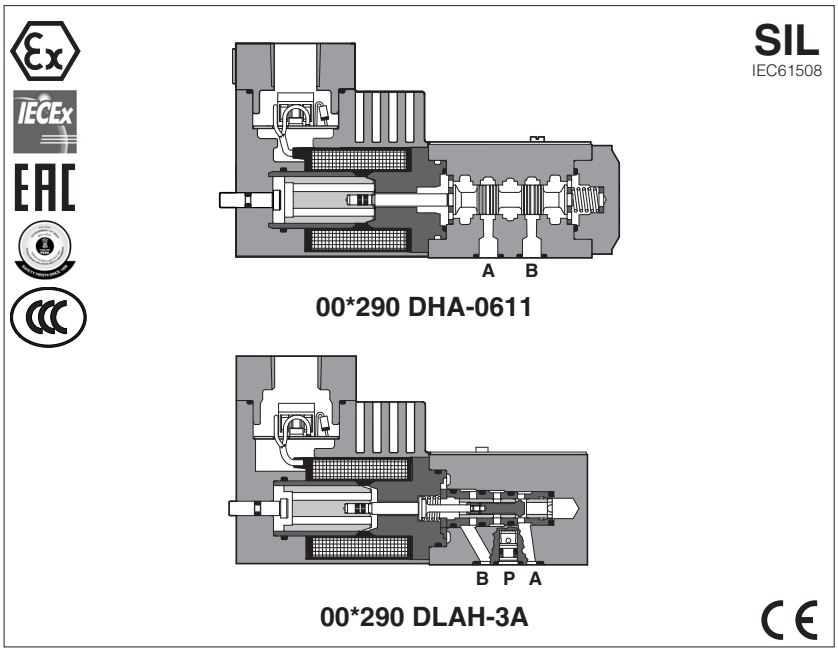
Explosion-proof solenoid valves with suppressor diode

on/off directional and leak-free - **ATEX, IECEx, EAC, PESO, CCC**

Availability and price only on request



On/off directional and leak-free valves equipped with explosion-proof solenoids provided with internal suppressor diode which eliminates the electric disturbances at the valve de-energizing.

Certifications:

- Multicertification **ATEX**, **IECEx**, **EAC**, **PESO**, **CCC** for gas group **II 2G** and dust category **II 2D**

DHA, DLAH and DLAHM 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.

1 **DHA MODEL CODE**

00*290	DHA	-	0	63	1/2	/	M	/	*	24DC	**	/	*

00*290: Special execution with internal suppressor diode

DHA: Spool type - direct valve
Ex-proof Multicertification
ATEX, IECEx, EAC, PESO, CCC
Group II 2G / II 2D

0: **Valve size** (ISO 4401)
0 = 06

63: **Configuration**, see section 2

1/2: **Spool type**, see section 2

M: **Solenoid threaded connection** for cable gland fitting:
GK = GK-1/2"
M = M20x1,5
NPT = 1/2" NPT

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

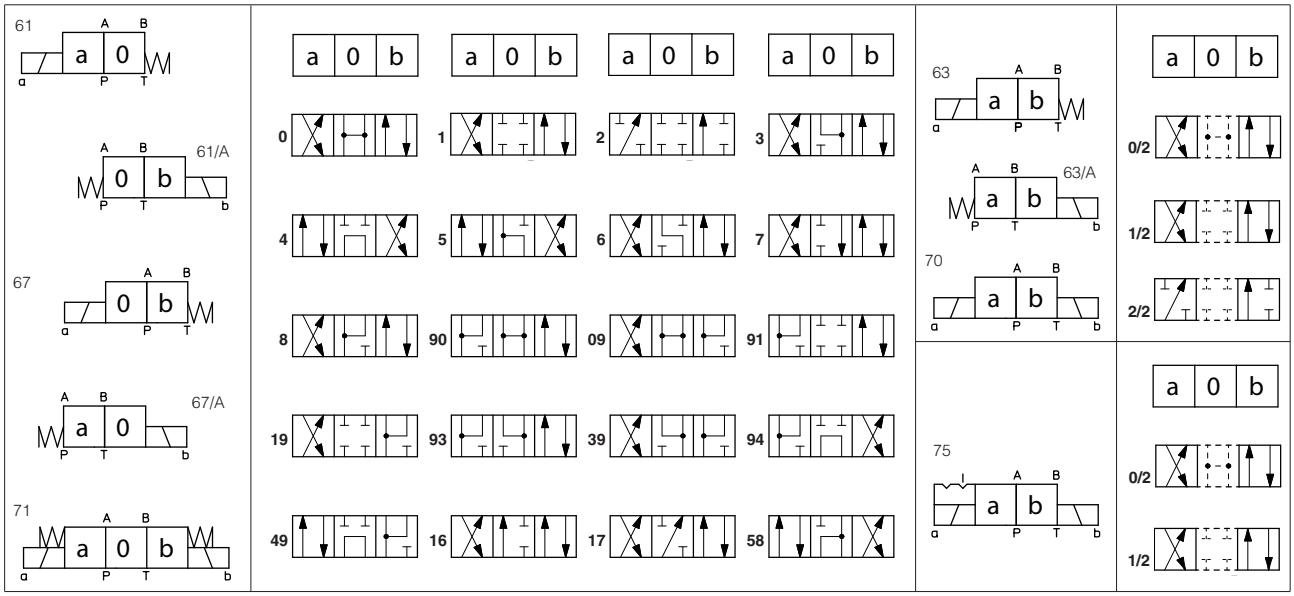
24DC: **Voltage code** - see section 8

******: Series number

*****: Seals material, see section 9:
- = NBR
PE = FKM
BT = HNBR

(1) 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**

2 DHA CONFIGURATIONS and SPOOLS



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 DLAH* and CART-DLAH* MODEL CODE

00*290
Special execution with internal suppressor diode

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

Poppet type - direct valve
Ex-proof Multicertification
ATEX, IECEx, EAC, PESO, CCC
Group II 2G / II 2D **(1)**
ISO 06 subplate version
DLAH = max flow 12 l/min
DLAHM = max flow 30 l/min

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

Configuration see section 4
A **C**

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

Solenoid threaded connection for cable gland fitting:
GK = GK-1/2"
M = M20x1,5
NPT = 1/2" NPT

Voltage code - see section 8

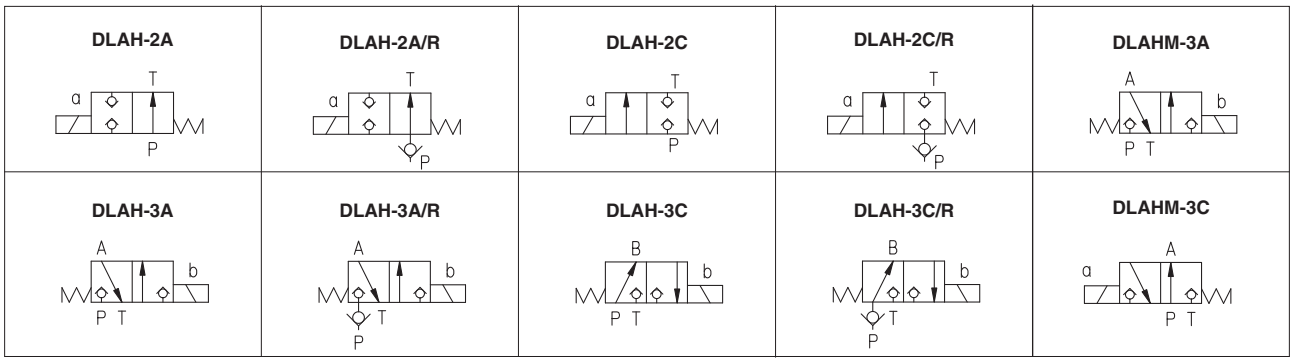
Series number

Seals material, see section 9:
- = NBR
PE = FKM
BT = HNBR

(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

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

4 DLAH* CONFIGURATIONS AND HYDRAULIC SYMBOLS (representation according to ISO 1219-1)



5 SIL IEC61508 compliance with IEC 61508: 2010

DHA, DLAH and DLAHM (multicertified for surface) 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)

6 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 10

7 HYDRAULIC CHARACTERISTICS

Operating pressure	Ports P,A,B: DHA, DLAH, **350** bar; DLAHM, ports P,A: **315** bar Port T **210** bar
Rated flow	See diagrams Q/Δp at section 14
Maximum flow	DHA = **70 l/min**, see operating limits at section 15 DLAH: **12 l/min**, DLAHM: **30 l/min**, see operating limits at section 13

8 ELECTRICAL CHARACTERISTICS

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

9 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, 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

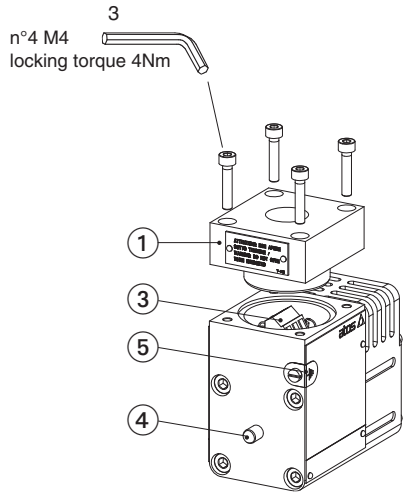
10 CERTIFICATION DATA

Valve type	DHA, DLAH, DLAHM	
Certifications	Multicertification Group II **ATEX, IECEx, EAC, PESO, CCC**	
Solenoid certified code	**OA**	
Type examination certificate **(1)**	ATEX: CESI 02 ATEX 014 IECEx: IECEx CES 10.0010x EAC: TC RU C-IT. 08.B.01784 PESO: P468212/2 CCC: 2020322307003240	
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 db IIC T6/T4/T3 Gb • CCC Ex d IIC T6/T4/T3 Gb Ex tD A21 IP66/IP67 T85°C/T135°C/T200°C	
Temperature class	**T6**	**T4**
Surface temperature	≤ 85 °C	≤ 135 °C
Ambient temperature **(2)**	-40 ÷ +45 °C	-40 ÷ +70 °C
Mechanical construction Flameproof housing enclosure Ex d	EN 60079-0 EN 60079-1 EN 60079-31	IEC 60079-0 IEC 60079-1 IEC 60079-31
Cable entrance: threaded connection vertical (standard) or horizontal (option /O)	**GK** = GK-1/2" **M** = M20x1,5 **NPT** = 1/2" NPT	

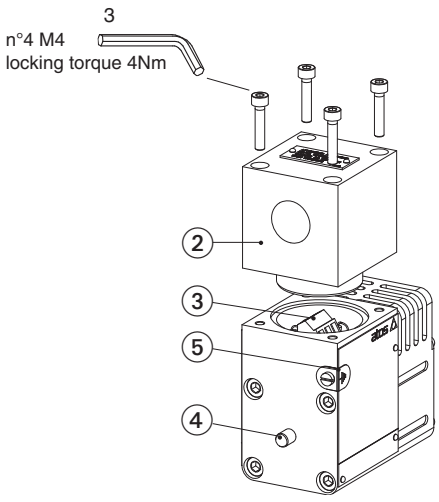
(1) The type examinator certificates can be downloaded from www.atos.com
(2) The solenoids **Group II** are certified for minimum ambient temperature -40°C.
In case the complete valve must withstand with minimum ambient temperature of -40°C, select **/BT** in the model code

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

11 EX PROOF SOLENOIDS WIRING



Standard version



Option /O

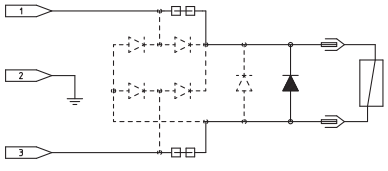
① cover with threaded connection for vertical cable gland fitting
② cover with threaded connection for horizontal cable gland fitting
③ terminal board for cables wiring
④ standard manual override
⑤ screw terminal for additional equipotential grounding

⚠ **Pay attention to coil polarity**

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

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

Electric scheme



Dotted line = additional diodes for AC version

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

Multicertification 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

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 Group II	Max surface temperature [°C] Group II	Min cable temperature
45 °C	T6	85 °C	not prescribed
70 °C	T4	135 °C	90 °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 **KX600**

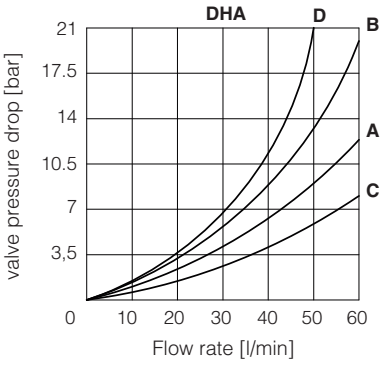
Note: a Loctite sealant type 545, should be used on the cable gland entry threads

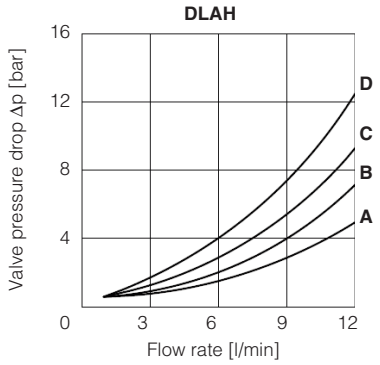
14 Q/Δp DIAGRAMS OF ON/OFF DIRECTIONAL CONTROLS (based on mineral oil ISO VG 46 at 50°C)

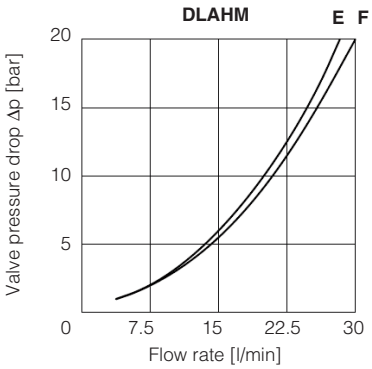
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0	C	C	C	C	
0/2, 1, 1/2	A	A	A	A	
3	A	A	C	C	
4, 5	D	D	D	D	A
6	A	A	C	A	
7	A	A	A	C	
8	C	C	B	B	

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

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

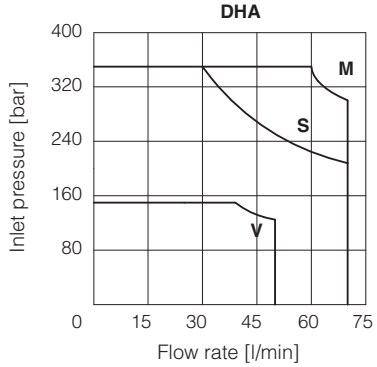




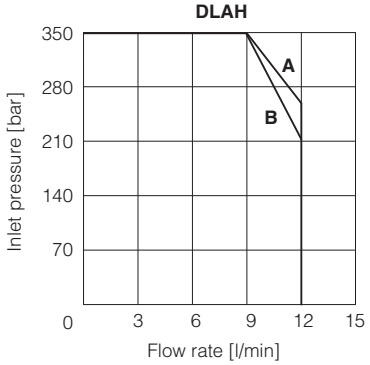


15 OPERATING LIMITS OF ON/OFF DIRECTIONAL CONTROLS (based on mineral oil ISO VG 46 at 50°C)

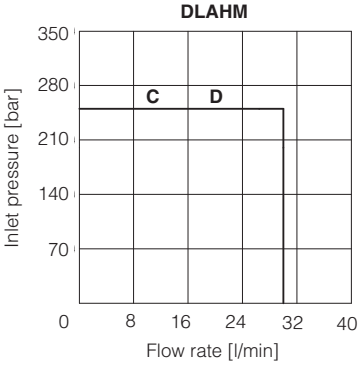
The diagram have been obtained with warm solenoids and power supply at lowest value (V_{nom}-10%). For DHA valves the curves refer to application with symmetrical flow through the valve (i.e. P → A and B → T). In case of asymmetric flow the operating limits must be reduced.



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



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

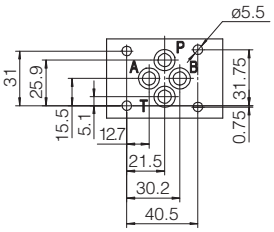


C = DLAHM-3A;
D = DLAHM-3C

00*290 DHA

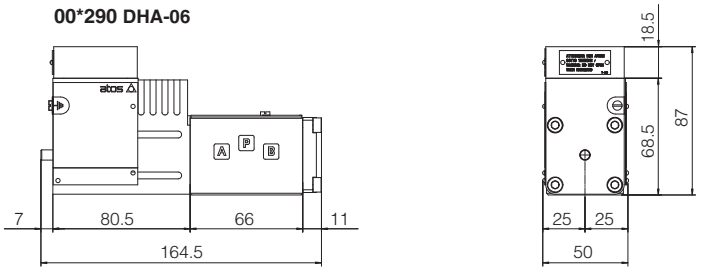
ISO 4401: 2005 (see table P005)
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)

Valve's bottom view

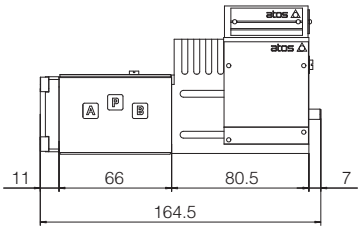


P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

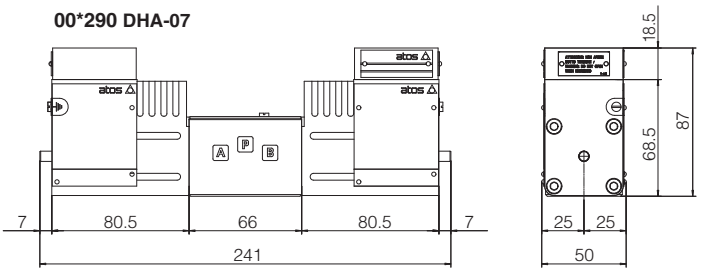
00*290 DHA-06



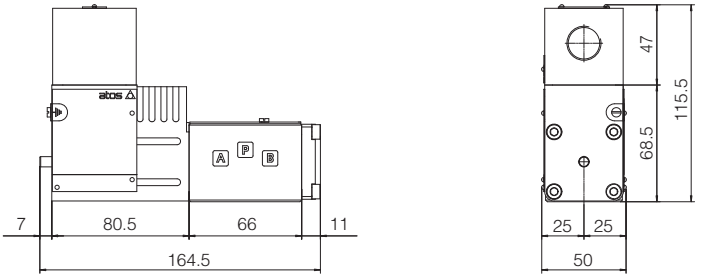
00*290 DHA-06 /A



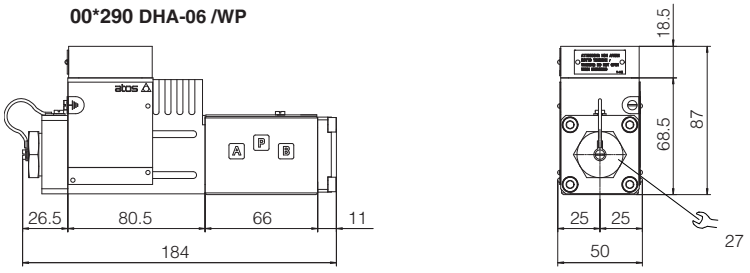
00*290 DHA-07



00*290 DHA-06 /O



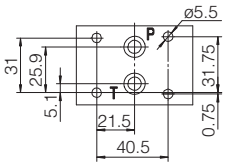
00*290 DHA-06 /WP



00*290 DLAH-2*

ISO 4401: 2005
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

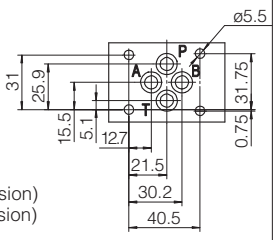


00*290 DLAH-3*

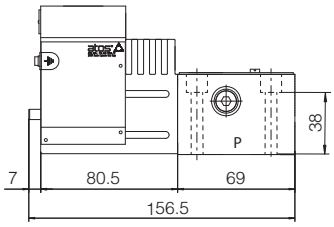
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5X50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)

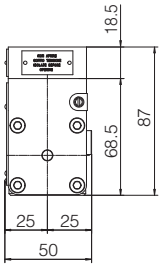
P = PRESSURE PORT
A = USE PORT (not used for DLAH-3C version)
B = USE PORT (not used for DLAH-3A version)
T = TANK PORT

Valve's bottom view

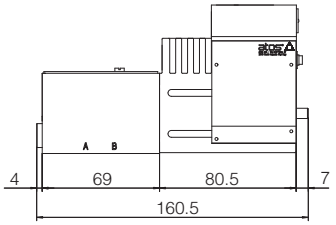


00*290 DLAH-2A, DLHA-2C





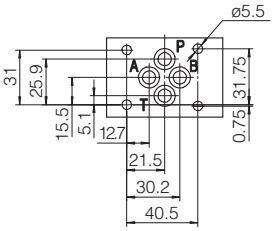
00*290 DLAH-3A ,DLAH-3C



00*290 DLAHM-3*

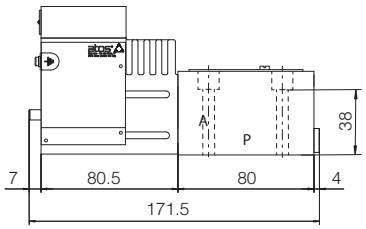
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts: 4 socket head screws:
M5X50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max)

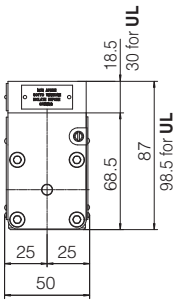
Valve's bottom view



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

00*290 DLAHM-3C





00*290 DLAHM-3A