

Good Vibrations

high performance
solid state
process viscosity control

Hydramotion, UK



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Company Profile

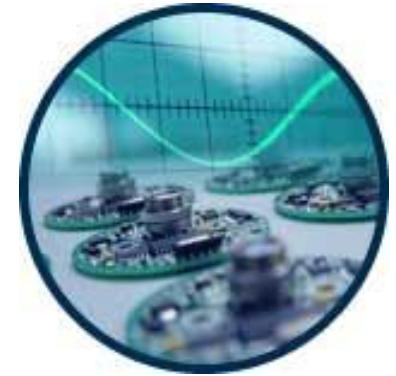
- Formed in 1988
- Headquarters in Malton - near York, England



- Specialists in viscosity measurement with proprietary patented technology
- Exports to over 60 countries - wherever fluids are handled or processed

Technology Leaders

- Recognised technology leaders in the field of on-line viscosity analysis
- Pioneered new industrial sensor design using mechanical resonance
- Dedicated R&D department of experienced graduate and postgraduate personnel in the fields of electronic, mechanical, and software engineering and physics
- Continuous program of product innovation and refinement
- Modern manufacturing facilities with ISO9000:2000 Quality Management System accreditation
- CAD, CAM and CNC linking design to production



ISO9001 : 2000



approved products

What is viscosity?

- Viscosity is **resistance to flow**
- Cooler or bigger molecules \Rightarrow increased viscosity
- Usually measured in **centipoise (cP)** or **millipascal-seconds (mPa·s)**

Typical viscosities

Air	0.02 cP
Water	1 cP
Bicycle Oil	10 cP
Olive Oil	100 cP
Glycerine	1000 cP
Treacle	10,000 cP
Syrup	100,000 cP
Bitumen	1,000,000 cP



How is viscosity measured?

Traditional techniques:

- Rotating bob
- Falling ball
- Glass Capillary
- Piston

.....all measuring the drag caused by fluid viscosity

Usually basic devices with moving or delicate parts,
and maintenance intensive.

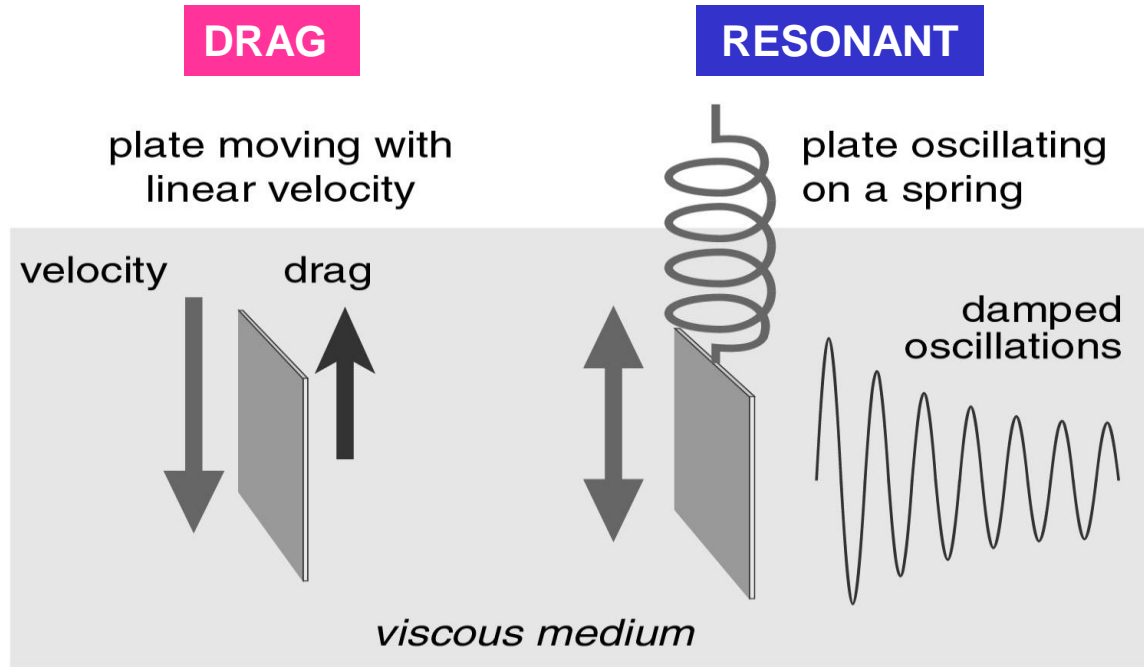
These are lab instruments, not suited to on-line process use.

For decades, viscosity measurement was trapped in the lab.



Then came resonant transducers.....





effect is to oppose motion with drag force

effect is to dampen oscillations

MEASURE DRAG FORCE

MEASURE ENERGY LOSS

Energy loss from resonant sensor is measured using specially developed hardware and software and is immune to the process conditions which cause problems with drag method

Result is **accurate real time viscosity** and **high plant and process immunity**

Resonant Viscometers

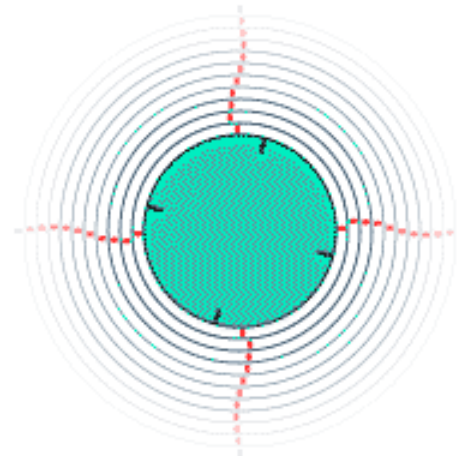
**Hydramotion didn't invent the resonant viscometer -
But we perfected it.**

- The technique to measure viscosity by measuring the damping on a vibrating element in a liquid has been around since the 1950's.
- Early designs of such vibrating or resonant devices, although well-intentioned in principle, were flawed and troublesome.
- Fifteen years ago Hydramotion pioneered new patented resonant sensor designs resulting in the 'XL7'
- the worlds first true on-line viscometer
that can work in any fluid and any conditions
on any process plant



How it works

torsional motion generates shear waves ...



... and shear waves dissipate energy depending on viscosity

Measuring Viscosity in the Process

- **Robustness**
- **Low maintenance**
- **High repeatability**
- **Not affected by process conditions - temperature, pressure, and flow**
- **Not affected by installation – sensor location, plant vibration**
- **Low cost of ownership**
- **Simple installation no special requirements**
- **High reliability – a plant critical process element**



Maintenance free

“You shouldn’t have to keep pulling up the tree to look at the roots”

- Solid state, all welded stainless steel design with no moving parts means maintenance free
- **Imagine this**, a process viscometer measuring bitumen at 600 deg F.

So hot you could light a newspaper off the transducer flange.

Working continuously on-line in a noisy plant for years, never been removed since installation day. Measuring with such a high sensitivity that it could detect the change in viscosity of a glass of water as it warms up in a room.

There are XL7s which have worked continuously, 24/7, for over 10 years without removal from the line, even for casual inspection.

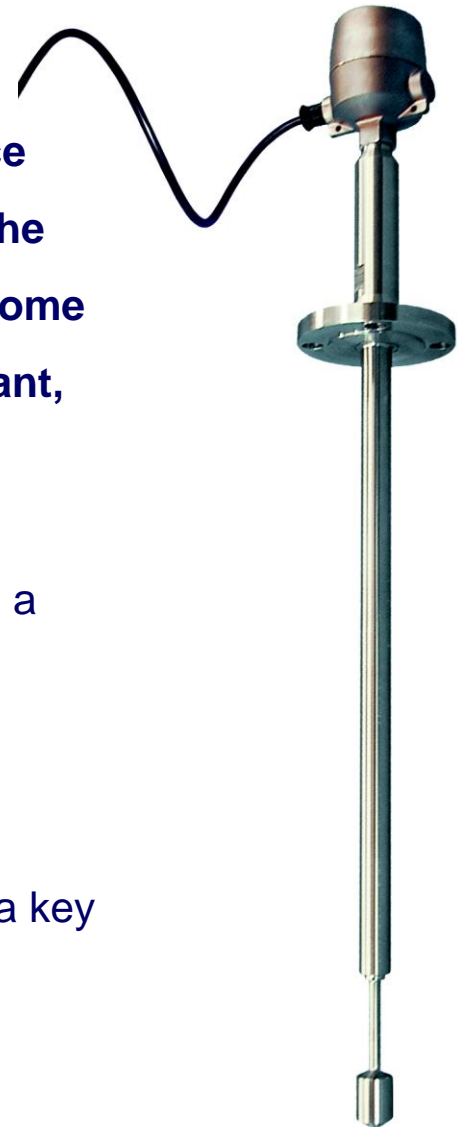


Measuring viscosity now

The situation is now reversed. Viscometers were once delicate lab devices that lasted no time in the field. The new generation of process viscosity sensors has become one of the smartest and toughest analysers on the plant, that can outperform the viscometer in the lab.

Hydramotion has, over a ten-year programme, developed a range of viscometers to suit virtually all applications for viscosity measurement in any environment.

Users are able to rely on the Hydramotion viscometer as a key control element in their process leading to full process automation with major quality and productivity benefits.



a viscosity analyser for all occasions



XL7 general purpose
process viscometer



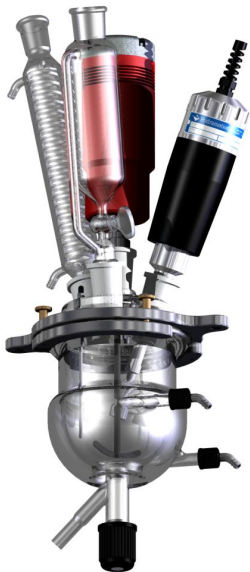
ViscoJet
standalone
viscometer



ViscoMelt
polymer melt
viscometer



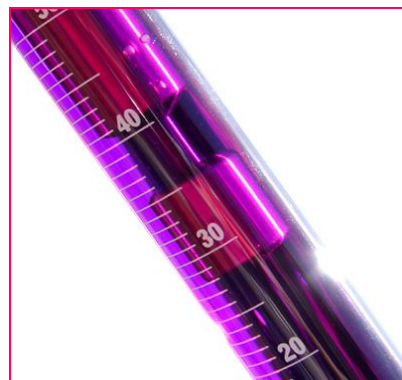
GoVisc
automation
viscometer



ReactaVisc
reaction vessel
viscometer

All available in any size, process fitting or material
and certified for EEx Hazardous Area use

in the lab and field.....



Viscolite
portable
viscometer



XL7 process viscometer

- any fluid
- any process
- any location
- simple installation
- virtually maintenance free
- digital and analogue outputs
- high accuracy and sensitivity
- resilient to process conditions

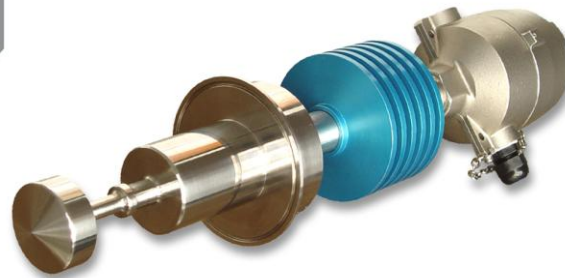


XL7 in all sizes

Standard:
up to 150°C

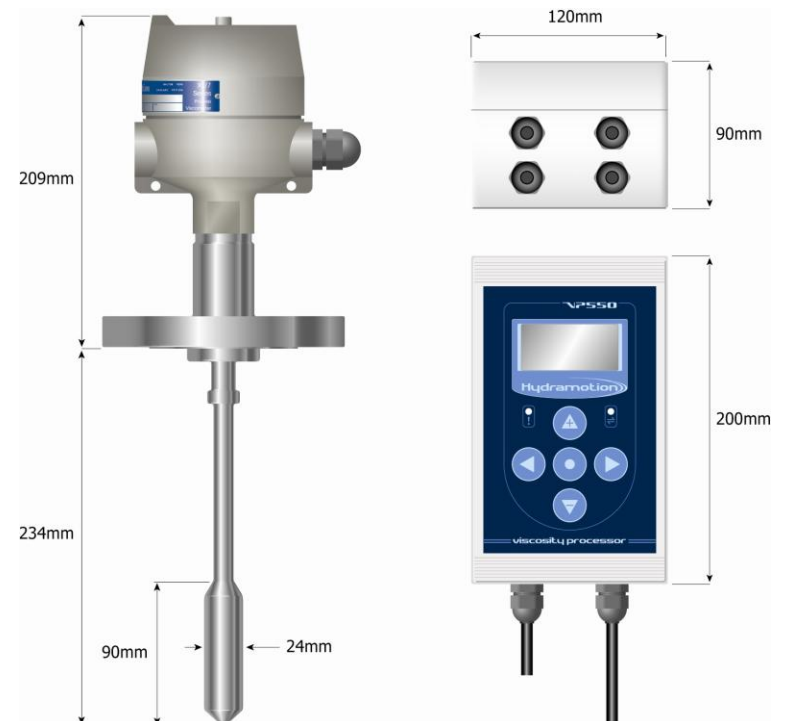


HT2:
up to 450°C



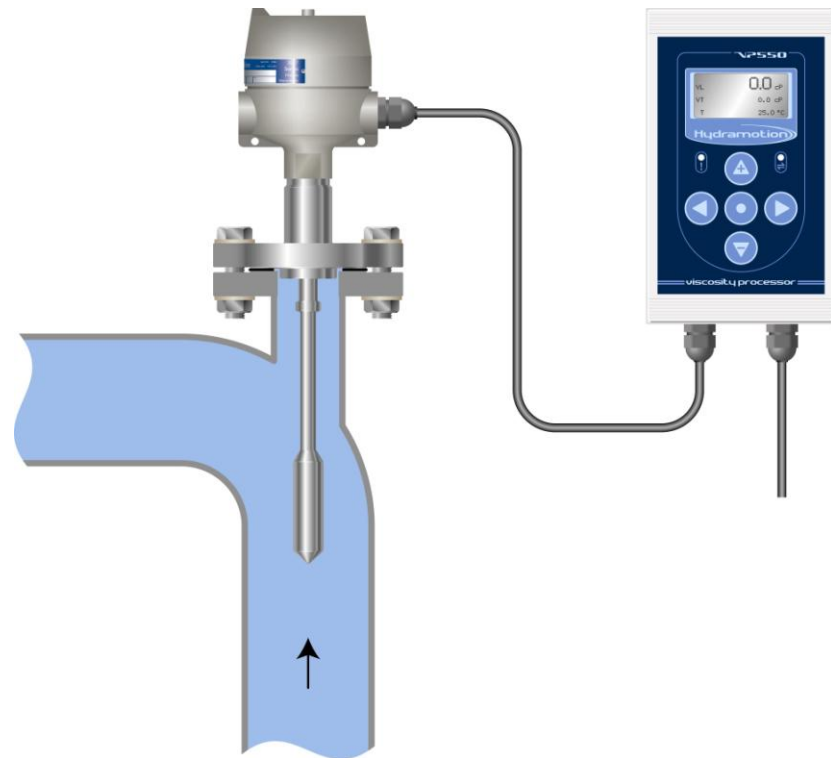
XL7 specification

range	0 – 1,000,000,000 cP
accuracy	±1% of reading
repeatability	±0.3% of reading
temperature (max)	–40 – +450 °C (HT2 model)
pressure	to process connection
materials	all 316 stainless steel; other materials on request
construction	all-welded crevice-free wetted parts
environmental rating	IP67



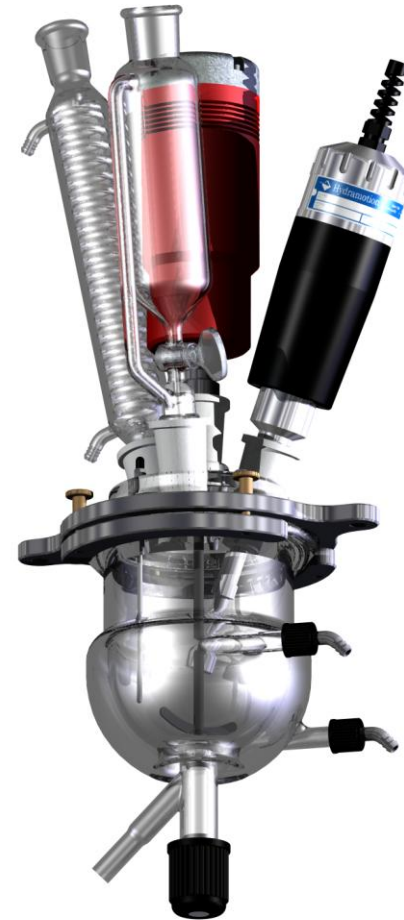
XL7 installation

- any size of pipe or tank
- any orientation
- “fit and forget”
- clean-in-place
- immune to plant noise



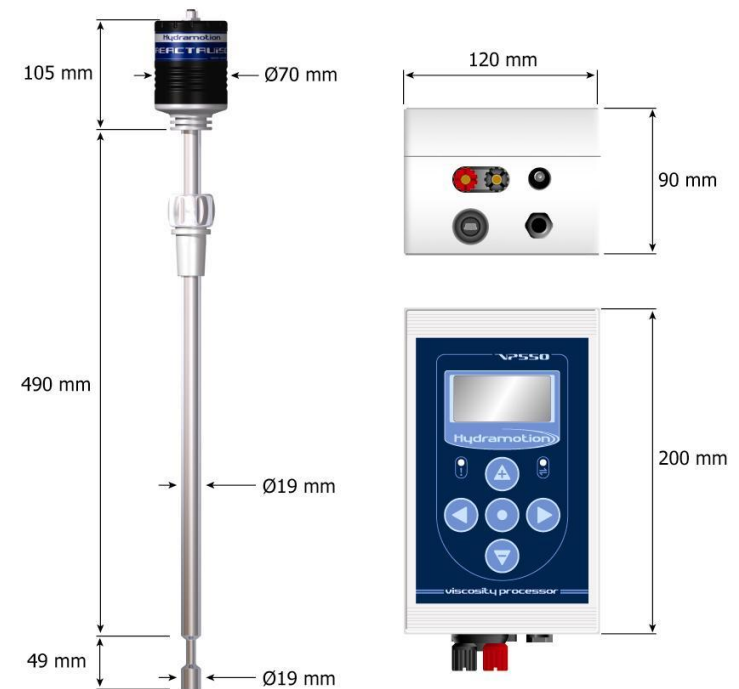
ReactaVisc reaction vessel viscometer

- fits any vessel
- high sensitivity
- compact design
- lightweight
- crevice-free sensor
- integrated temperature probe
- digital and analogue outputs



ReactaVisc specification

range	0 – 500,000 cP
accuracy	±1% of reading
repeatability	±0.3% of reading
temperature (max)	–40 – +150 °C
fitting	gland adapter
materials	wetted parts: 316 stainless steel enclosure: acetal (Delrin®)
construction	all-welded crevice-free wetted parts
environmental rating	IP65



Viscolite[®] VL700 portable viscometer

- fast
- accurate
- robust
- truly portable
- immerse – read – wipe
- temperature correction



Viscolite® VL700 specification

range	0 – 10,000 cP
repeatability	better than 1%
temperature (max)	-40 – +150°C
minimum sample	<i>standard VL700-S: 50 ml</i> <i>small-sample VL700-T15: 10 ml</i>
materials	<i>wetted parts: 316 stainless steel</i> <i>enclosure: acetal (Delrin®)</i>
power supply	4 × AA alkaline cells
environmental rating	IP65



Hydramotion – a summary

- Standard and bespoke solutions for all industrial viscosity applications
- Extensive specialist knowledge base in real time fluid physical analysis
- Wide ranging process and application experience covering all industry sectors and geographical territories
- Modern manufacturing facilities and highly accredited QA systems
- Dedicated highly skilled and creative R&D team
- Progressive innovation program to further develop new sensors for wider on-line fluid analysis applications
- Track record as successful partners in shared challenges for valued clients



...THANK YOU