



Certificate no.:
TAE00004XV

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Data transmission cables and systems

with type designation(s)
Profibus DP, RS485, Canbus

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 **Høvik** on **2024-09-03**

This Certificate is valid until **2029-09-02**.

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 300,000 USD.



Form code: TA 251

Revision: 2023-09

www.dnv.com

Page 1 of 4

Product description

Fieldbus cable

Profibus DP SHF1/SHF2 1x2x22AWG/7, M80 Armored Cable Profibus DP SHF1/SHF2 1x2x22AWG/7

RS485 SHF1/SHF2 SF/UTP 2x2x24AWG/7, M80 Armored RS485 SHF1/SHF2 SF/UTP 2x2x24AWG/7
RS485 SHF1/SHF2 SF/UTP 4x2x24AWG/7, M80 Armored RS485 SHF1/SHF2 SF/UTP 4x2x24AWG/7

RS485 SHF1/SHF2 SF/UTP 2x2x22AWG/7, M80 Armored RS485 SHF1/SHF2 SF/UTP 2x2x22AWG/7
RS485 SHF1/SHF2 SF/UTP 4x2x22AWG/7, M80 Armored RS485 SHF1/SHF2 SF/UTP 4x2x22AWG/7

CAN Bus SHF1/SHF2 1x2x18AWG/7, M80 Armored CAN Bus SHF1/SHF2 1x2x18AWG/7
CAN Bus SHF1/SHF2 2x2x18AWG/7, M80 Armored CAN Bus SHF1/SHF2 2x2x18AWG/7

CAN Bus SHF1/SHF2 SF/UTP 2x20AWG/19, M80 Armored CAN Bus SHF1/SHF2 SF/UTP 2x20AWG/19
CAN Bus SHF1/SHF2 SF/UTP 4x20AWG/19, M80 Armored CAN Bus SHF1/SHF2 SF/UTP 4x20AWG/19

CAN Bus SHF1/SHF2 SF/UTP 4x2x20AWG/19, M80 Armored CAN Bus SHF1/SHF2 SF/UTP 4x2x20AWG/19

IEC 61158-2	Type A	Type B				
Bus Type	Profibus	RS-485 24AWG	RS-485 22AWG	Canbus 18AWG	Canbus 20AWG	Units
Impedance	150 f=3-20MHz	120 f>100KHz	120 f>100KHz	120 f>100KHz	120 f>100KHz	Ohm
Capacitance (f=800Hz)	<30	<60	<60	<60	<60	pF/m
Conductor DC resistance	<55	<93	<59	<26	<35	Ohm/Km
Conductor cross- sectional area	0.34	0.22	0.34	0.88	0.57	mm ²
Conductor size	22	24	22	18	20	AWG
Number of pairs	1	2, 4	2, 4	1, 2	1, 2, 4	-
Individual shield	None	None	None	None	None	-
Overall shield	2	2	2	2	2	-
Wire A Color	Green	N/S	N/S	N/S	N/S	-
Wire B Color	Red	N/S	N/S	N/S	N/S	-
Option	Armor + Outer Sheath	Armor + Outer Sheath	Armor + Outer Sheath	Armor + Outer Sheath	Armor + Outer Sheath	-

Construction:

Conductor material	Stranded tinned copper wire
Insulation material	Foamed PE, foamed PE or HDPE RS485 type
Fillers and bedding	PP
Overall Shield	Al-polyester tape + tinned copper wire braid, braiding density ≥60%
Inner/outer jacket material	SHF1/SHF2 per IEC60092-360
Armor (Optional)	galvanized steel wire braiding, density ≥60%
Outer jacket material (Optional)	SHF1/SHF2 per IEC60092-360

Cable parameter	Type A	Type B
Impedance	135 to 165 ohm (f=3 to 20MHz)	100 to 130 ohm (f>100KHz)
Capacity	<30pF/m	<60pF/m
Resistance	<110ohm/km	Not specified
Conductor cross-sectional area	≥0.34mm ²	≥0.22mm ²

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.

Fieldbus Data communication cables.
Flame retardant Cat. A and Cat. C. Halogen free. Low smoke.

Temperature window:

Operation: -40°C to +80°C

Installation: -20°C to +60°C

Type Approval documentation

Tests carried out

Standard	Release	General description	Limitation
IEC 61158-2	2023-03	Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition	Cable specifications as per item 22.1.2.2 and table 144.
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 60332-3-24	2018-07	Tests on electric and optical fibre cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category C	Charred portion of sample does not exceed 2,5m above bottom edge of burner.
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	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	Clause 45.2 Methods of determination of low levels of fluorine	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%
UL 1581	2020-02	UL Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords	SHF1/SHF2, UV resistant acc. UL 1581 Cl.1200 min. 85% after 300h in the tensile strength and elongation
IEC 60811-404	2021-01	Electric and optical fibre cables – Test methods for non-metallic materials – Part 404: Miscellaneous tests – Mineral oil immersion tests for sheaths	SHF1 aging in IRM 902 70°C 4h SHF2 aging in IRM 902 100°C 24h tensile strength and elongation max +/- 40%

Marking of product

APS FINLAND MOG □WW/YY□Armored□M80□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 M80 Cable PROFIBUS DP SF/UTP 1x2x22AWG/7 SHF1 IEC 60332-3-22 IEC 60332-3-24 XXXXXX ****m

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