LOCTITE®

Research, Development & Engineering
Tallaght Business Park,
Dublin, Ireland

Technical Data Sheet
Product 221

January 1990

PRODUCT DESCRIPTION

LOCTITE® 221 is a one component, anaerobic material which has low strength for easy disassembly. It cures when confined in the absence of air between close fitting metal surfaces.

TYPICAL APPLICATIONS

Prevents loosening through vibration and leakage of threaded fasteners.

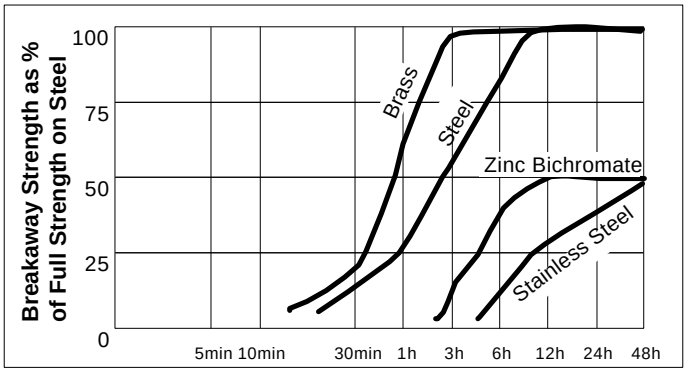
PROPERTIES OF UNCURED MATERIAL

	Typical Value	Range
Chemical Type:	Dimethacrylate ester	
Appearance	Violet, Flourescent	
Specific gravity, 25 C	1.05	
Viscosity @ 25 C mPa.s:		
Brookfield RVT		
Spindle 1@20.0 rev/min		100 to 150
DIN 54453, mPa.s:		
D=277 1/S		100 to 150
Flash point (COC), C:	>100	
Vapour pressure, mbar	<2	
Shelf life @ 5 to 28 C, months	12	

TYPICAL CURING PERFORMANCE

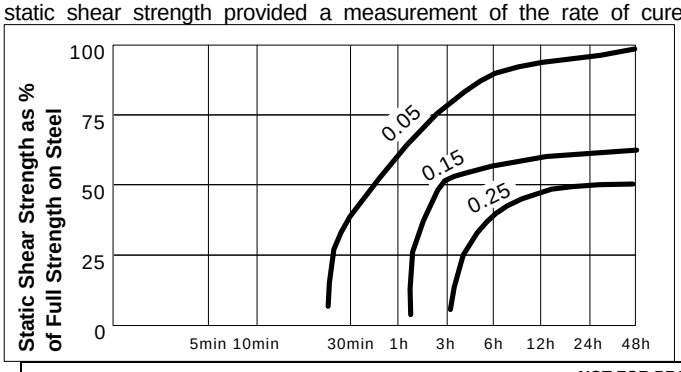
Cure speed vs. substrate

Figure 1 shows the rate of cure on M10 black oxide bolts and steel nuts against different materials. The breakaway strength was determined according to MIL-S-46163.



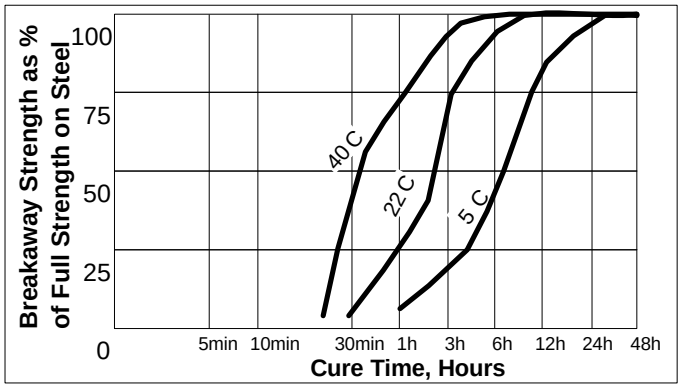
Cure speed vs bond gap

Figure 2 shows the rate of cure through different gaps. Gaps in threaded fasteners depend on thread type, quality and size. These tests were made on steel pins and collars with specified gaps. Test procedure in accordance with MIL-R-46082. The development of static shear strength provided a measurement of the rate of cure



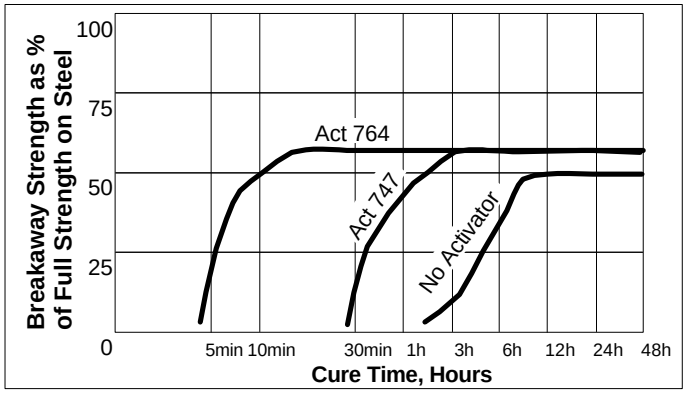
Cure speed vs ambient temperature

Figure 3 shows how the rate of cure varies with ambient temperature. Tests were made on M10 black oxide bolts and steel nuts according to MIL-S-46163.



Cure speed vs activator

Where cure speed is unacceptably long (because of substrate, temperature or gap) performance may be improved by treating the surface with LOCTITE ACTIVATOR 764 or ACTIVATOR 747. This effect is indicated in figure 4. Tests were carried out according to MIL-S-46163 on zinc bichromate steel M10 nuts and bolts.



PHYSICAL PROPERTIES OF CURED MATERIAL AND OPERATING PARAMETERS

Time to achieve full strength on steel @ 22 C (0.05mm), hours:	12
Coefficient of thermal expansion, ASTM D696, 1 K	$100x10^{-6}$
Coefficient of thermal conductivity, ASTM C177, $W.m^{-1}K^{-1}$ 0.1	
Specific heat, $kJ.kg^{1}K^{-1}$	0.3
Recommended gap, mm:	0.05
Maximum recommended bolt size:	M12

PERFORMANCE OF CURED MATERIAL

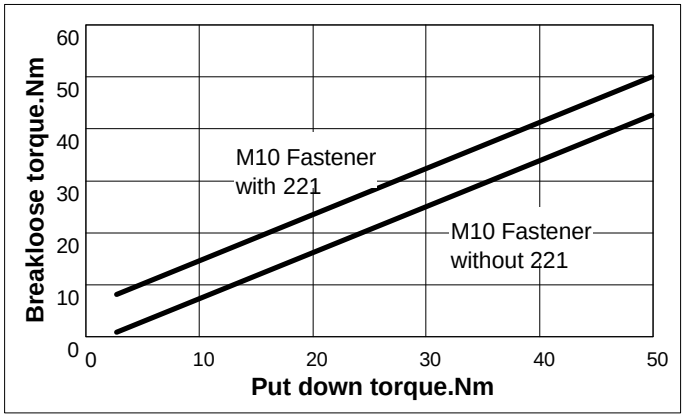
(After 24 hours at 22 C)

Breakaway torque, MIL-S-46163, N.m.:	5 to 12
Prevail torque, MIL-S-46163, N.m:	2 to 8
Breakloose torque, DIN 54454, N.m:	9 to 21
Maximum prevail torque, KIN 54454, N.m:	9 to 21
Static shear strength, MIL-R-46082, N/mm^2:	3 to 10
Static shear strength, DIN 54452, N/mm^2:	3 to 10

N.B. Ranges are based on mean ✺2✕ values.

Torque augmentation

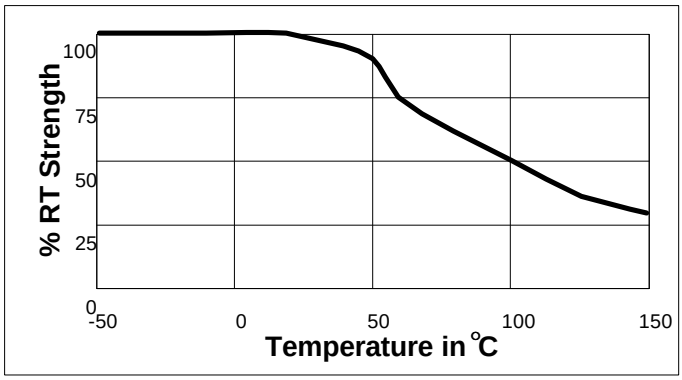
Breakloose torque of an untreated threaded fastener will normally be 15 to 30% less than the on-torque. The effect of LOCTITE 221 on the breakloose torque is shown in the graph



ENVIRONMENTAL RESISTANCE

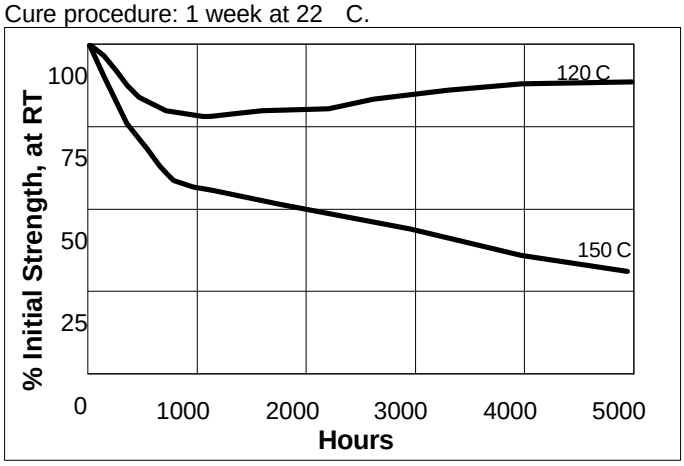
Hot strength

Strength test procedure: DIN 54454 breakloose torque.
Substrate: Zinc phosphate M10 nuts and bolts.
Cure procedure: 1 week at 22 C.



Heat Ageing

Strength test procedure: DIN 54454 breakloose torque.
Substrate: Zinc phosphate M10 nuts and bolts.
Cure procedure: 1 week at 22 C.



CHEMICAL/SOLVENT RESISTANCE

Strength test procedure: DIN 54454.
Substrate: Zinc phosphate M10 nuts and bolts.
Cure procedure: 1 week at 22 C

Solvent	Temperature	% Initial strength retained at		
		100hrs	500hrs	1000hrs
Motor Oil (MIL-l-46152)	125 C	100	95	95
Unleaded petrol:	22 C	95	95	95
Leaded petrol	22 C	95	95	95
Brake fluid	22 C	95	95	90
Ethanol	22 C	95	95	90
Acetone	22 C	100	90	90
1.1.1. trichloroethane	22 C	100	100	100
Water/glycol	87 C	80	80	80

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 oxidising materials.

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

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.

Directions for use

For best performance surfaces should be clean and free of grease. Product should be applied to the bolt in sufficient quantity to fill all engaged threads. This product performs best in thin bond gaps, (0.05mm). Very large thread sizes may create large gaps which will affect cure speed and strength. This product is designed to give controlled friction, (torque/tension ratio), during assembly. In critical tightening applications this ratio should be confirmed.

Storage

Product shall be ideally stored in a cool, dry location, in unopened containers at a temperature between 8 C to 28 C (46 F to 82 F) unless otherwise labelled. Optimal storage is at the lower half of this temperature range. To prevent contamination of unused product, do not return any material to it's original container. For further specific shelf life information contact your local Technical Service Centre.

Data Ranges

The data contained herein may be reported as a typical value and/or range (based on the mean value ± 2 standard deviations). Values are based on actual test data and are verified on a periodic basis.

Note

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, Loctite Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Loctite Corporation's products. Loctite Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits. The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a licence under any Loctite Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.