



## Cone Calorimeter

ISO 5660-1, 2 & 3 and ASTM E 1354

FIRE's reputation is founded solidly on the principle of providing the highest quality instrumentation backed by over 30 years of expertise in the fire testing field. FIRE is in the forefront of fire testing instrumentation through the manufacturing and testing activities of the Fire Laboratory of the University of Gent and Warrington Fire Research and drawing on the long term involvement of FIRE personnel in their previous companies.

Rate of heat release is well understood to be one of the most important parameters for determining the fire hazard that may be presented by material or a product. The most accurate and elegant method of measuring heat release is using oxygen depletion calorimetry. The Cone Calorimeter has gained very wide acceptance worldwide since it has been shown that, in many fields, its results can be used in a range of fire models for furniture, cables, building materials, etc.

FIRE has considerable in-depth experience in this field, which is evidenced in the design of our New Generation Cone Calorimeter which incorporates the latest technology and control systems and complies with all recent national and international standards. This new instrument is designed to be straightforward to operate and as automatic as possible with excellent and easy-to-use software both for control and processing of data.



## Features

- Purpose designed PLC control and permanent software integration to give unrivalled functionality, performance and ease of use.
- Background system monitoring facility. Continuously checks the operation of the instrument and sensors. If there is a problem, the software will highlight the specific component and sound an audible alarm as appropriate. This facility covers thermocouples, safety doors not closed, methane gas supply, shutter, heated filter, water flow in heat flux meter and all status checking within the gas analysis rack.
- Unique Calibration facility allows the Cone heater to be set up at various irradiance levels, performs a methane calibration and calibrates the gas analysis instrumentation completely automatically without the intervention of an operator. All of the calibration data is stored for retrieval if necessary.
- Conical heater rated at 5000W at 230 V to give a heat output up to 100kW/m<sup>2</sup> in either the horizontal or vertical orientation. Uses PLC PID 3-term temperature control. Shutter mechanism for both horizontal and vertical orientations. Electronic positioning interfaced with PLC control system for automatic test commencement by wireless remote control or direct instrument control.
- Spark ignition with special purpose electrode using a 10kV generator. Electronic positioning with safety interlocks. Will only allow sparking to commence when all safety door interlocks made.
- Test area has toughened glass doors with safety interlocks. Stainless steel base-plate and back-plate houses all electrical and gas connections. Incorporates the independently mounted mass loss unit.
- Load cell mounted independently of the main framework for superior stability and accuracy to 0.1g. Avoids any vibration problems from exhaust fan. Load cell is protected with a ceramic plate and a stainless steel enclosure to guard the unit from radiated heat and test debris. Fitted with mechanical stop and has digital display of mass along with software display. Push button electronic and software tare. Fully integrated with PLC control and data acquisition system.
- Electronic cone height adjustment at either 25 or 60 mm to allow for standard testing or for testing intumescent specimens.
- Supplied with high quality stainless steel sample holders for specimens 100 x 100 mm square and up to 50 mm thick, complete with standard edge retainer.
- Methane calibration burner with mass flow controller coupled with the PLC for unmatched precision. Calibrated water-cooled heat flux meter for accurate irradiance measurement.
- Quick-connect and disconnect gas analysis rack which can also be wheeled away for use on other large scale calorimeter rigs. All the advantages of a single purpose Cone but with this added flexibility.
- Gas sampling through a heated (200°C) ceramic filter, which can be used for several tests before changing. Can

readily be washed and re-used. Superior heat exchanger with refrigerator unit, which cools the sample gas to 5°C.

- Oxygen and CO<sub>2</sub> analyser with pressure compensation supplied as standard with total PLC integration, giving full auto-calibration routines and diagnostics.
- Exhaust system uses heavy gauge stainless steel ducting for minimum distortion. Soot sample and FTIR ports and ring sampler are standard. Orifice plate pressure measurement and quick response temperature measurement points.
- Stainless steel variable speed fan rated to 300°C with a noise level lower than 62 dB at 50 Hz. The fan is adjustable within the software for ease of use.
- Integrated high specification personal computer with an integrated LCD Flat screen monitor. FIRE personnel can connect to the Cone PC via a modem for remote support and software updates. Because the PC is integrated within the instrument the Cone assembly occupies the smallest possible footprint.
- Rugged design, easy to clean, with built in safety features, CE compliance and strict adherence to the latest standards.



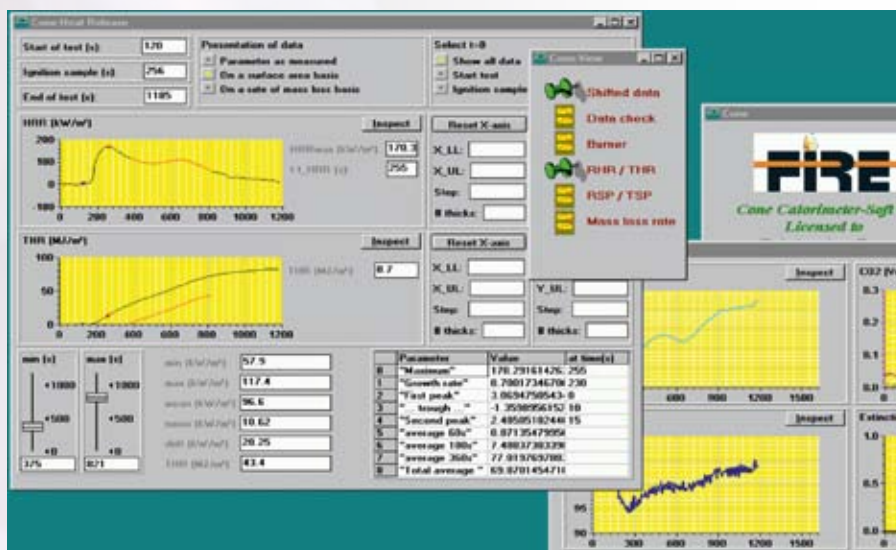
## Software

The sophisticated, elegant and easy-to-use control and acquisition software fully controls and auto-calibrates the FIRE Cone and acquires data. Reports are generated to the required international or national standards automatically to a user defined template. Raw data is always accessible and stored for any future reference, additional calculations and manipulations.

The following is a list of the available information and measurements via the Cone and software:

- Rate of Heat Release (kW)
- Rate of Heat Release per unit area (kW/m<sup>2</sup>)

- Average Rate of Heat Release for specified intervals (kW/m<sup>2</sup><sub>ln - ln+1</sub>)
- Total Heat Release (kW)
- Effective Heat of Combustion (MJ/kg)
- Total Mass Loss (kg)
- Time to Ignition (tig)
- Rate of Mass Loss (kg/s)
- Specific Extinction Area (m<sup>2</sup>/kg)
- Rate of Smoke Production (m<sup>2</sup>/s)
- Heat Flux (kW/m<sup>2</sup>)
- O<sub>2</sub> Concentration (%) as standard
- CO<sub>2</sub> (kg/kg and %) as standard
- CO (kg/kg and %) as option
- Soot Mass Sampling (kg/kg) as option





## Options

- CO measurement by NDIR option available using a O<sub>2</sub>/CO<sub>2</sub>/CO analyser with similar specification to the standard O<sub>2</sub>/CO<sub>2</sub> analyser.
- 2m Heated analytical line at 200°C maximum with temperature controller and software display of gas line and filter temperature.
- Soot mass sampling using mass flow controller.
- Enhanced gas analysis available using FTIR with a comprehensive software package. Mobile FTIR rack system, which can be readily disconnected and used in other applications.
- Smoke measurement (as per ISO 5660-2 standard) by helium-neon laser system insulated and solidly mounted for high stability.

## Requirements

- Power supply: 230/110V – 50/60 Hz - Single phase 30 Amp.
- Commercial methane at 4 bar (A) with a minimum purity of 99.5%
- CO<sub>2</sub> Calibration gas as standard - 1 bar. If CO is also analysed a CO/CO<sub>2</sub> gas mixture is required - 1 bar.
- Water supply for cooling heat flux meter at 2-3 bar (A) plus a drain line (a chilled water circulation unit is also acceptable)

## Other uses for the Detachable Oxygen Depletion Calorimetry Rack

As heat release measurement is so important in understanding fire, oxygen depletion calorimetry is widely used in large-scale tests. The detachable Gas Analysis Rack on the Cone can readily be used as the instrumentation console for oxygen depletion and gas analysis for CO<sub>2</sub> and CO in other fire tests, such as the SBI (EN 13823), the ISO 9705 room corner test, furniture calorimeters and other large-scale heat release apparatus. This arrangement allows maximum flexibility together with minimum investment for all fire testing needs.

**Note:** Higher capacity pumps and gas handling filtration required for large-scale calorimeters e.g. ISO 9705, Furniture Calorimeters etc.



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