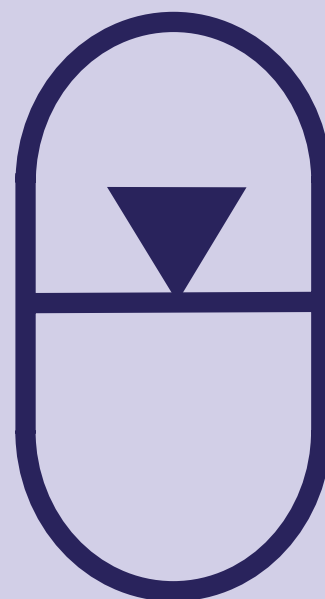


HYDROPNEUMATIC ACCUMULATORS

DIAPHRAGM
BLADDER
BLADDER-DIAPHRAGM
PISTON



HYDROPNEUMATIC ACCUMULATORS

BLADDER, DIAPHRAGM
BLADDER-DIAPHRAGM,
PISTON



Operating principle, functions and characteristics . 4

ACS(L) Welded accumulators . 6

Technical description	6
Dimensions and characteristics	7
Order code system	8
Hydraulic and gas connections	9
ACS(L) low temperature version	10
Accessories	11

AS Spherical accumulators . 12

Technical description	12
Characteristics, dimensions and accessories	13

ABVE Bladder accumulators . 14

Technical description	14
Characteristics, dimensions and accessories	15

APL Piston accumulators . 16

Technical description	16
Characteristics, dimensions and accessories	17
Order code system	18
Hydraulic and gas connections	19
Accessoires	19

Safety blocks . 20

Pressure relief valves . 22

Charging equipment . 24

Safety precautions & maintenance recommendations . 25

The complete LEDUC product range . 26

ACS(L)

- Nitrogen capacities from 0.18 to 1.06 gallons (0.7 to 4 litres)
- Maximum pressure 4786 psi (330 bar) depending on model
- Extreme operating temperatures (standard): -4°F to +212°F (-20°C to +100°C)
- Low temperature version: -40°F to +212°F (-40°C to +100°C)



ACS(L) series

AS

- Nitrogen capacities from 0.005 to 2.64 gallons (0.02 to 10 litres)
- Maximum pressure 5800 psi (400 bar) depending on model
- Extreme operating temperatures (standard): -4°F to +212°F (-20°C to +100°C)
- Low temperature version: -40°F to +212°F (-40°C to +100°C)



AS series

ABVE

- Nitrogen capacities from 1.06 to 13.21 gallons (4 to 50 litres)
- Maximum pressure 4786 psi (330 bar)
- Extreme operating temperatures: -4°F to +176°F (-20°C to +80°C)



ABVE series

APL

- Nitrogen capacities from 0.13 to 1.06 gallons (0.5 to 4 litres)
- Maximum pressure 3626 psi (250 bar)
- Extreme operating temperatures: -4°F to +176°F (-20°C to +80°C)



APL series

OPERATING PRINCIPLE

► Energy storage

A hydro-pneumatic accumulator is a vessel which, in hydraulic circuits, is capable of storing a large amount of energy in a small volume.

► A simple principle

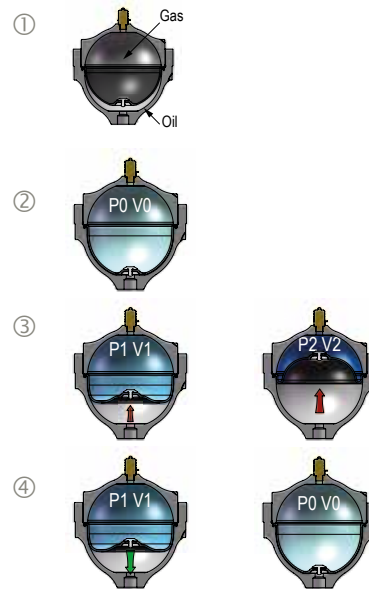
If the very low compressibility of fluids makes it difficult to store their energy in small volumes, it does, however, enable them to transfer a significant force. Gas on the other hand is highly compressible, and can therefore store considerable amounts of energy in small volumes. The hydro-pneumatic accumulator makes use of these two properties.

① The hydro-pneumatic accumulator is a tank divided into two chambers by a flexible separator. One chamber is for fluid under pressure, the other for nitrogen gas.

② It is pre-charged with nitrogen to a pressure P_0 .

③ When a fluid travels through the accumulator, and the pressure P_1 of that fluid is higher than the pre-charge pressure P_0 of the accumulator, then the gas compresses to P_1 , the separator changes shape, and the accumulator can take in the corresponding volume of fluid.

④ Any pressure drop in the hydraulic circuit causes the accumulator to return fluid to the circuit, until pressure reverts to the initial P_0 .



FUNCTIONS

► Surge control

The accumulator takes in the kinetic energy produced by a moving column of fluid when the circuit is suddenly shut off (valve, solenoid etc.), or more generally, when there is a sudden change in circuit pressure.

► Thermal expansion

The increase in volume due to increased temperature will be absorbed by the LEDUC accumulator.

► Shock absorbing – suspension

LEDUC accumulators, in a shock absorbing function, reduce fatigue of hydraulic and mechanical components.

Examples: lifts, forklift trucks, agricultural machinery, construction equipment, etc.

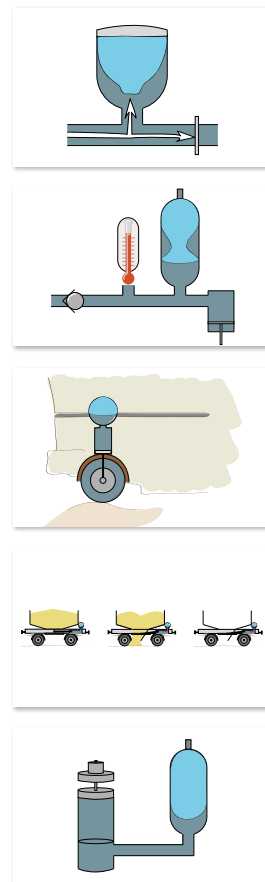
► Energy recovery and restitution

The energy supplied by a given load can be absorbed by the accumulator and put back into a hydraulic cylinder to produce a mechanical movement.

Example: closing railcar hopper doors.

► Leak compensation

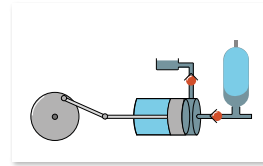
A leak in a hydraulic circuit can lead to pressure drop. The LEDUC accumulator compensates the loss in volume and thus maintains circuit pressure virtually constant.



► Pulsation dampening

Adding a LEDUC accumulator to a hydraulic circuit smooths out any flow irregularities from the pumps. This leads to better operation of the system, protection of the components and thus increased service life, and reduced noise levels.

Example: dosing pumps.

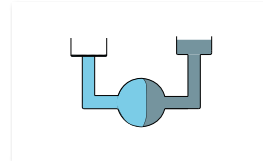


► Transfer of fluid

The LEDUC accumulator makes it possible to transfer hydraulic pressure between two incompatible fluids, via the diaphragm which separates the two fluids.

Examples:

- transfer between hydraulic fluid and sea water,
- test bench, etc.

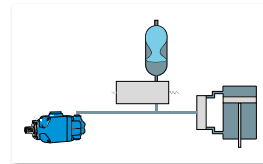


► Energy storage

In a circuit under pressure, the LEDUC accumulators mean a reserve of fluid may be kept permanently available. Thus a large amount of energy, accumulated by a low power system during periods of low or no usage, can be used in a very short time and within one cycle.

Examples:

- automatic machines,
- braking or declutching of vehicles or construction equipment,
- emergency completion of working cycle in case of failure of main power source.



CHARACTERISTICS

Main characteristics	Accumulator type			
	ACS-ACSL Diaphragm	ABVE Bladder	AS Bladder-diaphragm	AP Piston
Volumetric ratio (capacity to store a volume)	Ratio limited to 4	Ratio limited to 4	Ratio limited to: - 4 in dynamic - 6 for slow movement - 8 in static	without limit except to reach service pressure
Mounting position	Vertical position	Vertical position	For higher volumetric ratio, vertical position preferred	Any positions
Capacity for total discharge	Yes, in particular conditions	No, except particular conditions	✓	✓
Flow control	✗	✗	✗	✓
Control of the presence of fluid	✗	Reduced	✗	✓ (indicator possible)
Use at high temperature (+120°C)	Medium	Reduced	Medium	Favorable (special seals)
Use with special fluids	Limited	Limited	Limited	Favorable (special seals)
Service life	Good	Good	Good	Very good



► Technical description

The ACS(L) type welded accumulators are made up of a shell in high resistance steel containing a fluid-gas bladder-diaphragm. This bladder-diaphragm is made of nitrile for the standard ACS range, and of hydrogenated nitrile for low temperature applications. The bladder-diaphragm is fitted with an anti-extrusion stud, thus allowing rapid and total discharge of the accumulator.

► Advantages

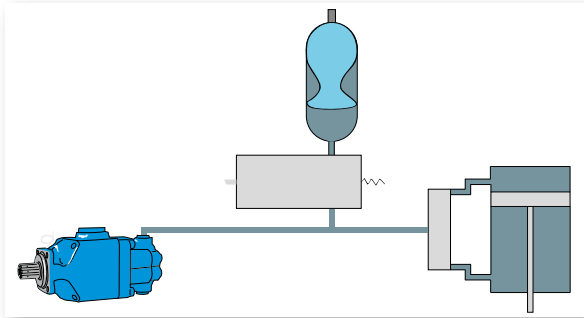
- Low temperature versions suitable for operation at temperatures down to -40°F.
- Completely modular from 0.18 to 1.06 gallons (0.7 to 4 litres). This design concept means easy addition of intermediate models if required.
- The bladder-diaphragm offers exceptionally good resistance to fatigue.
- Rapid and total discharge possible due to the anti-extrusion stud actually fitted onto the bladder-diaphragm.

► Operating fluids

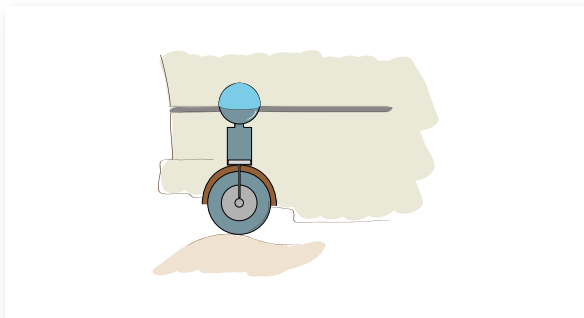
- Mineral-based hydraulic fluids.
- Other fluids: please ask.

► Examples of applications

Energy storage



Suspension



ACS 4786 psi (330 bar)

Maximum pressure: 4786 (330 bar)

Extreme operating temperature:

- Standard version: -4°F to 212°F (-20°C to +100°C)
- Low temperature version: -40°F to 212°F (-40°C to +100°C)

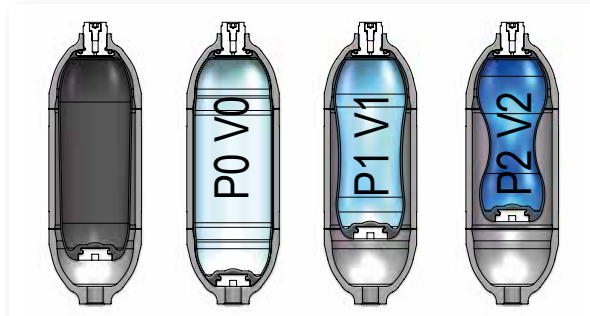
ACSL 3045 or 3626 psi (210 or 250 bar)

Maximum pressure: 3045 or 3626 psi (210 or 250 bar) depending on the version.

Extreme operating temperature:

- Standard version: -4°F to 212°F (-20°C to +100°C)
- Low temperature version: -40°F to 212°F (-40°C to +100°C)

► Deformation of the bladder-diaphragm

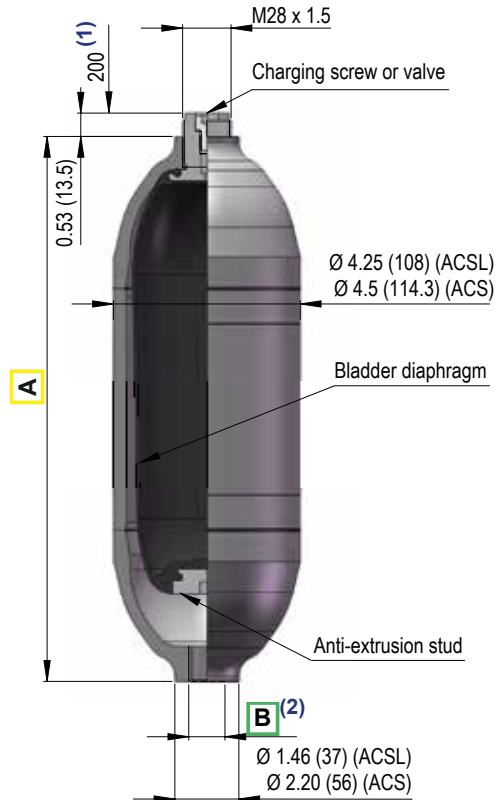


► Filling gas

Nitrogen only.

► Volumetric ratio (V0-V2)/V0

The recommended volumetric ratio of this type of accumulator is 0.75. For example: an ACS 4 accumulator can take in a maximum volume of $0.75 V_0 = 0.75 \times 4 = 3$ litres.



(1) Dimensions for setting up the charging and gauging device

(2) Hydraulic connections - see order code system code **4** (next page)

CHARACTERISTICS AND DIMENSIONS

	Volume gallons (L)	Max. pressure psi (bar)	Weight lbs (kg)	Length A inches (mm)
ACS	0.18 (0.7)	4786 (330)	8.8 (4)	6.9 (175)
	0.26 (1)		13 (5.9)	9.2 (236)
	0.40 (1.5)		17.2 (7.8)	12.4 (315)
	0.53 (2)		21.8 (9.9)	15.4 (392)
	0.66 (2.5)		25.3 (11.5)	18.2 (463)
	1.06 (4)		38.6 (17.5)	27.3 (695)
	Volume gallons (L)	Max. pressure psi (bar)	Masse lbs (kg)	Length A inches (mm)
ACSL	0.18 (0.7)	3626 (250)	6.6 (3)	6.9 (175)
	0.26 (1)		9.9 (4.5)	9.5 (241)
	0.40 (1.5)		13 (5.9)	12.4 (315)
	0.53 (2)		16.8 (7.6)	15.4 (392)
	0.66 (2.5)		19.6 (8.9)	18.2 (463)
	1.06 (4)		30.6 (13.9)	27.4 (696)

ACS(L) Order code system

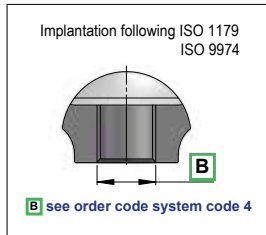
ACS(L)	...	S
01	02	03	04	05	06	07	08

To obtain the code of your welded cylindrical accumulator ACS(L), complete the different parameters from 01 to 08 in the table on the left according to the options you require (see table below).

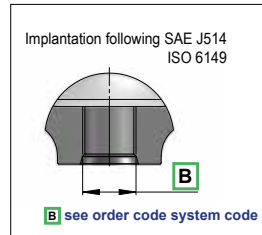
For ACS 0.7 L, or ACS(L) low temperature version (-40°F), please refer to the tables on page 10. For other accumulators, make your choice as a function of the possible combinations, using the columns below, and use the code in the far right-hand column.

Accumulator type													
		ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	
01	ACS 4786 psi		•		•		•		•		•		ACS
	ACSL 3625 psi	•		•		•		•		•		•	ACSL
Volume (L)													
02		0.7	1		1.5		2		2.5		4		
Operating temperature													
03	-4°F to 212°F	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	S
Hydraulic connections													
04		ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	
	G3/8"												G1
	G1/2"	•	•	•	•	•	•	•	•	•	•	•	G2
	G3/4"	•	•	•	•	•	•	•	•	•	•	•	G3
	M16 x 1.5												M1
	M18 x 1.5	•	•	•	•	•	•	•	•	•	•	•	M2
	3/4 - 16 UNF	•	•	•	•	•	•	•	•	•	•	•	U1
1 1/16" - 12 UN	•	•	•	•	•	•	•	•	•	•	•	U2	
Gas side connections													
05		ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	
	Charging screw M28 x 1.5	•	•	•	•	•	•	•	•	•	•	•	V
	P1620 valve		•	•	•	•	•	•	•	•	•	•	W
	SCHRADER valve		•	•	•	•	•	•	•	•	•	•	Y
Gas side connections protection													
06		ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	
	Without protection (P1620, Schrader) Plastic plug (Screw M28 x 1.5)	•	•	•	•	•	•	•	•	•	•	•	N
	With metallic plug	•	•	•	•	•	•	•	•	•	•	•	P
Hydraulic options													
07		ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	ACS	ACSL	
	Without connection	•	•	•	•	•	•	•	•	•	•	•	N
	Male connection M33 x 1.5 - G1/2"	•		•		•		•		•		•	M
	Male connection M18 x 1.5	•		•		•		•		•		•	D
	Male connection M27 x 2	•		•		•		•		•		•	E
	Male connection G3/8"	•		•		•		•		•		•	J
Charging pressure													
08	Specify the charging pressure (in psi)												

► Hydraulic connections - Code 04

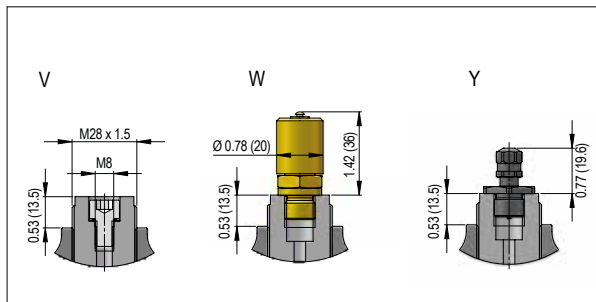


Code	
04	Ø B
G1	G3/8"
G2	G1/2"
G3	G3/4"
M2	M 18 x 1.5

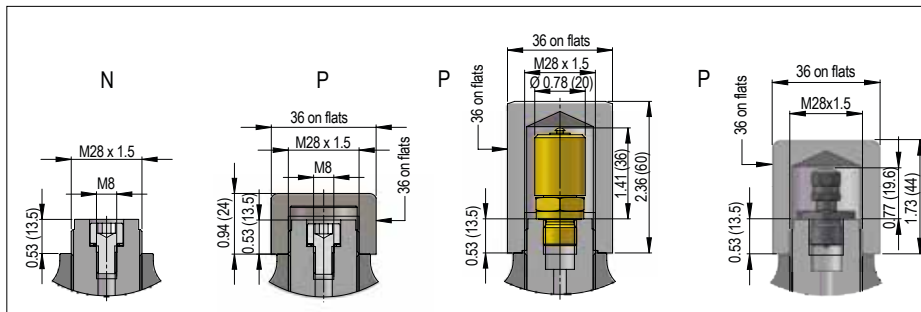


Code	
04	Ø B
M1	M 16 x 1.5
U1	3/4-16UNF - 2B
U2	1"1/16 - 12UNF - 2B

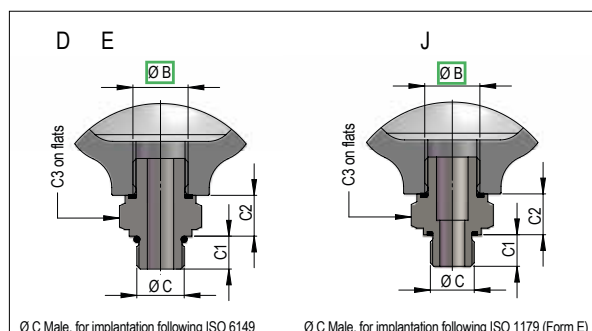
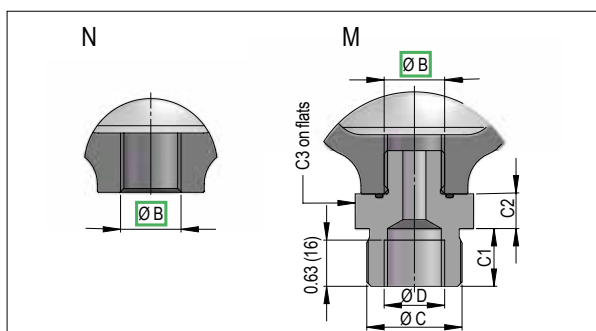
► Gas side connections - Code 05



► Gas side protections - Code 06



► Hydraulic options - Code 07



Code	Ø B	Ø C	C1	C2	C3	D
07						
N	Code 04	-	-	-	-	-
M	G1/2"	M33 x 1.5	0.78 (20)	0.47 (12)	1.61 (41)	G1/2"
D	G1/2"	M18 x 1.5	0.49 (12.5)	0.61 (15.5)	1.06 (27)	-
E	G1/2"	M27 x 2	0.55 (14)	0.63 (16)	1.26 (32)	-
J	G1/2"	G3/8"	0.47 (12)	0.61 (15.5)	1.06 (27)	-

► ACS low temperature version models

	LEDUC code	Nitrogen capacity V0 gallons (litres)	Max. pressure psi (bar)	Weight lbs (kg)	Length A inches (mm)	Hydraulic connection Ø B	Gas side
ACS 0.7	0610415	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	G1/2"	screw
ACS 1.5	0610425	0.40 (1.5)	4786 (330)	17.2 (7.8)	12.40 (315)	G3/4"	screw
ACS 2	0610430	0.53 (2)	4786 (330)	21.8 (9.9)	15.43 (392)	G3/4"	screw
ACS 2.5	0610435	0.66 (2.5)	4786 (330)	25.3 (11.5)	18.22 (463)	G3/4"	screw
ACS 4	0610440	1.06 (4)	4786 (330)	36.6 (17.5)	27.36 (695)	G3/4"	screw

► ACSL low temperature version models

	LEDUC code	Nitrogen capacity V0 gallons (litres)	Max. pressure psi (bar)	Weight lbs (kg)	Length A inches (mm)	Hydraulic connection Ø B	Gas side
ACSL 0.7	068360	0.18 (0.7)	3045 (210)	6.6 (3)	6.89 (175)	G1/2"	screw
ACSL 1	0610210	0.26 (0.99)	3045 (210)	9.9 (4.5)	9.48 (241)	G1/2"	screw
	0610335	0.26 (0.99)	3045 (210)	9.9 (4.5)	9.48 (241)	G1/2" / M33 x 1.5 MALE	screw
	068355	0.26 (0.99)	3045 (210)	9.9 (4.5)	9.48 (241)	G3/4"	screw
ACSL 1.5	068350	0.40 (1.5)	3045 (210)	13 (5.9)	12.40 (315)	G3/4"	screw
ACSL 2	068345	0.53 (2)	3045 (210)	16.7 (7.6)	15.43 (392)	G3/4"	screw
ACSL 2.5	068265	0.66 (2.5)	3045 (210)	19.6 (8.9)	18.22 (463)	G3/4"	screw

The ACS(L) low temperature models accumulators are equipped with a hydrogenated nitrile diaphragm (ref. E/7).

ACS 0.7 L model, not in the code system

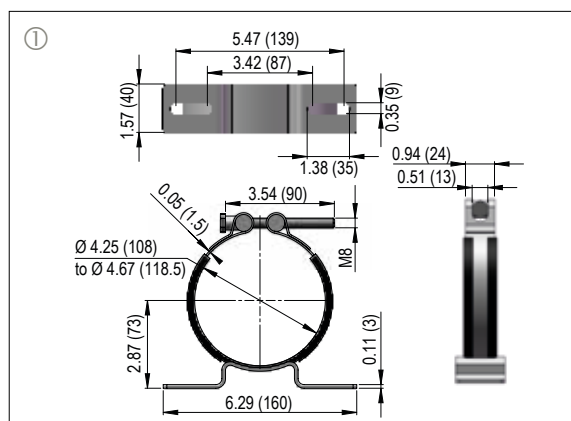
► ACS 0.7

LEDUC code	Nitrogen capacity V0 gallons (litres)	Max. pressure psi (bar)	Weight lbs (kg)	Length A inches (mm)	Hydraulic connection Ø B	Gas side
065947	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	3/4-16UNF-2B	SCHRADER valve
065950	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	M16 x 1.5	screw
065952	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	M18 x 1.5	screw
065975	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	G3/8"	P1620 valve
066035	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	G3/4"	screw
066130	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	G1/2"	screw
066255	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	G1/2"	P1620 valve
066445	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	G3/8"	screw
066845	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	3/4-16UNF-2B	screw
066695	0.18 (0.7)	4786 (330)	9 (4)	6.89 (175)	G1/2" / M33 x 1.5 MALE	screw

ACCESSORIES

► ACS(L) adjustable clamps ①

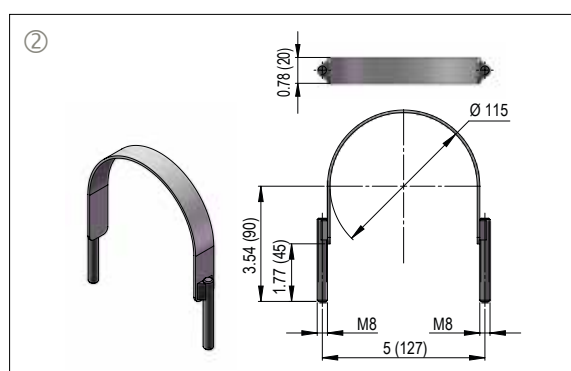
Volume gallons (litres)	Characteristics	Code LEDUC
0.18 (0.7) - 0.26 (1)	Zinc-plated steel	254021
0.40 (1.5) - 0.53 (2)	Zinc-plated steel quick-tightening	254031
0.66 (2.5) - 1.06 (4)	Stainless steel	254032



► ACS(L) fixed clamps ②

Volume gallons (litres)	Characteristics	Code LEDUC
0.18 (0.7) - 0.26 (1)	Zinc-plated steel	C001028
0.40 (1.5) - 0.53 (2)	Stainless steel	C001437
0.66 (2.5) - 1.06 (4)		

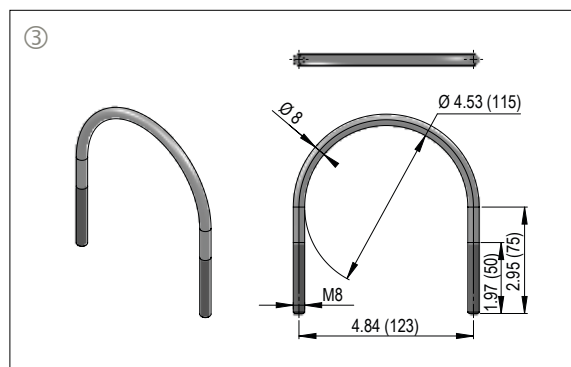
Tightening torque of the fixation screws: 20 Nm.



► ACS(L) clamps ③

Volume gallons (litres)	Characteristics	Code LEDUC
0.18 (0.7) - 0.26 (1)	Zinc-plated steel	C001031
0.40 (1.5) - 0.53 (2)	Stainless steel	C001032
0.66 (2.5) - 1.06 (4)		

Tightening torque of the fixation screws: 14.7 lbf.ft (20 N.m).





► Technical description

LEDUC spherical accumulators consist of two hemispherical shells which are screwed together and which hold a diaphragm. This diaphragm has a metal stud which closes off the operation hole when the fluid is completely discharged. There is therefore no danger of damage to the diaphragm.

The gas side port is fitted with a charging valve allowing the pressure in the accumulator to be checked or changed.

Separator:

- Standard, Nitrile: from -4°F to + 212°F (-20°C to +100°C)
- Special: from -40°F to + 212°F (-40°C to +100°C) dynamic use.

► Advantages

The diaphragm only changes position, the elastomer in fact works little. The LEDUC spherical accumulator owes most of its qualities to its diaphragm and metal pin:

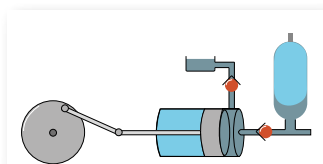
- excellent gas/fluid tightness,
- possibility of total and rapid discharge,
- can be adapted to suit a wide range of fluids handled.

► Operating fluids

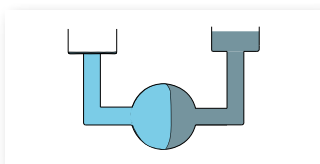
- Mineral-based hydraulic fluids: standard diaphragm.
- Corrosive or non-standard fluids: please consult our Customer Service Department.

► Examples of applications

Pulsation dampening



Transfer



AS 5800 psi (400 bar)

Maximum pressure: 5800 psi (400 bar)

Extreme operating temperature:

- Standard version : -4°F to + 212°F (-20°C to + 100°C)
- Low temperature version: -40°F to + 212°F (-40°C to + 100°C)

► Deformation of the bladder-diaphragm



► Filling gas

Nitrogen only.

► Volumetric ratio(V0–V2)/V0

The volumetric ratio of this type of accumulator is 0.75.

For example: an AS 1 accumulator can take in a maximum volume of 0.75 V0 = 0.75 x 1 = 0.75 litres.

► Protection

On request, ARCOR® anti-corrosion treatment.

► Order code

Capacity and code	Protection	Type of diaphragm	Charging valve	Control	Charging pressure
AS 0.5 060972	S	E/1	310367	D	Specify (in psi)
S: without protection P: ARCOR® anti-corrosion treatment	E/1 or E/2 or E/3 or E/4 or E/5	310367: P1620 310527: P1620 Stainless steel 067210: SCHRADER	S: without control D: CE approval		

E/1: NBR (nitrile)

Specific diaphragms available on request, minimum order quantity may apply; please consult us.

E/2: NBR (nitrile stainless steel insert)

available on special order:

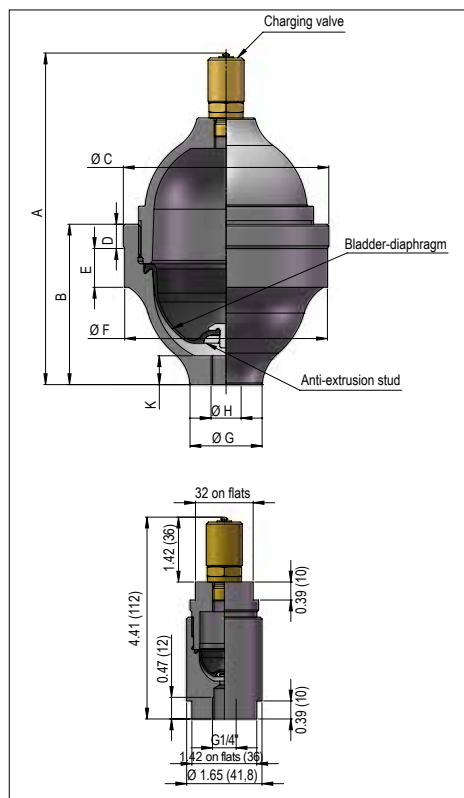
E/3: ECO (epichlorohydrine)

E/4: EPM (epr)

E/5: FKM (viton®)



CHARACTERISTICS AND DIMENSIONS



AS	LEDUC code	Nitrogen capacity Vo gallons (litres)	Max. pressure psi (bar)	Weight lbs (kg)	Dimensions inches (mm)								
					A	B	Ø C	D	E	Ø F	Ø G	Ø H	K
AS 00 20	060932	0.05 (0.19)	5801 (400)	3 (1.2)	5.91 (150)	2.72 (69)	3.33 (84.5)	0.35 (9)	0.79 (20)	3.29 (83.5)	1.14 (29)	G1/4"	0.47 (12)
AS 00 50	060972	0.12 (0.45)	5801 (400)	6 (2.8)	7.24 (184)	3.50 (89)	4.49 (114)	0.47 (12)	0.91 (23)	4.43 (113)	1.57 (40)	G3/8"	0.36 (16)
AS 00 70	060782	0.17 (0.65)	3626 (250)	7 (3)	7.76 (197)	3.50 (89)	4.70 (119.5)	0.35 (9)	0.94 (24)	4.67 (119)	1.18 (30)	G3/8"	0.51 (13)
AS 01 00	060110	0.29 (1.1)	5801 (400)	12 (5.5)	7.76 (197)	4.41 (112)	6.44 (163.5)	1.99 (50.5)	1.99 (50.5)	6.44 (164)	1.57 (40)	M18 x 1.5	0.47 (12)
AS 02 50	060812	0.66 (2.55)	5801 (400)	31 (14)	9.88 (251)	6.34 (161)	8.41 (213.5)	1.46 (37)	1.14 (29)	8.27 (210)	2.01 (51)	G3/4"	0.67 (17)
AS 04 00	060121	1.07 (4.1)	5801 (400)	49 (22)	11.73 (298)	7.95 (202)	9.88 (251)	1.73 (44)	1.57 (40)	9.72 (247)	4.13 (105)	M33 x 2	0.79 (20)
AS 10 00	060141	2.65 (10.19)	5801 (400)	117 (53)	15.39 (391)	10.55 (268)	13.35 (339)	2.07 (52.5)	2.07 (52.5)	13.11 (333)	4.14 (105.1)	M33 x 2	0.79 (20)
AC 00 02	060955	0.004 (0.017)	5801 (400)	1 (0.640)	see drawing								

HYDRO LEDUC provides after sales service, supplies spare parts and can requalify your accumulators (retesting).

AS series

ACCESSORIES

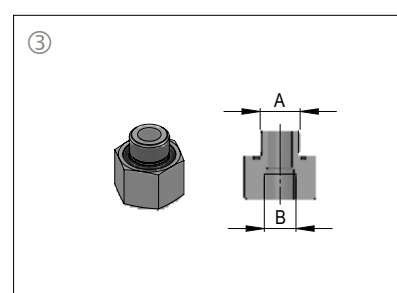
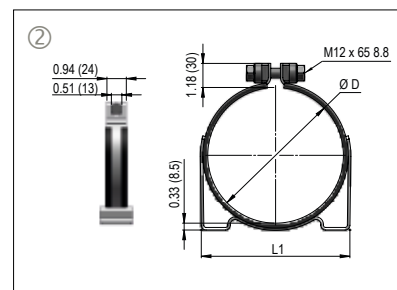
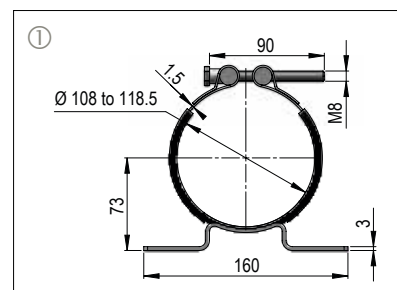
► Fixation clamps ① and ②

Volume gallons (Liters)	Characteristics	LEDUC code
0.13 (0.5) - 0.17 (0.7)	Zinc-plated steel	254021
	Zinc-plated steel quick-tightening	254031
	Stainless steel	254032

Volume gallons (Liters)	Dimensions inches (mm)			Characteristics	LEDUC code
	Ø D	L1	L2		
0.26 (1)	6.61 (168)	7.24 (184)	5.83 (148)	Zinc-plated steel	254022
0.66 (2.5)	8.27 (210)	10 (254)	8.35 (212)	Zinc-plated steel	254006
1.06 (4)	9.72 (247)	11.81 (300)	9.76 (248)	Zinc-plated steel	254005

► Adaptors ③

Volume gallons (Liters)	Dimensions inches (mm)		Characteristics	LEDUC code
	A	B		
0.26 (1)	M18 x 1.5	G1/2"	Steel	EC1054
0.66 (2.5)	G3/4"	G1/2"	Steel	066451
1.06 (4) - 2.64 (10)	M33 x 2	G1/2"	Steel	EC1059





► Technical description

The ABVE bottle type accumulators consist of:

- a forged steel body,
- a bladder,
- a charging valve,
- an oil side orifice fitted with a poppet valve which prevents extrusion of the bladder, and an air bleed screw used during system start-up.

► Advantages

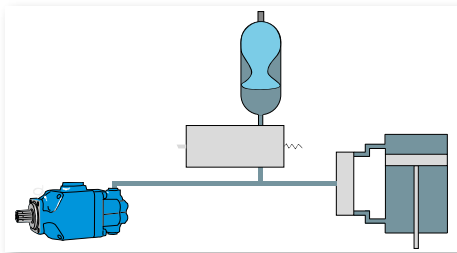
Bladder accumulator component parts are interchangeable with those of major accumulators available. Dimensions allow for easy installation and also use in batteries.

► Operating fluids

- Mineral-based hydraulic fluids: standard bladder.
- Non-standard and/or corrosive fluids: please consult our Customer Service Department.

► Examples of applications

Energy storage



ABVE 4786 psi (330 bar)

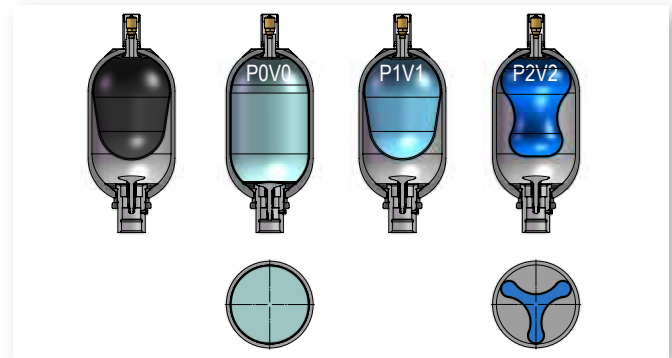
Maximum pressure: 4786 (330 bar)

ABVE 4 maximum pressure: 5076 (350 bar)

Extreme operating temperature:

- Standard version: -4°F to +176°F (-20°C to +80°C)

► Deformation of the bladder



► Filling gas

Nitrogen only.

► Volumetric ratio (V0-V2)/V0

The volumetric ratio of this type of accumulator is 0.75.

For example, an ABVE 4 accumulator can take in a maximum volume of $0.75 V_0 = 0.75 \times 4 = 3$ litres.

► Order code

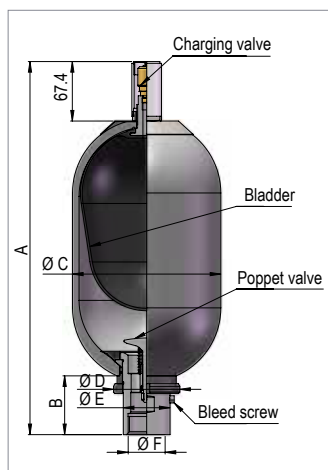
Capacity and code	Type of diaphragm	Charging valve	Control	Charging pressure
ABVE 10 066860	E/1	310379	D	Specify (in psi)
Either E/1 or E/3		310379: P1620 310308: V15N	D: CE approval	

E/1: NBR (nitrile)

available on special order:

E/3: ECO (epichlorohydrine)

CHARACTERISTICS AND DIMENSIONS



ABVE	LEDUC code	Nitrogen capacity Vo gallons (litres)	Max. pressure psi (bar)	Weight lbs (kg)	Dimensions inches (mm)					
					A	B	Ø C	D	E	Ø F
ABVE 4	066850	0.96 (3.7)	5076 (350)	30.9 (14)	(420)	(65)	169	75	(53)	G1 1/4"
ABVE 10	066860	2.39 (9.2)	4768 (330)	66.1 (30)	(568)	(88)	219	101	(76)	G 2"
ABVE 20	066870	4.63 (17.8)	4768 (330)	110.2 (50)	(888)	(88)	219	101	(76)	G 2"
ABVE 32	066880	8.32 (32)	4768 (330)	176.4 (80)	(1380)	(88)	219	101	(76)	G 2"
ABVE 50	066890	12.61 (48.5)	4768 (330)	220.5 (100)	(1885)	(88)	219	101	(76)	G 2"

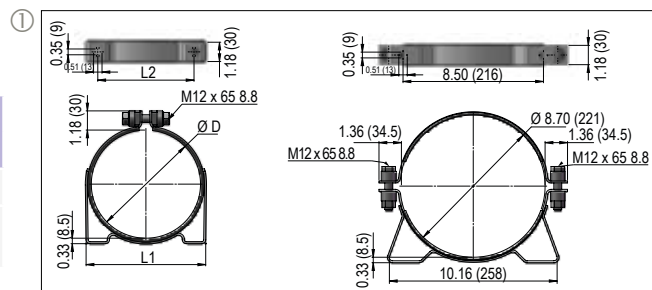
HYDRO LEDUC provides after sales service, supplies spare parts and can requalify your accumulators (retesting).



ACCESSORIES

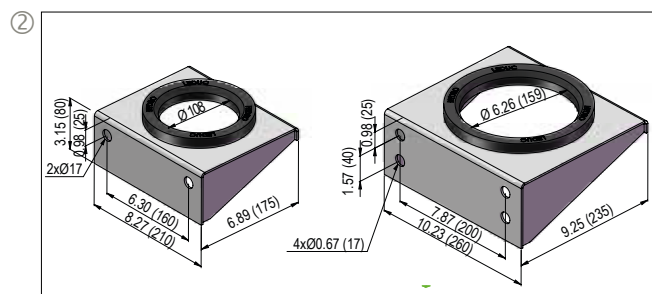
► Fixation clamps ①

Volume (L)	Dimensions			Characteristics	LEDUC code
	Ø D	L1	L2		
4	6.61 (168)	7.24 (184)	5.82 (148)	Zinc-plated steel	254022
10 - 20 32 - 50	8.70 (221)	10.16 (258)	8.50 (216)	Zinc-plated steel	254007



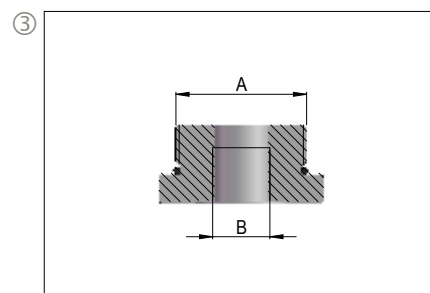
► Fixation seats ②

Volume (L)	LEDUC code
4	254012
10 - 20 - 32 - 50	254008



► Adaptors ③

Volume (L)	Dimension		Characteristics	LEDUC code
	A	B		
4	G1 1/4"	G3/4"	Steel	066305
10 - 20 - 32 - 50	G2"	G3/4"	Steel	066074
10 - 20 - 32 - 50	G2"	G1"	Steel	066068
10 - 20 - 32 - 50	G2"	Full	Steel	066069



► Technical description

APL accumulators are designed with a high mechanical resistance forged steel body.

The fluid-gas separating piston is equipped with seals adapted to:

- the fluids to convey,
- the operating temperature,

The APL accumulators can be fitted with a charging screw or charging valve, and are a modern solution for the needs of hydraulic circuits.

► Advantages

LEDUC APL piston accumulators, are designed:

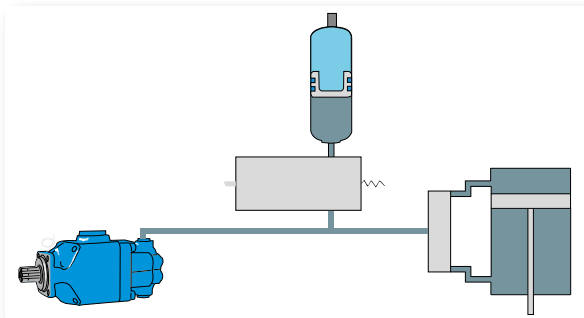
- to withstand very high volumetric ratios,
- to ensure total and rapid discharge of fluid,
- for assembly in any position,
- to guarantee minimal nitrogen loss overtime,
- for easy adaptation for use with different fluids and temperatures.

► Operating fluids

- Mineral-based hydraulic fluids.
- Non-standard and/or corrosive fluids: please consult our Customer Service Department.

► Examples of applications

Energy storage



APL 3626 psi (250 bar)

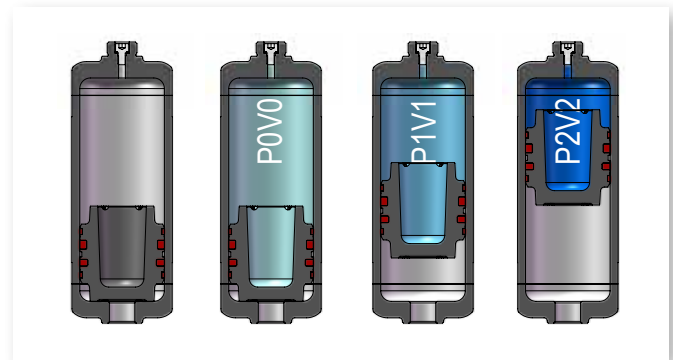
Maximum pressure: 3626 (250 bar)

Extreme operating temperature:

- Standard version: -4°F to 176°F (-20°C to + 80°C)
- For other temperatures, please consult us.



► Movement of the piston



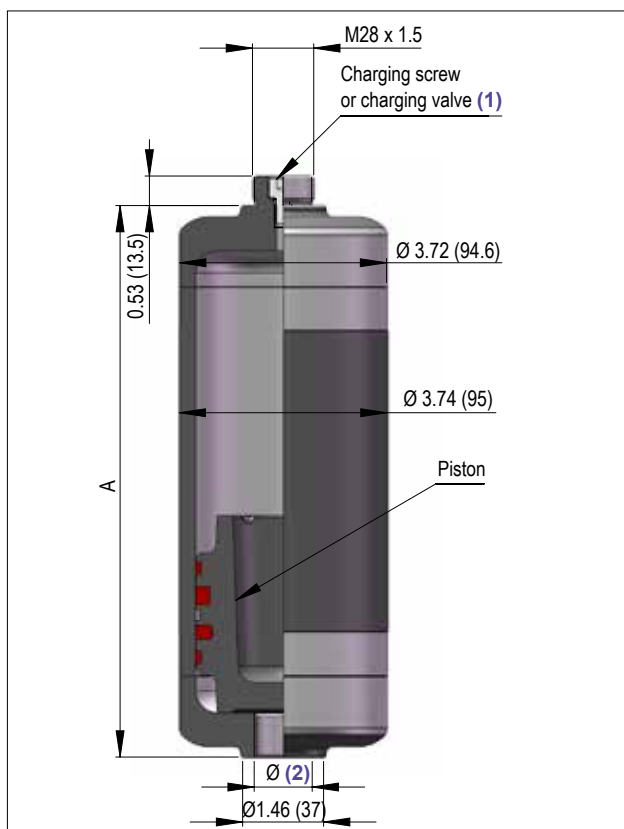
► Filling gas

Nitrogen only.

► Charging

Two versions available:

- with charging screw,
- with charging valve.



(1) See order code system code **06** (next page)

(2) Hydraulic connections - see order code system code **05** (next page)

CHARACTERISTICS AND DIMENSIONS

APL	Volume gallons (L)	Max. pressure psi (bar)	Weight lbs (kg)	Length A inches (mm)
	0.13 (0.5)	3626 (250)	13.7 (6.2)	7.96 (202.3)
	0.20 (0.75)		15.4 (7)	9.92 (252.1)
	0.26 (1)		17.4 (7.9)	11.88 (301.8)
	0.40 (1.5)		20.9 (9.5)	15.80 (401.3)
	0.53 (2)		24.5 (11.1)	19.72 (500.8)
	0.66 (2.5)		28.2 (12.8)	23.63 (600.2)
	0.79 (3)		31.7 (14.4)	27.55 (699.7)
	0.92 (3.5)		35.3 (16)	31.46 (799.2)
	1.06 (4)		38.8 (17.6)	35.38 (898.6)

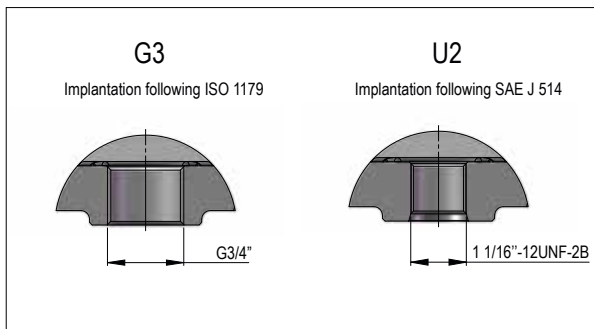
APL	..	D	08	..		.	N	.
01	02	03	04	05	06	07	08	09

To obtain the code of your piston accumulator APL, complete the different parameters from 01 to 09 in the table on the left according to the options you require (see table below).

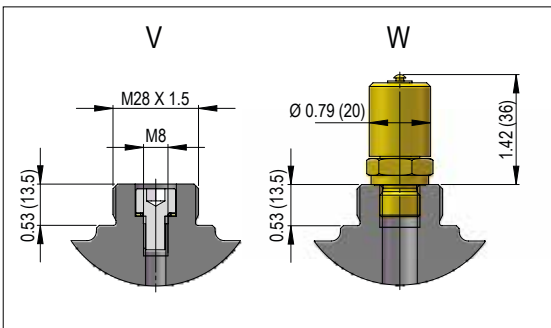
Make your choice as a function of the possible combinations, using the columns below, and use the code in the far right-hand column.

Accumulator type											
01	APL										APL
Volume (L)											
02		0.5	0.75	1	1.5	2	2.5	3	3.5	4	
Type of seal											
03	Double sealing	.	.	.	.	.	.	.	.	.	D
Diameter of the piston											
04	Ø 80 mm	.	.	.	.	.	.	.	.	.	08
Hydraulic connection											
05	G 3/4"	.	.	.	.	.	.	.	.	.	G3
	1 1/16" - 12 UN	.	.	.	.	.	.	.	.	.	U2
Gas side connection											
06	Screw M28 x 1.5	.	.	.	.	.	.	.	.	.	V
	P1620	.	.	.	.	.	.	.	.	.	W
Gas side options											
07	Without protection (P1620, Schrader) Plastic plug (Screw M28 x 1.5)	.	.	.	.	.	.	.	.	.	N
	With metallic plug	.	.	.	.	.	.	.	.	.	P
Hydraulic options											
08	Without protection	.	.	.	.	.	.	.	.	.	N
Charging pressure											
09	Specify the charging pressure (in psi)										

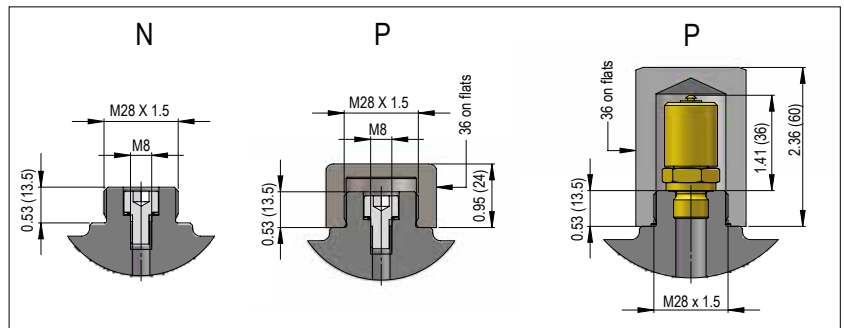
► Hydraulic connections - Code 05



► Gas side connections - Code 06



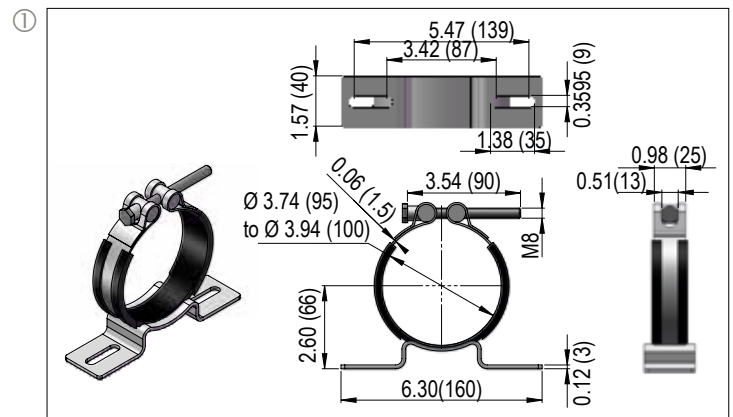
► Gas side options - Code 07



ACCESSORIES

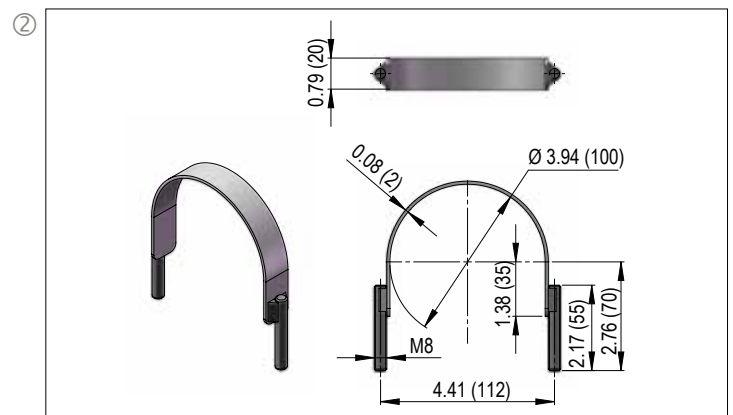
► Adjustable clamps ①

Volume gallons (L)	Characteristics	LEDUC code
0.13 - 0.20 - 0.26 - 0.40	Zinc-plated steel	C001026
0.53 - 0.66 - 0.79	Zinc-plated steel quick tightening	C001033
0.92 1.06		
(0.5 - 0.75 - 1 - 1.5 2 - 2.5 - 3 - 3.5 - 4)	Stainless steel	C001027



► Fixed clamps ②

Volume (L)	Characteristics	LEDUC code
0.13 - 0.20 - 0.26 - 0.40	Zinc-plated steel	C001029
0.53 - 0.66 - 0.79		
0.92 1.06		
(0.5 - 0.75 - 1 - 1.5 2 - 2.5 - 3 - 3.5 - 4)	Stainless steel	C001030



Tightening torque of the fixation screws: 14.7 lbf.ft (20 N.m).

DESCRIPTION

These safety and shut-off blocks are designed to bring together in a single block the necessary safety organs required for the correct operation of hydraulic circuits incorporating accumulators.

The basic block consists of :

- a ball valve with quarter turn closure, to isolate the accumulator from the circuit;
- needle valve ensuring the manual decompression of the circuit;
- relief valve (directly operated) set at the maximum operating pressure of the accumulator. This relief valve should never be used as a limiter to protect the hydraulic pump;
- the Q version is fitted with a one-way adjustable flow limiter. Mounted on the main block, this limiter controls the accumulator outlet flow, whilst inlet flow remains unrestricted.

► General technical characteristics

- nominal crossing diameter: 0.63 (16 mm) (BS 1 Block), 0.95 (24 mm) (BS 2 Block);
- maximum working pressure: 5800 psi (400 bar);
- temperature range: -4 to 158 °F (-20°C to +70°C);
- fluid: mineral based hydraulic oil (for other fluids please contact our Customer Service department);
- flow: see pressure loss graph;
- relief valve (nominal diameter): 0.24 (6 mm) (BS1), 0.39 (10 mm) (BS2);
- fitting of the BS2 Safety block, output side: welding-neck flange (CETOP 5800 psi (400 bar) standard).

NB1: the relief valve (0-400) is pre-set at 4786 psi (330 bar), but may be set at other values on request.

NB2: as standard, BS2 is fitted with a 2" port (accumulator side).

The safety and shut-off blocks are available in a simplified version.

They consist of a relief valve (directly operated) set at the maximum operating pressure of the accumulator. This relief valve should never be used as the limiter to protect the hydraulic pump.



ORDER CODE

Size

- 1 = size 16
- 2 = size 24

Decompression control

- M = manual

Flow limiter

- Q = with limiter
- Nothing written = without limiter

Pressure relief valve setting

- 0 to 5800 psi (400 bar) depending the accumulator

Option for BS1

- A = ACS - ACSL 1 to 4 (3/4") BS1 without pressure relief valve connection
- B = ABVE 4 (1 1/4") BS1 without limiter
- C = ABVE 10 to ABVE 50 (2") BS1 without limiter
- Q = for BS1 with limiter

Note : order codes for the simplified safety and shut-off blocks:
BS pressure setting of the relief valve.

Example 1:

A size 16 block, with followed by required manual decompression control with relief valve set at 4786 psi (330 bar), and fitting flange 1 1/4": BS1M24Q330BQ.

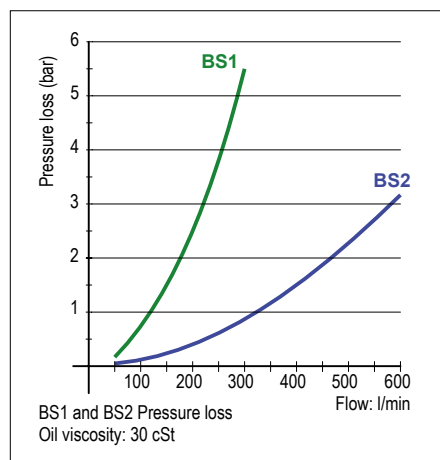
Example 2:

A size 24 block, with manual decompression control, relief valve set at 3626 (250 bar): BS2M250.

Example 3:

(simplified safety and shut-off block): a simplified safety and shut-off block with relief valve set at 4786 psi (330 bar): BS330.

► Graph of pressure drop as a function of flow





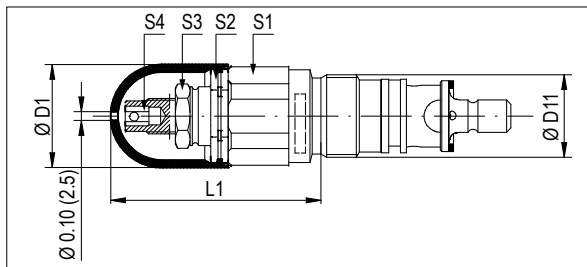
► DBDS cartridges

The pressure relief valve integrated in BS1 and BS2 safety blocks (see pages 20 and 21) are designed to limit the maximum pressure of the circuit to ensure it cannot exceed the maximum rated pressure of the accumulator.

► General technical characteristics

Type	LEDUC code	Reference	Pressure range (bar)	Ø D11	Tightening torque (N.m)	Weight lbs (kg)
Size 6	DBDS 6	310396	150-300	M28 x 1.5	80	0.9 (0.4)
		310328	300-400			
		310395	25-150			
Size 10	DBDS 10	310551	25-150	M35 x 1.5	140	1.1 (0.5)
		310552	150-300			
		310329	300-400			

Hydraulic fluid	Mineral oil	
Required fluid cleanliness class	ISO 4406 class 20/18/15	
Nominal fluid viscosity	37 mm ² /s at temperature 131 °F (55°C)	
Viscosity range	From 2.8 to 380 Cst	
Fluid temperature range (in tank)	Recommended: from 104 to 131 °F (40 to 55°C) Maxi : from -4 to 158°F (-20° to +70°C)	
Ambient temperature range	From -4 to 158°F (-20° to +70°C)	
Max. operating pressure	DBDS 6	DBDS 10
	5800 psi (400 bar)	2175 psi (150 bar)
Max. pressure in T port	43.5 psi (3 bar)	

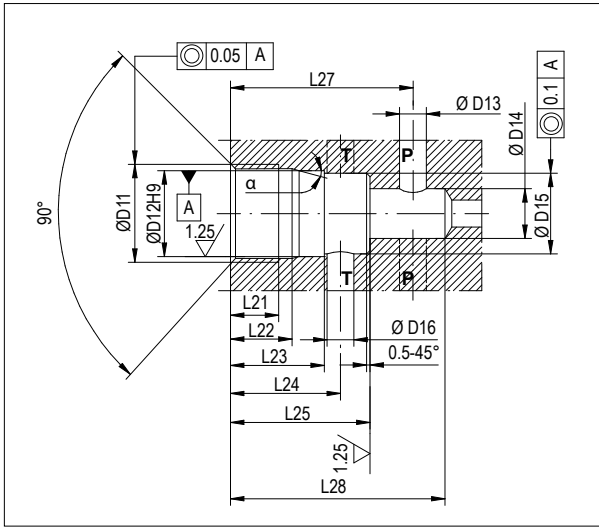


► Dimensions

Type	S1	S2	S3	S4	L1
Size 6	1.26 (32)	1.18 (30)	0.75 (19)	0.24 (6)	2.83 (72)
Size 10	1.42 (36)	1.18 (30)	0.75 (19)	0.24 (6)	2.68 (68)

These dimensions inches (mm) are given as an indication.

► Dimensions



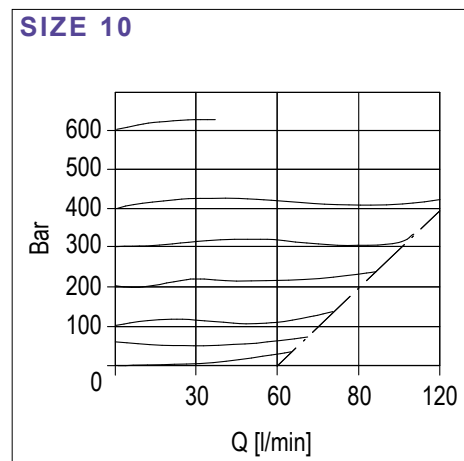
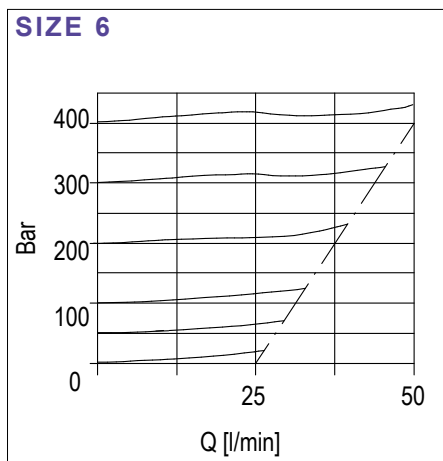
► Dimensions of the implantation of the DBDS cartridge

Type	$\varnothing D11$	$\varnothing D12$	$\varnothing D13$	$\varnothing D14$	$\varnothing D15$	$\varnothing D16$	L21	L22	L23	L24	L25	L27	L28	α
Size 6	M 28 x 1.5	0.98 (25)	0.24 (6)	0.59 (15)	0.98 (24.9)	0.24 (6)	0.60 (15)	0.75 (19)	1.18 (30)	1.38 (35)	1.78 (45)	2.22 (56.5) ± 5	2.56 (65)	15°
Size 10	M 35 x 1.5	1.26 (32)	0.39 (10)	0.73 (18.5)	1.26 (31.9)	0.39 (10)	0.71 (18)	0.91 (23)	1.38 (35)	1.61 (41)	2.05 (52)	2.66 (67.5) ± 7	3.15 (80)	15°

► Performance curves

Mesured at :

- Viscosity $\nu = 41$ Cst
- Temperature $t = 122$ °F (50°C).




These dimensions inches (mm) are given as an indication.

CHARGING VALVES

The P 1620 universal valve exists in two versions:

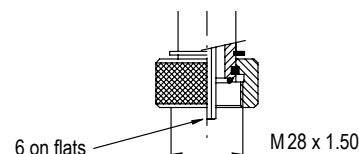
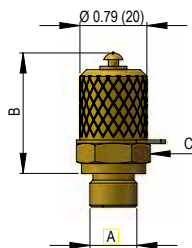
- P 1620: standard valve, thread M 16 x 200.
- PX 1620: stainless steel valve, thread M 16 x 200.

Valve type	LEDUC code	Gas side Implantation 	Accumulator type	Remark	Charging device	Adaptor
P1620	310367	G 1/4	ACS-ACSL-AS-APL	Standard	VGL4	M 16 x 2.00
	310379	M10 x 1.50	ABVE	Standard		
PX1620	310527	G 1/4	AS	Stainless steel		5/8" 18 UNF
V15N	310308	M10 x 1.50	ABVE	Stainless steel		

Screw	066542	M8 x 1.25 with ring BS 130331A	ACS - ACSL	Standard	VGL 4	None
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Schrader	067210	G1/4	ACS-ACSL-AS-APL		VGL 4	8V1
----------	--------	------	-----------------	--	-------	-----

LEDUC code	B inches (mm)	C on flats inches (mm)
310367	1.42 (36)	0.75 (19)
310379	1.50 (38)	0.67 (17)
310527	1.42 (36)	0.75 (19)



CHARGING KIT

Reference: CGLU 4F 066650

CGLU 4F: includes hose adapter for use on French and German nitrogen bottles. The charging kit comprises:

- VGL 4 universal pressure charging and gauging device (M28 x 1.50 outlet)
- two pressure gauge kits: 0 to 363 psi (0 to 25 bar) and 0 to 3626 psi (0 to 250 bar), additional manometers on request 0-1450; 0-5801 (0-100; 0-400);
- adapters for connection to charging valves (M16 x 200 - 5/8" 18UNF - G3/4" - 7/8" 14UNF - 8V1);
- 98.4 inches (2.50 m)-long hose, for connection to a source of nitrogen, standard version for pressures up to 5800 psi (400 bar). For higher pressures, please contact our Technical Sales Dpt..
- 6 mm A/F Allen wrench;
- spare seal kit.

CHARGING AND GAUGING DEVICE

Reference : VGL 4 066660

Description:

The VGL 4 charging and gauging device is the essential instrument to the checking and the nitrogen purge or the accumulator.

Technical characteristics:

- maximum pressure: 5800 psi (400 bar)
- accumulator connection:
M 16 x 200 - 5/8" 18UNF - G3/4" - M28 x 1.50.
- Pressure gauges: 2.48 inches (63 mm) diameter (glycerin-bath type) with G1/4" Cyl. rear outlet, fitted with a direct-connection to a rapid connector.
- Scale 0-5800 psi (0-400 bar) (or other on request) with accuracy of 1.6.

► Installing your accumulator:

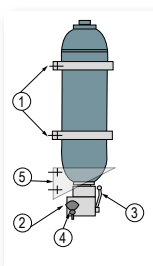
Before installation, it is essential to visually check the accumulator for any external damage.

For optimal operation, the accumulator should be placed as close as possible to the application. It should be installed in a vertical position with the charging valve or screw at the top. For use in a horizontal position, please contact our Technical Department. The accumulator should be installed in an easily accessible place and be fixed using robust collars ①, a seat etc.



It is strictly forbidden to make any modification to the accumulator (welding, grinding, machining etc.), or to change the information engraved on the accumulator.

The circuit should include an isolation valve to isolate the accumulator, and also a means of checking that the hydraulic pressure never exceeds the maximum service pressure engraved on the accumulator. The accumulator must be connected to a relief valve ④ set at the accumulator's maximum authorized service pressure. All of these functions are ensured by HYDRO LEDUC safety and shut-off blocks BS1M and BS2M (see pages 20-21).



Check that the fluid is compatible with the materials used in the accumulator: the shell, elastomer, and the fluid used for the hydraulic testing.

Suitable fluid : mineral-based hydraulic fluid or equivalent.
For other fluids, please consult our Technical Department.

► Start up:

Accumulators are supplied either with a pre-charge pressure for storage of around 5 bar, or with pre-charge pressure as specified and corresponding to the requirement calculated depending on working conditions. The pre-charge pressure is engraved on the accumulator shell.
Pre-charge pressure of LEDUC accumulators (all sizes).

For all pre-charge pressures greater than or equal to 20 bar, the tolerance is -29/+87 psi (-2/+6 bar).

For a tighter tolerance, please contact our Technical Department.

All pre-charge pressures done by HYDRO LEDUC are adjusted at ambient temperature of 68°F (20°C).

- Pre-charge pressure should be checked before start-up : see the recommendations sheet supplied with each accumulator.
- Check pre-charge pressure, or charge to required pressure level, using the charging and gauging device (see page 24), see also instructions supplied with the device. The influence of temperature on pre-charge pressure must be taken into consideration.
- Please note that a slight loss of nitrogen is possible when checking pre-charge pressure.



It is strictly forbidden to use any gas containing oxygen or an air compressor which would lead to danger of explosion.
Use only bottled dry nitrogen.

Check that the hydraulic installation is capable of withstanding the maximum service pressure engraved on the accumulator. Check that maximum service pressure of the accumulator never exceeds the maximum service pressure engraved on the shell and on the name plate.

Volumetric ratio (V0-V2/V0) must not be exceeded, see page 5.

Bleed the pipework of any air.

► Maintenance:

- Before intervening on any circuit which has a gas filled pressure vessel, the pressure must be discharged from the circuit.
- Check nitrogen pressure during the first few weeks of operation and adjust the frequency of checks depending on application.
- Ensure at every check that the accumulator has been isolated from the circuit, and that there is no more pressure in fluid side. Use the charging and gauging device VGL reference 066660 (see page 24).
- Be careful to use a manometer with a measuring range compatible with the nitrogen pressure to be checked.
- Visually inspect the accumulator regularly for any signs of deterioration such as corrosion, deformation etc.
- For cleaning recommendations and precautions : please contact our Technical Department.
- For spare parts, only use LEDUC parts.
- The user is not authorized to change any part of the accumulator without the manufacturer's prior approval. An accumulator is made up of sub-assemblies. Any modification not authorized by the manufacturer and its notified body invalidates the CE certification of the whole accumulator.

► Legislation

Hydraulic accumulators are gas pressure vessels.

The manufacture of such products must conform to Directive 2014/68/UE.

Local regulations and legislation must be strictly respected regarding the use of accumulators.

► Pressure Equipment Directive (PED) 2014/68/EU

LEDUC accumulators of less than 1 litre capacity are supplied with a manufacturer's certificate. They cannot be stamped CE, but conform to the Directive 2014/68/UE.

LEDUC accumulators of 1 litre capacity or more are supplied with a Certificate UE of conformity. They bear the CE stamp and the reference of the official organisation certifying their conformity.

Use of these accumulators in France is governed by decree dated 15 March 2000 (Official Bulletin n°96).

► Useful addresses:

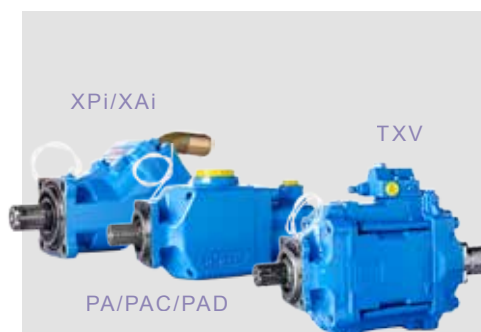
- French legislation and application of directive 2014/68/UE:
<http://www.adminet.com/jo>
- European legislation: <http://europa.eu.int>

Independent approved organisations: APAVE, TÜV, VERITAS...

Determine the right LEDUC accumulator for your application:
Our calculations software, free of charge, is available by e-mail on request.



PISTON PUMPS FOR TRUCKS



HYDRO LEDUC offers 3 types of piston pumps perfectly suited to all truck and PTO-mount applications.

- Fixed displacement from 0.73 to 7.93 cu.in/rev (12 to 130 cc/rev)
- Fixed displacement, twin-flow, from 2x1.53 to 2x4.58 (2x25 to 2x75 cc/rev)
- Variable displacement, with LS control (load sensing) from 2.44 to 9.15 cu.in/rev (40 to 150 cc/rev).

MOBILE & INDUSTRIAL PUMPS



The W range is composed of fixed displacement pumps, and the DELTA range, of variable displacement pumps. These pumps can operate at high pressures within minimal size.

► W and WA (SAE)* pumps:

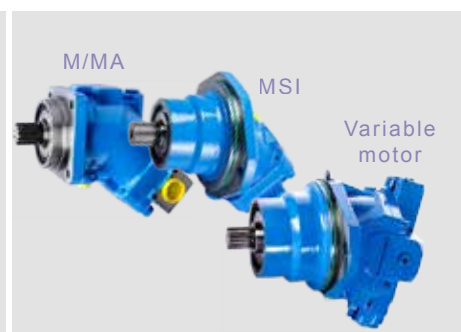
- Fixed displac. from 0.30 to 7.65 cu.in/rev (5 to 125 cc/rev).
- ISO 3019/2 or SAE flanges.
- DIN 5480 or SAE shafts.

► DELTA pumps:

- Variable displacement from 2.44 to 5.61 cu.in/rev (40 to 92 cc/rev)
- SAE shafts and flanges.

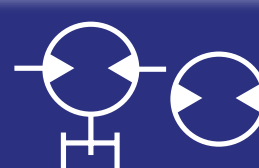
* For SAE version, please ask.

HYDRAULIC MOTORS



Fixed and variable displacement piston motors

- Models from 0.31 to 11.02 cu.in/rev (5 to 180 cc/rev).
- Available in DIN and SAE versions
- In fixed displacement, special drainless motor.





Complete catalogues available at www.hydroleduc.com

HYDROPNEUMATIC ACCUMULATORS



Diaphragm, bladder, bladder-diaphragm and piston accumulators.

Capacities from 0.005 to 13.21 US gallons (0.02 to 50 litres).

- Operating pressure up to 5800 psi (400 bar)
- Accessories for use with hydraulic accumulators.

MICRO HYDRAULICS



This is a field of exceptional HYDRO LEDUC know-how:

- Axial and radial piston pumps, of fixed and variable displacement
- Axial piston micro-hydraulic motors
- Micro-hydraulic units incorporating pump, electric motors, valving, controls, etc.

HYDRO LEDUC offers complete, original and reliable solutions for even the most difficult environments, and within the smallest size envelopes.

A dedicated R&D team means HYDRO LEDUC is able to adapt or create products to meet specific customer requirements.

Working in close cooperation with the decision-making teams of its customers, HYDRO LEDUC optimizes proposals based on the specifications submitted.



A passion for hydraulics



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