

Enerpac Integrated Solutions

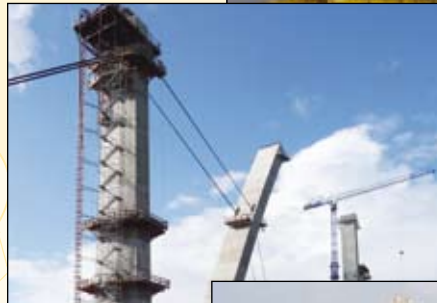
With more than 50 years of experience, Enerpac has gained unique expertise which is acknowledged by industrial and construction professionals around the world. In addition to standard products and components, Enerpac specializes in the design, manufacture and supply (sale & rental) of high-force hydraulic systems required for the precise controlled movement of heavy structures.

Engineers and construction experts consult with Enerpac to develop integrated hydraulic solutions, which have included:








- The incremental launching equipment for the tallest bridge in the world – le Viaduct de Millau (France),
- Construction solutions for the China Olympics – Beijing's National Stadium, the world's largest steel structure and the retractable roof system for the Nantong Olympic Stadium.
- Automatic foundation leveling systems for offshore wind turbines,
- Strand jacking equipment for construction, oil & gas and industrial heavy lifting applications.


Across every continent Enerpac has presence through local offices, including application engineers, authorized distributors and service centers to deliver innovative solutions and technical assistance.

The deciding factor to choose for Enerpac resides on a history of supply of quality products & systems as well as a strong relationship with customers, Enerpac local representation and an excellent back-up in technical support on a global front.



Integrated Solutions Section Overview


Capacity ton (kN)	Capabilities	Series	
N/A	Synchronous Lifting Systems Standard 4 to 16 point lift system	ESS	 ▶
N/A	Synchronous Lifting Systems Premium 4 to 64 point lift system	EPS	 ▶
37 - 673 (360 - 6600)	Heavy Lifting Strand Jack Systems Accurate lifting, lowering or horizontal movements of heavy loads	TT	 ▶
5,5 - 37 kW	Strand Jack Hydraulic Pumps Master PLC-Control Units Control multiple strand jacks & pumps	TTP	 ▶▶
50 - 200 (498 - 1995)	Stage Lifting Systems Incremental lifting	BLS	 ▶
60 - 110 (605 - 1110)	Synchronous Hoisting Systems SyncHoist – hydraulic precision positioning systems	SHS	 ▶
0,25 - 250 (2,2 - 2222)	Uni-Lift® Actuators Mechanical precision positioning	M B	 ▶


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Enerpac's INTEGRATED SOLUTIONS
combining world-class technology with extensive engineering expertise



Innovative Solutions in Controlled Movement

Enerpac combines its expertise in the accurate control of positioning, speed and force to facilitate the precise movement of some of the largest and most well-known structures on Earth. The safety and reliability provided by Enerpac's experience and technology have led to innovative solutions for supporting assembly of the 'Bird's Nest' stadium in Beijing, the lifting & balancing of a 5000-ton buckethead excavator in Australia, supporting the launch of France's Millau Viaduct, and lifting the famous Golden Gate Bridge in San Francisco for seismic retrofits. Contact us to discuss your most challenging project.

1 Sync Lift
2 Synchost
3 Cylinders
4 Pumps
5 Heavy lifting strand jacks
6 Sliding systems
7 Bridge launching equipment
8 Permanent hydraulic systems
9 Construction OEM systems
10 Manually Controlled Lift Systems
11 Custom Press

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Contact Enerpac!

Contact the Enerpac office nearest to you for advice and technical assistance in the layout of your ideal Lifting System or visit us at: **www.enerpac.com**.

Or ask Enerpac for assistance by email: **integratedsolutions@enerpac.com**.



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Standard 4 to 16 Point Lifting System

▼ ESS-Series 8-point Synchronous Lifting System (shown without cylinders)



- Stroke and load controlled movement for positioning and weighing
- Measurement accuracy better than 1,0 mm between leading and lagging cylinders
- Data storage and recording capabilities
- Load and stroke alarms for optimal safety
- For use with standard single or double-acting cylinders
- Integrated 700 bar hydraulic pump and controls.



▼ Synchronous system lifted and monitored the load of the bridge as pier heads were rebuilt for wider traffic lanes, while highway below and the railway on top of this bridge were kept operational.



Controlled Hydraulic Movement for Positioning and Weighing



Typical Synchronous Lifting Applications

- Lifting, lowering, weighing of heavy structures
- Centre of gravity measurement
- Bridge maintenance
- Deck lifting & bearing replacement
- De-propping/load transfer from temporary steel work
- Heavy plant installation
- Incremental bridge launching & box jacking
- Pile testing
- Foundation shoring.



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Or ask Enerpac for assistance by email: integratedsolutions@enerpac.com.



Lifting Cylinders

For a complete line of Enerpac cylinders, see the Cylinder and Lifting Products Section of this catalogue.



Premium Synchronous Lifting Systems

For networking, data storage, preprogrammable and recording functions, graphical representation and up to 64 lifting points see the **EPS-Series** Synchronous Lifting System.



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Standard 4 to 16 Point Synchronous Lifting System



Synchronous Lifting

The synchronous lift system uses feedback from multiple sensors to control the lifting, lowering and positioning of any large, heavy or complex structure, regardless of weight distribution.

Synchronous lifting reduces the risk of bending, twisting or tilting, due to uneven weight distribution or load-shifts between the lift points.

A PLC controller monitors each lift position stroke and optional load transducers located at each lift point. By varying the oil flow to each lift point, the system maintains very accurate positional control.

This control maintains structural integrity and can increase the productivity and safety of the lift, by eliminating manual intervention in the event of a load-shift or other problem.

Programmable and failsafe monitoring and safety alarms include operating parameters and hydraulic conditions, such as oil-level and over-temperature.

Programmable data recording and "differential-lift" options allow a load to be manipulated into a pre-set position.

ESS Series



Number of Lifting Points:

4, 8, 12 or 16

Accuracy Over Full Stroke:

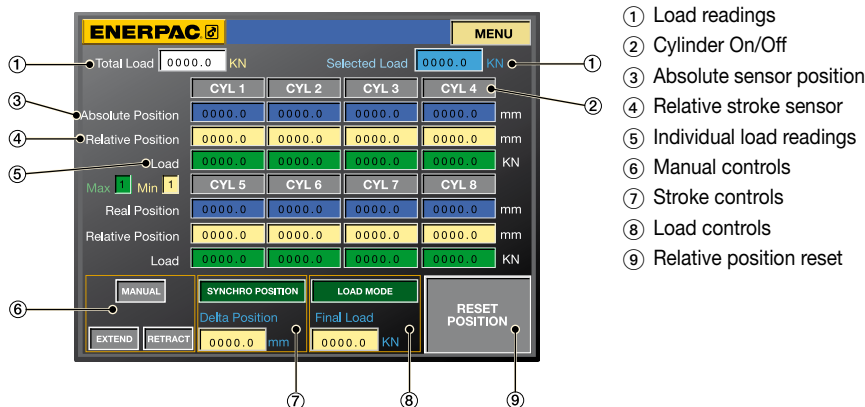
± 1,0 mm

Maximum Operating Pressure:

700 bar



▼ Touch screen display of ESS-Series synchronous lifting PLC-controller

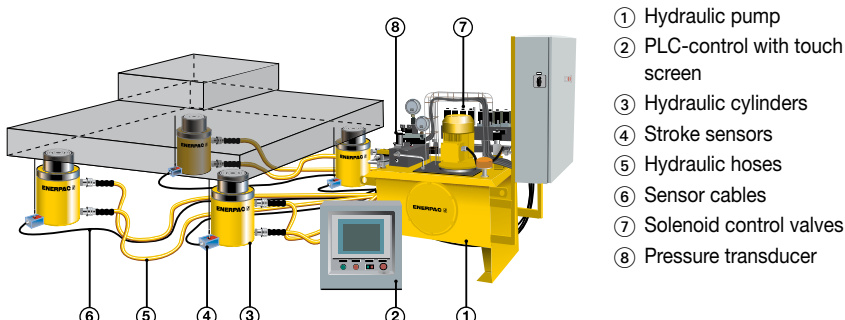


▲ PLC-controller station for ESS-Series synchronous lifting system.

▼ Offshore wind turbines levelling in the North Sea, Germany: Enerpac's hydraulic synchronous lifting system provided the solution for levelling the supporting cross pieces for 80 wind turbines of 5 MW each.



▼ Typical layout for a 4-point ESS-Series synchronous lifting system



Premium 4 to 64 Point Lifting System

▼ EPS-Series 4-point Premium Synchronous Lifting System



- Controls up to 64 lifting points
- Networking available to connect multiple systems
- Stroke, load and tilt controlled movement
- Hydraulic weighing and centre of gravity functions
- Dynamic load or stroke compensation
- Load and stroke alarms for optimal safety
- Pre-programmable movement
- Measurement accuracy better than $\pm 0,25$ mm between leading and lagging cylinders
- Data storage, recording capabilities and graphic representation available
- For use with standard single- or double-acting cylinders
- Integrated 700 bar hydraulic pump and controls.



Ideal for lifting applications requiring customised control features



Lifting an Unbalanced Load

Visit www.enerpac.com to learn more about hydraulics and system set-ups.



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EPS-Series Premium Synchronous Lifting Systems

The potential applications of this system are numerous. Synchronised lifting, lowering, pushing, pulling and positioning using computer technology and high-pressure hydraulics has become popular in many industries around the world.

The lifting or lowering capacity of this system is unlimited. By adding more or larger hydraulic cylinders to the setup, the system will allow jobs of 50.000 ton and more to be lifted with a high-level of safety and accuracy.

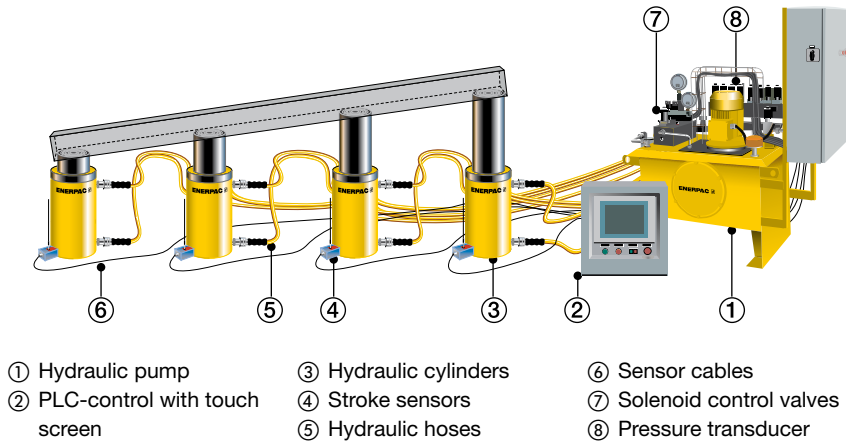
◀ Hydraulic lifting, weighing and manipulation system. During the lifting procedure the 16 point synchronous system operates within strict load and stroke constraints to ensure the desired load paths into the ship's hull structure are maintained. The various ship's hull segments up to 1300 tons are supported by the premium synchronous lifting system to confirm the design calculations.



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Premium 4 to 64 Point Synchronous Lifting System

- ▼ In tilting mode, each cylinder can be programmed to achieve a different stroke at the same time.



EPS Series

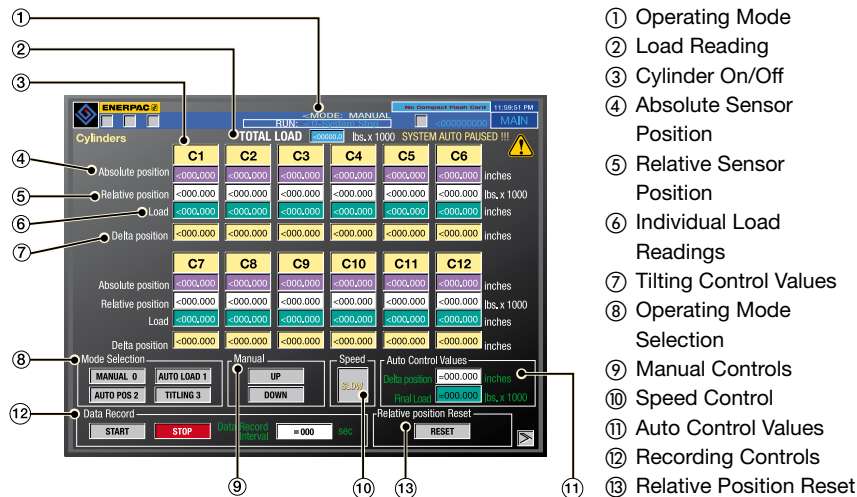


Number of Lifting Points:
4 to 64

Accuracy Over Full Stroke:
± 0,25 mm

Maximum Operating Pressure:
700 bar

▼ Touch screen display of EPS Synchronous Lift Controller.



▲ PLC-controller station of the EPS-Series premium synchronous lifting system.

- ▼ One of the world's first and largest lifting jobs for maintenance of a 3500 ton mining dragline was successfully done with an Enerpac synchronous hydraulic system: exact aligning of bearings on the rail on which this dragline rotates.



- ▼ Millau Viaduct, France: Bridge lifting and launching system. The load is balanced on groups of CLL-Series lock nut cylinders. The hydraulic lifting, launching and balancing movements are synchronised with PLC-control.



TT-Series, Heavy Lifting Strand Jacks

▼ Shown: TT-84SJ706, 86 ton Strand Jack



- Hydraulic wedge setting and wedge release for positive load control
- Individual strand guidance through jack
- Multi functional treatment for corrosion protection and trouble-free wedge release
- Jacks designed to be operated in all positions: vertical, horizontal or inclined
- Strand jack designed according to the highest safety standards with a minimum of 2,5:1 of strand breaking load
- Built-in sensors for closed-loop control.

▼ Heavy lifting system with 11 x 3720 kN Strand Jacks, 6 pumps, a master PLC-control system and network, for lifting roofs during the construction of a new triple bay aircraft maintenance hangar at Abu Dhabi International Airport.



Lifting, lowering or horizontal movements of heavy loads



Lifting in Unusual Situations

When loads need to be lifted or lowered in tight areas or in situations where overhead clearance is limited, Enerpac offers this economical alternative to traditional rigging equipment. Contact Enerpac: integratedsolutions@enerpac.com.



Pre-stress Cap

Included with all strand jacks. Used for tensioning strand prior to operation.



Strand Wedges

Specially designed wedges for use with Enerpac strand jacks are included and available to purchase separately.



Heavy Lifting Accessories

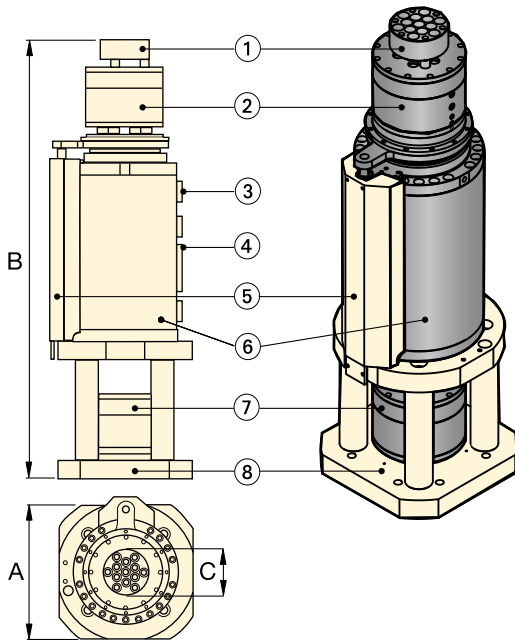
- Lifting attachments
- Palm trees
- Strand recoilers
- Strand dispenser.

▼ Eight 444 ton strand jacks including palm trees, lifting attachments, strand recoilers and lifting wedge consumables will lift twelve ball mills weighing 1500 ton to a height of 20 metres onto their bearing housings at an Australia mining facility.



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Heavy Lifting Strand Jacks



- ① Pre-Stress Cap
- ② Moving Lock Device
- ③ Pilot-Operated Check Valve
- ④ Electrical Connections
- ⑤ Stroke Sensor
- ⑥ Lifting Cylinder
- ⑦ Static Lock Device
- ⑧ Chair

TT Series



Rated Capacity per Jack:

37 - 673 ton

Effective Stroke:

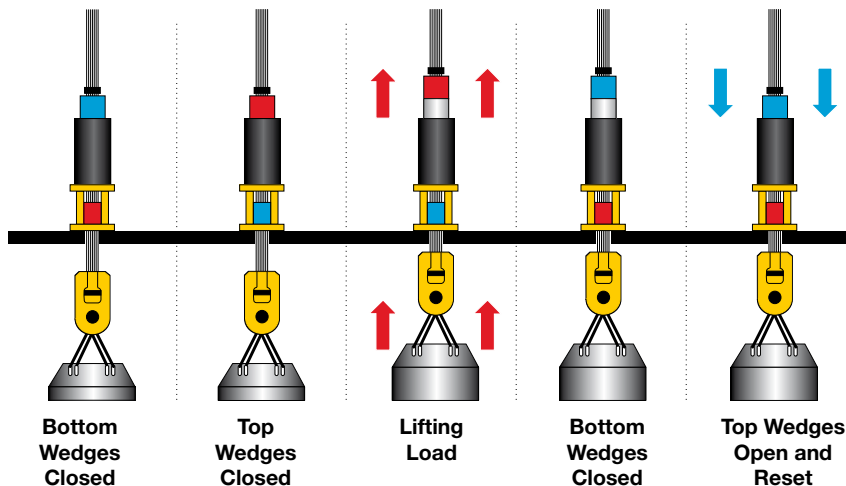
500 mm

Working Pressure:

300 bar

Strand Jacking Lifting Sequence

The sequence of operation is illustrated with the lock devices shown in *red* when the wedges are closed. The lock devices are shown in *blue* when the wedges are open.



PLC-Control Unit and Strand Jack Pumps

Using a network cable to interconnect each strand jack pump to the master jack pump to the master control enables the use of an unlimited number of jacks.



Mono Strand Lifting Jack

For heavy-lifting applications where a crane or hoist will not fit, the **ST-120M06** may be the only solution. Contact Enerpac for more details on this unique lifting solution.

▼ SELECTION CHART

Strand Jack Capacity ¹⁾ ton (kN)	Model Number Strand Jack	Strand Diameter ²⁾ inch (mm)	Number of Strands	Effective Stroke (mm)	Effective Area (cm ²)	Nominal Working Pressure (bar)	Dimensions (mm)		
							A	B (extended)	C
37 (360)	TT-36SJ306	0.60 (15,2)	3	500	123	300	300	2270	60
86 (840)	TT-84SJ706	0.60 (15,2)	7	500	287	300	430	2290	93
147 (1440)	TT-144SJ1206	0.60 (15,2)	12	500	466	300	490	2298	133
232 (2280)	TT-228SJ1906	0.60 (15,2)	19	500	754	300	600	2330	169
330 (3240)	TT-324SJ2706	0.60 (15,2)	27	500	1089	300	650	2330	208
453 (4440)	TT-444SJ3706	0.60 (15,2)	37	500	1486	300	700	2652	246
587 (5760)	TT-576SJ4806	0.60 (15,2)	48	500	1865	300	760	2693	284
673 (6600)	TT-660SJ5506	0.60 (15,2)	55	500	2199	300	900	2775	291

¹⁾ When used with compacted heavy lifting strand. Additional capacities and strokes are available.

²⁾ Strand jacks are also available for 18,0 mm (0.70 inch) strand. Contact Enerpac for further information.



TTP-Series, Strand Jack Hydraulic Pumps

▼ Shown: TTP-Series, Strand Jack Hydraulic Pump



- Multiple pump and reservoir options
- PLC-controlled operation
- Steel frame and lifting eyes
- One pump per strand jack allows for short connections and flexible jack positions
- Pumps can be interconnected with a network cable.

Premium Options:

- Variable frequency drive for flow control and accurate synchronization between multiple lifting points
- One pump to operate multiple jacks
- Fully enclosed cabinet
- Oil cooler for operation in high temperature environments or continuous operation
- Reinforced cabinet with steel frame and lifting lugs
- Oil pre-heater in low temperature applications
- Biodegradable oil.

Hydraulic Power for Demanding Strand Jacking Applications

Motor Size:

5,5 - 37 kW

Lifting Speed:

1 - 29 m/hr

Working Pressure:

300 bar



Hand Pendant

Allows individual control of strand jacks for set-up and manual operation. Included with each pump unit.



Contact Enerpac!

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integratedsolutions@enerpac.com.
or visit: **www.enerpac.com**.



TT-Series Strand Jacks

Multi Strand Jacks for accurate lifting, lowering or horizontal movements of heavy loads.



▼ Two concrete arches of this viaduct in Silleda, Spain are rotated and lowered by Enerpac Heavy Lifting Strand Jacking Systems.



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Strand Jack Controls

▼ Shown: Master PLC-Control Unit



- Modular based system
- Control up to 32 strand jacks with one master controller
- Multiple controllers can be networked
- Individual or synchronous control
- Individual and accumulative stroke and load display
- Stroke and load alarms for safety
- Data logging capabilities.

▼ Strand jack pumps and eight strand jacks are networked to the master PLC-controller to lift twelve ball mills, weighing 1500 ton each, at a mining facility in Australia. By using a network cable to interconnect each strand jack pump, multiple strand jacks can be operated from one master controller.



Control Multiple Strand Jacks from One Master Controller

▼ Bridge launching with Enerpac Heavy Lifting Strand Jacks.



▼ Bridge launching with Enerpac Heavy Lifting Strand Jacks.

