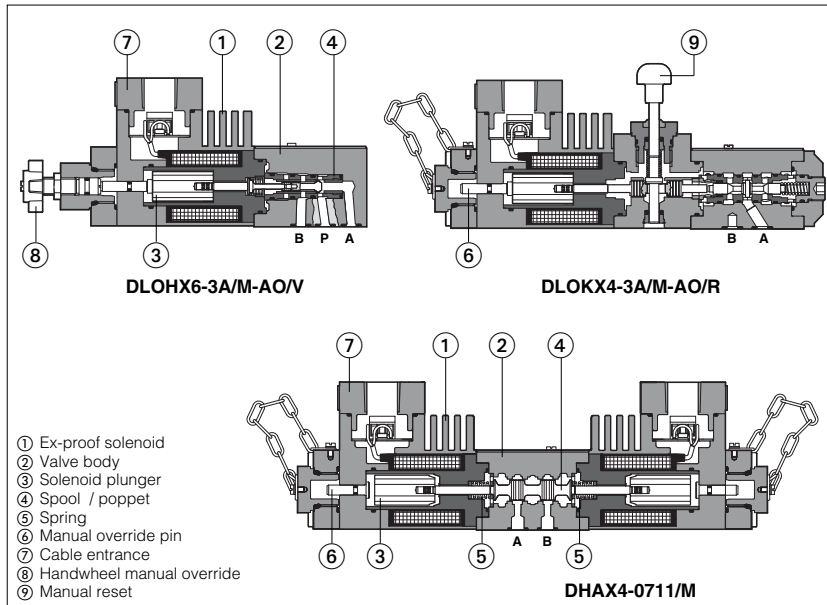


Stainless steel valves

explosion-proof solenoid valves and pressure relief valves



New line of directional solenoid valves and pressure relief valves in stainless steel execution for corrosive environments and special fluids.

Stainless steel solenoids ①, ex-proof Atex, for hazardous areas - see section ③.

Features:

- These valves are made by selected inoxidizable materials for external and internal parts, to withstand extreme and corrosive environmental conditions, and to ensure full compatibility also with water base and special fluids.
- Directional valves are available in two basic versions: poppet type, 3-way leak free (suitable for accumulator systems) or spool type, 4-way on-off valves.
- Explosion proof solenoids ① with ATEX 94/9/CE certification, protection mode Ex II 2G, Ex d IIC T6/T4/T3
- DHAX and DLOHX are **SIL 3** safety level according to the IEC 61508 standard
- Standard manual override pin ⑥ protected by a sealed stainless steel cap.
- Cable connection ⑦ M20x1,5.
- Stainless steel cable glands available
- ISO standard subplate mounting.

Options:

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

Common Applications:

Offshore, Chemical, Energy, Minery, Subsea plants.

1 STAINLESS STEEL VALVES: MAIN DATA

Code (1)	Description	ISO size	Voltages		ATEX T class (1)		Input Power W	Max flow l/min	Δp (at max flow) bar	Max pressure bar (2)
			DC	AC	Standard	Option /7				
DHAX4	4 way, spool type direct solenoid valves	06 (ISO 4401)	12	12/50/60	T4	T3	25	60	see diagram at section ④	350
DLOHX6-AO DLOHX4-AO	3 way, poppet type, direct solenoid valves	06 (ISO 4401)	24	24/50/60	T6	T4	8	10		315
			48	110/50	T4	T3	25	12		350
DLOKX4-AO	3 way, poppet type, direct solenoid valves	06 (ISO 4401)	110	120/60	T4	T3	25	25		315
DLOPX6-AO	3 way, poppet type, piloted solenoid valve	no	198	220/50	T6	T4	8	220		315
DLPX	3 way, poppet type, hydraulic operated valve	no	-	-	-	-	-	220	315	
SP-CART-MX-3	relief valve	no	-	-	-	-	-	2,5	30	350
SP-CART-MX-6	direct screw-in	no	-	-	-	-	-	40 (60 PED)		350
SP-CART AREX-20	relief valve	no	-	-	-	-	-	120 (150 PED)		400
HMPX-*	relief valve direct modular	06 (ISO 4401)	-	-	-	-	-	40	35	350
SC LIX-2531* LIMMX-2/* (3)	relief valve DIN cartridge	25 (ISO 7368)	-	-	-	-	-	400	6	350

Notes:

- 1) X6 and X4 versions differ only for the coil power (see Input Power) - 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 (standard, see the sixth column in the above table), for higher ambient temperature (-40/+70 °C) the temperature class has to be degraded (option /7).
- 2) Max pressure on T port = 110 bar
- 3) Optional electrohydraulic venting available on request.
- 4) Valves are provided by NBR seals, which allow min ambient temperature down to -40 °C (max oil viscosity = 380 cSt). The min ambient temperature fr valves with PE option (FPM seals) is -20°C.

2 MATERIALS SPECIFICATION

Valve type	solenoid housing	valve body	internal parts	springs	seals	
	①	②	③+④	⑤	std	/PE
DHAX	AISI 630	AISI 316L	AISI 316L, 420B, 440C, 430F	AISI 302	NBR (buna)	FPM (viton)
DLOHX DLOKX	AISI 630	AISI 316L	AISI 316L, 420B, 440C, 430F	AISI 302	NBR (buna)	FPM (viton)
DLOPX	AISI 630	AISI 630	AISI 316L, 420B, 440C, 430F	AISI 302	NBR (buna)	FPM (viton)
DLPX	-	AISI 630	AISI 420B,	AISI 302	NBR (buna)	FPM (viton)
SP-CART-*X	-	AISI 316L	AISI 316L, 420B, 630	AISI 302	NBR (buna)	FPM (viton)
HMPX	-	AISI 316L	AISI 316L, 420B, 630	AISI 302	NBR (buna)	FPM (viton)
LIMMX	-	AISI 316L	AISI 316L, 420B, 630	AISI 302	NBR (buna)	FPM (viton)
SC LIX	-	-	AISI 630, AISI 420B	AISI 302	NBR (buna)	FPM (viton)

3 EXPLOSION PROOF SOLENOIDS: MAIN DATA

VALVE TYPE	DLOHX6 DLOPX6		DHAX4 DLOHX4 DLOKX4	
Solenoid code Group II, ATEX	OAX/WP		OAKX/WP	
Voltage Vdc ±10%	12DC, 24DC, 48DC, 110DC, 220DC			
code VAC 50/60 Hz ±10%	12AC, 24AC, 110AC, 230AC (1)			
Power consumption	8W		25W	
Coil insulation	Class H			
Protection degree	IP 67 According to IEC 144 when correctly coupled with the relevant cable gland SP-PAX19*, see section 16			
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 16 for cable gland			
Method of protection	Ex d			
Temperature class (surface temp.)	T6 (≤ 85°C)	T4 (≤ 135°C) option /7	T4 (≤ 135°C)	T3 (≤ 200°C) option /7
Ambient temperature (according ATEX certification)	-40 ÷ +45 °C	-40 ÷ +70 °C	-40 ÷ +40 °C	-40 ÷ +70 °C

Certification
Ex = explosion proof according to EN 6079-0, EN 6079-1
d = flame proof execution
IIC = gas group - application in surface plants
Zone 1 (and 2) = explosive atmosphere desultorily present
T6 (T4, T3) = temperature class of the solenoid surface is dependent to the ambient temperature

Solenoid wiring

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

4 MODEL CODE OF SPOOL TYPE DIRECTIONAL SOLENOID VALVES

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

Spool type - direct

Stainless steel execution

Temperature class
4 = T4

Size:
0 = 06

Valve configuration, see section 4.1
61, 63, 71, 75
(configurations 63 and 75 are available only with spool type 1/2)

Spool type, see section 4.2

Synthetic fluids:
PE = phosphate ester

Series number

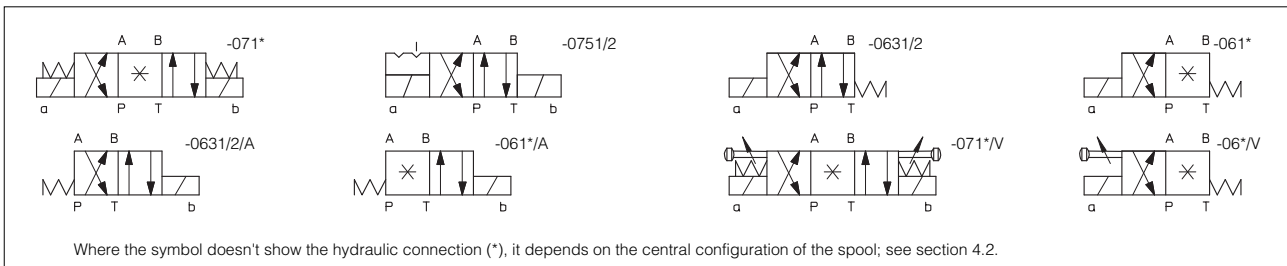
Voltage code - see section 3

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

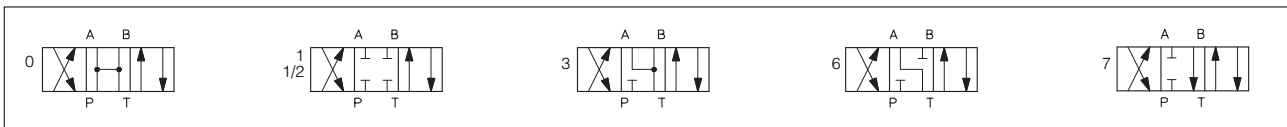
Solenoid threaded connection:
M = M20x1,5 UNI-4535 (6H/6g)

Optional cable gland:
PA = with threaded cable gland, see section 15

4.1 Hydraulic configuration



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

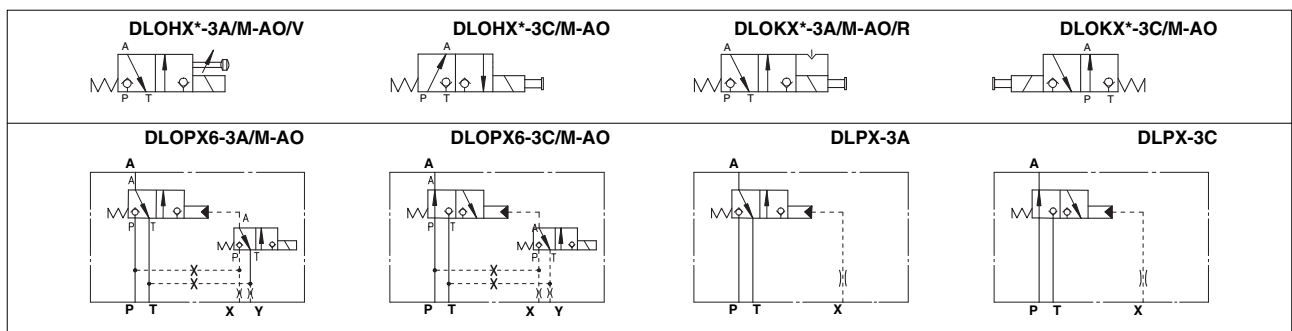


5 MODEL CODE OF POPPET TYPE LEAK FREE DIRECTIONAL SOLENOID VALVES

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

<p>DLOH - DLOK = poppet type - direct DLOP = poppet type - piloted DLP = as DLOP but without pilot valve</p> <p>Stainless steel execution</p> <p>Temperature class 4 = T4 (for DLOHX and DLOKX) 6 = T6 (for DLOHX and DLOPX)</p> <p>3 = three way</p> <p>Valve configuration, see section 5.1 A = A to T in rest position C = P to A in rest position</p>	<p>Synthetic fluids: PE = phosphate ester</p> <p>Series number</p> <p>Voltage code - see section 3</p> <p>Options: (not for DLP) R = with solenoid manual reset V = with handwheel manual override 7 = for ambient temperature up to 70°C O = Horizontal cable entrance Only for DLOPX D = internal drain E = external pilot pressure</p> <p>AO = explosion proof solenoid</p> <p>Solenoid threaded connection: M = M20x1,5 UNI-4535 (6H/6g)</p> <p>Optional cable gland: PA = with threaded cable gland, see section 15</p>	
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5.1 Hydraulic configuration



6 MODEL CODE OF PRESSURE CONTROL VALVES

6.1 Screw-in type

SP-CART MX-6 / 350 / * / * ** / *

<p>Screw-in relief cartridge</p> <p>Stainless steel execution and size MX-3 = G1/2 MX-6 = M33x1,5 AREX-20 = M35x1,5</p> <p>Pressure range 50 = 50 bar (not for AREX-20 PED) 100 = 100 bar 210 = 210 bar 315 = 315 bar (only for AREX-20) 350 = 350 bar (not for AREX-20) 400 = 400 bar (only for AREX-20)</p>	<p>Synthetic fluids: PE = phosphate ester</p> <p>Series number</p> <p>Only for PED P = factory preset regulation</p> <p>Options PED = reduced leakages and certified according to 97/23/CE</p>	
---	--	--

6.2 Modular type

HMP X - 011 / 350 ** / *

<p>Modular pressure relief valve ISO 4401 size 06</p> <p>Stainless steel execution</p> <p>Configuration, see section 7.5 011, 013, 014</p>	<p>Synthetic fluids: PE = phosphate ester</p> <p>Series number</p> <p>Pressure range for HMP: 50 = 50 bar 100 = 100 bar 210 = 210 bar 350 = 350 bar</p>	
--	---	--

6.3 Control cover

LIMM X - 2 / 350 ** / *

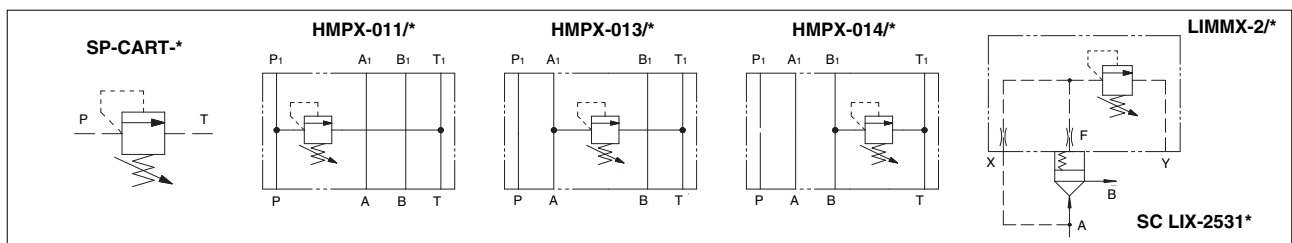
<p>Cover according to ISO 7368</p> <p>Stainless steel execution</p> <p>Size 2 = 25</p>	<p>Synthetic fluids: PE = phosphate ester</p> <p>Series number</p> <p>Pressure range 50 = 6 ÷ 50 bar 100 = 8 ÷ 100 bar 210 = 10 ÷ 210 bar 350 = 15 ÷ 350 bar</p>	
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6.4 Cartridge valve to be coupled with LIMMX cover

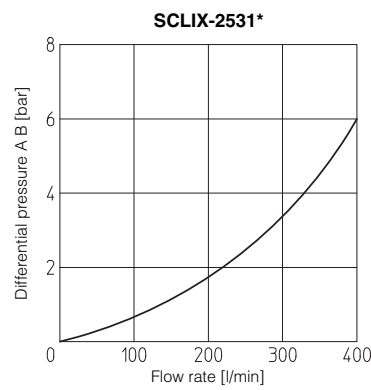
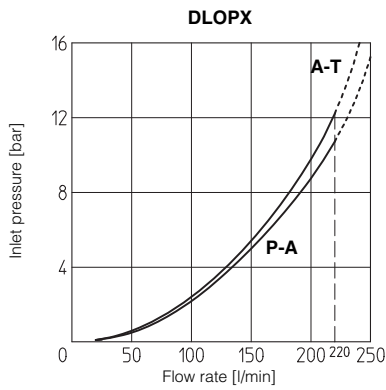
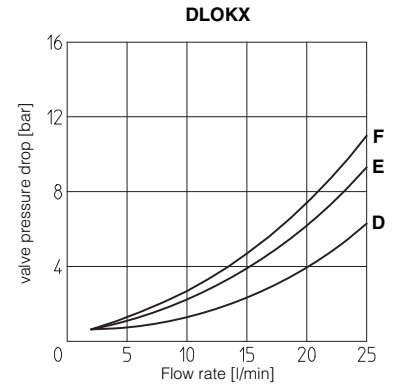
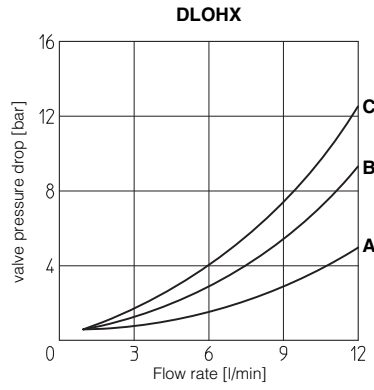
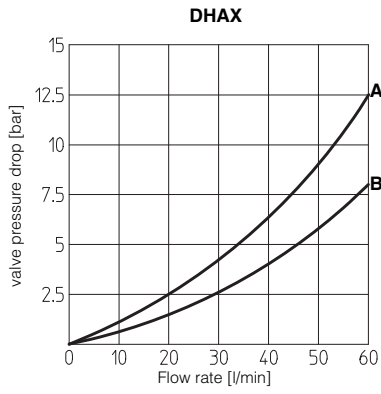
SC LI X - 25 31 2 ** / *

<p>Cartridge according to ISO 7368</p> <p>Stainless steel execution</p> <p>Size 25</p> <p>Area ratio 1÷1</p>	<p>Synthetic fluids: PE = phosphate ester</p> <p>Series number</p> <p>Spring cracking pressure 1 = 0,3 bar 2 = 1,2 bar 3 = 3 bar 6 = 6 bar</p>	
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6.5 hydraulic configuration



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



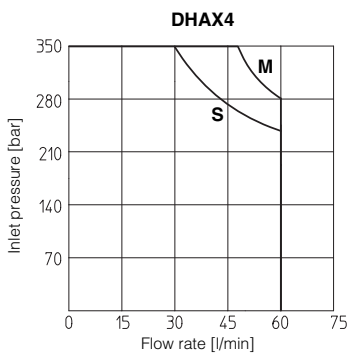
DHAX

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

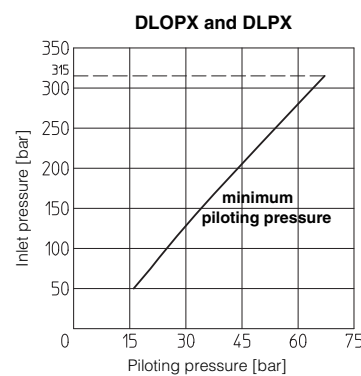
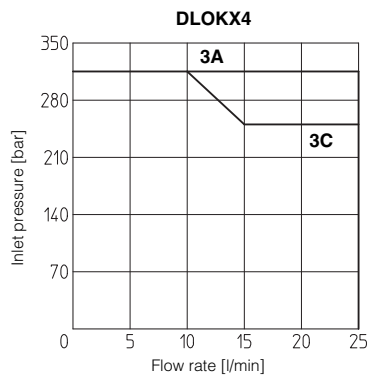
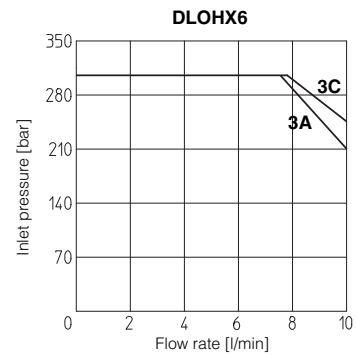
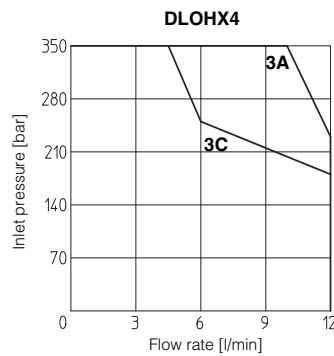
Flow direction \ Valve type	P → A (P → B)	A → T (B → T)
	DLOHX-3A	C
DLOHX-3C	B	A
DLOKX-3A	F	E
DLOKX-3C	E	D

8 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 DHAX 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; **S** = Spools 1/2, 3, 6, 7



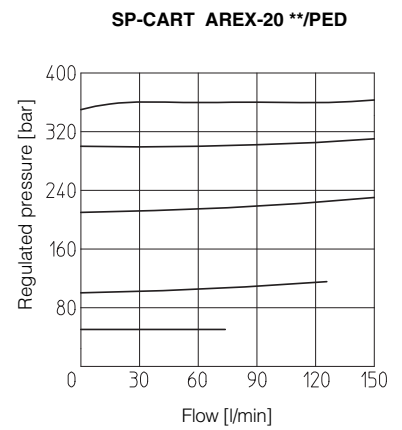
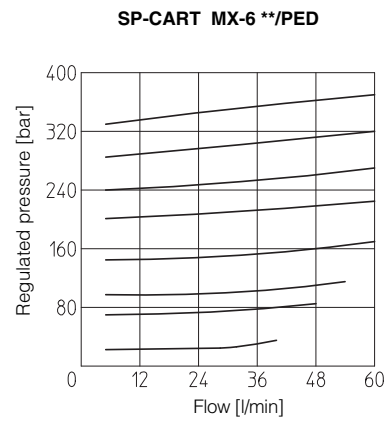
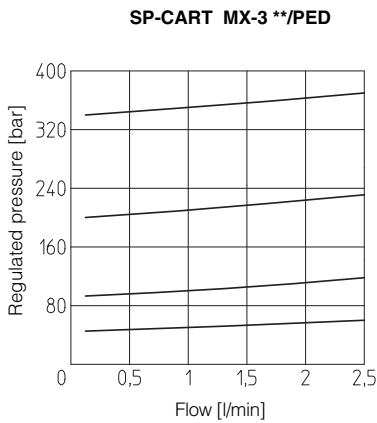
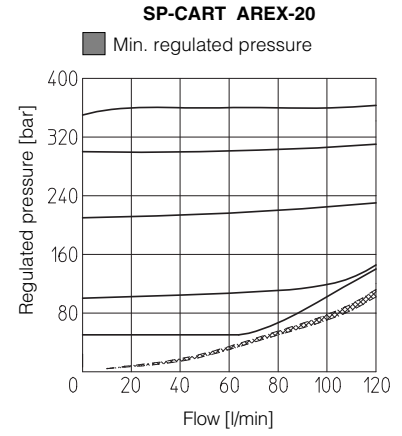
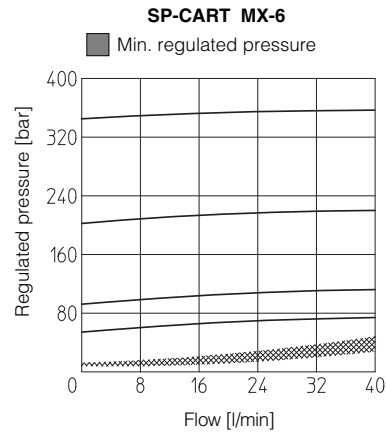
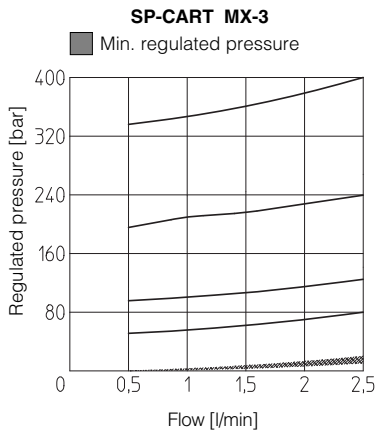
8.1 Internal leakages

internal leakage of DLOHX, DLOKX, DLOPX and DLPX: less than 5 drops/min (0,36 cm³/min) at max pressure.

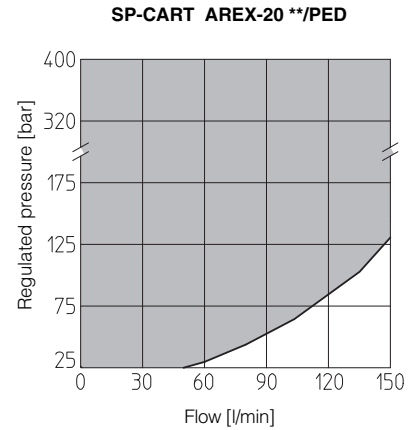
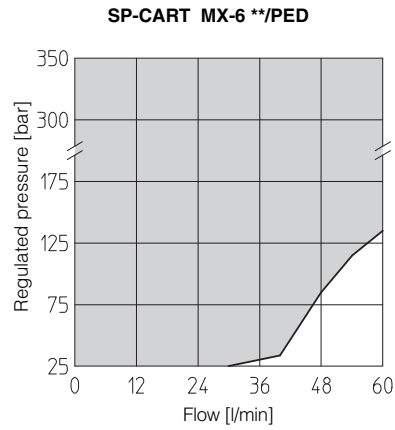
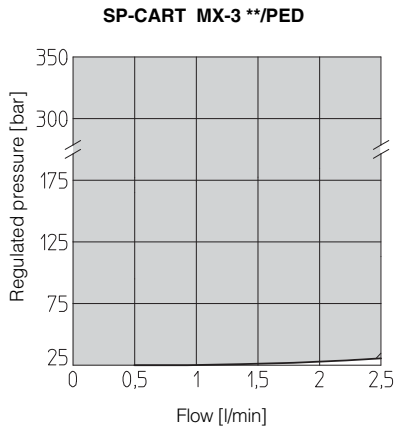
8.2 Piloting pressure (DLOPX and DLPX)

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

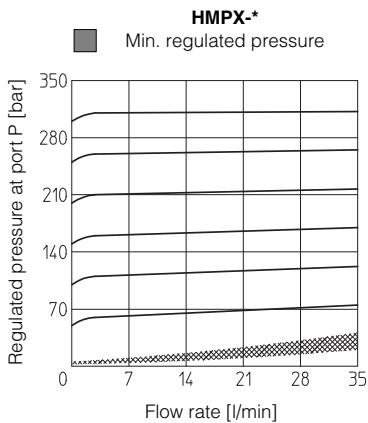
9 REGULATED PRESSURE VERSUS FLOW DIAGRAM of screw-in cartridge valves (based on mineral oil ISO VG 46 at 50°C)



10 PERMITTED WORKING RANGES of screw-in cartridge valves with PED option (shared area)

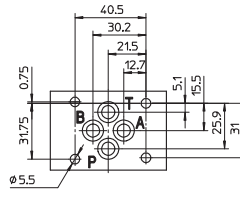
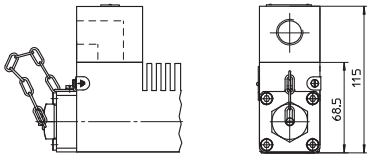


10.1 Regulated pressure for modular valves



11 INSTALLATION DIMENSIONS OF DHAX [mm]

horizontal cable entrance option /O



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

ISO 4401: 2005

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

Fastening bolts:

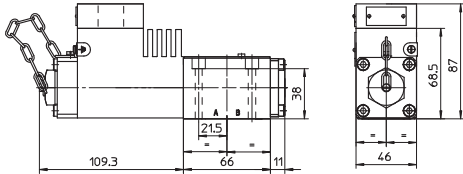
4 socket head screws M5x50-A4-70

Tightening torque = 5,5 Nm

Seals: 4 OR 108

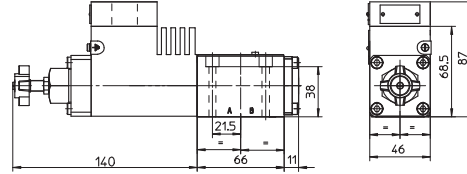
Ports P,A,B,T: $\varnothing = 7.5$ mm (max).

DHAX4-06*



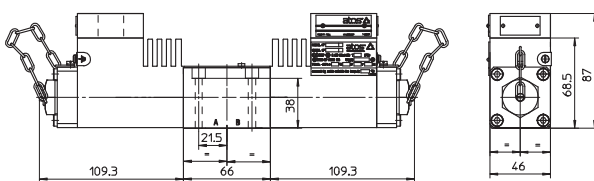
Mass: 2,9 kg

DHAX4-06*/V



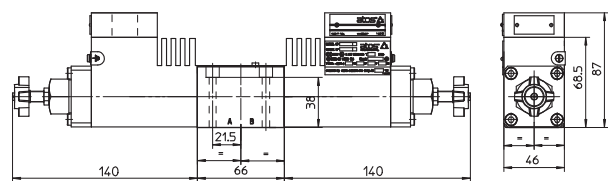
Mass: 3 kg

DHAX4-07*



Mass: 4,6 kg

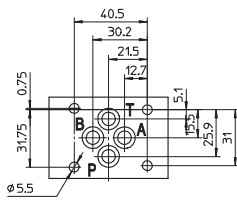
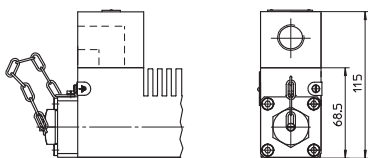
DHAX4-07*/V



Mass: 4,8 kg

12 INSTALLATION DIMENSIONS OF DLOHX AND DLOKX [mm]

horizontal cable entrance option /O



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

ISO 4401: 2005

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

Fastening bolts:

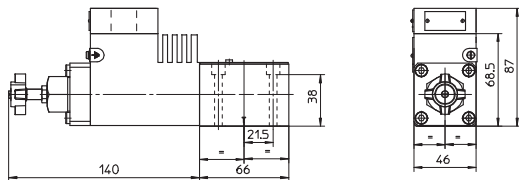
4 socket head screws M5x50-A4-70

Tightening torque = 5,5 Nm

Seals: 4 OR 108

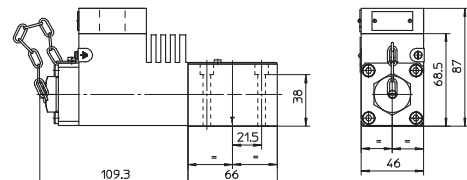
Ports P,A,B,T: $\varnothing = 7.5$ mm (max).

DLOHX6-3A/M-AO/V

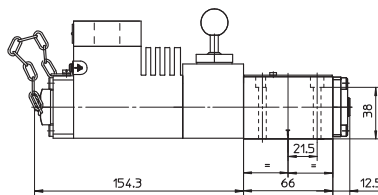


Mass: 3 kg

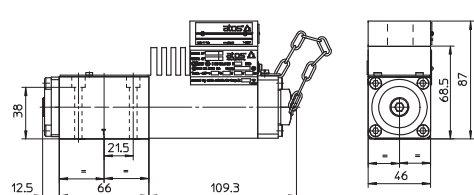
DLOHX4-3C/M-AO



Mass: 2,9 kg



Mass: 3,8 kg

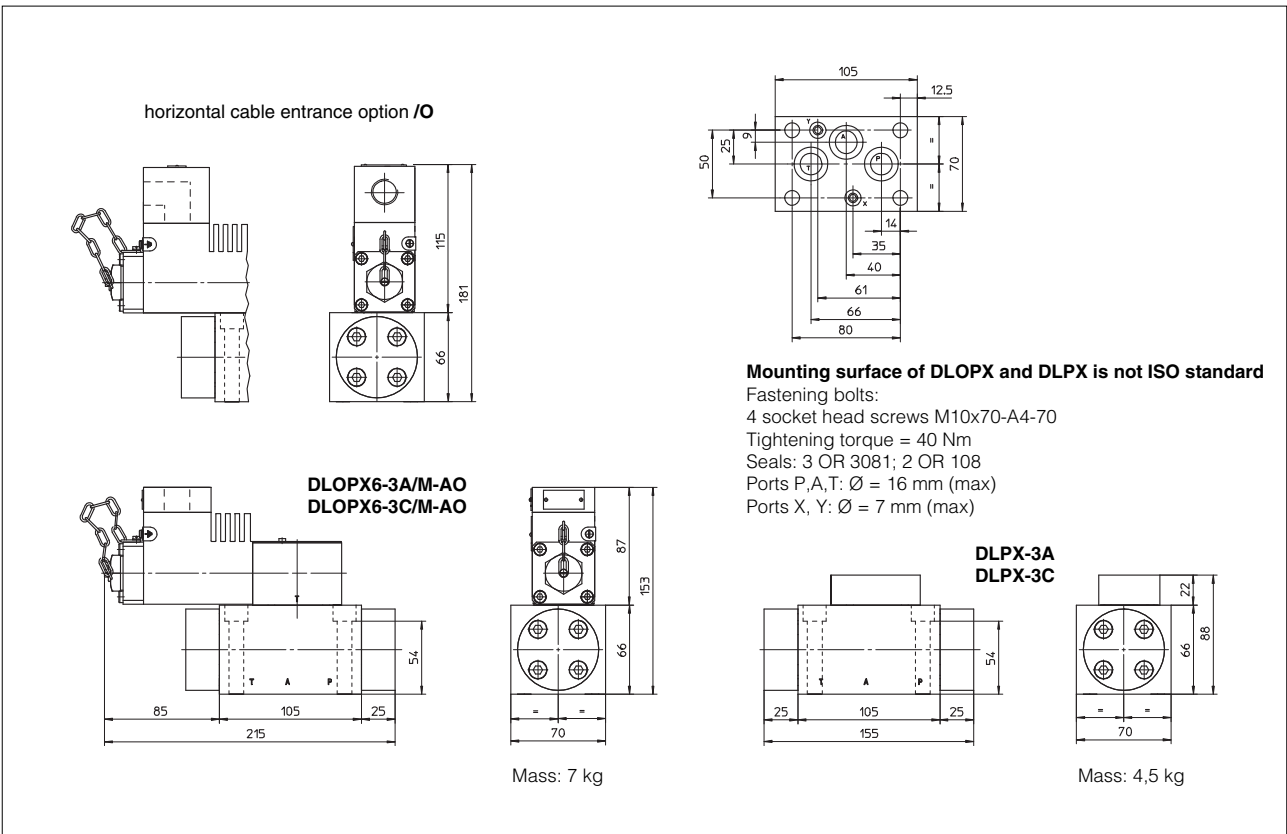


Mass: 2,9 kg

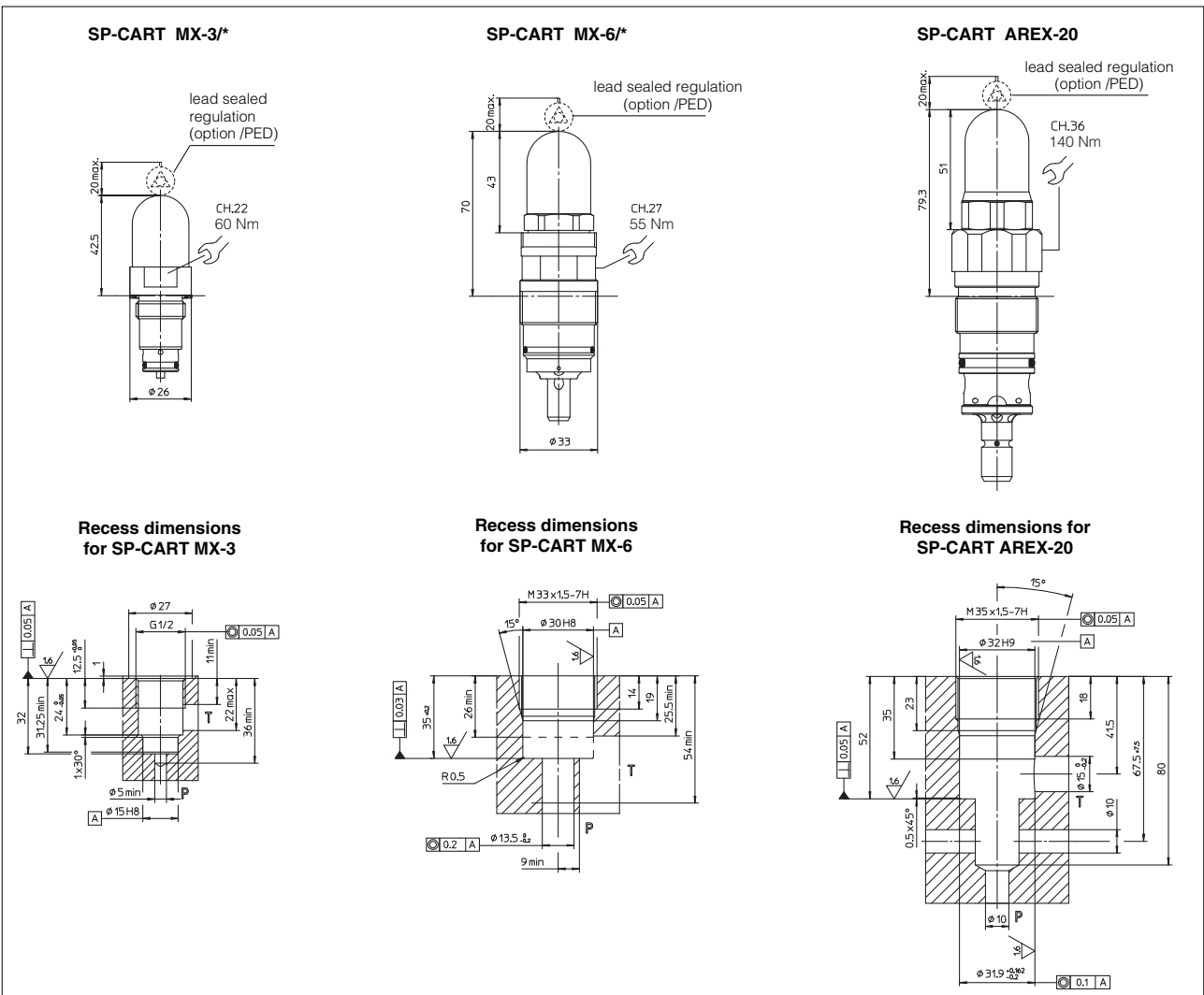
DLOKX4-3A/M-AO/R

DLOKX4-3C/M-AO

13 INSTALLATION DIMENSIONS OF DLOPX AND DLPX [mm]



14 INSTALLATION DIMENSIONS OF SCREW IN PRESSURE RELIEF VALVES [mm]



15 INSTALLATION DIMENSIONS OF MODULAR AND CARTRIDGE VALVES

ISO 4401: 2005

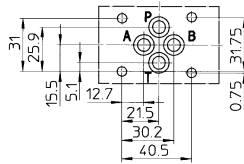
Mounting surface: 4401-03-02-0-05

Fastening bolts: M5x**-A4-70

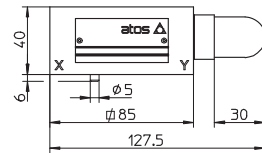
Tightening torque = 5,5 Nm

Seals: 4 OR 108

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

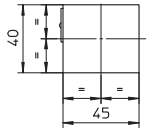


LIMMX-2/*

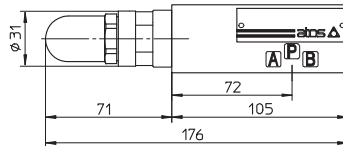


Mass: 2,2 kg

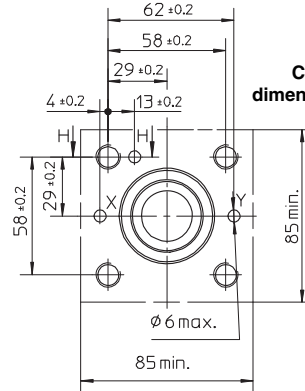
HMPX-011/*



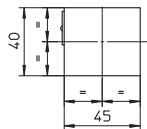
Mass: 1,4 kg



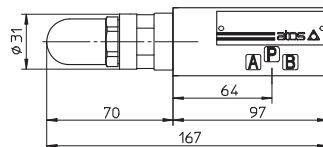
Cover interface dimensions for LIMMX-2



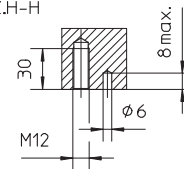
HMPX-013/*



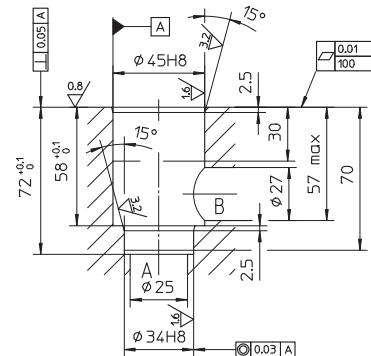
Mass: 1,2 kg



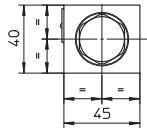
SEZP.H-H



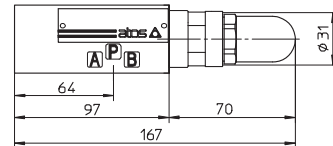
Recess dimensions for SC LIX-25



HMPX-014/*

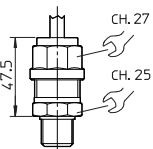


Mass: 1,2 kg



16 CABLE GLAND

STAINLESS STEEL CABLE GLAND SP-PAX19/* (PG9 - IP67)



Stainless steel cable glands - available on request - are certified ATEX according to EN60079-0 and EN60079-1.

Following codes have to be specified for spare cable glands:
SP-PAX19/M = with threaded connection M20x1,5 UNI-4535 (6H/6g).
 This cable gland 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 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 threaded connection for cable entrance: M20x1,5 (UNI-4535)