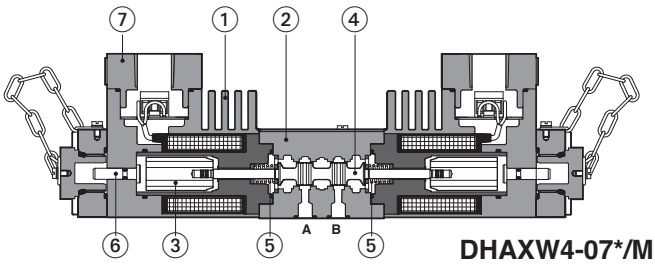
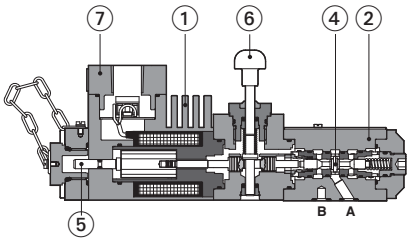
Stainless steel ex-proof solenoid directional valves for water base fluids

on-off, direct or pilot operated - **ATEX, IECEx, EAC, PESO, CCC** or **cULus**

Availability and price only on request



DHAXW4-07*/M



DLAHMXW4-3A/M/R

① Ex-proof solenoid
② Valve body
③ Solenoid plunger
④ Spool
⑤ Manual override pin
⑥ Manual reset, option R
⑦ Cable entrance

Ex-proof solenoid directional valves with stainless steel internal parts for application with water base fluids.

Features:

- These valves are made by selected inoxidizable materials for internal parts to withstand applications with water base fluids or just pure water. External components are derived from standard valves.
- Two basic versions are available, poppet type, 3-way leak free (suitable for accumulator systems) or spool type, 4-way valves.
- Ex-proof solenoids ①, are provided with **ATEX, IECEx, EAC, CCC** Multicertification or **cULus** North American certification

Options:

- Handwheel manual override (option /V)
- Manual reset ⑥ (option /R) for safety applications
- Horizontal cable entrance.

Common Applications:
Steel plants, die casting, foundry.

1 SUMMARY OF AVAILABLE MODELS

Code	Description	ISO 4401 size	Voltages		Multicertification		cULus		Max flow (l/min)	Max pressure (bar)
			DC	AC 50/60Hz	T class	Power	T class	Power		
DHAXW6 **DHAXW4**	direct, 4 way, spool type	06	12 24 48 110 220	12 24 110 230	T6, T4 T4, T3	8 W 25 W	T6, T5 T3	12 W 33 W	60 70	350
DLAHXW6 **DLAHXW4**	direct, 3 way, poppet type	06			T6, T4 T4, T3	8 W 25 W	T6, T5 T3	12 W 33 W	10 12	315 350
DLAHMXW6 **DLAHMXW4**	direct, 3 way, poppet type	06			T6, T4 T4, T3	8 W 25 W	T6, T5 T3	12 W 33 W	25 30	250 315
DLAPXW6	piloted, 3 way, spool type	-			T6, T4	8 W	T6, T5	12 W	220	315

2 MODEL CODE OF DHAXW

DHA	XW	4	*	-	0	63	1/2	-	M	V	24DC	**	/*

DHA: Spool type - direct

XW: Stainless steel execution for internal parts see section 9 for material specification

4: **Solenoid power and Temperature class,** see also certification data in section 11:
Multicertification
4 = 25W, class **T4/T3**
6 = 8W, class **T6/T4**
cULus
4 = 33W, class **T3**
6 = 12W, class **T6/T5**

*: **Certification type**:
- = omit for **Multicertification** (Group II)
UL = cULus certification

0: Size: **0** = 06

63: Valve configuration, see section 4
61, 63, 71, 75
(configurations 63 and 75 are available only with spool type 1/2)

1/2: Spool type, see section 4

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

V: **Options** - see section 15 for possible combined options:
A = solenoid at side of port B
V = with handwheel manual override
O = horizontal cable entrance

24DC: Voltage code - see section 8

**: Series number

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

3 MODEL CODE OF POPPET TYPE LEAK FREE VALVES

DLAH	XW	6	*	-	3	A	-	M	V	24DC	**	/*

DLAH = direct (10 l/min)
DLAHM = direct (25 l/min)
DLAP = electro-hydraulically piloted

Stainless steel execution for internal parts
see section 9 for material specification

Solenoid power and Temperature class,
see also certification data in section 11 :
Multicertification
4 = 25W, class **T4/T3**
6 = 8W, class **T6/T4**
cULus
4 = 33W, class **T3**
6 = 12W, class **T6/T5**

Certification type:
- = omit for **Multicertification** (Group II)
UL = cULus certification

3 = three way

Valve configuration, see section 8.1
A = A to T in rest position **C** = P to A in rest position

Solenoid threated connection:
M = M20x1,5 UNI-4535 (6H/6g)
NPT = 1/2" NPT ANSI/ASME B46.1 (tapered) only for **/UL**

Options - see section 15 for possible combined options:
O = horizontal cable entrance
R = with solenoid manual reset
V = with handweel manual override
Only for DLAPXW
D = internal drain
E = external pilot pressure

Voltage code - see section 8

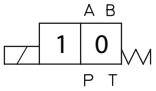
Series number

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

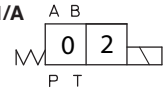
4 CONFIGURATIONS and SPOOLS of spool type valves

Configurations

61



61/A



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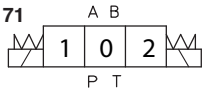
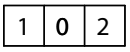


Spools



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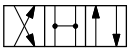

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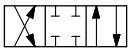

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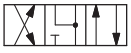
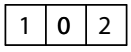
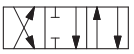


Spools



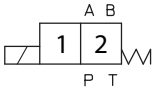
6

7

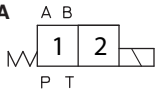


Configurations

63



63/A



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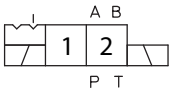
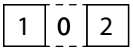


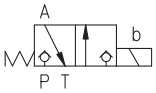
Spools



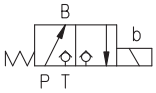
1/2

5 CONFIGURATIONS of POPPET TYPE leak free valves

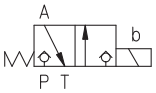
DLAHXW*-3A



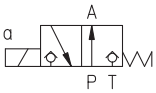
DLAHXW*-3C



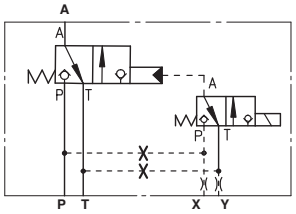
DLAHMXW*-3A



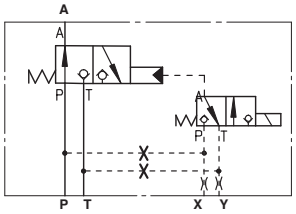
DLAHMXW*-3C



DLAPXW-3A



DLAPXW-3C



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	75 years (DLAPXW), 150 years (DHAXW, DLAHXW, DLAHMXW), for further details see tech. table P007
Ambient temperature	**Standard** = -40°C ÷ +70°C **/PE** option = -20°C ÷ +70°C
Storage temperature range	**Standard** = -40°C ÷ +80°C **/PE** option = -20°C ÷ +80°C
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 2015/863/EU REACH Regulation (EC) n°1907/2006

7 HYDRAULIC CHARACTERISTICS

Max operating pressure	DHAXW, DLAHXW Ports P,A,B = **350** bar; Port T = **110** bar DLAHMXW Ports P,A,B = **315** bar; Ports T = **110** bar DLAPXW Ports P,A,B, X = **315** bar; Ports T, Y = **110** bar
Piloting pressure	Only for DLAPXW - max **315** bar; min: see diagram at section 18
Rated flow	See diagrams Q/Δp at section 16
Max flow	DHAXW = **70 l/min** DLAHXW = **12 l/min** DLAHMXW = **25 l/min** DLAPXW = **220 l/min** See operating limits at section 17
Internal leakages	Only for DLAHXW, DLAHMXW, DLAPXW: ≤ 0,36 cm³/min (less than 5 drops/min)

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

8 ELECTRICAL CHARACTERISTICS

Valve type		**DHAXW4 DLAHXW4 DLAHMXW4**	**DHAXW6 DLAHXW6 DLAHMXW6 DLAPXW6**	**DHAXW4/UL DLAHXW4/UL DLAHMXW4/UL**	**DHAXW6/UL DLAHXW6/UL DLAHMXW6/UL DLAPXW6/UL**
Voltage code **(1)**	VDC ±10%	**12DC, 24DC, 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		25W	8W	33W	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

9 MATERIALS SPECIFICATION

Valve code	**Solenoid housing**	**Valve body**	**Internal parts**	**Spring**	**Seals**	
DHAXW	Cast iron / Carbon steel	AISI 316L	AISI 316L, 420B, 440C, 430F	AISI 302	NBR 70Sh low temp	FKM (viton)
DLAHXW DLAHMXW	Cast iron / Carbon steel	AISI 316L	AISI 316L, 420B, 440C, 430F	AISI 302	NBR 70Sh low temp	FKM (viton)
DLAPXW	Cast iron / Carbon steel	AISI 630	AISI 316L, 420B, 440C, 430F	AISI 302	NBR 70Sh low temp	FKM (viton)

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

Seals, recommended fluid temperature **(1)**	NBR low temp. seals (standard) = -40°C ÷ +60°C FKM seals (/PE option) = -20°C ÷ +80°C		
Recommended viscosity	15÷100 mm²/s - max allowed range 2.8 ÷ 500 mm²/s min = 0,9 mm²/s for X full stainless steel execution with pure water		
Max fluid contamination level	ISO4406 class 20/18/15 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog		
Hydraulic fluid	**Suitable seals type**	**Classification**	**Ref. Standard**
Mineral oils	NBR low temp., FKM	HL, HLP, HLPD, HVLP, HVLPD	DIN 51524
Flame resistant without water	FKM	HFDU, HFDR	ISO 12922
Flame resistant with water **(2)**	NBR low temp.	HFA-E, HFA-S, HFB, HFC	

(1) The operating temperature of the fluid must be compatible with the maximum viscosity range allowed for the valve

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

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

11 CERTIFICATION DATA

11.1 Certification data for ambient temperature range -40 ÷ +70°C

Valve type	DHAXW4, DLAHW4 DLAHMXW4		DHAXW6, DLAHW6 DLAHMXW6, DLAPXW6		DHAXW4**/UL**, DLAHW4**/UL** DLAHMXW4**/UL**	DHAXW6**/UL**, DLAHW6**/UL** DLAHMXW6**/UL,** DLAPXW6**/UL**	
Certifications	Multicertification **ATEX IECEx EAC PESO CCC**				North American **cULus**		
Solenoid certified code	**OAKXW/WP**		**OAXW/WP**		**OAKXW/EC/WP**	**OAXW/EC/WP**	
Temperature class	**T4**	**T3**	**T6**	**T4**	**T3**	**T6**	**T5**
Surface temperature	≤ 135°C	≤ 200°C	≤ 85°C	≤ 135°C	≤ 200°C	≤ 85°C	≤ 100°C
Ambient temperature	-40 ÷ +45°C	-40 ÷ +70°C	-40 ÷ +45°C	-40 ÷ +70°C	-40 ÷ +70°C	-40 ÷ +55°C	-40 ÷ +70°C

11.2 Certificates and applicable standards

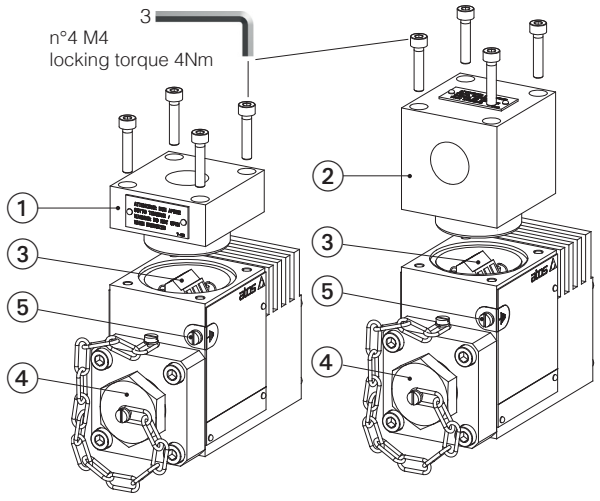
Certifications	Multicertification Group II **ATEX IECEx EAC PESO CCC**	North American **cULus**
Type examination certificate **(1)**	ATEX: CESI 02 ATEX 014 IECEx: IECEx CES 10.0010x EAC: RU C - IT.AЖ38.B.00425/21 PESO: P468212/2 CCC: 2020322307003240	20170324 - E366100
Method of protection	• ATEX Ex II 2G Ex db IIC T6/T4/T3 Gb Ex II 2D Ex tb IIIC T85°C/T200°C Db • IECEx Ex db IIC T6/T4/T3 Gb Ex tb IIIC T85°C/T200°C Db • EAC 1Ex d IIC T6/T4/T3 Gb X Ex tb IIIC T85°C/T200°C Db X • 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	• UL 1203 Class I, Div.I, Groups C & D Class I, Zone I, Groups IIA & IIB
Applicable standards	EN 60079-0 IEC 60079-0 EN 60079-1 IEC 60079-1 EN 60079-31 IEC 60079-31	UL 1203 and UL429, CSA 22.2 n°30-1986 CSA 22.2 n°139-13
Cable entrance:	M20x1,5	1/2" NPT ANSI/ASME B46.1

(1) The type examinator certificates can be downloaded from www.atos.com

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

12 EX PROOF SOLENOIDS WIRING

Multicertification



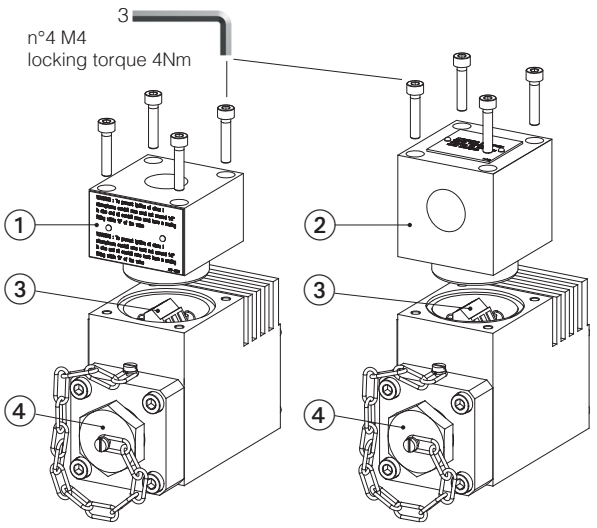
Standard version **Option /O**

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 protected by cap
⑤ screw terminal for additional equipotential grounding

1 = Coil
2 = GND
3 = Coil

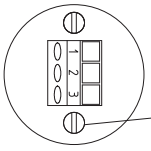
PCB 3 poles terminal board suitable for wires cross sections up to 2,5 mm² (max AWG14)

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 protected by cap



⚠ **Pay attention to respect the polarity**

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

PCB 3 poles terminal board suggested cable section up to 1,5 mm² (max AWG16), see section 11 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

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

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

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 -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

Solenoid code	Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min cable temperature
OAXW	45°C	T6	85°C	not prescribed
	70°C	T4	135°C	90°C
OAKXW	45°C	T4	135°C	100°C
	50°C	T3	200°C	110°C
	60°C	T3	200°C	120°C
	70°C	T3	200°C	130°C

cULus certification

Solenoid code	Max ambient temperature [°C]	Temperature class	Max surface temperature [°C]	Min cable temperature
OAXW/EC	55°C	T6	85°C	100°C
	70°C	T5	100°C	100°C
OAKXW/EC	55°C	T3	200°C	115°C
	70°C	T3	200°C	140°C

14 CABLE GLANDS - only **Multicertification**

Cable glands with threaded connections 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 OPTIONS

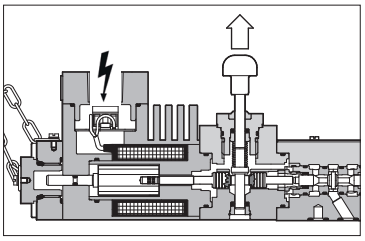
A = solenoid at side of port B (only for DHAXW single solenoid valves)
O = horizontal cable entrance , to be selected in case of limited verical space
R = the R device operates as a security
When the valve is electrically energized, the manual reset knob must be manually lifted at the same time in order to permit the poppet to move from the rest position to the switched position.
The return of the valve to the rest position does not require lifting the manual reset knob.
V = with handweel manual override

Only for DLAPXW

D = internal drain
E = external pilot pressure

Option /R

Lift to permit the valve switching



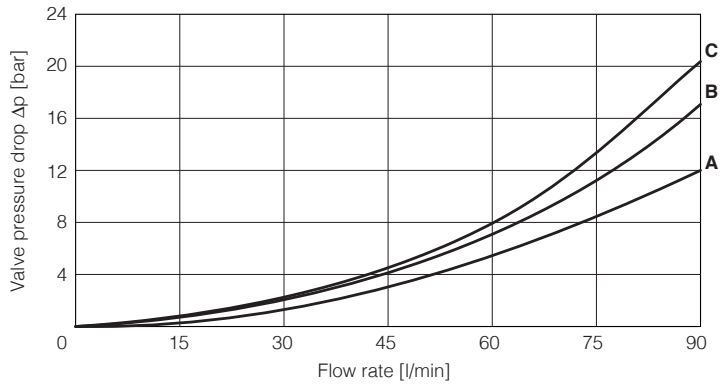
15.1 Possible combined options

DHAXW: AO, AV, OV, AOV
DLAHXW, DLAHMXW: OR, OV
DLAPXW: DE, DO, DR, DV, EO, ER, EV, OR, OV, DEO, DER, DEV, DOR, DOV, EOR, EOV

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

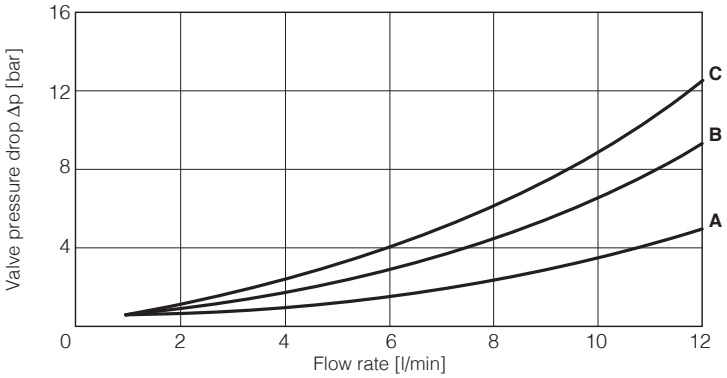
DHAXW

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



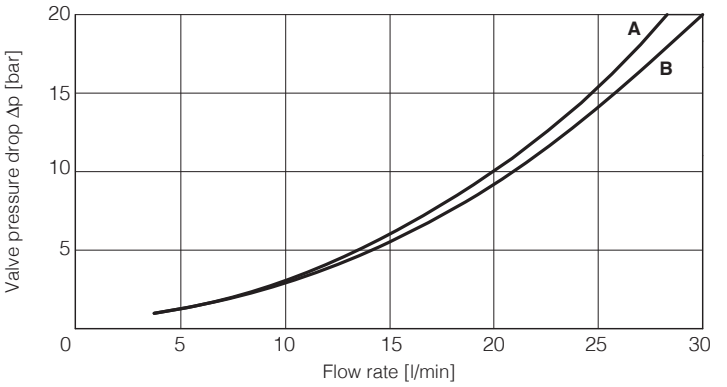
DLAHXW

Valve type	Curve	Flow direction
DLAHXW-3A	C	P-A, P-B
	B	A-T, B-T
DLAHXW-3C	B	P-A, P-B
	A	A-T, B-T



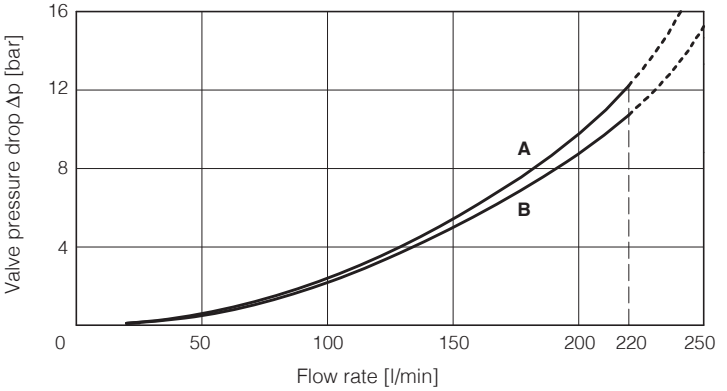
DLAHMXW

Valve type	Curve	Flow direction
DLAHMXW-3A	B	P-A, P-B
	A	A-T, B-T
DLAHMXW-3C	B	P-A, P-B
	A	A-T, B-T



DLAPXW

Valve type	Curve	Flow direction
DLAPXW	A	A-T
	B	P-A



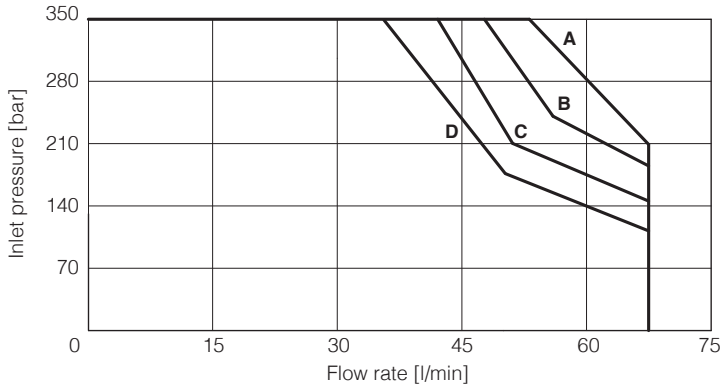
17 **OPERATING LIMITS** (based on mineral oil ISO VG 46 at 50°C)

The diagram have been obtained with warm solenoids and power supply at lowest value (V_{nom} -10%). For DHOXW 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.

DHAXW

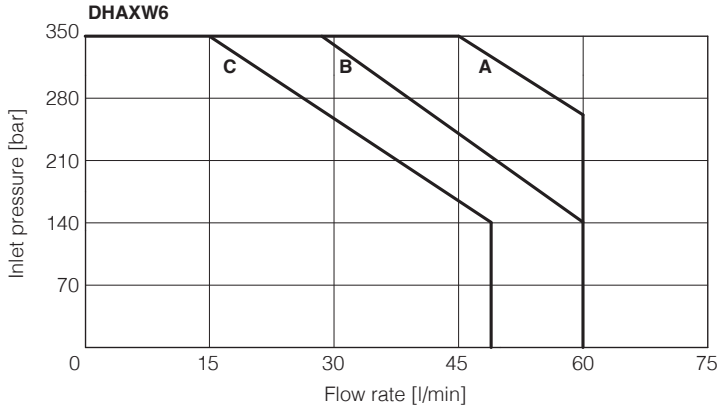
Valve type	Curve	Spool type
DHAXW4	A	0 , 1
	B	3
	C	1/2
	D	6, 7

DHAXW4



Valve type	Curve	Spool type
DHAXW6	A	0
	B	1, 1/2
	C	3, 6, 7

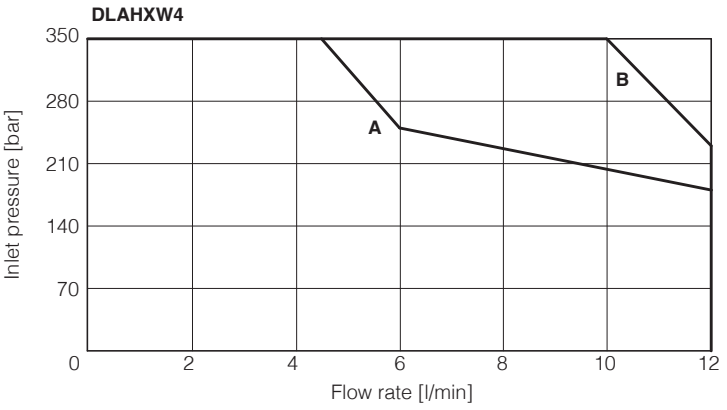
DHAXW6



DLAHXW

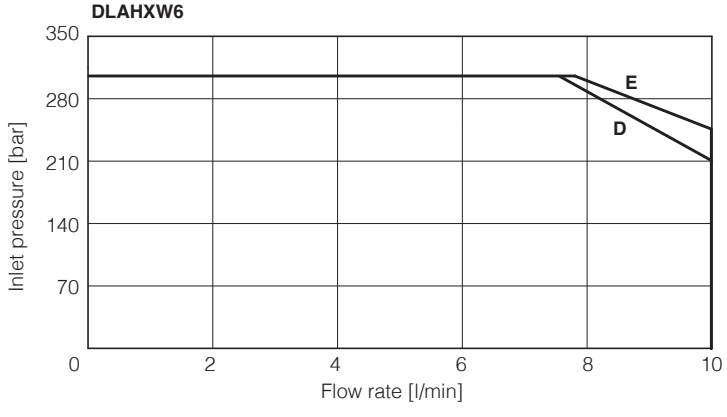
Valve type	Curve	Configuration
DLAHXW4	A	3C
	B	3A

DLAHXW4



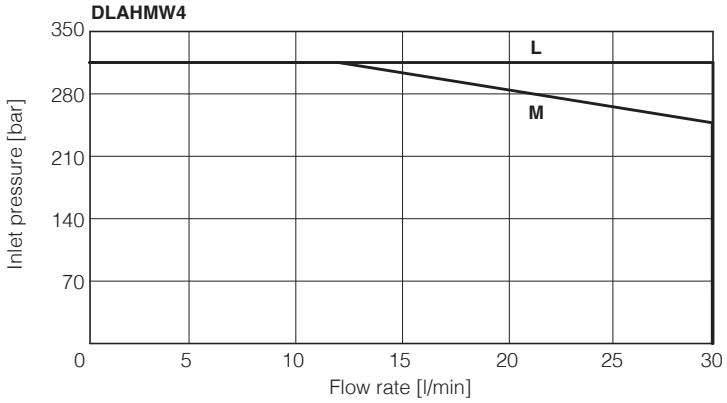
Valve type	Curve	Configuration
DLAHXW6	D	3A
	E	3C

DLAHXW6

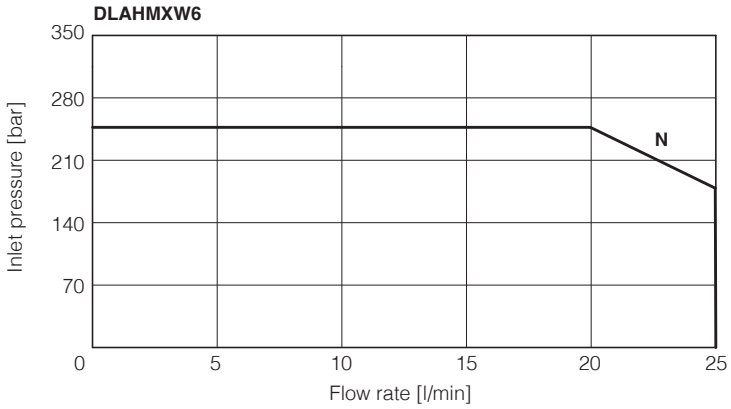


DLAHMXW

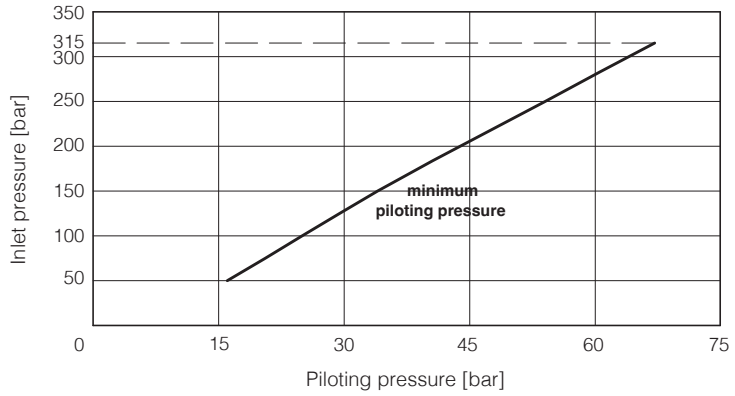
Valve type	Curve	Configuration
DLAHMXW4	L	3A
	M	3C



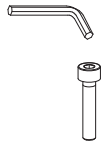
Valve type	Curve	Configuration
DLAHMXW6	N	3A , 3C



18 MINIMUM PILOT PRESSURE FOR DLAPXW

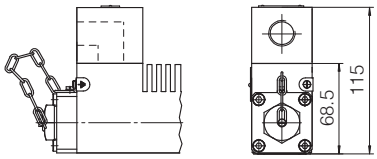


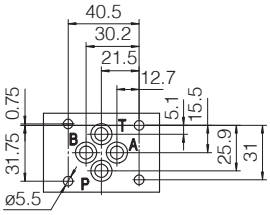
19 FASTENING BOLTS AND SEALS

	DHAXW, DLAHXW, DLAHMXW	DLAPXW
	**Fastening bolts:** 4 socket head screws M5x50-A4-70 Tightening torque = 5,5 Nm	**Fastening bolts:** 4 socket head screws M10x70-A4-70 Tightening torque = 40 Nm
	**Seals:** 4 OR 108; Diameter of ports P, A, B, T: Ø 7,5 mm (max)	**Seals:** 3 OR 3081; Diameter of ports P, A, B, T: Ø 16 mm (max) 2 OR 108; Diameter of ports P, A, B, T: Ø 7 mm (max)

20 INSTALLATION DIMENSIONS OF DHAXW [mm]

horizontal cable entrance option **/O**



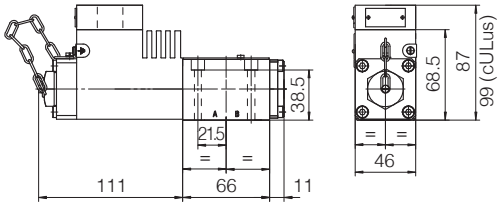


ISO 4401: 2005
Mounting surface: 4401-03-02-0-05

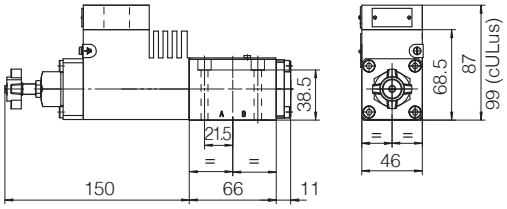
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

Mass [kg]	
DHAXW-06	2,9
DHAXW-07	4,6
Option /O	+0,35
Option /V	+0,1

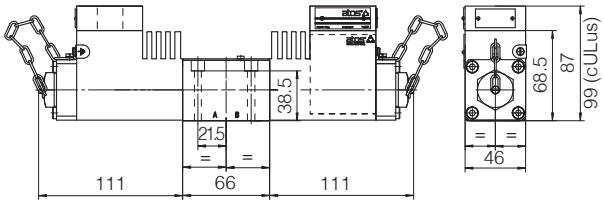
DHAXW-06***



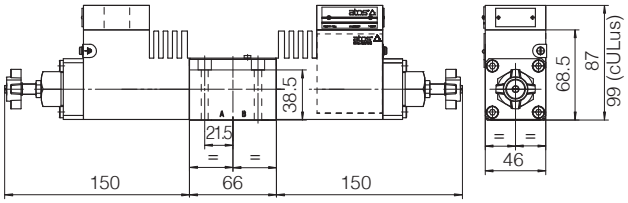
DHAXW-06*/V**



DHAXW-07***

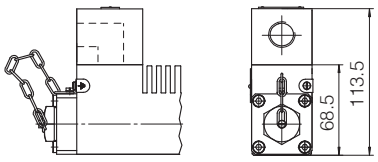


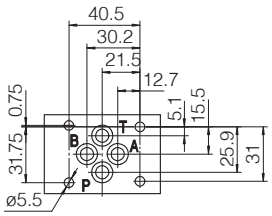
DHAXW-07*/V**



21 INSTALLATION DIMENSIONS OF DLAHXW AND DLAHMXW [mm]

horizontal cable entrance option **/O**



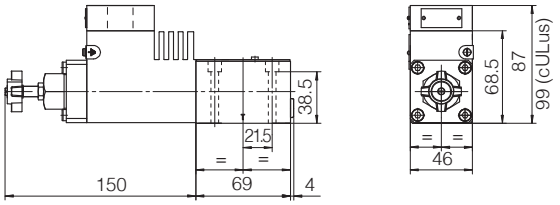


ISO 4401: 2005
Mounting surface: 4401-03-02-0-05

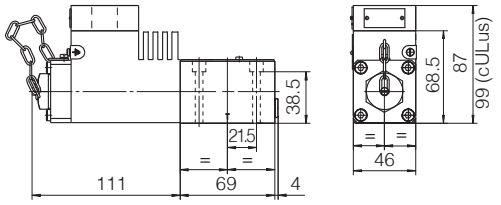
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT

Mass [kg]	
DLAHXW	2,9
DLAHMXW	2,9
Option /O	+0,35
Option /R	+0,9
Option /V	+0,1

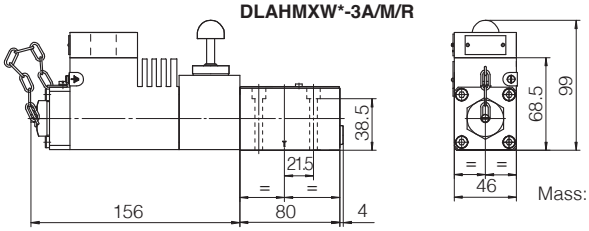
DLAHXW*-3A/M/V



DLAHXW*-3C/M

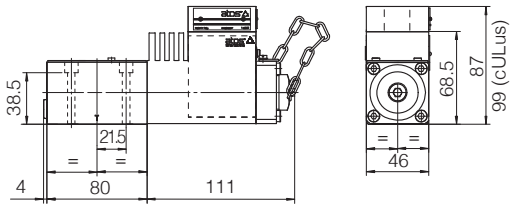


DLAHMXW*-3A/M/R



Mass: 3,8 kg

DLAHMXW*-3C/M

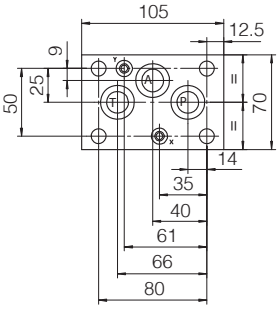


22 INSTALLATION DIMENSIONS OF DLAPXW [mm]

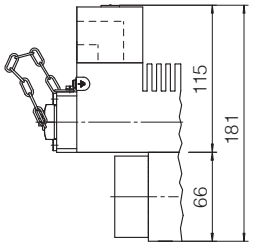
Mounting surface DLAPXW
not ISO standard

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

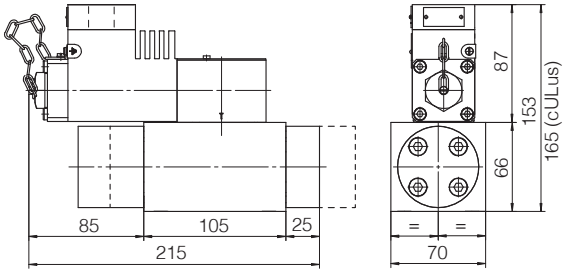
Mass [kg]	
DLAPXW	8,5
Option /O	+0,35
Option /V	+0,1



option **/O**



DLAPXW6-3A/M
DLAPXW6-3C/M (dotted line)



option **/V**