VAF INSTRUMENTS

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PRODUCT BULLETIN 744

ViscoSense®

Viscosity Measurement and Control System

Introduction

VAF Instruments ViscoSense® is a sensor which provides you with direct liquid viscosity or elasticity measurement and indication.

The design of the sensor makes it suitable for operation in process (in-line) and laboratory (off-line) environments.

Its high accuracy and repeatability makes ViscoSense® a reliable link in your process control chain.

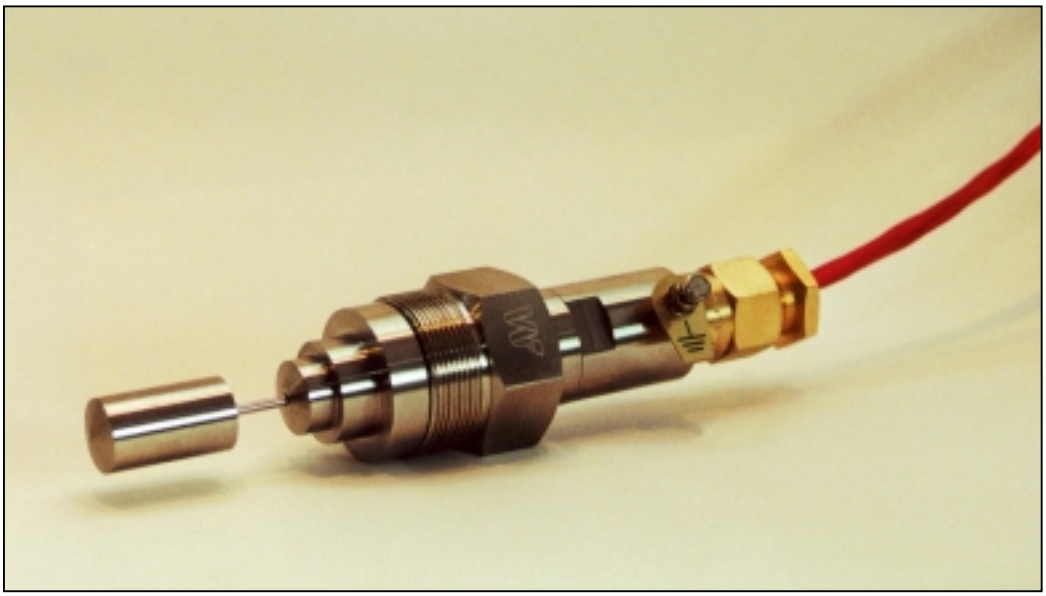

Figure 1: ViscoSense® sensor

Saving time and raw material

Accurate viscosity measurement has proven to be essential in numerous industrial processes.

In-line measurement of viscosity will give you the possibility to optimise your process and instantly obtain the required quality of final product.

No samples have to be taken and bulky mixing vessels are no longer necessary. As a result valuable raw materials and time are saved.

ViscoSense® sensor qualities

The ViscoSense® sensor is an economical design with only few essential parts.
It has no moving parts or mechanical seals and is resistant against temperatures up-to 180 °C.
The sensor is compact which makes it suitable for almost any process connection.

In practice the smooth edged design of the stainless steel ViscoSense® sensor makes it highly insensitive to adherence and easy to clean. Therefore it can be easily used in clean or sanitary processes. Once calibrated the sensor's accuracy is set for life without need for any re-calibration. All in all ViscoSense® provides you with excellent measurement qualities against low operational costs.

Unique features

VAF Instruments ViscoSense® patented measuring principle is based on rotational vibration of a pendulum in liquid.
The influence of the surrounding liquid on this electrically controlled vibration is directly related to its viscosity and elasticity. Through this ViscoSense® achieves the most accurate measurements possible.

ViscoSense® measuring principle has some unique features.
Based on rotational vibration, longitudinal external vibration inputs have no influence on the accuracy of the measurement. On top of that changes in flow velocity and direction have no effect on the sensors operation.

These features make ViscoSense® ideal for in-line viscosity measurement.
The amplitude of the pendulum rotation is very small.
With this ViscoSense® can measure elasticity of a wide range of liquids without distortion of the liquid's structure. Finally the build-in temperature sensor gives an instant liquid temperature read-out.

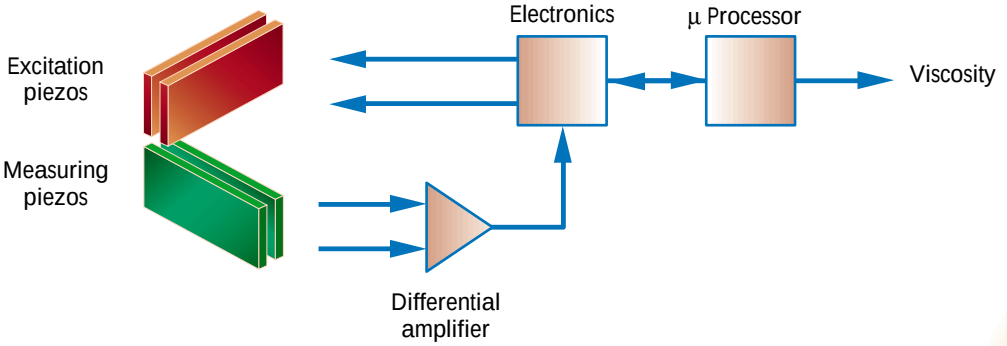

Figure 2

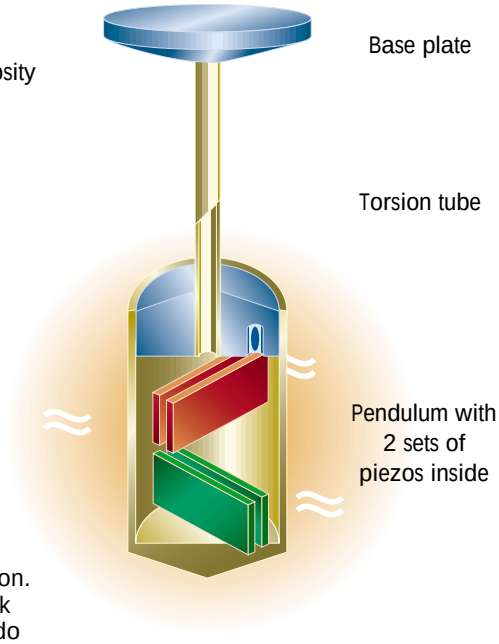

Figure 3

Measurement principle

The sensor consists of a pendulum attached to a base plate by a torsion tube (see figure 3).
Two sets of piezo-electric elements are positioned inside the pendulum. One set drives the pendulum, the other set measures and controls its rotational movement via a feedback circuit (see figure 2).
This closed-loop controlled rotational vibration principle is independent of ageing of piezo material, ensuring long term stable and accurate measurement.
For viscosity measurement, the resulting frequency at two specific values of phase difference is detected.
This gives a value for the dampening which is proportional to the square root of the viscosity.
For elasticity measurement the frequency shift of the oscillation is detected.

Electronic signal processing

VAF Instruments ViscoSense® is supplied with a signal processing unit (see figure 4). It provides instant 4 .. 20 mA outputs for viscosity or elasticity and temperature of the liquid. These can be easily linked to a standard display, PLC or process computer. Further the unit is equipped with a system status indication. With this you can check proper operation and do user friendly trouble shooting.

Features	User benefits
• Stable and accurate measurement	• Direct optimal and consistent final product
• In-line viscosity measurement	• No need to take samples • Saving of raw material • Time saving
• No moving parts	• No preventive maintenance required • Low operating costs
• Economic, compact light-weight construction	• Suitable for a wide range of process connections • Easy to install without process system adjustments
• All SS-316 pendulum	• Compatible with numerous liquids • Durable
• Smooth edged pendulum	• Highly insensitive to adherence • Easy to clean
• Rotational vibration measuring principle	• Reliable under all circumstances Not influenced by vibrations, changes in flow velocity • No down time
• Minimal load on components	• Minimal ageing and wear effects • Long and trouble-free operation
• Calibrated for life	• No need for re-calibration • No operating training required • No local servicing costs
• Electronic signal processing unit	• Standard 4 .. 20 mA signals No need for expensive additional equipment • System status indication User friendly trouble shooting
• Ex-proof execution	• In-line measurement in hazardous areas No special equipment or precautions needed
• Manufactured by a ISO 9001 accredited organisation	• Assured constant product quality

Figure 4: Signal processing unit

Tailor made solutions.

Because not one industrial application is like an other they need special attention. VAF Instruments offers you to evaluate your application and find the answers to your viscosity measurement requirements. With that information VAF Instruments can provide you with a tailor made solution.

Applications

Typical examples of materials of which accurate viscosity indication, like ViscoSense® performs, helps to improve product quality and consistency or process results are:

- Hydrocarbons
- Syrups and molasses
- Asphalt bitumen
- Paint for spraying and baking
- Plastic melts
- Liquids in food processing industries
- Spinning solutions
- Drilling mud

Process connections

Figure 5 shows a standard 2" housing with flanges for the ViscoSense® sensor. Because of the compact build of the sensor almost any process connection can be supplied on application. Contact VAF Instruments for further information.

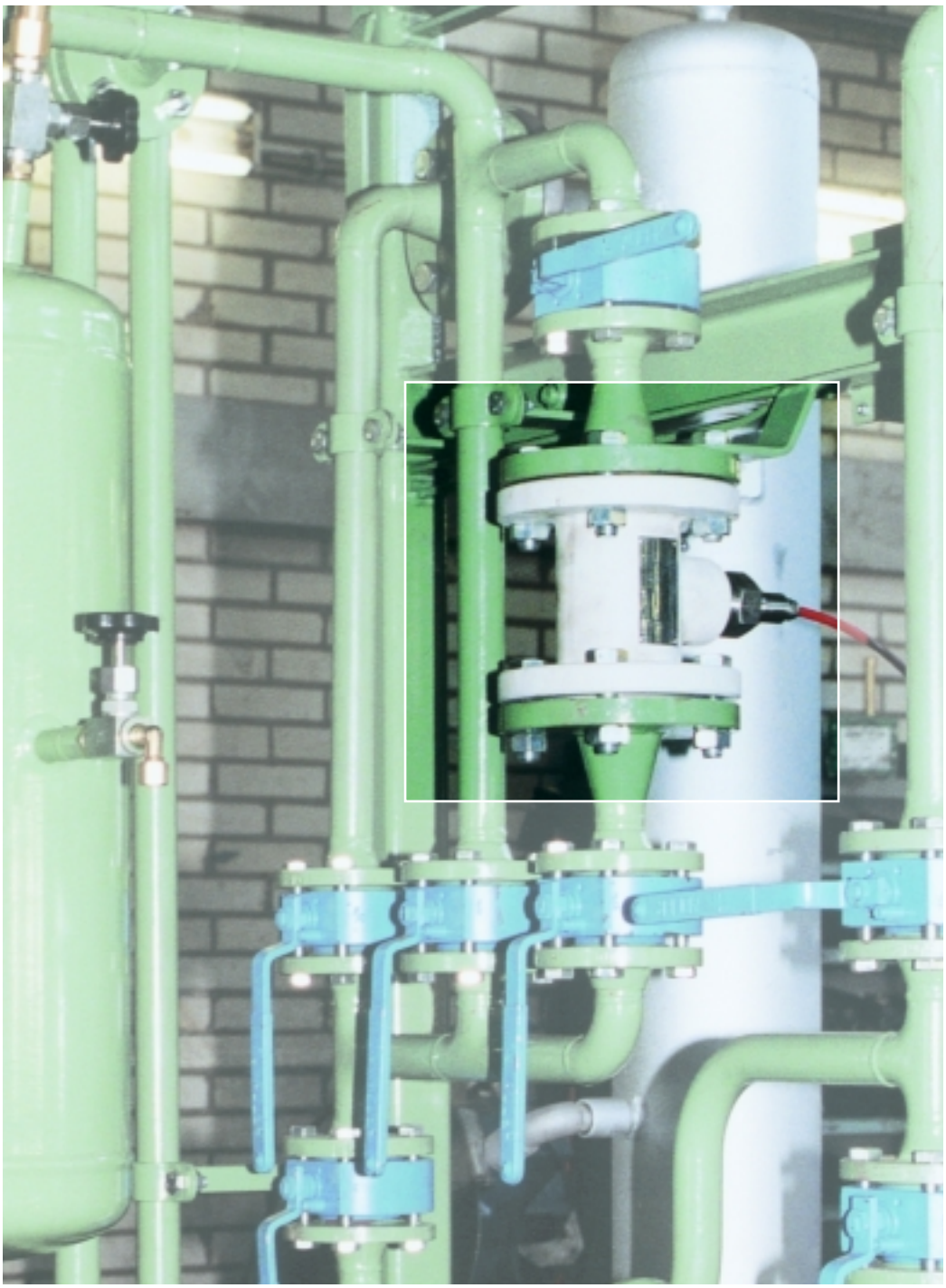

Figure 5

Technical specification

Sensor

Viscosity range	: 0…1000 mPa·s standard, other ranges on request
Resolution	: +/- 0.1 mPa·s
Accuracy	
Viscosity	: +/- 2% instantaneous, with a minimum of 0.5 mPa·s
Temperature	: < 1°C
Response time	: Less than 5 seconds
Liquid temperature	: max. 170°C
Flow rate	: max. 2,5 m/s at 0 .. 25 mPa·s
Pressure rating	: Depending on process connection
Materials	
Housing	: Depending on process connection
Sensor	: Stainless steel 316
Protection class	: IP68
Ex-proof (Optinal)	: EExIICT6…T3
Process connections	: On application

Signal processing unit

Supply voltage	: 110/240 VAC, 50/60 Hz
Output	
Viscosity / Elasticity	: 4 .. 20 mA
Temperature	: 4 .. 20 mA
Ambient temperature	: -20 … +55°C
Protection class	: IP65
Mounting	: Wall or work bench mounted

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