

CAF Digital & illumination for biofuels & solid recovered fuel testing

Designed to meet the following standards:

DD CEN/TS 15404:2006 Solid recovered fuels – Methods for the determination of ash melting behaviour by using characteristic temperatures

Final Draft prCEN/TS 15370-1 October 2005 Solid biofuels – Methods for the determination of ash melting behaviour – Part 1: Characteristic temperatures method



The above image shows the digital CAF with standard illumination and optional zoom lens.

Introduction

Ash melting is a complex process where shrinkage, sintering and swelling can occur.

The test method specified in the standards provides information about fusion and melting behaviour of the composite inorganic constituents of the fuel ash at high temperatures.

The test method is empirical. The ash used for the test is a homogeneous material, prepared from the fuel and the determination is performed at a controlled rate of heating in a controlled atmosphere. In contrast, under full-scale conditions, the complex process of combustion and fusion involve heterogeneous mixtures of particles, variable heating rates and gas compositions.

The terms ash fusibility and ash softening are synonymous with ash melting.

The published standards require that the temperature is measured and recorded at 4 points: the initial rounding of the test piece, when the test piece has softened, when melted to a hemisphere and finally when it flows into a puddle.

The Furnace

The CAF furnace is designed to heat ash samples up to a maximum temperature of 1600°C in a controlled atmosphere and visually record the fusion of the samples for analysis. At these temperatures, there is good contrast between the sample and its background.

Biomass and combined (biomass/mineral) fuels frequently exhibit much lower fusion temperatures. The biomass option for the CAF digital overcomes this by the addition of an illumination system to provide improved image clarity at lower temperatures.

For applications using the smaller cylindrical sample, the test piece mould will be supplied as standard from April 2010.

The furnace work tube is sealed and has a 'fail safe' gas control system for safety when testing with toxic and flammable gases. A sliding and rotating door mechanism provides unrestricted access to the work tube, allowing easy loading and unloading of the test samples using the sample loading tool provided. The large diameter work tube can accept up to 12 samples at any one time. The use of lightweight insulation allows the furnace to cool quickly, permitting multiple tests to be completed during the day.

An optional zoom lens (additional cost) is recommended for viewing up to 3 of the 3-5mm high samples of the following standards:

- DD CEN/TS 15404:2006 Solid recovered fuels – Methods for the determination of ash melting behaviour by using characteristic temperatures
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The start and finish temperatures can be pre-set and the rate of temperature rise is adjustable within the parameters of the relevant published standards. Independent over-temperature protection is provided by a separate temperature controller using its own thermocouple and contactor to override the heating circuit.

Gas controls:

A 'fail-safe' gas system is incorporated into the furnace. Oxidising or reducing gases are automatically introduced into the work tube during an ash fusibility test. The flow rate and required atmosphere are controlled from the furnace control panel.

To ensure operator safety, the following features are included:

- safety purge of the work tube prior to and after carrying out an ash fusibility test;
- 'Purge Gas Failure' audible and visual alarm;
- safety purge of work tube in the event of a power failure during a test;
- test in progress indicator to warn the operator that oxidising or reducing gases are present within the work tube;
- 'gas tight' work tube

Digital image Recording:

An image from the video camera is captured at specified time and temperature intervals and stored on computer in sequence order, including date, time, a batch identifier and the temperature at the point of capture. A real time image of the samples is displayed on the computer monitor throughout the test. The precise stages of fusion are then determined by quickly and accurately scrolling through the stored images to the required point and recording the deformation temperature using the automatic results feature in the software. To ensure accurate comparison of height and width, a grid overlay feature is provided in the software. The scale of the grid is adjustable and can easily be moved on the screen to analyse each sample in turn.

A results print out can easily be generated using the test software. Also, the results and their associated images can be easily imported into a Windows based word processor and spreadsheet software package. Tests can be stored on computer disc for future analysis and a high density storage media and drive are provided to allow compact and secure archiving of test data.

Furnace Specification:

Furnace cabinet dimensions (mm) * (h x w x case depth x overall depth)	700 x 505 x 765 x 970
Work tube dimensions (mm) (internal id)	79
Tube material	Mullite
Maximum no of samples	12
Maximum temperature °C (°F)	1600 (2912)
Maximum recommended heat up rate °C/minute (°F/minute)	8 (15)
Heating elements	Silicon carbide
Temperature control	Digital PID with multi offset parameters
Temperature sensor	Pt & Pt/13%Rh thermocouple
Overtemperature protection	Digital with single high alarm relay
Power switching	Solid state relays
Power supply	380/415V, 50/60Hz, two phase, 25A/phase or 220 & 240V, 50/60Hz, single phase, 50A Other voltages available on request
Maximum power consumption (kW)	7
<u>Gases:</u> Reducing gas or Oxidising gas or Purge gas or	60% (V/V) CO + 40% (V/V) CO ₂ 50% (V/V) H ₂ + 50% (V/V) CO ₂ CO ₂ Air N ₂ (for use with CO/CO ₂) CO ₂ (for use with H ₂)

Image Capture Specification:

The following equipment is supplied:

Both units are supplied with a monochrome video camera. The standard lens is suitable for the 12.4mm test piece of the British/IS) and the 19mm (3/4") test piece of ASTM standards.

An optional zoom lens is recommended for viewing up to 3 of the 3-5mm high samples of the following standards:

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The computer controlled digital image system also includes a high specification PC, (and TFT flat screen) incorporating a frame grabber card and high capacity removable data storage medium, and Microsoft Windows and Microsoft Office software.

Standard accessories

- Sample carrier
- Sample tiles
- Sample loading tool
- Test piece mould
- External mounting proprietary CO alarm

Optional accessories:

- Optional zoom lens

A comprehensive spares kit is available - please ask for details.



Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.



UK Office

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Please note - Product designs and specifications are subject to change without notice. The user is responsible for determining the suitability of this product.