Certificate no.:
TAE00004Z2

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Electric Power Cable

with type designation(s)
RFOU

issued to
Thermo Cables Ltd
Jedcherala, Telangana, India

is found to comply with

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

Application:

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

Rated voltage (kV)	**0,6/1**
Temp. class (°C)	**90**

Issued at **Hamburg** on **2024-12-17**
This Certificate is valid until **2029-12-16**.
DNV local unit: **India CMC MES**

for **DNV**

Approval Engineer: **Carsten Hunsalz**

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 USD 300 000.

Product description

Type: RFOU

Construction:

Conductors:	Tinned, stranded copper class 2 or class 5
Core insulation:	EPR
Screen:	Lapped inner covering + copper wire braid screen
Inner sheath:	SHF2
Metal covering:	Tinned copper or galvanised steel wire braid (not for single core variants)
Outer sheath:	SHF2

Number of cores	Cross section [mm²]	Overall Diameter [mm]
1	10	10,73
1	16	11,93
1	25	14,22
1	35	15,53
1	50	17,66
1	70	19,64
1	95	22,06
1	120	23,85
1	150	26,14
1	185	28,58
1	240	31,78
1	300	34,88
1	400	39,72
1	500	43,58
1	630	47,59
1	800	52,22
1	1000	57,50
3+E	2,5	15,29
3+E	4	16,76
3+E	6	18,30
3+E	10	20,81
3+E	16	23,72
3+E*	25/16	27,24
3+E*	35/25	30,49
3+E*	50/25	33,86
3+E*	70/35	37,99
3+E*	95/50	43,24
3+E*	120/70	47,12
3+E*	150/95	52,36
3+E*	185/95	56,17
3+E*	240/120	62,33

Number of cores	Cross section [mm²]	Overall Diameter [mm]
4+E	2,5	16,56
4+E	4	18,20
4+E	6	19,92
4+E	10	22,72
4+E	16	25,96
4+E	25	30,98
4+E	35	34,54
4+E	50	40,71
4+E	70	46,05
4+E	95	52,58
4+E	120	57,40
4+E	150	63,59
4+E	185	70,19
4+E	240	78,83
4+E	300	87,20
4+E	400	99,11
2	1,5	11,96
2	2,5	12,97
2	4	14,61
2	6	15,88
2	10	17,96
2	16	20,36
2	25	24,08
3	1,5	12,60
3	2,5	14,12
3	4	15,43
3	6	16,80
3	10	19,04
3	16	21,64
3	25	25,66
3	35	28,50

Number of cores	Cross section [mm²]	Overall Diameter [mm]
3	50	33,10
3	70	37,80
3	95	43,02
3	120	46,88
3	150	51,83
3	240	64,02
4	1,5	14,07
4	2,5	15,29
4	4	16,76
4	6	18,30
4	10	20,81
4	16	23,72
4	25	28,22
4	35	31,41
4	50	36,56
4	70	41,77
4	95	47,62
4	120	51,95
5	2,5	16,56
7	1,5	16,40
7	2,5	17,91
12	1,5	21,06
12	2,5	23,15
19	1,5	24,43
19	2,5	26,95
27	1,5	29,05
27	2,5	32,15
37	1,5	32,46
37	2,5	36,41

*Sector shaped conductor

With wire braid screen

Number of cores	Cross section [mm²]	Overall Diameter [mm]
2	1,5	13,96
2	2,5	14,97
2	4	16,61
2	6	17,88
2	10	20,36
2	16	23,16
2	25	26,88
3	1,5	14,60
3	2,5	16,12
3	4	17,43
3	6	18,80
3	10	21,44
3	16	24,44
3	25	28,06
3	35	30,90
3	50	35,90
3	70	40,80

Number of cores	Cross section [mm²]	Overall Diameter [mm]
3	95	46,22
3	120	50,48
3	150	56,23
3	185	61,51
3	240	68,82
4	1,5	16,07
4	2,5	17,29
4	4	18,76
4	6	20,30
4	10	22,81
4	16	26,52
4	25	30,62
4	35	33,61
4	50	38,96
4	70	44,57
4	95	50,62
4	120	55,75

Number of cores	Cross section [mm²]	Overall Diameter [mm]
4	150	61,49
4	185	67,81
4	240	75,95
5	1,5	17,20
5	2,5	18,56
7	1,5	18,40
7	2,5	19,91
12	1,5	23,06
12	2,5	25,15
19	1,5	26,43
19	2,5	28,95
27	1,5	31,05
27	2,5	33,75
37	1,5	34,46
37	2,5	38,41

Application/Limitation

The conductor cross sections 800 mm^2 and 1000 mm^2 are not covered by the IEC 60092-Series for ship cables. The current rating shall be calculated with an appropriated method, depending on the ambient temperature and installation method. Manufacturer's instructions to be observed.

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.

General power and lighting.
Flame retardant in bunch Cat. A. Halogen free. Low smoke.

Type Approval documentation

Tests carried out

Standard	Release	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 60092-353	2024-06	Electrical installations in ships - Part 353: Power cables for rated voltages 1 kV and 3 kV	
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 60332-1-2	2015-07	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	
EC 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 2: Determination of acidity (by pH measurement) and conductivity	Halogen free: pH > 4,3 Conductivity < 10µS/mm
IEC 60684-2	2011-08	Flexible insulating sleeving – Part 2: Methods of test.	Fluorine content < 0,1%
IEC 61034-1/2	2019-11	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance >60%

Marking of product

Example

Thermo Cables Ltd - RFOU - size - 0,6/1kV - IEC 60332-3-22 Cat.A - Lot no.

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) checked (if not available tests according to RT to 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