Certificate No:
TAE00004K4

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Low Voltage Cable

with type designation(s)
FRA-MPI/ MPI(C)/ MPIE/ MPIE(C), FRA-TTPI(C)/ TTPI(I)/ TTPI(I/C)

Issued to
LS Cable & System Ltd (Donghae Plant)
Donghae-si, Gangwon-do, Korea, Republic of

is found to comply with
DNV rules for classification – Ships, offshore units, and high speed and light craft
IEC 60092-376 (2017-05)

Application :

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

Rated voltage (V)	**250**
Temp. class (°C)	**90**

Issued at **Busan** on **2022-10-25**
This Certificate is valid until **2027-10-24**.
DNV local station: **Seoul**

Approval Engineer: **Eun Jin Lee**

for **DNV**

Hanwee Low
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

Type : 250V FRA-MPI/ MPI(C)/ MPIE/ MPIE(C) / TTPI(C)/ TTPI(I)/ TTPI(I/C)

Conductor :	Stranded tinned annealed copper conductor, Class 2
Insulation :	HEPR + Mica tape
Individual screen :	AL/PS tape with drain wire ('I)' type)
Overall screen :	AL/PS tape with drain wire ('C)' type)
Inner sheath :	SHF1
Armor :	Copper wire braid(O) / Galvanized steel wire braid(C)
Outer sheath :	SHF1

No. of cores		**Conductor nominal area(mm^2)**
MPI/ MPI(C)/ MPIE/ MPIE(C)	2C, 3C ~ 44C(2C+E ~43C+E)	0.75, 1.0, 1.5 (Earth conductor : 0.75, 1.0, 1.5)
TTPI(C)	2P ~ 37P, 2T ~ 37T	0.75, 1.0, 1.5, 2.5
TTPI(I)/TTPI(I/C)	1P ~ 37P, 1T ~ 37T	0.75, 1.0, 1.5, 2.5

Application/Limitation

This type of cable is fire resistant in accordance with IEC Publication 60331.

The requirement 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.

Type Approval documentation

Tests carried out

Standard	Release	General description	Limitation
IEC 60092-350	2020	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-376	2017	Cables for control and instrumentation circuits 150/250V(300V)	
IEC 60092-360	2021	Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation, telecommunication cables	
IEC 60332-1	2015	Test for vertical flame propagation for a single insulated wire or cable - Apparatus	
IEC 60332-3-22	2018	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	Bunch test Category A
IEC 60331-1	2018	Tests for electric cables under fire conditions - Circuit integrity - Part 1: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm	@ 830 ˚C w/shock (120 min)
IEC 60331-2	2018	Tests for electric cables under fire conditions - Circuit integrity - Part 2: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter not exceeding 20mm	@ 830 ˚C w/shock (120 min)
IEC 60754-1	2019	Test on gases evolved during combustion of materials from cables – Determination of the amount of halogen acid gas	Low Halogen <0,5%

Standard	Release	General description	Limitation
IEC 60754-2	2019	Test on gases evolved during combustion of materials from cables – Determination of the degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity	Halogen free ≥4,3pH, ≤10µS/mm
IEC 60684-2	2011	Flexible insulating sleeving – Part 2: Methods of test.	Fluorine content <0,1%
IEC 61034-1/2	2019	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke >60%
IEC 60092-350 Annex E	2020	Cold bend test and impact test for low temperature behaviour	Cold bend: -40°C Cold impact: -40°C
UL1581	2015	Sunlight resistance	Tensile strength ≥80% Elongation ≥80%

Marking of product

Voltage rating – Type designation – Size – IEC 60331-1(or -2) 120 - 60332-3 Cat.A – LS Cable – Year of manufacture – Length

Periodical assessment

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

The main elements of the survey are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Production Sample Tests(PST) and Routines(RT) checked (if not available tests according to PST and 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