



# Vp Vapour Pressure

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 Vapour Pressure analyser measures the pressure exerted by vapour in equilibrium above a liquid at a specific temperature and vapour-liquid ratio(s). Vapour pressure is a measurement of volatility, and finds use in gasoline, LNG condensate, crude oil, and liquefied petroleum gas production, especially for blending control, and also in terminals and storage applications.

The Vapour Pressure analyser uses the piston-expansion principle to measure vapour pressure in line with the latest vapour pressure test methods. Normal operation is at 37.8°C (100°F) and a 4:1 vapour-liquid ratio, however the measuring temperature and vapour-liquid ratios can also be varied up to 60°C and 4:1, allowing for single and multiple expansions. 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. A resistance thermometer within the measuring cell enables the cell 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 then raised to achieve the desired vapour-liquid ratio(s). Once equilibrium is established, the absolute pressure inside the cell is converted into actual vapour pressure as required by the test method being used.

# Why choose the Icon Scientific Vapour Pressure Analyser?

**Directly performs any modern ASTM vapour pressure test method:** taking advantage of newer methods and technology developed for specific product types and applications. Results can also be correlated back to Reid Vapour Pressure and other older methods using published and accepted correlation factors.

**Test method adaptability:** variable expansion ratios enable the vapour pressure to be tested according to any standard single and multiple-expansion test methods.

**Laser precise liquid-vapour ratio:** provides superior repeatability and precise piston expansions unaffected by measurements, sample, or age of the equipment.

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

**Reduced lab bias:** using the same methods as the lab allows for better bias management and tighter process control resulting in reduced giveaway.

## Applicable Test Methods

**Directly applicable standard test methods include:**

**ASTM D5191:** Vapour Pressure of Petroleum Products (Mini Method).

**ASTM D6378:** 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).

**ASTM D6377:** Vapor Pressure of Crude Oil (VPCR<sub>x</sub>) (Expansion Method).

Now approved by the EPA for environmental considerations and being adopted for all crude oil applications, ultimately replacing ASTM D323 (RVP).

The analyser can also perform "True Vapour Pressure" (TVP) analysis by extrapolation of a multiple expansion curve to a user defined Vapour liquid ratio as described in ASTM D6377. The analyser can also estimate the Gas Oil Ratio (GOR).

**Correlatable standard test methods include:**

**ASTM D323:** Vapour Pressure of Petroleum Products (Reid Method).

**ASTM D4953:** Vapour Pressure of Gasoline and Gasoline-Oxygenate Blends (Dry Method).

**ASTM D5190:** Vapour Pressure of Petroleum products (Automatic method).

**ASTM D5188:** Vapour-Liquid Ratio Temperature Determination of Fuels (Evacuated Chamber Method).

**ASTM D5482:** Vapour Pressure of Petroleum Products (Mini Method - Atmospheric).



*"Future-proofed with multiple pre-programmed ASTM methods available as standard."*

- ASTM D323 - RVPE
- ASTM D6377 - Crude Oil
- ASTM D6378 - Gasoline - Triple Expansion
- ASTM D5191 - DVPE
- ASTM D4953 - DVPE
- ASTM D6897 - LPG Vapour Pressure



## Sample Requirements

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| <b>Inlet Temperature</b>               | Minimum 0°C (32°F)<br>Maximum 60°C (140°F)   |
| <b>Inlet Pressure</b><br>(maximum)     | 7 barg (102 psig) for 2 bara sensors<br>20 barg (290 psig) for 5 bara sensors<br>25 barg (363 psig) for 20 bara sensors  |
| <b>Outlet Pressure</b>                 | Can be returned to pressure provided minimum flow requirement is achieved. Typically requires a minimum 2-bar differential across the analyser.<br><br>Optional internal sample recovery tank with pumped return to 5 barg (73 psig). For higher pressure return contact Icon. |
| <b>Sample Flow</b><br>(non-continuous) | Minimum 6 L/H<br>Recommended 15 L/H<br><br>N.B: Flow only during Flush/Rinse<br>Typical Consumption 2-4 L/H  |
| <b>Sample Quality</b>                  | Filtered to 10 microns (µm).<br>Sample should contain no free water.   |
| <b>Vent</b><br>(optional)              | Atmospheric, with continuous fall to vent point (for optional internal sample recovery tank only).   |

## Validation Requirements

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| <b>Inlet Temperature</b>               | Same requirement as for sample inlet.   |
| <b>Inlet Pressure</b>                  | Same requirement as for sample inlet.   |
| <b>Consumption</b><br>(non-continuous) | Typically 70 ml per validation cycle, with the optional internal validation valve fitted. |
| <b>Filtration &amp; Quality</b>        | Same requirement as for sample inlet.   |

## Utility Requirements

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| <b>Instrument Air</b> | Not Required (standard)   |
| <b>Pressure</b>       | 0.2 barg (3 psig) for optional cell and/or electronics enclosure cooling. |
| <b>Consumption</b>    | Typically 5-10 L/H  |
| <b>Quality</b>        | ISO 8573.1 Class 3<br>ANSI / ISA-7.0.0                                    |
| <b>Coolant</b>        | Not Required  |
| <b>Power</b>          | 115VAC 50-60Hz, 230VAC 50-60Hz<br>Max 500VA                               |

## Installation Requirements

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| <b>Location</b>            | Unit must be located out of direct wind sun and rain. |
| <b>Ambient Temperature</b> | +5 to +40 °C  |
| <b>Ambient Humidity</b>    | 0-95% RH, non-condensing.                             |

## Control System

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| <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

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| <b>Hazardous Area Certification</b> | Exd certified to ATEX, IECEx, UKEx, TIIS, and EACEx 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

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| <b>Measuring Sensor Ranges</b><br>(output freely adjustable within range) | 0-2 bara (0-29 psia)<br>0-5 bara (0-73 psia)<br>0-20 bara (0-290 psia)   |
| <b>Repeatability</b>  | Application dependent, but typically 0.04psi (0.3kpa) over 0-2 bara range.   |
| <b>Cycle Time</b>   | Typically 4-6 minutes for single expansion methods.<br><br>Typically 6-15 minutes for triple/multiple expansion methods. |
| <b>Vapour/Liquid Ratio</b>  | Normally 4:1 but adjustable as required by the analysis method.  |

## Inputs/Outputs

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| <b>Analog Outputs</b>            | 3 x 4-20mA (active) isolated outputs provided as standard for:<br><b>VP</b> results (method dependant)<br><b>TVP</b> and <b>GOR</b> (for ASTM D6377 only)   |
| <b>Digital (Contact) Inputs</b>  | <b>Run / Standby:</b> reads a customer supplied latching switch to toggle between run and standby modes.<br><br><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.   |
| <b>Digital (Contact) Outputs</b> | <b>Fatal Alarm (NC):</b> a general fault alarm that causes the analyser to suspend its operation when triggered.<br><br><b>Warning Alarm (NC):</b> a general fault alarm for notification only.<br><br><b>New Result (NO):</b> a variable-length momentary contact to notify that a new analyser result is available.<br><br><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 running validations.<br><br><b>Validation (NO):</b> indicates that the analyser is currently in validation mode.<br><br><b>Spill Alarm (NC):</b> an alarm contact that triggers if a leak is detected in the analyser enclosure.<br><br>All contact ratings are 24VDC 0.5A, 230VAC 1A |

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| <b>Digital (Signal) Outputs</b> | <b>Validation Valve:</b> provides a 28VDC signal to an external solenoid valve to switch between process and validation samples. |
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| <b>Analog Inputs</b><br>Set of 4x inputs (optional) | The analyser can optionally read up to four 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><br>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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## Stream Switching (optional)

### Control Modes

Stream switching control can be assigned to any of the following selectable modes:

- Digital Input (up to 2 streams)
- Modbus (up to 3 streams)
- OPC (up to 3 streams)
- Internal Stream Switching Table (up to 3 streams)

Each stream can be individually named and can have their own ASTM method assigned from the internal stream switching table or over Modbus.

An additional validation stream (with an optional dedicated inlet and internal validation stream selection valve) is also available and is controlled independently of the process stream switching modes selected above.

### Analog Outputs (additional)

3x additional 4-20mA (active) analog outputs provided for VP, TVP, and GOR results from stream 2.

Stream 3 results are available over Modbus and OPC only.

The current stream number is also available over Modbus and OPC.

### Digital (Contact) Outputs (additional)

**Current Stream:** this contact indicates the current stream, applicable when stream control is by digital input.

### External Device Signals

28VDC signals provided for external stream selection solenoid valves.



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.

## Dimensions & Weights

### Notes:

All dimensions in mm

Unpacked weight approx. 418kg

Packed weight approx. 525kg

