

King MRV TP-1

Mini-Rotary Viscometer

ASTM D3829, D4684, D6821, D6896



Principle

Low-Temperature Pumpability & Yield Stress:
A pre-heated oil sample is cooled at a programmed rate to a final test temperature. A series of increasing low torques (weights) are applied to the rotor shafts until rotation occurs to determine the yield stress, if any exhibited. Higher weight applications then determine the apparent viscosity of the samples. The MRV methods are applied to fresh and used engine oils, driveline lubricants, and predict the borderline pumping temperatures (BPT) of oils.

History

Originally developed in 1979, the D3829 MRV method measures borderline pumping temperature — the lowest temperature at which an engine oil can continuously flow to the oil pump inlet of an engine. Following significant engine failures during the winter of 1980-81 due to gel formations in oils, the MRV method was modified with a temperature profile (TP-1) and reestablished as D4684 in 1987. Since then, the MRV TP-1 has been included in the SAE J300 Viscosity Classification System and numerous OEM and International Specifications.

Innovation

The King MRV (D4684, Procedure A) innovated the MRV test by incorporating self-contained, solid-block 'direct refrigeration' technology for both heating and cooling to evenly distribute constant temperature to all (10) Test Cells. This provides cell-to-cell temperature consistency of $\pm 0.1^\circ\text{C}$ down to -40°C and eliminates external pre-heating and cold-temperature circulating baths. The King MRV utilizes 'removable' test cells for easier test setup and cleaning, carbon fiber rotor shafts and a special design feature for the delivery of pre-cooled, dry air to each Rotor/Stator removing the need for cell caps required by other manufacturers.

Features

- An internal hermetic refrigeration system for direct, instant cooling with no need for external refrigeration or heat exchangers.
- Customizable with 5 to 10 removable test cells for easy cleaning and sample handling.
- Carbon Fiber Rotor Shafts to minimize test cell heat transfer.
- A quick cool rate and reliable temperature control from -5°C to -40°C ($\pm 0.1^\circ\text{C}$).



- Built-in pre-heating system to 80°C to remove oil memory before testing.
- Microprocessor temperature controller to store all MRV TP-1 testing profiles.
- Optical encoder for digital detection of viscosity and yield stress
- MS Windows 10[®] compatible software with customizable cooling profile configurations.
- Internal system to provide a continuous blanket of dry gas over samples to reduce/eliminate moisture accumulation (gas source not included).

The Automated Pulley Wheel uses a LED light sensor for precise measurements.

ASTM D3829

Predicts the borderline pumping temperatures (BPT) of engine oils over a 16 hour cooling cycle from 0°C to -40°C .

ASTM D4684

Determines yield stress and viscosity of engine oils following a cooling profile over a period exceeding 45 hours to a final test temperature between -10°C to -40°C .

ASTM D6821

Measures viscosity of drive line lubricants after preheating and controlled cooling to final test temperatures from 10°C to -40°C .

ASTM D6896

Determines yield stress and viscosity of 'used' diesel oils after controlled cooling for 43 to 45 hours to a final test temperature of -20°C to -25°C .

Required test for :

- SAE J300 Viscosity Classification
- ILSAC GF & dexos[™] Specifications
- API 'SM', 'SN' and 'SP' categories for modern engine oils.
- ASTM D4485 | JPI 5S-42-04
- Chinese Standard GB-11121
- OEM Factory Fill

Parts & Accessories

Instrument:

350700: MRV TP-1, 208-220 VAC, 50/60 Hz

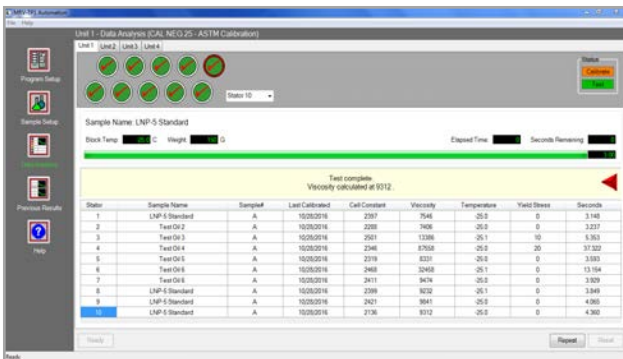
Parts & Accessories:

- 350600: King MRV Software Package
- 350702: MRV Rotor/Stator Set (5 Set)
- 350222: MRV Rotor/Stator Set (1 Set)
- 350114: Stator Well Plug (Cells without Rotor/Stator Set)
- 350127: Stator Insertion & Removal Tool (S.I.R.T.)
- 350232: MRV Driveline Rotor (for ASTM D6821)
- 350223: MRV Weight Set - Driveline (for ASTM D6821)
- 950508: Stainless Steel Thumb Nut
- 350128: Moisture Cover
- 170028: Test Cell Holding Rack
- 350129: MRV Weight - 10 gram
- 350153: MRV Weight - 150 gram
- 350417: MRV String
- 350190: Desiccant Assembly
- 550175: Desiccant Media (1 lb. | 0.45 kg)
- 020013: LNP-5 Reference Oil (Pint | 0.47 L)

Instrument Specifications

Dimensions (W x D x H)	Benchtop: 46 x 46 x 40 cm (18 x 18 x 16 inches)
Weight	~43 kg (94 lbs.)
Voltage	208-220 VAC, 7 Amp.
Frequency	50/60 Hz.
Heating Capacity	600 Watts
Temp. Range	80°C to -40°C (176°F to -40°F)
Temp. Control	±0.1°C across all test cells Digital readout
Cooling Rate	5.0°C per minute maximum
Refrigerant	R-507
Compressor Size	1/3 Horsepower
Testing Capacity	10 samples (customizable 5 to 10)
Cabinet Material	Stainless steel and durable thermoplastic
Bath Design	Solid, direct refrigeration without liquids
Safety	High Pressure cutout High Temperature limit CE Marked
Shipping Weight	~122 - 136 kg (270 - 300 lbs.)
Shipping Dimensions (W x D x H)	97 x 84 x 61 cm (38 x 33 x 24 inches)

Automated Software



The King MRV Automation Software Package calculates Yield Stress, Viscosity, and Rotor/Stator Cell Constants. It offers simple user prompts to facilitate the testing process and comes installed on the laptop computer.

Additional KING REFRIGERATION Precision Laboratory Instruments



Brookfield Liquid Bath (BLB)

- ASTM D2983 | IP 267 | DIN 51398
- Innovative SimAir® Test Cells
- Models: BLB701, BLB702, BLB-DIN

