

TYPE APPROVAL CERTIFICATE

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 GL rules for classification – Ships, offshore units, and high speed and light craft**Application :****Fieldbus Data communication cables. Non-armoured.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**Issued at **Høvik** on **2017-11-08**This Certificate is valid until **2022-11-07**.DNV GL local station: **Southampton**for **DNV GL**Approval Engineer: **Ivar Bull**

**Andreas Kristoffersen
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.



Job Id: **262.1-026922-1**
Certificate No: **TAE00002A2**

Name & place of manufacturer

DNVGL Id 10096273.

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	FieldBUS-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 Color	Green	N/S	N/S	N/S	N/S	N/S	N/S	N/S	-
Wire B Color	Red	N/S	N/S	N/S	N/S	N/S	N/S	N/S	-
Jacket Color	Violet	N/S	N/S	N/S	N/S	N/S	N/S	N/S	-
Additional wires (option)	Common wire	Common wire	Common wire	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
Jacket material	IEC 60092-359 SHF 2
Outer Jacket 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	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.

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	2014-08	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.
		-8.3 Insulation resistance.	Minimum 150 MOhm for 1 km cable after dielectric test
		-4.3 Conductor elongation at break	$\geq 8\%$
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

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Standard	Release	General description	Limitation
IEC 60332-3-22	2009-02	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	2009-02	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	2011-11	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	2011-11	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	2013-06	Measurement of smoke density of cables	Light transmittance > 60%

Marking of product

Armada® - P/N – Number & size of pairs / conductors – BUS type – LSZH FireFighter® SHF2 or SHF MUD - IEC60092-360 / NEK TS 606:2015 - IEC 60332-3-22-24 Cat A / Cat C - Batch Number - Metre Mark

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