



**完美配方、  
Perfect Formulations,**

**专业推介、  
Professional Recommendations,**

**成就超级品牌！  
Boost Superbrands for Customers!**

**MWF ADDITIVES HANDBOOK  
金属加工液添加剂手册**

# SMART OIL 思敏油品

## 企业使命 CORPORATE MISSION

营造一个润滑油添加剂及其相关产品的供应平台；  
以产品类别一应俱全、库存充足、品质稳定、  
取价开明的超市策略为经营基础，服务客户。

Provide a Supply Platform for Lubricant Additives and  
related Products to Serve Customers with Supermarket  
Concept that Capitalized on Comprehensive Supplies,  
Explicit Pricing and Consistent Quality.

## 市场信念 MARKET FAITH

正直为本、以客为先；

Integrity Driven with Customer Orientation,

真诚合作、共创佳绩；

Sincere Cooperation for Mutual Benefits,

质造市场、满足客户。

Quality Marketing to Customer Satisfaction.

## 服务承诺 SERVICE COMMITMENTS

完美配方、专业推介、成就超级品牌。

Perfect Formulations, Professional Recommendations,  
Boost Superbrands for Customers!

## 思敏油品简介 SMART OIL PROFILE

**思敏油品化工有限公司** 专业经营金属加工液及特种油品添加剂；一九九四年成立於香港，以中国市场为主要服务对象。多年来，思敏致力营造一个润滑添加剂及相关产品的供应平台，为客户提供品质稳定、类别齐全、性价比高的添加剂产品。发展至今，思敏已成为金属加工液添加剂市场中极具代表性的经营商之一。

**Smart Oil & Chemical Ltd.** specializes in metal working fluids and specialty lubricant additives. Founded in 1994 in Hong Kong, Smart Oil focuses on China market. For many years, Smart Oil has dedicated to maintain a supply platform for lubricant additives and related products, so as to supply our customers comprehensive and cost-effective additive products with consistent product qualities. Now, Smart Oil has developed to be one of the most leading representative endeavors in the market of metal working fluid additives.



思敏®



近30年来，我们经销行业领先的国际品牌产品，包括：

For the last three decades, we have been distributing products of leading international renowned brands, including:

- ▶ **法国阿科玛公司**: 浅色低味硫化添加剂、水基含硫极压剂;  
**ARKEMA of France**: light color, low odor sulfurized additives, water-based sulfurized additives;
- ▶ **美国伊士曼公司**: 多功能胺添加剂;  
**EASTMAN of the US**: multifunctional amine additives;
- ▶ **美国功能产品公司**: 增稠剂、粘度改进剂、食品机械级润滑添加剂;  
**FUNCTIONAL PRODUCTS of the US**: tackifiers, viscosity modifiers, food machinery lubricant additives;
- ▶ **美国杜发化学公司**: 硫、氯、磷、代氯添加剂、界面润滑剂、水基防锈剂。  
**DOVER CHEMICAL of the US**: sulfurized, chlorinated, phosphorus and chlorine replacement additives, boundary lubricants, water-based rust preventives;

思敏累积多年产品开发及现场实务经验；对配方优化、添加剂相容性和生产工艺均有深入见解。我们提供的添加剂产品种类繁多，包括：

Based on years of product development and hands-on experience on-site, Smart Oil has gained in-depth insights into formula optimization, additive compatibility, and production engineering. Our additive products dedicated to customers include:

黑色及浅色低味硫化添加剂、水基及油性防锈剂、杀菌防霉剂、乳化油复合剂、天然及合成脂肪酸酯、动植物脂肪酸、消泡剂、水基极压添加剂、界面润滑剂、石蜡分散剂、氯化添加剂、含磷化合物、水基系统稳定剂、半合成及全合成浓缩液、清洗剂、工业润滑脂、攻牙油精、拉伸成型油精、粘度改进剂、设备用油添加剂、增粘剂，以及相关依客户规格调整的OEM产品。

Dark-color and light-color, low-odor sulfurized additives, water-based and oil-based rust-preventives, bactericides and fungicides, emulsifier packages, natural and synthetic fatty esters, animal-based and plant-based fatty acids, defoamers, water-based EP additives, boundary lubricants, paraffin wax dispersants, chlorinated additives, phosphorus-containing additives, water-based system stabilizers, semi-synthetic and synthetic concentrates, cleansing agents, industrial grease, tapping oil concentrates, drawing and forming oil concentrates, viscosity improvers, equipment oil additives, tackifiers, and related OEM customized products based on specification requirements.

### 广东省清远英德生产基地 Production Base in YingDe, QingYuan of Guangdong Province

2022年初，我司坐落于广东省清远英德市的生产基地 - 思敏(清远)润滑科技有限公司 - 正式投入服务。新公司占地面积 23,502m<sup>2</sup> (建筑面积 10,465m<sup>2</sup>)。规划生产优质的金属加工液、润滑添加剂及高效水处理剂产品。公司是集研发、生产及营销于一体的科技型企业，已通过ISO 9001:2015 质量管理体系和 ISO 14001:2015 环境管理体系认证。

In early 2022, our production base in YingDe, QingYuan - Smart (QingYuan) Lubrication Technologies Co., Ltd - was put into service officially. The new company occupies area of 23,502m<sup>2</sup> (construction area 10,465m<sup>2</sup>). It was planned to manufacture premium quality metalworking fluids, lubricant additives, and high-performance water treatment agents. We are tech-savvy company integrating R&D, manufacturing and marketing capabilities, and have passed ISO 9001:2015 Quality Management Systems and 14001:2015 Environmental Management Systems certification.

ARKEMA

EASTMAN

FUNCTIONAL PRODUCTS INC.  
Innovative Chemistry For Lubricants

DOVER Chemical Corporation  
A Subsidiary of ICC Industries Inc.

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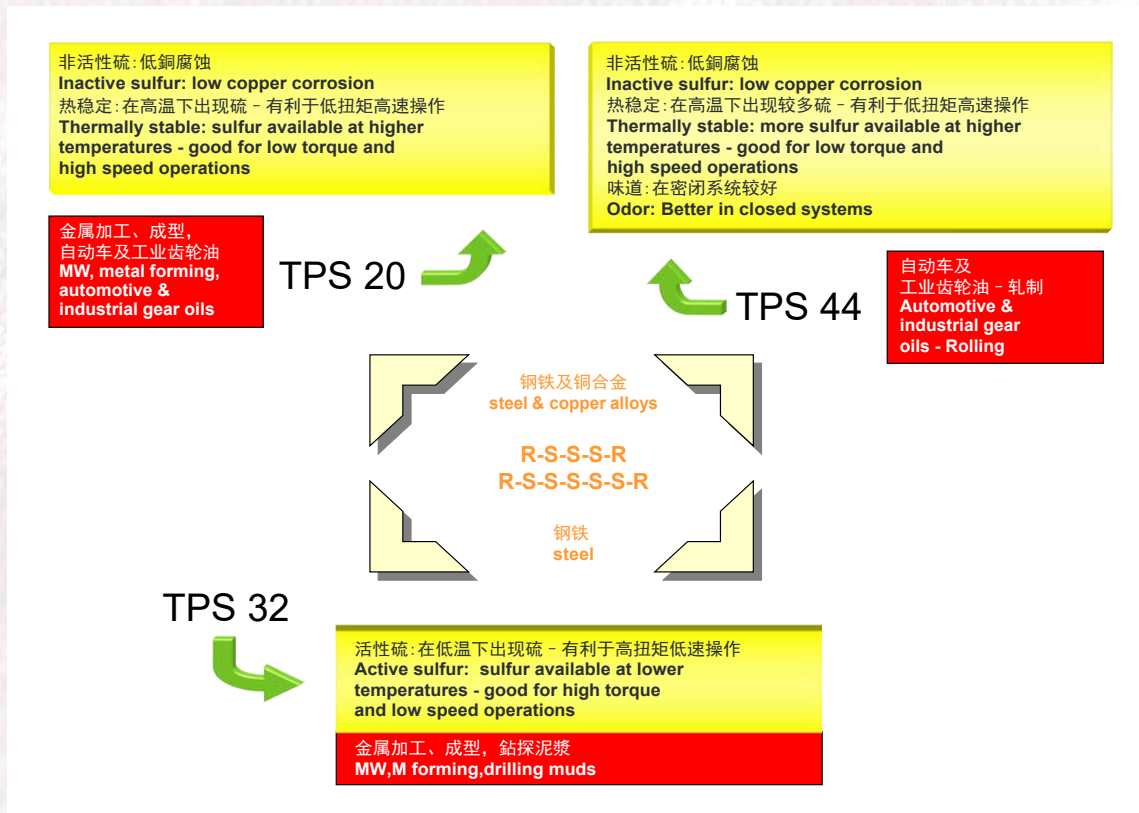
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## 阿科玛含硫添加剂

## ARKEMA SULFUR CONTAINING ADDITIVE

阿科玛公司累积40年硫化学专业技术，在硫化学占据领导地位；产品包括多硫聚合物 (TPS) 及植物基多硫化物 (VPS) 系列；是应用于金属加工液及齿轮油的优良极压添加剂。这两系列产品一直为各大油公司、天然气公司及各中小型企业所采用。产品能满足现代润滑剂最苛刻的要求。再者，产品味低、色浅，安全及环保。活性硫化添加剂在低温时即能与金属产生反应，而非活性硫则相应非常稳定，对铜不易产生腐蚀问题。

Arkema has cummulated 40 years experience in thio-chemical professional technologies, occupying the leading position in thio-chemistry. Their products include polysulfides (TPS) and vegetable-based sulfurized product (VPS) series; which are premium EP additives for metal working fluids and gear oils. The two series have long been adopted by the oil majors, natural gas companies and the medium and small business enterprises. The products can satisfy the most severe requirements of modern lubricants. Also, products possess low odor, light color; safe to use and environmentally sound. The active sulfur additives react with metal promptly under low temperature, and the non-active counterparts are very stable, not easy to pose corrosion problems to copper.



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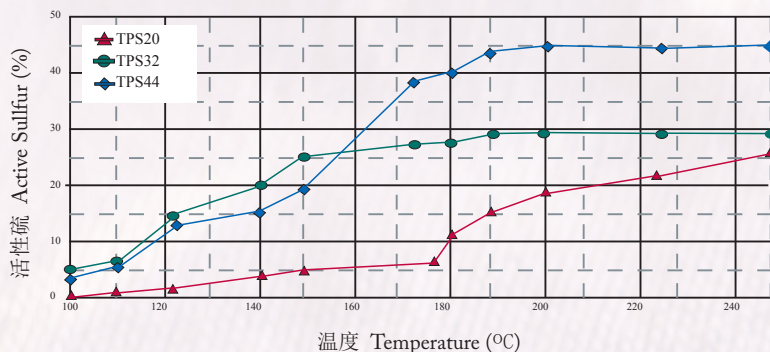
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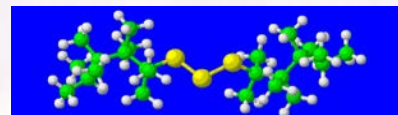
## 产品特性 PRODUCT FEATURES TPS / VPS

### 活性硫 ACTIVE SULFUR

活性硫可参考在铜粉存在的情况下，添加剂释放出来的硫含量。  
Active sulfur refers to the sulfur content released from additive in the presence of copper powder.

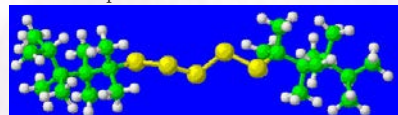


TPS 20  
C<sub>24</sub>H<sub>50</sub>S<sub>3</sub>  
分子量 MW = 434



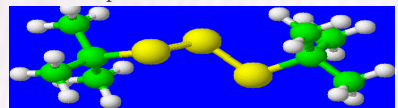
成分 Composition C:66.3% H:11.6% S:22.1%

TPS 32  
C<sub>24</sub>H<sub>50</sub>S<sub>5</sub>  
分子量 MW = 498



成分 Composition C:57.8% H:10.1% S:32.1%

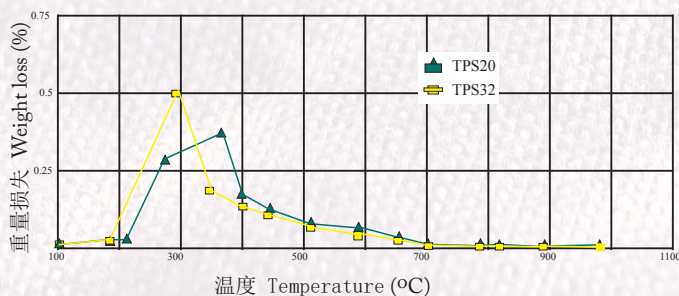
TPS 44  
C<sub>8</sub>H<sub>18</sub>S<sub>3</sub>  
分子量 MW = 210



成分 Composition C:45.7% H:8.6% S:45.7%

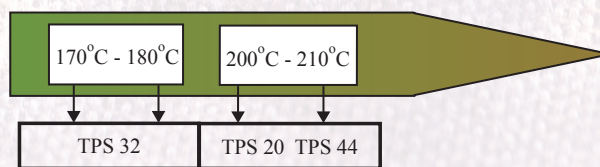
### 热稳定性 THERMAL STABILITY

添加剂的热稳定性是一很好的性能指标。数据显示三硫化物(TPS20)的热稳定性较五硫化物(TPS32)好。  
Thermal behavior of additives is a good indicator of performance. Figures show that trisulfides (TPS20) present higher thermal stability than pentasulfides (TPS32).



不同温度下铜粉释放量的多少显示活性硫的含量。  
Active sulfur content is indicated by copper powder discharged under different temperatures.

差示扫描法量起始分解温度  
DSC Start Decomposition Temperature



根据热重量分析显示产品在不同温度下的重量损失情况。  
Weight loss of products as function of temperature by Thermal Gravimetric Analysis

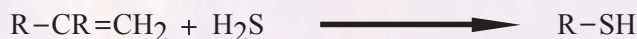
烷烃 ALKYL (R)	硫醇 (RSH) MERCAPTAN	非活性硫 INACTIVE SULFUR	活性硫 ACTIVE SULFUR	气味 ODOR
C12	叔基十二烷基硫醇 (TDM) tert-Dodecyl Mercaptan	TPS 20	TPS 32	十分低 Very Low
C4	叔基丁烷基硫醇 (TBM) tert-Butyl Mercaptan	TPS 44		中等 Medium

### 叔烷基多硫化物(TPS)生产工艺

#### PRODUCTION PROCESS OF TERTIARY ALKYL POLYSULFIDE

TPS 低味、浅色、与多种底液相容、高硫含量和高极压强度。这些特质是基于以高纯硫醇(RSH)为起始的特有生产工艺。

TPS exhibits outstanding performances: low odor, light color, excellent solubility in a variety of base fluids, high sulfur content and high EP capacity. These properties stem from their unique manufacturing process starting from high purity mercaptans (RSH).



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产品应用 PRODUCT APPLICATIONS

型号 BRAND	拉削 铁金属 BROACHING FERROUS METALS	拉削非 铁金属 BROACHING NON- FERROUS METALS	切削 铁金属 MACHINING FERROUS METALS	切削非 铁金属 MACHINING NON- FERROUS METALS	拉伸 冲压 DRAWING STAMPING	齿轮油 GEAR OILS	润滑脂 LUBRICATING GREASES	磨削 铁金属 GRINDING FERROUS METALS	磨削非 铁金属 BROACHING NON- FERROUS METALS	加工 铁金属 PROCESSING FERROUS METALS	加工非 铁金属 PROCESSING NON- FERROUS METALS	滚轧油 ROLLING OILS	攻丝 TREADING
TPS 20	•	•	•	•	•	•	•	•	•	•	•	•	•
TPS 32	•		•		•			•		•			•
TPS 44						•	•						
VPS 11	•	•	•	•	•	•	•	•	•	•	•	•	•
VPS 15	•	•	•	•	•	•	•	•	•	•	•	•	•
VPS 17	•		•		•			•		•			•

硫化极压添加剂 TPS SULFURIZED EP ADDITIVES 叔烷基多硫化物 TERTIARY ALKYL POLY-SULFIDES

型号 BRAND 类别 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES										
	原液 ORIG. FLUID	5% 稀释 DIL		硫 S (活性 硫) (ACT S) wt %	动力 粘度 KIN. VISCOSITY mm <sup>2</sup> /s	颜色 COLOR	闪点 FLASH POINT °C	倾点 POUR POINT °C	四球极压 4 BALL EP Pd / Pb (负载磨 损指数) (LOAD WEAR INDEX)	四球 磨损 4 BALL WEAR	瑞查特 试验 REICHERT TEST	铜腐蚀 Cu Corr. (1% 硫等量 EQ S ISO22基础油 BASE OIL) ASTM D130		
				ASTM D1662 @ 150 °C	ASTM D445 @ 40 °C	ASTM D1544 GARDNER (D1500)	ASTM D93 闭口杯 ASTM D92 (开口 杯) (O CUP)	ASTM D97 -96a	ASTM D2783 5% ISO VC32 石蜡基 基础油 PARAFFINIC BASE OIL	IP239 40kg 1hr 磨损 直径 WEAR DIA mm	磨痕 面积 WEAR SCAR 300N 负荷 LOAD mm <sup>2</sup>	纯产品 PURE PRODUCT	加入 ①二硫基 DIMERCAPTO- THIAZOLE ADDED (%)	加入 ②苯并 三氮唑 BENZO- TRIAZOLE ADDED (%)
TPS 20 二烷基 三硫化物 Dialkyl Trisulfide			非腐蚀性(铜腐蚀 1a), 适用于有色金属。气味极低。热稳定性高, 硫可存于高温(起始分解温度200-210°C)。适用于低扭矩高速操作; 包括一般加工、成型、汽车及工业齿轮油。 Non-corrosive(Cu corr. 1a), suitable for yellow metals. Very light odor. High thermal stability. Sulfur can exist in high temperature (init. decomposition temp 200-210°C). Suitable for low gear high-speed operations; including general operation, forming, car and industrial gear oils.	20 - 23 (4)	53	2 (≤5)	≥121	≤ -20	250/76 (50)	0.78	4	≤1b	NA	NA
TPS 32 二烷基 五硫化物 Dialkyl Penta- sulfide			活性硫, 不适用于有色金属。可调配纯油及乳化切削油。气味极低。硫可存于低温下(起始分解温度170-180°C), 适用于高扭矩低速操作; 包括一般金属加工、成型和钻井液。 Active sulfur, not suitable for yellow metals. Can be blended with neat and soluble cutting oils. Extremely low odor. Sulfur can exist in high temperature (init. decomposition temp 170-180°C). Suitable for high gear low-speed operations; including general metal operations, forming and well drilling fluids.	29 - 32 (23)	64 @50 °C	6 (≤10)	≥121	≤ -20	315/82 (72)	1.07	9.7	4c	1a-1b (0.3)	1a-1b (0.1)
TPS 44 二烷基 三硫化物 Dialkyl Trisulfide			硫含量高, 适用于齿轮油等工业润滑油和润滑脂。非腐蚀性, 适用于有色金属。热稳定性高, 更多硫可存于高温(起始分解温度200-210°C)。适用于低扭矩高速操作; 包括汽车/工业齿轮油及轧制油。有味, 较适合密闭系统中。 High sulfur, suitable for industrial lub like gear oils and lubricating grease. Not corrosive, suitable for yellow metals. High thermal stability, more sulfur can exist in high temperature (init. decomposition temp 200-210°C). Suitable for low gear high-speed operation; including car/ industrial gear oils and rolling oils. With odor, better used in closed systems.	42 - 48 (18)	4 @20 °C	4 (-)	≥70	≤ +10	400/63 (64)	0.85	2.6	≤1b	1a (0.08)	1a (0.01)

注 Note: 1: 硫清道夫 Sulfur Scavenger 2: 表面减活剂 Surface Passivator







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## 硫化极压添加剂 VPS SULFURIZED EP ADDITIVES 植物基多硫化物 VEGETABLE BASED POLY-SULFIDES

型号 BRAND 类别 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES									
	原液 ORIG. FLUID	5% 稀释 液 DIL		硫 S (活性硫) (ACT S) wt %	动力 粘度 KIN. VIS. mm <sup>2</sup> /s	颜色 COLOR	闪点 FLASH POINT °C	倾点 POUR POINT °C	四球极压 4 BALL EP Pd/Pb (负载磨 损指数) (LOAD WEAR INDEX)	四球 磨损 4BALL WEAR	瑞查特 试验 REICHERT TEEST	铜腐蚀 COPPER CORR.	H.S 试验 TEST
				ASTM D1662 @ 150°C	ASTM D445 @ 40°C	ASTM D1544 GARDNER (D1500)	ASTM D93 闭口 杯 C CUP ASTM D92 (开口 杯) O CUP	ASTM D97 -96a	ASTM D2783 5% ISO VG32 石蜡基 基础油 PARAFFINIC BASE OIL	IP239 40kg 1hr 磨痕 直径 WEAR DIA mm	磨痕 面积 WEAR SCAR 300N 负荷 LOAD mm <sup>2</sup>	ASTM D130 10% 3h, 100°C	醋酸 盐 试纸 颜色 ACETATE PAPER COLOR
VPS 11 硫化植物 脂肪酯 Fatty Ester Tri- glyceride			低味、热稳定。提供润滑、抗磨及极压特性。非腐蚀性，可用于有色金属。可调纯油或乳化液。与TPS 20相配，有良好表现。 Low odor, thermally stable. Provide lubricity, anti-wear and EP properties. Non-corrosive, can be used for yellow metals. Can be blended with neat and soluble oils. Good performance when blended with TPS 20.	>10 (<1)	200 - 300	<7	>150	≤ -10	250/80 (42)	0.5	1.2	≤1b	<3
VPS 15 硫化植物 脂肪酯 Fatty Ester Tri- glyceride			低味、热稳定。提供润滑、抗磨及极压特性。非腐蚀性，可用于有色金属。可调纯油或乳化油。与TPS20相配，有良好表现。 Low odor, thermally stable. Provide lubricity, anti-wear and EP properties. Non-corrosive, can be used for yellow metals. Can be blended with neat and soluble oils. Good performance when blended with TPS20.	14.5 - 16 (8)	550 - 750	<6.5	>100	≤ -10	400/80 (62)	0.76	0.8	≤1b	<3
VPS 17 硫化植物 脂肪酯 Fatty Ester Tri- glyceride			低味、热稳定。提供润滑、抗磨及极压特性。腐蚀性，不适合有色金属。可调配纯油和乳化液。与TPS 32相配，有良好表现。 Low odor, thermally stable. Provide lubricity, anti-wear and EP properties. Corrosive, cannot be used for yellow metals. Can be blended with neat and soluble oils. Good performance when blended with TPS 32.	16 - 18 (8)	10 - 30	<5	>150	≤ -10	315/63 (62)	0.72	1.0	4a - 4c	<5

## 水溶性硫化极压添加剂 WATER SOLUBLE EXTREME PRESSURE ADDITIVE






型号 BRAND 类别 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES					
			硫含量 SULFUR CONTENT (wt%)	颜色 COLOR (APHA)	闪点 FLASH POINT °C 闭口杯 Close Cup	pH	铜腐蚀 COPPER CORR. 100% 98°C 4h	粘度 VISCOSITY 20°C mPas
SPS 10LS 硫极压 润滑 添加剂 Extreme Pressure Lubricant Additive		没异味、水溶性、含非活性硫极压添加剂。不易腐蚀铜、铝。与水可以任何比例相容，且在任何碱性pH值下都非常稳定。推荐用于液压液、半合成及全合成金属加工液中。能有效提高产品的极压性。若与抗磨添加剂一起使用，效果更佳。其使用量视产品配方而定，5%-20%即能提高极压性能。用于全合成或半合成加工液时，不易引起泡沫。与其他添加剂配合，稳定性及相容性好。加工液在未滋生细菌情况下可存放超过12个月而不变质。 No stange odor, water-soluble, EP additive containing contains non-active sulfur. Not easily stain copper and aluminum. Soluble in all proportions with water, and is stable at full alkaline pH. Recommended for hydraulic fluids, synthetic and semi-synthetic metal working fluids. Can elevate EP properties of product. More superior effect can be attained when working with anti-wear additives. Treat rates depend upon individual formulations, but 5-20% immediately give outstanding performance. Not easy to cause foaming problem when used with synthetic or semi-synthetic fluids. Good stability and compatibility with other additives. The metal working fluid can be stored for over 12 months without degradation when there is no bacteria proliferation.	9.5 - 10.5	≤50	>110	>7	1b	2.22

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## 表面活性剂 SURFACTANTS


型号 BRAND 类别 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES							
			比重 S.G. 20°C	碘值 IODINE VALUE I <sub>g</sub> /100 g	闪点 FLASH POINT °C 闭口杯 Close Cup	浊点 CLOUD POINT °C MAX	总碱值 TOTAL ALKALINITY ml HCL(N)/g	酸值 ACID VALUE mg KOH/g	含水量 MOISTURE % MAX	粘度 VISCOSITY 20°C mPas
Surfaline OC5 C16-C18 烷基醇(5EO) Oleocetyl Alcohol (5EO)	 半透明 Trans- lucent	由C16-1醇8和5个环氧乙烷分子化合而成的非离子表面活性剂。能乳化矿物油及天然油脂，可提供良好的清洗性；能有效提高铝及铸铁的加工性能。 Non-ionic surfactant obtained by reaction between oleocetyl alcohol and ethylene oxide (5 moles). Excellent emulsifier for mineral and natural oils, provides good detergency property that is highly effective for aluminium and cast-iron machining.	NA	NA	NA	69 - 73	NA	NA	1	3
Surfaline R20 聚氧乙烯 蓖麻油 Ethoxylated Castor Oil	 清澈黄 Clear Yellow	聚氧乙烯蓖麻油，非离子型表面活性剂，HLB值为10。可做甘油三油酸酯及菜油的乳化剂。 Ethoxylated castor oil non-ionic surfactant with HLB value of 10. Can be used as emulsifying agent for oleine and vegetable oils.	1.040	≥80	NA	64 - 70	NA	NA	0.5	NA
Inipol 002 烷基二胺衍生物 Alkyldiamine Derivatives	 乳白 Milky White	由脂肪酸和脂肪二胺反应制备的盐，有良好的亲油及疏水特性。能吸附在亲水及潮湿的表面然后产生脱水及排水效果。不溶于水，溶于大部分的有机溶剂。可应用于拉拔软铜、铝管、棒、及线等金属加工配方中。 Salt from fatty acid and fatty diamine, with good lipophilic and hydrophobic properties. Can be adsorbed onto the hydrophilic or moist surfaces to give dewatering and water repelling effect. Insoluble in water, soluble in most organic solvents. Can be used for drawing soft copper, aluminium tubing, rod and wire in metal working formulations.	870 kg/m <sup>3</sup> @50°C	NA	<100	NA	2.15 - 2.35	53.6 - 58.6	1	NA
Noramox C5 乙氧基椰油烷基胺 Polyoxyethylene (5) Coco Amine	 琥珀 Amber	在碱性及中性溶液呈非离子型的表面活性剂。在酸性溶液中呈阳离子型。可作为润湿剂、分散剂及乳化剂。 Non-ionic surfactant in alkaline or neutral aqueous solution. Enables cationic property in acidic aqueous solution. Can be used as wetting and dispersing agent, and emulsifier.	0.980	NA	<100	NA	2.25 - 2.45	NA	0.5	150
Surfaline OX10M08 烷基基表面活性剂 Alkoxylyated Surfactant	 清澈 Clear	特种烷基基表面活性剂，可应用于洗涤及纺织加工行业作为润湿剂使用；具高消泡性能。 Specialty Alkoxylyated Surfactant, can be used as wetting agent in detergent applications and textile processing; possesses high defoaming property.	NA	NA	NA	49 - 52	NA	NA	NA	NA

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## 含磷化合物 PHOSPHORUS CONTAINING ADDITIVES

型号 BRAND 类别 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES							
			比重 S.G. 20°C	碘值 IODINE VALUE I <sub>g</sub> /100 g	闪点 FLASH POINT °C 闭口杯 Close Cup	浊点 CLOUD POINT °C MAX	总碱值 TOTAL ALKALINITY ml HCL(N)/g	酸值 ACID VALUE mg KOH/g	含水量 MOISTURE % MAX	粘度 VISCOSITY 20 °C mPas
Surfline PE684 油醇磷酸酯 (SEO) Phosphate Ester of Oleyl Alcohol (SEO)	 琥珀 Amber	含5个环氧乙烷分子的油醇磷酸酯。可作金属加工液的抗磨添加剂。产品与硫搭配时可发挥油性剂和防锈剂的协同作用。乳化能力良好，在硬水中可保持稳定状态。 Phosphate Ester of oleyl alcohol with 5 ethoxylates. Anti-wear additive for metal working formulations. Exhibits oiliness and anti-corrosion properties, and brings synergies, for products with sulphur. Excellent emulsification power, and stable in hard water.	NA	NA	NA	NA	NA	150 - 165	2	NA

## 其它添加剂 OTHER ADDITIVES



型号 BRAND 类别 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES							
			比重 S.G. 20°C	折光系数 REFRAC INDEX 20°C	闪点 FLASH POINT °C 闭口杯 Close Cup	沸点 BOILING POINT °C	pKa 20°C	表面张力 SURFACE TENSION 25 °C nM/m	蒸汽压 VAPOR PRESS 20 °C Pa	粘度 VISCOSITY 20 °C mPas
Alpamine N41 多功能 中和性胺 Multi- Functional Neutralizing Amine	 清澈 Clear	多功能水基系统稳定剂，中和能力强。正常环境下能保持pH在应用范围内。低味，低表面张力，有湿润效能。高沸点，蒸发率低。有抑菌功能，与大部分杀菌剂有协同效应；故能在水性配方中大大减少杀菌剂加入量。可提升防腐性能。偶合性能高，可有效维持产品的乳化稳定性。 Multifunctional water-based system stabilizer with high neutralising capability. Can maintain pH range under normal condition. Low odor, low surface tension with wetting capability. High boiling point, with low vaporation rate. Can restrain bacteria growth, have synergistic effect with majority of biocides; so can greatly reduce treat rate of biocides. Can boost anti-corrosion property. High coupling power, can effectively maintain emulsion stability of products.	0.895	1.445	85	186	9.9	27	40	19.5
Hexasol 水基 偶合剂 Water Based Coupling Agent	 清澈 Clear	水白带氧溶剂，溶解能力高。可与脂肪类及芳烃混合；亦能与水、酒精和脂肪酸等极性物质相混；能把油及水连在一起；是多功能的偶合剂。低度可燃、低蒸发率、低表面张力。适用于液压液、金属加工液及钻井液。 Water white oxygenated solvent with high solubility. Can mix with aliphatics and aromatics, also with polar materials like water, alcohols and fatty acids; being a multifunctional coupling agent. slightly flammable, with low vaporisation rate, low surface tension. Suitable for hydraulic oils, metal working fluids and drilling fluids.	0.920 - 0.923	1.4276	97	197.5	NA	28.5	7	38

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## 合成酯 SYNTHETIC ESTERS

型号 BRAND 类别 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES								
			C18酯含量 C18 ESTER CONTENT %		碘指数 IODINE INDEX g/100 g		色值 POUR POINT °C		酸指数 ACID INDEX mg KOH/g		
			最小值 MINI	最大值 MAXI	最小值 MINI	最大值 MAXI	最小值 MINI	最大值 MAXI	最小值 MINI	最大值 MAXI	
Esterol A		<p><b>介绍 Description</b></p> <ul style="list-style-type: none"> <li>线性脂肪酸甲酯：饱和与不饱和，特别是C18类（主要是油酸和亚油类） Methyl esters of linear fatty acids: saturated and unsaturated, essentially in C18 (primarily oleate and linoleate).</li> <li>100%植物基，产自蓖麻油 100% vegetable oil origin, processed from castor oil.</li> <li>易于生物降解：28天后75% Readily biodegradable: 75% after 28 days (方法 Method OECD TestGuideline 301 B)</li> </ul> <p><b>典型特性 Typical characteristics</b></p> <ul style="list-style-type: none"> <li>油点 (11°C) 外观：有针状晶体的清澈透明液体 Appearance at cloud point (11 °C): clear limpid liquid with presence of crystals and needles</li> <li>凝固点 Freezing point: 6 °C</li> <li>假如需要在低温使用，我们建议 Oleris® Esterol F</li> <li>If low temperature is needed we recommend to use Oleris® Esterol F grade</li> <li>Kauri-Butanol Value 值：IKB= 69 (ASTM D1133)</li> <li>亲水-亲油平衡：HLB=11，可用作水溶性非离子表面活性剂 Hydrophilic-Lipophilic Balance: HLB = 11, can be formulated in aqueous solutions with non-ionic surfactants</li> <li>高沸点 High boiling point (354 °C)，高闪点 high flash point(173 °C)</li> </ul> <p><b>应用 Applications</b></p> <ul style="list-style-type: none"> <li>润滑油添加剂（用作粘度调节剂），主要切削油和金属加工液 Lubricant additive (as viscosity regulator) in cutting oils and metal working fluids</li> <li>皮革纺织品处理用油剂 Oily agent for the treatment of leather and textile</li> <li>脱油脱脂清洗剂 Degreasing and cleaning agent</li> <li>涂料和胶黏剂行业生物基增塑剂 Bio-based plasticizers in coatings and adhesives applications.</li> </ul>	75	-	100	200	-	5	-	5	<p>注册识别码 Identification numbers Registrations</p> <p>CAS-No: 67762-38-3</p> <p>EC Nr: 267-015-4</p> <p>REACH (欧洲 Europe): 01-2119471664-32-0076</p>
Esterol F		<p><b>介绍 Description</b></p> <ul style="list-style-type: none"> <li>线性脂肪酸甲酯：饱和与不饱和，特别是C18类（主要是油酸和亚油类） Methyl esters of linear fatty acids: saturated and unsaturated, essentially in C18 (primarily oleate and linoleate)</li> <li>100%植物基，产自蓖麻油 100% vegetable oil origin, processed from castor oil</li> <li>Esterol F 98% 易于生物降解 98% of Esterol F is readily biodegradeable</li> </ul> <p><b>典型特性 Typical characteristics</b></p> <ul style="list-style-type: none"> <li>油点 (6°C) 外观：有蜡状小颗粒的清澈透明液体 Appearance at cloud point (6°C): clear limpid liquid with presence of small wax particles</li> <li>倾点 (-8°C) 外观：不透明白色粘性液体 Appearance at pour point (-8°C): opaque white viscous liquid</li> <li>高沸点 High boiling point (305°C)，高闪点 high flash point (167°C)</li> </ul> <p><b>应用 Applications</b></p> <ul style="list-style-type: none"> <li>混凝土脱模剂（适合所有季节配方） Concrete mould-release agent (all seasons formulations)</li> <li>沥青助熔剂 Fluxing agent in asphalt and bitumen</li> <li>润滑油添加剂（用作粘度调节剂），主要切削油和金属加工液 Lubricant additive (as viscosity regulator) in cutting oils and metal working fluids</li> <li>农药制剂用溶剂 Solvent for agrochemical preparations</li> </ul>	73	-	100	120	-	< -8	-	5	

## 主要组分 Typical composition

Esterol A C18 链段 CHAINS (> 75%) , Esterol F C18 链段 CHAINS (> 73%)		其他链段 OTHER CHAINS	
C18:0	硬脂酸酯 STEARATE	C16:0	棕榈酸酯 PALMITATE
C18:1	油酸酯 OLEATE	C13:1	十三烯酸酯 TRIDECENOATE
C18:2	亚油酸酯 LINOLEATE	C11:1	十一烯酸酯 UNDECYLENATE
C18:1, OH	蓖麻酸酯 RICINOLEATE		

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伊士曼Synergex 多功能胺添加剂与其它胺配合应用或在浓缩液、旧液池边中单独使用，或是用于制造防锈抑制剂盐及酰胺。Synergex产品能延长冷剂寿命和改进大部分水基金属加工液的性能。

Synergex multifunctional amine additives from Eastman can be used in combination with other amines or used by themselves in a concentrate, used tank side, or used to make corrosion inhibiting salts and amides. Synergex products can extend coolant life and improve the performance of most water-based metalworking fluids.






使用Synergex有多项优点，例如改进pH控制、较大乳化稳定性、低挥发性、低味和良好水溶性。

With the use of Synergex, multiple benefits are available such as improved pH control, greater emulsion stability, low volatility, low odor and good water solubility.

Synergex能与如杀菌剂、防霉剂、金属钝化剂和腐蚀抑制剂等其它添加剂匹配以提升效能。再者，他能与多种羧酸结合成盐以达腐蚀抑制目的。

Synergex can be compatibility with other additives such as biocides, fungicides, metal deactivators and corrosion inhibitor that can boost their performance as well. Besides, it can combine with various carboxylic acids to make the salts for corrosion inhibiting purpose.

## 多功能胺添加剂 MULTIFUNCTIONAL AMINE

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议加入量 SUGGESTED TREAT RATE %	典型数据 TYPICAL PROPERTIES				
				密度 DENSITY g/cm <sup>3</sup> @20°C	凝固点 FREEZING POINT °C	沸点 BOILING POINT °C	闪点 FLASH POINT 闭杯 TAG CLOSED CUP °C	蒸气压 VAPOUR PRESSURE hPa
Synergex 烷基醇胺 Alkyl Alkanol Amine	 无色 Colorless	多功能水基系统稳定剂。正常条件下能保持pH在应用范围内。用于各水基系统。能增强与水基系统其它成分的相容性。有效延长系统寿命。产品亦具防锈及杀菌功能。不含苯酸衍生物等类似有害物质。 Multipurpose water-based system stabilizer. Can control pH to the range of application under normal condition. For use in various water-based systems. Can enhance compatibility with other components in water-based systems. Effectively prolongs system usage life. Product can also provide anti-rust and biocide function. Contains no benzoic acid derivative and similar harmful materials.	2 浓缩液 Concentrate	0.890	-2.5	197.7	97.5	0.1394 @20°C
Synergex T 烷基醇胺 Alkyl Alkanol Amine	 无色 Colorless		0.1-0.2 槽边添加 Tankside	0.963 - 0.980	-70	283	141	< 0.01 @25°C
IPAE 异丙基氨 乙醇混合物 Isopropyl Amino Ethanol Mixed	 无色 Colorless	由70%异丙基氨乙醇与30%异丙基二乙醇胺混合而成。可在乳化油，半合成及防火液压油中提供润滑，pH调节及防锈功能。 A blend of 70% isopropylaminoethanol and 30% isopropyl diethanolamine. Provides lubrication, pH adjustment and anti-rust properties in soluble oils, semi-synthetic coolants and fire resistant hydraulic oils.	3-15 浓缩液 Concentrate  0.5-2 槽边添加 Tankside	0.930	-50 (光透) (Glassy)	110 - 265	75	0.4 @20°C
MDEA 甲基二乙醇胺 Methyl Diethanolamine	 无色 Colorless	低挥发性，低味叔胺。作中和剂应用于多种金属加工液配方中使用。 Low VOC, low odor tertiary amine. For use as neutralizing agent in vast types of metalworking fluids	3-20 浓缩液 Concentrate	1.040	-21.3	243.3	138	0.0031
Synergex LA 疏水性的 N-烷基醇胺类 Hydrophobic N-alkylalkanolamine	 无色 Colorless	略带臭味，属疏水性的N-烷基醇胺。用于金属加工液中作为疏水性胺中和剂及生物稳定剂。 Mild odor, hydrophobic N-alkylalkanolamine. For use as hydrophobic neutralizing amine and bio-stabilizing agent.	0.5-2 槽边添加 Tankside	0.860	-75	227.3	96	<0.05

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## 产品选择指南 SYNERGEX™ PRODUCT SELECTION GUIDE

伊士曼公司的Synergex胺类添加剂系列显著提高金属加工液的性能，同时延长其使用寿命。  
Eastman's Synergex line of amine additives significantly boosts performance while extending the life of your metalworking fluids.

### Synergex 加入配方 Synergex Formulating with Synergex

胺 Amine	液体类型 Fluid type(s)	等效重量 Equivalent weight	气味 Odor	半数致死量 (口服/白鼠) LD50 (oral/rat) mg/kg
Synergex	水包油乳状液, 合成 O/W emulsion, synthetic	117	微 Slight	1150
Synergex T	合成 Synthetic	161	无 None	4250
Synergex T Plus	水包油乳状液, 合成, 无添加剂矿物油 O/W emulsion, synthetic, straight oil	217	无 None	2823
Synergex LA	水包油乳状液 O/W emulsion	173	淡 Light	550

#### Synergex

这烷醇胺是已跨越多个十年的主力产品。它有助于延长工作液使用寿命，并且可以很容易渗入水包油型 (O/W) 乳液中。

This workhorse alkanolamine has been in use for decades. It helps extend fluid life and can easily be incorporated into oil-in-water (O/W) emulsions.

#### Synergex T Plus

大幅延长工作液使用寿命。容易渗入水包油型 (O/W) 乳液中。

Can substantially extend fluid life. Easy incorporation into oil-in-water (O/W) emulsions.

#### Synergex T

Synergex的亲水性叔胺替代物。在全合成液应用中提供较长工作液寿命，同时具极优的锈蚀抑制功能。

The hydrophilic tertiary amine alternative to Synergex. Provides for longer life in fully synthetic fluids along with excellent corrosion inhibition.

#### Synergex LA

Synergex LA作为我们Synergex产品系列的最新成员，可作为高效的疏水性烷醇胺，用于疏水/亲水的各胺类组合。

As the newest addition to our Synergex product line, Synergex LA serves as a highly effective hydrophobic alkanolamine for hydrophobic/hydrophilic amine combinations.

### 采用Synergex 胺配制 Formulating with Synergex amines

胺 Amine	正常沸点 NBP °C	% VOC	亲水亲油平衡 HLB	常规用量 % Typical use level	生物协同效应 Biosynergy	油Oil / 水 water 分领 partition	pKa
Synergex	200	99	中档 Mid-range	4 - 6	优 Excellent	两亲性 Amphiphilic	10
Synergex T	285	< 8	亲水性 Hydrophilic	2 - 10	良 Good	水 Water	9
Synergex T Plus	>300	0	疏水性 Hydrophobic	2 - 6	优 Excellent	油 Oil	9
Synergex LA	230	99	疏水性 Hydrophobic	4 - 8	良 Good	油 Oil	10

NBP = 正常沸点 normal boiling point % VOC per ASTM-D1868 NK = 不详 not known

浓缩液中通常使用的最佳使用量，然后，在使用时工作液浓度要稀释到 ≈5%。

Typical use level designates the typically optimal amount to use in a concentration, which in turn will be diluted to ≈ 5% in the working fluid.

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## SYNERGEX™ 在配方中的应用 FORMULATING WITH SYNERGEX™

Synergex™ 产品能延长冷却液寿命及改良大部分水基金属加工液的性能

Synergex™ products can extend coolant life and improve the performance of most water-based metalworking fluids.

伊士曼的 Synergex™ 多功能胺类添加剂系列可与其它胺类添加剂复配使用或自身单独用于浓缩液中，或槽边添加使用，或用于制造腐蚀抑制盐和酰胺。Synergex™ 产品能延长冷却液寿命和改进大部分水基金属加工液的性能。

Eastman's Synergex family of multi-functional amine additives can be used in combination with other amines or used by themselves in a concentrate, used tank side, or used to make corrosion inhibiting salts and amides. Synergex™ products can extend coolant life and improve the performance of most water-based metalworking fluids.

Synergex™ 加进你的冷却液配方可提供多种效益

Including Synergex in your coolant formulas can offer multiple benefits:

延长了冷却液寿命 Extended coolant life	与其它添加剂相容 Compatibility with other additives:	容易形成盐配搭物: Easy salt formation with:
▶ 改良 pH 控制 Improved pH control	▶ 杀菌剂 Biocides	▶ Corfree® M1
▶ 乳化稳定性较强 Greater emulsion stability	▶ 防霉剂 Fungicides	▶ 癸二酸 Sebacic acid
▶ 低挥发性和低味 Low volatility and low odor	▶ 金属减活剂 Metal deactivators	▶ 新癸酸及異壬酸 Neodecanoic & isononanoic acid
▶ 水溶性良好 Good water solubility	▶ 腐蚀抑制剂 Corrosion inhibitors	▶ 辛酸/癸酸 Caprylic/capric acid
		▶ 硼酸 Boric acid

### 用 Synergex™ 配成的胺羧酸盐 Amine carboxylate with Synergex™

将 Synergex™ 加入全合成或半合成配方中的其中一个最容易方法是制备 Synergex™ 的二元羧酸盐锈蚀抑制剂。如以下配方可以在不需外热源的情况下简单调配而成:

One of the easiest ways to insert Synergex into synthetic and semi-synthetic formulations is to prepare a Synergex dicarboxylate salt rust inhibitor. The following example can easily be prepared by simple blending without the use of an outside source of heat:

胺羧酸盐 Amine carboxylate salt	磅 Lbs	%
水 Water	200	47.06
Corfree® M1 *	108	25.41
Synergex	117	27.53
	425	100.00

先放水，调入 Synergex™，然后加入 Corfree® M1 直到大部分的颗粒溶解。混和到清澈为止。

Start with water and blend in the Synergex, then add the Corfree® M1 until most of the granules are dissolved. Mix until clear

\* Corfree® 是 INVISTA S.a.r.l. 的注册商标 Corfree® is a registered trademark of INVISTA S.a.r.l.

上述配方制造 50 加仑 Synergex™ 盐，有下述特性:

The above formula makes 50 gallons of Synergex™ salt with the following properties:

特性 Properties	结果 Results	
颜色 Color	琥珀 Amber	• pH = 6.91 @ 1.0/1.0 Synergex/Corfree M1 比例 ratio
气味 Odor	温和的 Bland	• pH = 7.58 @ 1.1/1.0 Synergex/Corfree M1 比例 ratio
磅/加仑 Lbs/gal	8.6	• pH = 8.55 @ 1.2/1.0 Synergex/Corfree M1 比例 ratio
固含量 Solids	50%	• pH = 9.02 @ 1.3/1.0 Synergex/Corfree M1 比例 ratio
		• pH = 9.38 @ 1.4/1.0 Synergex/Corfree M1 比例 ratio
		• pH = 9.56 @ 1.5/1.0 Synergex/Corfree M1 比例 ratio

(气味由肥皂味转至较似胺味 odor is shifting from soapy to more amine-like)

如果这样的 Synergex™ 盐在全合成或半合成配方中占 24%，则 Synergex™ 在最终浓缩液的浓度将为 6%，这是优化有协同效益的胺的理想浓度。以上的 Synergex™ 盐可取代典型只含 5-25% 水的锈蚀抑制剂，故可相应调整你的配方。

If this Synergex™ salt is used to make up 24% of the synthetic or semi-synthetic formulation, then the concentration of Synergex™ in the final concentrate will be 6%, ideal for optimizing all the benefits of a synergistic amine. The above Synergex salt will be replacing rust inhibitors that typically contain only 5% to 25% water so adjust your formula accordingly.

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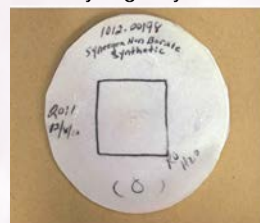
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## 半合成推荐配方 recommended semi-synthetic formula

成分 Ingredient	wt %
1 水 Water	19.00
2 Synergex™	9.00
3 Corfree® M1	8.00
4 消泡剂 Anti-Foam	0.15
5 甲基苯并三氮唑钠 Sodium TolyTriazole 50%	0.10
6 乙二胺四乙酸 EDTA 40%	0.10
7 二异丙醇油酰胺 DIPA Oleamide 2/1 摩尔比 molar ratio	20.00
8 低松香妥尔油脂肪酸 Low Rosin Tall Oil Fatty Acid	8.00
9 环烷基基础油 Naphthenic Oil 100 SUS	22.00
10 高分子量脂肪酯 High Mol Wt Fatty Ester	9.00
11 PEG 600单妥尔油酸酯 PEG 600 monotallate	1.00
12 4摩尔乙氧基乙醇 4 mole Ethoxylated Alcohol	3.00
13 防霉剂 Fungicide	0.65
总计 Total:	100.00

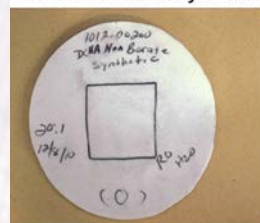
5% Synergex synthetic



5% Synergex T synthetic



5% DCHA-based synthetic



5% Aqualox™ 232 synthetic



Aqualox™ is a trademark of the Lubrizol corporation.

Synergex™ 盐锈蚀抑制剂的半合成配方与采用 DCHA 的半合成配方及另

一采用 TEA / 伯胺基硼酰胺的配方进行比较。在典型的过滤纸上铸屑的锈蚀测试中，这三种配方以蒸馏水稀释 (5%) 时均显示无锈蚀。对含 Synergex™ 的半合成液，铝浸出结果十分有利。在钴浸出中，含 Synergex™ 的全合成液亦有很好表现。最后，铸铁屑锈蚀测试显示在维持长寿命冷却液所需浓度 (5% 稀释) 下，并无锈蚀迹象。

The Semi-Synthetic formula with a Synergex™ salt rust inhibitor was compared to a Semi-Synthetic formula made from DCHA and another Semi-Synthetic formula with a commercial TEA/Primary amine based Boramide. All three formulas showed no rust in distilled water at a 5% dilution in a typical cast iron chip on filter paper rust test. The aluminum leaching results were very favorable to Synergex™ containing semi-synthetics. Also in the cobalt leach, the Synergex™ containing synthetics did very well. Lastly, the Cast Iron Chip rust testing showed that at the concentrations necessary for long coolant life (5% dilution), there is no trace of rust.

## 全合成体系中的缓蚀性能 Corrosion inhibition in synthetics

我们用羧酸铵盐 / Synergex 防锈剂组合对比三种分别以 Synergex T、DCHA、及商用防锈剂 Aqualox™ 232 为基础的防锈剂，比较它们的防锈性能。不同组合的防锈剂以 20% 加入量调合，其中含 20% 二异丙醇胺，及加入常用的三氮唑、防霉剂及消泡剂调合而成。此四种配方在 20:1 蒸馏水稀释后作典型的铸铁屑试验，结果均在滤纸上无锈蚀现象 (参见图 1)。当然，这四个配方的 Corfree® M1 含量一致。

这些合成液配方进行了铝腐蚀测试。铝腐蚀实验是把 Al 1100 H14 样片浸泡在在广口瓶的样品中 24 小时。样片在测试前后经过称重，样片移走时观察是否有腐蚀现象。用电感耦合等离子光谱发生仪 (ICP/emission) 测定铝从样片浸出的铝金属浓度 (ppm)。所有配方含都不含硼酸，含 Corfree® M1。Synergex T 的表现最好，铝的损失率比 DCHA 低 50%，而三乙醇胺防腐剂的损失率仅为 17%。

含长久稳定性胺的全合成冷却液，期待有较低的钴浸出倾向，这点在冷却液已作测试完证及确认。只有该商用添加剂含满意水平的三乙醇胺，同时全部组合均有强化金属减活剂。

We compared the amine-carboxylate with Synergex salt rust inhibitor to a similar rust inhibitor made from DCHA, Synergex T and the commercial rust inhibitor Aqualox™ 232. The rust inhibitors were formulated at 20% with 20% diisopropanolamine and the usual additions of tolyltriazole, fungicide and antifoam. All four formulas showed no rust in distilled water at a 20:1 dilution in a typical cast iron chip test on filter paper (See Figure 1). This is not surprising in that the level of Corfree® M1 is the same for all four.

These synthetic formulas were also tested for aluminum corrosion. The aluminum stain test is run using Al 1100 H14 coupons placed in a jar covered with the sample and allowed to sit for 24 hours. The coupon is weighted before and after the test, and any staining is noted when the coupons are removed. ICP/emission was used to determine the dissolved metal concentration (measured in ppm) of aluminum which leached out of the coupon. All formulas were boric acid free and included Corfree® M1. Synergex T performed the best with 50% less loss of aluminum than DCHA and only 17% the mass loss of the typical TEA-based corrosion inhibitor.

The potential for cobalt leaching was expected to be very low for synthetic coolants with long-life amines, and test work done on the finished coolants confirmed this to be true. Only the commercial additive contains appreciable levels of TEA, and all are fortified with the usual metal deactivator.

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## Synergex™ / MIPA 结合使用 combinations

**Synergex / MIPA 组合可增强生物稳定性并大大延长液体寿命。**

**Synergex / MIPA combinations offer enhanced stability and greatly extended fluid life.**

与大多数金属加工液添加剂不同的是，Synergex™ 胺添加剂均显示能强化表现，同时能在延长金属加工液寿命。与叔AAA (烷基醇胺) 及伯胺的组合较单独使用能提供更大稳定性。与 MIPA (一异丙醇胺) 组合时，Synergex 胺可延长液体寿命，保持较高pH值。作为验证，四种 MIPA/AAA 组合已测试，并比较MIPA/TEA99 (三乙醇胺99)及 MIPA / DCHA的结果。

Unlike most metalworking fluid additives, Synergex™ amine additives are shown to enhance performance while extending the life of metalworking fluids. Combinations of tertiary AAA (alkyl alkanolamines) and primary amines provide greater stability than a single amine on its own. Combined with MIPA (monoisopropanolamine), Synergex amines provide greatly extended fluid life, maintaining higher fluid pH. To demonstrate, four MIPA / AAA combinations were tested then compared to MIPA/ TEA99 (triethanolamine 99) and MIPA / DCHA.

表 Table 1 测试配方包含 contains the test formula

	表 Table 1 冷却液配方 Coolant formula	wt %
1	100-second 环烷油 Naphthenic oil	55.00
2	磺酸盐乳化剂 Soap sulfonate emulsifier	15.00
3	烷醇酰胺乳化剂 Alkanolamide emulsifier	15.00
4	妥尔油脂脂肪酸 Tall oil fatty acid	2.00
5	10 HLB 非离子表面活性 Nonionic surfactant	3.00
6	MIPA	5.00
7	AAA	5.00
	总计 Total:	100.00

稀释至6%后，MIPA 和 AAA 的浓度均是3000ppm，总胺的浓度是6000ppm。（以下所指为各 MIPA 组合）TEA99 与 Amietol™M12 比较，同时 DCHA 与 Synergex、Synergex LA 和 Synergex T 比较。

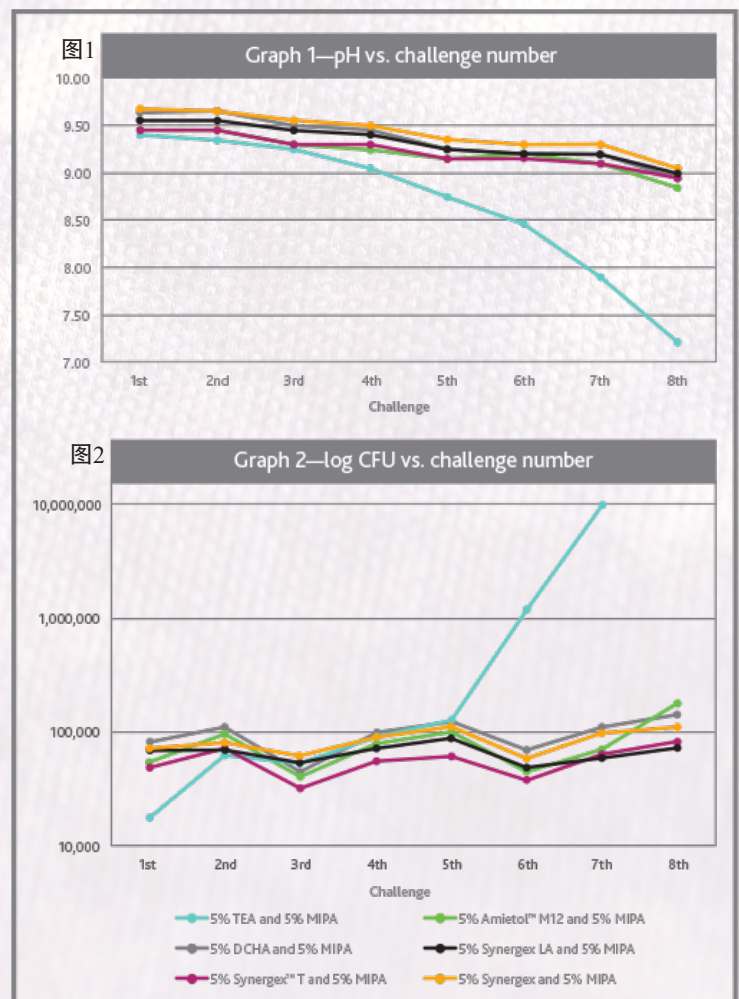
结果 Synergex / MIPA 最好，TEA / MIPA 相应最差 (如右上图所示)。

用国际生物技术公司的 HMB IV 细菌检测仪测量生物活性;无论细菌还是真菌，所有微生物数量均与 CFU/mL 单位报告。由下图显示，尽管pH值较低，Synergex T和Synergex LA 的 CFU 数量远低于 DCHA。

By diluting the fluids to 6%, both the MIPA and AAA are used at 3000 ppm for an amine total of 6000 ppm. Triethanolamine 99 was compared to Amietol™ M12, and DCHA was compared to Synergex, Synergex LA, and Synergex T.

Synergex / MIPA was the best. TEA / MIPA was the worst by far, as the right Graph 1 shows.

Measuring biological activity using the HMB IV Bacteria Tester from Biotech International, all microbial populations are reported as CFU/mL regardless of whether they are bacteria or mold. The right Graph 2 shows that, despite lower pH readings, Synergex T and Synergex LA ran much lower CFU counts than DCHA.



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右图显示了铸铁屑测试进行到一半时的结果（第4个挑战）。顶行均含的液体浓度6%。中行为4%。底行液体为2%。这里正是锈斑出现在含TEA99及DCHA的液体位置。

这测试清楚显示Synergex™胺和Amietol™M12的用处。

The right figure shows results of cast iron chip tests on fluids halfway through testing (4th challenge). Fluids across the top row are at 6% concentration. Fluids in the middle row are at 4%. Fluids across the bottom row are at 2%. This is where most of the rust appears on those fluids with triethanolamine 99 and DCHA.

These tests clearly demonstrate the usefulness of Synergex™ amine additives and Amietol™ M12.



### Synergex 可应用于大部分的金属加工液中 Synergex additives make the most of your metalworking fluids.

- ▶ Synergex 胺和 Amietol M12 提供真正的持久力 - 提供较高的碱储备以中和金属切削过程中产生的酸，这是金属加工液的一中重要特性。

Synergex amines and Amietol M12 offer true staying power - providing higher reserve alkalinity to neutralize acids formed during the metal-cutting operation, an important property of any metalworking fluid.

- ▶ Synergex、Synergex T、Synergex LA 和 Amietol M12 都较不易因微生物活动降解，而TEA99 则非常容易受到攻击。Synergex, Synergex T, Synergex LA, and Amietol M12 are less susceptible to degradation by microbial activity, whereas triethanolamine 99 is very susceptible to attack.

- ▶ Synergex 胺和 Amietol M12 在不断试验中表现出更强的保护和较少锈蚀，而 TEA99 和 DCHA 则显露更多锈蚀和腐蚀事件。

Synergex amines and Amietol M12 provide greater protection and less rust in test after test, while triethanolamine 99 and DCHA reveal increased incidence of rust and corrosion.

### SYNERGEX™ 中和胺作为锈蚀抑制剂 SYNERGEX™ NEUTRALIZING AMINE AS RUST INHIBITORS

Synergex™ 中和胺添加剂<sup>1</sup>具有优于如单乙醇胺 (MEA) 及三乙醇胺 (TEA) 等乙醇胺产品的防锈性能，当用于水溶性金属加工液的防锈剂浓缩液时，亦能容纳许较高羧酸盐含量（水分较少）。其一配方应用到自乳化酯 (SEE) / 反向块聚合物及抗杂油乳化剂，应用于半合成金属加工液浓缩液中。

Synergex™ neutralizing amine additives<sup>1</sup> have anti-rust properties superior to those of commodity ethanolamines such as monoethanolamine (MEA) & triethanolamine (TEA), and they will tolerate higher carboxylate contents (with less water) when used in a water soluble metalworking fluid rust inhibitor concentrate. One such formula has been used with self emulsifying esters (SEE's), reverse block polymers and tramp oil rejecting emulsifiers in semisynthetic metalworking fluid concentrates.

表 Table 1 — 防锈剂 Rust inhibitor M116 — Synergex / MIPA / Corfree® M1

组成成分 Component	描述 Description	重量比 Weight %	碱值 Base val.	当量重量 Weight equivalent	碱基当量总计 Base eq total
水 Water	水 Water	20		119.75	
Synergex™	胺 Amine	25	479	149.6	269.35
MIPA*	胺 Amine	20	748		
			酸值 Acid val.		酸值当量总计 Acid eq total
Corfree® M1		35	509	178.15	178.15
					碱酸比 Base/acid ratio
Total		100			1.5

\* 单异丙醇胺 Monoisopropanolamine

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请注意，考虑到酸碱值，我们把碱酸比设置为 1.5: 1。在研究课题中这一比值保持不变。此防锈剂中二元酸的含量异常高，但在室温条件下其仍然维持为液体。在把它调入金属加工液前是无需预先将其在“热箱”中的。

Note that when the acid and base values are taken into consideration, the base to acid ratio is 1.5 to 1. This ratio will be maintained throughout the study. There is an unusually high level of di-acid content in this rust inhibitor, and yet it remains a liquid at room temperature. There is no need to store this product in a "hot box" prior to blending it into a metalworking fluid.

此研究课题用了有潜能替代 Corfree® M1的癸二酸；但还可考类的二元酸，包括十二烷二酸（DDDA）。留意DDDA是 Corfree® M1的主要成分，市场上可买到的（在展望可预知的将来可以供应的）<sup>2</sup>。我们将几种二元酸及其混合物与不同种类的胺中和以研究其锈蚀抑制特性（见表2）。5种抑制复合剂是按15%（重量）浓度调配成轻切割及磨削液样品，再加入15% TEA 和 10%的聚(亚烷基)二醇660，其余为水（~60%）。将此样品配方稀释到3%，用于湿润置于铝盘上滤纸内的铸铁屑。去除液体，让湿铁屑隔夜蒸干。图1显示隔夜腐蚀的外观结果。请注意从目测不同Synergex-MIPA中和二元酸的铁屑均无显示腐蚀，而浸泡于用TEA/MEA中和 Corfree® M1液体中的铁屑则有明显锈蚀迹象。

Sebacic acid, a readily available potential substitute for Corfree® M1, was used in this study. However, there are other diacids which can be considered, including dodecanedioic acid (DDDA). Note that DDDA is the majority component of Corfree® M1, and DDDA is commercially available (and forecasted to be available for the foreseeable future).<sup>2</sup> Several diacids and mixtures of diacids, neutralized with varied amines, were studied for their corrosion inhibition properties (see table 2). Five inhibitor packages were formulated @15% (w/w) concentrations into sample synthetic light cutting & grinding fluids, along with 15% concentration of TEA and 10% polyalkylene glycol 660, with a balance of water (~60%). The formulated sample fluids were then diluted to 3% and were used to wet cast iron chips placed on filter paper within aluminum pans. The fluid was removed, and the wet chips were evaporated to dryness overnight. Visual results of overnight corrosion are displayed in Figure 1. Note that visual inspection of iron chips from various diacids neutralized with the Synergex-MIPA combination show no corrosion, whereas the chips exposed to TEA/MEA neutralized Corfree® M1 fluid display significant rust.

<sup>1</sup> <http://www.eastman.com/Brands/Synergex/Pages/Overview.aspx>

<sup>2</sup> <http://www.grandviewresearch.com/industry-analysis/dodecanedioic-acid-ddda-industry>



图 Figure 1

表 Table 2 锈蚀抑制剂配方 THE FORMULAS FOR THE RUST INHIBITORS

	#1	#2	#3 <sup>3</sup>	#4	#5
叙述 Description	Emerox® 1195 Synergex™	C10 & C12 Synergex	Corfree® M1 Synergex	Aqualox® 232H	Corfree® M1 MEA TEA
水 Water	20	20	20	% 不详 not known	18
Emerox® 1195	35				
DDDA		24			
癸二酸 Sebacic acid		11			
Corfree® M1			35	% 不详 not known	35
Synergex™	25	25	25		
MIPA	20	20	20		
TEA 99				% 不详 not known	27.5
MEA				% 不详 not known	19.5

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<sup>3</sup> 配方3与表1 Formula 3 Synergex/MIPA/Corfree® M1 的一样 is the same as the rust inhibitor with Synergex/MIPA/Corfree® M1 from table 1

因为只有配方#5显示锈蚀，我们可以推断 Synergex / MIPA (单异丙醇胺) 的胺类组合比 TEA / MEA较能防锈。TEA 在冷却剂浓缩液中占重15%，在6%的金属加工稀释液中浓度为9,000ppm。15%的防锈抑制剂中 MIPA (单异并醇胺) 和 Synergex 的共计2,722ppm，足够维持长寿活性。防锈测试的浓度定为仅3%以避免不会所有新开的稀释液均无锈蚀现象。由于这些配方代表了合成的金属加工液，其任何成品金属加工液配方中都不含油。使用 Synergex 和 MIPA (单异丙醇胺) 组合作为防锈剂，效果比常用的 TEA 和 MEA 更好，不只可以加强防锈，还有长寿特性。

Because only formula #5 showed rust, we conclude that Synergex/MIPA is a better amine combination than TEA/MEA for preventing rust. At 15% by weight in the coolant concentrate, the amount TEA at 6% dilution of the metalworking fluid is 9,000 ppm. The contribution of MIPA and Synergex from 15% of the rust inhibitor is 2,722 ppm, sufficient for long life activity. The rust testing was done at 3% just to stress the fluid otherwise there would be no rust at all with the fresh dilutions. Because these formulas represent synthetic metalworking fluids, there was no oil in any of the finished fluid formulas. Using Synergex and MIPA to make up the rust inhibitor instead of the more common use of TEA & MEA, allows for not only a more rust resistant formula but also one that has long life properties.

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## 半合成金属加工液测试

## Semisynthetic metalworking fluid testing

制备半合成液，其配方包含20%油、13%磺酸盐/非离子乳化剂、19%胺/脂肪酸皂和38%水。在配方中水溶性防锈剂占6%，同时皂盐中胺部分分别由伯胺(DGA)及叔胺(TEA LF)各5%浓度提供。在最终应用以6%稀释度时，水溶性防锈剂中的胺有3000ppm伯胺及1800ppm叔胺。6%稀释液的pH值为8.75 (配方6#)，对一般长寿液体说pH值算较低，因此在冷却液配方中，我们用MDEA代替TEA LF，及用MIPA代替DGA。这使6%稀释液的pH值达致约为9.20(配方7#)。

The semisynthetic work was done with a formula that contains 20% oil, 13% sulfonate/nonionic emulsifier, 19% amine/fatty acid soap and 38% water in the concentrate. The water-soluble rust inhibitor made up 6% of the formula, and the amine portion of the soap was evenly divided between primary amine (DGA) and tertiary amine (TEA LF) at 5% each. At an end-use dilution of 6%, there was 3000 ppm each of primary amine and tertiary amine and about 1800 ppm from the amines in the water-soluble rust inhibitor. The pH of the 6% dilution was 8.75 (formula #6), which was generally low for a long-life fluid, so we substituted MDEA for TEA LF and MIPA for DGA in the coolant formula. This resulted in a pH of about 9.20 for the 6% dilution (formula #7).

表 Table 3 剩余水溶性防锈剂配方 The remaining formulas for the water-soluble rust inhibitors

	#6 & #7	#8	#9	#10	#11	#12
防锈剂 Rust inhibitor ID	Aqualox® 232H	Corfree® M1 Synergex™	Sebacic acid Synergex T	Sebacic acid <sup>4</sup> Synergex T Plus	Sebacic acid DMAPF <sup>5</sup>	Sebacic acid Synergex
水 Water	% 不详 not known	20	20	20	20	20
癸二酸 Sebacic acid			30	30	30	30
Corfree® M1 Synergex	% 不详 not known	35 25				20
MIPA		20	20	25	25	20
Synergex T Synergex T Plus			30		25	5
4-二甲氨基吡啶 DMAPF <sup>5</sup>					20	
MEA	% 不详 not known				5	
TEA	% 不详 not known					

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七个半合成配方已进行测试。两个配方使用了Aqualox®232H，在半合成配方中配方6#采用DGA和TEA用作中和脂肪酸，余下配方则采用MDEA和MIPA用作中和脂肪酸。经过四次挑战试验，除原本含DGA和TEA的配方外，其余七种溶液的pH值均在9.0或以上。铸铁屑测试结果如图2所示。正如所料，4次挑战试验后，含DGA和TEA LF的6#配方在浓度3%时有锈斑。用MDEA和MIPA代替DGA和TEA的余下6个配方中，除1个配方外，均在3%浓度未出现锈斑。只有在使用Synergex T作为防锈剂的配方#9中显示出少量锈蚀。Synergex T是Synergex中和胺系列中水溶性最好。

A total of seven semisynthetic formulas were tested. Two formulas using Aqualox® 232H, formula #6 where DGA and TEA are the neutralizing amines and the remaining formulas where MDEA and MIPA neutralize the fatty acid in the semisynthetic metalworking fluid. After four challenges, the pH of all seven solutions is 9.0 and above except the original formula with DGA and TEA. The results of the cast iron chip testing are pictured in Figure 2. As expected, formula #6 with DGA and TEA LF showed rust at 3% concentration after four challenges. All but one of the remaining six formulas, in which MDEA and MIPA were substituted for DGA and TEA, did not show any rust at 3% concentration after four challenges. Only formula 9 which uses Synergex T in the rust inhibitor portion of the formula showed a little rust. Synergex T is the most water-soluble of the Synergex neutralizing amine additives.

<sup>4</sup>本研究中没有用Synergex LA (亲脂胺)，因为它油溶性太高，不易与水溶性防锈剂中的常用的酸及二价酸形成水溶性皂盐。

<sup>4</sup> There is no Synergex LA (lipophilic amine) in this study because it is too oil soluble to form a water-soluble soap with the usual acids and diacids typically used in these water-soluble rust inhibitors.

<sup>5</sup> DMAPF是一正在开发的项目。它属DMAPA (二甲基氨基丙胺)的甲酰胺。

<sup>5</sup> DMAPF is a developmental project. It is the formamide of DMAPA (dimethylaminopropylamine).





Figure 2

由于此半合成配方含有杀菌剂、防霉剂及长寿胺，预计在为期8周的挑战试验过程中，不会有任何明显的微生物生长。这些挑战测试的设计在于体现液体的防锈性能。更重要的是，通过四次挑战测试，这些溶液的气味一直很淡，没有任何“臭蛋”味道，即使测试液体已呈黑色并带有很强臭味。在金属加工溶液第一次测试时，它们会变灰，但在2天内它们会变成没有任何气味的褐色。癸二酸和Synergex™中和胺添加剂的组合对这类金属加工液的防锈作用是非常足够的。

最后值得一提的是，长寿金属加工液的设计在于应用在特定浓度，烷基醇胺(如Synergex中和胺添加剂)与抗菌添加剂(如杀菌剂和防霉剂)的协同作用能发挥完美效果。防锈测试的3%浓度仅为加工浓度6%的一半，却能足够满足此四次挑战实验防锈要求。

这些挑战实验旨在演示通过降低测试液的pH值使金属加工液防锈性能恶化。结果显示，通过把水溶性防锈剂的胺类级别提升以代替常用的MEA/TEA组合，癸二酸便能在半合成金属加工液中取代Corfree® M1使用。

Because the semisynthetic formula contains both biocide and fungicide as well as long life amines, it was not expected that any appreciable microbial growth would take place over the course of an 8-week challenge study. The challenges were designed to stress the rust-inhibiting properties of these fluids. More importantly, through four challenges, the odor of these solutions has remained bland and has not taken on any "rotten egg" smell, even though the challenge solution is black and has that very strong odor. When the metalworking solutions are first challenged, they turn grey, but within 2 days, they turn back to a tan color without any odor. The combination of sebacic acid and Synergex™ neutralizing amine additives is more than adequate for rust inhibition in these types of metalworking fluids.

Lastly, it should also be pointed out that long-life metalworking fluids are designed to be used at a specific concentration in order to get the full effect of the synergy between alkyl amino alcohols such as Synergex neutralizing amine additives and antimicrobial additives such as biocides and fungicides. The rust test being run at 3% is one half of the operating concentration of 6%, and yet there is enough rust inhibition even after four challenges. These challenges were specifically designed to demonstrate deterioration of the rust protection of the metalworking fluid mainly through a decrease in pH of the test fluid. The resulting information demonstrates that sebacic acid can substitute for Corfree® M1 in a semisynthetic metalworking fluid by upgrading the amine portion of the water-soluble rust inhibitor over the usual MEA/TEA combination.

在水溶性防锈剂中，与MEA和TEA的组合相比，Synergex中和胺添加剂及MIPA的组合能提供更好的防锈性能。Amietol® M-12 (MDEA)和MIPA与TOFA等脂肪酸一起使用，比TEA LF、DGA更能持久提升pH值。

癸二酸和Synergex胺添加剂能是Corfree® M1极佳替代品。

The combination of Synergex neutralizing amine additives and MIPA give better rust protection than the combination of MEA and TEA in a water-soluble rust inhibitor.

The use of Amietol® M-12 (MDEA) and MIPA with fatty acids like TOFA has a longer lasting pH boost than TEA LF and DGA.

Sebacic acid and Synergex amine additives are an excellent alternative to Corfree® M1.

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## Synergex™ 与 Synergex™ T 对铝的抗腐蚀性 Synergex™ and Synergex™ T against aluminum corrosion

### Synergex™ 和 Synergex™ T 的铝腐蚀性性能 Aluminum corrosion properties of Synergex™ and Synergex™ T

采用 Synergex™ 中和胺添加剂配制成全合成及低油半合成金属加工液。其后，用两种类型的铝材（6061 和 7075 样片）检测铝腐蚀性能。将样片浸泡在金属加工稀释液中 24 小时，量度其减少的重量。在试验过程中迁移到液体中的铝浓度用 ICP 量度并记下。最后，对铝片表面进行目视检查（见图 1 和图 2）。这比量胺的全合成及半合成配方的最终液浓度是达致长寿水平的 2400 ppm。表 1 是铝的腐蚀数据的撮要。

Synthetic and low oil semisynthetic metalworking fluids were formulated using Synergex™ neutralizing amine additives. These were then checked for aluminum corrosion on two types of aluminum: 6061 and 7075 coupons. The coupons were immersed in the diluted metalworking fluids for 24 hours and the weight loss was measured. The concentration of aluminum which migrates into the fluid during the test is measured by ICP and also reported. Lastly, a visual inspection of the surface of the aluminum coupon is made (see Figures 1 and 2). The concentration of the comparative amine in the end use dilution is at a long life level of 2400 ppm for both the synthetic and semisynthetic formula. Table 1 summarizes the aluminum corrosion data.

表 Table 1

Formula type	Low oil semi	Low oil semi	Low oil semi	Synthetic formula	Synthetic formula	Synthetic formula
胺类比较 Comparative amine	Synergex T	Synergex	Corrguard 95 <sup>1</sup>	Synergex T	TEA 99%	Corrguard 95
Dilution	4%	4%	4%	6%	6%	6%
pH	8.45	8.65	8.60	8.05	8.00	8.25
Aluminum alloy	AL 6061	AL 6061	AL 6061	AL 6061	AL 6061	AL 6061
Wt. change, grams	-0.0003	-0.0005	-0.0007	-0.0001	-0.0001	-0.0002
ppm Aluminum	14	30	40	<5	<5	13
Appearance	Dark stain	Dark stain	Dark stain	No stain	No stain	Med. dark
Aluminum alloy	AL 7075	AL 7075	AL 7075	AL 7075	AL 7075	AL 7075
Wt. change, grams	-0.0005	-0.0008	-0.0009	-0.0005	-0.0006	-0.0008
ppm Aluminum	14	32	41	<5	<5	17
Appearance	Dark stain	Dark stain	Dark stain	Light/faint	Light/faint	Dark stain

## 结果 Results

在全合成和半合成配方中，Synergex T 导致铝的腐蚀量为最少。前人工作显示其对软钢的铁溶解度为低（Corrguard 95 的 1/20）。

Synergex T 在 ASTM E1648 (<8%) 测试中显示挥发性非常低，同时其气味极低，在全面及胺类的气味测试中评级不俗。Synergex T 的 HLB 值为 12，故此能提供油/水溶解的平衡性能，可容许无泡下表面活性，提供优异的乳液稳定性，而兼容良好抗油效能。

In both the synthetic and semisynthetic formula, Synergex T caused the least amount of aluminum corrosion. Past work has also shown low ferrous dissolution from mild steel (1/20 that of Corrguard 95).

Synergex T has shown very low volatility by means of ASTM E1648 (<8%) and has a very low odor profile and scores well in both global and amine odor tests.

The HLB of Synergex T is 12 and this provides balanced oil/water solubility, allows for surface activity without foam, and gives excellent emulsion stability with good tramp oil rejection.

<sup>1</sup>Corrguard® 95 是安格斯化学公司的注册商标 is a registered Trademark of ANGUS Chemical Company.



Figure 1—Aluminum 6061 synthetic fluid with Synergex T

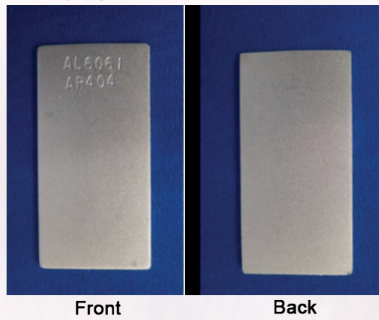


Figure 2—Aluminum 7075 synthetic fluid with Synergex T

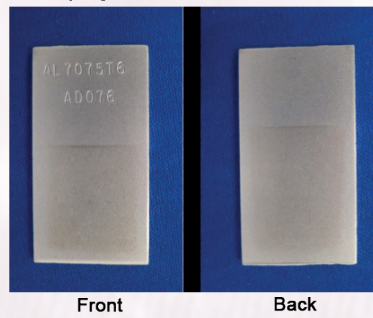


表 Table 2—铁及非铁加工的合成金属加工液 Synthetic metalworking fluid for ferrous and nonferrous machining

Phase 期 A	wt %	
PERFAD™ 3950 <sup>2</sup>	16	多用途添加剂 Multifunctional additive
Synergex T	4	长寿胺 Long-life amine
新葵酸 Neodecanoic acid	3	防锈酸 Rust-inhibiting acid
TAS COR PE 401	0.8	磷酸酯 Phosphate ester
水 Water	10	
Phase 期 B		
Water	49.5	
Amietol M12 (MDEA)	4	Neutralizing amine
MIPA (monoisopropanolamine)	3.2	Neutralizing amine
Isononanoic acid	3	Coupling acid
TAS COR 215A Dicarboxylic acid mix	5.6	Rust-inhibiting diacid
Troyshield FX 40	0.5	Antimicrobial
TT40DC (Cobratec)	0.4	Multi-metal inhibitor

表 Table 3—配方 Formulations

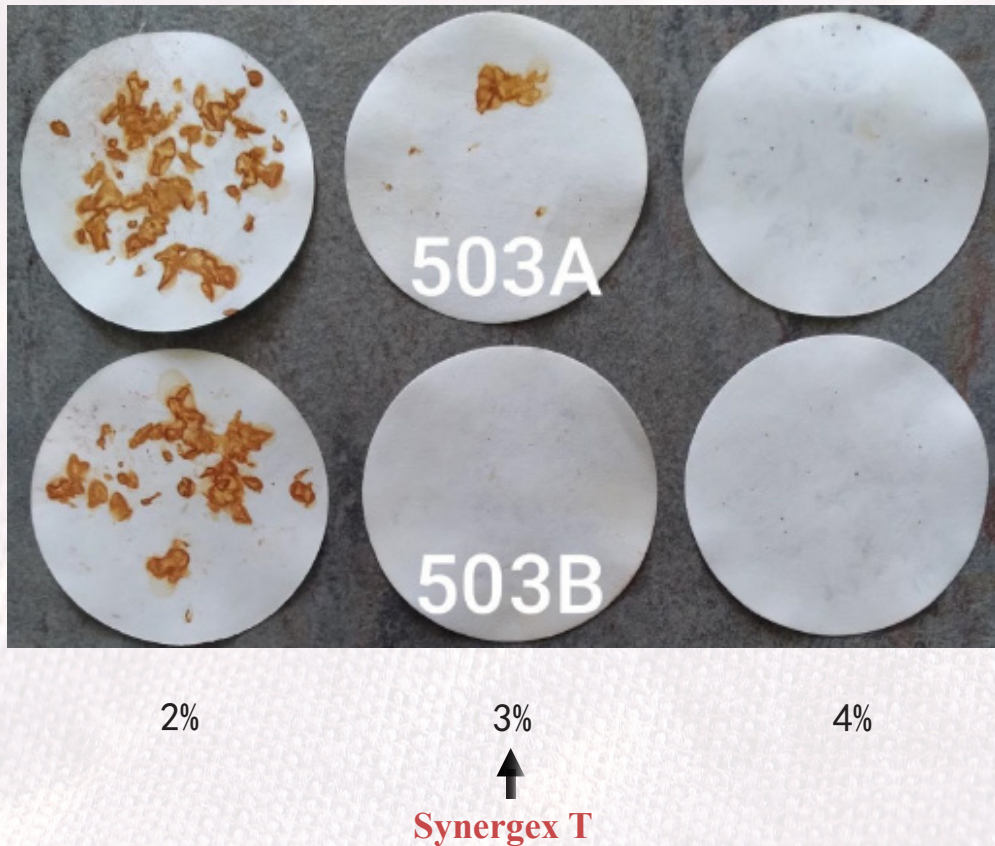
原材料 Raw material	描述 Description	供应商 Supplier	配方 Formulation 503A	配方 Formulation 503B	配方 Formulation 503C
HyGold 100	100 sus 环烷基油 naphthenic oil	Ergon	20.0	20.0	20.0
Polartec® EA-700	聚合乳化剂 Polymeric emulsifier	Afton	7.0	7.0	7.0
Altapyne® M-28B	高松香托尔油脂肪酸 High-rosin tall oil fatty acids	Sea-Land	2.0	2.0	2.0
TAS DL-960	酰胺 Amide	ACC	4.0	4.0	4.0
Synative® AC LF-420	非离子型乳化剂 Nonionic emulsifier	BASF	5.0	5.0	5.0
AE-43	环氧乙烷/环氧丙烷醇 EO/PO alcohol	ACC	3.0	3.0	3.0
AKYPO TEC-AM	醚 - 羧酸盐 Ether carboxylate	KAO	1.5	1.5	1.5
Rhodafac® AS-010	铝腐蚀抑制剂 Aluminum stain inhibitor	Solvay	1.0	1.0	1.0
Troyshield® FX40	杀真菌剂 Fungicide	Troy	1.0	1.0	1.0
DIPA 85%	-	Dow	5.0	-	-
DGA	-	Huntsman	2.0	2.0	-
Synergex T	-	Eastman	-	5.0	5.0
MIPA	-	Dow	-	-	2.0
Cola® Cor 232	腐蚀抑制剂调配物 Corrosion inhibitor blend	Colonial	6.0	6.0	6.0
去离子水 DI water	去离子水 Deionized water	-	40.0	40.0	40.0
TT50	甲基苯并三氮唑钠盐 Sodium tolyltriazole 50%	-	0.5	0.5	0.5
三嗪类 Triazine	杀细菌剂 Bactericide	Troy	2.0	2.0	2.0
配方中胺部分成本 Cost for amine portion of formulation (每磅 per pound)			\$0.1815	\$0.1940	\$0.1833
配方中胺部分成本 Cost for amine portion of formulation (每加仑 per gallon)			\$1.49	\$1.59	\$1.50
密度 Density = 8.2 磅/加仑 lb/gal					

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## 改进铸铁的防锈保护 Improved cast-iron chip corrosion protection



## 配方提示 Formulation tips

这是从禾大网站获得关于调合Perfad 3950的资料。一般情况下，它必须用如Synergex T等胺中和，并在常温下量加水前与助表活剂调合。对全合成版本，只需要很少的助表活剂。对于重负荷加工、可添加逆溶解性的聚亚烷基二醇（PAG），或是对半合成版本，可加助表活剂及矿物油。

很多助表活剂有剩余酸值，能被Synergex 及Synergex T中和。

There is information available about blending with Perfad 3950 from the Croda web site. In general, it must be neutralized with an amine such as Synergex T and blended with cosurfactant before bulk water addition at ambient temperature. For the synthetic version, very little cosurfactant is needed. Inverse solubility polyalkylene glycols can also be added for heavy-duty machining or additional cosurfactants and petroleum oil for a semisynthetic version.

Many cosurfactants have residual acid values which can be neutralized with Synergex and Synergex T.

## 总结 Summary

Synergex T是一款高性能叔胺添加剂，用于顾虑仲胺引发问题的体系。Synergex T是低气味、低VOC的胺类物，十分适用于中和半合成/全合成金属加工液和乳化润滑剂。Synergex T具有极低的蒸气压和挥发性，其分子结构稳定，故可显著延长液体寿命。

对于可以接受仲胺的半合成，全合成乳化润滑剂来说，Synergex是一款适合做pH调节剂的低气味胺。Synergex在超过30多年前已开始引入金属加工市场，在延长液体使用寿命的同时，取得令人赞叹的成本效益。

Synergex T is a high performance tertiary amine additive for use where secondary amine issues are a concern. Synergex T is a very low-odor, low-VOC amine ideal for use in neutralizing semisynthetic and full synthetic metalworking fluids and emulsion lubricants. The very low vapor pressure and volatility of Synergex T and its molecular stability allows for significantly extended fluid life.

Synergex is a low-odor amine ideal for pH adjustment in semisynthetic and full synthetic emulsion lubricants where secondary amines can be tolerated. Synergex was first introduced to the metalworking market over 30 years ago and gives extended fluid life with an impressive balance of benefit/cost.

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Synergex™ LA lipophilic amine 亲脂性胺

The hydrophobic/hydrophilic amine combination 疏水性/亲水性胺组合

一种极好的疏水性链烷醇胺，用于配置疏水性/亲水性胺组合。Synergex LA，特别是与亲水性胺配合使用时，可以得到极为稳定的乳液。疏水性叔胺与亲水性伯胺组合使用，比单一胺的液体稳定性更好。Synergex LA与MIPA（单异丙醇胺）组合使用，可延长使用寿命。

An excellent hydrophobic alkanolamine for hydrophobic/ hydrophilic amine combinations. Synergex LA, especially in combination with a hydrophilic amine, can allow for exceptionally stable emulsions. Combining hydrophobic tertiary amines with hydrophilic primary amines can provide for greater fluid stability than a single amine can on its own. Synergex LA can provide for greatly extended fluid life when combined with MIPA (monoisopropanolamine).

成分 Component	克 Grams	%
1 环烷油 Naphthenic oil (Hygold 100)	75.0	50.00
2 皂型磺酸盐乳化剂 Soap sulfonate emulsifier (IdaMix D42)	15.0	10.00
3 非磺酸盐型乳化剂 Non-sulfonate emulsifier (Tas-Sol 37N)	21.0	14.00
4 二异丙醇胺 DIPA 妥尔油脂肪酸 TOFA 酰胺 amide 2:1 (酰胺 amide 5)	5.5	3.67
5 妥儿油脂肪酸 TOFA 28	7.5	5.00
6 亲脂性胺 Lipophilic amine	7.5	5.00
7 亲水性胺或双倍剂量的亲脂性胺 Hydrophilic amine or double dose of lipophilic amine	7.5	5.00
8 聚合酯 Polymeric ester (Syn-Ester GY-25)	3.0	2.00
9 甲苯三唑 Toly triazole 50% (Preventol CI 7-50)	0.5	0.33
10 消泡剂 Antifoam (Surtec KE-131)	0.3	0.20
11 杀菌剂 Biocide (Bioban P-1487)	1.0	0.67
12 气味剂 Odorant (Ida-Soil SM 101)	0.6	0.40
13 防霉剂 Fungicide (Troy Shield FX 40)	0.6	0.40
14 羧酸盐腐蚀抑制剂 Carboxylate rust inhibitor (Aqualox 232H)	5.0	3.33
总计 Grand totals		100.00

微生物挑战性试验 CHALLENGE TESTS

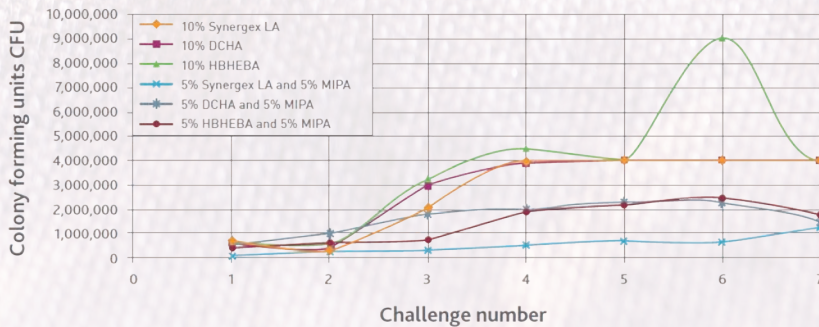


表 Table 2  
菌落形成单位  
对应挑战次数  
CFU vs challenge  
number

TEA: 三乙醇胺 triethanolamine  
DCHA: 二环己胺 dicyclohexylamine  
HBHEBA: N-2-羟基乙基N-2-羟基丁基丁胺  
N-2-hydroxyethyl N-2-hydroxybutyl butylamine  
MDEA: 甲基二乙醇胺 methyldiethanolamine  
MIPA: 单异丙醇胺 monoisopropanolamine  
MEA: 单乙醇胺 monoethanolamine

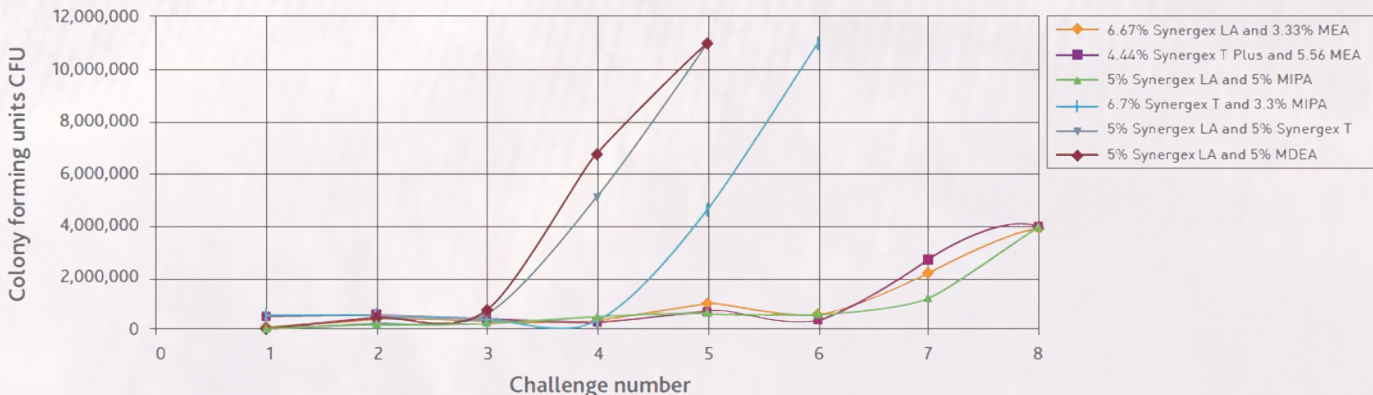


表 Table 3  
菌落形成单位对应挑战次数  
CFU vs challenge number

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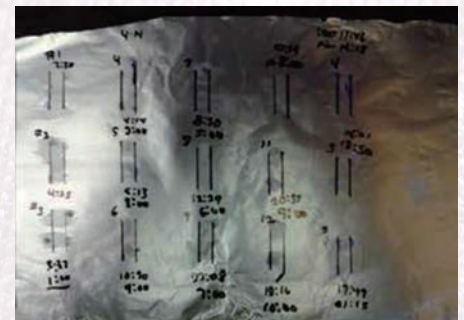
**Synergex™ LA 是一金属加工液的理想疏水胺****Synergex™ LA is an ideal hydrophobic amine for metalworking**

如下表所示, Synergex LA 性比许多其他胺, 在铝上湿润时间更短。Synergex LA 与 MIPA (单异丙醇胺) 的平衡组合可以延长金属加工液的使用寿命 (见下列配方)。As the following table illustrates, Synergex LA provides faster wetting time on aluminium when compared to many other amines. A balanced combination of Synergex LA with MIPA can provide for greatly extended fluid life (see formula below).

纸上铸铁屑 Cast iron chips on paper	铝件 Aluminum 湿润时间 (秒) wetting time (seconds) 硬水 hard water	铝件 Aluminum 湿润时间 (秒) wetting time (seconds) 软水 soft water
TEA (控制 control)	450	49
DCHA	155	40
Synergex LA	141	29
Synergex T Plus	210	43
Synergex T	389	79
MDEA	908	210
HBHEBA	179	67

冷却剂配方 Coolant formula	%
环烷基基础油 Hygold 100 naphthenic base oil	55
磺酸盐乳化剂 Ida-Mix D42M sulfonate emulsifier	15
非磺酸盐乳化剂 Tas Sol 37N non-sulfonate emulsifier	15
妥尔油脂脂肪酸 Tall oil fatty acid	5
胺 Amine	10
总计 Total	100

稀释6%到金属加工液中含6000ppm胺  
6% dilution to 6000 ppm amine in fluid



两滴稀释液滴在铝箔上, 记录液体前沿延展到规定界限的时间, 报告为“铝湿润秒数”

Two drops of diluted fluid are deposited on the aluminum foil and the time to spread out to the prescribed lines is timed and reported as the "seconds aluminum wetting time".

\* 研究样本为HOSS乳化液HOSS emulsion fluid used for studies

表 Table 1—配方 Formulations

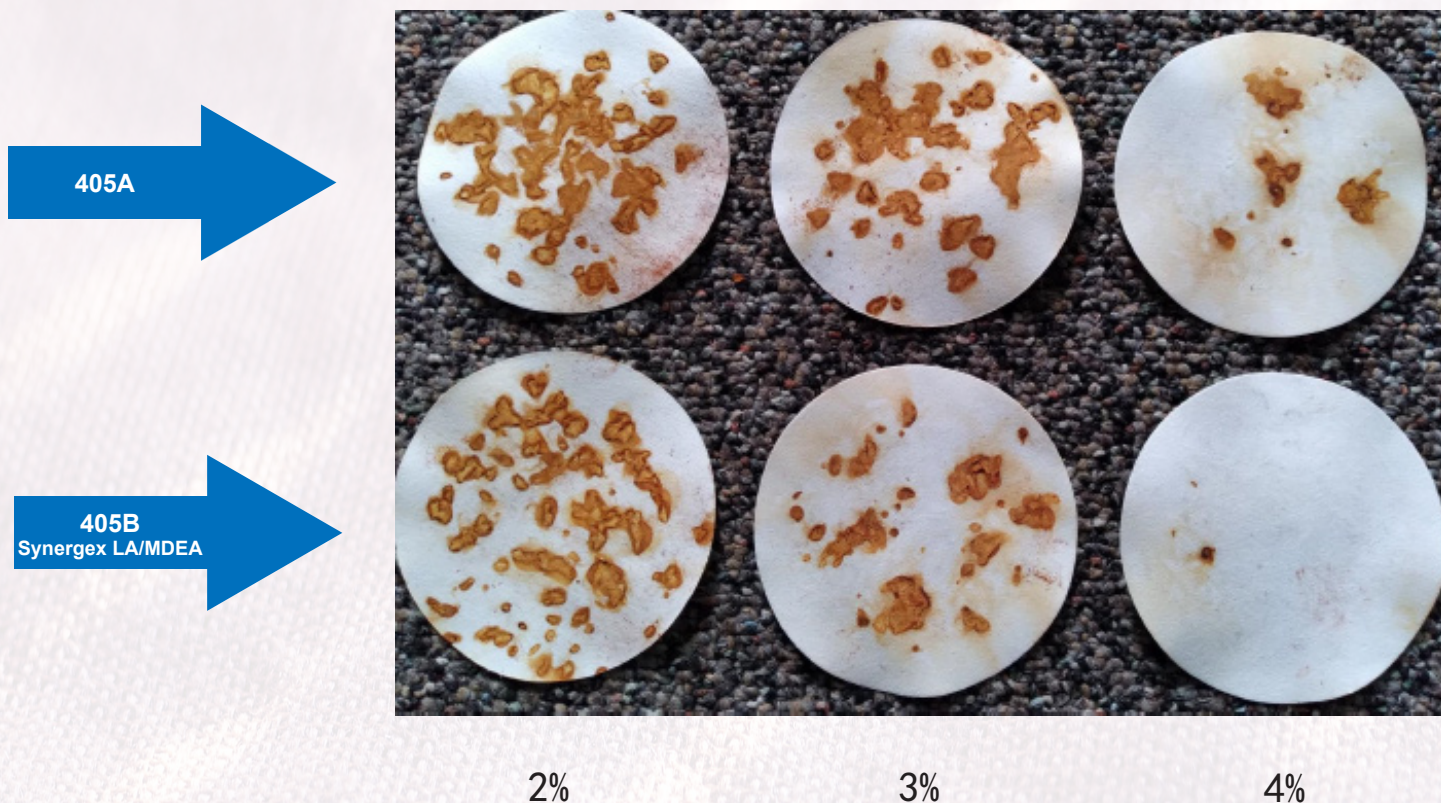
原材料 Raw material	描述 Description	配方 Formulation 405A	配方 Formulation 405B
Ergon HyGold 100	100 sus 环烷基油 naphthenic oil	40.0	40.0
Polartec® EA-700	聚合乳化剂 Polymeric emulsifier	7.0	7.0
Altapyne® M-28B	高松香托尔油脂脂肪酸 High-rosin tall oil fatty acids	2.0	2.0
Polartec® LA™ 8005	聚合蓖麻子油酸 Polymerized ricinoleic acid	3.0	4.0
ACC EM-8	非离子型乳化剂 Nonionic emulsifier	4.0	5.0
ACC AE-43	环氧乙烷/环氧丙烷醇 EO/PO alcohol	3.0	3.0
AKYPO® TEC-AM	醚-羧酸盐 Ether carboxylate	1.5	1.5
Rhodafac® AS-010	铝腐蚀抑制剂 Aluminum stain inhibitor	0.75	1.0
Opp 40%	杀细菌剂/杀真菌剂 Bactericide/fungicide; 40%乙二醇中 in glycol	3.75	1.0
MIPA	胺 Amine	2	-
TEA 99 LFG	三乙醇胺 Triethanolamine	5.0	-
Amietol M12	胺 Amine	-	5.0
Synergex LA	特种胺 Specialty amine	-	3.0
Cola® Cor 232	腐蚀抑制剂调配物 Corrosion inhibitor blend	4.0	4.0
Cola® Cor RP	硼酸胺复合物 Amine broate complex	4.0	4.0
去离子水 DI water	去离子水 Deionized water	18.45	17.45
TT50	甲基苯并三氮唑钠盐 Sodium tolyltriazole 50%	0.50	0.5
消泡剂 Defoamer	消泡剂 Defoamer	0.05	0.05
<b>耦合剂 Coupler</b>			
丙二醇 Propylene glycol	-	1.0	-
EO 醇 EO alcohol	高-HLB 乳化剂 High-HLB emulsifier	-	1.0

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## 改进铸铁的防锈保护 Improved cast-iron chip corrosion protection



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## Synergex™ T 胺添加剂与MDEA搭配 amine additive combined with MDEA

### 金属加工液的经济型乳化剂和生物稳定剂

#### Economical emulsification and biostability in metalworking fluids

Synergex™ T和Amietol M12（甲基二乙醇胺或MDEA）组合可配制不含甲醛及硼的经济便捷型金属加工液配方。

The combination of Synergex™ T and Amietol M12 (methyldiethanolamine or MDEA) allows for the economical and convenient formulation of formaldehyde-free and boron-free metalworking fluids.

#### Synergex T 是 is:

- 一在金属加工液中可做低VOC 胺型添加剂 A low-VOC additive for metalworking fluids (< 25% 挥发性 volatile by ASTM E1868)
- 一叔胺 A tertiary amine
- 一高纯度胺 A pure amine (98%+)

MDEA是一款低气味，低VOC，高价值的理想型醇胺，可使工作液的pH值提高至9。它可在合理的成本内替代MEA、DEA、TEA以改进性能。推荐在浓缩液配方中含5% Synergex T、10%苯氧基乙醇或10%苯氧基丙醇型生物控制剂。

MDEA is an ideal low-odor, low-VOC, value-priced alkanolamine that can be used to bring the pH of the operating fluid up to 9. Use MDEA instead of MEA, DEA, and TEA to improve performance at a reasonable cost. Concentrates formulated with 5% Synergex T and either 10% phenoxyethanol or 10% phenoxypropanol-type biocontrol agent are recommended.

#### 观察所得 Observations

- Synergex T和MDEA的组合在与杀菌剂一起使用时可提供杰出的生物稳定性。  
When used with biocides, the combination of Synergex T and MDEA offers excellent biostability.
- 含有Synergex T，MDEA和适量防霉剂的液体不会演示真菌生长。  
Fluids containing Synergex T, MDEA, and appropriate levels of fungicide do not exhibit fungal growth.
- Synergex T可用于生物稳定、低VOC的金属加工液中。  
Synergex T can be used as part of a biostable, low-VOC metalworking fluid.
- 以Synergex N-烷基醇胺为基础调配的液体不会腐蚀铝（图示Al 2024工件浸入流体中，MDEA为参考）  
Fluids based on the Synergex N-alkyl alkanolamines do not stain aluminum (Al 2024 pieces dipped in the fluids shown, MDEA for reference).



Synergex T Plus and MDEA      Synergex T and MDEA      MDEA

#### 结论 Conclusion

- Synergex T与MDEA结合使用可提供优越溶液
- Synergex T combined with MDEA can provide excellent fluids.

以下浓缩液配方代表以Synergex T和MDEA为基础的全合成液良好初型。

The following concentrate formula represents a good starting point for fully synthetic fluids based on Synergex T combined with MDEA.

Synergex T	5%
Amietol M12 (MDEA) from Eastman	10% + 工作液达到预期pH值所需的额外添加量 10% + additional amount needed to reach desired pH in operating fluid
异壬酸 Isononanoic acid	8%
聚合酯 Polymeric ester	20%
苯氧乙醇 Phenoxyethanol	高达 Up to 10%
水 Water	≈ 50%

生物防治体系能从苯氧乙醇改变至50ppm BIT（稀释液）；用水调节分量。苯氧乙醇生防体系能以BIT替换（50ppm有效浓度的工作液，用水调节浓缩液总量）。此浓缩液可以1/20稀释成工作液。建议优先添加腐蚀抑制剂及/或复合添加剂。

The biocontrol system can be changed from phenoxyethanol to 50 ppm BIT (diluted fluid); use water to adjust volumes. The phenoxyethanol biocontrol system can be swapped out for BIT (50 ppm effective concentration operating fluid; adjust concentrate volume with water). This concentrate can be diluted 20/1 to provide the operating fluid. The addition of preferred corrosion-inhibiting additive(s) and/or packages is recommended.

请注意已知Synergex T等叔二乙醇胺可在全合成金属加工液中提供出色的生物稳定协同作用。（参见 Golec, K.; Hill, E.C.; Kazemi, P.; Skold, R. O.; 国际摩擦学 1989, 22(6), 375–382）

Note that tertiary diethanolamines like Synergex T are known to provide exceptional biostabilizing synergy in fully synthetic metalworking fluids (see Golec, K.; Hill, E.C.; Kazemi, P.; Skold, R. O.; Tribology International 1989, 22(6), 375–382.)

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## 金属加工和VOCs Metalworking and VOCs

### 重要提示 An issue of importance

金属加工液的挥发性有机物释出是大众关注问题。一种可帮助配方制定者选择低VOC的添加剂（如伊士曼的 Synergex™ T胺添加剂）的ASTM测试方法 (ASTM E1868) 已广泛采用。此外，还有各种如沸点等测试方法和标准。

The contribution of metalworking fluids to VOC is a concern. An ASTM test (ASTM E1868) has been developed that can help formulators select low-VOC additives like Synergex™ T amine additive from Eastman. Additionally, there are a variety of other methods and standards, such as boiling point.

### 基于热重分析的VOC评估

#### VOC assessment based on thermogravimetric analysis (TGA) (ASTM E1868)

- 基于 Based on: 110min/81°C 重量损失 weight loss
- Synergex T胺添加剂 amine additive: 重量损失 weight loss <10%

胺 Amine	VOC (g/L)	% 已蒸发 Evaporated	正常Normal BP (°C)
DCHA	911	99.7	256
Synergex	883	98.9	199
Synergex LA	860	99.8	230
Corrguard™ EXT	620	78.2	218
MDEA	171	16.5	247
Synergex T	69	7.5	285

### Synergex T

#### 符合金属加工VOC标准的醇胺

#### VOC-compliant alkanolamine for metalworking

正常沸点 Normal boiling point = 285°C

TAG CC 闪点 flash point = 295°F

### VOC 豁免 exemptions

#### 基于正常沸点的绿标签豁免 Green Seal exemption based on normal boiling point:

- 正常沸点 Normal BP <280°C是 is a VOC
- 正常沸点 Normal BP >280°C不是 is not a VOC

#### 基于正常沸点的豁免 EU ISO 11890 exemption based on normal boiling point:

- 正常沸点 Normal BP <250°C是 is a VOC
- 正常沸点 Normal BP >250°C不是 is not a VOC

#### 闪点 Flash point (TAG CC) 豁免 exemption:

- 闪点 Flash point <280°F是 is a VOC
- 闪点 Flash point >280°F不是 is not a VOC

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功能产品力求加强每一客户在润滑剂及润滑脂市场中得到最新的添加剂技术及训练。我们用聚合物技术向各人提供出众产品和配方服务：涵盖家族小企业到财富百大跨国企业。

功能产品公司承诺向我们客户提供优质产品和服务，借持续改进满足或超越客户期待。

Functional Products seeks to empower every customer in the lubricant and grease market with the latest additive technologies and education. We use polymer technology to provide renowned products and formulation services to everyone: from family-owned small businesses to Fortune 100 multinational firms.

Functional Products Inc. is committed to providing our customers with quality products and services that meet or exceed their expectations through the use of continual improvement.

产品包括 The products include:

- 增粘剂 Tackifiers
- 粘度调节剂 Viscosity Modifiers
- 工业润滑油添加剂 Industrial Lubricant Additives
- 润滑脂添加剂 Grease Additives
- 生物基添加剂 Grease Additives
- 附带食品接触 (NSF H1) 添加剂 Incidental Food Contact (NSF H1) Additives

## 增稠剂 TACKIFIERS

型号 BRAND	产品特性 PRODUCT FEATURES	典型粘度 TYPICAL VISCOSITY 100°C cSt	应用 APPLICATIONS								
			加入量 TREAT LEVEL WT %	美国国家卫生基金会 NSF	生物基 BIODEBASED	链条油 BAR & CHAIN	润滑脂 GREASES	润滑油 LUBRICATING OILS	金属加工 METALWORKING	齿轮油 GEAR OILS	防雾 ANTI-MIST
Paratac	聚异丁烯溶于石蜡基基础油中。 PIB in paraffinic oil.	2950	0.5-2.0			•	•	•		•	
Paratac XT	聚异丁烯溶于石蜡基基础油中。 PIB in paraffinic oil.	900	0.5-2.0			•	•	•		•	
V-176	聚异丁烯溶于石蜡基基础油中。良好剪切稳定性及拉丝长度。 PIB in paraffinic oil. Good shear stability and good string length.	2500 3300	0.5-2.0			•	•	•		•	
V-188	乙烯/丙烯共聚物溶于石蜡基基础油中。优越剪切稳定性及良好拉丝长度。 OCP in paraffinic oil. Excellent shear stability and good string length.	3000 5000	0.5-2.0				•	•	•	•	•
V-198A	聚异丁烯溶于石蜡基基础油中。优越拉丝长度及较好剪切稳定性。 PIB in paraffinic oil. Excellent string length and fair shear stability.	4600 5500	0.5-2.0				•	•	•		
V-378	聚异丁烯溶于第三类基础油中。优越热稳定性、良好剪切稳定性及拉丝长度。 PIB in Group III oil. Excellent thermal stability, good shear stability and string length.	4000 6000	0.5-2.0				•	•	•	•	
V-422	聚异丁烯溶于食品技术级白油。良好的剪切稳定性及拉丝长度。 PIB in food grade technical white oil. Good shear stability and string length.	2300 3800	0.5-2.0	•			•	•	•	•	
V-570	有良好的剪切稳定性及拉丝长度。植物油基。 Good shear stability and good string length. Vegetable oil base.	7000 9000	0.5-2.0		•	•	•	•	•		•
V-584	纯天然、食品级植物基增稠剂。优越的粘稠性。 All natural, food grade vegetable based tackifier. Excellent tack.	2000 3000 @40°C	3.0-10.0	•	•	•	•	•	•	•	•

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## 粘度改进剂 VISCOSITY MODIFIERS

型号 BRAND	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES		应用 APPLICATIONS										
		粘度 VISCOSITY 100°C cSt	剪切稳定指数 SHEAR STABILITY INDEX (PSSD) ASTM D-6278	粘度 加入量 VISCOSITY TREAT IN ISO 32 cSt @100°C	目标粘度 加入量 TREAT TO OBTAIN 1000cSt @100°C %	一般应用 加入量 GENERAL TREAT LEVEL WT %	美国 国家卫生基金会 NSF	生物基 BIODEBASED	润滑脂 GREASES	润滑油 LUBRICATING OILS	金属加工 METAL-WORKING	齿轮油 GEAR OILS	发动机油 ENGINE OILS	液压液 HYDRAULIC FLUIDS
V-101	贝尔烯共聚物。 Bale olefin copolymer.		45	1% =13 cSt	10	0.5-2.0						•	•	
V-158	乙烯/丙烯共聚物溶于石蜡基础油中。 OCP in paraffinic oil.	1250	45	12% =11cSt		7.0-10.0					•		•	
V-160	剪切稳定聚合物溶液溶于石蜡基础油中。 Shear stable polymer solution in paraffinic oil.	800 1200	22	12% =11cSt		5.0-10.0				•	•	•	•	•
V-255	颗粒型态剪切稳定聚合物。 Shear stable polymer in pellet form.		25	1% =10.5 cSt	12	0.5-2.0			•	•		•	•	

## 润滑脂添加剂 GREASE ADDITIVES

型号 BRAND	产品特性 PRODUCT FEATURES	加入量 TREAT LEVEL WT %
V-207	加入脂及冷却油的速溶性粉状聚合物。对差不多所有润滑脂有优越的剪切稳定性和排水性。 Quick dissolving powder polymer added to grease with cooling oil. Superior shear stability and water spray off for almost all grease types.	0.5-2.0
V-4020	具有排水性及剪切稳定性的粒状聚合物。在脂的初始反应时添加。 Pellet polymer for water spray off and shear stability. Added at initial grease reaction.	0.2-0.5
V-4004A	用于改进剪切稳定性及排水性的液体聚合物。容易处理。 Liquid polymer to improve shear stability and water spray off. Easy handling.	1.0-5.0
DP-200	将简单锂基脂的滴点改进25°C幅度。 Improves dropping point by 25°C for simple lithium grease.	0.5

## 特殊复合剂和添加剂 SPECIALTY PACKAGES &amp; ADDITIVES

型号 BRAND	产品特性 PRODUCT FEATURES	应用 APPLICATIONS									
		加入量 TREAT LEVEL WT %	美国 国家卫生基金会 NSF	生物基 BIODEBASED	链条油 BAR & CHAIN	润滑脂 GREASES	润滑油 LUBRICATING OILS	金属加工 METAL-WORKING	齿轮油 GEAR OILS	防雾 ANTI-MIST	液压液 HYDRAULIC FLUIDS
AO-550	用于植物基油的抗氧化剂。改进氧化稳定性。 Anti-oxidant for vegetable based oils. Improves oxidative stability.	0.15-0.5		•	•	•	•		•		•
CA-447	改进食品级油品极性的耦合剂，令添加剂能发挥作用。 Coupling agent that improves polarity of food grade oils, to enable use of additives.	3.0-7.0	•			•	•	•			
CI-426	食品级应用的腐蚀抑制及抗磨损复合剂。 Corrosion inhibitor and anti-wear package for food grade applications.	0.5-2.0	•			•	•	•			
EVO-530	以50%水稀释的植物性乳化复合剂，用于润滑泵的活塞和压缩机。低至-25°C时仍有优越的相对稳定表现。 Vegetable emulsifier package used with 50% water to lubricate pistons on pumps and compressors. Performs to -25°C with excellent phase stability.	15-30		•			•				•
V-162	用于冷却液的抗雾添加剂。 Anti-mist additive for oil-based coolants.	0.02-0.1									•
CMR-1001	不会腐蚀铝及钢材的生物型水泥脱模产品。 Biobased concrete mold release product that does not stain aluminum or steel forms.	3.0-6.0		•							

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杜发化学是金属加工液添加剂的主要供应商，其中我们有经销的产品包括：

Dover Chemical is a major supplier for the metal working additives, the products we have carried include:

- 长链氯化烷烃 Long-Chain Chlorinated Alkanes, C20+
- 中链氯化烷烃 Medium-Chain Chlorinated Alkanes, C14-C16
- 动物油及酯 (铜腐蚀/非铜腐蚀性) Lard Oils and Esters (Non Staining/Staining to Copper)
- 烯烃 (铜腐蚀性) Olefins (Staining to Copper)
- 氯化脂肪复合物 Chlorinated Fatty Compounds
- 磷酸酯 Phosphate Esters
- 合成界面润滑 Synthetic Boundary Lubrication
- 酰胺 Amide
- 油溶性界面润滑剂 Oil Soluble Boundary Lubricants
- 水溶性界面润滑剂 Water Soluble Boundary Lubricants
- 半合成浓缩液 Semi-synthetic Concentrates
- 合成冷却液 Synthetic Coolants
- 硼酸胺腐蚀抑制剂 Amine Borate Rust Inhibitors
- 脂肪酸基腐蚀抑制剂 Fatty Acid Based Rust Inhibitors

### 黑色硫化极压添加剂 DARK COLOR SULFURIZED EP ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES							
	原液 ORIG. FLUID	5% 稀 释液 DIL. (SNI50)			比重 S.G.	粘度 VIS. 40°C cSt	硫 S (活 硫) (ACT S) %wt	铜 腐蚀 COPPER CORR. 3h 100°C	酸值 ACID VALUE mg KOH/g	皂化 值 SAP. NO. mg KOH/g	闪点 FLASH POINT COC °C	
Mayco Base 1351 硫化 动物油 Sulfurized Fatty Oil			低粘度，广泛满足非铁金属操作需要。非腐蚀性，可用于难切削青铜和黄铜等严峻操作。具优良极压和润滑性；适合切削油、导轨油、打头油等各类纯油性配方。 Low viscosity, extensively satisfies needs for operating non-ferrous metals. Non-staining, can be used for severe operations of bronze/brass. Good EP and lubricity. Suitable for cutting oils, waylube, and neat oil formulations including cold heading.	导轨 Waylube 车削 Cutting 攻牙 Threading 绞牙/自动螺钉机(切面) Tapping/Auto Screw Machine (Cut Side) 冷锻 Cold Forging	5 5-8 10-15 10-20 25-50	0.970	375	10.5 (0)	1B	≤8	NA	>204
Mayco Base 1210 硫化 动物油 Sulfurized Fatty Oil			非腐蚀性。可调配金属加工油、乳化油、轧制油和工业油脂。完全反应硫化物；不含自由或活性硫，对有色金属无不良影响。配方中以环烷基基础油较为合适。粘度高，调合时适当加热以帮助均衡扩散。 Non-staining. Can blend metal working oils, emulsifier, rolling oils and industrial greases. Fully reacted sulfurized product; with no free sulfur or active sulfur, no adverse effect on yellow metals. Raise temperature properly when blending for even dispersion.	工业油脂 Ind. Grease 车削 Turning Operation 切齿 Gear Cutting 乳化液 Sol Oils 自动螺钉机(切面) AutoScrewMachine (Cut Side)	1-5 5-10 5-10 5-15 10-15	0.980	5300 @100 °F SUS	10.5 (0)	1B	12	NA	>204
Mayco Base 1362 硫化 脂肪油 Sulfurized Fatty Oil			低粘，适合多种铁类金属。可用于难切削铁合金的严峻加工。含活性硫；不适合铜、青铜和黄铜合金。 Low viscosity, suitable for different ferrous metals. Good for severe operations on hard-to-machine alloys. Contains active sulfur; not suitable for machining copper, bronze and brass alloys.	车削 Cutting 攻丝/绞牙 Threading/Tapping 自动螺钉机(切面)Auto Screw Maching(Cut Side) 打头	5-10 10-20 10-20 20-30	0.996	625	17 (6)	4B	8	NA	204

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## 氯化添加剂 CHLORINATED ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES					
				比重 S.G.	粘度 VIS. 40°C cSt	粘度 VIS. 100°C cSt	氯 CHLOR % wt	闪点 FLASH POINT COC °C	
Paroil 53NR 氯化石蜡 Chlorinated Paraffin	 清澈淡黄 Clear Pale Yellow	在室温下是非腐蚀及低挥发性液体。含稳定剂；可维持产品在运输和储存过程时完整不变。用途广泛，可用于调配纯切削、拉伸及冲压油。 Non-corrosive and low volatile liquid at room temperature. Contains stabilizer to maintain product integrity during transportation and storage process. Extensive applications, can be used to blend machining, drawing and stamping oils.	纯油切削 Straight Oil Cutting 纯油拉伸/冲压 Straight Oil Drawing/ Stamping	3-10 5-30	1.260	350	15	53.7	>232
DA-8506XS 氯化 甲基酯 Chlorinated Methyl Ester	 清澈淡黄 Clear Pale Yellow	具极压、润滑及湿润性。产品稳定、非腐蚀性。可调配用于铁及非铁金属的全合成和半合成液；亦可用于拉伸及齿轮油配方。可与氯化石蜡、磷酸酯及硫化添加剂掺混使用。 Possesses EP, lubricity and wetting properties. Product stable, non-corrosive. Suitable for blending synthetic and semi-synthetic fluids, that used in ferrous and non-ferrous metals. Also good for drawing and gear oil formulations. Can be blended with chlorinated paraffins, phosphate esters and sulfurized additives in applications.	纯油切削 Straight Oil Cutting 纯油拉伸/冲压 Straight Oil Drawing/ Stamping 乳化油切削 Sol. Oil Cutting 乳化油拉伸/冲压 Sol. Oil Drawing/ Stamping	3-10 5-15 3-10 3-10	1.160	135	11	29	>220
DA-8527 氯化 脂肪酸 Chlorinated Fatty Acid	 清澈黄 Clear Yellow	具极压、湿润及润滑性。产品稳定。对金属表面的粘附性好。以稍微过量的烷基醇胺中和后可溶于水。用于合成液配方中。 Possesses EP, wetting and lubricity properties. Product stable, good adhesive property to metal surfaces. Soluble in water when neutralised with slight excess of alkanolamine. For use in synthetic fluid formulations.	合成液 Synthetic Fluids	3-10	1.1 @50°C	420	20	30	NA

## 代氯添加剂 CHLORINE REPLACEMENT ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES					
			比重 S.G.	粘度 VIS. 40°C cSt	中和值 NEUT. NO. mgKOH/g	极压剂 成分 EP CONTENT %wt	闪点 FLASH POINT COC °C	
Mayfree 133 磷氮化合物 Phosphorus- Nitrogen Compound	 深琥珀 Deep Amber	油溶性，但可加入水溶性配方中。以1:1氯含量取代氯化石蜡。酸值高，水性配方中须提高三乙醇胺等碱性成分比例。在油性系统中，不能与高碱值磺酸盐相容。取代氯的成功例子最高含氯量达15%。在绝大部分操作中均能取代氯；但对非常严峻操作或不锈钢等加工，推荐用高氯含量(>20%)的切削油配方取代。 Oil-based, but can be added to water-based formulations. Replaces chlorinated paraffin by 1:1 chlorine content. High acid value, need to increase alkaline content of say, TEA in water-based formulations. Not compatible with overbased sulphonates in oil-based systems. Chlorine replacement attained as high as 15% in some successful example. Can replace chlorine in most operations. But for severe or stainless operations, cutting oil formulations with high chlorine contents (>20%) is recommended as alternative.		0.99 @60 °F	9500	155	磷 Phosphorus 4	238
Doverlube NCL-2 磷盐抗磨 极压剂 Phosphate Anti-wear EP Additives	 深褐 Deep Brown	含非卤素型极压剂及抗磨剂的无氯润滑添加剂。无腐蚀性。与环烷基油相容；配合石油磺酸钠或其他耦合剂，亦可相容于石蜡基油。与硫和胺类添加剂搭配有加成效应；后者可部分中和NCL-2。在低至重负荷金属加工液配方中，可以有效取代氯化石蜡；在油性配方中(石蜡基及环烷基)，可以等量或更少量取代。 Non-chlorinated lubrication additive containing non-halogenated EP and anti-wear additives. Non-corrosive. Compatible with naphthenic oil, and also with paraffinic oil when blended with petroleum sulfonate or other couplers. With synergistic effect when blended with sulfur and amine based additives; with the latter partially neutralizes NCL-2. Replaces conventional chlorinated additives in low to heavy duty metalworking fluid formulations. Replaces chlorinated paraffin at lesser to normal proportions in oil-based formulations (naphthenic and paraffinic oils).		0.98 @50 °C	10000 @100 °F	150	磷 Phosphorus 3	232

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## 水基防锈剂 WATER-BASED RUST PREVENTIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES				
	原液 ORIG. FLUID	5% 稀释液 DIL.			比重 S.G.	pH 纯液 NEAT	pH 5% 水 WATER	酸值 ACID VALUE meq KOH/g	总碱值 TOTAL ALKALINITY meq HCl/g
Mayco Base RP8765 二羧酸 盐基 复合物 Dicarboxylic Acid Salt Based Cpd			合成腐蚀抑制剂，含润滑性成分。不含硼及亚硝酸盐。用于半合成液及吸油/抗油性全合成液。可全比例相容于水形成极透明液。可用于工序间防锈配方。可槽边添加于冷却液中以加强防锈效果。 Synthetic corrosion inhibitor with lubricity content. Contains no boron nor nitrite. Used in semi-synthetic fluids and synthetic fluids of oil absorbing and rejecting types. Miscible with water in all proportions to form very transparent solution. Can be used in formulations for in-process rust protection. Can be added sumpside to coolant tank to enhance anti-rust performance.	12 浓缩液 Conc.	1.060	8.0	7.8	185	20

## 含磷添加剂 PHOSPHORUS CONTAINING ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES				
				磷 PHOS. %wt	比重 S.G.	粘度 VISCOSITY	个别参数 INDIVIDUAL PARAMETERS	
Doverphos 253 双油酸亚磷酸酯 Dioleryl Hydrogen Phosphite		属液态双烷基亚磷酸盐，分子量较高、低磷含量；在金属加工应用中主要提供润滑及减磨性能。 Liquid dialkyl phosphite with a relatively high molecular weight and low phosphorous content. Mainly used in MWF applications to provide lubricity and anti-wear properties.	一般应用 General Application	0.1-3	5.3	0.910	35cps @25°C	NA
Mayphos 45 磷酸酯 Phosphate Ester		不溶于水，但可用胺类等碱性物质中和后加进水性配方。对非铁金属有极好表现。与PEG酯类或其它含油点的非离子活性剂配合，有加成效应。高度推荐用于槽磨应用；在其常用的硅藻土过滤单元中不会从油性载体分离。 Not soluble in water, but can incorporate in water-based formulations when neutralised with alkaline components such as amines. Extremely good performance on non-ferrous metals. Synergism noted with PEG esters or cloud point possessing non-ionic surfactants. Highly recommended in flute grinding applications as the commonly used diatomaceous earth filtration units do not strip the additive from the oil carrier.	槽磨 Flute Grinding 螺旋刀削 Screw Cutting 冷锤 Cold Heading 拉伸/冲压 Drawing/Stamping 一般切削(抗磨) General Cutting (AW)	2-4 4-6 5-10 10-25 0.5-2	5.5	1.07 @60 °F	21500 cSt @40°C	中和值 Neut.No. 200 meqKOH/g  闪点 Flash Pt. COC. 193°C
Doverphos EP-425 亚磷酸酯 聚合物 Polymeric Phosphite Ester		浅色低味非氯亚磷酸酯聚合物，适合切削/研磨铁及非铁合金。能应用于油基及水基产品中。在配方中有抗磨及极压功能；与硫化，氯化及含磷添加剂相比，在碳钢材质的拉伸测试中有较优异表现。 Light color, low odor, non-chlorinated polymeric phosphite ester suitable for machining/grinding ferrous and non-ferrous alloys. Can be incorporated in neat oils and water-dilutable coolants. Possesses anti-wear and EP properties; exhibit superior performance in drawing test of carbon steel materials when compared to sulfurized, chlorinated and phosphorus containing additives.	油基配方 Oil-based Formulations	1-5	4.5	0.990	500 @210 °F	酸值 ACID VALUE meq KOH/g 0.5max

## 其它添加剂/复合剂 OTHER ADDITIVES / PACKAGES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5% 稀释液 DIL.			比重 S.G.	个别参数 INDIVIDUAL PARAMETERS	
Mayco Base WLA-88 浅色 导轨油 添加剂 Light Color Waylube Additive			优质级别。色浅、无硫无锌。极压及抗磨性极佳。高润滑性；对适当的粘滑性及抗氧化起关键作用。易被金属加工冷却液排斥；故方便移除废油。能防止在冷却液喷涂或接触时洗掉。可完全油水分离，符合ASTM D-1401反乳化测试标准。导轨油须加入0.5%增粘剂以提供适当的油粘附性。用1.5%(w/w)加入量与石蜡基油(ISO68)调合的配方，通过了Cincinnati Milacron的粘滑性试验，试验值为0.77。 Premium grade. Light color, sulfur free, zinc free. Excellent EP and AW properties. High level of lubricity critical for proper stick-slip properties, and anti-oxidant for long life. Readily rejected by metalworking coolants for easy sump removal. Resists water wash-off by the spray and contact by these fluids. Complete oil/water separation achieved in ASTM D-1401 demulsibility test. 0.5% tackifier is required for proper oil adhesion to the ways. The blend with a treat level of 1.5%(w/w) in a paraffinic oil (ISO68) passed the Cincinnati Milacron stick/slip test with a value of 0.77.	导轨油 Waylube Oil	1.5	0.94 @15.6 °C	粘度 VIS@40°C 54cSt  闪点 FLASH PT COC >176°C  中和值 NEUT. NO 54 meqKOH/g  磷含量 Phos. Content 1.2%

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## 思敏OEM产品 Smart Oil OEM Products

多年来，思敏不断应客户要求，在提供名牌产品之余，亦为他们开发和购存各种复合剂或其它产品；思敏亦因此不断致力开拓货源和提升技术层面。至今，思敏推出的 OEM 产品已全面成熟，能为客户提供补给性的超市选择。



思敏®

For many years, Smart Oil has been requested by customers to develop and purchase various packages and other products, along with our supplies of the Big Names. For this, Smart Oil has continuously devoted to the exploit the supply and improvement in technologies. Nowadays, Smart Oil OEM products are already mature and comprehensive, which contribute to a supplementary supermarket choice for customers.



思敏的 OEM 产品包括复合剂和单剂，部分采用思敏分销的顶级名牌产品为原料；客户稍作加工，甚或只更改包装即能用自己品牌开发和渗透市场。思敏供应 OEM 复合剂，令客户在产品开发和品质控制方面的负担大减，从而集中处理他们专长的销售网络和业务关系。在单剂方面，思敏为客户提供较为独特，或是以价廉物美为卖点的非商标产品，包括成本效益极高的商品材料。

Smart Oil OEM products include packages and components, some of them are derived from the Big Names products distributed by Smart Oil as raw materials. Customers can explore and penetrate the market using their own brands with only little add-value processing or even only changing the packages. Smart Oil OEM packages can let customers focus on their professional sales network and business relationship without much burden on product development and quality control in production. Regarding components, Smart Oil provides comparatively unique supplies, or the generic products that are value for money; these covering commodity materials with extremely high cost efficiency.

在现今资讯澎湃的年代，思敏的 OEM 产品已在接近完全竞争市场中广为业界接受。思敏产品类别包括拉伸油精、攻牙油精、切削油精、防锈油精、乳化油精、合成和半合成冷却液、水基防锈液、硫化添加剂、含磷化合物、润滑脂、脱水剂、动植物脂肪、脂肪酸、增粘剂、防霉杀菌剂、清洗剂等。这些 OEM 产品，配合思敏服务多年的名牌系列产品，令思敏的产品组合更为丰富，更能适应现今一体化市场的环境。

In this era of information boom, products are already widely acknowledged by the industry approaching total competition. Categories of Smart Oil products include drawing oil concentrates, tapping concentrates, cutting oil concentrates, rust-preventives, emulsifier bases, synthetic and semi-synthetic coolants, water-based rust preventives, sulfurized additives, phosphorus containing compounds, lubricating greases, de-watering agents, animal and plant fats, fatty acids, tackifiers, fungicides and bacteriocides, cleansing agents, etc. This OEM products, team up with the big names series products served for years, highly enrich Smart Oil product mix with more adaptability to this integrated market environments.



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界面润滑添加剂 BOUNDARY LUBRICATING ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES			
				比重 S.G	粘度 VIS. 40°C cSt	酸值 ACID VALUE mgKOH/g	闪点 FLASH POINT COC °C
SmartLub S9010 冲剪油 复合剂 Stamping Package	 清澈淡黄 Clear Pale Yellow	优质合成酯复合物，含特种分散及润滑剂。具特强润湿性，令工件加工后有良好表面光洁度。溶剂载体挥发后残留物甚少。可用于矽钢片、铝片、铜片等合金的冲剪或成型加工。 Premium package based on synthetic esters, contains specialty dispersant and lubricating agents. Possesses particularly strong wetting property to provide good surface finishing of the workpiece after operation. Leaves very little residual materials after evaporation of the solvent. Can be used in punching and forming of alloy chips such as silicon steel, aluminum or copper.	1-3 (挥发性)	0.900 - 1.000	<15	<15	>100
SmartLub V6150 植物脂肪 甲基酯 vegetable based Methyl Ester	 清澈透明 Clear Transparent	无味，低粘。润湿、防锈及润滑性优越。酸值低，氧化稳定性极佳。可用于水基或油基产品。可在配方中取代矿物油使用。可在油基配方中用于冲剪、钻孔、攻丝、切削及磨削等操作。 Low odor, low viscosity, with excellent wetting, anti-rust and lubricating properties. Low acid value, excellent oxidation stability. Can be used in both water and oil-based products. Can replace mineral oils in formulations. Can be used for stamping, drilling, threading, cutting and grinding operations in oil-based formulations.	5-40	0.850 - 0.880	<10	<1	>120
SmartLub 9212 脂肪酸酯 复合剂 Fatty Ester Package	 琥珀 Amber	优质脂肪酸酯复合物，含特种分散、抗磨、防锈及润滑剂。产品有优越润湿性能。可与白油调和后用于珩磨、深孔钻及攻丝等工艺。 Premium package based on fatty esters, contains specialty dispersion, antiwear, anti-rust and lubricating additives. Products have excellent wetting and lubricating properties. Can be compounded with white oils prior operations like honing, deep-hole drilling and threading.	3-15	0.900 - 1.000	60 - 90	<50	>160
Smart PB 精制猪油 Highly Refined Lard Oil	 清澈黄 Clear Yellow	提供优质界面润滑性能。倾点低、润湿性强、酸值低、产品稳定。用于切削、冲压和拉伸等纯油配方中。 Provides superior boundary lubricating property. Low pour point, strong lubricating and wetting properties, low acid value, product stable. Used in neat oil formulations for operations such as cutting, stamping and drawing.	3-60	0.900 - 1.000	35 - 50	<1	>250
Smart DTO 蒸馏妥尔油 Distilled Tall Oil	 浅琥珀 Light Amber	润滑剂及乳化助剂，适用于调配乳化及半合成液。提供良好润滑性能；能增强工件表面光洁度。可微调水基系统pH值，以达至更佳平衡效果。松香成分约30%。 Lubricant and co-emulsifier; suitable for blending soluble oils and semi-synthetic fluids. Provides good lubricating property; can enhance surface finishing of the workpiece. Can be used to fine tune pH value of water-based systems to achieve better equilibrium. Rosin content is about 30%.	1-30	0.900 - 1.000	40 - 60	130 - 210	>200

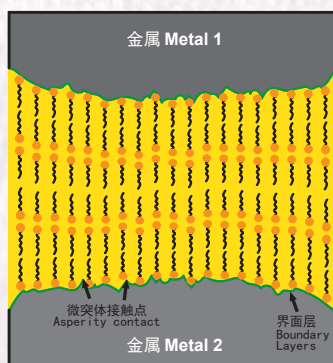
摩擦改进剂 Friction Modifiers



摩擦改进剂 Friction Modifier

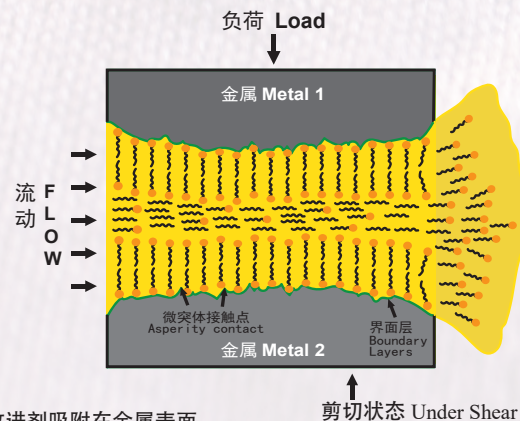
润滑油 Oil

静止状态 Steady State



摩擦改进剂吸附在金属表面

Adsorption of friction modifiers on metal surface



剪切状态 Under Shear

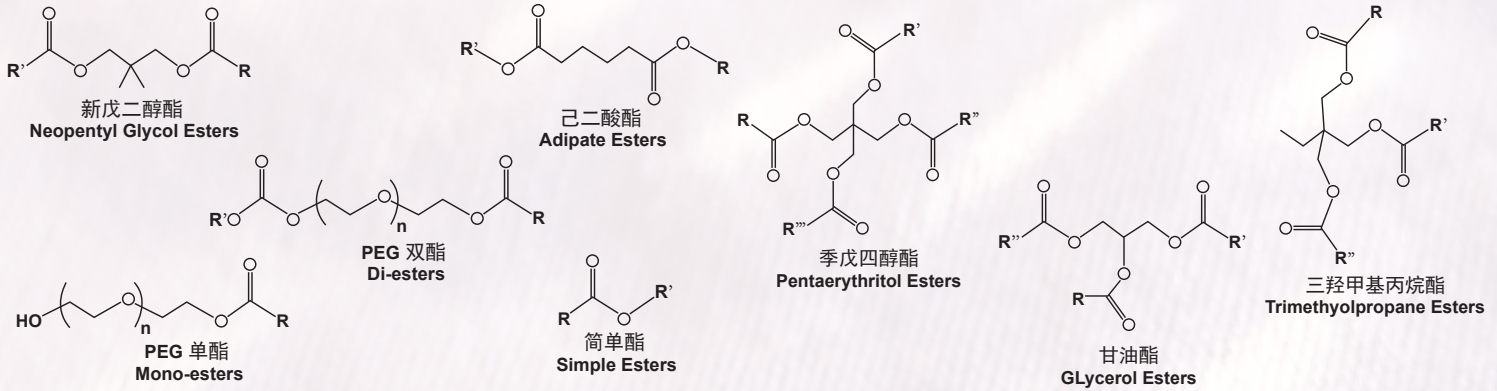
摩擦改进剂加入润滑油中，会在摩擦表面形成物理或化学吸附膜，减少金属滑动时的表面接触，从而降低摩擦系数，起润滑作用。摩擦改进剂是由两部分组成，分别为极性头部和油溶性尾端，头部附在金属表面上，尾部像地毯毛竖起，同样，另一分子的摩擦改进剂的头部附着相对摩擦运动的金属表面而其尾部也是像地毯一样竖立，故两边尾部垂直堆叠在一起，使金属间形成一层纳米缓冲边界薄膜，达致减磨功能。同时，摩擦改进剂也有抗氧化剂和腐蚀抑制剂功能。当两金属负载增加而摩擦到达一定温度时，极性分子消失，减摩擦功能亦会失去。

When friction modifier is added to lubricating oil, a physical or chemical adsorbing film will be formed at the frictional surfaces, which reduces the surface contact during metal sliding, so as to lower the frictional coefficient and lead to lubrication. Frictional modifier is composed of two parts, namely the polar head and oil-soluble tail end. The head is attached to the metal surface, and the tail props up like carpet wool. Similarly, the head of another molecule of frictional modifier is attached to the corresponding metal surface with opponent frictional movement, with its tail also props up like carpet wool, so both tail sides stacked together vertically, forming a layer of nano film as boundary buffer between the metal surfaces. On top of this, frictional modifier can also be used as anti-oxidant and corrosion inhibitor. When the loading of two corresponding metals increases to cause the friction attaining a certain temperature, polar molecules will diminish, and the function of friction reduction will be lost.

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## 多元醇酯 Polyolesters



其中 Where R=R'=R'' 或不同或混合 or different or mixed

其中 Where R=R'=R''=R''' 或不同或混合 or different or mixed

## 多元醇酯 POLYOLESTERS

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES					
			粘度 指数 VISCOSITY INDEX	比重 S.G.	粘度 VIS. 40°C cSt	酸值 ACID VALUE mg KOH/g	闪点 FLASH PT COC °C	pH 5%水稀 释液DIL (WATER)
Smart 1616W 乳化型 复合酯 Emulsifiable Complex Ester	 清澈 深琥珀 Clear Deep Amber	高粘度乳化型复合酯，其独特结构对金属表面有很强亲和力；即使在高温情况下也能保持良好的润滑和减磨性能。特别适用于水/油性轧钢液及铜/铝拉伸液。饱和度，可避免氧化反应形成污染物。有效取代硫、氯、磷极压剂而表现出相近的效果。 High viscosity, emulsifiable complex ester that possesses unique structure to contribute to the property of strong affinity to metal surfaces; which also maintains superior lubricating and anti-frictional characteristics even under high temperature during processing. Especially suitable for water/oil based fluids for steel rolling and aluminum/copper drawing fluids. With high degree of saturation that can prevent producing contaminants from oxidation. Also, it can effectively replace sulfur, chlorine and phosphorous-containing EP additives with similar performance.	NA	0.900 - 1.000	800 - 1200	<60	NA	9 - 11
Smart DPE1506 双季戊四醇 复合酯 Dipentaerythritol Complex ester	 清澈琥珀 Clear Amber	粘度指数高、耐剪切，与金属表面亲和力强。在高温下仍能保持工件及刀具间润滑、抗磨和极压性能。可替代硫、磷、氯作极压剂使用。产品应用后无残留，能提高工件光泽度。特别适用于水/油性轧钢液、铜/铝拉伸液。与矿物油、合成酯、合成油有良好相容性，饱和度。产品易于生物降解，更能代替矿物油做基础原料使用，对环境无害。	>160	0.900 - 1.000	110 - 150	<15	>240	NA
Smart PE1536 季戊四醇 复合酯 Pentaerythritol Complex Ester	 清澈琥珀 Clear Amber	High viscosity index, good shear endurance, with good affinity to metal surface. Can maintain superior lubricating and anti-frictional characteristics even under high temperature, can replace the sulfur, chlorine or phosphorous-containing additives for EP functionality. Can improve the shininess of the workpiece as it leaves no residue after application. Especially suitable for water/oil based fluids for steel rolling, and aluminum/copper drawing fluids. With high degree of saturation and good compatibility with mineral oils, synthetic oils and synthetic esters. Products easily biodegradable, and can even replace mineral oil as base raw material, no harm to the environment.	>250	0.850 - 0.950	20 - 30	<8	>270	NA
Smart PE1586 季戊四醇 复合酯 Pentaerythritol Complex Ester	 清澈琥珀 Clear Amber		>170	0.900 - 1.000	450 - 600	<15	>290	NA
Smart TMP1806 三羟甲基丙烷 复合酯 Trimethylolpropane Complex Ester	 清澈黄 Clear Yellow		>160	0.900 - 1.000	210 - 250	<20	>245	NA

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## 高分子量聚合酯的特征 Features of High Molecular Weight Polymeric Esters

- ▶ 氧化稳定性强（含长饱和碳链） Strong oxidation stability (contains long saturated carbon chain) ;
- ▶ 增加油膜厚度，减少工件磨损 Thicken oil film, can reduce abrasion of the workpiece;
- ▶ 高粘度指数，在温差大的条件下仍能保持添加剂的润滑性能  
High viscosity index, can maintain lubrication property of additives even under high temperature fluctuations;
- ▶ 含极性组分 Contains polar components (C-O, C=O);
- ▶ 良好金属吸附性；有效增强产品润滑效能  
Good metal adsorption, effectively enhance lubrication performance of products;
- ▶ 与其他添加剂有良好相容性 Good compatibility with other additives;
- ▶ 生物降解性良好 Good biodegradability.

### 高分子量聚合酯 HIGH MOLECULAR WEIGHT POLYMERIC ESTER

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES					四球极压 4 BALL WEAR†			
			粘度 指数 VISCOSITY INDEX	比重 S.G.	粘度 VIS. 40℃ cSt	酸值 ACID VALUE mg KOH/g	闪点 FLASH PT COC ℃	5% 添加剂 ADDITIVE + 95% SN150		5% 添加剂 ADDITIVE + 5% SMART BASE 2517 + 90% SN150	
								P <sub>B</sub> /k g	P <sub>D</sub> /k g	P <sub>B</sub> /k g	P <sub>D</sub> /k g
Smart HMPE 9310 高分子 聚合酯 High Mwt. Polymeric Ester	 清澈浅黄 Clear Light Yellow	不含硫、氯、磷及矿物油的高分子聚合酯。独特的高分子结构使其在高温下能紧紧粘附在金属表面上，能表现优异的减磨及抗磨性能。有良好水解稳定性，适用于水基配方中。饱和度高，不易产生在刀具与金属表面因氧化反应形成的污染物。高粘度指数，有优异高温稳定性、低温流动性、低挥发性和良好剪切稳定性。能保持加工过程中刀具与工件接触点在不同温度下所产生相对的润滑性、抗磨性和极压性能。这不但使工件能在不同温度范围内保持良好的润滑操作，同时可减少添加剂的损耗。配方中可取代硫、氯、磷极压添加剂，表现极相近效果，同时还可避免因极压剂与工件表面产生反应，降低加工工件光洁度。与小量硫、氯、磷添加剂共用，能产生明显协调效果。添加剂与矿物油、合成油及合成酯的相容性良好，易于调合。清洁性能佳，同时易于生物降解。产品可用作调高润滑体系的粘度。属无灰型产品，高温下没有残留物。不易腐蚀有色金属，特别适用于加工铝合金切削、拉伸及冲压配方。产品亦适用于齿轮油、润滑脂、冷冻机油及其他金属加工液的配方中。	>140	0.900 - 1.000	40 - 60	<8	>200	44	100	76	315
Smart HMPE 9320 高分子 聚合酯 High Mwt. Polymeric Ester	 浅琥珀 Light Amber	High molecular polymeric esters that contain no sulfur, chlorine, nor phosphorous. With unique molecular structures that can adhere tightly to the metal surface even at elevated temperatures. Superior frictional and antiwear properties. Good hydrolytic stability, suitable for water-based coolants formulations. With high degree of saturation, not easy to form contaminants at contact points of tool and workpiece surface due to oxidation. High viscosity index, with superior high temperature stability, cold flow property, low volatility, and good shear stability; which can maintain corresponding functions of lubrication, anti-wear and EP at different temperatures at contact points during machining. These can not only maintain good lubricity operations at extended temperature range, but also can reduce consumption of additives. Can replace sulfur, chlorine and phosphorous-containing additives in formulations with very comparable performance. Moreover, reduction of product shininess can be avoided, as otherwise will be caused by the reaction of EP additives with metal during machining. Can also be blended with small quantities of sulfur, chlorine, and phosphorus-containing additives to achieve synergistic effects. Good compatibility with mineral oils, synthetic oils and synthetic esters to make blending easy. Good cleaning characteristic and readily biodegradable. Product can be used to raise the viscosity of the lubrication system. Being ashless additive, leaves no residue after high temperature operations. Not easy to corrode non-ferrous metals; especially suitable for cutting, drawing, and stamping operations on aluminum alloys. Product also suitable for use in formulations of gear oil, grease, refrigeration oil and other metal working fluid..	>165	0.900 - 1.000	215 - 250	≤20	>245	61	160	94	315
Smart HMPE 9340 高分子 聚合酯 High Mwt. Polymeric Ester	 清澈黄 Clear Yellow		>150	0.950 - 1.050	550 - 750	<15	>220	71	160	100	400
Smart HMPE 9350 高分子 聚合酯 High Mwt. Polymeric Ester	 清澈黄 Clear Yellow		>170	0.950 - 1.050	1400 - 1700	<15	>270	66	160	94	400
Smart HMPE 9380 高分子 聚合酯 High Mwt. Polymeric Ester	 清澈黄 Clear Yellow		>170	0.900 - 1.000	1800 - 2200	<15	>270	52	160	94	500

† 伺服马达速度 Servo motor speed - P<sub>B</sub>: 0.03秒达1500 rpm in 0.03s, P<sub>D</sub>: 0.03秒达1760 rpm in 0.03s.

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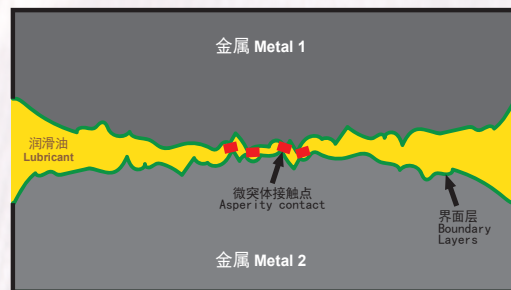


## 极压抗磨剂功能 Function of EP and AW Agents

极压抗磨剂主要成分可为氯、磷或硫的有机化合物。

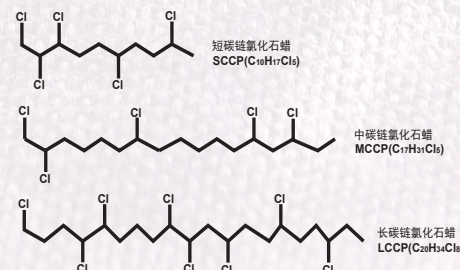
Major components of EP and anti-wear agents can be organic compounds of sulfur, chlorine or phosphorus.

- ▶ 氯主要指氯化石蜡、氯化脂肪等；在高负荷高温条件下防止烧结和磨损  
Chlorine mainly refers to chlorinated paraffins, chlorinated fatty oils, etc., which prevent welding and wearing under high-load, high-temperature conditions.
- ▶ 磷主要是指磷酸酯、磷酸盐等；在负荷较低条件下提供明显的抗磨性。  
Phosphorus mainly refers to phosphate esters, phosphates, etc., which provide conspicuous anti-wear property under comparatively low-load conditions.
- ▶ 硫主要指硫化脂肪油，硫化烯烃、多硫化物等；在高负荷高温条件下防止烧结和磨损。  
Sulfur mainly refers to sulfurized fatty oils, sulfurized olefin, and polysulfides, etc., which prevent welding and wearing under high-load, high-temperature conditions.
- ▶ 摩擦面接触压力非常高；两金属表面的微凸体互相啮合，会产生局部高压高温。此时极压、抗磨剂中的活性元素与金属发生化学反应，形成剪切强度低的固体保护膜，把两金属表面隔开，从而防止金属磨损及烧结。  
Contact pressure between frictional areas is very high, so the engagement at asperity between two metal surfaces will produce high pressure and high temperature locally. At that time, the active elements of the EP and anti-wear agents have chemical reaction with the metal, forming low-shear solid protective membrane, which separates the two metal surfaces, thus preventing metal wearing and welding.



## 氯化石蜡的特征 Features of Chlorinated Paraffin

- ▶ 能形成持久润滑膜，即使在低温中压下仍能有效 Can maintain long-lasting lubricant film, effective even under low temperature and medium pressure;
- ▶ 在高温、高压下氯极压剂会分解；碳-氯键断裂，释出氯与金属反应、形成氯化铁覆盖膜，覆盖金属的微凸表面。氯化铁膜属层状结晶结构，剪切强度低，摩擦系数小，故能减少金属的相对运动摩擦。氯化铁熔点较低，在350°C时会失效。Chlorine EP additive is decomposes under high temperature and high pressure; carbon-chlorine bonds break to release chlorine, which react with the metal to form ferric chloride covering film over the metal surface with micro-protrusions. The chlorinated paraffin film has layered crystallized structure, with low shear strength and low friction coefficient, so can reduce the friction due to relative movement among metal surfaces. Ferric chloride has low melting point, so will fail to perform at 350°C.
- ▶ 氯化物易水解而生成氯化氢，导致金属腐蚀；所以有水存在不宜使用 Chloride is easy to hydrolyze, forming hydrogen chloride and leading to metal corrosion; so not suitable for use in the presence of water.



## 氯化添加剂 CHLORINE REPLACEMENT ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES				
			比重 S.G.	粘度 VIS. 40°C cSt	粘度 VIS. 100°C cSt	氯 CHLOR % wt	闪点 FLASH POINT COC °C
Smart Base CP52 氯化石蜡 Chlorinated Paraffin C10-C13	 淡黄 Pale Yellow	在室温下为非腐蚀及低挥发性液体。用途广泛，可用于调配纯切削、拉伸及冲压油。 Non-corrosive and low-volatility liquid at room temperature. Extensive applications, can be used to blend neat machining, drawing and stamping oils	1.200 - 1.300	410	14	51 - 53	>200
Smart Base CP60 氯化石蜡 Chlorinated Paraffin C14-C17	 淡黄 Pale Yellow	氯含量中等、粘度极高。用于拉伸、冲压及成型配方。 Medium chlorine level, extremely high viscosity. For use in drawing, stamping and forming formulations.	1.300 - 1.400	10290	60	59 - 61	>220

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## 含磷极压抗磨剂的特征 Features of Phosphorus Containing EP and AW Agent

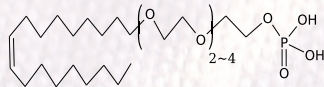
含磷极压抗磨剂会吸附在金属表面，在金属凸起处因金属摩擦产生热，继而引起局部化学反应。添加剂基于水解或热分解生成磷酸盐膜，能起抗磨及极压作用。在金属加工液配方中，磷酸酯有良好的乳化、缓蚀、极压抗磨及边界润滑性能，适合应用在水基系统中。此外，磷酸酯耐碱性强，适合应用于强力清洗剂配方中。磷酸酯可以被碱土金属或胺中和而成为胺盐，既有良好的极压抗磨性，又可减少腐蚀性。不同分子结构磷酸酯对铝合金如319, 356, 6061及7075有不同程度的防腐蚀性能，包括含非极性（不含氧）的碳氢链磷酸酯，对铝合金的防腐蚀性能较强。据有关研究<sup>†</sup>，不同碳氢链结构的磷酸酯对铝合金防腐蚀强度表现的关系如下：

Phosphorus containing EP anti-wear agent adsorbs itself to the metal surface, with the metal asperities creating heat due to metal friction, local chemical reaction results. Through hydrolysis or heat decomposition, the additives generate phosphate film for anti-wear and EP operations. In metal working fluids recipes, phosphate esters have good properties of emulsification, corrosion inhibition and EP/anti-wear boundary lubrication; so is suitable for application in water-based systems. Also, phosphate esters are strongly resistant to alkalinity, so suitable for the recipes of strong cleansers applications. Phosphate esters can be neutralized by alkaline earth metals or amines, forming amine salts, which imparts good EP/AW properties, on top of corrosion reduction. Phosphate esters with different molecular structures have different degrees of corrosion resistance in aluminium alloys such as 319, 356, 6061 and 7075, including the phosphate esters with non-polar (without oxygen) hydrocarbon chain, which have stronger corrosion resistance for aluminium alloys. According to relevant studies<sup>†</sup>, different structures of hydrocarbon chain in phosphate esters have different strengths of corrosion characteristic as below:

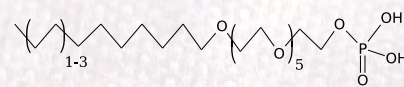
### 防腐性能 Anti-corrosion performance: P1 > P2 > P3 > P4 > P5



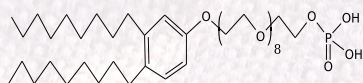
P1: 癸基辛基磷酸  
polyethylene glycol  
mono-octadecyl  
ether phosphate



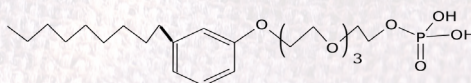
P2: 油醇聚氧乙烯醚磷酸酯  
decyl octyl acid  
phosphate



P3: 聚乙二醇单C10-14-烷基醚磷酸酯  
polyethylene glycol mono-  
C10-14-alkyl ether phosphate



P4: 壬基酚聚氧乙烯醚磷酸酯  
polyoxyethylene dinonylphenyl  
ether phosphate



P5: 聚氧乙烯壬基苯醚磷酸酯  
polyoxyethylene nonylphenyl  
ether phosphate

<sup>†</sup>参考 Reference: INFLUENCE OF INHIBITOR'S CHEMISTRY AND STRUCTURE ON ALUMINUM CORROSION IN MWF by Hoon Kim, Chemetall US, Inc., Peter Konopi, Chemetall US Inc. STLE, May 17-21, Dallas

## 含磷添加剂 PHOSPHORUS CONTAINING ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES						
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40℃ cSt	磷 PHOS. %wt	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT ℃	四球极压 4 BALL WEAR/KG <sup>†</sup>	
									P <sub>B</sub>	P <sub>D</sub>	
SmartPhos P3273 亚磷酸酯 Phosphite Ester			长链亚磷酸酯添加剂。功能广泛，有良好润滑、减摩、抗磨、极压及抗氧化性能，能提高工作液的加工精度。酸值低，产品分子大（属大分子结构），热稳定性良好，不易水解，能有延长加工液的寿命。产品适合应用于轧钢液、有色金属如铜铝等合金等高速成型、冲裁加工。 Long chain phosphite ester additive. With wide range functionality, good lubrication, friction-reduction, antiwear, EP and antioxidation properties. Low acid value, and of large product molecule (macromolecule structure), good thermal stability, not easy to hydrolyze, can extend MWF life. Product suitable for use in steel rolling fluids and the high-speed forming and blanking processing for yellow metals like copper and aluminum alloys.	0.1 - 3	0.800 - 0.900	16 - 18	>4.5 - -	<30 - -	>145 - -	71	126
SmartPhos P3358 磷酸酯 Phosphate Ester			粘度较低，抗磨性特佳。工件加工后有良好光洁度。可在抗磨液压油复合配方中作抗磨防锈剂使用。亦可以与硫化添加剂复配使用，有良好协同效果。 Lower viscosity, excellent antiwear property. Good surface finishing of the workpiece after operation. Can be used as antiwear and antirust agents in hydraulic package formulations. Can also be compounded with sulfurized additives to achieve good synergistic effect.	2 - 5	0.900 - 1.050	200 - 350	>0.8 - -	<150 - -	>160 - -	107	200
SmartPhos P6800 磷酸酯 Phosphate Ester			浅色、低味、油性磷酸酯，粘度极高。与硫或氯极压添加剂调合，能达极佳协同效果。适用于拉伸、冲压及成型油配方。 Light color, low odor, oil-based phosphate ester, with extremely high viscosity. Excellent synergistic effect can be attained when blended with sulfurized or chlorinated EP additives. Suitable for use in formulations of drawing, stamping and forming oils.	0.5 - 3	0.900 - 1.100	NA	>5	<230	>170	114	250

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## 含磷添加剂 PHOSPHORUS CONTAINING ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES						
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40 °C cSt	磷 PHOS. %wt	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT COC °C	四球极压 4 BALL WEAR/KG+	
									P <sub>8</sub>	P <sub>0</sub>	
SmartPhos P7800 磷酸酯 Phosphate Ester			粘度低，可用于油基或水基配方中。可与硫、氯极压剂复配使用。抗磨性极优；能减少烟雾、保护刀具及加强工件光洁度。能在水性配方中取代硫、氯极压剂。特别适合在铝、镁合金的乳化油配方中使用。 Low viscosity, can be used in oil or water-based formulations. Can be used to blend with the sulfurized and chlorinated EP additives. Extremely superior antiwear property; can reduce smoke, protect tools and enhance surface finishing of the workpiece. Can replace sulfurized, chlorinated EP additives in water-based formulations. Specially suitable for use in soluble oil formulations for magnesium and aluminum alloys.	0.5 - 4	0.900 - 1.200	550 - 950	>4	<240	>180	128	315
SmartPhos P7900 磷酸酯 Phosphate Ester			粘度较高，与其它添加剂的相容性较佳。可用于油性及水性配方。抗磨性极优；能减少烟雾及保护刀具。适用于加工铝镁合金的乳化油配方中，能防止腐蚀金属及增强工件的表面光洁度。 Higher viscosity, very good compatibility with other additives. Can be used in oil-based and water-based formulations. Extremely superior antiwear property; can reduce smoke and protect tools. Suitable for use in soluble oil formulations for magnesium and aluminum alloys, can prevent metal corrosion and enhance surface finishing of the workpiece.	0.5 - 5	0.950 - 1.150	1500 - 2200	>4	<250	>160	135	315

## 润滑/抗磨增强剂 LUBRICITY / ANTI-WEAR BOOSTERS

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5% 水稀 释液 DIL. (WATER)			比重 S.G.	粘度 VIS. 40 °C cSt	pH 5%水 稀释液 DIL. (WATER)
Smart Base AW2110 润滑/抗磨 增强剂 Lubricity/ Anti-wear Booster			聚醚酯类。低味、低泡。具良好润湿、润滑及抗磨性能。适合调配全合成液。能有效提高产品表面光洁度。适合多种金属加工。产品在碱性环境中，其低泡性能尤为显著。 Polyether ester type. Low odor, low foam. Possesses good wetting, lubricating and antiwear properties. Suitable for blending fully synthetic fluids. Can effectively enhance surface finishing of the workpiece. Suitable for processing wide variety of metals. Significant low foam property exhibited in alkaline environment.	5-20	1.050 - 1.150	2000 - 3000	1.2 - 2.2
SmartFort LB6210 高分子 脂肪酸酯 复合剂 High Molecular Fatty Acid Ester Package			生物降解型。不含硫、氯及磷。具优越润滑及润湿性能。可用于全合成、半合成及乳化油配方；能增强工件的表面光洁度。与 SmartPhos W5880 复配使用，能加强抗磨性能。亦适用于铜、铝合金的冲压和拉伸工艺。可用作槽边添加剂使用。 Biodegradable. Contains no sulfur, chlorine and phosphorus. Possesses superior lubricating and wetting properties. Can be used in fully synthetic, semi-synthetic and soluble oil formulations; can enhance surface finishing of the workpiece. Can enhance antiwear property when compounded with SmartPhos W5880. Also suitable for stamping and drawing of copper and aluminum alloys. Can be used as tankside additive.	2-8	0.950 - 1.050	350 - 550	7.0 - 8.5
SmartFort LB6220 高分子 脂肪酸酯 复合剂 High Molecular Fatty Acid Ester Package			优质镁、铝合金光洁度增强剂。具有润滑、湿润及防锈性能。可用于全合成及乳化油配方。可反相与水稀释(水倒进产品中)，作冲压液使用。可在槽边添加，以增强工件光洁度。不含硫、氯、磷；不含亚硝酸盐等有害物质。 Premium surface finishing enhancer for magnesium and aluminum alloys. Possesses lubricity, wetting and anti-rust properties. Can be used in fully synthetic and soluble oil formulations. Can be diluted invert with water (water added to product) for use as stamping fluids. Can be added tankside to enhance surface finishing of the workpiece. Contains no sulfur, chlorine, phosphorus; nor harmful materials such as nitrite.	5-15	0.900 - 1.000	30 - 60	8.5 - 9.5
SmartLube LB6280 蓖麻油 脂肪酸酯 复合剂 Castor oil based ester package			良好润湿及界面润滑性能。适合于乳化油及半合成冷却液配方中使用。适合于铝合金加工配方，作为工件光洁度速进剂。 Good wetting and boundary lubrication properties. Suitable for use in formulations of soluble oil and semi-synthetic coolant. Suitable for formulations for machining aluminum alloys, as booster for workpiece shininess.	3-8	1.000 - 1.100	45 - 65	7.0 - 8.5

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## 含硫极压抗磨剂的特征 Features of Sulfur Containing EP & AW Agents

在高负荷高温条件下防止烧结和磨损，硫含量越高，极压性越强；但对铜金属的腐蚀性越高。

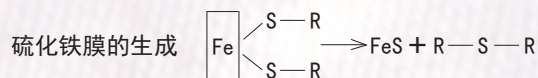
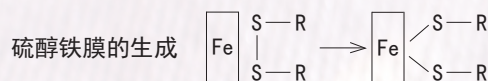
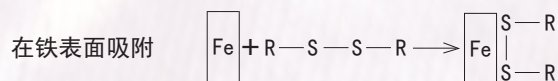
Prevent welding and abrasion under high-load high-temperature conditions. High sulfur content leads to high EP property; but also comes with high corrosion to copper metals.

以二硫化物为例简述硫化物作用机理：

Using disulfides as example to illustrate the operational mechanism of sulfides:

在调和条件作用下 S-S 键断裂，形成硫醇铁覆盖膜，起抗磨作用，在极压条件作用下 C-S 键断裂，形成硫化铁覆盖膜，起极压作用。因此硫化物在低负荷起抗磨作用，在高负荷起极压作用。

S-S bond is broken under conditions in mixing, forming thiol iron coverage film for antiwear effect. The C-S bond is broken under EP condition, forming ferric sulfur coverage film for EP effect. So, sulfide imparts antiwear (AW) effect at low loading, EP effect at high loading.

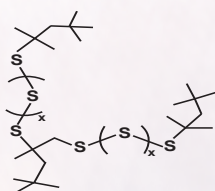
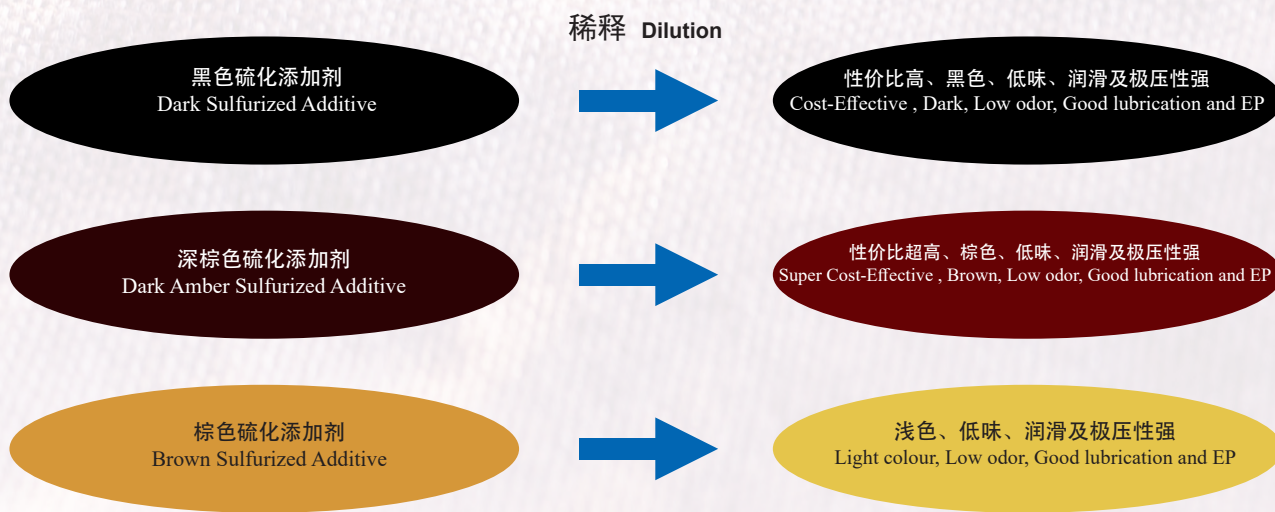
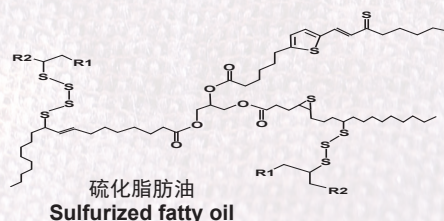


硫化物极压抗磨剂的作用遵从以下顺序 EP/AW effects of the sulfides follow the following order:

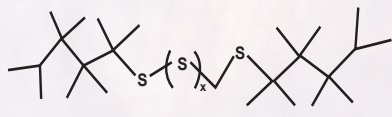
硫化物 Sulfides < 二硫化物 Disulfide < 三硫化物 Trisulfide

## 含硫极压抗磨剂

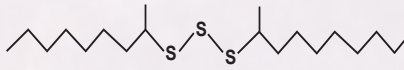
### Sulfur containing EP AW agents:



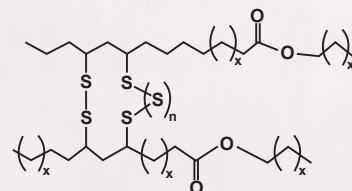
二烷基多硫化物  
Dialkyl Polysulfide



多硫化物  
Polysulfide



硫化烯烃  
Sulfurized olefin









硫化酯  
Sulfurized ester

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## 黑色硫化极压添加剂 DARK COLOR SULFURIZED EP ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES							
				比重 S.G.	粘度 VIS. 40 °C cSt	硫 S (活硫) (ACT S) %wt	铜 腐蚀 COPPER CORR. 3h 100 °C	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT COC °C	四球极压 4 BALL WEAR†	
							P <sub>B</sub> kg	P <sub>D</sub> kg			
Smart Base 1110 硫化 脂肪油 Sulfurized Fatty Oil	 深褐 Dark	粘度较高。含非活性硫；适用于黑色及有色金属加工。可用于调配切削油、拉伸油、工业润滑脂。 Higher viscosity. Contains non-active sulfur; suitable for processing ferrous and yellow metals. Can be used in blending cutting oils, drawing oils, and industrial greases.	3-15	0.950 - 1.000	900 - 1300	9-12 (0)	1B	<8	>200	88	250
Smart Base 1120 硫化 脂肪油 Sulfurized Fatty Oil	 深褐 Dark	粘度较高。含非活性硫；适合加工黑色及有色金属。具优良的极压及润滑性能。可调配导轨油、切削油及打头油。 Higher viscosity. Contains non-active sulfur; suitable for processing ferrous and yellow metals. Possesses superior EP and lubricating properties. Can be used to blend way-lubes, cutting oils and cold-heading oils.	5-15	0.950 - 1.000	450 - 950	10-12 (0)	1B	≤8	>170	88	250
Smart Base 1217 硫化 脂肪油 Sulfurized Fatty Oil	 深褐 Dark	粘度稍高；适合黑色金属及难切削铁合金的苛刻加工。含活性硫；不适合一般铜、青铜及黄铜等非铁合金的加工。 Higher viscosity; suitable for tough processing of hard-to-machine ferrous alloys. Contains active sulfur; not suitable for processing non-ferrous metals like bronze and brass.	5-20	1.000 - 1.100	700 - 1100	16-19 (6)	4B	≤8	>200	94	315
Smart Base 1217DN 硫化 脂肪油 Sulfurized Fatty Oil	 深褐 Dark	粘度低。硫含量较高，适用于难切削铁合金的苛刻加工。含活性硫，不适用于一般铜、青铜及黄铜等非铁合金加工。 Low viscosity. Contains higher sulfur content, suitable for processing hard-to-machine ferrous alloys. With active sulfur, not suitable for non-ferrous metals like copper, bronze, and brass.	5-20	1.000 - 1.100	300 - 450	17-19 (6)	4B	≤8	>180	94	315
Smart Base 1219 硫化 脂肪油 Sulfurized Fatty Oil	 深褐 Dark	粘度稍低。硫含量较高，含活性硫；适用于难切削铁合金的苛刻加工，不适用于一般铜、青铜及黄铜等非铁合金等的加工。 Slightly lower viscosity. Contains higher sulfur content, with active sulfur; suitable for processing hard-to-machine ferrous alloys, not suitable for processing non-ferrous metals like bronze and brass.	5-20	1.000 - 1.100	550 - 850	17-20 (6)	4B	≤8	>190	88	315
Smart Base 1238 硫化烯烃 Sulfurized Olefin	 深褐 Dark	气味低。粘度很低；容易调合。高硫含量；适合加工严苛金属，包括不锈钢及高合金钢。与氯化及代氯极压添加剂等相配合，有加成效果。含活性硫；不适合加工红铜、青铜及黄铜等有色金属。 Low odor. Very low viscosity; easy to blend. Contains high sulfur content; suitable for processing tough metals including stainless steels and high alloy steels. Can attain synergetic effect with chlorinated or chlorinated replacement additives. Contains active sulfur; not suitable for processing yellow metals like bronze and brass.	2-10	1.000 - 1.100	50 - 130	33-38 (27)	4B	≤8	>160	82	315

† 伺服马达速度 Servo motor speed - P<sub>B</sub>: 0.03秒达1500 rpm in 0.03s, P<sub>D</sub>: 0.03秒达1760 rpm in 0.03s.

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## 黑色硫化极压添加剂 DARK COLOR SULFURIZED EP ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES							
				比重 S.G.	粘度 VIS. 40°C cSt	硫 S (活硫) (ACT S) %wt	铜 腐蚀 COPPER CORR. 3h 100°C	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT COC °C	四球极压 4 BALL WEAR†	
										P <sub>B</sub> kg	P <sub>D</sub> kg
Smart Base 1310LV 硫化 甲基酯 Sulfurized Methyl Ester	 深褐 Dark	粘度极低，低气味；容易调配。不含活性硫；适合加工有色金属。可用于调配纯油和水性配方，作为润滑及极压剂。 Extremely low viscosity; low odor; easy to blend. Contains no active sulfur; suitable for processing yellow metals. Can be used in straight oil and water-based formulations, as lubricant and EP additive.	2-15	0.900 - 1.000	15-25	9-11 (0)	1B	≤8	>160	82	200
 Smart Base 1317 硫化 脂肪油 Sulfurized Fatty Oil	 深褐 Dark	中粘度硫化脂肪油添加剂；适用于生产广泛粘度体系的加工液。产品有优越的抗磨，润滑及极压性能。用途广泛；适合应用于螺帽、冲压、拉伸、冷锻等工艺。能延长模具使用寿命。产品含活性硫；适合加工黑色金属，但不适用于一般铜、青铜及黄铜的加工。 Medium viscosity sulfurized fatty oil additive, suitable for use in processing fluids for systems of wide-range viscosities. Product with excellent antiwear, lubrication and EP properties. Extensive usage; suitable for nuts, stamping, drawing, cold forging and other processes. Can extend service life of the mold. Product contains active sulfur; suitable for processing ferrous metals, but not for general copper, bronze and brass.	5-20	0.950 - 1.050	450 - 650	16-18 (5)	4B	≤8	>190	88	315
Smart Base 1410 硫化 脂肪油 Sulfurized Fatty Oil	 褐 Brown	气味低。粘度很低，易于调和。不含活性硫；适合加工黑色及有色金属。调合后产品呈棕红色。具优异润滑及极压性能；加工后工件光洁度高。与大部分矿物油相容。广泛应用于切削、拉伸及打头油配方。 Low odor. Very low viscosity; easy to blend. Contains non-active sulfur; suitable for processing ferrous and yellow metals. Blended product is amber red. Possesses superior lubricating and EP properties; good surface finishing of the workpiece after operation. Compatible with majority of mineral oils. Extensively used in formulations of cutting, drawing and cold-heading oils.	5-50	0.950 - 1.000	100 - 200	9-11 (0)	1B	≤8	>160	82	200
Smart Base 1417 硫化 脂肪油 Sulfurized Fatty Oil	 深褐 Dark	低味。低粘度，易调合。含活性硫，硫含量稍高。相对传统硫化猪油，润滑性更佳。不易腐败，加工后清洁性良好。极压性高，适合钛等合金的苛刻加工。因含活性硫，故不适合于一般铜、青铜及黄铜合金的加工。 Low odor. Very low viscosity; easy to blend. Contains active sulfur, with slightly higher sulfur content. Better lubrication when compared to traditional sulfurized lard oils. Not easy to corrupt, with good cleansing property after operation. High EP, suitable for processing tough alloys like titanium. Not suitable for processing alloys like bronze and brass as it contains active sulfur.	5-30	1.000 - 1.100	250 - 500	16-18 (6)	4B	≤8	>160	88	250

†伺服马达速度 Servo motor speed - P<sub>B</sub>: 0.03秒达1500 rpm in 0.03s, P<sub>D</sub>: 0.03秒达1760 rpm in 0.03s.

## 浅色硫化极压添加剂 LIGHT COLOR SULFURIZED EP ADDITIVES











型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES							
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	硫 SUL (活硫) (ACTIVE SUL.) %wt	铜 腐蚀 COPPER CORR. 3h 100°C	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT COC °C	四球极压 4 BALL WEAR†	
											P <sub>B</sub> kg	P <sub>D</sub> kg
Smart Base 2510 硫化 脂肪油 Sulfurized Fatty Oil	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	硫含量较低，不易腐蚀非铁金属，可用于铁类及有色金属的油基配方。润滑及极压性能极佳；能增强工件的表面光洁度。浅色，便于观察加工过程。低味，操作者易于接受。稳定性好，与大部分基础油相容。 Lower sulfur content, not easy to corrode non-ferrous metals, can be used in oil-based formulations for ferrous and yellow metals. Excellent lubricating and EP properties; can enhance surface finishing of the workpiece. Light color, easy to observe machining process. Low odor, easily acceptable by operators. Good stability, compatible with the majority of base stocks.	2-20	0.900 - 1.000	45 - 90	8.5 - 10.5 (<4)	1B	≤9	>145	76	250

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## 浅色硫化极压添加剂 LIGHT COLOR SULFURIZED EP ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES							
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40 °C cSt	硫 SUL (活硫 ACTIVE SUL.) %wt	铜 腐蚀 COPPER CORR. 3h 100 °C	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT COC °C	四球极压 4 BALL WEAR <sup>†</sup>	
										P <sub>B</sub> kg	P <sub>D</sub> kg	
Smart Base 2515 硫化 脂肪油 Sulfurized Fatty Oil	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	硫含量高，极压性好；但不易腐蚀铁及有色金属。适用于切削油、重负荷润滑脂及导轨油配方。浅色，加工过程便于观察。低味，使用者易于接受。稳定性好，与大部分基础油相容。 Higher sulfur content, good EP property; yet not easy to corrode ferrous and yellow metals. Suitable for use in formulations of cutting oils, heavy duty lubricating greases and waylubes. Light color, easy to observe operation process. Low odor, easily acceptable by operators. Good stability, compatible with the majority of base stocks.	2-18	0.900 - 1.000	40 - 90	13.5 - 16.5 (<3)	1B	≤15	>130	82	250
Smart Base 2516 硫化 脂肪油 Sulfurized Fatty Oil	 深琥珀 Dark Amber	 清澈黄 Clear Yellow	硫含量较高；但不易腐蚀铜；可用于铁及有色金属。粘度较高，润滑、抗磨及极压性能极佳；适用于切削及成型油配方，能增强油膜强度。同时，在冲压、拉伸配方中亦有优越表现。浅色，加工过程便于观察。低味，使用者易于接受。稳定性好，与大部分基础油相容。 Higher sulfur content, yet not easy to corrode copper; can be used in ferrous and yellow metals. Higher viscosity, with extremely good lubricating, antiwear and EP properties; suitable for formulations of oil-based cutting and forming oils, and can enhance oil-film strength. Also superior performance can be attained in stamping and drawing operations. Light color, easy to observe operation process. Low odor, easily acceptable by operators. Good stability, compatible with the majority of base stocks.	2-12	0.900 - 1.000	650 - 850	13.5 - 16.5 (<6)	1B	≤13	>130	82	315
Smart Base 2517 硫化 脂肪油 Sulfurized Fatty Oil	 浅琥珀 Light Amber	 清澈黄 Clear Yellow	活性硫含量较高，浅色、低味，具极佳润滑、抗磨及极压性能。粘度很低，适用于深孔钻油及珩磨油等要求润湿性极高的配方中。与磷酸酯 SMARTPHOS P6800 或代氯添加剂 SMART BASE CR-2050 调合，性能更佳。稳定性好，与大部分基础油相容。 Higher active sulfur, light color, low odor; possesses excellent lubricating, antiwear and EP properties. Very low viscosity, suitable for use in high wetting formulations like deep-hole drilling and honing oils. Even better performance when blended with phosphate ester SmartPhos P6800 or chlorine replacement additive Smart Base CR-2050. Good stability, compatible with the majority of base stocks.	2-15	0.900 - 1.000	40 - 140	13 - 17 (7)	4B	≤8	>130	88	315
Smart Base 2518 硫化 脂肪油 Sulfurized Fatty Oil	 浅棕 Light Brown	 清澈浅黄 Clear Light Yellow	粘度极低，能增强工件加工后的表面光洁度，硫含量较高，浅色、低味；具优越润滑、抗磨及极压性能。活性硫含量低，可加工有色金属。同时能延长刀具寿命。可用于纯油或乳化油配方中。与多类添加剂有良好相容性。 Extremely low viscosity, can enhance surface finishing of the workpiece after operation. Higher sulfur content, light color, low odor; possesses superior lubricating, antiwear and EP properties. Low active sulfur content; can be used for processing yellow metals. Also can extend tool life. Can be used in straight oil or soluble oil formulations. Good compatibility with various types of additives.	2-15	0.900 - 1.000	10 - 30	15 - 17 (<4)	1B	<11	>135	82	315
Smart Base 2526 硫化 脂肪油 Sulfurized Fatty Oil	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	硫含量较高，浅色，低味、粘度低；适合深孔钻油、珩磨油等要求清洗性极佳的配方。容易乳化。适用于重负荷水性配方。稳定性好，与大部分基础油相容性佳。 Higher sulfur content, light color, low odor, low viscosity; suitable for formulations requiring extremely high cleansing capability, such as deep drilling and honing oils. Easily emulsified; suitable for heavy duty water-based formulations. Good stability, very good compatibility with the majority of base stocks.	2-15	0.900 - 1.000	100 - 200	24-27 (<4)	1B	≤8	>130	88	315











<sup>†</sup>伺服马达速度 Servo motor speed - P<sub>B</sub>: 0.03秒达1500 rpm in 0.03s, P<sub>D</sub>: 0.03秒达1760 rpm in 0.03s.

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## 浅色硫化极压添加剂 LIGHT COLOR SULFURIZED EP ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES							
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	硫 SUL (活硫) (ACTIVE SUL.) %wt	铜 腐蚀 COPPER CORR. 3h 100°C	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT COC °C	四球极压 4 BALL WEAR <sup>†</sup>	
										P <sub>B</sub> kg	P <sub>D</sub> kg	
Smart Base 2810 硫化 脂肪油 Sulfurized Fatty Oil	 清澈 深琥珀 Clear Deep Amber	 清澈黄 Clear Yellow	粘度高，润滑及极压性能佳；可用于拉伸、冲压及切削油配方中。非活性硫，不易腐蚀非铁金属；可用于加工铁类及有色金属。色浅；便于观察加工过程。低味；操作者易于接受。稳定性好，与大部分基础油相容性佳。 High viscosity, extremely high lubricating and EP properties; can be used in formulations for drawing, stamping and machining. Non-active sulfur; not easy to corrode yellow metals, suitable for processing ferrous and yellow metals. light color; easy to observe operation process. Low odor; easily acceptable by operators. Good stability, can be compatible with the majority of base stocks.	2-15	0.900 - 1.000	900 - 1400	10-12 (<3)	1B	≤5	>145	76	315
Smart Base 2816 硫化 脂肪油 Sulfurized Fatty Oil	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	较高硫含量，浅色、低味，中等粘度；适合攻牙、拉伸、冲压、车削及攻丝等重负荷操作。活性硫含量低；可用于加工铁类及有色金属的油基配方中。较传统硫含量相等的添加剂具更佳抗磨及极压性能。能有效增强工件的表面光洁度。 Higher sulfur content, light color, low odor, medium viscosity; suitable for heavy-duty operations such as tapping, drawing, stamping, cutting and threading. Low active sulfur content; can be used in oil-based formulations for processing ferrous and yellow metals. Possesses better antiwear and EP properties when compared to traditional additives with the same sulfur content. Can enhance surface finishing of the workpiece.	2-15	0.900 - 1.000	300 - 400	16-18 (<3)	1B	≤20	>150	88	315
Smart Base 2826 硫化 脂肪油 Sulfurized Fatty Oil	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	粘度较低，含硫量高，浅色、低味；适合攻牙、拉伸、冲压、车削及攻丝等重负荷加工。可用于加工铁类的油基配方中，但不适合有色金属。较传统相等硫含量的添加剂，具更佳抗磨及极压性能。润滑性能高，能有效增强工件的表面光洁度。 Lower viscosity, high sulfur content, light color, low odor; suitable for heavy duty processing such as tapping, drawing, stamping, cutting and threading. Can be used in oil-based formulations for ferrous metals, but not suitable for yellow metals. Possesses better antiwear and EP properties when compared to traditional additives with the same sulfur content. High lubricity; can effectively enhance surface finishing of the workpiece.	2-15	0.900 - 1.000	150 - 250	26-28 (>15)	4B	≤8	>130	88	315
Smart Base 2916 硫化 脂肪油 Sulfurized Fatty Oil	 深琥珀 Dark Amber	 清澈黄 Clear Yellow	高粘度，低味硫化脂肪油；具有极佳的润滑及极压性能，推荐用于加工黑色金属的油基配方中。适合应用于攻牙、拉伸、冲压、车削及攻丝等重负荷加工。与传统硫含量相同的添加剂相比，具有更佳的润滑及极压性能，可有效提高工件的表面光洁度及延长刀具寿命。与其他添加剂及不同组别的基础油混合有良好的相容性和稳定性；故易于调合不同应用的加工油。含活性硫；故不适合于一般铜、青铜及黄铜之加工。 High viscosity, low odor sulfurized fatty oil; with excellent lubrication and EP properties. Recommended for use in neat oil formulation for processing ferrous metals. Suitable for use in heavy-duty processes like tapping, drawing, stamping, turning and threading. Possesses better lubricating and EP property when compared to other traditional additives with similar sulfur contents, so can effectively elevate the surface finishing of workpieces and extend the tool life. Good compatibility and stability when blended with other additives and base oils of different groups; so can easily blend process oil for different applications. Contains active sulfur, so not suitable for processing ordinary copper, bronze, and brass.	2-15	0.900 - 1.000	170 - 250	14-16	4B	≤2	>150	82	315
Smart Base 3517 硫化 脂肪油 Sulfurized Fatty Oil	 深褐 Dark	 清澈琥珀 Clear Amber		2-15	0.900 - 1.000	200 - 400	15-17	4B	<8	>150	88	315

<sup>†</sup>伺服马达速度 Servo motor speed - P<sub>B</sub>: 0.03秒达1500 rpm in 0.03s, P<sub>D</sub>: 0.03秒达1760 rpm in 0.03s.

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## 代氯极压添加剂 CHLORINE REPLACEMENT ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES						
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)		比重 S.G.	粘度 VIS. 40°C cSt	磷 PHOS. %wt	酸值 ACID VALUE mg KOH/g	硫 SUL. %wt	脂肪酯 FATTY ESTER %wt	闪点 FLASH POINT COC °C
Smart Base CR-2040 黑色硫化 磺酸盐 Sulfurized Sulphonate	 深褐 Deep Brown	 深褐 Deep Brown	可取代氯化石蜡的极压添加剂。黑色低味。可用于重负荷加工，适合铁及有色金属。有良好的抗磨性；可提高刀具寿命。脂肪含量高；能提高工件表面光洁度。在配方里不能与磷酸酯复配使用。 EP additive that replaces chlorinated paraffins. Dark color, low odor. Can be used in heavy-duty operations, suitable for ferrous and yellow metals. Possesses good antiwear property; can prolong tool life. High fat content; can enhance surface finishing of the workpiece. Cannot be used for blending with phosphate ester in formulations.	1.050 - 1.150	100 - 200	NA	NA	>2.3	>55	>160
Smart Base CR-2050 浅色硫化 磺酸盐 Light Color Sulfurized Sulphonate	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	可取代氯化石蜡的极压添加剂。浅色，较 CR-2040 更低味。可用于重负荷加工。有良好的抗磨性；可提高刀具寿命。适合铁及有色金属。脂肪含量高；能提高工件光洁度。在配方里不能与磷酸酯复配使用。 EP additive that replaces chlorinated paraffins. Light color, even lower odor than CR-2040. Can be used in heavy-duty operations. Possesses good antiwear property; can prolong tool life. Suitable for ferrous and yellow metals. High fat content; can improve surface finishing of the workpiece. Cannot be blended with phosphate ester in formulations.	1.050 - 1.150	20 - 60	NA	NA	4-5	40-60	>160
Smart Base CR-2060 含磷复合 添加剂	 清澈 深琥珀 Clear Deep Amber	 清澈黄 Clear Yellow	两种分别粘度不同用作取代氯化石蜡的极压添加剂。可用于重负荷切削油及乳液配方中。低腐蚀性，故可用于加工有色及黑色金属。极压及抗磨性能良好，能延长刀具寿命。润滑性能特强，有效提高工件表面光洁度。按 1:1 原则取代氯。如在某油性切削油中，氯含量为50%的氯化石蜡加入量为4%，对整个配方中氯含量贡献值为2%；故可用 2% SMART BASE CR-2060 或 SMART BASE CR-2080 与之取代。 Two EP additives of different viscosities for replacing chlorinated paraffin. Can be used in formulations of heavy-duty cutting oils and emulsifiers. Low corrosion, can be used for processing yellow and ferrous metals. Good EP and anti-wear properties, can extend tool life. Especially high lubricity, can effectively elevate surface finishing of the workpiece. Replace chlorine based on 1:1 ratio. For instance, treatment of 4% of 50% chlorinated paraffin contributes to 2% chlorine content in the formulation; so 2% of SMART BASE CR-2060 or SMART BASE CR-2080 can be used for replacement.	0.900 - 1.000	1100 - 1800	>2.6	<190	NA	NA	>160
<b>NEW</b> Smart Base CR-2080 含磷复合 添加剂	 清澈 深琥珀 Clear Deep Amber	 清澈黄 Clear Yellow	两种分别粘度不同用作取代氯化石蜡的极压添加剂。可用于重负荷切削油及乳液配方中。低腐蚀性，故可用于加工有色及黑色金属。极压及抗磨性能良好，能延长刀具寿命。润滑性能特强，有效提高工件表面光洁度。按 1:1 原则取代氯。如在某油性切削油中，氯含量为50%的氯化石蜡加入量为4%，对整个配方中氯含量贡献值为2%；故可用 2% SMART BASE CR-2060 或 SMART BASE CR-2080 与之取代。 Two EP additives of different viscosities for replacing chlorinated paraffin. Can be used in formulations of heavy-duty cutting oils and emulsifiers. Low corrosion, can be used for processing yellow and ferrous metals. Good EP and anti-wear properties, can extend tool life. Especially high lubricity, can effectively elevate surface finishing of the workpiece. Replace chlorine based on 1:1 ratio. For instance, treatment of 4% of 50% chlorinated paraffin contributes to 2% chlorine content in the formulation; so 2% of SMART BASE CR-2060 or SMART BASE CR-2080 can be used for replacement.	0.950 - 1.050	1200 - 1800	>2.6	<160	NA	NA	>160

## 水基腐蚀抑制剂 WATER-BASED CORROSION INHIBITORS













型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5%水 稀释液 DIL. (WATER)			比重 S.G.	pH 5% 水稀释 液DIL (WATER)	残留膜 RESIDUE FILM LAYER
Smart Base RP9090 羧酸盐复合剂 Dicarboxylic Acid Salt Corrosion Inhibitor	 清澈黄 Clear Yellow	 清澈淡黄 Clear Pale Yellow	针对黑色金属及非铁金属防锈的超浓缩防锈复合剂；由 C9-11 羧酸盐和三唑衍生物调合而成。不含硼及二乙醇胺。具润滑及防锈双功能；可作工序间及短期室内防锈。可用于乳化油、半合成、全合成及清洗剂配方中。 Super-concentrated corrosion inhibitor package addressed to ferrous and nonferrous metals. Compounded from C9-11 dicarboxylic acid salt with triazole derivatives. Contains no boron and diethanolamine. With dual functions of lubrication and anti-corrosion; good for in-process and short-term indoor anti-rust protection. Can be used in soluble oils, semi-synthetic and fully synthetic coolants, and cleaners.	3-10	1.000 - 1.100	9.0-9.8	软、 不粘 Soft, Not Viscous
Smart Base RP9190 羧酸盐复合剂 Dicarboxylic Acid Salt Corrosion Inhibitor	 浅琥珀 Light Amber	 清澈淡黄 Clear Pale Yellow	含二乙醇胺衍生物及润滑复合剂。可用于全合成、半合成及乳化液配方中。pH值较低，加入量少，防锈期特长。可与水稀释后单独作工序间防锈剂，或槽边添加剂使用。水分蒸发后会在工件上形成透明防锈保护膜。 Contains diethanolamine derivatives and lubricant packages. Can be used in synthetic, semi-synthetic and soluble oil formulations. Lower pH value, low treat rates, specially long rust-protect period. Can be diluted with water to form standalone in-process rust preventive, or used as tankside additives. Translucent protective film will be formed on surface of workpieces after evaporation of water.	3-10	1.000 - 1.100	7.0-8.5	软、 不粘 Soft, Not Viscous

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## 水基腐蚀抑制剂 WATER-BASED CORROSION INHIBITORS

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5%水 稀释液 DIL. (WATER)			比重 S.G.	pH 5% 水稀释 液DIL. (WATER).	残留膜 RESIDUE FILM LAYER
Smart Base RP9200 铜、铝腐蚀 抑制剂 Corrosion Inhibitor for Copper / Aluminum			高效有色金属防腐剂，不含硼、磷、羧酸盐及三氮唑。低味，中性 pH，适用于乳化液、半合成及全合成液配方，可有效保护各类型铝合金；包括 319 (铸铝合金)、2024-T3 (高铜铝合金)、6061 (高镁铝合金) 和 7075 (高锌铝合金)，亦能保护铜合金。无泡，润滑及抗磨性良好，可提高刀具寿命。 High performance corrosion inhibitor; contains no boron, phosphorus, carboxylate and triazole. Low odor, neutral pH; suitable for formulations of soluble oils, semi-synthetic and synthetic fluids. Can effectively protect various types of aluminum alloys; including 319 (cast aluminum alloy), 2024-T3 (high copper aluminum alloy), 6061 (high magnesium aluminum alloy) and 7075 (high zinc aluminum alloy), can also protect copper alloys. Foamless, possesses good lubricating and anti-wear properties, can extend tool life.	3-10	1.000 - 1.200	7.0-8.5	软、 不粘 Soft, Not Viscous
Smart Base RP9290 二羧酸盐 复合剂 Dicarboxylic Acid Salt Package			含润滑复合剂。可用于全合成、半合成及乳化液配方中。可与水稀释后单独作工序间防锈剂或槽边添加剂使用。不含亚硝酸盐及乙二醇胺等有害物质。不含硼酰胺，故可用于掺配成环保型产品。与 Smart Base RP9390 混合使用，防锈特性极佳。水分蒸发后，会在工件上形成透明防锈保护膜。 Contains lubricant package. Can be used in synthetic, semi-synthetic and soluble oil formulations. Can be diluted with water to form standalone in-process rust preventive or as tankside additive. Contains no harmful materials such as nitrite and diethanolamine. Contains no borate amine, so can be used to blend environmental-friendly products. Extremely good anti-rust property attained when compounded with Smart Base RP9390. Translucent protective film will be formed on surface of workpieces after evaporation of water.	3-20	1.000 - 1.100	8.0-9.0	软、 不粘 Soft, Not Viscous
Smart Base RP9390 硼酸酯型 合成防锈剂 Synthetic Borate Ester Based Inhibitor			有别于一般硼酸酯调合产品；产品挥发性低，不易留下硼酸残留物，且有良好防锈性能。可用于乳化液、半合成及全合成配方中。不含亚硝酸盐及乙二醇胺等物质。在硬水环境中能保持防锈性。有辅助杀菌剂能力，可减少杀菌剂用量。水分蒸发后，会在工件上形成透明防锈保护膜。 Different from ordinary blended products of boric acid ester; products are less volatile, not easy to leave boric acid residue, also possesses good anti-rust property. Can be used in soluble oils, semi-synthetic and synthetic formulations. Contains no harmful materials such as nitrite and diethanolamine. Can maintain anti-rust property in hard water environment. Can fortify biocide performance; so to reduce biocide treat rate. Translucent protective film will be formed on surface of the workpiece after evaporation of water.	3-10	1.080 - 1.120	9-10.5	软、 不粘 Soft, Not Viscous
Smart Base RP9490 磷酸酯型 防锈防腐 复合剂 Phosphate Ester Based Corrosion Inhibitor			高效有色金属防腐剂。含醇胺、羧酸盐及三唑生物。适用于乳化液、半合成及全合成液配方。能有效保护各类型铝合金；包括 319 (铸铝合金)、2024-T3 (高铜铝金)、6061 (高镁铝合金) 和 7075 (高锌铝合金)；亦可保护铜及铸铁。不易破坏系统的稳定性。有润滑性能；能提高刀具寿命。 High performance corrosion inhibitors for yellow metals. Contains alkanolamine, carboxylate acid salt and triazole derivatives. Suitable for formulations of soluble oils, semi-synthetic and synthetic fluids. Can effectively protect various types of aluminum alloys; including 319 (cast aluminum alloy), 2024-T3 (high copper aluminum alloy), 6061 (high magnesium aluminum alloy) and 7075 (high zinc aluminum alloy); can also protect copper and cast iron. Not prone to spoil system stability. Possesses lubricating property; can extend tool life.	1-5	1.000 - 1.200	7.8-8.8	软、 不粘 Soft, Not Viscous
Smart Base RP9690 硼酸酯防锈 润滑复合剂 Borate Ester Based Corrosion Inhibitor			含长链羧酸盐，防锈时间较长。与一般硼酸酯调合物不同；产品挥发性低，不易留下硼酸残留物，且有良好防锈及润滑性能。可用于乳化油、半合成及全合成配方。不含亚硝酸盐及乙二醇胺等有害物质。在硬水环境中能保持防锈性。有辅助杀菌剂；减少杀菌剂用量。水分蒸发后会在工件上形成透明防锈保护膜。 Contains long chain dicarboxylates, with longer rust-proof period. Different from ordinary blended products of boric acid ester; products less volatile, not easy to leave boric acid residue, and with good anti-rust and lubricating properties. Can be used in soluble oils, semi-synthetic and synthetic formulations. Contains no harmful materials such as nitrite and diethanolamine. Can maintain good anti-rust capability in hard water environment. Can fortify biocide performance; reduce biocide treat rate. Translucent protective film will be formed on surface of workpieces after evaporation of water.	3-10	1.100 - 1.200	9-10.5	软、 不粘 Soft, Not Viscous
Smart Base RP9830 羧酸盐防锈 复合剂 Carboxylate Salt Package			它是由羧酸盐及润滑剂组合而成的水基防锈、防腐蚀复合添加剂。产品有独特的润湿特性，能加强加工工件的光洁度。可用于乳化油、半合成及全合成配方。 Package of water-based corrosion inhibitor and anti-rust additives, compounded with dicarboxylic acid salt and lubricant additives. Product exhibits peculiar wetting and lubricating characteristics, that can enhance surface finishing of the workpiece. Can be used for soluble oils, semi-synthetic and synthetic formulations.	3-20	1.000 - 1.150	8.0-9.0	软、 不粘 Soft, Not Viscous

















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## 油性防锈防腐及脱水添加剂 OIL-BASED ANTI-RUST ANTI-CORROSION &amp; DEWATERING PACKAGES







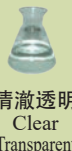



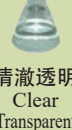

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	闪点 FLASH POINT COC °C
Smart Base RP2330 钡盐防锈剂 Barium Based Rust Preventive	 深棕 Deep Brown	 琥珀 Amber	浅色、低味、低粘度酯类防锈复合剂。具极佳的湿润及防锈性能，能与石油磺酸钡或磺酸钙复合使用。盐雾检测数据特佳；记录有达94小时。 Light color, low odor, low viscosity ester-based anti-rust package. Possesses extremely good wetting and anti-rust properties, can be compounded with petroleum barium sulphonate or calcium sulphonate for usage. Specially good salt-spray test results; with record up to 94 hours.	6-15	0.900 - 1.000	100 - 200	>90
Smart Base RP3113 磺酸钡盐 防锈剂 Barium Salt Rust Preventive	 琥珀半固体 Amber Semi-Solid	 浅琥珀 Light Amber	磺酸钡为基础原料，掺配石蜡及排水剂。可用矿物油或溶剂油调配出高效防锈油。能在工件表面形成防锈保护膜。在湿度高的环境下，仍能保护黑色及有色金属。 Base material is barium sulphonate, blended with paraffin wax and water displacement agent. Can blend with mineral oil or solvent to make high performance rust preventive oils. Can leave rust preventive film on surface of the workpiece. Can protect ferrous and yellow metals even under high humidity environment.	1.0	NA	NA	>115
Smart Base RP3314 铜腐蚀抑制剂 Corrosion Inhibitor For Copper	 深琥珀 Deep Amber	 清澈黄 Clear Yellow	以苯并三氮唑为基础原料的多功能腐蚀抑制剂。可加入含活性硫配方中以抑制铜腐蚀。可用基础油或矿物油调合使用。可加入乳化液配方中以保护有色金属。 Multifunction corrosion inhibitor based on benzotriazole. Can be added to formulations with active sulfur to inhibit copper corrosion. Can be used after blending with basestock or mineral oil. Can be added to soluble oil formulations to protect yellow metals.	6-15	0.900 - 1.000	200 - 400	≥160
Smart Base RP333H 硬膜 防锈剂 Hard Film Rust Preventive	 深褐 Deep Brown	 浅棕 Light Brown	磺酸钡型；掺配石蜡及排水剂的复合添加剂。可以用矿物油或溶剂油为基础原料调配成高效防锈油。加工后工件表面会形成防锈保护膜。即使在湿度高情况下，仍然能保护黑色及有色金属。 Barium sulphonate based package, compounded with paraffin wax and water displacement agents. Can be used with mineral or solvent oils to blend high performance rust preventive oils. Anti-rust protection film will be formed on surface of the processed workpiece. Can protect ferrous and yellow metals even under very humid environment.	3-15	NA	NA	>85
Smart Base RP3340 高碱值磺酸钙 Over Base Calcium Sulphonate (400 TBN)	 深褐 Deep Brown	 浅琥珀 Light Amber	氯取代物，具优越极压性能；但不腐蚀有色金属。能相容于不同组别的基础油。适用于加工铁及非铁合金。如与 TPS 20、TPS 32 或 TPS 44 等叔基多硫化物共用于配方中，极压效能更为显著。不建议与磷酸酯等高酸值材料调配。 Chlorine replacement, possesses excellent EP property; but not staining yellow metals. Can be compatible with different groups of basestock. Suitable for processing ferrous and non-ferrous alloys. EP performance will be more significant when put into formulations with tertiary polysulfides such as TPS 20, TPS 32 or TPS 44. Not recommended for blending with high acid value stuff such as phosphate ester.	1-4	1.150 - 1.250	700 - 1200	>200
Smart Base RP3393 硼酸酯型 防锈剂 Borate Ester Based Rust Preventive	 琥珀 Amber	 淡黄 Pale Yellow	浅色、低味。能与各种粘度基础油调合成不同等级防锈油。可用于工序间防锈。有优越的润滑及渗透性能；能有效覆盖工件表面，发挥极佳的防锈效能。针对户内和户外等各种不同防锈要求，可与钡盐或钙盐搭配使用。产品亦可加入切削液中以增强防锈性，润滑性及相容性。 Light color, low smell, Can be blended with basestock of various viscosities to form different grades of rust preventive oil. Can be used for in-process rust prevention. With excellent lubricity and wetting properties; can effectively cover up surface of the workpiece, exhibiting outstanding rust preventing performance. Can be blended with barium or calcium salts, addressing to different anti-rust requirements based on indoors and outdoor activities, etc. Products can be added into cutting fluids to enhance anti-rust, lubricity and compatibility properties.	6-15	0.900 - 1.000	120 - 200	>180
Smart Base RP3740H 钙盐型防锈剂 Calcium Based Rust Preventive	 琥珀 Amber	 深黄 Deep Yellow	掺配脱水添加剂，适用于高湿度及高酸性的大气环境。成品可用作远洋运输或汽车工业的户外长期防锈剂。与各类溶剂相容性高；可与白电油、无味煤油或松节水等调配出不同挥发速度、防锈期及软硬膜要求的防锈油。调合时无需加热。特别适合于硬膜防锈产品。 Compounded with water displacement agent, suitable for high humidity and highly acidic atmosphere environment. Products can be used as long-term outdoor rust preventives for ocean shipping or car industry. High compatibility with various solvents; can be blended with white spirit, odorless kerosene or turpentine, etc., to make rust preventive oils coping with different rates of evaporation, rust-proof periods and hard-soft film requirements. Heating is not required in blending. Specially suitable for hard-film anti-rust products.	3-17	0.950 - 1.100	150 - 300	>180
Smart Base RP3753 钡盐型防锈剂 Barium Based Rust Preventive	 深琥珀 Deep Amber	 浅黄 Light Yellow	掺配高渗透性合成酯及排水剂。可与不同溶剂或基础油调合成快干或软膜性防锈油。用于加工刀具刀片及五金扳手等工具。能在工件上形成较薄膜，适合精度要求高产品。湿润性强，能较长期保护工件而不干。成膜几乎无色透明。适合于喷涂或手涂工艺。 Compounded with high wetting lubricating synthetic esters and water displacement agent. Can be blended with different solvents or basestocks to form fast drying or soft-film rust preventive oils. Suitable for processing tools like stationery blades and metal wrenches. Can form soft film on the workpiece, suitable for products with high precision requirements. Strong wetting capability, can protect the workpiece in longer term without easily get dried. Film formed almost colorless and transparent. Suitable for aerosol or hand-coating operations.	3-17	0.900 - 1.000	85 - 105	>150

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## 油性防锈防腐及脱水添加剂 OIL-BASED ANTI-RUST ANTI-CORROSION &amp; DEWATERING PACKAGES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	闪点 FLASH POINT COC °C
Smart Base RP4460 铜铝腐蚀抑制剂 Corrosion Inhibitor For Copper/Aluminum	 清澈黄 Clear Yellow	 清澈黄 Clear Yellow	油溶性；具备润湿、防锈及防腐功能。与各类基础油相容。适用于冲压及拉伸配方。 Oil-based, possesses wetting, anti-rust, and anti-corrosion properties. Compatible with various kinds of base stock. Suitable for use in formulations for stamping and drawing.	0.5-3	0.800 - 1.000	20 - 30	>120
Smart Base RP5720 磷酸酯型 防锈剂 Phosphate Ester Type Rust Preventive	 清澈浅黄 Clear Light Yellow	 清澈浅黄 Clear Light Yellow	不含钡盐、钙盐及石蜡成分。优越抗磨及防锈性能；适用于一般加工用油、液压油和齿轮油等纯油配方。色浅，可用矿物油或溶剂油为载体以调配出高效防锈油。能在工件表面形成防锈保护膜。 Contains no barium salt, calcium salt nor paraffin wax. Exhibits excellent antiwear and anti-rust properties. For use in neat oil formulations of general machining oils, hydraulic oils and gear oils. Light color, can be used with carrier like mineral or base oils to blend high performance rust preventive oils. Can leave anti-rust protective film on surface of the workpiece after operation.	0.5-3	0.900 - 1.000	200 - 300	>60
Smart Base RP7130 钙盐型防锈剂 Calcium-Based Rust Preventive	 深琥珀 Deep Amber	 清澈黄 Clear Yellow	浅色。不含钡，可生物降解。由植物蜡、高分子量聚合物酯及钙皂调和而成。可在金属表面留下超薄保护软膜；即使在高湿度或盐分环境中，也有良好的防锈性能。可用溶剂油或矿物油调配成不同等级的防锈油。产品可被碱性清洗剂或脱脂型溶剂清除掉。 Light color. Contains no barium, biodegradable. Blended from vegetable waxes, high molecular polymeric esters, and calcium soaps, can leave an ultra-thin protective soft film on the metal surface. Good rust protection even in high humidity and salty environment. Can be blended with mineral spirits or mineral oils to make different grades of rust preventive oils. Product can be removed by alkaline cleaners and solvent degreasers.	3-25	0.920 - 0.980	180 - 280	>135
Smart Base DM6180 破乳化 复合 剂 Demulsifier Package	 清澈透明 Clear Transparent	 浅黄 Light Yellow	以非离子型表面活性剂为基础的破乳化复合添加剂。分子量和溶解度适中，能有效破乳。可把燃料油或润滑油中的水分从储存罐底部有效分离出来。可在金属加工液配方中作脱水剂使用，工件加工后不留水斑。 Non-ionic surfactant-based emulsion breaking compound additive. Effective demulsification can be achieved with appropriate molecular weight and solubility. Water in fuel oils or lubricating oils can be effectively separated from the bottom of storage tank. Can be used as dewatering agent in the metal working fluid formulations, the workpiece will not leave water spots after processing.	0.5-1	0.900 - 1.050	180 - 230	>190
Smart Base DW8350 脱水复合剂 Dewatering Agent	 浅黄 Light Yellow	 浅黄 Light Yellow	胺气味极低。可把燃料油或润滑油中的水分有效分离出来；在储槽底部排出。可加入排水型防锈油中使用。 Extremely low smell of amine. Can effectively separate out water from fuel or lubricating oils; water can be disposed of from the bottom of storage tanks. Can be used by adding to water displacement rust preventive.	0.1-2	0.850 - 1.950	25 - 35	>75
Smart Base DW8810 脱水复合剂 Dewatering Agent	 清澈透明 Clear Transparent	 浅黄 Light Yellow	非离子型，浅色、低味。特别适用于排水防锈油配方。疏水性能特强；能有效把水分排出。易与各种基础油掺配，与防锈添加剂的相容性好。属优良防锈促进剂。 Nonionic, light color, low odor. Specially suitable for use in formulations of water displacement rust preventing oils. Specially strong hydrophobic property; can displace water effectively. Easily blended with various types of base stock, possesses good compatibility with anti-rust additives. Belong to superior anti-rust booster.	0.5-1	1.000 - 1.100	250 - 400	NA

## 高分子聚合物 HIGH MOLECULE POLYMERS

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
				比重 S.G.	闪点 FLASH POINT COC °C	粘度 VIS. 100°C cSt
SmartTac H 高分子聚合物 High Molecule Polymer	 清澈粘稠 Clear Viscous	优质增稠剂。可用于纯油产品以增强严峻加工时对工件的粘附性。适用于导轨油、齿轮油及其它工业用油配方；亦可作减烟剂。 Premium tackifier. Can be used in neat oil products to enhance adherence to the workpiece during severe operation. Suitable for formulations of waylubes, gear and other industrial oils; also can act as anti-smoke agent.	0.5-2.0	0.800 - 0.900	>155	2450 - 3250
SmartTac.M 高分子聚合物 High Molecule Polymer	 清澈粘稠 Clear Viscous	高分子量聚丁烯共聚物。具良好增粘和润滑性能，能有效提高金属加工液及润滑油的粘附性能。与不同组别基础油有良好的相容性；使易于调合，亦可提高流体在工件上的耐久依附性。产品适合应用于调配链条油及齿轮油。 High molecular weight polybutene copolymer. Possesses good viscosity and lubricating properties, can effectively elevate the adhesion properties of metal working fluids and lubricating oils. Good compatibility when compared to different groups of base stock, so easy to blend, and can elevate the sustained adhesion of fluid on the workpiece. Products suitable for blending chain oils and gear oils.	1-30	0.908 - 0.921	≥170	3900 - 4600

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## 水基极压添加剂 WATER-BASED EP ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5% 水稀 释液 DIL. (WATER)			比重 S.G.	粘度 VIS. 40°C cSt	pH 5%水 稀释液 DIL. (WATER)
SmartSul W4770 硫化添加剂 Sulfurized Additive	 清澈透明 Clear Transparent	 清澈透明 Clear Transparent	不含活性硫；不易腐蚀铜。有轻微胺味。它可用水以任何比例稀释。耐碱性。可用于乳化油、半合成、全合成配方；能提高重负荷性能。配合润滑剂或氯化脂肪，有更佳表现。 Contains no active sulfur; not easy to stain copper. With slight amine smell. Can dissolve in water at all proportions. Alkaline resistant. Can be used in soluble oils, semi-synthetic and fully synthetic formulations; can elevate heavy-duty performance. More superior performance can be attained when combined with lubricants or chlorinated fats.	3-15	1.050 -	60 -	9-11
SmartSul W4772 硫化添加剂 Sulfurized Additive	 琥珀 Amber	 清澈黄 Clear Yellow	与水互溶，浅色，低味多硫化物。不属润滑剂或抗磨剂，但如与Smart Base AW2185等润滑抗磨剂调和，有良好的协同效果，能提高极压性能。产品适用于乳化油，半合成及全合成配方。 Water miscible, light color and low odor polysulfide compound. Product is not lubricity/anti-wear agent, but has synergistic effect when blended with the lubricants or antiwear additives such Smart Base AW2185. Suitable for use in formulations of soluble oil, semi-synthetic oil and synthetic fluids.	3-15	1.200 -	<5	7-9
 SmartSul W4773 硫化添加剂 Sulfurized Additive	 清澈透明 Clear Transparent	 清澈透明 Clear Transparent	低泡水溶性硫化极压添加剂。不含活性硫，不易腐蚀铜；可加工铝合金。适合应用于研磨、攻牙及钻孔等加工工艺；推荐用于全合成、半合成及乳化油等水基配方中。产品可与润滑及抗磨添加剂（如 Smart Base AW2110 或 SmartPhos W5882）混合使用以产生协同效应，获更佳表现。产品不粘砂轮，损耗量小；可延长刀具寿命，并提高工件亮度。可用水稀释使用，可应用于槽边添加。 Low-foaming, water-soluble sulfurized EP additive. Contains no active sulfur, not easy to corrode copper; can process aluminum alloys. Suitable for use in processes like grinding, tapping and drilling; recommended for use in water-based formulations such as fully synthetic, semi-synthetic and soluble oils. Product can be used mixing with lubricating and anti-wear additives (such as Smart Base AW2110 or SmartPhos W5882); with synergistic effect to gain better performance. Product does not stick to grinding wheel so with low loss; can extend tool life and improve brightness of the workpiece. Can be used after dilution with water, and as sump side addition.	3-15	1.350 -	<2.5	9.5 -
SmartPhos W5880 磷化添加剂 Phosphate Additive	 清澈透明 Clear Transparent	 清澈透明 Clear Transparent	无色、无味，易溶于水，加入量少。用于半合成及全合成配方中，能有效提高润滑和抗磨性能。能有效保护切削刀具及增强工件表面光洁度。亦适用于冲压及拉伸油配方。 Colorless, odorless, easily soluble in water, low treat rate. For use in soluble oil, semi-synthetic and fully synthetic formulations; can effectively elevate lubricating and anti-wear properties. Can effectively protect cutting tools and enhance surface finishing of the workpiece. Also suitable for use in formulations of stamping and drawing oils.	3-8	1.150 -	500 -	1-3
SmartPhos W5882 磷酸酯 复合剂 Phosphate Ester Package	 清澈琥珀 Clear Amber	 半透明 Translucent	特佳润湿、防锈及抗磨性能；能增强工件表面光洁度。特别适用于加工镁、铝合金的半合成及全合成冷却液配方中。亦可以1:1比例与水反乳化（水加入产品中）稀释，以应用于不锈钢及有色金属的冲压及拉伸工艺。 Excellent wetting, lubricating, anti-rust and antiwear properties. Can enhance surface finishing of the workpiece. Specially suitable in formulations of semi-synthetic and synthetic coolants for processing magnesium and aluminum alloys. Also can be diluted invert with water (add water to product) at 1:1 ratio, for use in drawing and stamping operations on stainless steels and yellow metals.	3-15	1.000 -	200 -	7.0-8.5

## 水基润滑防锈助乳剂 WATER-BASED LUBRICATING &amp; ANTI-RUST CO-EMULSIFIERS




型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES				
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	中和值 NEUT. NO. meq KOH/g	5%水WATER pH	折光读数 REFRACTIVE INDEX READING	
SmartLub 3250 二异丙醇 酰胺 Diiso- propanol- amide	 清澈黄 Clear Yellow	 半透明 Trans- lucent	高性能润滑，防腐蚀及乳化助剂。适用于半合成及乳化液配方中；能提升产品透明度及加强其湿润性能。能与水反相（水倒进产品中）调和成拉伸液。 High performance lubricating agent, corrosive preventive and co-emulsifier. Suitable for use in soluble oil and semi-synthetic formulations; can make products more translucent, and enhance lubricating and wetting properties. Can be inversely blended with water (add water to product) to form drawing fluids.	一般 General 拉伸液 Drawing Fluids	5-10 10-20	0.900 -	≤8	9.5 -	4.5 -
SmartLub 3260 二元亚尔油 脂肪酸酯 Ditalate Ester	 清澈黄 Clear Yellow	 半透明 Trans- lucent	乳化液增强剂。具防锈、润滑、湿润及清洁性能。适合加工铜铝等合金；可增强工件的表面光洁度。能减少碎屑的粘附，从而延长刀具寿命。适合应用于乳化液、半合成及全合成配方中。 Soluble oil booster. Possesses anti-rust, lubrication, wetting and cleansing properties. Suitable for processing alloys like copper and aluminum; can enhance surface finishing of the workpiece. Can reduce chips adherence, so as to extend tool life. Suitable for use in formulations of soluble oils, semi-synthetic and synthetic fluids.	乳化液 Soluble Oils 半合成液 Semi- synthetics 合成液 Synthetics	5-10 5-10 10-15	0.950 -	≤28	5.5 -	4.4 -

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## 水基润滑防锈助乳剂 WATER-BASED LUBRICATING &amp; ANTI-RUST CO-EMULSIFIERS

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES				
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	中和值 NEUT. NO. meq KOH/g	5%水 WATER pH	折光读数 REFRACTIVE INDEX READING	
SmartLub 3599 甘油酯酰胺 二异丙醇酰胺 DIPA Amide of Fatty Acid of Triglycerides		NA	不含二乙醇胺。有良好的润滑、防锈及助乳化性能。可作为粘度加强剂。适用于作为切削、拉伸及冲压加工的水基配方。 DEA free. Good boundary lubricity, with antirust and co-emulsifier characteristics. Can act as viscosity booster. Suitable for water-based formulations for machining, drawing and stamping processing.	乳化液 Soluble Oils 半合成液 Semi-synthetics	5-10 - 5-10	0.900 - 1.000	50 - 60	10.2 - 11.2	4.8 - 5.2
SmartLub 3699 三羟甲基丙烷 自乳化酯 Self Emulsifying Ester of TMP			良好的润滑、分散及热稳定性能。用水稀释后呈稳定的白色乳液，能加入乳化油、半合成及全合成等水基冷却液，提升润滑及抗磨性能。 Good lubricity, dispersibility and thermal stability. Can form stable milky emulsion after dilution with water. Can be incorporated into the water-based coolants such as soluble oils, semi-synthetic and fully synthetic coolants to boost up anti-wear and lubricity properties.	乳化液 Soluble Oils 半合成液 Semi-synthetics	5-10 - 5-10	0.950 - 1.050	<5 - -	8 - 9	4.5 - 5.5

## 杀菌剂/系统稳定剂 BIOCIDES / SYSTEM STABILIZERS

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
				比重 S.G.	pH 5% 水稀 释液 DIL. (WATER)	粘度 VISCOSITY 40 °C cSt
SmartCide BIT-20 广谱杀菌剂 Broad Spectrum Bactericide		活性成分：1,2-苯并异噻唑啉-3-酮 Active Ingredients: 2-benzisothiazolin-3-one 广谱杀菌剂。不含甲醛、5-氯甲基异噻唑啉-3-酮及1-甲基异噻唑啉酮。于水基产品中有防细菌、酵母菌及真菌功能。产品在 pH 2-12 范围内保持稳定，可用于乳化油、半合成及全合成冷却液配方中有效抑制霉。 Broad spectrum biocide. Contains no formaldehyde, nor CMIT/MIT. For applications in water-based products against bacteria, yeasts, and fungi. Products are stable in pH range of 2-12, so can be use in recipes of soluble oils, semi-synthetic and fully synthetic coolants, with effective inhibition against microbial growth.	1-3 (浓缩液) (Concentrate)	1.110 - 1.150	>12	NA
System Stabilizer SS7698 杀菌剂/系统稳定剂 Bactericide System Stabilizer		活性成分：溴硝丙二醇、5-氯-2-甲基异噻唑啉-3-酮、2-甲基异噻唑啉-3-酮 Active Ingredients: 5-Chloro-2-methyl-3(2h)-isothiazolone and 2-methyl-3(2h)-isothiazolone 不含甲醛；含杀菌、防腐、pH稳定及杂质沉降等多功能。能用于乳化油、半合成及全合成冷却液配方中。 No formaldehyde. Contains multi-functions of biocide, fungicide, pH stabilizer and impurity settling agent, etc. Can be used in formulations of soluble oils, semi-synthetic and fully synthetic coolants.	1-3 (浓缩液) (Concentrate)	1.000 - 1.050	NA	10 - 15
SmartCide BK983 广谱杀菌剂 Broad Spectrum Bactericide		活性成分：含甲醛复合添加剂 Active Ingredient: Package containing Formaldehyde 具杀菌、防腐、pH稳定性等多功能水基复合添加剂。能减低配方中其它添加剂的降解速度从而延长产品寿命；亦有效改善工作间的环境。 Multi-functional water-based package with bactericide, fungicide, pH stabilizer, etc. Can reduce degradation of other additives in formulations to extend product life; so can also effectively improve environment of the working space.	1-3 (浓缩液) (Concentrate)	1.000 - 1.200	10.2 - 11.5	27 - 97
SmartCide BK988 广谱杀菌剂 Broad Spectrum Bactericide		活性成分：六氢三嗪化合物 Active Ingredient: 1,3,5-Hexahydrotriazine (HHT) 具经济效益。提供中速抗菌功能。在乳化液、半合成及全合成液配方中能抑制细菌增长。甲醛释放较 BK978 慢，储存及系统应用有效期较长；故不需频繁添加。不适用于 pH 值低于 7 的系统中。产品亦可从槽边添加，或作系统 pH 提升剂使用。 Cost-effective. Provides medium speed anti-microbial function. Can effectively inhibit growth of bacteria in soluble oils, semi-synthetic and fully synthetic systems. Formaldehyde release is slower when compared with BK978, so can have longer efficacy period for storage and system application; with less requirement for frequent addition. Not suitable for systems with pH less than 7. Products can be added tankside, or used as pH booster in systems.	0.1-0.3 (工作液) (Working Fluids)	1.000 - 1.200	9 - 11	45 - 65

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## 杀菌剂/系统稳定剂 BIOCIDES / SYSTEM STABILIZERS

型号 BRAND 类型 TYPE	外观 APPEARANCE	产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
				比重 S.G.	pH 5% 水稀 释液 DIL. (WATER)	粘度 VISCOSITY 40 °C cSt
SmartCide MBM 广谱杀菌剂 Broad Spectrum Biocide	 淡黄 Pale Yellow	<p>活性成分：亚甲基双吗啉 Active Ingredient: Methylene Bismorpholine</p> <p>可以中速率抑制细菌及真菌的增长。适用于乳化液、半合成及全合成液。甲醛释放速率较BK968及BK978为慢；杀菌/抑菌期较长，故不需频密添加。不适用于pH值低于7的系统。如与BK978或BK988(3BK:1MBM)使用，性能更佳。可槽边添加及作pH提升剂使用。</p> <p>Provides medium speed inhibition of bacteria and fungi growth. Suitable for use in soluble oils, semi-synthetic and synthetic systems. Rate of formaldehyde release is slower when compared to BK968 and BK978; with longer anti-microbial efficacy period, so frequent addition is not required. Not suitable for systems with pH less than 7. Better performance when used with BK978 or BK988 (3 BK : 1 MBM). Can be added tankside and used as pH booster.</p>	0.1 - 0.18 (工作液) (Working Fluids)	1.050 - 1.200	9.0 - 11	4 - 10

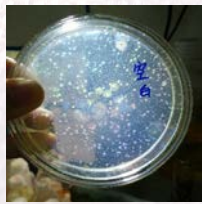
## 杀菌剂评定 (抑菌圈法) BIOCIDES EVALUATION (BACTERIA INHIBITION ZONE METHOD)

**抑菌圈法：**在已种菌的琼脂培养基中央放置浸渍过杀菌剂稀释液的小圆片滤纸（杀菌剂浓度0.5%，浸渍时间30秒，试验时间24小时）。因杀菌剂经琼脂扩散，形成不同浓度梯度的同心圆；越近中央，杀菌剂浓度越高，抑菌能力越强。同时在同等条件（时间、浓度）下可籍此比较不同杀菌剂；抑制圈越大，杀菌剂效能越强。

**Bacteria inhibition zone method:** Small disc of filter paper that has been dipped into biocide dilution is placed in the middle of a bacteria infected culture medium of beef extract-peptone agar (biocide concentration 0.5%, dipping time 30s, test time 24hr). Concentric circles on a concentration gradient of biocide are formed by diffusion through the culture medium; more close to the centre, more strong the bacteria inhibition capacity. At the same time, different biocides can be compared under the same conditions (time, concentration): the bigger the inhibition circle, the stronger the biocide.

**结果：**从下图我们可以看出SmartCide BK983, SmartCide BK988, Smart Cide MBM 均能形成明显的抑制圈，说明三种产品都有明显的杀菌效果。同时，我们可看出 SmartCide BK983 及 BK988 的抑制圈比 SmartCide MBM 的稍大。这反映出在短时间内，SmartCide BK983 / BK988 释放的甲醛比 Smart Cide MBM 多；杀菌较迅速，所以形成抑制圈较大。

**Result:** from the photos below, we can see that SmartCide BK983, SmartCide BK988 and SmartCide MBM can all form significant inhibition circle, showing significant anti-bacterial effect. At the same time, we can see that SmartCide BK983 and BK988 has bigger inhibition circle than SmartCide MBM. This reflects that in short time, SmartCide BK983 / BK988 release more formaldehyde than Smart Cide MBM; killing bacteria much faster, so forming bigger inhibition circle.



不加杀菌剂 No Biocide



SmartCide BK983



SmartCide BK988



SmartCide MBM

## 细菌及真菌检测片 BACTERIA-FUNGI TESTING KITS

## 产品叙述 PRODUCT DESCRIPTION

细菌-真菌/酵母菌 测菌片 是一款经济、快速、准确的测菌片。用于检测水基系统中的细菌、真菌和酵母菌数量和生长速度。

Bactericide-fungicide testing kit is an economic, quick and accurate testing kit to monitor the population of bacteria, fungi and yeast growth in the water-based system.

## 检测用法 TEST INSTRUCTION

1. 将测试版连盖从容器中取出 (不要触碰测试版)

Take out the cap and paddle unit from the container (avoid touching the paddle);

2. 将测试版浸泡在检测液中5-10秒；确保测试版表面充分浸润

Immerse the paddle into the fluid under test for 5-15 sec; immerse the paddle into the fluid under test for 5-15 sec, insure both paddle surfaces are fully wetted;

3. 拿出并让测试版静待数秒，让多余的液体流走 Take out and drain excess fluid for a few seconds from the sides of the paddle;

4. 将测试版放回容器中，扭紧盖子 Return paddle to container, tighten the cap;

5. 将时间日期等有关信息记录在随附的标签纸上 Record related information such as date and time on the label provided;

6. 将整个单元垂直放置于 27-30°C 的环境下，培养 24-48 小时 (对酵母或霉菌，培养时间应偏向范围上限)

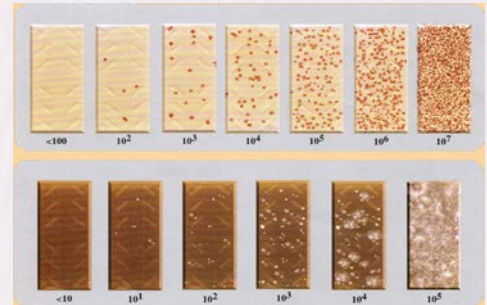
Incubate unit in an upright position at 27-30°C for 24-48 hours (for yeasts and moulds, incubation time should be at the upper side of range);

7. 拿出测试版并目测在其上的菌落数量，与随附的菌落密度图作对比，以决定测试液的含菌量

Take out the paddle and observe the colonies on it, compare them with colony density chart provided to determine cell quantity in tested fluid.

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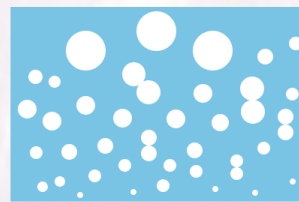
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## 气泡在纯液系统中形成及破裂 Bubble Formation and Breakage in Pure Liquid System

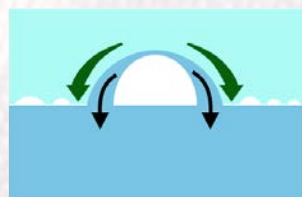


自由能: 液气系统搅拌后形成气泡。  
**Free Energy:** Bubbles are formed in the air-liquid system after stirring

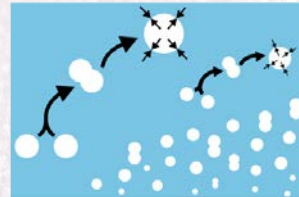


排水破裂: 气泡液膜因地心引力引流而变薄。当承受不了气体压力时, 气泡会破裂。气泡只能在液面破裂。

**Drainage rupture:** Liquid film of the bubble drains due to gravity and gets thinner. When it cannot hold the gas pressure anymore, the bubbles will rupture. Bubbles can only break at the surface of the liquid.



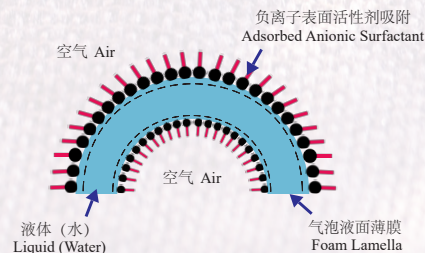
浮力: 气泡上浮液面。泡内的压力是均等的。  
**Buoyancy:** bubbles rise to the surface of the liquid. Pressure inside the bubble is equal.



聚结: 受困气泡互相碰撞形成较大气泡。  
**Coalescence:** Entrapped bubbles collide and form bigger bubbles.

当系统中加有表面活性剂, 表面活性剂会吸附在气-液薄层处。离子型表面活性剂因薄层表面的负电荷排斥抑制液膜的重力引流, 而非离子型表面活性剂藉分子亲水部分的空间位阻/熵斥力抑制引流的变薄过程; 故泡沫能稳定于系统中。

When surfactant is included in the system, surfactant will adsorb to the surface of air-liquid lamella. Ionic surfactants inhibit the gravity drainage by charge repulsion at the lamella surfaces, whilst the non-ionic surfactants inhibit drainage thinning by steric/entropic repulsion of the hydrophilic portion of the molecules. Hence, foam can be stabilized in the system.



创建高效消泡剂需考虑以下规范:

**The following criteria should be considered to create high performance defoamer:**

- ▶ 與系統液的溶解度极低, 但仍有一定的相容性以维持界面连续相 (泡沫介质)。  
Scarce solubility in system, but still with some compatibility to ensure a continuous phase (the foaming medium).
- ▶ 较泡沫介质有更低表面张力, 故能渗入并铺展到泡沫液膜上, 取代其上的表面活性剂。  
Lower surface tension than the foaming medium, so that the defoamer can penetrate and spread onto the foam lamella displacing the surfactant.
- ▶ 必须能在泡沫介质中迅速分散。  
Must be able to rapidly disperse in the foaming medium.
- ▶ 其疏水粒子的大小与气 / 液薄层的厚度属同一级别。  
The size of the hydrophobic particles is the same order as the thickness of the air/liquid lamella.
- ▶ 化学上须为惰性。  
Must be chemically inert.
- ▶ 快速爆破泡沫, 保持系统均质性。  
Fast foam breaking and stay homogeneous in the system.

不同系统的 **FoamQuer** 消泡剂 是基于反复调试而制定。其成分由以下各项中选出:

**FoamQuer defoamers are based on recurrent tests and modification for different systems. Components are chosen from the following:**

- |                     |   |
|---------------------|---|
| 载体:                 | 矿物油、水或合成烯烃; 如聚乙烯、聚丙烯、聚亚烷基乙二醇或烷基聚丙烯酸酯。   |
| Carriers:           | Mineral oil, water, or synthetic base stocks; such as polyethylene, polypropylene, polyalkylene glycol or alkyl polyacrylate.     |
| 有效成分:               | 疏水性二氧化硅、脂肪酸、聚二甲基硅氧烷、硅聚醚共聚物、蜡和有机硅氧烷聚合物。  |
| Active ingredients: | Hydrophobic silica, fatty acid, poly-dimethyl siloxane (silicone), silicone polyether copolymer, wax, and organosiloxane polymer. |
| 表面活性剂:              | 烷氧基酯或脂肪醇。   |
| Surfactants:        | Alkoxyated esters or fatty alcohols.  |

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## 消泡剂 FOAMQUER DEFOAMER

型号 BRAND 类型 TYPE	建议 加入量 SUGGESTED TREAT RATE 浓缩液 CONC. %	典型数据 TYPICAL PROPERTIES					应用推荐 SUGGESTED APPLICATIONS												
		比重 S.G.	粘度 VISCOSITY CPS	固含量 SOLID CONTENT %	产品特性 PRODUCT FEATURES	pH 50% 水稀 释液 DIL. (WATER)	乳化液 SOLUBLE OILS		半合成液 SEMI-SYNTHETICS			全合 成液 SYN- THETIC FLUID	工业 清洗 剂 IND. CLEANER	高水/ 含液 压 油 HWC &WC HYDRAULIC FLUID	防冷 冻剂 ANTI- FREEZE COOLANTS	工艺 油 METAL CUTTING OIL	工业 油 IND. OIL		
							矿物 油基 MINERAL OIL BASED	植物 油基 VEGETABLE OIL BASED	高矿 物油 HIGH MIN. OIL CONTENT	低矿 物油 LOW MIN. OIL CONTENT	酯/植 物油 ESTER/ VEGETABLE OIL								
FoamQuer 4172	0.05-0.2	0.950 - 1.050	1000-3300	>70	水性消泡剂 Water-Miscible Defoamer	7-8.5			•	•	•	•							
FoamQuer 7365		0.950 - 1.100	900-2500	>98		7-9.5			•	•	•	•							
FoamQuer 7396		1.000 - 1.100	600-2000	>98		7-9			•	•	•	•	•						
FoamQuer 8617		0.950 - 1.050	600-2000	>70		7-9	•	•	•	•	•	•							
FoamQuer 8619		0.990 - 1.060	500-1500	>98		6.6-8.5	•	•	•	•	•								
FoamQuer 8629		0.990 - 1.060	300-900	>98		7-8	•	•	•	•	•								
FoamQuer 9936		1.000 - 1.100	80-400	>98		7-8.5						•							
FoamQuer 9968		0.950 - 1.050	1500-3000	>70		8-9.5			•	•	•								
FoamQuer 9191		0.750 - 0.850	400-1200	>80		水性消泡剂 (非硅) Water-Miscible Defoamer (Non-Silicone)	6.5-7.5			•	•	•							
FoamQuer 9281		0.950 - 1.050	120-220	>90			6-8	•	•				•						
FoamQuer 1010	0.1-0.5	0.950 - 1.050	30-400	15-25	水性消泡剂 (槽边添加) Water-Miscible Defoamer (Tankside)	6-9	•	•	•	•	•	•	•	•	•				
FoamQuer 1020		0.960 - 1.060	150-500	15-40		6-9	•		•	•	•	•	•						
FoamQuer 1030		0.960 - 1.060	750-1100	15-40		6-9				•		•	•						
FoamQuer 8016		0.950 - 1.050	30-400	15-25		6-9	•	•	•	•	•	•	•	•	•	•			
FoamQuer 9300		0.700 - 0.800	3-5 (cSt)	NA		NA												•	•
FoamQuer 9317H	0.05-0.1	0.750 - 0.850	3.5-6.5 (cSt)	NA	油性消泡剂 Oil-Soluble Defoamer	NA												•	
FoamQuer 9371		0.750 - 0.850	10-20 (cSt)	NA		NA												•	•
FoamQuer 9717H		0.750 - 0.850	3.6-5.6	NA		NA													•
FoamQuer 9775		0.750 - 0.850	5-8	NA		油性消泡剂 (非硅) Oil-Soluble Defoamer (Non-Silicone)	NA												•

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## 乳化剂 EMULSIFIERS

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5% 水稀 释液 DIL. (WATER)			油点 CLOUD POINT °C MAX	含水量 MOISTURE % MAX.	pH 1%水 稀释液 DIL. (WATER)
SmartEmul 1618 EO/PO C16/C18醇(Alcohol)	 清澈透明 Clear Transparent	 半透明 Translucent	可乳化磺烷基、石蜡基、酯类、聚α烯烃油。HLB为 8.0-10，硬水稳定性强，低泡。适用于铝、镁合金加工配方。 Emulsifier for naphthenic and paraffinic oils, esters, PAO and PAGs. With HLB 8.0-10, strong hard-water stability, low foam. Good for use in formulations of aluminum and magnesium alloys.	3-15	60 - 65	0.5	5.5-7.5

## 乳化油复合剂 EMULSIFIER BASE PACKAGES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5% 水稀 释液 DIL. (WATER)			比重 S.G.	粘度 VIS. 40°C cSt	pH 5%水 稀释液 DIL. (WATER)
Smart Base S1215C 通用型 乳化油精 Universal Emulsifier Package	 浅琥珀 Light Amber	 乳白 Milky White	磺酸盐及合成酯型乳化复合剂。高成本效益。含润滑、极压、防锈、消泡、杀菌和防霉添加剂。性能全面，适用于调合稳定乳化液。可用于铁类及铜铝等合金的切削和研磨工艺。 Sulphonate and synthetic ester-based emulsifier package. High cost-efficiency. Contains additives for lubricity, EP, anti-rust, anti-foam, bacteriocides and fungicides. Full-fledge performance properties, suitable for use in blending stable soluble oils. Can be used for cutting and grinding operations on ferrous metals as well as copper and aluminum alloys.	15-30	1.000 - 1.100	100 - 200	8.0-9.5
Smart Base S2215C 通用型 乳化油精 Universal Emulsifier Package	 琥珀 Amber	 乳白 Milky White	磺酸盐型优质乳化复合剂。含润滑、极压、防锈、消泡、杀菌、防霉添加剂。性能全面，适用于调合稳定乳化液。可用于铁及铜铝等合金的切削和研磨工艺。 Sulphonate type emulsifier package. Contains additives for lubricity, EP, anti-rust, antifoam, bacteriocides and fungicides. Full-fledge performance properties, suitable for use in blending stable soluble oils. Can be used for cutting and grinding operations on ferrous metals as well as copper and aluminum alloys.	15-30	1.000 - 1.100	210 - 230	8.0-9.5

## 半合成冷却浓缩液 SEMI-SYNTHETIC COOLANT CONCENTRATES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES			
	原液 ORIG. FLUID	5% 水稀 释液 DIL. (WATER)			比重 S.G.	pH 5%水 稀释液 DIL. (WATER)	粘度 VIS. 40°C cSt	5% 折光 读数 REFRACTOMETER READING
SanCut EP369 环保型极压半 合成超浓缩液 Environmental Friendly EP Semi-Synthetic Ultra-Concentrate	 清澈深绿 Clear Deep Green	 清澈黄绿 Clear Greenish Yellow	不含硫、氯及亚硝酸盐。含磷；对有色金属有极佳保护作用。有良好润滑、抗磨、极压及防锈功能；适合加工不锈钢、铸铁及铜铝合金。含完备杀菌防霉剂，故工作液能较长久而不变质。浓度极高；可以70%水稀释后，供最终用户再稀释使用。 Contains no sulfur, chlorine, nor nitrite. Contains phosphorous; can provide excellent protection on yellow metals. Possesses good lubricating, antiwear, EP and anti-rust properties; suitable for machining stainless steels, copper and aluminum alloys and cast irons. Fortified with bacteriocides and fungicides, so the working fluid can be used long time without deterioration. Extremely concentrated, can be diluted at 70% with water before delivery to end-users for their further dilution.	3-10	0.950 - 1.050	8.5 - 9.5	70 - 100	4.5 - 5.5
SanCut EP3561 极压半合成 超浓缩液 EP Semi-Synthetic Ultra- Concentrate	 琥珀 Amber	 清澈黄绿 Clear Greenish Yellow	不含硫、氯、磷及亚硝酸盐。具良好润滑、抗磨，极压及防锈功能。适合加工不锈钢、铜铝合金及铸铁。含完备杀菌防霉剂，可使工作液长时间使用而不变质。浓度极高；可以70%的水稀释后，供最终用户稀释使用。 Contains no sulfur, chlorine, phosphorous, nor nitrite. Possesses good lubricating, antiwear, EP and anti-rust properties. Suitable for machining stainless steels, copper/aluminum alloys and cast irons. Fortified with full-fledged bacteriocides and fungicides, working fluids can be used long time without deterioration. Extremely concentrated, can be diluted at 70% with water before delivery to end-users for their further dilution.	3-10	1.000 - 1.100	8.0 - 9.5	90 - 150	4.0 - 4.4


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## 微乳液 MICRO-EMULSIONS

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5% 水稀 释液 DIL. (WATER)		5% 折光 读数 REFRACT- METER READING	pH5% 水稀 释液 DIL. (WATER)	思敏钻 孔系数 SMART OIL DRILLING INDEX 孔数 HOLES <sup>†</sup>
SanSol MA806 镁/铝合金 微乳液 Mg/Al Alloys Micro- emulsion			<p>含优质合成复合酯、非离子型乳化剂及磷酸酯。清洗力及抗磨性能特强。具优越抗硬水性能；寿命长。酯类组分润湿性能极高，令镁铝合金等工件有极佳表面光洁度。不含磺酸盐；防腐蚀及抗败坏性能特佳。</p> <p>Contains superior synthetic ester, non-ionic emulsifier and phosphate ester. Specially strong cleansing and antiwear properties. Possesses superior hard-water resistance to enable long shelf life. Ester component possesses extremely high wetting property, so to ensure good surface finishing of workpieces like magnesium and aluminum alloys. Contains no sulphonate; with superior anti-corrosive and anti-microbial characteristics.</p>	4.2 - 5.2	8.0 - 9.5	116

†数控机床 CNC: 转速Rotation Speed:3500 rpm, 钻头Drilling heads: 1mm, 进给率Advance: 22, 钻孔深度Drilling depth: 4mm, 钻孔材料Drilling material: 316L

## 全合成冷却浓缩液 SYNTHETIC COOLANT CONCENTRATES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES			
	原液 ORIG. FLUID	5% 水稀 释液 DIL. (WATER)			比重 S.G.	pH5% 水稀 释液 DIL. (WATER)	粘度 VISCOSITY 40 °C cSt	5% 折光 读数 REFRACT- METER READING
SanSyn SG6160 全合成 研磨液 Synthetic Grinding Fluid			<p>优质抗杂油型。不含矿物油及氯化添加剂；亦不含亚硝酸盐等有害物质。用水稀释后产品为无色无味，清澈透明。含极压添加剂；适合切削、钻孔及磨削等加工工艺。具极佳防锈、沉降及消泡性能。可加工铁及含稀土金属，包括钕、铈、镧、钆等合金。清洁性能良好；操作后不会有粘附性沉积物，故工作液可保持清澈透明。也适合光学玻璃的精磨加工工艺。产品的浓度较高，可加 30% 水稀释后供最终用户稀释使用。</p> <p>Premium oil rejecting synthetic type. Contains no mineral oils and chlorinated additives; also no harmful materials such as nitrite. Exhibits clear and transparent liquid with no color and odor after dilution with water. Contains EP additive, suitable for cutting, drilling and grinding operations, etc. Possesses extremely good anti-rust, sedimentary and foam release properties. Can process ferrous and rare earth metals, including alloys of neodymium, cerium, lanthanum, samarium, etc. Good cleansing properties, will not leave adherent sediments after operation, so working fluid can keep clear and transparent. Suitable for fine grinding operation on optical glass. Product comparatively more concentrated, can be diluted by adding 30% water before delivery to end customers.</p>	3-10	1.050 - 1.150	8.5 - 9.5	<10	2.5 - 3.0
SanSyn SD6260 全合成 钻孔液 Synthetic Drilling Fluid			<p>新一代低味钻孔磨削液；不含亚硝酸盐及其他有害物质。具有极优润滑、抗磨及极压性能。特别设计用于钻孔、切削等加工工序。防锈性特强，可作工序间防锈液使用。亦可用于单机或中央系统。冲洗性能特佳；加工时碎屑不易粘附在工件的表面上。产品的浓度颇高，可加20%水稀释后，供最终用户稀释使用。</p> <p>New generation drilling and grinding fluid with low odor. Contains no nitrite and other harmful materials. Possesses superior lubricating, antiwear, and EP properties. Specially designed for drilling and grinding operations. Very strong anti-rust capability, can be used as in-process rust preventive. Can be used for standalone machine or in centralized systems. Excellent cleansing property, chip debris will not easily adhere to the workpiece during operation. Product highly concentrated, can add 20% water before delivery to end customers.</p>	3-10	1.000 - 1.100	8.0 - 9.0	50 - 80	3.2 - 3.6

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## 全合成冷却浓缩液 FULLY SYNTHETIC COOLANT CONCENTRATES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES			
	原液 ORIG. FLUID	5% 水稀 释液 DIL. (WATER)			比重 S.G.	pH5% 水稀 释液 DIL. (WATER)	粘度 VISCOSITY 40°C cSt	5% 折光 读数 REFRAC- TOMETER READING
SanSyn SM6560 多功能 全合成 冷却液 Multi-Functional Synthetic Coolant			含磷及减磨添加剂；适用于切削、钻孔及磨削等加工工艺。防锈、防腐性、沉降性及消泡性能极佳。可用于加工 316L 不锈钢、铸铁、铜及铝合金。对铜、铝的抗腐蚀性特强，可加工易于腐蚀的有色金属。产品有良好清洁性；加工时碎屑不易粘附在工件的表面。具良好冷却性能；工件不会因过热减低表面光洁度。产品浓度颇高，可以 70% 水稀释后供最终用户再稀释使用。Contains phosphorus and friction modifier; suitable for use in cutting, drilling and grinding operations. Superior anti-rust, anti-microbial growth, metal filing sedimentation and defoaming properties. Can be used for machining 316L stainless steels, cast irons, copper and aluminum alloys. Specially good protection for copper and aluminum alloys from corrosion, can process yellow metals that are prone to corrosion. Product with excellent cleansing property; chip debris will not easily adhere to the workpiece during operation. Good cooling properties, workpiece will not lead to poor surface finishing due to overheating. Product rather concentrated, can be diluted at 70% with water before delivery to end-users for their further dilution.	3-10	1.000 -	8.5 -	12 -	2.8 -
GlassGrind GG6767 全合成 研磨液 Synthetic Grinding Fluid			全合成玻璃研磨冷却液。不含硅、二乙醇胺、亚硝酸盐、磷酸盐、多氯联苯、苯酚及矿物油。具特强的润滑性能；能有效减少玻璃颗粒与砂轮的摩擦，增强产品的光洁度；同时能提高加工速度，令玻璃粉末有良好沉降性，防止粉末回流而堵塞冷却管道。Fully synthetic glass grinding coolant. Contains no silicon, diethanolamine, nitrite, phosphate, polychlorinated biphenols, phenol and mineral oils. Possesses strong lubricating characteristics which can effectively reduce the friction between small glass granules and grinding wheel, so product finishing can be enhanced. Besides, machining rate can be increased, leading to good glass powder settling which can avoid the powder being refluxed to the coolant tubing and get it blocked.	2-5	1.100 -	8.0 -	<10	2.6 -

## 浅色油性拉伸油精 LIGHT COLOR DRAWING OIL CONCENTRATES.

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES			
	原液 ORIG. FLUID	5% 稀 释液 DIL. (S150)			比重 S.G.	粘度 VIS. 40°C cSt	脂肪 FAT %wt	闪点 FLASH POINT COC °C
Smart Draw SD361 高粘度吹泡 动物油 High Viscosity Lard Oil			湿润性能极佳；适用于拉伸及冲压工艺，能有效渗透于工件上以防止工件拉花拉裂。配方中可加入乳化剂以调出易冲洗型拉伸成型油。Superior wetting and lubricating properties; suitable for use in drawing and stamping operations, can effectively penetrate into the workpiece to avoid scratching and cracking during operation. Emulsifier agent can be added to formulation to blend easily washable drawing oil.	5 -	0.900 -	100 -	100	>170
Smart Draw SD379 不锈钢管 拉伸成型油 Drawing/ Forming Oil for SS Tube			含氯 (>40%)。设计用于不锈钢管、线拉伸及弯管成型工艺。由高粘度氯化石蜡、精制猪油及高性能润滑剂配制而成。工件在加工过程中不易断裂。用户可直接使用此产品，或先用菜籽油或棕榈油稀释后使用（建议产品 / 稀释油比例为 70:30）。Contains chlorine (>40%). Designed for stainless steel tubing, wire drawing and tube bending and forming operations. Blended with high viscosity chlorinated paraffin, highly refined lard oil, and high performance lubricants. Workpiece will not easily get cracked or broken during operations. Users can use this product direct, or dilute with rapeseed or palm oil prior usage (Suggested product / oil ratio is 70:30).	2 -	1.400 -	NA	<5	>200
Smart Draw SD3629 高粘度 拉伸冲压油 High Viscosity Drawing & Stamping Oil			由植物油、动物油及合成酯复合而成。提供极佳界面润滑及冷却功能；能有效防止模具与金属黏附或烧结；同时具耐冲击性能，能增强模具耐用性。可用菜籽油、棕榈油或矿物油稀释后使用；适合深拉伸及冲压操作。加工后清洗容易，方便往后再喷涂或涂瓷等加工工序。可通过手涂，滚筒涂或回流喷涂等方法加到工件上应用。Compounded with vegetable oils, animal oils and synthetic esters. Provides excellent boundary lubricating and cooling functions; can effectively prevent metal adherence or welding to moulds; also possesses impact endurance property. Can enhance durability of dies. Can be used after dilution with rapeseed oil, palm oil or mineral oil; suitable for deep drawing and stamping operations. Clean up is easy after operation, convenient for subsequent process like spray painting or porcelainizing. Can be applied on the workpiece using hand brush, rollers or recirculation.	10 -	0.900 -	700 -	>80	>130

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## 浅色油性拉伸油精 LIGHT COLOR DRAWING OIL CONCENTRATES.

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES			
	原液 ORIG. FLUID	5% 稀释 液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	脂肪 FAT %wt	闪点 FLASH POINT COC °C
Smart Draw SDA3630 铝拉丝油 Aluminium Wire Drawing Oil			不含氯。低黏、黏度指数高。特种摩擦改进剂及高性能润湿剂。含合成酯，润滑性强。增温条件下仍能维持高剪切稳定性。铝丝即使在高速加工下仍能令加工模具维持较低温度；从而确保工件有良好光洁度及清洁性。适合加工1350、3xxx至7xxx系列合金铝。可直接涂上工件上使用。操作上可从起始直径2mm拉到成品直径0.1mm。 No Chlorine. Low viscosity, high viscosity index. Special friction modifier and high performance lubricant. Contains synthetic esters, with strong lubricity. Can maintain high shear stability at elevated temperature. Operation of aluminum wire drawing can keep dies at low temperature even under high speed operation; so can ensure good surface finishing and cleanliness of the workpiece. Suitable for processing aluminum series of 1350, 3xxx to 7xxx. Can be used by direct application on the workpiece. Operation can be done from starting diameter of 2mm to finishing diameter 0.1mm.	50 - 100	NA	200 - 400	>50	>150
Smart Draw SDA4894 铝合金拉伸 冲压油 Aluminum Alloy Stamping and Drawing Concentrate			不含氯，可水洗，专为铝合金加工设计的拉伸冲压油精。含特种磨擦改进剂、高分子聚合物、极压剂、合成酯。润滑性强，高温条件下仍能保持高强度润滑油膜。产品不易氧化，特别适合铝合金的拉伸及冲压工艺。在加工过程中残留物少，可确保工件有良好的光洁度。含防锈成分，工件加工后不须另涂防锈剂仍有短期防锈保护。可原液使用，或基础油稀释应用。 No chlorine, washable stamping and drawing concentrate, specially designed for machining aluminum alloys. Contains specialty friction modifier, high molecular weight polymeric esters, extreme pressure additives, synthetic ester; which can perform good lubricity and maintain high film-strength even at high temperature during machining. Products not easy to be oxidized, specially suitable for drawing and stamping operations on aluminum alloys. Leaves very little residue from operation, so can ensure good surface finishing of the workpiece. Contains anti-corrosion component which imparts short term corrosion protection after machining without otherwise brushing rust preventive. Can be used neat or diluted with mineral oil in application.	25 - 50	0.800 - 0.900	60 - 120	>90	>130
Smart Draw SDA4896 铝合金拉伸 冲压油 Aluminum Alloy Stamping and Drawing Concentrate			不含氯，专为铝合金加工设计的拉伸冲压复合浓缩液。含特种磨擦改进剂、高分子聚合物、极压剂和合成酯。润滑性强，高温条件下仍能在工件上保持高强度润滑油膜。加工后残留物少；工件有良好的光洁度。可原液使用，或以溶剂油或基础油稀释使用。建议产品 / 稀释油比例为 30:70。 Contains no chlorine, stamping and drawing compound concentrate specially designed for machining aluminum alloys. Contains specialty friction modifier, high molecular weight polymeric esters, EP additives and synthetic esters. Strong lubricity, can maintain high film strength even under high temperature condition. Leaves very little residue after operation; so workpiece with good surface finishing. Can be used neat or diluted with solvent or mineral oil for application. Suggested product / oil ratio is 30:70.	25 - 50	0.900 - 1.000	40 - 80	>70	>170

## 浅色油性切削复合添加剂 LIGHT COLOR CUTTING OIL PACKAGES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES					
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS 40°C cSt	硫S (活硫) (ACT S) %wt	氯 CHLOR. % wt	脂肪 FAT % wt	闪点 FLASH POINT COC °C
Smart Base CF1101L 浅色万能切 削油复合剂 Light Color Multifunctional Cutting Oil Package			浅色，低味。含硫、氯、高湿润性脂肪及极压剂；能有效地降低操作负荷及切削刀口的摩擦阻力，减少刀具磨损及防止金属烧结；亦可提升工作精度及工件表面光洁度。产品可直接使用，或可按加工的苛刻程度用矿物油适量稀释后使用。适用于加工不锈钢及含铁金属。 Light color, low odor. Contains sulfur, chlorine, high-wetting fat, and EP. Can effectively lower workload and frictional impedance at cutting edge, reduce tool wear and metal welding, also can elevate work precision, and enhance surface finishing of the workpiece. Product can be used neat or blended with mineral oil prior usage according to severity requirements. Suitable for processing stainless steels, alloy steels and ferrous containing metals.	5-20	0.950 - 1.150	120 - 300	>3 (微量) (Traces)	>20	>10	>160
Smart Base CF1104LK 浅色通用切 削油复合剂 Light Color Universal Cutting Oil Package			不含氯；浅色，低味；含硫极压剂。能有效地降低操作负荷及切削刀口的摩擦阻力；故能减少刀具磨损及延长机械寿命。含较多高湿润性脂肪润滑剂；能有效提高加工精度及工件表面光洁度。可加工钛合金。产品可直接使用或可按加工的苛刻程度用矿物油适量稀释后使用。 Contains no chlorine; light color, low odor; contains sulfur EP. Can effectively lower operation load and the impedance at cutting edge; so can reduce tool wear and prolong machine life. Contains more high wetting fatty lubricants; can effectively elevate work precision and enhance surface finishing of the workpiece. Can process titanium. Product can be used direct or blended with mineral oil prior usage according to severity requirements.	5-20	0.900 - 1.000	20 - 50	10 - 15 (<3.5)	NA	>20	>150

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浅色油性切削复合添加剂 LIGHT COLOR CUTTING OIL PACKAGES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES					
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS 40℃ cSt	硫 S (活硫) (ACT S) %wt	氯 CHLOR. % wt	脂肪 FAT % wt	闪点 FLASH POINT COC ℃
Smart Base CF1107L 浅色通用切 削油复合剂 Light Color Universal Cutting Oil Package	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	浅色、低味。含硫、氯及高渗透性脂肪，能有效地降低操作负荷及切削点的摩擦阻力；可提升工作精度及表面光洁度。粘度低，易于调和，适用于不锈钢、合金钢的高速切削、钻孔、扩孔、攻牙、攻丝、拉销、轧制、滚齿及刨齿等工艺。 Light color, low odor. Contains sulfur, chlorine, and high-wetting fat, can effectively lower operation workload and frictional impedance at the cutting edge, which can elevate work precision and enhance surface finishing of the workpiece. Low viscosity, so easy to blend, suitable for stainless steels, alloy steels for operations of high-speed cutting, drilling, reaming, tapping, threading, broaching, rolling, hobbing, and gear shaping, etc.	5-20	0.950 - 1.150	50 - 80	>3	>20	>20	>130
Smart Base CF1108L 浅色环 保型切 削油精 Light Color Environmental Friendly Cutting Oil Package	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	专为切削钻孔工艺设计。浅色、低味、不含氯及活性硫。适用于有色及黑色金属。具抗磨、极压及特强的润湿性能；能提高加工精度及工件的表面光洁度。广泛用于各种有色金属之切削、钻孔、攻牙、攻丝等工艺。基于优异的润滑和抗氧化性能，特别适合于不锈钢的深孔钻操作。 Specially designed for cutting and drilling processes. Light color, low odor, contains no chlorine, nor active sulfur. Suitable for yellow and ferrous metals. Possesses antiwear, EP and strong wetting properties; can enhance operation precision and surface finishing of the workpiece. Extensively used for cutting, drilling, tapping, threading operations, etc. Specifically suitable for deep drilling on stainless steels due to outstanding lubricating and antioxidant properties.	3-25	0.900 - 1.000	25 - 50	>3	NA	>20	>120
Smart Base CF1109LT 浅色重 负荷切 削油复 合剂 Light Color Heavy Duty Cutting Oil Package	 清澈琥珀 Clear Amber	 清澈黄 Clear Yellow	浅色，低味；含活性硫和磷化物；不含氯。可调配加工重负荷钛合金切削油。含合成脂肪酸酯；产品的润湿性特强，能增强工件表面光洁度。广泛应用于坚硬不锈钢；如 316 及 316L 等合金的切削、钻孔、攻牙、攻丝等工艺。 Light color, low odor; contains active sulfur and phosphorus compounds, with no chlorine. Can blend cutting oils for heavy duty processing of titanium alloys. Contains synthetic fatty esters; with strong wetting property to improve surface finishing of the workpiece. Extensively used on hard stainless steels, like 316 and 316L alloys, for cutting, drilling, tapping, threading operations, etc.	5-25	0.900 - 1.000	25 - 50	>9 (<5)	NA	>20	>120

ASTM 铜条腐蚀标准 COPPER STRIP CORROSION STANDARDS  
ASTM 方法 METHOD D 130 / IP 154



刚擦亮 Freshly Polished	1a	1b	2a	2b	2c	2d	2e	3a	3b	4a	4b	4c
	轻等变色 Slight Tarnish		中等变色 Moderate Tarnish				深度变色 Dark Tarnish		腐蚀 Corrosion			

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## 深色油性切削添加剂 DARK COLOR CUTTING OIL PACKAGES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES					
	原液 ORIG. FLUID	5% 稀释 液DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	硫SUL. (活硫) (ACT S)%wt	氯 CHLOR. % wt	脂肪 FAT % wt	闪点 FLASH POINT COC°C
Smart Base 1103SS 拉削成型 油精 Drawing/ Forming Oil Concentrate			适用于不锈钢等硬金属的拉伸、成型及切削等工艺。含硫、氯及高渗透性脂肪润滑剂。能有效降低操作负荷及切削刀口的摩擦阻力，提高加工精度及工件表面光洁度，防止金属接触面烧结。气味温和，在严峻加工时其冒出油烟亦较少。 Suitable for drawing, forming and cutting operations of hard metals such as stainless steels. Contains sulfur, chlorine and high wetting fatty lubricants. Can effectively lower operation load and frictional impedance at knife blade, improve work precision and surface finishing of the workpiece, avoid welding at contact points. Gentle odor, evolving less smoke during severe operations.	5-20	1.000 - 1.200	150 - 500	>8 (<4)	>25	>20	>160
Smart Base 1105SS 攻牙/绞牙 油精 Tapping/ Threading Oil Concentrate			高粘度、润滑性能优越；含硫氯极压剂。适合加工硬度极高的 316 及 316L 等不锈钢及钛合金材料。碎屑易随流体本身带走。能有效保护刀具及增强工件的表面光洁度。 High viscosity, superior lubricity; with sulfurized and chlorinated EP additives. Suitable for machining very hard materials such as stainless steels like 316, 316L and titanium alloys. Chips can be removed by fluid itself easily. Can effectively protect tools and enhance surface finishing of the workpiece.	5-20	1.000 - 1.200	450 - 850	>3 (微量) (Traces)	>25	<50	>180
Smart Base 1110A 螺帽成型 油精 Screw Cap Forming Oil Concentrate			专为螺帽成型而设计；针对不锈钢等硬金属的加工；可用于拉伸、成型及切削等工艺。含硫、氯添加剂，配合高渗透性脂肪润滑剂；能有效保护模具，防止金属接触面烧结，有效提高产品光洁度。 Specially designed for screw cap forming; aimed at processing hard metals such as stainless steels. Can be used for drawing, forming and cutting operations. Contains sulfurized and chlorinated additives, blended with high wetting fatty ester lubricants; can effectively protect dies, avoid welding at contact points, and effectively enhance surface finishing of the workpiece.	5-20	1.000 - 1.200	400 - 650	>5 (>2)	>6	>15	>160

## 攻牙油精 TAPPING OIL PACKAGES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID	5%稀 释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	闪点 FLASH POINT COC°C
SmartTap ST-1 黑色攻牙 复合油精 Dark Color Tapping Package			高度浓缩。用于攻牙、车牙、攻丝及钻孔等严峻工艺。适合不锈钢、合金钢、高抗力钢及其它极坚硬的钢铁金属。含氯及多种极压添加剂；能降低操作负荷，减少刀具磨损及提高机械寿命。具备渗透性极优的脂肪润滑剂，使操作容易，加工精密，工件表面光洁度高。 Highly concentrated. For use in severe operations of tapping, turning, threading and drilling. Suitable for stainless steels, alloy steels, high tensile steels and other extremely hard steel metals. Contains chlorine and various EP; can lower operation loading, reduce tool wear and prolong machine life. Possesses fatty lubricants with superior wetting property, which enables easy operation, good precision machining, and high surface finishing of the workpiece.	2-12	1.000 - 1.100	100 - 300	>160
SmartTap ST-2 浅色攻牙 复合油精 Light Color Tapping Package			色浅、高浓缩。用于攻牙、车牙、攻丝及钻孔等严峻工艺。适合不锈钢、合金钢、高抗力钢及其它极为坚硬钢铁金属。含高量硫、氯等极压添加剂；能降低操作负荷，减少刀具磨损及提高机械寿命。具备渗透性极优的脂肪润滑剂，使操作容易，加工精密，工件表面光洁度高。 Light color, highly concentrated. For use in severe operations of tapping, turning, threading and drilling. Suitable for stainless steels, alloy steels, high tensile steels and other extremely hard steel metals. Contains high content EP such as sulfur and chlorine; can lower operation loading, reduce tool wear and prolong machine life. Possesses fatty lubricants with superior wetting property, which enables easy operation, good precision machining, and high surface finishing of the workpiece.	2-15	1.050 - 1.150	120 - 170	>150
SmartTap STH 特强攻牙 复合油精 Reinforced Tapping Package			不含氯。专为攻牙、车牙、攻丝及钻孔等工艺而配制的加强型攻牙复合剂。适用于难加工不锈钢、合金钢、高抗力钢及其它极为坚硬的钢铁金属等严峻加工。含有多种高效极压硫及磷等添加剂，故能降低操作负荷，减少刀具磨损和提高机械寿命。同时，它具有优越渗透性的润滑剂，可使加工操作容易，及有良好的加工精度及工件光洁度。 Contains no chlorine. Special reinforced package designed for use in heavy-duty operations, such as tapping, turning, threading and drilling. Can be used in severe operations on difficult-to-machine stainless steels, alloy steels and high tensile steels, and other extremely hard steel metals. Contains various efficient sulfurized EP and phosphorus additives; thus can lower operation loading, reduce tool wear and prolong machine use life. Moreover, it possesses fatty lubricants with superior wetting property; which provides easy operation, good work precision, and good surface finishing of the workpiece.	2-12	1.000 - 1.100	100 - 300	>110

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## 浅色导轨油添加剂 LIGHT COLOR WAYLUBE ADDITIVE

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES							
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	硫 S (活硫) (ACT S) %wt	铜腐蚀 COPPER CORR. 3h 100°C	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT COC °C	四球极压 4 BALLWEAR <sup>†</sup>	
Smart Base WLA6600 导轨油复 合添加剂 Waylube Additive Package			含磷、脂肪酸，抗氧化剂及破乳化剂。不含硫、氯及二烷基二硫代磷酸锌。具良好抗磨、抗氧化、防腐及油水分离性。适用于调配导轨油，亦可用于液压油和齿轮油配方中。 Contains phosphorus, fatty acid, antioxidant and de-mulsifying agents. Contains no sulfur, chlorine, nor ZDDP. Possesses excellent anti-wear, anti-oxidant, anti-corrosion and oil-water separation properties. Suitable for blending way lubricant, also can be used in formulations of hydraulic and gear oils.	0.5 - 0.8	0.900 - 1.000	30 - 50	NA	1B	<60	>135	61	200

<sup>†</sup>伺服马达速度 Servo motor speed - P<sub>B</sub>: 0.03秒达1500 rpm in 0.03s, P<sub>D</sub>: 0.03秒达1760 rpm in 0.03s.

## 清洗剂浓缩液 CLEANER CONCENTRATES



型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES				
	原液 ORIG. FLUID	5% 水稀 释液 DIL (WATER)			比重 S.G.	pH 浓缩液 CONCENTRATE	pH 5%水 稀释液 DIL (WATER)	残留膜 RESIDUE FILM LAYER	
SmartClean SC100 多用途系统 浓缩清洗液 Multipurpose Cleaner			能去除刀具及机械部件中的残留切削液和油膜，效力特强；但在清洁时不易腐蚀铁及有色金属。清洁后能在工件及刀具表面留下一层防腐薄膜，有短暂防护功用。在加温或超声波震荡条件下使用效果更佳。产品必须稀释后再用。 Can remove cutting fluid residue and oil film on tools and machinery parts, with superior performance; yet not easily stain ferrous and yellow metals after cleaning. Leaves an anti-rust thin film on surface of the workpiece and cutting tools after cleaning, have short-term rust-resistant property. Better performance can be achieved when heated or under ultra-sound condition. Product must be diluted prior usage.	1.0 - 5.0	1.000 - 1.100	10.0 - 13.0	10.0 - 12.0	不粘 Non- Sticky	
SmartClean SC100PF 不含磷 浓缩清洗液 Non-Phosphorus Containing Cleaner Conc.			低泡浓缩，不含磷化物。清洗力特强，含防锈剂；工件清洗后有短暂防锈功能。如用温水清洗，效果更为突出。 Low foam and concentrated, contains no phosphate compound. Possesses outstanding cleansing power, with rust preventive; the workpiece has short-term rust-resistant protection after cleaning. Can be more outperforming when cleaning is in warm water.	1.0 - 5.0	1.000 - 1.100	10.0 - 14.0	10.0 - 12.0	不粘 Non- Sticky	
SmartClean SC400 中碱性零部件 浓缩清洗液 Medium Alkaline Cleaner Conc. for Parts			适合高压喷淋操作。含铜、铝腐蚀抑制剂；适合清洗铁类及有色金属。清洗后容易油水分离，以便去除系统油泥。在50°C左右使用效果更佳。 Suitable for high pressure spray operations. Contains corrosion inhibitors for copper and aluminum; suitable for cleansing ferrous and yellow metals. Oil water separation is easy after cleaning, so convenient to remove oil sludge. Better performance can be achieved at temperature about 50°C.	1.0 - 5.0	1.000 - 1.100	10.0 - 13.0	10.0 - 12.0	不粘 Non- Sticky	
SmartClean SC700 高碱性零部件 清洗剂 High Alkaline Cleaner Concentrate For Parts			强力油泥油污清除剂；能有效去除刀具及机械部件中的残留切削液和油膜。可作厂房一般洗擦剂使用。不含防锈剂，工件清洗后须马上加以防锈保护。 Strong oil sludge and greasy dirt removal agent; can effectively remove fluid residuals and oil films from tools and machinery parts. Can be used as general scouring agent in factory. Contains no rust preventive, rust prevention procedure on the workpiece is needed immediately after cleaning.	1.0 - 5.0	1.000 - 1.100	10.0 - 14.0	10.0 - 12.3	不粘 Non- Sticky	
SmartClean SC900 含磷 浓缩清洗液 Phosphorus Containing Cleaner Conc.			含磷酸酯，清洗力强，能除去刀具及机械部件中的残留切削液和油膜，但在清洁时不易腐蚀铁及有色金属。清洁后能在工件及刀具表面留下一层防腐薄膜，有短暂防护功用。在加温或超声波震荡条件下使用；效果更佳。产品必须稀释后再用。 Contains phosphate ester, strong cleansing power, can remove residual cutting fluid and oil film from cutting tools and mechanical parts, but not easy to corrode iron and yellow metals during cleaning. A layer of anti-corrosion film can be left on the surface of the workpiece and tools after cleaning, so with short-term protective function. Even better effect when used under heating or ultrasonic vibration conditions; Product must be diluted prior usage.	1.0 - 5.0	1.000 - 1.100	9.0 - 11.0	9.2 - 10.8	不粘 Non- Sticky	

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## 环保溶剂型清洗剂 ECO-FRIENDLY SOLVENT-BASED CLEANERS

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	典型数据 TYPICAL PROPERTIES		
	原液 ORIG. FLUID			比重 S.G.	水溶 解度 WATER SOLUBILITY	闪点 FLASH POINT COC °C
SmartClean MC1070 快干型 清洗液 Fast Dry Cleaner		清澈透明 Clear Transparent	浅色、低味碳氢基溶剂，对油、脂及其它有机废物有强效溶解能力。对主要的铁及非铁物质有良好的清洁性能，不会产生腐蚀节点。适用于喷雾，浸泡，刷洗，涂抹等清洗工艺。由于污染物会溶于产品中，须加新配溶剂持续冲洗以达更有效的清洗效果。 Light color, low odor hydrocarbon-based solvent with strong solvating power on oils, greases, and other organic debris; that will leave dry surface after operation. Good cleansing on major ferrous and nonferrous materials without causing corrosive defect. Cleansing can be effected by spraying, dipping, brushing or swabbing. As the contaminants will be solvated in the product, continuous flushing with fresh solvent is needed for more effective cleansing result.	0.750 - 0.780	不溶 Insoluble	>60
SmartClean MC2100 快干型 清洗液 Fast Dry Cleaner		清澈透明 Clear Transparent	浅色、低味合成酯溶剂；能强力移除在污染表面的油、脂、沥青、蜡及焦油等物质；无残留物，不需干燥程序。易于生物降解。可用于铁和非铁合金，不会产生腐蚀节点。适用于喷雾，浸泡，刷洗，涂抹等清洗工艺。由于污染物会溶于产品中，须加新配溶剂持续冲洗以达更有效的清洗效果。 Low odor, light color synthetic ester-based solvent with strong cleaning power to remove oil, grease, asphalt, wax and tar from contaminated surfaces; no residue left behind and no drying procedure is necessary. Readily biodegradable. Can be applied on both metal and non-metals alloys without corrosive defect. Cleansing process can be effected by spraying, dipping, brushing or swabbing. As the contaminants will be solvated in the product, continuous flushing with fresh solvent is needed for more effective cleansing result.	0.960 - 0.980	微溶 Slightly Soluble <4%	>80

## 设备用油复合剂 EQUIPMENT OIL PACKAGES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES							
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40°C cSt	硫 SUL. (活硫) (ACTIVE SUL.) %wt	铜腐蚀 COPPER CORR. 3h 100°C	酸值 ACID VALUE mg KOH/g	闪点 FLASH POINT COC °C	四球极压 4 BALL WEAR*	
									P <sub>B</sub> kg	P <sub>D</sub> kg		
Smart Base H5210 抗磨液压 油复合剂 Anitwear Hydraulic Oil Package		清澈黄 Clear Yellow	清澈黄 ClearPale Yellow	0.5 - 1.0	0.900 - 1.000	55 - 130	17 - 20	1B	<45	>120	88	250
Smart Base G5310 多功能齿轮 油复合剂 Multifunctional Gear Oil Package		清澈黄 Clear Yellow	清澈黄 Clear Yellow	0.8 - 1.0	0.800 - 1.000	8 - 15	15 - 19	1B	20 - 30	>60	94	200







\*伺服马达速度 Servo motor speed - P<sub>B</sub>: 0.03秒达1500 rpm in 0.03s, P<sub>D</sub>: 0.03秒达1760 rpm in 0.03s.

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## 其它添加剂 OTHER ADDITIVES

型号 BRAND 类型 TYPE	外观 APPEARANCE		产品特性 PRODUCT FEATURES	建议 加入量 SUGGESTED TREAT RATES %	典型数据 TYPICAL PROPERTIES			
	原液 ORIG. FLUID	5% 稀释液 DIL. (SN150)			比重 S.G.	粘度 VIS. 40℃ cSt	粘度 VIS. 100℃ cSt	闪点 FLASH POINT COC ℃
Smart Base CC8180 氯清道夫 Chlorine Scavenger	 清澈黄 Clear Yellow	 清澈浅黄 Clear Light Yellow	粘稠性脂肪衍生物，作氯清道夫使用。主要应用于高氯含量的切削、成型油配方中。能与切削油系统中的游离氯反应以消除氯腐蚀的威胁。具抗腐蚀性能，其成品亦可作防锈剂使用。 High viscosity fatty acid derivative, used as chlorine scavenger. Mainly used in formulations of high-chlorine cutting and forming oils. Can react with free chlorine in the cutting oil system to eliminate rust threat from the chlorine. With anti-corrosion property, so finished products can be used as rust inhibitor.	0.5 - 2.0	0.900 - 1.000	140 - 180	NA	>260
SmartSed 8958 金属粉末 沉降剂 Metal Debris Sedimenting Additive	 清澈黄 Clear Yellow	 清澈浅黄 Clear Light Yellow	阳离子型，含氯。具沉降金属粉末功能。用于全合成配方。能螯合金属粉末，使其沉降到槽液底部；可保持冷却液清澈，延长换液周期。具消泡性，能降低因金属粉末被泡沫包裹而降低冷却效能，或缩短工具寿命。有助于降低杀菌剂加入量。能与 IPBC 类防霉剂共用，效果显著。 Cationic types, contains chlorine. Possesses metal sedimentary properties. Specially designed for synthetic coolant formulations. Can chelate metal powders for settlement to bottom of fluid tank; so can keep the coolant clean and clear, and so extend replenishment cycle. Possesses defoaming property, can avoid lowering of coolant performance, or shortening of tool life, due to metal powders wrapped by the foam form. Help to lower treatment of biocide in formulations. Can be used together with IPBC type fungicide with significant effect.	0.5 - 1.5	1.100 - 1.200	120 - 180	NA	NA
MistQuer M1000 抗雾 添加剂 Anti-Fog Additives	 清澈透明 Clear Transparent	NA	高分子量聚合物添加剂，可用于防止非常细小液滴形成，因此可以减少雾。添加量少（如10ppm）；可以有效增加金属切削液的粘性，从而扩大雾滴的平均粒径。颗粒大会减少空气中颗粒形成数量，故亦可缩减颗粒从加工操作点下落的范围。 High molecular weight polymeric additive, can be used to prevent the formation of very fine droplets, so can reduce mist. Low treat rate (like 10 ppm); can effectively increase the tackiness of metal working fluids, leading to the extended average diameter of the mist droplets. Larger particles can reduce the quantity of particles formed in air, also leading to the reduced area scope that the particles will fall from the point of operation.	0.001 - 0.002	0.900 - 0.930	NA	3000 - 5000	≥170
MistQuer W3000 抗雾 添加剂 Anti-Fog Additives	 乳白 Milky White	NA	水溶性EO / PO嵌段共聚物，可降低金属加工液的表面张力，从而减少在加工时流体飞溅和起泡带来烟雾。属低发泡性非离子表面活性剂，具有良好的润湿、分散性能，也可在水基体系中作消泡剂使用。根据不同的配方组合，建议推荐剂量为3-8%。 Water soluble EO/PO block co-polymer, can reduce the surface tension of metal working fluids, so can reduce the mist from fluid splash and foaming. Belong to low-foaming non-ionic surfactant, possesses good wetting and dispersing characteristics, and also can act as defoamer in water-based systems. Recommended dosage is 3-8% based on different formulation recipes.	3 - 8	1.000 - 1.100	NA	2000 - 3000	≥220

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## 纯油配方指引 NEAT OIL FORMULATION GUIDES

SN150	93
CP52	7
P <sub>B</sub>	66
P <sub>D</sub>	315

SN150	93
TPS20	7
P <sub>B</sub>	100
P <sub>D</sub>	250

SN150	93
spp7900	7
P <sub>B</sub>	135
P <sub>D</sub>	315

SN150	75
SD361	8
SB2518	13
SBC2040	4
P <sub>B</sub>	94
P <sub>D</sub>	620

SN150	83
SPB	4
SB2518	9
SBC2040	4
P <sub>B</sub>	100
P <sub>D</sub>	500

SN150	92
SB2516	4
SBC2040	4
P <sub>B</sub>	88
P <sub>D</sub>	500

SN150	71
SD361	8
SB2516	17
SBC2040	4
P <sub>B</sub>	107
P <sub>D</sub>	620

SN150	77
SLV6150	20
SPP6800	3
P <sub>B</sub>	143
P <sub>D</sub>	250

SN150	75
SPB	8
SB2517N	13
SBC2040	4
P <sub>B</sub>	107
P <sub>D</sub>	620

SN150	93
SB2517	7
P <sub>B</sub>	94
P <sub>D</sub>	315

SN150	83
SPB	4
SB2517	9
SBC2040	4
P <sub>B</sub>	94
P <sub>D</sub>	500

SN150	93
TPS32	7
P <sub>B</sub>	100
P <sub>D</sub>	400

SN150	80
SB1110	16
SBC2040	4
P <sub>B</sub>	135
P <sub>D</sub>	315

SN150	93
SB1120	7
P <sub>B</sub>	100
P <sub>D</sub>	250

SN150	95
SB2916	5
P <sub>B</sub>	82
P <sub>D</sub>	315

SN150	80
SPB	7
SLV6150	1
SB1120	1
SB1217	9
SBR3340	2
P <sub>B</sub>	100
P <sub>D</sub>	500

SN150	85
SPB	7
SB1238	4
SBC2040	4
P <sub>B</sub>	100
P <sub>D</sub>	500

SN150	95
SB3517	5
P <sub>B</sub>	88
P <sub>D</sub>	315


SN150	83
SPB	5
SB1238	4
SB1310LV	2
CP52	6
P <sub>B</sub>	76
P <sub>D</sub>	400


SN150	76
SPB	8
SB1238	8
SBC2040	8
P <sub>B</sub>	114
P <sub>D</sub>	620


SN150	93
SB1238	7
P <sub>B</sub>	88
P <sub>D</sub>	315


SN150	71
SB1217	15
SB1238	5
CP52	8
SMARTACH	0.6
P <sub>B</sub>	88
P <sub>D</sub>	500

SN150	93
SB1217	7
P <sub>B</sub>	94
P <sub>D</sub>	315

 浅色, 可加工有色金属  
Light color, can process yellow metals

 浅色, 不可加工有色金属  
Light color, cannot process yellow metals

 黑色, 可加工有色金属  
Black color, can process yellow metals

 黑色, 不可加工有色金属  
Light color, cannot process yellow metals

†伺服马达速度 Servo motor speed - P<sub>B</sub>: 0.03秒达1500 rpm in 0.03s, P<sub>D</sub>: 0.03秒达1760 rpm in 0.03s.

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## 乳化油配方 FORMULATION FOR SOLUBLE OIL

## 配方骨架 FORMULATION SKELETON

主要功能 Main Roles	成分 Ingredients	%
		SanSol SO2991
润滑剂 Lubricant	矿物油 Mineral Oil	79.00
	三乙醇胺 Triethanolamine	0.48
	SmartLub 3699 (可乳化三羟甲基丙烷酯 Emulsifiable TMP Ester)	0.31
乳化剂 Emulsifier	SmartLub 3250 (二异丙醇酰胺 Diisopropanolamide)	4.10
	Smart Base S1215C (通用型乳化油精 Universal Emulsifier Package)	5.00
	Smart AOA (动物油酸 Animal Based Oleic Acid)	2.90
	SmartLub 3350 (C16-C18脂肪醇聚氧乙烯醚 Fatty alcohol alkoxylate)	0.69
	司盘 Span 80 (山梨醇酐单油酸酯 sorbitan oleate, 乳化剂 emulsifier)	2.72
防锈剂 Rust Preventative	Smart Base RP3393 (硼酸盐型防锈剂 Borate Ester Based Rust Preventive)	0.86
	Smart Base RP9090 (羧酸盐防锈复合剂 Carboxylate salt package)	1.11
腐蚀抑制剂 Corrosion Inhibitor	苯并三氮唑 Benzotriazole	0.03
抗磨剂 Anti-wear Additive	SmartPhos P7800 (磷酸酯 Phosphate Ester)	1.16
耦合剂 Coupling Agent	Hexasol (二甲基-2,4戊二醇 2-Methyl-2,4-pentandiol)	0.14
杀菌复合剂 Biocide package	SmartCide BK983 甲醛复合剂 Formaldehyde Containing Compound	0.44
	Dicyclohexylamine (二环己胺 Dicyclohexylamine, DCHA)	0.41
pH稳定剂 Stabilizer	Synergex	0.14
消泡剂 Defoamer	FoamQuer 8617	0.05
稀释剂 Couple/Diluent	水 Water	0.46
总计 Total		100.0

检测项目 Test Items	检测结果 Test Results	检测方法 Test Methods
外观 Appearance	清澈黄 Clear Yellow	目测 Visual
pH (10% 稀释度 Dilution)	8.36	pH 计 Meter
折光读数 Refractometer Reading (10% 稀释度 Dilution)	9.6	折光计 Refractometer
消泡试验 Defoaming Test (10 分钟 MIN ≤2mL)	合格 Pass	GB/T6144
铜腐蚀试验 Copper Corrosion Test 55 ± 2°C <sup>1</sup>	A级 Grade A	GB/T6144
铝腐蚀试验 Aluminum Corrosion Test 55 ± 2°C <sup>1</sup>	A级 Grade A	GB/T6144
单片铁防锈试验 Monolithic Anti-rust Test 35 ± 2°C, 24 小时hr	A级 Grade A	GB/T6144
磨斑 Wear Scar 1500 rpm, 30 kg, 30 min, mm	0.560	四球机 4-Ball Wear Machine
钻孔测试 Drilling Testing <sup>2</sup>	82	数控机床 CNC
扭矩试验 Microtap Test <sup>3</sup>	135 (5%), 130 (10%)	ASTM D5619-00 (2011)

1. 全浸 4 小时 soaked thoroughly for 4 hr 2. 15 次测试平均钻孔数 average no. of hole drilled in 15 tests

3. TTT System G8, 材质 Material: 3.4365M4F, 转速 Speed: 1500 rpm, 深度 Depth 8mm, 最大输出扭矩 Max. Output Torque 400Ncm

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## 微乳液配方 FORMULATION FOR MICRO-EMULSIONS

## 配方骨架 FORMULATION SKELETON

主要功能 Main Roles	成分 Ingredients	%	
		SanSol ME2992	SanSol ME2993
润滑剂 Lubricant	SN150	41.9	37.2
	SmartLub 6280 (蓖麻油脂肪酸酯复合剂 Castor Oil Fatty Ester)	4.2	-
	Smart HMPE 9320 (高分子聚合酯 High Mwt. Polyester)	7.3	6.5
乳化剂 Emulsifier	Surfaline OC5 C16-C18 (烷基醇(5EO) Oleocetyl Alcohol (5EO)) (ARKEMA)	6.3	10.2
	SmartLub 3250 (二异丙醇酰胺 Diisopropanolamide)	-	3.7
	SmartLub 3260 (妥尔油脂肪酸酯 Ditalate Ester)	-	4.7
	Smart DTO (蒸馏妥尔油 Distilled Tall Oil)	5.2	1.9
防锈剂 Rust Preventative	Smart Base RP9390 (硼酸酯型合成防锈剂 Synthetic Borate Ester Based Inhibitor)	4.2	-
	Smart Base RP9490 (磷酸酯型防锈防腐复合剂 Phosphate Ester Based Corrosion Inhibitor)	1.0	-
	Smart Base RP9690 (硼酸酯防锈润滑复合剂 Borate Ester Based Corrosion Inhibitor)	0.5	4.7
抗磨剂 Anti-wear Additive	SmartPhos P7800 (磷酸酯 Phosphate Ester)	5.2	0.9
耦合剂 Coupling Agent	Hexasol (二甲基-2,4戊二醇 2-Methyl-2,4-pentanediol)	1.0	-
	异壬酸 Isononanoic Acid	0.5	0.5
杀菌复合剂 Biocide package	SmartCide BK983 甲醛复合剂 Formaldehyde Containing Compound	1.0	1.9
pH稳定剂 Stabilizer	Synergex LA (特种胺 Specialty Amine) (EASTMAN)	3.1	-
消泡剂 Defoamer	FoamQuer 4172	0.05	0.05
耦合/稀释剂 Coupling/Diluent	水 Water	18.55	27.75
总计 Total		100.00	100.00

检测项目 Test Items	检测结果 Test Results		检测方法 Test Methods
	SanSol S2992	SanSol S2993	
外观 Appearance	清澈黄 Clear Yellow	清澈黄 Clear Yellow	目测 Visual
pH (5% 稀释度 Dilution)	9.23	9.16	pH 计 Meter
折光读数 Refractometer Reading (5% 稀释度 Dilution)	4.4	4.4	折光计 Refractometer
消泡试验 Defoaming Test (10 分钟 MIN ≤2mL)	合格 Pass	合格 Pass	GB/T6144
铜腐蚀试验 Copper Corrosion Test 55 ± 2°C <sup>1</sup>	A级 Grade A	A级 Grade A	GB/T6144
铝腐蚀试验 Aluminum Corrosion Test 55 ± 2°C <sup>1</sup>	A级 Grade A	A级 Grade A	GB/T6144
单片铁防锈试验 Monolithic Anti-rust Test 35 ± 2°C, 24 小时hr	A级 Grade A	A级 Grade A	GB/T6144
磨斑 Wear Scar 1500 rpm, 30 kg, 30 min, mm	0.560	0.560	四球机 4-Ball Wear Machine
钻孔测试 Drilling Testing <sup>2</sup>	NA	NA	数控机床 CNC
扭矩试验 Microtap Test <sup>3</sup>	139.1 (5%)	144.7 (5%)	ASTM D5619-00 (2011)

1. 全浸 4 小时 soaked thoroughly for 4 hr 2. 15次测试平均钻孔数 average no. of hole drilled in 15 tests  
3. TTT System G8, 材质 Material: 3.4365M4F, 转速 Speed: 1500 rpm, 深度 Depth 8mm, 最大输出扭矩 Max. Output Torque 400Ncm

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## 半合成液配方 FORMULATION FOR SEMI-SYNTHETIC FLUID

## 配方骨架 FORMULATION SKELETON

主要功能 Main Roles	成分 Ingredients	% 成分		
		SanCut EP3691	SanCut EP3692	SanCut EP3693
润滑剂 Lubricant	矿物油 Mineral Oil	4.48	-	-
	SN150	-	16.7	15.4
	三乙醇胺 Triethanolamine	6.71	-	-
	SmartLub 6280 (蓖麻油脂肪酸酯复合剂 Castor Oil Fatty Ester)	5.97	5.0	-
	Smart HMPE 9320 (高分子聚合酯 High Mwt. Polyester Ester)	-	8.3	7.7
乳化剂 Emulsifier	Surfaline OC5 C16-C18 (烷基醇(5EO) Oleocetyl Alcohol (5EO)) (ARKEMA)	-	5.0	4.6
	SmartLub 3250 (二异丙醇酰胺 Diisopropanolamide)	4.48	-	4.6
	SmartLub 3260 (妥尔油脂肪酸酯 Ditalate Ester)	11.19	-	4.6
	Smart DTO (蒸馏妥尔油 Distilled Tall Oil)	6.26	10	-
	Smart AOA (油酸 Oleic Acid)	-	-	3.1
防锈剂 Rust Preventative	Smart Base RP9830 (羧酸盐防锈复合剂 Carboxylate Based Rust Inhibitor Package)	9.39	-	-
	Smart Base RP9490 (磷酸酯型防锈防腐复合剂 Phosphate Ester Based Corrosion Inhibitor)	-	1.7	-
	Smart Base RP9690 (硼酸酯防锈润滑复合剂 Borate Ester Based Corrosion Inhibitor)	-	6.7	9.2
抗磨剂 Anti-wear Additive	SmartPhos P7800 (磷酸酯 Phosphate Ester)	2.24	-	1.5
	SmartPhos P7900 (磷酸酯 Phosphate Ester)	-	6.7	-
耦合剂 Coupling Agent	Hexasol (二甲基-2,4戊二醇 2-Methyl-2,4-pentanediol)	4.48	1.7	-
	异壬酸 Isononanoic Acid	-	-	-
杀菌复合剂 Biocide package	SmartCide BK983 甲醛复合剂 Formaldehyde Containing Compound	1.49	1.7	3.1
	SmartCide MBM (亚甲基双吗啉 N,N'-methylene bismorpholine, MBM)	0.24	-	-
	Dicyclohexylamine (二环己胺 Dicyclohexylamine, DCHA)	1.56	-	-
pH稳定剂 Stabilizer	Synergex LA (特种胺 Specialty Amine) (EASTMAN)	-	5.0	-
	Synergex T (EASTMAN)	1.49	1.7	-
消泡剂 Defoamer	FoamQuer 9968	0.02	0.05	0.05
耦合/稀释剂 Coupling/Diluent	水 Water	40.00	29.75	46.15
总计 Total		100.00	100.00	100.00

检测项目 Test Items	检测结果 Test Results			检测方法 Test Methods
	SanCut EP3691	SanCut EP3692	SanCut EP3693	
外观 Appearance	清澈黄 Clear Yellow	清澈黄 Clear Yellow	清澈黄 Clear Yellow	目测 Visual
pH (5% 稀释度 Dilution)	8.62	8.8	9.3	pH 计 Meter
折光读数 Refractometer Reading (5% 稀释度 Dilution)	5.6	3.6	3	折光计 Refractometer
消泡试验 Defoaming Test (10 分钟 MIN ≤2mL)	合格 Pass	合格 Pass	合格 Pass	GB/T6144
铜腐蚀试验 Copper Corrosion Test 55 ± 2 °C <sup>1</sup>	A级 Grade A	A级 Grade A	A级 Grade A	GB/T6144
铝腐蚀试验 Aluminum Corrosion Test 55 ± 2 °C <sup>1</sup>	A级 Grade A	A级 Grade A	A级 Grade A	GB/T6144
单片铁防锈试验 Monolithic Anti-rust Test 35 ± 2 °C, 24 小时 hr	A级 Grade A	A级 Grade A	A级 Grade A	GB/T6144
磨斑 Wear Scar 1500 rpm, 30 kg, 30 min, mm	0.560	0.560	0.560	四球机 4-Ball Wear Machine
钻孔测试 Drilling Testing <sup>2</sup>	82	NA	NA	数控机床 CNC
扭矩试验 Microtap Test <sup>3</sup>	148 (5%), 126 (10%)	144.8 (5%)	136 (5%)	ASTM D5619-00 (2011)

1. 全浸 4 小时 soaked thoroughly for 4 hr 2. 15次测试平均钻孔数 average no. of hole drilled in 15 tests

3. TTT System G8, 材质 Material: 3.4365M4F, 转速 Speed: 1500 rpm, 深度 Depth 8mm, 最大输出扭矩 Max. Output Torque 400Ncm

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## 全合成液配方 FORMULATIONS FOR FULLY SYNTHETIC FLUID

## 配方骨架 FORMULATION SKELETON

主要功能 Main Roles	成分 Ingredients	% SanSyn SA6991
润滑剂 Lubricant	三乙醇胺 Triethanolamine	6.00
乳化剂 Emulsifier	Smart Base AW2185 (润滑/抗磨 增强剂 Lubricity / Anti-wear Improver)	26.00
防锈剂 Rust Preventative	Smart Base RP9830 (羧酸盐防锈复合剂 Carboxylate salt package)	16.00
沉降剂 Sinking Agent	SmartSed 8958 SmartSed (金属粉末沉降剂 Metal Debris Sedimenting Additive)	0.50
耦合剂 Coupling Agent	Hexasol (二甲基-2,4戊二醇 2-Methyl-2,4-pentanediol)	2.50
	异壬酸 Isononanoic acid	2.40
杀菌剂 Biocide	SmartCide BK983 甲醛复合剂	3.50
系统稳定剂 pH Stabilizer	Synergex (EASTMAN)	0.60
消泡剂 Defoamer	FoamQuer 9936	0.01
耦合/稀释剂 Coupling/Diluent	水	42.50
总计 Total		100.00

检测项目 Test Items	检测结果 Test Results	检测方法 Test Methods
外观 Appearance	清澈黄 Clear Yellow	目测 Visual
pH (10% 稀释度 Dilution)	8.13	pH 计 Meter
折光读数 Refractometer Reading (10% 稀释度 Dilution)	5.2	折光计 Refractometer
消泡试验 Defoaming Test (10 分钟 MIN ≤2mL)	合格 Pass	GB/T6144
铜腐蚀试验 Copper Corrosion Test 55±2°C <sup>1</sup>	A级 Grade A	GB/T6144
铝腐蚀试验 Aluminum Corrosion Test 55±2°C <sup>1</sup>	A级 Grade A	GB/T6144
单片铁防锈试验 Monolithic Anti-rust Test 35±2°C, 24 小时hr	A级 Grade A	GB/T6144
磨斑 Wear Scar 1500 rpm, 30 kg, 30 min, mm	0.560	四球机 4-Ball Wear Machine
钻孔测试 Drilling Testing <sup>2</sup>	82	数控机床 CNC
扭矩试验 Microtap Test <sup>3</sup>	157 (5%), 132 (10%)	ASTM D5619-00 (2011)

1. 全浸 4 小时 soaked thoroughly for 4 hr 2. 15次测试平均钻孔数 average no. of hole drilled in 15 tests

3. TTT System G8, 材质 Material: 3.4365M4F, 转速 Speed: 1500 rpm, 深度 Depth 8mm, 最大输出扭矩 Max. Output Torque 400Ncm

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**Our Vision in Product Design**

**可持续性 Sustainable**  
**减少污染 Reduce Pollution**  
**合理定价 Reasonable Pricing**



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