Operating Instructions

Gradient plate

MFFT 10 (VF9600)
MFFT 20 (VF9700)
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1 Preface

Devices of the MFFT series are used for determination of the Minimum Film Formation Temperature, white point temperature, synthetic-resin-, stoving-varnish- and dispersions glass transition temperature, as well as determination of endload and stackability of coated papers, films, printings, etc.

Examinations are possible acc. to following norms (if needed, with special accessories)

DIN 53 787 / 74 Testing of aqueous Plastic Dispersions Determination of Minimum Film Formation and white Point Temperature.

ISO 2115 / 76 (draft 94) Plastics - Aqueous Dispersions of Polymers and Copolymers - Determination of white Point Temperature and minimum Film-forming Temperature.


ASTM D 2354/86 Test Method for Minimum Film Formation Temperature (MFFT) of Emulsion Vehicles.


2 Commissioning

2.1 Damage during Transportation

The package of the device prevents the latter from any damage during transportation. If you could unexpectedly recognise any damage of the device or attached packed parts, please inform the shipper and allow him to examine the damage.

In any case, please contact us directly at first, before you send us back the damaged device, as well as in any other cases of faults. Many problems can be often solved directly on site.

2.2 Placing

Please place the measuring system only on a level floor. Using a spirit level, check if the device is placed horizontally and align it by screwing the adjustable feet, if necessary.
2.3 Power supply
Before plugging the power plug of the device into a socket, please check whether the input power data given on the nameplate meet the values of your power supply (standard values are 230 V, 50 Hz)

<table>
<thead>
<tr>
<th>Caution!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate the device only using the appropriate grounding!</td>
</tr>
</tbody>
</table>

Before switching on the device, all device system cables must be plugged. When connecting or plugging a cable, switch off all devices!

2.4 Connecting the cooling thermostat with power supply
Before switching-on the devices, the thermostat shall be installed (e.g. KWK 10, purchasable as accessory). For that purpose, please read the separate Operating Instructions for the cooling thermostat. In order to achieve faultless temperature gradients at low temperatures, the device shall be connected to a cryostat (e.g. COESFELD-KWK).

The interfaces for cooling devices are on the back surface of the device (see Fig. 2). Inlet and outlet collars are marked by their symbols. The hose connections shall be clad with insulation hoses to prevent cold losses.

In cooling thermostats, please fill a suitable liquid which can be used also for maximum permissible temperature range without any danger (be careful in case of alcohol!).
3 Device Description

The device consists of a polished hard-chromium metal plate (measuring plate). The samples shall be put on that plate. Through heating and cooling the measuring plate, a temperature gradient results within the range of -30 to +250 °C, and remains constant for a desirable time.

The measuring plate provided with 10 or 20 temperature sensors (Pt100 DIN 43 760). The distances between measuring locations are 25 mm in MFFT20 or 50 mm in MFFT10.

Using an integrated multi-channel digital thermometer (6), you can measure temperature along all the range.

3.1 Accessories

For checking the minimum film formation temperature (MFT), you shall prevent the measuring area from air draft using a hood. There are two versions for that:

The standard version consists of a hood with a flanged air dryer attachment. A desiccant (e.g. silica gel) shall be filled into the drawer of the attachment. The integrated air pump allows an air flow over the measuring plate.
### No. | Meaning
--- | ---
1 | Holding Grips
2 | Measuring plate
3 | Power switch
4 | Thermal actuator
5 | Thermal control lamp
6 | Operator panel
7 | ENTER key
8 | Decrement measuring location
9 | Increment measuring location
10 | Decrease set value
11 | Increase set value
12 | Measuring location temperature
13 | Measuring location set value
14 | Measuring location number
15 | Covering hood
16 | Pump switch (only old MFT)
17 | Control wheel airflow
18 | Display
19 | Control lamp

### Display

<table>
<thead>
<tr>
<th>No.</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Sensor short circuit LED</td>
</tr>
<tr>
<td>b</td>
<td>Sensor break LED</td>
</tr>
<tr>
<td>c</td>
<td>OK LED, the green LED shows a normal trouble-free operation, and the temperature values are achieved.</td>
</tr>
<tr>
<td>d</td>
<td>Exceeded temperature LED. The set value was exceeded</td>
</tr>
<tr>
<td>e</td>
<td>Too low temperature LED. The set value is still not achieved</td>
</tr>
<tr>
<td>f</td>
<td>The values are shown in Fahrenheit degrees</td>
</tr>
<tr>
<td>g</td>
<td>Watchdog LED, the maximum permissible temperature (HI value) was exceeded or there are problems with power supply, or a faulty part is detected</td>
</tr>
<tr>
<td>h</td>
<td>The values are shown in Celsius degrees</td>
</tr>
</tbody>
</table>
1 Power supply connection  
2 Main fuse  
3 Cooling (out)  
4 Cooling (in)  
5 Air Unit complete (max. 6 bar)  
6 Air support (blue)

max. 0.2 MPa
4 Operation

For determination of the minimum film formation temperature ("MFFT"), products are applied onto the measuring plate by a film drawing device and then protected by a covering hood against ambient air. Products which can cause problems with cleaning shall be put onto a thin aluminium film what is to be rubbed on the measuring plate.

For determination of the block points, the samples on the measuring plate shall be loaded with defined weights simulating stack height.

4.1 Process of a trial

- Switch on the cooler
- Switch on the MFT device
- Set the desired values (see Chapter 4.2.4)
- Wait until the right temperature is reached
- Apply the sample (close the hood, if provided)
- After the measuring time is elapsed, read the measuring results
- Switch off the device
- Switch off the cooler

4.2 Switching on the device

The device is switched on by the line switch (see Fig. 1, No. 3).

After switching on the MFFT, the regulator executes a self-test. After successful test, the regulation starts automatically, and the current temperature of the measuring location 1 is shown.

Airflow switch ON/OFF

Using the switch 17 (Fig. 1), the intern pump can be switched on and off. So you can move samples over the plate with or without airflow (only old versions of MFT). MFFT Version provides the airflow by connecting air on the back side (2-6 BAR/PSI compressed air is needed) The air flows from the cool side to the warm side.

Adjust the airflow with the adjust wheel (17) on all devices.
4.2.1 Operating keys

The regulator can be operated with 5 keys:

- "E"-key to acknowledge input data (Fig. 1, No.7)
- two arrow keys for selection of the measuring location to be displayed (Fig. 1, No. 8 and 9)
- two arrow keys for setting the desired values (Fig. 1, No. 10 and 11)

4.2.2 Display

Display from the right to the left:

1. Number of the selected measuring location (14)
2. The set value for that measuring location (13)
3. The current actual value for that measuring location (12)

4.2.2.1 Scanning Mode

In the scanning mode, all measuring locations are displayed automatically one by one, with 3 seconds for each. A point near the measuring location number means "scanning mode".

To enter the scanning mode, please press key 9 (Fig. 1) and hold about 1 second. Then the device will switch to the scanning mode itself, as soon as all set values are achieved within some tolerance. To quit the scanning mode, please press key 8 (Fig. 1).

4.2.3 Main set values

You can set values only on the first and on the last measuring location. On the first measuring location, the cold temperature is set, and on the last one, the warm temperature is selected.

4.2.4 Status Display

4.2.4.1 Blinking -H- in the display of actual value

This message appears when the temperature of the selected measuring location is 15°C higher than the set value. That is quite normal during transient, especially for a cold measuring point.
4.2.4.2 Blinking -L- in the display of actual value

This message appears when the temperature of the selected measuring location is 15 °C lower than the set value. That is quite normal during transient, especially for a warm measuring point.

4.3 Excess Temperature

For security reasons, the device is provided with a protective thermal relay. If the maximum temperature is exceeded the heating circuit will be interrupted, so that the overheating will be prevented. In such a case, the signal lamp lights up (Fig. 1.3). The switching threshold can be set by the user.

For setting the excess temperature threshold, turn the rotary knob (Fig. 1.4) to the desired position. The threshold shall be some degrees higher than the operating temperature.
5 Defect Analysis

5.1 LED lamps do not light

Caution

Only trained staff is allowed to open the device and change the fuses!

Before opening the device, pull out the power supply plug!

Check the main fuse on the back surface of the device. After opening the back surface of the casing, you can operate the fuses of the temperature regulator directly. (2 regulators in MFFT)

<table>
<thead>
<tr>
<th>Function</th>
<th>Location</th>
<th>Fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main fuse</td>
<td>back surface MFFT</td>
<td>6,3 A MT</td>
</tr>
<tr>
<td>Regulator fuse</td>
<td>back surface of the regulator (the first one from the left)</td>
<td>0,5 A MT</td>
</tr>
<tr>
<td>Heating output fuse</td>
<td>back surface of the regulator (all others)</td>
<td>16 A FF</td>
</tr>
</tbody>
</table>

5.2 Device does not heat

If the control lamp for excess temperature lights up, set a higher value. If this does not help, a heating output fuse might be faulty.

5.3 Actual value is -E-

Sensor short circuit; please contact our after-sales-service.

5.4 Actual value is -S-

Sensor short circuit; please contact our after-sales-service.

5.5 -HELP-

Please contact our after-sales-service.
6 Konformitätserklärung / Deklaration of conformity

Die Firma / the company

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erklärt, dass dieses Gerät mit folgenden Richtlinien und Normen konform ist:
declares, that this device conforms with EC guidelines and norms for the CE mark:
Artikel / Article: MFFT 10 / 20
Artikel Nr / article-no: 50-130
Modell / model: -----

EU Richtlinien / EC guidelines
EMV-Richtlinie / EMC guidelines: 89/336/EWG
Niederspannungsrichtlinie / low voltage guideline: 73/23/EWG

EU Normen / EC norms
Sicherheitsbestimmungen für elektrische Laborgeräte / safety requirements for electrical laboratory devices: EN 61010-1:1993 (VDE 0411)
Elektromagnetische Verträglichkeit (EMV) / electromagnetic compatibility (EMC): EN 61000-6-3/61000-6-2

Nationale Normen / national norms
Elektrische Sicherheit von Geräten / Electrical Safety of devices: DIN VDE 0701ff

Datum / date: Name / name: Unterschrift / Signature:
2008-08-14 Reinhold Kipscholl
## 7 Cleaning and maintenance

A periodical maintenance is a condition for a permanent failure-free function of the MFFT 10/20

### 7.1.1 Checks before each using sequence

The MFFT 10/20 should be clean before a using is started. Remove all old samples or splitters.

### 7.1.2 Periodical maintenance and calibration

Periodical maintenance and calibration should only be done by certified service engineers.
8 Accessories

9 Disposal

It is not allowed to give testing units to the public waste management authorities. According to the European Directive 2002/96/EC and the Electrical and Electronic Equipment Act (or ElektroG), of 16. March 2005, the recycling of COESFELD testing units has to be ensured.

The registered manufacturer of this testing unit is being observed by the German governmental office of environment and obliged to make a redelivery possible. According to this fact they are willingly to make an appropriate offer.

Registration Number: 94025320