Certificate No:
TAE00004FA

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Electric Power Cable

with type designation(s)
Texiline Heli Twist Alu EMC 2.7/4.5 kV DC

Issued to
amo specialkabel AB
ALSTERMO, **Sweden**

is found to comply with
DNV rules for classification – Ships, offshore units, and high speed and light craft

Application :

DC Power cables with aluminum conductor. EMC screened.
Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Rated voltage (kV)	**2.7/4.5**
Temp. class (°C)	**90**

Issued at **Høvik** on **2022-03-15**
This Certificate is valid until **2027-03-14**.
DNV local station: **Malmö**

Approval Engineer: **Ivar Bull**

for **DNV**

Trond Sjåvåg
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.

Product description

Texiline Heli Twist Alu EMC 2.7/4.5 kV DC

4 single core cables twisted together in quad construction without common outer sheath.

No of cores:	Cross sectional area [mm^2]
4 x 1	50, 70, 95, 120, 150

Construction:

Conductors:	Stranded aluminium class 5 according to ISO 6722-2.
Core insulation:	XLPE
EMC Screen:	Cu wire braid and Cu/PET foil
Outer sheath:	SHF 1
Cabling:	4 single core cables twisted together

Application/Limitation

The requirements of SOLAS Amendments Chapter II-1, Part D, Reg. 45, 5.2 (provision to be taken to limit Fire Propagation along Bunches of Cables or Wires) are fulfilled without any additional measures.

Cable shall be terminated with type DNV approved DBI-terminations designed for aluminium conductors, ref. DNV TA certificate TAE00002GJ.

Press to be performed with approved press tool and correct die size.

Heat shrink tubing with melt glue shall be installed over pressed termination overlapping cable outer sheath in order to prevent ingress of moisture.

Ampacity table for Heli Twist Alu EMC DC. Installed on cable ladder with min 2x OD between twisted cables for free air circulation:

Cross sectional area [mm^2]	Ampacity in each circuit ref Annex B*)	Ampacity in each circuit Ref Annex A*)
4 x 1 x 50	149 A	128 A
4 x 1 x 70	184 A	164 A
4 x 1 x 95	223 A	199 A
4 x 1 x 120	258 A	231 A
4 x 1 x 150	296 A	266 A

*) Ampacities from IEC 60092-352 tables B4 and A4 derated with 0.76 for aluminum conductors.

DNV Rules states: If bunched cables are expected to be under full continuous load simultaneously with risk of being overheated, then IEC 60092-352 Annex A should be used.

Type Approval documentation

Tests carried out

Standard	Release	General description	Limitation
DNV-CP-0399	2021-08	Class Programme Electric cables	Same requirements as for copper cables except for Aluminium conductor
DNV-CP-0409	2021-09	Class Programme for terminal lugs for LV power cables with aluminium conductors	
IEC 60228	2004-11	Conductors of insulated cables	For reference only.
ISO 6722-2	2013-12	Road vehicles – 60V and 600 V single core cables Part 2: Dimensions, test methods and requirements for aluminium conductor cables.	IEC 60228 does not define class 5 aluminium conductors
IEC 60092-350	2020-01	Electrical installations in ships - Part 350: General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	Exception for aluminium conductor.
IEC 60092-360	2021-01	Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard	

Standard	Release	General description	Limitation
		and offshore units, power, control, instrumentation and telecommunication cables	
IEC 60092-353	2016-09	Electrical installations in ships - Part 353: Power cables for rated voltages 1 kV and 3 kV	
IEC 60332-1-2:2004+AMD1:2015	2004	Tests on electric and optical fibre cables under fire conditions - Part 1-2: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame	Flame retardant small scale
IEC 60332-3-22	2018-07	Tests on electric and optical fibre cables under fire conditions - Part 3-22: Test for vertical flame spread of vertically mounted bunched wires or cables - Category A	Charred portion of sample does not exceed 2,5m above bottom edge of burner.
IEC 60754-1	2019-11	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content	Low Halogen: <0,5% Halogen
IEC 60754-2	2019-11	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content	Halogen free: pH > 4,3 Conductivity < 10µS/mm
IEC 61034-1/2	2019-11	Measurement of smoke density of cables burning under defined conditions – Part 1: Test apparatus Part 2: Test procedure and requirements	Low smoke Light transmittance >60%

Marking of product

AMOKABEL Texiline Heli Twist Alu EMC 2.7/4.5 kV DC - size xxx mm^2 – IEC 60092-353 - IEC 60332-3-22 – DNV certificates TAE00004FA/TAE00002GJ

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the Type approval are complied with and that no alterations are made to the product design or choice of materials.

The main elements of the assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routine tests (RT) and selected type tests (ref. to applicable class programs) checked (if not available these tests shall be carried out)
- Review of type approval documentation
- Review of possible change in design, materials and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate.

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE