LEENAARS BV

MARINE & OFFSHORE DESIGN

Flexible Lay Vessels & Flexible Lay Equipment

Leenaars bv

Leenaars has developed some of the most succesful flexible lay vessels in the world.
They operate in the following markets.

- Fibre Optic Cable
- Power Cable
- Flex-lay

Vessels can be designed for a specific market or designed for a combination of all these markets.

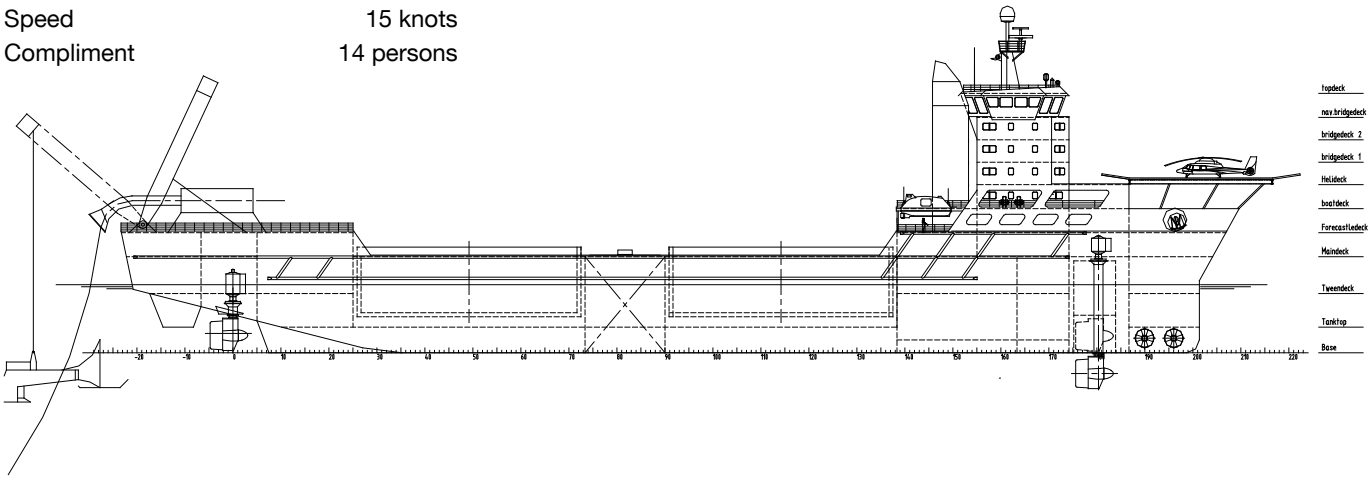
OUTFITTING AS FUNCTION OF MARKET		
MARKET	PRODUCT	OUTFITTING
TELECOM	FIBRE OPTIC	CAROUSELS NOT ROTATING REPEATER HANDLING DONUTS UP AND DOWN RUNNERS LAY EQUIPMENT SAME AS POWER CABLE
ENERGY	LONG POWER CABLES	2X 6000 TONS CAROUSELS ROTATING PLOUGH WITH A- FRAME WHEEL PAIR DOHB DRUM ENGINE 6 MTR STERN ROLLERS 6 METER
OFFSHORE INFIELD CONSTRUCTION	LONG UMBILICALS FLEXIBLES REELED CARBON TENDONS MOORING LINES	CAROUSELS ROTATING LAYTOWER WITH 150 TONS TENSIONER 350 TONS CRANE DECK SPACE SEE ABOVE SEE ABOVE SEE ABOVE
OFFSHORE CONSTRUCTION SUPPORT	WATER INJECTION FLOWLINES STEEL PIPE TO 14 INCH	LARGE VERTICAL REEL DEEPWATER CRANE ROV LARGER ACCONMODATION

Statnett / HMC / Dockwise

The vessel below was designed with 2 carousels of 6000 tons in open holds and large moon pool in the center. This design is for installation of long distance power cable and burial in combination with rockdumping and power cable repair.
Relatively cheap vessel but has to change heading when weather deteriorates.

Principal characteristics:

Length o.a.	148.00 m
Breadth	32.20 m
Max. draft	8.50 m
Deadweight	17,000 tons
Speed	15 knots
Compliment	14 persons



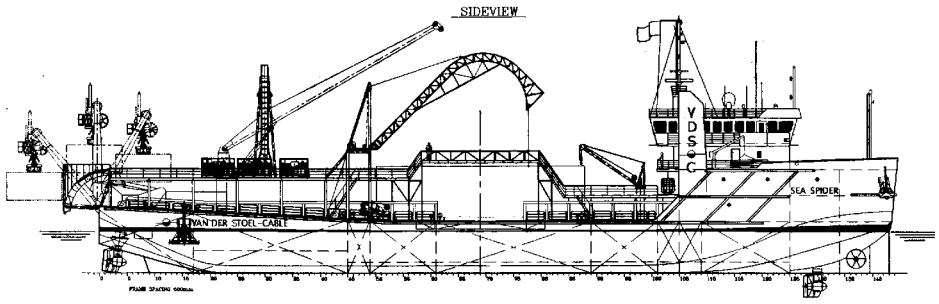
Boskalis

Sea Spider

Originally designed for v/d Stoel, this vessel was intended for coastal areas.
Cable capacity 4000 tons in one carousel

Principal characteristics:

Length o.a.	82.00 m
Breadth	24.00 m
Max. draft	4.50 m
Deadweight	5,500 tons
Speed	10 knots
Compliment	15 persons



Fibre Optic Cable Vessel References

Designs:

- Coastal Connector for Tycom
- The Provider for Tycom
- Dock Express 20 for AT&T
- Knight & Baron for Tycom

Knight & Baron

Vessels designed The state-of-the-art cable-laying and repair ships Knight and Baron are equipped with a wide range of specialist equipment such as EB plough system Sea Stallion, Racal Makai Lay cable installation software and a double redundant dynamic positioning system. The ships are the largest cable-laying vessels with three cable tanks and a cable-carrying capacity of 8,600 tons. The cs Knight and cs Baron -launched in 2001 and 2002 respectively perform at a maximum speed of 17 knots and are capable of burying cable as deep as 3.3 metres under the seabed.

Plough handling

- ODIM
- Very powerful active scissor
- Frame with trolley
- Plough-share recessed in the deck
- Self-locking scissor clamp
- Floating umbillical
- Cable laying through plough is possible

Plough technology

- EB Plough Sea Stallion
- Repeater passage through share
- Reduction in pull by lifting soil plug in 3 steps
- Minimum cable bend through slope in share
- 3.3 metres penetration in soft clay
- Passive bridle steering and skid steering
- Prepared for jet package

Fibre Optic Cable Vessels References

Principal characteristics of Knight & Baron:

Length o.a.	146.87m
Length b.p.	128.60 m
Breadth	21.00 m
Max. draft	9.00 m
Gross tonnage	14,149 tons
Main cable tank capacity	8,600 tons
Spare cable tank capacity	900 tons

Speed

Service	16 knots
Maximum 1	7knots
Range	65 days

Cable engines

ODIM,

Portside:

14 wheel pairs in line with 4 meter cable drum and 50 tons capacity

Starboard side:

4 wheel pairs in line with 4 meter cable drum and 50 tons capacity.

Cable tension

- Strainstall
- Dynamometer integrated in whiskers
- Cable engines are mounted on pendulum legs
- Pull of each engine is measured by redundant straingages

Cable management system

Racal Makai Lay cable installation software.

Vessel automation and class 2 DP Kongsberg-Simrad Type SDP 22

Vessel automation

Kongsberg-Simrad SVC

Reference systems

- Taut wire: Bandaks light weight taut wire
- HIPAP: acoustic positioning Kongsberg-Simrad
- DGPS: 2x Kongsberg-Simrad Seatex DPS 100

Bottom profiler

Kongsberg-Simrad EA 1000

Main engines/generators

4x 3,840 kW Hyundai MAN B&W 8L32/40

Thrusters

2x 4,500 kW Azimuth aft thrusters

2x 2,500 kW Azimuth retractable forward thrusters

1x 1,320 kW forward tunnel thruster

Cranes

1x 10 tons Knuckle boom crane

1x 20 tons Knuckle boom crane

Accommodation

Total accommodation for 80 persons:

- captain class: 6
- officers class: 10
- crew double cabins: 64

Classification

DNV + 1A1, EO, WI-OC, DYNPOS-AUTR

Rieber

Polar Queen

The Polar Queen is one of the most advanced flexlay and subsea construction ships available. At a length overall of 150m, with a flexlay capability at up to 340 mt lay tension, flexible product storage capacity up to 3800 mt; a crane with 300 mt inshore, 200 mt offshore capacity combined with a 400 mt heave compensated deployment winch system for subsea structure installation and a large clear work deck area; this dynamically positioned, DNV Classed flexlay and subsea construction ship with accommodation for up to 121 persons is ideally suited for operations worldwide. Capabilities include flexible, umbilical and subsea structure installation in water depths of 2000 m.

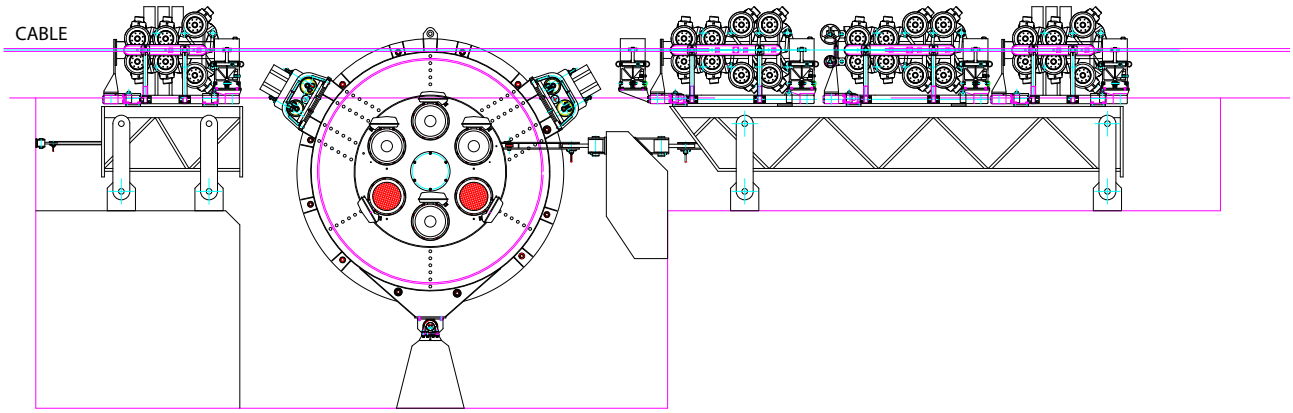
Principal characteristics:

Length o.a.	150.00 m	Speed	16 knots
Breadth	21.00 m	Compliment	80 persons
Max. draft	9.00 m	Carousel	2 x 2,000 tons

Leenaars BV develops and designs offshore equipment for the offshore construction market.
Fabrication is done by Dahlian Heavy Industries DHI·DCW.
The combination of ofshore vessel design with offshore equipment design results in more efficient vessels designed around their specific tasks.
The following equipment is designed for the cable installation market

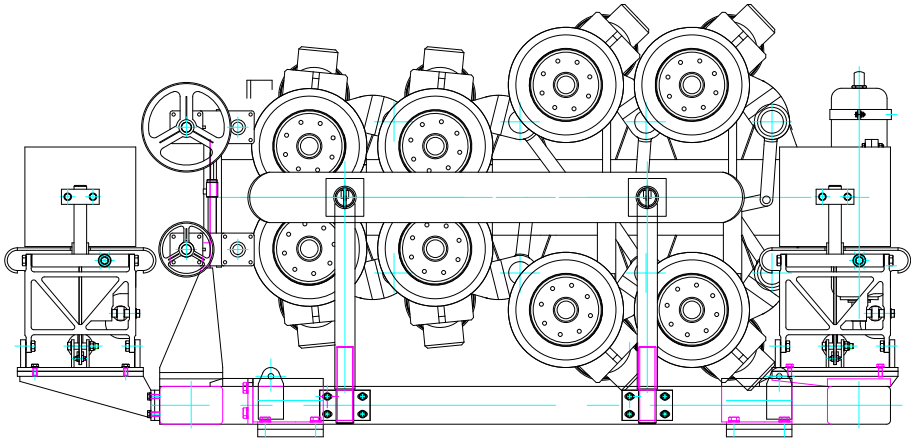
Drum Engines

For power cable the drum engine diameter is 6 meters and for fibre optic cable the drum diameter is 3 meters. All engines are on hinged links to perform accurate load cell measurements.



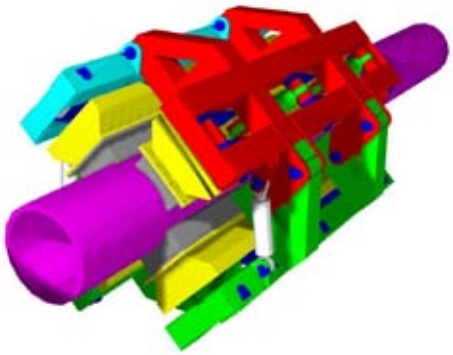
Wheel Pairs

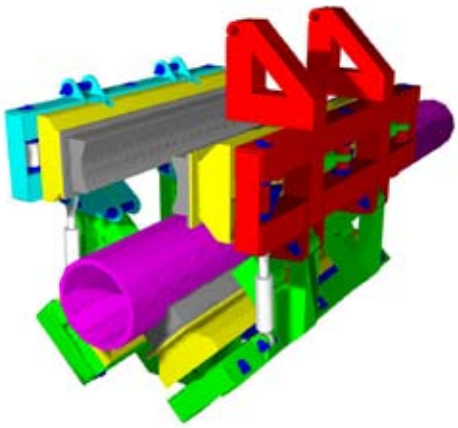
For fibre optic cable and power cable the wheel pairs can be arranged such that in shallow water only the wheel pairs are used and the drum engine is passed.



Lineair Traction Engines and Clamps

Lineair traction engines can only be used for power cable and flexible pipe.



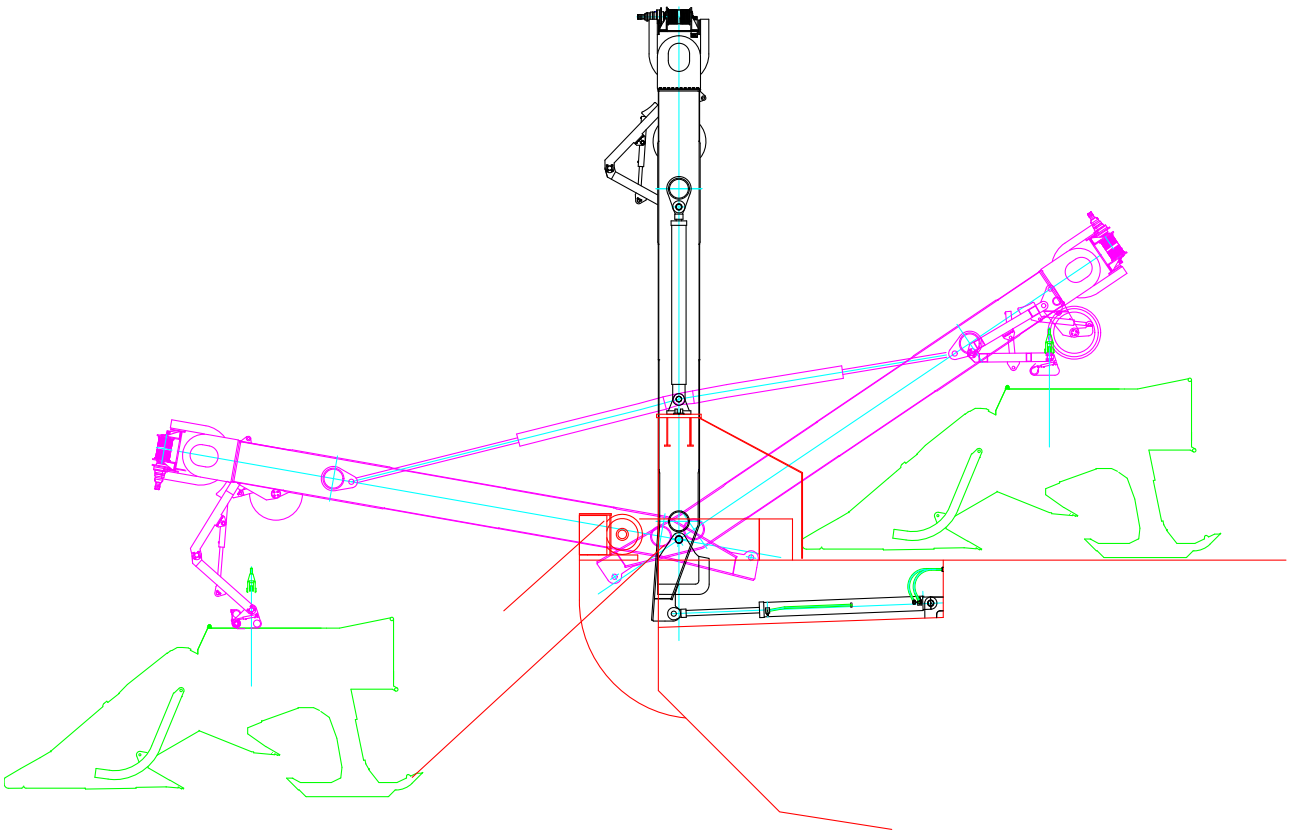


Carousels

Two carousel designs are available, a propelled carousel with traction wheel and a propelled carousel with rack and pinion system. For fibre optic cable the carousel is not rotating and slots are provided for repeated handling.

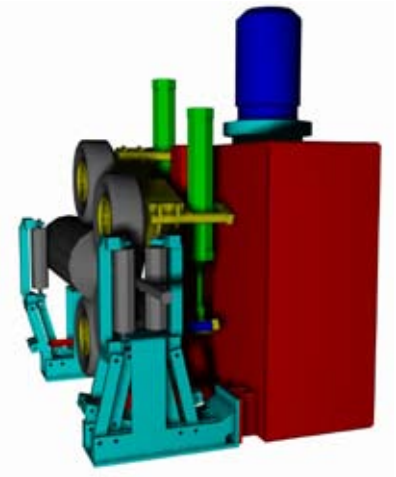
A-Frame

Wide angle A-frame is used with scissor to lock the plough in the splash zone. The plough can be positioned in way of the cable in a slot in the deck. The way of the cable can be layed through the plough. The trolley can traverse to place plough from launch position to storage position.



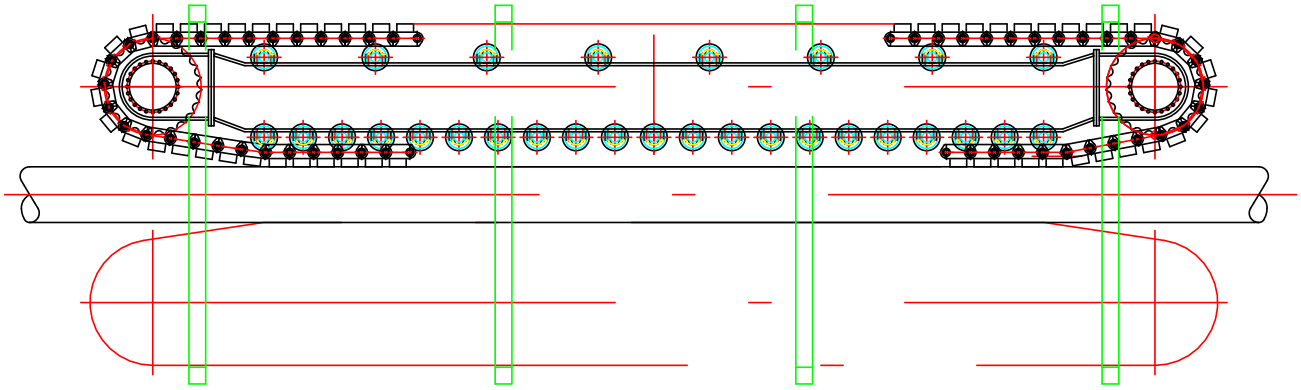
Cable Hauler

Simple cable hauler is designed for loading cable.



Flexible Pipe Tensioners

Four quadrant 150 tons pipe tensioner is designed for low pressures on flexible pipe or umbelical.



Deepwater Knuckle Boom Cranes

Several types of knuckle boom cranes were designed for deep-water operation with single fall and loads ranging from 50 to 300 tons and waterdepth up to 3000 meters

ISO 9001

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