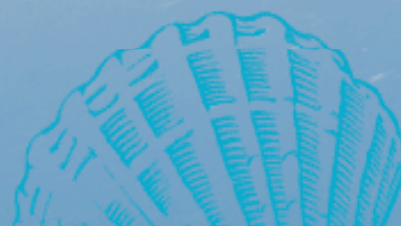
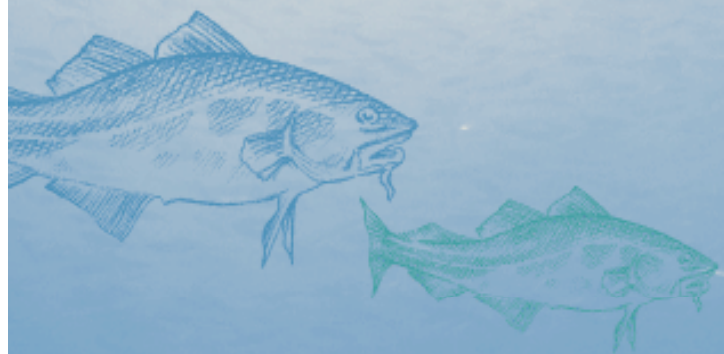


INSTITUTE OF MARINE RESEARCH
HAVFORSKNINGSINSTITUTTET





Synthetic cable for deep sea camera

Hans Petter Knudsen

MAREANO - kart - Windows Internet Explorer

http://www.mareano.no/kart/viewer.php?language=no&bbox=209879.3,7800740.0,1529158.7,8610860.0&KARTBILDE_ID=82

Fil Rediger Vis Favoritter Verktøy Hjelp

MAREANO - kart

Samler kunnskap om havet

Startsiden Kart Tema Nyheter Om Mareano Resultater Bilder/video Lenker Kontakt Nettstedskart English

Ferdige kart Lag ditt eget kart

- MAREANO-aktiviteter
 - MAREANO-området
 - Kartlegging - fullført / planlagt
 - MAREANO-stasjoner
 - Bilder fra tokt 2006
 - Video fra tokt 2006
- + Dybdekart
- + Havbunn og vannmasser
- + Biologisk mangfold og naturtyper
- + Bestandsutbredelse
- Miljøkjemi og forurensning
 - Kjemi stasjoner
 - Arsen-nivåer
 - Barium-nivåer
 - Bly-nivåer
 - Kadmium-nivåer
 - Krom-nivåer
 - Kobber-nivåer
 - Kvikksølv-nivåer
 - Nikkel-nivåer
 - Sink-nivåer
 - Barium-nivåer, rasterkart
 - Bly-nivåer, rasterkart
 - Kvikksølv-nivåer, rasterkart
 - Antracen-nivåer

Behold valgt område

--- Zoom til område ---

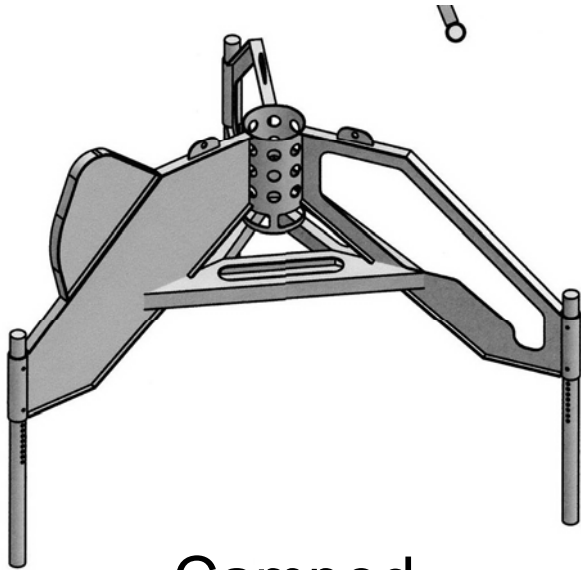
BARENTS

NORSKEHAVET

434km

Coorvrikt (C) 2005-2009 MAREANO
Kartprojeksjon: WGS84, UTM 33 N

The surface of Mars is mapped with better resolution than much of this area



Campod

Mareano project

<http://www.mareano.no/>

Vendor:

Sperre AS, Norway

<http://www.sperre-as.com/no>

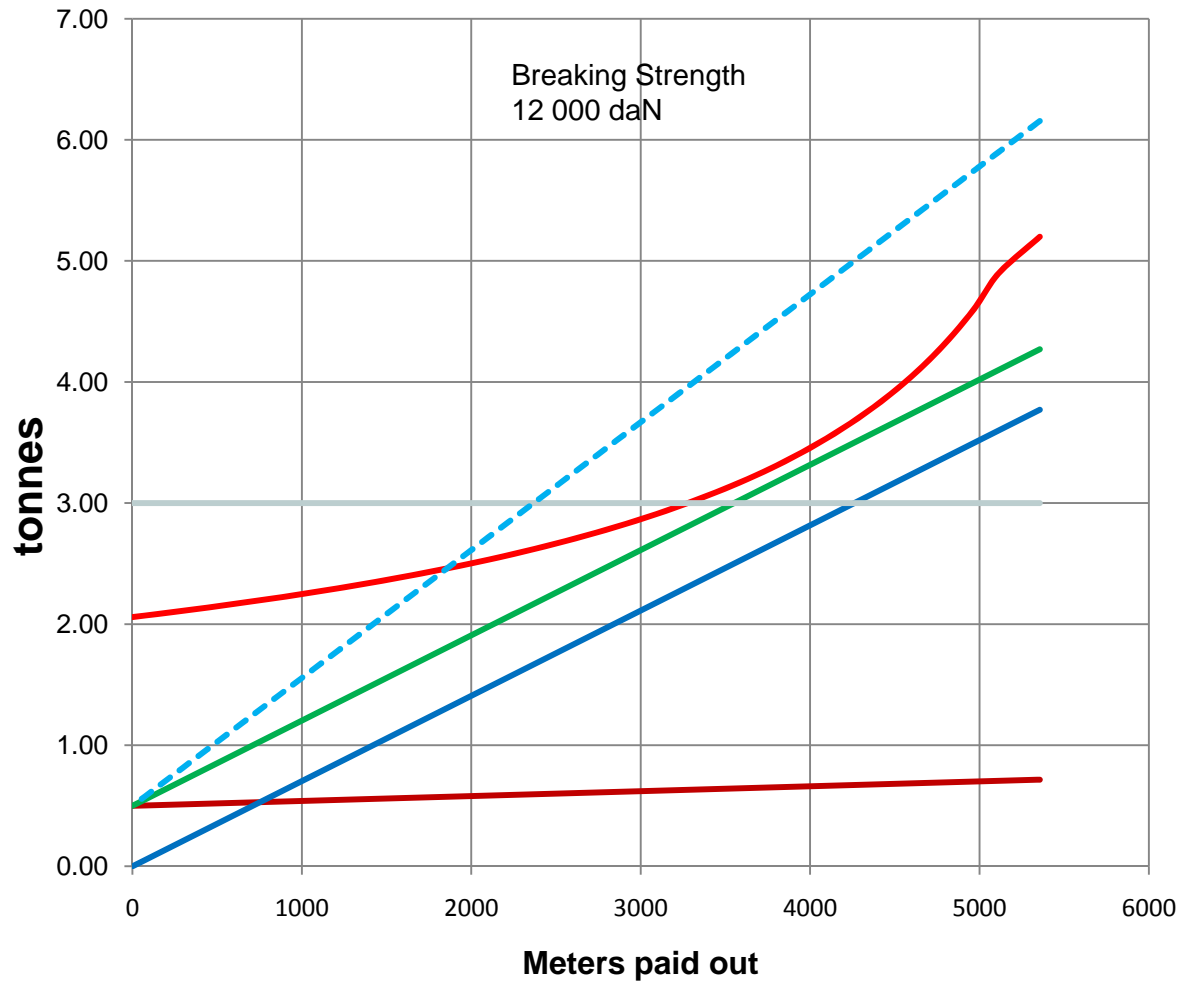
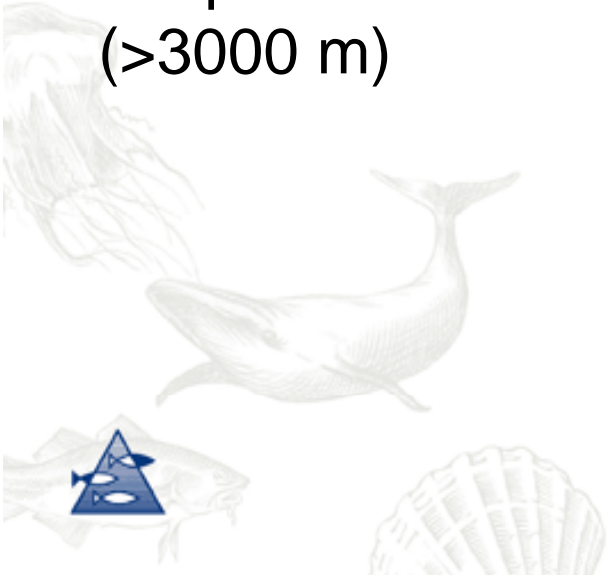


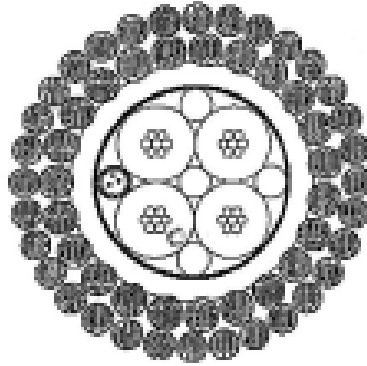


Main hangar on
RV G.O. Sars



The original steel armoured cable was too heavy for operation on the deepest stations (>3000 m)





	Steel armoured cable	Aramid armoured cable
Diameter	16 mm	18.5 mm
Breaking strength	126 kN	240 kN
Recommended WL max	25 kN	20 kN
Weight in air	887 kg/km	310 kg/km
Weight in seawater	704 kg/km	35 kg/km
Minimum bend diameter	800 mm	800 mm
Electrical conductors	4 x 1 mm ²	2 x 1 mm ²
Optical conductors	3 x Single Mode fiber	3 x Single Mode fiber



Technical Description

ARAMID ARMoured UMBILICAL

Document no.:	RA427		
Unit content:			
UNIT-P1	Power conductor, 1mm ² , 4.5kV	2	off
UNIT-FO	Fibre optic element, 4SM	1	off



D-8902 Issue 3

Material description: Gs(4)+2x1mm² FMAM

Material no.: 10193666

Tender no.: KI-008/09

Contract no.:

Issue no.	Date	Document status	Prepared by	Approved by	Released by
03E	23.04.09	Approved for Construction	MHY	ANK	LJV
02T	20.01.09	Issued for Tender	MHY	ANK	LJV
01T	12.01.09	Issued for Tender	MHY	ANK	LJV

Revision / Status coding:

Issued for Tender	XXT	Issued for Company Comment (Review)	XXR
Issued for DIC / IDC (Draft)	XXD	Approved for Construction	XXF
		As-Built	XXA

CONFIDENTIAL
All rights reserved. Passing on or copying of this document, use and communication of its content are not permitted without prior written authorization from Nexans Norway AS.

3. CABLE DESIGN

3.1 Element details

Process/ Material		Nom. thickness (mm)	Nom. outer diameter (mm)
UNIT-FO Fibre Optic element			
Optical fibre	4SM (9/125 μ m)		0.25
Tube	Steel tube with filling compound	0.15	1.5
Sheath	Polypropylene, natural		3.2
UNIT-P1 Power conductor, 1mm², 4.5kV			
Conductor	Cu, 1mm ²	7x0.43	1.3
Insulation	Semiconducting polypropylene Insulating polypropylene, colour coded		3.2

3.2 Element lay-up

Process/ Material		Nom. thickness (mm)	Nom. outer diameter (mm)
1st-layer			
UNIT-P1	Power conductor, 1mm ² , 2 off	3.2	7.1
UNIT-FO	Fibre optic element, 1 off	3.2	7.1
Filling	Soft adhesive compound		
Screen	Semicond.insul. 0.35mm ² Cu, 3 off Cu/polyester laminate	1.6	7.3
Inner sheath	Thermoplastic polyester, orange		9.7
Armouring	Aramid, 4 layers		16.2
Outer sheath	Thermoplastic polyester, yellow		18.5



3.3 Characteristics

Physical characteristics	Unit	Nominal value	±
Cable outer diameter	mm	18.5	1
Weight in air, approx.	kg/km	310	
Weight in seawater, approx.	kg/km	35	
Minimum dynamic bending diameter	mm	800	
Armouring breaking strength	kN	240	
Safe working load	kN	20	

Electrical / Optical characteristics (target values)	Unit	Nominal value	±
UNIT-FO Fibre Optic element			
SINGLEMODE FIBRE:			
Attenuation @ 1310nm	dB/km	<0.6	
Attenuation @ 1550nm	dB/km	<0.4	
UNIT-P1 Power conductor, 1mm², 4.5kV			
DC resistance, max	Ω/km	20	
Insulation resistance @ 500 V DC	GΩ·km	>5	
HV test for 5 min.: Conductor - screen	kV DC	16	

3.4 Cable marking

Element	Marking
UNIT-P1	Conductor #1-#2: Blue and orange
UNIT-FO	Natural 4SM fibres: Red, green, blue, yellow
SHEATHS	<Production order no.> Nexans Norway High Voltage <year>, <meter>



4. CROSS-SECTIONAL DRAWING

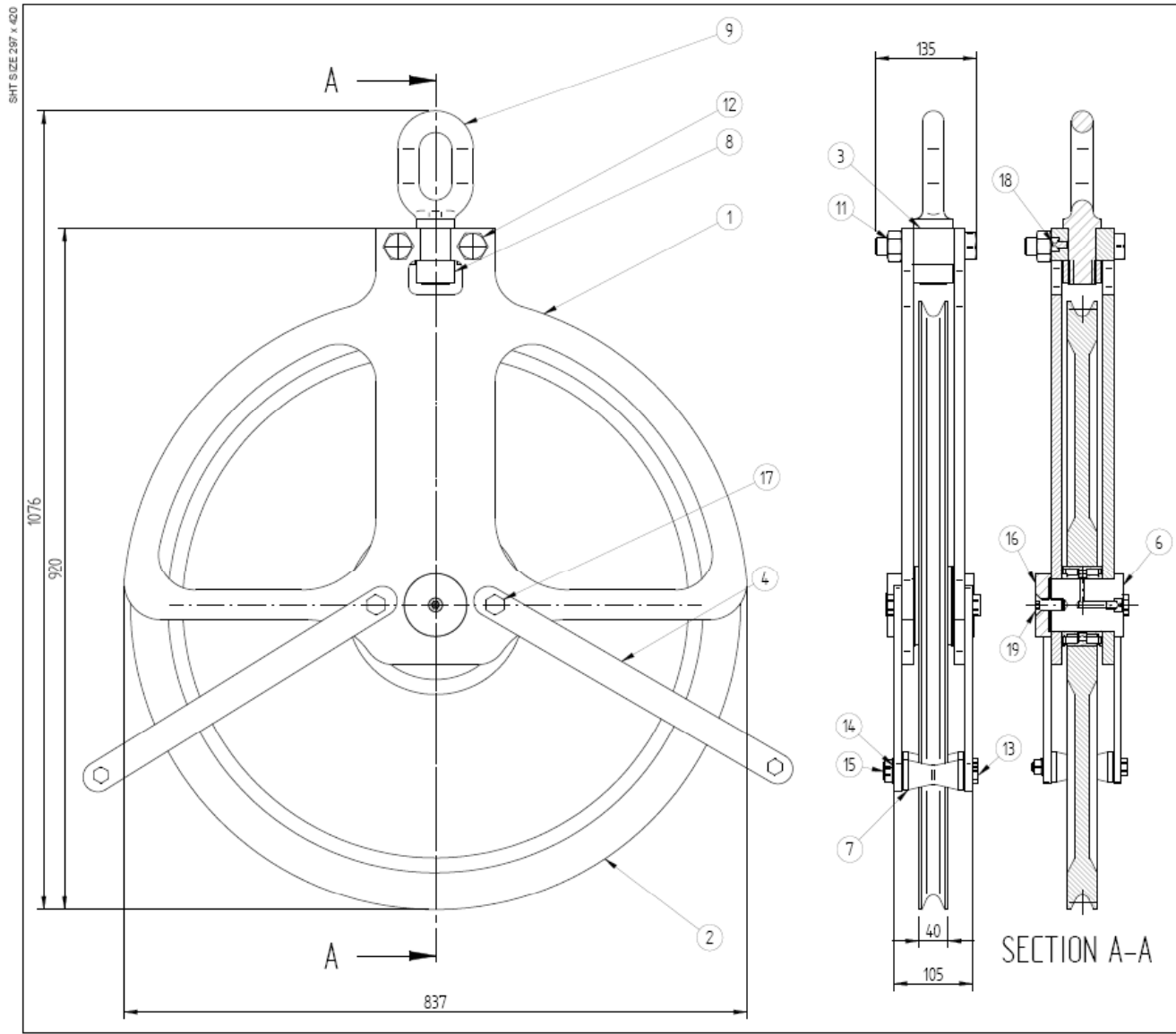


D-8902 Issue 3

5. AMENDMENT LIST

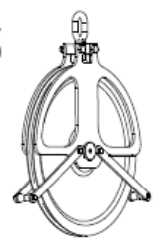
Issue no.	Date	Amendments
03E	23.04.09	<ul style="list-style-type: none"> • Document status updated to Approved for Construction. • Removed option 2. • Updated from 2 to 4 aramid layers.
02T	20.01.09	Replaced UNIT-P2.5 with UNIT-P1.
01T	12.01.09	First edition.





DO NOT SCALE IF IN DOUBT ASK

NOTES:
 1. MATERIAL CERTIFICATE ACCORDING TO NS-EN 10204 3.1
 2. GENERAL TOLERANCE ACC. TO NS-EN 2768-1m U.O.S.
 3. BREAK SHARP EDGES
 4. SURFACES $\sqrt{6.3} / \sqrt{3.2}$



1	19	COUNTERSUNK SCREW M16x35		DIN 7991
2	18	GREASE NIPPLE M10x1	SST	
4	17	HEX BOLT M16x40		DIN 931
1	16	SHAFT RETAINER		
2	15	HEX NUT M12		DIN 934
2	14	WASHER FOR M12	GALV. ST.	DIN 125A
2	13	HEX BOLT M12x120		ISO 4014
2	12	HEX BOLT M24x120	A4-80	DIN 931
2	11	HEX NUT M24	CLASS 8	DIN 934
1	9	OVAL EYE	24500-02	
1	8	M36 ROUND NUT		
2	7	ROLLER		
1	6	Ø70 SHAFT		
4	4	GUIDE ARM		
1	3	TRAVERSE		
1	2	Ø800 CABLE SHEAVE	3-2907	
2	1	BLOCK PLATE		

Qty	Item	Description/Dimension	Material/Exp.	Remarks
1	151205	ISSUED FOR COMMENTS		

Project Name: _____
 Date: _____



Drawn by:	Checked by:	Approved by:	Designed by:	This document must not be copied or its contents shared or published in third party without Imenco's written permission.		
Date:	Date:	Date:	Date:	Revision:		
Version:	Drawing Size:	Print Scale:	Sp. No.:	Weight:		

780 CABLE BLOCK 18mm WIRE ASSEMBLY

Reference:	Job No.:	Project No.:	Drawing No.:	Sheet No.:
	37150	3-2898		1 OF 1

CAD Process Drawing - Do Not Change Manually Imenco CAD REF: 3-2898 cable block assembly.dft

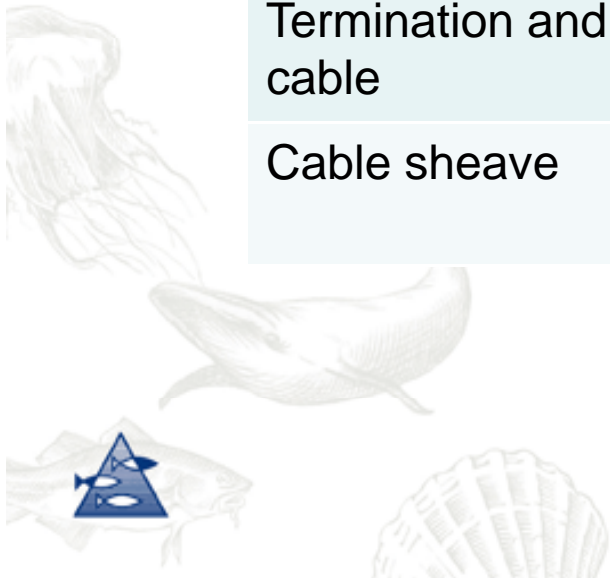
Cable sheave special designed

Strain relief with
integrated
counterpart for the
latch

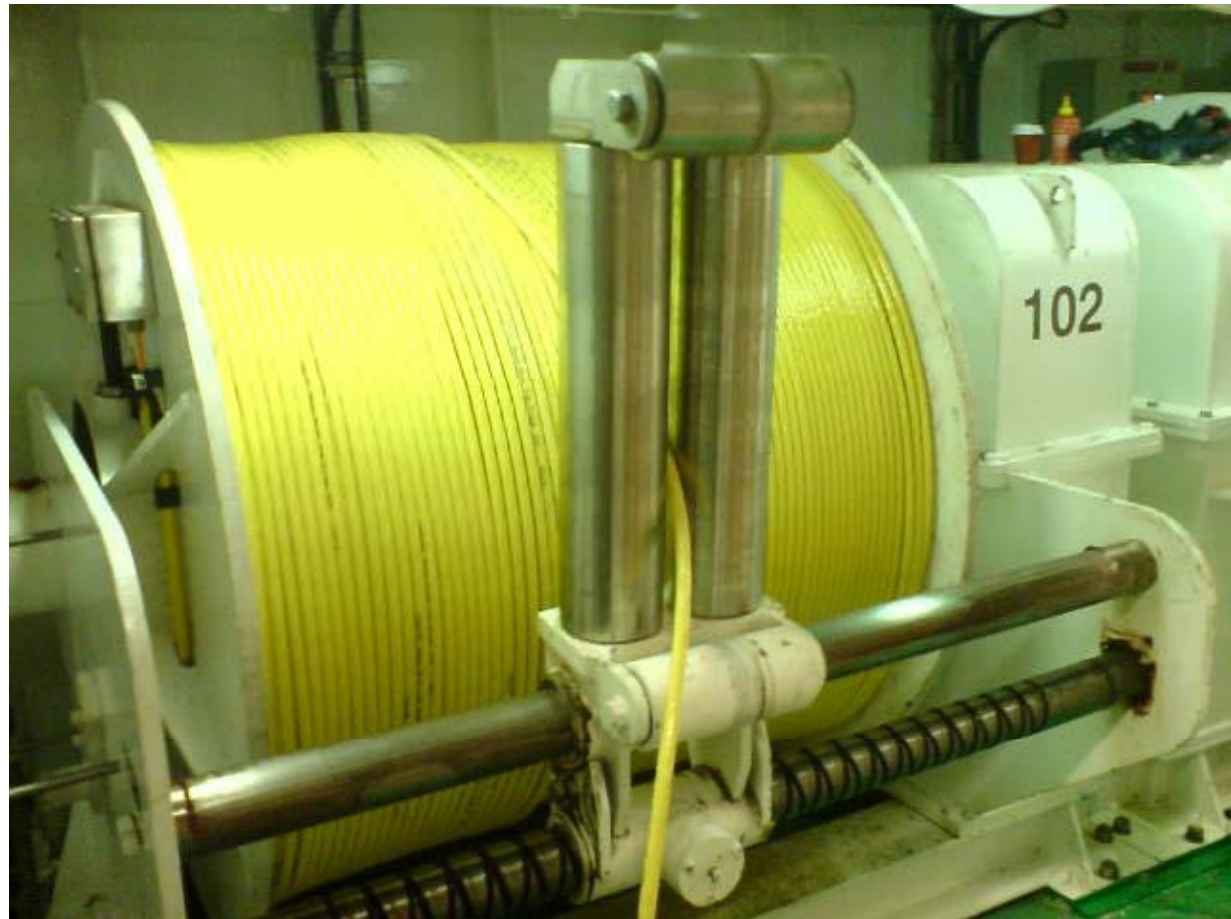


Makers list

Aramid armoured cable	Nexans Norway AS http://www.nexans.no
Strain relief	Seaproof Solutions AS http://www.seaproof.com/ Imenco AS http://www.imenco.no/
Termination and installation of cable	Seaproof Solutions AS
Cable sheave	Imenco AS



The original
cable was
replaced by the
aramid armoured
cable



4300 m spooled on

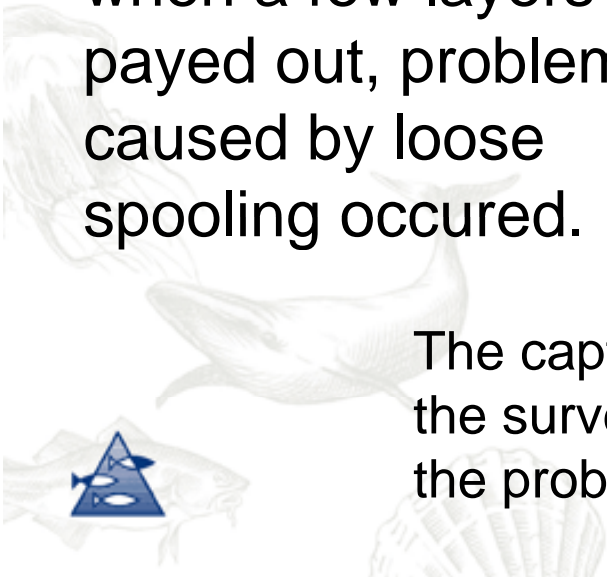


Originally the factory had spooled the cable to the transport reel with 7 kN tension. By a mistake the cable was spooled to the winch without tension.

At the first station, when a few layers were payed out, problems caused by loose spooling occurred.



The captain refused to operate the cable in this condition and the survey was halted until Seaproof Solutions cleared out the problem.



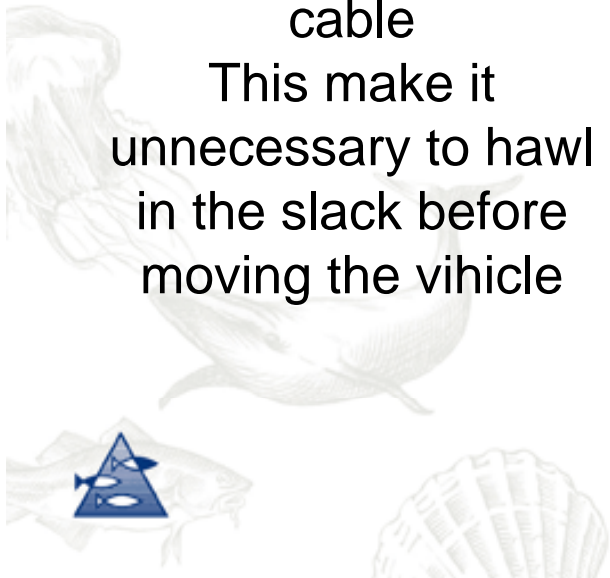
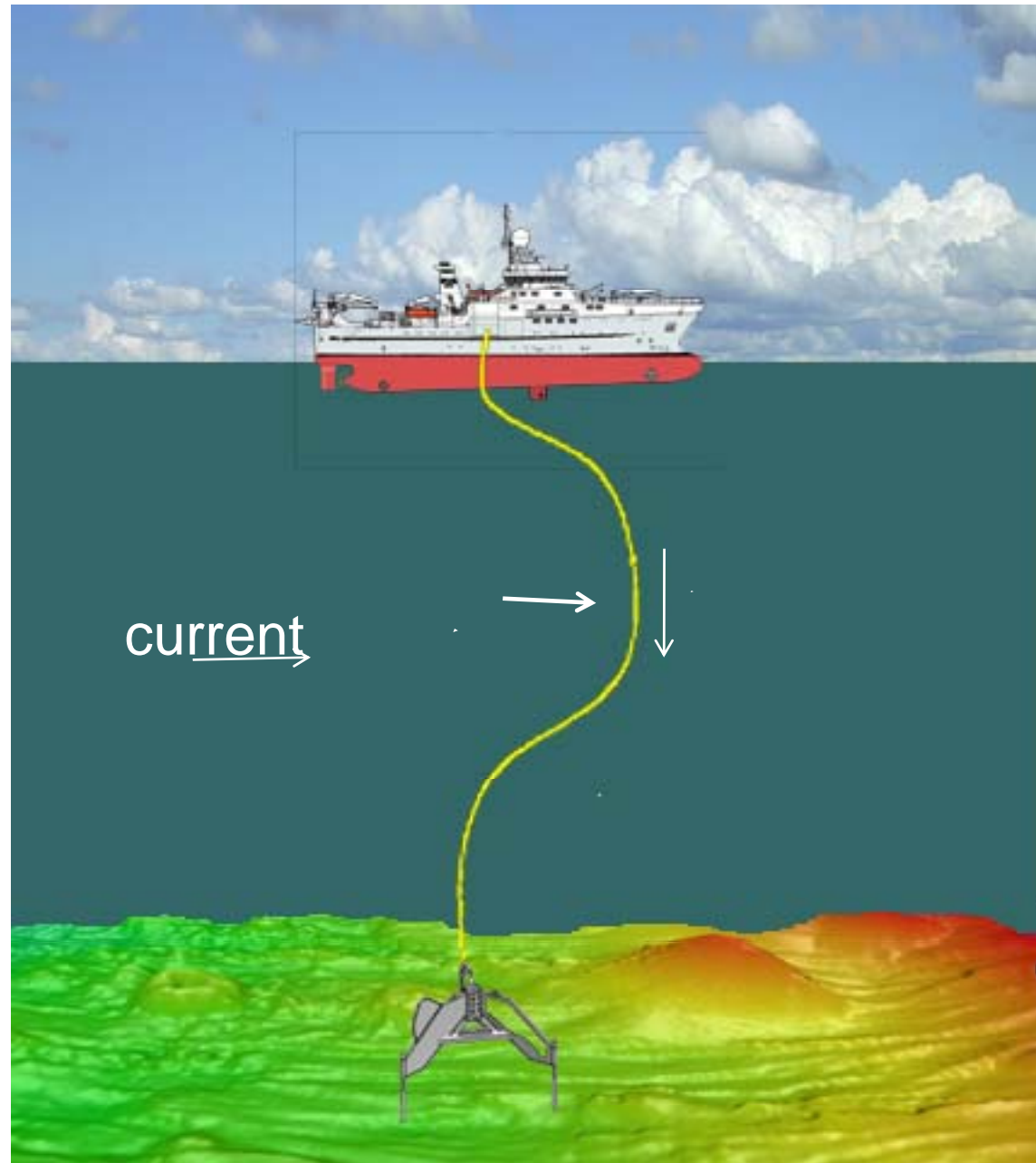
After an operation with almost all cable payed out with a dummy load on deep water, the problem was solved, and the spooling was reasonable good.

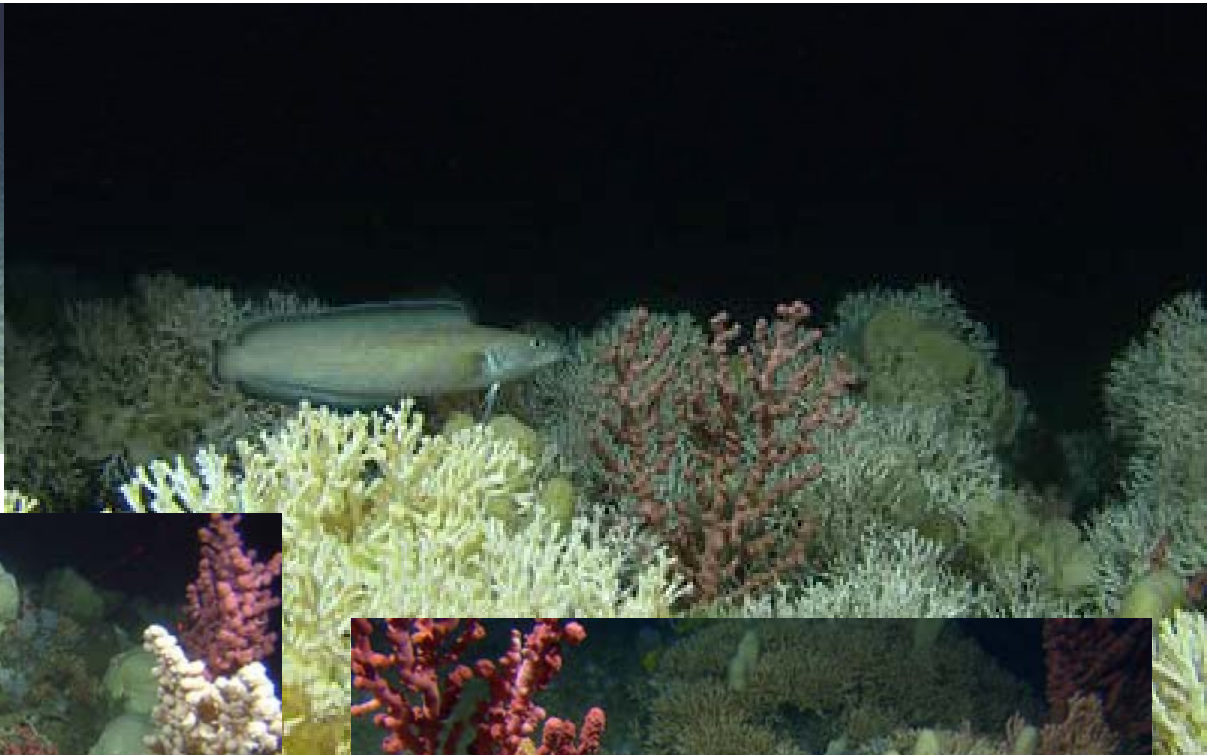


In case of current it is necessary to pay out cable in order to keep the vehicle stable on the seabed

The athwart forces may be greater than the forces along the cable

This make it unnecessary to haul in the slack before moving the vehicle





After some trials and adjustments the cable worked perfectly, and sharp and crisp videos and photos of the seabed were recorded.

Thank you for your attention.

