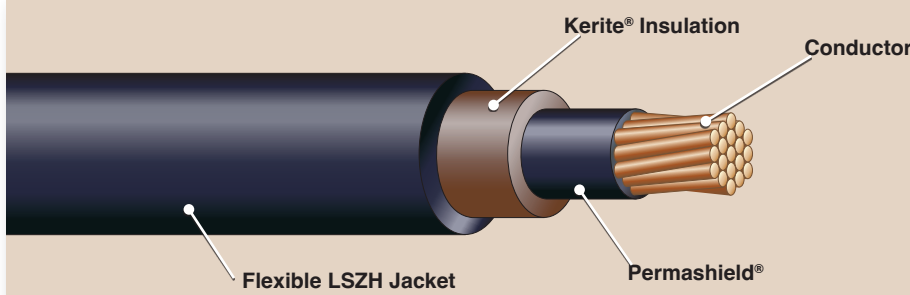


# PermaLife® Nonshielded Medium Voltage Power Cable 5kV

Discharge Resistant Kerite® Insulation System



60 Year Qualified Life at 90°C  
for Class 1E Nuclear Plant  
Use

LOCA Qualified  
Spec. RSS-7-020

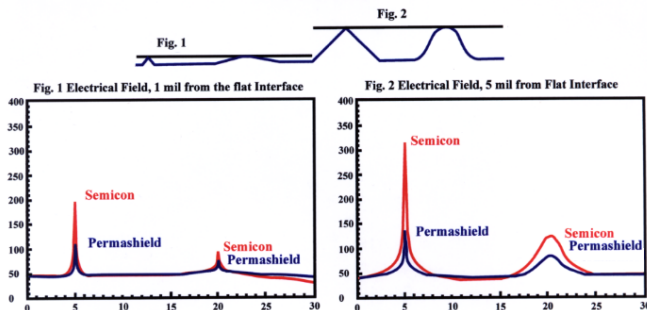
## Scope

PermaLife medium voltage is a jacketed single conductor power cable designed for applications in Nuclear Power Generating Plants and Substations. It is intended for use in harsh and demanding environments and qualified for Class 1E applications (LOCA Qualified). It may be installed indoors or outdoors in trays, ducts, conduits, direct burial, or aerial applications to perform a variety of power functions.

## Features

### Permashield® non-conducting stress control layer:

- 100% production tested in accordance with ICEA S-96-659.
- Greater than 2X reduction in electrical stress magnification caused by surface irregularities compared to semicon conductor shields.

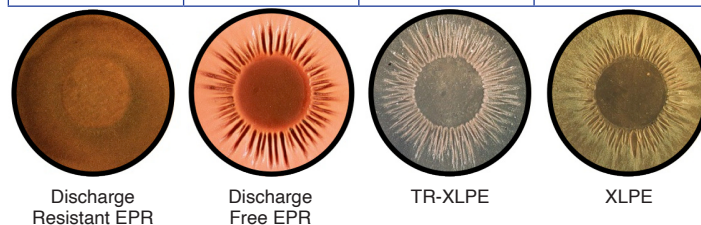


- 66% improvement in average AC breakdown strength over semicon (Ref. A.D. Little, Inc., *The Physics of Permashield®*, August 1983)

### Kerite® discharge resistant EPR insulation:

- Discharge resistant insulation system formulated to prevent the degradation that occurs as a result of partial discharge per ASTM D2275.

| Point Probe Test for Discharge Resistance |                    |           |           |
|---|--------------------|-----------|-----------|
| Discharge Resistant EPR                   | Discharge Free EPR | TR-XLPE   | XLPE      |
| TIME TO INCEPTION OF EROSION (HOURS)      |                    |           |           |
| >250                                      | 48                 | Immediate | Immediate |
| TIME TO DIELECTRIC FAILURE (HOURS)        |                    |           |           |
| >250                                      | 120                | 80        | 45        |



Rated 90°C for normal operation in wet and dry locations, 130°C for emergency overload conditions, and 250°C for short circuit conditions.

- Only medium voltage cable with zero reported failures of the insulation system. (Ref. NEI 06-05, *Medium Voltage Underground Cable White Paper and EPRI Plant Engineering: Aging Management Program for Medium Voltage Cable systems for Nuclear Power Plants*)

### Performance history:

- NEI 06-05 *Medium Voltage Underground Cable White Paper* concluded that “81 units provided information on the number of circuits in wet and dry applications” and “of the 20 units having brown EPR (Kerite), none had a failure of wet underground cable.” It further went on to state that “no wet failures of brown EPR have been identified to-date.”
- EPRI Plant Engineering: *Aging Management Program Guidance for Medium-Voltage Cable Systems for Nuclear Power Plants*, Revision 1 concluded that “brown EPR (Kerite) insulation, while being available to the early nuclear plants, continues to be produced. Approximately 20% of plants report its use. No water related failures have been reported in the nuclear industry to date.”

## Construction

**Conductor:** Bare copper (tinned copper also available), class “B” compressed strand (compact strand also available)

**Conductor Shield:** Permashield® conductor shield (non-conducting stress control layer)

**Insulation:** Proprietary Kerite® discharge resistant insulation

**Braid:** Woven glass braid

**Jacket:** Flexible, thermoset low smoke zero halogen (LSZH)

**Note:** Special designs are available on request

## Variable Frequency Drive (VFD) Design

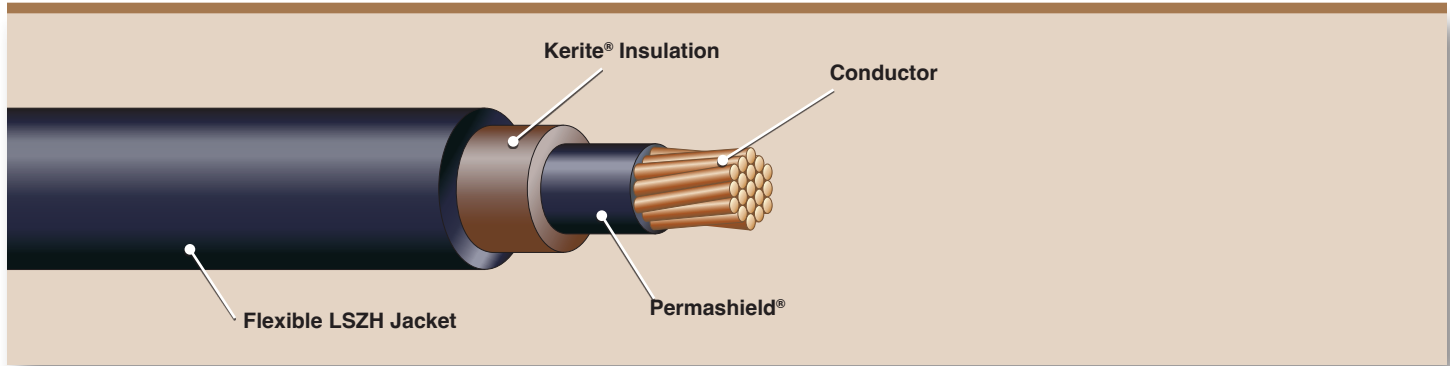
- Symmetric ground conductors provide a near complete cancellation of the magnetic fields which emanate from the three phase conductors.
- The Gardex® armor provides a uniform electric field which increases the allowable cable length between the drive and the motor prior to voltage doubling.
- “We strongly recommend a symmetrical, six conductor, three phase, base cable core with a continuous corrugated armor type sheath.” (Ref. Bentley, *Evaluation of Motor Power Cables for Power AC Drives*, June 1996)

## Performance Standards

- Designed and tested in accordance with ICEA S-96-659
- Class 1E qualified in accordance with IEEE 383-1974 and IEEE 323-1974
- Nuclear qualified with a minimum 60 year thermal life expectancy at 90°C
- Radiation resistant (up to 220 megarads)
- Cable passes IEEE 383-1974 as modified by NRC. Reg. Guide 1.131 vertical tray flame test
- Quality Assurance program in accordance with 10 CFR Appendix B
- Full traceability

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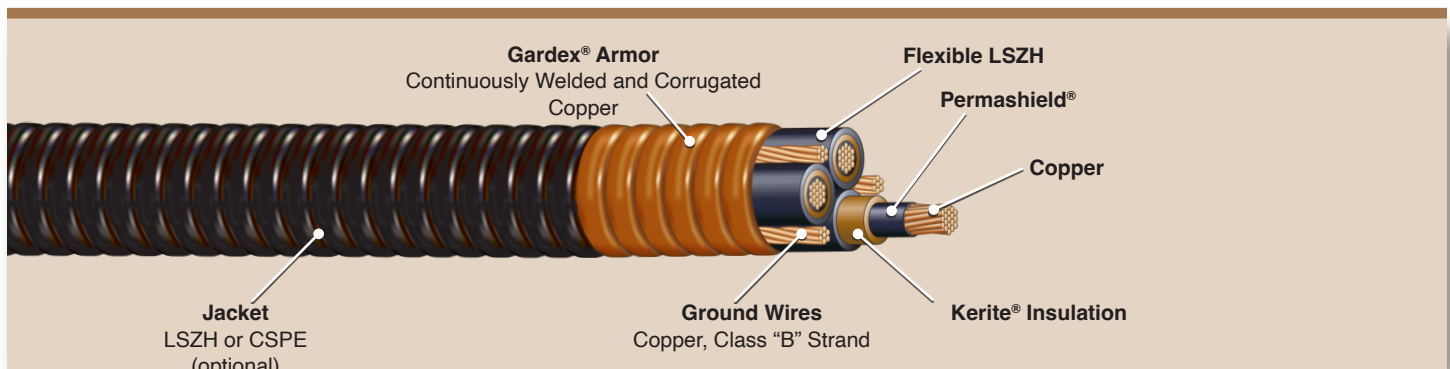
## 5kV Single Conductor (100%) and (133%) Insulation Level

| Catalog No. Prefix | Size (AWG/kcmil) | Number of Strands | O.D. Over Insulation (Inch) | Jacket Thickness (Mils) | Jacket O.D. (Inches) | Cable Weight (Lbs/M') |
|--------------------|------------------|-------------------|-----------------------------|-------------------------|----------------------|-----------------------|
| P45-3400           | 4/0              | 19                | 0.81                        | 85                      | 1.02                 | 1,075                 |
| P45-3250           | 250              | 37                | 0.89                        | 100                     | 1.14                 | 1,290                 |
| P45-3350           | 350              | 37                | 1.00                        | 100                     | 1.24                 | 1,675                 |
| P45-3500           | 500              | 37                | 1.14                        | 100                     | 1.39                 | 2,225                 |
| P45-3750           | 750              | 61                | 1.34                        | 115                     | 1.58                 | 3,075                 |
| P45-3751           | 1000             | 61                | 1.48                        | 115                     | 1.72                 | 3,925                 |
| P45-3752           | 2000             | 127               | 1.99                        | 140                     | 2.28                 | 7,175                 |

**Note:** All gauge sizes and triplex constructions are available.

# PermaLife VFD Medium Voltage Power Cable 5kV

Discharge Resistant  
Kerite® Insulation System



## 5kV Triplexed Conductors (100%) and (133%) Insulation Level

| Catalog No. Prefix | Size (AWG/kcmil) | Individual Cable O.D. (Inches) | Triplexed Cable O.D. (Inches) | Gardex O.D. (Inches) | Optional Jacket O.D. (Inches) | Cable Weight (Lbs/M') |
|--------------------|------------------|--------------------------------|-------------------------------|----------------------|-------------------------------|-----------------------|
| P45-4306           | 6                | 0.65                           | 1.41                          | 1.97                 | 2.08                          | 2,210                 |
| P45-4302           | 2                | 0.76                           | 1.64                          | 2.19                 | 2.30                          | 2,910                 |
| P45-4340           | 4/0              | 1.02                           | 2.21                          | 2.66                 | 2.79                          | 5,200                 |
| P45-4325           | 250              | 1.14                           | 2.45                          | 2.95                 | 3.08                          | 6,150                 |
| P45-4335           | 350              | 1.24                           | 2.68                          | 3.16                 | 3.31                          | 7,450                 |
| P45-4350           | 500              | 1.39                           | 2.99                          | 3.46                 | 3.60                          | 9,500                 |
| P45-4375           | 750              | 1.58                           | 3.45                          | 4.27                 | 4.42                          | 12,650                |

**Note:** Custom designs available upon request.



Made in the USA



Marmon Electrical  
A Berkshire Hathaway Company