

PRODUCT DESCRIPTION

**COMPLIANT LINEAR
TRACTION DRIVE (CLTD)
FOR
CABLE & TOWED ARRAY
HANDLING SYSTEMS**

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COMPLIANT LINEAR TRACTION DRIVE

The Compliant Linear Traction Drive (CLTD) is a form of "linear traction drive" or "traction engine", that has been specifically designed and adapted to the handling, towing and related tension requirements of ship-towed seismic streamer systems. The CLTD can help reduce the significant manpower requirements often needed to load and unload large cables from dockside-to-ship. The CLTD can also be used for ocean bottom cable laying and other large cable handling requirements. The CLTD is designed to handle a wide range of streamer sizes and designs.

The CLTD "grips" the streamer/array between two opposing belts and acts to propel or brake as required (see Figures 3 and 4). The belts are steel-reinforced urethane timing belts, 100 mm wide, that run over aluminum drive/idler sprockets. The sprockets are supported with sealed, self-aligning ball bearings, which are further protected from the environment with supplementary Forsheda V-ring seals.

The drive/braking force is supplied by a hydraulic motor through a serpentine chain arrangement that ensures the belts drive in the same direction and at the same speed. The hydraulic system consists of the motor and a three position, spring-centred, open centre, four way valve. It allows the operator to drive in either direction, or the open centre allows the CLTD belts to freewheel in case of an overload condition, or during braking operations. The hydraulic system uses standard mineral oil-based hydraulic fluids such as Shell Tellus or its equivalent. The operating speed is controlled manually with the valve; the more it is opened, the faster the belts travel. The controls are positioned above the frame at an operator=s height.

The gripping or compressive load is applied using pneumatic pressure from within a "bladder", which in turn exerts force through a series of load plates to the back side of the belt. The load plates are limited in displacement such that the grip force is only applied to solid objects in (or on) the streamer such as spacers, connectors or "bird collars". In this way, the drive/braking load is applied through the skin directly to the spacers which in turn are bonded to the Kevlar strength members inside the streamer. In areas where the skin is unsupported,

the pneumatic grip force will flatten the streamer slightly, but will not transmit any significant drive or braking force to the skin.

The pneumatic system consists of a pressure regulator, a pressure relief valve, a "blow down" valve and two loading bladders. The bladders are manufactured from high pressure air hose, which are capped at the ends with rubber plugs. They are then bolted in place to the CLTD frame. The bladders are contained within a framework which forces the bladders into an almost flat condition. This then allows the air pressure to be applied in a uniform manner against the load plates. The single air pressure port into each bladder is located on the back side of each frame opposite the belt. The required air pressure varies depending on the task and loads required, but it is generally less than 15 psi. A pressure relief valve is adjusted to release at about 40 psi.

The gripping load from the pneumatic bladder is transmitted to the streamer spacers through the load plates and the belt. While running, the belt slides over the stationary load plates. The load plates are linked together and held in position using rivets, to a length of fabric- reinforced rubber belting, which in turn is fastened to the end of the frame assembly using the same bolts as the bladder. The cross section of the load plates is curved in order to direct the streamer into the centre of the belt. To ensure correct performance, however, the streamer must also be directed straight down the centreline of the belt at the entry/exit locations, using a sheave accessory package.

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COMPLIANT LINEAR TRACTION DRIVE (CLTD)

(APPLICATION - DOCKSIDE-TO-SHIP ARRAY STREAMER LOADING)



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Provision has been made to load/unload cable from the CLTD without the need to separate the cable or to thread it through. The side of the CLTD opposite the drive chain has four aluminum blocks which can be removed to allow the streamer to pass through. The blocks perform a double duty function, in that they act as cable guides inside the CLTD, as well as setting the gap between the belts. The belt gap is sized based on spacers and "bird collars" that are typically used with a seismic streamer, although much larger components can be accommodated.

Safety covers are provided for the top side of the CLTD and for the drive chain.

MANUFACTURE AND TEST

The CLTD is built and tested at Spectrum's facility in Peterborough, Ontario. Each unit undergoes a complete Acceptance Test Procedure (with subsequent report generated). The ATP includes the following tasks as a minimum.

- Visual & mechanical inspection and checks
- Pneumatic system checks
- Hydraulic system checks
- Operational tests with sample streamers
- Weight check

APPLICATIONS

The CLTD has been in operational service since early 1996. The CLTD can be used for both dockside-to-ship cable loading, and as a shipboard detensioning device. The CLTD's ability to take up the load of an overboarded cable or array significantly reduces loads on winches. This allows a winch to function in a more appropriate cable storage role, without having to handle high towing, payout and retrieval loads.

NAVAL & SEISMIC SURVEY

Applications include dockside-to-ship array streamer loading, and ship or submarine cable deployment and detensioning.

OTHER POSSIBLE APPLICATIONS

- ! Ocean bottom cable laying
- ! Other high strain cable handling applications.

REQUIREMENTS & OPTIONS

Base Support Requirements

The CLTD is mounted using one lug on each of the four feet. They are sized for 3/80 bolts using the mounting pattern shown in Figures 1 and 2. The mounting structure must be capable of withstanding the weight of the CLTD and a potential cable tension load of up to 1000 lb. Depending on the application, the CLTD can have horizontal alignment pulleys, as well as four retractable wheels for easy maneuverability. Weight estimates for the components are listed below:

CLTD basic unit	341 kg (750 lbs.)
Horizontal alignment pulleys with support brackets (pair) and retractable wheels	91 kg (200 lbs.)
TOTAL	432 kg (950 lbs.)

Total weight when crated
approx. 636 kg (1400 lbs.)

Streamer Guidance Requirements

Horizontal alignment pulleys provide proper guidance and centerline alignment for the streamer into the CLTD. They include two support frames and pulley units which bolt directly to the existing CLTD frame.

Maximum Allowable Size of Connectors, "Bird Collars," and Other Attachments

The maximum size of component that the current design of CLTD can handle is the "bird collars" on a streamer system complete with Velcro protective boots. The approx. diameter is 4.5 in., and represents the upper limit of an object that could pass through the unit. This limitation arises from the sizing of the "throat" at the entrance to the CLTD, in the horizontal plane.

PRODUCT DATA & SPECIFICATIONS

Note: The configuration, size, material, weight and other information presented below are based on a contractual Technical Statement of Requirements, that in turn reflects and satisfies relevant customer specifications and system performance criteria, as well as actual operational requirements. Therefore, depending on the application, the CLTD, as detailed in the following, can be modified to suit other cable handling requirements.

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|------------------------------------|-------------------------|--|
| 1. | Mechanism type | <ul style="list-style-type: none"> - fixed or portable traction drive, using pneumatic pressure to achieve appropriate normal loading on streamer/array spacers. - drive forces are imparted from bladder into 1 to 3 streamer/ array spacers via belt load plates and timing belt interface (both sides). |
| 2. | Drive type | <ul style="list-style-type: none"> - manually controlled variable speed hydraulic motor with chain drive to timing belts. Hydraulic power is to be supplied by others. |
| 3. | Construction | <ul style="list-style-type: none"> - welded steel frame - cable/streamer access from one side |
| 4. | Unit overall length | <ul style="list-style-type: none"> - 1727 mm (68 in) main unit Σ 3098 mm (122 in) with horizontal alignment pulleys |
| 5. | Unit height | <ul style="list-style-type: none"> - 688 mm (21.7 in) to centreline 940 mm (37 in) overall |
| 6. | Unit width | <ul style="list-style-type: none"> - 457 mm (18.0 in) |
| 7. | Load plate drive length | <ul style="list-style-type: none"> - 965 mm (38.0 in) |
| 8. | Hydraulic flow rate | <ul style="list-style-type: none"> - 7 gpm @ 61m./min. (200 ft./min.) |
| 9. | Hydraulic pressure | <ul style="list-style-type: none"> - 2500 psi |
| 10. | Air supply to bladders | <ul style="list-style-type: none"> - 0 to 100 psi |
| 11. | Design speed | <ul style="list-style-type: none"> - up to 61 m/min (200 ft/min) |
| 12. | Line pull | <ul style="list-style-type: none"> - line pull is a function of the number of internal streamer/array spacers in contact at any one time. The design target, depending on the streamer/array construction detail, is typically 150 lb./spacer. |
| 13. | Unit weight: | <ul style="list-style-type: none"> a) Basic CLTD - 341 kg (750 lbs.) b) Horizontal alignment pulleys with support brackets (pair) - 91 kg (200 lbs.) <li style="padding-left: 40px;">TOTAL - 432 kg (950 lbs.) |
| Total weight when crated - approx. | | <ul style="list-style-type: none"> - 636 kg (1400 lbs.) |