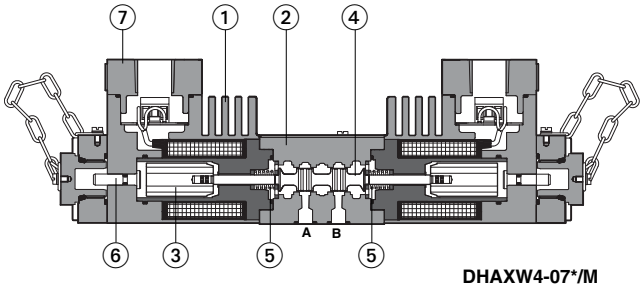
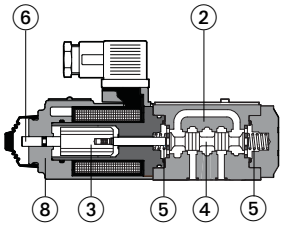
Stainless steel valves for water base fluids

standard or explosion-proof solenoid valves, with Atex or C UL US certification



DHAXW4-07*/M



DHOXW-06*

① Ex-proof solenoid
② Valve body
③ Solenoid plunger
④ Spool / poppet
⑤ Spring
⑥ Manual override pin
⑦ Cable entrance
⑧ Standard solenoid

New line of directional solenoid 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 on-off valves.
- The valves are available with standard ⑧ or ex-proof solenoids ①, these last certified according to:
  - **ATEX** 94/9/CE certification, protection mode Ex II 2GD, Ex d IIC T6/T4/T3, Ex tD A21 IP67
  - **C UL US** certification, according to UL 1002 and CSA 22.2 n°139-1982 class I Group C & D (Groups IIA & IIB to NEC 505-7)
- ISO standard subplate mounting.

Options for ex-proof version:

- Handwheel manual override ⑧ (option /V)
- Manual reset ⑨ (option /R) for safety applications
- Horizontal cable entrance.

Common Applications:
Steel plants, die casting, foundry.

1 STAINLESS STEEL VALVES: MAIN DATA

Code (1)	Description	ISO size	Voltages		ATEX			C UL US		Max flow l/min	Δp (at max flow) bar	Max pressure bar (3)
			DC	AC 50/60Hz	T class (1) Standard	T class (1) Option /7	Input Power	T class (1)	Input Power			
DHOXW	4 way, spool type direct solenoid valves	06 (ISO 4401)	12	–	–	–	32 W (only for 12 and 24 DC)	–	–	60	see diagram at section 8	350
DLOHXW	3 way, poppet type, direct solenoid valves	06 (ISO 4401)	24		–	–		–	–	12		350
DLOKXW	3 way, poppet type, direct solenoid valves	06 (ISO 4401)	110		–	–	40 W (only for 110 and 220 DC)	–	–	25		315
DLOPXW	3 way, poppet type, piloted solenoid valve	no	220		–	–		–	–	220		315
DHAXW4 DHAXW6	4 way, spool type direct solenoid valves	06 (ISO 4401)	12	12	T6 T4	T4 T3	8 W 25 W	(2) T4	12 W 33 W	60 70		350
DLOHXW4-AO DLOHXW6-AO	3 way, poppet type, direct solenoid valves	06 (ISO 4401)	24	24	T6 T4	T4 T3	8 W 25 W	(2) T4	12 W 33 W	10 12		315 350
DLOKXW4-AO DLOKXW6-AO	3 way, poppet type, direct solenoid valves	06 (ISO 4401)	48 110	110 220	T6 T4	T4 T3	8W 25 W	(2) T4	12 W 33 W	25 30		250 315
DLOPXW6-AO	3 way, poppet type, piloted solenoid valve	no	220	230	T6	T4	8 W	(2)	12 W	220		315

Notes:

1) XW6 and XW4 versions differ only for the coil power (see Input Power) - For ATEX certification the certified temperature class T6, T4, T3 is related to the max ambient temperature, from which results the max solenoid surface temperature allowed in the application (see section 3). The reference ambient temperature is -40÷+40°C, for higher ambient temperature (-40÷+70 °C) the temperature class has to be degraded (option /7). For C UL US certification the temperature class is related to the coil power 12W or 33 W
2) For C UL US certification the temperature class corresponding to the coil power 12W is not reported in the nameplate marking. For coil power 33W the temperature class is T4.
3) Max pressure on T port = 110 bar
4) Valves are provided by HNBR seals, which allow min ambient temperature down to -40 °C (max oil viscosity = 380 cSt). The min ambient temperature for valves with PE option (FPM seals) is -20°C.

2 MATERIALS SPECIFICATION

Valve type	solenoid housing ①	valve body ②	internal parts ③ + ④	spring ⑤	seals std	seals /PE
DHAXW DHOXW	Cast iron	AISI 316L	AISI 316L, 420B, 440C, 430F	AISI 302	HNBR (buna)	FPM (viton)
DLOHXW DLOKXW DLOHXW-AO DLOKXW-AO	Cast iron	AISI 316L	AISI 316L, 420B, 440C, 430F	AISI 302	HNBR (buna)	FPM (viton)
DLOPXW DLOPXW-AO	Cast iron	AISI 630	AISI 316L, 420B, 440C, 430F	AISI 302	HNBR (buna)	FPM (viton)

3 MAIN CHARACTERISTICS

Assembly position / location	Any position for all valves except for type - 070* (without springs) that must be installed with horizontal axis if operated by impulses
Subplate surface finishing	Roughness index $\sqrt{}^{0.4}$ flatness ratio 0,01/100 (ISO 1101)
Ambient temperature	from -20°C to +70°C
Fluid	Hydraulic oil as per DIN 51524 .... 535; for other fluids see section 6 and 7
Recommended viscosity	15 ÷ 100 mm²/s at 40°C (ISO VG 15 ÷ 100)
Fluid contamination class	ISO 19/16, achieved with in line filters at 25 μm value to $\beta_{25} \geq 75$ (recommended)
Fluid temperature	-20°C +60°C (standard and /WG seals) -20°C +80°C (/PE seals)
Flow direction	As shown in the symbols of tables 6.1 and 7.1
Operating pressure	See main data at section 1
Rated flow	See diagrams Q/Δp at section 7
Maximum flow	See operating limits at section 8

4 COILS CHARACTERISTICS for valves with standard solenoids

Insulation class	H (180°C) Due to the occuring surface temperatures of the solenoid coils, the European standards EN563 and EN982 must be taken into account
Relative duty factor	100%
Voltage code	**X12DC** = 12VDC **X24DC** = 24VDC **X110DC** = 110VDC **X220DC** = 12VDC
Supply voltage tolerance	± 10%

5 EXPLOSION PROOF SOLENOIDS: MAIN DATA

VALVE TYPE		DLOHXW6 DLOKXW6 DLOPXW6		DHAXW4 DLOHXW4 DLOKXW4	
Solenoid code **Group II, ATEX, UL**		OAX/WP		OAKX/WP	
Voltage code	VDC ±10%	**12DC, 24DC, 48DC (1), 110DC, 220DC**			
	VAC 50/60 Hz ±10%	**12AC, 24AC, 110AC, 220AC (2), 230AC (3)**			
Power consumption	**ATEX**	8W		25W	
	C UL US	12W		33W	
Coil insulation		Class H			
Protection degree		IP 66 According to IEC 144 when correctly coupled with the relevant cable gland SP-PA19*, see section 17			
Duty factor		100%			
Mechanical construction		Explosion proof safety case classified Ex d, according to EN 60079-0: 2006, EN 6079-1: 2007			
Cable entrance and electrical wiring		Internal terminal board for cable connection threaded connection M20x1,5 for cable entrance, vertical (standard) or Horizontal (option /O). See section 17 for cable gland			
Metod of protection		Ex d			
Temperature class (surface temperature)	**ATEX**	T6 (≤ 85°C)	T4 (≤ 135°C) option /7	T4 (≤ 135°C)	T3 (≤ 200°C) option /7
	C UL US	not applicable		T4 (≤ 135°C)	
Ambient temperature	**ATEX**	-40 ÷ +45 °C	-40 ÷ +70 °C	-40 ÷ +40 °C	-40 ÷ +70 °C
	C UL US	-40 ÷ +70 °C			

Atex certification

Ex = Equipment for explosive atmospheres
II = Group II for surfaces plants
2 = High protection (equipment category)
GD = For gas, vapours and dust
d = Flame proof housing
IIC = Gas group
T6/T4/T3 = Temperature class of solenoid surface referred to +40°C ambient temperature
tD = Dust ignition protection
A21 = Housing protection practice (for dust)
IP67 = Protection degree
Zone 1 (gas) and 21 (dust) = Possibility of explosive atmosphere during normal functioning
Zone 2 (gas) and 22 (dust) = Low probability of explosive atmosphere

C UL US certification

Class I = Equipment for famable gas and vapours
Division 1 = Possibility of explosive atmosphere during normal functioning
Groups C&D = Gas group (according to UL 1002)
Groups IIA&IIB = Gas group (according to NEC 505-7)
T4 = Temperature class of solenoid surface referred to +70°C ambient temperature

Notes:

(1) 48DC only for ATEX
(2) 220AC only for UL
(3) 230AC only for ATEX

For alternating current supply a rectifier bridge is integrated in the solenoid

6 SPOOL TYPE DIRECTIONAL SOLENOID VALVES: MODEL CODE

DH A XW 4 * - 0 63 1/2 / PA – M / V 24DC ** /*

Spool type - direct

A = ex-proof solenoids
O = standard solenoids

Stainless steel execution for internal parts

Temperature class, see section 1 (only for DHA)
4 = T4
6 = T6

Certification type
- (omit for ATEX)
/UL = C UL US

Size:
0 = 06

Valve configuration, see section 6.1
61, 63, 71, 75
(configurations 63 and 75 are available only with spool type 1/2)

Spool type, see section 6.2

Optional cable gland (only for DHA):
PA = with threaded cable gland, see section 17

Solenoid threated connection (only for DHA):
M = M20x1,5 UNI-4535 (6H/6g)
NPT = 1/2" NPT ANSI B2.1 (tapered) only for /UL

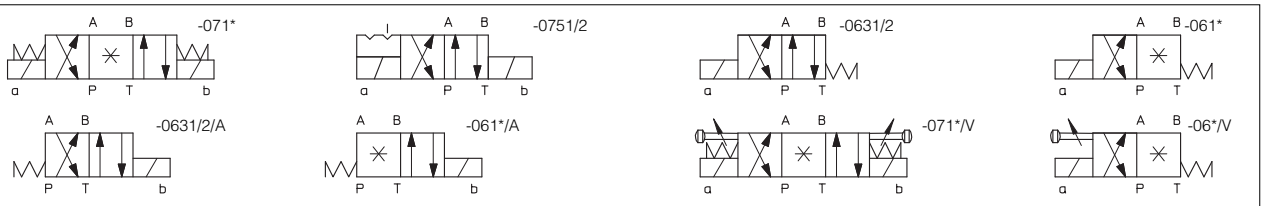
Options:
A = solenoid at side of port B
Options (only for DHA):
V = with handwheel manual override
7 = for ambient temperature up to 70°C (only for Atex)
O = horizontal cable entrance

Voltage code - see section 4 (for DHO), see section 5 (for DHA)

Series number

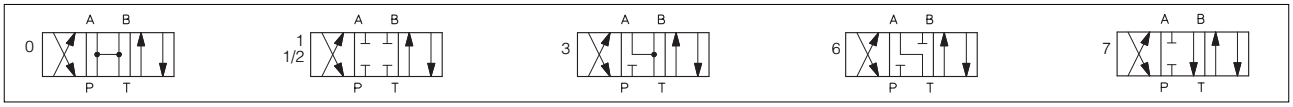
Synthetic fluids:
WG = water-glycol
PE = phosphate ester

6.1 Hydraulic configuration



Where the symbol doesn't show the hydraulic connection (*), it depends on the central configuration of the spool; see section 6.2.

6.2 Spools - for intermediate passages, see tab. E001.



7 POPPET TYPE LEAK FREE DIRECTIONAL SOLENOID VALVES: MODEL CODE

DLOH XW 6 - 3 A / PA - M – AO / V 24DC ** /*

DLOH - DLOK = poppet type - direct
DLOP = poppet type - piloted

Stainless steel execution for internal parts

Temperature class, see section 1 (only for ex-proof solenoids)
4 = T4 (for DLOH and DLOK)
6 = T6 (for all models)

3 = three way

Valve configuration, see section 7.1
A = A to T in rest position
C = P to A in rest position

Optional cable gland (only for ex-proof solenoids):
PA = with threaded cable gland, see section 17

Solenoid threated connection (only for ex-proof solenoids):
M = M20x1,5 UNI-4535 (6H/6g)
NPT = 1/2" NPT ANSI B2.1 (tapered) only for /UL

Certification type:
AO = Group II, Atex
AO/UL = C UL US

Options (only for ex-proof solenoids):
R = with solenoid manual reset
V = with handweel manual override
7 = for ambient temperature up to 70°C (only for Atex)
O = Horizontal cable entrance
Only for DLOP
D = internal drain
E = external pilot pressure

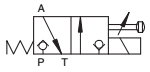
Voltage code - see section 3

Series number

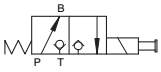
Synthetic fluids:
WG = water-glycol
PE = phosphate ester

7.1 Hydraulic configuration

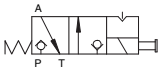
DLOHXW*-3A/M-AO/V



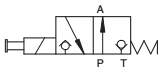
DLOHXW*-3C/M-AO



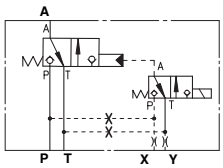
DLOKXW*-3A/M-AO/R



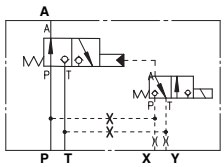
DLOKXW*-3C/M-AO



DLOPXW6-3A/M-AO

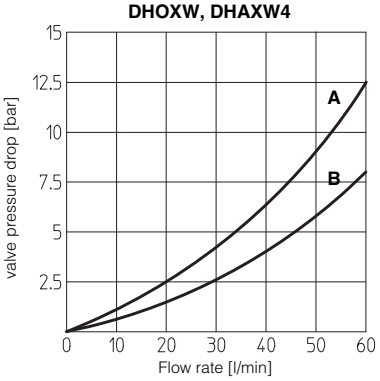


DLOPXW6-3C/M-AO

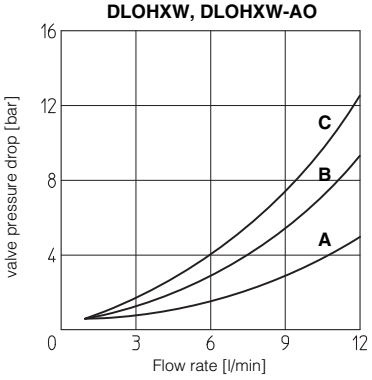


8 Q/Δp DIAGRAMS (based on mineral oil ISO VG 46 at 50°C)

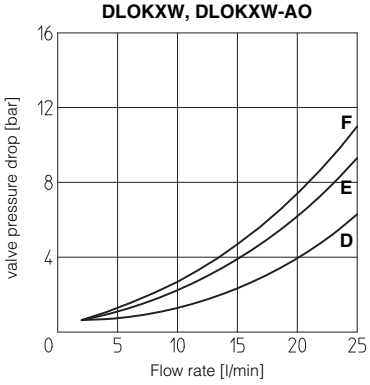
DHOXW, DHAXW4



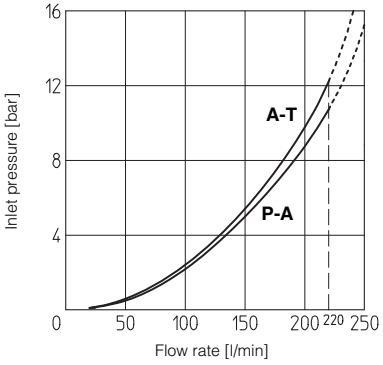
DLOHXW, DLOHXW-AO



DLOKXW, DLOKXW-AO



DLOPXW, DLOPXW-AO



DHOXW, DHAXW

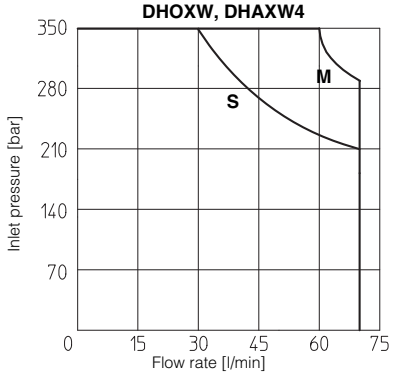
Flow direction / Spool type	P→A	P→B	A→T	B→T	P→T
0	B	B	B	B	A
1, 1/2	A	A	A	A	
3	A	A	B	B	
6	A	A	B	A	
7	A	A	A	B	

Flow direction / Valve type	P → A (P → B)	A → T (B → T)
DLOHXW-3A	C	B
DLOHXW-3C	B	A
DLOKXW-3A	F	E
DLOKXW-3C	E	D

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

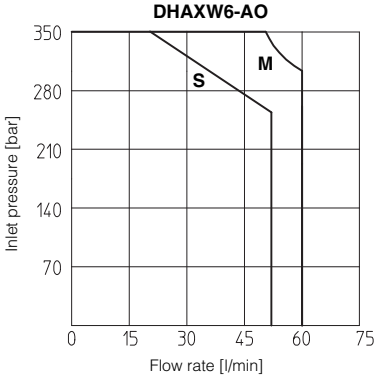
The diagram have been obtained with warm solenoids and power supply at lowest value (V_{nom} -10%). For DHAXW valves the curves refer to application with symmetrical flow through the valve (i.e. P → A and B → T). In case of asymmetric flow the operating limits must be reduced.

DHOXW, DHAXW4



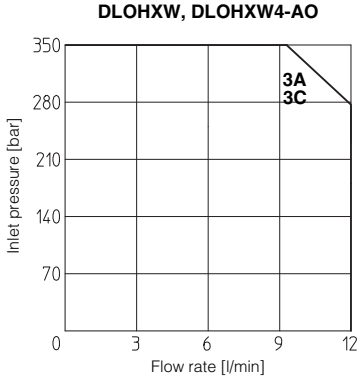
M = Spools 0, 1 **S** = Spools 1/2, 3, 6, 7

DHAXW6-AO

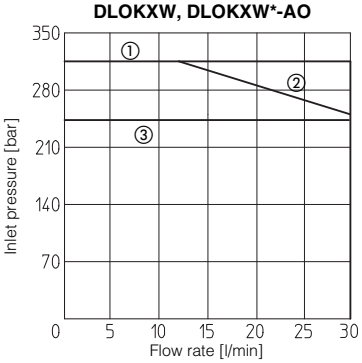


M = Spools 0, 1 **S** = Spools 1/2, 3, 6, 7

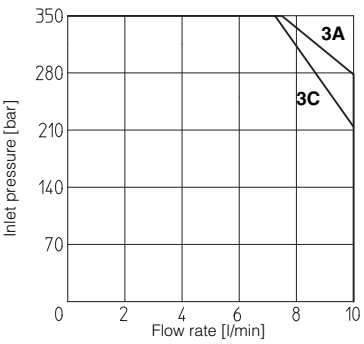
DLOHXW, DLOHXW4-AO



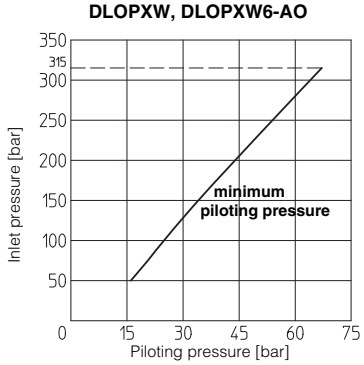
DLOKXW, DLOKXW*-AO



DLOHXW6-AO



DLOPXW, DLOPXW6-AO



① DLOKXW-3A and DLOKXW4-3A-AO

② DLOKXW-3C and DLOKXW4-3C-AO

③ DLOKXW6-3A(3C)-AO

9.1 Internal leakages

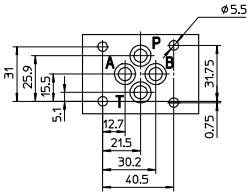
internal leakage of DLOHXW, DLOKXW, DLOPXW and DLPXW: less than 5 drops/min (0,36 cm^3/min) at max pressure.

9.2 Piloting pressure (DLOPXW and DLPXW)

- max piloting pressure = 315 bar
- min piloting pressure = see diagram

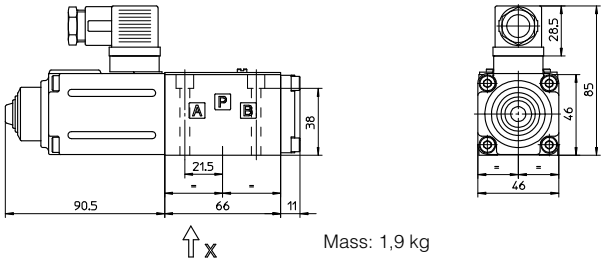
10 INSTALLATION DIMENSIONS OF DHOXW [mm]

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).



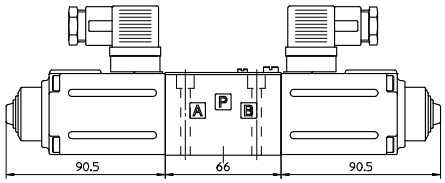
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT
For the max pressures on ports, see section [4]

DHOXW-06



Mass: 1,9 kg

DHOXW-07

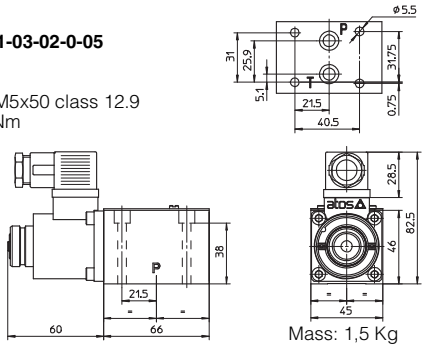


Mass: 2,6 kg

Overall dimensions refer to valves with connectors type SP-666

11 INSTALLATION DIMENSIONS OF DLOHXW and DLOKXW [mm]

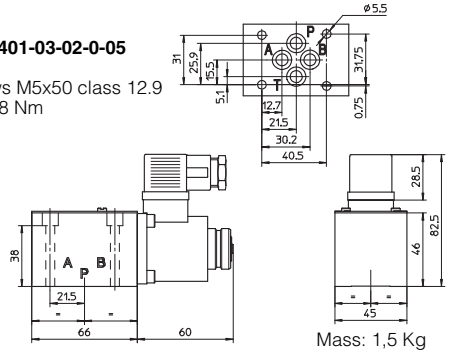
DLOHXW-2*
DLOHXW-2*/R
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
without A and B ports
Fastening bolts:
4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 2 OR 108
Ports P, T:
Ø = 7,5 mm (max)



Mass: 1,5 Kg

P = PRESSURE PORT
T = USE PORT

DLO*XW-3*
DLO*XW-3*/R
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)



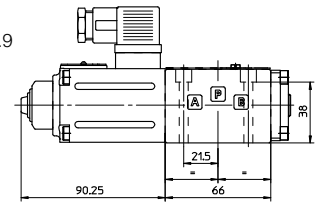
Mass: 1,5 Kg

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

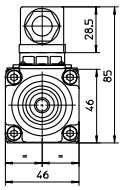
DLOKXW-3*
ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts:
4 socket head screws M5x50 class 12.9
Tightening torque = 8 Nm
Seals: 4 OR 108
Ports P, A, B, T:
Ø = 7,5 mm (max)

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

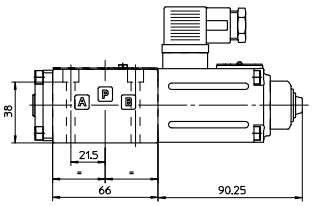
DLOK*XW-3C



Mass: 1,6 Kg



DLOK*XW-3A

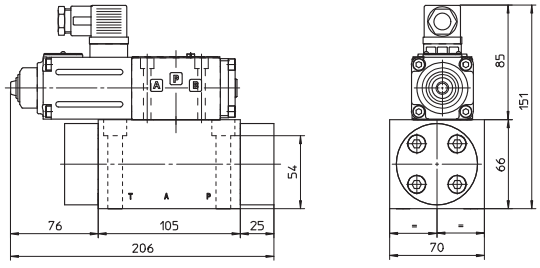


Mass: 1,6 Kg

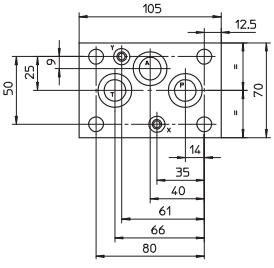
Overall dimensions refer to valves with connectors type SP-666

12 INSTALLATION DIMENSIONS OF DLOPXW [mm]

DLOPXW6-3A/M-AO(/UL)
DLOPXW6-3C/M-AO(/UL)



Mass: 7 kg

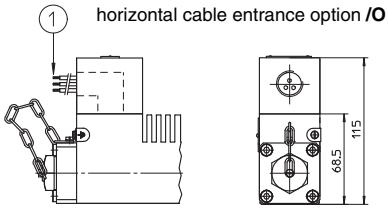


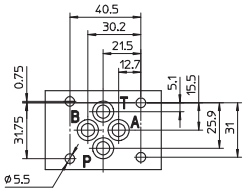
Mounting surface of DLOPXW is not ISO standard

Fastening bolts:
4 socket head screws M10x70-A4-70
Tightening torque = 40 Nm
Seals: 3 OR 3081; 2 OR 108
Ports P,A,T: Ø = 16 mm (max)
Ports X, Y: Ø = 7 mm (max)

Overall dimensions refer to valves with connectors type SP-666

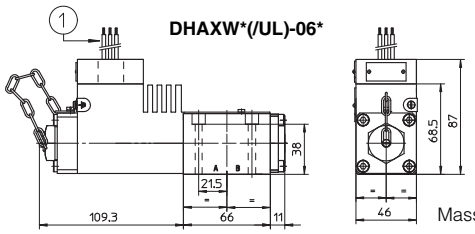
13 INSTALLATION DIMENSIONS OF EX-PROOF DHAXW [mm]



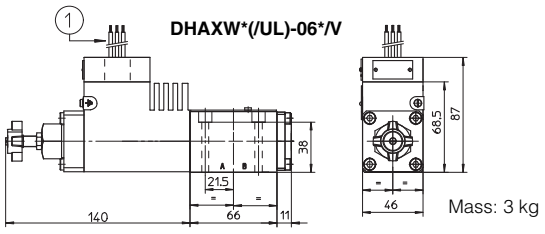


ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts:
4 socket head screws M5x50-A4-70
Tightening torque = 5,5 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max).

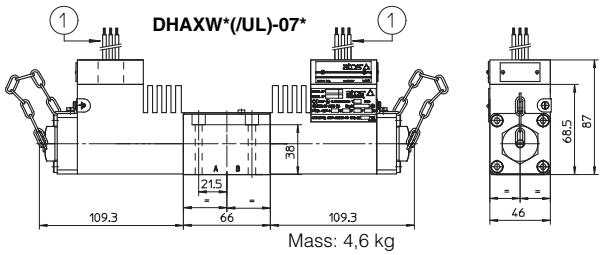
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT



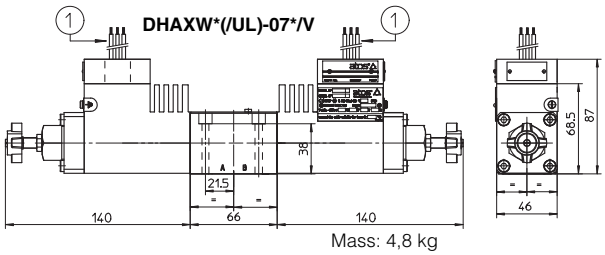
Mass: 2,9 kg



Mass: 3 kg



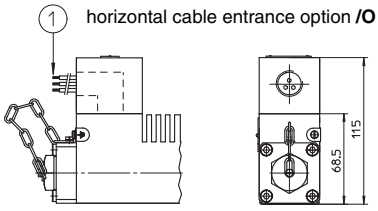
Mass: 4,6 kg

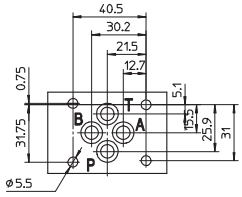


Mass: 4,8 kg

① Factory wired cables only for /UL

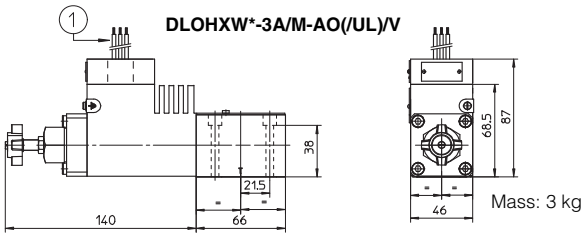
14 INSTALLATION DIMENSIONS OF EX-PROOF DLOHXW AND DLOKXW [mm]



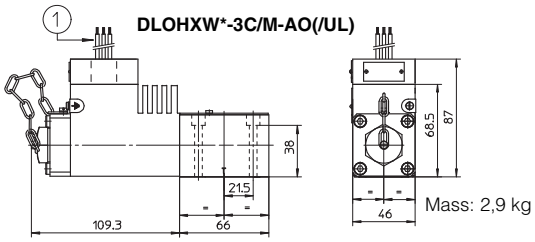


ISO 4401: 2005
Mounting surface: 4401-03-02-0-05
Fastening bolts:
4 socket head screws M5x50-A4-70
Tightening torque = 5,5 Nm
Seals: 4 OR 108
Ports P,A,B,T: Ø = 7.5 mm (max).

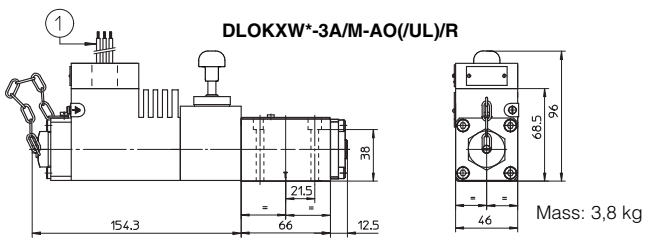
P = PRESSURE PORT
A, B = USE PORT
T = TANK PORT



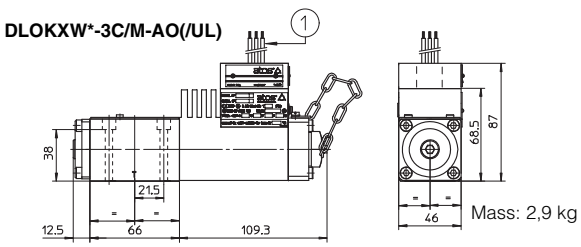
Mass: 3 kg



Mass: 2,9 kg



Mass: 3,8 kg

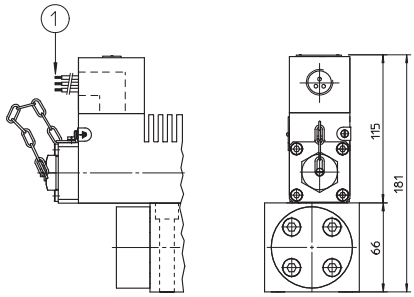


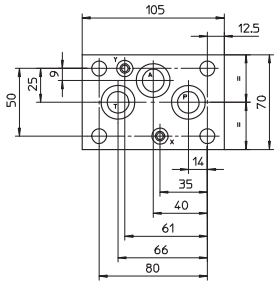
Mass: 2,9 kg

① Factory wired cables only for /UL

15 INSTALLATION DIMENSIONS OF EX-PROOF DLOPXW AND DLPXW [mm]

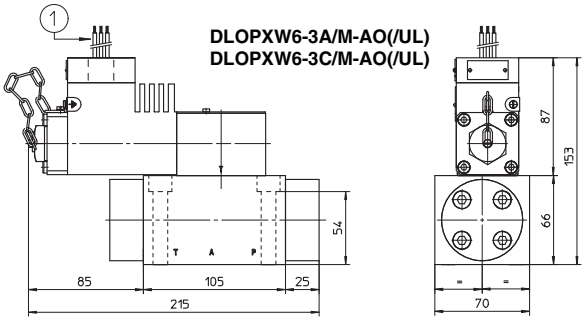
horizontal cable entrance option **/O**





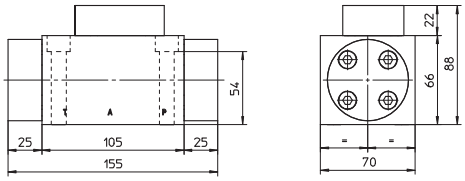
Mounting surface of DLOPXW and DLPXW is not ISO standard
Fastening bolts:
4 socket head screws M10x70-A4-70
Tightening torque = 40 Nm
Seals: 3 OR 3081; 2 OR 108
Ports P,A,T: Ø = 16 mm (max)
Ports X, Y: Ø = 7 mm (max)

DLOPXW6-3A/M-AO(/UL)
DLOPXW6-3C/M-AO(/UL)



Mass: 7 kg

DLPXW-3A
DLPXW-3C



Mass: 4,5 kg

16 SOLENOID WIRING

Solenoid wiring (ATEX)

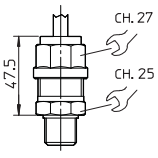
1 = Coil
2 = GND
3 = Coil

Solenoid wiring (UL)

		AC	DC
1	= Coil	white	red
2	= GND	green	green
3	= Coil	black	black

17 CABLE GLAND

CABLE GLAND SP-PA19/* (PG9 - IP67)



The cable glands are available on request certified ATEX according to EN 60079-0 and EN 60079-1.
PA19 cable size 7÷9,5 mm
PA112 cable size 9÷12 mm

Following codes have to be specified for spare cable glands:
SP-PA(M)19/GK = with threated connection GK-1/2" ISO/UNI-6125 (tapered)
SP-PA(M)19/NPT = with threated connection 1/2" NPT ANSI B2.1 (tapered)

Note: special cable clamps PA112 (PG12) available on request only as spare parts.

The valves must be connected to the power supply using the terminal board inside the solenoid.
The cable must be suitable for the working temperature as specified in the "safety instructions" delivered with the first supply of the products.
Additional equipotential grounding can be also performed by the user on the external facility provided on the solenoid case.
Minimum section of external ground wire = 4 mm².
Minimum section of internal ground wire = the same of supply wire.
In order to reach the terminal board inside the solenoid, the top plate of the solenoid must be removed.
Solenoids are provided with threated connection for cable entrance: GK-1/2" GAS (ISO/UNI 6125) or M20x1,5 (UNI-4535) or 1/2"NPT (ANSI B2.1)