastening bolts:
4 socket head screws M5x50 class 12.9

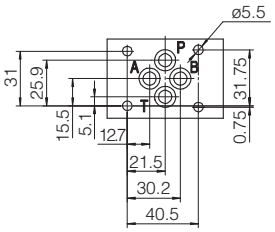
Tightening torque = 8 Nm

Seals: 4 OR 108

Diameter of ports P, A, B, T: Ø 7,5 mm (max)



Valve's bottom view



P = PRESSURE PORT

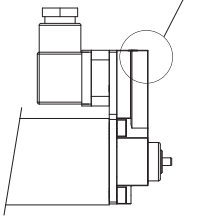
A = USE PORT
(not used for DLAH-3C version)

B = USE PORT
(not used for DLAH-3A version)

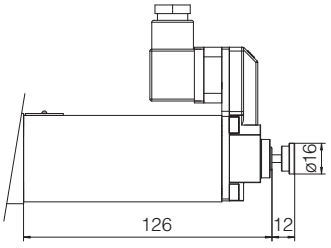
T = TANK PORT

Mass [kg]	
DLWH-02	2,3
DLWH-03	2,3

DLWH/M
(different cover shape)



Option **/WP**



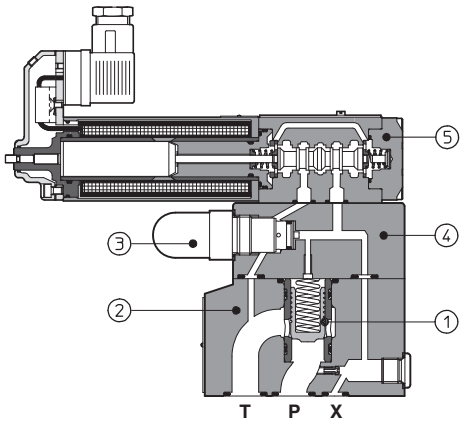
Note: the connector is supplied with the valve

14 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments
X050	Summary of Atos intrinsically safe components certified to ATEX, IECEx
EX950	Operating and maintenance information for intrinsically safe valves
P005	Mounting surfaces for electrohydraulic valves

Intrinsically safe pressure relief valves

piloted, subplate or in line mounting - **ATEX** or **IECEx certification**



① main poppet
② valve main body
③ mechanical pressure limiter
④ cover
⑤ intrinsically safe pilot valve

AGAM-10/10/-WO**

AGAM, ARAM

Intrinsically safe pressure relief valves equipped with solenoid pilot valve for venting or multiple pressure selection, certified for safe operation in hazardous environment with potentially explosive atmosphere.

Certifications:

- **ATEX** or **IECEx**:
  II 1G Ex ia IIC, IIB, IIA
  surface plants zone 0, 1 and 2
- **ATEX** or **IECEx**:
  IM2 Ex ia IMb, Ex ib IMb
  surface, tunnels or mining plants

The valves must be electrically powered through specific "safety barriers" limiting the max current to the solenoid, see section 10.

AGAM: pressure relief, subplate mounting
Size: **10, 20** and **32** - ISO 6264
Max flow: **200, 400** and **600 l/min**

ARAM: pressure relief, threaded connections
Size: **G 3/4"** and **G 1 1/4"**
Max flow: **350** and **500 l/min**

Max pressure: **350 bar**

1 MODEL CODE

AGAM	/	*	-	20	/	20	/	210/100/100	-	WO	/	*	/	6	*	/	*

AGAM
Intrinsically safe pressure relief valves, piloted

AGAM
subplate mounting

ARAM
threated connections

Certification type:
- = Omit for Atex Group II
M = Atex Group I (mining)
IE = IECEx Group II
IEM = IECEx Group I (mining)

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

Configuration, see section 2 :
10 **20** **22**
11 **21** **32**

Max regulated pressure
of first (second / third) setting, see section 4 :
50 = 50 bar **100** = 100 bar
210 = 210 bar **350** = 350 bar

WO = intrinsically safe solenoid

Options (2):
E = external pilot
V = regulating handweel for pressure adjustment
WP = ⚠ manual override
Y = external drain

Connector type:
6 = DIN 43650 (standard)

Series number

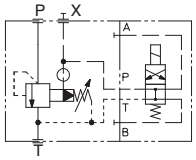
Seals material, see section 6 :
- = NBR
PE = FKM
BT = HNBR **(1)**

(1) Not for certification **M** and **IEM**, Group I (mining)
(2) Possible combined options: all combinations are available

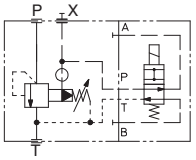
⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 CONFIGURATIONS AND HYDRAULIC SYMBOLS

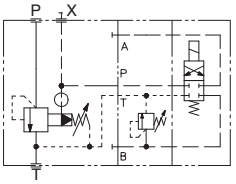
AGAM-/10**
ARAM-/10**
one setting pressure
+ venting with
de-energized solenoid



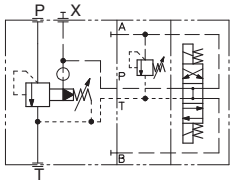
ARAM-/11**
AGAM-/11**
one setting pressure
+ venting with
energized solenoid



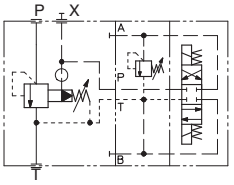
AGAM-/22**
ARAM-/22**
two setting pressure
without venting



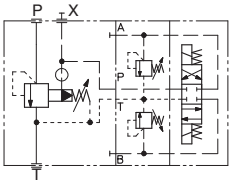
AGAM-/20**
ARAM-/20**
two setting pressure
+ venting with
de-energized solenoid



AGAM-/21**
ARAM-/21**
two setting pressure
+ venting with
energized solenoid



AGAM-/32**
ARAM-/32**
three setting pressure
without venting



3 GENERAL CHARACTERISTICS

Assembly position / location	Horizontal position only
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +60°C **/BT** option = -40°C ÷ +60°C
Storage temperature range	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Intrinsically safe protection “Ex ia”, see section 7 RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

4 HYDRAULIC CHARACTERISTICS

Valve size		**10**	**20**	**32**
Max operating pressure	[bar]	port P = **350** port T, Y = **210**		
Max regulated pressure	[bar]	**50**	**100** **210**	**350**
Pressure range	[bar]	4÷50;	6÷100; 7÷210;	8÷350
Max flow **AGAM (1)**	[l/min]	200	400	600
Max flow **ARAM (1)**	[l/min]	-	350	500

(1) see Q/Δp diagrams at section 11 and 12

5 ELECTRICAL CHARACTERISTICS - see also section 7

Nominal resistance at 20°C	150 Ω
Coil insulation	Class H
Working voltage	12 ÷ 26 V
Minimum supply current	65mA, from I.S. barriers
Protection degree	IP66
Duty factor	100%
Electrical connector	DIN 43650 2 pin+GND

6 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO 4406 class 20/18/15 NAS 1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar
-max fluid temperature = 50°C

7 CERTIFICATION DATA

Valve type		AGAM ARAM		AGAM/**IE** ARAM/**IE**			AGAM/**M** ARAM/**M**			AGAM/**IEM** ARAM/**IEM**		
Certification		**ATEX** (Group II)		**IECEx** (Group II)			**ATEX (mining)** (Group I)			**IECEx (mining)** (Group I)		
Solenoid code		**OW-18/6**		**OWI-18/6**			**OWM-18/6**			**OWIM-18/6**		
Type examination certificate **(1)**		CESI 02 ATEX 013		IECEx CES 12.0017			CESI 02 ATEX 013			IECEx CES 12.0017		
Method of protection		**Ex II 1G Ex ia**					**Ex I M2 Ex ia I Mb Ex ib I Mb**					
		IIA T5 Ga	**IIB T6 Ga**	**IIC T6 Ga**								
Electrical characteristics (max values)	Ui [V]	28	28	27	19,5	19,11	28	28	27	19,5	19,11	12,4
	Ii [mA]	396	250	130	360	360	396	250	130	360	360	2200
	Pi [W]	2,8	1,8	0,9	1,64	1,72	2,8	1,8	0,9	1,64	1,72	6,82
	Ci , Li	≅ 0	≅ 0				≅ 0					
Temperature class		**T5**	**T6**				–					
Surface temperature (ambient temp. +60°C)		≤ 100°C	≤ 85°C				≤ 150°C					
Ambient temperature		-20 ÷ +60°C	-40 ÷ +60°C **(2)**				-20 ÷ +60°C					
Applicable standards		EN 60079-0 EN 60079-11 EN 60079-26		IEC 60079-0 IEC 60079-11 IEC 60079-26								

(1) The type examinator certificates can be downloaded from
(2) Only for **/BT** option

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

8 OPTIONS

E = External pilot option to be selected when the pilot pressure is supplied from a different line respect to the P main line.
With option E the internal connection between port P and X of the valve is plugged.
The pilot pressure must be connected to the X port available on the valve's mounting surface or on main body (threaded pipe connection G ¼").

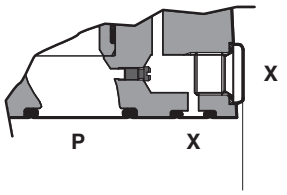
V = Regulating handweel for pressure adjustment

WP = Manual override protect by metallic cap

Y = The external drain is mandatory in case the main line T is subjected to pressure peaks or it is pressurized.
The Y drain port has a threaded connection G ¼" available on the pilot stage body.

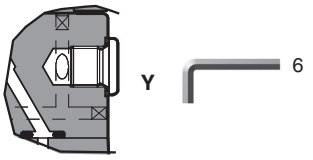
11.1 Possible combined options: all combinations are available

E option



Blinded plug SP-X100A

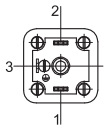
Y option

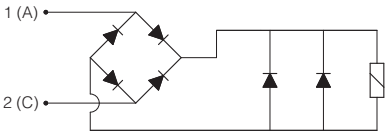


9 SOLENOIDS WIRING

Connector wiring	
/6	Connections
1	Coil
2	Coil
3	GND

DIN 43650





10 INTRINSICALLY SAFE BARRIERS - see tech. table **GX010**

Intrinsically safe valves must be powered through safety barriers certified according to Ex-ie protection mode, limiting the energy to the solenoid.

To select the proper intrinsically safe barriers following data must be considered:
1) Vmax and Imax of the solenoid as specified in section 7 must not be exceeded also in fault conditions;
2) the resistance of the solenoid is 150 Ω and the current supplied by the barrier, in normal operation condition, must be over the min. limit (65 mA) to ensure the valve correct operation (over 70 mA for max performances).

The barriers type **Y-BXNE 412** are galvanically isolated electronic devices, complying with European Norms EN60079-0/06, EN60079-11/07 and ATEX certified according to protection mode Ex ia IIC.
These barriers ensure the optimized functioning of the Atos valves up to the max operating limits specified in section 4.

The barriers Y-BXNE-412 are double channel type, suitable to operate valves with double or single solenoid. Two single solenoid valves can be connected to the barrier (one to each channel) but they cannot be contemporary operated.

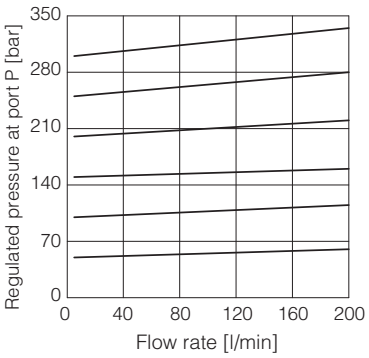
MODEL CODE OF I.S. BARRIER

Y-BXNE 412 00	*

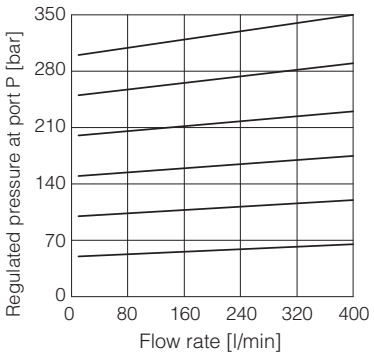
Supply voltage
E = 110/230 VAC
2 = 24÷48 VDC

11 REGULATED PRESSURE VERSUS FLOW DIAGRAMS based on mineral oil ISO VG 46 at 50°C

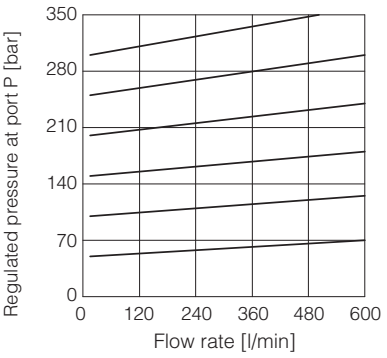
AGAM-10



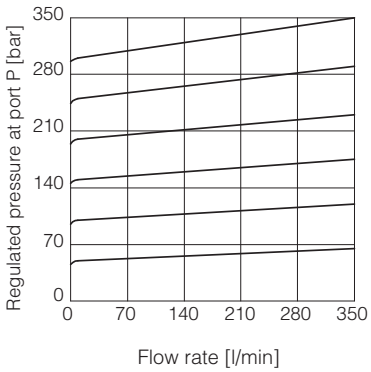
AGAM-20



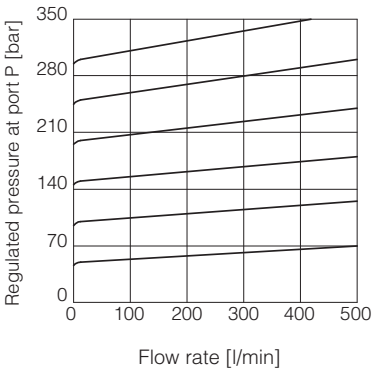
AGAM-32



ARAM-20

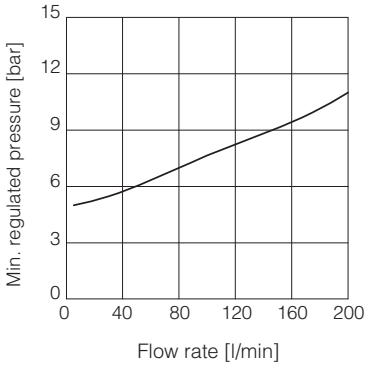


ARAM-32

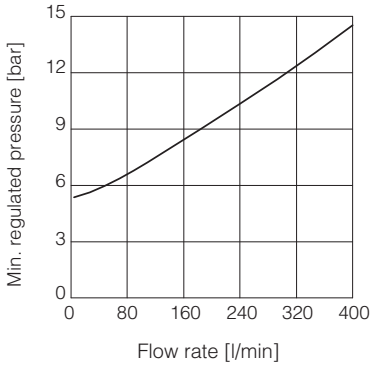


12 MINIMUM PRESSURE VERSUS FLOW DIAGRAMS based on mineral oil ISO VG 46 at 50°C

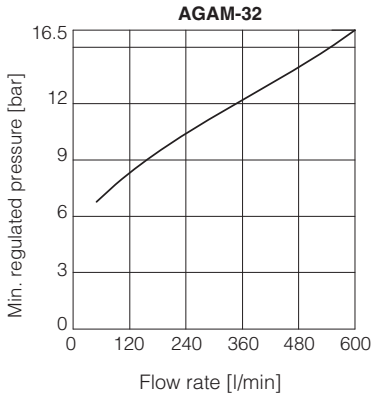
AGAM-10



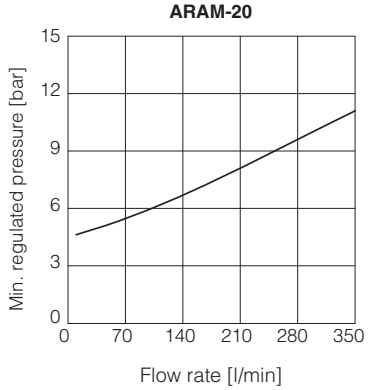
AGAM-20



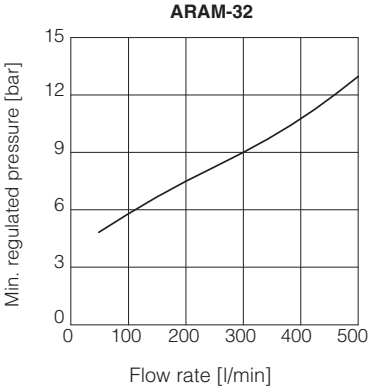
AGAM-32



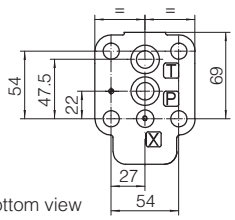
ARAM-20



ARAM-32



AGAM-10

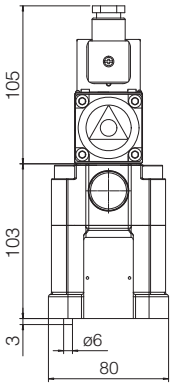


Valve's bottom view

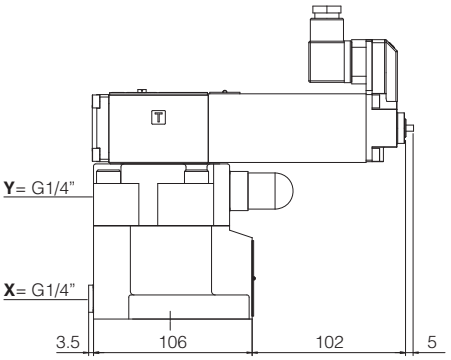
ISO 6264: 2007 (see table P005)
Mounting surface: 6264-06-09-1-97
Fastening bolts:
4 socket head screws M12x35 class 12.9
Tightening torque = 125 Nm
Seals: 2 OR 123; 1 OR 109/70
Ports P, T: Ø = 14,5 mm
Ports X: Ø = 3,2 mm

X = port connection for external pilot (option /E)
Y = port connection for external drain (option /Y)

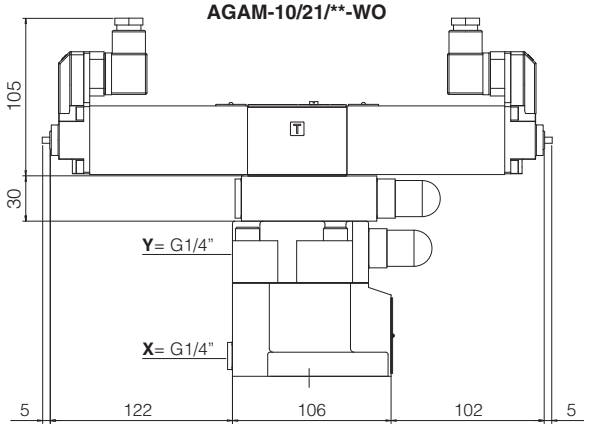
Mass [kg]	
AGAM-10/10 10/11	6,45
AGAM-10/20 10/21	7,55
AGAM-10/22 10/32	7,25 9



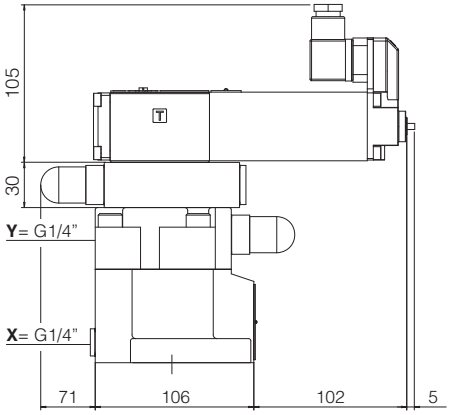
AGAM-10/10/-WO**
AGAM-10/11/-WO**



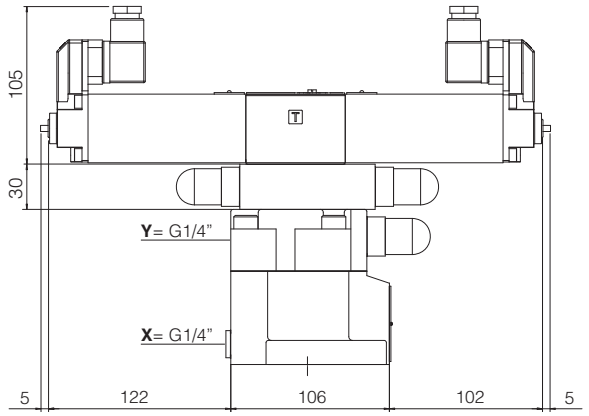
AGAM-10/20/-WO**
AGAM-10/21/-WO**



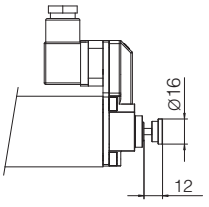
AGAM-10/22/-WO**



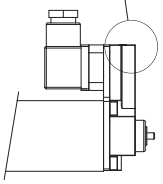
AGAM-10/32/-WO**



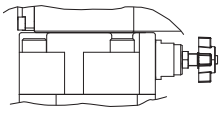
Option /WP



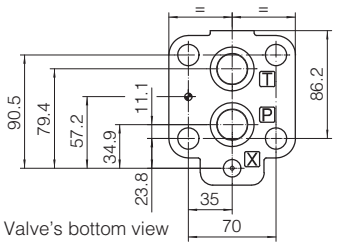
Mining version /M and /IEM
(different cover shape)



Option /V



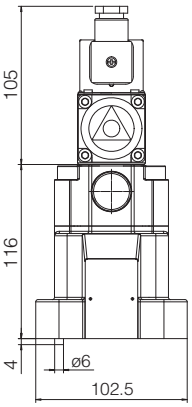
AGAM-20



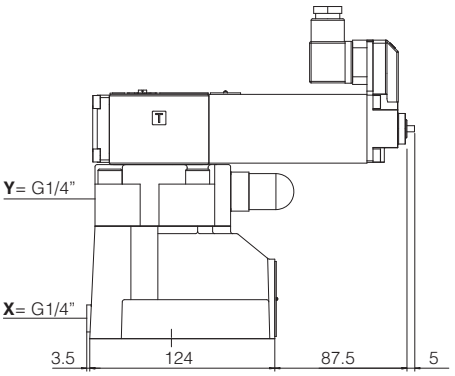
ISO 6264: 2007 (see table P005)
Mounting surface: 6264-08-11-1-97
Fastening bolts:
4 socket head screws M16x50 class 12.9
Tightening torque = 300 Nm
Seals: 2 OR 4112; 1 OR 109/70
Ports P, T: Ø = 24 mm
Ports X: Ø = 3,2 mm

X = port connection for external pilot (option /E)
Y = port connection for external drain (option /Y)

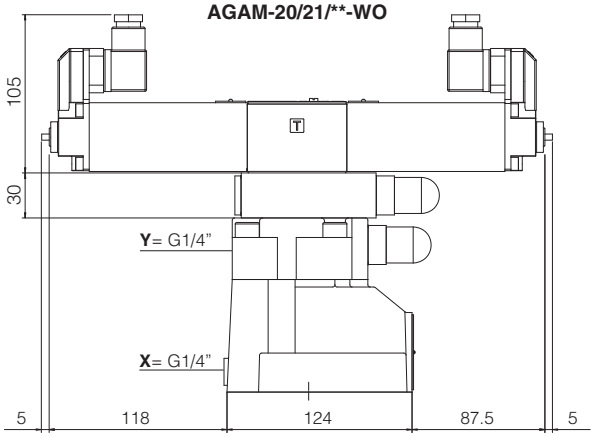
Mass [kg]	
AGAM-20/10 20/11	7,65
AGAM-20/20 20/21	8,75
AGAM-20/22 20/32	8,45 10,2



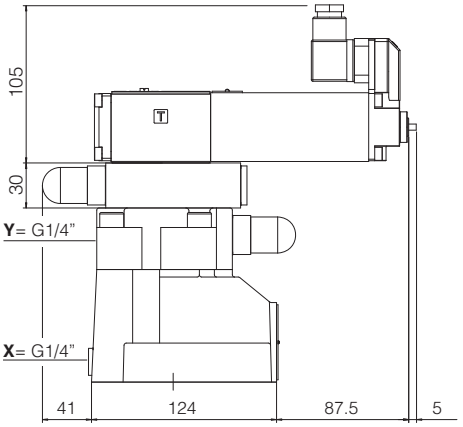
AGAM-20/10/-WO**
AGAM-20/11/-WO**



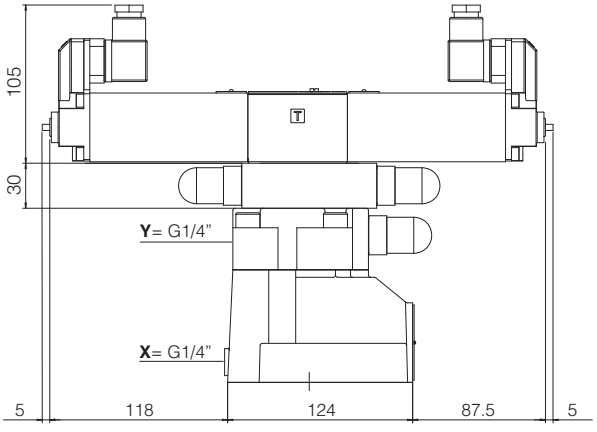
AGAM-20/20/-WO**
AGAM-20/21/-WO**



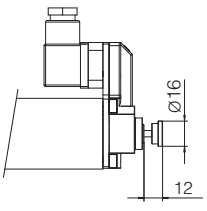
AGAM-20/22/-WO**



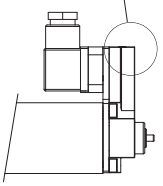
AGAM-20/32/-WO**



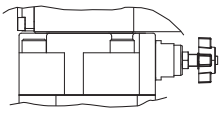
Option /WP



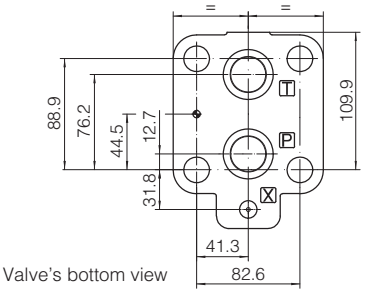
Mining version /M and /IEM
(different cover shape)



Option /V



AGAM-32

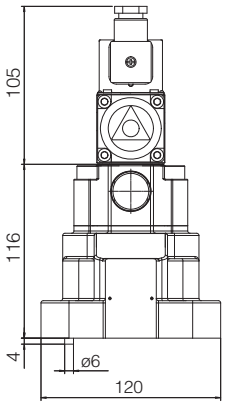


Valve's bottom view

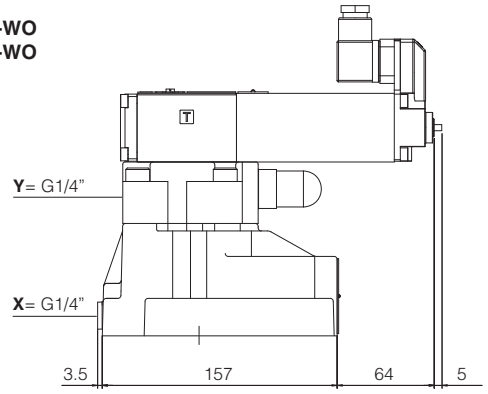
ISO 6264: 2007 (see table P005)
Mounting surface: 6264-10-17-1-97
(with M20 fixing holes instead of standard M18)
Fastening bolts:
4 socket head screws M20x60 class 12.9
Tightening torque = 600 Nm
Seals: 2 OR 4131; 1 OR 109/70
Ports P, T: Ø = 28,5 mm
Ports X: Ø = 3,2 mm

X = port connection for external pilot (option /E)
Y = port connection for external drain (option /Y)

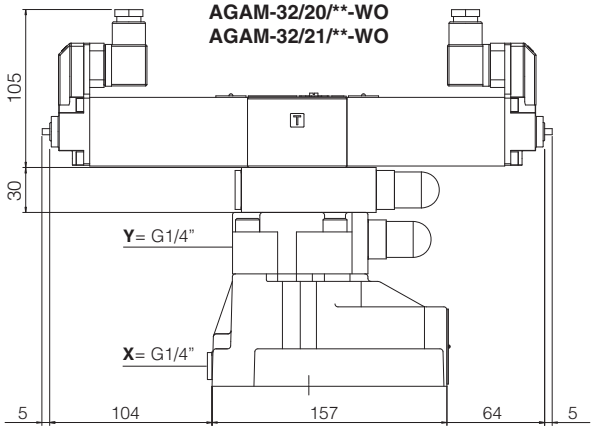
Mass [kg]	
AGAM-32/10 32/11	9,05
AGAM-32/20 32/21	10,05
AGAM-32/22 32/32	9,85 11,6



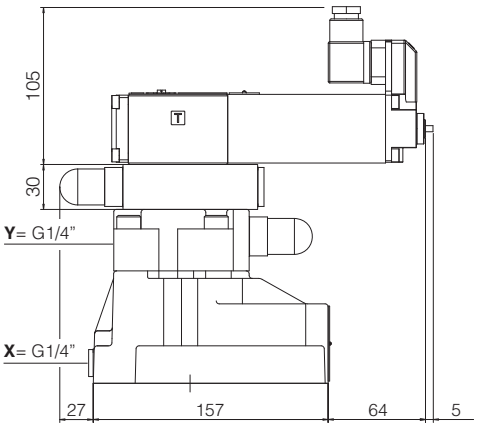
AGAM-32/10/-WO**
AGAM-32/11/-WO**



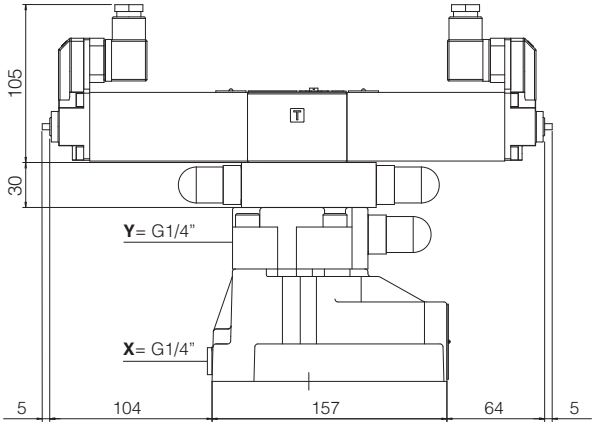
AGAM-32/20/-WO**
AGAM-32/21/-WO**



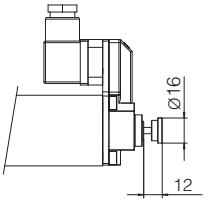
AGAM-32/22/-WO**



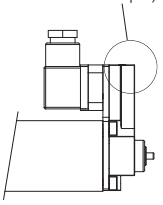
AGAM-32/32/-WO**



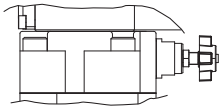
Option /WP



Mining version /M and /IEM
(different cover shape)



Option /V

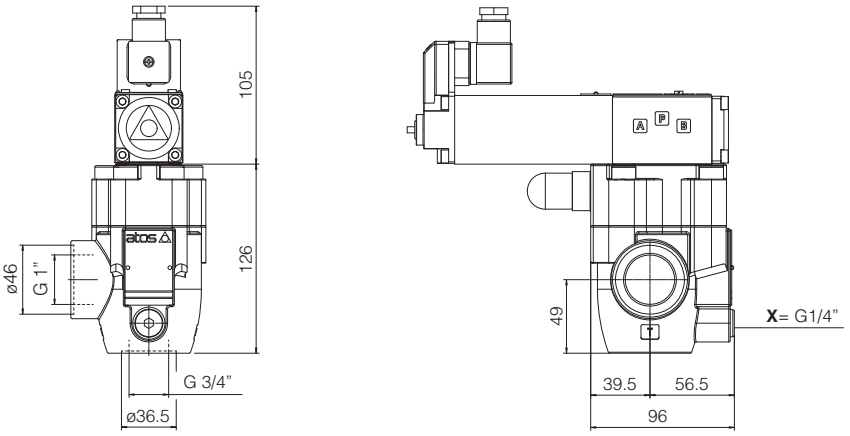


ARAM-20

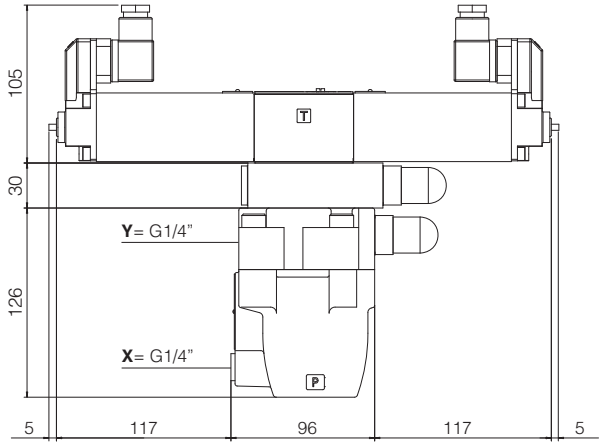
X = port connection for external pilot (option /E)
Y = port connection for external drain (option /Y)

Mass [kg]	
ARAM-20/10 20/11	6,75
ARAM-20/20 20/21	8,45
ARAM-20/22 20/32	8,15 10,1

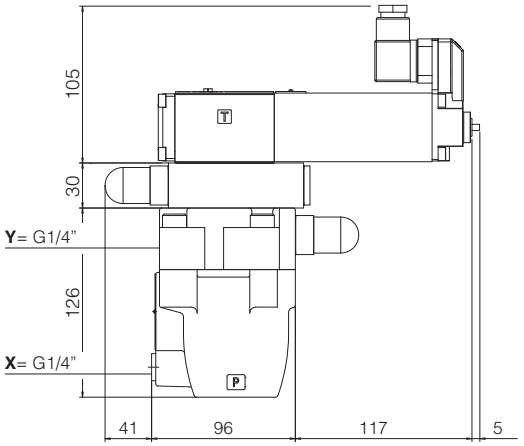
ARAM-20/10/-WO**
ARAM-20/11/-WO**



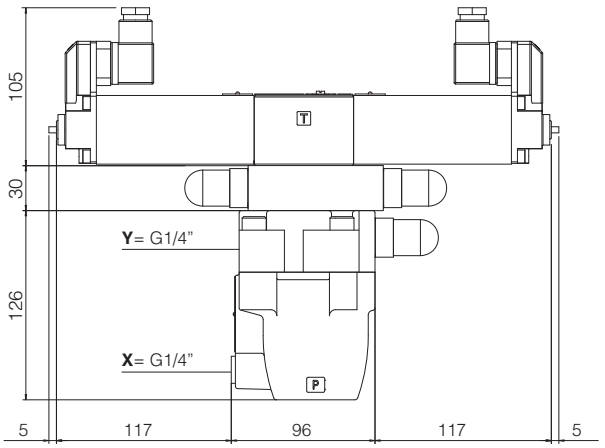
ARAM-20/20/-WO**
ARAM-20/21/-WO**



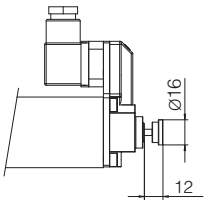
ARAM-20/22/-WO**



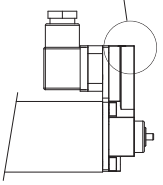
ARAM-20/32/-WO**



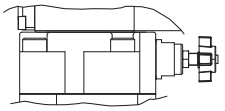
Option /WP



Mining version /M and /IEM
(different cover shape)



Option /V

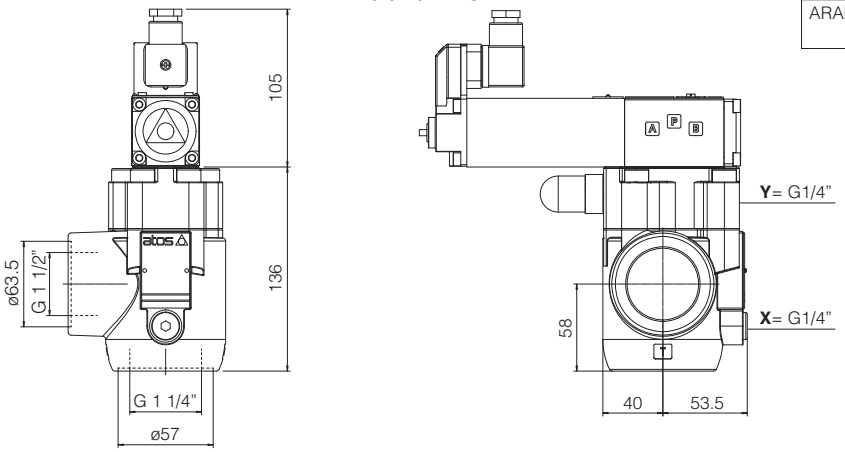


ARAM-32

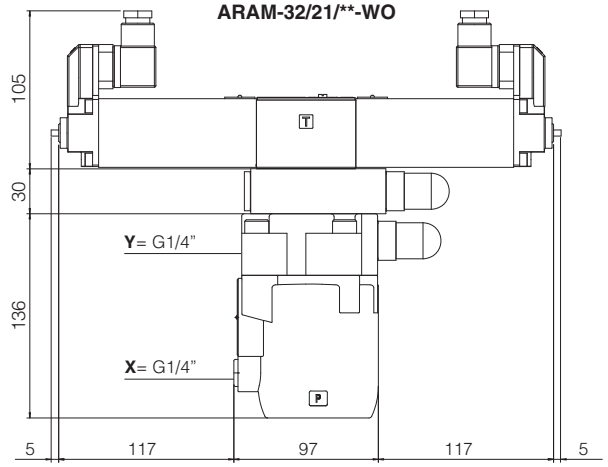
X = port connection for external pilot (option /E)
Y = port connection for external drain (option /Y)

Mass [kg]	
ARAM-32/10 32/11	7,05
ARAM-32/20 32/21	9,05
ARAM-32/22 32/32	8,55 10,7

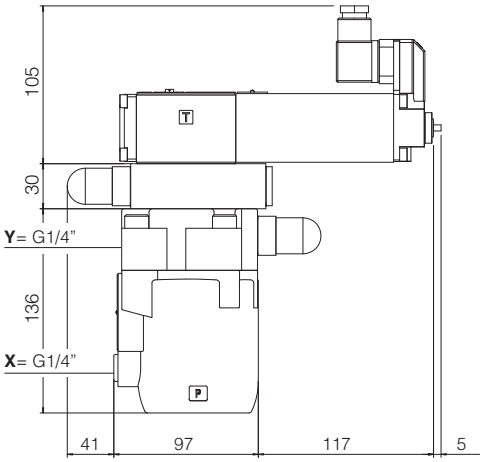
ARAM-32/10/-WO**
ARAM-32/11/-WO**



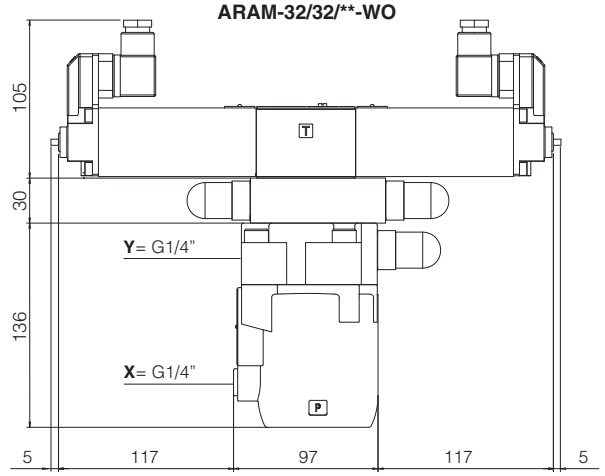
ARAM-32/20/-WO**
ARAM-32/21/-WO**



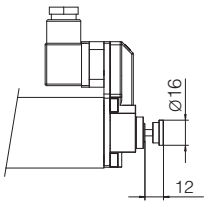
ARAM-32/22/-WO**



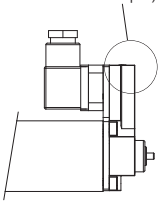
ARAM-32/32/-WO**



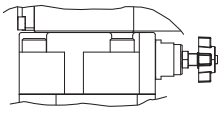
Option /WP



Mining version /M and /IEM
(different cover shape)



Option /V

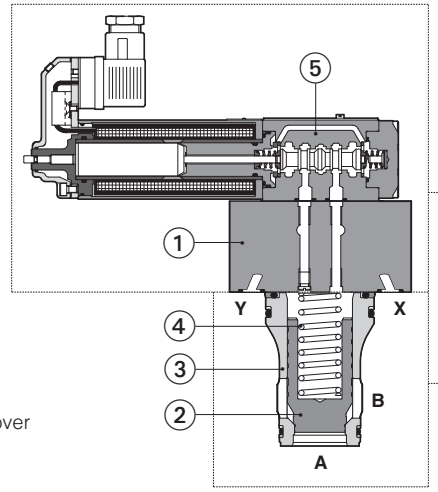


15 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments
X050	Summary of Atos intrinsically safe components certified to ATEX, IECEx
EX950	Operating and maintenance information for intrinsically safe valves
P005	Mounting surfaces for electrohydraulic valves

Intrinsically safe ISO cartridge valves

on-off directional control, ISO 7368 - **ATEX** or **IECEx**



LIDEW1-4/*-WO

SC LI-4043*

① functional cover
② poppet
③ sleeve
④ spring
⑤ intrinsically safe solenoid pilot valve

LIDEW, LIDBH, SC LI

On-off ISO directional cartridges equipped with intrinsically safe solenoid pilot valve for poppet control, certified for safe operation in hazardous environment with potentially explosive atmosphere.

Certifications:

- **ATEX** or **IECEx**:
  II 1G Ex ia IIC, IIB, IIA
  surface plants zone 0, 1 and 2
- **ATEX** or **IECEx**:
  IM2 Ex ia IMb, Ex ib IMb
  surface, tunnels or mining plants

See section 11 for certification data

The valves must be electrically powered through specific “safety barriers” limiting the max current to the solenoid, see section 13

LIDEW: directional control with ex-proof solenoid valve for oppet control

LIDBH: directional control with solenoid valve and shuttle valve for pilot line selection

Size: **16** ÷ **63**
Flow: **240** ÷ **4000 l/min** at Δp 5 bar
Max pressure: **350 bar**

1 **MODEL CODE OF COVERS** - to be coupled with cartridge in section 5

LI	D	EW /	*	-	1	-	1	/	*	-	WO	/	6	*	/	*	*

Cover according to ISO 7368

D = directional function

EW = with pilot solenoid valve
BH = as EW plus shuttle valve for pilot selection

Certification type:
- = Omit for Atex Group II
M = Atex Group I (mining)
IE = IECEx Group II
IEM = IECEx Group I (mining)

Cover configuration see section 2 :
LIDEW: **-**, **1**, **2**, **4**, **5**, **6**
LIDBH: **1A**, **1C**, **2A**, **2C**

Valve size (ISO 7368):
1 = 16 **3** = 32 **5** = 50
2 = 25 **4** = 40 **6** = 63

Options (2):
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)
WP = ⚠ manual override

WO = Intrinsically safe slenoid

Connector type:
6 = DIN 43650 (standard)

Series number

Seals material, see section 10 :
- = NBR
PE = FKM
BT = HNBR **(1)**

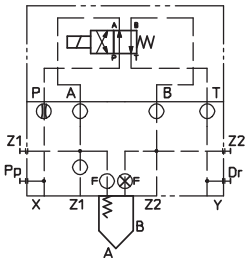
Optional different setting of the calibrated plugs in the pilot channels see section 3

(1) Not for certification **M** and **IEM**, Group I (mining)
(2) Possible combined options: all combinations are available

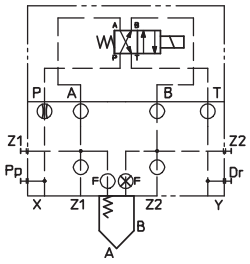
⚠ The pressure at T port makes difficult the manual override operation that can be possible only if its value is lower than 50 bar

2 VALVES CONFIGURATIONS AND HYDRAULIC SYMBOLS

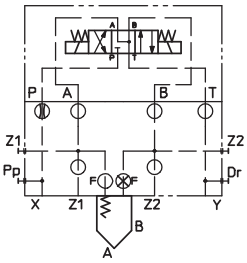
LIDEW



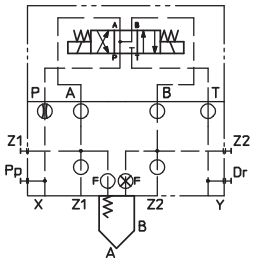
LIDEW1-*



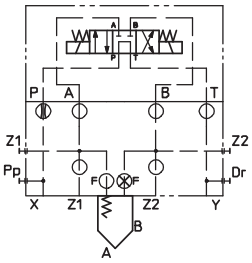
LIDEW2-*



LIDEW4-*

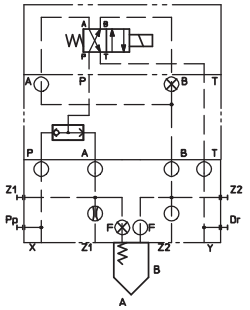


LIDEW5-*

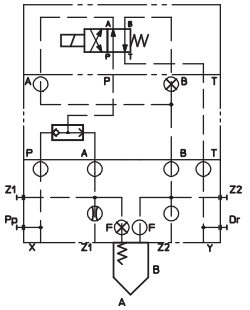


LIDEW6-*

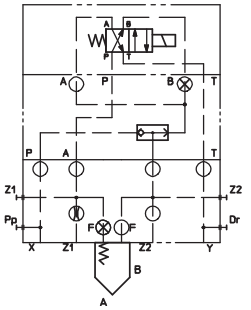
LIDBH



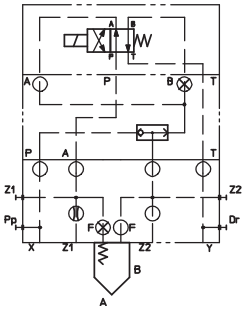
LIDBH1A-*



LIDBH1C-*



LIDBH2A-*



LIDBH2C-*

3 OPTIONS

For LIDEW*, LIDBH* covers (sizes 40…100):

/E = with external attachments Pp and underneath port X supplied plugged;

For all the models:

/B = cartridge piloted via port "B" of solenoid pilot valve;

/F = prearranged for coupling to an intermediate element with poppet position detector for safety function. See tab. EY120.

/WP = prolonged manual override protected for solenoid pilot valve.

******* = Calibrated plugs different from standard ones reported in section 4. The restrictors configuration (if different from the standard) must be indicated at the end of the model code:

LIDEW2	-	1	/*	-	WO	/6	**

P
Channel where the orifice has to be provided: **P** = channel X, port P **Z1** = channel Z1 **F** = channel F **Z2** = channel Z2

06
Size of the throttling hole in teths of millimeters: **05** = 0,5 mm **10** = 1 mm **17** = 1,7 mm **06** = 0,6 mm **12** = 1,2 mm **20** = 2 mm **08** = 0,8 mm **15** = 1,5 mm

4 STANDARD ORIFICES CONFIGURATION

Port \ Cover	LIDEW*-1 LIDBH*-1	LIDEW*-2 LIDBH*-2	LIDEW*-3 LIDBH*-3	LIDEW*-4 LIDBH*-4	LIDEW*-5 LIDBH*-5	LIDEW*-6 LIDBH*-6
Z1 (only for LIDBH*-*)	M4 12A	M4 12A	M6 15A	M6 17A	M6 20A	M6 20A
P	M6 12A	M6 12A	M6 15A	M6 17A	M6 20A	M6 20A

M4 ÷ M8 = screw size; **12A ÷ 20A** = calibrated orifices diameter in tenths of mm; **A** = short calibrated hole

5 MODEL CODE OF SLIP-IN CARTRIDGES, to be coupled with covers in section 1

SC LI	-	16	43	1	40	/*

SC LI: Cartridge valve

16: **Size** (ISO 7368): **16 25 32 40 50 63**

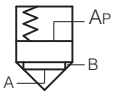
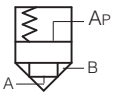
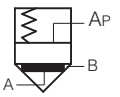
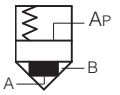
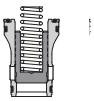
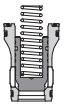
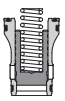
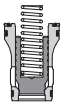
43: **Type of poppet**, see section 6 for maximum flow
32, 33
42 = as 32 but with dumping nose
43 = as 33 but with dumping nose

1: **Spring cracking pressure**:
1 = 0,3 bar for poppet 32, 42;
1 = 0,6 bar for poppet 33, 43;
2 = 1,5 bar for poppet 32, 42;
3 = 3 bar for all poppets
6 = 5,5 bar for all poppets

40: **High flow:**
40 = all sizes

/*: Seals material:
- = NBR
PE = FKM
BT = HNBR

6 TYPE OF POPPET

Type of poppet		**32**	**33**	**42**	**43**
Functional sketch (Hydraulic symbol)					
Operating pressure		**420 bar max** (only SCLI cartridge)			
Nominal flow at Δp 5bar (l/min) see diagrams Q/Δp at section 9	Size **16**	270	270	240	240
	25	550	550	500	500
	32	1000	1000	800	800
	40	1700	1700	1400	1400
	50	2500	2500	2200	2200
	63	4000	4000	3300	3300
Typical section					
Area ratio A:Ap		**1:1,1**	**1:1,5**	**1:1,1**	**1:1,5**
Cracking pressure A→B	Spring **1**	0,3 bar	0,6 bar	0,3 bar	0,6 bar
	2	1,5 bar	-	1,5 bar	-
	3	3 bar	3 bar	3 bar	3 bar
	6	5,5 bar	5,5 bar	5,5 bar	5,5 bar
Cracking pressure B→A	Spring **1**	3 bar	1,2 bar	3 bar	1,2 bar
	2	12,8 bar	-	12,8 bar	-
	3	32,5 bar	6 bar	32,5 bar	6 bar
	6	54,5 bar	11 bar	54,5 bar	11 bar

7 GENERAL CHARACTERISTICS

Assembly position / location	Horizontal position only
Subplate surface finishing to ISO 4401	Acceptable roughness index, Ra ≤0,8 recommended Ra 0,4 - flatness ratio 0,01/100)
MTTFd values according to EN ISO 13849	75 years, for further details see technical table P007
Ambient temperature	**Standard** = -20°C ÷ +60°C **/PE** option = -20°C ÷ +60°C **/BT** option = -40°C ÷ +60°C
Storage temperature range	**Standard** = -20°C ÷ +70°C **/PE** option = -20°C ÷ +70°C **/BT** option = -40°C ÷ +70°C
Surface protection	Zinc coating with black passivation - salt spray test (EN ISO 9227) > 200h
Compliance	Intrinsically safe protection "Ex ia", see section 11 RoHs Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006

8 HYDRAULIC CHARACTERISTICS

Functional cover operating pressure	port A, B, X, Z1, Z2 = **350**; port Y = **160**
Rated flow	see section 6

9 ELECTRICAL CHARACTERISTICS - see also section 11

Nominal resistance at 20°C	150 Ω
Coil insulation	Class H
Working voltage	12 ÷ 26 V
Minimum supply current	65mA, from I.S. barriers
Protection degree	IP66
Duty factor	100%
Electrical connector	DIN 43650 2 pin+GND

10 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

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		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
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	

⚠ The ignition temperature of the hydraulic fluid must be 50°C higher than the max solenoid surface temperature

(1) Performance limitations in case of flame resistant fluids with water:
-max operating pressure = 210 bar
-max fluid temperature = 50°C

11 CERTIFICATION DATA

Valve type		LIDEW LIDBH		LIDEW/**IE** LIDBH/**IE**			LIDEW/**M** LIDBH/**M**			LIDEW/**IEM** LIDBH/**IEM**		
Certification		**ATEX** (Group II)		**IECEx** (Group II)			**ATEX (mining)** (Group I)			**IECEx (mining)** (Group I)		
Solenoid code		**OW-18/6**		**OWI-18/6**			**OWM-18/6**			**OWIM-18/6**		
Type examination certificate **(1)**		CESI 02 ATEX 013		IECEx CES 12.0017			CESI 02 ATEX 013			IECEx CES 12.0017		
Method of protection		**Ex II 1G Ex ia**					**Ex I M2 Ex ia I Mb Ex ib I Mb**					
		IIA T5 Ga	**IIB T6 Ga**	**IIC T6 Ga**								
Electrical characteristics (max values)	Ui [V]	28	28	27	19,5	19,11	28	28	27	19,5	19,11	12,4
	Ii [mA]	396	250	130	360	360	396	250	130	360	360	2200
	Pi [W]	2,8	1,8	0,9	1,64	1,72	2,8	1,8	0,9	1,64	1,72	6,82
	Ci , Li	≅ 0	≅ 0				≅ 0					
Temperature class		**T5**	**T6**				–					
Surface temperature (ambient temp. +60°C)		≤ 100°C	≤ 85°C				≤ 150°C					
Ambient temperature		-20 ÷ +60°C	-40 ÷ +60°C **(2)**				-20 ÷ +60°C					
Applicable standards		EN 60079-0 EN 60079-11 EN 60079-26	IEC 60079-0 IEC 60079-11 IEC 60079-26									

(1) The type examinator certificates can be downloaded from

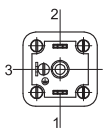
(2) Only for **/BT** option

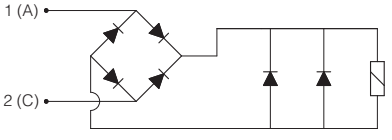
⚠ **WARNING: service work performed on the valve by the end users or not qualified personnel invalidates the certification**

12 SOLENOIDS WIRING

Connector wiring	
/6	Connections
1	Coil
2	Coil
3	GND

DIN 43650





13 **INTRINSICALLY SAFE BARRIERS** - see tech. table **GX010**

The electric supply to these valves must be done through intrinsically safe barriers situated out of potentially flammable environment (i.e. in safe zone), which limit the electric current to the intrinsically safe solenoid. The "intrinsically safe" circuit is virtually unable to produce electrical surges or thermic effects able to cause explosion in hazardous environments also in presence of specific break-down situations. The intrinsically safe barriers must be approved and certified according to the Ex ia protection mode.

To select the proper intrinsically safe barriers following data must be considered:
1) Vmax and Imax of the solenoid as specified in section **11** must not be exceeded also in fault conditions;
2) the resistance of the solenoid is 150 Ω and the current supplied by the barrier, in normal operation condition, must be over the min. limit (65 mA) to ensure the valve correct operation (over 70 mA for max performances).

The barriers type **Y-BXNE 412** are galvanically isolated electronic devices, complying with European Norms EN60079-0/06, EN60079-11/07 and ATEX certified according to protection mode Ex ia IIC.
These barriers ensure the optimized functioning of the Atos valves up to the max operating limits specified in section **8**.

The barriers Y-BXNE-412 are double channel type, suitable to operate valves with double or single solenoid. Two single solenoid valves can be connected to the barrier (one to each channel) but they cannot be contemporary operated.

MODEL CODE OF I.S. BARRIER

Y-BXNE 412 00	*

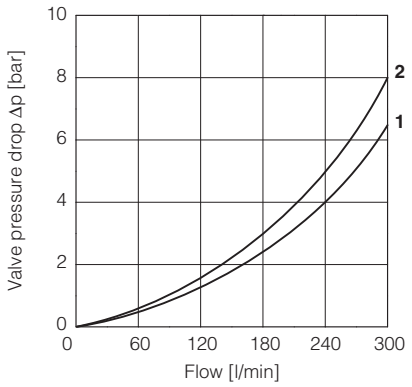
Supply voltage
E = 110/230 VAC
2 = 24÷48 VDC

14 **Q/Δp DIAGRAMS** based on mineral oil ISO VG 46 at 50 °C

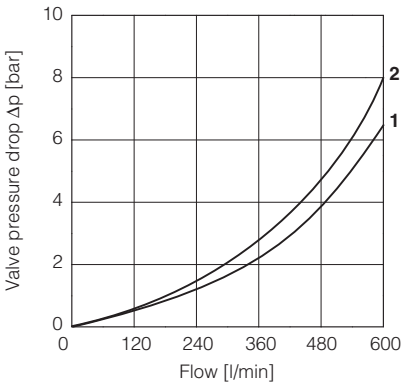
SC LI High flow - series 40

1 = poppet type 32 and 33 **2** = poppet type 42 and 43

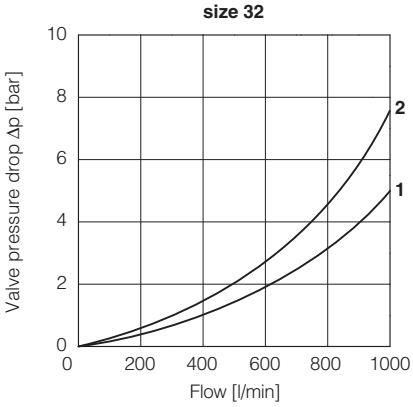
size 16



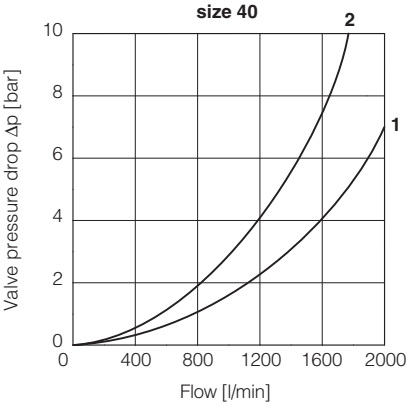
size 25



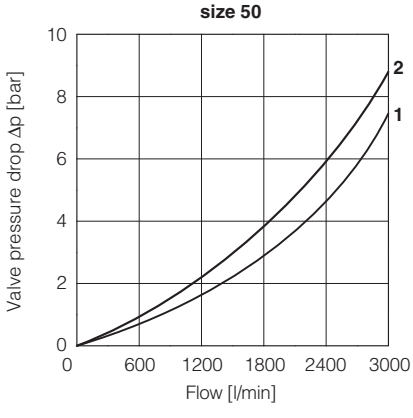
size 32



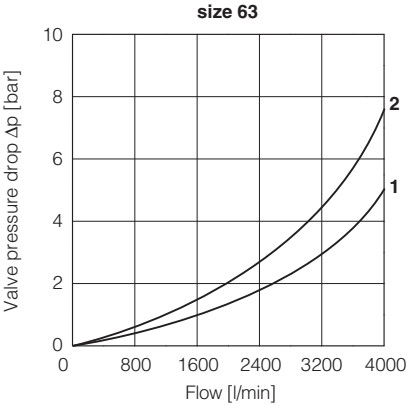
size 40



size 50

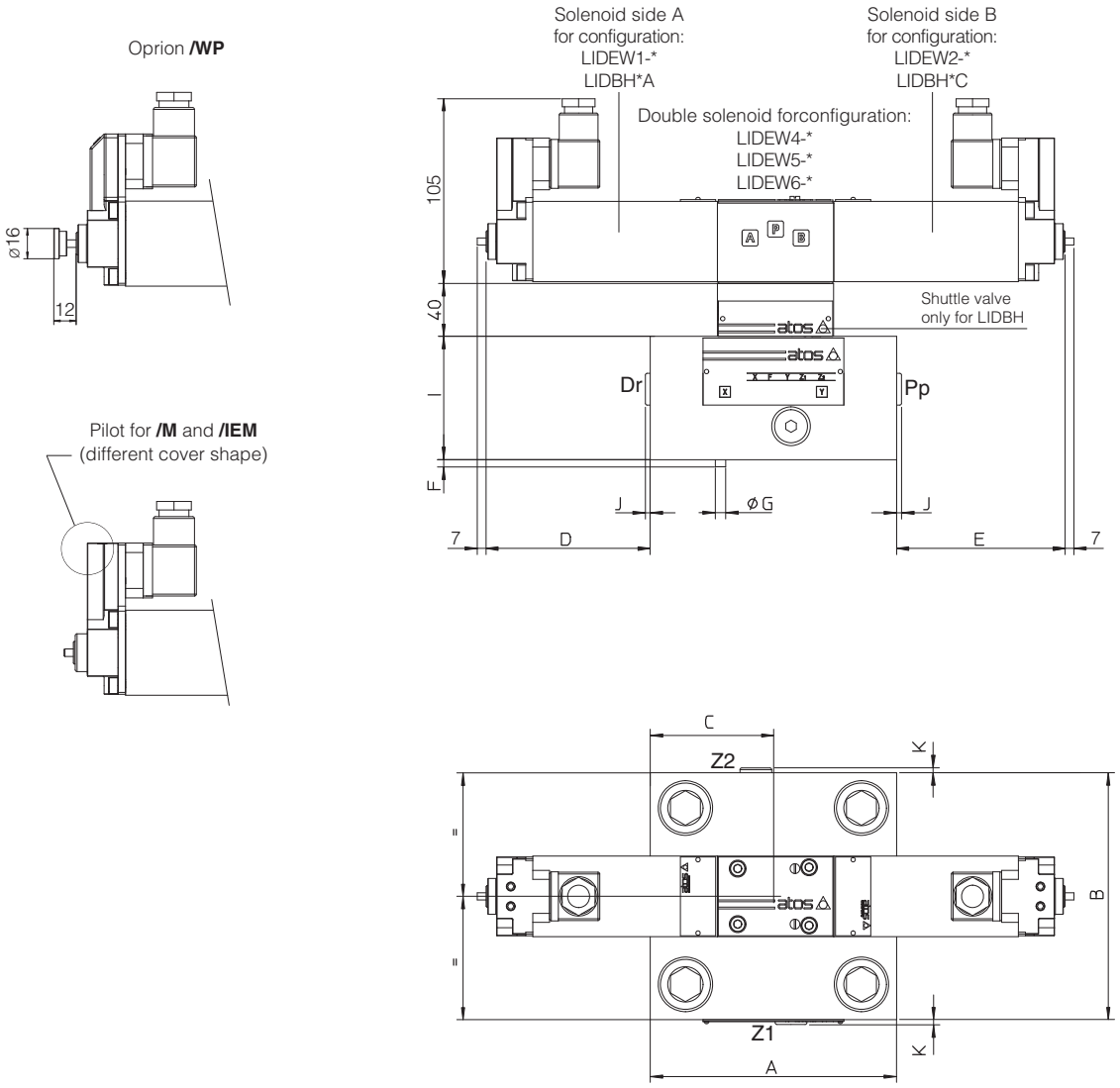


size 63



15 COVER INSTALLATION DIMENSIONS [mm] - for cartridge cavity dimensions see tech. table P006

Size 16 ÷ 63
Drawing of size 50



Notes referred to the below table:

(1) LIDEW1* - LIDBH*A: solenoid at side of port Y of cover
LIDEW2* - LIDBH*C: solenoid at side of port X of cover

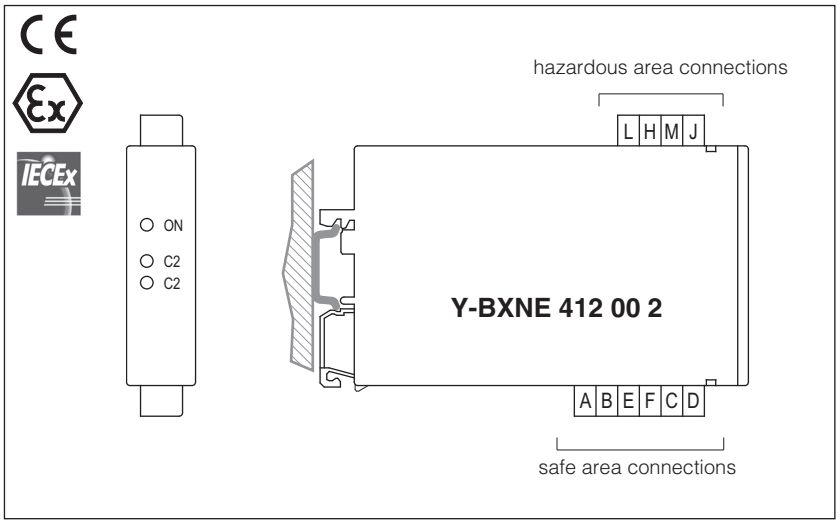
Size (1)	A	B	C	D max	E max	F	G	I	J	K	Ports Pp-Dr	Ports Z_1-Z_2	Seals	Fastening bolts (3)	Tightening torque [Nm]	Mass [Kg]
16	70	65	41	135	123	4	3	40	-	-	-	-	4 OR-108	Nr. 4 M8x45	35	3,95 ÷ 5,7
25	85	85	42,5	123	123	6	5	40	-	-	-	-	4 OR-108	Nr. 4 M12x45	125	4,35 ÷ 6,1
32	100	100	50	115	115	6	5	50	-	-	-	-	4 OR-2043	Nr. 4 M16x55	300	4,85 ÷ 6,7
40	125	125	62,5	102	102	6	5	60	3,5	-	G 1/4	-	4 OR-3043	Nr. 4 M20x70	600	7,75 ÷ 9,6
50	140	140	70	95	95	4	6	70	3,5	3,5	G 1/4	G 1/4	4 OR-3043	Nr. 4 M20x80	600	10,85 ÷ 12,7
63	180	180	90	75	75	4	6	80	3,5	3,5	G 3/8	G 3/8	4 OR-3050	Nr. 4 M30x90	2100	18,65 ÷ 20,4

16 RELATED DOCUMENTATION

X010	Basics for electrohydraulics in hazardous environments
X050	Summary of Atos intrinsically safe components certified to ATEX, IECEx
EX950	Operating and maintenance information for intrinsically safe valves
P006	Mounting surfaces and cavities for cartridge valves

Safety barriers for on-off intrinsically safe valves

DIN-rail panel format - **ATEX** and **IECEx**



Y-BXNE

Safety barriers are designed to electrically supply Atos intrinsically safe valves.

In intrinsically safe systems, the safety barrier is installed between the “safe area” and the “hazardous area” with potential presence of explosive gases and vapors, so that any fault that generates a high energy level, would not get carried over to the hazardous area.

Y-BXNE safety barriers are ATEX and IECEx certified according to the Ex ia protection mode

1 MODEL CODE OF I.S. BARRIER

Y-BXNE	412	00	*
Intrinsically safe barrier	**Model:** **412** = output voltage 19,5 V output current 170 mA 2 channels	**00** = no options	**Power supply**: **E** = 110 / 230 VAC **2** = 24 / 48 VDC

The above barrier can be used both for double or for single solenoid valves.
With one barrier, two single solenoid valves can be operated but not contemporary

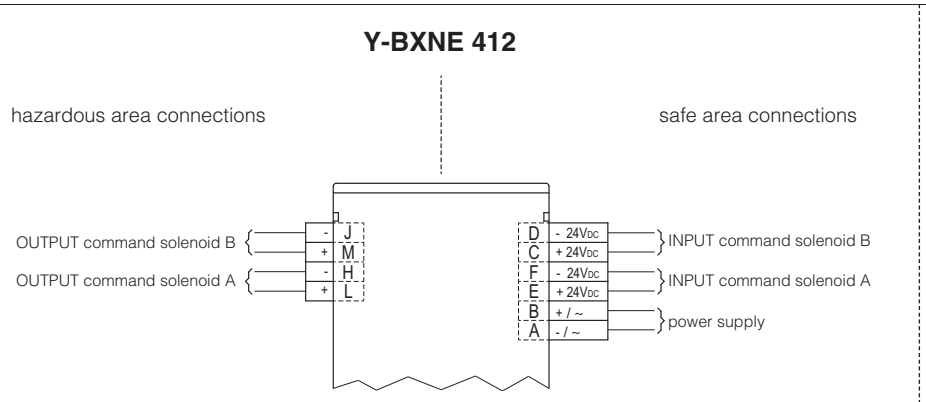
2 TECHNICAL CHARACTERISTICS

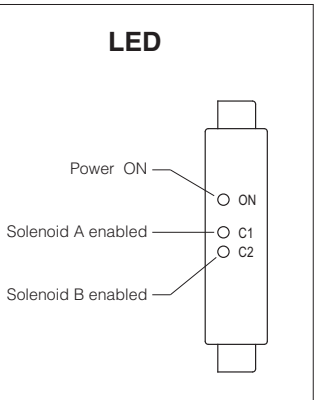
Power supply	21,6 ÷ 53 VDC or 110÷230 VAC ±10% (50/60 HZ)
Power consumption	< 3W
Output voltage Uo	19,5 V
Output current Io	170 mA
Output power Po	1,64 W
N° output channels	2
Galvanic insulation supply/output	2500 VAC / 50 Hz
Storage temperature	-25 °C ÷ +70 °C
Working temperature	-10 °C ÷ +60 °C
Format	Plastic box ; IP20 protection degree ; DIN-rail mounting as per EN50022
Electrical connections	screw terminals
Max conductor size	2,5 mm^2 max
Mass	200 gr

2.1 CERTIFICATION DATA

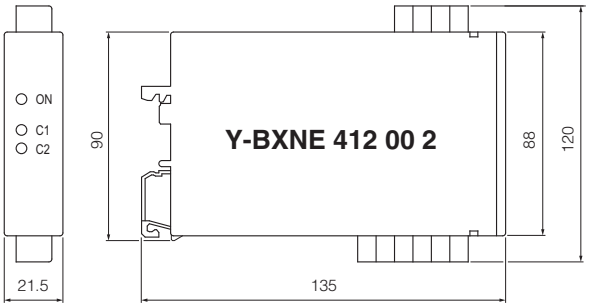
Certification	ATEX	IECEx
Type examination certificate	LCIE 02 ATEX 6104 X	LCI 09.0013 X
Method of protection	Ex II 1 G , Ex ia II C , Ex II 1 D , Ex ia D II C	
Applicabile standards	EN 60079 - 0 EN 60079 - 11 EN 61241 - 0 EN 61241 - 11	IEC 60079 - 0 IEC 60079 - 11 IEC 61241 - 0 IEC 61241 - 11

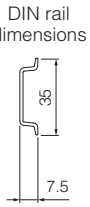
3 ELECTRIC CONNECTIONS AND LED

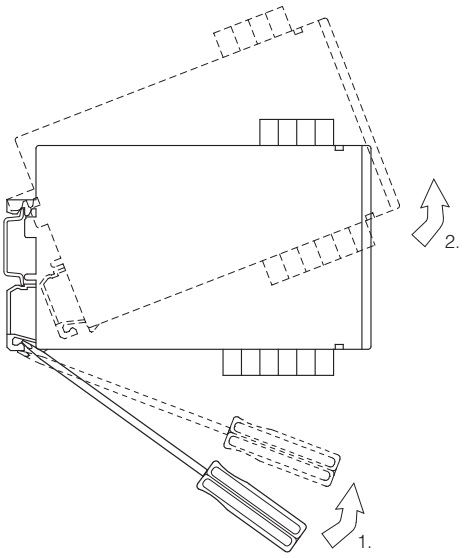




4 OVERALL DIMENSION

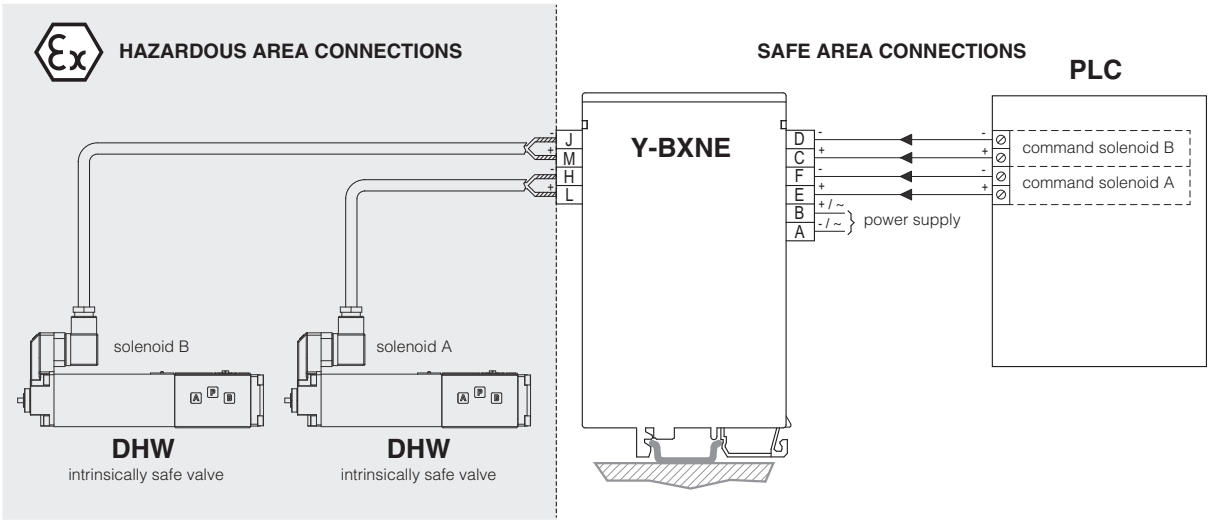






To unlock the safety barrier from the DIN rail:
1. pull down the locking slide with a screwdriver
2. rotate up the safety barrier

5 INSTALLATION EXAMPLE



Example of two single solenoid valves connection - the valves cannot be contemporaly operated

Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

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