

海底探査用海中ケーブル



概要

Cables and umbilicals used for offshore hydrocarbon exploration and oceanographic research generally operate in the aggressive surface zone and are subjected to the most physically demanding conditions. Their performance and reliability are critical to efficient and economic data acquisition.

Airgun umbilicals, ocean bottom cables and armoured lead-ins (tow leaders) used for marine geophysical survey in hostile waters around the globe pose a particularly stern challenge to the cable/umbilical designer/manufacturer.

Marine geophysical survey contractors require equipment optimised to suit their individual deployment operation and data acquisition systems.

JDR Cable Systems has developed a wide range of products to suit the requirements of all the major operators as well as an off-the-shelf capability for industry standard systems. These products have been extensively factory and field-tested.

Please note that the following technical information is only representative of typical products. More detailed mechanical and electrical characteristics can be provided relative to your specifications and needs.

デザイン製造及び試験設備

All manufacturing facilities are fully equipped with plant capable of producing custom-designed umbilicals/cables. This includes manufacture of individual electrical components, hoses, fibre optic units, lay-up of assemblies, extrusion of thermoplastic sheaths, application of strength braids or armouring and termination of completed umbilicals/cables.

This provides flexibility in manufacture as there is a degree of crossover in the sites' abilities, ensuring that exacting delivery demands can be met.

JDR Cable Systems' sites at Littleport (UK) and at Capelle (The Netherlands) are fully approved to ISO 9001:1994.

JDR社の豊富な経験

JDR Cable Systems has an impressive track record in the design and manufacture of rugged and innovative marine geophysical cables and umbilical systems. To meet customer applications and specific requirements, we draw upon a wide variety of special materials, techniques and design tools.

JDR Cable Systems has the unique capability to produce all cables, hoses, terminations and ancillary items in-house, allowing changes in detail to be executed without undue delay to critical schedules.

To ensure single point responsibility, complete integrated packages can be supplied, including handling winches, slip rings and rotary unions, all factory outfitted and tested (in-house) prior to despatch.

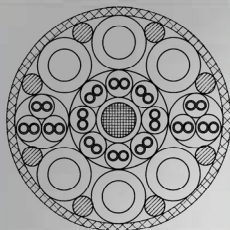
製品／サービス

- **エアガン・アンビリカル** Single or multi-hose, integrated tow wire, aramid braided or armoured.
- **リード-イン** Armoured lead-ins or tow leaders (direct tow). Conventional telemetry pair or fibre optic.
- **海底ケーブル** Rugged, high strength cables for digital ocean bottom or bay cable systems.
- **地震探査用ケーブル** Robust telemetry cables for harsh environment land/transition zone systems.
- **海中ケーブル** Towed and buoyant magnetometer cables, sparker and boomer noise source cables and towed and side-scan sonar cabling.
- **ヘア・フェアリング** For reduction of cable strumming in all towed systems
- **ターミネーション** Umbilical, lead-in and cable terminations to support any electrical, pneumatic and mechanical connection requirements.
- **オフサイト・バックアップ・サービス** Engineers are available for off-site support, testing and termination work.



エアガン・アンビリカル

JDR Cable Systems' air-gun umbilicals are designed to be rugged, flexible, low diameter, high strength with the maximum content. These products incorporate a range of high pressure thermoplastic hoses all optimised for maximum flow rates as well as electrical units manufactured from high strength conductors or fibre optics, if required. Steel wire armoured umbilicals are available, these can be made lighter by using sheathed armour wires. Alternatively aramid fibre braids or servings can be applied as a replacement for steel armour wire to further reduce weight.



エアガン・アンビリカル

構造

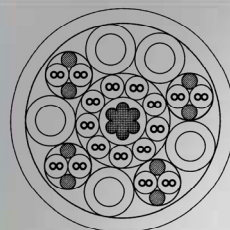
- Aramid fibre strength member.
- 6 x 3/8" NB hoses.
- 14 x 15 AWG cadmium bronze pair cables.
- Close mesh monofilament overbraid.

外径

67 mm.

破壊荷重

10.5 Tonnes.



エアガン・アンビリカル

構造

- Stainless steel strength member.
- 5 x 3/8" NB hoses.
- 17 x 15 AWG cadmium bronze pair cables.
- Polyurethane outer sheath.

外径

73 mm.

破壊荷重

8.5 Tonnes.



シングル・ホース・エアガン・アンビリカル

構造

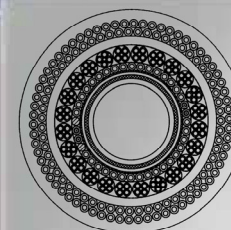
- 1 x 7/8" NB hose.
- 27 x 15 AWG cadmium bronze quad cables.
- Polyurethane inner sheath.
- Aramid fibre strength braid.
- Polyurethane outer sheath.

外径

75 mm.

破壊荷重

30 Tonnes.



アーマード・エアガン・アンビリカル

構造

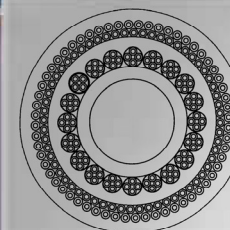
- 1 x 7/8" NB hose.
- 34 x 1mm² plain copper cores.
- 20 x 18 AWG cadmium bronze quads.
- 4 x 18 AWG screened cadmium bronze quads.
- 4 x multi-mode fibre optic units.
- Polyurethane inner sheath.
- 2 x layers polyethylene sheathed, contrahelically wound, preformed high tensile galvanised steel wire armour.
- Nylon outer sheath.

外径

66.5 mm.

破壊荷重

23 Tonnes.



アーマード・エアガン・アンビリカル

構造

- 1 x 7/8" NB hose.
- 19 x 0.88mm² plain copper quads.
- 1 x 0.88mm² screened plain copper quad.
- Polyurethane inner sheath.
- 2 x layers polyethylene sheathed, contrahelically wound, preformed high tensile galvanised steel wire armour.
- Nylon outer sheath.

外径

60 mm.

破壊荷重

22 Tonnes.

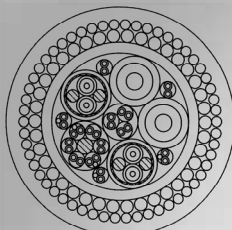


リード-イン・ケーブル

The use of multiple streamers and wide tow arrangements demand maximum strength coupled with minimum diameter and weight to reduce hydrodynamic drag. These conflicting variables must be optimised while ensuring long term electrical and fibre optic component reliability under severe flexing, vibration and possible impact loads.

Lead-in cables can be used with separate tow wires or for "direct" tow where they take the full tow load, hence breakloads of up to 80 Tonnes are required.

The high rate and content of data passing through the cable calls for either precision low loss data transmission pairs or fibre optics. These must perform with minimal signal loss or corruption even under extreme load and vibrational conditions.



電気アーマード・リード-イン・ケーブル

・ 構造

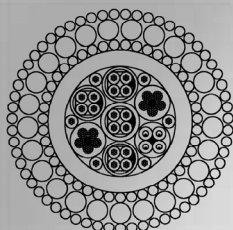
- 9 x 0.5 mm² twisted pairs.
- 5 x 0.5 mm² screened twisted pairs.
- 2 x 6.0 mm² power cores.
- 2 x Telemetry pairs.
- Polyurethane inner sheath.
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour.
- Nylon outer sheath.

・ 外径

43.5mm.

・ 破壊荷重

45 Tonnes.



電気/光アーマード・リード-イン・ケーブル

・ 構造

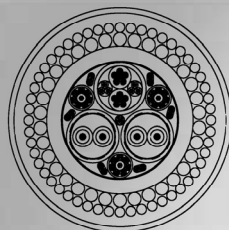
- 6 x optical fibres.
- 10 x 0.5 mm² signal cores.
- 2 x 6.0 mm² power cores.
- 3 x 0.5 mm² screened twisted quads.
- Polyurethane inner sheath.
- 3 x layers contrahelically wound, preformed high tensile galvanised steel wire armour.
- Optional haired fairing.

・ 外径

33.7mm.

・ 破壊荷重

64 Tonnes.



電気アーマード・リード-イン・ケーブル

・ 構造

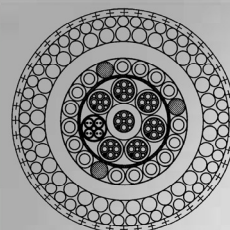
- 2 x 6.5 mm² power cores.
- 22 x 0.6 mm² signal cores.
- 6 x 0.6 mm² signal pairs.
- 2 x telemetry pairs.
- Polyurethane inner sheath.
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour.
- Polyurethane outer sheath.
- Optional haired fairing.

・ 外径

50.0mm.

・ 破壊荷重

83 Tonnes.



電気アーマード・リード-イン・ケーブル

・ 構造

- 7 x 0.5 mm² screened twisted quads.
- 8 x multi-mode optical fibres.
- 16 x 2.0 mm² power cores.
- Polyurethane inner sheath.
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour.
- Optional haired fairing.

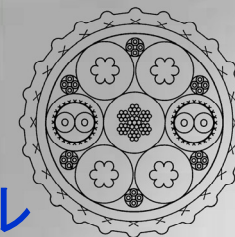
・ 外径

38.2mm.

・ 破壊荷重

48 Tonnes.

海底ケーブル



・ 海底ケーブル

・ 構造

- 1 sheathed galvanised steel wire rope.
- 2 x digital data pairs.
- 4 x 10.0 mm² power cores.
- 6 x 0.23 mm² twisted quads.
- Polyurethane inner sheath.
- Aramid fibre braid.
- Polyurethane ribbed outer sheath.

・ 外径

37.5 mm.

・ 破壊荷重

2.3 Tonnes.

Incorporating all of the requirements of armoured lead-in cables in terms of data transmission, the Ocean Bottom Cable (OBC) must be light, flexible and extremely durable.

In order to withstand the rigours of deployment and recovery, **JDR Cable Systems' OBC** has been designed with all of the company's experience of dynamic and harsh environment cables, thus incorporating an assembly with a high component lay-angle, trapped aramid fibre braid within the outer jacket and individual components optimised for the application.



ヘア・フェアリングの原理

One of the major considerations when designing marine tow cable systems is the effect of fluid dynamics on the system i.e. hydrodynamic drag and cable strumming.

With a conventional round section cable moving through water, a low pressure area is created behind the cable as it moves and water rushes around the cable to fill this area. This creates vortices in the wake of the cable. As the velocity of the cable increases, turbulence caused by these vortices produces an unnecessarily high drag coefficient and cable instability or strumming. The effect of strumming on a cable can be to greatly increase its drag coefficient (as the effective surface area increases).

"Kiting" can also occur when the cable begins to hydroplane through the water in a skip pattern as a kite would in high winds.

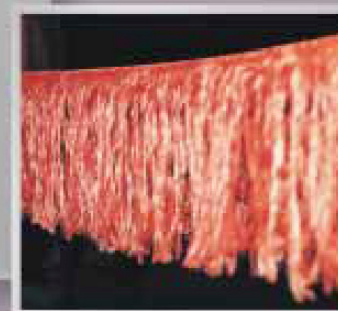
Fairing of a cable will help to address these effects by producing a controlled shedding of the vortices and reducing turbulence. The haired fairing trails behind the cable like the tail of a kite and can freely adjust to the direction of cable movement and water flow.



By reducing the turbulence caused by uncontrolled vortice shedding the fairing reduces strumming and can also reduce drag (as the cable presents a more stable condition in the water flow).

●ヘア・フェアリングのタイプ

JDR Cable Systems[®] has developed two distinct fairing variants of the original Streamline product, these offer extended service life in arduous conditions for a modest cost increase over the standard product. All products use the tough and hard wearing polyester yarn for the base braiding, however the frond material has been further processed to resist strand breakdown and therefore extend service life.

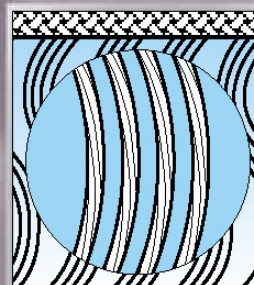


●ヘア・フェアリングの構造

JDR Cable Systems "Strumbuster" haired fairings comprise a close knit polyester fiber braid with tails (fronds) of various materials and constructions (see opposite) pulled out at regular intervals along one or more axis. Both frond density and length are variable to suit cable size and service requirements. Production is fully automated with individual fronds being fully locked into the braid package. The degree of security of the fronds can be further increased by the use of high strength adhesive systems.

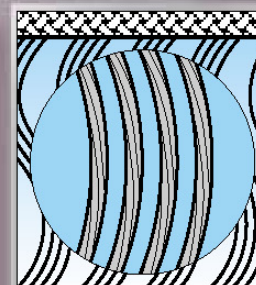
Strumbuster haired fairing can be added to virtually any cable or rope or retro-fitted with minimal effect on weight or diameter thus reducing impact on deployment reels and removing any requirement for specialised handling equipment.

The fairing will withstand repeated reeling onto winch drums without significant damage, and easily deforms to fit under the cable wraps. At the end of the fairing's useful service life it can be removed and a new fairing applied without the need to remove any cable terminations.



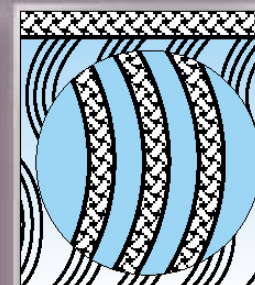
● 流線型

Fronds are composed of high tenacity bunched polyester fiber. These fibers deliver good mechanical performance in sea-water and are suited to most low-medium duty applications.



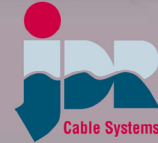
● コーティング型

Improved frond performance and lifetime is achieved by pre-treating the polyester frond strands with a proprietary abrasion resistant, water proof coating system. Tuffcoat offers improved lifetime for all but the most arduous applications.



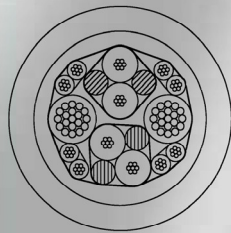
● 編組型

Ultimate long term performance in any application is achieved by the use of braided fronds of polyester or alternate fibers. Both fiber strength and wear characteristics are greatly improved offering the potential for much extended service life.



地震探査用ケーブル

In order to meet the harsh environmental conditions of land and transition zone seismic acquisition, Land Seismic and Bay Cables must meet strict mechanical and electrical specifications. To ensure reliable data acquisition in multichannel operation, low attenuation and cross talk are essential. Mechanically, cables must be able to withstand handling across widely varying climates and terrain and be resistant to repeated winding at tight bend radii whilst being light enough to remain portable.



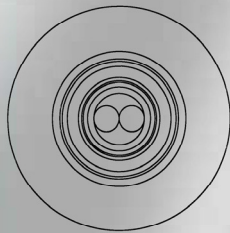
地震探査用ケーブル

構造

- 2 x 0.16 mm² twisted pairs.
- 4 x 0.14 mm² twisted pairs.
- 2 x 1.34 mm² cores.
- PVC inner sheath.
- Polyurethane outer sheath.

外径

9.3 mm.



マグネットメーターケーブル

構造

- 2 x 4.5 mm² twisted pairs.
- Bronze wire braid.
- PVC filler sheath.
- Steel wire braid.
- Polyurethane inner sheath.

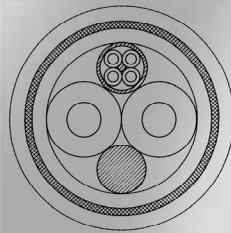
- Foam polyethylene outer sheath.

外径

30 mm.

破壊荷重

0.4 Tonnes.



ブーマーケーブル

構造

- 2 x 10.0 mm² power cores.
- 1 x 1.0 mm² screened twisted quad.
- Polyurethane inner sheath.
- Galvanised steel wire braid.
- Polyurethane outer sheath.

外径

27.5 mm.

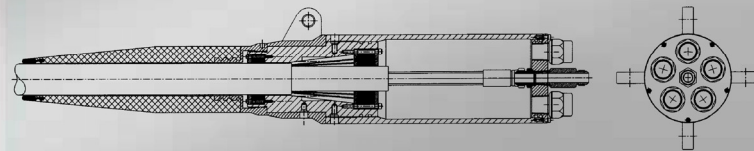
破壊荷重

2 Tonnes.

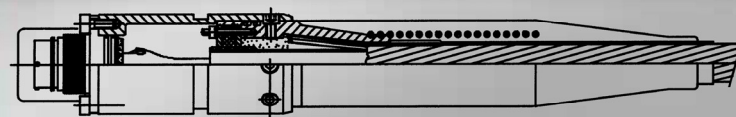
ターミネーション

Terminations for both airgun umbilicals and armoured lead-in cables must be capable of transferring high tow loads as well as protecting sensitive electrical or optical fibre connections. In addition, they need to seal the umbilical/cable against water ingress in a high shock-load environment.

Airgun umbilical terminations can be designed to be field accessible to enable wiring changes or connector replacement. Lead-in cable terminations can be provided to suit all industry standard connector types whilst offering full cable breakload. Fibre optic lead-in cables can be offered with electro-optic converters integral to the terminations. In addition to terminations, **JDR Cable Systems** can supply complete systems including cable handling, connectors and jumper harnesses.



Typical airgun umbilical termination



Typical tow leader cable termination



ケーブル／アンビリカルの構造

レイ・アップ

To achieve the best dynamic performance and to prevent stress build-up in outer components during bending, all units are helically laid-up in a full 360 degree cabled construction. Lay angles are carefully selected to suit the construction and subcomponent design.

ストレンクス・メンバー

Strength members (usually polyester, aramid fibre or wire rope) may be manufactured in-house or procured from specialist manufacturers. Inert packing ropes of polypropylene are employed to ensure a compact circular form.

シース

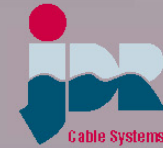
Extruded sheathing of most thermoplastic materials (Ether-based polyurethane, polyethylene, nylon, polyester elastomer are commonly used) is available for maximum protection and service life. Materials are selected for their resistance to a seawater environment, durability under handling and cost. Alternatively, a lightweight monofilament polyethylene braid can also be offered for maximum flexibility and ease of handling, troubleshooting and repair.



アーマリング／テキスタイルによる補強

Lightweight wire, polyester or aramid fibre braids or heavy duty, preformed, contrahelical steel wire armour are provided for tow cables and umbilicals. Both steel and textile reinforced cables and umbilicals possess high tensile strength. Armoured umbilicals are also protected against damage
JDR Cable Systems can manufacture armoured cables up to 10,000 metres in length, depending upon diameter and weight. Cables can have one, two, three or more layers of wire armour to ensure maximum strength and protection according to application. Manufacturing plant includes a 120 bobbin armouring machine fully equipped to pre-form high tensile steel wire.

構成



エレクトリカル・コア

Electrical conductors comprise multi-strand copper, cadmium bronze (cadmium copper), copper/steel and other alloys, either tinned or plain. Strand size is determined according to specification and/or duty. Multi-strand constructions ensure good flexibility for dynamic duties.

Insulation materials are usually thermoplastic compounds, including polyethylene, cross-linked polyethylene, polypropylene, FEP and ETFE.



光ファイバーの構成

Fibre optic cables are selected from standard basic units and then further processed as necessary. Fibre optics are being used more widely for data transmission due to their large bandwidth capability, low attenuation and freedom from interference. Multi and single-mode fibres are available in a variety of constructions: loose tube systems utilise fibres in plastic or steel tubes, while tight buffered systems typically include a steel armour or aramid reinforcement.

ケーブル

Designed and manufactured in-house to suit the final bundle make-up, each component is sized to ensure a balanced and circular construction. Data and signal transmission line options include twisted pairs, triads or quads (screened if required) and coaxes of various specifications. These are all optimised for particular attenuation, capacitance, cross-talk, resistance and other important electrical parameters. To avoid RF and EM interference, power cables are screened using either copper braid or aluminium/polyester film.



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**For the latest information
on JDR Cable Systems'
products and services see
our web site.**

www.jdr cables.com

オフサイト・バックアップ・サービス

Recognising that our customers frequently require modifications or repairs to umbilicals or cable systems due to the harsh environments they are subjected to,

JDR Cable Systems offers full back-up support. Highly skilled and experienced technicians are ready to mobilise at a moment's notice anywhere in the world to offer advice and carry out testing or termination functions.



試験

Apart from normal routine pressure and electrical testing, a sample length of umbilical or cable can be subjected to a wide range of mechanical, electrical and optical tests to ensure conformance to pre-determined standards. These tests may include ultimate tensile and/or cycle-testing with full component monitoring at design working load.

Our purpose-built cycle/tensile test rig is capable of pulling loads up to 100T, and cycling umbilicals up to 150 mm in diameter at 50T, whilst continuously monitoring all components whether electrical, optical or hydraulic.

For instance, we have tested armoured lead-in cables under tension whilst being subjected to over 100,000 load tension cycles.

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