



Analytical  
Technology  
& Control  
Limited

## ATAC Hone 'Freezar' Model 4302 Freeze Point Analyser

### MEASURES THE FREEZING POINT OF AVIATION FUELS

The Model 4302 Freezar is a completely automatic process stream analyser for measuring the freeze point of aviation fuels. The analysis is performed in correlation with ASTM D2386 / IP 16.

#### TYPICAL APPLICATION

- Jet fuel blending

#### PRINCIPLE OF OPERATION

The Freezar is a microprocessor controlled, on-line freeze point analyser designed to measure the freezing point of any product that falls within the scope of the ASTM D 2386 / IP 16 laboratory tests.

The laboratory test involves cooling the fuel until a slurry of wax crystals forms throughout the fuel and then measuring the temperature at which all the crystals disappear on re-warming the fuel.

A test cell is filled with sample and cooled at a controlled rate until an optical detector senses the formation of a wax cloud. The cell is then warmed at a controlled rate until the wax crystals disappear.

The temperature of the cell at this time is output as an isolated 4 - 20 mA signal. This is the freeze point. Typical cycle time 10 - 20 minutes.

On completion of each test cycle, the cell is flushed with fresh sample and, after a short settling time, the freeze point analysis is repeated.

#### **Freeze point test cell**

The test cell uses a light source mounted at right angles to a photo detector which responds to light reflected from the forming wax cloud.

The use of this reflective principle offers considerable advantages over directly transmitted light detection since it is easier to determine small increases of light against a dark background. The sensitivity of the optical system allows precise freeze point measurement to be made on samples containing appreciable amounts of dissolved water.

#### **Control system**

The analyser incorporates a microprocessor based control system which controls the valve sequence timing and cooling rate, as well as implementing freeze point detection, status reports and output scaling.

#### **Sample flush time**

The time taken to flush the test cell with fresh sample is variable from 0 - 255 seconds.

#### **Settling time**

The time allowed for the sample to settle in the cell before commencement of the cooling sequence is variable from 0 - 255 seconds.



**ONE OF THE ATAC RANGE OF PROCESS ANALYSERS**

### Cooling sequence

The analyser cools the cell at 3°C / minute until wax crystals form. At this point the cell is allowed to warm at 1°C / minute until the wax disappears.

### Freeze point detection

The freeze point sensor and temperature sensor outputs are both read into the microprocessor system. The freeze point detection is based on the rate of change in the freeze point sensor output. This ensures that the freeze point detected is independent of any initial reflectance.

### Output scaling

The microprocessor scales the temperature into an isolated 4 - 20 mA output which is preset to individual requirements within a range -10°C to -60°C.

### Status reports

At all times, the Freezar informs the operator of analyser status via an in-built 28 digit alphanumeric display.

Three items of information are continuously displayed:

- The sequence or error status of the analyser.
- The current value of the sequence timer or the freeze point sensor output.
- The current cell temperature and the last freeze point.

An error state is notified by a flashing display.

The sequence states are indicated on the LED display as follows:

FLUSH  
SETTLE  
COOL  
WARM  
STROBE

The error states are:

STANDBY  
BULB FAIL  
COOLER FAIL  
FLUSH ERROR  
LOW FLOW  
RANGE LOW  
RANGE HIGH  
DELTA LOW  
DELTA HIGH  
TIME OUT  
EXT. 1  
EXT. 2

## SPECIFICATION

### Analyser performance

Range -10°C to -60°C  
Span 47°C maximum  
Repeatability ± 0.5°C.  
Accuracy Better than or equivalent to laboratory test.  
Cycle time 10 to 20 minutes typical.

### Output signal

Range 4 - 20 mA fully isolated.  
Load impedance 700 ohms maximum connected load.  
Four sets of volt free contacts for alarm condition are available, rated 0.5 amps at 250V ac.

### Typical alarms

2 external  
Cooler fail  
Low flow  
Out of range

### Sample conditions required at inlet

Pressure 0.5 to 1 bar g  
Temperature ≥ 25°C above maximum expected freeze point.  
45°C maximum.  
Flow 15 to 25 litres / hour free of water and entrained solids.

### Sample conditioning

The analyser will accept samples having the inlet conditions above. Complete systems can be supplied to condition sample as required at the analyser inlet.

### Sample disposal

The analyser sample outlet must be connected to a system which is at atmospheric pressure. Sample recovery systems can be supplied.

### Analyser vent

The analyser must be vented to atmosphere.

### Utility requirements

#### Power supply

Voltage 110 / 120V or 220 / 240V  
ac ± 10%  
Frequency 50 or 60 Hz  
Consumption 400 VA maximum

#### Cooling water

Temperature - 5°C to - 10°C  
Pressure 0.1 bar g  
Consumption 20 litres / hour

### Local display

A 28 character alphanumeric LED display provides signal and diagnostic information. Standard display is in English language.

### Standard connections

Sample in ¼" API (female)  
Drain and vent ½" API (female)  
Cooling water ½" API (female)  
Power and signals M20

### Explosion protection

The analyser is ATEX certified  
II 2G EEx d IIB T5 (T<sub>amb</sub> +55)  
for use in zone 1 hazardous areas.  
Certificate no. DEMKO 03 ATEX 135888

### Environmental protection

Whilst the analyser is weatherproof to IP55 and will operate in ambient temperatures within the range +5°C to +35°C, a weatherproof shelter is strongly recommended.

### Dimensions and weight

Height 1750 mm  
Width 650 mm  
Depth 330 mm  
Weight 160 kg

### Options

- Multi-stream applications
- Automatic calibration sample injection

4302 APR 2007

For further information contact :-



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