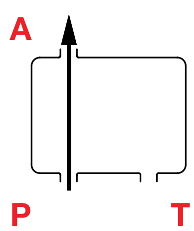
LARZEP HYDRAULIC

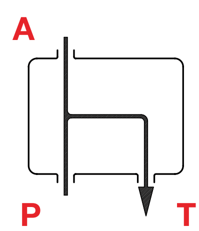
VALVE INFORMATION

CONTROL OF SINGLE ACTING CYLINDERS

Single acting cylinders require 3-way valve.
3-way valve has 3 ports: P pump, T tank and A cylinder.
3-way valve can have 2 or 3 positions.
2 position valve can only control the advance or the retraction of the cylinder.

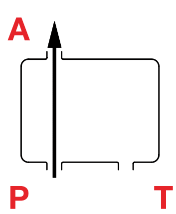
ADVANCE: Oil flows from the pump P to the cylinder A. The cylinder will extend.	**RETRACT**: Oil flows from the cylinder A and pump P to the tank T. The cylinder will retract.

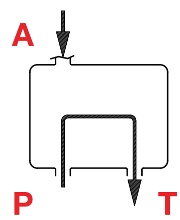


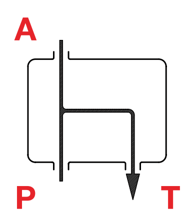


3 position valve controls advance, hold and retraction of the cylinder.

ADVANCE: Oil flows from the pump P to the cylinder A. The cylinder will extend.	**HOLD**: Oil flows from the pump P to the tank T. A port is closed and holds the pressure maintaining the extended position.	**RETRACT**: Oil flows from the cylinder A and pump P to the tank T. The cylinder will retract.



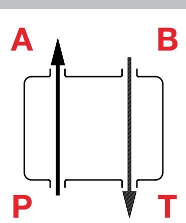


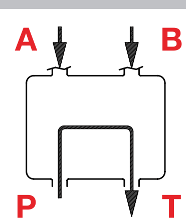


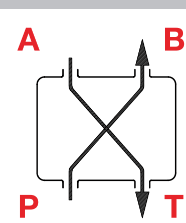
CONTROL OF DOUBLE ACTING CYLINDERS

Double acting cylinders require 4-way valve.
4-way valve has 4 ports: P pressure, T tank, A advance and B retract.
4-way valve has 3 positions. 3 position valve can advance, hold and retract the cylinder.

ADVANCE: Oil flows from the pump P to the advance port A and from the return port B to the tank T. The cylinder will extend.	**HOLD**: Oil flows from the pump P to the tank T. A and B ports are closed and hold the pressure maintaining the extended position.	**RETRACT**: Oil flows from the pump P to the retract port B and from the advance port A to the tank T. The cylinder will retract.







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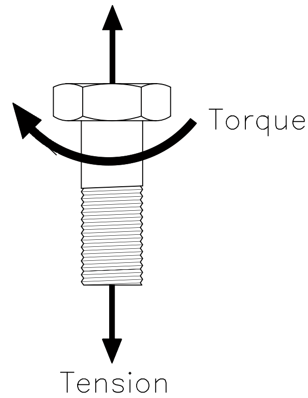
TECHNICAL INFORMATION

TORQUE TIGHTENING

The main function of the bolts and nuts is to create a clamping force across the joint which is able to sustain the operation conditions without loosening.

TIGHTENING

The most used methods to tighten threaded fasteners are Torque, which is rotation of the nut or bolt head, or Direct Tension to stretch the fastener.

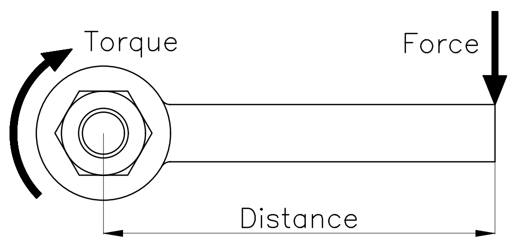


Hooke's Law states that the stress in a bolt is directly proportional to its strain, provided the applied force is kept within the materials elastic limits.

A fastener should be tightened until it has a retained tension of 40-60% of its elastic limit.

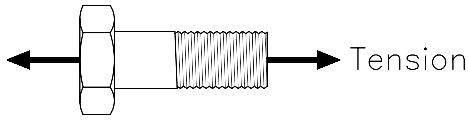
Torque: It is the turning or twisting force extended on a nut or bolt head. It is the product of two measurements: force and distance (N·m in the metric system).

The amount of torque to be applied to a threaded fastener depends on several factors: design application, type of joint, size, length and quantity of fasteners to be used and type of thread lubricant.



WARNING **Loosening a nut or bolt usually requires more torque than tightening, mainly due to corrosion and deformation in the bolt and nut threads. Depending on conditions, breakout torque can take up to 2 ½ times the input torque.**

Direct tension: It is applied to the fastener using a hydraulic tensioning device commonly known as a hydraulic stud bolt tensioner.

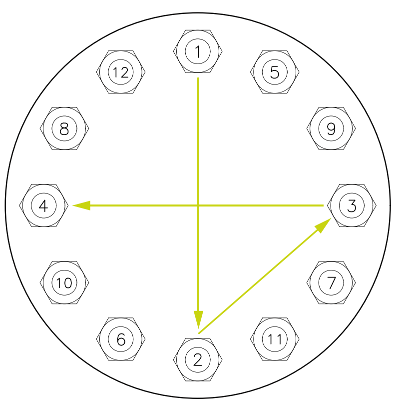


TORQUE PATTERN

When all bolts cannot be tensioned or tightened simultaneously and only can tighten one bolt at a time, this can result in point loading and load scatter.

To avoid this, start tightening the bolts sequentially following the pattern shown, starting with a first pass at **25%** of the final required torque, a second pass at **50%** and a third pass at **100%**.

Finally, perform a final check pass on each bolt working clockwise from bolt 1 at 100% of the required torque to ensure all bolts are uniformly tightened.



LARZEP HYDRAULIC

BASIC HYDRAULICS

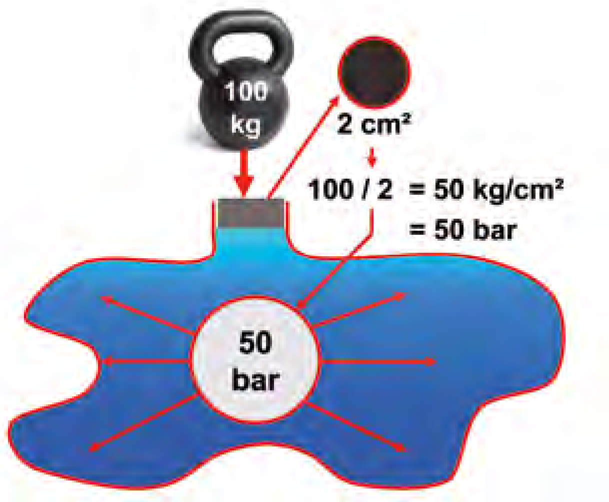
PASCAL'S LAW

Pressure applied at any point upon a confined fluid is transmitted undiminished in all directions.

The hydraulic pressure at any point within the fluid is the same in all directions.

Hydraulic pressure is measured as a force per unit of area:

kg / cm² ≈ bar

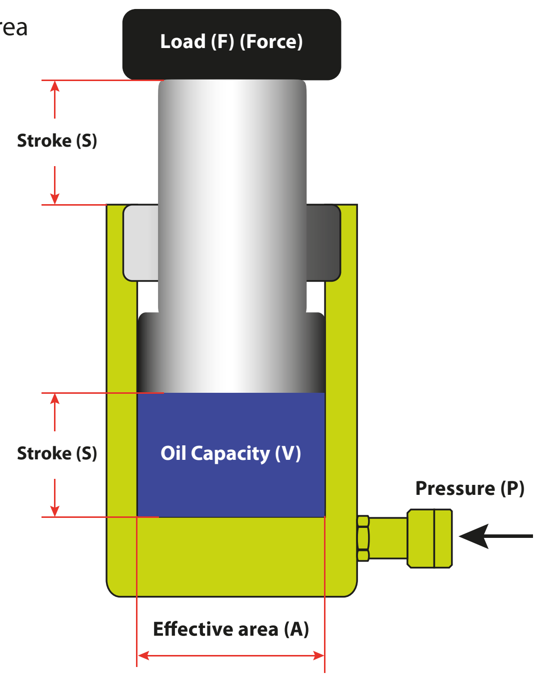


FORCE

The force that a hydraulic cylinder can apply depends on the effective area of the cylinder and the hydraulic pressure.

Force (kg) = Hydraulic Pressure (bar) x Cylinder Effective Area (cm²)

F (kg) = P (bar) x A (cm²)



OIL CAPACITY

When a hydraulic cylinder is operated by a hand pump, the cylinder plunger moves a certain distance per pump actuation. This distance depends on the cylinders effective area and on the pump's oil flow per stroke.

Minimum effective tank volume of pump is the sum of the oil volume of all cylinders and all hoses.

The volume of oil required for a cylinder is which need to achieve the full stroke of the cylinder.

Cylinder Oil Capacity (cm³) = Cylinder Effective Area (cm²) x Cylinder Stroke (cm)

V (cm³) = A (cm²) x S (cm)

The oil flow always chooses the line of least resistance in a hydraulic system. When using more than one hydraulic cylinder, each cylinder lifts at its own speed. When the cylinders have the same capacity, it will start moving first the cylinder at the point of the lightest load and last the cylinder at the point of the heaviest load.

To make sure that the oil flow can be controlled to operate all the cylinders uniformly to lift the load horizontally, a control valve or a split-flow pump must be used.

CYLINDER PISTON EXTENDING SPEED

$$\text{Piston Speed } \mathbf{v\ (mm/s)} = \frac{\text{Pump Oil } \mathbf{Flow\ (cm^3/min)\ x\ 10}}{\text{Cylinder Effective } \mathbf{Area\ (cm^2)\ x\ 60}}$$

INFORMATION

UNIT CONVERTER

LENGTH	
1 mm	= 0,039 in
1 cm	= 0,393 in
1 m	= 3,28 ft
1 in	= 25,4 mm
1 in	= 0,083 ft
1 ft	= 4 in
1 ft	= 0,305 m

MASS	
1 kg	= 2,205 lb
1 kg	= 35,27 oz
1 t	= 1000 kg
1 t	= 2205 lb
1 t	= 1,1 ton (short)
1 lb	= 0,453 kg
1 ton (short)	= 907,18 kg
1 ton (short)	= 0,907 t
1 ton (short)	= 2000 lb

FORCE	
1 kg	= 9,8 N
1 N	= 0,1019 kg
1 N	= 0,225 lb
1 kN	= 0,1019 t
1 kN	= 224,8 lb
1 lb	= 4,448 N

POWER	
1 kW	= 1.359 hp
1 hp	= 0,735 kW
1 w	= 1 J/s

AREA	
1 cm^2	= 0,155 in^2
1 m^2	= 10,76 ft^2
1 in^2	= 6,45 cm^2
1 in^2	= 645 mm^2

PRESSURE	
1 bar	= 0,1 MPa
1 bar	= 10 N/cm^2
1 bar	= 1,0197 kg/cm^2
1 bar	= 14.5 psi
1 Pa	= 1 N/m^2
1 kPa	= 0.,145 psi
1 MPa	= 10 bar
1 N/cm^2	= 0,1 bar
1 kg/cm^2	= 0,98 bar
1 psi	= 0,069 bar
1 psi	= 1 lb/in^2

TORQUE	
1 kg·m	= 9,8 N·m
1 kg·m	= 86,79 lb·in
1 kg·m	= 7,233 lb·ft
1 N·m	= 0,1019 kg·m
1 N·m	= 8,85 lb·in
1 N·m	= 0,737 lb·ft
1 lb·ft	= 0,138 kg·m
1 lb·ft	= 1,356 N·m
1 lb·ft	= 12 lb·in
1 lb·in	= 0,0115 kg·m
1 lb·in	= 0,113 N·m

VOLUME	
1 cm^3	= 0,061 in^3
1 m^3	= 1000 l
1 m^3	= 1,3 $yard^3$
1 ml	= 1 cm^3
1 ml	= 0,035 oz-liq
1 l	= 1000 cm^3
1 l	= 0,264 gal (US)
1 l	= 0,219 gal (UK)
1 l	= 61,023 in^3
1 l	= 0,035 ft^3
1 l	= 1,056 quart
1 in^3	= 16,387 cm^3
1 in^3	= 0,016 l
1 in^3	= 0,576 oz-liq
1 in^3	= 0,017 quart
1 gal (UK)	= 4,546 l
1 gal (US)	= 3,785 l
1 gal (US)	= 3785 cm^3
1 gal (US)	= 231 in^3
1 gal (US)	= 0,133 ft^3
1 quart	= 0,946 l

FLOW	
1 l/min	= 1000 cm^3/min
1 l/min	= 0,264 gal/min (US)
1 l/min	= 0,22 gal/min (UK)
1 cm^3/min	= 0,61 in^3/min
1 in^3/min	= 16,4 cm^3/min
1 gal/min (US)	= 3,785 l/min

TEMPERATURE	
(˚C x 1,8) + 32	= ˚F
(˚F - 32) / 1,8	= ˚C

Visit our website **www.larzep.com** and use the Unit converter application.

LARZEP HYDRAULIC

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