DNV·GL

Certificate No:
E-13823
File No:
827.50
Job Id:
262.1-014430-3

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Data transmission cables and systems

with type designation(s)
DK Type ProfiBUS 150, SHF1, DK Type ProfiBUS 100, SHF1, DK Type CanBUS, SHF1, DK Type DeviceNET, SHF1, DK Type FieldBUS-H1, SHF1, DK Type Ethernet/IP BUS, SHF1, DK Type RS-485, SHF1, DK Type RS-422, SHF1

Issued to
TELDOR Cables & Systems Ltd.
Israel, Israel

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards
IEC 60332-3-22 (2009-02)
IEC 60332-3-24 (2009-02)

Application :

Fieldbus Data communication cables. Non-armoured. SHF1 sheath.
Flame retardant in bunch Cat A or Cat. C. Halogen free. Low smoke.

Type	Voltage (kV)	Temp. class (°C)
DK Type ProfiBUS 150, SHF1	150-300V	90
DK Type ProfiBUS 100, SHF1	300	90
DK Type CanBUS, SHF1	150-300 V	90
DK Type DeviceNET, SHF1	300 V	90
DK Type FieldBUS-H1, SHF1	300 V	90
DK Type Ethernet/IP BUS, SHF1	48 V	90
DK Type RS-485, SHF1	300 V	90
DK Type RS-422, SHF1	300 V	90

This Certificate is valid until **2017-12-31**.
Issued at **Høvik** on **2014-12-05**

DNV GL local station: **Piraeus**

Approval Engineer: **Ivar Bull**

for **DNV GL**
Digitally Signed By: Sjåvåg, Trond
Location: DNV Høvik, Norway
Signing Date: 2014-12-05 , on behalf of

Marit Laumann
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.

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Product description

DK Type ProfiBUS 150, SHF1
DK Type ProfiBUS 100, SHF1
DK Type CanBUS, SHF1
DK Type DeviceNET, SHF1
DK Type FieldBUS-H1, SHF1
DK Type Ethernet/IP BUS, SHF1
DK Type RS-485, SHF1
DK Type RS-422 ,SHF1

IEC 61158-2	Type A	Type B							Units
P/N	U	P	C	D	F	E	R	S	
Bus Type	ProfiBUS 150	ProfiBUS 100	CanBUS	DeviceNET	FieldBUS-H1	Ethernet/IP BUS	RS-485	RS-422	
Impedance	150 f=3-20MHz	100 f>100KHz	100-130 f>100KHz	120 f>100KHz	120 – 100 f>100KHz	100 f>100KHz	100 - 120 f>100KHz	100 - 120 f>100KHz	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 SHF1
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: SHF1, 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	≥ 0,34 mm^2	≥ 0,22 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

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Application/Limitation

By the termination of the cables the total strings of the cable to be kept through into the termination point as for coax cables.
Operation temperature -40C to +90C. Installation temperature -15C to 50C.

Type Approval documentation

Data sheets.

Test reports: DK-01D24T25301_98DNV01101_TEST_REPORT
DK-04E24T11001_9EDNV01101_TEST_REPORT

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	2003-05	Cables for control and instrumentation circuits 150/250 V (300 V)	
IEC 60092-350	2008-04	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	2004-07	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	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

Standard	Release	General description	Limitation
IEC 60754-1	1994-01	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	2005-04	Measurement of smoke density of cables	Light transmittance > 60%

Marking of product

Teldor - DK SHF1 – Number & Type of conductors – BUS type – Shield type – Armour type – Voltage – P/N – B/N – Meter mark – IEC 60332-3 Cat A or Cat C - Lot No

Periodical assessment

The scope of the Periodical assessment 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:

- 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.

Survey to be performed at least every second year.

END OF CERTIFICATE