DNV·GL

Certificate No:
TAE00003U7

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Low Voltage Cable

with type designation(s)
S101 RFOU(i) H-M, S102 RFOU(c) H-M, RFCU(i)&(c),

Issued to
KEI Industries Ltd.
Mumbai, Maharashtra, India

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

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Type	Rated voltage (V)	Temp. class (°C)
S101 RFOU(i) H-M	150/250	90
S102 RFOU(c) H-M	150/250	90
RFCU(i)&(c)	150/250	90

Issued at **Hamburg** on **2019-12-09**

This Certificate is valid until **2024-12-08**.
DNV GL local station: **Mumbai NB & CMC**

Approval Engineer: **Carsten Hunsalz**

for **DNV GL**

Digitally Signed By: Schaarmann, Arne
Location: DNV GL SE Hamburg, Germany
Signing Date: 2019-12-09

Arne Schaarmann
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

Type: S101 RFOU(i) H-M, S102 RFOU(c) H-M, RFCU(i)&(c),

Construction:
Conductors: Tinned stranded copper class 2 or class 5
Core Insulation: EPR
Screen: Copper backed polyester tape with tinned copper drain wire.
Inner covering: SHF1
Metal covering: Tinned copper wire braid (O) according to NEK606
Or Galvanized steel wire braid (C)
Outer sheath: SHF2 or SHF Oil and Mud

PAIRS:

Number of cores x conductor cross-section
mm^2
1 X 2 X 0.75
2 X 2 X 0.75
3 X 2 X 0.75
4 X 2 X 0.75
5 X 2 X 0.75
6 X 2 X 0.75
7 X 2 X 0.75
8 X 2 X 0.75
9 X 2 X 0.75
10 X 2 X 0.75
11 X 2 x 0.75
12 X 2 x 0.75
13 X 2 x 0.75
14 X 2 x 0.75
15 X 2 x 0.75
16 X 2 x 0.75
17 X 2 x 0.75
18 X 2 x 0.75
19 X 2 x 0.75
20 X 2 x 0.75
21 X 2 x 0.75
22 X 2 x 0.75
23 X 2 x 0.75
24 X 2 x 0.75
25 X 2 x 0.75
26 X 2 x 0.75

Number of cores x conductor cross-section
mm^2
27 X 2 x 0.75
30 X 2 x 0.75
32 X 2 x 0.75
37 X 2 x 0.75
40 X 2 x 0.75
44 X 2 x 0.75
48 X 2 x 0.75
50 X 2 x 0.75
1 X 2 X 1.5
2 X 2 X 1.5
3 X 2 X 1.5
4 X 2 X 1.5
5 X 2 X 1.5
6 X 2 X 1.5
7 X 2 X 1.5
8 X 2 X 1.5
9 X 2 X 1.5
10 X 2 X 1.5
11 X 2 x 1.5
12 X 2 x 1.5
13 X 2 x 1.5
14 X 2 x 1.5
15 X 2 x 1.5
16 X 2 x 1.5
17 X 2 x 1.5

Number of cores x conductor cross-section
mm^2
18 X 2 x 1.5
19 X 2 x 1.5
20 X 2 x 1.5
21 X 2 x 1.5
22 X 2 x 1.5
23 X 2 x 1.5
24 X 2 x 1.5
25 X 2 x 1.5
26 X 2 x 1.5
27 X 2 x 1.5
30 X 2 x 1.5
32 X 2 x 1.5
37 X 2 x 1.5
40 X 2 x 1.5
44 X 2 x 1.5
48 X 2 x 1.5
50 X 2 x 1.5
1 X 2 X 2.5
2 X 2 X 2.5
3 X 2 X 2.5
4 X 2 X 2.5
5 X 2 X 2.5
6 X 2 X 2.5
7 X 2 X 2.5
8 X 2 X 2.5

Number of cores x conductor cross-section
mm^2
9 X 2 X 2.5
10 X 2 X 2.5
11 X 2 x 2.5
12 X 2 x 2.5
13 X 2 x 2.5
14 X 2 x 2.5
15 X 2 x 2.5
16 X 2 x 2.5
17 X 2 x 2.5
18 X 2 x 2.5
19 X 2 x 2.5
20 X 2 x 2.5
21 X 2 x 2.5
22 X 2 x 2.5
23 X 2 x 2.5
24 X 2 x 2.5
25 X 2 x 2.5
26 X 2 x 2.5
27 X 2 x 2.5
30 X 2 x 2.5
32 X 2 x 2.5
37 X 2 x 2.5
40 X 2 x 2.5
44 X 2 x 2.5
48 X 2 x 2.5
50 X 2 x 2.5

TRIADS

Number of cores x conductor cross-section	Number of cores x conductor cross-section	Number of cores x conductor cross-section	Number of cores x conductor cross-section
mm^2	mm^2	mm^2	mm^2
1 X 3 X 0.75	27 X 3 x 0.75	18 X 3 x 1.5	9 X 3 X 2.5
2 X 3 X 0.75	30 X 3 x 0.75	19 X 3 x 1.5	10 X 3 X 2.5
3 X 3 X 0.75	32 X 3 x 0.75	20 X 3 x 1.5	11 X 3 x 2.5
4 X 3 X 0.75	37 X 3 x 0.75	21 X 3 x 1.5	12 X 3 x 2.5
5 X 3 X 0.75	40 X 3 x 0.75	22 X 3 x 1.5	13 X 3 x 2.5
6 X 3 X 0.75	44 X 3 x 0.75	23 X 3 x 1.5	14 X 3 x 2.5
7 X 3 X 0.75	48 X 3 x 0.75	24 X 3 x 1.5	15 X 3 x 2.5
8 X 3 X 0.75	50 X 3 x 0.75	25 X 3 x 1.5	16 X 3 x 2.5
9 X 3 X 0.75		26 X 3 x 1.5	17 X 3 x 2.5
10 X 3 X 0.75	1 X 3 X 1.5	27 X 3 x 1.5	18 X 3 x 2.5
11 X 3 x 0.75	2 X 3 X 1.5	30 X 3 x 1.5	19 X 3 x 2.5
12 X 3 x 0.75	3 X 3 X 1.5	32 X 3 x 1.5	20 X 3 x 2.5
13 X 3 x 0.75	4 X 3 X 1.5	37 X 3 x 1.5	21 X 3 x 2.5
14 X 3 x 0.75	5 X 3 X 1.5	40 X 3 x 1.5	22 X 3 x 2.5
15 X 3 x 0.75	6 X 3 X 1.5	44 X 3 x 1.5	23 X 3 x 2.5
16 X 3 x 0.75	7 X 3 X 1.5	48 X 3 x 1.5	24 X 3 x 2.5
17 X 3 x 0.75	8 X 3 X 1.5	50 X 3 x 1.5	25 X 3 x 2.5
18 X 3 x 0.75	9 X 3 X 1.5		26 X 3 x 2.5
19 X 3 x 0.75	10 X 3 X 1.5	1 X 3 X 2.5	27 X 3 x 2.5
20 X 3 x 0.75	11 X 3 x 1.5	2 X 3 X 2.5	30 X 3 x 2.5
21 X 3 x 0.75	12 X 3 x 1.5	3 X 3 X 2.5	32 X 3 x 2.5
22 X 3 x 0.75	13 X 3 x 1.5	4 X 3 X 2.5	37 X 3 x 2.5
23 X 3 x 0.75	14 X 3 x 1.5	5 X 3 X 2.5	40 X 3 x 2.5
24 X 3 x 0.75	15 X 3 x 1.5	6 X 3 X 2.5	44 X 3 x 2.5
25 X 3 x 0.75	16 X 3 x 1.5	7 X 3 X 2.5	48 X 3 x 2.5
26 X 3 x 0.75	17 X 3 x 1.5	8 X 3 X 2.5	50 X 3 x 2.5

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.

Instrumentation, communication and control.
Flame retardant in bunch Cat. A. Low smoke.
Oil and Mud resistant, Category d with Hydraulic/gear oil PARTHAN EP No.320 / ENKLO No.68

Type Approval documentation

Data sheets: KEI RFOU (c) S2/S6 dated 2009-12-29
KEI RFOU (i) S1/S5 dated 2009-12-29
KEI/19/DNV DATED: 08 March 2019

Test reports: KEI dated 2010-06-02
KEI DNV/19/IT/01 dated 2019-09-04/05/13/20 and 2019-11-02 and 2019-06-10

Tests carried out

Standard	Release	General description	Limitation
IEC 60092-350	2014-08	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications	
IEC 60092-376	2017-05	Cables for control and instrumentation circuits 150/250 V (300 V)	
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.	
EC 60332-3-22	2018-07	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 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	2013-06	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance >60%
NEK TS 606	2016	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.	S-types only, Mud resistance test: IRM902+IRM903 100°C 7d. Calcium Bromide 70°C 56d. <u>Oil based mud:</u> Carbo Sea 70°C 56d or EDC 95/11 70°C 56d <u>Hydraulic/gear oil:</u> PARTHAN EP No.320 / ENKLO No.68 100°C 7d.

Marking of product

KEI – S101 RFOU(i) H-M or S102 RFOU(c) H-M or RFCU(i)&(c) - size - 0,6/1 kV – IEC 60332-3-22 Cat A - Year

Place of Production

KEI Industries Limited, SP-919,920 & 922, Riico Industrial Area, Phase-III, Bhiwadi, Rajasthan-301019, INDIA.

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) checked (if not available tests according to RT to 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