ISO 9001 Registered Quality System,
Burlington, Ontario, Canada QMI File # 004008

NPB Precision Cleaning Solvent 4112 Technical Data Sheet

4112-Liquid

Description

The 4112 *Precision Cleaning Solvent* is a powerful but environmentally friendly cleaner degreaser that is non-toxic, non-flammable, non-corrosive, non-ozone depleting, and non-regulated. Its solvency power allows it to clean many contaminants without requiring changes to existing degreasing equipment and processes. Since it is highly soluble in both alcohols and hydrocarbons, the solvency can easily be extended to clean particularly stubborn contaminants by mixing in suitable co-solvents. The 4112 physical characteristics are close to 1,1,1-trichloroethane, so that switching over to the 4112 should be easy. Only minimal adjustments of the vapor degreasers and ultrasonic tanks should be required. Last but not least, the 4112 often lowers of the overall material and operational costs relative to many other types of cleaning solvent systems.

Applications & Usages

The 4112 cleans oils, greases, waxes, resins, uncured epoxies, polymers, and more. This precision cleaning solvent can be used as a direct drop-in replacement for banned, regulated, or flammable solvent degreaser formulations such as the 1,1,1-trichloroethane, HFC-141b, CFC-112, triochloroethylene, MEK, acetone, and more.

Benefits and Features

- **High Solvency**
- **Non-Flammable and Non-Corrosive**
- **Safe for Most Metal and Plastic Substrates**
  - **Wide cleaning application range**
- **Fast Drying with Low Residue and Low Toxicity**
- **Low Cost:**
  - **Lower priced than many alternatives**
  - **Non-regulated product** = no shipping surcharge
  - **Low hazard** = reduced cost of safety infrastructure, training, and health care
  - **Compatible with vapor degreaser and ultrasonic tank equipment** = low switching costs
- **High Reusability**
  - **Low boiling point** = less energy consumption
  - **Low latent heat** = better vaporization efficiency per heat unit
  - **High vapor density** = less solvent loss due to better recovery efficiency (and lower operator exposure to solvent)

ENVIRONMENT
- RoHS Compliant
- Non-Ozone Depleting
- Low Global Warming Potential
- Biodegradable

Principal Components

Name	***CAS Number***
n-Propyl Bromide	*106-94-5*
1,2-Epoxybutane	*106-88-7*

Properties of the 4112 Solvent

Evaporation Properties	*Data*
Boiling Point	71 °C [160 °F]
Energy Requirements[a)] for Boiling	
Un-insulated Degreaser	13.8 kwh
Insulated Degreaser	7.6 kwh
Vapor Pressure @23 °C	110.8 mmHg
Vapor Density @23 °C	4.3
Specific Heat	0.27 cal/(g·°C) [4.2 J/(g·°C)]
Latent Heat of Vaporization	58.8 cal/g [246 J/g]

a) Energy requirements are based on cleaning five 100 lb loads of steel with 20 gal of solvent per hour. In contrast, chlorinated solvents (1:1:1 Trichlorotehylene, 14.0 kwh; Trichlorotehylene, 16.3 kwh; perchloroethylene, 20.8 kwh) all show higher energy consumptions.

Solvation Parameters	*Data*
Hildebrand Solubility Parameter[b)]	18.2
Kauri-Butanol (KB) Number[c)]	125
Solubility in water (by wt)	0.24 ppm
Solubility for water (by wt)	0.05 ppm
Dielectric Constant[d)]	8.07

b) Contaminants with similar Hildebrand solubility values will likely be miscible
c) The high Kauri-butanol number score indicates good solvent power (more aggressive solvent action)
d) Dielectric Constants of less than 15 are classified as non-polar; we suggest admixture of polar solvents to better dissolve highly ionic contaminants (if present)

Other Properties	*Data*
Odor	Slight, Ethereal
Color	Colorless, Clear
Viscosity @23 °C [73 °F]	0.49 cP [0.00049 Pa·s]
Specific gravity @25 °C [77 °F]	1.35
Non-volatile Residue (%wt)	≤0.001% (≤10 ppm)
Flash Point	None
Flammability Limits (%vol)	Lower: 2.8%; Upper: 9.5%
Surface Tension	25 dynes/cm

b) No detectable flash point by tag close cup method

Properties Continued on Next Page

Environmental Properties	*Data*
Global Warming Potential [e)]	0.31
Ozone Depletion Potential [f)]	0.002—0.026
Atmospheric Lifetime	11 d
Volatile Organic Content	100% (submitted for exemption)

e) Value relative to the global warming potential of CO_2 for 100 year (defined as 1.0)
f) Value relative to the ozone depletion potential for CFC-11 (defined as 1.0)

Soil and Contaminant Removal Lists

Plastic Substrate	*Removal* (g/100 g NPB)	*Plastic Substrate*	*Removal* (g/100 g NPB)
Inorganic compounds	Insoluble	Aromatic hydrocarbons	100
Salts	Insoluble	Chlorinated Oils	100
Sodium Hydroxides	Insoluble	Ester Based Oils	100
Sulfuric Acid	Insoluble	Mineral Oils	100
Water	Slight	Ketones (acetone, MEK)	100
Metal Working Fluids (Synth.)	85	Paraffinic Wax	100
Silicone Oils	90	Synthetic Hydrocarbon Oils	100
Alcohols	100		

NOTE: Solubility scores of 100 g of non-hydrocarbon per 100 g of NPB solvent indicate high removal capacity.

As well as the above, the following oils and greases can be cleaned:

- Oils (low molecular weight hydrocarbons) ✓
- Graphite ✓
- Greases (high molecular weight hydrocarbons) ✓
- Molybdenum Disulfide Greases✓
- Silicone Greases and Lubricants ✓
- Chlorinated Oils and Greases ✓
- BUT NOT Fluorinated Oils and Greases ×

Estimated Solvent Consumption Rate Comparison

The consumption rate of solvent is directly proportional to the cost. The consumption rate is affected by the solvent properties, power requirements, process details (such as cycle time, workload, open system area) and substrate type. To allow for a comparison with other degreasers, a test was performed with an open top vapor degreaser. In each case, the same 24" by 48" opening was used and the instrument was let idle while monitoring the weight loss.

Solvent	***Loss Rate*** lb/(ft^2·h)	kg/(m^2·h)	***TLV 8 h*** ppm
4112 NPB Precision Cleaner Solvent	0.132	0.644	100*
1,1,1-trichloroethane	0.142	0.693	350
Trichloroethylene	0.201	0.981	50
Perchloroethylene	0.293	1.43	25

* Workplace Exposure Limit

This table shows that 4112 consumes 7% less solvent per open area than 1,1,1-trichloroethane.

Compatibility

The NPB solvent is compatible with several plastics and elastomers most metal and inorganics. This means it will clean—without dulling, corroding, or staining—a wider variety of plastics and metals than any other non-NPB degreaser systems.

ATTENTION: Due to the great number of additives and blend varieties on the market, compatibility tests are always recommended before production runs. Compatibilities or incompatibilities listed in the tables below are for typical substrates, but they may not apply.

4112 Compatibility With Plastics

Plastic Substrate	***Compatible***	***Plastic Substrate***	***Compatible***
ABS	✗	Polyester (Mylar)	✓
Acetal (Delrin)	✓	Polyether Ether Ketone (Arlon)	✓
Acrylic	✗	Polyetherimide (Ultem)	✓
Cellulose Acetate	✗	Polyethylene Terephthalate	✓
Chlorinated PVC	✓	Polyimide	✓
Epoxy	✓	Polyoxymethylene	✓
Fluoroethylpropylene	✓	Polypneylene Sulfide (Ryton)	✓
High Density Polyethylene	✓	Polypropylene	✓
Ionomer Resin	✓	Polystyrene	✗
Methylmethacrylate	✓	polytetrafluoroethylene	✓
Molding Compounds	✗	PVC (rigid pipe compound)	✓
Nylon (polyamide)	✓	Polyvinal Chloride, clear	✗
Polyamide	✓	Polyvinylidene Fluoride (Kynar)	✓
Polycarbonate (Lexan)	✗	Vinylester composite	✓

Compatibilities Continued on Next Page

4112 Compatibility With Elastomers

Plastic Substrate	*Compatible*	*Plastic Substrate*	*Compatible*
Acrylonitrile-Butadiene (Bunan)	✗	Isobutylene-Isoprene (butyl)	✗
Butadiene Nitrile	✓	Natural Rubber	✗
Butadiene Styrene	✓	Perfluoroelastomer (Chemraz)	✓
Butyl	✓	Polychloroprene (Neoprene)	✗
Chlorosulfonate Polyethylene	✓	Polysiloxane (silicone)	✗
Epichlorohydrin 956	✓	Polyurethane	✗
Ehylene Propylene	✓	Polyether Urethane	✓
Ethylene-Propylene (Terpolymer)	✗	Polysulfide	✓
Fluorelastomer (Viton A, B)	✓	Vinyl-methyl Siloxane	✓

4112 Corrosion Compatibility With Metals

Substrate	*Soak Test* Corrosion %	*Vapor Test* Corrosion %	*Compatible*
Aluminum	0	0	✓
Brass (Naval)	0	0	✓
Bronze	0	0	✓
Chromium	0	0	✓
Copper	0	0	✓
Iconel	0	0	✓
Iron	0	0	✓
Lead	0	0	✓
Manganese	0	~0 (trace)	✓
Molybdenum	0	0	✓
Nickel	0	0	✓
Steel (1010 Cold Rolled)	0	0	✓
Steel (1010 Iron Phosphated)	0	0	✓
Steel (1010 Zinc Phosphated)	0	0	✓
Stainless Steel (3042B)	0	0	✓
Tin	0	0	✓
Titanium	0	0	✓
Vanadium	0	0	✓
Zinc	0	0	✓
Zirconium	0	0	✓

Compatibilities Continued on Next Page

4112 Compatibility With Inorganics

Substrate	***Soak Test*** Corrosion %	***Vapor Test*** Corrosion %	***Compatible***
Beryllium	0	~0 (trace)	✓
Boron	0	0	✓
Calcium	4.9	7.30	×
Magnesium	0	0	✓

Health, Safety, and Environmental Awareness

Please see the 4112 **Material Safety Data Sheet** (MSDS) for greater details on transportation, storage, handling and other security guidelines.

Environmental Impact: The volatile organic content (VOC) is 100% by EPA and WHMIS standards. However, it is not expected to contribute much to the photochemical reactivity that generates smog. An application has been submitted to get it officially recognized as a VOC-exempt substance. This product is biodegradable with a hydrolysis half-life of 19 days in water.

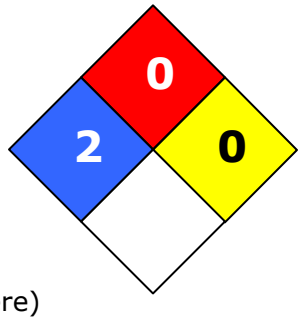
This product meets the European Directive 2011/65/EU Annex II (ROHS); recasting 2002/95/EC.

Health and Safety: The 4112 solvent is easily among the safest cleaning solvents in use today. It is not carcinogenic. It can be absorbed through the skin and it is a mild skin and eye irritant, so gloves should be worn. Vapor or aerosol inhalation cause upper respiratory tract irritation and possible central nervous systems effects, so proper ventilation controls should be used.

HMIS® RATING

HEALTH:	**2**
FLAMMABILITY:	**0**
PHYSICAL HAZARD:	**0**
PERSONAL PROTECTION:	

NFPA® 704 CODES



Approximate HMIS and NFPA Risk Ratings Legend:
0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

Packaging and Supporting Products

Cat. No.	*Form*	*Sizes*	
4112-340G	aerosol	340 g	12 oz
4112-1L	Liquid	1 L	1.0 qt
4112-4L	Liquid	4 L	1.0 qt
4112-20L	Liquid	20 L	1.0 gal
4112-200L	Liquid	200 L	1.0 gal

Technical Support

Contact us regarding any questions, improvement suggestions, or problems with this product. Application notes, instructions, and FAQs are located at www.mgchemicals.com.

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Warranty

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