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LOCTITE

Technical Data Sheet

LOCTITE® 648™

May 2021

PRODUCT DESCRIPTION

LOCTITE® 648™ provides the following product characteristics:

Technology	Acrylic
Chemical Type	Urethane methacrylate
Appearance (uncured)	Green liquid
Fluorescence	Positive under UV light
Viscosity	Low
Cure	Anaerobic
Secondary Cure	Activator
Application	Retaining
Strength	High

LOCTITE® 648™ is designed for the bonding of cylindrical fitting parts, particularly where bond gaps can approach 0.15 mm and where maximum strength at room temperature is required. The product cures when confined in the absence of air between close fitting metal surfaces and prevents loosening and leakage from shock and vibration. LOCTITE® 648™ provides robust curing performance. It not only works on active metals (e.g. mild steel) but also on passive substrates such as stainless steel and plated surfaces. The product offers high temperature performance and oil tolerance. It tolerates minor surface contaminations from various oils, such as cutting, lubrication, anti-corrosion and protection fluids. Typical applications include holding gears and sprockets onto gearbox shafts and rotors on electric motor shafts.

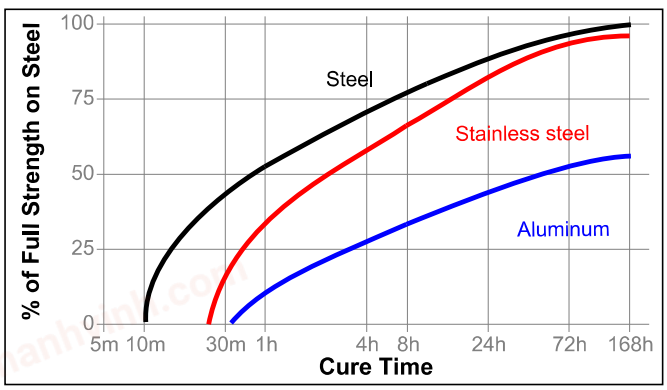
TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 23 °C	1.1
Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP): Spindle 2, speed 20 rpm	500
Viscosity, Cone & Plate, 25 °C, mPa·s (cP): Shear rate 129 s^{-1}	500

TYPICAL CURING PERFORMANCE

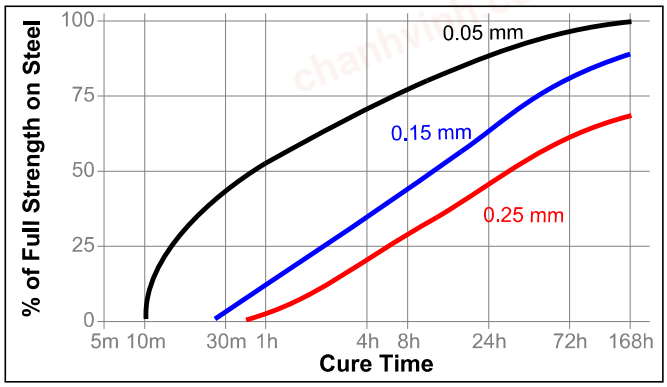
Cure Speed vs. Substrate

The rate of cure will depend on the substrate used
The graph below shows the shear strength developed with time @ 23 °C on steel pins and collars compared to different materials and tested according to ISO 10123



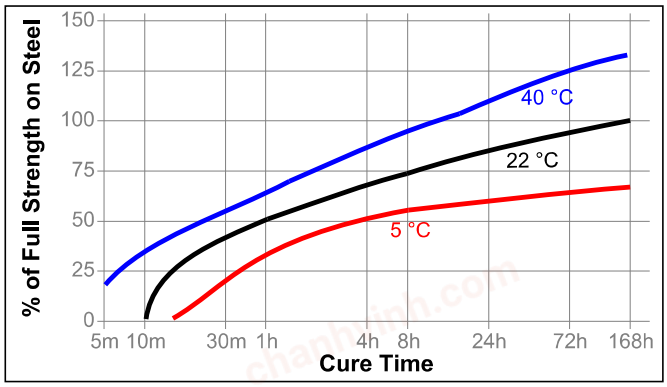
Cure Speed vs. Bond Gap

The rate of cure will depend on the bondline gap.
The following graph shows shear strength developed with time @ 23 °C on steel pins and collars at different controlled gaps and tested according to ISO 10123



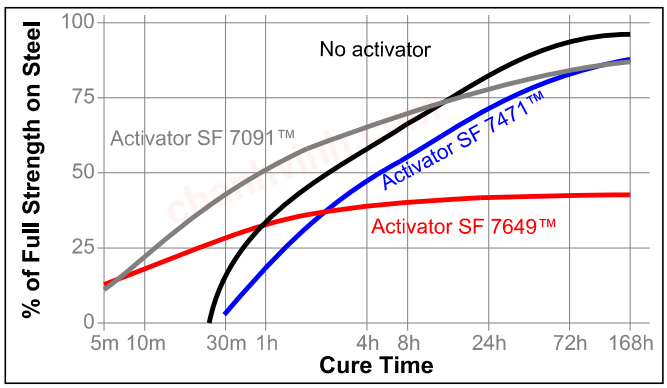
Cure Speed vs. Temperature

The rate of cure will depend on the temperature.
The graph below shows the shear strength developed with time at different temperatures vs @ 23°C on steel pins and collars and tested according to ISO 10123



Cure Speed vs. Activator

The graph below shows the shear strength developed with time @ 23 on stainless steel pins and collars using Activator SF 7471™, SF 7649™ and SF 7091™ and tested according to ISO 10123



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TYPICAL PERFORMANCE OF CURED MATERIAL

Physical Properties

Cured for 24 hours @ 23 °C		
Glass Transition Temperature ISO 11359-2, °C		100
Coefficient of Thermal Expansion, ISO 11359-2, K^{-1}		
Below Tg		93×10^{-06}
Above Tg		184×10^{-06}

Adhesive Properties

Cured for 15 minutes @ 23°C		
Compressive Shear Strength, ISO 10123:		
Steel pins and collars	N/mm² (psi)	13.5 (1,960)
Cured for 72 hours @ 23°C		
Compressive Shear Strength, ISO 10123:		
Steel pins and collars	N/mm² (psi)	31 (4,480)
Stainless Steel pins and collars	N/mm² (psi)	30 (4,350)
Aluminum pins and collars	N/mm² (psi)	18 (2,610)
Cured for 72 hours @ 23°C		
Breakaway Torque, ISO 10964:		
M10 black oxide bolts and mild steel nuts	N·m (lb.in.)	58 (515)
3/8 x 16 steel nuts (grade 2) and bolts (grade5)	N·m (lb.in.)	32 (285)
Prevail Torque, ISO 10964:		
M10 black oxide bolts and mild steel nuts	N·m (lb.in.)	40 (355)
3/8 x 16 steel nuts (grade 2) and bolts (grade5)	N·m (lb.in.)	16 (140)
Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:		
3/8 x 16 steel nuts (grade 2) and bolts (grade5)	N·m (lb.in.)	29 (255)
Prevail Torque, ISO 10964, Pre-torqued to 5 N·m:		
3/8 x 16 steel nuts and bolts	N·m (lb.in.)	29 (255)

TYPICAL ENVIRONMENTAL RESISTANCE

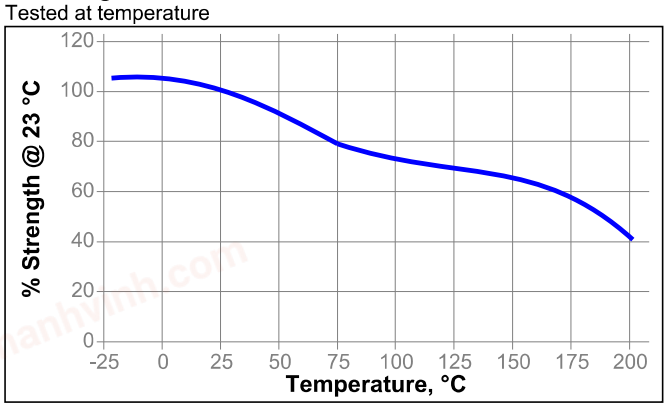
Cured for 1 week @ 23 °C

Compressive Shear Strength, ISO 10123:

Steel pins and collars

Hot Strength

Tested at temperature

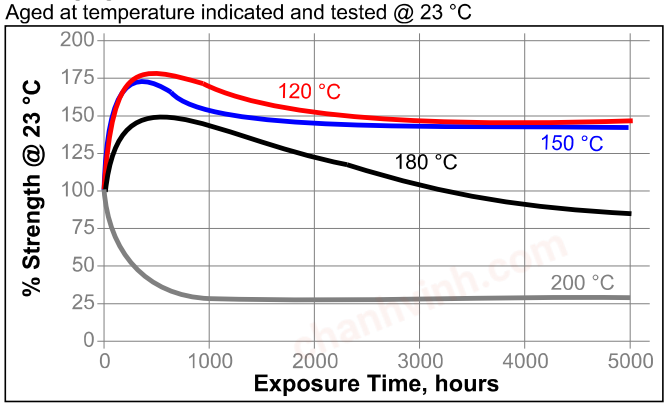


Cold Strength

This product has been tested to -75°C (-100 F). This product may work below this temperature, but has not been tested.

Heat Aging

Aged at temperature indicated and tested @ 23 °C



Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 23°C

		% of initial strength			
Environment	**°C**	**500 h**	**1000 h**	**3000 h**	**5000 h**
Motor oil (5W40 -Synthetic)	125	170	165	150	145
Unleaded Petrol	23	130	130	110	105
Brake fluid	23	130	140	135	125
Water/glycol 50/50	87	85	80	80	80
Ethanol	23	130	130	125	120
Acetone	23	100	100	100	100
B100 Bio-Diesel	23	115	115	105	100
DEF (AdBlue®)	23	95	95	90	100

Stainless Steel pins and collars

		% of initial strength			
Environment	**°C**	**500 h**	**1000 h**	**3000 h**	**5000 h**
Sodium Hydroxide, 20%	23	115	105	95	90
Phosphoric Acid, 10%	23	75	60	40	35

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For safe handling information on this product, consult the Safety Data Sheet (SDS).

Where aqueous washing systems are used to clean the surfaces before bonding, it is important to check for compatibility of the washing solution with the adhesive. In some cases these aqueous washes can affect the cure and performance of the adhesive.

This product is not normally recommended for use on plastics (particularly thermoplastic materials where stress cracking of the plastic could result). Users are recommended to confirm compatibility of the product with such substrates.

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Directions for use:

For Assembly

1. For best results, clean all surfaces (external and internal) with a LOCTITE® cleaning solvent and allow to dry.
2. To accelerate cure speed or where large gaps are present, use activator and allow to dry.
3. **For Slip Fitted Assemblies**, apply adhesive around the leading edge of the pin and the inside of the collar and use a rotating motion during assembly to ensure good coverage.
4. **For Press Fitted Assemblies**, apply adhesive thoroughly to both bond surfaces and assemble at high press on rates.
5. **For Shrink Fitted Assemblies,** the adhesive should be coated onto the part to produce a smooth, even film of material. If heating the hub for assembly, coat the pin. If the pin is to be cooled for assembly, coat the hub. If both heating and cooling is to be done, apply material to cooled part. Avoid condensation on cooled parts.
6. Parts should not be disturbed until sufficient handling strength is achieved.

For Disassembly

1. Remove with standard hand tools.
2. If needed, apply localized heat to the assembly to approximately 250 °C. Disassemble while hot.
3. If this temperature is not possible, heat as much as possible and use mechanical aids.

Clean-up

1. Cured product can be removed with a combination of soaking in a LOCTITE® solvent and mechanical abrasion such as a wire brush.

Storage
Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.
Optimal Storage: 8 °C to 21 °C. Storage below 8 °C or greater than 28 °C can adversely affect product properties.
Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Henkel representative.

Product Specification
The technical data contained herein are intended as reference only and are not considered specifications for the product. Product specifications are located on the Certificate of Analysis or please contact Henkel representative.

Approval and Certificate
Please contact a Henkel representative for related approval or certificate of this product.

Data Ranges
The data contained herein may be reported as a typical value. Values are based on actual test data and are verified on a periodic basis.

Temperature/Humidity Ranges: 23°C / 50% RH = 23±2°C / 50±5% RH

Conversions
(°C x 1.8) + 32 = °F
kV/mm x 25.4 = V/mil
mm / 25.4 = inches
µm / 25.4 = mil
N x 0.225 = lb
N/mm x 5.71 = lb/in
N/mm² x 145 = psi
MPa x 145 = psi
N·m x 8.851 = lb·in
N·m x 0.738 = lb·ft
N·mm x 0.142 = oz·in
mPa·s = cP

Disclaimer
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