



# Vo<sup>o</sup> Viscometer

Powered by Icon

## All Icon products are...

**Easy to use:** with an intuitive multilingual graphic user interface on a large armoured-glass wipe-clean touch-screen display.

**Certified to global standards:** ATEX, IECEx, UKEx, TIIS, EACEx, and ETL approved to give absolute confidence and peace of mind in hazardous areas and manufactured under an ISO9001:2015 certified Quality Management System.

**Robust and fully explosion proof:** with no air or inert gas purging required for safe operation in explosion hazard areas.

**Highly efficient:** with low sample consumption, sample flow monitoring, and minimal or no utility requirements.

**Safety assured:** with configurable general fault alarms, and a dedicated alarm for internal sample leakage.

**Flexible:** with auto validation or calibration options and standard Modbus, 4-20mA, and digital contact outputs.



## What does it do?

The Icon Viscosity analyser is used to measure the dynamic viscosity of a range of petroleum products including lube oils, lube oil stocks, biodiesel and fuel oils. Kinematic viscosity may also be calculated with a density input.

The results obtained may be directly correlated to standard test methods such as ASTM D445 and D2270.

## How does it work?

The unit works by measuring the differential pressure across a capillary tube at a constant flow rate. The use of a variable speed metering pump allows a single capillary tube to be used for an adjustable range of viscosity measurements. Precise temperature control is achieved by immersing the measuring capillary in a small stirred heated oil bath. The unit can accommodate a wide range of pressures and temperatures at the inlet and can return sample direct to the process.

## Why choose the Icon Scientific Viscosity Analyser?

**Proven reliable measuring principle:** the determination of viscosity by capillary tube measurement is the most widely accepted industry standard.

**Miniature oil bath:** for ease of maintenance by a single technician, whilst still maintaining reliable oil bath temperature control.

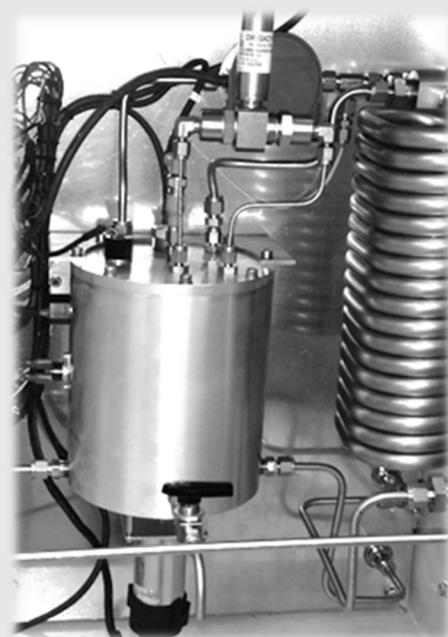
**Wide range of measuring temperatures and sample inlet/outlet conditions:** minimises the need for additional sample handling components, thereby simplifying the overall system design.

**User friendly multi-language interface:** uses the same common PC system as the other Icon analysers with user friendly 17" glass touchscreen graphic user interface with full size plotting of all parameters.

**Auto calibration and validation:** the analyser can be programmed to perform automatic validation and calibration on demand or on a timed basis.

**Pre-heat exchanger:** used to preheat incoming sample using residual heat from outgoing sample so that the sample is already close to the measuring temperature by the time it enters the oil bath.

**Viscosity index:** can be measured using two Viscosity analysers with two different bath temperatures (typically 40°C and 100°C) operating as a slave and master pair. Calculations are performed internally, and the viscosity index is outputted directly from the master analyser. Contact Icon for more details.



## Sample Requirements

<b>Inlet Temperature</b>	Within $\pm 50^{\circ}\text{C}$ ( $\pm 90^{\circ}\text{F}$ ) of the bath (measuring) temperature.
<b>Static Sample Pressure</b> (inlet & outlet)	Minimum 3 bar (43.5 psi) Maximum 15 bar (217.5 psi) Fast loop across analyser inlet/outlet.
<b>Fast Loop Flow</b>	Sufficient to ensure adequate response time for user.
<b>Sample Quality</b>	Filtered to 10 microns ( $\mu\text{m}$ ). Sample should contain no free water.
<b>Inlet Viscosity</b>	Typically 50 cP, but application specific. Contact Icon for details.

## Utility Requirements

<b>Instrument Air</b> Not Required (standard)	Cell enclosure cooling may be needed for bath temperatures $> 50^{\circ}\text{C}$ ( $122^{\circ}\text{F}$ ).
<b>Pressure</b>	0.2 bar (3 psi) for cell enclosure cooling (included) and optional electronics enclosure cooling.
<b>Consumption</b>	Typically 5-10 L/H
<b>Quality</b>	ISO 8573.1 Class 3 ANSI / ISA-7.0.0
<b>Coolant</b> Not Required (standard)	A suitable coolant may be needed for bath temperatures $< 50^{\circ}\text{C}$ ( $122^{\circ}\text{F}$ ). Potable water, or antifreeze mixture. (Do not use sea water)
<b>Inlet Temperature</b>	At least $10^{\circ}\text{C}$ ( $18^{\circ}\text{F}$ ) below the bath temperature set point.
<b>Inlet Pressure</b>	Maximum 15 bar (217.5 psi)
<b>Outlet Pressure</b>	Can be returned to pressure, provided minimum flow requirement is achieved.
<b>Flow Rate</b>	Stable flow of between 6-12 L/H
<b>Filtration</b>	100 microns ( $\mu\text{m}$ )
<b>Viscosity</b>	Maximum 10 cSt
<b>Breather</b>	Must be to atmospheric pressure.
<b>Power</b>	115VAC 50-60Hz, 230VAC 50-60Hz Max 1000VA

## Installation Requirements

<b>Location</b>	Unit must be located out of direct wind sun and rain.
<b>Ambient Temperature</b>	+5 to $+40^{\circ}\text{C}$
<b>Ambient Humidity</b>	0-95% RH, non-condensing.

## Control System

<b>Control System</b>	Based on fan-less industrial PC with solid state hard drive.
<b>Graphical User Interface (GUI)</b>	17" armoured glass touch-screen. The GUI is used to program the unit and display current and historical analyser results and alarm status.
<b>Language</b>	User-selectable multilingual display.

## Certification

<b>Hazardous Area Certification</b>	Exd certified to ATEX, IECEx & UKEx standards, suitable for zone 1 or zone 2 use in gas groups IIA, IIB, or IIB+H2, with a variable T-rating depending upon application. It is also ETL listed for the USA and Canada Class 1, Div 1, groups B,C,D.
<b>IP Ratings</b>	Tested and certified to IP66/IP67 (dust tight and protected from temporary total immersion in water).

## Specification

<b>Measuring Range</b>	Between 0-5 and 0-200 cP
<b>Measurement Temperature</b>	Maximum $135^{\circ}\text{C}$
<b>Repeatability</b>	Within the repeatability criteria of the ASTM D445 test for the measuring range and type of product under test.
<b>Response Time</b>	2-3 minutes to register 90% step change in viscosity at sample inlet.

## Inputs/Outputs

<b>Analog Outputs</b>	2 x 4-20mA (active) isolated outputs provided as standard for the bath temperature and for dynamic or kinematic viscosity results.
<b>Analog Inputs</b>	1 x 4-20mA (passive) inputs provided for external density input for calculation of kinematic viscosity.
<b>Digital (Contact) Inputs</b>	<b>Run / Standby:</b> reads a customer supplied latching switch to toggle between run and standby modes. <b>Remote Cal:</b> reads a customer supplied momentary switch to remotely initiate a calibration cycle. <b>Remote Val:</b> reads a customer supplied momentary switch to remotely initiate a validation cycle.

<b>General Fault Alarms</b>	Alarm limits can be configured for monitored conditions, and set to be Fatal, Warning, or Inactive. Active alarms are notified on screen and stored in the alarm history table.
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<b>Digital (Contact) Outputs</b>	<b>Fatal Alarm (NC):</b> a general fault alarm that causes the analyser to suspend its operation when triggered. <b>Warning Alarm (NC):</b> a general fault alarm for notification only. <b>Data Valid (NO):</b> indicates that the analyser is currently running on a process stream, and that data is valid. As opposed to when in standby, or when in Cal. or Val. modes. <b>Cal/Val (NO):</b> indicates that the analyser is currently in Cal/Val mode. <b>Spill / Bath High Alarm (NC):</b> an alarm contact that triggers if a leak is detected in the analyser enclosure, or if the oil bath high level is detected.  All contact ratings are 24VDC 0.5A, 230VAC 1A
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<b>Digital (Signal) Outputs</b>	<b>Calibration Valve:</b> provides a 24VDC signal to an external solenoid valve to switch between process and calibration samples. <b>Flush Valve:</b> provides a 24VDC signal to control an external switching system to flush the analyser when going into standby. This prevents process sample solidifying in the analyser as it cools.
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<b>Analog Inputs</b> Set of 2x inputs (optional)	The analyser can optionally read up to two 0-10V or 4-20mA active signals. These input values can each have high/low alarm levels associated with them to trigger either of the analyser's general fault alarms.
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<b>Digital (Contact) Inputs</b> Set of 4x inputs (optional)	The analyser can optionally monitor up to four volt-free external contacts or customer alarms. These contacts may also be included in the analyser alarm table to trigger the general fault alarms.
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<b>Communications</b>	Modbus RTU or OPC over RS485 or Ethernet (TCP/IP), with optional fiber optics. Optional OPC server software.
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## Viscosity Index (optional)

### Analog Outputs

2 x 4-20mA (active) isolated outputs provided for: **kinematic viscosity** between 'slave' to 'master' analysers, and **viscosity index** output from the 'master' analyser to the customer.

### Analog Inputs

1 x 4-20mA (passive) inputs provided to read the **kinematic viscosity** signal from the 'slave' analyser.

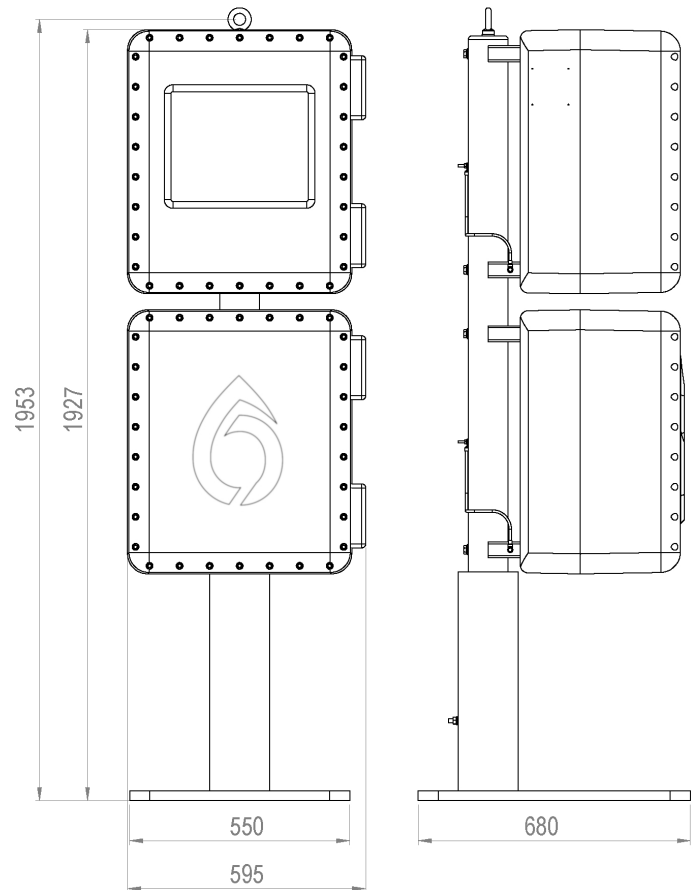
## Dimensions & Weights

### Notes:

All dimensions in mm

Unpacked weight approx. 417kg

Packed weight approx. 524kg



*Note: Icon Scientific products are subject to a program of continuous development and improvement and specifications are liable to change without notice. Please check that you have the latest information available before relying on any specification.*