DNV·GL

Certificate No:
**TAE00003ZK**

# TYPE APPROVAL CERTIFICATE

## This is to certify:

**That the Data transmission cables and systems**

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

## Application :

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

Issued at **Høvik** on **2020-05-28**
This Certificate is valid until **2022-12-31**.
DNV GL local station: **Haifa**

Approval Engineer: **Ivar Bull**

for **DNV GL**

**Marta Alonso Pontes**
**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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Job Id: **262.1-025553-2**
Certificate No: **TAE00003ZK**

## 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<br>Braided galvanized steel wire<br>Corrugated steel tape<br>Served (Galvanized) steel wire<br>Bronze wire braid<br>Copper wire braid<br>Tinned copper wire braid |
| Outer jacket material (Optional) | SHF1 or SHF2 or SHF2-MUD per IEC60092-360 |
| 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.

## Type Approval documentation

## 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 | Min 90 min + 15 min cooling. Transmission propertiesd monitored |

| | | | |
|---|---|---|---|
| | | requirements – Electric data cables | 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:<br><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:<br>pH > 4,3<br>Conductivity < 10µS/mm |
| IEC 61034-1/2 | 2013-07<br>2013-09 | Measurement of smoke density of cables burning under defined conditions –<br>Test apparatus, procedure and requirements | Low smoke<br>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