

RheoStream®

Fully automatic
rheology control in
your manufacturing
process



Keep rheology on track

RheoStream® is a fully automated process rheometer.

With RheoStream you can monitor the viscosity profile of paints, coatings, inks, adhesives, detergents, shower products and lotions.

Optimizing production with RheoStream®

RheoStream® is a process rheometer for monitoring of the viscosity profile in manufacture of viscous, non-Newtonian liquids like paint, ink, detergent, soap, skincare, adhesive, and sauces.

RheoStream® will help you:

- ◆ Increase first-time-right
- ◆ Improve quality
- ◆ Save resources, save time, save capacity

Let RheoStream monitor the viscosity and make sure that the process is in control.

With RheoStream, now viscosity is a parameter that can be automatically adjusted – no more waiting for manual analysis and no more re-processing or scrapping of off-spec product. You get a complete log of the material produced, and you gain new insight into process variations. As a result you achieve a more consistent product quality to the benefit of your customer. RheoStream can fit both in continuous processes and in batch processes.

Remove human error from the equation. RheoStream measures the same way every time with higher precision than most QC procedures.

Measuring method

RheoStream® is a fully automated capillary rheometer in a box! Unlike any other process rheometer RheoStream takes full control of the sample. That gives important benefits:

- ◆ The sample temperature is controlled to the desired level
- ◆ The viscosity is measured across a controlled range of shear rates

The output from RheoStream is the viscosity at 3 shear rates. Or you can get the parameters from a model of the viscosity curve (Bingham, Casson, etc.).

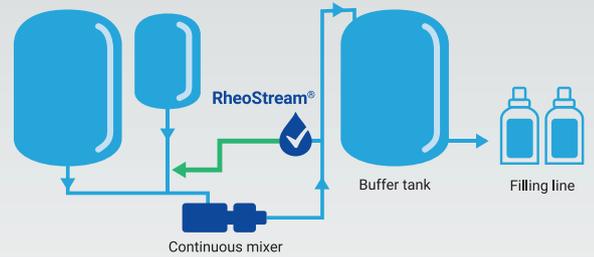
RheoStream measures a new viscosity profile every 1-2 minutes: A sample automatically flows into the instrument, where it is measured in a sequence of steps.

A precision pump controls the sample flow rate through the capillary at a number of pre-set flow rates and the pressure drop is recorded. Proprietary RheoStream software converts the pressure data into precise viscosity values.

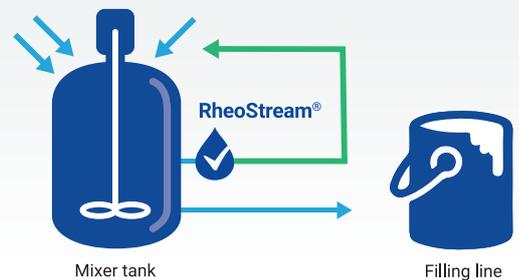
The application area can be illustrated like this:

In this example Wallpoint 1 can be measured across the full range (shear rate 1.5 - 1000 s⁻¹). The Wallpoint 2 can be measured up to about 100 s⁻¹.

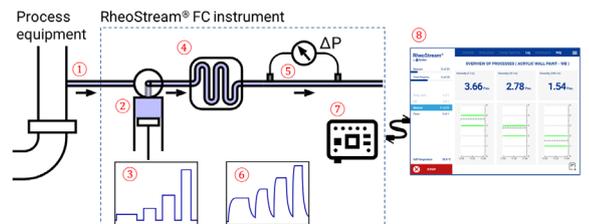
RheoStream® in continuous production line



RheoStream® in batch production line

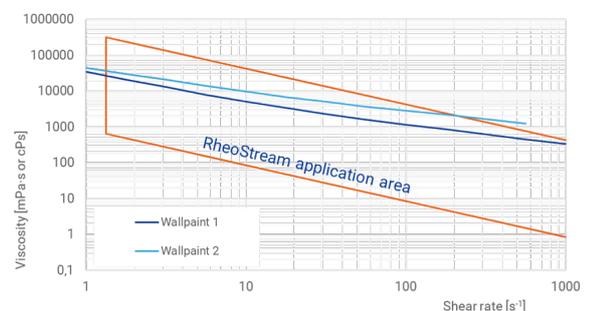


RheoStream® measurement



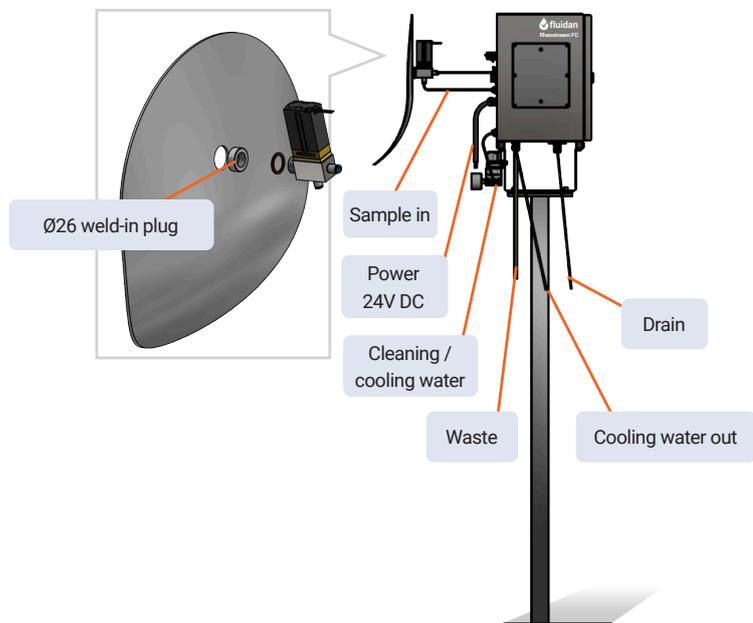
- 1 A sample is drawn from process equipment
- 2 The syringe pump controls flow rates in pulses
- 3 A preheater/cooler ensures a steady temperature of the measurement
- 4 The liquid flows through a thin tube (capillary)
- 5 A pressure difference (ΔP) is measured for each pulse
- 6 The instrument computer converts pressure signals into viscosity values
- 7 Displays results on the user interface

RheoStream® FC - Limit plot



Installing RheoStream®

RheoStream is installed adjacent to the process having the liquid to be measured. RheoStream can be installed on a pipe or a tank.



How to implement

The instrument box is mounted on a rack keeping RheoStream in the correct position.

RheoStream draws in a small sample (5 ml), carries out the measurement, and expels the sample, then moves on to the adjacent sample. The samples enter through a sample inlet via a control valve provided with the instrument.

RheoStream is automatic self-cleaning at intervals and is connected to a cleaning liquid supply – this can be water for most products, or it can be a cleaning solution used in the factory. An outlet tube leads the spent sample and cleaning liquid to a waste container. Alternatively, waste is led to a waste collection system, if that is available.

RheoStream requires a 24V DC power supply, and it communicates via an ethernet cable.

Interface and GUI

RheoStream interfaces to the factory computer system via an ethernet cable. The interface can be fully digital, or it can be an analog signal.

The all-digital solution:

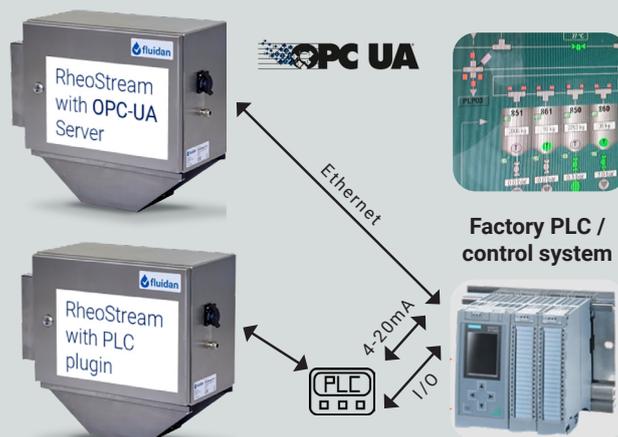
OPC-UA is a digital machine-to-machine communication protocol supported by most automation providers.

Fluidan offers the software making RheoStream act as an OPC-UA server. The factory control system can be programmed to inquire for new viscosity data from RheoStream. A rich communication of commands, error messages and warnings can be transferred.

The PLC solution:

Viscosity data are communicated as analog 4-20mA signals. Error messages from RheoStream or start/stop/clean commands to RheoStream, are transmitted by I/O digital signals. The communication is handled by a PLC supplied by Fluidan.

Both solutions require programming in the factory control system. Fluidan provides complete documentation, and we stay in dialogue with your programmers.



Application examples

Today, rheology control of non-Newtonian liquids is done manually.

RheoStream® is the tool for automation across multiple applications:

Paint / Coating / Ink:

Save more than half of the production time.

Viscosity adjustment based on manual measurements is time consuming and often not accurate.

Paint must be thick in the can (low shear) but thin on the wall (high shear). RheoStream measures the viscosity across a range of shear rates.

Adhesive:

With RheoStream you can monitor the viscosity of e.g., PVA and PVAc adhesives in continuous or batch mixing processes.

Detergents & Shower Products:

Install RheoStream downstream of continuous mixing, to secure that critical rheology is kept on track.

Other Applications:

Use RheoStream for monitoring the viscosity profile in continuous processes or batch processes making lotions, food products and other non-Newtonian liquids.

RheoStream® in different applications



RheoStream® - precision and control

Superior precision

Any manually operated instrument comes with the risk of human errors having an impact on the result: For many viscous liquids it is critical that the sample is handled in the exact same way every time. The temperature control may not be consistent, or the result may be noted incorrectly.

Forget about SOPs. RheoStream is fully automated. It performs the measurement in exactly the same way every time. As a result, the precision is superior to most manual methods.

Temperature is controlled

Viscosity depends on temperature – typically, the viscosity changes 2-5% for each °C temperature change. RheoStream controls the temperature at exactly the level you specify.

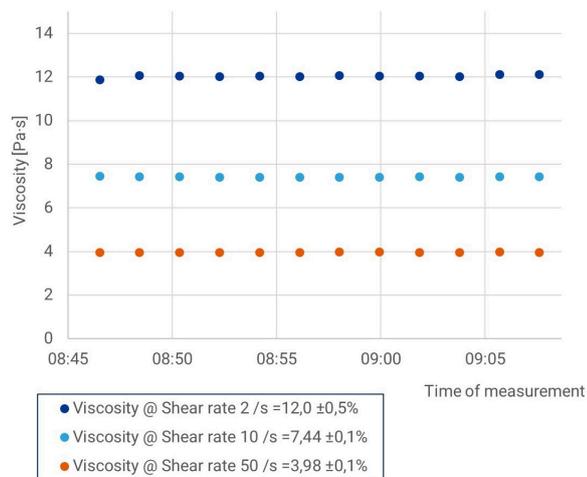
Shear rate is controlled

Laboratory rheometers control a range of shear rates. In contrast, inline viscometers measure at one shear rate and offline process viscometers may not provide a well-defined shear rate. RheoStream controls multiple shear rates and provides a snapshot of the shear thinning characteristics.

Automatic cleaning, no intruding parts

RheoStream has no parts protruding into the pipe or tank where it is mounted. You can monitor the viscosity profile even in a pipe being cleaned by a pigging system or in a tank with inside scrapers.

Repeatability of measurement; Wall paint



Continuous measurement of viscosity at three shear rates of wall paint. A new measurement at all three shear rates happens every other minute.

Specifications

Topic	Specification
Dimensions	H x W x D = 300 x 300 x 220 mm (cabinet)
Weight	10 kg
Power supply	24 VDC, max 10 A
Noise level	<41 dB(A)
Cabinet material	Stainless steel (aluminum heat sink)
Materials in contact with sample	Stainless steel 316, Polytetrafluoroethylene (PTFE), Nylon 12, Borosilicate glass & PEEK Sealing material: FKM. Optional: FFKM
Maximum particle size in the sample	1000 µm
Operating pressure	max 3 bar(g)
Temperatures:	Ambient temperature: 15 - 40°C Temperature of incoming sample: 15 - 50°C Measurement temperature: 20 - 40 ± 0.2°C
Temperature control	Instrument is water cooled, water usage: 2-5 l/h
Viscosity range	100 – 20,000 mPa·s @ 10s ⁻¹
Volume of sample per measurement	Max. 5 ml
Measurement frequency	1 measurement every 1 – 3 min
Data output	i. Viscometry (flow curve, 1 – 4 points of viscosity vs. shear rate) ii. Measuring temperature
Precision	Viscometry precision (repeatability): ±2%

Certification and standards

CE certified according to:

- ♦ EU machinery directive (MD - 2006/42/EC)
- ♦ EMC directive (2014/30/EU)
- ♦ Low Voltage Directive (LVD – 2014/35/EU)
- ♦ RoHS directive (2011/65/EU)

IP66 certified according to EN 60529:1991/A2:2013

ATEX

RheoStream can be used in a hazardous area with a risk of flammable atmosphere.

Some viscous liquids contain volatile solvents, e.g., solvent borne coatings or adhesives.

Typically, that leads to a demand for Ex instruments that are certified for use in the classified area

The Ex-version of RheoStream is RheoStream® FCX.

RheoStream FCX has no sources of ignition on the outside of the cabinet and inside the atmosphere is monitored by a highly sensitive gas detector. If the inside atmosphere reaches a preset safe level of flammable gas, the instrument powers off immediately.



Work with Fluidan

We help you installing RheoStream and interfacing to your control system.

We support your factory trial, if you wish to test RheoStream.

We will always deliver a solution that helps you meeting your goals for automation, efficiency and quality improvements.

Get in touch

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