

Nexans Submarine Cable Systems

Worldwide experience and knowledge

With more than 80 years' experience of submarine cables and more than 20 years' experience of fibre-optic submarine cables, Nexans has a solid technology base and worldwide project and customer references.

This experience has been gained from over 115 projects, 125 clients and the installation of more than 14 000 km of cable. Nexans also holds the world record for the number of fibres installed in one single cable - 384.

The Nexans system offers:

- Turnkey installations involving
- system engineering
 - cable system supply
 - marine work
 - transmission solutions

Selected customers

Telenor • Michigan Bell • Transpower • KEPCO • TDC • Etisalat • TCI • PTT Telecom • Deutsche Telecom • Vasa Telefon • ELF • Yemen Telecom • Djibouti Telecom • Shell • France Telecom • Statoil • Estonia Telephone • BT • China Telecom • Egyptian Electricity • Jordan Electricity • Shanghai PTT • Telmex • Statnett • SAIC/Maripro • PTAC • NorSeaCom • Bermuda Telecom • Xiamen PTA • Logicon Syscon • Rockwater • Antelecom • Zhejiang PTA • Mobilix • Level 3 • Global Crossing • Infostrada • Iceland Telecom • China Navy • Pangea • General Dynamics • PGN • Hyundai • FMV • Salten BB • Sira-Kvina Power • Horns Rev Windfarm • IT Canada • Bravida • NTE • CDAC • Perenco • PTJayaMulia • e-marine • Smøla wind farm • Sina Telecom • Petropars • TransTel • Tjøme Municipality • GCI.



Nexans has been involved in many projects over many years and has installed cables in most areas of the world.

Nexans - a turnkey supplier

Nexans supplies cable worldwide and will also install from Terminal to Terminal whenever this is required or more convenient for the customer.

The cable may be loaded onto the cable ship at Nexans factory in Rognan, Norway or transported to the cable ship on a freighter.



Transportation in a freighter

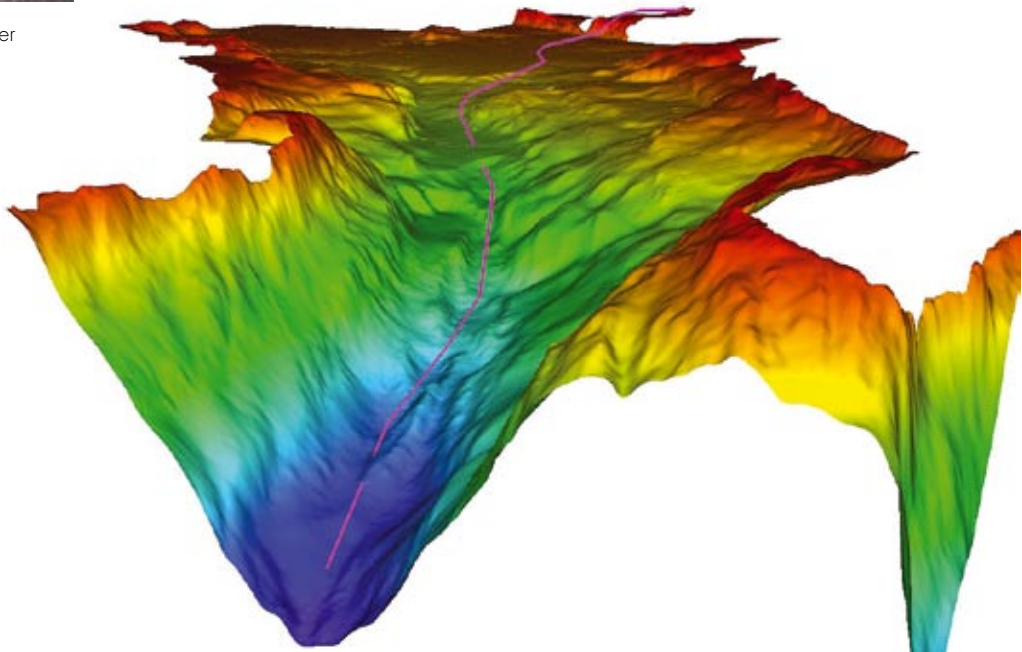
We have a large team of engineers and project managers who have comprehensive experience in both managing large submarine projects and installing submarine cables. The engineering resources have modern and sophisticated tools available for planning and modelling tasks and these have been used in energy, telecom, oil & gas and wind farm projects.



Nexans operates a large vessel to install cables and also has a large suite of containerized equipment that can be used on board a ship-of-opportunity anywhere in the world. We also work very close with other marine installers in order

to provide the most efficient service to our customers.

The marine installation work provided by Nexans includes marine surveys, route engineering, burial assessment, route clearance, installation, burial, testing, etc.



A route plan engineered using high resolution multibeam echosounder data

Nexans Submarine Cables

URC-1 and ROC-1

Cable core

The cable core comprises a central, hermetically sealed steel tube with three different diameters to hold different fibre counts. In addition, the cables can be supplied with two different copper conductor solutions - one for electroding purposes and one for power feeding subsea equipment. A polyethylene sheath covers the steel tube and copper conductor.

- 2.7 mm steel tube for up to 16 fibres
- 3.7 mm steel tube for up to 48 fibres
- 5.6 mm steel tube for up to 96 fibres

The two largest tubes can be equipped with a 7 ohm/km copper conductor, while the smallest tube will be equipped with a 1.4 ohm/km copper conductor.

The sheathing has a diameter of 10 mm for all core alternatives. The core alternatives are illustrated below.

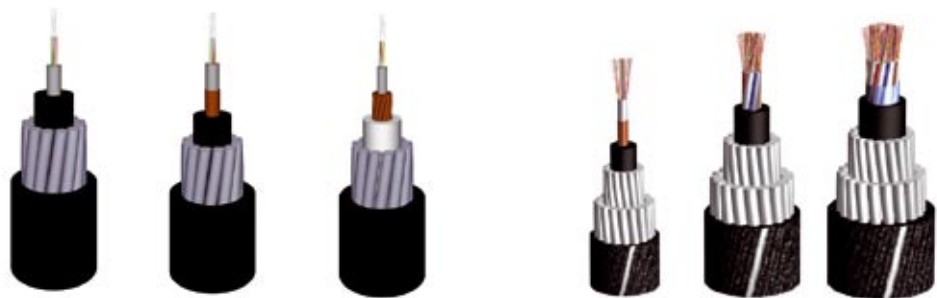
In addition, four or eight 3.7 mm tubes can be stranded together to offer a maximum of 192 and 384 fibres per cable.

protection against hazards during installation and operation, six different armour packages can be applied over the basic cores, depending on the expected hazards. The armouring alternatives are shown below.

- LW: Light weight
- SA: Single armoured
- DA: Double Armoured
- RA: Rock Armoured

Outer Protection

In order to provide the cable core with mechanical



SA Cable with various copper conductors

Different maximum fibre counts



Six different armouring alternatives applicable to all single-tube core alternatives

Cable Mechanical Characteristics

Characteristics	LW	SA	DA	RA
Outer Diameter (mm)	19	20 - 32	24 - 41	47
Cable Weight in Air (kg/m)	0.7	0.8 - 2.4	1.5 - 4.8	6.7
Minimum Breaking Load (kN)	60 - 75	100 - 280	200 - 640	400,0
Nominal Transient Tensile Strength, NTTS (kN)	40 - 60	70 - 200	150 - 400	200
Maximum Deployment Ocean Depth	3000 - 5000	1000 - 3000	1000 - 3000	500
Minimum Bending Diameter (m)	1.0	1.0 - 1.5	1.5 - 2.5	2.5

Summary of Nexans' submarine cable design:

- 5,000 m depth rating
- single-tube designs with up to 96 optical fibres
- multi-tube designs with up to 384 optical fibres
- electrical resistance 1.4 or 7 ohms/km
- 6 armouring types from LW (Light Weight) to HA (Heavy Armoured, double armoured)
- qualified for all fibre types
- available joints for all cable types up to 384 optical fibres, with demonstrated offshore jointing time of less than 24 hours
- branching units available for up to 96 fibres
- qualified for use with the Universal Quick Joint (UQJ) and Universal Joint (UJ)
- special components for offshore systems (cable hang-off, fire resistant cable, dynamic riser solutions, pull-in tube seals, wet mateable connectors)
- engineered solutions for energy, oil & gas, surveillance and telecom applications with special requirements

Joints for the URC-1 cable family

Three joints are adapted to the URC-1 cable family; the URC-1 proprietary joint box, the Universal Quick Joint (UQJ) and the Universal Joint (UJ). In addition, Branching Units (BUs) have been developed to suit the cable types.

URC-1 JB

The joint box (Type URC-1-JB) is intended to provide optical and mechanical continuity between cable sections and serve as both a planned factory joint and a repair joint for maintenance.



Complete URC-1 JB for armoured cable with Bend-Strain Restrictors

URC-1 BU

The URC-1 BU allows three different URC-1 cables to be connected in a predetermined manner. The unit does not contain any active elements, so no rerouting can be accomplished from the terminal stations.

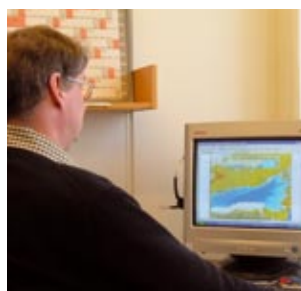


Complete URC-1 BU with Bend-Strain Restrictors

Nexans Marine Work

If Nexans is responsible for a complete, installed system from Terminal to Terminal or from Beach Joint to Beach Joint, the marine work includes route planning, marine surveys, cable transport, and submarine cable installation and burial. In addition, Nexans conducts training courses for its customers and contractors whenever necessary.

Route planning and surveys involve finding the best route between any two landing points, which is normally not the shortest route, taking into account the restrictions imposed by commercial traffic, the fishing industry, environmental regulations, defence interests, seabed topography and the seabed condition.



Route engineering

Cable may be loaded onto a cable ship or freighter at the Nexans factory in Rognan, Norway, or at a harbour in Europe that has railway tracks. In the latter case, cable is coiled directly onto railway cars in Nexans' factory and subsequently transported to a suitable port.

The cable ship used for any installation is chosen according to its capacity, rate, availability, suitability and location. Different ships from various owners have been used to install Nexans submarine cables.

Nexans itself operates *c/s Bourbon Skagerrak*. This ship is purpose-built for installing power cables but has also been used for telecom cables in several projects. Nexans normally uses ships that are purpose-built for telecom installations and whose size and capacity are suitable for each project.



c/s Bourbon Skagerrak loading a fibre optic submarine cable to be installed together with a high voltage cable



c/s Intrepid owned by International Telecom, Canada

In some cases, cables are installed on the seabed without burial, but in the majority of projects cables are buried in water depths down to 1000 m. This requires various tools, including water-jetting machines and different ploughs. Nexans provides its own jointers to carry out jointing on various cable ships.



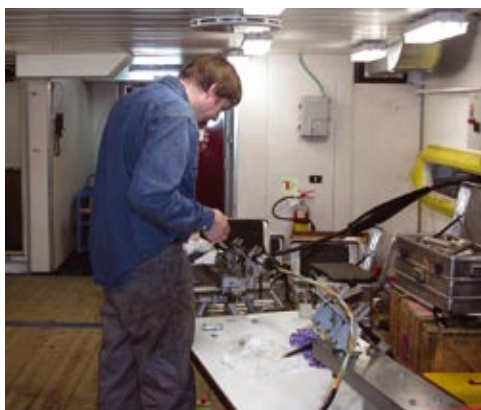
Capjet owned by Nexans



Plough owned by International Telecom



Offshore cable plough owned by Global Marine



Nexans' jointer onboard Elettra's cables ship, the c/s *Pertinacio*



Training of e-marine's jointers

Nexans Norway AS - Contacts

Marketing

Ragnar Vogt + 47 22 88 62 25 ragnar.vogt@nexans.com
 Mobile + 47 90 92 01 88

Mariana Penkova Grozeva + 47 22 88 62 21 mariana_penkova.grozeva@nexans.com
 Mobile + 47 48 04 24 81

Rolf Bøe +47 22 88 62 23 rolf.boe@nexans.com
 Mobile +47 45 04 40 04

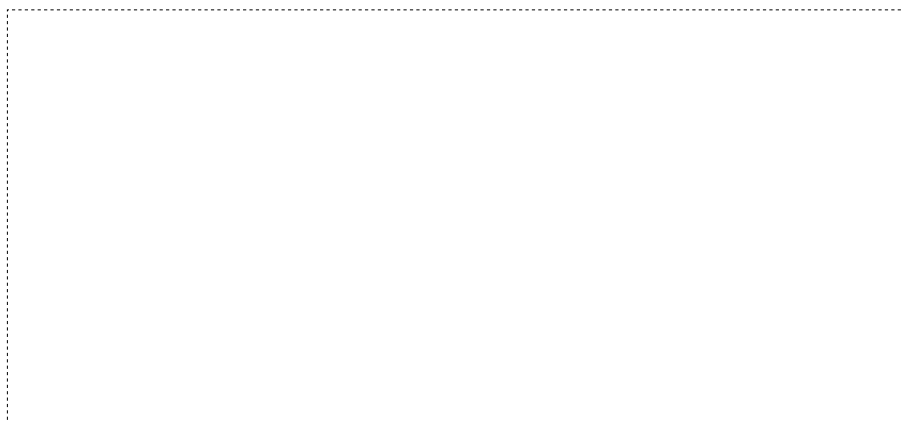
Business Development

Gunnar Berthelsen +47 22 88 62 07 gunnar.berthelsen@nexans.com
 Mobile +47 90 92 02 51

Technical

Inge Vintermyr +47 22 88 62 29 inge.vintermyr@nexans.com
 Mobile +47 95 23 57 43

Postal address: Nexans Norway AS, P.O. Box 6450 Etterstad, N-0605 Oslo, Norway
 Visitor address: Innspurten 9, Helsefy, Oslo
 Telefax: +47 22 88 62 60



Global expert in cables and cabling systems