



# CONCEPT EQUIPMENT

## CONE CALORIMETER

ISO 5660 PART 1

BS 476 PART 15

ASTM E 1354

ASTM F 1550

ASTM E 1740

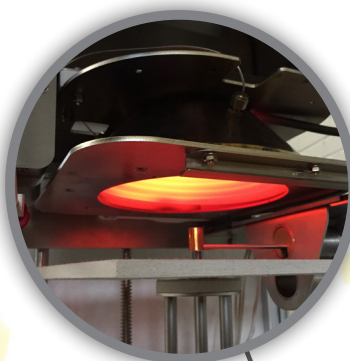
ASTM D 5485

ASTM D 6113

NFPA 264

NFPA 271

CAN ULC 135



THE ULTIMATE IN FIRE TESTING



# The Concept Cone Calorimeter

## Standards

ISO 5660 PART 1

- Reaction to Fire Tests – Heat Release, Smoke Production and Mass Loss Rate

BS 476 PART 15

- Tests on Building Materials to Measure the Rate of Heat Release

ASTM E 1354

- Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter

ASTM F 1550

- Standard Test Method for Determination of Fire-Test-Response Characteristics of Components or Composites of Mattresses or Furniture for Use in Correctional Facilities after Exposure to Vandalism, by Employing a Bench Scale Oxygen Consumption Calorimeter

ASTM E 1740

- Standard Test Method for Determining the Heat Release Rate and Other Fire-Test-Response Characteristics of Wall Covering or Ceiling Covering Composites Using a Cone Calorimeter

ASTM D 5485

- Standard Test Method for Determining the Corrosive Effect of Combustion Products using the Cone Calorimeter

ASTM D 6113

- Standard Test Method for Using a Cone Calorimeter to Determine Fire-Test-Response Characteristics of Insulating Materials Contained in Electrical or Optical Fibre Cables

NFPA 271

- Standard Method of Test for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter

NFPA 264

- Method Of Test For Heat And Visible Smoke Release For Materials And Products Using An Oxygen Consumption Calorimeter

CAN ULC 135

- Standard Method of Test for Determination of Degrees of Combustibility of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter)
- UKCA and CE compliant

Part Number: 304000





## Features and Benefits

### Cone Heater:

- Tubular heater element rated at 5000 watts at 230 Volts, conically wound to a truncated cone shape producing uniform irradiances of up to 75kW/m<sup>2</sup>, measured 25mm below heater face over the 100mm x 100mm specimen exposure area
- Heater temperature is monitored and controlled by three type-K thermocouples with 3-term, PID temperature control with digital communications to software
- Spark ignition and specimen shield are push button/software actuated, not manual
- Computerised calibration of heat flux level
- Combustion area surrounded by transparent toughened glass screens to prevent drafts during test and to provide the operator with protection from potentially hazardous smoke and toxic gases produced during testing

### Exhaust System:

- Stainless-steel construction of combustion area exhaust hood, duct, orifice plate, exhaust fan and gas sampling ring probe
- Variable speed stainless-steel fan with a nominal operational flow rate of 0.024m<sup>3</sup>/s, software controlled
- Thermocouple temperature measurement at sampling point and at smoke measurement point
- Calibrated pressure transducer for determining exhaust flow rate
- Easy to disassemble for routine maintenance or service

### Weighing System:

- Independently floor mounted weighing system for maximum stability
- Total range of 6Kg
- Resolution better than +/- 0.01g
- Constructed to minimize effects of temperature
- Software calibration and scaling
- Thermally protected with calcium silicate protection cladding
- Stainless-steel enclosure

### Specimen Holders:

- Two stainless steel specimen holders, one horizontal, one vertical
- Retainer frame and grid included for each specimen holder
- Can accommodate specimens measuring 100mm x 100mm x 50mm thick
- Easy loading of test specimens into holder







## Features and Benefits

### Heat Release Calibration:

- Calibration burner for burning pure methane to calibrate heat release measurement (for determination of C-factor)
  - Calibrated mass flow controller used to control gas flow. Supplied with manufacturers' calibration certificate
  - Computerised calibration of O<sub>2</sub>, CO/CO<sub>2</sub> analyser together with a hydrocarbon measurement
  - Software adjustment of gas flow to allow user to set energy level for calibration of burner
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### Heat Flux Meter:

- Computer controlled procedure for setting exposure irradiance of specimen under test
  - System stores preset heat flux levels and can send to the controller for testing at various heat flux levels
  - Computer control of heater temperature controller
  - Schmidt-Boelter-type heat flux meter
    - Water cooled
    - 0-100kW/m<sup>2</sup> range
    - NIST traceable calibration certificate
  - One complete heat flux meter assembly included (daily use)
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### Smoke Measurement System:

- Laser light source optimised at 633nm
  - Main beam and reference beam (compensation) detectors
  - Absorptive type glass 0.3OD and 0.8OD neutral density calibration filters
  - K-type thermocouple temperature measurement
  - Software calibration and scaling
  - Remote external adjustment of optics for easy adjustment
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### Gas Sampling and Analysis System:

- The measurement equipment is housed in a free-standing mobile rack unit
- The main component included in the measuring system is the Heat Release Analyser which can combine the functions of the oxygen analyser and the CO/CO<sub>2</sub> analyser. It also includes a hydrocarbons cell as standard, giving an indication of HC levels.
- Custom-designed heat release analyser encloses all the analytical electronics, flow controllers and digital interfaces into a module with low swept volume which provides ultra-fast response
- The unit brings together the necessary analyser and data acquisition components into a single package so reducing the number of interconnected subsystems normally found in heat release measurement
- The heat release analyser can combine the functions of the oxygen analyser, the CO/CO<sub>2</sub> analyser and also includes a hydrocarbon transducer giving an indication of HC levels
- Oxygen analysis is via a precision temperature controlled paramagnetic cell offering the high resolution and low drift characteristics essential for oxygen depletion measurement
- Dead volume in the sample stream is minimised throughout and volume flow through the device maximised to optimise response time



## Features and Benefits

- Pressure is accurately set on the feed to the analyser to maintain gas flow pressure for precision measurement of sample gas
- Sample flows are monitored by electronic mass flow sensors to allow precise adjustment of flow stability within the system to enable maximum accuracy of gas measurement
- The unit includes inputs for all standard additional sensors used in heat release measurements such as pressure, smoke and temperature
- The analyser provides a range of connectivity options such as analogue voltage, RS485 and USB connectivity
- Carbon dioxide and monoxide measurements are included via a high stability NDIR bench incorporating the latest enhanced optics
- Complete gas sample preparation instrumentation is included in the mobile rack unit which provides a clean noncondensing sample gas stream with automatic drain
- The unit includes a main sample filter with large area filter surface but low dead volume, multi-path electronic gas cooler and hardy sample pump. Internal back up filters are also fitted
- Standard flow rate is 8l/min although higher flow rates are available
- An RS485 digital interface provides remote control of the sample pump, calibration gas input valves and monitoring of cooler gas temperature
- System specifications:
  - O<sub>2</sub> analyser: Range 0-25%; Resolution 0.001%; Response T10-T90 <12s
  - CO<sub>2</sub> analyser: Range 0-10% volume; Resolution 0.01%; Response T10-T90 <12s
  - CO analyser: Range 0-1% volume; Resolution 0.001%; Response T10-T90 <12s
  - Hydrocarbon analyser: Range 0-200ppm; Resolution 1ppm
  - Main sample flow 0-8l/min (other flows available)
  - Analogue input has programmable range and high resolution
  - Update scan rate adjustable down to 1 second

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### Software:

- Together with the above hardware and data acquisition, data is produced for instantaneous heat release, total heat release, mass loss rate, net heat of combustion, rate of smoke production and toxic CO/CO<sub>2</sub> gas yields
- Windows 10 computer included with 27" HD monitor
- Simplified automatic calibration
- The system software allows testing and report generation to be carried out with minimum effort
- During a test, all data channels are displayed together with elapsed time, ignition, flameout, rate of heat release and time averaged heat release, smoke level and duct flow
- A graphical plot of heat release and the ability to plot multiple channels in real time is also provided
- Automatic data reduction is provided to satisfy ISO 5660 as well as offering extended facilities to improve data evaluation in difficult test scenarios and graph generation, including in 3D
- All data can be exported to other spread sheet and word processing programmes using both file export and copy and paste functions
- An Excel report template is also included for automated calculations of results and display of required graphs required for ISO 5660 and ASTM E 1354. These can be customised to users requirements



## Technical Data

Electrical	230V AC 50Hz 32Amp / 115V AC 60Hz 50Amp Single Phase
Ambient Temperature	Operating 10°C to 35°C
Product Dimensions	2420mm (H) X 2140mm (W) 700mm (D)
Shipping Details	Approx. Crated: 1970mm (H) x 2360mm (W) x 1460mm (D) – 642Kg
Service/Maintenance	Concept recommend that equipment be serviced every year in order to ensure reliable service
Calibration	Apart from periodic calibrations by operators, heatflux meters, mass flow controller, pressure transducers need to be calibrated regularly. Please contact us for more information



## Services Required

Space	3m x 1.5m minimum floor space with a free height of 2.5m. Concrete floor to be very flat, even and smooth with suitable loadbearing screed. Recommended 100kg/m <sup>2</sup> as a minimum
Gas Requirements	<p><b>Methane:</b></p> <p>The ISO standard requires the methane to be of at least 99.5% purity. The regulator attached to the methane cylinder must be capable of supplying 20 litres per minute with an adjustable line pressure of 10-20 PSI</p> <p>During the commissioning of the Cone Calorimeter, enough methane should be available for at least 40 minutes of burning at 20 litres per minute at STP (i.e. approximately 800 litres)</p> <p>Inlet: 6mm Swagelok fitting</p> <p>For normal working practice (daily calibration), expect to use between 30 and 100 litres each working day</p> <p><b>Oxygen Analyser Zero Gas:</b></p> <p>Oxygen-free nitrogen must be available to zero the gas analyser. The line must be capable of supplying a typical line pressure of about 10-30 PSI.</p> <p>The nitrogen must be dried before being passed through the oxygen analyser</p> <p><b>CO/CO<sub>2</sub> Span Gas:</b></p> <p>A suitable span gas mixture should also be available. The line must be capable of supplying a typical line pressure of 10-30 PSI</p>
Air Supply	Dry and filtered compressed air at nominal 45psi, 3-4 bar. Has to be regulated with an isolator valve. The air must be supplied via an approved regulator
Water Supply	<p>The Cone Calorimeter requires cooling water for the heat flux meter and the cold trap. It is a very minimal flow. A pressure regulator set at 250kPa (35psi) should be provided if the mains pressure is likely to undergo surges greater than this value</p> <p>Cooling water may be taken directly from the mains supply provided that it is clean and controllable. The water should be cooler than 25°C. A drain line is also required</p> <p>An optional Recirculating Chiller is available if required.</p> <p>Water Inlet: 6mm Swagelok fitting 0-1 ltr/m, nominal room temperature.</p> <p>Water Outlet: 6mm Swagelok fitting to drain.</p>
Extraction	<p>A variable extraction system with an extraction rate of 0-400l/sec needs to be used.</p> <p>An indirectly mounted exhaust hood should be used above the exhaust duct of the Cone Calorimeter as specified in the test standard. A 600mm x 600mm truncated stainless steel hood, connected to the facility exhaust system would be suitable. Hoods can be supplied as optional extras. Please contact us for more information</p>

# Documentation



Manual in English

Concept Equipment Certificate of Compliance in English

Manufacturer's calibration certificate for heat flux meter

Manufacturer's calibration certificate for methane mass flow controller

Manufacturer's calibration certificate for calibration weight

Calibration certificates for specific items can be provided at additional cost and must be requested at time of quotation or order

Due to Concept Equipment's policy of continuous product development, technical information is subject to change.

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