



CSI-HRRR3

Heat Release Rate Apparatus (OSU)



LIFETIME
TECHNICAL
SUPPORT



Introduction

Manufactured from FAA inspected components, the HRR3 fully complies with Chapter Five of the FAA Aircraft Material Fire Test Handbook. The HRR3 determines the heat release rate for qualification of interior aircraft materials as specified by the Federal Aviation Administration when exposed to a radiant heat flux of 35 kW/m².

The standard HRR3 is configured to FAA and optionally to ASTM standards and is capable of testing with unparalleled accuracy, repeatability and convenience

The instrument consists of the following

- Test Chamber with viewing window, holding chamber, exhaust smoke stack with a thermopile and gas controls
- Calibration Control System
- Air Distribution System
- Computerized Data Acquisition System

Test Chamber

The test chamber is comprised of a heavy-duty steel welded frame with removeable access covers for ease of servicing and maintenance. The Test Chamber, Holding Chamber, Lower Chamber and Smoke Stack are constructed from high quality brushed stainless steel. The test chamber includes removeable access panel for quick and easy cleaning. The chambers and smoke stack are insulated in 475FR to ensure minimum heat loss.



- ✓ Side View Window to observe during testing
- ✓ Manual Lever for Sample Insertion
- ✓ Ignition Wand Assembly used to conveniently light both the calibration and upper pilot burners
- ✓ Upper and Lower Pilot Burners
- ✓ Calibration T-type Burner
- ✓ (4) Silicone carbide Heating Elements with mounting hardware
- ✓ Stainless Steel Rear Reflector Plate for heating elements
- ✓ Stainless Steel Diamond-shaped plate to ensure uniform distribution of heat
- ✓ Differential Thermopile for heat release determination comprising of having five hot and five cold junctions
- ✓ Dual solid-state power controllers with digital display for upper and lower radiant heater controls
- ✓ Dual Transformer power conversion system



- ✓ Independent Gas Control Cabinet for air and methane of the Lower and Upper pilot burners
- ✓ Fine Adjust Potentiometers for heating element percent power output
- ✓ Electronic Spark Ignition System for Lower Pilot Burners
- ✓ Stainless Steel quick connect coupling and valves for ease of making connections

- ✓ Specimen Position Jig, Upper Thermopile Position Jig and Tongs are included
- ✓ Safety Automatic Gas Flow shut off when power failure occurs
- ✓ (3) Stainless Steel Sample Holder Assemblies with Drip Pan and Specimen Support Wire
- ✓ Automatic Start and Stop Test
- ✓ Safety Magnetic Circuit Breaker

Calibration Control System

Dedicated Calibration Control System includes all the controls required to calibrate the CSI HRR3 gas flow rate, heat flux transducer and exhaust temperature. Hinged Access Door allows quick access for routine inspection and servicing



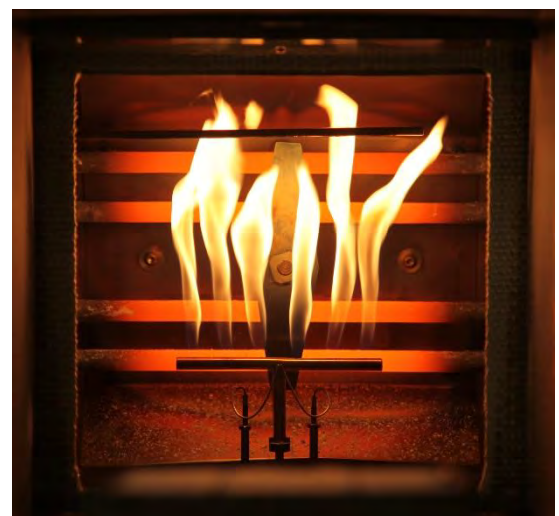
- ✓ Digital Display for Exhaust Temperature
- ✓ Digital Display for Input Air Supply Temperature
- ✓ Digital Display for Flow control outputs expressed in Volts for each gas flowrate
- ✓ Digital Display for transducer output expressed in millivolts
- ✓ 5 pushbutton controls for gas flow rate calibration
- ✓ Calibrated Wet test meter

- ✓ Calibrated (2) Heat Flux Transducers Assembly with dedicated insertion system, water lines and output cables

Air Distribution System

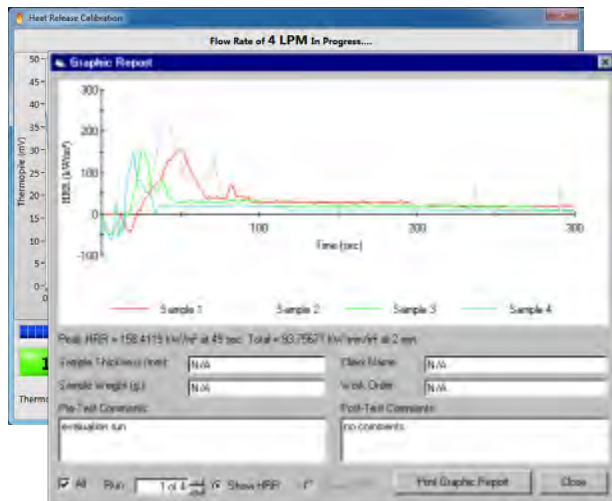
Fully equipped to support the required air supply of 21-24°C at 0.04 m³/s through the orifice meter

- ✓ Air Supply Manifold, will have 48 evenly spaced, 0.147 ± 0.001 " (3.7 ± 0.03 -mm) diameter holes 0.38" (10 mm) from the inner edge
- ✓ Lower Air distribution plate constructed of aluminum; that is 0.25" (6.3-mm) thick having eight 0.209 ± 0.001 " (5.3 ± 0.03 mm) diameter holes, 2 inches (51 mm) from the sides on 4-inch (102-mm) centers, mounted at the base of the environmental chamber.
- ✓ Upper Air distribution plate having 120 evenly spaced, 0.140 ± 0.001 " (3.6 ± 0.03 mm) diameter holes, will be mounted 6 inches (152 mm) above the aluminum plate).
- ✓ Airflow Manometer to measure differential pressure drop
- ✓ The orifice meter comprised of a squared-edged, circular plate orifice, 0.024 inch (0.5 mm) thick
- ✓ 1-1/2" I.D. PVC Pipe for the Air Input



Computerized Data Acquisition System

The CSI HRR3 Data Acquisition System is offered as a standard feature. It allows the user to perform accurate and repeatable test results, calibration, generate test reports, and much more.



The 3 main functions of the software:

✓ Calibration

This section provides the calculation of the system calibration factor in kW/mV. The user inputs the pertinent information such as methane flow rates, temperature and pressure after the measurements of these parameters.

✓ Sample Testing

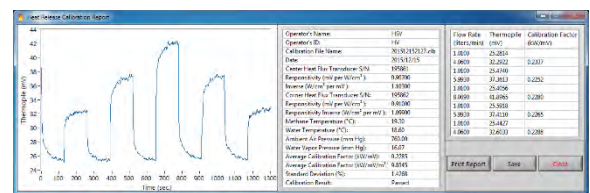
This function provides all of the data storage and acquisition, stabilization and test period timing, and other associated tasks for the testing of materials. The operator inputs the data file name, system air flow, sample, heat flux, pretest comments, and other pertinent data. After insertion of the sample into the holding chamber, the user is informed of the stabilization time, acquisition of the baseline thermopile reading, insertion of the test sample and progression through the five (5) minute testing period. At the end of the test run, the user may select to run another test and use or modify the previous test parameters. The data is acquired at the rate of once per second, which includes both the

thermopile reading and the smoke detection system output. The user may test several samples in one data file for the comparison of results.

✓ Test Reporting of Data

The test software main menu for test reports allows the operator to view, print, save raw data and edit test information. Test Results are available in formats such as:

- Graphical - allows you to visually observe the Heat Release Rate Graph produced by the sample during the test for individual samples or all runs.
- Run Report - displays the data acquired during the test of the particular specimen along with the test information, pre-test, and after-test comments.
- Test Report - displays test results for all specimens tested along with the test information and pre-test comments.
- Edit-This feature permits the user to modify text entered during a particular test session.



Dimensions and Weights

Approx Shipping Weight	HRR3 Unit 1,100 lbs. HRR3 Calibration Cabinet 600 lbs.
Approx Shipping Dimensions	HRR3 Unit 54" x 46" x 95" HRR3 Calibration Cabinet 56" x 40" x 65"

Installation Requirements

Electrical Specification:	HRR3 Main Unit HRR3 Calibration Cabinet	220 VAC, 50/60 Hz, 1 Ph 55 A 220VAC, 50/60Hz, 1 Ph, 1A
Methane Gas Supply:	Type Purity Input Connection Flow rate Pressure Placement	Pure Methane, CH ₄ , 99% minimum ¼" Tube Compression Swagelok Up to 8 liters/min. 25PSI (172kPa) (0.17MPa) (Use of a 2-stage regulator required.) The gas supply tank must be located at least 30 ft away from the HRR3 unit.
Air Distribution System:	Input Connection Inlet Flow rate Temperature Differential Pressure Drop/Input Air flow Purpose	1 ½" I.D. PVC, Schedule 40, Pipe (approximate 1.9" outside diameter). A bleeding valve is required next to the input connection to help fine adjust the input air flow. A needle shut off valve is required next to the air distribution system before the bleeding valve to set input air flow. 0.04 m ³ /sec. (85 ft ³ /min) @ 4.0 psi air 21°C to 24°C (use of a refrigerated chiller with heat exchanger is recommended to achieve these temperatures.) 200 mmHg measured at orifice meter (set by orifice plate in the inlet pipe) A Dedicated Air Supply is required. Alternatively a Blower may be used, but must be no further than 50 ft (15m) from HRR3.
Exhaust Blower/Ventilation:	Exhaust Hood Size	4 ft. (120 cm x 120 cm) minimum centered over apparatus. Bottom of hood should be

	<p>6 – 9 in. (15 – 20 cm) above exhaust stack of apparatus.</p> <p>Volume 1,500 CFM (45 m³/min)</p> <p>Pressure 0.75 inch H₂O static pressure (1.4 mm Hg.)</p>
Compressed Air Supply:	<p>Input Type Filters Required Pressure</p> <p>¼" Tube Compression Swagelok Dry, clean, oil-less. Air particle filter and Air oil filter 25 psi with a pressure regulator and shut off valve</p>
Water Supply	<p>Water Type: Tap Water</p> <p>A closed loop circulator may also be used with Inlet water connection going to a water pump and shut off valve.</p> <p>The outlet water connection would need to lead to a 5 gallon reservoir. The required flow rate is 1 GPM</p> <p>This is required for the cooling of the heat flux transducers.</p> <p>Barded connectors for 1/8"ID x 1/4"OD tubing is required.</p>
Tools and Supplies Required for Testing:	<ul style="list-style-type: none"> • 2 lb. of mercury for U-manometer • Small Funnel for mercury • Measurement device to display room temperature (°C) and ambient pressure (mm Hg) • 2 gallons of distilled water for wet test meter • Computer Desk at least 48"L x 24"W • Work Table at least 24"L x 24"W • Power outlet strip with a minimum of 6 outlets for computer and accessories. • Weight Scale • Caliper • Aluminum foil per specification



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