

LOCTITE[®] PC 7211[™]

October 2019

PRODUCT DESCRIPTION

LOCTITE[®] PC 7211[™] provides the following product characteristics:

Technology	Epoxy
Chemical Type	Epoxy
Appearance (Resin)	White
Appearance (Hardener)	Dark Brown
Appearance (Mixture)	Light Brown
Components	Two part - Resin & Hardener
Mix Ratio, by weight - Resin : Hardener	6 : 1
Cure	Heat cure
Application	Industrial Maintenance
Product Benefits	<ul style="list-style-type: none"> • Structural, toughened epoxy • Both direct heat-curing or room temperature + post-curing suitable • Chemical resistant • Corrosion resistant • Temperature resistant

LOCTITE[®] PC 7211[™] is a two-component, heat curing toughened epoxy adhesive. This product can be combined with LOCTITE[®] PC 5085, a multiply carbon-glass fabric, for a fiber-reinforced plastic composite. It is used as a composite repair system to repair damaged and corroded parts where high strength is required, together with corrosion protection and chemical resistance.

ISO 24817 - Composite Repairs for Pipework - Qualification and Design, Installation, Testing and Inspection

The composite repair system was developed to repair and protect metal pipes and tanks e.g. in the petroleum, petrochemical, and natural gas industry. Typical applications include the repair and the reinforcement of damaged tanks, pipes and pipe components.

The standard ISO 24817 gives requirements and recommendations for the qualification and design, installation, testing and inspection for the external application of composite repairs to corroded or damaged pipework used in the petroleum, petrochemical and natural gas industries. The composite repair system consisting of LOCTITE[®] PC 7211, LOCTITE[®] PC 5085, LOCTITE[®] EA 3488, and LOCTITE[®] PC 5090 is certified according to ISO 24817 up to 130°C. **Note:** Please contact your Henkel partner for further information on the requirements of certified repair applications.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Resin

Specific Gravity @ 25 °C	1.15
Viscosity, Cone & Plate, :	
Viscosity @ 25°C, mPa·s (cP)	60,000

Hardener

Specific Gravity @ 25 °C	0.97
Viscosity, Cone & Plate, Pa·s:	
Viscosity @ 25°C, mPa·s (cP)	5,000
Flash Point - See SDS	

TYPICAL CURING PERFORMANCE

Working Life @ 25 °C, minutes	30
Working Life @ 40 °C, minutes	20

Curing Properties

Required conditions for curing are exposure of the composite and the bond line to temperatures at or above 90°C either directly after the repair process or after a room temperature cycle:

1. 16 hours @ 25°C + 3h @ 90°C
or
2. 3 hours @ 90°C

TYPICAL PROPERTIES OF CURED MATERIAL

Cured for 16 hours @ 25 °C + 3 hours @ 90 °C

Physical Properties:

Glass Transition Temperature, °C: (Tg) by DMA, ASTM E 1640	156
Hardness (Shore D)	74

TYPICAL PERFORMANCE OF CURED MATERIAL

Cured for 16 hours @ 25°C + 3 hours @ 90°C

Lap Shear Strength, ASTM D1002/EN 1465, (0.05 mm bond gap):

Steel (grit blasted), bonded to FRP	*N/mm ²	21
	*(psi)	(3,000)
Mild steel (grit blasted)	N/mm ²	38
	(psi)	(5,500)
Aluminum	N/mm ²	18
	(psi)	(2,600)
Stainless Steel	N/mm ²	27
	(psi)	(4,000)
Copper	N/mm ²	5
	(psi)	(700)
Brass	N/mm ²	18
	(psi)	(2,600)

* substrate failure

Peel Strength, ASTM D1876 (0.25 mm bond gap):

Aluminum (grit blasted)	N/mm ²	5
	(psi)	(700)

TYPICAL PROPERTIES OF CURED REPAIR SYSTEM

The following properties were tested on the cured repair system consisting of LOCTITE® PC 7211 and LOCTITE® 5085

Cured for 7 days @ 22 °C

Physical Properties:

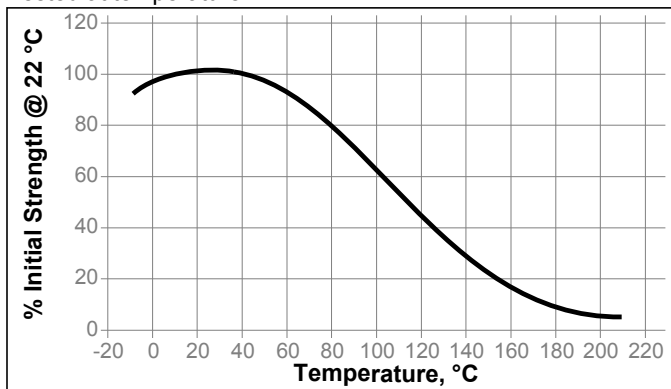
Elongation, ISO 527-5, %	1.97
Poisson's Ratio, ISO 527-5	0.07
Tensile Strength, ISO 527-5	N/mm ² 370 (psi) (53,000)
Young's Modulus, ISO 527-5	N/mm ² 18,500 (psi) (2,680,000)
Shear Strength, ASTM D 5379 (V-notched beam)	N/mm ² 39 (psi) (5,700)
Shear Modulus, ASTM D 5379 (V-notched beam)	N/mm ² 1,500 (psi) (218,000)

TYPICAL ENVIRONMENTAL RESISTANCE OF CURED REPAIR SYSTEM

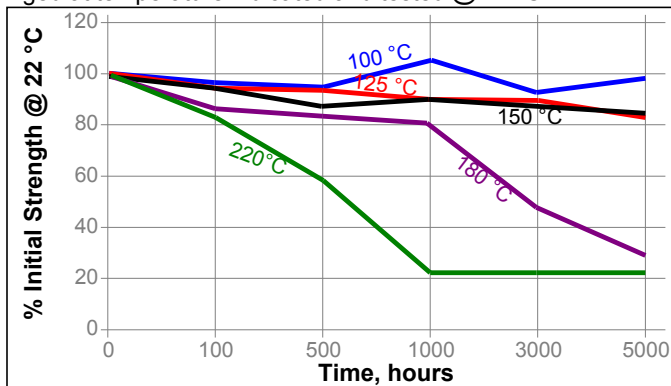
Cured for 16 hours @ 25°C + 3 hours @ 90°C

Hot Strength

Tested at temperature

**Heat Aging**

Aged at temperature indicated and tested @ 22 °C

**Chemical Resistance**

Tables below show chemical resistance @ 22°C. Tested on product specimens, immersed up to 5,000 hours @ 22°C in fluids indicated.

Acids

20 % Acetic Acid	Spill, Splash with immediate cleanup
36 % Hydrochloric Acid	Spill, splash with immediate cleanup
30 % Hydrogen Peroxide	Spill, Splash with immediate cleanup
10 % Nitric Acid	Short term or intermittent immersion
5 % Phosphoric Acid	Short term or intermittent immersion
40 % Sulphuric Acid	Continuous long term immersion
75 % Sulphuric Acid	Spill, Splash with immediate cleanup

Alkalis

40 % sodium hydroxide	Continuous long term immersion
25 % ammonium hydroxide	Continuous long term immersion

Water

100 % Deionized Water	Continuous long term immersion
100 % Water	Continuous long term immersion
10 % Salt Water	Continuous long term immersion

Hydrocarbons

100 % Benzene (Benzol)	Spill, Splash with immediate cleanup
100 % Crude Oil	Continuous long term immersion
100 % Diesel Fuel	Continuous long term immersion
100 % Ether Petroleum (Naphtha)	Continuous long term immersion
100 % Kerosene	Continuous long term immersion
100 % MEK	
100 % Paraffin	Continuous long term immersion
100 % Petrol Fuel Unleaded	Spill, Splash with immediate cleanup
100 % Xylene	Short term or intermittent immersion

Other

50% Urea	Continuous long term immersion
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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).

Directions For Use:

NOTE: Composite repairs according to ISO 24817 or ASME PCC-2 have to be calculated and designed by Henkel. The application process for certified repairs is to be carried out exclusively by qualified personnel trained and approved by Henkel. Please contact your Henkel partner for further information on the requirements of certified repair applications. The following text gives only a brief summary on the application process in general.

Surface Preparation

Proper surface preparation is critical to the long-term performance of this product. The exact requirements vary with the severity of the application, expected service life, and initial substrate conditions.

1. Remove dirt, oil, grease etc with a suitable cleaner, e.g. high pressure water cleaning system using LOCTITE® 7840™ or LOCTITE® Natural Blue® cleaner/degreaser.
2. Blast all surfaces to be coated with a sharp edged angular grit to a depth of profile of 75 to 100 microns (3 to 4 mils), and a degree of cleanliness of SA 2.5 to SA 3.0.

- After blasting, metal surfaces should be cleaned, e.g. with LOCTITE® SF 7063™ or LOCTITE® ODC Free Cleaner and Degreaser, and be coated with LOCTITE® SF 7515 before any oxidation or contamination takes place..
- Metal that has been in contact with salt solutions, e.g. seawater, should be grit blasted and high-pressure water blasted, left for 3 hours to allow any salts in the metal to sweat to the surface. A test for chloride contamination should be performed. The procedure should be repeated until chloride ions concentration on the surface is below 3 µg/cm².

Mixing:

- Add hardener completely to resin. Mix material vigorously until uniform in color. Continue mixing for another 3 to 5 minutes. Be sure to mix along the bottom and sides of mixing container..
- Heat buildup during and after mixing is normal. To reduce the likelihood of exothermic reaction or excessive heat buildup, mix less than 1,000 grams at a time. Mixing smaller amounts will minimize heat buildup.

Impregnation

- Start the impregnation process immediately after mixing.
- Impregnate the multi axial, multi-ply fabric, LOCTITE® PC 5085 thoroughly with mixed LOCTITE® PC 7211™.

Application:

- Ensure component temperature is between 15 to 30°C (60 to 85°F).
- For non-through-wall defects, use LOCTITE® EA 3488 to rebuild external part design.
- Apply a layer of LOCTITE® PC 7211™ at least 200 microns (8 mil) thick onto the surface of the repair area by spatula..
- Press the impregnated fabric firmly onto the surface. Ensure that no air is trapped between the surface and the fabric.
- A minimum of two layers is needed to seal the surface properly.
- Application of the product must proceed quickly so as not to exceed the working time of 30 minutes (depending on temperature).
- Post cure 90 °C for 3 hours or 25 °C for 16 hours + 90 °C for 3 hours.
- To improve weathering resistance, fire resistance or esthetical aspects, a layer of LOCTITE® PC 7255 or LOCTITE® PC 7234 should be applied on top by spraying or brushing.

Clean-up:

- Immediately after use clean tools with suitable cleaner, e.g. TEROSON® PU 8550 or BONDERITE® C-MC 21130. Once cured, the material can only be removed mechanically.
- If excess material is left over after application do not dispose of more than 200g per container to avoid excess heat during cure.

Composite repairs according to ISO 24817 or ASME PCC-2 have to be calculated and designed by Henkel. The application process for certified repairs is to be carried out exclusively by Henkel TCS.

Not for product specifications

The technical data contained herein are intended as reference only. Please contact your local quality department for assistance and recommendations on specifications for this product.

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 Technical Service Center or Customer Service Representative.

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

Note:

The information provided in this Technical Data Sheet (TDS) including the recommendations for use and application of the product are based on our knowledge and experience of the product as at the date of this TDS. The product can have a variety of different applications as well as differing application and working conditions in your environment that are beyond our control. Henkel is, therefore, not liable for the suitability of our product for the production processes and conditions in respect of which you use them, as well as the intended applications and results. We strongly recommend that you carry out your own prior trials to confirm such suitability of our product. Any liability in respect of the information in the Technical Data Sheet or any other written or oral recommendation(s) regarding the concerned product is excluded, except if otherwise explicitly agreed and except in relation to death or personal injury caused by our negligence and any liability under any applicable mandatory product liability law.

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Reference 0.1

