

### FUNCTIONAL V-711

#### SHEAR STABLE STYRENE VISCOSITY MODIFIER IN FLAKE FORM

#### APPLICATION:

**FUNCTIONAL V-711** is a flake form viscosity modifier with exceptional shear stability and low temperature fluidity for high performance in hydraulic fluids, greases, and fuel efficient engine oils,

#### COMPOSITION:

**FUNCTIONAL V-711** is 100% styrene copolymer in solid flake form.

Typical Properties	
Appearance	White Crumb/Flake
Density (lb/gal)	7.5 lb/gal
Specific Gravity	0.90 g/mL
Thickening Efficiency (1wt% in ISO 32 Group I)	9.8 cSt @ 100°C
Solution Viscosity (1wt% in 100N)	8.7 cSt @ 100°C
Shear Stability Index (PSSI), ASTM D6278 (1.5wt% in 100N)	7 SSI
Sonic Shear, ASTM D2603 (1.5wt% in 100N)	9 SSI
20hr KRL Shear, CEC L-45-A-99 (1.5wt% in 100N)	71 SSI

#### TREATMENT LEVEL:

Treatment levels of 1.0 – 2.0% are typical in industrial lubricants and greases. Concentrates may be prepared at up to 5.0 – 7.0wt% in light mineral oil. See next page for formulation details.

#### FUNCTIONAL V-705 Treat Rates in 100N Group II

	1.0wt%	1.1wt%	1.5wt%	1.75wt%	2.0wt%
KV100, cSt	8.7	9.3	12.4	16.1	21.0

#### HANDLING:

Dissolving is best accomplished with continuous agitation at temperatures of 176-212°F (80-100°C) for 8-16 hours. Use 0.05wt% phenolic antioxidant to preserve low color.

**FUNCTIONAL V-711** is a non-hazardous material; see the current Safety Data Sheet.

# FUNCTIONAL PRODUCTS INC.

Innovative Chemistry for Lubricants

## Technical Data Sheet

### FORMULATION GUIDE:

For crankcase oils and hydraulic fluids, **FUNCTIONAL V-711** provides excellent thickening efficiency, shear stable viscosity, and high viscosity index improvement. Up to 3.0wt% may be used in light oil while retaining low pour points. The more shear stable **FUNCTIONAL V-705** is recommended for gear oils meeting stringent CEC L-45-A-99 "20 hour KRL" shear stability.

### Example Treat Rates for High VI Hydraulic Fluid in 120N Group II

ISO VG=	32	46	68	100	150	220	320	460
wt% V-711	0.20	0.95	1.40	1.80	2.15	2.45	2.75	3.00
Viscosity Index	135	164	182	196	208	216	223	229

### Example Treat Rates for Multigrade Crankcase Oil in 4 cSt and 6 cSt Paraffinic Base Stocks

SAE J300 VG=	SAE 16	SAE 20	SAE 30	SAE 40	SAE 50	SAE 60
KV100, cSt =	6.1	6.9	9.3	12.5	16.3	21.9
wt% V-711 in 4 cSt	0.75	0.90	1.30	1.60	1.85	2.15
wt% V-711 in 6 cSt	--	0.30	0.80	1.15	1.45	1.75

For greases, **FUNCTIONAL V-711** is a shear stable viscosity modifier for paraffinic and naphthenic base stocks and provides adhesion, water resistance, increased yield, and oil bleed reduction. Replacing a very heavy base stock with a lighter oil and **FUNCTIONAL V-711** at the same viscosity offers better low temperature fluidity.

ISO VG=	150	220	320	460	680	1000	1500	2200	3200	4600
wt% V-711 in 600N Group II	1.10	1.65	2.10	2.35	2.70	2.95	3.20	3.45	3.65	3.80
wt% V-711 in 750 Naphthenic	--	0.90	1.25	1.50	1.75	2.00	2.25	2.45	2.70	2.90
wt% V-711 in 150 Bright Stock	--	--	--	--	1.20	1.90	2.40	2.85	3.20	3.55

\* Base KV40's: 600N Group II = 111 cSt, 750 Naphthenic = 143 cSt, 150 Bright Stock = 500 cSt

### COMPETITIVE EVALUATION:

**FUNCTIONAL V-711** provides higher thickening efficiencies and faster solubilization in most petroleum base stocks versus competing shear stable styrene crumb "L08".

	FUNCTIONAL V-711	Competitor L08
Chemistry	Styrene Olefin Copolymer	Styrene Olefin Copolymer
K-O Shear Stability (ASTM D6278)	7 SSI *	5 SSI *
20hr KRL Shear Stability (CEC L-44-A-99)	71 SSI	71 SSI
2wt% in 120N Group II	128.9@40C, 22.4@100C, VI 204	103.3@40C, 17.5@100C, VI 187
2wt% in 600N Group II	KV40 = 304.2 cSt	KV40 = 346.9 cSt
2wt% in 750 Naphthenic	KV40 = 1007.8 cSt	KV40 = 804.8 cSt
2wt% in 150 Bright Stock	KV40 = 1101.3 cSt	KV40 = 968.8 cSt

\* K-O shear stability results are within the ASTM D6278 method's reproducibility (+/- 2.7%).

This Technical Data Sheet and the Safety Data Sheet contain information believed to be accurate and reliable. No warranty is made, however, to information beyond the control of FUNCTIONAL PRODUCTS INC. The engineering and management personnel of the user are responsible for determining the suitability of this or any product for any specific application, and this information is offered to them for that purpose.

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