FUNCTIONAL PRODUCTS INC.

Innovative Chemistry for Lubricants

Technical Data Sheet

FUNCTIONAL V-705

HIGH PERFORMANCE LOW TEMPERATURE BASE STOCK AND THICKENER

APPLICATION:

FUNCTIONAL V-705 is a pure liquid viscosity modifier with high thickening efficiency and low temperature fluidity for high performance at lower cost per treat. The exceptional shear stability of **FUNCTIONAL V-705** allows it to act as a high viscosity synthetic base stock.

COMPOSITION:

FUNCTIONAL V-705 is pure low molecular weight liquid polymer with no diluent oil.

Typical Properties	
Appearance	Clear Colorless Liquid
Kinematic Viscosity, ASTM D445	6,500 cSt @ 100°C 37,000 cSt @ 40°C
Viscosity Index	516
Density (lb/gal)	7.5 lb/gal
Specific Gravity	0.90 g/mL
Flashpoint, ASTM D92 COC	>220°C (428°F)
Pour Point, ASTM D97	-24°C / 11°F
Thickening Efficiency (10wt% in ISO 32 Gr. II)	20.3 cSt @ 100°C
Thickening Efficiency (10wt% in Canola)	26.4 cSt @ 100°C
Shear Stability Index (PSSI), ASTM D6278 (10wt% in PAO4)	0 SSI
20hr KRL Shear Stability, CEC L-45-A-99 (10wt% in PAO4)	3.9%

TREATMENT LEVEL:

FUNCTIONAL V-705 is compatible in petroleum oils (Group I-III and naphthenic), PAO, vegetable oils, polyol esters, diesters, and estolides. **FUNCTIONAL V-705** is compatible in low viscosity oil soluble (OS) PAG fluids but not WS or WI grades. See next page for sample formulations and viscosities at treat.

Treatment levels of 2 - 20% are typical in industrial lubricants and greases. **FUNCTIONAL V-705** can be used as either a VI improver or a shear stable base stock depending on the need. See next page for starting formulas.

FUNCTIONAL V-705 is not suggested for very high temperature service. See next page for more information.

HANDLING:

Dissolving is best accomplished with continuous agitation at temperatures of 104-140°F (40-60°C). **FUNCTIONAL V-705** may be preheated in a hot room or tank at up to 176°F (80°C) to aid in pumping but long term storage should remain below 140°F (60°C).

FUNCTIONAL V-705 is a non-hazardous material; see the current Safety Data Sheet.

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Functional Products, Inc. 8282 Bavaria Rd. Macedonia, OH 44056

Ph: 330.963.3060 Fax:330.963.3322

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NOTICE:

FUNCTIONAL V-705 is intended for lubricants operating within temperature ranges from “average” (70-100°C / 158-212°F) to “very low” (<-34°C/-29°F) as defined in ISO 6743-6 guidelines.

FUNCTIONAL V-705 is not recommended for use in lubricants or greases operating in continuous service >120°C/248°F ("very high"). This includes engine or crankcase oils, automatic transmission fluids, clutch fluids, and other lubricants under severe thermal loads.

Very high temperature testing (methods like CEC L-60 and CEC L-37) may produce inadequate results in viscosity change and precipitation number. Testing at intermediate temperatures of 120-135°C (250-275°F), in ASTM D2893 and D2070 for example, is best when limiting total sulfur in the formulation to < 1.0wt% for 121°C and ideally < 0.50wt% for 135°C. Inactive sulfur packages are recommended where possible.

Best use is determined by the formulator and products must be tested against specification requirements.

FORMULATION GUIDE:

FUNCTIONAL V-705 formulations shown with Functional Products Inc. packages and pour point depressants. Contact Functional Products for custom design and formulation using your oils, additives, and packages.

Low Temperature Hydraulic Fluids

Approach:	w/ PMA	w/ V-705				
30 SUS Naph. (Cross C30 oil)	84.25	89.25				
Naphthenic Polymethacrylate (VM)	15.0	--				
FUNCTIONAL V-705 (VM)	--	10.0	Aviation HF Performance Specification			
Zinc HF Package	0.75	0.75	**83282D**	**6083**	**5606A**	**5606H**
Pour Point, D97	-63C	< -65C	≤-55C	≤-59C	≤-60C	≤-60C
Viscosity Index	381	425	--	--	--	--
KV40, cSt	13.2	14.5	≥14.0	≥13.2	≥13.0	≥13.2
KV100, cSt	5.0	5.8	≥3.45	≥4.6	≥4.0	≥4.9
KV-40, cSt	478	385	≤2200	≤700	≤500	≤600
KV-54, cSt	2009	1446	--	≤3300	≤3000	≤2500
Sonic Shear Loss, D5621	15%	3%	--	--	--	≤15%

Very High VI (200-250) Industrial Hydraulic Fluids in Group II and Bright Stock

ISO VG:	100	150	220	320	460	680	1000	1500	2200
110N Group II (Oil)	87.5								
150N Group II (Oil)		88.4	84.4	80.5					
600N Group II (Oil)					83.1	78.2	73.4		
150 Bright Stock (Oil)								81.1	73.5
FUNCTIONAL V-705 (VM)	12.5	11.6	15.6	19.5	16.9	21.8	26.6	18.9	26.5
KV40, cSt	100	150	220	320	460	680	1000	1500	2200
KV100, cSt	21.5	25.7	37.9	55.2	65.8	100.2	151.1	141.1	242.8
Viscosity Index	243	208	224	240	219	243	267	203	252
% KRL Visc Loss	3.2%	2.9%	3.2%	3.4%	3.2%	3.4%	3.6%	3.1%	3.4%

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