

DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. E-7977
This Certificate consists of 3 pages

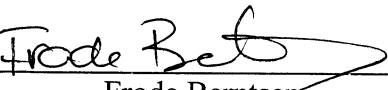
This is to certify that the
Heat Shrinkable Cable Protection
with type designation(s)
Heat shrinkable tubing: LS-PMWT -FR

Manufactured by
LS Cable Ltd.(Anyang)

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det
Norske Veritas' Offshore Standards

Application
For protection/insulation of cables and wires. Voltage: Max. 1000 V.



Place and date
Høvik, 2006-04-18
for DET NORSKE VERITAS AS


Frode Berntsen
Head of Section



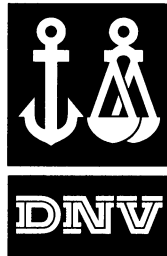
Local Office
DNV Seoul

This Certificate is valid until
2010-06-30


Ivar Bull
Surveyor 

Notice: 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.

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million. In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.



Cert. No.: E-7977
File No.: 828.20

Product description

Flame retardant, adhesive lined, heat shrinkable medium-wall polyolefin (shrink ratio 3:1) tubing type LS-PMWT-FR.

Insulation: Irradiated Cross-linked polyolefin "XZ-LV01(A)" complying with ASTM, ISO, IEC specification. Dielectric Strength: Min. 7,9 kV/mm.

Dual layer tube with meltable liner EVA grade "Q3293".

Inner adhesive is coated to inner surface of outer jacket.

Standard color of insulation: Black

Flame rating IEEE383 VTFT.

Expanded inside diameter and recovered thickness at any point of insulation shall be according to table 1.

List of sizes:

| Standard Size [mm] | Expanded[mm] | | Recovered [mm] | | Standard length [m] |
|-----------------------|-----------------------------|--|----------------------------|------------------------------------|---------------------------|
| | Inside diameter [min] | | Inside Diameter Max. | Thickness at any point [min] | |
| 10 / 3 | 10,0 | | 3,0 | 1,0 | 1,2 |
| 16 / 5 | 16,0 | | 5,0 | 1,5 | 1,2 |
| 25 / 8 | 25,0 | | 8,0 | 2,0 | 1,2 |
| 27 / 8 | 27,0 | | 8,0 | 2,0 | 1,2 |
| 30 / 10 | 30,0 | | 10,0 | 2,0 | 1,2 |
| 35 / 12 | 35,0 | | 12,0 | 2,0 | 1,2 |
| 40 / 15 | 40,0 | | 15,0 | 2,0 | 1,2 |
| 45 / 12 | 45,0 | | 12,0 | 3,5 | 1,2 |
| 50 / 16 | 50,0 | | 16,0 | 2,0 | 1,2 |
| 63 / 19 | 63,0 | | 19,0 | 2,5 | 1,2 |
| 75 / 22 | 75,0 | | 22,0 | 3,0 | 1,2 |
| 85 / 25 | 85,0 | | 25,0 | 3,0 | 1,2 |
| 95 / 29 | 95,0 | | 29,0 | 3,3 | 1,2 |
| 115 / 34 | 115,0 | | 34,0 | 3,3 | 1,2 |
| 140 / 42 | 140,0 | | 42,0 | 3,5 | 1,2 |

Application/Limitation

For protection/outer sheath repair of cables.

Voltage: Max. 1000 V.

Temperature class: - 55 °C to + 110 °C.

Storage and installation according to manufacturer's instructions.



Cert. No.: E-7977
File No.: 828.20

Type Approval documentation

Data sheets:

Specification for flame retardant, adhesive lined medium and heavy wall heat shrinkable polyolefin tubing, rev. 00 dated 06.01.20 Spec. No.: LSC(29)-K-C-00000044&45

Test reports:

LS Test report for DNV type approval. Type designation LS-PMWT-FR date 2006.02.22.
Flame test report by KETI according to IEEE 383 Vertical Tray Flame test, Feb.23. 2006

Tests carried out

Aged/unaged tensile strength and elongation. Flammability. Heat shock, Low temperature flexibility. Dielectric strength. Volume resistivity. Water absorption, Fluid resistance
Tensile strength Elongation.

Marking of product

Certificate retention survey

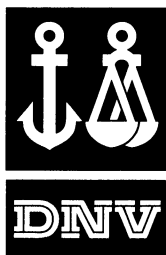
The scope of the retention/renewal survey is to verify that the conditions stipulated for the Type approval is complied with and that no alterations are made to the product design or choice of materials.

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.

Survey to be performed at renewal only.

END OF CERTIFICATE



DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. E-7978
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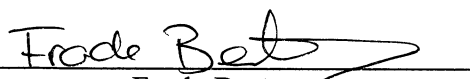
This is to certify that the
Termination and Joint for Cable Protection
with type designation(s)
Heat shrinkable tubing: LS-PHWT-FR

Manufactured by
LS Cable Ltd.(Anyang)

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det
Norske Veritas' Offshore Standards

Application
For protection/insulation of cables and wires. Voltage: Max. 1000 V.

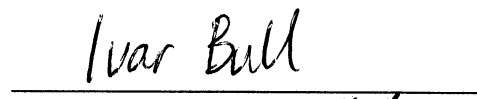

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Frode Berntsen
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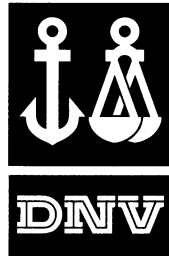
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Cert. No.: E-7978
File No.: 828.20

Product description

Flame retardant, adhesive lined, heat shrinkable heavy-wall polyolefin (shrink ratio 3:1) tubing type LS-PHWT-FR.

Insulation: Irradiated Cross-linked polyolefin "XZ-LV01(A)" complying with ASTM, ISO, IEC specification. Dielectric Strength: Min. 7,9 kV/mm.
Dual layer tube with meltable liner EVA grade "Q3293".
Inner adhesive is coated to inner surface of outer jacket.
Standard color of insulation: Black
Flame rating IEEE383 VTFT.

Expanded inside diameter and recovered thickness at any point of insulation shall be according to table 1.

List of sizes:

| Standard Size [mm] | Expanded[mm] | | Recovered [mm] | | Standard length [m] |
|-----------------------|-----------------------------|--|----------------------------|------------------------------------|---------------------------|
| | Inside diameter [min] | | Inside Diameter Max. | Thickness at any point [min] | |
| 9 / 3 | 9,0 | | 3,0 | 1,8 | 1,2 |
| 13 / 4 | 13,0 | | 4,0 | 2,4 | 1,2 |
| 20 / 6 | 20,0 | | 6,0 | 2,4 | 1,2 |
| 33 / 8 | 33,0 | | 8,0 | 3,0 | 1,2 |
| 43 / 12 | 43,0 | | 12,0 | 4,1 | 1,2 |
| 51 / 16 | 51,0 | | 16,0 | 4,1 | 1,2 |
| 70 / 21 | 70,0 | | 21,0 | 4,1 | 1,2 |
| 85 / 25 | 85,0 | | 25,0 | 4,1 | 1,2 |
| 90 / 30 | 90,0 | | 30,0 | 4,1 | 1,2 |
| 130 / 36 | 130,0 | | 36,0 | 4,1 | 1,2 |

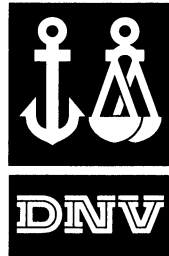
Application/Limitation

For protection/outer sheath repair of cables.

Voltage: Max. 1000 V.

Temperature class: - 55°C to + 110°C.

Storage and installation according to manufacturer's instructions.



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Tests carried out

Aged/unaged tensile strength and elongation. Flammability. Heat shock, Low temperature flexibility. Dielectric strength. Volume resistivity. Water absorption, Fluid resistance
Tensile strength Elongation.

Marking of product

The product shall be marked with the following information:
Type designation – Size – Manufacturers name – Lot No.

Certificate retention survey

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)
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