

## Description of the Cable and Offshore Diving Support Vessel



# Cable One

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# General Description of C/S Cable One

C/S Cable One is the most advanced vessels in JD-Contractor ApS' fleet. It can operate anywhere in the world. Due to its design the vessel can quickly be adapted to a number of different situations.

The crew of C/S Cable One and its machines can comfortably carry out very complicated pipe and cable work. Amongst other things the vessel is capable of loading and embedding up to 310 tons of cables at one time.

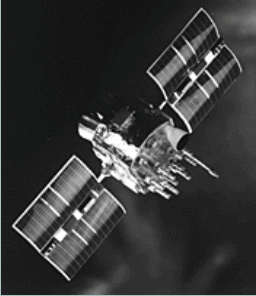
## C/S Cable One:

- Is equipped with four kedge anchors but also work on any given position with its Azimuth thruster.
- Has an A-frame with a lift capability up to 30 tons is placed on the vessel.
- Has a Bollard pull of 20 tons.

Cable laying and Offshore Diving Support Vessel Specifications	
Specialised for:	Can hold up to 250-310 tons of submarine cables, depending of the operational distance.
	ROVs and embedding systems with track point 2 can be controlled from the vessel
	Splicing of submarine cables
	Surveys of any kind
	Surface diving capability to 100 metres (Trimix)
	Salvage operations
Permanently equipped with:	Diving systems and treatment chamber, all systems are connected to a monitoring system
	When required, the vessel can be equipped with ROV (Remote Operated Vehicle) Eyeball-class
Technical data:	Is equipped with Azimuth thruster.
	Has DGPS positioning system with echo sounder, gyro and NAVIPAC on-line. When required, RTK-DGPS is installed.
	Three containers can be fixed on deck
	A separate cable chute with a diameter of 3 metres is mounted astern when laying cables
	30 tons A-frame astern
	Hydraulic deck-crane 16 tons/metres
	2 tons MOB-crane on starboard side
	Bollard Pull 20 tons
	Engines: Main engine, 1700 BHP with pitch propeller and Azimuth bow thruster, 380 BHP
	Speed: 12 knots (max. 14 knots)
	Operational: 9,500 nautical miles
	Accommodation: 15 PSN
	Length: 35.3 m, width: 9.5 m, depth: 4.75 m, draught: 3.8 m
	Tonnage 419 GT, Hold 400 T
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# Navigational Aids

## Please note



The positioning system is optional, and installed each time to the client's specification as stated in the agreement between JD-Contractor ApS and the customer.

As standard a DGPS system with echo sounder and a Gyro are installed, but C/S Cable One can be supplied with other equipment after the client's wishes.



Standard Positioning Equipment	
Receiver:	Ashtech GP2 The differential from a public station.
Gyro:	SR-180 MK1 Litton Marine System
Echo sounder:	Furuno FCV 1200 L
Helmsman's Display:	The RGB monitor is a remote display unit that provides the helmsman with all information required to follow a track. The steering repeater instrument indicates left/right information, both analogue and digital.
Software	
Navigation:	Penta C (Plotter)
On-Line Survey - and Data Acquisition System:	The proposed on-line software package is the "Navi Pac 2004" system, delivered by the EIVA A/S.

## RTK DGPS positioning System

### Precise navigation and precise positioning

In order to satisfy our customer's requirements for documentation, we have the latest equipment for positioning and depth measurement. C/S Cable One can therefore be equipped with precise RTK DGPS positioning equipment, which is connected on-line to Navi Pac and can be installed with Track Point II and a depth sensor.

A computer system calculates the co-ordinates and compares them with the actual cable route or work position. The actual position and data are shown on the captain's/helmsman's display.

The system can communicate with both our ROVs and our embedding systems. This gives us the exact location of our ships and more importantly the cables. The system can be installed on all our vessels, and can be equipped on the floating stage as well.

**RTK DGPS** is a position determination system based on the American satellite position system GPS (Global Positioning System).

The satellite signals for the required positioning accuracy cannot be obtained by using one GPS receiver only. DGPS is the designation of a so-called differential GPS positioning system.

A stationary land station (placed at a fix point) connected to a radio link transmits the correction signals to the mobile (e.g. located on a ship).

With use of the signals the mobile adjusts the distorted satellite signals, and a dynamic positioning accuracy of 5 to 10 centimetres is hereby obtained for the mobile.

The GPS system calculates the position in the global, geographic co-ordinate system in WGS84. The calculated position is sent electronically to the Navipac system, which transforms the WGS84 co-ordinates to the local system. Navi Pac is a navigation program, which continuously calculates co-ordinates and stores data on a hard disk.

#### Extra Positioning Equipment

<b>Primary Receiver:</b>	Ashtech Z-Surveyor RTK (real time kinematic) DGPS (Global Positioning System)
<b>Secondary Receiver:</b>	Ashtech GP2 The correction signal Differential from a public station.
<b>Underwater Positioning:</b>	Track Point II

#### Calibration

The total navigation system is checked by mooring the ship.

#### Software

**On-Line Navigation - and Data Acquisition System:** The proposed on-line software package is the "Navi Pac 2004" system, delivered by the EIVA A/S.

All heavy computer routines are compiled and all time consuming interface handlings are isolated in fast interrupt transfers. Therefore, the system can easily achieve a navigation cycle time of less than 2 seconds.

All user-activated functions (parameter input, mode setting, etc.) are implemented in such a way that the system's primary tasks are kept running during input and execution of the functions.

# Stages in the Laying Process

## Loading and Transport



From the quay by the cable factory the cables are winded directly onboard the hold of C/S Cable One. The vessel has a hold of up to 250 tons of cable and has a loaded draught of only 5.5 metres.

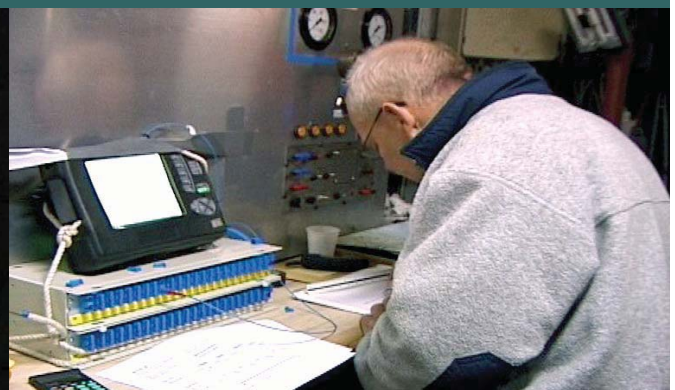
## Laying Preparation



Before starting the laying operation, the following preparations must be carried out:

- ◀ On shore beacons and other navigation outfits are established, if necessary.
- ◀ The position of the end connection point must be carefully determined and correct co-ordinates provided.
- ◀ The trenches on the bottom and on shore must be ready.
- ◀ On the coast a powered winch or bulldozer for hauling in the cable is set up.

## The Laying



Next to the cable hold the cable operating room is located. During cable laying there is direct communication to the bridge, video monitoring of the quarterdeck and monitoring of the position of C/S Cable One and the cable run-line. On the picture to the right cable operator is seen continually measuring a fibre optic cable during the laying of the cable.

# Complete Offshore Diving System

Within advanced technical diving - due to C/S Cable One, JD-Contractor ApS is the principal actor in Denmark. The diving systems onboard C/S Cable One have the latest technology for conventional diving as well as diving on gas mixtures consisting of helium. This enables JD-Contractor ApS to carry out all assignment down to a water depth of 100 metres .

## The Diving and Support Vessel C/S Cable One successfully fought an oil-catastrophe in the Baltic Sea.

In 2003 C/S Cable One was engaged to assist with divers during the retrieval of the remaining oil inside the wreck of the Chinese cargo ship Fu Shang Hai.

Inside the ship was 1,600 tons of fuel oil located in seven tanks. Additionally there were a number of smaller tanks with diesel, and oil for lubrication and hydraulics.

The assignment consist of the following:

- To get an overview of the wreck and its condition.
- Seal of all oil-leaks to end the pollution.
- Empty all oil-tanks.
- Cut of the masts and other objects, which were a danger to the sea traffic.

C/S Cable One and its crew of twelve men, six of whom are offshore divers, carried out the assignment.

Due to dives down to a depth of 68 metres the diving was done on a gas mixture consisting of helium, nitrogen and oxygen.

Further more, special equipment from the Norwegian company "Frank Mohn Flatøy" was installed on C/S Cable One to pump up the oil.

This include a ROLS (Remote offloading system) that can attached itself to the wreck, and drill trough the hull into the tanks, and pump the remaining oil from the wreck to a surface vessel.

### Data about the cargo ship Fu Shan Hai

The ship was build in 1995 in Shanghai and is registered in China. The ships details:

- Weight: 71,835 ton
- Length: 225 metres
- Wide: 32.20 metres
- From deck to bottom: 18.70 metres
- The pilohouse is approx. ca. 19 metre high.



## Diving panel and equipment



Diving supervisor personnel work in the control room. Every dive is monitored.

Diving basket:

- ◀ One man open diving basket
- ◀ A-frame and double winch to lift 500 kg

The diving basket is lowered down to the seabed where it is used as a working platform for the divers.

### Diving Panel for two divers

MoDive monitoring system - on-line overview of all important diver parameters.

Monitor and video recorder connected to a video splitter for taking out video signals without any losses.

Helmet light

Gauge for measuring divers depth

Digital watch for year, day and time and three stopwatches for backup.

Radio for communication with the divers, diving assistants, the standby diver and the bridge

Main air with flow regulation

Air reserve with flow regulation

Mixed gas for trimix with flow regulation

### Diving Equipment for two divers

Hot water suit, inner suit, hat, gloves, boots, fins and a knife

150 metres of umbilical that provides: hot water, diving gas, pneumo, communication, video and light

Harness with reserve regulator from bailout

Bailout tank 1 x 10 Litres at 300 bar = 3,000 Litres of air

EXO-26 (full face mask) or a Kirby Morgan-17 (helmet)

12 volt halogen light and digital camera mounted on the divers helmet

## Treatment and Decompression Chamber

The Treatment and Decompression Chamber onboard C/S Cable One is approved by the Danish, U.K. and Norwegian Authorities for offshore diving on air to 50 metres.

The Chamber was build in 1983 by Magpie Ltd. UK for Sea-forth Engineering Ltd. In 1988 it was modified with an I.U.C.-flange, toilet and a sink. The I.U.C.-flange was constructed by Dräger A.G. Lübeck and installed by Vølund-Energy-Esbjerg.

**Original stamp: serial no.:**  
**MAG 032P/40/8706 - Chamber no. 1**

**Design pressure: 11 Bar**  
**Test pressure: 17 Bar**

**Design temperature: 0-50 degrees Celsius.**

**Radio Graph 100% X-Ray main seams.**  
**Design Authority D.N.V.**



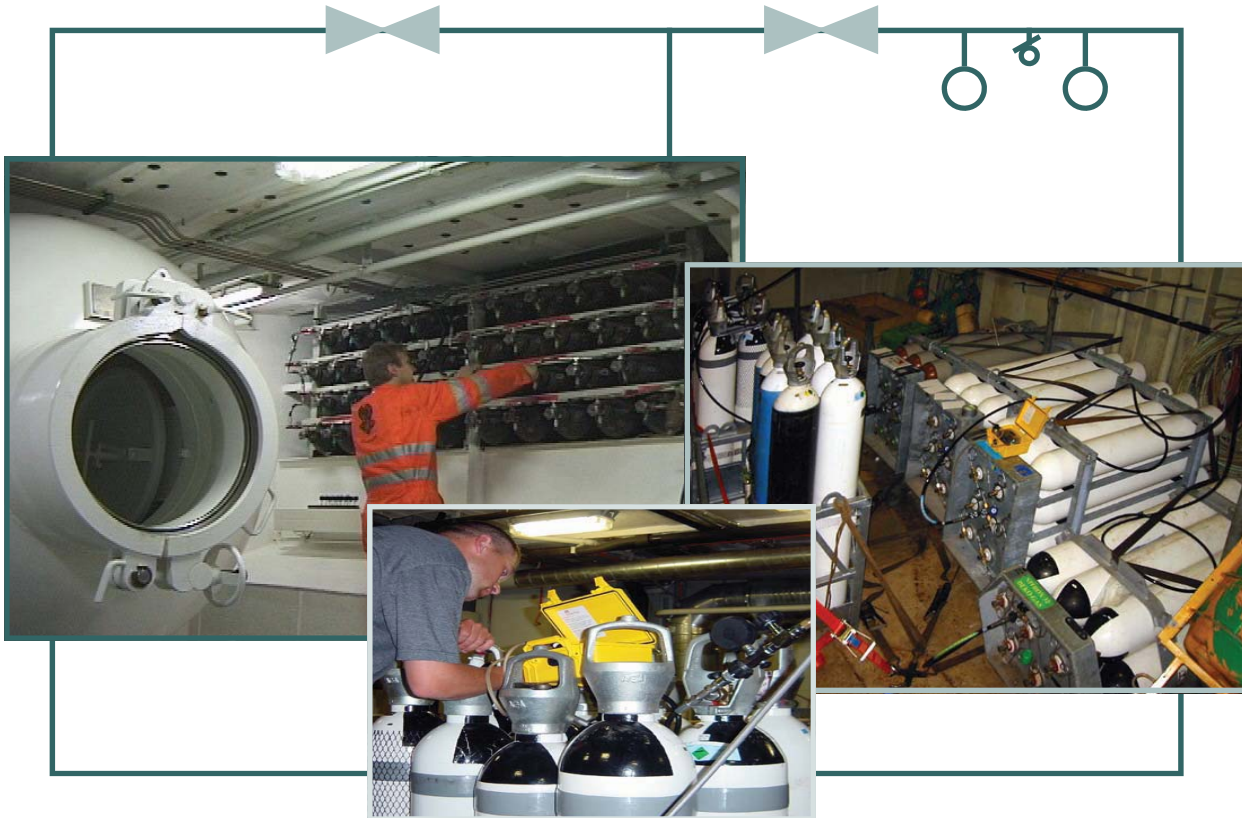
Main chamber	
Technical data:	Diameter 1829 mm, length 2400 mm
	Three port-holes and a medical lock
Equipped with:	MoDive monitoring system - on-line overview of all important decompression chamber parameters.
	Thermometer, Hygrometer and Gauge for measuring divers depth both inside and outside the chamber
	CO <sup>2</sup> and O <sup>2</sup> analyser/warning/indicator
	Air ventilation under pressure and a CO <sup>2</sup> scupper (Carbon dioxide cleaner)
	Four oxygen oral-masks (Oxygen BIBS)
	Heat thermostat
	Two 12 volt radios, one main communication and one emergency communication with Ups.
	12 volt light with Ups.
Entry lock	
Technical data:	Diameter 1829 mm, length 1250 mm and with an I.U.C. -flange
	One port-hole, a toilet and a sink.
Equipped with:	MoDive monitoring system - on-line overview of all important decompression chamber parameters.
	Thermometer, Hygrometer and Gauge for measuring divers depth both inside and outside the chamber
	Two oxygen oral-masks (Oxygen BIBS)
	Two 12 volt radios, one main communication and one emergency communication with Ups.
	12 volt light with Ups.

## Air/mixed Gas Supplies

Air is normally used on depth between 0 to 30 metres

Nitrox (oxygen enriched air) is mostly used from 20 to 40 metres

Trimix (mixed gas diving - helium, nitrogen and oxygen) is used from 40 to 100 metres



Air compressor	
Main compressor:	Bauer 940 Litres a minute
Backup compressor:	Bauer 240 Litres a minute
Air battery	
Diver main air:	4 x 50 Litres at 200 bar = 40,000 litres of air
Diver air reserve:	9 x 50 Litres at 200 bar = 90,000 litres of air
Air Main Chamber:	18 x 50 Litres at 200 bar = 180,000 litres of air
Air reserve Chamber:	9 x 50 Litres at 200 bar = 90,000 litres of air
Scuba tanks:	3 x (2 x 10 Litres at 200 bar = 12,000 litres of air
Mixed Gas battery	
TX-(x) (Bottom:	12 x 50 Litres at 200 bar = 120,000 litres of Trimix (Bottom Gas)
EAN-(x) (Deco):	12 x 50Litres at 200 bar = 120,000 litres of Nitrox (1. Decompression Gas)
EAN-(x) (Deco):	12 x 50 Litres at 200 bar = 120,000 litres of Nitrox (2. Decompression Gas)
Helium:	12 x 50 Litres at 200 bar = 120,000 litres of Helium

# MoDive Monitoring System



The MoDive monitoring system is used as the main monitoring system in the North Sea, and has been used for all major operations in this area.

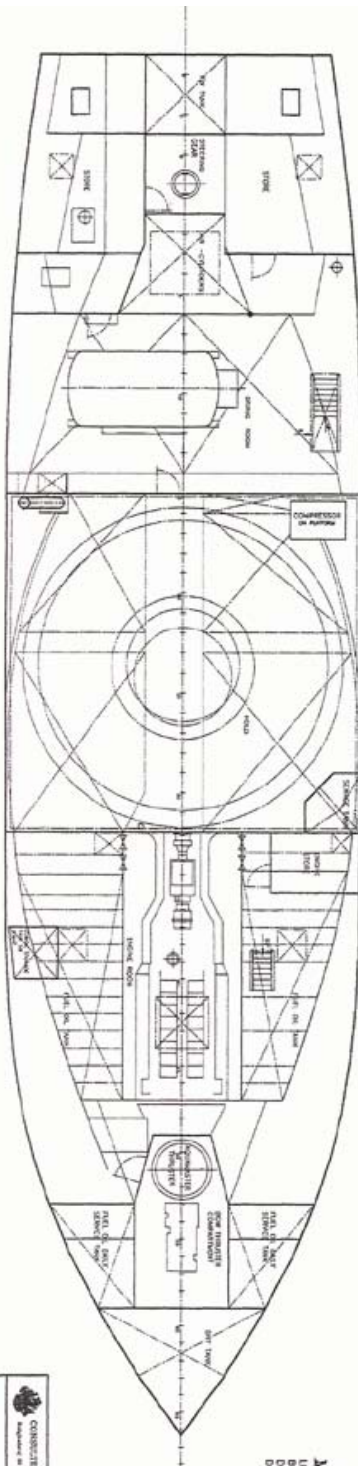
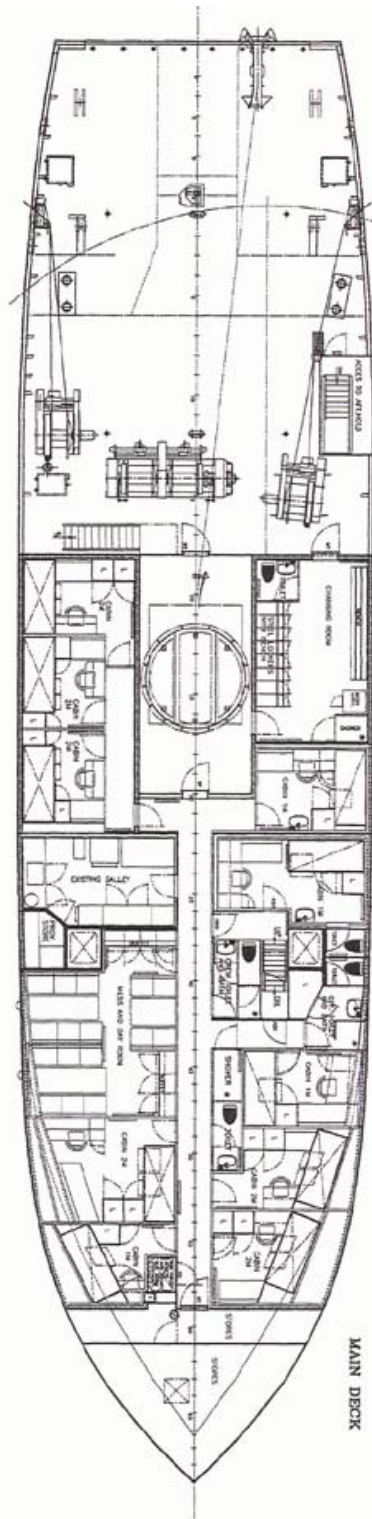
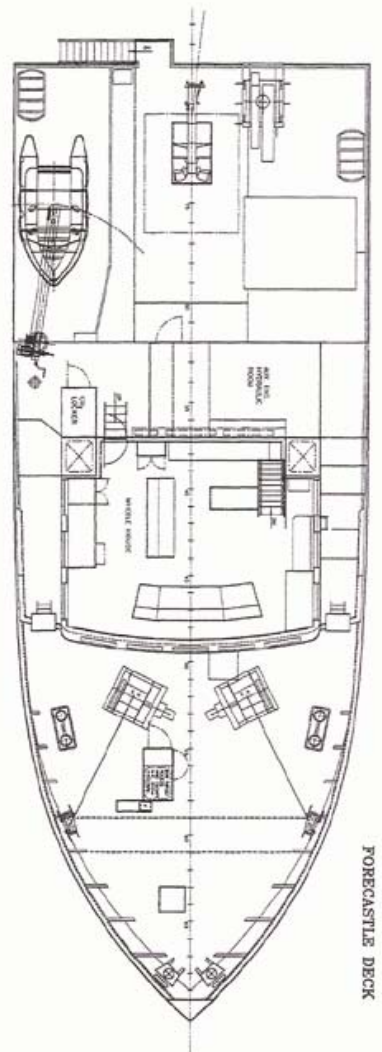
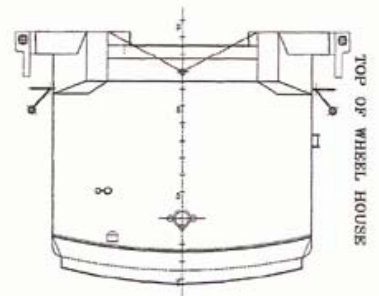
The MoDive Monitoring System is an on-line system giving a total overview of all important diver and decompression chamber parameters.

With its powerful standard features, surface interval timers, dive reports and multi-function control buttons, the MoDive System is a sophisticated tool ensuring both safety and efficiency.

The Dive Exposure Matrix shows the diving activities during the last 18 days for every diver, and is meant to be a help for the supervisors to see who the next diver is to go diving. The digital value in each square in the Matrix shows at which hour that particular dive was ended. Data from divers 1, 2 and 3 is shown in the main menu. In case of a repetitive dive, this hour indication will be displayed in a red colour. The matrix updates itself automatically.



The flexibility of the MoDive Software makes it very easy to accommodate to customer specifications.



**MAIN DIMENSIONS:**  
 LENGTH BETWEEN P-P 32.25m  
 BROADTH MOULDED 9.48m  
 DESIGN DRAUGHT 2.50m  
 DESIGN LOADED DRAUGHT 3.50m

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