

## Model 1354

### Vapour Pressure Analyser

The ATAC Model 1354 is a completely automatic Vapour Pressure Analyser for measuring the Reid Vapour Pressure (the vapour pressure exerted by a liquid at 100° F/37.8°C) for a wide range of refinery streams. Accurate measurements that correlate with ASTM D323 (D1267 for LPG) can be made on samples having viscosities up to 80 cP at the measurement temperature.

- Fast, continuous vapour pressure analysis
- Correlates to ASTM D323/D1267 and IP69 test methods
- Exceeds test method repeatability
- Accurate, reliable absolute pressure measurement
- Industry standard communications - HART, Fieldbus or Modbus
- Repeatability of 0.1 psi (0.007 bar)

#### TYPICAL APPLICATIONS

- Liquefied Petroleum Gas
- Gasoline
- Naphtha's/Kerosene's
- Crude Oil

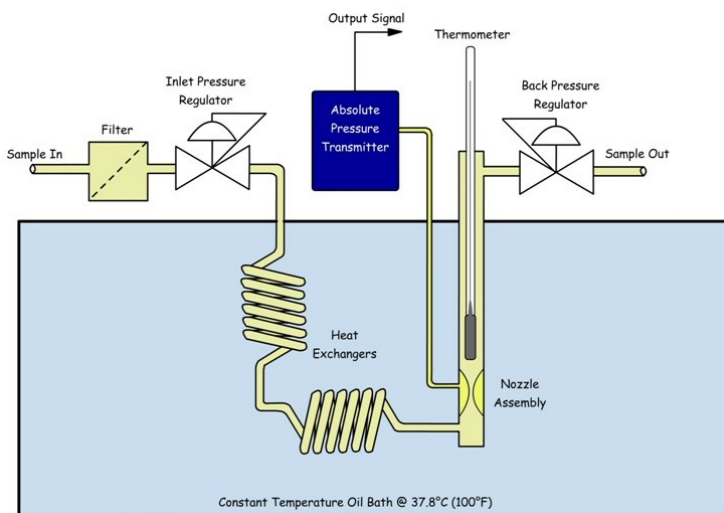
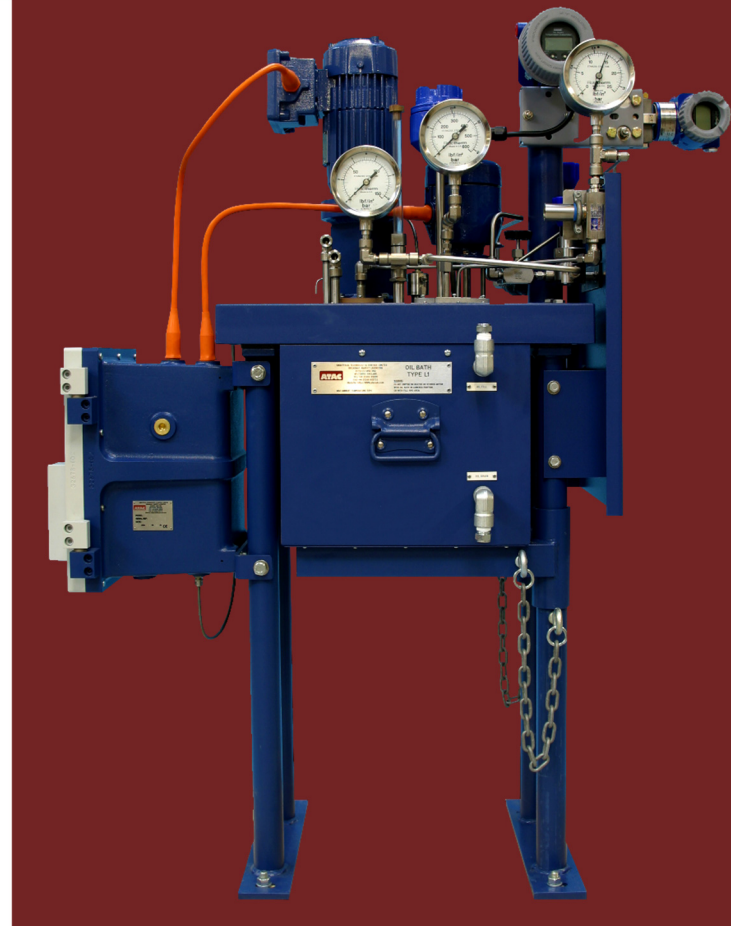


Figure 1: Model 1354 schematic



#### PRINCIPLE OF OPERATION

The Model 1354 RVP analyser schematic is shown in Figure 1. The measured sample flows under constant temperature and pressure through a nozzle which is mounted inside a venturi shaped aspirator. As the sample is forced through the nozzle, its fluid velocity increases. This creates a pressure drop sufficient to vaporise the liquid.

The relationship between the fluid velocity and pressure is given by the flow energy equation:

$$(V_1)^2 + P_1 = (V_2)^2 + P_2 + F_2$$

Where  $V_1$  = Fluid Velocity At Inlet,  $V_2$  = Fluid Velocity At Outlet,  $P_1$  = Inlet Pressure,  $P_2$  = Outlet Pressure  $F_2$  = Fluid Friction Loss

If  $V_2$  is sufficiently large while  $V_1$  and  $P_1$  are held constant then, ignoring friction, the pressure of the fluid out of the nozzle can be reduced to the effective vapour pressure of the sample.

Since the fluid temperature is held constant and the pressure at the nozzle inlet is maintained at a level that causes vaporisation of the sample, the pressure at the nozzle output is effectively the Kinetic Vapour Pressure, (KVP).

This pressure is measured by an absolute pressure transmitter which gives a continuous output and is calibrated to equal the Reid Vapour Pressure (RVP). A back pressure regulator prevents back flow of the sample and vaporisation in the output line.

The sample passes through a pressure regulating valve before the nozzle to maintain a constant inlet pressure. Critical components are immersed in an oil bath at a fixed temperature which is controlled by a precision temperature controller, heater and, when necessary, water cooling. The temperature is monitored by the relevant ASTM (IP) thermometer.

The analyser can be fitted with the customer's choice of pressure transmitter to include either a 4-20 mA with HART output or the alternatives of Foundation Fieldbus or Modbus communications.

## SPECIFICATIONS

<b>Analyser performance</b>	Accurate measurements can be made from samples having viscosities up to 80 cP
<b>Available ranges</b>	From 0 – 1.6 barA standard (other spans and other units of measurement available)
<b>Repeatability</b>	± 0.007 bar (0.1 psi)
<b>Precision</b>	Within ASTM D323 (ASTM D1267 for LPG)
<b>Response time</b>	Better than 50 seconds
<b>Output signal</b>	Range: 4-20 mA fully isolated loop powered and/or digital output depending on selected transmitter Out-of-service alarm contact signalling mains failure (or off) or bath temperature fuse blown. 2 sets c/o contacts rated at 25A @ 250V or 12A @ 120V
<b>Sample pressure (g)</b>	Depends on the back pressure at the analyser outlet but must normally exceed [outlet pressure (bar) x 2.5] + 7 bar. Standard max pressure 40 bar (580psi)
<b>Sample temperature</b>	Should remain within the range 25°C - 50°C (77°F - 120°F). Fluctuations must be minimal and not exceed 5°C (9°F).
<b>Sample flow</b>	55-230 litres/hour (12-50 gallons/hour) depending on back pressure
<b>Sample conditioning</b>	Complete sample systems can be supplied to pre-condition process sample to the conditions required at the analyser inlet.
<b>Sample disposal</b>	Return to process or a recovery system. Sample recovery systems can be supplied.
<b>Power supply</b>	Voltage 115V or 230V ± 10% single phase. Frequency 50 or 60 Hz. Consumption 2.0 kVA
<b>Cooling water</b>	A supply of potable water at up to 135 l/h (30gal/h) and at a temperature ≤30°C (Maximum Pressure 7 barG) should be provided to carry away excess heat. The necessary coil is fitted as standard. If potable water is not available alternative cooling coil materials can be provided.
<b>Oil for temperature bath</b>	11 litres (2.5 gal) of Shell Thermia B or equivalent. Reid vapour pressure tests are carried out at 37.8°C (100°F), but with this analyser, temperatures up to 110°C (240°F) may be selected and controlled to ±0.1°C.
<b>Local display</b>	Gauge indicates absolute vapour pressure. 0 - 100% linear scale on the transmitter
<b>Standard connections</b>	Sample inlet ¼" NPT (male)
	Sample outlet ¼" NPT (male)
	Cooling water ¼" NPT (female) IN
	Cooling water ¼" NPT (female) OUT
	Electrical ISO M20 Standard (½" NPT NEC) Signal out: As transmitter specification, either EExd or EExia with 4-20mA isolated output and / or digital output.
<b>Explosion protection options</b>	This analyser is ATEX certified for use in Zone 1 hazardous areas II 2G EEx d e ia IIB T4 Certificate no. ITS 09ATEX16356X Option: II 2G EEx d e ia IIB + H2 T4 Certificate no. ITS 09ATEX16357X
<b>Environmental protection</b>	Will operate satisfactorily under normal ambient temperature conditions between 0 and 55°C (32-130°F) but should be sheltered from direct sun and rain - see options below. Frost protection is recommended for water cooled analysers.
<b>Dimensions</b>	Width: 500mm Length: 900mm Height: 1400mm Weight: 180kg *Allow Extra for Access
<b>Mounting</b>	Floor fixing bolt holes (4 off 5/8" dia) at 448 mm (17 5/8") x 351 mm (13 13/16") centres
<b>Options</b>	<ul style="list-style-type: none"> <li>• Configuration for CSA local approval</li> <li>• Cooling coil in Hastelloy C or Monel</li> <li>• Digital bath temperature transmitter and/or indicator instead of spirit thermometer</li> <li>• Vapour pressure of LPG to ASTM D1267 – How is this an option!?</li> <li>• Choice of pressure transmitter to include HART, Foundation Fieldbus or Modbus communications. (Remote diagnostics from DCS or hand held communicator)</li> <li>• Environmental protection to IP65</li> <li>• ATEX cert IIB + H<sub>2</sub></li> </ul>