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INTERNATIONAL SERIES BOTTOM REPARAIBLE

Technical Features:

Maximum working pressure (PS) : 350/330 bar

Test Pressure (PT) : PS x 1.43 bar

Body: forged steel, sand and painted

Working temperature (TS) : from - 20°C to + 80°C

Standard bladder: can be used whit mineral oils and non corrosive fluids

Installation position: vertical position (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

Warranty: see dedicated page

Spare parts: see dedicated page

Special execution:
- inside and outside epoxy painted body
- inside and outside nickel, zinc, Teflon plated body
- bladders for working temperatures from –50 °C to +130 °C

According to:
97/23/CE – PED
94/9/CE – ATEX Group II Cat 2

CE Ex **II 2 G/D**

Type	Max Pressure	Nitrogen Volume	Max Preload	H	D	C	B	CH	Hydraulic Connection	Max Flow	Weight
	Bar	Litre	Bar	Mm	mm	mm	mm	mm		Litre/min	Kg
HB2.5	350	2.5	230	495	114	25	60	50	1“¼ BSP	220	12
HB4.5	350	4	230	410	168	47	60	50	1“¼ BSP	400	16
HB6	350	6	230	505	168	47	60	50	1“¼ BSP	350	19.5
HB10	350	10	230	775	168	47	60	50	1“¼ BSP	300	36
HB20	330	18.5	230	870	223	60	100	70	2” BSP	600	53
HB25	330	24.9	230	1030	223	60	100	70	2”BSP	570	62
HB35	330	33.5	230	1400	223	60	100	70	2” BSP	540	84
HB50	330	49	230	1900	223	60	100	70	2” BSP	500	115

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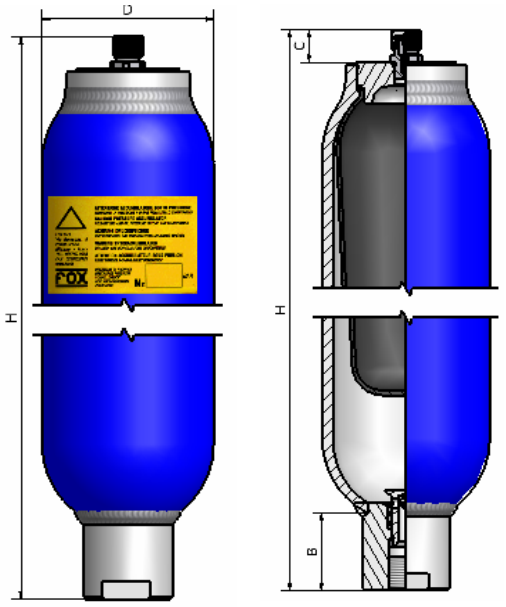
BLADDER TYPE HYDROPNEUMATIC ACCUMULATORS HTR SERIES

Drawing N°1



Drawing N°2

TOP REPARAIBLE

Technical Features:

Maximum working pressure (PS): 250/210 /150 bar

Test pressure (PT): PS **x** 1,43 bar

Body: made in painted carbon steel

Working temperature (TS): from - 20°C to + 80°C

Standard bladder: can be used with mineral oils and non corrosive fluids

Installation position: from vertical (nitrogen valve upward) to horizontal position

Compression Ration:
- recommended: P2/P0 = 2.5
- maximum : P2/P0 = 4

Mechanical life: the number of cycles is proportional to the increase compression ratio

Warranty: see dedicated page

Spare parts: see dedicated page

Available:
- **HTR .. T** inside and outside zinc-plated body
- inside and outside epoxy painted body
- inside an outside nickel-plated body
- special bladder: FPM – EPDM – Hytrel – Alcryn ecc…
- bladders for working temperatures till 150 °C
- **HTR .. LT** series for utilization oil temperature to – 40°C
- hydraulic connection ½"BSP for the models marked with (*)

According to:

97/23/CE – PED
94/9/CE – ATEX II 2 G

CE Ex II 2 G/D

Type	Max Pressure	Nitrogen Volume	Max Preload	H	D	C	B	Hydraulic Connection	Max Flow	Weight	Draw.
	Bar	Litri	Bar	mm	mm	mm	mm		Lt./min	Kg	
HTR0.3	250	0.3	150	185	72	15	20	M 18X1.5 *	40	2	1
HTR0.35	250	0.35	150	155	93	15	20	M 18X1.5 *	45	2.5	1
HTR0.7	250	0.75	150	220	92	15	20	M 18X1.5 *	40	3.7	1
HTR1.5	250	1.5	150	280	115	15	25	M 18X1.5 *	40	5.3	1
HTR2.5	250	2.5	150	483	115	15	50	¾" BSP	110	11.5	2
HTR4.5	210	4.5	150	395	170	15	80	1"¼ BSP	400	15	2
HTR6.5	210	6.5	150	520	170	20	60	1"¼ BSP	350	24	2
HTR10	210	10	150	760	170	15	80	1"¼ BSP	300	31	2
HTR20	150	19.5	100	845	220	15	110	2" BSP	600	59	2
HTR35	150	35	100	1380	220	15	110	2" BSP	540	90	2
HTR50	150	50	100	1870	220	15	110	2" BSP	500	121	2

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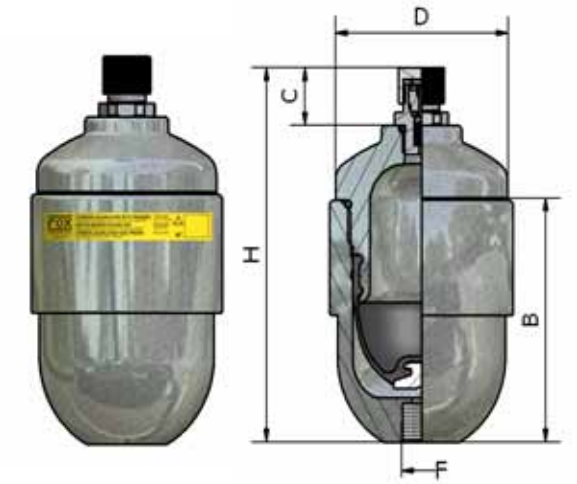
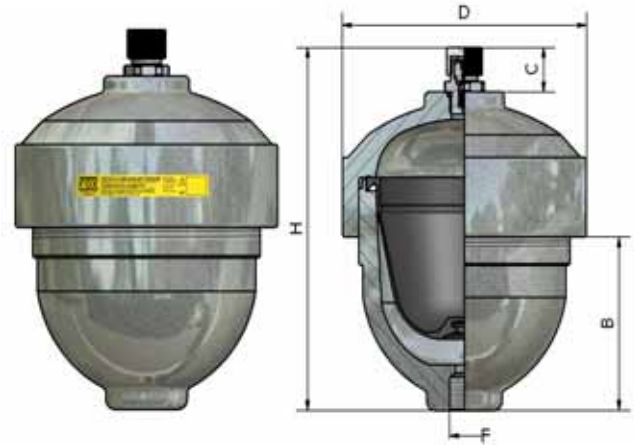
DIAPHRAGM TYPE HYDROPNEUMATIC ACCUMULATORS HST / 300 SERIES



Drawing N°1



Drawing N°2

Technical Features:

Maximum working pressure (PS) : 300 bar

Test pressure (PT) : PS x 1.43 bar

Maximum precharge admissible : 210 bar

Body: made in painted carbon steel

Standard nitrogen valve : 5/8" UNF

Constructive methodology: two different parts united whit a special threading that under condition of dynamic pressure tends to self-block

Working temperature for standard execution:
from - 20°C to + 90°C

Standard diaphragm: can be used with mineral oils and non corrosive fluids

Installation: in every position

Compression ratio:
- recommended: P2/P0 = 2.5
- maximum : P2/P0 = 6

Mechanical life: the number of cycles is inversely proportional to the increase compression ratio

Warranty: see dedicated page

Spare parts: see dedicated page

Available :
- **HST .. T** inside and outside zinc-plated body
- **HST..LT** with diaphragm suitable for working temperatures to –40 °C
- **HST .. M:** rechargeable with nitrogen valve M28x1.5
- **HST .. V:** not rechargeable with a fixed nitrogen preload in the factory
- **HST .. S:** separator of fluid execution

According to:
97/23/CE – PED
94/9/CE – ATEX

CE Ex II 2 G/D

Type	Max Pressure	Nitrogen Volume	Max Preload	H	D	B	C	Hydraulic Connection	Max Flow	Weight	Draw.N°
	Bar	Litre	Bar	mm	mm	mm	mm		Litre/min	Kg	
HST 0.04	300	0.04	210	100	60	35	11	⅜" BSP	35	0.7	2
HST 0.1	300	0.12	210	141	80	94	22	M 18X1.5	45	2.1	1
HST 0.35	300	0.35	210	152	101	100	22	M 18X1.5	50	3.2	1
HST 0.5	300	0.5	210	175	124	120	22	M 18X1.5	60	5	1
HST 0.7	300	0.7	210	218	100	80	22	M 18X1.5	55	5.5	1
HST 0.8	300	0.8	210	185	138	85	22	M 18X1.5	60	5.8	2
HST 1.3	300	1.3	210	232	120	180	22	M 18X1.5	55	7.9	1
HST 1.5	300	1.5	210	270	138	160	22	M 18X1.5	55	8.7	2
HST 2.3	300	2.3	210	340	138	165	22	M 18X1.5	55	10.5	2

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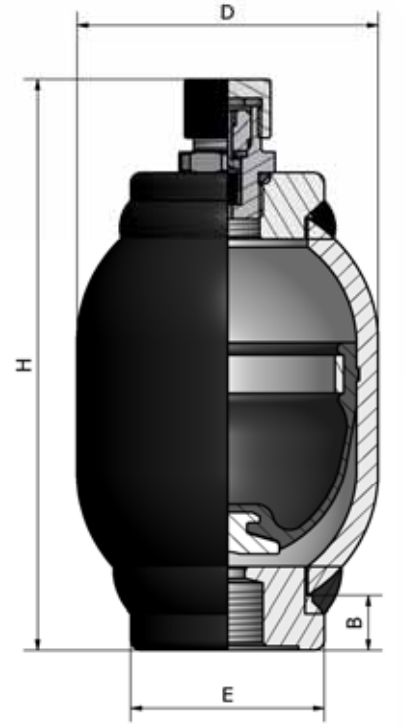


PATENTED EXECUTION

Technical Features:

Maximum working pressure (PS): 250 bar

Test pressure (PT) : PS x 1.43 bar

Maximum preload: 160 bar

Body: in cold formed steel

Constructive methodology: end parts welded in protected argon atmosphere

Working temperature for standard execution: from - 20°C to + 80°C

Standard diaphragm: non replaceable can be used with mineral oils and non corrosive fluids

Installation: in any position

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

Warranty: see dedicated page

Spare parts: see dedicated page

Also available:
- **H.. LT** series for working temperature till – 40°C
- diaphragm for working with aggressive fluids

According to:
97/23/CE – PED
94/9/CE – ATEX

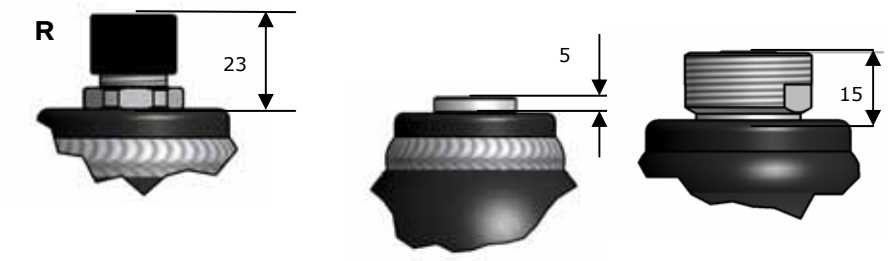
II 2 G/D

Nitrogen connection parts:

R = rechargeable ⅝"UNF

V = non rechargeable

M = rechargeable M28x1,5



Dimensions with valve R type

Type	P. Max	Nitrogen Volume	Max Preload	H	D	E	C	B	Hydraulic Connection	Max Flow	Weight
	Bar	Litres	Bar	mm	mm	mm	mm	mm		Litre/min	Kg
H100R	250	0.15	160	142	70	45	23	15	M 18X1.5	40	1.2
H350R	250	0.35	160	205	70	35	23	15	M 18X1.5	35	1.7
H500R	250	0.45	160	167	92	55	23	17	M 18X1.5	50	1.9
H700R	250	0.7	160	220	92	40	23	17	M 18X1.5	40	2.7
H1000R	250	1	160	200	115	60	23	19	M 18X1.5	50	3.5
H1400R	250	1.4	160	270	115	60	23	19	M 18X1.5	40	4.9
H2000R	250	2	160	350	115	60	23	19	M 18X1.5	40	5.8
H4000R	210	3.8	135	320	170	95	23	15	¾"BSP	80	14

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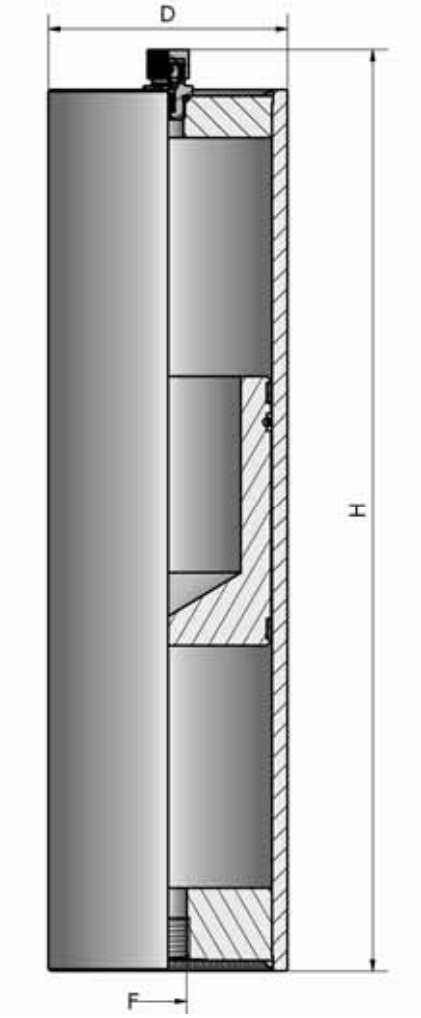

Technical Features :

Maximum working pressure (PS) : 250 (bar)

Test pressure (PT) : PS x 1,43 (bar)

Working temperature (T): from -20°C to +80°C

Type: "piston type accumulator , not repairable "

Construction method : plated carbon steel body with welded end-parts and a sliding internal piston (in according whit European Directive 97/23/CE PED).
Separation piston made in aluminium alloy.

Seals:
- standard execution : NBR
- made on request : Poliuretane – FKM – PTFE

Installation position: in any position.

Spare parts : "R" valve (for nitrogen preload)

Warranty: see dedicated page

According to:
97/23/CE – PED
94/9/CE – ATEX

CE Ex II 2 G/D

Notes :
The model list illustrates the mainly requested execution.
Are available execution and capacity on request.

Type	Max pressure	Nitrogen volume	Max preload pressure	H	D	Hydraulic connection	Max flow	Weight
	bar	Litri	bar	mm	mm	F	Lt/minuto	Kg
HP0,35	250	0,35	150	277	70	½" BSP	80	3,2
HP0,7	250	0,7	150	387	70	½" BSP	80	6
HP1	250	1	150	327	115	¾"BSP	150	8.7
HP2	250	2	150	487	115	¾"BSP	150	11,3
HP4	250	4	150	682	115	¾"BSP	150	16,7
HP6	250	6	150	942	115	¾"BSP	150	23

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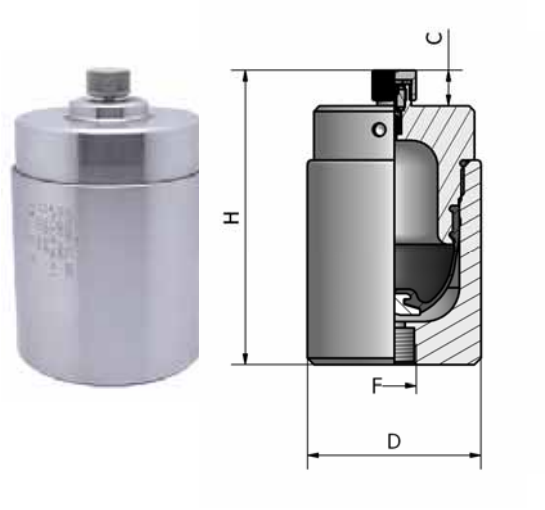
DIAPHRAGM TYPE PULSATION DAMPENER HSTX / 150-210 SERIES



Drawing N°1

Drawing N°2

Technical Features:

Maximum working pressure (PS) : 150 / 210 bar

Test pressure (PT) : PS x 1.43 bar

Body: in AISI 316L stainless steel

Constructive methodology: two or three different parts united whit a special threading that under condition of dynamic pressure tends to self-block

Diaphragm: different types in relation to the used fluid:
-Perbunan (NBR)
-Butile
-Nitrile (NBR)
-Poliuretano
-EPDM
-Viton

Installation position: in every position

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 working temperature.

Warranty: see dedicated page

Spare parts: see dedicated page

Also available:
- execution for working pressure further 500 bar

According to:
97/23/CE – PED
94/9/CE – ATEX

CE Ex **II 2 G/D**

Type	Max Pressure	Nitrogen Volume	Max Preload	H	D	C	B	Hydraulic Connection	Weight	Draw.
	bar	litre	bar	mm	mm	mm	mm		Kg	N°
HSTX 0.04	210	0.04	150	100	60	11	35	⅜“ BSP	0.7	2
HSTX 0.1	150/210	0.12	105/150	138	80	23	-	½“BSP	2.2	1
HSTX 0.35	150/210	0.35	105/150	152	100	23	-	½“BSP	3.7	1
HSTX 0.7	150/210	0.7	105/150	215	100	23	-	¾“BSP	5	1
HSTX 0.8	150/210	0.8	105/150	180	138	23	77	¾“BSP	6.1	2
HSTX 1.5	150/210	1.5	105/150	270	138	23	170	1“BSP	8.7	2
HSTX 2.3	150/210	2.3	105/150	360	138	23	170	1“BSP	10.5	2
HSTX 4.5	150/210	4.5	105/150	370	180	18	-	1“BSP	24	1
HSTX 10	150/210	10	105/150	740	180	18	-	1“¼ BSP	45	1

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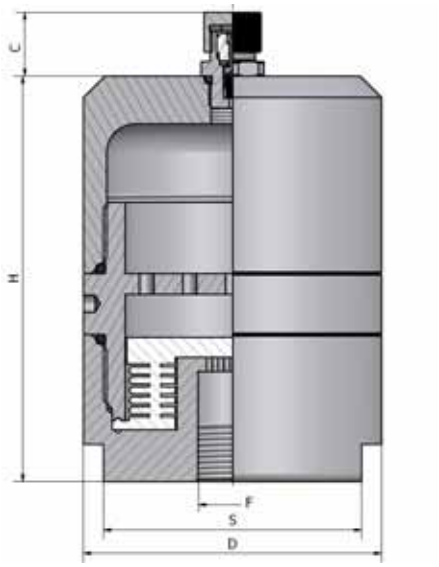
DIAPHRAGM TYPE HYDROPNEUMATIC ACCUMULATORS BTHX SERIES



Technical features:

Maximum working pressure (PS): 210 Bar

Test pressure (PT): 315 Bar

Body: in AISI 316 L stainless steel

Diaphragm : in PTFE (Teflon)

Working temperature: -50°C ÷ +150°C

Installation position: from vertical (nitrogen valve upward) to horizontal position

Preload pressure :
- P0 = 0.6 x P1 for SIMPLEX and DUPLEX pump
- P0 = 0.7 x P1 for TRIPLEX pump
- P0 = 0.8 x P1 for QUINTUPLEX and other pump

Mechanical life: the number of cycles is inversely proportional to the increase of the compression ratio.
For pulsation damper applications , the nitrogen value must be from 60% to 80% of the working pressure also in relation with the working temperature

Warranty: see dedicated page

Spare parts: see dedicated page

According to:
97/23/CE - PED
94/9/CE – ATEX

CE Ex II 2 G/D

Type	Max pressure	Test pressure	Nitrogen volume	H	D	C	S	Hydraulic connection (F)	Weight
	Bar	Bar	Litres	mm	mm	mm	mm	inch	Kg
BTHX0.06	210	315	0.06	82	104	22	90	¾"BSP	3.9
BTHX0.15	210	315	0.15	115	104	22	90	¾"BSP	5.2
BTHX0.30	210	315	0.3	135	104	22	90	¾"BSP	6
BTHX0.50	210	315	0.5	190	104	22	90	¾"BSP	7
BTHX0.75	210	315	0.75	232	104	22	90	¾" BSP	8
BTHX1.00	210	315	1	185	168	22	150	1 ½"BSP	11
BTHX1.50	210	315	1.5	211	168	22	150	1 ½" BSP	13
BTHX2.00	210	315	2	243	168	22	150	1 ½" BSP	15
BTHX2.50	210	315	2.5	276	168	22	150	1 ½" BSP	17

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TOP REPARABLE

Hydropneumatic bladder accumulator with stainless steel body AISI316L in welded execution. The HTRX series is suitable for the use with water and with the aggressive fluids used on the alimentary, chemical, pharmaceutical and petrochemical sectors.

Technical Features:

Maximum working pressure (PS): 30 / 150 bar

Test pressure (PT): PS x 1.43 bar

Body: in AISI 316L stainless steel

Constructive methodology: two (draw.1) or three (draw.2) different parts welded together

Bladder: different type in relation to the used fluid:
-Perbunan (NBR) -Butile -Nitrile (NBR)
-Poliuretane -EPDM -Viton -Hytrel

Installation position: from vertical position (nitrogen valve upward) to horizontal

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 dampner applications, the nitrogen value must be from 60% to 80% of the working pressure also in relation with the pump's type and the working temperature

Warranty: see dedicated page

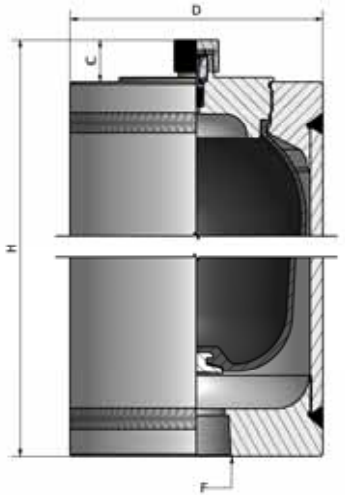
Spare parts: see dedicated page

According to:

97/23/CE – PED
94/9/CE – ATEX
ASME VIII° div.1

CE Ex II 2 G/D

Draw. 1



Draw. 2

Type	Max Pressure	Test Pressure	Nitrogen Volume	Max Preload	H	D	C	Hydraulic Connection	Weight	Draw.
	Bar	Bar	Litre	Bar	mm	mm	mm		Kg	N.
HTRX 0.35	150	214.5	0.35	105	175	90	25	¾"NPT	2.8	1
HTRX 0.7	150	214.5	0.7	105	228	90	25	¾"NPT	4	1
HTRX 1.5	70	100.1	1.5	49	270	114	25	1"NPT	7	2
HTRX 2.5	70	100.1	2.5	49	405	114	25	1"NPT	9	2
HTRX 4.5	50	71.5	4.5	35	350	168	25	1"½ NPT	15	2
HTRX 6.5	50	71.5	6.5	35	486	168	25	2"BSP	19	2
HTRX 10	50	71.5	10	35	720	168	25	2"BSP	25	2
HTRX 20	30	42.9	20	21	750	220	40	3"BSP	36	2
HTRX 35	30	42.9	35	21	1290	220	40	3"BSP	58	2
HTRX 50	30	42.9	50	21	1780	220	40	3"BSP	75	2

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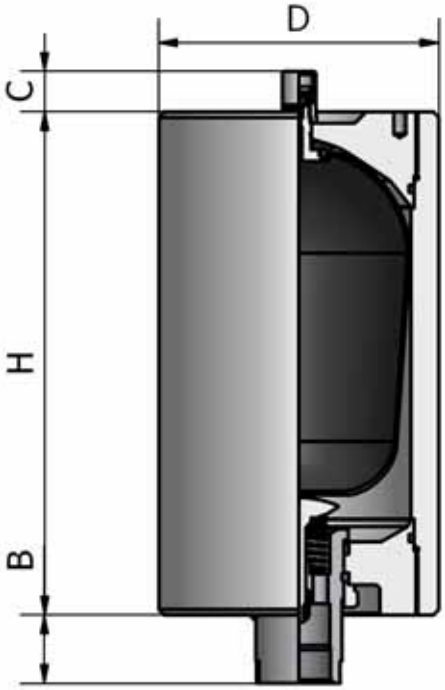
TOP REPAIRABLE



Bladder type hydropneumatic accumulators with body in AISI 316L stainless steel

Technical features :

Maximum working pressure (PS): 220 bar

Test pressure (PT): PS x 1,43 bar

Body : in AISI 316L Stainless Steel

Construction methods : three different parts united whit a special threading that under conditions of dynamic pressure tends to self-block

Bladder : differently type due to the fluid utilized :
-Perbunan (NBR) -Butil -Nitrile (NBR)
-Poliuretano -EPDM -Viton

Installation position: vertical position, nitrogen valve upward

Compression Ration:
- recommended: P2/P0 = 2.5
- maximum : P2/P0 = 4

Mechanical life: the number of the cycles is inversely proporzioned to the increase of the compression ration. To be used as antipulsation dampner, the precharged pressure should be between 60% and 80% of the working pressure depending also to the temperature value.

Warranty: see dedicated page

Spare parts: see dedicated page

Available:
- flanged execution on requests

According to

97/23/CE – PED
94/9/CE – ATEX

ASME VIII° div.1

II 2 G/D

Type	Max Pressure	Test pressure	Nitrogen Volume	H	D	C	B	Hydraulic connection	Weight
	bar	bar	litri	mm	mm	mm	mm		Kg
ACSX 10	220	314.6	10	450	250	36	70	2“BSP	59.7
ACSX 20	220	314.6	20	735	250	36	70	2“BSP	99.2
ACSX 25	220	314.6	25	885	250	36	70	2“BSP	120.1
ACSX 35	220	314.6	35	1265	250	36	70	2“BSP	172.9
ACSX 50	220	314.6	50	1750	250	36	70	2“BSP	240.3

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DIAPHRAGM TYPE PULSATION DAMPENERS HSTPVC / HSTP SERIES

Drawing N°1

Drawing N°2

Technical Features:

Maximum working pressure (PS): 10 bar

Test pressure(PT) : PS x 1.43 bar

Body:
- HSTPVC series: in PVC
- HSTP series : in POLIPROPILENE

Constructive methodology: two different parts joined with a specia thread that under condition of dynamic pressure tends to self-block

Maximum working temperature:
- HSTPVC series: + 50 °C
- HSTP series : + 70 °C

Diaphragm: different types in relation to the used fluid:

-Perbunan (NBR)	-Butile
-Nitrile (NBR)	-Poliuretano
-EPDM	-Viton
-Hytrel "Du Pont"	-Alcryn "Du Pont"

Installation position: vertical position, 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 working temperature

Warranty: see dedicated page

Spare parts: see dedicated page

Special execution :
HSTPVC.C : with body in PVC.C
HSTPVC.PVDF : with body in PVDF
- with a reinforcement liner for utilization till a 15 bar pressure

According to:
97/23/CE – PED
94/9/CE – ATEX

CE Ex II 2 G/D

Type		Max Pressure	Nitrogen Volume	Max Preload	H	D	C	Hydraulic Connection	Weight	Draw.
		Bar	litre	Bar	mm	mm	mm		Kg	N°
HSTPVC 0.04	**HSTP 0.04**	10	0.04	7	100	60	23	⅜"BSP	0.3	1
HSTPVC 0.1	**HSTP 0.1**	10	0.12	7	138	80	23	½" BSP	0.7	1
HSTPVC 0.35	**HSTP 0.35**	10	0.35	7	155	100	23	½"BSP	1.1	1
HSTPVC 0.7	**HSTP 0.7**	10	0.7	7	218	110	23	½"BSP	1.8	1
HSTPVC 1.5	**HSTP 1.5**	10	1.5	7	270	140	23	¾"BSP	3.5	2
HSTPVC 2.3	**HSTP 2.3**	10	2.3	7	360	140	23	¾"BSP	4	1
HSTPVC 5	**HSTP 5**	10	5	7	375	180	23	1"½ BSP	10	2
HSTPVC 10	**HSTP 10**	10	10	7	730	200	23	2"BSP	20	2

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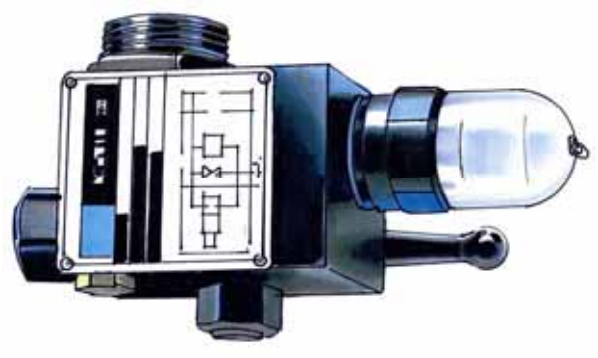

Technical Features:

Maximum working pressure: 350 bar

Body: in phosphated steel

Standard execution:
- Isolation ball valve
- Safety relief valve
- Drain port
- Gauge port

Working temperature: from - 20°C to + 80°C

Special execution:
- Safety valve /TÜV test inspected
- Electric solenoid valve for accumulator discharge
- SAE and CETOP connecting flange for SB4 / SB5 / SB6 types
- Stainless steel housing

CE

Type	Fox Compatible Accumulators	Hydraulic Connection Accumulator's side	Hydraulic Connection Installation's side	Fluid passage diameter	Note
				mm	
SB1	-	¾"BSP male	½"BSP female	10	
SB2	HB series till 10 litres, HTR series from 4.5 to 10 litres, HSTX10	1"¼ BSP male	½"BSP female	10	
SB3	HB series from 20 to 50 litres, HTR20 HTRX10 HSTPVC10	2" BSP male	½"BSP female	10	
SB4		2" BSP male	¾"BSP female	20	
SB5		2" BSP male	1"BSP female	25	Execution for high flow. Pre-designed for SAE and CETOP flange connection
SB6		2" BSP male	1"½BSP female	32	

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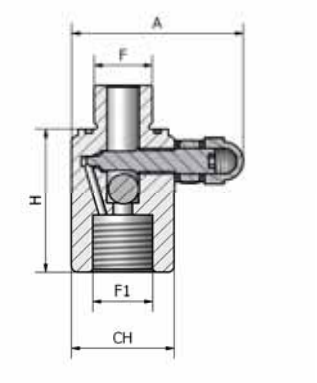
ONEWAY FLOW REGULATORS VSA SERIES



Technical Features:

Maximum working pressure: 330 bar

Body: in zinc-plated carbon steel

Use: for an optimal use of an hydropneumatic accumulator is advisable to have in the almost totality of the applications a regulation of the flow. The VSA series of flow regulators has been conceived for resolving in the most economic way this requirement

Regulation: the flow set point is controlled by means of a set screw without the need of an external control knob

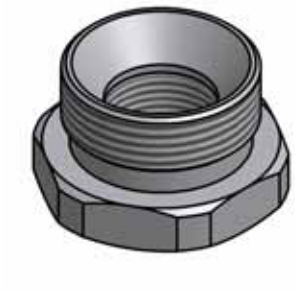
Installation position: in every position

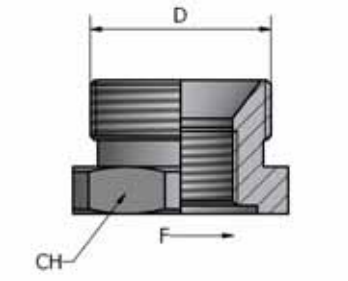
Maximum flow without accumulator:
- VSA 18: 50 litre/min
- VSA 21: 50 litre/min
- VSA 34: 90 litre/min

Maximum flow with accumulator:
the flow increase following a directly proportional function to the value of the nitrogen preload

Type	Max Pressure	Max Flow Without Accumulator	Hydraulic Connection Accumulator's Side	Hydraulic Connection Installation's Side	H	A	Hexagon	Weight
	Bar	Litre/min			mm	mm	mm	Kg
VSA 18	330	50	M 18x1.5	M 18x1.5	45	53	32	0.3
VSA 21	330	50	M 18x1.5	½" BSP	45	53	32	0.3
VSA 34	330	90	¾" BSP	1"1/4 BSP	57	65	36	0.45

VS SERIES ADAPTORS





Type	D	F	Hexagon
			mm
VS 21	M 18x1.5	½" BSP	32
VS 34	1"¼ BSP	¾" BSP	50
VS 214	2" BSP	1"¼ BSP	70
VS 234	2" BSP	¾" BSP	70

NS SERIES NIPPLES

Type	F1	F2	Hexagon
			mm
NS15	M 18x1.5	⅜" BSP	27
NS21	M 18x1.5	½" BSP	27

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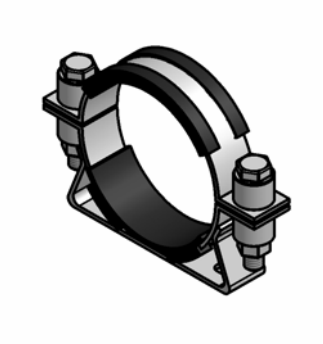
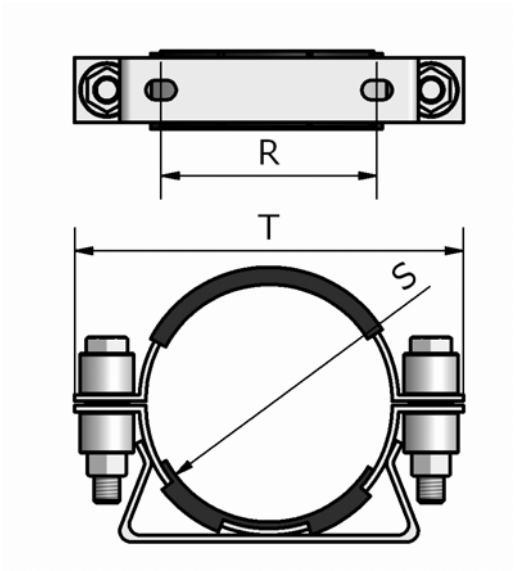
Designed for specific use on accumulator installation, both clamps and brackets are supplied complete with rubber support to ensure rigid mounting

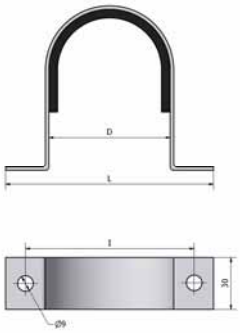
CLAMPS CR SERIES





Type	S	R	T
	mm	mm	mm
CR 114	114÷116	100	180
CR 168	168÷172	148	230
CR 223	216÷225	216	290

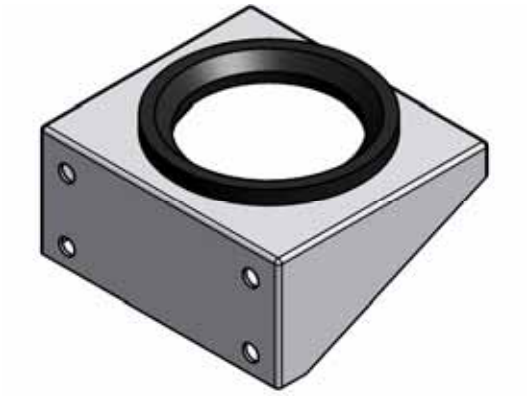
CLAMPS CRE SERIES

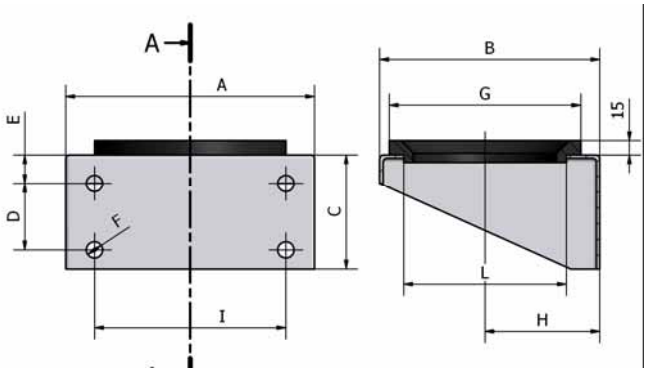


Type	L	I	D
	mm	mm	mm
CRE 70	120	94	70
CRE 92	145	120	92
CRE 115	180	155	115
CRE 138	210	185	138

BRACKETS MRC SERIES

Type	A	B	C	D	E	F	G	H	I	L
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
MRC 168	200	175	90	40	30	11	140	93	140	120
MRC 223	260	230	120	70	30	17	200	120	200	170





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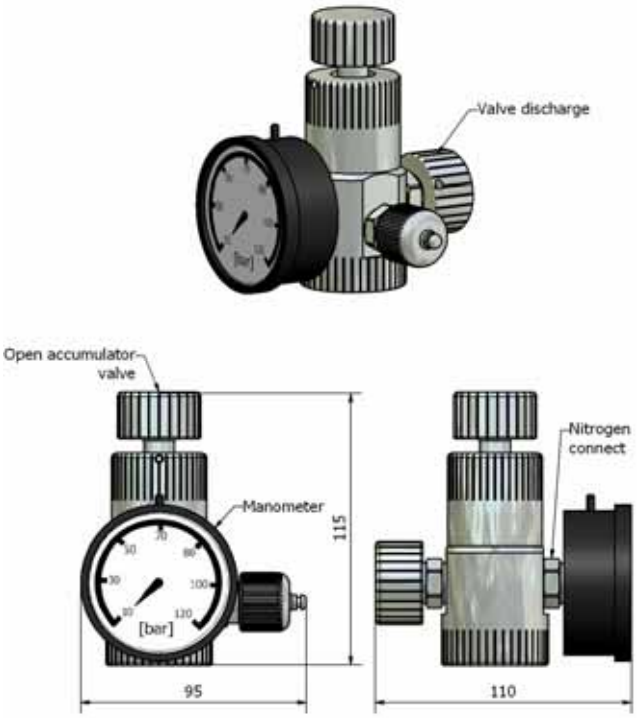
FILLING AND TESTING UNIT AR TYPE



The equipment of preload AR is an essential tool for the operations of control and restoration of the pressure of the nitrogen in the accumulators

Technical Features:

Maximum working pressure : 350 bar

Body: in zinc-plated steel

Standard execution:
- manometer included
- useful dedicated handbag
- 2.5 m flexible pipe for cylinder nitrogen with thread connection of 3/8"BSP

Warranty: see dedicated page

Spare parts: see dedicated page

Type	Manometer Scale
	bar
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

Instruction for use:

How To Check Nitrogen Pressure:

a) If the accumulator is connected to the systems please check there is no pressure on the oil side. Turn anticlockwise the valve knob until it is fully disengaged and install it on the accumulator.

b) Close the nitrogen discharge valve and turn the "AR "valve knob clockwise until the pressure gauge signals there is not internal pressure left or knob is fully turned clockwise in the event accumulator is fully discharged.

c) Once nitrogen pressure is checked, gently unscrew discharge valve until pressure start decreasing. Once wanted nitrogen pressure is reached fully unscrew valve knob, open the nitrogen discharge valve to eliminate residual pressure and unscrew "AR" valve from the accumulator re-install protection cap of filling valve on accumulator turn strongly.

Filling Of Nitrogen:

Repeat A.M. operations connecting the nitrogen bottle quick release coupling before opening the valve knob.
Start filling nitrogen very gently. We recommend to use 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 every approx six months.

NITROGEN VALVE R TYPE

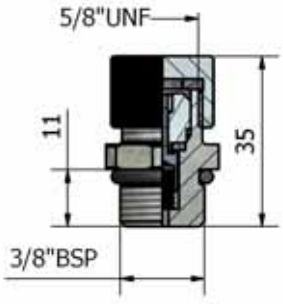
Technical Features:

Body: zinc-plated steel

Maximum working pressure: 400 bar

Available also:
- with body in AISI 316L stainless steel

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



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SPECIAL EXECUTIONS

The catalogue does not include all the special modifications that are available from Fox. We recommend therefore that you contact our technical office concerning any special request, which cannot be satisfied by our standard product.

Following is a list of a few example of special products already manufactured by Fox:

-Special flanges per request.

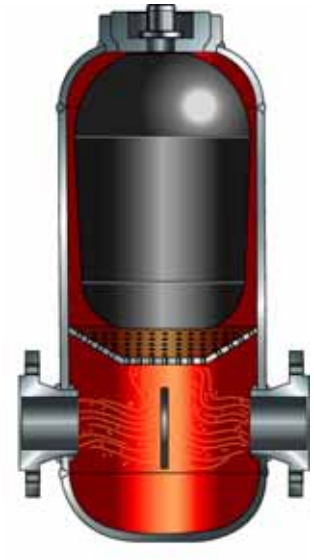
-Accumulators for very high pressures (500-1000 bar) both in carbon steel and stainless steel.

-Accumulators in preheated vapour chambers.

-Accumulators for pulsation dampening in carbon steel and stainless steel.

-Accumulators manufactured with diaphragm in PTFE

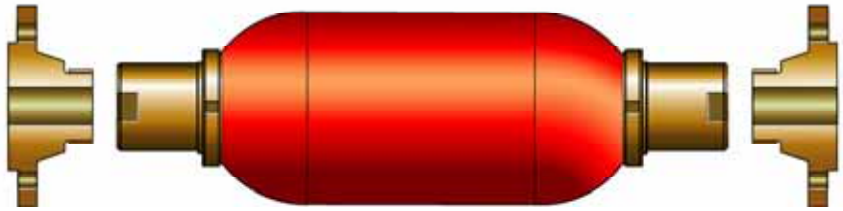
-Accumulators manufactured in hastelloy.



-Inline silencers without elastomers for aggressive fluids.

-Inline silencers without elastomers for extremely high temperature fluids.

-Inline silencers with elastomers without precharge pressure.



HOW TO DISASSEMBLY BLADDERS:

1) Discharge nitrogen from the bladder by using our "AR" charging and gauging assembly.

2) Make sure that the nitrogen pressure is nil and then take apart all the components of the nitrogen valve.

3) Set the accumulator into a vice, remove the vent (bladder) screw, then unscrew the threaded sleeve which retains the fluid valve, then push the complete valve assembly inside the accumulator and remove the internal seal.

4) Remove, by folding, the rubber-metal seal inside the accumulator which allows the extraction of the fluid valve.

5) Unscrew the nut which retains the bladder, remove the identification plate and extract the bladder

HOW TO ASSEMBLY BLADDERS:

6) After having replaced all defective parts and checked that the accumulator body is internally clean repeat all previous operation inversely.
May attention there is no air inside the bladder by folding it before reintroduce into the accumulator body

7) For an easy introduction of the bladder inside the accumulator body we suggest the use of a rod having one end threaded M11x1 which can be screwed on to the bladder threaded port. We strongly recommend to fill the accumulator with oil in a quantity of 5% of total volume capacity, this will allow the bladder to get the right position when filled with nitrogen.
We also recommend to fill nitrogen very slowly specially when the bladder is initially expanding.

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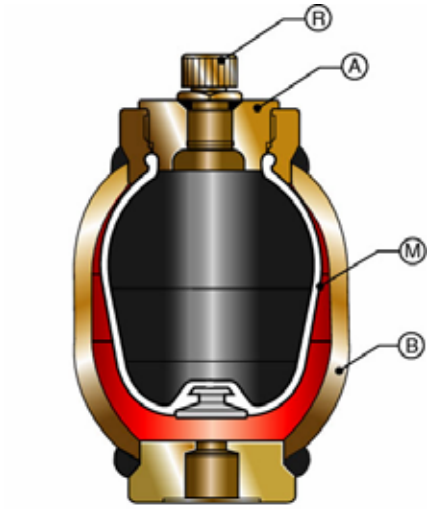
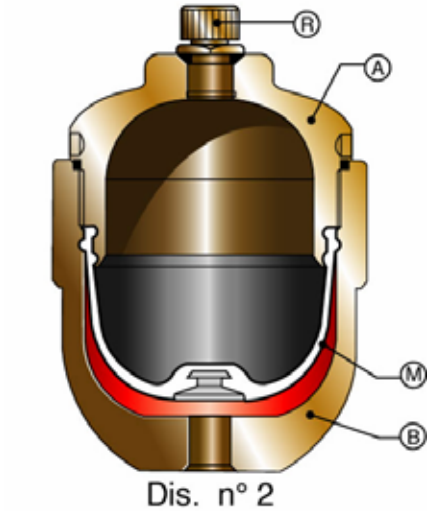
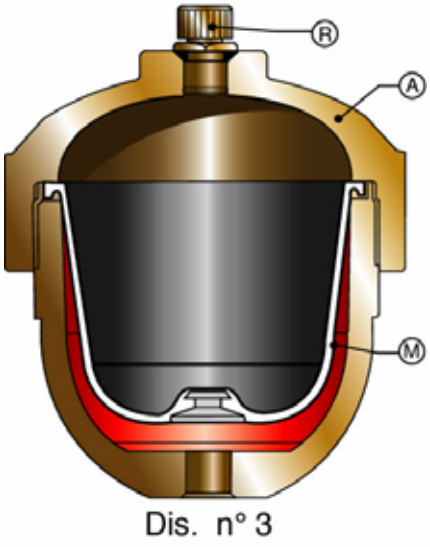
HOW TO DISASSEMBLY DIAPHRAGMS:



Dis. n° 1



Dis. n° 2



Dis. n° 3

1) Before any repair work, discharge totally the nitrogen inside the accumulator by using our "AR" charging and gauging assembly.

2) Firmly fasten the lower part (B) of accumulator in a vice

3) Remove the gas valve "R" from the accumulator.

4) Unscrew the top cap (A) using a band or chain pipe wrench Dis.3° or an open ended wrench for Dis.1° and 2°.

5) Extract the diaphragms and the seals

HOW TO REASSEMBLY DIAPHRAGMS:

6) After careful cleaning, replace any damaged parts.
Wet the outer surface of the bag and seals with the operating fluid.
Reassemble the cap (or ring nut) and tighten it firmly.
Reassemble the nitrogen valve and start filling the gas with the "AR" device as indicated on the dedicated page

7) Slowly introduce nitrogen into the accumulator until it reaches a pressure 5% higher than the value required. Disconnect the charging hose from the equipment and wait some minutes for the stabilization of the temperature and the set the pressure by venting off excess gas.

NOTE:
It is advisable to make an initial check of the precharge pressure during the first week after installation and subsequently every 6 months.

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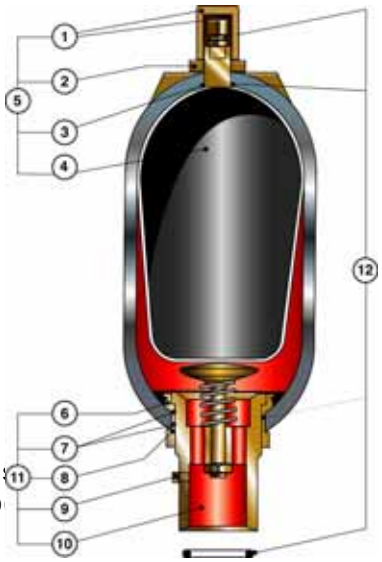
Replacement Part List

1. Valve cap and gasket
2. Nut
3. O-ring seal
4. Bladder
5. Bladder complete of 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:

In case of order please always state besides type and accumulator tag also diameter size of the main bo valve side.

STANDARD BLADDERS:

In the table are pointed the dimensions of bladders in function of volumes.
All our standard bladders are supplied complete of nitrogen valve attack 5/8"UNF, nut of locking and cup of protection.
Being however replaceable with many other types of accumulators of same capacity, they are available side connection nitrogen with different attacks, in this case specifying with full particulars before to order.

HB BLADDERS										
Volume	Litres	2.5	4.5	5	6	10	20	25	35	50
D	mm	93	145	93	145	145	198	198	198	198
H	mm	350	240	680	310	600	600	740	1110	1500
F	mm	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25

HTR BLADDERS												
Volume	Litres	0.3	0.35	0.7	1.5	2.5	4.5	5	10	20	35	50
D	mm	56	74	74	95	95	142	93	142	198	198	198
H	mm	120	88	150	190	300	240	680	600	600	1110	1500
F	mm	35	44	44	53	40	74	74	74	74	22.25	22.25

HST DIAPHRAGM									
Volume	Litres	0.1	0.35	0.5	0.7	0.8	1.3	1.5	2.3
D	mm	60	80	100	75	110	100	110	110
H	mm	50	55	75	110	80	130	160	160
Draw N°		2	2	2	1	1	2	1	1

Dis. n.1

Dis. n.2

SPECIAL BLADDERS AND DIAPHRAGM:

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.

For the bladders the material available are the following:

- NITRILE (NBR) - BUTILE - NEOPRENE - EPDM - PVC - HYTREL (DU PONT) - ALIMENTAR

For the diaphragm the material available are the following:

- VITON - POLIURETANO - ALCRYN (DU PONT)

In every case we remember that our technicians are ready, to your disposition, to furnish you further indications.

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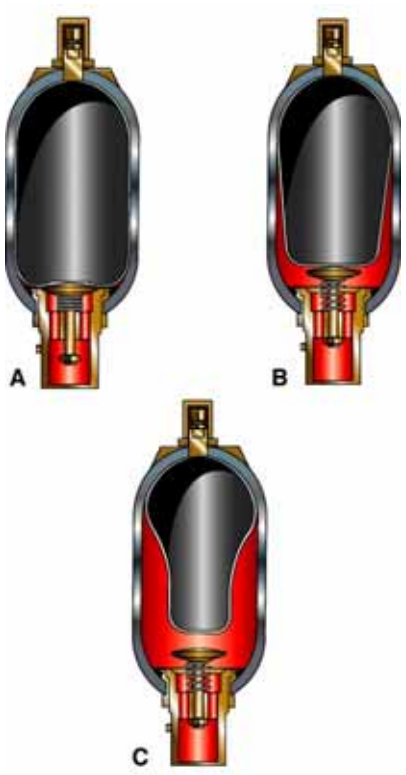
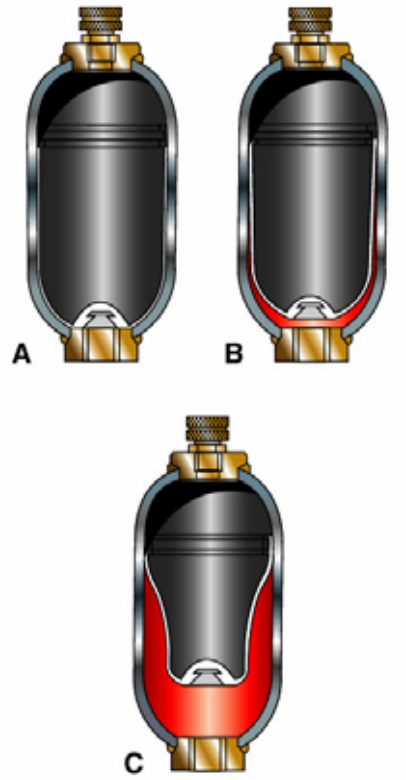
BLADDER EXECUTION





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 bag 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, available in various methods of construction.

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 bag or diaphragm not undergo precocious wear and tear due to contact with the metal body during every work cycle. Therefore value of pressure least of the fluid has always to be the 10% superior to pressure of pre-loading 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 to establish prior to achieving maximum fluid pressure that it is inferior to that of 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.

Construction Differences

The bag 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 bag 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 spontaneous capacity, therefore, its use is limited to applications where this is not requested (max. 50 lt/min).
FOX constructs diaphragm accumulators up to a capacity of 2,3 litres and the remainder of its production in bag type.

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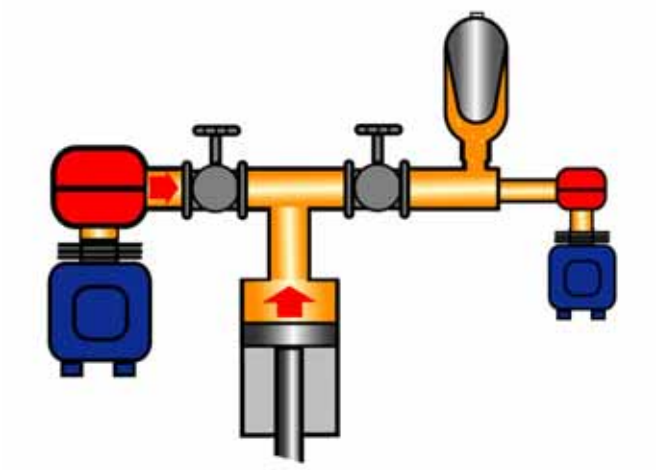
Nomenclature		
P0	Nitrogen pressure	Bar
P1	Minimum pressure of fluid	Bar
P2	Maximum pressure of fluid	Bar
V0	Accumulator volume	Litre
ΔV	Volume of accumulated fluid	Litre
T1	Minimum temperature of fluid	°C
T2	Maximum temperature of fluid	°C
Y	Specific nitrogen temperature ratio = 1,4	



Energy Accumulator:

It is improbable that an hydraulic system use all of its capacity on a continuous basis. An hydropneumatic accumulator can store a certain amount of fluid in the tank discharge phase 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 measuring the exact FOX accumulator either for this application or for all other applications in which its use is requested. In all applications the following isothermic 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.

Isothermic 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

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

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

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

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

TEMPERATURE INFLUENCE :

On order to obtain maximum yield from the accumulator the nitrogen pressure must be: P0 = 0, 9 · P1 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 to apply is the following:

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

P0 at 20° C = Value of nitrogen pre-loading pressure at 20° C in consideration of pressure increase when temperature rises to value T2

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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 course is desired from one or more cylinders (formula a). It should also be considered 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 5% less than the maximum accumulator pressure.

Leakage Compensator

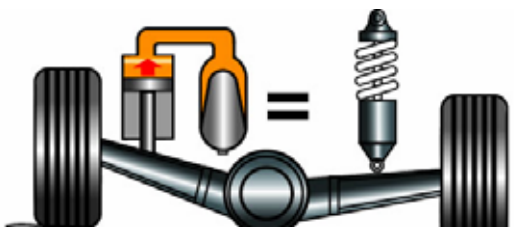
An hydropneumatic accumulator can be utilized to maintain the pressure in a closed hydraulic circuit compensating the losses due to gasket blow-by and valve leakage. To regulate it is necessary to quantify the volume of fluid to be stored also in relation to the amount of time under pressure, in addition to establishing minimum and maximum system pressures and applying formula (a) for sizing.
The value of P0= 0.9 • P1

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:
/\V=V o (T2-T1) o ß where V = Volume of tank fluid (lt) and 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.
Consider as well the formulas that take into consideration the measurement of temperature influence (c,d)

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.



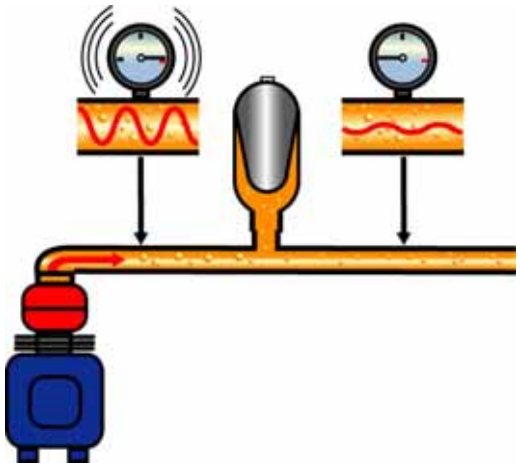
Pulsation Dampener

It is well known that pumps, in particular plunger 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

PUMP **K**
SIMPLEX **0.60**
DUPLEX **0.25**
TRIPLEX **0.12**
QUINTUPLEX **0.06**

Pump	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 . P1 for simplex and duplex pumps
P0 = 0.7 . P1 for triplex pumps
P0 = 0.8 . 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: Vo = **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 body constructions can also be supplied which are not provided in this catalogue, such as the following: dampeners with larger inlets with improved yield according to pressure or accumulators constructed without poppet valve, with direct flow passages or anti-extrusion screen and versions with welded, stainless steel bodies for low pressure. Dampeners with inline flow passages, etc.

Pump (S.E.)	Z	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:	Triplex
Flow:	190 litres/min
N° cycles:	270
Pressure:	150 bar
Residual pulsation:	± 2.5%

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

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 litres

P0 nitrogen a 20 °C = 105 x 293 / (273+50) = 94.5 bar

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

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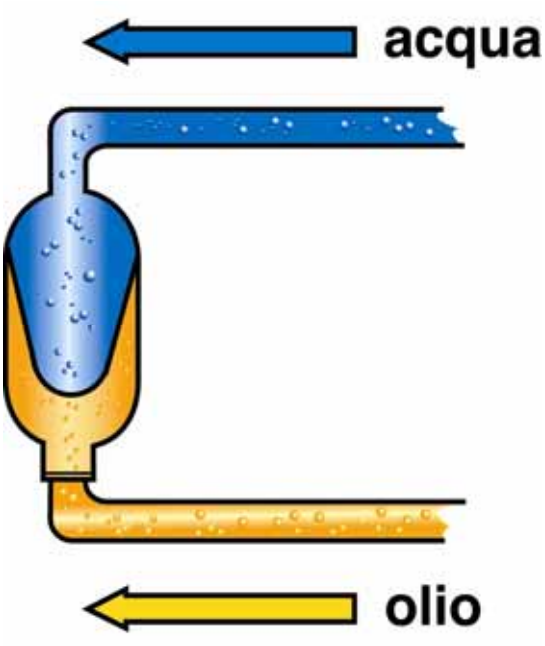
Fluid Separator

An hydropneumatic accumulator can be utilized 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.

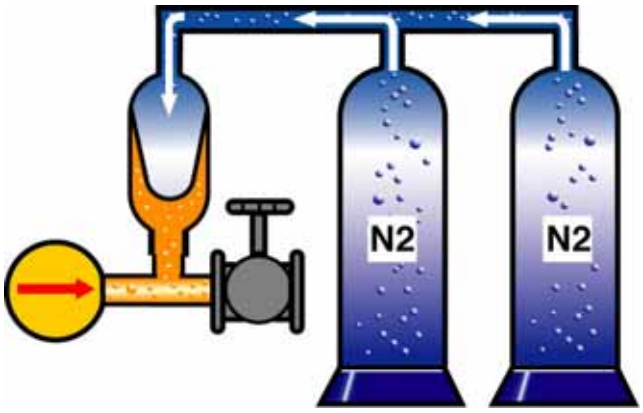


Accumulators With Additional Gas Cylinders

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 (?V) 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 ?V = 0,75 • V0 where V0 is the accumulator volume not considering the volume of the additional cylinders. The pre-loading nitrogen pressure must be Po = P1 • 0,97.

Other Applications

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



General note for assembly and maintenance

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 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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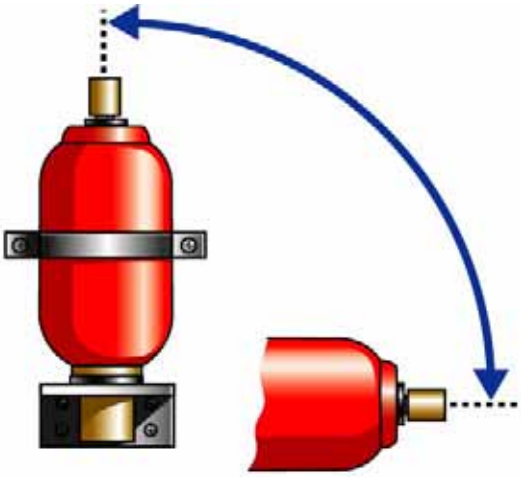
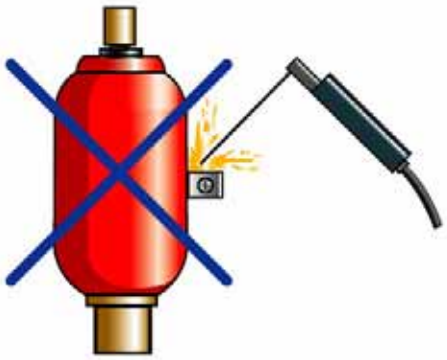
Fastening in Position

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.

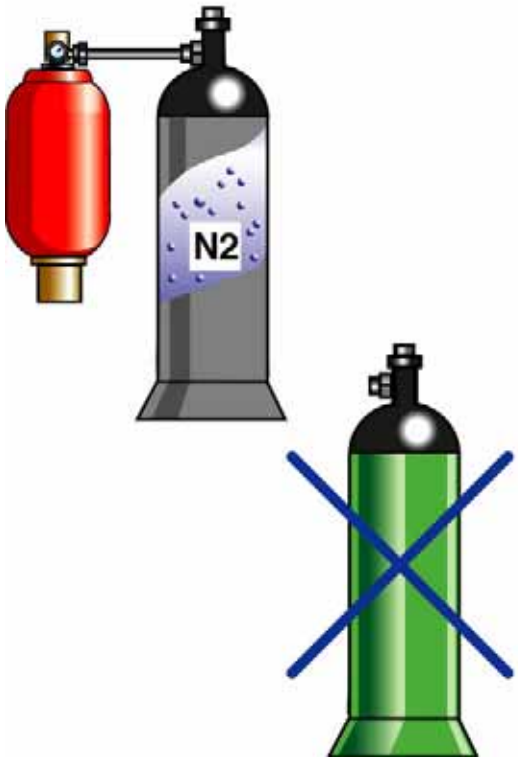


Pre-Loading Gas

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(N_2). 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.



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Accumulator Flow Capacity

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 higher than permitted flow capacities there exists the possibility to bag or diaphragm prolapse, 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 spontaneous 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).

General Testing and Quality Control

FOX hydropneumatic accumulators are all individually tested at a pressure =1.5 greater than maximum consented pressure stamped on accumulator body.
For total quality concerning every consignment in addition to specific certification on the part of the client there is also an enclosed internal certificate certifying testing undertaken in dynamic working conditions carried out singularly on each individual piece.

Italian Regulations

Hydropneumatic accumulator enter under the norms regarding pressurized instrumentation controlled by ISPESL which requires in their presence for volumes over 25 litres of capacity.

International Testing Regulations

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

Quality control

FOX hydropneumatic accumulators are constructed following the precise guidelines regulating construction norms. All mechanical turning (C.n.c.), automated welding (ARGON unit), bags and diaphragms molding, assembly, painting and testing are carried out and controlled during the work process directly in our factory shop area 1500 m2. 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 (series H) diaphragm accumulator on the market. The principal innovation that differentiates this gamma from all the other competitor products is that it is constructed of a single body and is not welded at its largest diameter, a guarantee of safety at high pressures together with the fact that it avoids excessive diaphragm heating at points where diaphragm is located near fluid and nitrogen side gates.
Both models with patent regularly deposited.

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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
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 P1 x 0.85 (fixed value) = P0.
Measure the compression ratio P2 : P0 = Δ P
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.

Working temperature T2	NITROGEN PRESSURE PRELOAD 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

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

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CERTIFICATE

The TÜV CERT Certification Body

of TÜV Rheinland Industrie Service GmbH

certifies in accordance with
TÜV CERT procedures that

FOX S.r.l.
Via Romagna, 6
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has established and applies a quality management system for

Design, manufacture and sales of hydropneumatic accumulators, bladder, membrane and piston type accumulators; electromechanical, electromagnetic and electronic pressure switches, pressure transducers, vacuum indicators, flow indicators and level gauges for tanks.

An audit was performed, Report No. **027458**.

Proof has been furnished that the requirements according to

DIN EN ISO 9001:2000

are fulfilled.

The certificate is valid until **2009-08-24**.

Certificate Registration No. **01 100 027458**

TGA-ZM-28-96-00

Milan, 2006-08-23

First certification 2003

TÜV

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