



Offshore and
Marine Shipboard
Cables

IEEE 1580 Type P MOR® Polyrad® XT-125 Multi Conductor



Specification BR-782
MOR® Polyrad® XT-125 Flexible Marine Type P
Irradiated Cross-Linked Polyolefin Multi Conductor
Rated 600/1000 Volts (AC or DC)
For Use on Oil Rigs-Shipboard-Apparatus

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I. Scope

This specification covers cables manufactured in accordance with IEEE Std 45/ IEEE Std 1580-2010. These Power and Distribution, Signal, and Control cables are rated at 600/1000 volts AC or DC. They are manufactured with General Cable's MOR Polyrad XT-125 Type P Marine insulation, and a thermosetting irradiated cross-linked Polyolefin and Arctic-Grade, Enhanced Mud Oil resistant, Chlorosulfonated Polyethylene jacket which have been designed for use on oil rigs, shipboard and associated apparatus. An armor of aluminum or bronze and an overall sheath are also available at the option of the purchaser.

IEEE 1580 Type P cables should be designed, engineered and produced by cable manufacturers that have manufactured these specific cables for a minimum of 15 years. These manufacturers should be actively involved in the standards organizations that support the continued development, safety and quality of IEEE 1580 Type P cables.

II. Applicable Documents

The wire and cable manufactured under this specification shall be tested and inspected in accordance with the latest issues of the following standards, as applicable or as modified herein:

ASTM B33	Tinned Soft or Annealed Copper Wire
ASTM D149	Test for Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulation Materials at Commercial Power Frequencies
CSA C22.2 No. 245/ UL 1309	Marine Shipboard Cable
CSA C22.2 No. 38 RW 75 XLPE 600V	Standard for Thermoset Insulated Wires and Cables
CSA C22.2 No. 230 TC	Standard for Tray Cable
IEEE Std 45	IEEE Recommended Practice for Electrical Installation on Shipboard
IEEE Std 1580	IEEE Recommended Practice for use on Shipboard and Marine Fixed or Floating Platforms
IEEE Std 383	Type Test of Class 1E Electrical Cable, Field Splices & Connectors for Nuclear Power Generating Stations
IEEE Std 1202	Standard for Flame Testing of Cables for use in Cable Tray in Industrial and Commercial Occupancies
IEC-92-3	Electrical Installations in Ships, Part 3; Cables (Construction, Testing and Installation)
IEC 60332-3 A	Tests on Electric Cables Under Fire Conditions
ICEA S-95-658	ICEA/NEMA Standard for Non-shielded Power Cables Rated 2000 Volt or Less for Distribution of Electrical Energy (NEMA WC 70)
NEK 606	Cables for offshore installations halogen-free and/or mud resistant
UL 44 XHHW	Standard for Rubber Insulated Wire & Cable
UL (UBVZ)	Shipboard Cable, Marine



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III. Conductor

Conductors shall be of soft annealed tinned copper per ASTM B33 and shall conform to requirements as listed in the Dimensional Data section of the Type P data sheets.

IV. Separator

A suitable separator may be used if deemed necessary by the manufacturer.

V. Insulation

The insulation shall be Polyrad® XT-125 Type P Marine, an irradiated cross-linked polyolefin, with a minimum average thickness as listed in the Dimensional Data section of the Type P data sheets. The insulated conductor shall meet the following requirements:

A. Physical Properties

Unaged Requirement

Tensile Strength, Min. PSI	2000 Min.
Elongation at rupture, Min. %	250 Min.

Aged Requirements

After air oven 7 days @ 158°C ± 2°C

Tensile Strength (% of original)	90 Min.
Elongation (% of original)	55 Min.

After air oven 7 days @ 121°C ± 2°C

Tensile Strength (% of original)	90 Min.
Elongation (% of original)	90 Min.

Oxygen Bomb 7 days @ 80°C @ 300 PSI

Tensile Strength (% of original)	90 Min.
Elongation (% of original)	90 Min.

Air Bomb 42 hours @ 127°C 80 PSI

Tensile Strength (% of original)	90 Min.
Elongation (% of original)	90 Min.

Heat Distortion, 1 hour @ 200°C

Clause 4.3.6.1 CSA Std. C22.2 No. 0.3	20% Max.
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Cold Bend, 120 hours @ -55°C	6 kV - 5 Min.
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B. Electrical Properties

Dielectric Strength per ASTM D-149	> 700 V/Mil
Insulation Resistance	> 5000 Megohms/m' = 20,000
Insulation Resistance K Accelerated Water Absorption Gravimetric 7 days @ 70°C	5 MG/in ²
Electrical SIC 24 hours @ 75°C Increase in Capacitance	6.0
1 - 14 Days	4.0
7 - 14 Days	1.5
Stability Factor after 14 Days	.5

C. Qualification Testing

1. Tension Set
Gauge marks are 4" apart. 10% Maximum
2. Ozone Resistance
After 24 hours exposure to an ozone concentration of 0.03% by volume at 90°C ± 2°C, there shall be no insulation cracks.
3. Flammability Requirements
Insulated conductors shall pass the flame test described in ICEA S-19-81 and the VW-1 vertical flame test described in UL Subject 44. The maximum afterburn after each flame application shall be no greater than 3 seconds.

All multi conductor cables insulated with Polyrad XT-125 Type P Marine insulation and jacketed with thermosetting Chlorosulfonated Polyethylene shall meet the requirements of IEEE Standard 45, IEEE Standard 1580, IEEE Standard 1202 and IEC 60332-2A for flame tests.

4. Corrosion Tests
 - a) Copper Mirror: (Ref. ASTM 2671) A 0.4 gram sample of insulation is placed in the bottom of a 2 inch x 12 inch test tube. A copper coated glass mirror shall be suspended 6 inches over the sample by a thin copper wire. The lower two inches of the test tube shall be heated to 175°C for 16 hours.
Requirement: Remove less than 5% of the copper film.
 - b) Acid Gas Detection: A 1.0 mg sample shall be heated to combustion in a closed quartz tube. The resulting gases are drawn through a detector tube (MSA #91636) using a special air sampling pump manufactured by Mine Safety Apparatus Company. The amount of acid gas is determined by measuring the length of the color change in the detector tube.
Requirement: 220 PPM/MG typical.



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5. Oil Resistance

Hot Oil Swell Tests - Insulated wires are premeasured and immersed in a hot oil bath. After the required exposure time, they are removed and measured for the amount of swell.

Requirement:

A. IRM 902 Oil	100 hours @ 150°C Max.	Max. % Swell 60
B. Diesel Oil	100 hours @ 60°C Max.	Max. % Swell 60

Note: When tested in accordance with AAR 589 (ASTM #2 Oil at 121°C for 18 hours), the retention of tensile and elongation shall be:

Tensile - 70% Minimum Elongation - 90% Minimum

6. Smoke Emission

The tests shall be performed in an N.B.S. Smoke Chamber using #12 AWG wire insulated with 45 mils of Polyrad XT Marine. The procedures are per NFPA Standard 258 in the flaming (F) and non-flaming (N) modes.

	<u>Dm</u>	<u>T16</u>	<u>T.9Dm</u>
(F) Flaming plus Radiant Furnace	485	1.20	7.15
(N) Non-flaming Radiant Furnace	203	10.3	25.7

Dm = Max. Specified Optical Density
T16 = Time to reach critical Ds (Specified Optical Density)
T.9 Dm = Time to reach 90% of Dm

7. Abrasion Resistance

Rotating Scrap abrader (Ref. MIL-C-915) - A 24 inch specimen is draped over an 8 inch rotating drum with two (2) 90° vee edge abrading tools 180° apart. Failure is detected by electrical contact between abrading tool and conductor. The cable is weighted with a 450 gram weight.

Requirement: 2500 cycles minimum

8. Crush Resistance

A wire sample is placed between two (2) parallel flat plates and compressed until electrical contact is detected across conductor to the plate.

Requirement: 7500 lbs. minimum

9. MC-HL Crush and Impact

Meets UL 2225 crush and impact requirements

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VI. Conductor Identification

Conductor identification shall be obtained by Method 1 of ICEA S-95-658, solid colors with tracer stripes when necessary.

VII. Cabling

Individual conductors shall be cabled together with a lay of 8 to 16 times the overall diameter of the cable layer. When required, non-hygroscopic cable binder tape or cable fillers shall be used to maintain a concentric cross-section.

VIII. Arctic-Grade Overall Jacket/Overall Sheath

The arctic-grade overall jacket, and when required the arctic-grade overall sheath, will meet NEK 606 ester-based mud oil resistant requirements and be black irradiated cross-linked Chlorosulfonated Polyethylene meeting the following requirements when tested in accordance with IEEE Standard 1580-2010.

Jacket & Overall Sheath Physical Properties	Requirements Per IEEE 1580-2010 Table 16	General Cable Type CP Jacket
Material	Thermosetting Chlorosulfonated Polyethylene	Thermosetting Chlorosulfonated Polyethylene
Physical Requirements Unaged:		
Tensile Strength, min. psi	1800	2200
Elongation at rupture, min. percent	300	350
Set, max. percent	30	12
Aging Requirements		
After air oven at °C	121 ± 1	121 ± 1
Hours	168	168
Tensile Strength percent of unaged, min.	85	100
Elongation at rupture, percent of unaged, min.	65	90
After oil immersion at °C	121 ± 1	121 ± 1
Hours	18	18
Tensile Strength percent of unaged, min.	60	90
Elongation at rupture, percent of unaged, min.	60	90
Cold Bend, no cracks, °C (Note 1)	-40	-55
Cold Impact, °C (Note 1)	-40	-40
Mechanical water absorption, mg/in ²	100	87
ICEA Test Procedure reference	S-95-658	S-95-658

NOTE: (1) For test procedures refer to CSA Standard C22.2, No. 38, Clause 6.4.7. The insulation system used for this test shall be representative of the final product. Cable intended for arctic or severe cold application should be capable of passing both cold bend at -40°C and cold impact at -40°C.



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IX. Finished Cable Test

Each completed cable length shall be tested without immersion in water and successfully withstand a 5 minute AC potential in accordance with Table 3-2 of ICEA S-95-658. In addition to the voltage withstand test described above, randomly selected samples shall be tested in accordance with Part 6, ICEA S-95-658 and meet the requirements as stated in this specification.

X. Armor

When specified, shall be in accordance with IEEE Standard 1580.

XI. Cable Identification

The surface of the cable shall be printed with the following minimum information at intervals not greater than two feet. Where appropriate, additional print legend markings pertaining to (UL) Type TC, (UL) Type TC-ER, and/or (CSA) Type TC will be included.

MOR® POLYRAD® XT-125 (UL) E85994 BR782 110C XX/C XXAWG OR TC-ER¹ XHHW OR (CSA) 245/1309 FT4 -40C 600/1000V OR 600V RW75 XLPE TC² OR IEC 60332.3A IEEE 1580 Type P or (ETL) 109229 YEAR OF MFG SEQUENTIAL FOOTAGE MARK

¹ - ER for 3 conductors or more, unarmored

² CSA Listing - 600V RW75 XLPE TC for 14 AWG and larger, unarmored

XII. Reel Markings

Each reel to be shipped shall be marked to include the following information in addition to any other information specified by the purchaser:

General Cable
MOR Polyrad XT-125 Type P Marine
Voltage Rating
Conductor Size & No. of Conductors
Footage on Reel
Month/Year of Manufacture