

海中ロボット用 ケーブル



概要

Cables and tethers used for Remotely Operated Vehicles are the vital connection between the vehicle and the surface, providing the mechanical link, as well as electrical power and communications. Their performance and reliability are critical to efficient and accurate control as well as providing the required strength to support the vehicle.

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 the specifications and requirements.

- 海中ロボット(ROV)向け
- 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 remotely operated vehicle cable and tether 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 cable components and ancillary items in-house, allowing changes in detail to be executed without undue delay to critical schedules. To ensure single point responsibility, complete packages can be supplied including handling winches and terminations, all factory outfitted and tested (in-house) prior to despatch.



- デザイン製造及び
- 試験設備

Manufacturing facilities are fully equipped with plant capable of producing custom-designed cables. This includes manufacture of individual electrical components, fibre optic units, lay-up of assemblies, extrusion of thermoplastic sheaths, application of strength braids or armouring and termination of completed cables. This provides flexibility in manufacture as there is a degree of crossover in each sites' abilities, ensuring that exacting deliveries can be met.

- アプリケーション

Vehicles catered for include those intended for use in the survey, construction, pipe inspection, drill support, maintenance, cable burial markets as well as "Eyeball" vehicles which are primarily used for video inspection.

In addition to being used within the hydrocarbon, mineral mining, research and construction commercial markets, ROVs are also used for military applications including, surveillance, mine counter measures, mine hunting and submarine rescue.

Similar cables and tethers are also supplied to operate seabed trenching vehicles, manned submersibles, atmospheric hard diving suits and fixed remotely operated tooling systems.

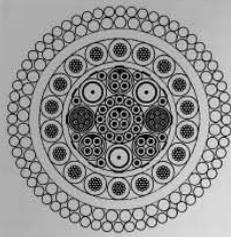
- 製品/サービス

- **メイン・リフト・ケーブル** Used to either directly deploy the ROV, or a Tether Management System (T.M.S.)/cage and ROV.
- **テザー用ケーブル** Used in conjunction with vehicles being deployed from T.M.S./cage systems or directly from the vessel.
- **海底溝、サンプリング及び測量船用ケーブル** Variety of power/signal cables for controlling a wide range of vehicle types.
- **ダイビング・スーツ及び有人潜水ケーブル** Cables providing power and signal to manned diving suits and manned submersible systems.



メイン・リフト・ケーブル

These cables are used for "Work Class" systems, either to directly deploy the ROV, or a Tether Management System (T.M.S.) or "Cage" containing the ROV. The armoured cable is designed to support the weight of the vehicle/T.M.S. plus tooling and sensor options, with a safety margin adequate to cope with the forces imposed by the system's arduous journey to its work-site.



ROV用メイン・リフト・ケーブル

・ 構造

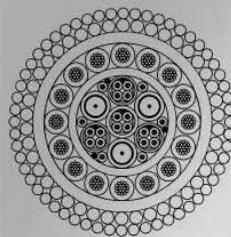
- 4 x 0.5 mm² screened twisted quads
- 3 x 75 Ω coaxial cables
- 20 x 0.5 mm² signal cores
- 2 x 6 way fibre optic units
- Polyethylene inner sheath
- 18 x 4.0 mm² power cores
- Polyurethane outer sheath
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour

・ 外径

43.0 mm

・ 破壊荷重

55 Tonnes



ROV用メイン・リフト・ケーブル

・ 構造

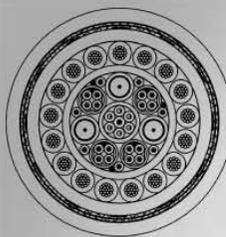
- 4 x 0.5 mm² screened twisted quads
- 3 x 75 Ω coaxial cables
- 6 x 0.5 mm² signal cores
- Polyethylene inner sheath
- 16 x 4.0 mm² power cores
- Polyurethane outer sheath
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour

・ 外径

40.4 mm

・ 破壊荷重

55 Tonnes



ROV用メイン・リフト・ケーブル

・ 構造

- 1 x 6 way loose tube fibre optic unit
- 3 x 75 Ω coaxial cables
- 4 x 0.50 mm² screened twisted quads
- 7 x 0.5 mm² signal cores
- Polyethylene inner sheath
- 17 x 4.0 mm² power cores
- Polyurethane outer sheath
- 2 x layers contrahelically served aramid fibre
- Thermoplastic polyester outer sheath

・ 外径

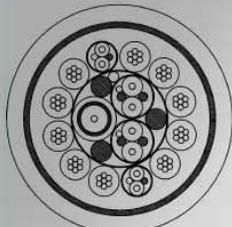
41.6 mm

・ 破壊荷重

10.0 Tonnes

テザー(Tether)用ケーブル

Tether cables are used in conjunction with vehicles being deployed from T.M.S./cage systems or directly from the surface for the smaller vehicles. A T.M.S./cage provides the vehicle with added protection when passing through the air/water interface and enables the ROV to be de-coupled via the tether cable, from the motion of the surface vessel caused by wave action. Tether design and manufacture is optimised taking into account the common requirements which include high flexibility, good durability, neutral buoyancy and minimum drag, all of which aid vehicle manoeuvrability.



中性浮力タイプ
ROV用テザー

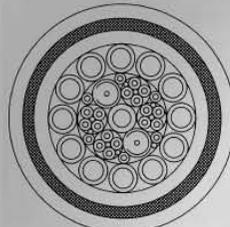
・ 構造

- 4 x 0.12 mm² screened twisted pairs
- 1 x 75 Ω coaxial cable
- 10 x 0.88 mm² aluminium power cores
- Thermoplastic rubber inner sheath
- Aramid fibre strength braid
- Thermoplastic rubber outer sheath

・ 重量(海中)
0 kg/km

・ 外径
16.4 mm

・ 破壊荷重
0.425 Tonnes



ROV用テザー

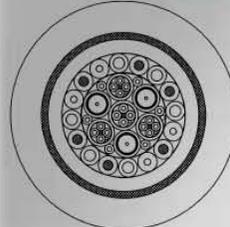
・ 構造

- 1 x 2.5 mm² earth core
- 4 x 0.22 mm² twisted quads
- 2 x 75 Ω mini coaxial cables
- 6 x 0.22 mm² cores
- 12 x 3.33 mm² aluminium power cores
- Polyurethane inner sheath
- Aramid fibre strength braid
- Polyurethane outer sheath

・ 重量(海中)
135 kg/km

・ 外径
24.5 mm

・ 破壊荷重
3.0 Tonnes



ROV用テザー

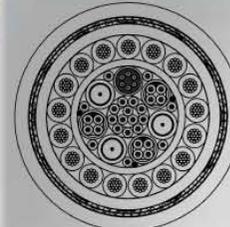
・ 構造

- 4 x 0.50 mm² screened twisted quads
- 3 x 75 Ω coaxial cables
- 6 x 0.50 mm² signal cores
- 4 x 1.0 mm² power cores
- 6 x 3.0 mm² power cores
- Polyurethane inner sheath
- Polyester fibre strength braid
- Thermoplastic rubber outer sheath

・ 重量(海中)
155 kg/km

・ 外径
45.0 mm

・ 破壊荷重
3.0 Tonnes



ROV用テザー

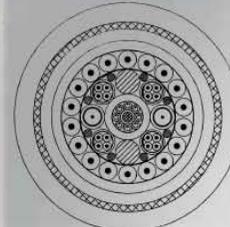
・ 構造

- 19 x 0.5 mm² signal cores
- 3 x 75 Ω coaxial cables
- 3 x 0.50 mm² screened twisted quads
- 1 x 6 way fibre optic unit
- Polyethylene inner sheath
- 17 x 4.0 mm² power cores
- Polyurethane bedding sheath
- 2 layers of contrahelical served aramid fibre
- Thermoplastic polyester outer sheath

・ 重量(海中)
938 kg/km

・ 外径
41.0 mm

・ 破壊荷重
10 Tonnes



ユニバーサルの使用
ROV用テザー

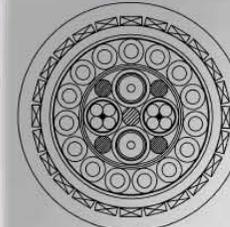
・ 構造

- 1 x 8 way fibre optic unit
- 4 x 0.34 mm² screened twisted quads
- 2 x 75 Ω coaxial cables
- 18 x 0.93 mm² power cores
- Polyethylene inner sheath
- Thermoplastic rubber bedding sheath
- Aramid fibre strength braid
- Thermoplastic rubber outer sheath

・ 重量(海中)
0 kg/km

・ 外径
49.0 mm

・ 破壊荷重
7.7 Tonnes



ROV用ガレージ
テザー

・ 構造

- 2 x 0.50 mm² screened twisted quads
- 2 x 75 Ω coaxial cables
- 15 x 2.0 mm² power cores
- Polyethylene inner sheath
- Aramid fibre strength braid
- Polyurethane outer sheath

・ 重量(海中)
514 kg/km

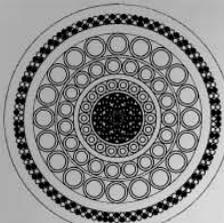
・ 外径
30.5 mm

・ 破壊荷重
4.5 Tonnes



- 海底トレンチング(溝掘り)、サンプリング
- 及び各種探査ロボット用ケーブル

A variety of power/signal cables are offered for controlling a wide range of vehicle types. These are frequently armoured cables incorporating power cores, fibre optic components and/or conventional electrical signal cores for telemetry.



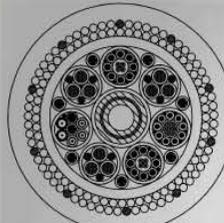
電気/機械トレンチャー用ケーブル

構造

- 1 x 6 way fibre optic unit
- 22 x 1.34 mm² screened twisted pairs
- Polyethylene filler sheath
- 18 x 6.0 mm² power cores
- Polyethylene filler sheath
- 19 x 25.0 mm² power cores
- Polyethylene filler sheath
- 20 x 50.0 mm² power cores
- Polyurethane inner sheath
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour
- Polyurethane outer sheath

外径

139.0 mm
破壊荷重
79 Tonnes



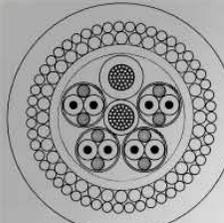
トレンチャー用ケーブル

構造

- 1 x 1/2" NB, 200 bar working pressure pneumatic hose
- 3 x 16.0 mm² (3.3 kV) triads with earth cores
- 2 x units comprising 1 x 4 way fibre optic unit, 8 x 4.0 mm² power cores
- 1 x unit comprising 1 x 6 way fibre optic unit, 9 x 2.5 mm² power cores
- 1 x unit comprising 2 x 0.8 mm² screened twisted pairs, 3 x 50 Ω coaxial cables, 2 x 75 Ω coaxial cables
- 7 x 0.75 mm² screened twisted pairs
- Polyurethane inner sheath
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour
- Polyurethane outer sheath

外径

84.0 mm
破壊荷重
193 Tonnes



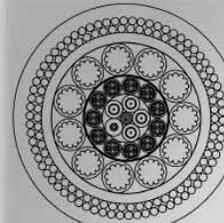
トレンチャー用ケーブル

構造

- 2 x 2.5 mm² cores
- 4 x 0.22 mm² screened twisted pairs
- Polyurethane inner sheath
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour
- Polyurethane outer sheath

外径

18.0 mm
破壊荷重
7.2 Tonnes



トレンチャー用ケーブル

構造

- 1 x unit comprising 1 x 6 way loose tube fibre optic unit
- 4 x 75 Ω coaxial cables
- 11 x 1.0 mm² screened twisted pairs
- 11 x 50.0 mm² power cores
- Polyurethane inner sheath
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour
- Nylon outer sheath

外径

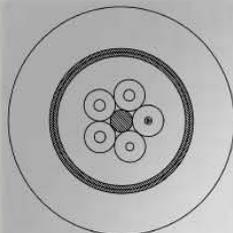
90.0 mm
破壊荷重
50 Tonnes





ハード・ダイビング・スーツ及び有人潜水ケーブル

A variety of power/signal cables are offered for controlling a wide range of manned equipment/vehicle types. These are frequently armoured cables incorporating power cores, fibre optic components or conventional electrical signal cores for telemetry. Cables can also be offered which are more lightweight or neutrally buoyant to be used with a TM.S/cage.



中性浮力テザー

構造

- 3 x 2.0 mm² power cores
- 1 x 1.0 mm² earth core
- 1 x 3 way fibre optic unit
- Thermoplastic rubber inner sheath
- 2 layers of aramid fibre serving
- Thermoplastic rubber outer sheath

重量(海中)

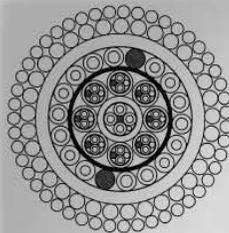
- 88 kg/km

外径

37 mm

破壊荷重

14.1 Tonnes



ハード・ダイビング・スーツ金属補強型 リフト・ケーブル

構造

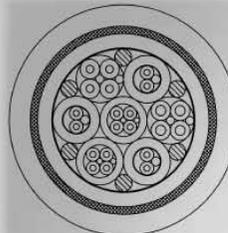
- 1 x 0.75 mm² screened twisted quad
- 8 x 0.50 mm² screened twisted pairs
- 8 x 1.34 mm² power cores
- 8 x 2.0 mm² power cores
- Polyurethane inner sheath
- 2 x layers contrahelically wound, preformed high tensile galvanised steel wire armour

外径

34.6 mm

破壊荷重

35.7 Tonnes



ハード・ダイビング・スーツ・テザー

構造

- 2 x 0.50 mm² screened twisted quads
- 1 x 1.34 mm² screened twisted quad
- 1 x 0.75 mm² screened twisted quad
- 3 x 0.5 mm² screened twisted pairs
- Thermoplastic rubber inner sheath
- Aramid fibre strength braid
- Thermoplastic rubber outer sheath

重量(海中)

24 kg/km

外径

34.0 mm

破壊荷重

5.0 Tonnes



ターミネーション

A variety of termination solutions can be offered to suit remotely operated vehicles. This ranges from supplying and fitting proprietary electrical connectors to custom-designing and manufacturing mechanical strength terminations, which are suitable for transferring working loads as well as protecting sensitive electrical or optical fibre connections. In addition to this, terminations need to seal the cable/tether against water ingress in a harsh environment. In an effort to provide as complete a package as possible,

JDR Cable Systems can supply systems including cable handling and connectors.



● コンポーネント

● 電気的中心導体

Electrical conductors generally comprise multi-strand copper or where neutral buoyancy is critical, aluminium. 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, PTFE and ETFE.

● 光ファイバー・エレメント

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, small outside diameter and freedom from interference. There are also advantages in using fibres for long cables (say over 1000 metres) where signal losses in copper conductors may be unacceptable. 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/テザー構造

● 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 planetary cabled construction. Lay angles are carefully selected to suit the construction and subcomponent design. As a general rule, the smallest diameter possible is always strived for, taking into account the components required. This is important where drag effects of the cable and stiffness can affect the performance of the vehicle.

● 金属補強/テキスタイル強化構造

Heavy duty, preformed contrahelical galvanised steel wire armour or aramid fibre servings or braids are offered to provide strength to the cables and tethers. Both steel and textile reinforced cables and tethers possess high tensile strength, or with the application of armouring, are also protected against damage. **JDR Cable Systems** can manufacture armoured cables up to 10,000 metres in length depending on diameter and weight. Cables can have one, two, three or more layers of wire armour to ensure maximum strength, protection and minimum diameter according to the application. Manufacturing plant includes a 120 bobbin armouring machine fully equipped to pre-form high tensile steel wire. All cables have been designed to be torque balanced, which results in negligible rotation at the working load.



● ケーブルの構成

Designed and manufactured in-house, 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.

● 外被シーシング

Extruded sheathing of most thermoplastic materials (ether-based polyurethane, polyethylene, thermoplastic rubber are commonly used) is available for maximum protection and service life. Materials are selected for their resistance to a seawater environment, durability under handling, low weight (where buoyancy is a requirement) and cost.

所在地

JDR Cable Systems (Holdings) Ltd

Badentoy Road, Badentoy Park, Portlethen, Aberdeen AB12 4YA
Scotland.

Tel: +44 (0)1224 782 244 Fax: +44 (0)1224 782 250
e mail: aberdeen@jdr cables.com

JDR Cable Systems Ltd.

11 Padnal, Littleport, Ely, Cambridgeshire, CB6 1NS, England.

Tel: +44 (0)1353 860 022 Fax: +44 (0)1353 861 388
e mail: uk@jdr cables.com

JDR Cable Systems BV.

Admiraal Helfrichweg 2, P. O. Box 49, 2900 AA Capelle a/d IJssel,
The Netherlands.

Tel: +31 (0)10 258 6800 Fax: +31 (0)10 458 6364
e mail: nl@jdr cables.com

JDR Cable Systems Inc.

6225 West Sam Houston Parkway North, Houston, TX 77041, USA

Tel: +1 281 240 6600 Fax: +1 281 240 6601
e mail: usa@jdr cables.com

JDR Cable Systems A.s.

P.O. Box 343, Storgata 4, N-4892 Grimstad, Norway.

Tel: +47 3704 3202 Fax: +47 3704 0255
e mail: norway@jdr cables.com

JDR Cable Systems

3 Route de Choisy, 60200 Compiègne, France.

Tel: +33 (0)3 44 40 80 81 Fax: +33 (0)3 44 40 81 18
e mail: france@jdr cables.com



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

www.jdr cables.com

スタンダードROVケーブル

To improve our service to the ROV industry, **JDR Cable Systems** has introduced a range of ROV cables which can be constructed from ex stock components.

Our concept is to base standard builds on company stocked power cores, coaxes, fibre optic bundles and standard aramid fibres or armour wires to offer many combinations within a quick turnaround of approximately 3 weeks.

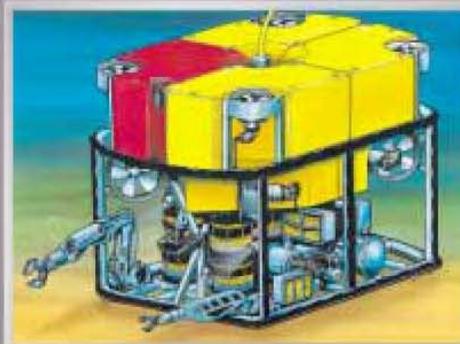
Some of these cable variants can be manufactured in lengths up to 2200 metres. The main signal components are all of 5.3 mm OD and so can be swapped to offer many alternatives to cover a wide variety of requirements and utilise standard stock components to allow quick completion times.

Any special requirements not satisfied by these components or complete cables can be designed and built as made to order builds on more normal leadtimes. A full list of stock components and designs is available upon request. High performance quads, coaxes and tight buffered or plastic/steel loose tube fibre optic units can also be offered as specials.



試験

Apart from normal routine pressure and electrical testing, a sample length of cable or tether 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 cables up to 150 mm in diameter at 50T, whilst continuously monitoring all components whether electrical, optical or hydraulic. **JDR Cable Systems** also has the capability of buoyancy testing samples at depth.



製造元: JDRケーブル・システムズ社

輸入元: 日本エアークラフトサプライ株式会社

住所 東京都新宿区西新宿1-19-6 山手新宿ビル

TEL 03-3343-1800

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