

## KINEMATIC VISCOSITY - VISCOSITY ANALYZER AT REFERENCE TEMPERATURE



*Directly correlated with ASTM*

### SELECTED APPLICATIONS

Refining: light to heavy fuels, distillation bottoms, bitumen and asphalts

Lubricants, hydraulic fluids

Polymers: resins, high molecular weight additives

### AUTOMATED AND SIMPLE ANALYZER FOR ON-LINE VISCOSITY MEASUREMENT AT REFERENCE TEMPERATURE

With innovative functionalities and **9731** electronics, the **ThermoSet-KV** is the most convenient and effective technology for kinematic viscosity measurement at reference temperature. Using the acclaimed advancements of the MIVI viscosity sensor, the **ThermoSet-KV** brings the fluid to the required temperature and measures its kinematic viscosity directly correlated to the ASTM D445 standard.

- **Guarantee product quality:** Thanks to reliable and repeatable measurements obtained continuously from the main process by-pass, the **ThermoSet-KV** maintains strict manufacturing specifications.
- **Deliver optimal production efficiency:** With its simple installation in process operations, the **ThermoSet-KV** has a small footprint, requires no side-systems and allows for outside installation.
- **Increase profitability:** An integrated bathless and ovenless flow-through cell guarantees minimal cleaning and maintenance related downtime. This asset provides tangible savings in both time and money while maximizing return on investment.
- **Technological versatility:** The **ThermoSet-KV** processes myriads of parameters. It is highly tolerant to sample input temperature and is unaffected by the presence of particles, regardless of size. It is available for general purpose as well as classified areas. It can directly measure kinematic viscosity and thus calculate viscosity index as described in the ASTM 2270-04.

Whatever your industry, we understand and develop solutions for many applications. For a personalized approach, contact us at [instruments@sofraser.com](mailto:instruments@sofraser.com)



## THERMOSET-KV PROCESS ANALYZER

### FEATURES AND SPECIFICATIONS

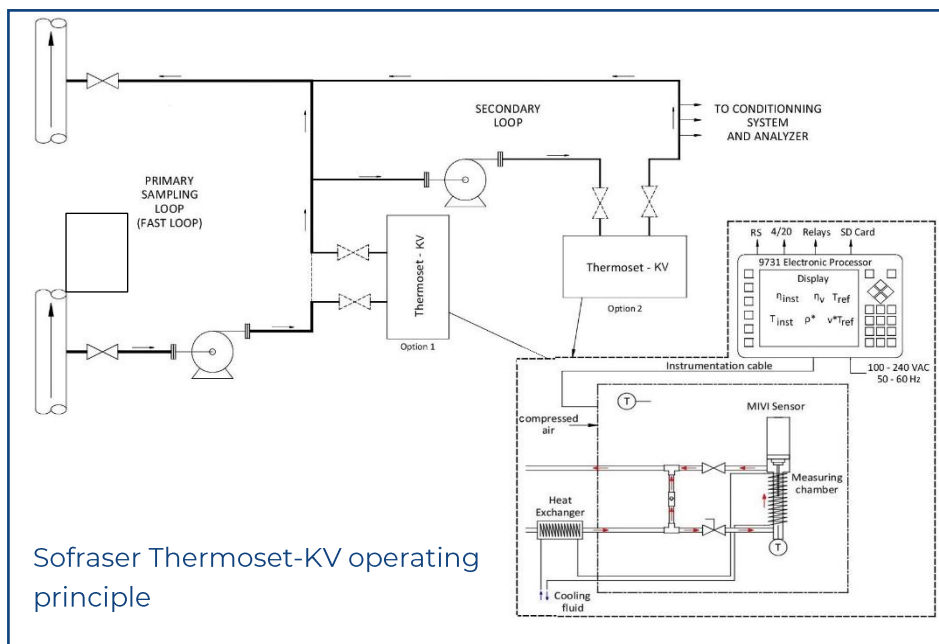
<b>Measuring range</b>	<ul style="list-style-type: none"> <li>Selectable up to 1000 cSt at reference temperature</li> </ul>
<b>Precision</b>	<ul style="list-style-type: none"> <li>+/- 1% of reading (between 50% and 100% of full scale range)</li> </ul>
<b>Response time</b>	<ul style="list-style-type: none"> <li>2 to 5 min (depending on input sample temperature and reference temperature)</li> </ul>
<b>Outputs</b>	<ul style="list-style-type: none"> <li>5.7" LCD illuminated color touchscreen. Display of viscosity, temperature and density (option), 24 keys keypad &amp; virtual keyboard</li> <li>4-20 mA (viscosity, temperature, density)</li> <li>RS 485 – RS 232</li> <li>Viscosity and temperature alarms and relays</li> </ul>
<b>Operating conditions</b>	<ul style="list-style-type: none"> <li>Maximum inlet temperature: 150 °C – 302°F (higher on request)</li> <li>Reference temperature: from 40 to 135 °C – 100 to 275 °F (according to inlet temperature)</li> <li>Maximum working pressure: 16 bar – 230 psi (higher on request)</li> </ul>
<b>Certification</b>	<p><b>Analyzer</b></p> <ul style="list-style-type: none"> <li>ATEX: II 2 G Ex IIB or II 3 G Ex IIB (temperature classification depending on fluid temperature)</li> <li>Class 1 Div 2</li> </ul> <p><b>Processor</b></p> <ul style="list-style-type: none"> <li>IP66 – General purpose (To be placed in a safe area)</li> </ul>
<b>Process connections</b>	<ul style="list-style-type: none"> <li>Standard Swagelok® tube fittings Ø12mm or ANSI flanges (to be specified)</li> </ul>
<b>Required inputs</b>	<ul style="list-style-type: none"> <li>110 or 240 VAC, single phase, 50-60 Hz, &lt;100 W</li> <li>Compressed air: 7 bar, 0.5 m<sup>3</sup>/h – 100 psi, 0.3 SCFM</li> <li>Heating or cooling fluid (when required)</li> <li>Product flow rate: 60 l/h – 0.25 gpm suggested</li> </ul>
<b>Size and weight (standard)</b>	<p><b>Analyzer</b></p> <ul style="list-style-type: none"> <li>H: 600 mm – W: 600 mm – D: 250 mm – 60 kg approx.</li> <li>H: 2' – W: 2' – D: 10" – 130 lbs approx.</li> </ul> <p><b>Processor</b></p> <ul style="list-style-type: none"> <li>H: 400 mm – W: 300 mm – D: 200 mm – 10 kg approx</li> <li>H: 1'4" – W: 1' – D: 8" – 22 lb approx.</li> </ul>
<b>Options and Accessories</b>	<ul style="list-style-type: none"> <li>Specific data logging on SD card</li> <li>Insertion of processor in an Ex-proof box</li> <li>Installation skid</li> </ul>

In 1981, Sofraser invented & patented the world's first vibrating viscometer at resonance frequency also called tuning-type.

The vibration amplitude varies according to the viscosity of the product in which the rod is immersed.

The active part of the sensor, a vibrating rod held in oscillation at resonance frequency, is driven by constant electrical power.

Sofraser remains unsurpassed regarding process reliability and accuracy.



Sofraser ThermoSet-KV operating principle



## INLINE VISCOMETER FOR EXTRUSION



### TYPICAL APPLICATION FIELDS

Plastics, polymers, elastomers

PE, PP, PS, PC, PET, PVC, PA...

Food

Extrusion, injection

Recycling, Compounding

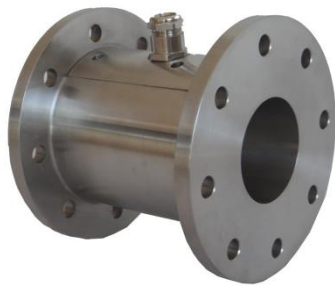


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### THE FIRST INLINE VISCOMETER TO BE INSERTED DIRECTLY IN THE EXTRUDER STREAM

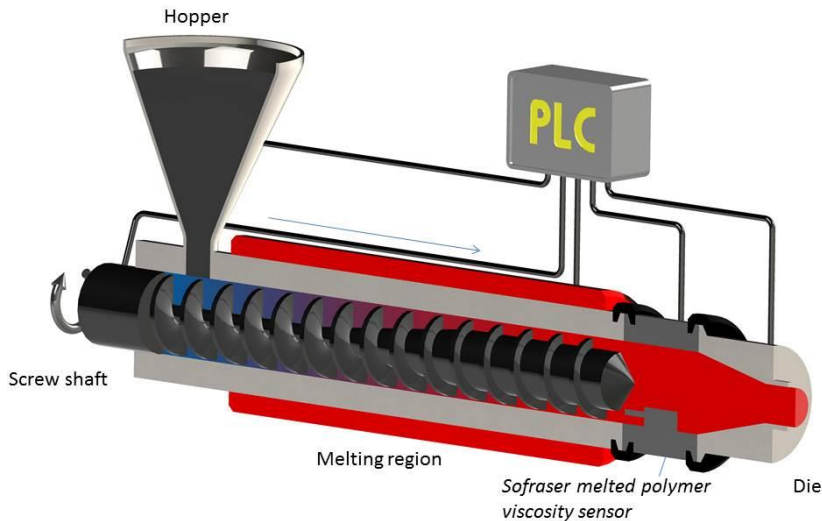
**SOFLUX viscosity sensor** is a new vibrating inline process viscometer with a dedicated shape allowing easy integration into any plastic, polymer or elastomer extruder. It is the ideal solution to monitor any extrusion process even the most demanding like speciality compounding, recycling, reactive extrusion...

- **Based on the proven vibrating technology of Sofraser:** Reliable, repeatable and continuous measurements combined with superior quality result in permanent production efficiency and increased profitability.
- **First real inline viscosity measurement for melted polymers:** Installed between the screw and the die, the Soflux measures viscosity directly inside the flow and in **real time** avoiding any error due to the evolution of the product outside of the process.
- **Easy correlation:** Viscosity by the Soflux can be correlated to usual parameters like **MFI** or **intrinsic viscosity (iV)** in order to control the extrusion process via analog or digital output.
- **Minimal maintenance:** Thanks to its design, the Soflux does not have drift in time and is easy to clean. Designed in 316 stainless steel, it is robust and reliable.



## SOFLUX VISCOMETER

### TYPICAL SOFLUX INTEGRATION ON EXTRUDER



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The vibration amplitude varies according to the viscosity of the product in which the rod is immersed.

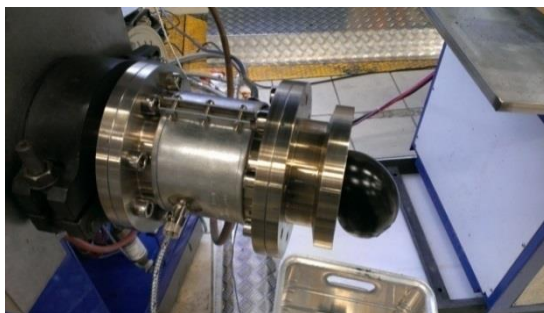
The active part of the sensor, a vibrating rod held in oscillation at resonance frequency, is driven by constant electrical power.

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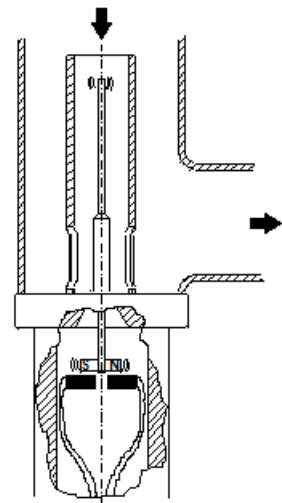
### EXAMPLE OF APPLICATION

#### Working conditions:

210 °C  
200 bar  
Thermoplastic material



Measured in line viscosity with Soflux (at about  $1\,000\text{ s}^{-1}$ ) of 245 Pa.s, correlated to the lab measurement at  $1\text{ s}^{-1}$  of 10 208 Pa.s



CE



## PROCESS VISCOSITY METER



### TYPICAL APPLICATION FIELDS

Chemical: polymers, plastics, resins, gels

Printing and coating: inks, paints, lacquers, varnishes

Food and beverage: milk, cheese, juices, sauces

Refineries: diesel, gasoline, heavy fuel, bitumen,

Pharmaceuticals and cosmetics: gels capsules, shampoos

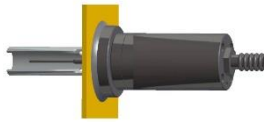
Whatever your industry, we understand and develop solutions for many applications. For a personalized approach, contact us at [instruments@sofraser.com](mailto:instruments@sofraser.com)

### THE PROVEN, 30-YEAR SENSOR IN PROCESS VISCOSITY MEASUREMENT

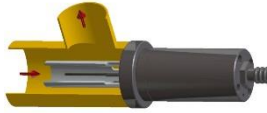
**Sofraser's MIVI sensor** is the expert viscometer on the market and is used in every process application and quality control condition. Reliable viscosity measurement in every fluid provides complete satisfaction to thousands of users worldwide. The versatile Sofraser MIVI sensor has many options making it the ideal industry instrument.

- **Improved process operations:** **Reliable, repeatable** and continuous measurements combined with superior quality result in permanent **production efficiency** and increased **profitability**.
- **Both dynamic & kinematic viscosities available:** With density measurement also available with the same sensor, **kinematic viscosity** can easily be calculated.
- **One sensor, myriad choices:** The MIVI sensor is used in standard and hygienic process conditions as well as harsh environments like dust, high temperature, high pressure and hazardous areas. Its measuring range easily adapts to different viscosities; up to 10mPa.s, it can provide high sensitivity capabilities at 0.01mPa.s. Multiple mounting options (inline, online, on reactor, measuring chamber) allow for flawless installation.
- **Simple and long-lasting:** The MIVI sensor guarantees a rapid return on investment because it is **easy to install** and is **easy to use**. With non-wearing parts, the MIVI requires almost **no maintenance**.
- **Matched with electronics:** The MIVI sensor matched with state-of-the-art display, data processing, and adjustable outputs capabilities electronic device, easily handles all process and quality control needs.

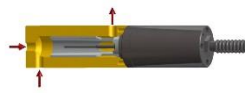
## Mountings:



On reactor wall



On pipe angle



Measuring chamber

## STANDARD FEATURES AND SPECIFICATIONS

Viscosity measuring range	<ul style="list-style-type: none"> <li>Any range from 0.1 – 10mPa.s to 1000 – 1000 000mPa.s</li> <li>High sensitivity option : from 0.01 – 10mPa.s (more on request)</li> </ul>
Viscosity precision*	<ul style="list-style-type: none"> <li>±0.2% of reading</li> </ul>
Viscosity accuracy**	<ul style="list-style-type: none"> <li>±0.5% of reading</li> </ul>
Density measuring range	<ul style="list-style-type: none"> <li>Available ranges between 0.6g/cc to 1.6g/cc (only with temperature probe option, 9710 electronics and viscosity up to 500cP)</li> </ul>
Density precision	<ul style="list-style-type: none"> <li>±0.005g/cc</li> </ul>
Density accuracy**	<ul style="list-style-type: none"> <li>±0.01g/cc</li> </ul>
Operating temperature	<ul style="list-style-type: none"> <li>0 to 200°C / 32 to 390°F</li> <li>High temperature option up to 300°C / 570°F</li> <li>Low temperature option down to -55°C / -67°F</li> </ul>
Working pressure	<ul style="list-style-type: none"> <li>Up to 60bar / 870psi</li> <li>High pressure option up to 1400bar / 20000psi</li> </ul>
Material	<ul style="list-style-type: none"> <li>Stainless steel 316L</li> <li>Optional alloys: Hastelloy, 316Ti...</li> </ul>
Coating on vibrating rod	<ul style="list-style-type: none"> <li>PTFE, Amorphous Diamond-Like Carbon, Electropolish</li> </ul>
Weight	<ul style="list-style-type: none"> <li>Sensor: 2.6kg / 5.7lb</li> </ul>
Size	<ul style="list-style-type: none"> <li>Length: 238mm / 9 3/8" from sensor body to flow damper</li> <li>Flexible cable length: 3 meters / 118 inches</li> </ul>
Protection	<ul style="list-style-type: none"> <li>Water-tightness: IP67 / NEMA 6P</li> </ul>
Ex proof agreement option	<ul style="list-style-type: none"> <li>European ATEX flameproof enclosure for Zone 1: <ul style="list-style-type: none"> <li>- ATEX II 2 G Ex db IIC Tl...T6 Gb – For Gas</li> <li>- ATEX II 2 D Ex tD IIIC IP67 Tl...T6 Db - for Dust</li> </ul> </li> <li>European ATEX intrinsically safe for Zone 0: <ul style="list-style-type: none"> <li>- ATEX II 1 G Ex ia IIC Tl...T6 Ga</li> </ul> </li> <li>FM Class I, Division 1, Groups A,B,C,D, T4A</li> <li>Japan (JIS), South Korea (KGS), IECEx</li> </ul>
Regulatory	<ul style="list-style-type: none"> <li>CE marked (European conformity)</li> </ul>
Options	<ul style="list-style-type: none"> <li>Included temperature probe: thermowell immersed directly in the product (from -55°C / -20°F to 250°C / 480°F)</li> <li>EHEDG certified design (Hygienic applications) 16 bars, 135°C</li> <li>Sanitary design (CIP applications)</li> </ul>
Accessories	<ul style="list-style-type: none"> <li>Mounting flange (on reactor wall, on pipe angle)</li> <li>Complete elbow mounting (inline) – Ø mini: 32mm / 1 1/4"</li> <li>Measuring chamber - For small pipe diameter – Ø maxi : 3/4"</li> <li>Other on request (immersion tube, etc.)</li> </ul>

- \* From 10% to 90% of the full scale range. Depends on electronic resolution
- \*\* From 10% to 90% of the full scale range. Depends on calibration options

## MIVI PROCESS VISCOMETER

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With its exclusive Flow Damper technology that acts like an embedded Flow cell, the measurements stays stable in any conditions.

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