Chemlok®

Chemlok® 250
Versatile, One-Coat Rubber-to-Metal Adhesive

product information

Description

Chemlok® 250 adhesive is a one-coat adhesive used to bond a variety of elastomers to various substrates during the vulcanization process.

A single coat of Chemlok 250 adhesive will bond compounds based on natural rubber (NR), polyisoprene (IR), styrenebutadiene (SBR), polybutadiene (BR), polychloroprene (CR), nitrile (NBR), butyl (IIR), EPDM and polyepichlorohydrin polymers to a variety of metals. The metals include carbon and alloy steels, stainless steel, aluminum, copper and copper alloys, magnesium, zinc, etc., as well as a variety of plastics, composites, and fabrics. Refer to Table I for examples of adhesion strength using various elastomers.

Features and Benefits

One-Coat Application - reduces labor, inventory and shipping costs. Fewer solvents are required with one-coat systems.

Versatile - bonds many elastomers to metals, plastics and fabrics. Chemlok 250 adhesive fits existing production lines and has a wide tolerance to variations in stock formulations.

Strength - provides superior adhesion to plated and chromate rinsed metals. Chemlok 250 adhesive produces rubber tearing bonds.

Dependable - provides consistent bonds and lowers scrap rates.

Typical Properties* of Chemlok 250 Adhesive

Composition	A mixture of polymers, organic compounds and mineral fillers dissolved or dispersed in an organic solvent system.
Appearance	Black liquid
Viscosity, cps Brookfield LVT, #2 Spindle @ 30 rpm @ 25°C (77°F)	200 - 550
Zahn Cup #3 Zahn Cup #2	30 seconds 72 seconds
Non-Volatile Content by weight	23.5 - 27.5%
Density kgs/m^3 lbs/gal	 1114.4 - 1162.3 9.3 - 9.7
Flash Point (Pensky-Martens)	34°C (94°F)
Solvents	Xylene, Trichloroethylene
Shelf Life	One year from date of shipment, unopened container, 21°C - 27°C (70°F - 80°F) storage temperature.

*Data is typical and not to be used for specification purposes.

Table 1: Typical Adhesion to Various Elastomer Stocks

Type	Durometer	kN/m	pli	%R
Natural Rubber*	50	7.0	40	100
Styrene-butadiene*	60	21.9	125	100
Polychloroprene	55	20.3	116	100
Butyl*	60	15.8	90	100
Nitrile	60	16.3	93	100

Test stock ASTM D429, Method B, 45°, 20"/min.

Surface Preparation

Thoroughly clean metal surfaces prior to applying the adhesive. Remove protective oils, cutting oils, and greases, by solvent degreasing or alkaline cleaning. Remove rust, scale, or tightly adherent oxide coatings by mechanical or chemical cleaning methods.

Grit blasting is the most widely used method of mechanical cleaning; but machining, grinding or wire brushing can be used. Steel grit is used for blast cleaning of steel, cast iron, or other ferrous metals. Use aluminum oxide, sand, or other nonferrous grit for blast cleaning stainless steel, aluminum, brass, zinc, or other nonferrous metals.

Chemical cleaning or pretreatment of the metals will remove rust, scale, or tightly adherent oxide coatings. Chemical treatments are readily adapted to automated metal treatment and adhesive application lines. Chemical treatments are also used on metal parts that would be distorted by blast cleaning, or in cases where tight size tolerances must be maintained. Phosphatizing is a commonly used chemical treatment for steel, while chromate conversion coating is commonly used for aluminum.

For the most consistent bonding results, apply Chemlok adhesive to stainless steel, aluminum, brass and other nonferrous substrates within one-half hour after cleaning. For ferrous substrates such as steel, a long layover can be used if no rust is formed.

For further details on Chemlok surface preparation of specific substrates, refer to Chemlok Bulletin DS10-7101, "Preparation of Substrates for Bonding."

Mixing

Thoroughly stir Chemlok 250 adhesive before using and agitate sufficiently during use to keep dispersed solids uniformly suspended.

Dilution of Chemlok 250 Adhesive

Adhesive/Xylene	Viscosity (Zahn #2)
100/10	48 seconds
100/20	30 seconds
100/30	24 seconds
100/40	21 seconds

Chemlok 250 adhesive is usually used full strength for brush and roller applications. For dip applications, dilute 10% to 25% by volume. For spray applications, dilute 25% to 50%, by volume. Give careful attention to agitation since dilution will accelerate settling.

While Chemlok 250 adhesive is tolerant of a wide variety of stock formulation, avoid excessive amounts of oily or waxy compounding ingredients that have limited solubility in the polymer. Use milling or mixing techniques that ensure maximum dispersion of all ingredients. Stocks compounded to give minimum viscosity at maximum scorch time will provide the best adhesion because of better wetting at the elastomer-adhesive interface. Stock preforms, used in compression molding, should be freshened or wiped with an aromatic solvent to remove surface bloom or other contamination prior to molding.

Avoid prolonged storage of compounded rubber stocks.

Application

Good bonding requires a fresh, free-flowing stock surface at the bond interface. Excessive heat during preparation tends to precure the stock and interfere with bond formation.

Apply Chemlok 250 adhesive by brush, dip, roll-coat, or spray (air-atomized, airless or electrostatic equipment) methods. For best results, apply a uniform coating by methods which avoid excessive runs and tears.

Listed below are features of the major application methods:

Brushing - Useful for small runs or production that is not continuous. Complete and uniform coverage is necessary..

Dipping - Convenient and economical for small runs since no special equipment is required. For larger production runs, process can be conveyorized. When dipping, proper withdrawal rate will help prevent the occurrence of tears and fatty edges. Diluting 10% with xylene is suggested.

Table 2: Typical Film Thickness Requirements* of Chemlok 250 Adhesive

Dry Film Thickness (Dip Applied)	Primary Adhesion	Stressed Test Assemblies (Exposed to 5% Salt Fog, Tested at 48 hours)	Boiling H_2O (2 Hours with Bond Stress)
7.5 microns (0.3 mils), 50% dilution, 1 coat	100R	70R/30CM	65R/35CM
20 microns (0.8 mils), 0 dilution, 1 coat	100R	95R, 5CM	95R, 5CM
37.5 microns (1.5 mils), 0 dilution, 2 coats	100R	100R	100R

*Dry Film thickness measured with Nordson magnetic film thickness gauge,
Adhesion and environmental resistance measured to 55 Shore A natural rubber,
Adhesion determined per D429 Method B with 45° angle of peel, 2 inch per minute, 3/16 inch rubber section.

Roll Coating - An excellent method for coating large flat areas, as well as cylindrical objects. For best results, apply uniformly to surfaces.

Spraying - Provides excellent application where selective or spot coating is required. Hand guns are adequate for small runs. On larger runs, automatic guns, together with automatic cleaning and drying units can be used.

When using the spray method, make sure the adhesive is wet when it reaches the metal part. Poor adhesion will result if the spray dries (cobwebbing) before it reaches the metal. Adding a higher boiling solvent such as xylene will help prevent adhesive predrying. To achieve a uniform wet film without runs, the spray equipment needs to be properly adjusted. Usually, dilutions of 25 - 30 seconds work well. For electrostatic applications, dilutions of 4 parts adhesive to 1 part MEK, at 30 seconds Zahn #2, are effective.

Avoid excessive exposure to high humidity. Keep containers tightly closed when not in use. After opening, fit 208.2 liter (55 gallon) drums of Chemlok 250 adhesive with desiccant tubes. Information on desiccant tubes can be obtained from your Lord Chemical Products Representative.

For optimum bond and environmental resistance, the dry film thickness of Chemlok 250 adhesive is 0.5 - 0.7 mils (12.7 - 17.8 microns). Thinner films can be used on easy-to-bond stocks where minimum environmental resistance is required. Thicker films may be necessary on certain hard-to-bond stocks and where maximum environmental resistance is required. Refer to Table 2 for more information on film thickness.

Drying

Allow the adhesive to dry until visual examination of the film shows all solvent has evaporated. This will usually take 20 to 40 minutes at room temperature.

Drying times can be shortened by using hot air drying ovens or tunnels. The metal parts can be preheated up to 65°C (150°F). Although moderate drying temperatures are preferable, temperatures as high as 149°C (300°F) can be used for short periods of time. Maximum air flow at minimum temperatures will give the best results.

Long layover times between cement application and bonding have no adverse effect on the bond, provided the coated parts are covered to prevent contamination. High humidity will shorten layover time. Refer to Table 3 for layover time results.

Table 3: Chemlok 250 Adhesive Layover*

Days	kN/m	Natural Adhesion (55 Shore A)	kN/m	SBR Adhesion (65 Shore A)
1	14.0	80 pli/100R	28.1	160 pli/100R
2	17.0	97 pli/100R	28.2	161 pli/100R
4	14.9	85 pli/100R	24.6	140 pli/100R
7	17.9	102 pli/100R	22.9	131 pli/100R
14	10.3	59 pli/100R	22.8	130 pli/100R

*Layover at 40% - 50% relative humidity at 18°-24°C (65°-75°F),
Adhesion per D429 Method B modified to 45° angle of peel,
2 inch per minute, 3/16 inch rubber section.

Curing

Ideal bonding conditions exist when both the adhesive and the rubber cure at the same time. To accomplish this, determine the scorch time at molding temperature and use this as the maximum allowable time to load both the adhesive coated metal parts into the mold and to fill the cavities with the rubber stock. Refer to Table 4 for bond results in relation to molding temperature.

Table 4: Typical Elevated Temperature Molding Cycles*

Molding Temperatures	kN/m	Bond Results
40' @ 149°C (300°F)	22.9	131 pli/100R
30' @ 165°C (330°F)	24.6	140 pli/100R
20' @ 182°C (360°F)	27.0	154 pli/100R
10' @ 199°C (390°F)	22.8	130 pli/100R

*Layover in 40-50% relative humidity at 18° -24° C (65° -75° F),
Adhesion per D429 Method B modified to 45° angle of peel,
2 inch per minute, 3/16 inch rubber section.

While it is desirable to keep mold loading cycles to a minimum to prevent precure of the adhesive and the rubber, Chemlok 250 adhesive will resist moderate prebaking times without a negative affect on the bond. Dry films of Chemlok 250 adhesive remain firm at molding temperature and show minimum tendency to wipe or sweep under transfer or injection molding conditions.

Stocks compounded to give minimum viscosity at maximum scorch time will promote improved adhesion because of better wetting at the elastomer/adhesive interface. Make sure that transfer or injection molds have properly designed runners and sprues as well as adequate pressures to prevent precure of the rubber before the mold cavities are completely filled.

Subsequent Processing

Dried films of Chemlok 250 adhesive are non-tacky; therefore, coated parts can be piled into tote pans for subsequent processing. The usual handling precautions are necessary. Wear clean gloves when handling cemented parts to prevent contamination of cemented parts by dirt, dust, grease, oil, etc.

The bond formed by Chemlok 250 adhesive will resist the normal postbonding treatments such as flash removal, machining, plating, etc. Do not use procedures that generate excessive heat or excessive exposure to deleterious environments.

High stress concentration points are often where bonded parts will fail. Therefore, it is important that no chipping or abrasion of the dried adhesive occurs at those points prior to bonding. Use a touch-up brush if this type of damage occurs. Avoid tears and adhesive runs in those critical stress areas.

Refer to Table 5 for test results that measure the strength of Chemlok 250 bonded assemblies in various environments.

Clean Up

Solvents such as xylene and MEK have been shown to work well before heat is applied. Once cured, removal by solvent clean up is not possible.

Packaging

- 1 Gallon Container (3.8 Liter)
- 5 Gallon Pail (19 Liter)
- 55 Gallon Drum (208 Liter)

Storage

Store in well ventilated area at a temperature between 21°C - 27°C (70°F - 80°F). Do not store or use near heat, sparks, or open flames.

Cautionary Information

Before using this or any other Lord product refer to the Material Safety Data Sheet (MSDS) and label for safe use and handling.

Table 5: Typical Environmental Resistance* of Chemlok 205 Adhesive Bonded Assemblies

Environment	Test Conditions	Result
ASTM Oil No. 1	70 hrs. @ 149°C (300°F)	100R
ASTM Oil No. 3	70 hrs. @ 149°C (300°F)	100R
Sunamatic Transmission Oil	70 hrs. @ 149°C (300°F)	100R
Turbo Oil 15	70 hrs. @ 149°C (300°F)	100R
JP-5 Fluid	6 days @ 25°C (77°F)	95R
Water	2 hrs. @ 100°C (212°F)	80R
Reference Fuel B	94 hrs. @ 25°C (77°F)	100R
Leaded Gasoline	94 hrs. @ 25°C (77°F)	100R
Low Lead Gasoline	94 hrs. @ 25°C (77°F)	100R
Heat Resistance**	30 min. @ 121°C (250°F)	100R

*Test results per D429 Method B, 45° angle 2 inch per minute, Nitrile elastomer compound bonded.
**Natural Rubber peeled at (121°C) 250°F

Values stated in this bulletin represent typical values as not all tests are run on each lot of material produced. For formalized product specifications for specific product end uses, contact the Customer Service Department.

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