

LOCTITE®

Loctite® Fixmaster® Marine Chocking
Application Guide



Henkel



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Introduction to Henkel & Loctite®

Henkel's Leading-Edge Technologies

For more than 130 years, Henkel has been a leader with brands and technologies that make people's lives easier, better and more beautiful. Henkel operates in three business areas – Home Care, Personal Care, and Adhesives Technologies – and ranks among the Fortune Global 500 companies. Our 52,000+ employees worldwide are dedicated to fulfilling our corporate claim, “A Brand like a Friend,” and ensuring that people in more than 125 countries can trust in brands and technologies from Henkel.

Loctite® Innovation

Over fifty years of success has made the Henkel brand Loctite the recognised world leader in the development and manufacture of high-performance engineering adhesives, sealants, coatings and specialty products: Success that is based on industry experience, leadership and technical innovation coupled with unmatched in-field support. This has enabled industry to increase speed of production while reducing manufacturing and maintenance costs. Our commitment to providing technical support and end user training ensures that the right solution is selected for each application.

Loctite® Fixmaster® Marine Chocking

Loctite® Fixmaster® Marine Chocking is a two-part epoxy system recommended for the installation of main engines and other equipment. It achieves 100% surface coverage, precise equipment alignment, high compressive strength and long term durability. Loctite® Fixmaster® Marine Chocking was specifically developed for chocking marine main propulsion and auxiliary machinery. Other shipboard applications include: Sterntube and Strut Bearings, Pintle and Rudder Bearings, Pedestal Bearings, Steering Gears, Stern Winches, Engine Room Pumps, Cargo Pumps, Cable Penetrations, Large Ball or Roller Bearings, Bow Thrusters and Anchor Windlasses.

Advantages of Loctite® Fixmaster® Marine Chocking

Widely used within the marine industry, epoxy compounds have many advantages compared with traditional cast iron chock:

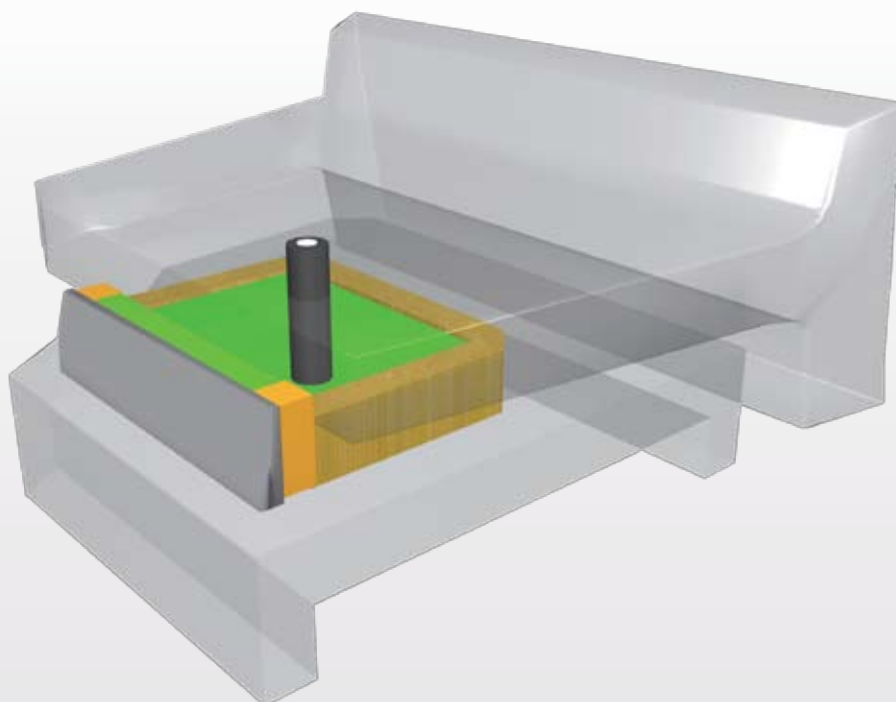
- Eliminates need for precise preparation of machine surface
- Easy to use and shortens construction time
- Is stronger, more durable and non-corrosive
- Does not move easily, and eliminates loosening of locked bolt
- Decreases the shock and noise of machine
- Approved by worldwide ship building classifications

Application Criteria

Loctite® Fixmaster® Marine Chocking is suitable for chocking all sizes and types of main or auxiliary marine engines and other machines that need accurate location such as stern shaft tube and pintle bush. It eliminates need for fine machining of foundation as it will conform precisely to the machine surfaces. It is easy to apply, simply prepare the surface by removing grease, oil, rust, stress concentration points or thicker coatings, however the intact primer coating on the base surface does not need to be cleaned.

Typical Applications:

- Main Engine
- Auxiliary Machines
- Gear Box
- Neck Bearing
- Stern Shaft Tube
- Pintle Bush
- Freight Crane
- Deck Machines (Wind lass or Winch)
- Bow / Stern Propeller
- Single Point Mooring
- LNG/LPG Liquid Tank Installation
- Propulsion Shaft Coating



Design Criteria

Currently, most of the shipping classifications prescribe that the pressure on the epoxy chock caused by the weight of machine should not exceed 0.7~0.9N/mm² (100~130psi), this is called dead-weight load.

The pressure on the chock due to dead-weight plus the bolts tension is typically designed to not exceed 3.5~5N /mm² (507~725psi).

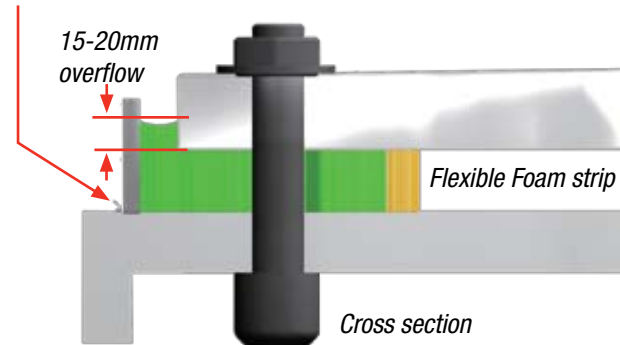
The bolts tension must be at least 2.5 times more than the weight of machine. This is to ensure the machine will not move.

The bolts tension must be at least 50N/mm² (7,250psi) to ensure the bolts will stay tight.

Continuous chock temperature should not exceed 90°C. This is applied to main engines only. Unless otherwise stated it may be assumed that a diesel engine's chocks will exceed 80°C.

If the pressure on the chock exceeds the extreme value, please consult the applicator of Marine Chocking or Henkel technical service center.

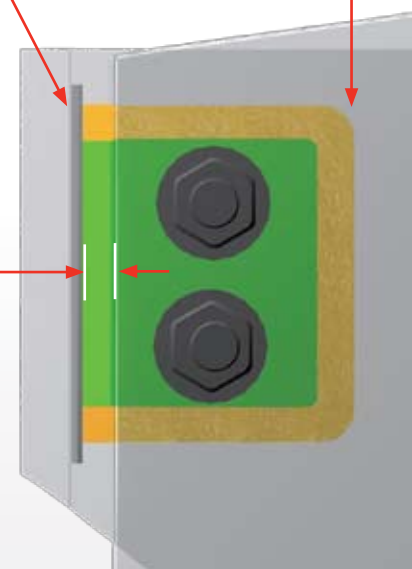
Spot Welding and Sealant



Front Metal Plate

Flexible Foam Strip

15 - 20 mm Pouring Gap



Pour Depth, mm	Temperature, °C																
	<-1	-1-2	2-4	4-7	7-10	10-13	13-16	16-18	18-21	21-24	24-27	27-29	29-32	32-35	35-38	38-42	41-43
0 - 6	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction
6 - 13	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction
13 - 19	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction
19 - 25	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	1/4 reduction	1/4 reduction	1/4 reduction
32 - 38	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	1/2 reduction	1/2 reduction	1/2 reduction	1/2 reduction
38 - 44	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	3/4 reduction	3/4 reduction	3/4 reduction	3/4 reduction	3/4 reduction
44 - 51	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	3/4 reduction	3/4 reduction	3/4 reduction	3/4 reduction	3/4 reduction
51 - 57	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	3/4 reduction	3/4 reduction	3/4 reduction	3/4 reduction	3/4 reduction
57 - 64	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	no reduction	3/4 reduction	3/4 reduction	3/4 reduction	3/4 reduction	3/4 reduction
64 - 70	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction
70 - 76	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction
>76	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction	1/4 reduction

- no reduction
- 1/4 reduction
- 1/2 reduction
- 3/4 reduction
- Full reduction
- Layered Pours

Note: Because of many variables of chocking area, such as size, thickness, metal temperature, heat diffusion and so on, the amount of curing agent used will be different. The service engineer will make the decision of how much curing agent should be used accurately and

in accordance to the specific condition. The table above is for reference only. The detailed and correct mixture ratio should be improved during practice. The best temperature for pouring of epoxy resin is 20°C to 25°C.

Application Guide

A. Normal Materials Required

1. Marine Chocking Epoxy Resin:

Calculate from the chock plan the amount required. The amount of allowance should depend on the area of machinery base and the height of chocking.

2. Damming Materials

- a. Flexible Foam Strip
- b. Front Metal Plate (2-3mm thick)
- c. Sealant
- d. Adhesive

3. Release Agent

4. High Temperature Grease

5. Heavy Duty Hand Electric Drill of 200-300rpm

6. Loctite® Specified Blade

7. Infra-Red Thermometer, Barcol Hardness Instrument

8. Goggles and Protective Gloves

9. If environment temperature is below 15°C, use tungsten lamp, heater and canvas to increase the temperature to 20-25°C.



B. Preparations Before Pouring

1. Check that all materials are available.

2. Try to store the resin and hardener at 15°C to 25°C for at least 24 hours before use.

If environment temperature is below 15°C, use sufficient heaters to increase it to 20-25°C such as tungsten lamp, heater, and canvas.

3. Clean all surfaces that chock will contact to ensure that they are free from oil, grease, water, rust, thick paint or fine particles. An intact primer coat is acceptable, but the surface paint must be polished completely, grind surface when necessary.

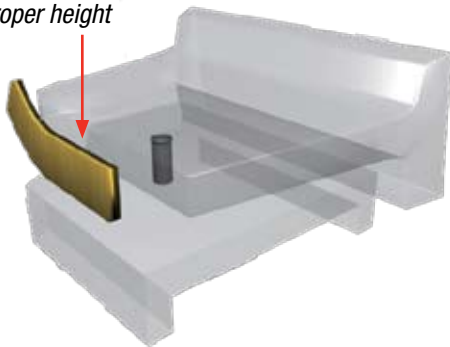
4. The machine's alignment should be correct and all bolt holes must be drilled.

5. Create dam according to chock plan.

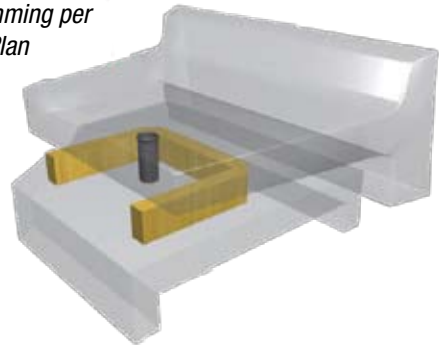
6. Insert flexible foam tube into all bolt holes to prevent chock from filling holes.

Application Guide

Trim flexible foam strip to proper height



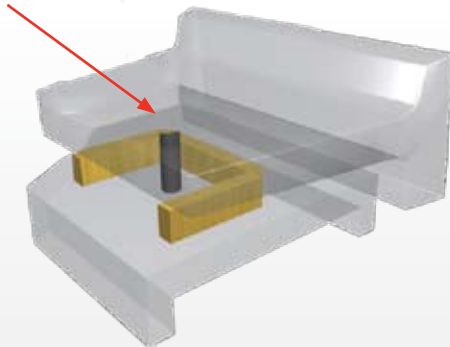
Create damming per Chocking Plan



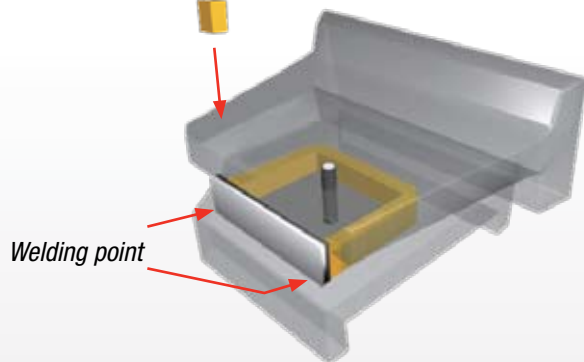
The pictures show the general damming procedure. Follow the dimensions given on the chock plan for the particular machine. For usual heavy machine, install inter baffle beforehand. The height is set to be 2/3 of the epoxy thickness and the specific height depends on the thickness of chock.

The exposed bolt holes, should preferably be plugged with flexible foam tube. These flexible foam tubes must first be well coated with high temperature grease.

Flexible foam tube



15-20mm



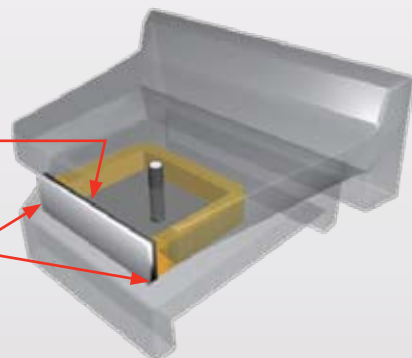
Adjust bolts when in the chocking area should be wrapped with thin foam sheet with high temperature grease and installed before chock is poured. Contact applicator for detailed information.

The size of front dam should be strictly designed according to the figure.

Weld front metal plate as indicated

Spray inside face of metal plate with release agent.

Welding point

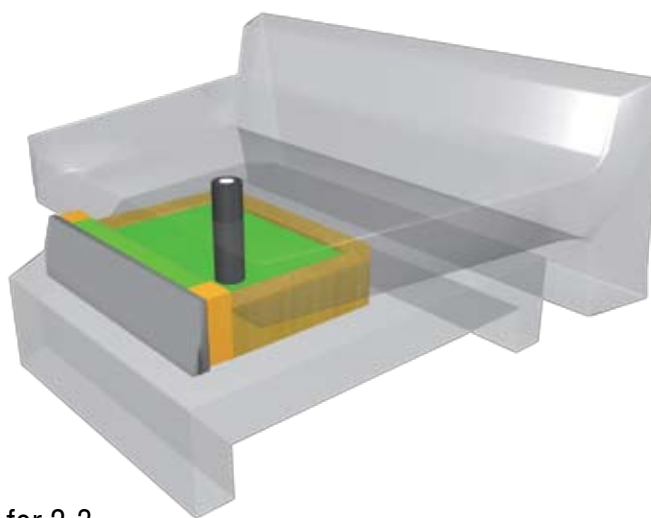


Seal front metal plate at bottom, to make sure all potential leaks are well sealed. It is easier to prevent leaks before the resin is poured than to stop them afterwards.

Application Guide

C. Mixing and Pouring

1. Ensure that all damming is completed.
2. Check that there is enough Marine Chocking on site.
3. Consult Marine Chocking guideline manual and decide from the graph the amount of hardener to be used.
4. Put on gloves and eye protection.
5. Add the hardener to the epoxy resin.



Use the recommended blade to stir the mixture for 2-3 minutes at about 200-300 rpm. Keep the blade submerged below the liquid surface, move the can to ensure homogeneous mixing.

6. Pour the chock as soon as possible after mixing. Do not scrape out the residue from the sides and bottom of the can.
7. Prepare sample chock for hardness test.

D. After Pouring

1. Leaks may happen at any time when the resin is still liquid. So keep watching until all chock has become hard.

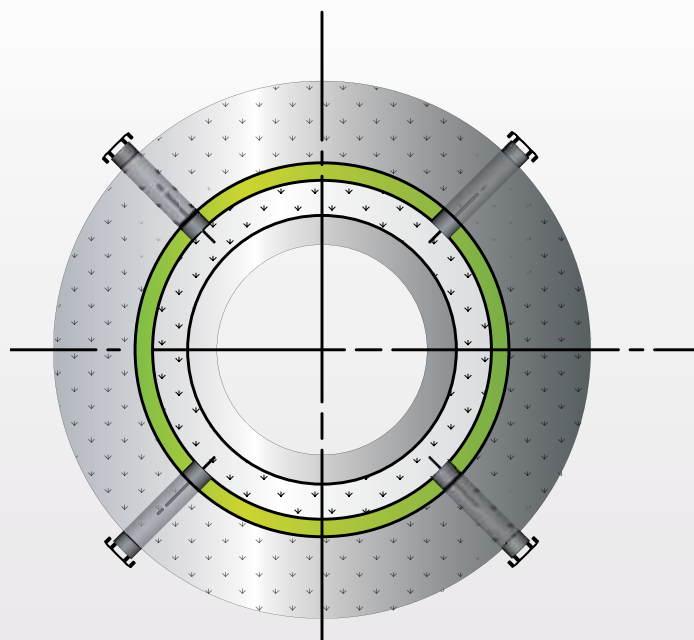
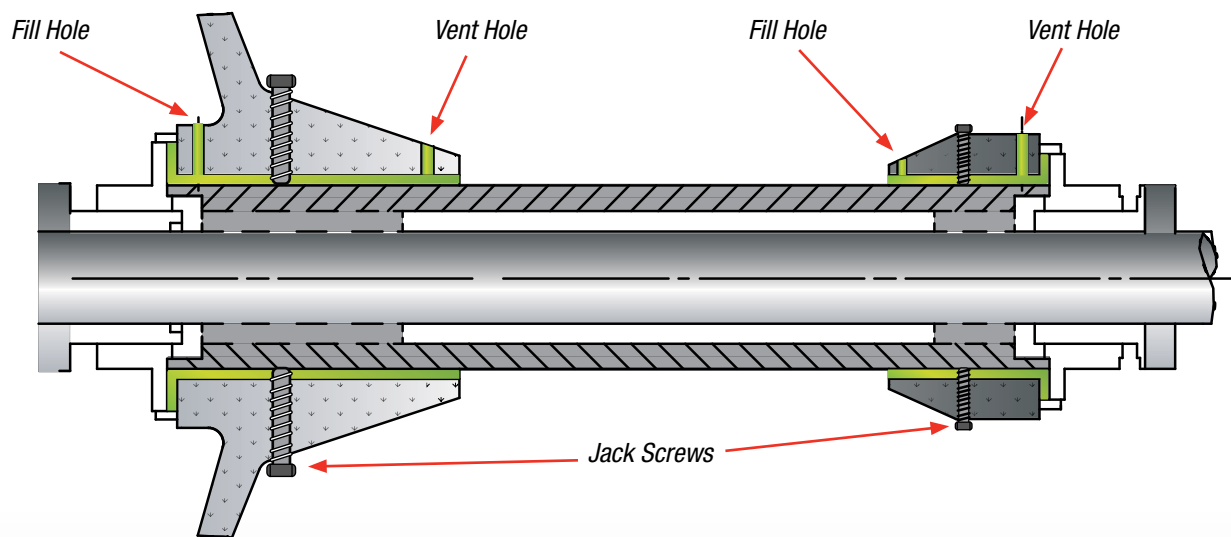
2. During cold weather, make sure the temperature is at least 15°C, and keep heating for the time indicated to ensure the epoxy cures completely. After complete curing, remove the heater, allow the cured chock to return to ambient temperature.

15 °C	36 hours
21 °C	24 hours
26 °C	16 hours
32 °C	11 hours

3. Remove the front metal plate. Abrade off the sharp edge of the chock.
4. Release the adjust bolts.
5. Tighten the hold down and fitted bolts to the required torque.
6. Measure hardness of sample chock and submit to marine class society, shipowner and shipbuilder.

Main Applications

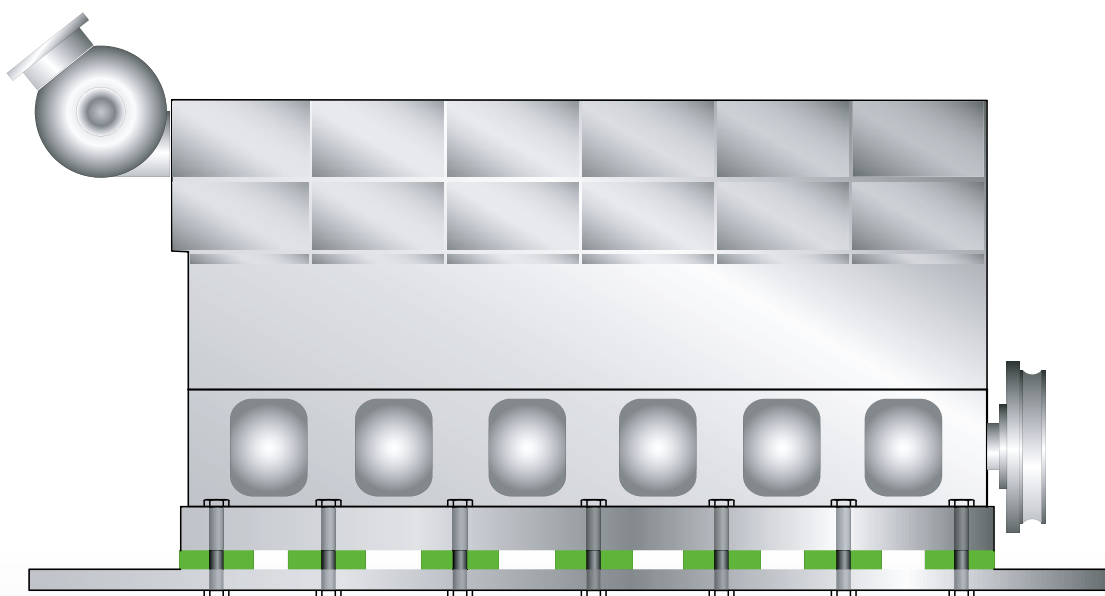
Installation of Stern Shaft Tube



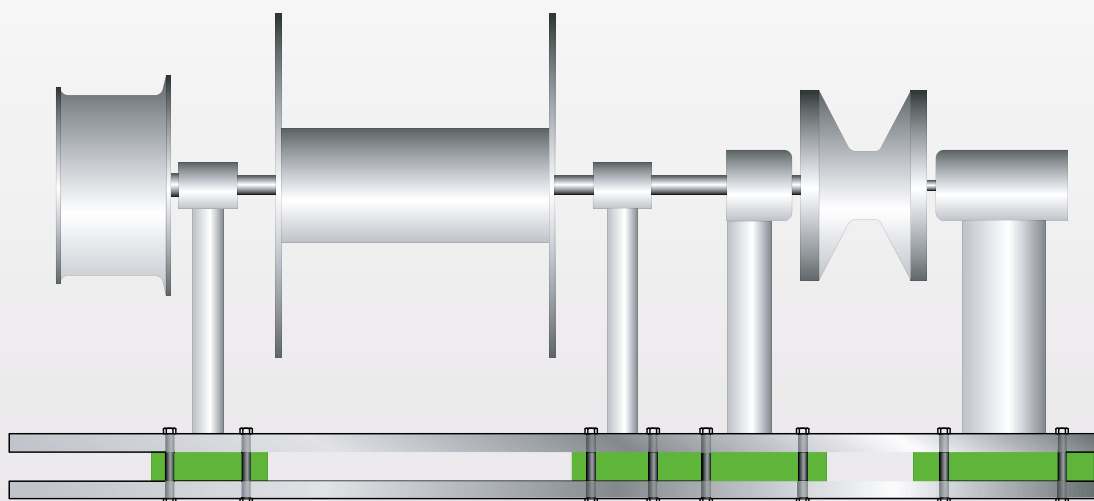
Cross Section of Jack Screws

Main Applications

Installation of Main Engine



Installation of Deck Machinery



Physical Property of Marine Chocking

Loctite® Fixmaster® Marine Chocking	
Packaging Size	3.4kg (7.5lbs) kit 9.8kg (21.5lbs) kit
Net Volume	2.2 L 6.2 L
Color	Green
Maximum Temperature	121°C (250°F)
Specific Gravity	Resin 1.64 Kg/Ltr Hardener 0.98 Kg/Ltr
Hardness - Barcol ASTM D-2583	>35
Compressive Modulus ISO604	2,760 N/mm ² (400,000 psi)
Compressive Strength ISO604	150 N/mm ² (22,000 psi)
Tensile Strength ISO527-2	38 N/mm ² (5,500 psi)
Working Life	10-15min @ 25°C
Cure Time (Approximately)	36 hours @ 15°C 24 hours @ 21°C 16 hours @ 26°C 11 hours @ 32°C
Agency Approvals	ABS, Lloyd's, DNV, GL, NK

Loctite® Marine Approvals Selection Guide

Loctite® Liquid Threadlockers

Product Name	Typical Application	Colour	Viscosity (cP)	Average Break Off Torque (N.m)	Average Prevailing Torque (N.m)	Temperature Range (°C)	Curing Speed on (Steel @ 25°C)	Activator Recommended	Specific Gravity	Agency Approvals
242	Medium strength used for 6mm-20mm thread locking	Blue	1,200/5,000 Thixotropy	4.9	12.4	-54/149	Fixture-10min. Full-24hr.	7088N/T	1.07	MIL-S-46163A for existing designs, ASTM D-5363, ABS
262	High strength solvent proof max. lock 20mm bolt	Red	1,800/5,000 Thixotropy	32	22	-54/149	Fixture-3min. Full-24hr.	7088N/T	1.05	MIL-S-46163A for existing designs, ASTM D-5363, ABS

Loctite® Instant Adhesives

Product Name	Typical Application	Colour	Viscosity (cP)	Average Break Off Torque (N.m)	Average Prevailing Torque (N.m)	Shear Strength (psi)	Temperature Range (°C)	Curing Speed on Steel @ 25°C	Specific Gravity	Agency Approvals
404 Quick Set	Rubber o-ring bonding	Clear	0.13mm	Ethyl	70/110	3,500	-54/82	Fixture-30sec. Full-24hr.	1.09	ABS, Commercial item standard A-A-3097
454	Wood, paper, leather, textile	Clear	0.25mm	Ethyl	Gel	3,200	-54/82	Fixture-15sec. Full-24hr.	1.05	ABS
495 Super Bonder	Metal, rubber, plastic	Clear	0.10mm	Ethyl	20/60	2,750	-54/82	Fixture-20sec. Full-24hr.	1.05	ABS, Commercial item standard A-A-3097

Loctite® Marine Approvals Selection Guide

Loctite® Liquid Thread Sealants

Product Name	Typical Application	Colour	Viscosity (cP)	Temperature Range (°C)	Activator Recommended	Specific Gravity	Agency Approvals
545	Sealing pneumatic, hydraulic pressure system, no filler	Purple	14,000	-54/149	7088N/T	1.09	ABS
567 PST	High temperature resistant, suitable for stainless steel and other metal joints	White	540,000	-54/204	7088N/T	1.14	ABS

Loctite® Silicones and Urethane Gasketing

Product Name	Colour	Extrude Ratio	Tack Free Time	Specific Gravity	Temperature Range (°C)	Hardness (Shore)	Elongation	Tensile Strength	Agency Approvals
587	Blue	250/600	10-50min.	1.28/1.33	-59/260	A26/40	≥350	≥1.6	ABS
598	Black	250/550	≤25min.	1.27/1.32	-59/329	A26/40	≥325	≥1.31	ABS

Loctite® Retaining Compounds

Product Name	Typical Application	Colour	Viscosity (cP)	Average Break Off Torque (N.m)	Average Prevailing Torque (N.m)	Temperature Range (°C)	Curing Speed on Steel @ 25 °C	Activator Recommended	Specific Gravity	Agency Approvals
620	Suitable for cylindrical parts retaining, high temperature resistant	Green	0.381mm	5,000/12,000	2,495	-54/232	Fixture-30min. Full-24hr.	7649/7471	1.16	ABS
680	High strength for slip-fitted parts	Green	0.381mm	750/1,750	2,800	-54/149	Fixture-10min. Full-24hr.	7649/7471	1.11	ABS

Loctite® Protective Coatings

Product Name	Typical Application	Colour / Appearance	Drying Time	Temperature Resistance Performance	Agency Approvals
Extend® Rust Treatment	Get rid of rust and protect metal surface of pipe, container, hull and auxiliary equipments	Converts from a white liquid to matte black	Recoat in 20 min.	To 121(°C)	ABS

Loctite® Wear-Resistant Coatings

Product Name	Typical Application	Coverage, cm ² 6.35mm Thickness	Colour	Maximum Operation Temperature (°C)	Compression Strength (psi)	Hardness (Shore D)	Application Time, min. @ 25 °C	Functional Cure hr @ 25 °C	Mix Ratio by Volume (R:H)	Mix Ratio by weight (R:H)	Agency Approvals
Nordbak® Brushable Ceramic	Repair and coat the surface of transport and storage equipments for wear resistant and anticorrosion	11148cm ³ (order No.98733) 334444cm ³ (order No.98732)	grey	93	12,500	85	30min.	6hr.	2.75:1	4.8:1	ABS, NEHC, Lloyd's
Nordbak® Pneu-Wear	protect lining of transport equipment from pneumatic and dust particles wear	10219cm ³ (order No.99383) 8361cm ³ (order No.99382)	Grey	121	15,000	90	30min.	6hr.	4:1	4:1	ABS, NEHC, Lloyd's

Loctite® Marine Approvals Selection Guide

Loctite® Anti-Seize

Product Name	Typical Application	Temperature Resistance Range	Colour	K Value (torque coefficient)	Agency Approvals
Marine Grade Anti-Seize	Smooth the water-contact equipment, water splash resistant	-29°C/1315°C	Black	0.18	ABS
Nickel Anti-Seize	Anti-seize and wear resistant under high temperature, heavy load, corrosive media environment	-18°C/1315°C	Silver	0.13	ABS
Silver Grade Anti-Seize	Lubricate thread and anti-seize under high temperature, heavy load environment	871°C	Silver	0.18	MIL-PRF-907F, ABS

Loctite® Fixmaster® Maintenance and Repair Epoxies

Product Name	Typical Application	Coverage, cm ² 6.35mm Thickness	Colour	Maximum Operation Temperature (°C)	Compressive Strength (psi)	Tensile Shear Strength (psi)	Hardness (Shore D)	Working Time	Functional Cure Time	Mixing Ratio by Volume, (R:H)	Mixing Ratio by Weight (R:H)	Agency Approvals
Fixmaster® Aluminum Liquid	Cast and repair aluminum parts	278.8cm ³	Aluminum	93	17,000	6,000	85	20 min.	6 hr.	5:1	9:1	NEHC ABS NAVSEA
Fixmaster® Aluminum Putty	Repair cast aluminum and aluminum parts, jig, mould prepare etc.	464cm ²	Aluminium	93	11,300	4,000	87	20 min.	6 hr.	4:1	6.3:1	NEHC ABS NAVSEA
Fixmaster® Poxy Pak	Produce and maintenance of metal, ceramics, wood, cement, glass and most plastic. Model bonding	--	Clear	149		2,300	80	5-8 min.	1 hr.			NEHC ABS NAVSEA
Fixmaster® Fast Set Steel Putty	Repair leakages of Oil,gas pipe and storage tank	371.6cm ²	Grey	93	10,800	4,600	80	3 min.	10 min.	1:1	1.8:1	NEHC ABS NAVSEA
Fixmaster® Flex 80 Putty	Repair metal, rubber,PUR surfaces	604cm ² (order No.97423) 3637.8cm ² (order No.97422)	Black	82		1,500	87	10 min.	8 hr.	100:40	72:28	ABS
Fixmaster® Stainless Steel Putty	Repair and renew stainless steel equipment and parts,make mould	232cm ²	Grey	107	12,000	4,600	85	20 min.	6 hr.	4:1	9:1	NEHC ABS NAVSEA
Fixmaster® Steel Liquid	Repair old metal parts , such as steel, cast iron, copper ,aluminium,etc.	213.2cm ³ (order No.97483) 852.2cm ³ (order No.97484)	Grey	107	13,500	6,000	86	25 min.	6 hr.	4:1	9.5:1	NEHC ABS NAVSEA
Fixmaster® Steel Putty	Repair and restore metal parts	278cm ² (order No.99913) 1115cm ² (order No.99914) 6968cm ² (order No.99912)	Grey	107	11,100	4,900	85	30 min.	6 hr.	2.5:1	6.25:1	NEHC ABS NAVSEA
Fixmaster® Wearing Resistant Putty	Coat surface of pump,pipe,butterfly valve,etc. fill air hole,wear resistant	342cm ² (order No.98742) 1026cm ² (order No.98743)	Grey	107	11,600	4,900	89	30 min.	6 hr.	2:1	2:1	NEHC ABS NAVSEA
Fixmaster® Wet Surface Repair Putty	Repair surface of steel,iron,copper,aluminium,concrete,wood and part palstic,which are wet,under water,	464cm ²	Grey	66	12,500	3,500	85	30 min.	18 hr.	1:1	10:8.9	NEHC ABS NAVSEA



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