#099

SOLID FILM LUBRICANT: HEAT CURE

SERIES E199

QUALIFIED TO MIL-PRF-46010 Color 1
QUALIFIED TO SAE AS5272 Type III
RoHS COMPLIANT

SANDSTROM PRODUCTS COMPANY

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DESCRIPTION

Sandstrom #099 dry film lubricant is a paint-like coating containing molybdenum disulfide and corrosion inhibiting pigments. This heat curing material prevents corrosion, galling, seizing, and fretting. It is a low-friction coating that exhibits long wear life when operated at -320°F to +500°F under loads exceeding 100,000 psi. Sandstrom #099 should be applied where maximum wear life and corrosion protection from a dry film lubricant are required.

Sandstrom #099 may be applied by brush, dip or spray method to a wide variety of surfaces. After it is heat cured, #099 is virtually unaffected by atmospheric and fretting corrosion, solvents, acids, oils, degreasers and is not re-softened at elevated temperatures.

Basic Product Guidance:

- Use LC-300 or #099 on metals that may be adversely affected by a 1 hour @ 400°F bake cycle.
- Use 9A on metals not affected by higher bake temperatures.
- Use #099 to meet low VOC requirements.

Please consult Sandstrom Technical Rep during product selection process for best results.

OUTSTANDING FEATURES/BENEFITS

- Excellent corrosion protection, chemical resistance and wear life
- Cured product exceeds the screening requirements for use in spacecraft materials
- Contains no graphite or lead
- Provides a low-VOC lubricant option

LIMITATIONS

Do not use #099 where there is potential for contact with liquid oxygen or food.

NOTICE

Before using this product, read all warnings, limitations and safety information printed on the product label, Safety Data Sheet (MSDS), and Technical Data Sheet.

TYPICAL USES

Sandstrom #099 is an excellent solution to the problem of lubricating parts:

- That will be operated in corrosive atmospheres.
- That may be stored for long periods.
- That are seldom lubricated once they leave the factory and permanent lubrication is desired.
- Where operating pressures exceed the load-bearing capacities of ordinary oils and greases.
- Where parts may be subjected to frequent disassembly.
- Where "clean operation" is desired (does not collect dirt and debris like grease and oils).
- Where a protective coating and sacrificial break-in lubricant is needed.
- Where fretting and galling is a problem (e.g., splines, universal joints, keyed bearings).
- Where easy release is desired (e.g., fasteners, PVC molds).

GENERAL

Sandstrom #099 is a paint-like material consisting of lubricative pigments dispersed in a thermosetting resin system thinned with appropriate solvents. For maximum service, the APPLICATION INSTRUCTIONS MUST BE FOLLOWED CLOSELY.

COVERAGE

One gallon of this material will cover 800 sq. ft. with a dry film thickness of 0.0005 inches. Coverage depends upon method of application and other variables such as overspray and type of surface to be coated. Above coverage rates are based on 100% efficiency.

COMPOSITION AND PHYSICAL PROPERTIES

Net Weight per gallon *ASTM D1475*	≥ 11.30 lbs.	**Vehicle**	Epoxy
Weight Solids	40% minimum	**Lubricating Pigment**	Molybdenum Disulfide
VOC *ASTM D3960*	< 250 g/L	**Color**	Flat Dark Gray (Burnishes w/ handling)
Odor	Mild Solvent	**Cleanup**	See CLEANUP
Collected Volatile Condensable Material	0.01%	**Thinner**	See THINNING
Water Vapor Regain	0.12%	**Drying Time**	See APPLICATION & BAKING
Viscosity	60 KU ± 10 @ 77°F	**Coverage Rate *** *ASTM D1400*	800 sq. ft./gal. @ 0.5 mil
Shelf Life (@ 77°F)	1 year from date of manufacture	**Dry Film Thickness**	0.5 mil
Storage Conditions	50° - 100°F		
Freeze/Thaw Stability	DO NOT FREEZE		
Flash Point	216°F ± 2°F Setaflash		

* Actual figures do not include spray loss. Also allow for surface irregularities and porosity, as well as material loss when mixing.

PERFORMANCE AND FUNCTIONAL PROPERTIES			
Coefficient of Friction	0.0286 (Falex Test)	**Fluid Resistance:**	
Corrosion Protection:		*MIL-PRF-46010 Table 1 Fluids* *ASTM D2510 A, ASTM D2510 C*	Exceeds
ASTM B117: Steel *MIL-DTL-16232 Type M Class 3*	750 hours * (at 0.5 mil)	*MEK double rubs*	200+ with no softening
Sulfurous Acid-Salt Spray *Fed-STD-791c Method 5331.1*	4 cycles with no effect *	*SAE AS5272 Table 3 Fluids* *ASTM D2510 C*	Pass
Load Carry Capacity *ASTM D2625B*	3000 lbf *	**Thermal Stability** *ASTM D2511*	Pass
Operating Temperature Range	-320°F to +500°F	**Vacuum Outgassing** *ASTM E595*	Total Mass Loss 0.31%
* Tests halted before failure.		**Wear Life** *ASTM D2625A*	508+ minutes average

FILM THICKNESS & ENGINEERING TOLERANCE

As supplied, Sandstrom #099 will yield a film thickness of about 0.0005 inches per dip coat. Usually engineering tolerances will permit necessary minimum film buildup of 0.0002 to 0.0003 inches without interference. If excess buildup does occur and a force fit is necessary, burnishing lightly will assist in mating the parts. The remaining excess will be worn away in the first few cycles of operation. Whenever possible, the proper tolerances should be designed into the part.

SURFACE PREPARATION

Please contact Sandstrom Products Company for substitute surface preparations if recommended steps cannot be followed.

Application on steel. Pre-clean surface with aliphatic naphtha or any other EPA compliant cleaner that sufficiently cleans surface to pass ASTM F22. Abrasive blast surface with 180-220 grit aluminum oxide (25-50 RMS optimum). Phosphate IAW MIL-DTL-16232 (weight should be 11-22 g/m^2), type M, class 3 (optimal performance) or type Z, class 3.

Application on stainless steels. Pre-clean surface with aliphatic naphtha or any other EPA compliant cleaner that sufficiently cleans surface to pass ASTM F22. Abrasive blast surface with 180-220 grit aluminum oxide (25-50 RMS optimum). Passivate surface with ASTM A967, types nitric 1, nitric 2 or nitric 3, as applicable.

Application on aluminum and aluminum alloys. Pre-clean surface with aliphatic naphtha or any other EPA compliant cleaner that sufficiently cleans surface to pass ASTM F22. Sulfuric acid anodize IAW MIL-A-8625 and seal surface.

Application on titanium and titanium alloys. Degrease surface to be coated with aliphatic naphtha or any other EPA compliant cleaner that sufficiently cleans surface to pass ASTM F22. Abrasive blast surface with 180-220 grit aluminum oxide (25-50 RMS optimum) and alkaline anodize.

Application on copper and copper alloys. Pre-clean surface with aliphatic naphtha or any other EPA compliant cleaner that sufficiently cleans surface to pass ASTM F22. Abrasive blast surface with 180-220 grit aluminum oxide (25-50 RMS optimum). Form a black oxide finish on surface.

IMPORTANT! ***DO NOT TOUCH CLEAN SURFACE WITH FINGERS - OIL FROM THE HANDS WILL INTERFERE WITH PROPER COATING ADHESION.*** Whenever possible, treat both contact surfaces (i.e., the shaft and the bearing).

STIRRING

IMPORTANT! This lubricant contains heavy pigments that settle rapidly. Therefore, if should be stirred **thoroughly** before use and **continuously** during application. **Do not use paint shaker as excessive foam buildup can occur.**

THINNING

For brushing – Use as supplied.

For spraying. Reduce sparingly (10% by volume) with deionized water or a combination of D151 Thinner and deionized water blended 1:1 by volume

For dipping. Reduce up to a maximum of 3:1 with deionized water or a combination of D151 Thinner and deionized water blended 1:1 by volume to maintain the dry film thickness specified.

APPLICATION

For Spec work, follow all instructions in the drawing.

Sandstrom #099 may be brushed, sprayed or dipped to the desired film thickness (usually 0.0003 to 0.0007 inches). Allow the surface to dry **at least** 30 minutes at 77°F ± 5°F and <70% relative humidity before baking. Lower temperatures and/or higher humidity may require a longer dry time to prevent film defects.

A flash cure at 150°F - 160°F for 10 - 30 minutes is an acceptable alternative to the air drying method.

It is important to keep container closed when not in use to keep loss of solvents at a minimum and avoid a change in volume solids.

BAKING

Cure instructions for applied film to meet MIL-PRF-46010 requires:
1 hour @ 400°F (204 ±15°C) *OR* 2 hours @ 300°F (150 ±15°C).

IMPORTANT! The time begins when **the part** has reached temperature, NOT when it is placed in the Class A oven. In cases of very thick metals, an extra hour may be required to bring the part up to the proper temperature. Thermocouples may be used to determine the true temperature of the metal.

Please consult Sandstrom Technical Service for alternative baking options to influence lubricity and/or corrosion protection.

CLEANUP

Use soap and water.

REMOVAL

In the event it is necessary to remove Sandstrom #099, physical removal is best (such as grit blasting, sanding, or grinding).

DANGER! USE WITH ADEQUATE VENTILATION.