TYPE APPROVAL CERTIFICATE

Certificate No:
TAE00003ZK
Revision No:
1

This is to certify:

That the Field bus cables

with type designation(s)
MG Type ProfiBUS 100, MG Type ProfiBUS 150, MG Type CanBUS, MG Type Devicenet, MG Type Fieldbus-H1, MG Type Ethernet/IP BUS, MG Type 485, MG Type RS-422

Issued to
TELDOR Cables & Systems Ltd.
Israel, **Israel**

is found to comply with
DNV rules for classification – Ships, offshore units, and high speed and light craft

Application :

Fieldbus Data communication cables. Fire resistant. Armoured or unarmoured.
Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Issued at **Høvik** on **2023-03-08**

This Certificate is valid until **2027-12-31**.
DNV local unit: **Haifa**

Approval Engineer: **Ivar Bull**

for **DNV**

Digitally Signed By: Elter, Frederik Tore
Location: DNV Høvik, Norway

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.

Product description

IEC 61158-2	Type A	Type B							Units
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	-
Additional wires (option)	Common wire	Common wire	Common wire	None	Common wire	Common wire	Common wire	Common wire	-

Construction:

Conductor material	Bare annealed copper or Tin-coated annealed copper
Conductor construction	Stranded - IEC 60228 Class 2 or Class 5
Insulation material	PO + Fire resistance tape
Fillers and bedding	Halogen-Free, Low-Smoke, Flame retardant
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 jacket material	SHF1 or SHF2 or SHF2-MUD per IEC60092-360 (Single or double layer)
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 jacket material (Optional)	SHF1 or SHF2 or SHF2-MUD per IEC60092-360. Optional: PUR jacket for increased mechanical resistance. *)
Outer jacket layers	Single or double layer
Overall diameter	2.0 mm min. - 40 mm max.
Max. pulling force	Specified in the detailed specification.
Special properties	Flame retardant, Fire Resistant, Halogen Free, Low Smoke, Mud Resistant

Cable parameter	Type A	Type B	Optional
Impedance	135 to 165 ohm (f=3 to 20MHz)	100 to 130 ohm (f>100KHz)	70 to 100 ohm (f<1MHz)
Capacity	<30pF/m	<60pF/m	
Resistance	<110ohm/km	Not specified	
Conductor cross-sectional area	>=0.34mm^2	>=0.22mm^2	

Optional: Cold bend per CSA 22.2 @ -40oC and Cold Impact per CSA 22.2 @ -35oC

Application/Limitation

This type of cable is fire resistant according to IEC 60331-21/23.

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.

*) Cables with PUR jacket are designed for application where flexibility is needed and shall be installed in open and/or ventilated areas and shall not be installed in bundle.

Type Approval documentation

Data sheets: See approval letter
Test reports: Test Report 7MG0116101 witnessed by DNV GL dated 2018-01-11
Test Report 7MG0016101 witnessed by DNV GL dated 2018-01-11
Product certificate 10941 HFA for Cat 6A cables dated 2016-10-18
Fire test report IEC 60331-21 [90+15 min] dated 2019-07-09

Tests carried out

Standard	Release	General description	Limitation
IEC 61158-2 ed. 6	2014-07	Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition	Cable specifications as per item 22.1.2.2 and table 113.
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 60092-360	2014-04	Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables.	
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	> 8%
IEC 60331-21	1999-04	Tests for electric cables under fire conditions – Circuit integrity – Part 21: Procedures and requirements – Cables of rated voltage up to and including 0,6/1,0 kV	Minimum 90 min + 15 min cooling down time

IEC 60331-23	1999-04	Tests for electric cables under fire conditions – Circuit integrity – Part 23: Procedures and requirements – Electric data cables	Min 90 min + 15 min cooling. Transmission propertiesd monitored during fire and cooling down.
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
IEC 60754-1	2011-11	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	2011-11	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 61034-1/2	2013-07 2013-09	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance ≥60%

Marking of product

TELDOR, Part number with “MG”, Number & Type of conductors, BUS type, shield type, Armor type, Batch (lot) number, METER MARK - IEC 60331-21/23 [90+15min] - IEC 60332-3-22 or 24

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) and selected type tests (ref. to applicable class programs) checked (if not available these tests shall 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