

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Electric Power Cable

with type designation(s)

BFOU P5/P12 0,6/1 kV, BFCU 0,6/1kV, BFOU VFD 0,6/1 kV,

Issued to

**KEI Industries Ltd.
 Mumbai DELHI, India**

is found to comply with

Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards

- IEC 60092-353 (2011-08)**
- IEC 60331-21 (1999-04)**
- IEC 60332-3-22 (2009-02)**
- IEC 60754-1 (2011-11)**
- IEC 60754-2 (2011-11)**
- IEC 61034-1/2 (2013-07/2013-09)**
- NEK TS 606 (2009-05) (P-types only)**

Application :

General power and lighting.

Fire resistant. Flame retardant Cat. A. Halogen free. Low smoke. Mud resistant.

Type	Voltage class (kV)	Temp. class (°C)
BFOU P5/P12 0,6/1 kV	0,6/1	90
BFCU 0,6/1kV	0,6/1	90
BFOU VFD 0,6/1 kV	0,6/1	90

This Certificate is valid until **2018-12-31**.

Issued at **Høvik** on **2015-03-23**

DNV GL local station: **Mumbai**

Approval Engineer: **Ludovico Gullifa**



for **DNV GL**

Digitally Signed By: Laumann, Marit

Location: DNV GL Høvik, Norway

Signing Date: 2015-03-25

**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.

Certificate No: **E-14123**
 File No: **827.10**
 Job Id: **262.1-002361-2**

Product description

Type: BFOU P5/P12 0,6/1 kV, BFCU 0,6/1 kV, BFOU-VFD 0,6/1 kV

Construction:
 Conductors: Tinned stranded copper class 2
 Core Insulation: Mica tape + EPR
 Filler: Extruded SHF1
 Metal covering: Tinned copper wire braid (O) or
 Galvanised steel wire braid (C) for multicore cables only
 Additional copper taped screen for Type BFOU-VFD
 Outer sheath: SHF2 or SHF Mud

BFOU P5/P12 0,6/1 kV, BFCU 0,6/1 kV:

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
1 x 10	3 x 70 / 35	4 x 150 / 75	3CX16
1 x 16	3 x 95 / 47,5	4 x 240 / 120	3CX25
1 x 25	3 x 120 / 60		3CX35
1 x 35	3 x 150 / 75	5 x 1,5 / 6	3CX50
1 x 50	3 x 185 / 95	5 x 2,5 / 6	3CX70
1 x 70	3 x 240 / 120	7 x 1,5 / 9	3CX95
1 x 95		7 x 2,5 / 10	3CX240
1 x 120	3C+E X 2.5	12 x 1,5 / 12	
1 x 150	3C+E X 4	12 x 2,5 / 13	
1 x 185	3C+E X 6	19 x 1,5 / 13	4CX1.5
1 x 240	3C+E X 10	19 x 2,5 / 14	4CX 2.5
1 x 300	3C+E X 16	27 x 1,5 / 16	4CX4
1 x 400	3C+E X 25	27 x 2,5 / 19	4CX6
1 x 500	3C+E X 35	37 x 1,5 / 25	4CX10
1 x 630	3C+E X 50	37 x 2,5 / 30	4CX16
1 x 800	3C+E X 70		4CX25
1 x 1000	3C+E X 95	BFCU	4CX35
	3C+E X 120		4CX50
2 x 1,5 / 7	3C+E X 150	2CX1.5	4CX70
2 x 2,5 / 7	3C+E X 185	2CX2.5	4CX95
2 x 4 / 8	3C+E X 240	2CX4	
2 x 6 / 8		2CX6	5CX2.5
2 x 10 / 10	4 x 1,5 / 7	2CX10	7C x 1.5
2 x 16 / 16	4 x 2,5 / 8	2CX16	7CX2.5
2 x 25 / 16	4 x 4 / 9	2CX25	8C x 2.5
	4 x 6 / 9	2CX50	12CX1.5
3 x 1,5 / 7	4 x 10 / 10	2CX70	12CX2.5
3 x 2,5 / 7	4 x 16 / 16	2CX95	14C x 2.5
3 x 4 / 8	4 x 25 / 16	2CX120	19CX1.5
3 x 6 / 9			19CX2.5
3 x 10 / 10	4 x 35 / 17,5	3CX1.5	21C x 1.5
3 x 16 / 16	4 x 50 / 25	3CX2.5	27CX1.5
3 x 25 / 16	4 x 70 / 35	3CX4	27CX2.5
3 x 35 / 17,5	4 x 95 / 47,5	3CX6	37CX1.5
3 x 50 / 25	4 x 120 / 60	3CX10	37CX2.5

Application/Limitation

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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 sheets: KEI BFOU P5/P12 0,6/1 and BFCU 0,6/1 kV and BFOU VFD 0,6/1kV dated 2009-09-10
 Test reports KEI BFOU P5/P12 0,6/1 and BFCU 0,6/1 kV BFOU VFD 0,6/1kV dated 2010-06-02

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 60092-360	2014-04	Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables.	
IEC 60092-353	2011-08	Electrical installations in ships - Part 353: Power cables for rated voltages 1 kV and 3 kV	
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%
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	Charred portion of sample does not exceed 2,5m above bottom edge of burner.
NEK 606 Ed. 4	2009-05	Cables for offshore installations. Halogen-free and/or mud resistant. Technical specification.	Mud resistance test: 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



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Marking of product

KEI - BFOU P1/P8 or BFCU or BFOU-VFD - size - 0,6/1 kV - IEC 60331-21 - IEC 60332-3-22 - Cat A,
Date

Periodical assessment

The scope of the 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 assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Production Sample Tests (PST) and Routines (RT) checked (if 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
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate.

Assessment to be performed at least every second year.

END OF CERTIFICATE