

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Electric Power Cable

with type designation(s)

**RFOU-VFD, RFOU-VFD E, RFOU-VFD M 0,6/1kV,
RFOU-VFD, RFOU-VFD E, RFOU-VFD M 1,8/3kV**

Issued to

**Zhongtian Technology Industrial Wire & Cable System Co.,Ltd.
Nantong, China**

is found to comply with

DNV rules for classification – Ships, offshore units, and high speed and light craft

Application :

Power cable for variable frequency drives.

Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Type	Rated voltage (kV)	Temp. class (°C)
RFOU-VFD, RFOU-VFD E, RFOU-VFD M 0,6/1kV	0,6/1	90
RFOU-VFD, RFOU-VFD E, RFOU-VFD M 1,8/3kV	1,8/3	90

Issued at **Høvik** on **2022-04-25**

This Certificate is valid until **2027-04-24**.

DNV local station: **Nantong CMC**

for **DNV**

Approval Engineer: **Ivar Bull**

Trond Sjøvåg
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

Types:

RFOU-VFD, RFOU-VFD E, RFOU-VFD M 0,6/1kV,
RFOU-VFD, RFOU-VFD E, RFOU-VFD M 1,8/3kV

Construction:

Conductors:	Tinned stranded copper class 2 or class 5
Core insulation:	EPR
Filler/bedding:	Halogen free compound
Screen:	Copper backed polyester tape
Aarmor / Screen	Plain or tinned Copper wire braid
Outer sheath:	SHF2 or SHF MUD for P101 RFOU-M cables

No of Elements:	Cross sectional area [mm ²]
3 ph. + 3E	3×10 + 3×4
	3×16 + 3×6
	3×25 + 3×6
	3×50 + 3×6
	3×50 + 3×10
	3×70 + 3×16
	3×95 + 3×16
	3×120 + 3×25
	3×150 + 3×25
	3×185 + 3×35
	3×240 + 3×50
	3×300 + 3×50

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 Bundles of Cables or Wires) are fulfilled without any additional measures.

Type Approval documentation

Tests carried out

Standard	Issued	General description	Limitation
IEC 60092-350	2020-01	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-360	2021-01	Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard 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	2015-07	Tests on electric cables under fire conditions. Test for vertical flame propagation for a single insulated wire or cable.	
IEC 60332-3-22	2018-07	Tests on electric 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 60754-1:2011 +AMD1:2019 CSV	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

Standard	Issued	General description	Limitation
IEC 60754-2:2011 +AMD1:2019 CSV	2019-11	Test on gases evolved during combustion of materials from cables - Part 2: Determination of acidity (by pH measurement) and conductivity	Halogen free: pH > 4,3 Conductivity < 10µS/mm
IEC 61034-1&2:2005 +AMD1:2013 +AMD2:2019 CSV	2019-11 2019-11	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance >60%
NEK 606 Ed. 5	2016-05	Cables for offshore installations - halogen-free low smoke flame-retardant / fire-resistant (HFFR-LS)	<u>Oil resistance test:</u> IRM902 100°C 1d IRM903 100°C 1d <u>Mud resistance test:</u> IRM903 100°C 7d. Calcium Bromide 70°C 56d. EDC 95/11 70°C 56d

Marking of product

Zhongtian Technology Industrial Wire and Cable System Co. LTD – RFOU-VFD, RFOU-VFD E, RFOU-VFD M – 0,6/1kV – IEC 60332-3-22 Cat. A – Year or

Zhongtian Technology Industrial Wire and Cable System Co. LTD – RFOU-VFD, RFOU-VFD E, RFOU-VFD M – 1,8/3kV – IEC 60332-3-22 Cat. A – Year

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