Anton Paar

# SVM Series


Kinematic viscometer series

# Welcome to
# **New Viscometry!**

**Progress and innovation, high-precision craft, and the passion for research – these values define Anton Paar. Components produced with the highest attention to detail, innovative measuring principles, and well-designed user interfaces represent our standard of quality. For more than 20 years, Anton Paar has provided viscosity measurement solutions for the petroleum industry. Building on our strong technological leadership, the SVM X001 series has once again revolutionized the world of viscometry, utilizing the latest technology to provide the best viscometers on the market.**

## MEASURING PRINCIPLE

The highly precise SVM viscometers are based on a modified Couette measuring principle and consist of a density cell and a viscosity cell. The small viscosity measuring cell contains a tube which rotates at a constant speed and is filled with sample fluid, while a measuring rotor with a built-in magnet floats freely in the sample. The sample's shear forces drive the rotor while magnetic forces delay its rotation. Shortly after the measurement begins, the rotor reaches equilibrium speed, which translates into the fluid's viscosity. The kinematic viscosity is automatically calculated from the dynamic viscosity and density of the sample.

## UNIQUE TECHNOLOGY

The patented motor design enables tool-free access to the measurement cell, keeping the maintenance effort at a minimum, while the revolutionary, patented FillingCheck™ feature monitors the filling quality of the density cell in real-time to ensure the most accurate viscosity measurements.
SVM – with its unique measuring principle ASTM D7042 – provides total compliance in the lubricant and fuel industries and is referenced in a wide variety of standards.
Visit www.anton-paar.com/viscometer to find out more.

# Expect more – SVM is easy, fast, and accurate

### Highest flexibility for every application

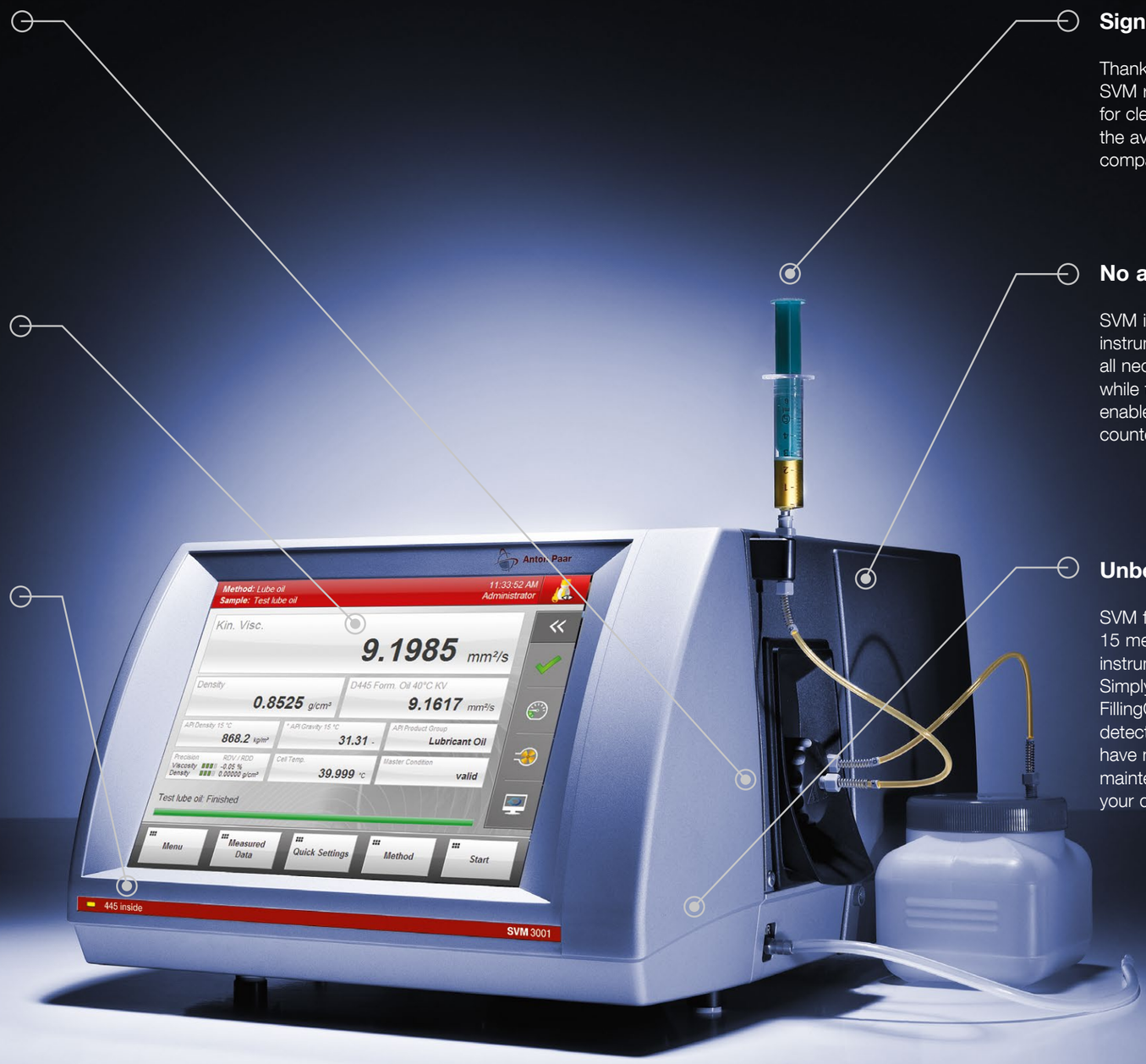
SVM covers the full viscosity, density, and temperature range with a single measurement cell, allowing a large variety of samples to be measured without the need to change capillaries. Additionally, fast temperature changes up to 20 °C/minute assist in collecting information about the properties of your sample across a wide temperature range.

### Multiple parameters from a single sample

SVM provides several parameters of your sample such as kinematic and dynamic viscosity (ASTM D7042), density (ASTM D4052), viscosity index (ASTM D2270), and API grades (API 2540) from a single syringe – gone are the days of having to perform several measurements.

### Bias-corrected D445 results according to ASTM

The implementation of ASTM bias statements for a multitude of samples (e.g. jet fuel, diesel and biodiesel, formulated oils, residual fuels) enables you to utilize the full range of benefits that come with our smart viscometer while reporting D445 results, if required.




### Significant savings on running costs

Thanks to the optimized design of the measuring cell, SVM requires as little as 1.5 mL of sample and solvent for cleaning. Despite the outstanding performance, the average energy consumption of 50 W is very low compared to traditional capillary measuring systems.

### No additional equipment needed

SVM is fully functional as a stand-alone, space-saving instrument in your laboratory. The embedded PC provides all necessary calculations needed for your measurements, while the integrated Peltier thermostatting technology enables temperature control without a liquid bath or counter-coolers.

### Unbeatable ease of operation

SVM features a user-friendly interface that puts 15 measuring parameters at your fingertips. The instrument is ready for use right out of the box. Simply inject the sample and start the measurement. FillingCheck™ makes sample handling easy by detecting filling errors. SVM series smart viscometers have no breakable glass capillaries and require minimal maintenance, reducing expensive downtime and making your daily work easier.

SCAN THIS QR CODE

## SVM 2001 — The most economic kinematic viscometer


DIESEL

FUEL OIL

HEAVY FUEL

LUBRICANTS

IN-SERVICE OIL

**Compliance with ASTM D396, D975, D3699, D6158, D6823, D7467, D8029, and many more standards**

**SVM 2001**

- ASTM-compliant, automated viscosity measurements with little effort at an affordable price
- Temperature range from +15 °C to +100 °C
- Easy handling without leaks or breakages
- Tool-free access to measurement cell for convenient cleaning
- Highest economic efficiency thanks to low sample, solvent, and energy consumption
- Ready to measure out of the box

## SVM 3001 — Wide-range viscometer for unparalleled flexibility


FUEL (DIESEL, JET, MARINE, BIOFUEL)

WAXES

LUBRICANTS

CRUDE OIL

(HEAVY) FUEL OIL

ADDITIVES

IN-SERVICE OIL

CHEMICALS

**Compliance with ASTM D396, ASTM D975, ASTM D1655, D2880, D3699, D6158, D6751, D6823, and many more standards**

**SVM 3001**

- One instrument for all samples – from jet fuel to waxes
- No change of capillaries necessary
- Widest temperature range (-60 °C to +135 °C)
- Cooling down to -20 °C without external counter-cooling
- Rapid heating and cooling rates (up to 20 °C/min)
- Quick temperature scan delivering information about the temperature behavior of your sample
- FillingCheck™ for detection of bubbles caused by improper filling (as required by ASTM D4052)

## SVM 3001 Cold Properties — Your all-in-one solution for low-temperature applications


**Compliance with ASTM D1655, D2880, D7566, DEF STAN 91-091, AFQRJOS, D396, D975, EN ISO 16896, and many more standards**

**SVM 3001 Cold Properties**

- Kinematic viscosity, density, cloud point, and freeze point from one measurement
- Determination of temperature at 12 cSt ('Viscosity Borderline Temperature') for safe operation of aircraft engines
- Superior temperature performance
  - › Down to -20 °C without counter-cooling
  - › Methanol-free cooling down to -60 °C
- Quick temperature scans for pumpability behavior of fuels
- Cleaning and drying at sub-zero temperatures without warming up in-between

## SVM 4001 — Experience “The power of two”


**Compliance with ASTM D6158, D6823, D7467, D8029, D396, D975, D3699, and many more standards**

**SVM 4001**

- Fastest viscosity index (VI) determination compliant to ASTM D2270, from the lowest sample volume
- Innovative double-cell design for simultaneous measurement of kinematic viscosity and density at any two temperatures between +15 °C and +100 °C, for example:
  - › 40 °C and 100 °C for viscosity index of base oils and lube blends
  - › 50 °C and 100 °C for viscosity of heavy fuel oils
  - › 15 °C for density and 40 °C for viscosity of fuel oils
- Convenient viscosity-temperature extrapolation according to ASTM D341

# Our solutions for your challenging tests

**Boost your low-temperature measurement**
- Air preparation kit to prevent condensation and contamination of the sample
- Optimized workflow with automatic sampler

**Maximize your productivity for in-service oil measurements**
- SVM 2001 is ideal for the fastest and easiest kinematic viscosity measurements at the lowest running cost.
- Heated magnetic particle trap (MPT) for removal of ferromagnetic particles from in-service oils

**Measure your highly viscous samples the easy way**
- Hot Filling Attachment for easy measurement of samples with a high melting or pour point, such as waxes, fuel oils, or heavy fuels (available for SVM 2001 and SVM 3001)
- Alternative: Xsample 610 heated sample changer for automated single sample filling and cleaning or Xsample 630 for up to 36 samples and temperatures of up to 95 °C (available for SVM 2001, SVM 3001, and SVM 4001)

**Know your sample: Determine carbon-type composition**
- Combine SVM with Anton Paar's Abbemat series refractometers for determination of carbon-type composition and carbon distribution according to ASTM D2140 and D3238, respectively
- All results are automatically calculated and displayed on the screen of SVM within a few minutes.
- All tests in one turnkey setup with convenient filling and cleaning

# Specifications

| | SVM 2001 | SVM 3001 | SVM 3001 Cold Properties | SVM 4001 |
|---|---|---|---|---|
| Patents granted | AT5160588 (B1), US10036695 (B2), CN105424556, AT516302 (B1), CN105628550 | | | |
| Temperature range | +15 °C to +100 °C | -60 °C to +135 °C | -60 °C to +100 °C | +15 °C to +100 °C |
| Viscosity range | 0.2 mm²/s to 30 000 mm²/s* | | | |
| Density range | 0.6 g/cm³ to 3 g/cm³ | | | |
| Viscosity repeatability** | 0.1 % | 0.1 % | 0.1 % | 0.1 % |
| Viscosity reproducibility** | 0.35 % | 0.35 % | 0.35 % | 0.35 % |
| Density repeatability** | 0.0002 g/cm³ | 0.00005 g/cm³ | 0.00005 g/cm³ | 0.00005 g/cm³ |
| Density reproducibility** | 0.0005 g/cm³ | 0.0001 g/cm³ | 0.0001 g/cm³ | 0.0001 g/cm³ |
| Cloud/freeze point repeatability** | | | <0.5 °C / <0.5 °C | |
| Cloud/freeze point reproducibility** | | | <2.5 °C / <1.3 °C | |
| Temperature repeatability | | | 0.005 °C (0.009 °F) | |
| Temperature reproducibility | 0.03 °C (0.054 °F) from 15 °C to 100 °C | 0.03 °C (0.054 °F) from 15 °C to 100 °C 0.05 °C (0.09 °F) outside this range | 0.03 °C (0.054 °F) from 15 °C to 100 °C 0.05 °C (0.09 °F) outside this range | 0.03 °C (0.054 °F) from 15 °C to 100 °C |
| Test methods | ASTM D7042, ISO 23581, EN 16896 | ASTM D7042, ISO 23581, EN 16896, ASTM D4052, ISO 12185 | ASTM D7042, ISO 23581, EN 16896, ASTM D4052, ISO 12185, ASTM D2386 equivalent or better, ASTM D2500 equivalent or better | ASTM D7042, ISO 23581, EN 16896 , ASTM D4052, ISO 12185 |
| Sample volume min./typical | 1.5 mL / 5 mL | 1.5 mL / 5 mL | 1.5 mL / 5 mL | 2.5 mL / 6 mL |
| Solvent volume min./typical | 1.5 mL / 6 mL | 1.5 mL / 6 mL | 1.5 mL / 6 mL | 2.5 mL / 10 mL |
| Maximum sample throughput | 30 samples per hour | | | 24 samples per hour |
| Peltier temperature control | Designed for constant temperature | Designed for fast heating/ cooling over a wide range | Designed for fast heating/ cooling over a wide range | Designed for simultaneous measurement at any two different temperatures within the range |
| Data memory | 1000 measurement results | | | |
| HID (Human Interface Device) | Touchscreen, optional keyboard, mouse, and 2D bar code reader | | | |
| Interfaces | 4 x USB (2.0 full speed), 1 x Ethernet (100 Mbit), 1 X CAN bus, 1 x RS-232; 1 x VGA | | | |
| Power supply | AC 100 V to 240 V, 50 Hz to 60 Hz, 250 VA max. | | | |
| Ambient conditions | 15 °C to 35 °C (59 °F to 95 °F), max. 80 % r.h. non-condensing | | | |
| Net weight/shipping weight | 15.9 kg/20.5 kg | 17.6 kg/22.2 kg | 18.0 kg/22.6 kg | 17.8 kg/22.4 kg |
| Dimensions (W x D x H) | 33 cm x 51 cm x 23.1 cm (13 in x 20 in x 9.1 in) | | | |
| Compliance | CE mark; EMC directive EN 61326-1; LV directive EN 61010-1; RoHS | | | |
| Included in standard delivery | - Kinematic viscosity<br>- Dynamic viscosity<br>- Density | - Automatic VI determination<br>- API calculations<br>- Temperature scan<br>- Time scan<br>- FillingCheck™<br>- Kinematic viscosity<br>- Dynamic viscosity<br>- Density | - Cloud point<br>- Freezing point<br>- Temperature @ 12 mm²/s (Kinematic Viscosity Borderline Temperature: KVBT)<br>- Standard above freeze point (SFP)<br>- Automatic VI determination<br>- API calculations<br>- Temperature scan<br>- Time scan<br>- FillingCheck™<br>- Kinematic viscosity<br>- Dynamic viscosity<br>- Density | - Simultaneous kinematic viscosity and density at any two different temperatures in the range<br>- Automatic VI determination<br>- API calculations<br>- Temperature scan<br>- Time scan<br>- FillingCheck™<br>- Kinematic viscosity<br>- Dynamic viscosity<br>- Density |
| Options | - Automatic VI determination<br>- Sample changer, heated<br>- Sample changer, non-heated | - Modularity with Abbemat refractometers<br>- Chemical upgrade kit<br>- Sample changer, heated<br>- Sample changer, non-heated<br>- Counter-cooling | - Sample changer, non-heated<br>- Counter-cooling | - Modularity with Abbemat refractometers<br>- Sample changer, heated<br>- Sample changer, non-heated |

* Viscosity range with chemical upgrade kit from 1 to 10 000 mPa·s
** Attested at the points of the works adjustment or at calibration correction points, not including the uncertainty of the standards.

Valid for ideal measuring and sample conditions within the works adjustment range.
SVM (EM13411996), Stabinger Viscometer (WO1232458, EM12708863), FillingCheck (EM006834725)

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