

PERMABOND® HH040 PURE™

***NSF 61 Approved
Anaerobic Retaining Compound***

Permabond®
Engineering Adhesives

Ref. #022908PBHH040P

FEATURES & BENEFITS

- ◆ NSF certified drinking water system component
- ◆ Simple one-part system
- ◆ Shaft-hub assemblies can be made with slip fits
- ◆ Expensive press fits can be eliminated
- ◆ High viscosity for maximum gap filling ability
- ◆ Excellent shear strength
- ◆ Superior environmental resistance
- ◆ Thixotropic viscosity allows for ease of dispensing

GENERAL DESCRIPTION

PERMABOND HH040 PURE is a single component liquid that cures only when in contact with metal parts and oxygen is excluded. The liquid adhesive fills the "air space" between parts and upon cure unitizes and retains male and female parts. Thus it prevents their movement relative to each other, eliminating wear, erosion, and pitting. **HH040 PURE** cures to a tough cross-linked plastic that will prevent the corrosion of mated parts, and provides excellent environmental and temperature resistance.

PERMABOND HH040 PURE Anaerobic Retaining Compound conforms to all applicable requirements of the **ANSI/NSF Standard 61**, Drinking Water System Components - Health Effects, as certified by the National Sanitation Foundation and the American National Standards Institute. **Standard 61** was developed in conjunction with regulatory agencies, industry, water suppliers, consultants, and other users of the products covered in the standard. **Standard 61** establishes requirements for the control of potential adverse human health effects from products added to water indirectly via contact with treatment, storage, transmission, and distribution system components. The **NSF** standards are widely recognized by public health officials, and certified products have been tested and determined to cause no adverse health effects. **The NSF has certified all PERMABOND PURE products.**

*Thixotropic viscosity, i.e., easy to dispense, but no migration when adhesive/sealant is on parts.

Non-Warranty: The information given and the recommendations made herein are based on our research and are believed to be accurate but no guarantee of their accuracy is made. In every case we urge and recommend that purchasers before using any product in full-scale production make their own tests to determine to their own satisfaction whether the product is of acceptable quality and is suitable for their particular purpose under their own operating conditions. **THE PRODUCTS DISCLOSED HEREIN ARE SOLD WITHOUT ANY WARRANTY AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.**

No representative of ours has any authority to waive or change the foregoing provisions but, subject to such provisions, our engineers are available to assist purchasers in adapting our products to their needs and to the circumstances prevailing in their business. Nothing contained herein shall be construed to imply the non-existence of any relevant patents or to constitute a permission, inducement or recommendation to practice any invention covered by any patent, without authority from the owner of this patent. We also expect purchasers to use our products in accordance with the guiding principles of the Chemical Manufacturers Association's Responsible Care® program.

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PHYSICAL PROPERTIES OF THE UNCURED ADHESIVE

<u>Properties</u>	
Base Resin	Methylacrylates
Solids, %	100
Color	Colorless to light amber
Mean Viscosity, cP* at 25°C (77°F)	5000
Specific Gravity	1.09
Flash Point, °C (°F)	>110 (230)
Shelf Life stored @ or below 27°C (80°F)**	12
Maximum Gap Filling, in (mm)	0.010 (0.25)

**Package sizes greater than one liter, six months.

SPEED OF CURE

Typical Fixturing Time	15 minutes
Full Strength	24 hours

*measured on M10 steel nuts & bolts

BEHAVIOR ON DIFFERENT SUBSTRATES

PERMABOND HH040 PURE performs best on clean steel and will also perform well on most metals, including aluminum, stainless steel, brass, and plated materials. It will also give good results on oily parts, but for optimum performance parts should be cleaned before applying the retaining compound. When used on materials that have been treated with anti-rust compounds, the anaerobic adhesive/sealant may not cure. Passive materials will induce a "slow cure" and ultimate strength may also be reduced. Generally metals, which induce a "fast cure", will achieve fixturing strength in approximately 15 minutes.

ACTIVITY OF MATERIALS AND FINISHES

Super Active	Active	Inactive	Passive
brass copper magnesium	iron steel aluminum nickel	anodized aluminum cadmium finishes chrome finishes passivated metals stainless steel titanium zinc	ceramics glass plastics paint finishes

EFFECT OF TEMPERATURE ON CURE SPEED

PERMABOND PURE Anaerobic Retaining Compound is designed to cure at room temperature but the cure can be accelerated by heat if a faster cure is needed. Heating the liquid compound above 120°C (248°F) is not recommended [the compound once cured, has an upper operating limit of 200°C (392°F)] For every 10°C rise in temperature, the rate of cure doubles. Conversely for every 10°C drop in temperature, the rate of cure is reduced by a factor of two.

PERFORMANCE PROPERTIES OF THE CURED ADHESIVE

Cured at 25°C for 24 hours	
Torque, ISO 10964	
Breakaway, lb-in (N·m)	
M10 steel nuts and bolts	200 (23)
Prevail, lb-in (N·m)	
M10 steel nuts and bolts	300 (34)
Compressive shear strength, ISO 10123 (Steel pin and collars)	2000 psi (14) N/mm ²

ELECTRICAL AND THERMAL PROPERTIES OF THE CURED ADHESIVE

Dielectric Strength, MV/m	11
Electrical Resistance, ohm-m	> 10 ¹⁷
Thermal Conductivity, W/m ^{°K}	0.2
Thermal Expansion Coefficient, in/in ^{°C}	90x10 ⁻⁶
Operating Temperature, °C (°F)	150°C (300°F)

HEAT RESISTANCE

Since **PERMABOND PURE** Anaerobic products cure to a crosslinked, thermoset plastic, they exhibit excellent environmental and heat resistance. However, they are organic materials so the extreme upper limit is approximately 150°C (300°F). Low temperatures do not markedly affect strength.

CHEMICAL RESISTANCE

The fully cured and crosslinked anaerobic retaining compound resists most chemicals well, even at elevated temperatures. Chemical washes of any kind will have no effect on the adhesive because of the generally short duration of exposure. Anaerobic products are not recommended for use in the severe environment of pure oxygen and strong acids or alkalis.

JOINT DESIGN

Manufacturers can realize significant savings by changing from precision-machined fits and similar retaining methods to anaerobic bonding methods. Typically, manufacturing times per joint were reduced by 40 to 70%, and material cost per joint by up to 80%, when compared to such retaining methods as interference fits, taper pins, spring pins, splines, and keys.

A press or interference fit requires extensive machining of the parts and still only yields contact between the parts of no more than 30% due to microscopic surface irregularities. As a result, press fits can still fail in service due to fretting (micro-movements that are produced between parts), tearing, or wearing off surface high spots due to corrosion, and chemical breakdown of the surface. Together they form the process of fretting corrosion that is the most common failure of cylindrical fitted parts.

With an anaerobic retaining compound this process is not possible, because it fills up all irregularities and forms a tough plastic that contacts both parts completely, thereby preventing micro-movements. It also seals the inner joint from external and internal chemical attack, thus the durability of the assembly is improved.

HH040 PURE for retaining, has a certain gap filling capability, i.e., the degree to which they will fill the tolerance between parts and cure to a tough plastic that contacts both parts and unitizes them. This means a slip fit can be used with **HH040 PURE** to replace an interference fitting. The following table shows the increase in push-out force in a pin and collar assembly due to this changeover.

Effect of Anaerobic Retaining Compound on Push-Off Force*

	<u>Clearance (inches)</u>	<u>Finish (micro-inches)</u>	<u>Push-Off Force (psi)</u>
Interference fit	-0.0005	6	2100
Slip fit HH040	+0.002	6	2350
Slip fit HH040	+0.002	63	3400

*1/2 inch steel pin & collar.

JOINT STRENGTH

The amount of bonded area, the bondline thickness, and the surface finish of the cylindrical parts determine the strength of a joint.

The bond area and bondline thickness (clearance) depend on the design of the joint. As the gap (clearance) between parts increases, some loss of strength is experienced. Maximum strength is obtained when the diametrical clearance does not exceed 0.005 inches.

Relationship between Strength and Clearance

<u>Clearance (inches)</u>	<u>Percent Shear Strength Retained</u>
0.0025	93%
0.0050	91%
0.0075	85%
0.0100	62%

Relationship between Strength and Surface Finish

<u>Surface Finish (micro-inches)*</u>	<u>Percent Shear Strength Retained</u>
8	45%
16	50%
32	57%
64	70%
70	100%

* Micro-inches = 1×10^{-6} in.

A machine finish will usually yield a surface roughness of 60 to 80 micro-inches that will typically give optimum strength when using **HH040 PURE**.

APPLICATION & DISPENSING

1. **PERMABOND HH040 PURE** For best results, clean all surfaces with a cleaning solvent and allow to dry.
2. If the substrates being used are inactive metals or the cure speed is too slow, then spray the parts with **PERMABOND ASC10** and allow to dry.
3. On slip fitted assemblies, apply adhesive on the leading edge of the pin and on the inside of the collar. Assemble with twisting action.
4. On press fitting assemblies, apply the adhesive on the pin and collar. Assemble using a press.
5. On shrink fitted assemblies, apply the adhesive to the pin, heat the collar to create enough clearance and assemble.
6. Allow the parts to fixture before disturbing them.

STORAGE & HANDLING

Material should be stored in the original container in a cool place away from sparks, flame, excessive heat and sunlight. Handling should be done using plastic gloves and proper eye protection. Skin contact should be avoided. If skin contact occurs, the affected area should be washed thoroughly with soap and water. Eye contact should be treated by thorough washing with water followed by medical attention. Adequate ventilation is necessary to prevent inhalation of vapors. Proper Personal Protective Equipment is always recommended when using chemicals. **For more information, consult the Material Safety Data Sheet.**

PERMABOND HH040 PURE has a shelf life of one year when stored at or below 27°C (80°F). Do not freeze. Product removed from original container might be contaminated during use. Do not return this material to the original container.

UNCURED (LIQUID) ANAEROBIC COMPOUND

Uncured anaerobic products contain reactive chemicals. These chemicals can cause skin irritation on individuals with sensitive skin. Good housekeeping to keep work areas and tools clean, is usually sufficient to prevent skin irritation. Barrier creams and plastic gloves should be used to ensure worker protection against accidental or chronic exposure.

Atomizing the liquid compound into the air can allow it to be inhaled and thereby expose the lungs and skin to contact irritation. Spray applications are not recommended.

CURED (SOLID) ANAEROBIC COMPOUND

The cured product is a hard inert plastic, which is safe to handle. The curing reaction reacts all of the liquid adhesive (100%) into the solid plastic. No solvents or other substances are released upon cure as is the case with many other adhesives. Once cured, **PERMABOND HH040 PURE** has been determined to cause no adverse health effects and is an **NSF certified drinking water system component**.

FOR INDUSTRIAL USE ONLY. KEEP OUT OF REACH OF CHILDREN.