



DLT Engineering

Pinned Climbing & Skidding Jack System

Pinned Climbing & Skidding Jacks, Hydraulic Power Units
and Control Systems



Introduction

DLT Pinned Climbing Jacks are an ideal solution for vertical and horizontal movement of heavy loads, where a rigid and totally secure means of holding the load are required. They are securely pinned at all times to a steel climbing bar which can be mounted vertically or horizontally and rigidly transfers the jacking forces in compression or tension to an end fixing point. The climbing bar is usually fixed at intervals with a sliding connection to an adjacent steel or concrete structure such as a steel tower of a concrete bridge pier, but can also be continuously welded to a steel beam or column.

Our DL-CP pinned climbing jacks vary from 60 - 1,000 tonnes safe working load per jack. Lifting speeds vary from 5 - 40 metres per hour depending on the size of hydraulic power unit used, for details on our hydraulic power units please see pages 11 & 12.

All DLT jacks and hydraulic power units can be monitored, controlled and synchronised by a single operator using either our DL-M manual control system or our DL-P40 computer controlled system. For detail on our control systems please see pages 13 to 17.

We have been designing, manufacturing and using hydraulic jacking systems since 1992 for use in the construction of bridges, refineries, offshore structures, large roof structures, power stations and other projects where these systems can be used to best advantage. The heavy lifting and skidding operations performed using these equipment are usually critical to the success of a project and it is therefore essential that the equipment is robust, reliable and easily serviced. All of our jacking systems are 100% designed and developed in-house to international standards and designed and manufactured in accordance with our accredited ISO 9001 quality management systems. Our systems are designed for safety, long life, robust performance and ease of maintenance.

All DLT systems are supplied with a comprehensive manual for the operation and maintenance of the equipment, including a full set of test certificates and a section giving guidance on method statements, risk assessment and health & safety with examples from our own heavy lifting projects. We offer on-site support, advice and training given by our own heavy lifting Site Supervisors to ensure that the equipment is used safely and properly maintained. We are also able to offer expert in-house engineering advice to our clients on how to use the equipment to best advantage, including detailed design of temporary works.



DL-CP600 pinned climbing jack during 125% load testing and certification

General Description

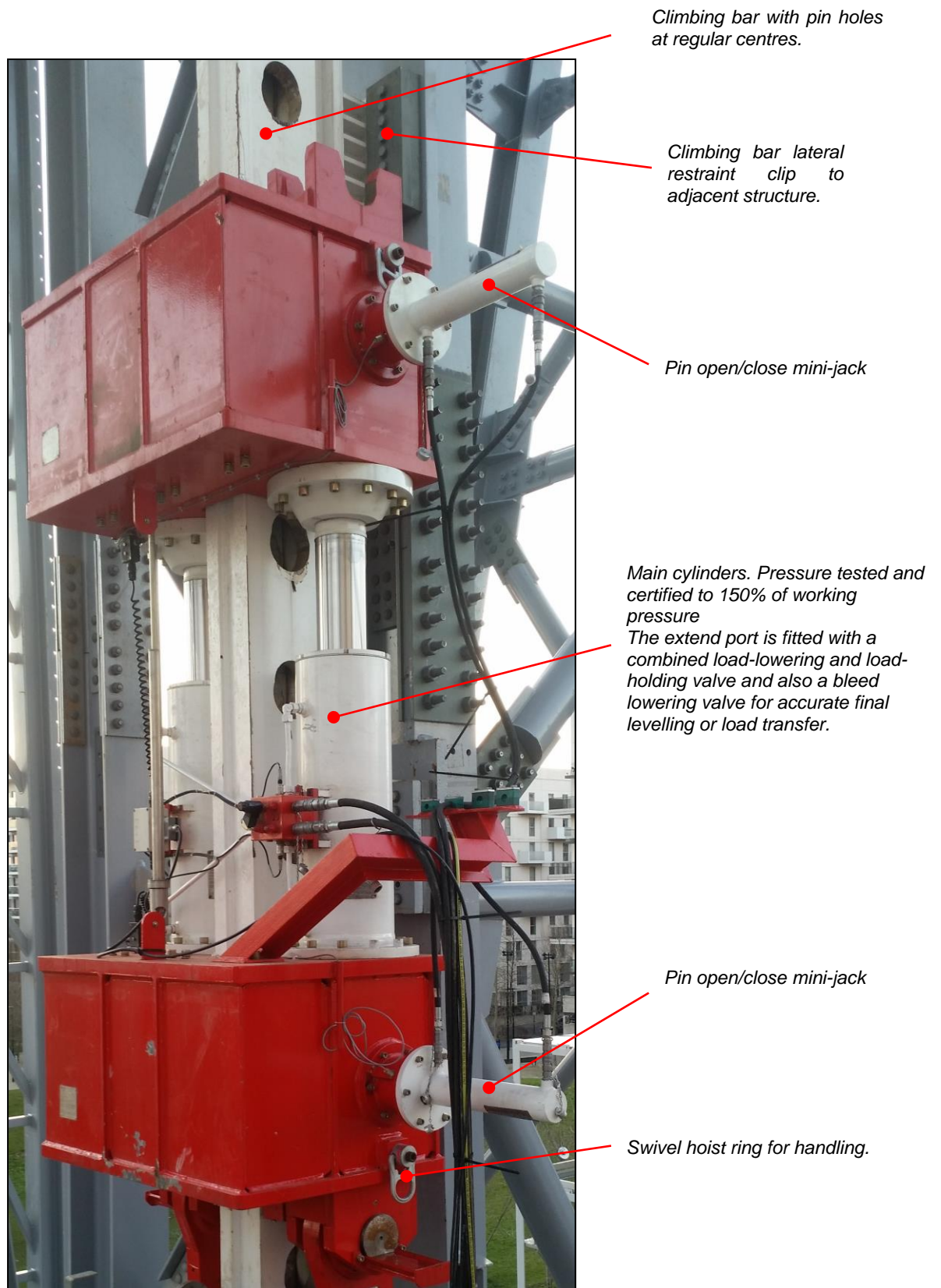
DLT Engineering pinned climbing jacks range from 60 to 1,000 tonne safe working load per jack. Please contact our offices to get the details of a particular capacity.

The main features of all DLT pinned climbing jacks are as follows:

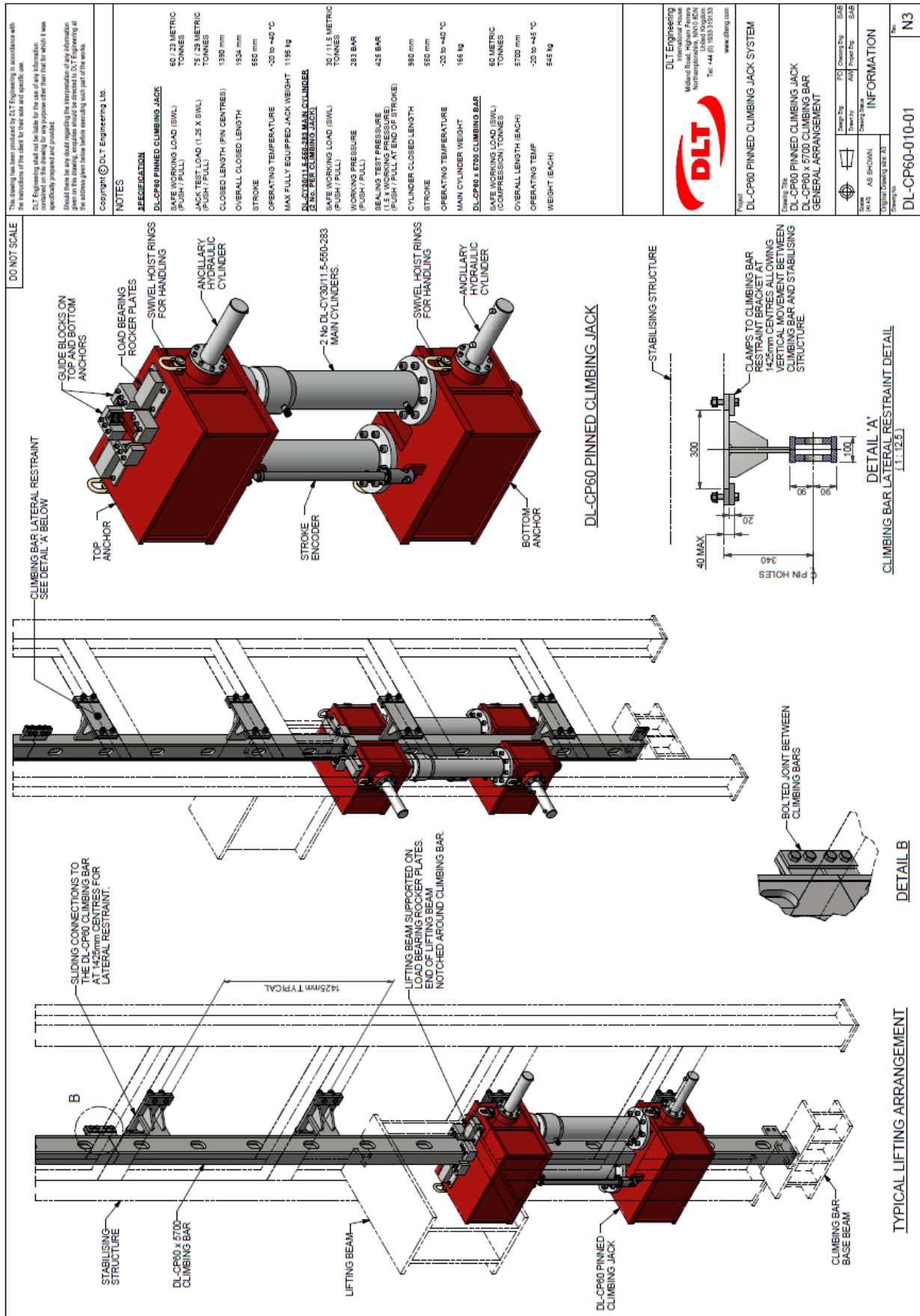
- Pinned climbing jacks are robust & maintenance free and provide a very good solution for regular lifting requirements due to the absence of any wearable component such as wire ropes, strands, grips etc.
- They are fool proof as compared to traditional wedge type climbing jacks due to the presence of pins for locking in the slotted holes of climbing bars.
- DLT pinned climbing jack system is equipped with hydraulic and electrical interlocks. This prevents the opening of both the top and base pins together unless bypassed for installation purposes.
- The double-acting mini jacks are operated by a weak hydraulic circuit (50 bar pressure), therefore the operator cannot open the loaded anchors, even by mistake.
- Pinned climbing jacks are monitored, controlled and synchronised by a single operator using either our DL-M manual control system or our DL-P40 computer control system.
- Main cylinder pressure tested and certified to 150% of working pressure.
- Complete jack load tested and certified to 125% of safe working load.
- Double-acting mini-jacks used for opening/closing the pins in the top and bottom anchors, which can be fully replaced in the middle of a lift if necessary without dismantling the anchors.
- Pilot operated over centre valve fitted to the extension port block for controlled and synchronised load lowering.
- Load holding valve fitted to the extension port block for safe holding of the load in the event of a hose burst.
- Fitted with quick release hose couplings.
- Corrosion protection to all exposed and running surfaces for long life and suitable for use in a marine environment.

Project specific steel fabrications are required to support the jacks. We are able to offer a full design and supply service for these items.

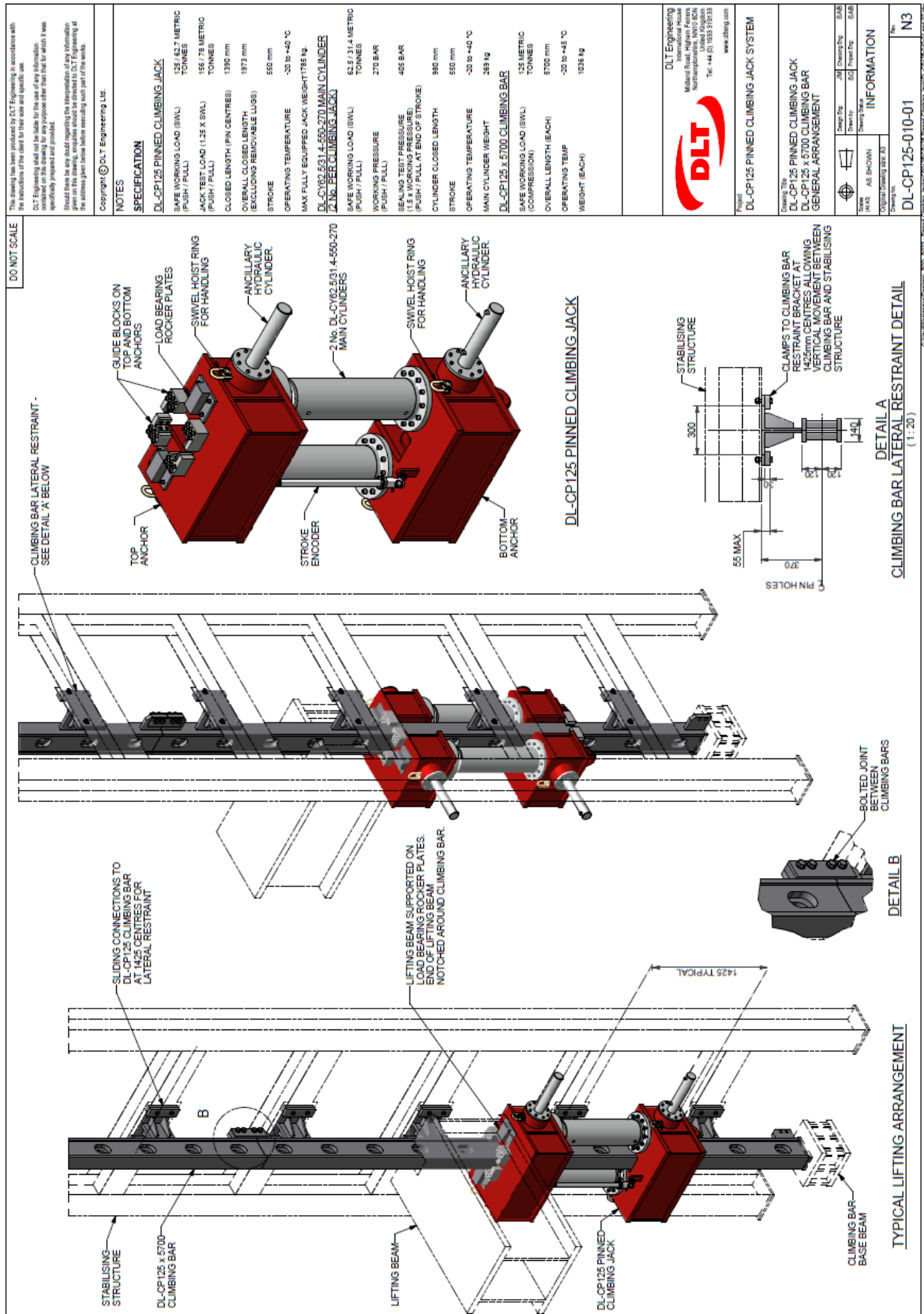
Main Features of DLT Pinned Climbing Jacks:



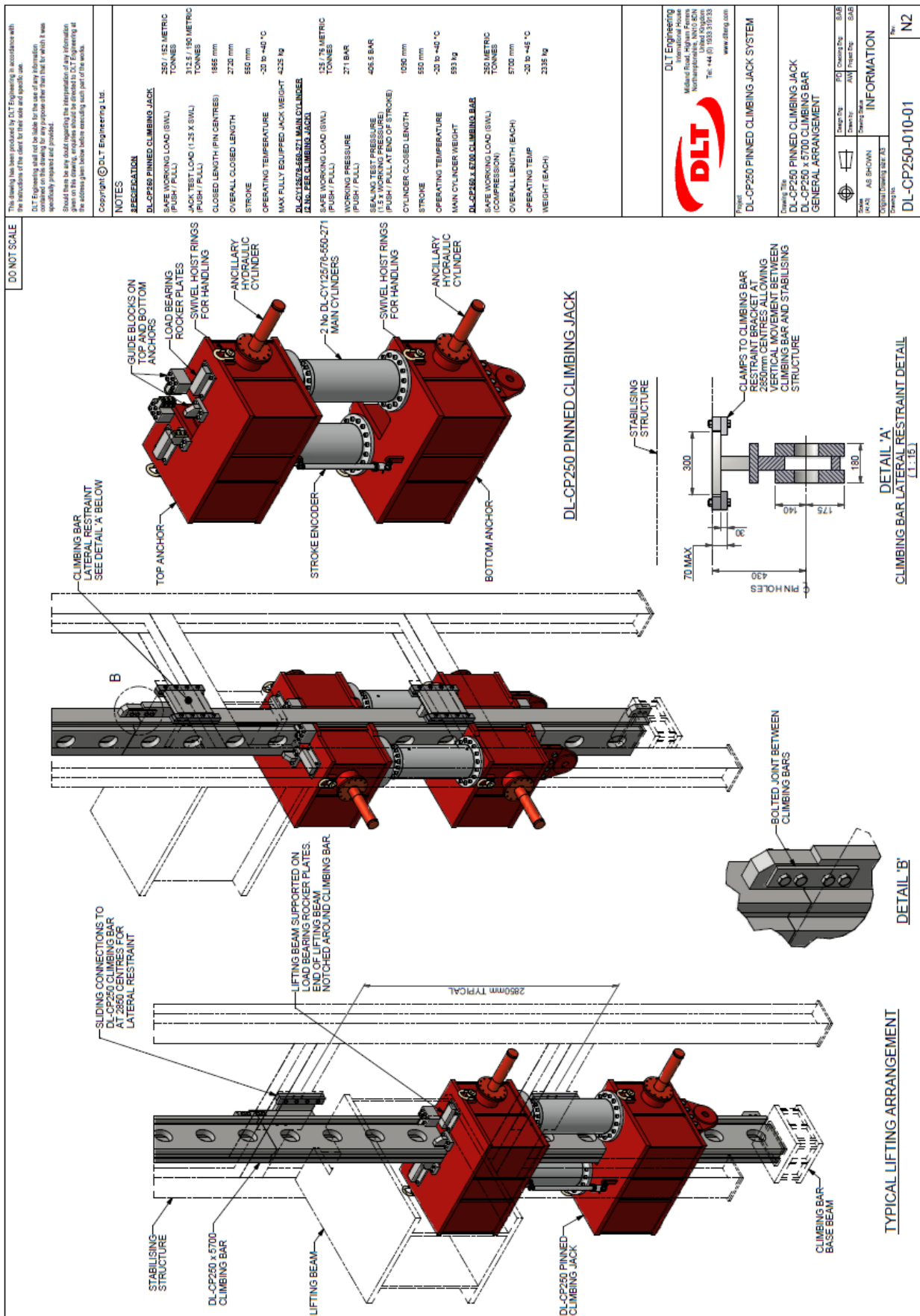
DL-CP60 Pinned Climbing Jack



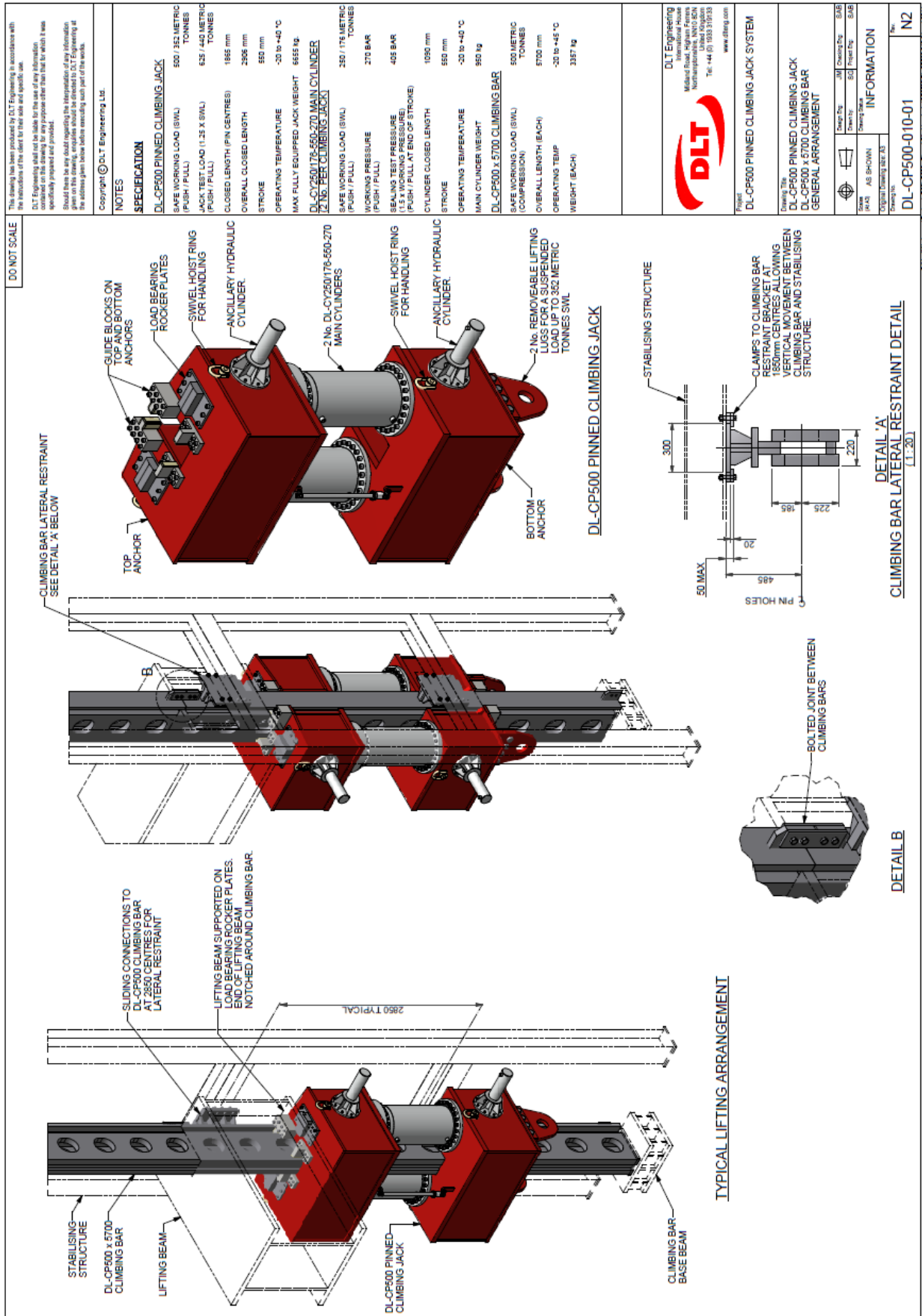
DL-CP125 Pinned Climbing Jack



DL-CP250 Pinned Climbing Jack



DL-CP500 Pinned Climbing Jack



DL-CP750 Pinned Climbing Jack

DL-CP750 PINNED CLIMBING JACK

Typical Lifting Arrangement: This diagram shows the DL-CP750 Pinned Climbing Jack in use. It consists of a Climbing Bar (Base Beam) supported by a Lifting Beam. The Lifting Beam is supported by a Load Bearing Rocker Plate, which is in turn supported by a Swivel Hoist Ring. The Swivel Hoist Ring is connected to an Ancillary Hydraulic Cylinder. The Climbing Bar is also supported by a Stabilising Structure. The diagram includes dimensions for the Lifting Beam (2850mm typical) and the Climbing Bar (2850mm typical).

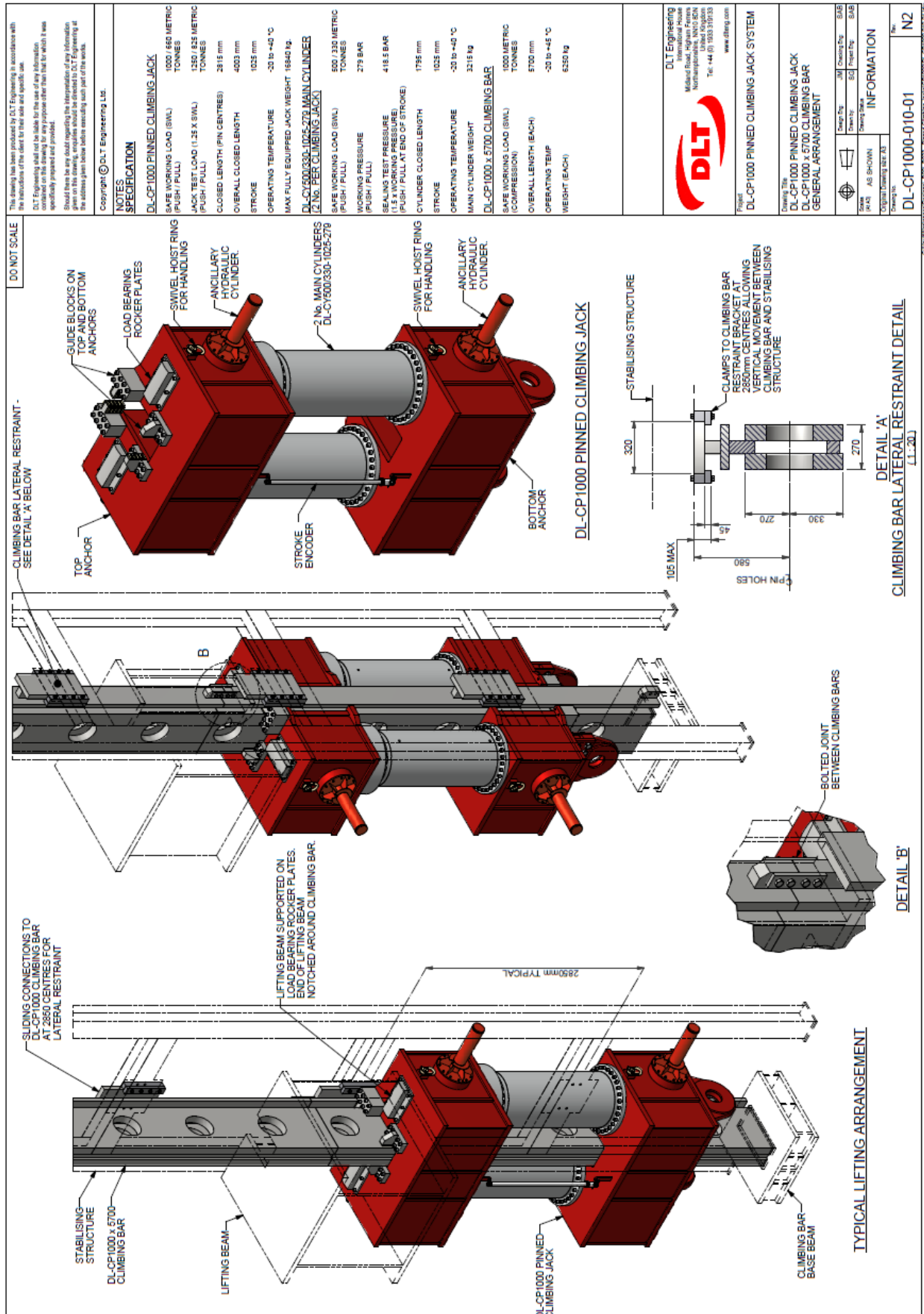
Detail 'A': Climbing Bar Lateral Restraint Detail

This detail shows the connection between the Climbing Bar and the Restraint Bracket. The Restraint Bracket is supported by a Swivel Hoist Ring, which is connected to an Ancillary Hydraulic Cylinder. The diagram includes dimensions for the Restraint Bracket (300mm, 250mm, 230mm, 270mm, 510mm) and the Swivel Hoist Ring (230mm, 270mm, 510mm).

DL-CP750 Pinned Climbing Jack Specifications:

Specification	Value
Safe Working Load (SWL) (Push/Pull)	750 / 470 METRIC TONNES
Jack Test Load (1.25 x SWL) (Push/Pull)	938 / 588 METRIC TONNES
Overall Length (Pin Centres)	2815 mm
Overall Closed Length (Excluding Removable Lugs)	3943 mm
Stroke	1025 mm
Operating Temperature	-20 to +40 °C
Max Fully Equipped Jack Weight	11500 kg
DL-CP750 x 5700 Main Cylinders (2 Nos. Per Climbing Jack)	375 / 235 METRIC TONNES
Safe Working Load (SWL) (Push/Pull)	279 BAR
Working Pressure	419 BAR
Sealing Test Pressure (Push/Pull at End of Stroke)	1675 mm
Cylinder Closed Length	1025 mm
Operating Temperature	-20 to +40 °C
Main Cylinder Weight	2020 kg
DL-CP750 x 5700 Climbing Bars (Compression)	750 METRIC TONNES
Safe Working Load (SWL)	5700 mm
Overall Length (Each)	-20 to +45 °C
Operating Temp	Weight (Each)
Weight (Each)	4900 kg

DL-CP1000 Pinned Climbing Jack



General Description

We produce a wide range of diesel and electric powered hydraulic power units which are compatible with both our DL-M manual control system or our DL-P40 computer control system. In addition, all DLT hydraulic power units come with their own fixed control panel for local operation of the connected jacks. Our hydraulic power units are designed for reliability in harsh environments, ease of service and long life. A single hydraulic power unit can be designed to power 1, 2, 4, 6, 8, 10 or 12 jacks.

The operating speed of the pinned climbing jacks is related to the flow of oil to the main cylinder. The approximate maximum movement speed of the load in metres per hour is given below for various combinations of oil flow and jack size:

L /min	DL-CP125	DL-CP250	DL-CP500	DL-CP750	DL-CP1000
3	2.6	1.2	-	-	-
6	5.1	2.4	1.1	-	-
8	6.8	3.2	1.5	1.1	-
10	8.4	4.0	1.9	1.4	1.0
15	12.5	6.0	2.8	2.0	1.5
20	16.5	7.9	3.8	2.7	2.0
30	24.1	11.7	5.6	4.1	3.0
40	31.5	15.5	7.4	5.4	4.0
50	38.5	19.1	9.3	6.7	5.0
60	45.2	22.7	11.0	8.0	5.9
70	-	26.2	12.8	9.3	6.9
80	-	29.7	14.6	10.6	7.9
90	-	33.0	16.3	11.9	8.8
100	-	36.3	18.0	13.2	9.8
120	-	42.7	21.4	15.7	11.7
140	-	-	24.8	18.2	13.6
160	-	-	28.0	20.7	15.4
180	-	-	31.2	23.1	17.3
200	-	-	34.4	25.5	19.1
220	-	-	37.4	27.8	20.9
240	-	-	40.5	30.1	22.7
260	-	-	-	32.4	24.4
280	-	-	-	34.7	26.2

For example, a 30 l/min flow to a DL-CP250 climbing jack would have an approximate operating speed of 11.7 m/hour i.e. it would take about 2 hours to lift a distance of 23.4 metres.

The main features of standard DLT hydraulic power units are as follows:

- Pressure tested and certified to 125% of working pressure.
- High quality piston pumps used for jack extend/retract circuit for maximum reliability and minimum variation in flow with changing jack loads.
- All electrical components weatherproof to IP 55 or better.
- Suitable for use with both mineral or biodegradable hydraulic oils.
- Visual oil level & temperature indicator and automatic shutdown system in the event of low oil level.
- Pressure gauges to main extend/retract p-line and mini-jack p-line.
- Separate pressure relief valves for cylinder extend, cylinder retract and mini-jack open/close.
- All DLT hydraulic power units come with a fixed control panel for manual operation of the connected jacks during set up, and a local/remote switch for selecting between this control panel and the DL-P40 and DL-M central control systems.

- All DLT hydraulic power units are compatible with both our DL-M and DL-P control systems for central monitoring and control of all jacks from a single point.
- Hydraulic power unit mounted in steel crash frame with fork lift truck points and lifting eyes.
- Components arranged for easy access for inspection and servicing.
- Overall size to suit transport in standard shipping containers.
- Fitted with quick release hose couplings.
- All exposed surfaces are corrosion protected for long life and are suitable for use in a marine environment.



DL-L120/2/300/D Diesel powered hydraulic power units



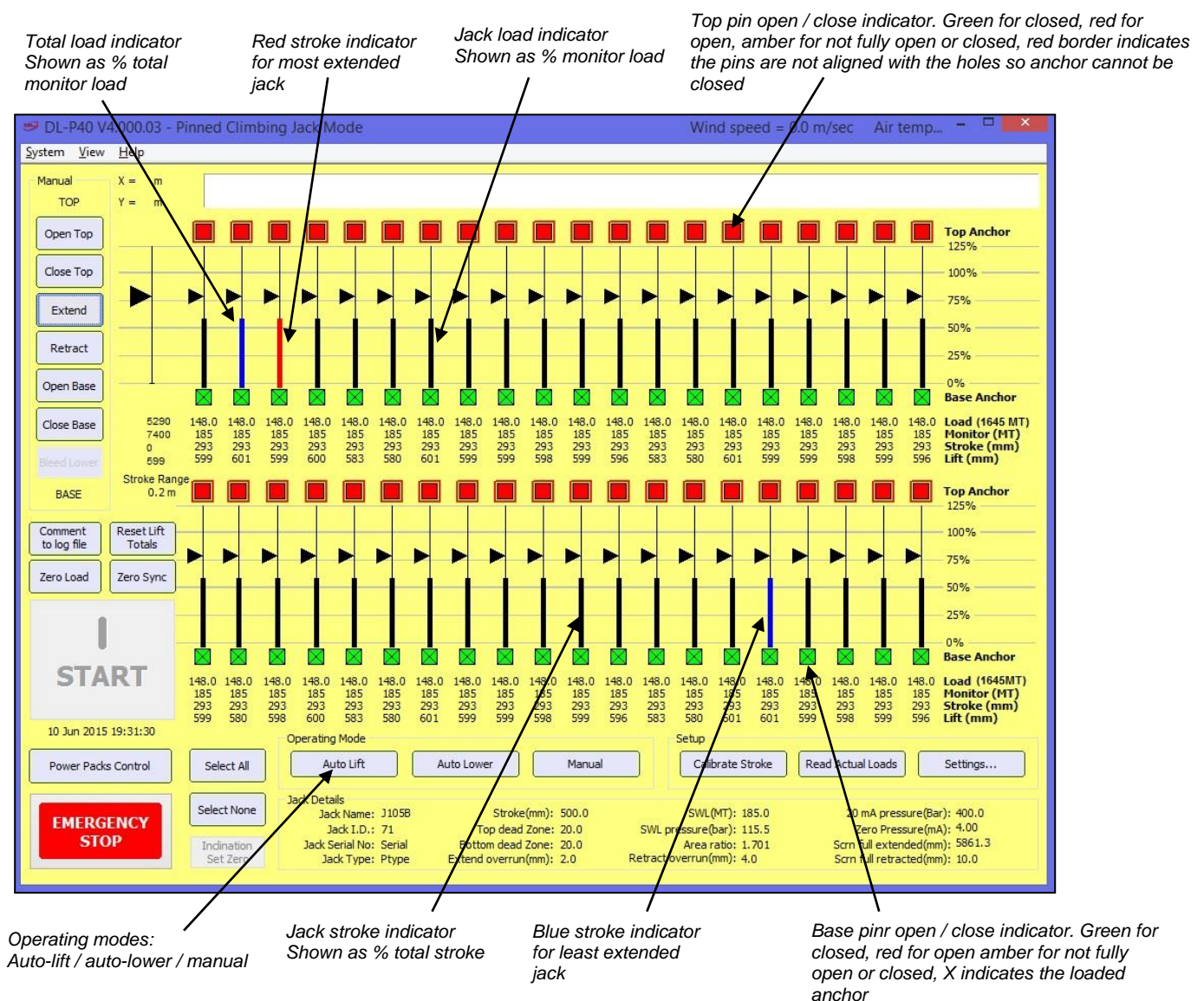
Electrically operated hydraulic power units

DL-P40 Computer Control System

The DL-P40 computer control system is written and developed in-house by DLT using our own software and hardware engineers, working in consultation with experienced DLT operators. It can be used to control all types of hydraulic jacking systems, including strand jacks, climbing jacks, gripper jacks and synchronous solid ram jacking systems. The system offers the simplest possible operating screen for increased safety, communicating between the control computer and CAN (Controller Area Network) Controllers located in the hydraulic power units using the latest CANbus networking system. The complete system has been tested and certified to all relevant European Electro-Magnetic Conformance (EMC) standards, an important consideration when used in a site environment.

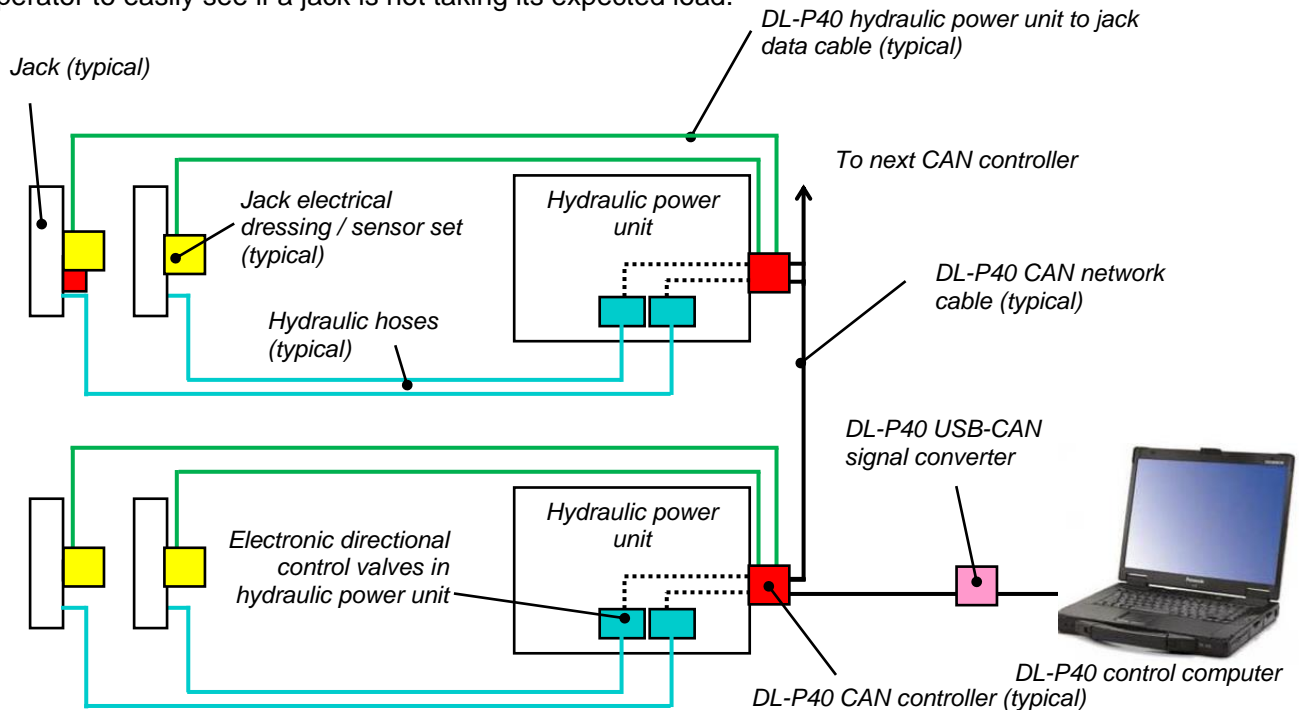
The DL-P40 uses programmable CAN Controllers located in the hydraulic power units for intelligent sensing and control functions, and a central control computer to manage all the tasks. The system can monitor and control any number of jacks, although the current interface is configured for up to 120 jacks. The full version of the computer software is free to load on any computer and has an inbuilt simulation mode that allows the operator to set up any combination of climbing jacks and hydraulic power units and simulate a full lift taking place.

The screen that the operator will see for a 40-jack lift is as shown below. An auxiliary screen can be utilised to show any additional jacks, allowing for up to 120 jacks in one network.



DL-P40 Software Interface

The operator can select any combination of jacks to be operated and has a choice of three operating modes – manual, auto-lift and auto-lower. In all 3 modes, the computer can be set to automatically synchronise the strokes of the jacks to within a user defined range to maintain an even load distribution between the jacks during a lift. The operator can also set an expected load for each individual jack and can set a maximum percentage of this load as the overload limit for the operation. The system will automatically stop all jacks if any single jack reaches its overload limit. The display graphics allow the operator to easily see if a jack is not taking its expected load.



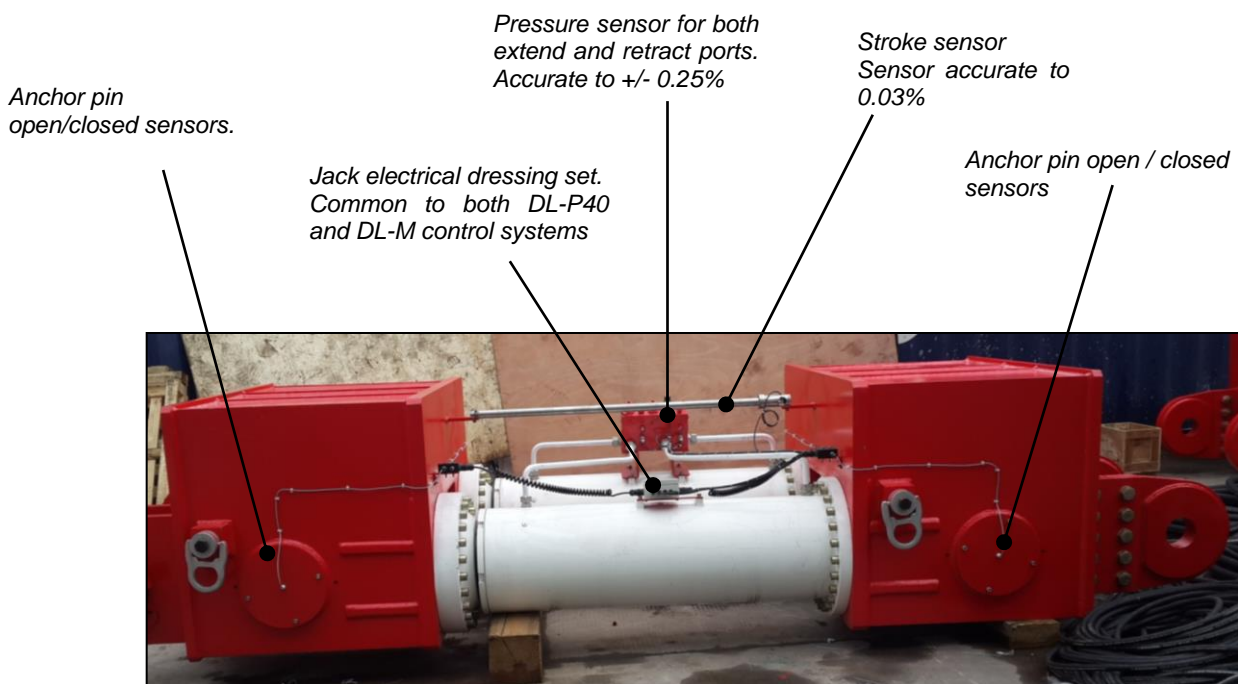
Schematic layout of the DL-P40 system hardware

In summary, the main features of the DL-P40 computer control system are as follows:

- Control of up to 120 No. jacks from a single control computer, with up to 40 jacks shown on the main screen and a further 80 jacks shown on the optional auxiliary screen.
- Control any type of hydraulic ram, either with or without a gripping system fitted e.g. strand jacks, climbing jacks, gripper jacks, compression rams, tension rams.
- Control all types of hydraulic power units, using electric motors or diesel engines, and having fixed flow or variable flow.
- Controller Area Network (CAN) for reliable communication between the control computer, the hydraulic power units and the jacks.
- Plug and play system using intelligent CAN nodes on all hydraulic power units. The Control Computer will automatically detect and understand all the equipment being used. This greatly reduces set-up time.
- User friendly interface, designed in consultation with DLT operators, to give a clear presentation of all essential data during a jacking operation.
- Project specific set-up information can be saved in project files and reloaded at any time, so that this data only needs to be entered once.
- Can accept a wide range of sensors fitted to the jacks and hydraulic power units for continuous display and monitoring of jack load, jack stroke, gripping system open/closed state, oil temperature, oil level and motor state.
- Automatic stroke synchronisation in automatic lift/lower modes and manual mode.
- Simple and accurate method for quickly calibrating all stroke sensors.

- Comprehensive log file of all jack loads, operator commands, messages and events is stored on the control computer for later analysis. The operator may comment to the log file at any time to explain what is happening.
- Remote start and stop of all hydraulic power unit motors from the control computer.
- Control computer can be running Windows 7 or Windows 10 and communicates with the CAN nodes via a USB-to-CAN link.
- Many inbuilt safety features to prevent unsafe operation of the jacking system.
- Tested and certified to European Electro Magnetic Conformance standards for reliable operation in all site conditions.
- Simulation mode for training and demonstration purposes, which can be set up by the user to run any combination of jacks and hydraulic power units.

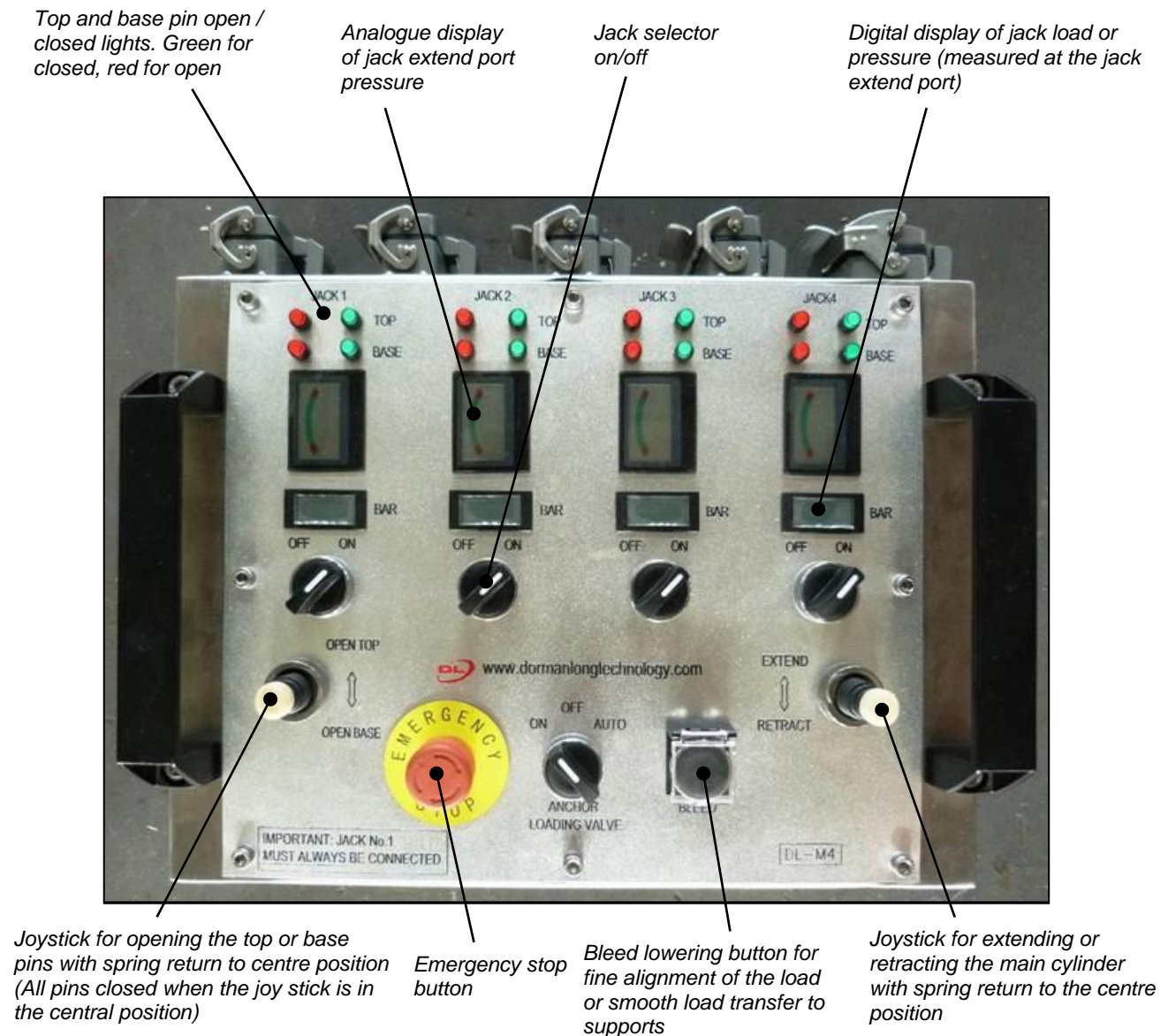
Each climbing jack has a number of sensors fitted to detect pressure, piston extension and pin open or closed states. All sensors, wiring and CAN nodes are weatherproof to IP 55 or better. The arrangement of the DL-P40 sensor system on a pinned climbing jack is shown below:



Example of the sensor arrangements on a typical climbing jack

DL-M Control System

DL-M pendant control systems can be used by a single operator to monitor and control up to 12 jacks and are operated from a control box as shown below (DL-M4 shown). The DL-M system has none of the automation of the DL-P40 computer control system. However, it offers a practical low cost alternative to the DL-P40. The DL-M control box is weatherproof to IP 55, suitable for external use in all weather, and in temperatures ranging from -10 to $+50$ degrees Celsius.



Example of a DL-M Control Box

The wiring and junction boxes on the jacks and hydraulic power units are the same for both the DL-P40 and DL-M systems, allowing the DL-M system to be used as a back up to the DL-P40 computer control system with a very quick changeover from one system to the other.

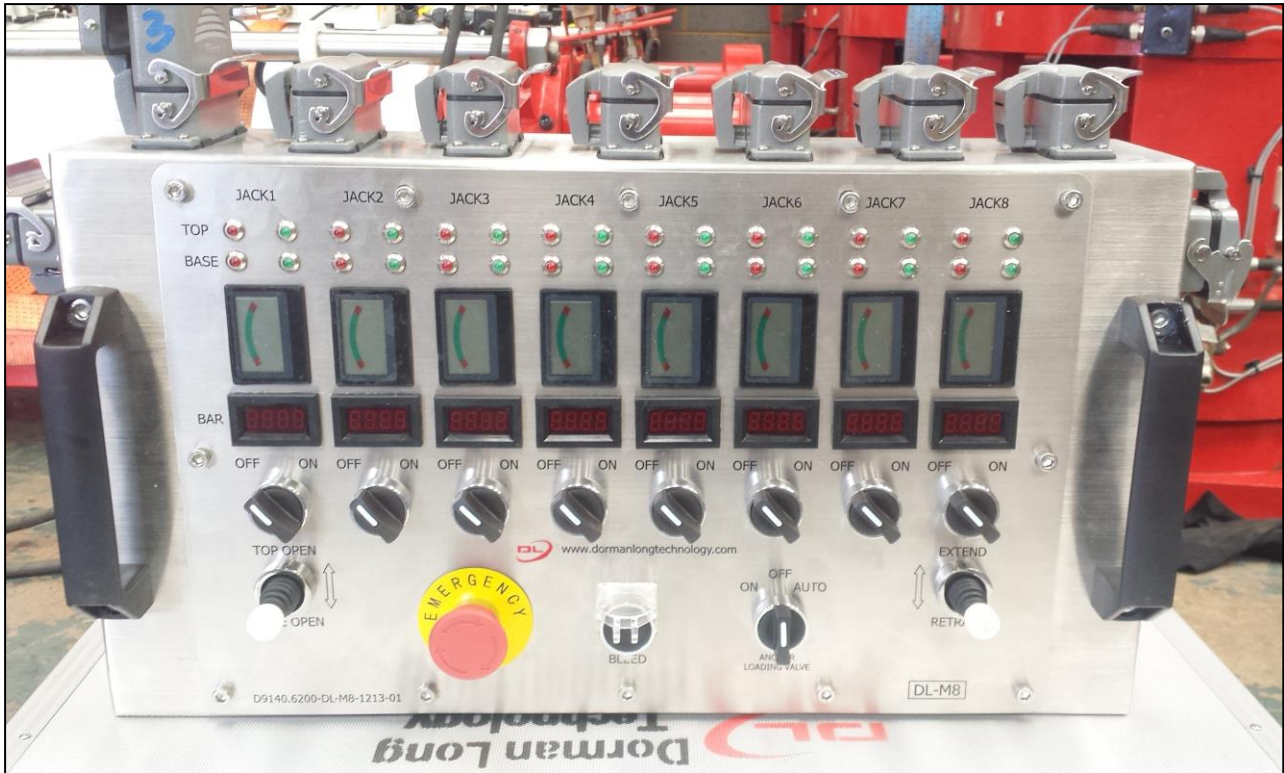
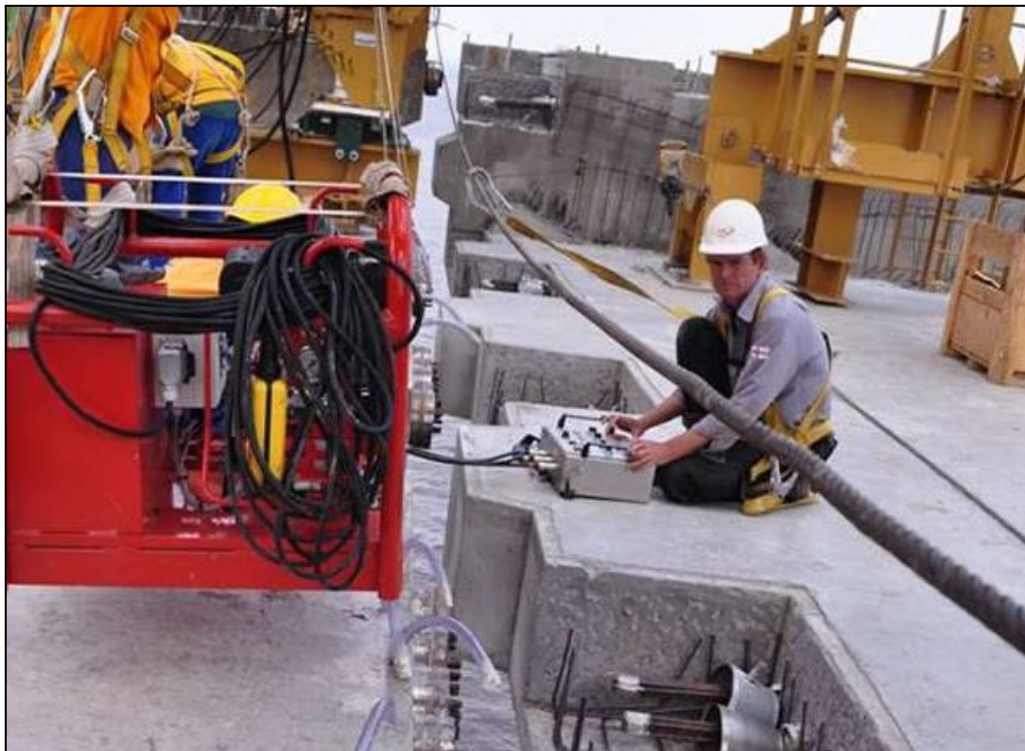


Photo of a DL-M8 Control Box



DL-M control system being used for final alignment of bridge deck sections

Site Support Services

Site Support for our equipment is provided by our Site Technicians, who have many years of experience in carrying out heavy lifting and moving operations. They are usually seconded into a client's team to assist with the first few operations until the client's own staff feel confident to safely operate the equipment themselves. As part of this service we provide a formal training and certification programme to approve client's staff as competent to operate and maintain the equipment. Our Site Technicians become a valued member of the site team and are often requested to return to assist with future operations.

Our Site Technicians are also available to carry out periodic inspection, maintenance and load testing of the equipment with manufacturer's certification of the work carried out.





Photos of projects that have used DLT climbing jacks

If you would like to discuss your requirements or obtain first-hand information about our engineering services, equipment and control systems, please do not hesitate to contact any of the following members of our team.

For general enquiries, please contact enquiries@dlteng.com

UK Head Office:

DLT Engineering Ltd
International House
Midland Road, Higham Ferrers
Northamptonshire
NN10 8DN, United Kingdom
Tel. +44 (0)1933 319133
E-mail: HQ@dlteng.com

UK Northern Office:

DLT Engineering Ltd
Whessoe Technology Centre
Morton Palms, Darlington
Co Durham, DL1 4WB, United Kingdom
Tel. +44 (0)1325 390010
E-mail: Engineering@dlteng.com

China Office:

Dorman Long Technology (Shanghai) Co. Ltd
19D, Ju Jia Building, 1336 Huashan Road
Changning District, Shanghai, 200052
Tel. +86 (0) 21 31756400
E-mail: China@dlteng.com

India Office:

Dorman Long Technology India Pvt. Ltd
L-2A, Hauz Khas Enclave, New Delhi
Pin-110016, Haryana, India
Tel. +91 999 9211064
E-mail: india@dlteng.com

Our jacking systems are under continuous development in response to feedback from our customers and our own experience in using this equipment. The information contained in the brochure is subject to change without notice.