MINIMUM FILM FORMING TEMPERATURE BAR MFFTB

Instrument Manual

RHOPOINT INSTRUMENTS LTD

MFFTB Operation Manual

DRD1212-380 Revision M
June 2021

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SPECIFICATION

Platen:	Copper, dull, nickel plated (other options available)
Platen Dimensions:	483min x 235min
Parallel Tracks:	Using 1" cube applicator (maximum 10)
Weight:	38kg (85 lb)
Dimensions:	550mm wide x 350mm high x 610mm deep
Temperature:	Digital readout of temperature.
Interface:	LED touchscreen, temperature cursor
Output:	Optional results printer
Indication:	LED indicators- heating, cooling, coolant failure
Alarms:	Audible and visual for water flow failure.

SERVICES REQUIRED

WARNING: THIS INSTRUMENT MUST BE EARTHED

Mains:	220 - 240 volts AC 110 - 120 volts AC
Air:	4 litres/min at 100 psi.
Water:	Normal mains supply or recirculation and chiller unit
Water Temperature:	15°C maximum for lowest temperature range operation.
Water Drain:	Gravity

ACCESSORIES

The MFFTB is supplied complete with the following;

MFFTB Instrument

Mains cable

Air connector

Water connectors

Cube applicator 75μm x 1'' cube

Quantity - desiccant

Quantity - indicator crystals

Five hypodermic type dispensers

Spare fuses

Instruction manual

OPTIONAL EXTRAS

Additional cube applicators

Re-circulating water unit

MINIMUM FILM FORMING TEMPERATURE MFFT

'The "minimum film forming temperature" has been described as "the minimum temperature at which a water-borne synthetic latex or emulsion will coalesce when laid on a substrate as a thin film. When this process occurs, in the absence of pigmentation or other opacifying materials, a clear transparent film is formed. At lower temperatures than the minimum, a white, powdery, cracked film will result''.

The minimum film forming temperature is usually closely related to the glass transition temperature (Tg) but not synonymous with it; whilst the Tg may be determined by predicted calculation, the minimum film forming temperature is best determined by the use of a MFFT Bar, the basic principles of which are described in ASTM D2354. Early instruments were usually cumbersome, inaccurate and slow to achieve equilibrium.

PRINCIPLE OF OPERATION

A nickel plated copper platen is electronically cooled at one end and warmed at the other end. Air or nitrogen is caused to flow over the surface, from cool end to warm end as a uniform blanket. To achieve the required degree of uniformity the air or gas is delivered via a carefully designed sintered distribution block; the design is such that freezing does not take place at the inlet.

For use with air, a drying system is incorporated into the housing together with a flow controller. The air dryer contains indicator crystals, which are clearly visible in a transparent container. The complete air conditioning system is readily accessible at the side of the instrument.

Water at normal mains pressure removes the excess heat from the coolers. Quick release couplings are provided. Water is normally drawn from a laboratory tap and the outlet is run to drain by gravity. Alarms, both audible and visual are actuated in the event of cooling water supply failure.

Temperature sensors are mounted under the surface of the platen. These are used to control the temperature of the platen in accordance with the chosen range. They are also used in conjunction with the temperature cursor to indicate the platen temperature at the MFFT point.

A hinged perspex cover over the platen provides thermal insulation whilst allowing visual inspection of the determination as it progresses. The transparent temperature cursor is mounted on the cover to identify the exact film forming temperature.

OPERATING RANGES

	Operating Temperature °C									
	Range 0	Range 1	Range 2	Range 3	Range 4	Range 5	Range 6	Range 7	Range 8	Range 9
Cool End	-10	-5	0	+5	+15	+23	+33	+43	+53	+63
Warm End	+8	+13	+18	+23	+33	+50	+60	+70	+80	+90

SET TIME AND DATE/ ADJUST CALIBRATION

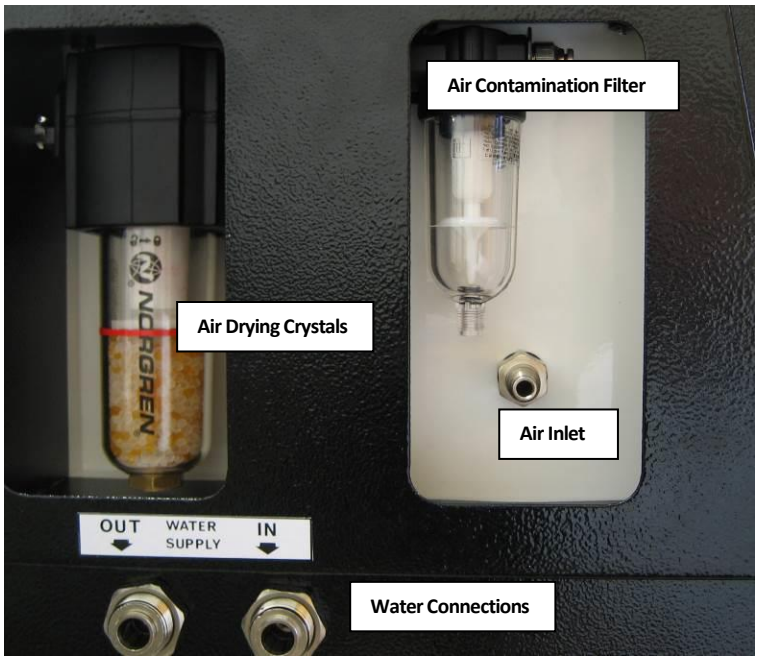
When powering up the instrument press and hold all three buttons on the front of the instrument to adjust time and date settings/ calibration constants.

Contact authorised Rhopoint Instruments Agent for more information about instrument calibration.

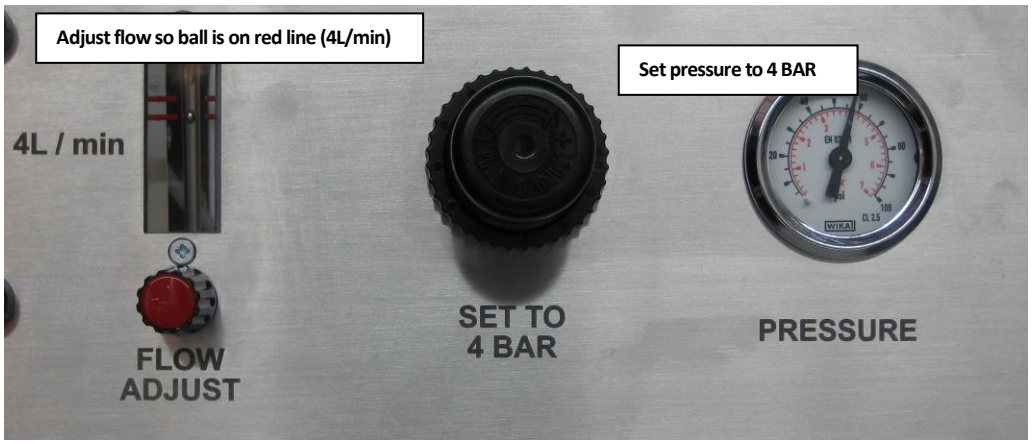
WARNING- CALIBRATION SHOULD ONLY BE ATTEMPTED BY AUTHORISED CALIBRATION PERSONNEL. FAILURE TO ADHERE TO CALIBRATION ROUTINE MAY RESULT IN ERRONEOUS READINGS.

OPERATING INSTRUCTIONS

- Check that the platen is clean and free from grease.
- Check that air dryer indicator crystals are orange. If green, change crystals; unscrew transparent container, empty refill with activated alumina and gel indicating crystals.
- Connect airline via coupler on right hand side of air control panel.



- Connect cold mains water and gravity water drain.
- WATER IN is right spigot, left spigot is WATER OUT.
- Close cover.
- Turn on water. A water valve ensures water only flows when cooling lamp is ON.
- Turn on air supply. Flow rate should be set to 4 litres/minute using flow indicator.



- Plug in mains 240V 50Hz or 115V 60Hz dependent on model.

- Switch on.

- Select desired temperature range on touch screen.

Use up and down buttons to select range.

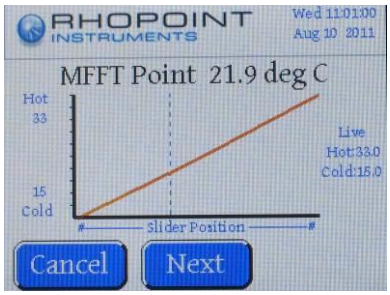
Wait for instrument to stabilise.

An audible "chirp" will indicate readiness.

- The touch screen will indicate when equilibrium is reached; an audible "chirp" will sound.

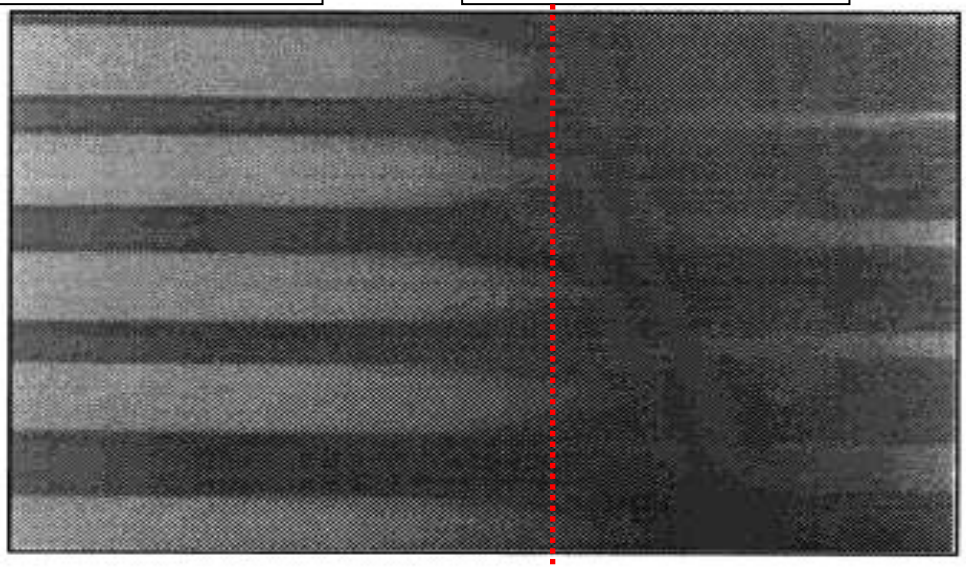
TESTING INSTRUCTIONS

- Apply emulsion using 75 micron cube applicator from warm end right to cold end left, or in U-Shaped form starting and finishing right hand side.
- Apply control strip using emulsion of known MFFT. Up to 10 single tracks can be applied.
- All coatings should be applied within ten minutes. If there is a delay in applying a track, close the cover to prevent ice formation, reopening the cover as soon as the next coating material is ready.
- The use of several applicators is recommended if more than one emulsion is to be applied. Pre-fill hypodermic type dispensers with emulsion to further reduce preparation time.
- Close the Perspex cover.
- Periodically check the films, film formation time depends on temperature but all films should be formed in approximately 1 hour.
- When films have formed (see illustration) set the temperature cursor to read point on track where the film has coalesced over 90% of the track width.



Move the slider to the MFFT point.

Print optional results label.



MFFT point indicated on five identical films.

PIGMENTED EMULSIONS

The MFFT bar is sometimes used for tests on pigmented emulsion, where the MFFT determination is more difficult because there is no clearly defined change in "colour" of the coalesced film.

There is, however, a slight change in the shininess of the surface and using a wooden spatula, lightly scraped on the surface, it is easy to define where the coalesced film stops and where the remaining film is poorly integrated and heavily cracked with very poor adhesion.

CLEANING

- Immediately after use the platen should be cleaned; the most common method is to use a dilute detergent.
- Solvents to the particular coating can be used.
- Some users apply the coatings to self-adhesive plastic tape or film which has been laid on the platen. The temperature error due to the intervening layer is said to be about 0.1 °C. Cleaning is accomplished very quickly - the method commends itself when the MFFT bar is used for production control.
- Other users lay aluminium foil over the platen before testing. A few drops of glycerine placed between the foil and platen ensure good thermodynamic contact and allow the foil to be smoothed out evenly.

REPLACING FUSES

- The MFFT is protected from drawing too much current by two fuses, situated in a compartment above the mains input.
- With the instrument unplugged, use a tool such as a flat head screwdriver to open the compartment. There are two fuse holders with white arrows on to indicate the direction. Slide these out, and test the fuses with a multimeter.
- If the fuses have blown, replace them with the spares provided.
- If the instrument still does not power up, or the fuses blow again, please contact your supplier for support.

Certificate of Conformity

This is to certify that device known as

Rhopoint-Hanatek
Minimum Film Forming Temperature - MFFT

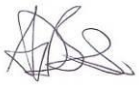
has been tested and found to satisfy and comply with the CE Marking requirements of the relevant parts and portions of the specifications listed below.

Tested By:

27 February 2012

Marc Dekenah (on behalf of Rhopoint Instruments) Date:

Accepted and Logged By:



23 January

Tony Burrows (Managing Director, Rhopoint Instruments)

Date:

BS EN 61010-1:2010 Clause 6
BS EN 61000-4-2:2009
BS EN 61000-6-3:2007
BS EN 61000-6-1:2007

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EU Directive 2002/96/EC on WEEE (Waste Electrical & Electronic Equipment) and RoHS (Restriction of the use of certain Hazardous Substances).

The European Union's Directive on Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (ROHS) defines each of 10 categories of electrical and electronic equipment in Annex I . Category 9 is defined as follows:

9. Monitoring and control instruments
Smoke detector
Heating regulators
Thermostats
Measuring, weighing, or adjusting appliances for household or as laboratory equipment
Other monitoring and control instruments used in industrial installations (e.g. in control panels).

The RoHS Directive defines the scope of restrictions in Article 2 as follows:

"1. Without prejudice to Article 6, this Directive shall apply to electrical and electronic equipment falling under the categories I, 2, 3, 4, 5, 6, 7 and 10 set out in Annex IA to Directive No 2002/96/EC (WEEE) and to electric light bulbs, and luminaires in households."

This product is supplied as a Monitoring and Control instrument and as such falls within category 9 of the EU directive 2002/96/EC and so is excluded from restrictions under the scope of the RoHS Directive.

The Waste Electrical and Electronic Equipment Directive is intended to reduce the amount of harmful substances that are added to the environment by the inappropriate disposal of these products through municipal waste.

Some of the materials contained in electrical and electronic products can damage the environment and are potentially hazardous to human health; for this reason the products are marked with the crossed out wheelie bin symbol which indicates that they must not be disposed of via unsorted municipal waste.

Rhopoint Instruments Ltd have arranged a means for our customers to have products that have reached the end of their useful life safely recycled. We encourage all end users to us at the end of the product's life to return their purchase to as for recycling as per Article 9 of the WEEE Directive.

Please contact us on +44 (0) 1424-739622 and we will advise on the process for returning these waste products so we can all contribute to the safe recycling of these materials.