



Certificate no.:  
**TAE00004ZU**

# TYPE APPROVAL CERTIFICATE

**This is to certify:**  
**that the Category cables**

with type designation(s)  
**S/FTP 4x2x23AWG CAT 5e, CAT 6, CAT 6A, CAT 7, CAT 7A**

issued to  
**AP MOG Solutions Pte Ltd**  
**Singapore, Singapore**

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.**

Issued at **Hamburg** on **2024-11-22**

This Certificate is valid until **2029-11-21**.

for **DNV**

DNV local unit: **Certification of Materials - Singapore**

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

S/FTP 4x2x23AWG CAT 5e, CAT 6, CAT 6A, CAT 7, CAT 7A

|                              |                                                                 |
|------------------------------|-----------------------------------------------------------------|
| Conductor:                   | Stranded, annealed and bare copper 4x2x23/7 AWG or 4x2x23/1 AWG |
| Insulation:                  | PE-foam                                                         |
| Cabling / Individual screen: | Twisted pairs with aluminum foil-polyester tape                 |
| Overall screen:              | Solid tinned copper braid                                       |
| Outer Sheath:                | SHF1, SHF2, SHF-MUD                                             |

|                                 |                                                                       |
|---------------------------------|-----------------------------------------------------------------------|
| Aarmor + outer sheath optional: | Tinned copper or galvanized steel wire braiding + SHF1, SHF2, SHF-MUD |
|---------------------------------|-----------------------------------------------------------------------|

| Number of cores x conductor cross-section  | Overall diameter |
|--------------------------------------------|------------------|
|                                            | mm               |
| 4 x 2 x 23/7 AWG                           | OD: 9.0 ±0.5mm   |
| 4 x 2 x 23/1 AWG                           | OD: 8.5 ±0.5mm   |
| 4 x 2 x 23/7 AWG with Armor + outer sheath | OD: 12.2 ±0.8mm  |
| 4 x 2 x 23/1 AWG with Armor + outer sheath | OD: 11.5 ±0.8mm  |

### CAT 5e

| Frequency<br>MHz | ATT<br>dB/100m<br>Max. | RL<br>dB<br>Min. | NEXT<br>dB<br>Min. | PSNEXT<br>dB<br>Min. | ELFEXT<br>dB<br>Min. | PSELFEXT<br>dB<br>Min. |
|------------------|------------------------|------------------|--------------------|----------------------|----------------------|------------------------|
| 4                | 4.08                   | 23.0             | 56.3               | 53.3                 | 52.0                 | 49.0                   |
| 8                | 5.78                   | 24.5             | 51.8               | 48.8                 | 45.9                 | 42.9                   |
| 10               | 6.48                   | 25.0             | 50.3               | 47.3                 | 44.0                 | 41.0                   |
| 16               | 8.26                   | 25.0             | 47.2               | 44.2                 | 39.9                 | 36.9                   |
| 20               | 9.28                   | 25.0             | 45.8               | 42.8                 | 38.0                 | 35.0                   |
| 25               | 10.43                  | 24.3             | 44.3               | 41.3                 | 36.0                 | 33.0                   |
| 31.25            | 11.73                  | 23.6             | 42.9               | 39.9                 | 34.1                 | 31.1                   |
| 62.5             | 17.00                  | 21.5             | 38.4               | 35.4                 | 28.1                 | 25.1                   |
| 100              | 21.98                  | 20.1             | 35.3               | 32.3                 | 24.0                 | 21.0                   |

## CAT 6

| Frequency<br>MHz | ATT<br>dB/100m<br>Max. | RL<br>dB<br>Min. | NEXT<br>dB<br>Min. | PSNEXT<br>dB<br>Min. | ELFEXT<br>dB<br>Min. | PSELFEXT<br>dB<br>Min. |
|------------------|------------------------|------------------|--------------------|----------------------|----------------------|------------------------|
| 4                | 3.83                   | 23.0             | 66.3               | 63.3                 | 56.0                 | 53.0                   |
| 8                | 5.37                   | 24.5             | 61.8               | 58.8                 | 49.9                 | 46.9                   |
| 10               | 6.00                   | 25.0             | 60.3               | 57.3                 | 48.0                 | 45.0                   |
| 16               | 7.61                   | 25.0             | 57.2               | 54.2                 | 43.9                 | 40.9                   |
| 20               | 8.53                   | 25.0             | 55.8               | 52.8                 | 42.0                 | 39.0                   |
| 25               | 9.57                   | 24.3             | 54.3               | 51.3                 | 40.0                 | 37.0                   |
| 31.25            | 10.75                  | 23.6             | 52.9               | 49.9                 | 38.1                 | 35.1                   |
| 62.5             | 15.48                  | 21.5             | 48.4               | 45.4                 | 32.1                 | 29.1                   |
| 100              | 19.92                  | 20.1             | 45.3               | 42.3                 | 28.0                 | 25.0                   |
| 200              | 29.14                  | 18.0             | 40.8               | 37.8                 | 22.0                 | 19.0                   |
| 250              | 33.02                  | 17.3             | 39.3               | 36.3                 | 20.0                 | 17.0                   |

## CAT 6A

| Frequency<br>MHz | ATT<br>dB/100m<br>Max. | RL<br>dB<br>Min. | NEXT<br>dB<br>Min. | PSNEXT<br>dB<br>Min. | ELFEXT<br>dB<br>Min. | PSELFEXT<br>dB<br>Min. |
|------------------|------------------------|------------------|--------------------|----------------------|----------------------|------------------------|
| 4                | 3.80                   | 23.0             | 66.3               | 63.3                 | 56.0                 | 53.0                   |
| 8                | 5.31                   | 24.5             | 61.8               | 58.8                 | 49.9                 | 46.9                   |
| 10               | 5.93                   | 25.0             | 60.3               | 57.3                 | 48.0                 | 45.0                   |
| 16               | 7.49                   | 25.0             | 57.2               | 54.2                 | 43.9                 | 40.9                   |
| 20               | 8.38                   | 25.0             | 55.8               | 52.8                 | 42.0                 | 39.0                   |
| 25               | 9.38                   | 24.3             | 54.3               | 51.3                 | 40.0                 | 37.0                   |
| 31.25            | 10.50                  | 23.6             | 52.9               | 49.9                 | 38.1                 | 35.1                   |
| 62.5             | 14.99                  | 21.5             | 48.4               | 45.4                 | 32.1                 | 29.1                   |
| 100              | 19.14                  | 20.1             | 45.3               | 42.3                 | 28.0                 | 25.0                   |
| 200              | 27.58                  | 18.0             | 40.8               | 37.8                 | 22.0                 | 19.0                   |
| 250              | 31.07                  | 17.3             | 39.3               | 36.3                 | 20.0                 | 17.0                   |
| 300              | 34.27                  | 17.3             | 38.1               | 35.1                 | 18.5                 | 15.5                   |
| 400              | 40.05                  | 17.3             | 36.3               | 33.3                 | 16.0                 | 13.0                   |
| 500              | 45.26                  | 17.3             | 34.8               | 31.8                 | 14.0                 | 11.0                   |

CAT 7

| Frequency<br>MHz | ATT<br>dB/100m<br>Max. | RL<br>dB<br>Min. | NEXT<br>dB<br>Min. | PSNEXT<br>dB<br>Min. | ELFEXT<br>dB<br>Min. | PSELFEXT<br>dB<br>Min. |
|------------------|------------------------|------------------|--------------------|----------------------|----------------------|------------------------|
| 4                | 3.74                   | 23.0             | 78.0               | 75.0                 | 78.0                 | 75.0                   |
| 8                | 5.24                   | 24.5             | 78.0               | 75.0                 | 77.2                 | 74.2                   |
| 10               | 5.86                   | 25.0             | 78.0               | 75.0                 | 75.3                 | 72.3                   |
| 16               | 7.41                   | 25.0             | 78.0               | 75.0                 | 71.2                 | 68.2                   |
| 20               | 8.29                   | 25.0             | 78.0               | 75.0                 | 69.3                 | 66.3                   |
| 25               | 9.29                   | 24.3             | 78.0               | 75.0                 | 67.3                 | 64.3                   |
| 31.25            | 10.41                  | 23.6             | 78.0               | 75.0                 | 65.4                 | 62.4                   |
| 62.5             | 14.88                  | 21.5             | 75.5               | 72.5                 | 59.4                 | 56.4                   |
| 100              | 19.02                  | 20.1             | 72.4               | 69.4                 | 55.3                 | 52.3                   |
| 200              | 27.47                  | 18.0             | 67.9               | 64.9                 | 51.5                 | 48.5                   |
| 250              | 31.97                  | 17.3             | 66.4               | 63.4                 | 49.3                 | 46.3                   |
| 300              | 34.19                  | 17.3             | 65.2               | 62.2                 | 45.8                 | 42.8                   |
| 400              | 40.01                  | 17.3             | 63.4               | 60.4                 | 43.3                 | 40.3                   |
| 500              | 45.26                  | 17.3             | 61.9               | 58.9                 | 41.3                 | 38.3                   |
| 600              | 50.10                  | 17.3             | 60.7               | 57.7                 | 39.7                 | 36.7                   |

CAT 7A

| Frequency<br>MHz | ATT<br>dB/100m<br>Max. | RL<br>dB<br>Min. | NEXT<br>dB<br>Min. | PSNEXT<br>dB<br>Min. | ELFEXT<br>dB<br>Min. | PSELFEXT<br>dB<br>Min. |
|------------------|------------------------|------------------|--------------------|----------------------|----------------------|------------------------|
| 4                | 3.75                   | 23.0             | 78.0               | 75.0                 | 78.0                 | 75.0                   |
| 8                | 5.22                   | 24.5             | 78.0               | 75.0                 | 77.2                 | 74.2                   |
| 10               | 5.82                   | 25.0             | 78.0               | 75.0                 | 75.3                 | 72.3                   |
| 16               | 7.34                   | 25.0             | 78.0               | 75.0                 | 71.2                 | 68.2                   |
| 20               | 8.21                   | 25.0             | 78.0               | 75.0                 | 69.3                 | 66.3                   |
| 25               | 9.18                   | 24.3             | 78.0               | 75.0                 | 67.3                 | 64.3                   |
| 31.25            | 10.26                  | 23.6             | 78.0               | 75.0                 | 65.4                 | 62.4                   |
| 62.5             | 14.57                  | 21.5             | 78.0               | 75.0                 | 59.4                 | 56.4                   |
| 100              | 18.53                  | 20.1             | 75.4               | 72.5                 | 55.3                 | 52.3                   |
| 200              | 26.47                  | 18.0             | 70.9               | 67.9                 | 49.3                 | 46.3                   |
| 250              | 29.73                  | 17.3             | 69.4               | 66.4                 | 47.3                 | 44.3                   |

|      |       |      |      |      |      |      |
|------|-------|------|------|------|------|------|
| 300  | 32.69 | 17.3 | 68.2 | 65.2 | 45.8 | 42.8 |
| 500  | 42.76 | 17.3 | 64.9 | 61.9 | 41.3 | 38.3 |
| 600  | 47.10 | 17.3 | 63.7 | 60.7 | 39.7 | 36.7 |
| 800  | 54.92 | 16.1 | 61.9 | 58.9 | 37.2 | 34.2 |
| 1000 | 61.93 | 15.1 | 60.4 | 57.4 | 35.3 | 32.3 |

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

Due to the low cross section of these cables, extra precautions shall be made during installation. In order to achieve a transmission link compliant with Category CAT5E, CAT6, CAT6A, CAT7, CAT7A, cables shall be installed with suitable termination equipment according to manufacturer's recommendations.

Horizontal wiring cables S/FTP 4x2x23AWG CAT 5e, CAT 6, CAT 6A, CAT 7, CAT 7A  
Flame retardant Cat. A. Halogen free. Low smoke.

Install at: -20°C to +60 °C

Operate at: -52°C to +90 °C

## Type Approval documentation

### Tests carried out

| Standard       | Release | General description                                                                                                                                                                                          | Limitation                                                                  |
|----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| DNV-CP-0403    | 2021-09 | DNV Type approval program for Data communication cables – category cables                                                                                                                                    | Ref. IEC 61156-5 standard Category 5e, 6, 6A, 7, 7A                         |
| IEC 61156-5    | 2020-04 | Multicore and symmetrical pair/quad cables for digital communications – Part 5: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Horizontal wiring – Sectional specification |                                                                             |
| IEC 60092-350  | 2020-01 | General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications                                                                                   | Partly used                                                                 |
| 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                   |                                                                             |
| IEC 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                                                                                     | Sheath only<br>Low Halogen:<br><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                                                                     | Sheath only<br>Halogen free:<br>pH > 4,3<br>Conductivity < 10µS/mm          |
| IEC 60684-2    | 2011-08 | Clause 45.2 Methods of determination of low levels of fluorine                                                                                                                                               | Sheath only<br>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<br>Light transmittance >60%                                       |

| Standard      | Release | General description                                                                                                                                                              | Limitation                                                                                                                      |
|---------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| NEK TS 606    | 2022    | Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.                                                                                   | SHF2-MUD resistance test:<br>IRM902+IRM903<br>100°C 7d.<br>Calcium Bromide<br>70°C 56d.<br>Oil based mud:<br>EDC 95/11 70°C 56d |
| UL 1581       | 2020-02 | UL Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords                                                                                       | SHF1, SHF2, SHF-MUD<br>UV resistant acc.<br>UL 1581 Cl.1200<br>min. 85% after 300h<br>in the tensile strength and elongation    |
| 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. | SHF1 aging in IRM 902<br>70°C 4h<br><br>SHF2 aging in IRM 902<br>100°C 24h<br><br>tensile strength and elongation max +/- 40%   |
| IEC 60079-14  | 2013-11 | Explosive atmospheres - Part 14: Electrical installations design, selection and erection                                                                                         | Test for limitation of the gas flow through the cable according to Annex E                                                      |
| EN 50288-1    | 2013-05 | Multi-element metallic cables used in analogue and digital communication and control - Part 1: Generic specification                                                             | 5.3.1 Cold bend performance                                                                                                     |

## Marking of product

APS FINLAND MOG □WW/YY□Armored□M82□Cable□Cable model□Cable shielding type and size□Jacket material□IEC□60332-3-22□IEC□60332-3-24□XXXXXX□\*\*\*\*m

Notice: □ represent Space; Armored only for armored cable types; XXXXXX represent batch number; \*\*\*\*m represent meter mark

Example:

APS FINLAND MOG 08/24 Armored M82 Cable Cat7 S/FTP 4PR 23AWG/7 SHF1 IEC 60332-3-22 XXXXXX \*\*\*\*m

## Place of Production

DNV id: 10630537

## 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