



LEEMIN
黎明液压

国标囊式蓄能器

CHINA NATIONAL STANDARD BLADDER ACCUMULATOR

(一) 工作原理

蓄能器内腔由皮囊分为两个部分：囊内装氮气，囊外充液压油。当液压泵将液压油压入蓄能器时，皮囊就受压变形，气体体积随压力增加而减少。液压油被逐渐储存。若液压系统工作需要增加液压油，则蓄能器将液压油排出，使系统的能量得到补偿。

INTRODUCTION

Inner space of accumulator is divided into two parts by bladder :the nitrogen is filled in bladder and hydraulic oil is filled the bladder .When hydraulic oil is compressed into accumulator by hydraulic pump ,the bladder is deformed by the pressure ,the volume of gas is compacted with the increasing of pressure ,the hydraulic oil is stored gradually .the accumulator is charge the hydraulic oil and compensate the system energy ,as required .

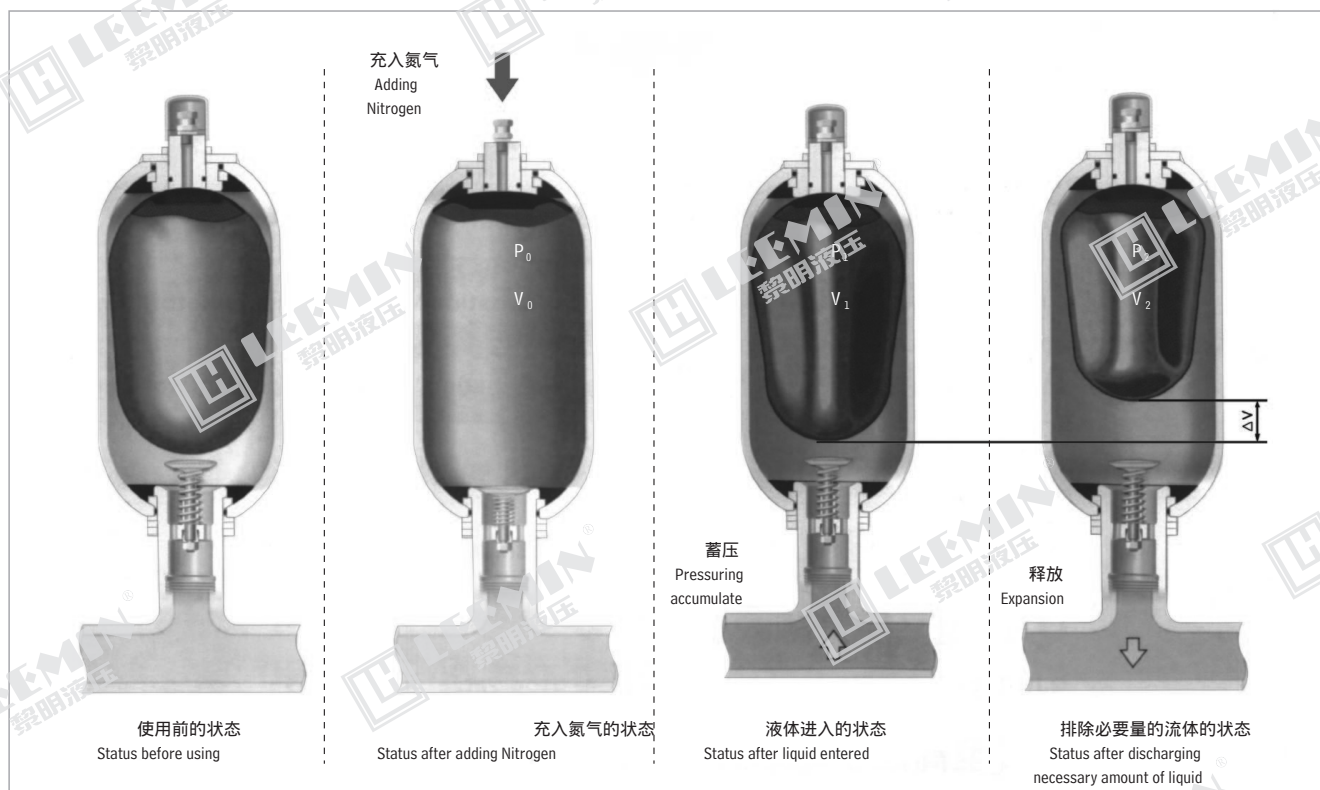


图1 蓄能器工作示意图

(二) 蓄能器的典型应用

1、如果在液压回路中短时间内流量变化较大，使用蓄能器就能选用较小的泵和电机，从而降低了设备费用和操作费用。图2所示的运用周期需要一个具有 Q_2 流量的泵。如果应用蓄能器，在时间周期 (t_1-t_2) 和 (t_3-t_4) 内蓄油，因为此时需要的油流量很小，或者甚至不需要用油。当所要求的流量高于泵送量 Q_1 时，在 t_2 和 t_3 周期内可使用蓄能器供油。选择泵送量 Q_1 须满足 V_1+V_2 V_3+V_4 。

Typical applications of the accumulator

In the case of hydraulic circuits where a large flow rate is required for a short period, alternating with a low or no flow condition, the use of an accumulator allows smaller pumps and motors to be used, thus reducing both installation and operating costs. The operation cycle shown in figure2 would require a pump having a capacity Q_2 . If an oilpneumatic accumulator is used, it is possible to store oil during the time periods (t_1-t_2) and (t_3-t_4) when requirement is very low or zero, and to re-utilize. During t_2 and (t_2-t_3) , when the required flow rate is higher than the pump capacity Q_1 . This pump must be selected to have the volumes V_1+V_2 V_3+V_4 .

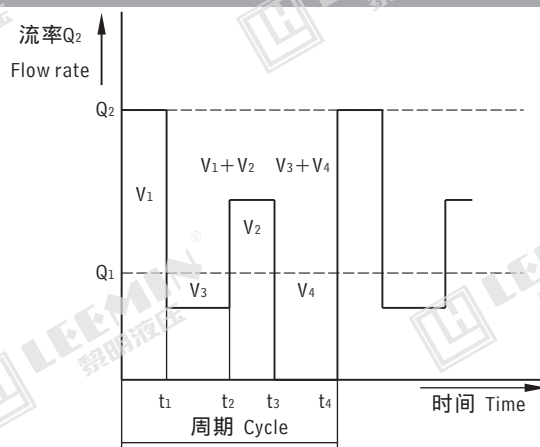


图2



1. 柱塞泵和隔膜泵在运行时会在液压回路里不可避免地产生脉动，这既不利于运动又有害于部件的使用寿命。在靠近泵的出口侧装上囊式蓄能器，可吸收脉动，使脉动降到满意的程度(图3)。典型的用途如：用于定量泵及活塞数较少的柱塞泵等。

Both piston and diaphragm pumps create pulsation or pressure peaks during operation, this being undesirable and detrimental to both the smooth operation and operational life of components. The fitting of an accumulator adjacent to down stream of the pump will dampen the pulsation to an acceptable level(fig.3) Typical Applications are dosing pumps, pump with a small number of pistons etc.

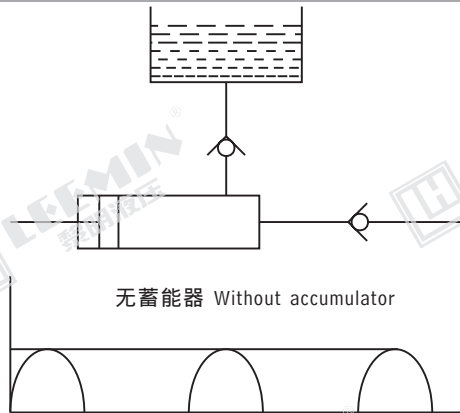


图3

3. 在动力突然损失的情况下，例如管道或接头故障、泵破损等，蓄能器能够提供足够的能量来完成运行循环或使传动机构、阀门等重新恢复到安全的位置，从而防止损坏设备或产品。在一些必须获得紧急动力源的情况下，如为关闭安全门、电器开关、安全阀、紧急制动器等所需要的液动源。

另一个典型用途是将燃油紧急提供给电厂的锅炉。(图4处所示的引起损失的故障，可通过手动操纵电子阀A而消除，这时就使用了蓄能器储备的能量。

In the case of a sudden power loss ,e.g .pipe or joint failure ,pump breakdown etc .the accumulator can supply with pressure to complete an operational cycle or to allow actuators ,valves etc .to reset to a safe position , and so prevent damage to equipment or product .The availability of such an emergency power source is essential in cases where a hydraulic power supply is required for closing a safety door ,electrical switch ,safety valve ,emergency brakes etc .

Another typical application is the emergency supply of fuel oil to power plant burners Fig 4 illustrates that a failure at "B" causing a loss of energy can be offset by manually overriding the electro valve "A" thus utilizing the potential energy of the accumulator .

4. 在闭式液压路中，由于热膨胀，温度的上升会导致压力上升。

在线安装的蓄能器可补偿油的容积变化，从而保护阀门、垫片、压力表等不出故障。炼油厂和远距离输油管是其常的用途(图5)

The installation of an accumulator compensates for the change in volume caused by temperature differences ,thus limiting over pressurization inside a closed system .This increases the life of pressurization inside a closed system . This increases the life of refineries and pipelines (fig 5) .

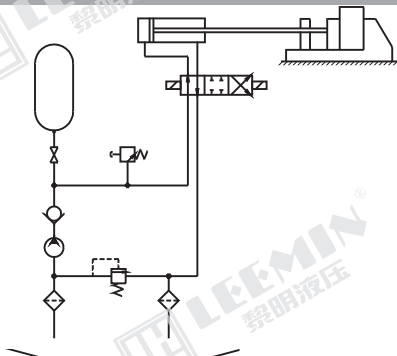


图6

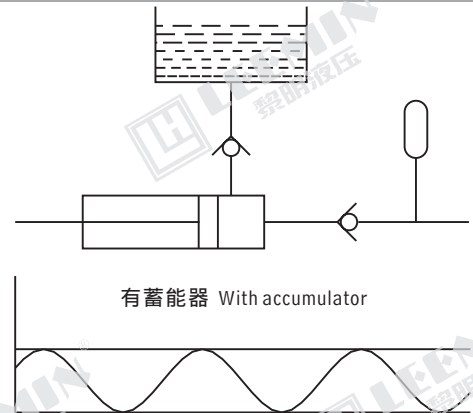


图4

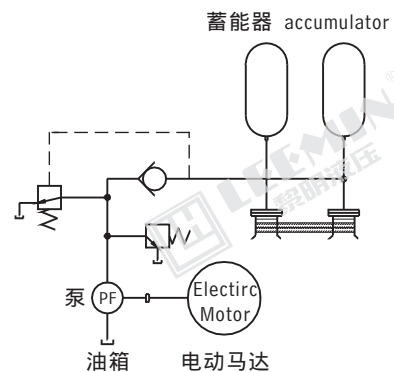


图5

5. 当长时间需要恒定静态压力时，蓄能器是必不可少的，因为它将补偿由于接头、密封等渗漏而造成的压力损失，而且能平衡在循环运行过程中可能发生的压力波动。典型用途为夹紧系统(如图6)、负载平台、筑路压力机润滑系统等。

As a constant static pressure is required for a long period ,an accumulator is indispensable as it will compensate for pressure loss due to leakage through joints ,seals etc .as well as balancing pressure peaks which may occur during the operating cycle .Typical applications are found in closing system (fig 6) loading platforms ,curing presses ,machine tools ,lubricating systems ,etc .



6、阀的快速关闭会产生冲击波（水锤现象），导致管子、接头、阀等部件的损坏。使用蓄能器能大大地减少冲击。典型用途为水管（图7）、燃油和油的远距离管路、洗涤设备等。

Rapid closing of the valve can generate pressure waves which travel through the pipe lines causing water hammer. The use of a suitable accumulator can bring the pressure surge back to an acceptable value. Typical applications are water pipe (Fig.7), fuel and oil distribution circuits, washing equipment etc.

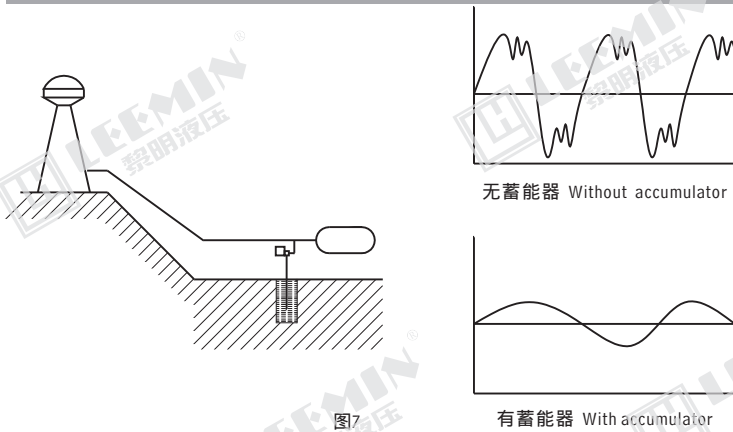


图7

7、液压设备中的机械振动可被蓄能器吸收，用于叉式提升机的驱动和悬挂系统、移动吊车、农用和市政设备、石块破碎机等。（图8所示）

Mechanical shocks in hydraulically driven equipment can be absorbed by accumulators. Possible applications are in drive and suspension systems for fork-lifts, mobile cranes, agricultural and civil engineering machinery, rock crusher etc (Fig.8).

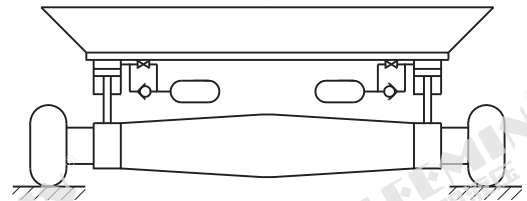


图8

8、流体传输 Fluid separator (transfer barrier)

在一个系统中，当作用在回路一侧的液体压力增加必须转换到回路另一侧液体中，而又不使两种液体混合，胶囊蓄能器可有效地解决这一问题（图9）。

蓄能器的胶囊犹如一个挠性屏障作用于液体和气体之间，提供瞬间响应而不减小系统的压力。

In a system where fluid pressure developed on one side of the of the two fluids intermixing, the bladder accumulator provides the of the two fluids intermixing, the bladder accumulator provides the satisfactory solution (Fig.9).

The accumulator bladder acts as a flexible barrier between the fluids and the gas, providing instantaneous response without reducing the system pressure.

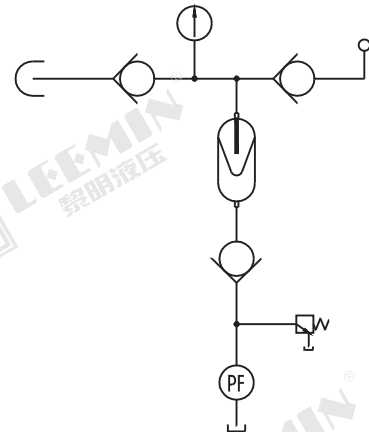


图9

(三) 蓄能器的选择 SELECTION

选择蓄能器时必须明确以下技术参数

It's necessary to clear the following parameters during the selection of an accumulator.

1、工作压力 Operating pressure

最小和最大工作压力（ P_1 、 P_2 ），其中最大允许工作压力不应大于被选用的蓄能器所规定的最大工作压力。

The minimum and maximum operating pressure (P_1 、 P_2), and the maximum allowable operating pressure must be lower or equal to the maximum nominal operating pressure of the accumulator which is selected.

2、工作容积 Operating volume

可储存或利用的液体容积（ V ）。

Volume（ V ）of liquid to be stored or utilized is required in addition to the maximum and minimum operating pressure for correct sizing of the accumulator.

3、工作介质 Operating mediums

一般为氮气和液压油或乳化液，特殊介质请咨询。

In general, the operating mediums are nitrogen and hydraulic oil or emulsion, for any special medium, please consult us.

4、工作温度 Operating temperature

工作温度决定着胶囊材料和壳体材料的选择，而且对初始负载压力、蓄能器容积确定也有影响。

The operating temperature determines the material of the bladder, also have influence on the preloading pressure, and consequently on the accumulator volume.

5、最大流量 Maximum flow rate

对于相同容积（ V ），流量与蓄能器规格和反应速度有关。

For the same（ V ）volume, the specification and response of the accumulator can be influenced on the immediate flow rate.

6、使用场所 Location

确定蓄能器的最终使用场所非常重要，这样可以使设计能够满足该场所设计参数和试验参数的要求。

It is important to know the using location of the accumulator in order that the design can meet local design and test parameter.



7. 容积计算 Volume calculation

应用场合	容积计算公式 Formula	说明 note
辅助动力源 Auxiliary power source	$V_0 = \frac{V_x(P_1/P_0)^{1/n}}{1-(P_1/P_2)^{1/n}}$	V_0 -所需蓄能器的容积(m^3);Volume required V_x -蓄能器的工作容积(m^3) efficient volume P_0 -充气压力Precharging pressure Pa, 且: $0.9P_1 > P_0 > 0.25P_2$ P_1 -系统最低工作压力(Pa)min. Operating pressure P_2 -系统最高工作压力(Pa)max. Operating pressure n -指数, 等温时取 $n=1$, 绝热时取 $n=1.4$ n coefficient $n=1$, isothermal condition; $n=1.4$ adiabatic condition
吸收泵的脉动 Pulsation damper	$V_0 = \frac{AkL(P_1/P_0)^{1/n} \times 10^3}{1-(P_1/P_2)^{1/n}}$	A-缸的有效面积 (m^2) Efficient square L-柱塞行程 (m) Plunger stroke K-与泵的类型有关的系数Coefficient relation with pump 泵的类型Type of pump 系数Coefficient 单缸单作用Single cylinder, single action 0.60 单缸双作用Single cylinder, dual action 0.25 双缸单作用Dual cylinder, single acting 0.25 双缸双作用Dual cylinder, dual action 0.15 三缸单作用 Triplex cylinder, single action 0.13 三缸双作用Triplex cylinder, dual action 0.05 - 充气压力 (pa), 按系统工作压力的60%充气: -Pre-charge pressure, charge the accumulator at a pressure 60% operating pressure.
吸收冲击 Absorb emergency energy	$V_0 = \frac{m}{2} \cdot V^2 \left(\frac{0.4}{P_0} \left[\frac{10^3}{(P_2/P_0)^{0.285} - 1} \right] \right)$	m -管路中液体的总质量 (kg); Total quality in hydraulic oil pipe v -管中流速 (m/s) Fluid flow rate - 充气压力 (pa), 按系统工作压力的90%充气: -Pre-charge pressure, charge the accumulator at a pressure 90% operating pressure.

注:1.充气压力按应用场合选用。Pre-charging pressure shall be determined according to application location.

2.蓄能器工作循环在3min以上时,按等温条件计算,其余均按绝热条件计算。

$n=1$, in case compression or expansion of nitrogen takes place so slow (over 3 minutes) that a complete interchange of heat is allowed between gas and environment, that is at constant temperature, the condition is isothermal $n=1.4$, when operation is so quick that no interchange of heat can take place, the condition is adiabatic.

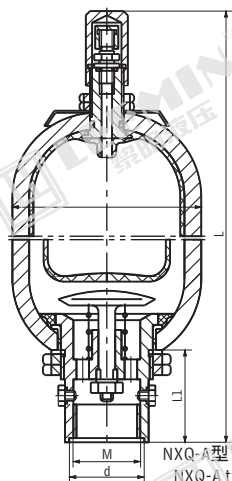
(四) 型号说明 MODEL CODE

NXQ - - / - -	
液压囊式蓄能器 Hydraulic Bladder Accumulator	Y: 液压油 Hydraulic oil R: 乳化液 emulsion
A 小孔 small opening ; Ab 大孔 big opening	L: 螺纹连接 threaded connection F: 法兰连接 flanged connection
公称容积 Capacity (L)	公称压力 Press. (MPa)

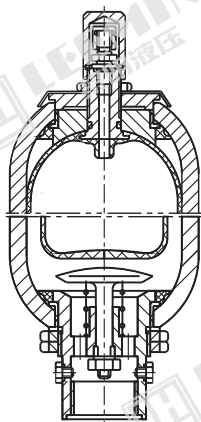
注:订购国标系列(ABS认证)蓄能器,需要在型号后面注明ABS;
订购国标系列(CE标记)蓄能器,需要在型号后面注明CE;



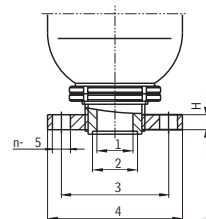
(五) 外形尺寸 MOUNTING SIZE



NXQ-A型蓄能器螺纹连接结构简图
NXQ-A type threaded hydraulic port
construction diagram of accumulator
NXQ-A- / -L-



NXQ-AB型蓄能器螺纹连接结构简图
NXQ-AB type threaded hydraulic port
construction diagram of accumulator
NXQ-AB- / -L-



NXQ-A(AB)型蓄能器法兰连接结构简图
NXQ-A(AB) type flanged hydraulic port
construction diagram of accumulator
NXQ-A(AB)- / -F-



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型号 Model	公称压力 Press. (MPa)	公称容积 Capacity (L)	尺寸Size(mm)											连接方式 Hydraulic Port (mm)		重量 Weight (Kg)	备注 remarks
			M	d	1	2	3	4	n-5	L1	H			螺纹	法兰		
														L			
NXQ-*-0.4/*-L-*	10	0.4	M27X2	/	22	30	85	115	4-	17	52	22	89	260	/	3	/
NXQ-*-0.63/*-L-*		0.63												315	/	3.5	
NXQ-*-1/*-L-*		1												430	/	4.5	
NXQ-*-1/*-L(F)-*(114)		1											114	330	340	5	
NXQ-*-2/*-L(F)-*		2												445	455	7.4	
NXQ-*-1.6/*-L(F)-*		1.6	M42X2	50	42	50	97	130	6-	17	66	28	152	365	380	11	若需要 CE 标记、 ABS 认证、 需特殊注明
NXQ-*-2.5/*-L(F)-*		2.5												430	445	14	
NXQ-*-4/*-L(F)-*		4												540	555	16	
NXQ-*-6.3/*-L(F)-*		6.3												710	725	22	
NXQ-*-10/*-L(F)-*		10												650	665	39	
NXQ-*-16/*-L(F)-*	20	16	M60X2	70	55	65	125	160	6-	21	90	32	219	860	875	54	
NXQ-*-20/*-L(F)-*		20												985	1000	62	
NXQ-*-25/*-L(F)-*		25												1160	1175	74	
NXQ-*-32/*-L(F)-*		32												1400	1415	90	
NXQ-*-40/*-L(F)-*		40												1680	1695	108	
NXQ-*-50/*-L(F)-*		50	M72X2	80	70	80	150	200	6-	26	106	40	299	2010	2025	128	
NXQ-*-20/*-L(F)-*(299)		20												680	695	80	
NXQ-*-25/*-L(F)-*(299)		25												770	785	90	
NXQ-*-40/*-L(F)-*(299)		40												1050	1065	118	
NXQ-*-50/*-L(F)-*		50												1230	1245	138	
NXQ-*-63/*-L(F)-*	31.5	63	M85X2	95	83	95	170	230	6-	26	110	40	351	1470	1485	171	/
NXQ-*-80/*-L(F)-*		80												1810	1825	213	
NXQ-*-100/*-L(F)-*		100												2190	2205	253	
NXQ-*-150/*-L(F)-*		150												3125	3140	335	
NXQ-*-63/*-L(F)-*(351)		63												1170	1185	170	
NXQ-*-80/*-L(F)-*(351)		80												1395	1410	206	
NXQ-*-100/*-L(F)-*(351)		100												1660	1675	250	
NXQ-*-125/*-L(F)-*		125												1990	2005	304	
NXQ-*-150/*-L(F)-*(351)		150												2310	2325	356	
NXQ-*-160/*-L(F)-*		160												2450	2465	379	
NXQ-*-180/*-L(F)-*		180												2700	2715	420	
NXQ-*-200/*-L(F)-*		200												2980	2995	466	



型号 Model	NXQ-A(AB)- /10	NXQ-A(AB)- /20	NXQ-A(AB)- /31.5
公称压力 MPa	10	20	31.5
耐压试验压力 MPa	13	26	41
允许充气压力范围 Allowance charging pressure	小于液压系统最低工作压力的 90% Less than 90% the min .operating pressure of the hydraulic system		
	大于液压系统最高工作压力的 25% More than 25% the max .operating pressure of the hydraulic system		
最大排放流量 Max .discharging flow	螺纹连接 Threaded connection	0.4-1L	1L/S
		1.6-6.3L	3.2L/S
		10-40L	6L/S
		40-100L	10L/S
		150L	15L/S
	法兰连接 Flanged connection	1.6-6.3L	6L/S
		10-40L	10L/S
		40-100L	15L/S
固定方式 Fixation way	1 升以下的直接安装在管路上,1 升以上用紧固环及支承座 Fixing direct to the pipeline if the volume of the accumulator is within 1 liter ,and fixing to the pipeline by clamp and bracket when the accumulator volume is more than 1 liter .		
	垂直安装 Vertical installation		
安装方式 Installation way	垂直安装 Vertical installation		
设计温度 Design temperature	-40 ~ +70 (低温 low temp .)、20 ~ +70 (常温 normal temp .)、20 ~ +130 (高温 high temp .)		
使用介质 Operating medium	液压油、乳化液 Hydraulic Oil ,Emulsion		
	水-乙二醇 Water glycol	特殊订货 Special order	
	磷酸酯 Phosphate	特殊订货 Special order	

注NOTE :

- (1)不得用焊接、铆接或机械加工等方法来固定蓄能器。
- (2)蓄能器严禁充氧气或空气。必须充氮气或其他惰性气体
- (3)作能量储存时,充气压力应低于液压系统最低工作压力的 90% (一般为60-80%)。
- (4)蓄能器安装后,应检查接口处是否漏气,漏油。(5)蓄能器设置后,应按定期进行气压检查。

(七) 安装 INSTALLATION

- 1.蓄能器原则上应该使气阀朝上垂直安装,为便于维护和检查,气阀处应留有一定空间。
- 2.蓄能器的固定:蓄能器必须牢固地固定在托架或壁面上。
- 3.用于缓冲和吸收脉动时,应尽可能装在靠近振动源处。
- 4.蓄能器与液压泵之间应装设单向阀,当泵电机停止运转时防止蓄能器中所储存的压力油倒流。
- 5.蓄能器与管路系统间设置操作简便的截止阀,此阀供充气,调节放油速度或长时间停机时使用。
- 6.不得用焊接方法来固定蓄能器。

(八) 氮气的充装

- 1.蓄能器原则上应该使气阀朝上垂直安装,为便于维护和检查,气阀处应留有一定空间。
- 2.蓄能器的固定:蓄能器必须牢固地固定在托架或壁面上。
- 3.用于缓冲和吸收脉动时,应尽可能装在靠近振动源处。
- 4.蓄能器与液压泵之间应装设单向阀,当泵电机停止运转时防止蓄能器中所储存的压力油倒流。
- 5.蓄能器与管路系统间设置操作简便的截止阀,此阀供充气,调节放油速度或长时间停机时使用。
- 6.不得用焊接方法来固定蓄能器。

- (1) Welding, riveting and mechanical machining is not applied to fix the accumulator.

- (2) Never use oxygen or air. Use nitrogen and inert gas only.

- (3) When the accumulator is used as saving the energy, the inflating pressure should be lower than 90% of the min. operating pressure of the hydraulic system (generally 60%-80%).

- (4) Check the hydraulic port for leakage when installing the accumulator.

- (5) Check the pressure as required timely after the accumulator is settled down.

1. Accumulator shall be installed vertically with the gas valve upright. Inspection space shall be retained near gas valve.

2. Accumulator shall be fixed tightly on the frame or wall.

3. When used for buffering and pulsation damper, accumulator shall be placed near the fluctuation source.

4. Check valve shall be placed between accumulator and hydraulic pump to prevent return flow of oil for the accumulator when the electric machine of pump stops working.

5. Stop valve shall be placed between accumulator and pipe system to be used in gas charging, draining speed adjusting or long term stopping.

6. Welding shall not be applied in fixing the accumulator.

CHARGING THE NITROGEN

1. Accumulator shall be installed vertically with the gas valve upright. Inspection space shall be retained near gas valve.

2. Accumulator shall be fixed tightly on the frame or wall.

3. When used for buffering and pulsation damper, accumulator shall be placed near the fluctuation source.

4. Check valve shall be placed between accumulator and hydraulic pump to prevent return flow of oil for the accumulator when the electric machine of pump stops working.

5. Stop valve shall be placed between accumulator and pipe system to be used in gas charging, draining speed adjusting or long term stopping.

6. Welding shall not be applied in fixing the accumulator.



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(九) 维修和检查

1. 检查漏气：蓄能器设置后，开始每周检查胶囊气压一次；一个月后，每月一次，半年后，半年检查一次；一年后，每年检查一次。定期检查可以保持最佳使用条件，并及时发现渗漏及时修复使用。
2. 检查方法：在蓄能器的进油口和油箱连接的油路上设置一个截止阀，并在截止阀前装上一个压力表。慢慢打开截止阀，使压力油流回油箱，同时注意压力表，压力表指针先是慢慢下降。达到某压力值后急速降到零，指针移动的速度发生变化的数值，就是充气压力。此外，还可以利用充气工具检查压力，但每检查一次都会放掉一点气体。
3. 装置长期停止使用时，应关闭油口与压力油管之间的截止阀，保持蓄能器的油压在充气压力以上。
4. 若蓄能器在装置中不起作用，请检查是否由于气阀漏气引起，以便给予补充氮气。若皮囊内没有氮气，气阀处冒油，请拆卸检查皮囊是否损坏。
5. 卸下蓄能器前必须卸去压力油，使用充气工具放掉皮囊中的氮气，然后才能拆下各零部件。
6. 因运输或试压过程中出现蓄能器紧固螺母松动，造成蓄能器向外漏油时，请检查密封圈是否被挤出密封槽外。安装平整后，旋紧螺母。最好在系统压力最高值时旋紧螺母。若仍然漏油，请卸换有关零件。

(十) 附则

1. 系统调试前，应排尽管道内空气。
2. 10L以上蓄能器，必须在进油口设置安全阀。
3. 蓄能器作用前必须检查囊内氮气压力是否符合充气压力确定值。
4. 蓄能器严禁充装氧气及可燃气体，以避免引起爆炸。

INSPECTION AND REPAIR

1. Inspection of leakage: After installation, check the gas pressure in bladder every week. A month later, check every month, half a year later, check every half year.
2. Inspection Method: Place a check-valve in the oil pipe connects the accumulator oil-inlet and oil box, and installs a pressure gage before the check-valve. Open the check-valve slowly to let compressed oil return to oil tank and watch the pressure gage simultaneously. The pointer of gage at first turn down slowly, turns down rapidly to zero at a certain point. The changed valve of moving speed of pointer is the gas charging pressure besides, gas charging device could be used to inspect pressure, but gas will be discharged a bit during each inspection.
3. When accumulator is not used for a long period, the check-valve shall be closed to ensure that the oil pressure is higher than charging pressure.
4. If the accumulator does not take effect, check whether there is leakage. If there is no nitrogen in the bladder and oil is out of gas valve, please check the bladder.
5. 4. Drain the oil before demounting the accumulator. First let out the nitrogen with the charging device, then the parts can be demounted.
6. If there is leakage because of loosening of nuts in the process of transportation and testing, please check that seal ring is in the slot. Place the seal ring in the right place and revolve the nut. If leakage still exists please replace the parts.

APPENDIX

1. Before debugging, air in the pipe shall be expelled.
2. Place a safety-valve in the hydraulic port when the volume of the accumulator is larger than 10L.
3. Check the pre-charging pressure before using the accumulator.
4. Never use oxygen and flammable gas, risk of explosion.



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囊式蓄能器装配示意图BLADDER ACCUMULATOR ASSEMBLY SCHEMATIC DRAWING

