



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.



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:

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_{amb} +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



MINDEX

Mindex Limited

Unit 6, Gatwick Metro Centre
Balcombe Rd, Horley, Surrey
RH6 9GA, United Kingdom
Tel: 44 (0) 1293 408123
Fax: 44 (0) 1293 408 125
email: sales@mindex-ltd.co.uk
web: www.mindex-ltd.co.uk