

Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

Manufacturer	TELDOR Cables & Systems
Address	Kibbutz Ein-Dor, 1933500, Israel
Place of Production	TELDOR Cables & Systems Kibbutz Ein-Dor, 1933500, Israel
Type	Digital communication cables
Description	Hybrid / Composite (Combination of Data/Lan – Fiber Optic – BUS – Instrumentation 300V – Power 600V cables) cables
Trade Name	Teldor
Application	Digital communication cables for Marine and Offshore applications
Specified Standard	IEC 60353:2016, IEC60092-376:2017, IEC 61156-1: 2009, IEC 61156-2:2010, IEC61156-5:2020, IEC61156- 7:2012, IEC 61156-6:2020 ICE 61156-8:2013, ICE 61156-9:2016, IEC 61158-2ed. 1:2010, IEC61784-1:2010, IEC 61784-2:2010; IEC 61189-1:2007;IEC60793-2-10:2019,IEC60793-2-50: 2018, IEC60794- series : 2021, IEC60092-350:2020, IEC60092-360:2021, IEC 60754-1/2:2019, IEC 61034-1/2:2019, IEC 60332-1-1/2/3:2015, BS6387:2013, 60331-1:2018, 60331-2:2018, 60331-25:1999, IEC 60332-2:2004,IEC60332-3-22:2018, IEC 60332-3-24:2018, IEC 60331-21:1999, IEC60331-23:1999, NEK 606:2016;ISO/ IEC11801:2017, ANSI/TIA/EIA568:2016, CSA 22.2 NO.03:2009(Cold bend, Cold

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impact), SOLAS Amendments chapter II-1 Part D, Reg.45.5.2.

Ratings

Combination of one or more cables/structures of Data/Lan cables, Fiber Optic cables, Bus cables and instrumentation/Control and power cables under common armor and/or jacket. Used for transmitting various types of signals including data/control/signal with power through copper and/or Fibers. The cables are flame retardant per IEC60332-3, halogen free with low smoke emission. The cables are jacketed and sheathed with FR-LSZH materials including SHF1, SHF2 and MUD resistant per NEK 606. The cables are made with copper (solid or stranded) and/or Fibers conductors, armored and non-armored and have fire resistance (optional).
Details see certificate appendix

This certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register Classification Society (China) Co Ltd of any modification or changes to the equipment in order to obtain a valid Certificate.

The Design Appraisal Document LR21447835TA and its supplementary Type Approval Terms and Conditions form part of this Certificate.

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Appendix

SPECIAL PROPERTIES:

Halogen free per IEC 60754-1/2
Flame retardant per IEC 60332-3-22 (cat.A), 60332-3-24 (cat.C), IEC 60332-1-1/2/3, IEC 60332-2
Low Smoke per IEC 61034-1/2
Armor/Non-Armor
Shielded / UnShielded
Multi Pair / Multi Core / Multi Cables options
Fire resistant per IEC 60331-21/23/25 (Optional) with verified transmission performance
Various Jacket types (SHF1, SHF2, SHF2-MUD resistant per NEK606)
Designed for marine and offshore application

Oil resistant
Designed for harsh conditions

Various fiber types (SM, MM and special)
Various construction types (Tight buffers, Breakout, Single loose tube, Multi loose tube)
Dry and Gel filled tubes
Various types: ProfiBus (100,150), CanBus, DeviceNet, FieldBus H1 Ethernet/IP, RS-485, RS-422

Combinations of cross sections and single/pair/core structures are permitted (for 300V elements)

600/1000V power / low voltage cores (options)
single cores, pairs or triads for Instrumentation / Control / Signal applications

DATA/LAN cables/components --DETAILED DESCRIPTION:

Cable types	Design standards	Cross section	Conductor type (IEC60228)	Shielding
MGD cat 3, 5	IEC 61156-2	24 AWG(0.204mm ²)	Solid class 1	U/UTP, F/UTP, U/FTP, F/FTP, S/FTP, SF/UTP, SF/FTP
	IEC 61156-2	26 AWG(0.138mm ²) 24 AWG(0.204mm ²)	Stranded class 2	
MGD cat 5e	IEC 61156-5	24 AWG(0.204mm ²)	Solid class 1	U/UTP, F/UTP, U/FTP, F/FTP, S/FTP, SF/UTP, SF/FTP
	IEC 61156-6 (Option IEC61156-5)	26 AWG(0.138mm ²) 24 AWG(0.204mm ²)	Stranded class 2	
MGD cat 6	IEC 61156-5	23 AWG(0.246mm ²) 22 AWG(0.324mm ²)	Solid class 1	U/UTP, F/UTP, U/FTP, F/FTP, S/FTP, SF/UTP, SF/FTP
	IEC 61156-6 (Option IEC61156-5)	26 AWG(0.138mm ²) 24 AWG(0.204mm ²)	Stranded class 2	

		23 AWG(0.246mm ²) 22 AWG(0.324mm ²)		
MGD cat 6A, 7, 7A	IEC 61156-5	23 AWG(0.246mm ²) 22 AWG(0.324mm ²)	Solid class 1	U/FTP, F/FTP, S/FTP, SF/FTP
	IEC 61156-6 (Option IEC61156-5)	26 AWG(0.138mm ²) 24 AWG(0.204mm ²) 23 AWG(0.246mm ²) 22 AWG(0.324mm ²)	Stranded class 2	
MGD 1200MHz	IEC 61156-7	23 AWG(0.246mm ²) 22 AWG(0.324mm ²)	Solid class 1	U/FTP, F/FTP, S/FTP, SF/FTP
	IEC 61156-6 (Option IEC61156-7)	26 AWG(0.138mm ²) 24 AWG(0.204mm ²) 23 AWG(0.246mm ²) 22 AWG(0.324mm ²)	Stranded class 2	U/FTP, F/FTP, S/FTP, SF/FTP

Construction

Conductor	Bare annealed or tinned copper solid (per IEC 60228 class 1) or stranded (per IEC 60228 class 2)
Insulation	Solid or cellular Polyolefine + optional fire resistant tape
Individual screen	*/FTP cables have individual foil screen
Common screen	S/*TP cables have a common braid screen F/*TP cables have a common foil screen SF/*TP cables have a common foil screen and a braid screen
Inner sheath	SHF1 or SHF2 or MUD Resistant (NEK 606)), single or double layer
Metallic covering (Armor)	B: braided galvanized steel wire R: corrugated steel tape W: served steel wire P: Bronze wire braid C: Copper wire braid T: Tinned copper wire braid
Outer sheath	SHF1 or SHF2 or SHF2 MUD (NEK 606), single or double layer

Optional Constructions:

Cat3 to Cat 5e cables:

Single cables: 4-25 Pair cables

Multi cables: 2-12 cores or jacketed cables cabled together, FIG-8 or Siames (2x 4 pair)

Cat 6 to 1200MHz Cables:

Single cables: 4 Pair cables

Multi cables: 2-12 cores or jacketed cables cabled together, FIG-8 or Siames (2x 4 pair)

Transmission Properties	Pair Count	AWG	Solid Cond.	Shield TYPE	Armor	Jacket Type	Fire resistant
3=CAT3 5=CAT5 E=CAT5e B=CAT 6 C=CAT 6A D=CAT 7 F=CAT 7A G=1200MHz	NN Core count in multi cables	26=26AWG 24=24AWG 23=23AWG 22=22AWG	R=TC Stranded (Tinned copper) S=BC Stranded (bare copper) B=BC Solid (bare copper) T=TC Solid (tinned copper)	1=U/UTP 2=F/UTP 3=SF/UTP 4=U/FTP 5=F/FTP 6=S/FTP 7=SF/FTP	B =Galvanized Braided Steel Wire R =Corrugated Steel Tape W =Galvanized Served Steel Wire P =Bronze wire braid C =Copper wire braid T =Tin Copper wire braid	SHF1 SHF2 MUD Resistance(N EK606)	F=fire resistant (optional)

Teldor Fire Resistant Data Transmission Cables per IEC 60331-23

Teldor's Fire Resistant Data Cables are designed and produced to meet and exceed the requirements of IEC 60331-23: Tests for electric cables under fire conditions - Circuit integrity for durations of 30, 60 or 90 minutes (and per customer requirement up to 180 minutes).

Transmission performance under fire per IEC 60331-23 for a duration of 90 minutes +15minutes cooling time*		
Cable Category	Typical transmission application / performance	Minimum transmission performance
Cat.3	Channel Cat. 3	10BASE-T / Channel Cat. 3
Cat. 5	Channel Cat. 5	100BASE-T / Channel Cat. 5
Cat. 5e	Channel Cat. 5e	100BASE-T / Channel Cat. 5
Cat. 6	Channel Cat. 6	100BASE-T / Channel Cat. 5

Cat. 6A	Channel Cat. 6A	100BASE-T / Channel Cat. 5
Cat. 7	Channel Cat. 6A	100BASE-T / Channel Cat. 5
Cat. 7A	Channel Cat. 6A	100BASE-T / Channel Cat. 5
IEC 61156-7 (1200MHz)	Channel Cat. 6A	100BASE-T / Channel Cat. 5

*The requirements of IEC 60331-23 for no open / short circuit between the conductors are fulfilled

Fiber Optic cables/components - Detailed Description:

Fiber types :

Step index

Single mode
Multi mode
Special fiber (per specific data sheet)

Construction:

MTD - Tight buffered (Multi-distribution cables)
BO - Tight buffered (BreakOut cables)
Gel filled Loose tube (Single or multi loose tube cables)
Dry Loose tube (Single or multi loose tube cables)
Combination of tight buffered and loose tubes)

Central strength member (opt.) :

Metalic strength member
Dielectric strength member

Peripheral strength member (opt.):

Glass Yarns
Aramid yarns

Inner Sheath:

SHF1
SHF2
SHF2-MUD Resistance (NEK606)

Aarmor:

Braided galvanized steel wire
Corrugated steel tape
Served (Galvanized) steel wire
Bronze wire braid
Copper wire braid
Tinned copper wire braid

Outer Sheath:

SHF1
SHF2
SHF2-MUD Resistance (NEK606)
(Sheath can be made from single or double layer)

Water Blocking (opt.):

Swellable Yarns
Swellable tapes
Gel

Fire Resistance (opt.): Fire resistance tapes

Typical performance of common fibers

Fiber Code	Units	3	4	5	6	7	8	9	A
Standard Designation		Multimode				Singlemode			
ISO/IEC 11801		OM4	OM3	OM2	OM1	-	-	OS2	-
ANSI/TIA/EIA-492		AAAD	AAAC	AAAB	AAAA	-	-	-	-
IEC 60793-2-10		A1a.3	A1a.2	A1a.1	A1b	-	-	-	-
ITU-T		-	-	-	-	G.657.A2	G.655	G.652.D	G.657.A1
IEC 60793-2-50		-	-	-	-	B6_a2	B4	B1.3	B6_a1
Operating wavelength	nm	850 1300				1310 1550 1625	1550 1625	1310 1550 1625	
Core diameter	μm	50±2.5	50±2.5	50±2.5	62.5±3	-	-	-	-
MFD @1310nm	μm	-	-	-	-	8.6±0.4	-	9.2±0.4	8.6±0.4
MFD @1550nm	μm	-	-	-	-	9.6±0.5	9.6±0.6	10.4±0.6	9.8±0.5
Cladding diameter	μm	125±1			125±2	125±0.7			
Coating diameter	μm	245±10				245±5			
Max. Attenuation Tight-buffer	dB/Km	3.0 @850nm 1.0 @1300nm			3.5 @850nm 1.0 @1300nm	0.40@1310nm 0.30 @1550nm	-	0.40@1310nm 0.30 @1550nm	
Max. Attenuation Loose-tube	dB/Km	2.8 @850nm 0.9 @1300nm			3.2 @850nm 1.0 @1300nm	0.35 @1310nm 0.22 @1550nm 0.25 @1625nm	0.22 @1550nm 0.26 @1625nm	0.35 @1310nm 0.22 @1550nm 0.25 @1625nm	

Fiber type	Buffer	Fiber count	Tube count	Water Blocking	Armor	Jacket Type (Inner/Outer)	Fire resistant
Step index Single mode Multi mode Special fiber	MTD=multi tight BO=Breakout Gel filled tube Dry Tubes	NNN	NNN	G=Gel D-Dry	B =Galvanized Braided Steel Wire R =Corrugated Steel Tape W =Galvanized Served Steel Wire P =Bronze wire braid C =Copper wire braid T =Tin Copper wire braid	SHF1 SHF2 MUD Resistance(NEK606)	F=fire resistant (opt.)

BUS cables/components - Detailed Description:

Cable types :

ProfiBus 100

ProfiBus 150
CanBus
DeviceNet
FieldBus-H1
Ethernet/IP BUS
RS-485
RS-422

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	-
Additional wires (option)	Common wire	Common wire	Common wire	None	Common wire	Common wire	Common wire	Common wire	-

Max. Cable length vs data rates

Data Rate	9.6 kbps	19.2 kbps	93.75 kbps	187.5 kbps	500 kbps	1.5 Mbps	3 Mbps	6 Mbps	12 Mbps
Max. Length - Cable Type A	1200 m	1200 m	1200 m	1000 m	400 m	200 m	100 m	100 m	100 m
Max. Length - Cable Type B	1200 m	1200 m	1200 m	600 m	200 m	70 m	N/A		

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 (Rx/D/TxD-N)	Green	Not specified
Colour inner cable conductor B (Rx/D/TxD-P)	Red	Not specified

Conductor material	Bare annealed copper or Tin-coated annealed copper
Conductor construction	Stranded - IEC 60228 Class 2 or Class 5
Insulation material	PO + Optional 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)
Aarmor 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
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

No. of Data Pairs	BUS Type	AWG (Data pairs)	Conductors	Individual Shield	Overall Shield	Armor (optional)	Voltage rating	Fire Resistance	Jacket Type (Inner/Outer)
Nn	P: ProfiBUS 100 U: ProfiBUS 150 C: CanBUS D: DeviceNET F: FieldBUS-H1 E: Ethernet/IP BUS R: RS-485 S: RS-422	24: 24AWG 22: 22AWG 20: 20AWG 18: 18AWG 16: 16AWG	T: Tin-coated copper B: Bare copper	1: Unshielded 2: Al. foil 3: Copper foil 4: BC braid 5: TC braid 6. Al. foil + TC braid 7. CU foil + BC braid	1: Unshielded 2: Al. foil 3: Copper foil 4: BC braid 5: TC braid 6. Al. foil + TC braid 7. CU foil + BC braid	B: Galvanized Braided Steel Wire M: Aluminum moisture barrier P: Braided Bronze wire R: Corrugated Steel Tape W: Galvanized Served Steel Wire C =Copper wire braid T =Tin Copper wire braid	0: 48V 1: 150V 3: 300V	F=fire resistant (opt.)	SHF1 SHF2 MUD Resistance(NEK 606)

300V Instrumentation/Control/Signal cables/components

Cable Type	Multicore	Multipair	Multitriad
Number of units	1-40	1-50	1-36
Conductor size	0.5 mm ² 0.75 mm ² 1.0 mm ² 1.5 mm ² 2.5 mm ²		
Conductor material	Bare annealed copper or Tin-coated annealed copper		
Conductor construction	Stranded - IEC 60228 Class 2 or Class 5		
Flame barrier	Inorganic tapes / Fire resistance tape		

Insulation material	IEC 60092-351 HF XLPE (Cross-Linked, Halogen-Free, Low-Smoke, Flame retardant)
Individual Shield	Optional metal foil + drain or metal braid or metal foil + metal braid
Individual jacket	Optional jacket (taped or extruded)
Overall Shield	Optional metal foil + drain or metal braid or metal foil + metal braid
Braid construction	0.15mm or 0.20mm tin-coated or bare copper wires, 84% coverage min.
Inner jacket material	SHF1 or SHF2 or SHF2-MUD per NEK606 single or double layer
Armor	Braid wire materials: Braided tinned copper wire. Braided bare copper wire. Braided galvanized steel wire. Braided aluminum alloy wire. Braided copper alloy wire. Braided bronze wire.
Outer jacket material	SHF1 or SHF2 or SHF2-MUD per NEK606 single or double layer
Overall diameter	2.0 mm min. - 60 mm max.
Special Construction	Combinations of various cross sections and combinations of single/pair & triads are allowed
Max. pulling force	Specified in the detailed specification.
Special properties	Flame retardant, Halogen Free, Circuit Integrity with water spray and mechanical shock per EN50200, Fire Resistant, Low Smoke, Mud Resistant

Cable structure:

Unit Count	Basic Unit type	Conductor Cross-section	Conductors Material	Individual Shield	Overall Shield	Armor	Fire resistant	Jacket Type (Inner/Outer)
Nn	S: Singles P: Pairs T: Triads	05: 0.5 mm ² 07: 0.75 mm ² 10: 1.0 mm ² 15: 1.5 mm ² 25: 2.5 mm ²	T: Tin-coated copper B: Bare copper	1: Unshielded 2: Al. foil 3: Copper foil 4: BC braid 5: TC braid 6: Al. foil + TC braid 7: CU foil + BC braid	1: Unshielded 2: Al. foil 3: Copper foil 4: BC braid 5: TC braid 6: Al. foil + TC braid 7: CU foil + BC braid	T: Braided tinned copper wire B: Braided bare copper wire G: Braided galvanized steel wire A: Braided aluminum alloy wire C: Braided copper alloy wire Z: Braided bronze wire	F=fire resistant (opt.)	SHF1 SHF2 MUD Resistance(NEK606)

600/1000V power/Instrumentation/Control cables/components

Construction:

Conductor:	Plain or tinned annealed copper Class 2 or Class 5
Flame barrier:	Inorganic tapes / Fire resistance tape
Insulation:	HF90, HF XLPE (Halogen-Free, Low-Smoke, Flame retardant)
Individual screen:	Aluminium/polyester tape with tinned copper drain wire
Collective screen:	Aluminium/polyester tape with tinned copper drain wire
Inner sheath:	SHF1 or SHF2 or SHF2 MUD single or double layer
Metal covering / Armor:	Plain/tinned copper wire braid or copper alloy wire braid or galvanized steel wire braid (multi core cables only) or Braided aluminum alloy wire or Braided bronze wire
Outer sheath:	SHF1 or SHF2 or SHF2 MUD single or double layer

No of cores:	Cross sectional area [mm ²]
1-37	1 1,5 2,5 4
1-33	6
1-23	10

No of Pairs:	Cross sectional area [mm ²]
2-27	1
2-23	1,5
2-19	2,5

No of Triads:	Cross sectional area [mm ²]
1-27	1

1-21	1,5
1-16	2,5

Cables may also include combinations of the above

Cable structure:

Unit Count	Basic Unit type	Conductor Cross-section	Conductors Material	Individual Shield	Overall Shield	Aarmor	Fire resistant	Jacket Type (Inner/Outer)
Nn	S: Singles P: Pairs T: Triads	05: 0.5 mm ² 07: 0.75 mm ² 10: 1.0 mm ² 15: 1.5 mm ² 25: 2.5 mm ² 04: 4.0 mm ² 06: 6.0 mm ² 100: 10.0 mm ²	T: Tin-coated copper B: Bare copper	1: Unshielded 2: Al. foil 3: Copper foil 4: BC braid 5: TC braid 6. Al. foil + TC braid 7. CU foil + BC braid	1: Unshielded 2: Al. foil 3: Copper foil 4: BC braid 5: TC braid 6. Al. foil + TC braid 7. CU foil + BC braid	T: Braided tinned copper wire B: Braided bare copper wire G: Braided galvanized steel wire A: Braided aluminum alloy wire C: Braided copper alloy wire Z: Braided bronze wire	F=fire resistant (opt.)	SHF1 SHF2 MUD Resistance(NEK606)

APPLICATION LIMITATION: (with Data / FO / BUS components):

Operation temperature: -40°C to +85°C

Storage temperature: -40°C to +85°C

Installation temperature: -20°C to +50°C

APPLICATION LIMITATION: (with 300v / 600V components):

Operation temperature: -40°C to +90°C

Storage temperature: -40°C to +90°C

Installation temperature: -15°C to +50°C