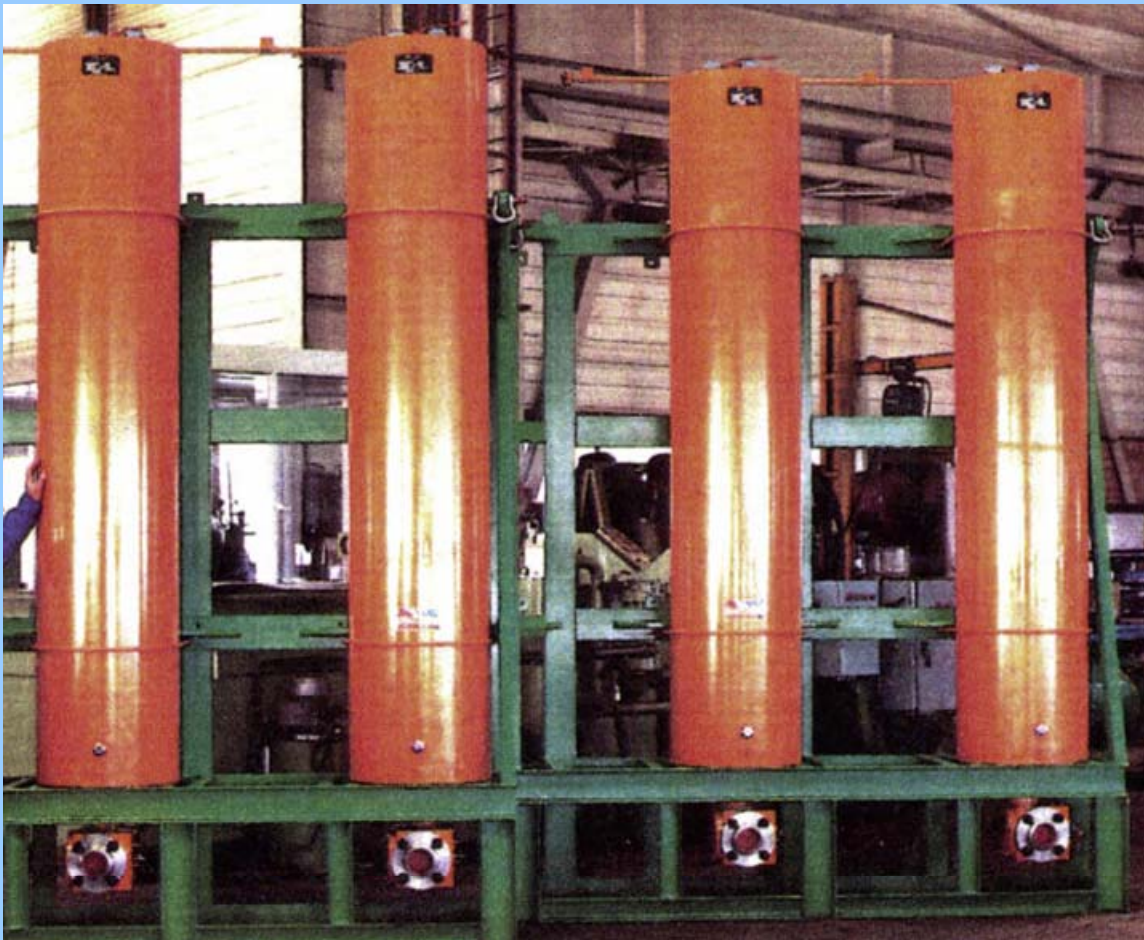




Douce-Hydro

HYDRO PNEUMATIC PISTON ACCUMULATORS



Piston Accumulators Brochure - Page 1 / 10

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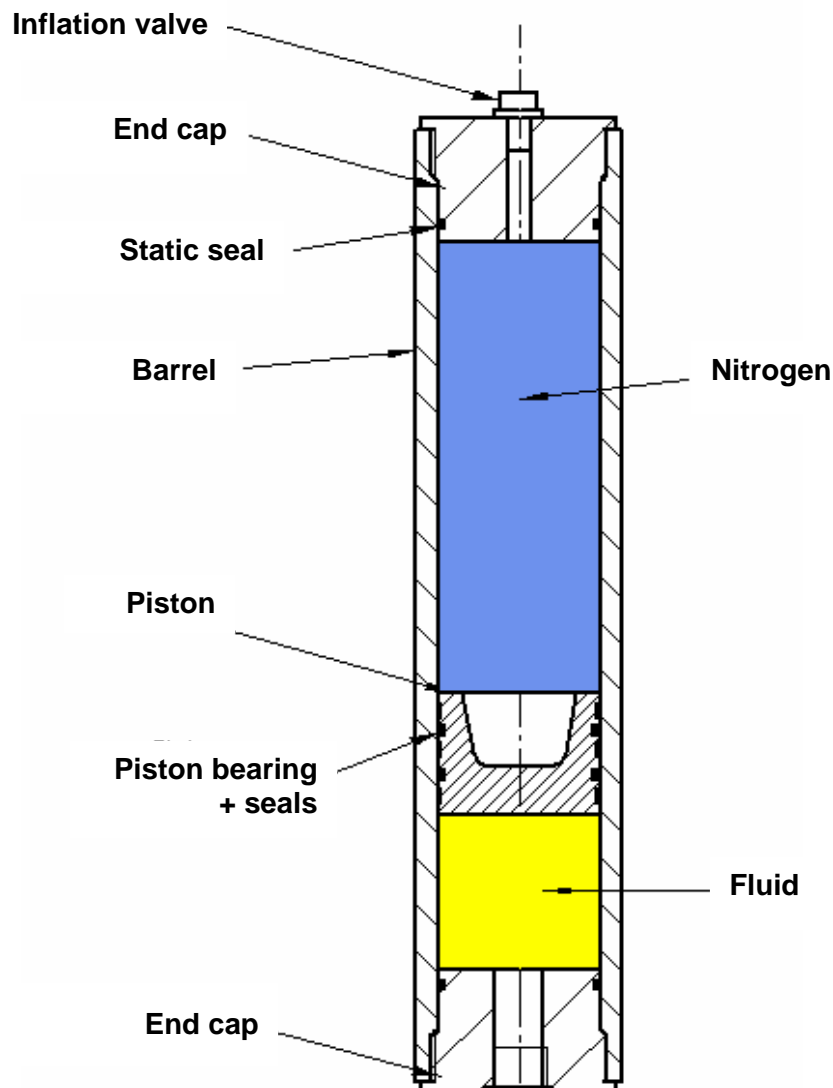
I – GENERAL NOTES:

The hydro pneumatic piston accumulator, or piston accumulator, is a sort of tank in a hydraulic circuit, capable of storing a large quantity of energy with a low volume.

A piston accumulator is divided in two chambers: one for the fluid under pressure, the other one for the nitrogen (or other type of gas). The two chambers are separated from one another by a piston.

In case of peak of pressure in the hydraulic circuit, the fluid pressure is higher than the initial pressure (called inflation pressure). When the fluid arrives in the piston accumulator, the nitrogen will compress and will therefore retain the corresponding fluid.

On the contrary, in case of pressure drop in the hydraulic circuit, the accumulator will reconstitute the fluid into the circuit until it recovers its initial pressure (inflation pressure).





APPLICATIONS:

Whatever the application, a piston accumulator is mainly used as a security system in the hydraulic circuit in which it is installed. The different applications are:

- **Energy storage:** allows the release of a high quantity of energy during a short amount of time. In this case, the piston accumulator is storing some additional fluid.
- **Hydraulic shock absorption** « hydraulic ram » type. Sudden pressure change in the hydraulic circuit, or sudden circuit shut-off by the valve or by the automatic valve.
- **Pump pulsation cushioning:** to allow a better pressure regularity in the hydraulic circuit.
- **Thermal dilatation:** to protect against a fluid volume increase due to temperature rise.
- **Leak compensation:** to compensate a pressure drop in case of a leak in the hydraulic circuit.
- **Transfer of incompatible fluids:** The piston which separated the two chambers is the link between the two non compatibles fluids.

APPLICATION SECTORS (but not limited to):

- **Offshore:** as a source of emergency power for safety and shut-down systems.
- **Winches:** to maintain line tension.
- **Machines-Tools:** to maintain pressure and reduce pump size.
- **Hydraulic press operation:** to provide the high flow rates necessary for rapid pressure rise.
- **Die-casting and injection industries (plastic injection, rubber....):** providing high working pressure with instantaneous flow rates during rapid cycling.
- **Paper-making machinery:** maintaining guide and backing roller position and pre-load.
- **Etc...**



ADVANTAGES OF PISTON ACCUMULATORS :

- **Instantaneous high flow rates**
- **Adapted to high temperatures**
- **High compression ratio**
- **Piston position detection** (option)
- **Can be adapted for transfer systems (with non-compatibles fluids)**
- **Custom capacity and volume**



*Application :
Offshore*

Our piston accumulators present many advantages compared to bladder accumulators:

- Our manufacturing capabilities allow to build up to very large volumes, which results in less space required than a solution which would have included « accumulator + additional gas bottles » and would simplify the installation by suppressing piping connections.

- For piston accumulators, the use of a fluid other than mineral oil has very low impact on the lifetime of the tightness system, whereas the diaphragm of bladder accumulators does not resist as well in the time. Therefore, the reliability of bladder accumulators is not as good as the one known with the use of mineral oil, whereas the reliability of piston accumulator is always very good, whatever the fluid.

- Likewise, high temperatures are source of problem for bladder accumulator diaphragms, which do not resist very well. On the other hand, piston accumulators do not face this type of problem and resist therefore very well to high temperatures.

- Piston accumulators allow to provide instantaneous high flow rates and to deliver therefore huge energy/power whenever it is needed.

- Piston accumulator is also the solution wherever security systems are needed, by example, the need to read the piston position and therefore the volume absorbed or provided (such as proximity switches, or integrated positioning system).



Piston accumulator (Mineral oil/nitrogen)

External diameter: 800 mm / 31 inches

Stroke: 300 mm / 12 inches

With piston position measuring system

Working pressure: 350 bar / 5 075 psi



II - DOUCE HYDRO RANGE:

Douce Hydro can answer to your specific needs for piston accumulators, whatever your requirements are.

STANDARD RANGE:

	Fluid volume	Bore diameter	Maximal pressure	Standard (*) certification
Serie ACCU DH-1000 :	0 to 50 liters <i>0 to 13 gallons</i>	50 to 150 mm <i>2 to 6 inches</i>	350 bar <i>5 000 psi</i>	CE
Serie ACCU DH-2000 :	50 to 300 liters <i>13 to 79 gallons</i>	150 to 400 mm <i>6 to 16 inches</i>	350 bar <i>5 000 psi</i>	CE

SPECIFIC RANGE :

	Fluid volume	Bore diameter	Maximal pressure	Standard (*) certification
Serie ACCU DH-3000 :	300 to 1 500 litres <i>79 to 396 gallons</i>	400 mm to 1200 mm <i>16 to 48 inches</i>	1 200 bar <i>17 400 psi</i>	CE

(*) Other certifications are possible (such as ASME...): on request

OPTIONS:

- **Metric or inch versions**
- **Proximity switches (end stroke detectors):** to detect the piston position whenever it is located on each end (fluid side or nitrogen side) for remote controlled security.
- **Integrated piston position monitoring:** continuous monitoring of the piston stroke (fluid side).
- **Internal coating of the bore diameter** with chrome or kanigen to improve seals friction characteristics and ensure a anti-corrosion protection which is necessary for the use of certain fluids.
- **Coating of the end caps and piston internal sides** for anti-corrosion protection.
- **Specific external protection** according to your specifications (for offshore applications by example).
- **Piston internal cushioning** on the fluid side, whenever the working conditions request complete and frequent discharges of the piston accumulator, especially for high speed piston stroke.
- **Other options are possibles on request**



FLUIDS AND GAS:

Fluids :

- Mineral oil – according to ISO 4406 (standard)
- Water glycol
- Chlorinated hydrocarbons
- Other fluids are possible on request

Gas :

- anhydrous nitrogen
- Ester phosphate
- Other gas are possible on request

For a maximum comment life of your piston accumulator, the system should be protected from contamination by effective filtration. Fluid cleanliness should be in accordance with ISO 4406. The quality of filters should be in accordance with the appropriate standards. Minimum: class 19/15 from ISO 4406, which equates to 25μ ($\beta_{10} \geq 75$).

WORKING TEMPERATURES :

From -10°C to $+80^{\circ}\text{C}$ ($= 14^{\circ}\text{F}$ to 176°F) or following your specifications.

CERTIFICATIONS:

CE certification: Douce Hydro's piston accumulators are manufactured in accordance with the European Pressure Equipment Directive 97/23/EC. They are delivered with a Certificate of Compliance CE, and carry the CE mark as well as the reference of the independent certifying party.

Independent certifying parties are: VERITAS, TÜV, LLOYD, DNV, ASAP, APAVE

In France, the operating requirements are regulated by the Directive dated March 15th 2000 (J.O. n°96)

Other certifications: For customers from outside the European Community, any other certification is possible (such as: ASME ...). To be requested with your order.



Piston accumulateurs
of 150 liters / 40
gallons each.



III – TO DETERMINE YOUR PISTON ACCUMULATOR

You'll find hereunder the different elements you will need to provide us, so that we can determine the sizing of your piston accumulator:

- **Fluid type**
- **Gas type**
- **Minimum and maximum working temperature**
- **Application type** (see applications listing page 3 – 1st paragraph)
- **Working pressure**
- **Flow rate**
- **Volume or restored volume**
- **Working position of the accumulator** : vertical or horizontal
(in general, we recommend vertical, fluid side towards the bottom)

Optional information which can be provided:

- Available room if it is limited



IV - SOME PAST REFERENCES:

- **Charles De Gaulle Navy aircraft carrier:**

Size per unit: 4 020 x 1 560 x 1 560 mm / 13 feet x 5 feet x 5 feet
Fluids: Compressed air / Hydraulic oil FYRQUEL 220 MLT

Working pressure :

P= 210 bars at 45°C / 3 045 psi at 113°F (Maximum high piston position)

P= 155 bars at 15°C / 2 250 psi at 60°F (Maximum low piston position)

Valve loading pressure: 230 bars / 3 335 psi (loaded)

Testing pressure accumulators only: 330 bars / 4 785 psi

Testing pressure for the piping: 375 bars / 5 438 psi

Maximal fluid flow rate (for the 4 accumulators):

- Feeding phase: 1 200 liters per minute / 317 gallons per minute

- in restitution : 7 200 liters per minute / 1 900 gallons per minute

Maximal fluid volume: 315 liters per accumulator





• **Materiel for fighter aircraft pilotes training station:**

Piston accumulateur (Mineral oil / nitrogen)
External diameter: 800 mm / 31 inches
Stroke: 300 mm / 12 inches
With piston position measuring system
Working pressure: 350 bar / 5 075 psi



2 piston accumulators

External diameter: 800 mm / 31 inches
Stroke: 3 000 mm / 10 feet

Capacity: 1 500 liters per accumulator
Working pressure : 350 bar / 5 075 psi

• **Cruise vessel CLUB MED 2 :**

- 5 piston accumulators 130 liters (diameter 260 mm, length : 2 810 mm)
- 5 piston accumulators 34 gallons (diameter 10 inches, length : 9 feet)
- 5 piston accumulators 70 liters (diameter 260 mm, length : 2 810 mm)
- 5 piston accumulators 18 gallons (diameter 10 inches, length : 9 feet)
- 2 piston accumulators 50 liters (diameter 180 mm, length : 2 235 mm)
- 2 piston accumulators 13 gallons (diameter 7 inches, length : 7 feet)
- 2 piston accumulators 15 liters (diameter 180 mm, length : 2 235 mm)
- 2 piston accumulators 4 gallons (diameter 7 inches, length : 7 feet)



Pressure : 250 bar / 3 625 psi



- **Bumping table for seismic tests:**

Supplying high instantaneous flows (1 800 liters per minute / 476 gallons per minute)

8 piston accumulators with end stroke detector (proximity switches)

Diameter: 420 mm / 16 inches

Stroke: 1 870 mm / 6 feet

Pressure: 210 bar / 3 045 psi

Volume: 260 litres / 69 gallons



- **Piston alternative circulator:**

4 chambers 2 x 40 liters / 2 x 10.5 gallons)
equipped with position contacts

Internal diameter: 220 mm / 9 inches

Stroke: 1 055 mm / 3 feet

Working pressure: 110 bar / 1 595 psi

Testing pressure: 165 bar / 2 292 psi

Chambers 1 and 4: Salted water

Chambers 2 and 3: Methane gas



- **Etc ...**
