

TYPE APPROVAL CERTIFICATE

Certificate No:

TA 1411a
DNV GL

This is to certify:

That the Low Voltage Cable

with type designation(s)

RUOU(i) & RUOU(c) & RUOU(i&c) 250 V

RUBU(i) & RUBU(c) & RUBU(i&c) 250 V

RUCU(i) & RUCU(c) & RUCU(i&c) 250 V

Issued to

TMC Co., Ltd

CHUNGNAM, Republic of Korea

is found to comply with

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

IEC 60092-376 (2003-05)

IEC 60332-3-22 (2009-02)

IEC 60754-1/2 (2011-11)

IEC 61034-2 Ed. 3.1 (2013-06)

NEK TS 606 (2009-05)

Application :

Control and instrumentation. Flame retardant Cat.A. Halogen free. Low smoke.

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

Type	Voltage class (V)	Temp. class (°C)
RUOU(i) & RUOU(c) & RUOU(i&c) 250 V	250	90
RUBU(i) & RUBU(c) & RUBU(i&c) 250 V	250	90
RUCU(i) & RUCU(c) & RUCU(i&c) 250 V	250	90

This Certificate is valid until **2019-09-07**.

Issued at **Busan** on **2015-09-08**

for **DNV GL**

DNV GL local station: **Seoul**

Approval Engineer: **Dong Ho Park**

Baeg Soon Choi
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: RUOU(i) & RUOU(c) & RUOU(i&c) 250 V
RUBU(i) & RUBU(c) & RUBU(i&c) 250 V
RUCU(i) & RUCU(c) & RUCU(i&c) 250 V

Conductors: Tinned stranded copper class 2
Core insulation: HF EPR
Screen: AL/PS tape or CU/PS with tinned copper drain wire
Inner Sheath: SHF2
Metal covering: Tinned copper wire braid (O) or Galv. steel wire (C) or Bronze wire (B)
Outer sheath: SHF2 or SHF Mud

Number of cores x conductor cross-section mm ²	Overall Diameter (i) mm	Overall Diameter (c) mm	Overall Diameter (i&c) mm
1 x 2 x 0,75	10.5±0.6	10.5±0.6	-
2 x 2 x 0,75	15.1±0.8	14.3±0.7	15.1±0.8
3 x 2 x 0,75	15.8±0.8	15.0±0.8	15.8±0.8
4 x 2 x 0,75	17.0±0.8	15.7±0.8	17.0±0.8
5 x 2 x 0,75	18.7±0.9	17.3±0.8	18.7±0.9
6 x 2 x 0,75	19.2±0.9	18.2±0.8	19.2±0.9
7 x 2 x 0,75	19.2±0.9	18.2±0.8	19.2±0.9
8 x 2 x 0,75	20.8±0.9	19.5±0.9	20.8±0.9
10 x 2 x 0,75	23.4±1.0	21.4±0.9	23.4±1.0
12 x 2 x 0,75	24.2±1.0	22.3±1.0	24.2±1.0
14 x 2 x 0,75	25.5±1.1	23.1±1.0	25.5±1.1
16 x 2 x 0,75	27.2±1.1	24.5±1.0	27.2±1.1
19 x 2 x 0,75	27.7±1.1	25.8±1.1	27.7±1.1
24 x 2 x 0,75	32.0±1.3	29.0±1.2	32.0±1.3
32 x 2 x 0,75	34.8±1.3	32.6±1.3	34.8±1.3
1 x 2 x 1,0	11.1±0.6	11.1±0.6	-
2 x 2 x 1,0	15.8±0.8	15.0±0.8	15.8±0.8
3 x 2 x 1,0	16.8±0.8	15.8±0.8	16.8±0.8
4 x 2 x 1,0	17.8±0.8	16.7±0.8	17.8±0.8
5 x 2 x 1,0	19.8±0.9	18.2±0.8	19.8±0.9
6 x 2 x 1,0	20.4±0.9	19.6±0.9	20.4±0.9
7 x 2 x 1,0	20.4±0.9	19.6±0.9	20.4±0.9
8 x 2 x 1,0	21.9±1.0	20.6±0.9	21.9±1.0
10 x 2 x 1,0	24.7±1.0	23.0±1.0	24.7±1.0
12 x 2 x 1,0	25.9±1.1	23.8±1.0	25.9±1.1
14 x 2 x 1,0	27.2±1.1	24.5±1.0	27.2±1.1
16 x 2 x 1,0	29.0±1.2	26.4±1.1	29.0±1.2
19 x 2 x 1,0	29.5±1.2	27.6±1.1	29.5±1.2
24 x 2 x 1,0	34.1±1.3	31.2±1.2	34.1±1.3
32 x 2 x 1,0	37.5±1.4	35.5±1.4	37.5±1.4
1 x 2 x 1,5	12.1±0.7	12.1±0.7	-
2 x 2 x 1,5	17.7±0.8	16.9±0.8	17.7±0.8
3 x 2 x 1,5	18.9±0.9	17.8±0.8	18.9±0.9
4 x 2 x 1,5	20.3±0.9	18.9±0.9	20.3±0.9
5 x 2 x 1,5	22.4±1.0	20.9±0.9	22.4±1.0

Number of cores x conductor cross-section mm ²	Overall Diameter (i) mm	Overall Diameter (c) mm	Overall Diameter (i&c) mm
6 x 2 x 1,5	23.3±1.0	22.3±1.0	23.3±1.0
7 x 2 x 1,5	23.3±1.0	22.3±1.0	23.3±1.0
8 x 2 x 1,5	25.5±1.1	23.7±1.0	25.5±1.1
10 x 2 x 1,5	28.8±1.2	26.5±1.1	28.8±1.2
12 x 2 x 1,5	29.7±1.2	27.6±1.1	29.7±1.2
14 x 2 x 1,5	31.4±1.2	28.7±1.2	31.4±1.2
16 x 2 x 1,5	33.3±1.3	30.5±1.2	33.3±1.3
19 x 2 x 1,5	34.1±1.3	32.1±1.3	34.1±1.3
24 x 2 x 1,5	40.2±1.5	36.5±1.4	40.2±1.5
32 x 2 x 1,5	43.3±1.6	41.5±1.5	43.3±1.6
1 x 2 x 2,5	12.9±0.7	12.9±0.7	-
2 x 2 x 2,5	19.5±0.9	18.5±0.9	19.5±0.9
3 x 2 x 2,5	20.6±0.9	19.7±0.9	20.6±0.9
4 x 2 x 2,5	22.2±1.0	20.7±0.9	22.2±1.0
5 x 2 x 2,5	24.5±1.0	23.1±1.0	24.5±1.0
6 x 2 x 2,5	25.7±1.1	24.5±1.0	25.7±1.1
7 x 2 x 2,5	25.7±1.1	24.5±1.0	25.7±1.1
8 x 2 x 2,5	28.2±1.1	26.3±1.1	28.2±1.1
10 x 2 x 2,5	31.8±1.3	29.4±1.2	31.8±1.3
12 x 2 x 2,5	32.8±1.3	30.4±1.2	32.8±1.3
14 x 2 x 2,5	34.9±1.3	31.8±1.3	34.9±1.3
16 x 2 x 2,5	37.6±1.4	34.1±1.3	37.6±1.4
19 x 2 x 2,5	38.3±1.4	36.0±1.4	38.3±1.4
24 x 2 x 2,5	44.4±1.6	40.9±1.5	44.4±1.6
32 x 2 x 2,5	48.0±1.7	46.3±1.7	48.0±1.7
1 x 3 x 0,75	11.1±0.6	11.1±0.6	-
2 x 3 x 0,75	15.8±0.8	15.3±0.8	15.8±0.8
3 x 3 x 0,75	16.8±0.8	16.0±0.8	16.8±0.8
4 x 3 x 0,75	18.0±0.8	17.4±0.8	18.0±0.8
5 x 3 x 0,75	19.9±0.9	19.0±0.9	19.9±0.9
6 x 3 x 0,75	21.9±1.0	21.0±0.9	21.9±1.0
7 x 3 x 0,75	21.9±1.0	21.0±0.9	21.9±1.0
8 x 3 x 0,75	23.5±1.0	22.4±1.0	23.5±1.0
10 x 3 x 0,75	26.3±1.1	25.3±1.1	26.3±1.1
12 x 3 x 0,75	27.8±1.1	26.5±1.1	27.8±1.1

Number of cores x conductor cross-section mm ²	Overall Diameter (i) mm	Overall Diameter (c) mm	Overall Diameter (i&c) mm
14 x 3 x 0,75	29.0±1.2	27.6±1.1	29.0±1.2
16 x 3 x 0,75	30.4±1.2	29.2±1.2	30.4±1.2
19 x 3 x 0,75	32.8±1.3	31.5±1.2	32.8±1.3
24 x 3 x 0,75	36.6±1.4	34.8±1.3	36.6±1.4
32 x 3 x 0,75	41.8±1.6	39.8±1.5	41.8±1.6
1 x 3 x 1,0	11.5±0.6	11.5±0.6	-
2 x 3 x 1,0	16.8±0.8	16.0±0.8	16.8±0.8
3 x 3 x 1,0	17.5±0.8	17.0±0.8	17.5±0.8
4 x 3 x 1,0	19.1±0.9	18.2±0.8	19.1±0.9
5 x 3 x 1,0	20.9±0.9	20.1±0.9	20.9±0.9
6 x 3 x 1,0	23.4±1.0	22.3±1.0	23.4±1.0
7 x 3 x 1,0	23.4±1.0	22.3±1.0	23.4±1.0
8 x 3 x 1,0	24.7±1.0	23.8±1.0	24.7±1.0
10 x 3 x 1,0	27.9±1.1	26.9±1.1	27.9±1.1
12 x 3 x 1,0	29.5±1.2	28.3±1.1	29.5±1.2
14 x 3 x 1,0	30.5±1.2	29.3±1.2	30.5±1.2
16 x 3 x 1,0	32.5±1.3	31.3±1.2	32.5±1.3
19 x 3 x 1,0	35.4±1.4	33.3±1.3	35.4±1.4
24 x 3 x 1,0	39.0±1.5	37.5±1.4	39.0±1.5
32 x 3 x 1,0	44.6±1.6	42.4±1.6	44.6±1.6
1 x 3 x 1,5	12.6±0.7	12.6±0.7	-
2 x 3 x 1,5	18.9±0.9	18.2±0.8	18.9±0.9
3 x 3 x 1,5	20.0±0.9	19.5±0.9	20.0±0.9
4 x 3 x 1,5	21.6±0.9	21.0±0.9	21.6±0.9
5 x 3 x 1,5	23.9±1.0	23.2±1.0	23.9±1.0

Number of cores x conductor cross-section mm ²	Overall Diameter (i) mm	Overall Diameter (c) mm	Overall Diameter (i&c) mm
6 x 3 x 1,5	27.0±1.1	26.0±1.1	27.0±1.1
7 x 3 x 1,5	27.0±1.1	26.0±1.1	27.0±1.1
8 x 3 x 1,5	28.8±1.2	27.7±1.1	28.8±1.2
10 x 3 x 1,5	32.4±1.3	31.3±1.2	32.4±1.3
12 x 3 x 1,5	34.1±1.3	32.8±1.3	34.1±1.3
14 x 3 x 1,5	36.0±1.4	34.2±1.3	36.0±1.4
16 x 3 x 1,5	38.3±1.4	36.6±1.4	38.3±1.4
19 x 3 x 1,5	41.3±1.5	39.7±1.5	41.3±1.5
24 x 3 x 1,5	45.4±1.7	43.9±1.6	45.4±1.7
32 x 3 x 1,5	52.1±1.9	49.9±1.8	52.1±1.9
1 x 3 x 2,5	13.9±0.7	13.9±0.7	-
2 x 3 x 2,5	20.7±0.9	20.1±0.9	20.7±0.9
3 x 3 x 2,5	21.7±1.0	21.2±0.9	21.7±1.0
4 x 3 x 2,5	23.9±1.0	23.3±1.0	23.9±1.0
5 x 3 x 2,5	26.5±1.1	25.8±1.1	26.5±1.1
6 x 3 x 2,5	29.7±1.2	28.9±1.2	29.7±1.2
7 x 3 x 2,5	29.7±1.2	28.9±1.2	29.7±1.2
8 x 3 x 2,5	31.9±1.3	30.6±1.2	31.9±1.3
10 x 3 x 2,5	36.3±1.4	35.3±1.4	36.3±1.4
12 x 3 x 2,5	38.5±1.5	37.4±1.4	38.5±1.5
14 x 3 x 2,5	40.3±1.5	38.7±1.5	40.3±1.5
16 x 3 x 2,5	42.5±1.6	41.2±1.5	42.5±1.6
19 x 3 x 2,5	46.0±1.7	44.4±1.6	46.0±1.7
24 x 3 x 2,5	50.6±1.8	49.1±1.8	50.6±1.8
32 x 3 x 2,5	58.0±2.0	55.9±2.0	58.0±2.0

Application/Limitation

The requirement of SOLAS Chapter II-1 Part D Reg. 45, 5.2 to limit Fire Propagation along Bunches of Cables or Wires are fulfilled without any additional measures.

Type Approval documentation Tests carried out

IEC 60092-353 (2011-08)
IEC 60332-3-22 (2009-02)
IEC 60754-1/-2 (2011-11)
IEC 61034-1/-2 (2005-04)
NEK TS 606 (2009-05)

CSA C22.2 No.03 / 38 (Cold impact -35°C / Cold bend -40°C)
ASTM D 2863 (Oxygen resistance – Min.32)

Marking of product

250V – Type designation – IEC 60332 Cat.A – Size – TMC – Year of manufacture – Length

Periodical assessment

The scope of the retention/renewal survey is to verify that the conditions stipulated for the Type Approval Certificate are complied with and that no alterations are made to the design and/or the material of product.

The main elements of the survey are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Check of the results from Production Sample Tests(PST) and Routine Tests(RT)
(if not available, PST and RT are to be carried out)
- Review of type approval documentation
- Review of possible changes in design, material and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate

Survey is to be performed at least every second year.

END OF CERTIFICATE