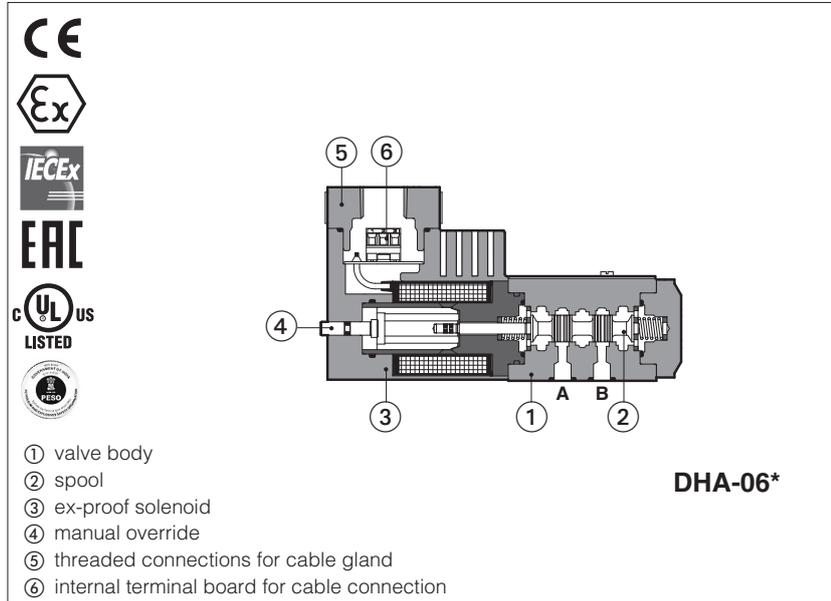


Ex-proof solenoid directional valves

multicertification **ATEX, IECEx, EAC** or **North American certification cULus**

on-off, direct operated, spool type



- 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

Spool type, direct operated directional valves equipped with ex-proof solenoids certified for safe operation in hazardous environments with potentially explosive atmosphere.

Certifications:

- **Multicertification** ATEX, IECEx and EAC 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 solenoid enclosure prevents the propagation of accidental internal sparks or fire to the external environment.

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

Mounting surface: **ISO 4401 size 06**

Max flow: **70 l/min**

Max pressure: **350 bar**

1 MODEL CODE

DHA	/	*	-	0	63	/	1/2	/	M	/	*	24DC	/	**	/	*
<p>Ex-proof directional valve, direct operated</p> <p>Certification type: Multicertification ATEX, IECEx, EAC: - = omit for Group II 2G / II 2D (1) M = Group I M2 (mining) North American Certification: UL = cULus</p> <p>Valve size (ISO 4401) 0 = 06</p> <p>Configuration, see section 2</p> <p>Spool type, see section 2</p> <p>Solenoid threaded connection for cable gland fitting: GK = GK-1/2" - not for cULus M = M20x1,5 - not for cULus NPT = 1/2" NPT</p>																
<p>Seals material, see section 6: - = NBR PE = FKM BT = HNBR (2)</p> <p>Series number</p> <p>Voltage code - see section 5</p>																
<p>Options: 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 (3): MV = vertical hand lever AMV = vertical hand lever installed at side of port B</p>																

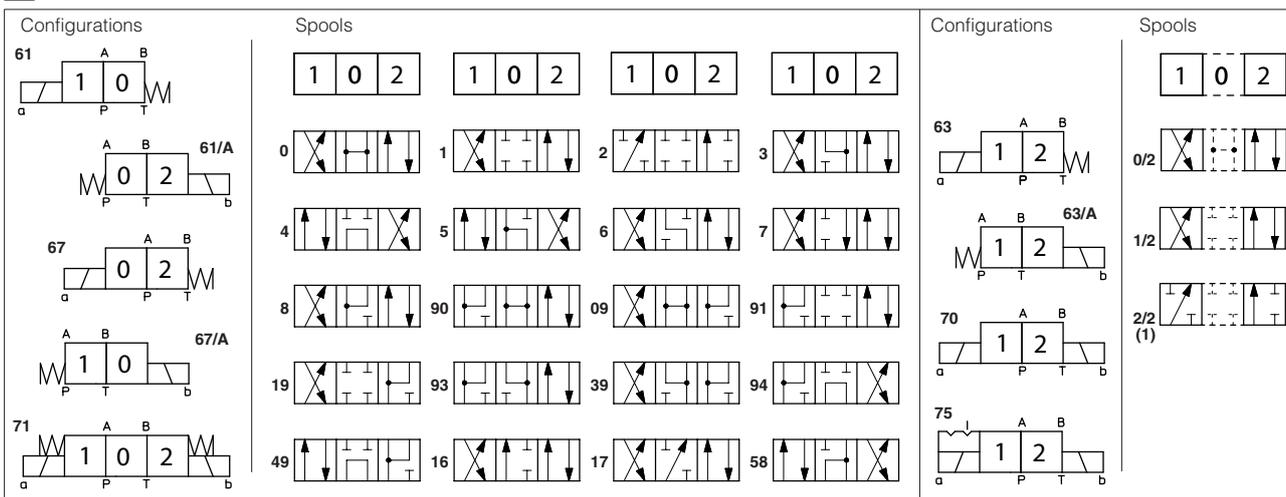
(1) The valves with Multicertification for Group II are also certified according to Indian petroleum and Explosion Safety Certification **PESO**. The PESO certificate can be downloaded from www.atos.com, catalog on line, **technical information** section

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

(3) 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**

⚠ 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	Roughness index Ra 0,4 - flatness ratio 0,01/100 (ISO 1101)
MTTFd values according to EN ISO 13849	150 years, for further details see technical table P007
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 (body and solenoid housing)
Compliance	Explosion proof protection, see section 7

4 HYDRAULIC CHARACTERISTICS

Operating pressure	Ports P,A,B: 350 bar; Port T 210 bar
Rated flow	See diagrams Q/Δp at section 11
Maximum flow	70 l/min , see operating limits at section 12

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		
Fluid contamination class	ISO 4406 class 21/19/16 NAS 1638 class 10, in line filters of 25 μm (β25 ≥75 recommended)		
Hydraulic fluid	Suitable seals type	Classification	Ref. Standard
Mineral oils	NBR, FKM, HNBR	HL, HLP, HLPD, HVL, HVLDP	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		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		ATEX: CESI 03 ATEX 057x IECEX: IECEX CES 12.0007x	20170324 - E366100	
Method of protection	<ul style="list-style-type: none"> • ATEX 2014/34/EU 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 • EAC Ex II 2G Exd IIC T6/T4 		<ul style="list-style-type: none"> • ATEX 2014/34/EU Ex I M2 Ex db I Mb • IECEX Ex db I Mb 	<ul style="list-style-type: none"> • 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
Mechanical construction Flameproof housing enclosure Ex d	EN 60079-0: 2012, EN 60079-1: 2007 IEC 61508: 2010			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 examiner certificates can be downloaded from www.atos.com, catalog on line, **technical information** section

(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 PCB 3 poles terminal board
 ② = GND suitable for wires cross sections
 ③ = Coil 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 + PCB 3 poles terminal board
 ② = GND sted cable section up to 1,5 mm²
 ③ = Coil - (max AWG16), see section 10 note 1
 alternative GND screw terminal
 connected to solenoid housing

9 CABLE SPECIFICATION AND TEMPERATURE

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

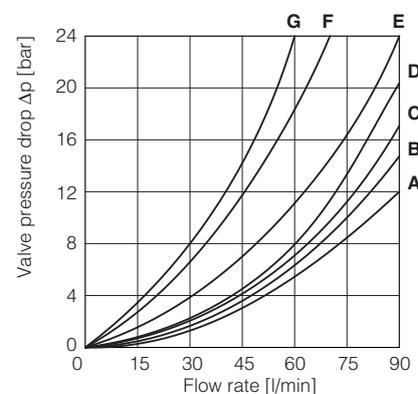
10 CABLE GLANDS only for Multicertification

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 **K600**

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

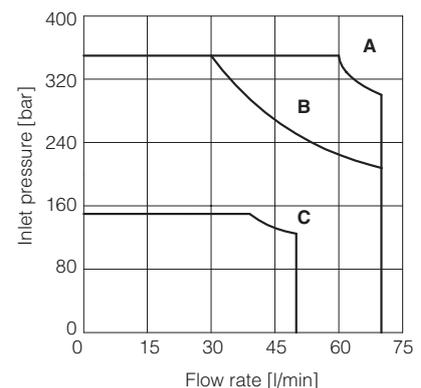
11 Q/Δp DIAGRAMS (based on mineral oil ISO VG 46 at 50°C)

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	



12 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
3/1, 4, 4/8, 5, 5/1, 16, 17, 19, 39, 49, 58, 58/1, 09, 90, 91, 93, 94	C



13 DIMENSIONS [mm] - Multicertified and UL

ISO 4401: 2005

Mounting surface: 4401-03-02-0-05

Fastening bolts: 4 socket head screws:

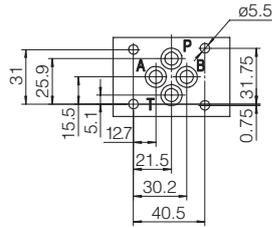
M5x50 class 12.9

Tightening torque = 8 Nm

Seals: 4 OR 108

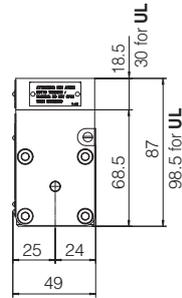
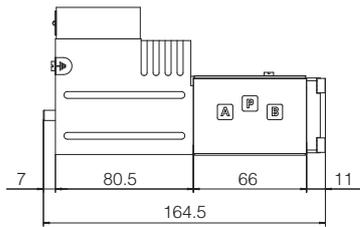
Ports P,A,B,T: $\varnothing = 7.5$ mm (max)

Valve's bottom view



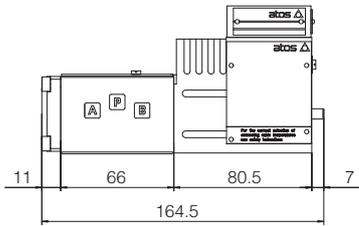
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

DHA-06

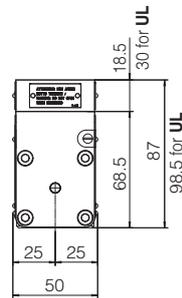
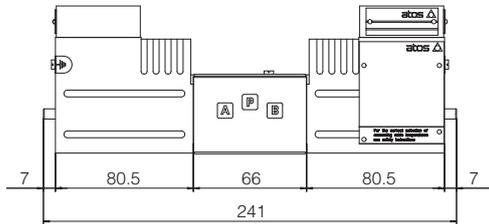


Mass (Kg)	
DHA-06	2,65
DHA-07	4,3
Option /O	+0,35
Option /WP	+0,25

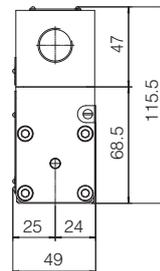
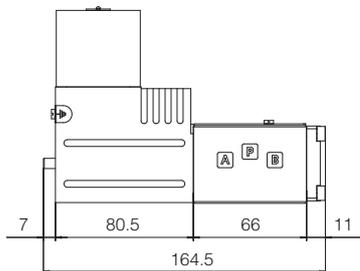
DHA-06 /A



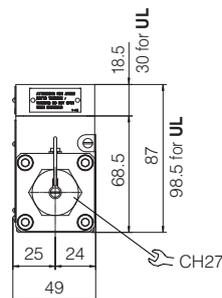
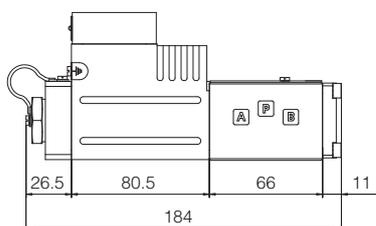
DHA-07



DHA-06 /O



DHA-06 /WP



ISO 4401: 2005

Mounting surface: 4401-03-02-0-05

Fastening bolts: 4 socket head screws:

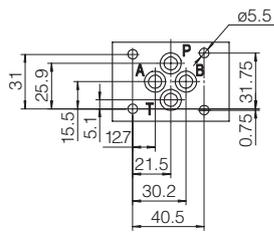
M5x30 class 12.9

Tightening torque = 8 Nm

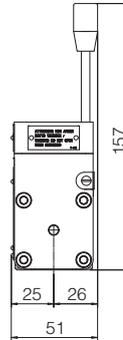
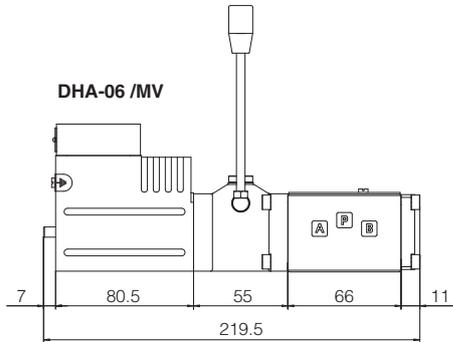
Seals: 4 OR 108

Ports P,A,B,T: $\varnothing = 7.5$ mm (max)

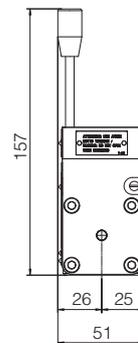
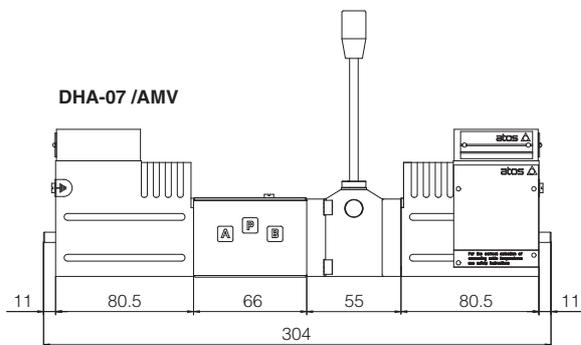
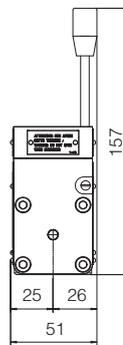
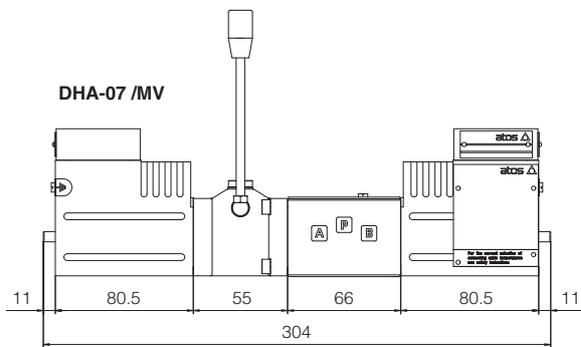
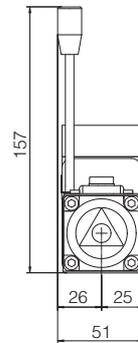
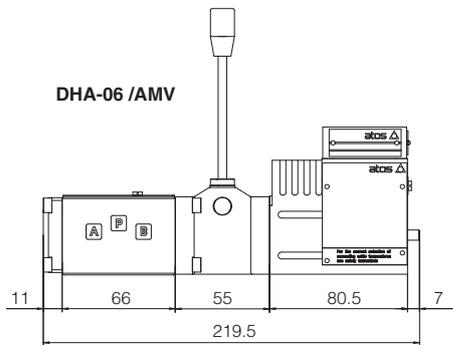
Valve's bottom view



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



Mass (Kg)	
DHA-06/MV	2,9
DHA-07/MV	4,55



14 RELATED DOCUMENTATION

- X010** General guideline for ex-proof components
- TT291** Safety instruction for Multicertification Atex, IECEx, EAC - Group II
- TT354** Safety instruction for Multicertification Atex, IECEx - Group I Mining