



TYPE APPROVAL CERTIFICATE

Certificate No:
TAE00002A2
Revision No:
3

This is to certify:

That the Data transmission cables and systems

with type designation(s)

ProfiBUS DP, ProfiBUS PA, CanBUS, DeviceNET, Foundation FieldBUS, Profinet, RS-485, RS-422

Issued to

**Belcom Cables Ltd.
Elsenham, Essex, United Kingdom**

is found to comply with

DNV rules for classification – Ships, offshore units, and high speed and light craft

Application :

Fieldbus Data communication cables. Armoured or Non-armoured.

Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Issued at **Høvik** on **2023-03-23**

This Certificate is valid until **2027-11-06**.

for **DNV**

DNV local unit: **Southampton**

Approval Engineer: **Ivar Bull**

Frederik Tore Elter
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

Profibus DP, Profibus PA, CanBUS, DeviceNET, Foundation FieldBUS, Profinet, RS-485, RS-422

P/N Family	AMD	AMP	AMC	AMV	AMF	AMN	AMR	AMT	Units
Bus Type	Profibus DP	Profibus PA	Can BUS	DeviceNET	FieldBU S-H1	Profinet	RS-485	RS-422	
Impedance	150 f=3-20 MHz	100 f>100 kHz	100-130 f>100 kHz	120 f>100 kHz	120-100 f>100 kHz	100 f>100 kHz	100-120 f>100 kHz	100-120 f>100 kHz	Ohm
Capacitance (f=800Hz)	<30	35-44	40-55	35-44	40- 55	40- 55	35-50	35-50	pF/m
DC Resistance	94-10	94-10	94-13	94-10	95-5	150-54	94- 10	94- 10	Ohm/ Km
Voltage rating	150 - 300	150- 300	150-300	300	300	48	300	300	Vrms
Conductor cross-sectional area	≥0.34	≥0.22	≥0.22	≥0.22	≥0.22	≥0.22	≥0.22	≥0.22	mm ²
Conductor size options	20, 22	16, 18, 20	16, 18, 20, 22, 24	16, 18, 20, 22, 24	16, 18	20, 22, 24	16, 18, 20, 22, 24	16, 18, 20, 22, 24	AWG
Number of pairs	1	1	1-8	1 data + 1 power	1-12	2-4	1-12	2, 4, 6, 8, 10, 12	-
Individual shield	None	None	1,2, 5, 6	2	1,2, 5, 6	1, 2, 5, 6	1, 2, 5, 6	1, 2, 5, 6	-
Overall shield	2, 5, 6	2, 5, 6	1,2, 5, 6	5	1,2, 5, 6	1, 2, 5, 6	1, 2, 5, 6	1, 2, 5, 6	-
Wire A Colour	Green	N/S	N/S	N/S	N/S	N/S	N/S	N/S	-
Wire B Colour	Red	N/S	N/S	N/S	N/S	N/S	N/S	N/S	-
Jacket Colour	Violet	N/S	N/S	N/S	N/S	N/S	N/S	N/S	-
Additional wires (option)	Common wire	Common wire	Common wire +2/E 1,5 or 2,5mm ² *)	None	Common wire	Common wire	Common wire	Common wire	-

Optional constructions:

Conductor material	Bare annealed copper or Tin-coated annealed copper
Conductor construction	Stranded - IEC 60228 Class 2 or Class 5
Insulation material	PO
Individual Shield	Optional metal foil + drain or metal braid or metal foil + metal braid
Individual jacket	Optional taped or extruded jacket
Overall Shield	Optional metal foil + drain or metal braid or metal foil + metal braid
Braid construction	0.15mm min., 0.25mm max. tin-coated or bare copper wires, 84% coverage min
Inner sheath material	IEC 60092-360 SHF1 or SHF 2
Armor and MB (Optional)	Bonded Aluminum Moisture barrier Braided galvanized steel wire Corrugated steel tape Served (Galvanized) steel wire Bronze wire braid Copper wire braid Tinned copper wire braid
Outer sheath thickness	Core OD x 0.025 + 0.9 mm min. Lower limit: 1.0 mm min.
Overall diameter	2.0 mm min. - 40 mm max.
Max. pulling force	50N/mm ²
Special properties	Flame retardant, Halogen Free, Low Smoke, Mud Resistant
Outer sheath	SHF1 or SHF2 or SHF MUD, single or double layer.

Table 107-Cable specifications (IEC 61158-2 ed. 1)

Cable parameter	Type A	Type B
Impedance	135 to 165 Ω (f = 3 to 20 MHz)	100 to 130 Ω (f > 100kHz)
Capacity	< 30 pF/m	< 60 pF/m
Resistance	< 110 Ω /km	not specified
Conductor cross-sectional area	$\geq 0,34 \text{ mm}^2$	$\geq 0,22 \text{ mm}^2$
Colour of sheath non-IS	Violet	Not specified
Colour of inner cable conductor A (RxD/TxD-N)	Green	Not specified
Colour inner cable conductor B (RxD/TxD-P)	Red	Not specified

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.

Operation temperature -40°C to +90°C. Installation temperature -15°C to 50°C.

*) If power conductors are operated with voltage above 50V, as a safety measure the braid and/or screen of all copper instrument and data cables shall be connected to earth potential. When power conductors are operated below 50V the earthed braid/screen is not required.

If one power core trips on overcurrent or short circuit, all power cores shall trip simultaneously.

All power, control and data elements of hybrid cable shall serve same consumer.

System designer shall ensure that hybrid cable provides sufficient signal integrity for reliable operation of equipment. Special care shall be taken if analogue signals are transmitted in combined power and data cable. Please refer to guidelines in IEC 60533(2015) Table B.1.

For safety reasons, marking of cable outer sheath should include power conductors 0,6/1kV.

Type Approval documentation

Tests carried out

Standard	Release	General description	Limitation
IEC 61158-2 ed. 1	2010-10	Industrial communication networks. Fieldbus specifications. Part 2: Physical layer specifications and service definition.	Cable specifications as per item 22.1.2.2
IEC 61784-1 Ed.3.0	2010-07	Industrial communication networks - Profiles - Part 1: Fieldbus profiles	
IEC 61784-2 Ed.2.0	2010-07	Industrial communication networks - Profiles - Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3	
IEC 60092-376	2017-05	Cables for control and instrumentation circuits 150/250 V (300 V)	
IEC 60092-350	2020-01	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications:	
		-7.4 Dielectric strength conductor/conductor and conductor/screen	3x U ₀ for 4 hours. No breakdown of insulation shall occur.
		-7.5 Mutual capacitance	Within limits specified in table 1
IEC 61189-1	2007-05	Low-frequency cables and wires with PVC insulation and PVC sheath - Part 1: General test and measuring methods:	
		-8.2 Dielectric strength conductor/conductor and conductor/screen	1,0 kV rms for 1 minute. No breakdown of insulation shall occur.

Standard	Release	General description	Limitation
		-8.3 Insulation resistance.	Minimum 150 MOhm for 1 km cable after dielectric test
		-4.3 Conductor elongation at break	≥ 8%
IEC 60332-1	2015-07	Tests on electric and optical fibre cables under fire conditions – Part 1-1: Test for vertical flame propagation for a single insulated wire or cable – Apparatus	Flame retardant small scale
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 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	Bunch test
IEC 60754-1	2019-11	Test on gases evolved during combustion of materials from cables – Determination of the amount of halogen acid gas	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:
IEC 61034-1/2	2011-08	Measurement of smoke density of cables	Light transmittance > 60%
NEK 606 Ed. 6	2022-03	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.	Mud resistance test: IRM903 100°C 7d. Calcium Bromide 70°C 56d or Carbo Sea 70°C 56d

Marking of product

Armada® - P/N – Number & size of pairs / conductors *) – BUS type – Armour type - LSZH FireFighter® SHF1 or SHF2 or SHF MUD - IEC60092-360 / NEK TS 606:2016 - IEC 60332-3-22-24 Cat A / Cat C - Batch Number - Metre Mark

*) For hybrid cable with power conductors, voltage level shall be included.

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 Production Sample Tests (PST) and Routine Tests (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
- Ensure 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