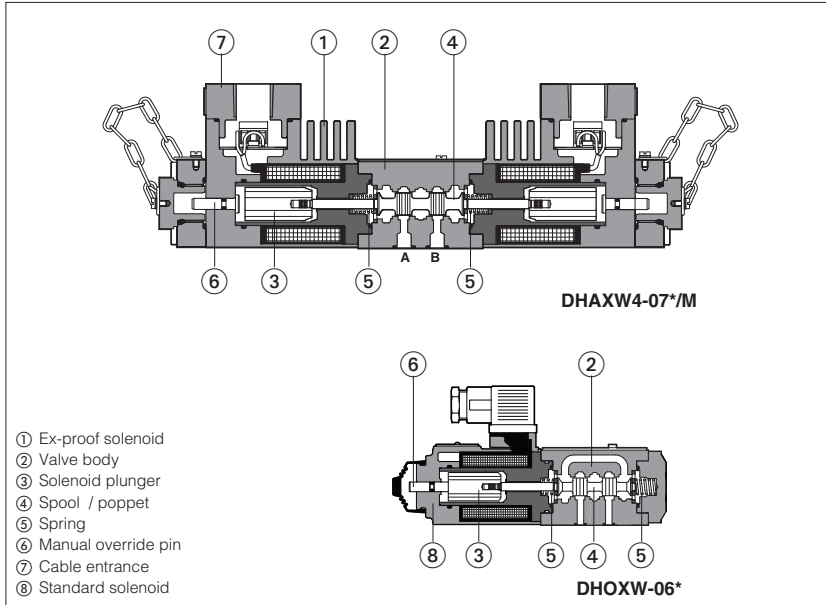


# Stainless steel valves for water base fluids

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



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
  - IECEX worldwide recognized safety certification, 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, IECEx		C UL US		Max flow /min	Δp (at max flow) bar	Max pressure bar (3)
			DC	AC 50/60Hz	T class (1)	Input Power	T class (1)	Input Power			
DHOXW	4 way, spool type direct solenoid valves	06 (ISO 4401)	12		-	-			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		-	-			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)	110	110	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 and IECEx 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 8). The reference ambient temperature is -40/+40°C (+45° for XW6), 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 33W
- 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

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. Max ambient temperature without solenoids is 70°C

**2 MATERIALS SPECIFICATION**

Valve type	solenoid housing (1)	valve body (2)	internal parts (3) + (4)	spring (5)	seals	
					std	/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 Ra 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
Recommended viscosity	15 ÷ 100 mm <sup>2</sup> /s at 40°C (ISO VG 15 ÷ 100)
Fluid contamination class	ISO 4406 class 21/19/16 NAS 1638 class 10, in line filters of 25 µm (β <sub>25</sub> ≥ 75 recommended)
Fluid temperature	-20°C +60°C (standard 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 <a href="#">1</a>
Rated flow	See diagrams Q/Δp at section <a href="#">7</a>
<b>Maximum flow</b>	See operating limits at section <a href="#">8</a>

### 4 COILS CHARACTERISTICS for valves with standard solenoids

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

### 5 EXPLOSION PROOF SOLENOIDS: MAIN DATA

<b>VALVE TYPE</b>		DLOHXW6 DLOKXW6 DLOPXW6	DHAXW4 DLOHXW4 DLOKXW4
Solenoid code	<b>ATEX</b>	OAXW/WP	OAKXW/WP
	<b>IECEX</b>	OAIKXW/WP	OAIKXW/WP
	<b>C UL US</b>	OAXWUL/WP	OAKXWUL/WP
Voltage code	Vdc ±10%	<b>12DC, 24DC, 48DC (1), 110DC, 220DC</b>	
	VAC 50/60 Hz ±10%	<b>12AC, 24AC, 110AC, 230AC</b>	
Power consumption	<b>ATEX, IECEX</b>	8W	25W
	<b>C UL US</b>	12W	33W
Coil insulation	Class H		
Protection degree	IP 67 According to IEC 144 when correctly coupled with the relevant cable gland SP-PA19*, see section <a href="#">17</a>		
Duty factor	100%		
Mechanical construction	Flame proof housing classified Ex d, according to EN 60079-0: 2006, EN 6079-1: 2007		
Cable entrance and electrical wiring	<b>ATEX, IECEX</b>	Internal terminal board for cable connection. Threaded connection M20x1.5 for cable entrance, vertical (standard) or horizontal (option /O)	
	<b>C UL US</b>	Connection 1/2"NPT (ANSI B2.1) for conduit pipe. The valves are supplied with 1,07m (42 inches cable length) factory wired.	
Method of protection	Ex d		
Temperature class (surface temperature)	<b>ATEX, IECEX</b>	T6 (≤ 85°C)	T4 (≤ 135°C) option /7
	<b>C UL US</b>	Not applicable	
Ambient temperature	<b>ATEX, IECEX</b>	-40 ÷ +45 °C	-40 ÷ +70 °C
	<b>C UL US</b>	-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, IECEX  
 For alternating current supply a rectifier bridge is integrated in the solenoid  
 According to EN60079-0 the valves with Atex certification can be coated with a non-metallic material (for ex. painted), observing the maximum thickness:  
**Group IIC** = 0,2 mm max

**6 SPOOL TYPE DIRECTIONAL SOLENOID VALVES: MODEL CODE**

<b>DH</b>	<b>A</b>	<b>XW</b>	<b>4</b>	<b>*</b>	<b>- 0</b>	<b>63</b>	<b>1/2</b>	<b>/ PA - M / V</b>	<b>24DC</b>	<b>**</b>	<b>/*</b>
Spool type - direct											Seals material: omit for NBR (mineral oil & water glycol) <b>PE</b> = FPM
<b>A</b> = ex-proof solenoids <b>O</b> = standard solenoids										Series number	
Stainless steel execution for internal parts										Voltage code - see section 4 (for DHO), see section 5 (for DHA)	
Temperature class, see section 11 (only for DHA) <b>4</b> = T4 <b>6</b> = T6										Options: <b>A</b> = solenoid at side of port B Options (only for DHA): <b>V</b> = with handwheel manual override <b>7</b> = for ambient temperature up to 70°C (only for Atex and IECEx) <b>O</b> = horizontal cable entrance	
Certification type - (omit for ATEX) <b>/IE</b> = Group II, IECEx <b>/UL</b> = C UL US with 1 m cable length, factory wired										Solenoid threaded connection (only for DHA): <b>M</b> = M20x1.5 UNI-4535 (6H/6g) <b>NPT</b> = 1/2" NPT ANSI B2.1 (tapered) only for /UL	
Size: <b>0</b> = 06										Optional cable gland (only for DHA): <b>PA</b> = with threaded cable gland, see section 17	
Valve configuration, see section 6.1 <b>61, 63, 71, 75</b> (configurations 63 and 75 are available only with spool type 1/2)											
Spool type, see section 6.2											

**6.1 Hydraulic configuration**

<p><b>Configuration for DHA</b></p>	<p><b>Spools for DHA</b></p>
<p><b>Configuration for DHA</b></p>	<p><b>Spools for DHA</b></p>

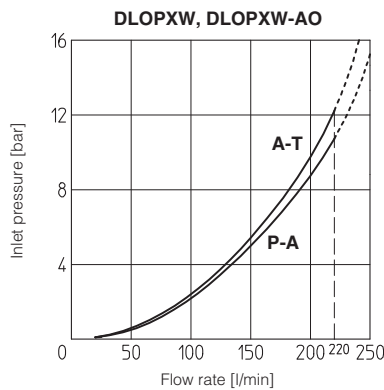
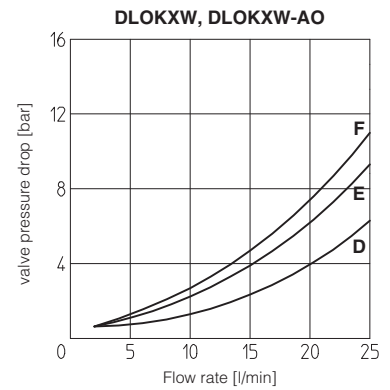
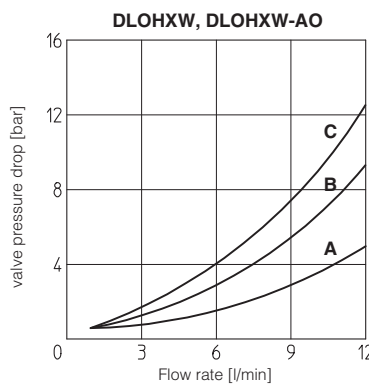
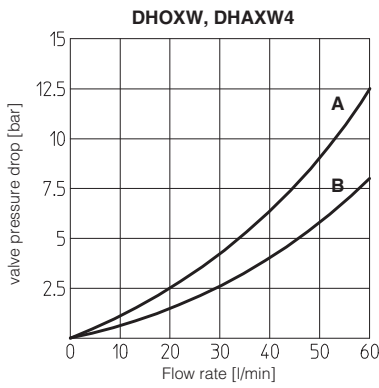
**7 POPPET TYPE LEAK FREE DIRECTIONAL SOLENOID VALVES: MODEL CODE**

<b>DLOH</b>	<b>XW</b>	<b>6 - 3</b>	<b>A / PA - M - AO / V</b>	<b>24DC</b>	<b>**</b>	<b>/*</b>
<b>DLOH - DLOK</b> = poppet type, direct <b>DLOP</b> = poppet type, electro-hydraulically piloted						Seals material: omit for NBR (mineral oil & water glycol) <b>PE</b> = FPM
Stainless steel execution for internal parts						Series number
Temperature class, see section 11 (only for ex-proof solenoids) <b>4</b> = T4 (for DLOH and DLOK) <b>6</b> = T6 (for all models)						Voltage code - see section 3
<b>3</b> = three way						Options (only for ex-proof solenoids): <b>R</b> = with solenoid manual reset <b>V</b> = with handwheel manual override <b>7</b> = for ambient temperature up to 70°C (only for Atex and IECEx) <b>O</b> = Horizontal cable entrance Only for DLOP <b>D</b> = internal drain <b>E</b> = external pilot pressure
Valve configuration, see section 7.1 <b>A</b> = A to T in rest position <b>C</b> = P to A in rest position						<b>OX</b> = Standard solenoid for DLOK Certification type (only for ex-proof solenoids): <b>AO</b> = Group II, Atex <b>AO/IE</b> = Group II, IECEx <b>AO/UL</b> = C UL US with 1 m cable length, factory wired
Optional cable gland (only for ex-proof solenoids): <b>PA</b> = with threaded cable gland, see section 17						Solenoid threaded connection (only for ex-proof solenoids): <b>M</b> = M20x1.5 UNI-4535 (6H/6g) <b>NPT</b> = 1/2" NPT ANSI B2.1 (tapered) only for /UL

**7.1 Hydraulic configuration**

<b>DLOHXW*-3A/M-AO/V</b>	<b>DLOHXW*-3C/M-AO</b>	<b>DLOKXW*-3A/M-AO/R</b>	<b>DLOKXW*-3C/M-AO</b>
<b>DLOPXW6-3A/M-AO</b>	<b>DLOPXW6-3C/M-AO</b>		

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



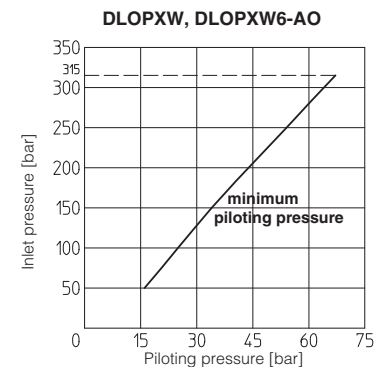
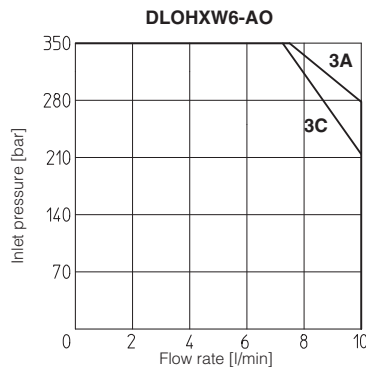
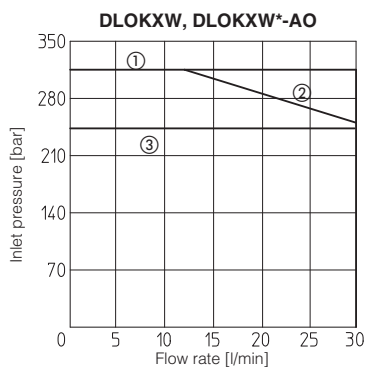
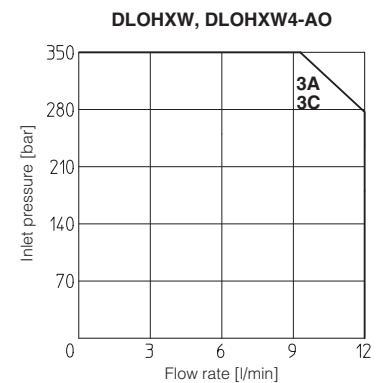
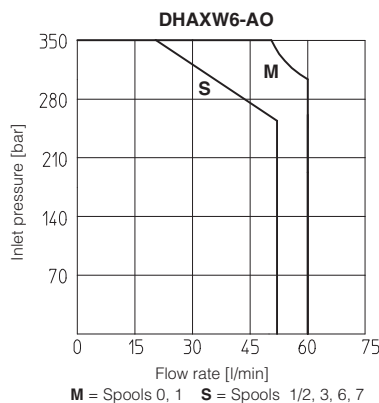
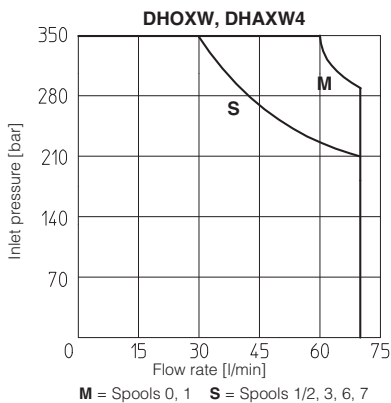
**DHOXW, DHAXW**

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

Valve type	Flow direction	
	P → A (P → B)	A → T (B → T)
<b>DLOHXW-3A</b>	C	B
<b>DLOHXW-3C</b>	B	A
<b>DLOKXW-3A</b>	F	E
<b>DLOKXW-3C</b>	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.



- 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<sup>3</sup>/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**

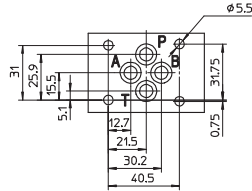
Fastening bolts:

4 socket head screws M5x50 class 12.9

Tightening torque = 8 Nm

Seals: 4 OR 108

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



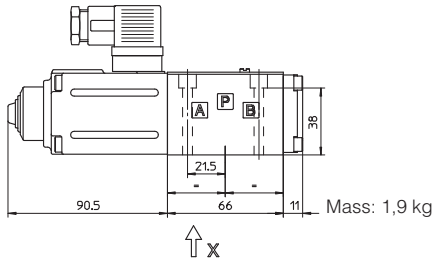
**P** = PRESSURE PORT

**A, B** = USE PORT

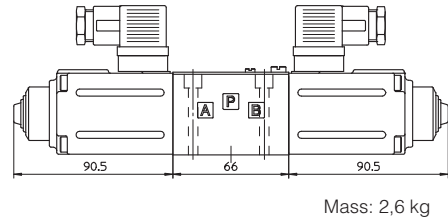
**T** = TANK PORT

For the max pressures on ports, see section 4

**DHOXW-06**



**DHOXW-07**



Overall dimensions refer to valves with connectors type 666

**11 INSTALLATION DIMENSIONS OF DLOXW [mm]**

**DLOXW-3\***

**ISO 4401: 2005**

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

Fastening bolts:

4 socket head screws M5x50 class 12.9

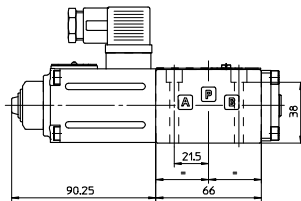
Tightening torque = 8 Nm

Seals: 4 OR 108

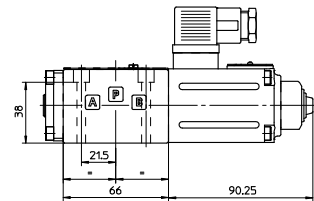
Ports P, A, B, T:

$\varnothing = 7,5$  mm (max)

**DLOK\*XW-3C**



**DLOK\*XW-3A**



**P** = PRESSURE PORT

**A** = USE PORT

**B** = CLOSED

**T** = TANK PORT

Overall dimensions refer to valves with connectors type 666

**12 INSTALLATION DIMENSIONS OF DLOPXW [mm]**

**Mounting surface of DLOPXW is not ISO standard**

Fastening bolts:

4 socket head screws M10x70-A4-70

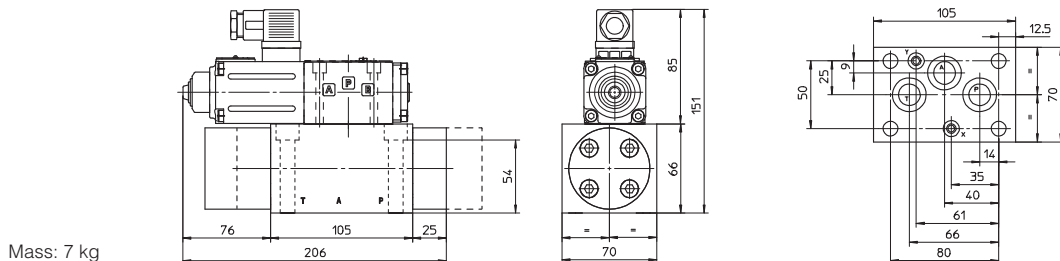
Tightening torque = 40 Nm

Seals: 3 OR 3081; 2 OR 108

Ports P,A,T:  $\varnothing = 16$  mm (max)

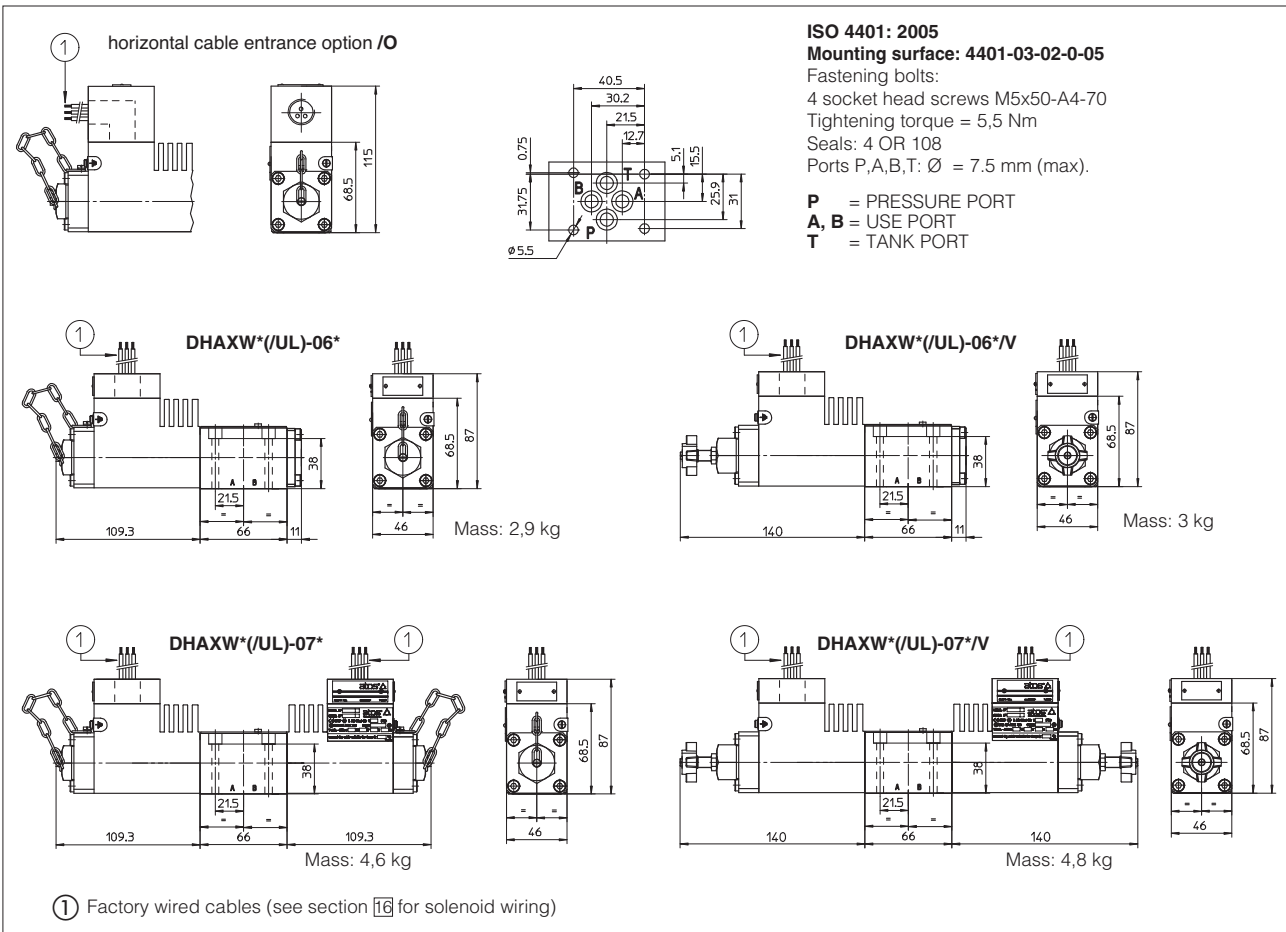
Ports X, Y:  $\varnothing = 7$  mm (max)

**DLOPXW6-3\***

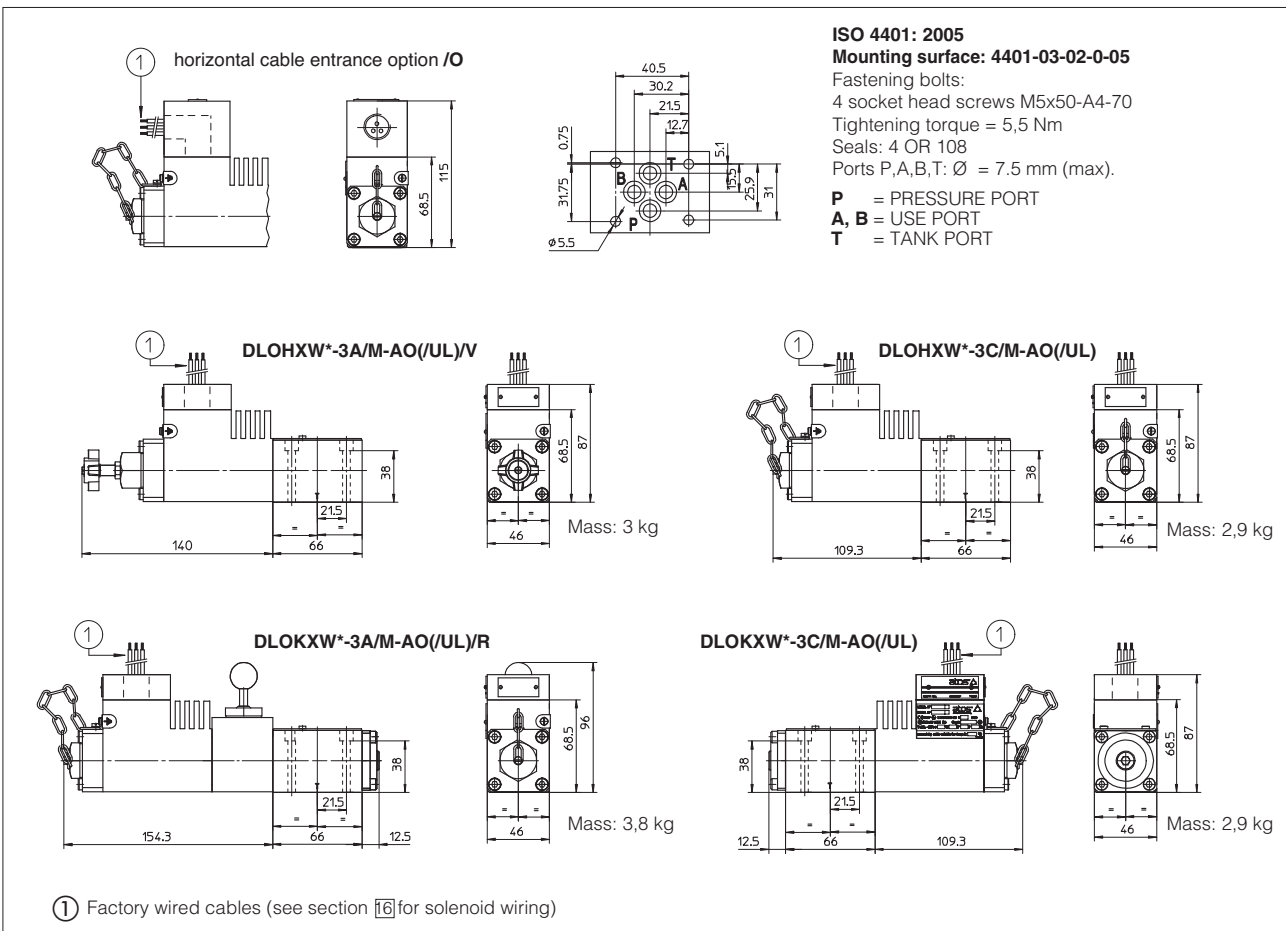


Overall dimensions refer to valves with connectors type 666

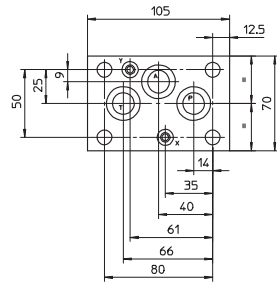
**13** INSTALLATION DIMENSIONS OF EX-PROOF DHAXW [mm]



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



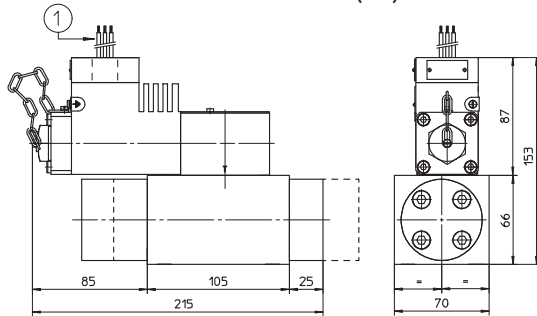
15 INSTALLATION DIMENSIONS OF EX-PROOF DLOPXW [mm]



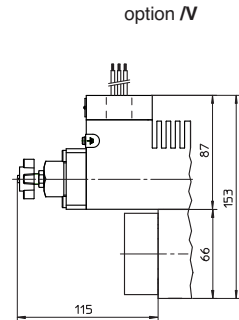
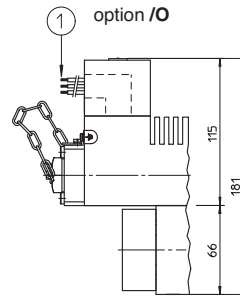
**Mounting surface of DLOPXW is not ISO standard**

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)

**DLOPXW6-3A/M-AO(/UL)**  
**DLOPXW6-3C/M-AO(/UL)** dotted line



Mass: 7 kg



① Factory wired cables (see section 16 for solenoid wiring)

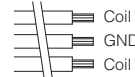
16 SOLENOID WIRING

**Solenoid wiring (ATEX, IECEx)**



1 = Coil  
 2 = GND  
 3 = Coil

**Solenoid wiring (UL)**

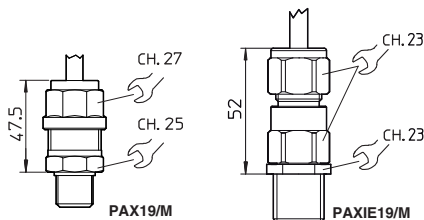


	AC	DC
Coil	white	red
GND	green	green
Coil	black	black

17 CABLE GLAND

**Stainless steel cable gland PAX19/M - M20x1,5 (PG9 - IP67) for valves with ATEX certification**

**Stainless steel cable gland PAXIE19/M - M20x1,5 (PG9 - IP66) for valves with IECEx certification**



Stainless steel cable glands - available on request - are certified ATEX according to EN60079-0 and EN60079-1, or IECEx, according to IEC 60079-0, IEC 60079-7, IEC 61241-0, IEC 61241-1

The cable glands must be blocked with loctite or similar or with a lock nut.  
 The valves must be connected to the power supply using the terminal board inside the solenoid.

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 mm<sup>2</sup>.  
 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 threaded connection for cable entrance: GK-1/2" GAS (ISO/UNI 6125) or M20x1,5 (UNI-4535) or 1/2"NPT (ANSI B2.1)