PULSATION DAMPENERS
ACCUMULATORS
CALIBRATION COLUMNS
ACCESSORIES

Griffco Valve Inc.
188 Creekside Drive
Amherst, NY 14228
Phone: 1 800-474-3326
www.griffcovalve.com

By:

YOUR SYSTEMS UNDER CONTROL

INDEX

FOX bases his business policy on the research of the complete satisfaction of the customers' requirements. For this reason, every single product is tested singularly by qualified people and is possible to guarantee the absence of defects due to a wrong execution or to the used materials.

FOX guarantees for two (2) years, from the delivery date, the whole range of his products against every type of defect related to the execution or caused by the materials.

If the customer notes some malfunctions, Fox invites him to return the material directly to the factory, where it will be possible to establish the reasons of the wrong operation, within 10 days after having received it.

If the products are disassembled, modified, repaired or if they do not arrive to the factory, every possibility to use the right of warranty will be precluded.

The warranty doesn't include the damages due to a not appropriated use, to carelessness or to a wrong application of the products. Moreover are not included damages caused during the transport or related to a contamination and/or related to a bad quality of the working fluid.

The warranty doesn't include parts subject to wear, component in rubber, seals, diaphragms, bladders and electric components.

The warranty doesn't cover possible indirect damages, missed profits or production losses and doesn't include reimbursements higher than the value of the supplied commodity.

FOX invites his customers to contact the Technical Office for possible doubts or explanations and in case of difficulties during the product's use.

FOX s.r.l. - Via Romagna 6, 20090 OPERA-MI- ITALY- Tel. +39.02.57600033 +39.02.57606543 -Fax +39.02.57600176 e-mail fox@fox.it www.fox.it

As a confirmation of almost 40 years of production of hydraulic accumulators and pulsation dampeners, FOX has the capability to supply along with the products, a several certifications listed below:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 latest edition
- U-Stamp + L. Service
- National Board
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210 + AS4343 (Australia)
- ARH (Algeria)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- KOSHA (Korea)
- BV
- RINA
- DNV
- Lloyd's
- ABS

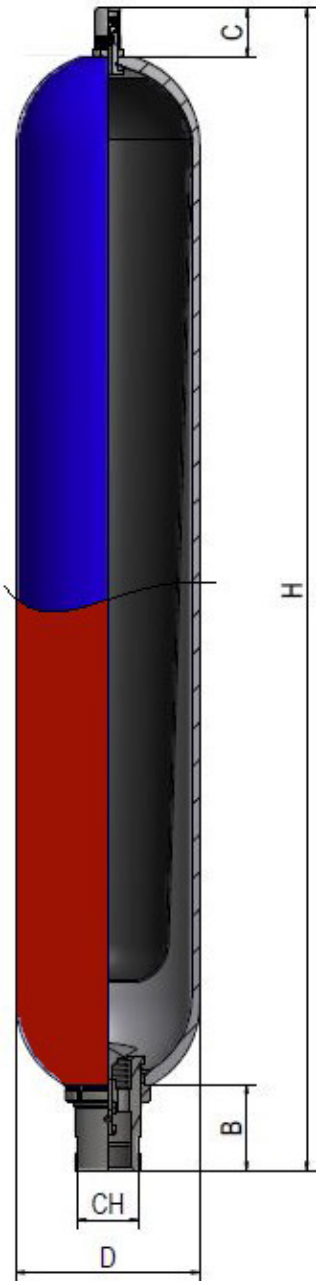
Special certifications can be made on specific request. Please, do not hesitate to contact Griffco Technical Department for further information.

INTERNATIONAL SERIES BOTTOM REPAIRABLE

Technical Features:

Maximum working pressure (PS):
5000-6900-10,000 psi
350-480-690 bar
Test Pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: forged steel, sand and painted
Standard nitrogen valve : ⅝" UNF
Working temperature (TS): -20°C ÷ +80°C
Standard bladder: can be used with mineral oils and noncorrosive fluids
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Special execution:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Internal lining in different materials
- Bladders in HNBR, EPDM, FPM
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Special connection on request
- Execution 480 Bar / 690 Bar
- Execution with nitrogen/poppet valve in inox
- Execution for additional nitrogen bottle
- Accumulators technically and dimensionally interchangeable with other brands of same type



On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Volume	Max Pressure	Max N2 precharge	H	D	C	B	CH	Hydraulic Connection	Max Flow	Weight
	cu in./liter	psi/Bar	psi/Bar	mm	mm	mm	mm	mm		Lt/min	Kg
HB1	61/1	5000/350	3335/230	295	114	55	52	36	¾" BSP-F	220	4.5
HB1.5	91/1.5	5000/350	3335230	357	114	55	52	36	¾" BSP-F	220	5.5
HB2.5	152/2.5	5000/350	3335/230	520	114	58	63	50	1-¼" BSP-F	220	12
HB4.5	244/4	5000/350	3335/230	410	168	58	63	50	1-¼" BSP-F	400	16
HB6	366/6	5000/350	3335/230	505	168	58	63	50	1-¼" BSP-F	350	19.5
HB10	610/10	5000/350	3335/230	775	168	58	63	50	1-¼" BSP-F	300	36
HB10/2	610/10	5000/350	3335/230	550	223	58	100	70	2" BSP-F	630	48
HB20	1128/18.5	5000/350	3335/230	870	223	58	100	70	2" BSP-F	600	53
HB25	1519/24.9	5000/350	3335/230	1030	223	58	100	70	2" BSP-F	570	62
HB35	2044/33.5	5000/350	3335/230	1400	223	58	100	70	2" BSP-F	540	84
HB50	2990/49	5000/350	3335/230	1900	223	58	100	70	2" BSP-F	500	115

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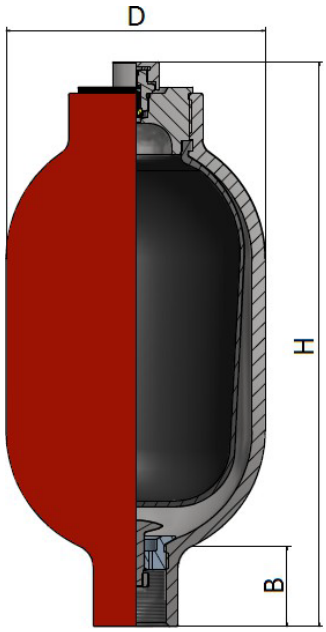

Drawing No 1

Drawing No 2

TOP REPAIRABLE

Technical Features:

Maximum working pressure (PS): 5000 psi/ 350 bar
Test Pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: forged steel, sand and painted
Standard nitrogen valve: ⅝" UNF
Working temperature (TS): -20°C ÷ +80°C
Standard bladder: can be used with mineral oils and noncorrosive fluids
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Special execution:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Internal lining in different materials
- Bladders in HNBR, EPDM, FPM
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Special connection on request
- Execution with nitrogen/poppet valve in inox

On request, according to:

- CE (2014/68/EU- PED)
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- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
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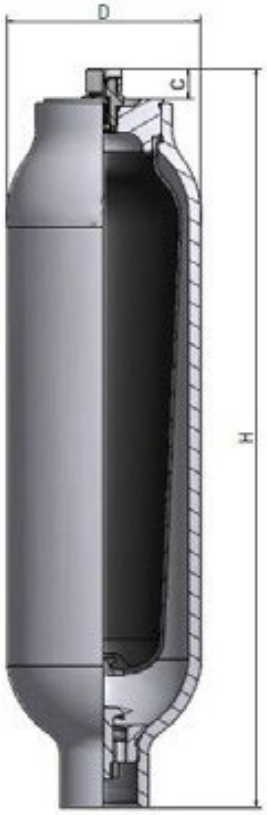
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Volume	Max Pressure	Max N2 precharge	H	D	B	Hydraulic Connection	Max Flow	Weight	Drawing
	cu.in/liter	psi/Bar	psi/Bar	mm	mm	mm		Lt/min	Kg	
HBR4	244/4	5000/350	3335/230	370	168	54	1-¼" BSP-F	400	16	1-2
HBR6	366/6	5000/350	3335/230	485	168	54	1-¼" BSP-F	350	19.5	1-2
HBR10	610/10	5000/350	3335/230	757	168	54	1-¼" BSP-F	300	36	1-2



Drawing No 2

TOP REPAIRABLE

Technical Features:

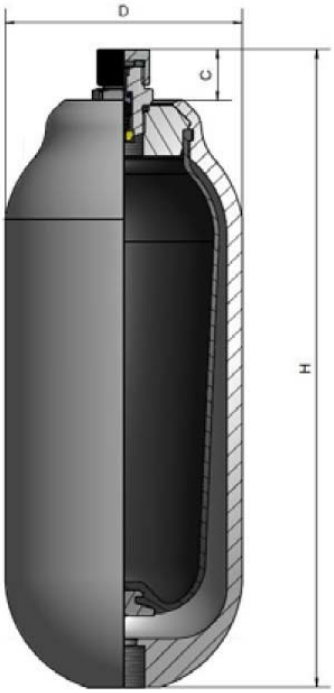
Maximum working pressure (PS): 3625-3045 psi, 250-210 bar
Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: made in painted carbon steel
Standard nitrogen valve : ⅝" UNF
Working temperature (TS): from -20°C to +80°C
Standard bladder: can be used with mineral oils and non corrosive fluids
Installation: horizontal / vertical (nitrogen valve upward)
Compression Ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Internal lining in different materials
- Bladders in HNBR, EPDM, FPM
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Special connection on request
- **LT** series for temperature of – 40°C
- **S** series for separator of fluid

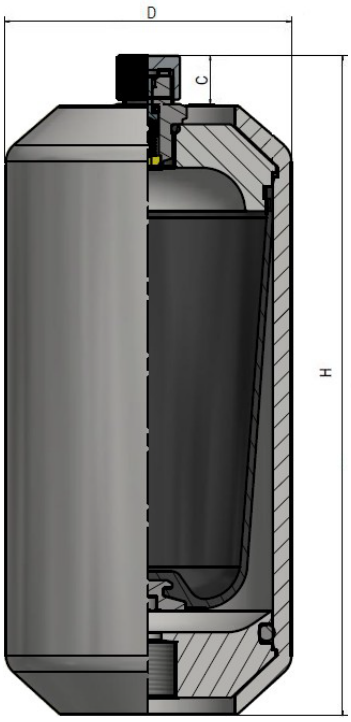
On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Volume	Max Pressure	Max N2 precharge	H	D	C	B	Hydraulic Connection	Max Flow	Weight	Drawing
	cu.in/liter	psi/Bar	psi/Bar	mm	mm	mm	mm		Lt./min	Kg	
HTR4.5	275/4.5	3000/210	2030/140	395	170	15	80	1-¼" BSP-F	400	14	2
HTR6.5	397/6.5	3000/210	2030/140	520	170	20	60	1-¼" BSP-F	350	20	2
HTR10	610/10	3000/210	2030/140	760	170	15	80	1-¼" BSP-F	300	31	2



Drawing No 1



Drawing No 2

NON REPAIREABLE DIAPHRAGM

Technical Features:

Maximum working pressure (PS): 3625-3000 psi, 250-210 bar
Test pressure (PT): PS x 1,43 / 1,3 / 1,5 **Body:** made in painted carbon steel
Standard nitrogen valve : ⅝" UNF (**R** version)
Constructive methodology: exectution with caulking, without welds
Working temperature (TS): from -20°C to +80°C
Standard diaphragm: can be used with mineral oils and non corrosive fluids, not replaceable
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: not available
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Diaphragm in HNBR, EPDM, FPM, HYTREL
- Connection with flange SAE 3000
- Connection with flange ANSI B16.5 or UNI/DIN
- Special connection on request
- **H…/LT** diaphragm for temperature up to -40°C
- **H…R** series rechargeable with nitrogen valve 5/8" UNF
- **H…M** series rechargeable with nitrogen valve M28x1.5
- **H…V** series not rechargeable with fix nitrogen value

***R** nitrogen valve version*

***M** nitrogen valve version*

On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Volume	Max Pressure	Max N2 precharge	H	D	C	Hydraulic Connection	Max Flow	Weight	Drawing
	cu.in/liter	psi/Bar	psi/Bar	mm	mm	mm		Lt/min	Kg	Kg
H120R	7/0.12	3625/250	2320/160	145	50	23	M18X1.5-F	35	1.0	1 & 2
H150R	9/0.15	3625/250	2320/160	135	70	23	M18X1.5-F	40	1.7	1 & 2
H350R	21/0.35	3625/250	2320/160	190	70	23	M18X1.5-F	35	2.5	1 & 2
H500R	27/0.45	3625/250	2320/160	167	92	23	M18X1.5-F	50	2.8	1 & 2
H700R	45/0.75	3625/250	2320/160	220	92	23	M18X1.5-F	40	3.2	2
H990R	60/0.99	3625/250	2320/160	251	92	23	M18X1.5-F	50	3.9	1 & 2
H1000R	61/1	3625/250	2320/160	200	115	23	M18X1.5-F	50	4.5	1 & 2
H1500R	91/1.5	3625/250	2320/160	270	115	23	M18X1.5-F	40	6.2	2
H2200R	134/2.2	3625/250	2320/160	350	115	23	M18X1.5-F	40	7.9	2
H2800R	170/2.8	3625/250	2320/160	391	115	23	M18X1.5-F	60	9.8	2
H4000R	231/3.8	3625/210	2320/135	335	170	23	¾"BSP-F	80	14	1 & 2

NON REPAREABLE DIAPHRAGM

MAX Pressure - 4786 PSI/330 BAR

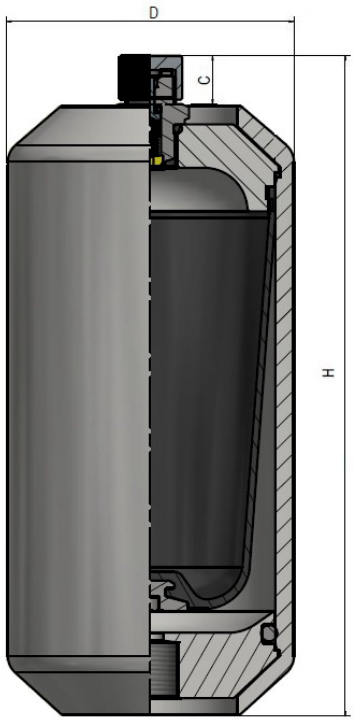
Technical Features:

Maximum working pressure (PS):

4786 psi, 330 bar

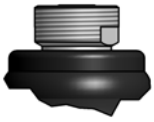
Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: made in painted carbon steel
Standard nitrogen valve : ⅝" UNF (**R** version)
Constructive methodology: exectution with caulking, without welds
Working temperature (TS): from -20°C to +80°C
Standard diaphragm: can be used with mineral oils and non corrosive fluids, not replaceable
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: not available
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Diaphragm in HNBR, EPDM, FPM, HYTREL
- Connection with flange SAE 3000
- Connection with flange ANSI B16.5 or UNI/DIN
- Special connection on request
- **H…/LT** diaphragm for temperature up to -40°C
- **H…R** series rechargeable with nitrogen valve 5/8" UNF
- **H…M** series rechargeable with nitrogen valve M28x1.5
- **H…V** series not rechargeable with fix nitrogen value



Drawing No 1

***R** nitrogen valve version*



***M** nitrogen valve version*

On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
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- EN 13445
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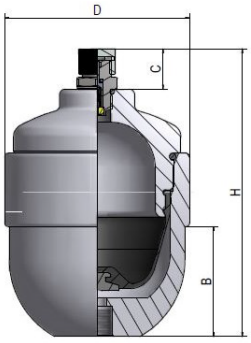
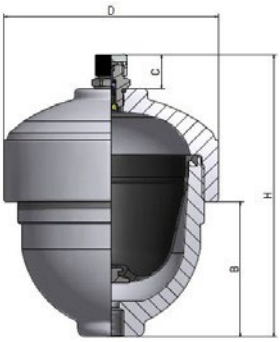
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Volume	Max Pressure	Max N2 precharge	H	D	C	Hydraulic Connection	Max Flow	Weight	Drawing
	cu in./liter	psi/Bar	psi/Bar	mm	mm	mm		Lt/min	Kg	Kg
HI500R	27/0.45	4786/330	2320/160	167	95	23	M18X1.5-F	50	3.8	1
HI700R	45/0.75	4786/330	2320/160	220	95	23	M18X1.5-F	40	4.2	1
HI990R	60/0.99	4786/330	2320/160	251	95	23	M18X1.5-F	50	4.9	1
HI1000R	61/1	4786/330	2320/160	200	120	23	M18X1.5-F	50	6.0	1
HI1500R	91/1.5	4786/330	2320/160	270	120	23	M18X1.5-F	40	7.5	1
HI2200R	134/2.2	4786/330	2320/160	350	120	23	M18X1.5-F	40	9.6	1
HI2800R	170/2.8	4786/330	2320/160	391	120	23	M18X1.5-F	60	11.5	1



Drawing No 1



Drawing No 2

Drawing No 3

THREADED INLET, REPAIRABLE

Technical Features:

Maximum working pressure (PS): 4351 psi, 300 bar
Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: made in painted carbon steel
Standard nitrogen valve : ⅝" UNF
Working temperature (TS): -20°C ÷ +80°C
Standard diaphragm: can be used with mineral oils and noncorrosive fluids
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 6

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Available :
- Outside epoxy painted as per standard FOX procedure or as project specification
- Internal lining in different materials
- Diaphragm in HNBR, EPDM, FPM , HYTREL
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Special connection on request
- **LT** series for temperatures up to -40 °C
- **M** series rechargeable with nitrogen valve M28x1.5
- **V** series not rechargeable with a fixed nitrogen preload in the factory
- **S** series for separator of fluid
- High pressure execution
- Available volumes up to 20 liters

On request, according to:

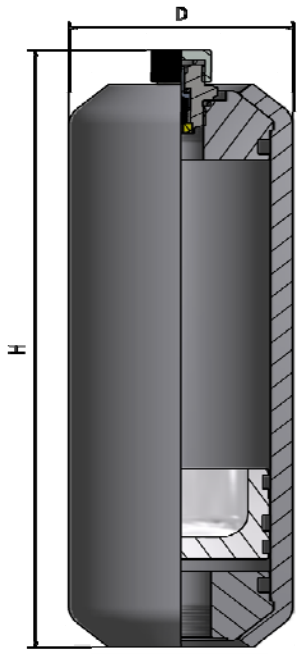
- ❖ CE (2014/68/EU- PED)
- ❖ ATEX (2014/34/EU)
- ❖ ASME VIII Div.1 or Div.2 Latest Edition
- ❖ U-Stamp + NB
- ❖ EN 14359
- ❖ PD5500 (UK)
- ❖ EN 13445
- ❖ AS1210/4343 (Australia)
- ❖ ARH (Algeria)
- ❖ KOSHA (Korea)
- ❖ SELO (China)
- ❖ CU-TR 032/2013 (Russia)
- ❖ DOSH (Malaysia)
- ❖ NR-13 (Brasil)
- ❖ CRN (Canada)
- ❖ BV
- ❖ DNV / RINA
- ❖ Lloyd's / ABS

Model	Volume	Pressure Max	Max N2 precharge	H	D	B	C	Hydraulic Connection	Max Flow	Weight	Drawing
	cu in./liter	psi/Bar	psi/Bar	mm	mm	mm	mm		Lt/min	Kg	
HST0.05	3/0.05	4351/300	3045/210	98	60	68	22	⅜" BSP-F	35	1.1	1
HST0.12	7/0.12	4351/300	3045/210	151	53	130	22	M18X1.5-F	45	1.6	1
HST0.15	9/0.15	4351/300	3045/210	141	80	94	22	M18X1.5-F	45	2.5	1
HST0.35	21/0.35	4351/300	3045/210	152	101	100	22	M18X1.5-F	50	4	1
HST0.5	30/0.5	4351/300	3045/210	175	124	120	22	M18X1.5-F	60	5.5	1
HST0.7	42/0.7	4351/300	3045/210	218	100	80	22	M18X1.5-F	55	5.5	1
HST0.8	48/0.8	4351/300	3045/210	185	138	85	22	M18X1.5-F	60	6.3	2
HST1.3	79/1.3	4351/300	3045/210	232	125	180	22	M18X1.5-F	55	8.2	1
HST1.5	91/1.5	4351/300	3045/210	282	138	160	22	M18X1.5-F	55	8.9	2-3
HST2.5	152/2.5	4351/300	3045/210	392	125	-	22	M18X1.5-F	55	11.5	3

PISTON DESIGN, NOT REPAIRABLE

Technical Features:

Maximum working pressure (PS):
3625 psi, 250 bar
Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Construction method: carbon steel body with caulking, without welds, not repairable/not disassemble; piston in aluminum
Standard nitrogen valve : ⅝" UNF
Working temperature (TS): -20°C ÷ +80°C
Seals: standard execution in NBR
Installation: in every position
Compression Ratio: It does not require compliance with defined parameters
Spare parts: see dedicated page
Warranty: see dedicated page
Available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Seal in Polyurethane, FPM, PTFE
- Execution with scraper for abrasive fluids
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Special connection on request
- High pressure version
- Special volume on request
- **X** series in SS316L or exotic material
- Version with external level indicator for piston position monitoring



Drawing No 1

On request, according to:

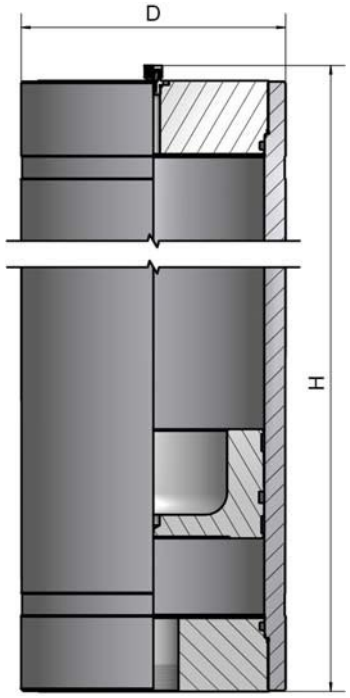
- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Nitrogen Volume	Max Pressure	Max N2 precharge	Max speed	Piston Diameter	H	D	Connection	Max Flow	Weight	Drawing
	cu.in/liter	psi/bar	psi/bar	m/s	Mm	mm	mm	F	Lt/min	Kg	N.
HP60-0,3	18/0.3	3625/250	2538/175	0,4	60	210	70	½" BSP-F	80	3,4	1
HP60-0,5	30/0.5	3625/250	2538/175	0,4	60	290	70	½" BSP-F	80	4	1
HP80-0,5	30/0.5	3625/250	2538/175	0,4	80	210	92	½" BSP-F	120	4,6	1
HP80-0,7	42/0.7	3625/250	2538/175	0,4	80	250	92	½" BSP-F	120	5,8	1
HP80-1	61/1	3625/250	2538/175	0,4	80	310	92	½" BSP-F	120	7	1
HP80-1,5	91/1.5	3625/250	2538/175	0,4	80	420	92	½" BSP-F	120	9	1
HP100-1	61/1	3625/250	2538/175	0,4	100	270	115	¾" BSP-F	180	11	1
HP100-2	122/2	3625/250	2538/175	0,4	100	400	115	¾" BSP-F	180	12	1
HP100-3	183/3	3625/250	2538/175	0,4	100	530	115	¾" BSP-F	180	14.5	1
HP100-4	244/4	3625/250	2538/175	0,4	100	660	115	¾" BSP-F	180	21	1
HP100-5	305/5	3625/250	2538/175	0,4	100	790	115	¾" BSP-F	180	25	1
HP100-6	366/6	3625/250	2538/175	0,4	100	920	115	¾" BSP-F	180	29	1
HP125-4	244/4	3625/250	2538/175	0,4	125	463	150	1" BSP-F	260	28	1
HP125-5	305/5	3625/250	2538/175	0,4	125	546	150	1" BSP-F	260	32	1
HP125-6	366/6	3625/250	2538/175	0,4	125	627	150	1" BSP-F	260	35	1
HP125-7	427/7	3625/250	2538/175	0,4	125	709	150	1" BSP-F	260	39	1
HP125-8	488/8	3625/250	2538/175	0,4	125	790	150	1" BSP-F	260	43	1

PISTON DESIGN, REPAIRABLE

Technical Features:

Maximum working pressure (PS):
3625 psi, 250 bar
Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Construction method: carbon steel body with unscrewed caps; piston made in aluminium
Standard nitrogen valve : ⅝" UNF
Working temperature (TS): -20°C ÷ +80°C
Seals: standard execution in NBR
Installation: in every position
Compression Ratio: It does not require compliance with defined parameters
Spare parts: see dedicated page
Warranty: see dedicated page
Available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Seal in Polyurethane, FPM, PTFE
- Execution with scraper for abrasive fluids
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Special connection on request
- High pressure version
- Special volume on request
- X series in SS316L or exotic material
- Version with external level indicator for piston position monitoring



Drawing No 2

On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
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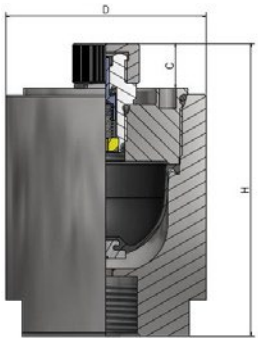
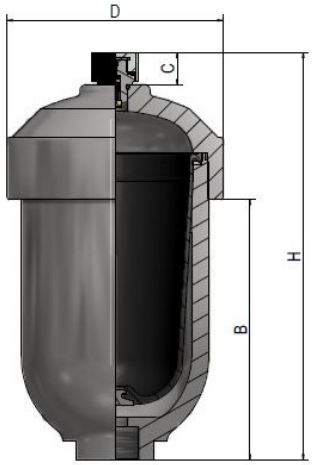
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Nitrogen Volume	Max Pressure	Max N2 precharge	Max speed	Piston Diameter	H	D	Connection	Max Flow	Weight	Drawing
	cu.in/liter	psi/bar	psi/bar	m/s	Mm	mm	mm	F	Lt/min	Kg	N.
HP150-7	427/7	3625/250	2538/175	0,6	150	570	175	1" BSP-F	450	38	2
HP150-10	610/10	3625/250	2538/175	0,6	150	750	175	1" BSP-F	450	45	2
HP150-13	793/13	3625/250	2538/175	0,6	150	930	178	1" BSP-F	450	54	2
HP180-15	915/15	3625/250	2538/175	0,6	180	825	207	1-½"BSP-F	900	92	2
HP180-20	1220/20	3625/250	2538/175	0,6	180	1021	207	1-½"BSP-F	900	106	2
HP180-25	1525/25	3625/250	2538/175	0,6	180	1218	207	1-½"BSP-F	900	118	2
HP180-30	1830/30	3625/250	2538/175	0,6	180	1414	207	1-½"BSP-F	900	129	2
HP180-35	2135/35	3625/250	2538/175	0,6	180	1611	207	1-½"BSP-F	900	140	2
HP250-20	1220/20	3625/250	2538/175	0,6	250	764	295	2"BSP-F	1700	198	2
HP250-30	1830/30	3625/250	2538/175	0,6	250	967	295	2"BSP-F	1700	240	2
HP250-40	244040	3625/250	2538/175	0,6	250	1170	295	2"BSP-F	1700	272	2
HP250-50	3051/50	3625/250	2538/175	0,6	250	1374	295	2"BSP-F	1700	294	2
HP250-60	3661/60	3625/250	2538/175	0,6	250	1578	295	2"BSP-F	1700	338	2
HP250-80	4881/80	3625/250	2538/175	0,6	250	1986	295	2"BSP-F	1700	386	2
HP250-100	6102/100	3625/250	2538/175	0,6	250	2363	295	2"BSP-F	1700	460	2
HP350-150	9153/150	3625/250	2538/175	0,6	350	1850	406	2"BSP-F	2000	860	2
HP350-250	15,255/250	3625/250	2538/175427/	0,6	350	2890	406	2"BSP-F	2000	1200	2

HSTX



Drawing No 1



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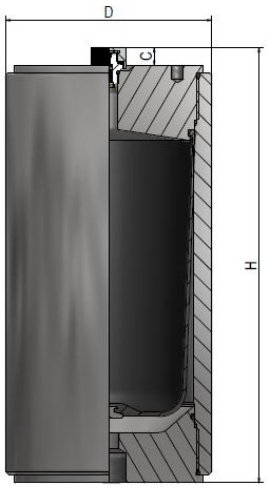

Drawing No 3

On request, according to:

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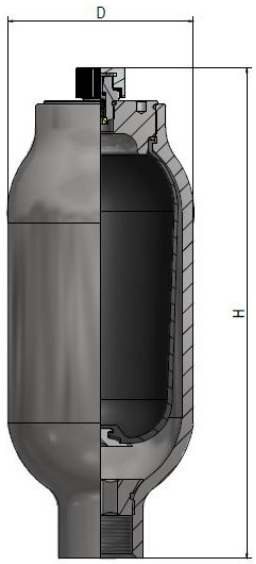
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Technical Features:

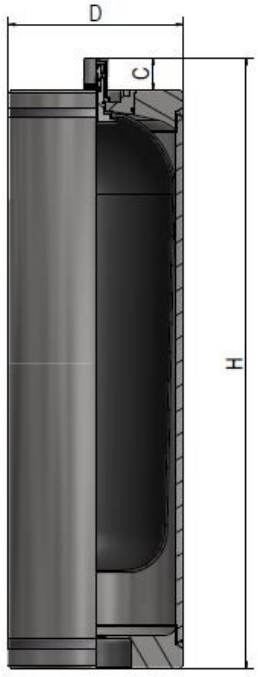
Maximum working pressure (PS): 2175-3045 psi, 150-210 bar
Test pressure (PT): PSx1,43 / 1,3 / 1,5
Body: in AISI 316 L stainless steel
Diaphragm: NBR, HNBR, EPDM, FPM, HYTREL
Standard nitrogen valve : ⅝" UNF
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Connection API spec. 6A type 6BX
- Autoclave or Grayloc connection
- Special connection on request
- Integral flange connection
- High pressure execution up to 1379 bar (20,000 psi)
- Maintenance Free (HSTX-SMF)
- Exotic material execution

Model	Volume	Max pressure	Max N2 precharge	H	D	C	B	Hydraulic Connection	Weight	Drawing
	cu in./liter	psi/bar	bar	mm	mm	mm	mm		Kg	N°
HSTX0.03	1.8/0.03	3045/210	150	90	60	22	-	½"BSP-F	1.1	1
HSTX0.05	3/0.05	3045/210	150	100	60	22	-	½"BSP-F	1.2	1
HSTX0.14	8.5/0.14	2175/150	105	154	54	22	-	½"BSP-F	3.5	1
HSTX0.15	9/0.15	(2175-3045)psi (150-210)bar	105 / 150	128	80	22	-	½"BSP-F	4	1
HSTX0.3	18/0.3	(2175-3045)psi (150-210)bar	105 / 150	162	80	22	-	½"BSP-F	4.5	1
HSTX0.35	21/0.35	(2175-3045)psi (150-210)bar	105 / 150	148	100	22	-	½"BSP-F	5	1
HSTX0.5	30/0.5	(2175-3045)psi (150-210)bar	105 / 150	160	100	22	-	½"BSP-F	5.5	1
HSTX0.7	42/0.7	(2175-3045)psi (150-210)bar	105 / 150	202	100	22	-	¾"BSP-F	6.4	1
HSTX1	61/1	(2175-3045)psi (150-210)bar	105 / 150	268	100	22	-	¾"BSP-F	7.5	1
HSTX1.5	91/1.5	(2175-3045)psi (150-210)bar	105 / 150	262	138	22	170	1"BSP-F	8.6	2
HSTX2.3	140/2.3	(2175-3045)psi (150-210)bar	105 / 150	342	138	22	170	1"BSP-F	10.5	2
HSTX3	183/3	(2175-3045)psi (150-210)bar	105 / 150	412	130	22	-	1"BSP-F	19	1 & 2
HSTX4.5	274/4.5	(2175-3045)psi (150-210)bar	105 / 150	370	180	22	-	1"BSP-F	24	3
HSTX6	366/6	(2175-3045)psi (150-210)bar	105 / 150	550	180	22	-	1"BSP-F	33	3
HSTX7	427/7	(2175-3045)psi (150-210)bar	105 / 150	610	180	22	-	1"BSP-F	39	3
HSTX10	610/10	(2175-3045)psi (150-210)bar	105 / 150	740	180	22	-	1-1/4"BSP-F	45	3



Drawing No 1



Drawing No 2

Technical Features:

Maximum working pressure (PS):

435-1740 psi, 30 - 120 bar

Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: in AISI 316L stainless steel
Bladder: NBR, HNBR, EPDM, FPM, HYTREL, Butyl, Polyurethane
Standard nitrogen valve : ⅝" UNF
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

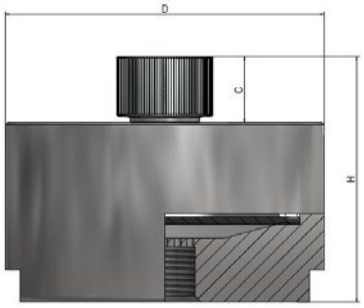
Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Connection API spec. 6A type 6BX
- Autoclave or Grayloc connection
- Special connection on request
- Integral flange connection
- Maintenance Free (HTRX-SMF)
- Exotic material execution
- High pressure execution

On request, according to:

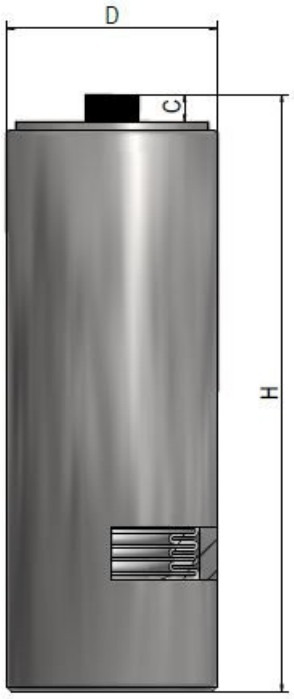
- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Volume	Max Pressure	Max N2 precharge	H	D	C	Hydraulic Connection	Weight	Drawing
	cu in./liter	psi/Bar	psi/Bar	mm	mm	mm		Kg	
HTRX1	61/1	1450/100	1015/70	300	92	22	¾" BSP-F	5.5	1
HTRX1.5	91/1.5	1740/120	1160/80	290	114	22	1-¼" BSP-F	7	1
HTRX2.5	152/2.5	1740/120	1160/80	420	114	22	1-¼" BSP-F	9	1
HTRX4.5	274/4.5	1015/70	725/50	365	168	22	1-¼" BSP-F	15	1
HTRX6.5	396/6.5	1015/70	725/50	495	168	22	2"BSP-F	19	1
HTRX10	610/10	1015/70	290/20	750	168	22	2"BSP-F	25	1
HTRX20	1220/20	435/30	290/20	750	220	40	3"BSP-F	36	2
HTRX35	2135/35	435/30	290/20	1290	220	40	3"BSP-F	58	2
HTRX50	3051/50	435/30	290/20	1780	220	40	3"BSP-F	75	2

Griffco Valve Inc. 188 Creekside Dr. Amherst, NY, 14228 www.griffcovavle.com FOX s.r.l. - Via Romagna 6, 20090 OPERA-MI- ITALY-www.fox.it



Drawing No 1



Drawing No 2

Technical Features :

Maximum working pressure (PS):

2175 PSI, 150 Bar

Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: in AISI 316 L stainless steel
Diaphragm / Bellow: in PTFE (Teflon)
Standard nitrogen valve : ⅝" UNF
Installation: horizontal / vertical (nitrogen valve upward)
Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Connection API spec. 6A type 6BX
- Autoclave or Grayloc connection
- Integral flange connection
- Special connection on request
- Special execution for high pressure
- Exotic material execution
- Diaphragm / Bellow FDA certified
- Lapped / electro polished execution for pharmaceutical applications
- Special volume on request
- **BTH**, carbon steel execution

On request, according to:

- ❖ CE (2014/68/EU- PED)
- ❖ ATEX (2014/34/EU)
- ❖ ASME VIII Div.1 or Div.2 Latest Edition
- ❖ U-Stamp + NB
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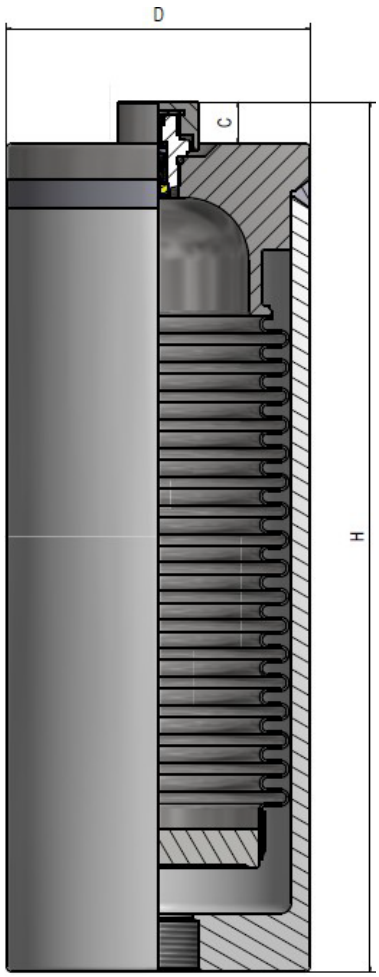
- ❖ SELO (China)
- ❖ CU-TR 032/2013 (Russia)
- ❖ DOSH (Malaysia)
- ❖ NR-13 (Brasil)
- ❖ CRN (Canada)
- ❖ BV
- ❖ DNV / RINA
- ❖ Lloyd's / ABS

Model	Nitrogen Volume	Max Pressure	Max N2 precharge	H	D	C	Hydraulic Connection	Weight	Drawing
	cu.in/Lt	Bar	Bar	mm	mm	mm		Kg	
BTHX0.06	3.7/.06	2175/150	1522/105	100	100	22	¾" BSP-F	3.9	1
BTHX0.15	9/0.15	2175/150	1522/105	100	120	22	¾" BSP-F	5.2	1 & 2
BTHX0.3	18/0.3	2175/150	1522/105	165	100	22	¾" BSP-F	6	2
BTHX0.5	30/0.5	2175/150	1522/105	195	100	22	¾" BSP-F	7	2
BTHX0.7	43/0.7	2175/150	1522/105	235	100	22	¾" BSP-F	8	2
BTHX1	61/1	2175/150	1522/105	245	125	22	1-½" BSP-F	11	2
BTHX1.5	91/1.5	2175/150	1522/105	310	125	22	1-½" BSP-F	13	2
BTHX2.5	152/2.5	2175/150	1522/105	435	125	22	1-½" BSP-F	15	2
BTHX3	183/3	2175/150	1522/105	250	180	22	1-½" BSP-F	19	2
BTHX4.5	274/4.5	2175/150	1522/105	375	180	22	1-½" BSP-F	24	2
BTHX6.5	396/6.5	2175/150	1522/105	560	180	22	1-½" BSP-F	35	2
BTHX10	610/10	2175/150	1522/105	740	180	22	1-½" BSP-F	45	2
BTHX12	732/12	2175/150	1522/105	790	180	22	1-½" BSP-F	54	2
BTHX15	915/15	2175/150	1522/105	1000	180	22	3" BSP-F	68	2



Drawing No 1

Technical Features :

Maximum working pressure (PS):
2175 PSI,150 Bar
Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: in AISI 316 L stainless steel
Bellow: in stainless steel
Standard nitrogen valve : ⅝" UNF
Installation: horizontal / vertical (nitrogen valve upward)
Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Connection API spec. 6A type 6BX
- Autoclave or Grayloc connection
- Integral flange connection
- Special connection on request
- Special execution for high pressure
- Exotic material execution
- Special volume on request

On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
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- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

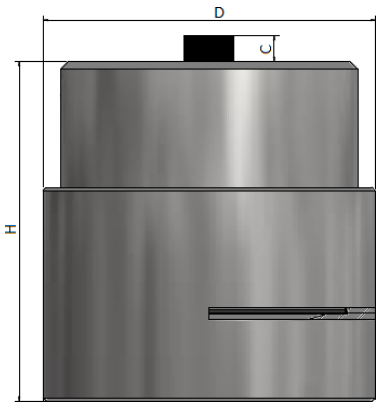
Model	Nitrogen Volume	Max Pressure	Max N2 precharge	H	D	C	Hydraulic Connection	Weight	Drawing
	cu.in/Lt	psi/Bar	Psi/Bar	mm	mm	mm		Kg	
BSTX0.35	2.1/0.35	2175/150	290/20	152	115	15	½" NPT-F	7,5	1
BSTX0.8	49/0.8	2175/150	290/20	243	115	15	¾" NPT-F	9,5	1
BSTX1.5	91/1.5	2175/150	290/20	330	115	15	1" NPT-F	11	1
BSTX3	183/3	2175/150	290/20	460	115	15	1" NPT-F	18	1
BSTX4	244/4	2175/150	290/20	340	170	15	1-½" NPT-F	25	1
BSTX6	366/6	2175/150	290/20	470	170	15	1-½" NPT-F	33	1
BSTX12	732/12	2175/150	290/20	830	170	15	2" NPT-F	60	1

Technical Features :

Maximum working pressure (PS):

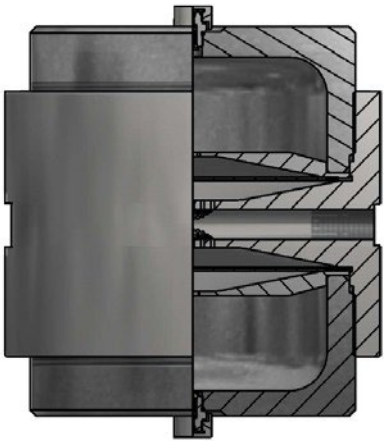
2175 PSI,150 Bar

Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: in AISI 316 L stainless steel
Flat diaphragm: in PTFE (Teflon)
Standard nitrogen valve : ⅝" UNF
Installation: in every position
Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Outside epoxy painted as per standard FOX procedure or as per project specification
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Connection API spec. 6A type 6BX
- Autoclave or Grayloc connection
- Integral flange connection
- Special connection on request
- Special execution for high pressure
- Exotic material or carbon steel execution
- Flat diaphragm FDA certified
- Lapped / electro polished execution for pharmaceutical applications
- Special volume on request
- Double diaphragm sandwich type with rupture diaphragm detector (pressure switch, pressure transmitter, pressure gauge or piston)

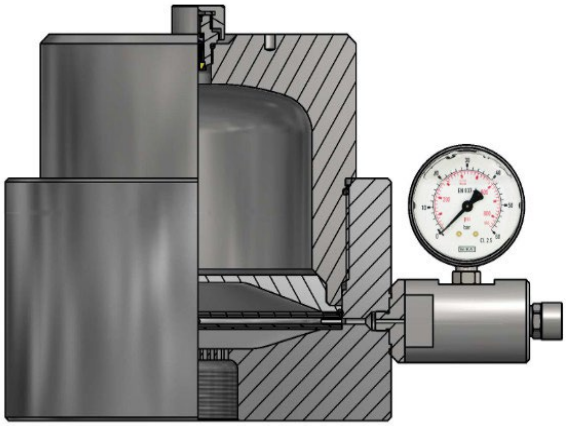


Drawing No 1

Double single diaphragm for in line flow-through



Double sandwich diaphragm with rupture diaphragm detector



On request, according to:

- CE (2014/68/EU- PED)
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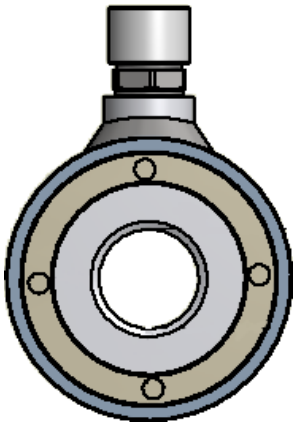
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Model	Nitrogen Volume	Max Pressure	Max N2 precharge	H	D	C	Hydraulic Connection	Weight	Drawing
	cu.in/Lt	psi/Bar	psi/Bar	mm	mm	mm		Kg	
MPX1.5	91/1.5	2175/150	1522/105	205	200	22	1-½" BSP-F	35	1
MPX2.5	152/2.5	2175/150	1522/105	300	200	22	1-½" BSP-F	48	1
MPX5.5	335/5.5	2175/150	1522/105	280	300	22	2" BSP-F	88	1
MPX7.5	457/7.5	2175/150	1522/105	330	300	22	2" BSP-F	95	1
MPX10	610/10	2175/150	1522/105	420	300	22	2" BSP-F	102	1
MPX12	732/12	2175/150	1522/105	470	300	22	2" BSP-F	110	1

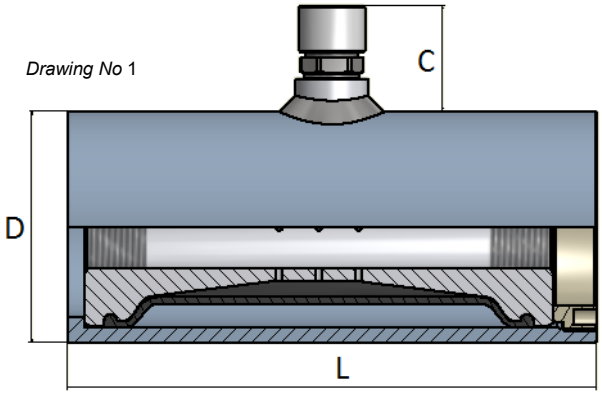
Technical features:

Maximum working pressure (PS): 150 / 210 bar
Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: in AISI 316L repairable series
Body: in carbon steel not repairable series
Bladder: NBR, HNBR, EPDM, FPM,
Standard nitrogen valve : ⅝" UNF
Installation: in every position
Compression Ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 10

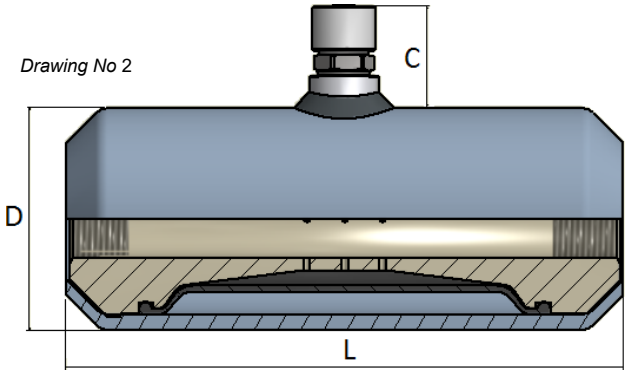
Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature
Warranty: see dedicated page
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Connection API spec. 6A type 6BX
- Autoclave or Grayloc connection
- Special connection on request
- Integral flange connection
- Exotic material execution



Drawing No 1



Drawing No 2



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- NR-13 (Brasile)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS

Modello	Shell material	Nitrogen Volume	Max Pressure	Max N2 precharge	D	L	C	Hydraulic Connection	Weight	Drawing
		cu.in/Lt	Psi/bar	Psi/bar	mm	mm	mm		Kg	
SLX0.2	AISI 316 L	12/0.2	2175/150	1522/105	70	160	32	2 x ¾" BSP-F	6	1

Modello	Shell material	Nitrogen Volume	Max Pressure	Max N2 precharge	D	L	C	Hydraulic Connection	Weight	Drawing
		cu.in/Lt	psi/bar	psi/bar	mm	mm	mm		Kg	
SL0.2	CARBON STEEL	12/0.2	3045/210	2175/150	70	160	32	2 x ¾" BSP-F	6	2

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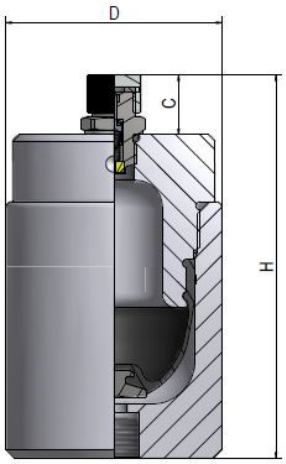
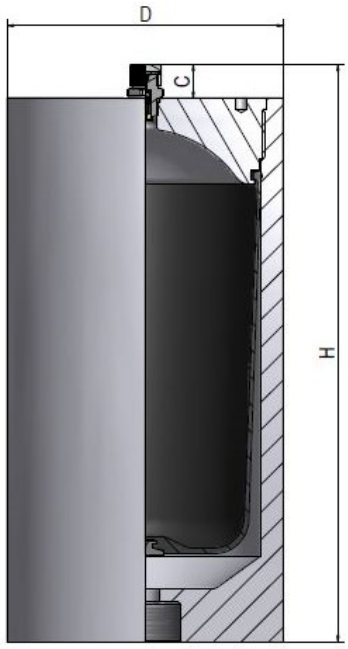
HST-Plastic



Drawing No 1



Drawing No 2

Technical Features:

Maximum working pressure (PS):

150 psi/10 bar

Test pressure(PT): PS x 1,43 / 1,5
Diaphragm: NBR, HNBR, EPDM, FPM, HYTREL, Alcryn
Standard nitrogen valve : ⅝" UNF
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio.
For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Connection with flange ANSI B16.5 or UNI/DIN
- Special connection on request
- Integral flange connection
- High pressure execution, 15bar
- Maintenance Free (HSTP-SMF)
- **HSTP** = PP → +0°C/+70°C
- **HSTPVC** = PVC-U → -5°C/+50°C
- **HSTPVCC** = PVC-C → -5°C/+60°C
- **HSTPVDF** = PVDF → -20°C/+80°C

On request, according to:

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- ❖ EN 14359
- ❖ PD5500 (UK)
- ❖ EN 13445
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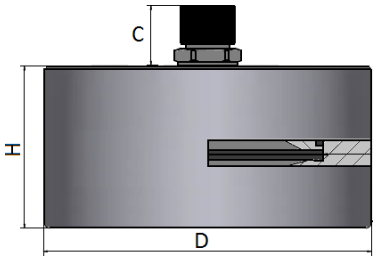
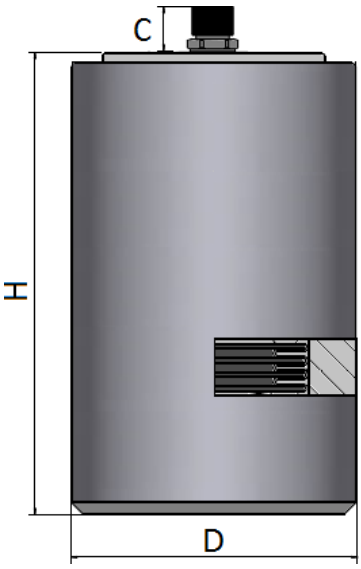
- ❖ NR-13 (Brasil)
- ❖ ARH (Algeria)
- ❖ Lloyd's / ABS
- ❖ CU-TR 032/2013 (Russia)

Model	Nitrogen Volume	Max Pressure	Max N2 precharge	H	D	C	Hydraulic Connection	Weight	Drawing
	cu.in/Lt	psi/Bar	psi/Bar	mm	mm	mm		Kg	
HST…0.05	3/0.05	150/10	100/7	100	60	23	⅜"BSP-F	0.3	1
HST…0.1	7/0.12	150/10	100/7	142	80	23	½" BSP-F	0.7	1
HST…0.35	21/0.35	150/10	100/7	155	100	23	½" BSP-F	1.1	1
HST…0.7	42/0.7	150/10	100/7	218	100	23	½" BSP-F	1.8	1
HST…1	61/1	150/10	100/7	270	100	23	½" BSP-F	2.6	1
HST…1.5	91/1.5	150/10	100/7	270	138	23	¾"BSP-F	3.5	1
HST…2	122/2	150/10	100/7	325	138	23	¾"BSP-F	3.9	1
HST…2.3	140/2.3	150/10	100/7	360	138	23	¾"BSP-F	4	1
HST…3	183/3	150/10	100/7	418	138	23	¾"BSP-F	5.5	1
HST…5	305/5	150/10	100/7	375	180	23	1-½" BSP-F	10	2
HST…6	366/6	150/10	100/7	433	180	23	1-½" BSP-F	14	1
HST…10	610/10	150/10	100/7	665	180	23	2"BSP-F	20	2

BTH-Plastic



Drawing No 1



Drawing No 2

Technical Features:

Maximum working pressure (PS):

150 psi/ 10 bar

Test pressure(PT): PS x 1,43 / 1,5
Diaphragm / Bellow: in PTFE (Teflon)
Standard nitrogen valve : ⅝" UNF
Installation: horizontal / vertical (nitrogen valve upward)
Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio.
For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature.
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Connection with flange ANSI B16.5 or UNI/DIN
- Special connection on request
- Integral flange connection
- High pressure execution, 15bar
- Maintenance Free (BTHP-SMF)
- **BTHP** = PP → +0°C/+70°C
- **BTHPVC** = PVC-U → -5°C/+50°C
- **BTHPVCC** = PVC-C → -5°C/+60°C
- **BTHPVDF** = PVDF → -20°C/+80°C

On request, according to:

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- ❖ EN 14359
- ❖ PD5500 (UK)
- ❖ EN 13445
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- ❖ NR-13 (Brasil)
- ❖ ARH (Algeria)
- ❖ Lloyd's / ABS
- ❖ CU-TR 032/2013 (Russia)

Model	Nitrogen Volume	Max Pressure	Max N2 precharge	H	D	C	Hydraulic Connection	Weight	Drawing
	cu.in/Lt	psi/Bar	psi/Bar	mm	mm	mm		Kg	
BTH...0.06	3.6/0.06	150/10	100/7	62	120	22	¾" BSP-F	0.4	1
BTH...0.15	9/0.15	150/10	100/7	135	120	22	¾" BSP-F	0.8	1 & 2
BTH...0.3	18/0.3	150/10	100/7	175	120	22	¾" BSP-F	1.1	2
BTH...0.5	30/0.5	150/10	100/7	210	120	22	¾" BSP-F	1.4	2
BTH...0.7	427/0.7	150/10	100/7	250	120	22	¾" BSP-F	1.8	2
BTH...1	61/1	150/10	100/7	212	125	22	¾" BSP-F	2.9	2
BTH...1.5	91/1.5	150/10	100/7	276	125	22	¾" BSP-F	3.5	2
BTH...2.5	152/2.5	150/10	100/7	382	125	22	¾" BSP-F	4.5	2
BTH...5	305/5	150/10	100/7	400	180	22	1-½" BSP-F	11	2
BTH...10	610/10	150/10	100/7	720	180	22	2" BSP-F	22	2

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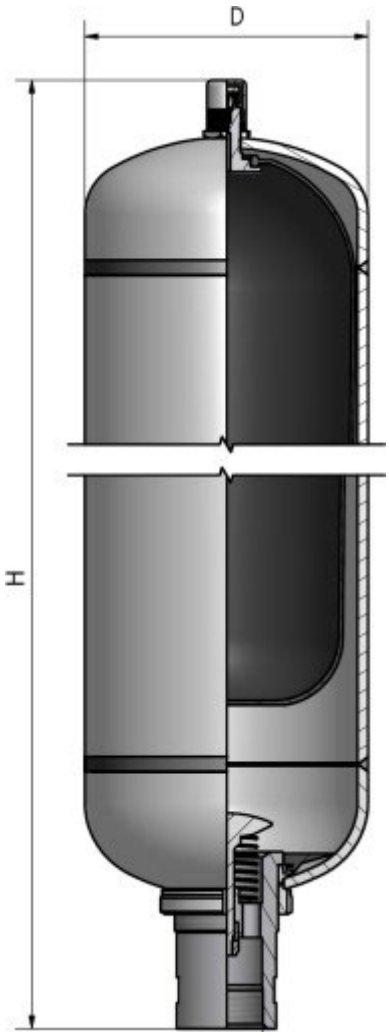

Drawing No 1

Technical Features:

Maximum working pressure (PS):

725-6525 psi/50-450 bar

Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: in AISI 316L stainless steel
Bladder: NBR, HNBR, EPDM, FPM, HYTREL, Butyl, Polyurethane
Standard nitrogen valve : ⅝" UNF
Installation: horizontal / vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Connection with flange SAE 3000 - SAE 6000, ANSI B16.5 or UNI/DIN
- Connection API spec. 6A type 6BX
- Autoclave or Grayloc connection
- Special connection on request
- Integral flange connection
- Maintenance Free (HBX-SMF)
- Exotic material execution

On request, according to:

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- BV
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Model	Nitrogen Volume	Max Pressure	Max N2 precharge	H	D (referred to 40 bar)	Hydraulic Connection	Weight	Drawing
	cu.in/Lt	psi/Bar	psi/Bar	mm	mm		kg	
HBX10	585/9.6	580-6800/40-470	In base of design pressure	535	219	2" BSP-F	In base of design pressure	1
HBX20	1208/19.8	580-6800/40-470	In base of design pressure	845	219	2" BSP-F	In base of design pressure	1
HBX25	1500/24.5	580-6800/40-470	In base of design pressure	1000	219	2" BSP-F	In base of design pressure	1
HBX35	2160/35.4	580-6800/40-470	In base of design pressure	1425	219	2" BSP-F	In base of design pressure	1
HBX50	3080/50.6	580-6800/40-470	In base of design pressure	1935	219	2" BSP-F	In base of design pressure	1

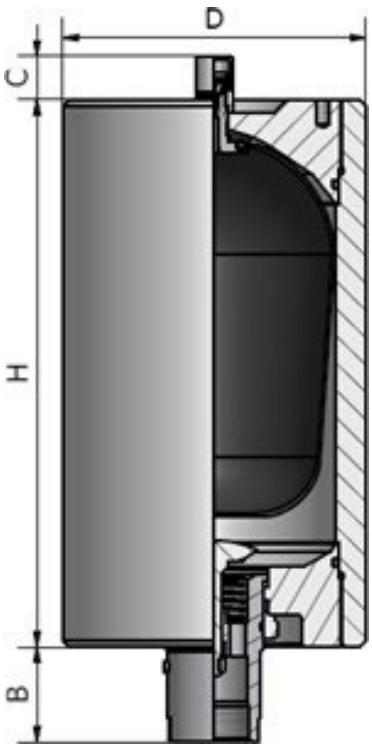
Technical features:

Maximum working pressure (PS):

3190 psi/220 bar

Test pressure (PT): PS x 1,43 / 1,3 / 1,5
Body: in AISI 316L Stainless Steel
Bladder: NBR, HNBR, EPDM, FPM, HYTREL, Butyl, Polyurethane
Standard nitrogen valve : ⅝" UNF
Installation: horizontal / vertical (nitrogen valve upward)
Compression Ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Connection API spec. 6A type 6BX
- Autoclave or Grayloc connection
- Special connection on request
- Integral flange connection
- Maintenance Free (ACSX-SMF)
- Exotic material execution



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Modello	Nitrogen Volume	Max Pressure	Max N2 precharge	H	D	C	B	Hydraulic Connection	Weight	Drawing
	cu.in/Lt	psi/bar	psi/bar	mm	mm	mm	mm		Kg	
ACSX10	610/10	3190/220	2100/145	450	250	36	70	2"BSP-F	60	1
ACSX20	1220/20	3190/220	2100/145	735	250	36	70	2"BSP-F	99.5	1
ACSX25	1525/25	3190/220	2100/145	885	250	36	70	2"BSP-F	120	1
ACSX35	2135/35	3190/220	2100/145	1265	250	36	70	2"BSP-F	173	1
ACSX50	3050/50	3190/220	2100/145	1750	250	36	70	2"BSP-F	240	1

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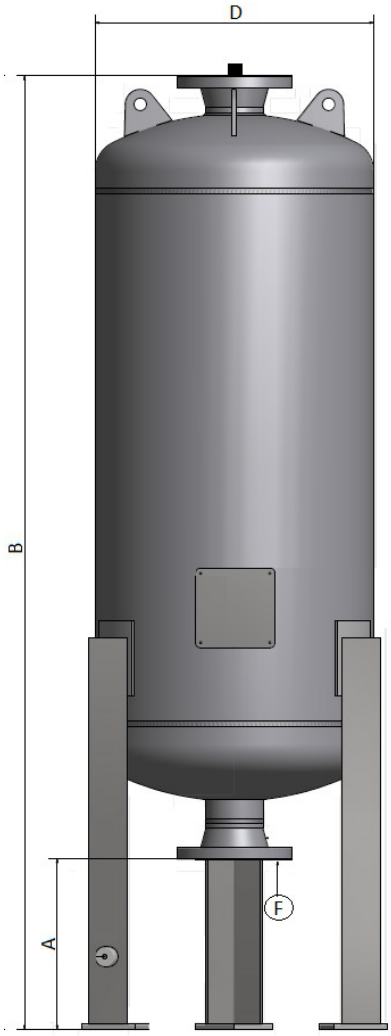


TOP REPAIRABLE

Technical Features:

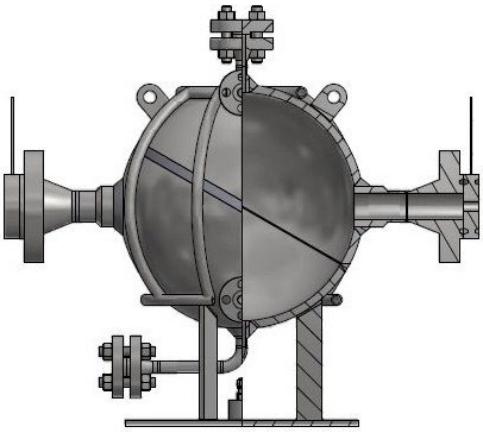
Maximum working pressure (PS):
Up to 725 psi/50 bar
Test Pressure (PT): PS x 1,43 / 1,3 / 1,5
Material: carbon steel
Working temperature (TS): -20°C / +80°C
Standard bladder: polyurethane; suitable for mineral oils, fuels and non-corrosive fluids
Standard nitrogen valve: ⅝" UNF or M28x1.5
Installation: vertical (nitrogen valve upward)
Compression ratio:
- recommended: P2/P0 = 2.5
- maximum: P2/P0 = 4

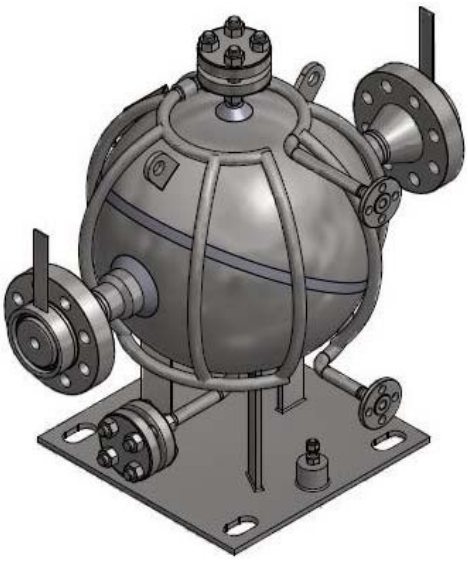
Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature
Warranty: see dedicated page
Spare parts: see dedicated page
Available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Bladders in IIR, NBR, FPM, ECO
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Special connection on request
- **HGX** series in AISI 304L/316L
- High pressure version till 50 barg
- Volume up to 5000 liters

(*) preliminary data

Model	Volume with standard polyurethane bladder	Max Pressure	Max N2 precharge	D	B (*)	A (*)	F	Weight (*)
	gallon/Lt	psi/bar	psi/bar	mm	mm	mm		kg
HG100	26/100	Up to 725/50	-	362	1650	250	4" ANSI 150 RF	140
HG150	40/150	Up to 725/50	-	362	2070	250	4" ANSI 150 RF	195
HG200	53/200	Up to 725/50	-	556	1300	250	4" ANSI 150 RF	255
HG250	66/250	Up to 725/50	-	556	1600	250	4" ANSI 150 RF	280
HG300	80/300	Up to 725/50	-	556	1900	250	4" ANSI 150 RF	320
HG350	82/350	Up to 725/50	-	556	2000	250	4" ANSI 150 RF	360
HG400	105/400	Up to 725/50	-	556	2500	250	4" ANSI 150 RF	415
HG450	119/450	Up to 725/50	-	556	2700	250	4" ANSI 150 RF	450
HG500	132/500	Up to 725/50	-	556	2900	250	4" ANSI 150 RF	500
HG1000	264/1000	Up to 725/50	-	700	3600	250	4" ANSI 150 RF	900
HG1500	396/1500	Up to 725/50	-	1000	3100	250	4" ANSI 150 RF	1200

Model	Volume with IIR, NBR, FPM, ECO bladder	Max Pressure	Max N2 precharge	D	B (*)	A (*)	F	Weight (*)
	Gallon/Lt	bar	bar	mm	mm	mm		kg
HG150	40/150	Up to 725/50	-	556	1240	250	4" ANSI 150 RF	195
HG200	53/200	Up to 725/50	-	556	1490	250	4" ANSI 150 RF	255
HG275	72/275	Up to 725/50	-	556	1720	250	4" ANSI 150 RF	305
HG300	80/300	Up to 725/50	-	556	1820	250	4" ANSI 150 RF	320
HG375	100/375	Up to 725/50	-	556	2230	250	4" ANSI 150 RF	400
HG475	125/475	Up to 725/50	-	556	2550	250	4" ANSI 150 RF	480
HG530	140/530	Up to 725/50	-	556	2790	250	4" ANSI 150 RF	510
HG575	152/575	Up to 725/50	-	556	2905	250	4" ANSI 150 RF	600





Technical Features:

Pressure: up to 1379 bar (20.000 PSI)
Test Pressure (PT): PS x 1,43 / 1,3 / 1,5
Warranty: see dedicated page

Free maintenance dampeners or better called resonator pulsation dampeners are typically installed on the suction and discharge sides of the API 674 or API 675 process pumps, very close to the suction and discharge nozzles.
Resonators are used, instead of bladder or diaphragm pulsation dampeners, with clear advantages:

1. Very high reduction of the discharge pulsation; the exact value depends especially on the pumped fluid features and piping connections. It is typically higher than 60%.
2. Complete customization, as per customers requests and projects specification.
3. There are no wearing or moving parts in the full equipment.
4. It's a dampener completely without maintenance.

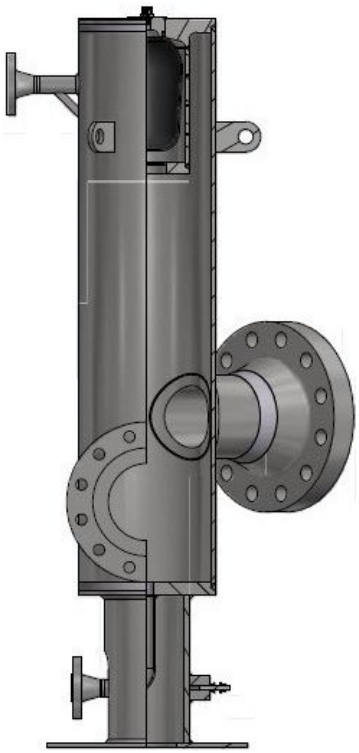
Construction material can be customized depending on the pumped fluid and end.user specification; as a standard, FOX dampeners are in stainless steel AISI 316 L but materials like: DSS (Duplex Stainless Steel), SDSS (Super Duplex Stainless Steel), Alloy-20, Hastelloy-C and Carbon Steel can be foreseen and painted, as per FOX painting procedure for marine and corrosive environments or as per end-user specification.
Volumes can be customized up to 5.000 liters; FOX is always suggesting to share all the necessary operating conditions, in order to be in a position to select the most appropriate volume for your pump.

The operating principle of the resonator is the resonance. The frequencies compensation generated by the pulsations are reduced by the internal design of the resonator and a key factor is the pumped fluid compressibility value (bulk modulus) that has to be considered while sizing the resonator.

Process connections (in & out flanges) are customized as per the requirement of the customer, as well as their position. As a standard a 180° is considered but we can foresee a 90° angle on the outer flange.
The same level of customization is foreseen for the vent & drain connections, as a standard without counter-flanges. We can consider blind flanges with all the relevant bolts, nuts and spiral wound gaskets or metallic ring joint, depending on the flange type considered (RF or RTJ).

On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS



Technical Features:

Pressure: up to 1379 bar (20.000 PSI)
Test Pressure (PT): PS x 1,43 / 1,3 / 1,5
Warranty: see dedicated page

Low maintenance dampeners or better called “low maintenance flow-through suction stabilizer” are typically installed on the suction sides of the API 674 or API 675 and usually combined with spherical resonator BHP series installed in the discharge nozzles.
The HGV series is used, instead the standard bladder or diaphragm pulsation dampeners, with clear advantages:

1. Complete customization, as per customers requests and projects specification.
2. The accidental failure of the bladder / bellow does not compromise the operation since the available liquid volume ensures its proper functionality.
3. It is a dampener useful to stabilize the flow and suction pressures on pumps, where high load losses, high vapor pressure and low NPSHa are present.

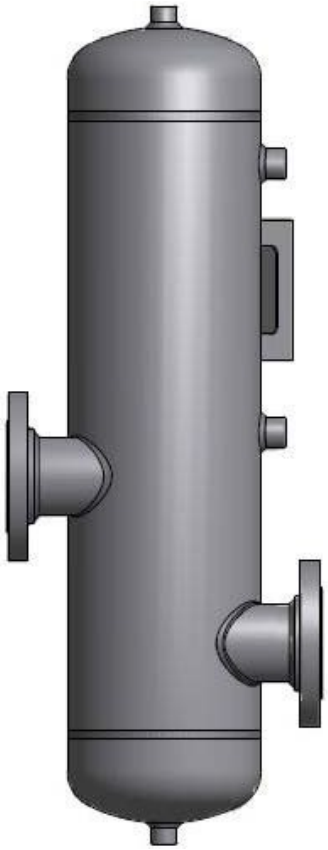
Construction material can be customized depending on the pumped fluid and end-user specification; as a standard, FOX dampeners are in stainless steel AISI 316 L but materials like: DSS (Duplex Stainless Steel), SDSS (Super Duplex Stainless Steel), Alloy-20, Hastelloy-C and Carbon Steel can be foreseen and painted, as per FOX painting procedure for marine and corrosive environments or as per end-user specification.
The elastomer material are available in NBR, HNBR, EPDM, FPM, HYTREL, Butile, Polyurethane, PTFE.
Volumes can be customized up to 5.000 liters; FOX is always suggesting to share all the necessary operating conditions, in order to be in a position to select the most appropriate volume for your pump.

Process connections (in & out flanges) are customized as per the requirement of the customer, as well as their position. As a standard a 180° is considered but we can foresee a 90° angle on the outer flange.
The same level of customization is foreseen for the vent & drain connections, as a standard without counter-flanges. We can consider blind flanges with all the relevant bolts, nuts and spiral wound gaskets or metallic ring joint, depending on the flange type considered (RF or RTJ).
Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio. For pulsation dampener applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the type of pump and the working temperature

On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (China)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasil)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd’s / ABS

HGVS

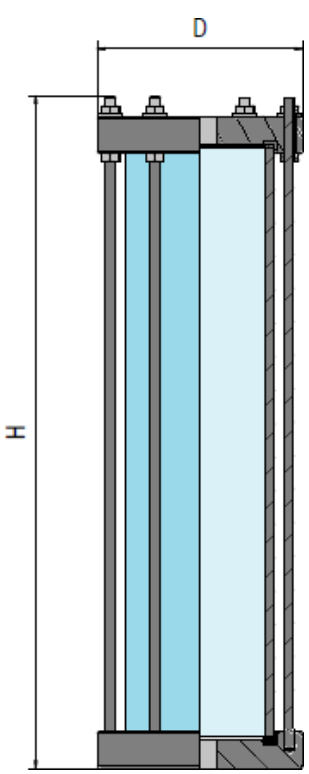


Technical Features:

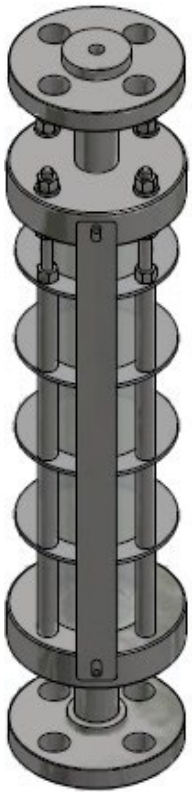
Pressure: up to 1379 bar (20.000 PSI)
Test Pressure (PT): PS x 1,43 / 1,3 / 1,5
Material: carbon steel, stainless steel, exotic material
Installation: vertical
The HGVS damper series extends the mechanical life of valves, actuators and other hydraulic components reducing vibrations and pressure pulsations into the system. It is suitable for every hydraulic connection; it provides a wide range of volumes up to 5.000 liters and customizable size depending on the application. Its main application is the damping of the pulsation in the suction or discharge of triplex pumps.
Warranty: see dedicated page
Spare parts: see dedicated page
Available:
- Outside epoxy painted as per standard FOX procedure or as project specification
- Bladders in HNBR, NBR
- Connection with flange SAE 3000 – SAE 6000, ANSI B16.5 or UNI/DIN
- Special connection on request
- **HGVSX** series in AISI 304L/316L
- High pressure version

On request, according to:

- CE (2014/68/EU- PED)
- ATEX (2014/34/EU)
- ASME VIII Div.1 or Div.2 Latest Edition
- U-Stamp + NB
- EN 14359
- PD5500 (UK)
- EN 13445
- AS1210/4343 (Australia)
- ARH (Algeria)
- KOSHA (Korea)
- SELO (Cina)
- CU-TR 032/2013 (Russia)
- DOSH (Malaysia)
- NR-13 (Brasile)
- CRN (Canada)
- BV
- DNV / RINA
- Lloyd's / ABS



Drawing No 1



Technical Features:

Functionality: installed on the suction side of dosing pumps are used to accurately calibrate their flow rates; they are usually sized with measurement time of 60 or 30 seconds
Maximum working pressure (PS): 1 bar
Closing caps std: stainless steel AISI316L
Gaskets: PTFE
Tube: Borosilicate glass, serigraphy in ml
Installation: vertical
Warranty: see dedicated page
Spare parts: see dedicated page
Also available:
- Serigraphy on external steel plate
- Various unit of measurement (gpm, l, m^3)
- Outside epoxy painted as per standard FOX procedure or as project specification
- Connection flanged ANSIB16.5 or UNI/DIN
- Special connections on request
- High pressure execution (10 bar)
- Exotic materials (see table below)
- Special volume (till 50 liters)
- External stainless steel safety protection

On request, according to:

* CE (2014/68/EU- PED)
* ATEX(2014/34/EU)

Model (referred to threaded execution)	Volume (mL)	Max Pressure (psi)	H (mm)	D (mm)	Threaded process standard connections (drawing n°1)	Flanged process standard connections	Option
CCG0001-1X1-11-0000	10	15	370	50	½" BSP-F	1/2" ANSI 150 RF or DN15 PN10-40	HD *Means external stainless steel protection, if not specified means standard version*
CCG0001-1X1-12-0000					½" NPT-F		
CCG0002-1X1-11-0000	25	15	370	50	½" BSP-F	1/2" ANSI 150 RF or DN15 PN10-40	
CCG0002-1X1-12-0000					½" NPT-F		
CCG0005-1X1-11-0000	50	15	370	50	½" BSP-F	1/2" ANSI 150 RF or DN15 PN10-40	
CCG0005-1X1-12-0000					½" NPT-F		
CCG0010-1X1-11-0000	100	15	360	60	½" BSP-F	1/2" ANSI 150 RF or DN15 PN10-40	
CCG0010-1X1-12-0000					½" NPT-F		
CCG0025-1X1-11-0000	250	15	290	90	½" BSP-F	1/2" ANSI 150 RF or DN15 PN10-40	
CCG0025-1X1-12-0000					½" NPT-F		
CCG0050-1X1-11-0000	500	15	490	90	½" BSP-F	1/2" ANSI 150 RF or DN15 PN10-40	
CCG0050-1X1-12-0000					½" NPT-F		
CCG0100-1X1-11-0000	1000	15	360	110	½" BSP-F	1/2" ANSI 150 RF or DN15 PN10-40	
CCG0100-1X1-12-0000					½" NPT-F		
CCG0150-1X1-11-0000	1500	15	490	110	½" BSP-F	1/2" ANSI 150 RF or DN15 PN10-40	
CCG0150-1X1-12-0000					½" NPT-F		
CCG0300-1X1-21-0000	3000	15	360	170	¾" BSP-F	3/4" ANSI 150 RF or DN20 PN10-40	
CCG0300-1X1-22-0000					¾" NPT-F		
CCG0500-1X1-21-0000	5000	15	540	170	¾" BSP-F	3/4" ANSI 150 RF or DN20 PN10-40	
CCG0500-1X1-22-0000					¾" NPT-F		
CCG1000-1X1-31-0000	10,000	15	550	220	1" BSP-F	1" ANSI 150 RF or DN25 PN10-40	
CCG1000-1X1-32-0000					1" NPT-F		
CCG1500-1X1-31-0000	15,000	15	700	240	1" BSP-F	1" ANSI 150 RF or DN25 PN10-40	
CCG1500-1X1-32-0000					1" NPT-F		
CCG2000-1X1-31-0000	20,000	15	900	240	1" BSP-F	1" ANSI 150 RF or DN25 PN10-40	
CCG2000-1X1-32-0000					1" NPT-F		
CCG2500-1X1-31-0000	25,000	15	1100	240	1" BSP-F	1" ANSI 150 RF or DN25 PN10-40	
CCG2500-1X1-32-0000					1" NPT-F		
CCG3000-1X1-51-0000	30,000	15	1150	260	2" BSP-F	2" ANSI 150 RF or DN50 PN10-40	
CCG3000-1X1-52-0000					2" NPT-F		
CCG3500-1X1-51-0000	35,000	15	1410	260	2" BSP-F	2" ANSI 150 RF or DN50 PN10-40	
CCG3500-1X1-52-0000					2" NPT-F		
CCG4000-1X1-51-0000	40,000	15	1143	280	2" BSP-F	2" ANSI 150 RF or DN50 PN10-40	
CCG4000-1X1-52-0000					2" NPT-F		

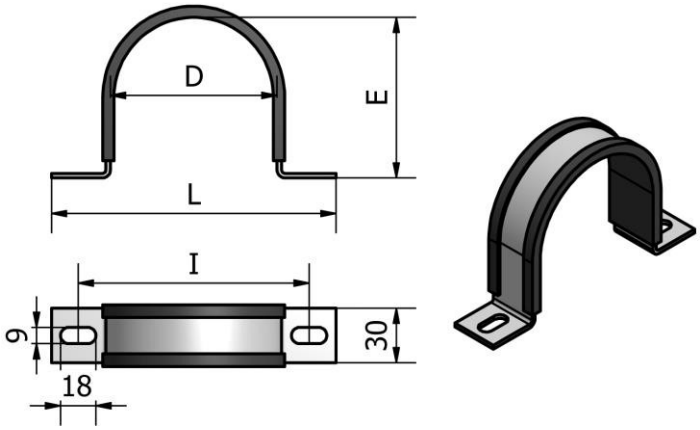
Materiali / Materials:			
	X = AISI316-316L **C** = PVC-C **U** = PVC-U **P** = PP	**E** = PVDF **F** = ASTM A350-LF2 (CARBON STEEL) **D** = F51 UNS S31803 **S** = F53 UNS S32750	**Y** = ALLOY-20 **H** = HASTELLOY-C 276 **I** = INCONEL 825 **T** =TITANIUM

Designed and fabricated in zinc plated steel (standard) or stainless steel (on request), for specific installation and fixing of accumulators rubber supports rings included

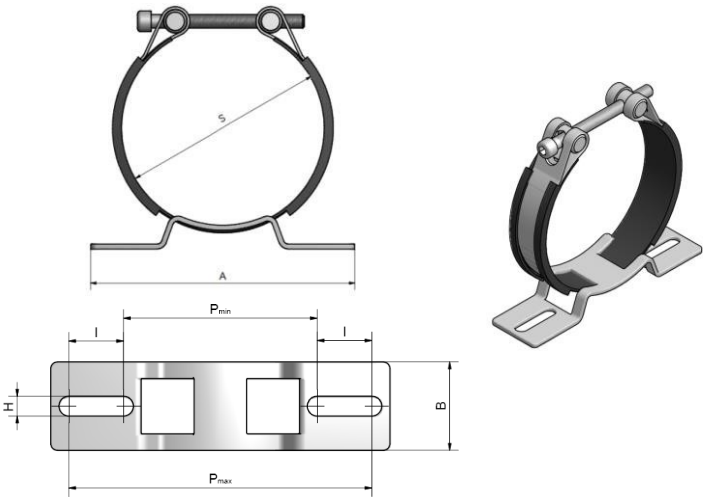
Available upon request:

- *Special dimension*
- *Stainless steel (CREX, CROX, CRX, MCRX)*

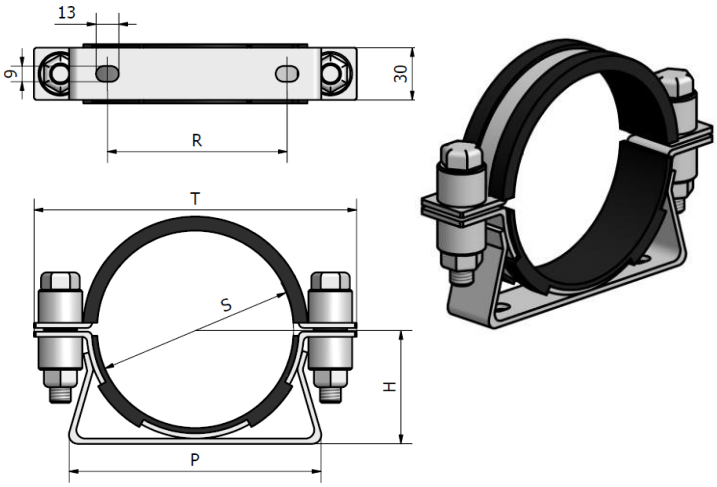
COLLARE / CLAMPS					CRE-CREX
Spessore metallo 3mm / Metal thickness 3mm					
Modello / Model		L	I	D	E
CRE	CREX	[mm]			
70	70	125	99	70	68
92	92	150	125	92	90
100	100	165	140	100	98
115	115	185	160	115	113
125	125	190	165	125	123
138	138	215	190	138	136



COLLARE / CLAMPS								CRO-CROX
Spessore metallo 3mm / Metal thickness 3mm								
Modello / Model		S	A	B	H	I	P min	P max
CRO	CROX	[mm]						
70	70	68÷73	156	50	9	17	100	136
92	92	92÷101	156	50	9	17	100	136
114	114	109÷117	156	50	9	17	100	136
125	125	117÷126	156	50	9	17	100	136
168	168	158÷169	156	50	9	17	100	136
-	180	180÷194	236	60	9	32	152	216
-	219	209÷222	236	60	9	32	152	216
-	240	235÷246	300	60	11	28	222	278
-	250	248÷259	300	60	11	28	222	278

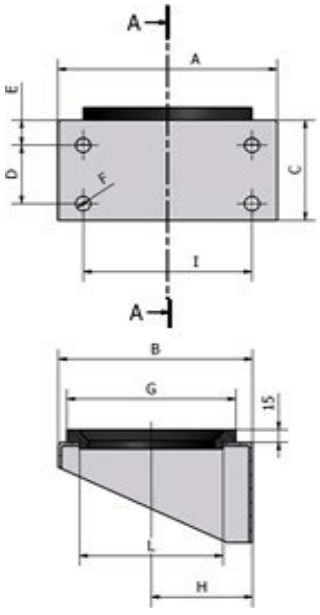


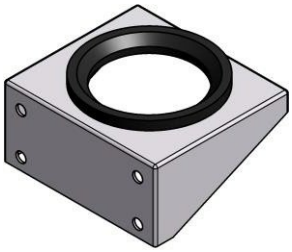
COLLARE / CLAMPS						CR-CRX
Spessore metallo 3mm / Metal thickness 3mm						
Modello / Model		S	R	T	H	P
CR	CRX	[mm]				
114	114	114÷116	100	180	66	137
168	168	168÷172	148	230	93	180
223	223	216÷225	210	295	110	241



MENSOLA / BRACKET						MCR-MCRX
Spessore metallo 3mm / Metal thickness 3mm						
Modello / Model		A	B	C	D	E
MCR	MCRX	[mm]				
168	168	200	175	90	40	30
223	223	260	230	120	70	30

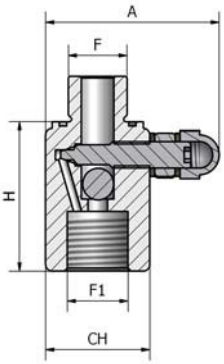
F	G	H	I	L
11	140	93	140	120
16	200	120	200	170





FLOW-RATE REGULATORS

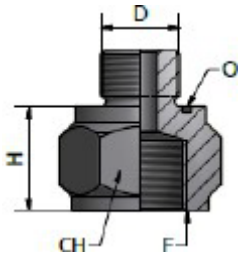
Essential accessory on accumulators without poppet valve and where there are negative pressure peaks; the VSA flow regulators are used to preserve the bladder/diaphragm preventing from hitting the bottom of the accumulator, damaging it irreparably. The optimal adjustment is found by bringing the screw to the end of the stroke and turning it counterclockwise 1/4 of a turn



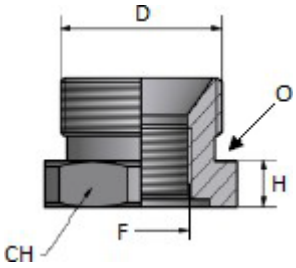
Model	Max Pressure	Max Flow without Accumulator	Max Flow with Accumulator	F Accumulator's Side	F1 Installation's Side	H	A	Hexagon	Weight
	Bar	Lt/min				mm	mm	mm	Kg
VSA 18	330	50	Aumenta seguendo una funzione direttamente proporzionale al valore della precarica di azoto / *increases following a function directly proportional to the value of the nitrogen precharge*	M 18x1.5-M	M 18x1.5-F	45	53	32	0.3
VSA 21	330	50		M 18x1.5-M	½" BSP-F	45	53	32	0.3
VSA 34	330	90		¾" BSP-M	¾" BSP-F	57	65	36	0.45

ADAPTERS

Drawing 1



Drawing 2

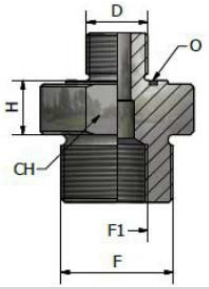


Model	D	F	O	H	Hexagon	Drawing
					mm	
VS21	M18x1.5-M	½" BSP-F	OR2081	24	32	1
VS34	1-¼" BSP-M	¾" BSP-F	OR3150	11	50	2
VS210	2" BSP-M	1" BSP-F	OR3218	11	70	2
VS212	2" BSP-M	½" BSP-F	OR3218	11	70	2
VS214	2" BSP-M	1-¼" BSP-F	OR3218	11	70	2
VS211-2	2" BSP-M	1-½" BSP-F	OR3218	11	70	2
VS234	2" BSP-M	¾" BSP-F	OR3218	11	70	2
VS238	2" BSP-M	⅜" BSP-F	OR3218	11	70	2

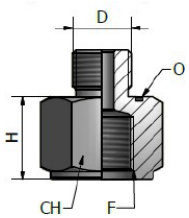
Esecuzioni speciali a richiesta / *Special execution on request*

SPECIAL ADAPTER

Drawing 1



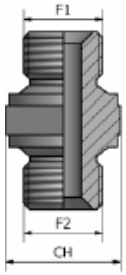
Drawing 2



Model	D	F	F1	O	H	Hexagon	Drawing
					mm	mm	
VS18/M33-12	M18x1.5-M	M33x1.5-M	½" BSP-F	OR2081	16	41	1
VS18/M33-18	M18x1.5-M	M33x1.5-M	M18x1.5-F	OR2081	16	41	1
VS18/SAE8	M18x1.5-M	1-1/16"-8 UNF	///	OR2081	25	32	2
VS18/SAE12	M18x1.5-M	1-1/16"-12 UNF	///	OR2081	25	46	2

Esecuzioni speciali a richiesta / *Special execution on request*

NIPPLES

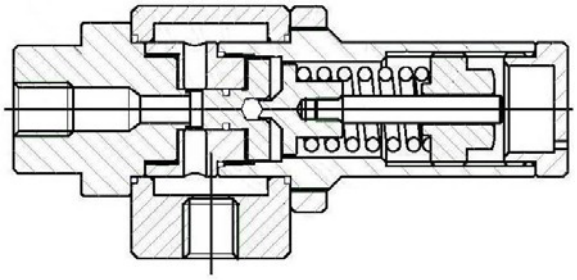


Type	F1	F2	Hexagon
			mm
NS15	M18x1.5	⅜" BSP	27
NS21	M18x1.5	½" BSP	27

Esecuzioni speciali a richiesta / *Special execution on request*

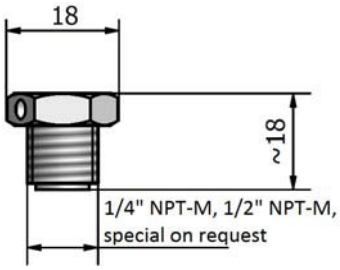
VG+DR+TFC+KIT

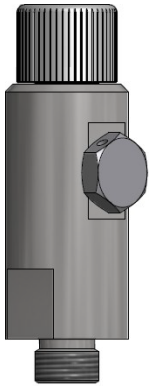
PRESSURE SAFETY VALVE



Technical features:
- Useful for safeguarding the integrity of the accumulator in case of overpressure; in case of overpressure, that valve unload the nitrogen contained into the accumulator, protecting the body from bursting - Body Material: A105 - Standard connection: ¾" BSP-F - Setting pressure: as request - Operating temperature: -20 / +150°c - Accuracy: ±7% - According to CE/PE - Available connection ½" e 1" - Disponibile in AISI 316

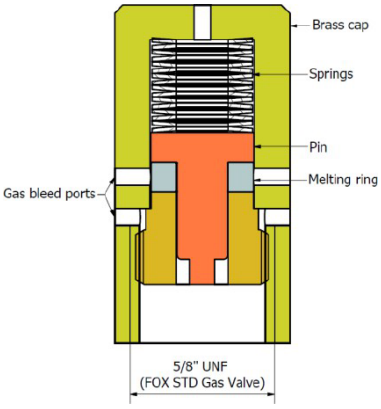
RUPTURE BURST DISC





Technical features:
- Useful for safeguarding the integrity of the accumulator in case of overpressure or overtemperature; in case of overpressure or overtemperature, that valve unload the nitrogen contained into the accumulator, protecting the body from bursting - Body material: ASTM A240 316L - Disc material: ASTM A240 316L - Seal material: ASTM A240 316L - Hydraulic connection: as per drawing - Radial or frontal discharge - Rupture pressure: as per request - Rupture temperature: as per request - Accuracy: ±10% - According to CE/PED

TEMPERATURE FUSE CAP FOR GAS UNLOAD

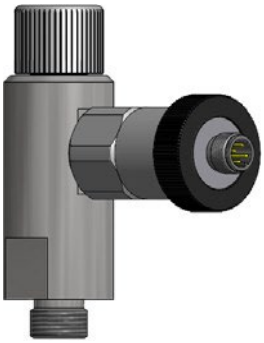


Technical features:
- Useful for safeguarding the integrity of the accumulator in case of fire or overtemperature; in case of fire, inside the cap, a thermal pad melts, then the thrust spring presses on the valve pin of the valve that unload the nitrogen contained into the accumulator, protecting the body from bursting - Body material: A350LF2 o SS 316 - Perpendicular discharge - Fuse temperature: 135°C - Operating temperature: -40 / +100°c - Accuracy: ±5°C

MONITORING PRECHARGE KIT

KIT-M

Kit with pressure gauge



KIT-T

Kit with pressure transductor

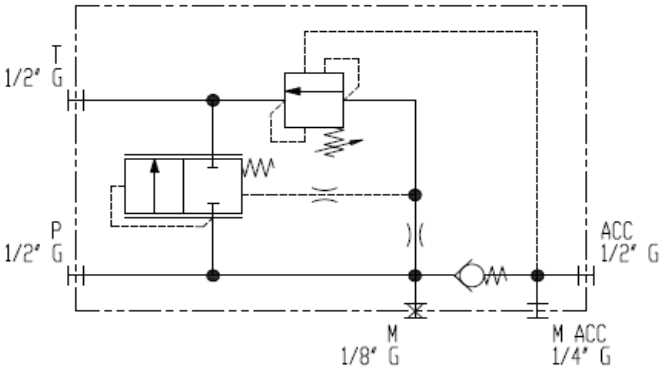
KIT-P

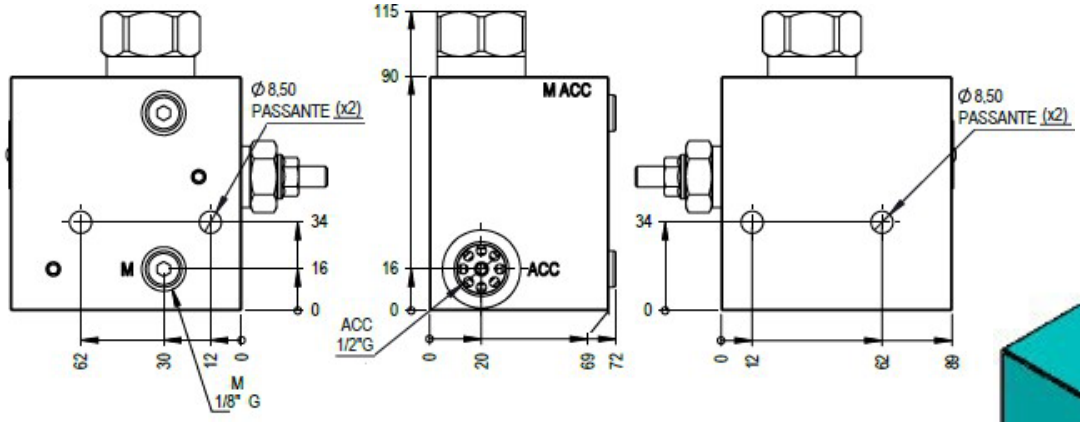
Kit with pressure switch

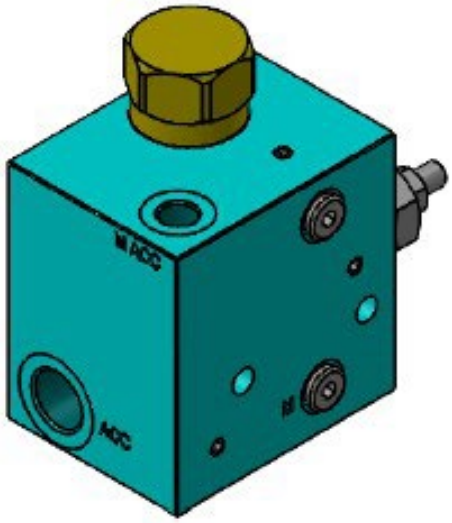
Are also available special execution or with double control (combined some control, example pressure gauge + transductor or transductor + rupture disc, ecc...)

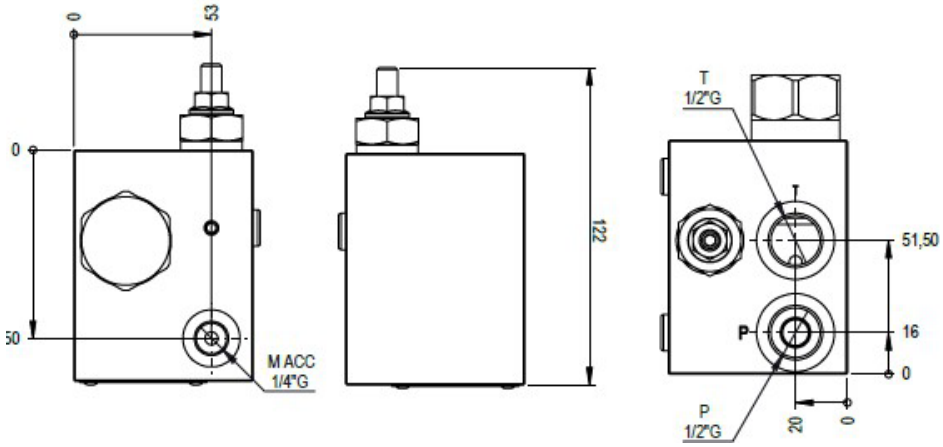
Technical Features:

The valve BVMS12 is a regulating valve of pressure with automatic unloading flow that to be use direct in line with oleodinamic accumulator.
At setting pressure value (P2, adjustable), this valve discharge the flow of oleodinamic pump untill, in the circuit, the value of minimum pressure (P1, not adjustable, fixed value) will be less than 15% of setting pressure value (P2).
We underline also that the precharge pressure of the accumulator (P0) must be ever 10% less than minimum pressure (P1). We highlight also that this valve have not any electric parts, for this reason in not necessary any supply voltage





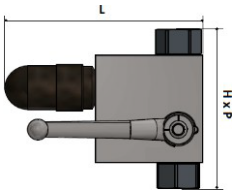


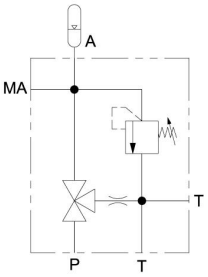


Type	Pressure range	Material	Max pressure
	Bar		
BVMS12/40	20 - 40	Alluminio Aluminium	250 bar
BVMS12/70	35 - 70		
BVMS12/140	70 - 140		
BVMS12/210	105 - 210		
BVMS12/250	175 - 250		

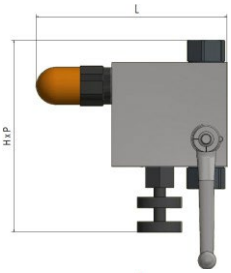
Technical features:
Useful to protect the accumulator from overpressure, it is made in zinc plated steel material (available also in stainless steel), maximum pressure of 350 bar and is composed by: on-off valve, pressure safety valve, discharge knob, predisposition hole for drainage, predisposition hole for pressure gauge. Standard operating temperature -20/+80°C. Available different connection from standard for accumulator side and system side, please refer to our adaptor VS, NS, SAE3000 or SAE6000; also available with safety valve tested by third part

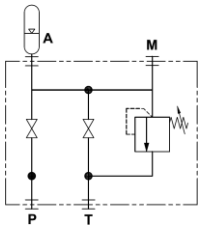
SB0



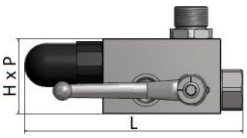


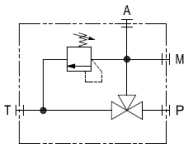
SB0M



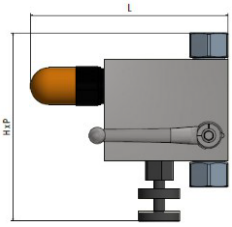


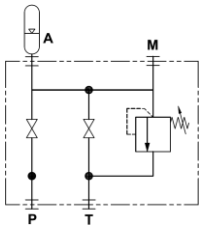
SB1-2-3



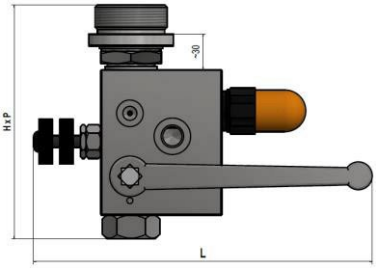


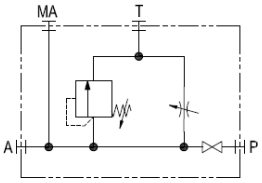
SB11 (0-1-2-3)



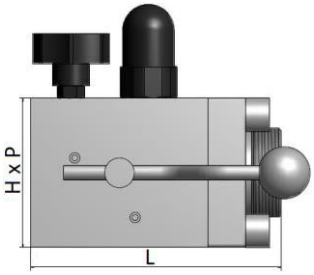


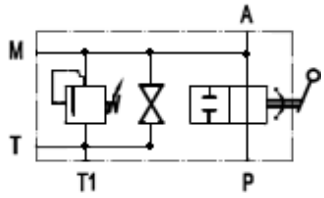
SB4-5





SB6



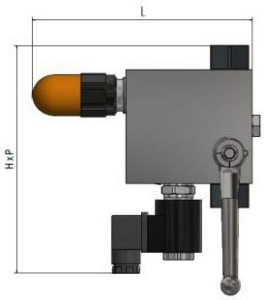


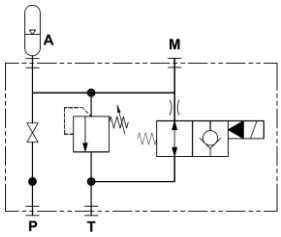
Type	Execution	FOX recommended accumulators	Hydraulic Connection Accumulator's side	Hydraulic Connection Installation's side	Hole diameter for fluid	Flowrate	Dimension (mm)			Pressure safety valve setting
							L	H	P	/
SB0*	Manuale *Manual*	Volumi da 0.05l a 10l *Volume from 0.05l to 10l*	**A0** - ½" BSP-F **A1** - ¾" BSP-F	**P0** - ½" BSP-F **P1** - ¾" BSP-F	8mm	50 l/min	146	117	40	Indicare il valore di taratura della valvola di sicurezza in Bar *Indicate the pressure value for safety valve in Bar*
SB0M*							172	174	40	
SB1			¾" BSP-M	½" BSP-F	10 mm	80 l/min	180	60	60	
SB2			1-¼" BSP-M	½" BSP-F			180	60	60	
SB3		Volumi da 10l a 50l *Volume from 10l to 50l*	2" BSP-M	½" BSP-F			180	60	60	
SB110*		Volumi da 0.05l a 50l *Volume from 0.05l to 50l*	½" BSP-F	**P0** - ½" BSP-F **P1** - ¾" BSP-F	12 mm	120 l/min	185	175	45	
SB111*			¾" BSP-F				185	175	45	
SB112*			1-¼" BSP-F				185	175	45	
SB113*			2" BSP-F				185	175	45	
SB4		Volumi da 2,5l a 10l *Volume from 2,5l to 10l*	1-¼" BSP-M	¾" BSP-F	20 mm	190 l/min	230	140	70	
SB5		Volumi da 10l (con attacco 2") a 50l *Volume* from 10l (with connection 2") to 50l	2" BSP-M	¾" BSP-F			230	140	70	
SB6			2" BSP-M	1-½" BSP-F	32 mm	295 l/min	190	100	160	

* Per le versioni SB0, SB0M, SB110, SB111, SB112, SB113 il codice è componibile con le diverse configurazioni di connessioni

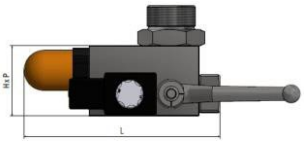
Technical features:
Useful to protect the accumulator from overpressure, it is made in zinc plated steel material (available also in stainless steel), maximum pressure of 350 bar and is composed by: on-off valve, pressure safety valve, discharge knob, predisposition hole for drainage, predisposition hole for pressure gauge. Electro valve CE/PED certified, standard power supply 24V, N.O. execution (Is available in N.C.). Standard operating temperature -20/+80°C. Available different connection from standard for accumulator side and system side, please refer to our adaptor VS, NS, SAE3000 or SAE6000; also available with safety valve tested by third part

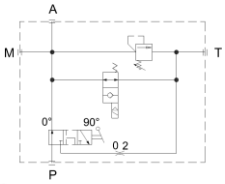
SB0E



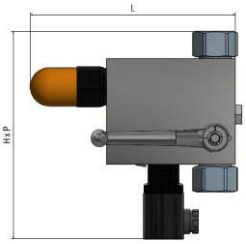


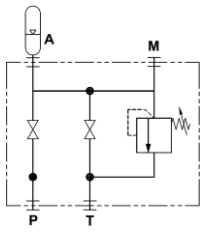
SB1-2-3E



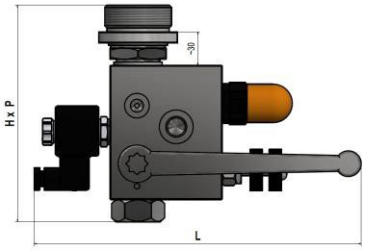


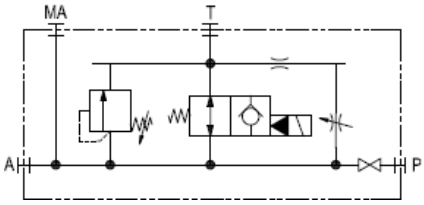
SB11 (0-1-2-3)E



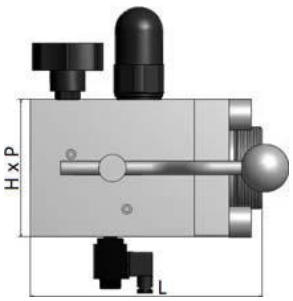


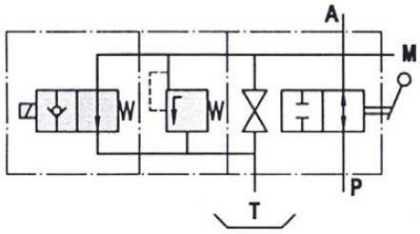
SB4-5E





SB6E



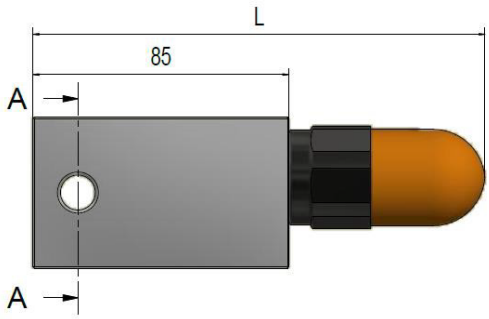


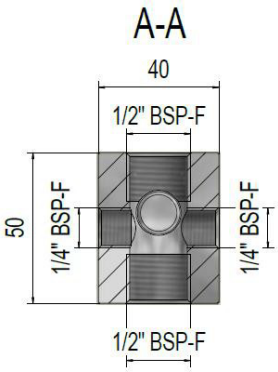
Type	Execution	FOX recommended accumulators	Hydraulic Connection Accumulator's side	Hydraulic Connection Installation's side	Hole diameter for fluid	Flowrate	Dimension (mm)			Pressure safety valve setting
							L	H	P	/
SB0E*	Elettrica *Electrical*	Volumi da 0.05l a 10l *Volume from 0.05l to 10l*	**A0** - ½" BSP-F **A1** - ¾" BSP-F	**P0** - ½" BSP-F **P1** - ¾" BSP-F	8mm	50 l/min	170	127	40	Indicare il valore di taratura della valvola di sicurezza in Bar *Indicate the pressure value for safety valve in Bar*
SB1E			¾" BSP-M	½" BSP-F	10 mm	80 l/min	180	60	60	
SB2E			1-¼" BSP-M	½" BSP-F			180	60	60	
SB3E		Volumi da 10l a 50l *Volume from 10l to 50l*	2" BSP-M	½" BSP-F			180	60	60	
SB110E*		Volumi da 0.05l a 50l *Volume from 0.05l to 50l*	½" BSP-F	**P0** - ½" BSP-F **P1** - ¾" BSP-F	12 mm	120 l/min	185	175	45	
SB111E*			¾" BSP-F				185	175	45	
SB112E*			1-¼" BSP-F				185	175	45	
SB113E*			2" BSP-F				185	175	45	
SB4E		Volumi da 2,5l a 10l *Volume from 2,5l to 10l*	1-¼" BSP-M	¾" BSP-F	20 mm	190 l/min	290	170	70	
SB5E		Volumi da 10l (con attacco 2") a 50l *Volume* from 10l (with connection 2") to 50l	2" BSP-M	¾" BSP-F			290	170	70	
SB6E			2" BSP-M	1-½" BSP-F	32 mm	295 l/min	240	190	100	

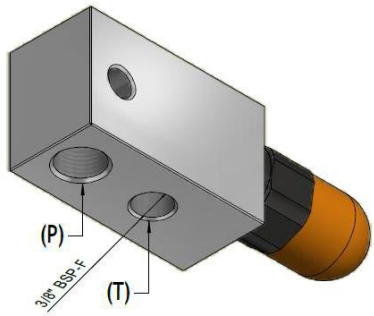
* Per le versioni SB0E, SB110E, SB111E, SB112E, SB113E il codice è componibile con le diverse configurazioni di connessioni

Technical features:
With this configuration we are able to propose a safety lock for all customers who already have taps, adapters and/or nipples or who want to customize the connections on the accumulator side and on the system side with our adaptor VS or our nipples NS.
The advantages are having a safety block to be customized autonomously already included of safety valve calibrated to the required pressure; available in two versions with different flow rate and passage opening diameter, they are both in galvanized steel, CE certified with a maximum pressure of 350 bar.
Stainless steel version is available on request

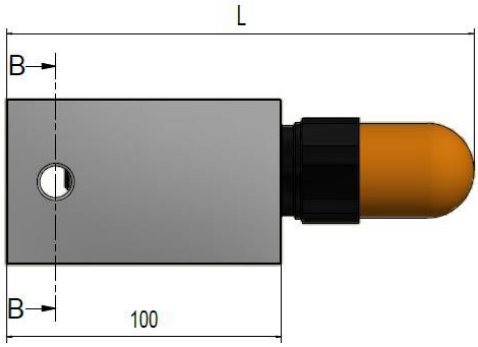
SSB6

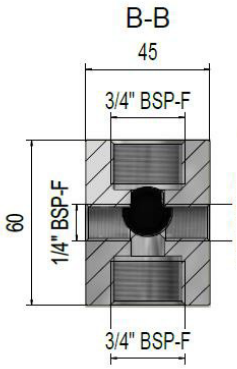


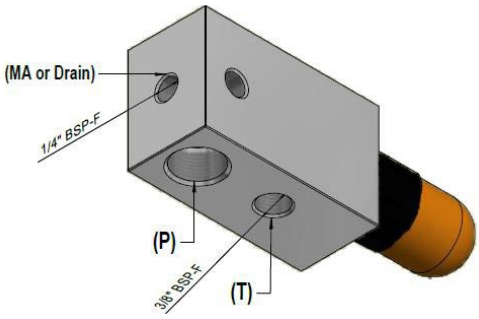


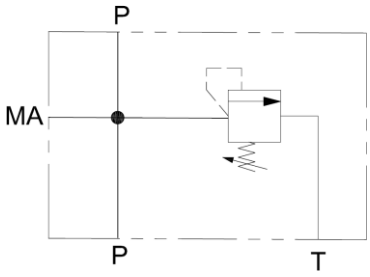


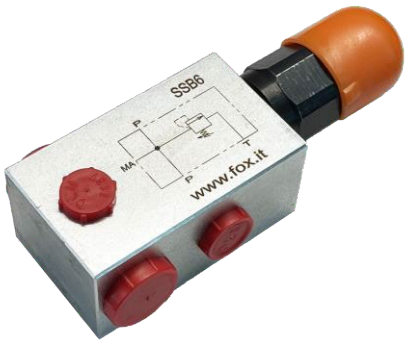
SSB10





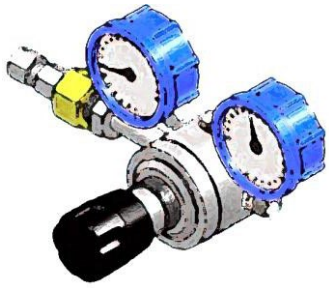


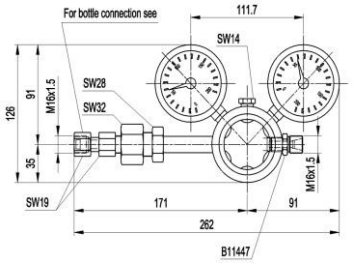


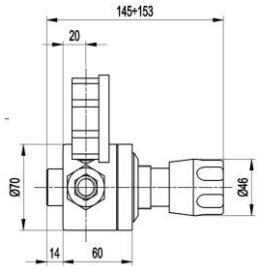


Type	Execution	FOX recommended accumulators	Hydraulic Connection Accumulator's side	Hydraulic Connection Installation's side	Hole diameter for fluid	Flowrate	Dimension (mm)			Pressure safety valve setting
							L	H	P	/
SSB6	Manuale *Manual*	Volumi da 0.05l a 10l *Volume from 0.05l to 10l*	½" BSP-F	½" BSP-F	10mm	50 l/min at ~10 m/s	150	50	40	Indicare il valore di taratura della valvola di sicurezza in Bar *Indicate the pressure value for safety valve in Bar*
SSB10	Manuale *Manual*		¾" BSP-F	¾" BSP-F	12mm	120 l/min at ~10 m/s	170	60	45	

RID







Type	*Pressure gauge scale*
	bar
RID1	1 > 8
RID2	1.5 > 15
RID3	3 > 30
RID4	5 > 50
RID5	10 > 100
RID6	30 > 200

Technical Features:

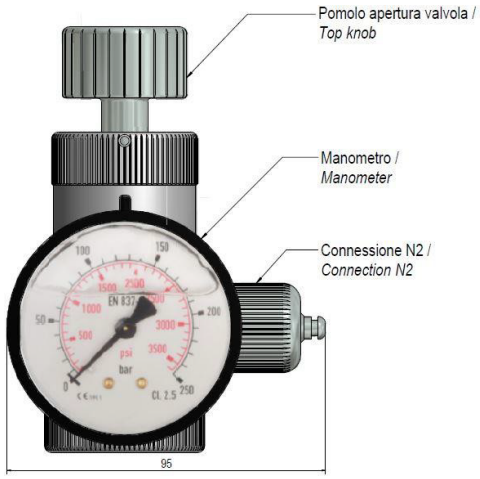
Maximum working pressure: 220 bar
Operating temperature: -20°C ÷ +80°C
Gas: nitrogen
Nitrogen degree of contamination: class 20/18/15 as per ISO 4406/99
Body material: brass
Diaphragm: stainless steel
Surface coating: chromium treated
Seals material: P = NBR and Derlin
Connections: M16x1.5
Weight: 1,75 Kg

Description
The pressure regulator is used to adjust the precharge pressure between the nitrogen cylinder and the accumulator. For the operators safety, when using nitrogen gas cylinders, it is necessary to install a pressure reducer. It allows to reduce the available pressure in the cylinder, to the required pressure. The reduction is manual and directly visible on the gauge.
With this reducer, you can avoid the possibility to preload an accumulator that has a lower working pressure than the nitrogen cylinder pressure. The inlet connection is coupled directly to the nitrogen cylinder connection in the country of installation, while the preload tube it's connected to the reducer outlet. The reducer has a strong construction and it's suitable for nitrogen cylinders up to 200 barg.

The standard version includes
Two pressure gauges to monitor the gas cylinder and reducer pressures. The pressure range is between 0-300 bar. The reduced pressure is adjustable from 0 to 200 barg.

Instructions
Avoid that the pressure reducer from being damaged accidentally (bumps and/or falls). Do not adjust the setting pressure of the pressure relief valve and keep the gaskets and the pressure gauges in perfect operating conditions.
In case of malfunctions (for example, increasing of the discharge pressure without consumption, leakages from the safety valves), immediately stop the flow with the nitrogen cylinder valve.

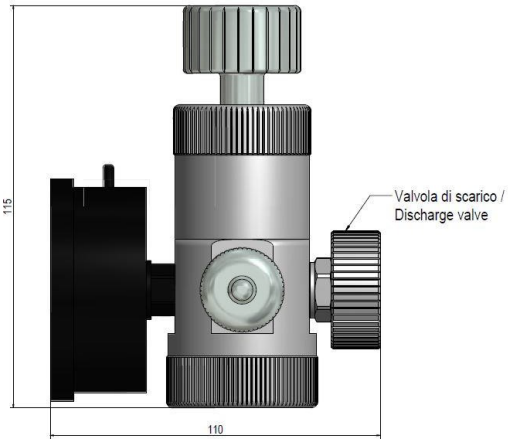
Maintenance
Pressure reducers have to be repaired or maintained by qualified and skilled personnel or in FOX workshop. Original spare parts are mandatory for warranty reasons.
FOX will not be responsible for non-authorized repairs, without an official authorization to proceed.



Technical Features:

The equipment of preload AR is an essential special tool for the operations of check and reduction or recharge of the pressure of the nitrogen in the accumulators/dampeners.
Maximum working pressure: 1000 bar
Body: in zinc-plated steel
Standard execution:
- manometer included (available in special unit measure)
- useful dedicated handbag
- 2.5 m flexible pipe
- Connection 3/8" BSP-F (nitrogen cylinder side)
- Connection 5/8" UNF (dampener/accumulator side).

Available:
RID132 – Adaptor 5/8" UNF > 1/32"
RID78 – Adaptor 5/8" UNF > 7/8" UNF
RID14 – Adaptor 5/8" UNF > 1/4" BSP



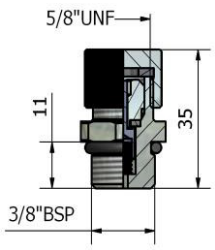
Modello Model	Scala del manometro Pressure Gauge Scale
	bar
AR 1.00	-1 > 1,5
AR 1.0	0 > 6
AR 1.1	0 > 16
AR 1	0 > 40
AR 2	0 > 60
AR 3	0 > 100
AR 4	0 > 160
AR 5	0 > 250
AR 6	0 > 400
AR 7	0 > 600
AR 8	0 > 1000

Instruction for use:

Pressure check and reduction:
A) After making sure that there is no pressure in this circuit which is eventually installed the accumulator, unscrew completely the top knob and screw the filling and unit device on the accumulator's nitrogen valve.
B) Unscrew the knob of the nitrogen discharge valve and turn the knob situated on top of the AR device clockwise until the manometer signals the pressure that there is inside the accumulator. If the knob is fully turned clockwise and the manometer doesn't show any pressure the accumulator discharged.
C) Once nitrogen pressure is checked, turning gently clockwise the knob of the discharge valve the pressure will start to decrease. Once the wanted nitrogen pressure is reached, fully unscrew the knob on top of the AR device, screw completely the knob of the nitrogen discharge valve to eliminate residual pressure. After that is possible to unscrew "AR" valve from the accumulator taking care of to re-install the protection cap of filling valve on turning strongly.

Recharge:
Repeat the same operations connecting the nitrogen bottle quick release coupling before opening the valve knob. Start filling nitrogen very slowly.
We recommend using a gas pressure reducer installed on the bottle in order to avoid over-pressurizations of the accumulator body during filling operation, especially when the precharge is low in pressure. Check nitrogen precharge approximately every six months.

NITROGEN VALVE VR TYPE

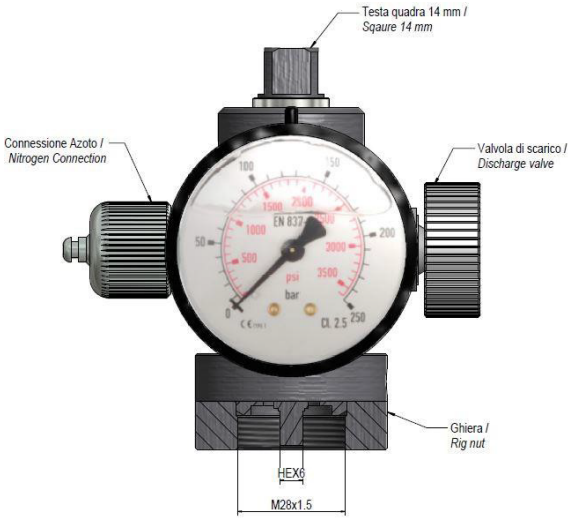


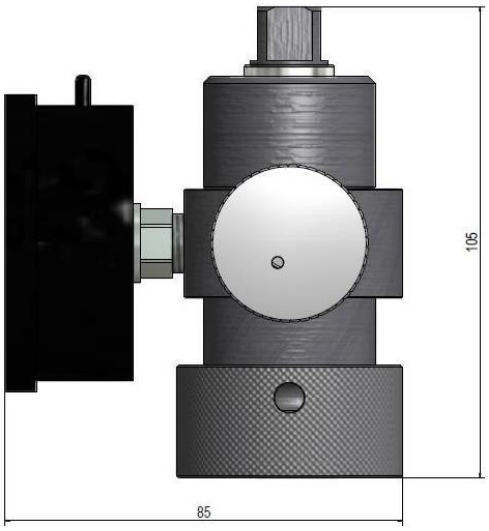
Technical Features:

Body: zinc-plated steel
Available also:
- **VRX** in AISI316L stainless steel
- **VRXHD** in AISI316L stainless steel for Heavy-Duty installation
- **VR14** ¼" BSP-M x 5/8" UNF in zinc-plated steel and stainless steel (**VRX14** version)

Installation:
- accumulators/dampeners
- control or variation of pressure in any system to gas or fluid
- drainage of air in closed hydraulic circuits

ARM28





Model	Pressure Gauge Scale
	bar
ARM28 1.00	-1 > 1,5
ARM28 1.0	0 > 6
ARM28 1.1	0 > 16
ARM281	0 > 40
ARM28 2	0 > 60
ARM28 3	0 > 100
ARM28 4	0 > 160
ARM28 5	0 > 250
ARM28 6	0 > 400
ARM28 7	0 > 600
ARM28 8	0 > 1000

Technical Features:

The equipment of preload ARM28 is an essential special tool for the operations of check and reduction or recharge of the pressure of the nitrogen in the accumulators/dampeners.
Maximum working pressure: 1000 bar
Body: in zinc-plated steel
Standard execution:
- manometer included (available in special unit measure)
- useful dedicated handbag
- 2.5 m flexible pipe
- Connection 3/8"BSP-F (nitrogen cylinder side)
- Connection M28x1.5 (dampener/accumulator side).

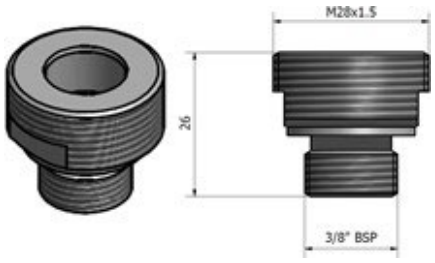
Available:
RID2858 – Adaptor M28x1.5 > 5/8"UNF

Instruction for use:

Pressure check and reduction:
A) After making sure that there is no pressure in this circuit which is eventually installed the accumulator, unscrew completely the top knob and screw the filling and unit device on the accumulator's nitrogen valve.
B) Unscrew the knob of the nitrogen discharge valve and turn the square situated on top of the ARM device clockwise until the manometer signals the pressure that there is inside the accumulator. If the knob is fully turned clockwise and the manometer doesn't show any pressure the accumulator discharged.
C) Once nitrogen pressure is checked, turning gently clockwise the knob of the discharge valve the pressure will start to decrease. Once the wanted nitrogen pressure is reached, fully unscrew the knob on top of the AR device, screw completely the square of the nitrogen discharge valve to eliminate residual pressure. After that is possible to unscrew "ARM" valve from the accumulator taking care of to re-install the protection cap of filling valve on turning strongly.

Recharge:
Repeat the same operations connecting the nitrogen bottle quick release coupling before opening the valve knob. Start filling nitrogen very slowly. We recommend using a gas pressure reducer installed on the bottle in order to avoid over-pressurizations of the accumulator body during filling operation, especially when the precharge is low in pressure. Check nitrogen precharge approximately every six months.

NITROGEN VALVE VM TYPE



Technical Features:

Body: zinc-plated steel
Available also:
- **VRMX** in AISI316L stainless steel
- **VRMXHD** in AISI316L stainless steel for Heavy-Duty installation

Installation:
- accumulators/dampeners
- control or variation of pressure in any system to gas or fluid
- drainage of air in closed hydraulic circuits

PV1

Technical Features:

Diaphragm vacuum pumps is regularly used in order to pre-charge the suction dampeners that are working in atmospheric pressure condition.
The principle of operating is considering a flexible diaphragm in the pump head that is moved up and down via a connecting rod, by the action of an eccentric mounted to the motor shaft. On the down-stroke, air is drawn into the pump chamber and expelled on the up-stroke. One-way flapper valves installed within the pump-head controls the direction of air flow.
Diaphragm pumps are oil-free and they are characterized by low noise, high efficiency and minimal current consumption

Maximum working pressure: 1 barg

Material:
Pump chamber ➔ Ryton® PPS
Pump head ➔ Ryton® PPS
Diaphragm ➔ FKM (Viton)
Valves ➔ FKM (Viton)
Seals ➔ Silicone

Pneumatic performance:
Free flow ➔ 6,0 LPM
Max. vacuum ➔ -800 mbar
Vacuum continuous ➔ -800 mbar
Max. vacuum restart ➔ 1 bar

Electrical data:
Motor type ➔ Shared pole
Nominal voltage ➔ 1x230 Vac / 50 Hz
Power consumption ➔ 36,5 W
Current consumption ➔ 330 mA

Vacuum (mbar)	Free flow (LPM)
0	6,00
-100	5,10
-200	4,20
-300	3,30
-400	2,90
-500	2,10
-600	1,20
-700	0,80
-800	0,00
0	6,00

In line spherical resonator

In this page it is not possible to include all the special executions made by FOX during its 40 years of experience in accumulators and dampeners.
Through this experience with passion and dedication, which is oriented to the complete satisfaction of customer needs, FOX is able to offer technical support that can help you to find a solution for all those applications that require different characteristics than those provided by the standard material.
Therefore, we recommend to contact our technical office for any question.

Here are some examples of special executions already made:
- Flanged connection according to every request
- High pressure applications (1379 bar) in carbon steel and stainless steel
- Versions with heating jacket
- Antipulsation connection in carbon and stainless steel
- Execution with membrane / bellows in PTFE
- Execution with bellows in Stainless Steel
- Executions in exotic materials
- Spherical and non-spherical dampers, with or without elastomers
- In line silencers with or without elastomers for high temperatures, aggressive fluids and with or without nitrogen precharge
- Dampeners maintenance free
- Dampeners having inlet connection higer than standard executionfor better performance at low pressures
- Dampeners without poppet valve, with direct passages or with extrusion net
- Dampeners with autoclave connection

In line hydrid pulsation damper

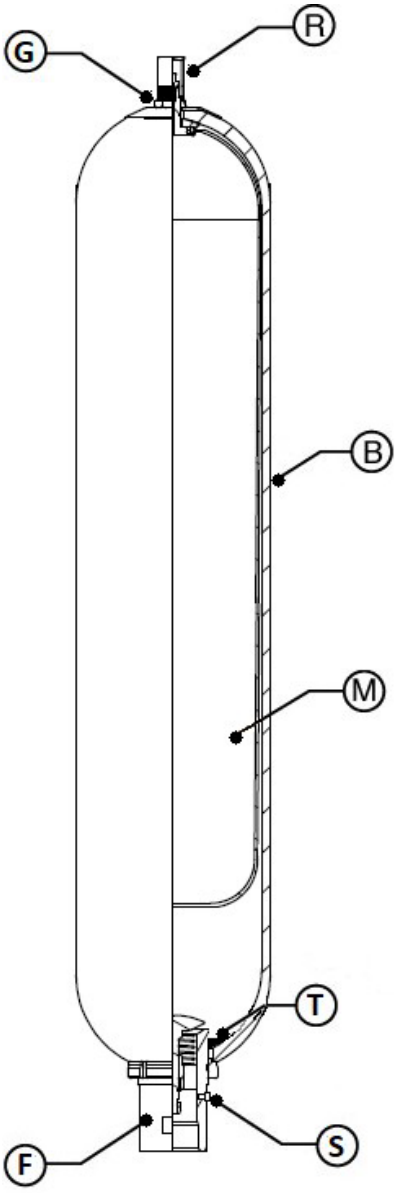
In line silencer

Heating Racket

Pressure gauge on dampener

Accumulators rack

Integral flange without thread/welds



Dis. n°1 / Drw. n°1

MAINTENANCE AND REPAIR:

1) Depressurize and drain the line where the accumulators are installed and make sure that there is no pressure inside of the line, release the nitrogen precharge inside of the accumulator using the AR or ARM type precharging and control kit equipment.

2) After making sure that there is no internal pressure in the accumulator, proceed by unscrewing the nitrogen inflation valve (R).

3) Disassemble the accumulator from the system and fix in horizontal position the central part (B) of the accumulator in a bench vice.

4) If the accumulator have the extractable poppet valve (F) or have a volume equal to or greater than 20 liters (drawing 1), continue reading, otherwise (drawing 2), refer to the page "MAINTENANCE AND REPAIR OF DIAPHRAGM ACCUMULATORS " because this accumulator have the same procedure for the maintenance

5) Fixed the accumulator in a bench vice is necessary to unscrew the drain screw (S) located on the poppet valve (F) and the threaded ring nut that blocks the valve. Once this is done, introduce the valve inside the accumulator and recover the sealing gaskets. Bending it, it is possible to extract the rubber-metal articulated ring (T) through the seat of the poppet valve

6) After unscrewing the nut/ring (G) that fixes the identification nameplate on top of the accumulator, remove the bladder from the top or from the bottom of the accumulator (depending on the type of execution) pulling it towards you.

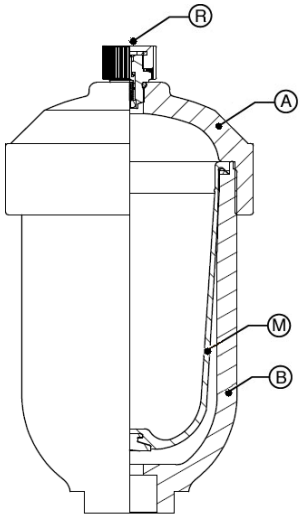
7) Clean and reclaim the internal surfaces of the accumulator perfectly; lubricate and moisten the bag (at least 5% of its volume), any gaskets, threads and all internal surfaces in contact with it with plenty of hydraulic oil and replace the parts deemed worn

8) To reassemble the accumulator, refer to the above operations and proceed in reverse having the foresight to eliminate the air contained in the bladder by rolling it up before introduction into the accumulator.
To facilitate the introduction it is possible use a bladder puller, for example with a round bar with M11x1 thread at one end which allows the attachment to the stem of the bladder.

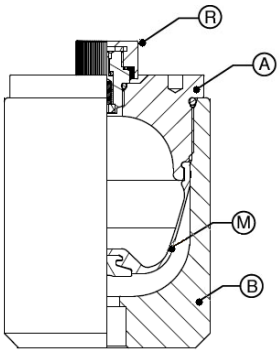
9) Proceed with recharge of dry nitrogen N2 with AR or ARM type equipment, making sure that a suitable pressure reducer is installed on the nitrogen cylinder. Introduce the nitrogen very slowly into the accumulator to permit the bladder to extend correctly along the internal surface of the accumulator until to reach a value of 5% higher than necessary pressure; disconnect the connection pipe between the nitrogen cylinder and the AR or ARM precharging and control kit equipment. Wait a few minutes for permit to stabilize the gas temperature and correctly calibrate the precharge pressure using the AR or ARM precharge equipment, discharging the excess gas.

NOTE:
The use of air, oxygen, compressed air or gas different than nitrogen, is strictly prohibited explosion risk (diesel effect).

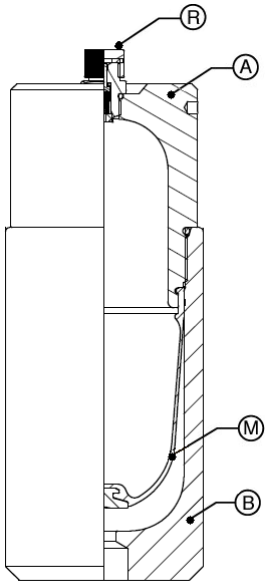
Animation and additional information are available on website www.fox.it



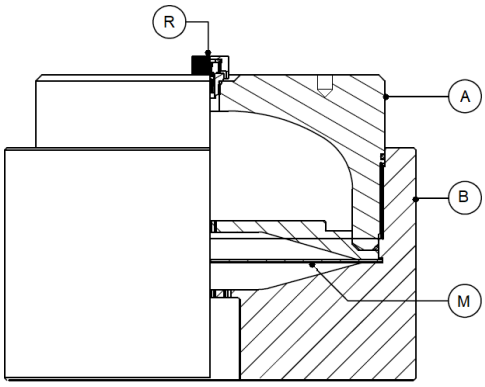
Dis. n°1 / Drw. n°1



Dis. n°2 / Drw. n°2



Dis. n°3 / Drw. n°3



Dis. n°4 / Drw. n°4

MAINTENANCE AND REPAIR:

1) Depressurize and drain the line where the accumulators are installed and make sure that there is no pressure inside of the line, release the nitrogen precharge inside of the accumulator using the AR or ARM type precharging and control kit equipment.

2) After making sure that there is no internal pressure in the accumulator, proceed by unscrewing the nitrogen inflation valve (R).

3) Disassemble the accumulator from the system and fix the lower part (B) of the accumulator in a bench vice.

4) Unscrew the upper cap (A) with a belt/chain key for executions as per drawing 1, or with a compass or fixed key for executions as per drawing 2, 3 and 4

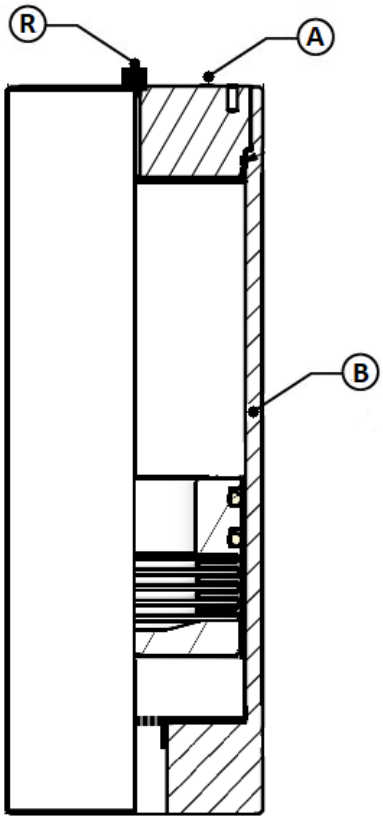
5) Remove the diaphragm (M) and eventual seals.

6) Clean and reclaim the internal surfaces of the accumulator perfectly; lubricate and wet the diaphragm (minimum 5% of the volume of it), possible gaskets, threads and all internal surfaces in contact with it with abundant hydraulic oil; insert the diaphragm into the appropriate seat, screw the cap or top cap firmly until compression occurs, paying attention to the internal thread.
Screw nitrogen valve (R).

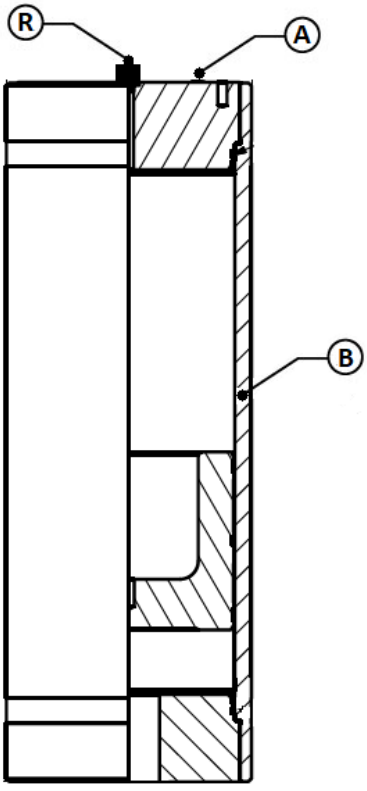
7) Proceed with recharge of dry nitrogen N2 with AR or ARM type equipment, making sure that a suitable pressure reducer is installed on the nitrogen cylinder. Introduce the nitrogen very slowly into the accumulator to permit the diaphragm to extend correctly along the internal surface of the accumulator until to reach a value of 5% higher than necessary pressure; disconnect the connection pipe between the nitrogen cylinder and the AR or ARM precharging and control kit equipment. Wait a few minutes for permit to stabilize the gas temperature and correctly calibrate the precharge pressure using the AR or ARM precharge equipment, discharging the excess gas.

NOTE:
The use of air, oxygen, compressed air or gas different than nitrogen, is strictly prohibited explosion risk (diesel effect).

Animation and additional information are available on website www.fox.it



Dis. n°1 / Drw. n°1



Dis. n°2 / Drw. n°2

MAINTENANCE AND REPAIR:

1) Depressurize and drain the line where the accumulators are installed and make sure that there is no pressure inside of the line, release the nitrogen precharge inside of the accumulator using the AR or ARM type precharging and control kit equipment.

2) After making sure that there is no internal pressure in the accumulator, proceed by unscrewing the nitrogen inflation valve (R).

3) Disassemble the accumulator from the system and fix the central part (B) of the accumulator in a bench vice.

4) Unscrew the upper cap (A) with a compass or fixed key

5) Remove the piston or bellow (M) and eventual seals.

1) BELLOW (drawing n°1) Clean and reclaim the internal surfaces of the accumulator perfectly; lubricate and wet the bellow, possible gaskets, threads and all internal surfaces in contact with it with abundant hydraulic oil; insert the bellow into the cylinder shell and gently push it down, screw the top cap firmly until compression occurs, paying attention to the internal thread.
Screw nitrogen valve (R).

2) PISTON (drawing n°2) Clean and reclaim the internal surfaces of the accumulator perfectly; lubricate and wet the seal and guide seal that you will substitute on the piston, threads and all internal surfaces in contact with it with abundant hydraulic oil; insert the piston into the cylinder shell and gently push it down, screw the top cap firmly until compression occurs, paying attention to the internal thread.
Screw nitrogen valve (R).

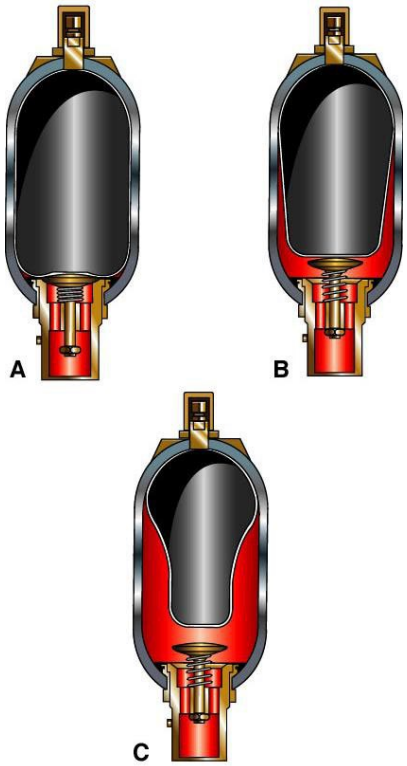
7) Proceed with recharge of dry nitrogen N2 with AR or ARM type equipment, making sure that a suitable pressure reducer is installed on the nitrogen cylinder. Introduce the nitrogen very slowly into the accumulator to permit to the piston or bellow to adhere to the bottom of the accumulator until to reach a value of 5% higher than necessary pressure; disconnect the connection pipe between the nitrogen cylinder and the AR or ARM precharging and control kit equipment. Wait a few minutes for permit to stabilize the gas temperature and correctly calibrate the precharge pressure using the AR or ARM precharge equipment, discharging the excess gas.

NOTE:
The use of air, oxygen, compressed air or gas different than nitrogen, is strictly prohibited explosion risk (diesel effect).

Animation and additional information are available on website www.fox.it

The hydropneumatic accumulator is a device that utilizes the compressibility of gas in order to permit hydraulic circuits to store quantities of fluids under pressure which are considered non compressible. FOX manufactures bladder or diaphragm type hydropneumatic accumulators. Both types of accumulators are constructed from a single body by deforming highly resistant steel tubes. Various alternatives are offered regarding elastic components compatible with the type of fluids and operating temperatures utilized, the same for fluid or nitrogen side valves, which are available in various methods of construction.

BLADDER EXECUTION



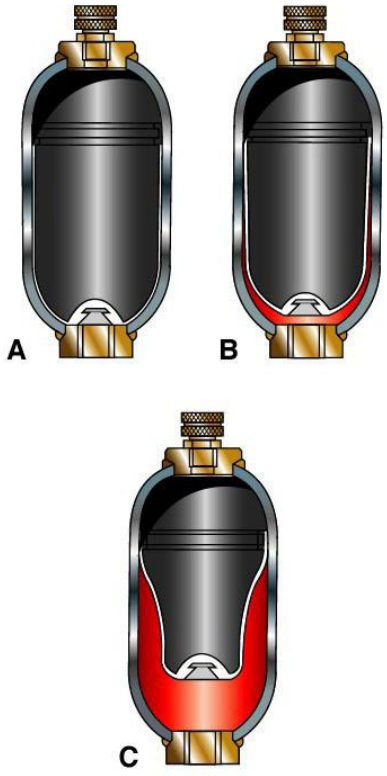
FUNCTIONS:

A) Accumulator under nitrogen pressure without fluid pressure.

B) Accumulator under minimum system pressure. This condition must be always verified to guarantee that the bladder or diaphragm do not hit the metal body during every cycle of work. Therefore the value of pressure of the fluid has always to be the 10% superior to pressure of the pre-loaded
- nitrogen pressure.

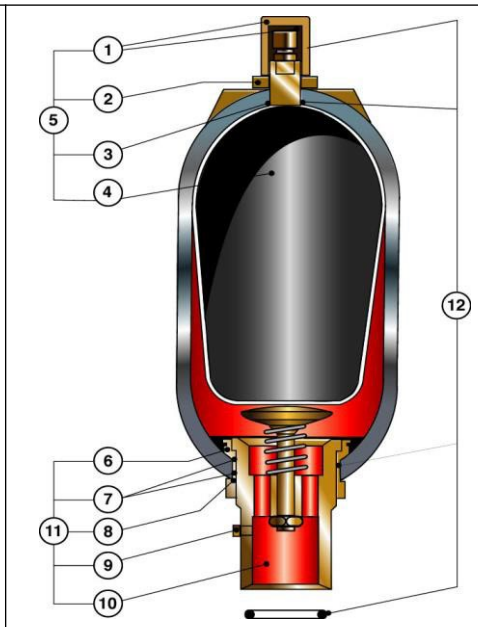
C) Accumulator under maximum system pressure. In this case we have maximum accumulated fluid capacity due to the difference between the initial and final nitrogen volumes **V1-V2= ΔV** (fluid volume). It is important, before to achieving the maximum fluid pressure, to establish that it is inferior the maximum permissible pressure of the body. Furthermore, in order to avoid any excessive deformation of elastic parts it should be taken into consideration that limiting parameters exist between pre-loading pressure and maximum fluid pressure. It is therefore advisable that the value of this rapport be inferior to 4.

DIAPHRAGM EXECUTION



CONSTRUCTION DIFFERENCES:

The bladder accumulator represents the ideal functional condition in particular concerning the operation of the more common anti-extrusion poppet valve. With this type of accumulator maximum results are achieved, therefore, very high discharge capacity, high yield, perfect gas-fluid separation and minimum reduction of osmosis effect since bladder stretching is minimal. The diaphragm type accumulator of more simple construction is very economical and can be mounted in any position as well as on any type of mobile machine. It has a higher osmosis effect due to higher diaphragm deformation. The principal limiting factor is however in its low instantaneous flow capacity, therefore, its use is limited to applications where this is not above to 50lt/min).



HB Series

LEGENDA

1. Valve cap and gasket
2. Nut
3. O-ring seal
4. Bladder
5. Bladder with seal
6. Rubber/metal ring
7. Back-up ring
8. Threaded sleeve
9. Drain screw
10. Valve housing
11. Complete fluid valve
12. Seals set

HOW TO ORDER:
Please always indicate: type, serial number (marked on accumulator), diameter size of the opening at nitrogen valve side.

STANDARD BLADDERS:
In the table are reported the dimensions of bladders for all the volumes. All our standard bladders are supplied with nitrogen valve 5/8"UNF, locking nut and protection cap. Since our bladders are compatible with many other types of accumulators with the same capacity, nitrogen side connections with different ports are available. Please indicate all details and requirements in order.

HB - *BLADDERS*

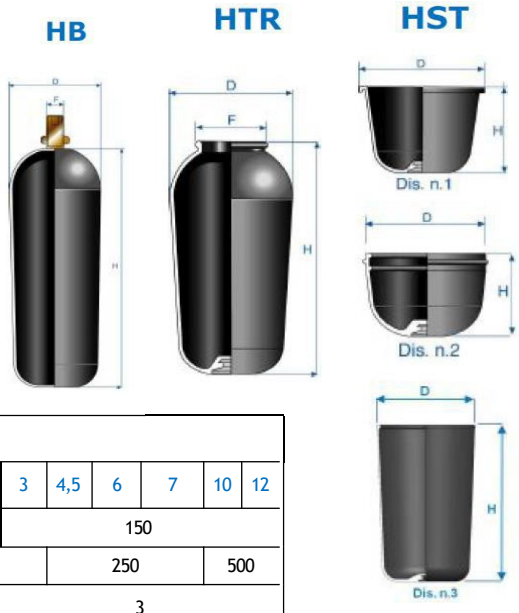
Volume	L	2,5	4,5	5	6	10	10/2	20	25	35	50
D	mm	93	145	93	145	145	200	200	200	200	200
H	mm	350	210	680	310	600	290	600	740	1110	1500
F	mm	22					22 or 50				

HTR - *BLADDERS*

Volume	L	0,3	0,35	0,7	1,5	2,5	3	4,5	6.5	10	10/2	20	35	50
D	mm	56	74				95	143			200			
H	mm	120	88	150	190	300		240	360	600	290	600	1110	1500
F	mm	41	53		68			74			22			

HST - *DIAPHRAGMS*

Volume	L	0,03	0,05	0,12	0,14	0,15	0,35	0,5	0,7	0,8	1	1,3	1,5	2	2,3	3	4,5	6	7	10	12
D	mm	44		60	50	60	80	100	75	110	75	110				150					
H	mm	29	29	50	55	50	55	75	110			130	160				250			500	
Disegno Drawing	n°	1		2							1	2	1			3					



A COMPLETE RANGE OF BLADDERS, DIAPHRAGMS AND BELLOWS:

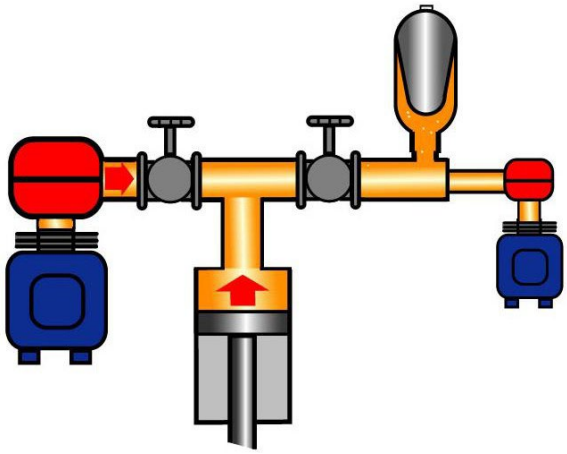
FOX thanks to a vast range of bladder and diaphragm of different materials is able to satisfy almost the totality of the possible industrial applications.

Material available for bladders, diaphragms and bellows:

- NITRILE (NBR) - BUTILE - NEOPRENE - EPDM - KARLEZ - ALIMENTARE
- HYTREL® (DU PONT) - FPM (VITON) – POLIURETHANE – SILICONE
- ALCRYN® (DU PONT) - PTFE – AISI316L

We remember that our technicians are at your disposal to give you further information and evaluated special material not above mentioned.

Nomenclatura / *Nomenclature*		
P0	*Nitrogen pressure*	BarA
P1	*Minimum pressure of fluid*	BarA
P2	*Maximum pressure of fluid*	BarA
V0	*Accumulator volume*	Litri
ΔV	*Volume of accumulated fluid*	Litri
T1	*Minimum temperature of fluid*	°C
T2	*Maximum temperature of fluid*	°C
Y	*Specific nitrogen temperature ratio = 1,4*	



ENERGY ACCUMULATOR:

It is improbable that an hydraulic system use all of its capacity without interruptions.
An hydropneumatic accumulator can store a certain amount of fluid that normally would be simply discharged in the tank and therefore help the pump when maximum capacity is requested.
It is therefore possible to measure the same system with reduced pump capacity and consequently save installed capacity. Moreover, fluids tend to heat less, less system noise together with a flattening out of pressure and water hammer absorption variations due to rapid valve operation.
The following formulas are the basis for sizing the exact FOX accumulator either for this application or for all other applications in which its use is requested. In all applications the following isothermal formula is used when charge and discharge times are prolonged at constant temperature (~3 minutes) and the adiabatic formula in the presence of frequent cycles.

Isothermal Conditions

$$a)\ V_0 = \frac{\Delta V \cdot P_1 \cdot P_2}{P_0 \cdot (P_2 - P_1)}$$

$$b)\ \Delta V = \frac{P_0 \cdot V_0 \cdot (P_2 - P_1)}{P_1 \cdot P_2}$$

Adiabatic Conditions

$$a_1)\ V_0 = \frac{\Delta V}{\left(\frac{P_0}{P_1}\right)^{\frac{1}{y}} - \left(\frac{P_0}{P_2}\right)^{\frac{1}{y}}}$$

$$b_1)\ \Delta V_0 = V_0 \left[\left(\frac{P_0}{P_1}\right)^{\frac{1}{y}} - \left(\frac{P_0}{P_2}\right)^{\frac{1}{y}} \right]$$

Where $\frac{1}{y} = 0.7143$

To get the maximum output of the accumulator the pressure of the nitrogen owes to be 0.9xP1.

TEMPERATURE INFLUENCE :
When a temperature change takes place in the system (T2) it is necessary to regulate the accumulator taking into consideration this variable. Consequently the values obtained from the previous formulas will be varied in the following manner:

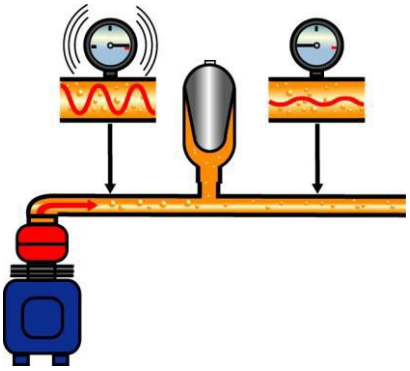
$$c)\ V_{0t} = V_0 \cdot \frac{273 + T_2}{273 + T_1}$$

V_{0t}= *Accumulator volume in consideration of temperature variation*

An other factor influenced by temperature is the nitrogen pre-loading phase also subject to pressure variations in function of temperature change. Considering that pre-loading pressure is carried out at an environmental temperature of 20° C, the formula is the following:

$$d)\ P_0 \text{ a } 20°C = 0{,}9 \cdot P_1 \cdot \frac{293}{273 + T_2}$$

P_0 a 20°C= *Value of the nitrogen pre-loading pressure at 20° C in consideration of pressure increase when temperature rises to value T2*



Pulsation dampener

It is well known that pumps, in particular volumetric pumps, have a more or less fixed capacity determined by their displacement and revolutions per minute. It is possible to improve pump flow uniformity by installing a FOX hydropneumatic accumulator.
For proper selection use the formula: (a1)
considering: **ΔV= C x K**
where:
C = plunger displacement in litres
K = pump type coefficient

Pompa	K
Simplex	0.6
Duplex	0.25
Triplex	0.12
Quintuplex	0.06

As far as the pressure values to be inserted in formula (a1) are concerned, they are a function of desired residual pulsation.
For example, if a pulsation of 5% above average delivery pressure is desired (Pm) the values will be P2 = Pm + 5% and P1 = Pm – 5%.
The value P0 relative to the precharge pressure must be:
P0 = 0.6 x P1 for simplex and duplex pumps
P0 = 0.7 x P1 for triplex pumps
P0 = 0.8 x P1 for quintuplex pumps and beyond.

For the precharge phase consider formula (d) which takes into consideration eventual temperature variations during the work phase.
In practical use, an easier way to calculate this volume has been developed experimentally and has been proven to be very useful:

V0 = C x Z

Where Z is the coefficient of the displacement of delivery in one revolution (c) of the pump (in litres), to obtain the volume of desired residual pulsation.

For this specific application it should be noted that in addition to different types of elastomers, various alternative as reported at page of catalogue dedicated to special execution

Pompa/ Pump (S.E.)	Z	Pulsazione residua Residual pulsation
Simplex	12	± 5%
	30	± 2.5%
	60	± 1.5%
Duplex	5	± 5%
	13	± 2.5%
	25	± 1.5%
Triplex	2	± 5%
	4	± 2.5%
	6	± 1.5%
Quintuplex	1	± 5%
	2	± 2.5%
	3	± 1.5%

Example	
Pump : Flow: N° cycles: Pressure: Residual pulsation::	Triplex 190 l/min 270 150 bar ± 2.5%

V0 = (190 x 4) / 270 = 2.8 l

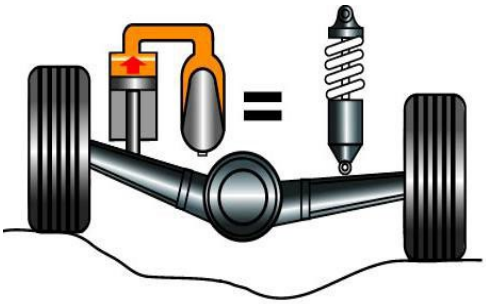
P0 = 150 x 0.7 = 105 bar

If the working temperature increases to 50°C we shall have:

V0t = 4.2 x (273+50) / (273+20) = 4.6 l

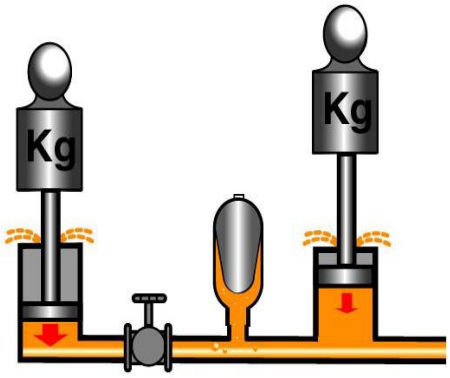
P0 nitrogen at 20°C=105 x 293 / (273+50)= 94.5bar
94.5 bar represents the value of preload to effect to 20°C to have to 50°C a pressure of exercise equal to 105 bar

Hydraulic spring balancing of forces



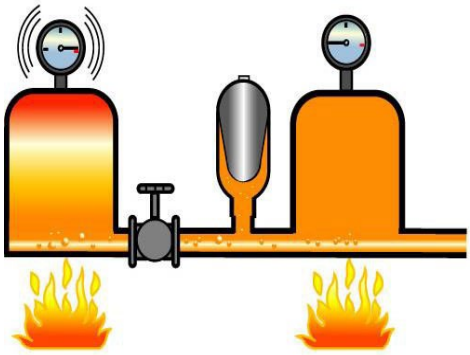
Hydropneumatic suspension

In these applications the accumulator volume is obviously in function of the fluid volume to be absorbed and the pressure variation within which a certain stroke is desired from one or more cylinders (formula). It's also necessary to consider indispensable to insert an unidirectional flow regulator inline to permit rapid accumulation and controlled return. As far as the closed circuits are concerned, it is also obligatory to insert a safety valve set at 95% of the maximum accumulator pressure.



Leakage compensator

A FOX hydropneumatic accumulator can be used to maintain the pressure in a closed hydraulic circuit compensating the losses due to gasket blow-by and valve leakage. To regulate, it is necessary to quantify the volume of fluid to be stored also in relation to the amount of time under pressure, in addition to establishing minimum and maximum system pressures and applying formula (a) for sizing.



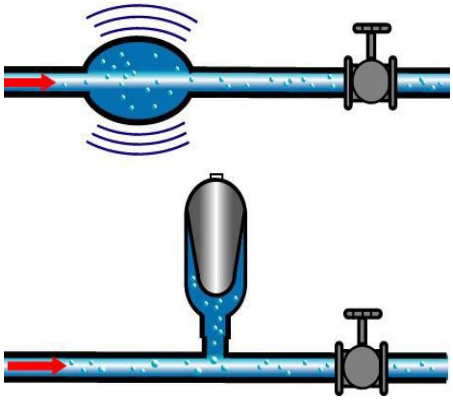
Thermal expansion compensator

In a closed hydraulic circuit subject to temperature variations, a variation of pressure takes place due to fluid expansion. A FOX hydropneumatic accumulator is able to absorb the expanded quantity of fluid and limit pressure increases within the values desired. To determine these values it is necessary to calculate the volume of fluid to be absorbed with the following formula:

$$\Delta V = V * (T2-T1) * \beta$$

Where:
V = Volume of tank fluid (lt)
ß = coefficient of cubic expansion of fluid.

Applying formula (a), the volume of the accumulator is selected in relation to the desired pressure at maximum temperature.
Must be considered also the formulas that take into consideration the influence of temperature in the sizing of your FOX accumulator.



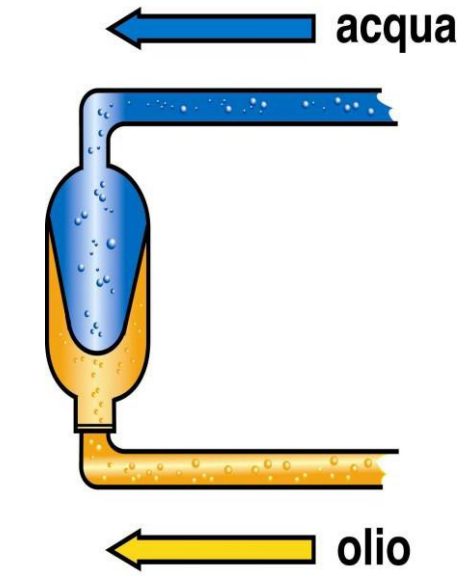
Water hammer/shock absorber

As in the preceding example it is necessary to calculate the volume of fluid that generates water hammer and apply formula (a) for setting a value indicating P2 as maximum desired pressure.
It is evident that the difficulty consists in quantifying the volume of fluid that generates water hammer subject to innumerable variables such as: tube diameter and length, pump capacity and pressure, valve closure time, temperature, type and viscosity of fluids etc...

Our technical office, due to its vast acquired experience can help to resolve such application problems.

Fluid separator:

An hydropneumatic accumulator can be used to transfer pressure on two different fluids that must not come in contact with each other. For this application in addition to requesting elastomers compatible with the fluids utilized it is necessary that the nominal value of the accumulator be 25% greater than the maximum quantity of fluid to be transferred in order to avoid excessive stretching of the elastomers.



Accumulators with additional gas cylinders:

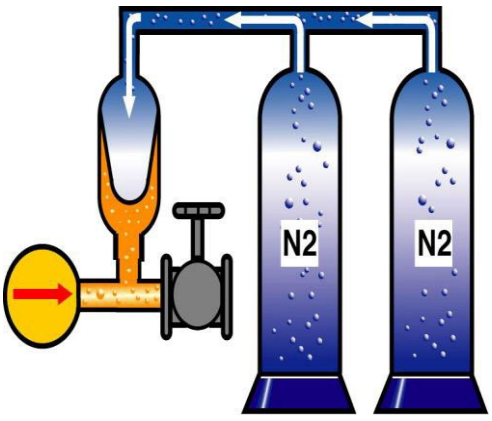
When in an hydraulic circuit the difference between maximum and minimum pressure is minimal and requires a considerable accumulation of fluid it is possible to connect additional cylinders of nitrogen to the accumulators in order to receive the total requested volume (ΔV) reducing the number of installed accumulators and exploiting even more the single capacity of accumulation. For regulation consider formula (a) bearing in mind that in addition to the formulas of temperature influence (c, d) we must also consider the quantity of gas divided in two parts: one in the accumulator and the other in the additional cylinder. In the first case, it is indispensable that at least 25% of nominal accumulator volume remain when maximum value pressure is reached (P2), therefore:

ΔV = 0,75 x V0

where V0 is the accumulator volume not considering the volume of the additional cylinders.

The pre-loading nitrogen pressure must be:

Po = P1 x 0,90



Other applications:

- Protection of pressure control and measuring instruments
- Noise reduction of system
- Timer for pressure rise

General note for assembly and maintenance

Preliminary checks:

Before effecting assembly check and compare data stamped on body or data plate of FOX accumulator with respective system, in particular maximum permissible pressure and pre-loading pressure. An incorrect pre-loading pressure selection often negatively influences accumulator life time.

Installation:

When the possibility exists, in order to achieve maximum yield, it is preferable to mount the accumulator as close as possible to the operator. The ideal position for the bag accumulators is from the vertical (with the nitrogen valve towards the top) to the horizontal position. Diaphragm and piston accumulators can be mounted in any position. It is advisable to leave accumulator data plate visible as well as 15 cm space around the nitrogen valve permitting easy access for controls and pre-loading regeneration.

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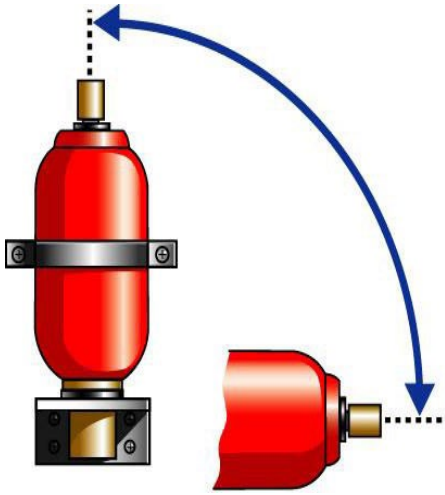


Installation:

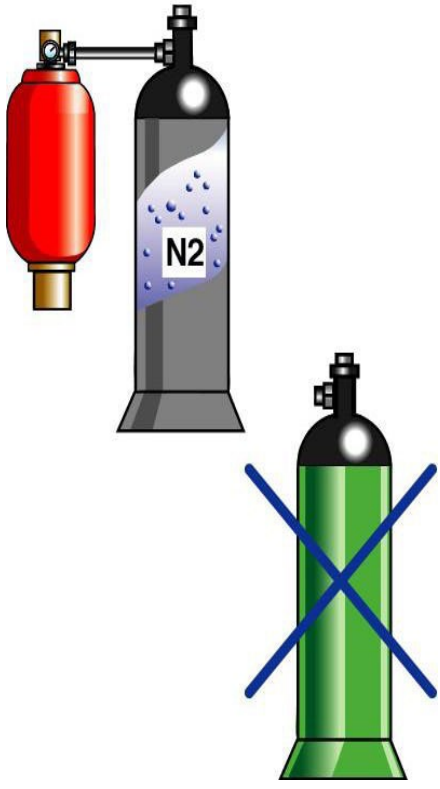
For small volumes installed on fixed machinery a standard screw thread attachment is sufficient, for larger volumes fixing brackets or clamps are necessary which protect the accumulator against vibrations or eventual impacts. At any rate it is absolutely prohibited to carry out welding on the bodies of the accumulators.

Start-up:

Before beginning the work cycle make sure that the circuit pressure limiting valve is connected directly to the accumulator. Bleed the air out of the fluid side utilizing the special screws provided on poppet valve type and furnish and fit a retaining valve at pump outlet that protects it from backflow.
We also recommend a cut-off and drain valve that permits maintenance during the working phase of the system as well as a unidirectional on line rate of flow regulator in order to regulate accumulator discharge flow.

Pre-loading gas:

FOX hydropneumatic accumulators are usually already loaded direct from the factory with the quantity of gas stipulated during the order phase and indicated on the data plate or stamped on accumulator body. This operation takes place at room temperature (~20° C); different working temperatures require different pre-loading procedures (see formula d).



Control of gas pre-Loading:

It is advisable to control pre-loading pressure within 10 days after system start up and subsequently every 6 months. Controls can be carried out easily from the fluid side with the accumulator mounted on system. This test method is based on the fact that, during the slow drainage phase of an accumulator full of fluid, the pressure on the accumulator side initially diminishes slowly according to laws regarding the physical properties of gas, but then suddenly drops off when the relative pre-loading gas value is reached. Such a phenomenon can be noticed with the aid of a manometer measuring accumulator fluid pressure directly. It is however also possible to control gas pre-loading from the gas side with the aid of the pre -loading device (AR), which also permits regeneration or pressure increase through bottled dry nitrogen(N2). It is absolutely prohibited to utilize compressed air, gas cylinders or other types of gas. It is indispensable that the control or pre-loading pressure variation be carried out in the absence of pressure on the fluid side no matter whatever accumulator is mounted on the system. The space above the nitrogen valve in order to be able to reach the pre-loading equipment must be at least 15 cm.

Accumulator flowrate

In selecting an accumulator, in addition to volume, maximum pressure, temperature and general utilization conditions we must also consider incoming and outgoing maximum consented flow capacity. The recommended values of maximum flow capacity under working conditions for each type of accumulator are reported in the technical tables. In system with the possibility of flow capacities higher than permitted, there exists the possibility to bladder or diaphragm prolepses, that is, the accumulated fluid is not restored due to anticipated closure of the elastic part on accumulator bottom through anti-extrusion screen or closure of poppet valve. This phenomenon normally occurs when the accumulator lacks outgoing flow regulation and does not take into consideration that this is due to gas expansion, therefore with the possibility of very high instantaneous flow notwithstanding reduced passage diameters. We therefore suggest the prevision of an on line unidirectional flow capacity regulator during the project phase that permits outgoing accumulator flow control. For this particular function, FOX has its own line of efficient, simple and economic regulators (series VSA).

Testing and quality control

FOX hydropneumatic accumulators are all individually tested at a pressure of 1.43 times the maximum permissible pressure stamped on the body. As confirmation of this test, the customer will receive with his new FOX products a certificate signed directly by the tester. On the body of the accumulators in addition to the maximum working pressure are indicated: the manufacturer's name, type, test pressure, nitrogen preload and date of construction. FOX has structured an internal management system that guarantees the complete traceability of the goods, thanks to this system, if is necessary to trace the original characteristics of the materials used of the treatments and the processing it is enough to request them at the time of order or by telephone contacting our Technical Office.

FOX accumulators are constructed in according to the European Directive 97/23-PED

Quality control

FOX hydropneumatic accumulators are constructed following the precise guidelines regulating construction norms. All mechanical turning (C.N.C.), automated welding (ARGON unit), bladders and diaphragms molding, assembly, painting and testing are carried out and controlled during the work process directly in our factory shop area 20'000 m^2. The parts which are forged externally are subject to careful inspection by a Giraud magnetic crack detector. Our constant efforts to improve quality have enabled us to realize and perfect the only welded monolithic diaphragm accumulator on the market (series H). The principal innovation that differentiates this gamma from all the other competitor products is that it is constructed of a single body without any welds, a guarantee of safety at high pressures together with the fact that it avoids excessive bladder heating at points where bladder is located near fluid and nitrogen side gates. Both models with patent regularly deposited.

SIMPLIFIED TABLE FOR MEASURING THE QUANTITY OF ACCUMULATED LIQUID IN RELATION TO THE PARTICULAR TYPE OF ACCUMULATOR UTILIZED IN THE **ADIABATIC** CONDITION.

	ΔP = P2/ P0	1.25	1.5	1.75	2	2.25	2.5	2.75	3	3.5	4
Litri/ Litres	0.1	0.004	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06
	0.35	0.01	0.05	0.08	0.1	0.11	0.13	0.14	0.15	0.17	0.18
	0.5	0.02	0.08	0.12	0.15	0.18	0.2	0.22	0.24	0.26	0.28
	0.8	0.03	0.11	0.17	0.22	0.26	0.3	0.32	0.35	0.38	0.41
	1.3	0.04	0.18	0.28	0.36	0.43	0.48	0.52	0.56	0.62	0.67
	1.5	0.05	0.2	0.33	0.4	0.49	0.55	0.6	0.65	0.72	0.78
	2.3	0.08	0.3	0.5	0.6	0.75	0.85	0.9	0.99	1.1	1.19
	2.5	0.09	0.33	0.57	0.7	0.8	0.9	0.95	1	1.2	1.3
	4	0.14	0.5	0.8	1.1	1.3	1.4	1.53	1.7	1.92	2.2
	5	0.18	0.7	1	1.4	1.6	1.8	1.93	2.1	2.3	2.5
	6	0.2	0.8	1.2	1.6	1.8	2.1	2.3	2.5	2.63	2.75
	10	0.36	1.4	2.1	2.7	3.1	3.6	3.9	4.3	4.7	5.2
	20	0.66	2.6	4	5.1	5.9	6.8	7.4	8	9.9	12.7
	35	1.2	4.6	7.3	9.3	10.8	12.3	13.3	14.4	15.4	16.5
	50	1.7	6.8	10.6	13.6	15.5	18	19.5	21.1	22.8	24.4

USE:
In a system we know the value of the maximum pressure P2 and minimum pressure P1. Measure the nitrogen precharge pressure P0 with the formula **P0 = P1 x 0.85 (fixed value).**
Measure the compression ratio **Δ P = P2 : P0** and identify the obtained value (ΔP) in the column. All reported values on the corresponding lines refer to the quantity of accumulated fluid in relation to the volume of accumulator utilized. The number of cycles is inversely proportional to the increase of the compression ratio. It is useless to compress a preloaded accumulator from 30 bar of nitrogen up to 120 bar of oil, when in the system for example, the minimum pressure never goes below the value of 70 bar. In this case, other than reducing membrane life, the nominal performance of the accumulator is not improved. The same quantity of accumulated oil is obtained with a preloaded pressure of 60 bar and the nominal nitrogen volume is reduced by half.

EXAMPLE: P2 = 180 bar
P1 = 140 bar
P0 = 140 x 0.85 = 119 bar
ΔP = 180 / 119 = 1.5

The following table shows the variations that undergo the nitrogen pre-charge pressure made to 20°C depending from working temperature T2. Referring to the table we get a volume of fluid accumulated of 0.11 liters with an 0.8 litres accumulator.

T2	***NITROGEN PRESSURE PRECHARGE in BAR to 20°C***											
°C	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**
-20	8.6	17	26	35	43	52	60	69	78	86	95	104
-10	9	18	27	36	45	54	63	72	81	90	99	108
0	9.3	19	28	37	47	56	65	75	84	93	102	112
10	9.7	19	29	39	48	58	68	77	87	97	106	116
20	10	20	30	40	50	60	70	80	90	100	110	120
30	10	21	31	41	52	62	72	83	93	103	114	124
40	11	21	32	43	53	64	75	85	96	107	118	128
50	11	22	33	44	55	66	77	88	99	110	121	132
60	11	23	34	45	57	68	80	91	102	114	125	136
70	12	23	35	47	59	70	82	94	105	117	129	140
80	12	24	36	48	60	72	84	96	108	120	133	145
90	12	25	37	50	62	74	87	99	112	124	136	149
100	13	26	38	51	64	76	89	102	115	127	140	153
110	13	26	39	52	65	78	92	105	118	131	144	157
120	13	27	40	54	67	80	94	107	121	134	148	161

EXAMPLE: nitrogen preload 20 °C = 80 bar
value when the temperature up to 40°C = 85 bar
value when the temperature up to 60°C = 91 bar