

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Electric Power Cable**

with type designation(s)

TP(OS)PN & TP(OBS)PN & TP(IS)PN & TP(IS-OS)PN & TT(OS)PN & TT(IS-OS)PN 0,6/1 kV

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**IEEE 1580 (2010)****IEC 60332-3-22 (2009-02)****Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.****Voltage class (kV) 0,6/1****Temp. class (°C) 100/110**This Certificate is valid until **2019-11-30**.Issued at **Busan** on **2015-12-01**for **DNV GL**DNV GL local station: **Seoul**Approval Engineer: **Eun Sook Kim**

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: TP(OS)PN & TP(OBS)PN & TP(IS)PN & TP(IS-OS)PN & TT(OS)PN & TT(IS-OS)PN 0,6/1 kV

Construction:

Conductors: Tinned, flexible stranded copper

Core insulation: XLPO (Type P & X110)

Screening: AL/PS tape + tinned copper drain wire (OS) & (IS) & (IS-OS) or Tinned copper wire braid (OBS)

Outer sheath: Type N

Number of cores x conductor cross-section	Overall Diameter Approx.	Overall Diameter Approx.
AWG/MCM	mm	inches
TP(OS)PN		
2 x 2 x 18	12,5	0,492
3 x 2 x 18	14,1	0,555
4 x 2 x 18	15,0	0,591
5 x 2 x 18	16,7	0,657
7 x 2 x 18	17,9	0,705
8 x 2 x 18	19,0	0,748
10 x 2 x 18	22,4	0,882
12 x 2 x 18	23,3	0,917
14 x 2 x 18	24,2	0,953
16 x 2 x 18	26,1	1,028
19 x 2 x 18	27,2	1,071
24 x 2 x 18	30,7	1,209
2 x 2 x 16	13,1	0,516
3 x 2 x 16	14,7	0,579
4 x 2 x 16	15,6	0,614
5 x 2 x 16	17,5	0,689
7 x 2 x 16	18,7	0,736
8 x 2 x 16	19,9	0,783
10 x 2 x 16	23,5	0,925
12 x 2 x 16	24,4	0,961
14 x 2 x 16	25,5	1,004
16 x 2 x 16	27,3	1,075
19 x 2 x 16	28,6	1,126
24 x 2 x 16	32,2	1,268
2 x 2 x 14	15,0	0,591
3 x 2 x 14	16,1	0,634
4 x 2 x 14	17,1	0,673
5 x 2 x 14	19,1	0,752
7 x 2 x 14	20,5	0,807
8 x 2 x 14	23,0	0,906
10 x 2 x 14	25,9	1,020
12 x 2 x 14	26,9	1,059
14 x 2 x 14	28,0	1,102
16 x 2 x 14	30,0	1,181
19 x 2 x 14	31,4	1,236
24 x 2 x 14	35,5	1,398
TP(OBS)PN		
1 x 2 x 18	9,4	0,370
2 x 2 x 18	14,3	0,563

Number of cores x conductor cross-section	Overall Diameter Approx.	Overall Diameter Approx.
AWG/MCM	mm	inches
4 x 2 x 18	16,1	0,634
7 x 2 x 18	19,1	0,752
9 x 2 x 18	23,1	0,909
10 x 2 x 18	23,7	0,933
14 x 2 x 18	25,8	1,016
15 x 2 x 18	26,4	1,039
1 x 2 x 16	9,7	0,382
2 x 2 x 16	14,9	0,587
4 x 2 x 16	16,8	0,661
7 x 2 x 16	20,0	0,787
8 x 2 x 16	22,4	0,882
9 x 2 x 16	24,3	0,957
10 x 2 x 16	24,9	0,980
12 x 2 x 16	26,2	1,031
14 x 2 x 16	27,2	1,071
15 x 2 x 16	27,8	1,094
TP(IS)PN		
1 x 2 x 18	8,9	0,350
2 x 2 x 18	13,2	0,520
3 x 2 x 18	14,9	0,587
4 x 2 x 18	15,8	0,622
5 x 2 x 18	17,7	0,697
6 x 2 x 18	18,9	0,744
7 x 2 x 18	18,9	0,744
8 x 2 x 18	20,2	0,795
10 x 2 x 18	23,8	0,937
12 x 2 x 18	24,9	0,980
14 x 2 x 18	25,9	1,020
16 x 2 x 18	27,7	1,091
18 x 2 x 18	29,0	1,142
20 x 2 x 18	29,6	1,165
24 x 2 x 18	32,7	1,287
1 x 2 x 16	9,2	0,362
2 x 2 x 16	14,5	0,571
3 x 2 x 16	15,5	0,610
4 x 2 x 16	16,5	0,650
5 x 2 x 16	18,5	0,728
6 x 2 x 16	19,8	0,780
7 x 2 x 16	19,8	0,780
8 x 2 x 16	22,2	0,874

Job Id: **262.1-003643-2**
Certificate No: **TAE00000T7**

Number of cores x conductor cross-section	Overall Diameter Approx.	Overall Diameter Approx.
AWG/MCM	mm	inches
10 x 2 x 16	25,0	0,984
12 x 2 x 16	26,0	1,024
14 x 2 x 16	27,0	1,063
16 x 2 x 16	29,0	1,142
18 x 2 x 16	30,3	1,193
20 x 2 x 16	31,0	1,220
24 x 2 x 16	34,3	1,350
1 x 2 x 14	9,9	0,390
2 x 2 x 14	15,7	0,618
3 x 2 x 14	16,8	0,661
4 x 2 x 14	17,9	0,705
5 x 2 x 14	20,1	0,791
6 x 2 x 14	22,7	0,894
7 x 2 x 14	22,7	0,894
8 x 2 x 14	24,2	0,953
10 x 2 x 14	27,3	1,075
12 x 2 x 14	28,4	1,118
14 x 2 x 14	29,5	1,161
16 x 2 x 14	31,7	1,248
18 x 2 x 14	33,1	1,303
20 x 2 x 14	33,9	1,335
24 x 2 x 14	37,5	1,476
TP(IS-OS)PN		
2 x 2 x 18	13,3	0,524
3 x 2 x 18	15,0	0,591
4 x 2 x 18	15,9	0,626
5 x 2 x 18	17,8	0,701
6 x 2 x 18	19,0	0,748
7 x 2 x 18	19,0	0,748
8 x 2 x 18	20,3	0,799
10 x 2 x 18	23,9	0,941
12 x 2 x 18	25,0	0,984
14 x 2 x 18	26,0	1,024
16 x 2 x 18	27,8	1,094
18 x 2 x 18	29,1	1,146
20 x 2 x 18	29,7	1,169
24 x 2 x 18	32,8	1,291
2 x 2 x 16	14,6	0,575
3 x 2 x 16	15,6	0,614
4 x 2 x 16	16,6	0,654
5 x 2 x 16	18,6	0,732
6 x 2 x 16	19,9	0,783
7 x 2 x 16	19,9	0,783
8 x 2 x 16	22,3	0,878
10 x 2 x 16	25,1	0,988
12 x 2 x 16	26,1	1,028
14 x 2 x 16	27,1	1,067
16 x 2 x 16	29,1	1,146
18 x 2 x 16	30,4	1,197
20 x 2 x 16	31,1	1,224

Number of cores x conductor cross-section	Overall Diameter Approx.	Overall Diameter Approx.
AWG/MCM	mm	inches
24 x 2 x 16	34,4	1,354
2 x 2 x 14	15,8	0,622
3 x 2 x 14	16,9	0,665
4 x 2 x 14	18,0	0,709
5 x 2 x 14	20,2	0,795
6 x 2 x 14	22,8	0,898
7 x 2 x 14	22,8	0,898
8 x 2 x 14	24,3	0,957
10 x 2 x 14	27,4	1,079
12 x 2 x 14	28,5	1,122
14 x 2 x 14	29,6	1,165
16 x 2 x 14	31,8	1,252
18 x 2 x 14	33,2	1,307
20 x 2 x 14	34,0	1,339
24 x 2 x 14	37,6	1,480
TT(OS)PN		
1 x 3 x 18	9,2	0,362
2 x 3 x 18	14,9	0,587
3 x 3 x 18	15,8	0,622
4 x 3 x 18	17,3	0,681
5 x 3 x 18	19,0	0,748
7 x 3 x 18	22,5	0,886
8 x 3 x 18	24,0	0,945
12 x 3 x 18	28,6	1,126
16 x 3 x 18	31,6	1,244
1 x 3 x 16	9,6	0,378
2 x 3 x 16	15,5	0,610
3 x 3 x 16	16,5	0,650
4 x 3 x 16	18,0	0,709
5 x 3 x 16	19,9	0,783
7 x 3 x 16	23,6	0,929
8 x 3 x 16	25,2	0,992
12 x 3 x 16	30,0	1,181
16 x 3 x 16	33,1	1,303
1 x 3 x 14	10,4	0,409
2 x 3 x 14	16,9	0,665
3 x 3 x 14	17,9	0,705
4 x 3 x 14	19,7	0,776
5 x 3 x 14	22,9	0,902
7 x 3 x 14	25,8	1,016
8 x 3 x 14	27,6	1,087
12 x 3 x 14	32,9	1,295
16 x 3 x 14	36,4	1,433
TT(IS-OS)PN		
2 x 3 x 18	15,4	0,606
3 x 3 x 18	16,3	0,642
4 x 3 x 18	17,9	0,705
5 x 3 x 18	19,8	0,780
7 x 3 x 18	23,4	0,921
8 x 3 x 18	25,1	0,988

Job Id: **262.1-003643-2**
Certificate No: **TAE00000T7**

Number of cores x conductor cross-section	Overall Diameter Approx.	Overall Diameter Approx.
AWG/MCM	mm	inches
12 x 3 x 18	29,8	1,173
16 x 3 x 18	33,0	1,299
2 x 3 x 16	16,0	0,630
3 x 3 x 16	17,0	0,669
4 x 3 x 16	18,7	0,736
5 x 3 x 16	20,7	0,815
7 x 3 x 16	24,4	0,961
8 x 3 x 16	26,2	1,031
12 x 3 x 16	31,2	1,228

Number of cores x conductor cross-section	Overall Diameter Approx.	Overall Diameter Approx.
AWG/MCM	mm	inches
16 x 3 x 16	34,5	1,358
2 x 3 x 14	17,4	0,685
3 x 3 x 14	18,5	0,728
4 x 3 x 14	20,3	0,799
5 x 3 x 14	23,6	0,929
7 x 3 x 14	26,8	1,055
8 x 3 x 14	28,6	1,126
12 x 3 x 14	34,1	1,343
16 x 3 x 14	37,7	1,484

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

Tests carried out

Type test according to IEEE 1580, IEEE 1202, UL 1309 and IEC 60332-3-22.

Marking of product

TMC – TP(OS)PN or TP(OBS)PN or TP(IS)PN or TP(IS-OS)PN or TT(OS)PN or TT(IS-OS)PN – Size – 0,6/1 kV

Periodical assessment

The scope of the retention/renewal survey 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 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.

Survey to be performed at least every second year.

END OF CERTIFICATE