Accumulators

Bladder Accumulators

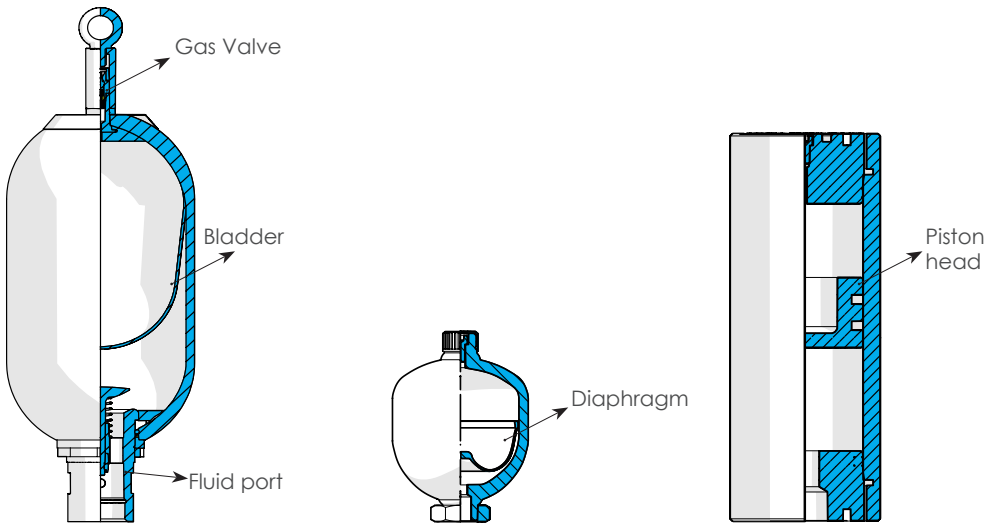
Diaphragm Accumulators

Piston Accumulators

What is an Accumulator?

Accumulators, also known as hydraulic accumulators, are devices that store energy to absorb pressure surges or shock pressures to protect hydraulic equipment or to supply momentary hydraulic pressure to the hydraulic device without the operation of the hydraulic pump. Depending on the configuration purpose of the hydraulic system, accumulators are an essential device that is widely used. Typically, accumulators are classified into bladder-type accumulators, diaphragm-type accumulators, and piston-type accumulators based on their design.

Types and structures of accumulators



Bladder accumulator　　Diaphragm accumulator　　Piston accumulator

An accumulator is typically made up of a separation element between the compressible gas part and the operating fluid. In a bladder accumulator, a flexible and elastic rubber bladder performs the separation function, and the material of the bladder is also determined by the type of operating fluid. Similarly, in a diaphragm accumulator, a flexible and elastic rubber diaphragm performs the separation function, and the material is also determined by the type of operating fluid. A piston accumulator is a product that moves freely inside the shell, and the piston performs the separation function. The material used for sealing the piston is important, and the material of the sealing is selected according to the type of use.

Bladder accumulators are widely used in general industrial hydraulic systems, and diaphragm bladders are used in small-capacity hydraulic systems, especially in mobile systems. Piston accumulators have no capacity limitations and are mainly applied to systems that require high discharge rates and high-speed operation.

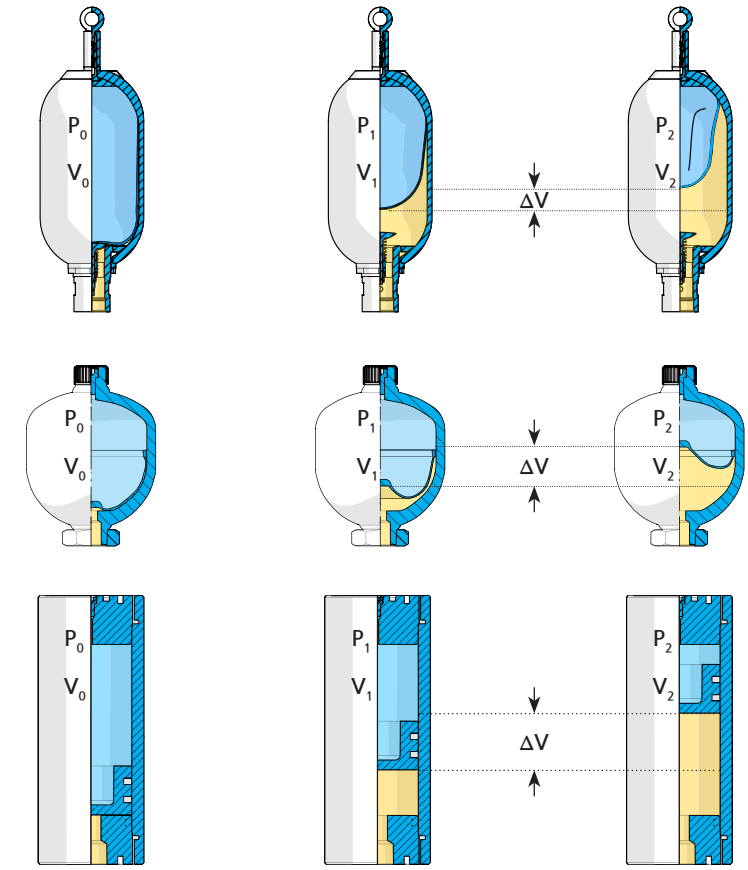
Operating principle of accumulator

As we've already seen in the definition and structure of accumulators, they can absorb, store, and release pressure between the compressible gas charge and the operating fluid pressure. Let's take a closer look at the basic operating principles of bladder, diaphragm, and piston accumulators. Prior to applying accumulators to a hydraulic system, they must be charged with nitrogen to meet the specified pre-charge condition. Although bladder, diaphragm, and piston accumulators all require pre-charging, the pre-charge conditions for each type are different as follows:

Bladder-type: $P_2/4 \leq P_0 \leq k \times P_1$　　* k: energy storage 80~90%

Diaphragm-type: $P_2/4 \leq P_0 \leq k \times P_1$　　absorbing pressure fluctuations 60~65%

Piston-type: $P_2/10 \leq P_0 \leq k \times P_1$　　absorbing shock 60~65%



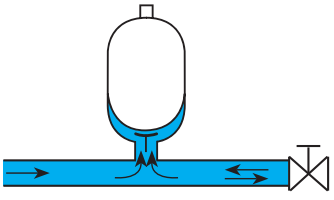
Pre-charge state **Min. Operating state** **Max. Operating state**

P_0	N_2 Pre-charge pressure
P_1	Minimum operating pressure
P_2	Maximum operating pressure
V_0	Pre-charge N_2 capacity
V_1	N_2 capacity at minimum operating pressure
V_2	N_2 capacity at maximum operating pressure
ΔV	V_1-V_2 Amount of stored or operating fluid

Applications

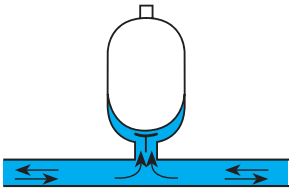
1. Shock Dampening

When valves are quickly opened and closed, hydraulic shock waves can occur in the hydraulic system. Such shocks can cause noise, damage to system components, and early failure of hoses, fittings, and other components. Using a compressor in such situations can remove shocks from the hydraulic system and protect the hydraulic system safely.



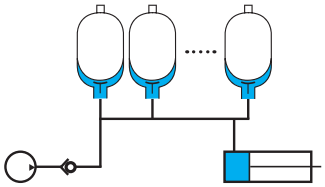
2. Pulsation Dampening

An accumulator can alleviate the shock and pulsation caused by the pump, protect the hydraulic system from static and vibration, and can also be used to eliminate noise.



3. Energy Storage

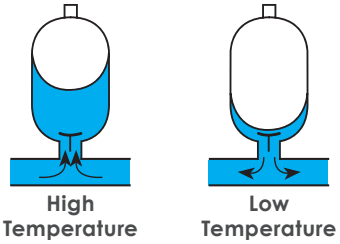
An accumulator stores some of the fluid discharged from the hydraulic pump, and when the actuator requires a flow rate that exceeds the intermittent pump discharge capacity, the fluid can be immediately discharged. Using this principle, the size of the pump in the hydraulic system can be reduced, and heat exchangers or electrical capacity applied to the system can be reduced, resulting in energy savings of more than 20%.



4. Volume Compensation

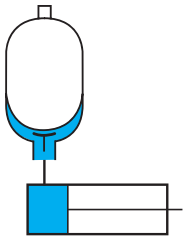
Temperature Compensation

In a closed hydraulic system, the volume of the fluid contracts as the system temperature decreases and expands as it increases. If this expansion of fluid volume is large enough, it can damage the system components. In such cases, using an accumulator can absorb the volume of fluid expansion and protect the system.



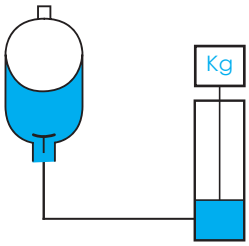
Leakage Compensation

An accumulator can also be used to replenish lost fluid due to leakage, low temperature, and other changes in fluid volume in a hydraulic system. This allows for the maintenance of a consistent system pressure.



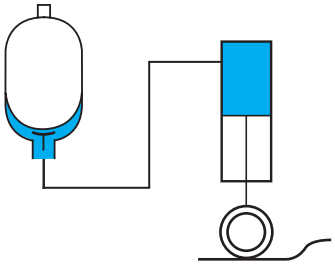
5. Counter Balance

As the weight increases, the accumulator absorbs the additional load, causing the gas volume to compress and balance out with the weight of the heavy item.



6. Shock Absorption

When a car runs over bumps or gaps, an accumulator absorbs the shocks that are passed from the wheel to the vehicle body.



Fluid and Material Compatibility

The compatibility of the fluid and the bladder material in an accumulator has a significant impact on the product's performance. The following information can serve as a reference for selecting the appropriate material based on the type of fluid.

Compatibility rating	Classification
1	Excellent
2	Good
3	Not good
4	Bad

Compound	Mineral oil	Unleaded gasoline	Glycol mixed water	Phosphate ester
N28	2	3	2	4
N33	1	3	2	4
N40	1	2	2	4
NH1	1	2	2	4
ECO	1	2	2	4
EP1	4	4	1	1
IIR	4	4	1	2
FKM	1	1	1	4

HDA Series

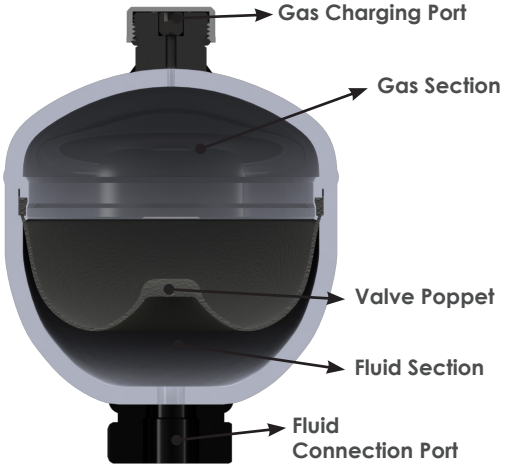
Diaphragm Accumulators

Features

- Capacities from 0.075 to 3.8 Liters
- Low cost, Non-repairable design
- Operating pressures to 250 bar
- Durable metric gas valve

Quick Overview

The HydroLync Diaphragm Accumulator (HDA) stores fluid pressure energy or absorbs pulsations in the system line to maintain hydraulic system stability. The diaphragm accumulator is composed of an upper gas section with a diaphragm and a fluid section with a lower gas portion. The fluid section is connected to the hydraulic circuit to intake fluid as the pressure increases and the gas is compressed. When the pressure decreases, the compressed gas expands and discharges the stored fluid into the circuit.



At the bottom of the diaphragm, there is a button or valve poppet. When the accumulator is completely emptied, the valve poppet blocks the hydraulic discharge port to prevent damage to the diaphragm.

Material

The shell material is typically made of carbon steel, but stainless steel (SUS 316L) can also be used upon customer request. The diaphragm material is as follows:

Compound	Temp. Range	Fluid
NBR	-15 °C to + 80 °C	Mineral oil
ECO (HYDRIN)	-40 °C to +125 °C	Mineral oil
IIR (BUTYL)	-30 °C to + 90 °C	Brake fluid
FKM (VITON)	-45 °C to +150 °C	Chlorination Hydrocarbon

Application case

- Presses, agricultural, and construction machines equipped with hydraulic drives.
- Hydraulic break system
- Hydraulic power drive
- Hydraulic suspension

Ordering code

Example: HD A [ ] 0.75 - 210 - R

1 2 3 4 5

1	Shell material
Code	**Material**
A	Carbon Steel (Standard)
AS	Stainless Steel 304

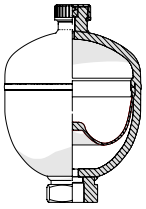
2	Bladder material	
Code	**Material**	**Temp. Range**
	NBR - Nitrile (standard)	-15~80 °C
ECO	Hydrin (Contact sales team)	-40~125 °C
IIR	Butyl (Contact sales team)	-30~90 °C
FKM	VITON (Contact sales team)	-45~150 °C

3	Volume
Code	**Volume**
0.075	0.08 Liter / 0.02 Gallon
0.16	0.16 Liter / 0.04 Gallon
0.32	0.32 Liter / 0.08 Gallon
0.5	0.5 Liter / 0.13 Gallon
0.7	0.7 Liter / 0.18 Gallon
0.75	0.75 Liter / 0.2 Gallon
1.0	1.0 Liter / 0.26 Gallon
1.4	1.4 Liter / 0.37 Gallon
2.0	2.0 Liter / 0.53 Gallon
2.8	2.8 Liter /0.74 Gallon
3.8	3.8 Liter / 1 Gallon

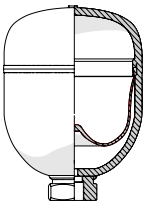
4	Pressure
Code	**Max. Working pressure**
100	100 bar
210	**210 bar (Standard)**
250	250 bar
330	330 bar

*** The standard specification is 210 bar, and other specifications require separate inquiries.**

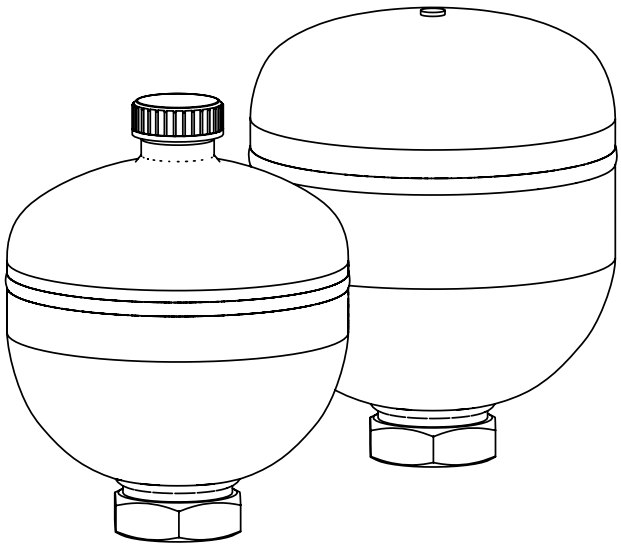
5	Type
Code	**Welding type**
R	Rechargeable (Standard)
S	Sealed



R type
(Rechargeable)

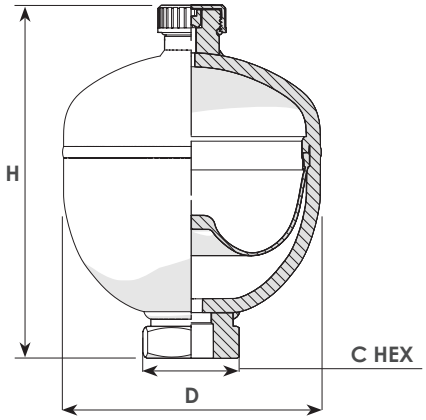


S type
(Sealed)



HDA R type

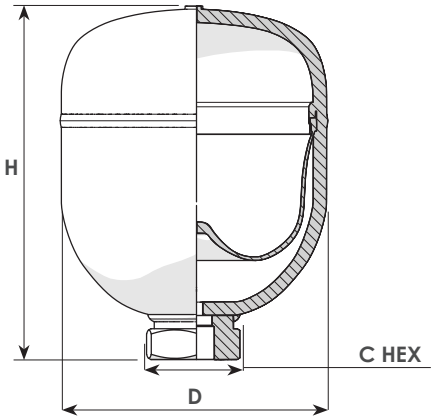
Rechargeable



Volume (L)	Pressure (bar)	Compression Ratio	Air Port	Oil Port	H	D	C Hex	Weight
0.075	210/330	8:1	M28x1.5	G1/2HEX	110	64	22	0.7
0.16	210/330	8:1	M28x1.5	G1/2HEX	120	74	32	1
0.32	210/330	8:1	M28x1.5	G1/2HEX	140	93	32	1.6
0.5	210/330	8:1	M28x1.5	G1/2HEX	152	105	32	1.7
0.75	100/210/330	8:1	M28x1.5	G1/2HEX	168	120	41	2.6
1.0	100/210/330	6:1	M28x1.5	G1/2HEX	178	136	41	4
1.4	100/210/330	6:1	M28x1.5	G1/2HEX	200	150	41	5.5
2.0	100/210/330	6:1	M28x1.5	G3/4HEX	219	166	41	6.6
2.8	250/330	4:1	M28x1.5	G3/4HEX	266	178	41	11
3.8	100/210/330	4:1	M28x1.5	G3/4HEX	317	178	41	15.3

*** The stainless steel shell is determined according to the customer's request.**

HDA S Type
Sealed

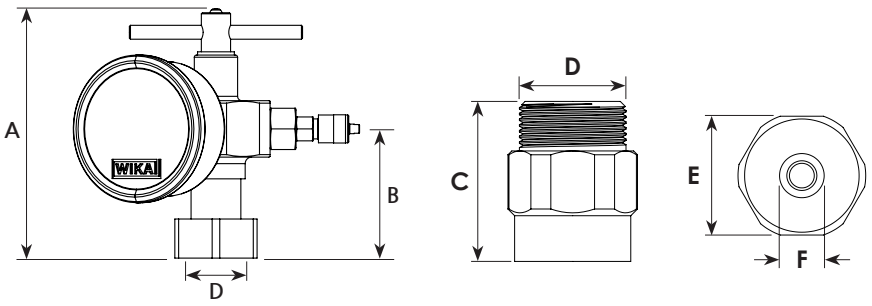


Volume (L)	Pressure (bar)	Compression Ratio	Oil Port	H	D	C Hex	Weight (Kg)
0.075	100/210/330	8:1	PF1/4(M)	123	64	22	0.7
0.16	100/210/330	8:1	G1/2(F)-14	120	74	32	0.9
0.32	100/210/330	8:1	G1/2(F)-14	138	93	30	1.6
0.5	100/210/330	8:1	M18x1.5	155	105	30	1.7
0.7	100/210/330	8:1	G1/2(F)	145	106	32	2.0
0.75	100/210/330	8:1	M18x1.5(M)	160	120	30	2.6
1.0	100/210/330	6:1	M22x1.5(F)	159	136	41	3.9
1.4	100/210/330	6:1	G1/2(F)-14	182	150	41	5.5
2.0	100/210/330	6:1	G3/4(F)-14	200	166	41	6.6
2.8	100/210/330	4:1	G3/4(F)-14	301	175	41	10.0
3.5	100/210/330	4:1	G3/4(F)-14	340	175	41	11.3

*** The stainless steel shell is determined according to the customer's request.**

N_2 charging kit HCD

- **Material:** Carbon Steel - Zinc plated
- **Features:** 1) Charging hose: Length 2.8m, Maximum operating pressure 210 bar
  2) It offers high compatibility and can support products from other brands



A	B	C	D	E	F
		42			5/16"-32UNF
		42			G 1/4"
113	59.5	42	M28 x 1.5	32	5/8"-18UNF
		39			7/8"-14UNF (Short)
		44			7/8"-14UNF (Long)

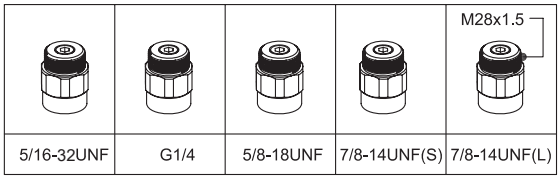
Ordering code

Example: HCD [250] - [D] - [5] - [1] - [1] - [1]
1 2 3 4 5 6

1	Pressure gauge
250	250 bar (Standard)
10	10 bar
25	25 bar
60	60 bar
100	100 bar

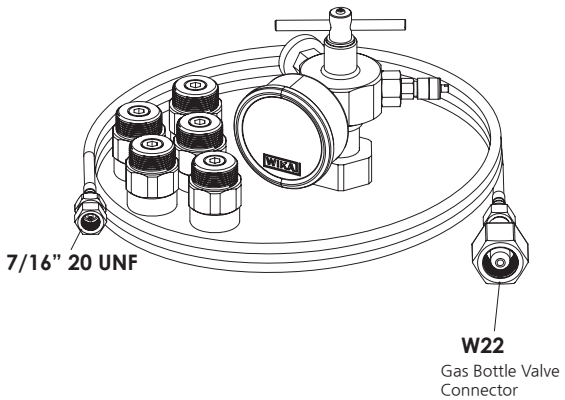
2	Gauge type
D	D Type (Standard)
A	A Type

3	Gas valve adopters
	None (Standard)
1	5/16-32UNF
2	G 1/4
3	5/8-18UNF
4	7/8-14UNF (short)
5	7/8-14UNF (Long)
6	Full Set



4	Charging hose
1	M16 - W22-7/16" 20 UNF 210 bar, 2.8m
2	M16 - W22-7/16" 20 UNF 400 bar, 2.8m
3	For customization, please consult with our sales team.

5	Case
1	Hard case (Standard)
2	For customization, please consult with our sales team.



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