

Leak Repair

TECHNICAL DATA SHEET

Description:

The PowerPatch® Leak Repair System provides fast and effective “in-field” leak repair for transformers, PILC cables, and other oil and gas insulated electrical equipment.

Once a leak has been temporarily stopped using the two-part Putty, the Sealant is applied and cures to form a strong, durable patch. The PowerPatch® Sealant is the functioning patching material.

PowerPatch® System is supplied with all the materials required to seal electrical insulating oil and gas leaks. The sealant bonds to polyethylene, lead, aluminum, ceramic and steel.

Leak Sealing Performance:

To test gas pressure sealing, a 1/16-inch hole was patched. The surface was prepared and sealant applied and cured according to the instructions. The repair was then subjected to continuous air pressure for 24 hours.

<u>Surface</u>	<u>Pressure</u>	<u>Result</u>
Steel	200 psi	No Leaking
HDPE (cable jacket)	80 psi	No Leaking
Lead	50 psi	No Leaking

To evaluate oil leak sealing, a seeping oil leak from a 1/8-inch hole in a galvanized pipe was repaired using standard procedures. The oil pressure in the pipe was then increased and held at 100 psi.

<u>Continuous Pressure</u>	<u>One Month Aging With Polybutene Oil</u>
100 psi	No Leaking

PowerPatch® Sealant shows good adhesion and no leakage under high pressure with both air and polybutene oil.



The PowerPatch® Leak Repair System provides a fast and easy in-field leak repair system.

Product Benefits:

- Quick plugging action
- Easy to use, fast repair time
- Long-lasting seal
- Durable- withstands environmental extremes
- Resistant to oils, water, and uv
- Prevents water entry into oil-filled equipment
- No bagging necessary to catch oil
- Convenient, field-ready kit

Typical Applications:

PowerPatch® Sealant repairs oil and SF₆ filled systems and restores electrical integrity to:

- Transformers
- Switchgear
- Terminations
- PILC Cables

Component Physical Properties:

PowerPatch® Sealant is a 2-part, thick paste sold ready to mix and use.

<u>Property</u>	<u>Part A (Resin)</u>	<u>Part B (Curing Agent)</u>
Color	Black	White
Form	Thick Paste	Thick Paste
VOC Content	0 g/L	0 g/L
Specific Gravity	1.7	1.4

Cured Properties:

PowerPatch® Sealant cures to form a solid patch. Pre-measured packaging contains enough material to seal one typical leak, ~ 6 in² at ¼-inch thickness.

<u>Property</u>	<u>Typical Result</u>
Color	Dark Grey
Peak Exotherm @ 70° F	< 200°F
Hardness 7 Days @ 70° F (Shore D Durometer)	75
Flexural Stress (ASTM D790)	6,925 lb _f /in ²
Flexural Strain (ASTM D790)	1.43 X 10 ⁻² in/in

Typical Peel Strength:

<u>Substrate</u>	<u>Result</u>
Galvanized Steel (180°)	>100 pli
Aluminum (180°)	>100 pli
Lead (180°)	16.5 pli
Copper (180°)	>100 pli
Stainless Steel (180°)	>100 pli
HDPE (90°)	49 pli
PVC (90°)	46 pli
Ceramic (90°)	> 100 pli

Tested using ASTM C794. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Shear Strength:

<u>Substrate</u>	<u>Result</u>
Steel	> 1,000 lbs/in ²
Aluminum	> 1,000 lbs/in ²
Polyethylene	114 lbs/in ²
PVC	148 lbs/in ²

Tested using ASTM D1002. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Impact Resistance:

<u>Substrate</u>	<u>Result</u>
HDPE	55 in-lbs
Lead	65 in-lbs
Steel	95 in-lbs

Tested using ASTM G14. Samples are sanded, cleaned and allowed to cure for 24 hours.

Electrical Testing:

PowerPatch® Sealant is non-conductive. Dielectric strength was tested using a 2,000 volts/second rate of rise and type 3 circular electrodes with a 0.25-inch diameter. All tests were performed in insulating oil to prevent discharges and flashovers. Results are the average of 10 trials.

<u>Sample Thickness</u>	<u>Breakdown Voltage</u>	<u>Dielectric Strength</u>
0.0916 Inch	43 kV	469 Volts/Mil

Tested using ASTM D149, Method A. Platen samples are cast and fully cured.

Chemical Resistance:

PowerPatch® Sealant chemically resists dielectric fluids, SF₆ gas, ultraviolet light, water, and oil.

ASTM D1002 was used to test the shear adhesive strength of the PowerPatch® Sealant on steel after exposure to the reagent. The sample was allowed to cure 7 days, then was immersed in the reagent and aged at 50°C for 6 months. Shear adhesion was compared to a control that was air aged.

<u>Fluid*</u>	<u>Appearance (6 months)</u>	<u>Comparison to Control</u>
Mineral Oil	No Change	100% (Pass)
Polybutene Fluid	No Change	100% (Pass)
Hydrocarbon Fluid	No Change	100% (Pass)
Silicone Oil	No Change	100% (Pass)

*Mineral Oil (Holland 70), Polybutene (Duddek PLIC), Hydrocarbon Fluid (Bio Temp), Silicone Oil (GE Silicone SF 96-100)

Application:

PowerPatch® Sealant is easy to use. For full installation information, please see [PowerPatch® Use Instructions](http://www.polywater.com/EPinstructions.pdf). (www.polywater.com/EPinstructions.pdf)

In cold weather, materials should be kept as warm as possible. Store materials in a warm vehicle and use chemical warming pad to increase the temperature of the repair area.

Cure Rate:

Recommended application temperature is 40° F to 120° F. Cure rate depends on temperature.

<u>Temperature</u>	<u>Working Time</u>	<u>Functional Cure</u>
35° F	40 Minutes	7 Hours
52° F	20 Minutes	3½ Hours
60° F	10 Minutes	1½ Hours
70° F	6 Minutes	60 Minutes
88° F	4 Minutes	40 Minutes

PowerPatch® Sealant is available in a slower-cure rate for larger applications that require more work time. (Product Code EPSC)

An oil pressure test was used to determine effective seal time under ambient conditions.

<u>Aging Condition</u>	<u>Result</u>
Ambient (70° F)	Holds 20 psi oil pressure after 15 minutes

The seal sets in less than 10 minutes at this temperature.

Vertical Sag:

PowerPatch® Sealant clings to vertical surfaces and other non-horizontal angles common in field repairs. Once applied, it stays in place.

In this test, the PowerPatch® Sealant is mixed and applied to a vertical metal platen. Displacement is measured and recorded.

<u>Temperature</u>	<u>Displacement from Center</u>
60°F	0 inches
75°F	1/16 inch
95°F	3/32 inch
110°F	3/16 inch

PowerPatch® Paste shows minimal sag within a large temperature range.

Paint Adherence:

PowerPatch® Sealant can be painted 15 minutes after application. In this test, the paste is applied, painted and the paint is allowed to dry for 24 hrs. Then, a cross-cut tape test is run.

<u>Paint Type</u>	<u>Results</u>
Enamel Paint	0% Paint Removed
Alkyd Paint	0% Paint Removed

Tested using ASTM D3359, Test Method B.

Both paints adhere well to the PowerPatch® Sealant.

Environmental Resistance:

Temperature Range:

Application: 40° F to 120° F
In Use: -40°F to 400°F

Temperature Cycle Testing:

Ten cycles at -22° F to 203° F showed no significant change in adhesion as shown below.

<u>Material</u>	<u>Adhesion Compared to Non-Aged Control</u>
Galvanized Steel	100 % (Pass)
Aluminum	100 % (Pass)
Ceramic	100 % (Pass)
Copper	100 % (Pass)
Stainless Steel	100 % (Pass)
Lead	100 % (Pass)

PowerPatch® Sealant is resistant to ultraviolet exposure and withstands direct sunlight with no decrease in functionality.

PowerPatch® Sealant has been outside aged for over five years with a temperature range from -25° F to 110° F. Conditions include rain, snow and sleet as well as exposure to direct sunlight. PowerPatch® shows no deterioration and cannot be physically pried from the surface. It shows only slight discoloration (<1/16" thickness).

Safety:

PowerPatch® Sealant has a low level of toxicity. Follow good industrial hygiene practice during use. Avoid inhalation of vapors and personal contact with the product. Use ventilation or respiratory protection against decomposition products during welding/flame operations on or near cured product (e.g., torches used to install heat shrink products). See MSDS for specific details.

Storage and Handling:

Keep containers cool, dry and away from sunlight.
Keep containers tightly closed.

Product shelf life is 15 months.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved electrical repair compound is PowerPatch® Sealant. The electrical repair compound shall come in a system that contains everything needed for the repairs. The system shall contain an oil block to allow repairs on an active oil leak. The sealant shall not sag during cure so that it may be applied to the bottom side of leaking surfaces without running or dripping.

The adhesive repair patch shall have excellent adhesion to a variety of substrates with minimum peel strength of 100 pli on stainless steel, copper, and ceramic; and 40 pli on polyethylene when measured by ASTM C 794. The adhesive repair patch will retain 100% of peel strength adhesion after 5 freeze/thaw cycles and shall withstand in-use temperatures from -50°F to 250°F.

The adhesive repair patch shall seal mineral oil and polybutene dielectric fluid at up to 200 psi oil pressure without leakage. The cured repair patch shall be impervious to water, salt water, oils, and dilute acids and bases. It shall have a minimum flexural strain of 1.1 in/in as measured by ASTM D790.

The adhesive patch shall not contain any metals and shall not corrode. It shall be non-conductive with a minimum dielectric breakdown voltage of 40 kV as measured by ASTM D 149.

Order Information:

Cat #	Package Description
EP-KIT11 Single-Use Kit	2-Part PowerPatch® Sealant (parts A and B) 1-3/4" Putty Stick 2 Type TR Cleaning and Preparation Wipes 12" Strip Sanding Cloth 2 Mixing Sticks 1 Pair disposable gloves 1 Instruction sheet

EP-KITB6	Box of 6 Single-Use Kits, EP-KIT11
-----------------	------------------------------------

EP-KITB12	Box of 12 Single-Use Kits, EP-KIT11
------------------	-------------------------------------

EP-KIT51	6 sets Part A and B PowerPatch® Sealant 7" Putty Stick 12 Type TR Cleaning and Preparation Wipes 6 24" Strips Sanding Cloth 12 Mixing Sticks 6 Pairs disposable gloves 1 Instruction sheet
-----------------	--

EPCT-KIT1 Multi-Use Cartridge Kit	2 PowerPatch® Sealant 2-part Cartridges 4 Static Mixers 2 Putty Sticks (1-3/4" ea) 8 Type TR Cleaning and Preparation Wipes 24" Strip Sanding Cloth 4 Application Sticks 1 Instruction sheet
---	--

EPCT-KIT1G	EPCT-KIT 1 with Application Tool
-------------------	----------------------------------

BT-TOOL	Application Tool to dispense cartridge package, EPCT
----------------	--

***Custom kits available. Call factory for details.*

***Slower curing version PowerPatch® Sealant available (EPSC). Call factory for details.*

Copyright © 2009-2011. American Polywater Corporation. All Rights Reserved

Important Notice: The statements here are made in good faith based on tests and observations we believe to be reliable. However, the completeness and accuracy of the information is not guaranteed. Before using, the end-user should conduct whatever evaluations are necessary to determine that the product is suitable for the intended use.

American Polywater expressly disclaims any implied warranties and conditions of merchantability and fitness for a particular purpose. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury, or direct, indirect, or consequential damages resulting from product's use, regardless of the legal theory asserted.

Lit-EPTECHSPEC2011/6-11/Internal/6-11

Makers of Polywater® and Dyna-Blue® Cable Lubricants
and Pull-Planner™ Software

**American
Polywater®
Corporation**

<http://www.polywater.com>(URL)

custserv@polywater.com(e-mail)

P.O. Box 53
Stillwater, MN 55082
U.S.A
1-800-328-9384
1-651-430-2270