

# TYPE APPROVAL CERTIFICATE

**This is to certify:****That the Data transmission cables and systems**with type designation(s)  
**QFCI, QFBI and QFOI**

Issued to

**TMC Co., Ltd**  
**Cheonan-si Chungcheongnam-do, Korea**

is found to comply with

**DNV GL rules for classification – Ships, offshore units, and high speed and light craft**  
**NEK TS 606 (2016)****Application :****Fire resistant fiber optic cable. Halogen free. Low smoke. Oil resistant.**  
**Cold bend(-40°C) Cold impact(-35°C)****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**Issued at **Busan** on **2017-12-06**This Certificate is valid until **2022-06-30**.for **DNV GL**DNV GL local station: **Seoul**Approval Engineer: **Eun Jin Lee**

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**Michael Jost Auf der Stroth**  
**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.



## Product description

Type : QFCI, QFBI, QFOI

| Type                 | Fiber       | Description                                                                                                                                                                                                |
|----------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| QFCI<br>QFBI<br>QFOI | SM-G.652    | Fiber Core: 2C~72C.<br>Outer Diameter : 16.1mm                                                                                                                                                             |
|                      | SM-G.657    |                                                                                                                                                                                                            |
|                      | MM-62.5-OM1 | Loose Tube type with mica tape,<br>Galvanized steel wire Armored(QFCI)<br>Bronze wire armored(QFBI)<br>Tinned copper armored(QFOI)<br>and Low Smoke, Halogen free,<br>SHF1 sheathed Fire-Resistance Cables |
|                      | MM-50-OM2   |                                                                                                                                                                                                            |
|                      | MM-50-OM3   |                                                                                                                                                                                                            |
|                      | MM-50-OM4   |                                                                                                                                                                                                            |

Optical Fiber in accordance with IEC 60793

| Fiber type |          | Core Dia. (μm) | Clad Dia. (μm) | Coat. Dia. (μm) | Dispersion (ps/km.nm) |           | Attenuation (dB/km) |                | Bandwidth (MHz-km) |           | Link Dist. (m) |           |
|------------|----------|----------------|----------------|-----------------|-----------------------|-----------|---------------------|----------------|--------------------|-----------|----------------|-----------|
|            |          |                |                |                 | 1290~1330 (nm)        | 1550 (nm) | 850 1310 (nm)       | 1300 1550 (nm) | 850 (nm)           | 1300 (nm) | 850 (nm)       | 1300 (nm) |
| SM         | G.652    | 9.2            | 125            | 250             | 3.0↓                  | 18↓       | 0.4                 | 0.3            | N/A                | N/A       | 2000           | 2000      |
| SM         | G.657    | 8.6            | 125            | 250             | 3.0↓                  | 17.5↓     | 0.4                 | 0.3            | N/A                | N/A       | 2000           | 2000      |
| MM         | 62.5-OM1 | 62.5           | 125            | 250             | N/A                   | N/A       | 3.5                 | 1.5            | 200                | 500       | 275 (1G)       | 550 (1G)  |
| MM         | 50-OM2   | 50             | 125            | 250             | N/A                   | N/A       | 3.5                 | 1.5            | 500                | 500       | 550 (1G)       | 550 (1G)  |
| MM         | 50-OM3   | 50             | 125            | 250             | N/A                   | N/A       | 3.5                 | 1.5            | 1500               | 500       | 300 (10G)      | 300 (10G) |
| MM         | 50-OM4   | 50             | 125            | 250             | N/A                   | N/A       | 3.5                 | 1.5            | 3500               | 500       | 550 (10G)      | 300 (10G) |

## Application/Limitation

Temperature window

Operation : -40°C ~ 70°C

Installation : -10°C ~ 60°C

Storage : -40°C ~ 70°C

Minimum Bend Radius

Installation : 15 x Outer diameter

Operation : 10 x Outer diameter

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

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

## Type Approval documentation

### Tests carried out

| Standard | Release | General description | Limitation |
|----------|---------|---------------------|------------|
|----------|---------|---------------------|------------|

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 Certificate No: **TAE00002B9**

| Standard                               | Release           | General description                                                                                                                                                                                                       | Limitation                       |
|----------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| IEC 60092-350                          | 2014              | General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications                                                                                                |                                  |
| IEC 60092-360                          | 2014              | Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation, telecommunication cables                                                                                            |                                  |
| IEC 60793-1-40                         | 2001              | Optical fibres – Part 1-40: Measurement methods and test procedures – Attenuation                                                                                                                                         |                                  |
| IEC 60794-1-1/-2                       | 2015<br>2017      | Optical fibre cables – Generic specification -<br>Part 1-1: General<br>Part 1-2: Basic optical cable test procedures                                                                                                      |                                  |
| IEC 60331-11/25 and BS EN50200 Annex E | 2009/1999<br>2015 | Tests under fire conditions with water spray – Circuit integrity                                                                                                                                                          | 1000°C, 3hrs                     |
| IEC 60332-3-22                         | 2009              | 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<br>Category A         |
| IEC 60754-1                            | 2011              | Test on gases evolved during combustion of materials from cables – Determination of the amount of halogen acid gas                                                                                                        | Low Halogen<br><0,5%             |
| IEC 60754-2                            | 2011              | 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<br>≥4,3pH, ≤10μS/mm |
| IEC 60684-2                            | 2011              | Flexible insulating sleeving – Part 2: Methods of test.                                                                                                                                                                   | Fluorine content<br><0,1%        |
| IEC 60811-404                          | 2012              | Electric and optical fibre cables – Test methods for non-metallic materials – Part 404: Miscellaneous tests – Mineral oil immersion tests for sheaths                                                                     | IRM 902(70°C, 4hrs)              |
| IEC 61034-1/-2                         | 2005              | Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements                                                                                                      | Low smoke<br>>60%                |
| UL 1581                                | 2017              | Sunlight resistant -Section 1200                                                                                                                                                                                          | 720hrs                           |
| CSA C22.2 No. 03                       | 2009              | 5.11 Flexibility at any specified temperature                                                                                                                                                                             | Cold bend: -40°C                 |
| CSA C22.2 No. 03                       | 2009              | 5.12 Abnormal low temperature – impact                                                                                                                                                                                    | Cold impact: -35°C               |

## Marking of product

TMC – Type designation – Fiber type – Diameter of Fiber count – Date – Length – Serial no.

## 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:

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- 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