



# VapourPressure

Powered by icon



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## All icon products are...

**Easy to use:** with an intuitive glass touch-screen, wipe-clean graphic user interface with multi-language options.

**Certified to the latest global standards:** ATEX and IECex approved to give absolute confidence and peace of mind in hazardous areas.

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

**Safety assured:** with an alarm for internal sample leakage.

**Highly efficient:** with low sample consumption and a sample flow monitor.

**Flexible:** with auto validation calibration options and standard modbus, 2x4-20mA and alarm contact outputs.

**Guaranteed:** with a two-year warranty if commissioned by icon scientific Ltd.

# What does it do?

The icon scientific VapourPressure Analyser measures the pressure exerted by vapour in equilibrium above a liquid at a specified temperature and vapour-liquid ratio. Vapour pressure is a measurement of volatility. Vapour pressure measurement finds use in crude oil, gasoline and liquefied petroleum gas production.

The VapourPressure Analyser uses the piston expansion principle to measure vapour pressure in line with the latest vapour pressure test methods. It can perform single or triple expansions, and while it normally operates at 37.8°C (100°F) and a 4:1 liquid vapour ratio, its measuring temperature and liquid-vapour ratios can be varied up to 60°C and 20:1. The liquid and vapour volumes are tracked by laser for unparalleled accuracy.

# How does it work?

The sample flows into a piston based measuring cell via low dead-volume solenoid valves, and is either flushed or isolated for measurement. Within the measuring cell, resistance thermometers enable the cell and sample temperature to be accurately controlled at the required measurement temperature. A small defined volume of the sample is held in place by the piston, which is moved to achieve the desired vapour-liquid ratio. Once equilibrium is established, the absolute pressure inside the cell is converted into actual vapour pressure as required by the test method being emulated.

# Why choose the icon scientific VapourPressure Analyser?

**Vapour pressure measured according to modern test methods:** results can still be correlated back to Reid Vapour Pressure by the use of published and accepted correlation factors.

**Precise temperature control:** using a Peltier cooler and cartridge heater, both the cell and sample temperature are accurately controlled and measured for better repeatability.

**Laser precise liquid-vapour ratio measurement:** provides superior repeatability.

**Test method adaptability:** variable piston expansion enables vapour pressure to be tested in accordance with various standard test methods.

## Applicable Test Methods

### The directly applicable test methods are:-

- ASTM D6377: Determination of Vapour Pressure of Crude Oil: VPCR<sub>x</sub> (Expansion Method).
- ASTM D6378: Determination of Vapour Pressure (VPX) of Petroleum products, Hydrocarbons, and Hydrocarbon-Oxygenate Mixtures (Triple Expansion Method).
- ASTM D6897: Vapour Pressure of Liquefied Petroleum Gases (LPG) (Expansion Method).

### The correlated test methods are:-

- ASTM D323: Standard Test Method for Vapour Pressure of Petroleum Products (Reid Method).
- ASTM D4953: Standard Test Method for Vapour Pressure of Gasoline and Gasoline-Oxygenate Blends (Dry Method).
- ASTM D5190: Standard Test Method for Vapour Pressure of Petroleum products (Automatic method).
- ASTM D5191: Standard Test Method for Vapour Pressure of Petroleum Products (Mini Method).
- ASTM D5188: Standard Test Method for Vapour-Liquid Ratio Temperature Determination of Fuels (Evacuated Chamber Method).
- ASTM D5482: Standard Test Method for Vapour Pressure of Petroleum Products (Mini Method-Atmospheric).



VapourPressure status screen



## Additional information

Measuring range	Standard ranges depending on pressure sensor are selectable within 0-1 bara, 0-2 bara, 0-5 bara and 0-16 bara. (Units are selectable between bara, psia and Kpa(a)).
Repeatability	Equal to or better than $\pm 0.5\%$ of fsd.
Reproducibility	Equal to or better than the reproducibility criteria of the relevant test.
Measuring temperature	Normally 37.8°C (100°F) but adjustable between 20-60°C.
Temperature control	$\leq \pm 0.1^\circ\text{C}$ .
Vapour-liquid ratio	Normally 4:1 but adjustable between zero to 20:1.
Cycle time	7-10 minutes depending on sample.

## Sample requirements

Filtration	Sample should be free from non-dissolved water and filtered to 10 microns.
Sample pressure at inlet	Sample should be supplied at a pressure greater than the expected maximum vapour pressure, but should not exceed a pressure of twice the maximum measuring range to avoid sensor damage.
Sample pressure at outlet	At least 0.5bar(g) below the inlet pressure.
Sample temperature at inlet	Between 5-60°C
Sample flow	Typically 1.0 L/h (through cell) and 20-30 L/h bypassed.

## Utility requirements

Instrument air	Not required.
Dry-down Nitrogen	Not required.
Coolant/Cooling water	Generally not required.
Power	115-220V ( $\pm 15\%$ ) AC 50/60Hz Maximum Consumption 500VA.

## Installation Requirements

Location	Unit should be located out of direct wind sun and rain.
Ambient temperature	The ambient temperature should be maintained between the limits of +5 to +50 °C.
Ambient humidity	0 to 95% relative humidity, non-condensing.

## Control System

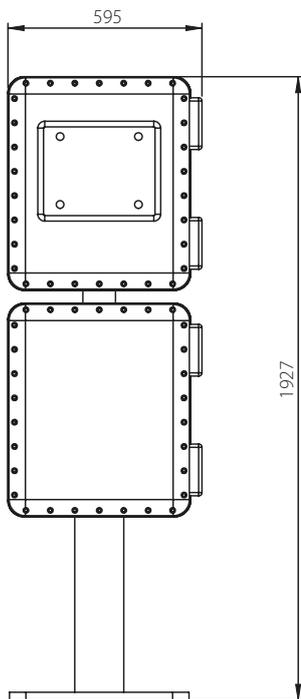
Control system	Based on fan-less industrial PC with solid state hard drive.
Graphical User Interface (GUI)	17" dual-touch touch-screen panel that can be wiped clean and operated with gloved hands. The GUI is used to programme the unit and display current and historical analyser results and alarm status.
Language	Screen language selectable between English, French, Spanish and Chinese (others on request).

## Inputs/Outputs

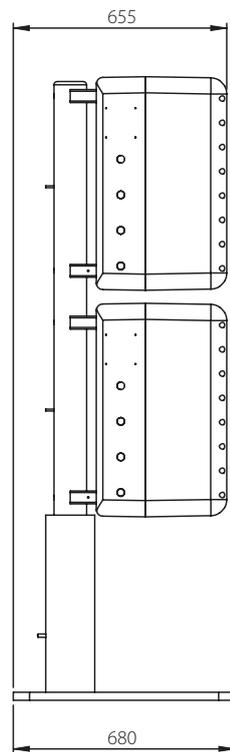
Analog outputs	2 x 4-20ma isolated outputs are provided as standard.
Modbus output	Wired Modbus RTU (RS485) and Modbus RTU over Ethernet available as standard.
Analog inputs	The analyser can read in up to four customer-provided 0-10V or 4-20mA signals. These inputs may be named, scaled and displayed and the values can have alarm levels associated with them.
Digital (contact) inputs	The analyser can monitor up to four volt-free external contacts. The contacts can be allocated names for screen display and may be included in the alarm table.
Alarms	<p>Any available alarm condition within the analyser may be allocated as active or inactive. Active alarms are notified on screen and stored in the alarm history table. Active alarms can be set by the user to activate a warning alarm contact or a fatal alarm contact.</p> <p>A warning alarm is for notification only while a fatal alarm causes the analyser to suspend its operation.</p>
Contact outputs	<p>In addition to the above Alarm contacts, the analyser also provides the following contact outputs.</p> <p>New Result: a two-second contact to notify that a new analyser result is available.</p> <p>Data Valid: this contact will operate if the analyser is operating but the data is not valid because calibration or validation is in progress, or the analyser is being run in manual mode.</p> <p>Service Alarm: the analyser monitors a number of internal functions and will warn the user if key items require service.</p> <p>All contact ratings are 24VDC 0.5A</p>
Hazardous area certification	<p>The icon Vapour Pressure Analyser is ATEX and IECEx certified Exd (Tamb. -20°C to +60°C) suitable for zone 1 or zone 2 use in gas groupings of IIA, IIB or IIB+H2 with a variable T-rating depending upon application.</p> <p>ATEX cert No. ITS10ATEX17191.</p> <p>IECEx certificate no. IECEx ITS 10.0060.</p>
IP ratings	Tested to IP66 (dust tight and protected from powerful water jets) and to IP67 (dust tight and protected from temporary total immersion in water).

# Dimensions & Weights

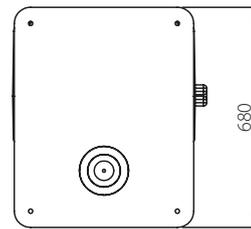
Front view



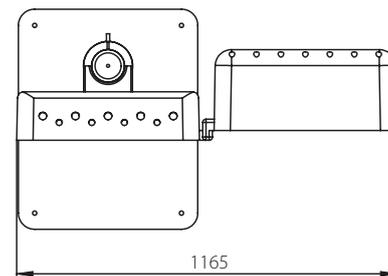
Side view



Top view



Top view with door open



## Notes:

All dimensions in mm

Unpacked weight approx 300kg

Packed weight approx 350kg

**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.

