DNV·GL

Certificate No:
E-13706
File No:
827.20
Job Id:
262.1-014430-2

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Low Voltage Cable

with type designation(s)
DF 250V Armored, Flame retardant, Halogen free, Low smoke Instrumentation and control cables

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)
IEC 60754-1/2 (2011-11)
IEC61034-1/2 (2005-04/2005-04)

Application :

Control and instrumentation. Armoured.
Flame retardant in bunch Cat. A or Cat. C. Halogen free. Low smoke.
Inner sheath SHF1. Outer sheath SHF2 or SHF Mud.

Voltage class (V)	**150/250V**
Temp. class (°C)	**90**

This Certificate is valid until **2017-12-31**.
Issued at **Høvik** on **2014-10-13**

DNV GL local station: **Piraeus**

Approval Engineer: **Ivar Bull**

for **DNV GL**
Digitally Signed By: Laumann, Marit
Location: DNV Høvik, Norway
Signing Date: 2014-10-31

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.
If any person suffers loss or damage which is proven to have been caused by any negligent act or omission of the Society, then the Society shall pay compensation to such person for his proven direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question. The maximum compensation shall never exceed USD 2 million.
In this provision the "Society" shall mean DNV GL AS as well as all its direct and indirect owners, affiliates, subsidiaries, directors, officers, employees, agents and any other person or entity acting on behalf of DNV GL AS.

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Product description

Type: DG 250V Armoured, Flame retardant, Fire resistant, Halogen free, Low smoke Control and Instrumentation cables

Construction:

Conductors:	Tinned, stranded copper class 2 or class 5
Core insulation:	Mica tape + HF XLPE
Screen:	Copper or aluminum backed polyester tape w/tinned copper drain wire
Inner sheath:	SHF1
Metal covering:	Metal wire braid made of bare or tinned copper, galvanized steel, aluminum alloy, copper alloy or bronze
Sheath:	SHF2 or SHF MUD, single or double layer

SINGLE CORES:

Number of cores x conductor cross-section mm^2	Number of cores x conductor cross-section mm^2	Number of cores x conductor cross-section mm^2	Number of cores x conductor cross-section mm^2
2 x 0,5	37 x 0,5	33 x 0,75	29 x 1
3 x 0,5	38 x 0,5	34 x 0,75	30 x 1
4 x 0,5	39 x 0,5	35 x 0,75	31 x 1
5 x 0,5	40 x 0,5	36 x 0,75	32 x 1
6 x 0,5	2 x 0,75	37 x 0,75	33 x 1
7 x 0,5	3 x 0,75	38 x 0,75	34 x 1
8 x 0,5	4 x 0,75	39 x 0,75	35 x 1
9 x 0,5	5 x 0,75	40 x 0,75	36 x 1
10 x 0,5	6 x 0,75	2 x 1	37 x 1
11 x 0,5	7 x 0,75	3 x 1	38 x 1
12 x 0,5	8 x 0,75	4 x 1	39 x 1
13 x 0,5	9 x 0,75	5 x 1	40 x 1
14 x 0,5	10 x 0,75	6 x 1	2 x 1,5
15 x 0,5	11 x 0,75	7 x 1	3 x 1,5
16 x 0,5	12 x 0,75	8 x 1	4 x 1,5
17 x 0,5	13 x 0,75	9 x 1	5 x 1,5
18 x 0,5	14 x 0,75	10 x 1	6 x 1,5
19 x 0,5	15 x 0,75	11 x 1	7 x 1,5
20 x 0,5	16 x 0,75	12 x 1	8 x 1,5
21 x 0,5	17 x 0,75	13 x 1	9 x 1,5
22 x 0,5	18 x 0,75	14 x 1	10 x 1,5
23 x 0,5	19 x 0,75	15 x 1	11 x 1,5
24 x 0,5	20 x 0,75	16 x 1	12 x 1,5
25 x 0,5	21 x 0,75	17 x 1	13 x 1,5
26 x 0,5	22 x 0,75	18 x 1	14 x 1,5
27 x 0,5	23 x 0,75	19 x 1	15 x 1,5
28 x 0,5	24 x 0,75	20 x 1	16 x 1,5
29 x 0,5	25 x 0,75	21 x 1	17 x 1,5
30 x 0,5	26 x 0,75	22 x 1	18 x 1,5
31 x 0,5	27 x 0,75	23 x 1	19 x 1,5
32 x 0,5	28 x 0,75	24 x 1	20 x 1,5
33 x 0,5	29 x 0,75	25 x 1	21 x 1,5
34 x 0,5	30 x 0,75	26 x 1	22 x 1,5
35 x 0,5	31 x 0,75	27 x 1	23 x 1,5
36 x 0,5	32 x 0,75	28 x 1	24 x 1,5

Number of cores x conductor cross-section mm^2
25 x 1,5
26 x 1,5
27 x 1,5
28 x 1,5
29 x 1,5
30 x 1,5
31 x 1,5
32 x 1,5
33 x 1,5
34 x 1,5
35 x 1,5
36 x 1,5
37 x 1,5
38 x 1,5

Number of cores x conductor cross-section mm^2
39 x 1,5
40 x 1,5
2 x 2,5
3 x 2,5
4 x 2,5
5 x 2,5
6 x 2,5
7 x 2,5
8 x 2,5
9 x 2,5
10 x 2,5
11 x 2,5
12 x 2,5
13 x 2,5

Number of cores x conductor cross-section mm^2
14 x 2,5
15 x 2,5
16 x 2,5
17 x 2,5
18 x 2,5
19 x 2,5
20 x 2,5
21 x 2,5
22 x 2,5
23 x 2,5
24 x 2,5
25 x 2,5
26 x 2,5
27 x 2,5

Number of cores x conductor cross-section mm^2
28 x 2,5
29 x 2,5
30 x 2,5
31 x 2,5
32 x 2,5
33 x 2,5
34 x 2,5
35 x 2,5
36 x 2,5
37 x 2,5
38 x 2,5
39 x 2,5
40 x 2,5

PAIRS:

Number of pairs x conductor cross-section mm^2
2 x2 x 0,5
3 x2 x 0,5
4 x2 x 0,5
5 x2 x 0,5
6 x2 x 0,5
7 x2 x 0,5
8 x2 x 0,5
9 x2 x 0,5
10 x2 x 0,5
11 x2 x 0,5
12 x2 x 0,5
13 x2 x 0,5
14 x2 x 0,5
15 x2 x 0,5
16 x2 x 0,5
17 x2 x 0,5
18 x2 x 0,5
19 x2 x 0,5
20 x2 x 0,5
21 x2 x 0,5
22 x2 x 0,5
23 x2 x 0,5
24 x2 x 0,5
25 x2 x 0,5
26 x2 x 0,5
27 x2 x 0,5
28 x2 x 0,5
29 x2 x 0,5

Number of pairs x conductor cross-section mm^2
30 x2 x 0,5
31 x2 x 0,5
32 x2 x 0,5
33 x2 x 0,5
34 x2 x 0,5
35 x2 x 0,5
36 x2 x 0,5
37 x2 x 0,5
38 x2 x 0,5
39 x2 x 0,5
40 x2 x 0,5
41 x2 x 0,5
42 x2 x 0,5
43 x2 x 0,5
44 x2 x 0,5
45 x2 x 0,5
46 x2 x 0,5
47 x2 x 0,5
48 x2 x 0,5
49 x2 x 0,5
50 x2 x 0,5
2 x2 x 0,75
3 x2 x 0,75
4 x2 x 0,75
5 x2 x 0,75
6 x2 x 0,75
7 x2 x 0,75
8 x2 x 0,75

Number of pairs x conductor cross-section mm^2
9 x2 x 0,75
10 x2 x 0,75
11 x2 x 0,75
12 x2 x 0,75
13 x2 x 0,75
14 x2 x 0,75
15 x2 x 0,75
16 x2 x 0,75
17 x2 x 0,75
18 x2 x 0,75
19 x2 x 0,75
20 x2 x 0,75
21 x2 x 0,75
22 x2 x 0,75
23 x2 x 0,75
24 x2 x 0,75
25 x2 x 0,75
26 x2 x 0,75
27 x2 x 0,75
28 x2 x 0,75
29 x2 x 0,75
30 x2 x 0,75
31 x2 x 0,75
32 x2 x 0,75
33 x2 x 0,75
34 x2 x 0,75
35 x2 x 0,75
36 x2 x 0,75

Number of pairs x conductor cross-section mm^2
37 x2 x 0,75
38 x2 x 0,75
39 x2 x 0,75
40 x2 x 0,75
41 x2 x 0,75
42 x2 x 0,75
43 x2 x 0,75
44 x2 x 0,75
45 x2 x 0,75
46 x2 x 0,75
47 x2 x 0,75
48 x2 x 0,75
49 x2 x 0,75
50 x2 x 0,75
2 x2 x 1
3 x2 x 1
4 x2 x 1
5 x2 x 1
6 x2 x 1
7 x2 x 1
8 x2 x 1
9 x2 x 1
10 x2 x 1
11 x2 x 1
12 x2 x 1
13 x2 x 1
14 x2 x 1
15 x2 x 1

Number of pairs x conductor cross-section mm^2
16 x2 x 1
17 x2 x 1
18 x2 x 1
19 x2 x 1
20 x2 x 1
21 x2 x 1
22 x2 x 1
23 x2 x 1
24 x2 x 1
25 x2 x 1
26 x2 x 1
27 x2 x 1
28 x2 x 1
29 x2 x 1
30 x2 x 1
31 x2 x 1
32 x2 x 1
33 x2 x 1
34 x2 x 1
35 x2 x 1
36 x2 x 1
37 x2 x 1
38 x2 x 1
39 x2 x 1
40 x2 x 1
41 x2 x 1
42 x2 x 1
43 x2 x 1
44 x2 x 1
45 x2 x 1
46 x2 x 1
47 x2 x 1
48 x2 x 1
49 x2 x 1

Number of pairs x conductor cross-section mm^2
50 x2 x 1
2 x2 x 1,5
3 x2 x 1,5
4 x2 x 1,5
5 x2 x 1,5
6 x2 x 1,5
7 x2 x 1,5
8 x2 x 1,5
9 x2 x 1,5
10 x2 x 1,5
11 x2 x 1,5
12 x2 x 1,5
13 x2 x 1,5
14 x2 x 1,5
15 x2 x 1,5
16 x2 x 1,5
17 x2 x 1,5
18 x2 x 1,5
19 x2 x 1,5
20 x2 x 1,5
21 x2 x 1,5
22 x2 x 1,5
23 x2 x 1,5
24 x2 x 1,5
25 x2 x 1,5
26 x2 x 1,5
27 x2 x 1,5
28 x2 x 1,5
29 x2 x 1,5
30 x2 x 1,5
31 x2 x 1,5
32 x2 x 1,5
33 x2 x 1,5
34 x2 x 1,5

Number of pairs x conductor cross-section mm^2
35 x2 x 1,5
36 x2 x 1,5
37 x2 x 1,5
38 x2 x 1,5
39 x2 x 1,5
40 x2 x 1,5
41 x2 x 1,5
42 x2 x 1,5
43 x2 x 1,5
44 x2 x 1,5
45 x2 x 1,5
46 x2 x 1,5
47 x2 x 1,5
48 x2 x 1,5
49 x2 x 1,5
50 x2 x 1,5
2 x2 x 2,5
3 x2 x 2,5
4 x2 x 2,5
5 x2 x 2,5
6 x2 x 2,5
7 x2 x 2,5
8 x2 x 2,5
9 x2 x 2,5
10 x2 x 2,5
11 x2 x 2,5
12 x2 x 2,5
13 x2 x 2,5
14 x2 x 2,5
15 x2 x 2,5
16 x2 x 2,5
17 x2 x 2,5
18 x2 x 2,5
19 x2 x 2,5

Number of pairs x conductor cross-section mm^2
20 x2 x 2,5
21 x2 x 2,5
22 x2 x 2,5
23 x2 x 2,5
24 x2 x 2,5
25 x2 x 2,5
26 x2 x 2,5
27 x2 x 2,5
28 x2 x 2,5
29 x2 x 2,5
30 x2 x 2,5
31 x2 x 2,5
32 x2 x 2,5
33 x2 x 2,5
34 x2 x 2,5
35 x2 x 2,5
36 x2 x 2,5
37 x2 x 2,5
38 x2 x 2,5
39 x2 x 2,5
40 x2 x 2,5
41 x2 x 2,5
42 x2 x 2,5
43 x2 x 2,5
44 x2 x 2,5
45 x2 x 2,5
46 x2 x 2,5
47 x2 x 2,5
48 x2 x 2,5
49 x2 x 2,5
50 x2 x 2,5

TRIPLES:

Number of triples x conductor cross-section mm^2
1x3 x0,5
2x3 x0,5
3x3 x0,5
4x3 x0,5
5x3 x0,5
6x3 x0,5
7x3 x0,5

Number of triples x conductor cross-section mm^2
8x3 x0,5
9x3 x0,5
10x3 x0,5
11x3 x0,5
12x3 x0,5
13x3 x0,5
14x3 x0,5

Number of triples x conductor cross-section mm^2
15x3 x0,5
16x3 x0,5
17x3 x0,5
18x3 x0,5
19x3 x0,5
20x3 x0,5
21x3 x0,5

Number of triples x conductor cross-section mm^2
22x3 x0,5
23x3 x0,5
24x3 x0,5
25x3 x0,5
26x3 x0,5
27x3 x0,5
28x3 x0,5

Number of triples x conductor cross-section mm^2
29x3 x0,5
30x3 x0,5
31x3 x0,5
32x3 x0,5
33x3 x0,5
34x3 x0,5
35x3 x0,5
36x3 x0,5
1x3 x0,75
2x3 x0,75
3x3 x0,75
4x3 x0,75
5x3 x0,75
6x3 x0,75
7x3 x0,75
8x3 x0,75
9x3 x0,75
10x3 x0,75
11x3 x0,75
12x3 x0,75
13x3 x0,75
14x3 x0,75
15x3 x0,75
16x3 x0,75
17x3 x0,75
18x3 x0,75
19x3 x0,75
20x3 x0,75
21x3 x0,75
22x3 x0,75
23x3 x0,75
24x3 x0,75
25x3 x0,75
26x3 x0,75
27x3 x0,75
28x3 x0,75
29x3 x0,75
30x3 x0,75
31x3 x0,75

Number of triples x conductor cross-section mm^2
32x3 x0,75
33x3 x0,75
34x3 x0,75
35x3 x0,75
36x3 x0,75
1x3 x1
2x3 x1
3x3 x1
4x3 x1
5x3 x1
6x3 x1
7x3 x1
8x3 x1
9x3 x1
10x3 x1
11x3 x1
12x3 x1
13x3 x1
14x3 x1
15x3 x1
16x3 x1
17x3 x1
18x3 x1
19x3 x1
20x3 x1
21x3 x1
22x3 x1
23x3 x1
24x3 x1
25x3 x1
26x3 x1
27x3 x1
28x3 x1
29x3 x1
30x3 x1
31x3 x1
32x3 x1
33x3 x1
34x3 x1

Number of triples x conductor cross-section mm^2
35x3 x1
36x3 x1
1x3 x1,5
2x3 x1,5
3x3 x1,5
4x3 x1,5
5x3 x1,5
6x3 x1,5
7x3 x1,5
8x3 x1,5
9x3 x1,5
10x3 x1,5
11x3 x1,5
12x3 x1,5
13x3 x1,5
14x3 x1,5
15x3 x1,5
16x3 x1,5
17x3 x1,5
18x3 x1,5
19x3 x1,5
20x3 x1,5
21x3 x1,5
22x3 x1,5
23x3 x1,5
24x3 x1,5
25x3 x1,5
26x3 x1,5
27x3 x1,5
28x3 x1,5
29x3 x1,5
30x3 x1,5
31x3 x1,5
32x3 x1,5
33x3 x1,5
34x3 x1,5
35x3 x1,5
36x3 x1,5
1x3 x2,5

Number of triples x conductor cross-section mm^2
2x3 x2,5
3x3 x2,5
4x3 x2,5
5x3 x2,5
6x3 x2,5
7x3 x2,5
8x3 x2,5
9x3 x2,5
10x3 x2,5
11x3 x2,5
12x3 x2,5
13x3 x2,5
14x3 x2,5
15x3 x2,5
16x3 x2,5
17x3 x2,5
18x3 x2,5
19x3 x2,5
20x3 x2,5
21x3 x2,5
22x3 x2,5
23x3 x2,5
24x3 x2,5
25x3 x2,5
26x3 x2,5
27x3 x2,5
28x3 x2,5
29x3 x2,5
30x3 x2,5
31x3 x2,5
32x3 x2,5
33x3 x2,5
34x3 x2,5
35x3 x2,5
36x3 x2,5

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.

Type Approval documentation

Data sheet: DF type
Test reports: Certificate of Tes per DNV Instrumentation and Control cablesw IEC 60092-376 P/N DG-01P05T12T01
dated December 5, 2013

BRE Halogen free test

Tests carried out

Standard	Issued	General description	Limitation
IEC 60092-350	2008-02	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-351	2004-04	Insulating materials for shipboard and offshore units, power, control, instrumentation, telecommunication and data cables	
IEC 60092-359	1999-08	Sheathing materials for shipboard power and telecommunication cables	
IEC 60092-376	*2003-05*	*Cables for control and instrumentation circuits 150/250 V (300 V)*	
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 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	Bunch test Category A
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 – Determination of the degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and condctivity	Halogen free: pH > 4,3 Conductivity < 10µS
IEC 61034-1/2	2005-04	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke

Marking of product

Teldor – DF type – Size – 150/250V – IEC 60331-21 – IEC 60332-3-22 Cat.A or Cat C – Meter mark – 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 RT- and PST-test reports are 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 shall be performed at least every second year.

END OF CERTIFICATE