



Fulham HotSpot LED Emergency System Thermal Testing Procedure

This document describes the thermal testing method and procedure for Fulham HotSpot LED Emergency Systems. Warranty will be considered based on the testing method and results following this procedure.

This document applies to the following models:

Table 1

Driver PN#	Module PN#	Battery PN#	Ambient Rating
FHS1-UNV-3.6L	FHS1-AR-4W-L FHS2-AR-4W-C FHS3-AR-6W-SH FHS3-AR-10W-SH FHS4-AR-8W-LH FHS4-AR-10W-LH FHS5-AR-6W-CL FHS6-AR-3W-L	FHSBATT3-C3 FHSBATT3-D4 FHSBATT3-F7 FHSBATT3-F7L	0°C TO 50°C (32°F TO 122°F) NiCd Battery
FHS2-UNV-36L FHS2-UNV-56S	N/A	FHSBATT8-AA.9 FHSBATT8-C3 FHSBATT8-C3L FHSBATT8-D4	0°C TO 50°C (32°F TO 122°F) NiCd Battery
		FHSBATL3-1 FHSBATL3-1.5 FHSBATL3-1.5S FHSBATL3-3 FHSBATL6-.6 FHSBATL6-1.5 FHSBATL6-1.5L FHSBATL6-1.5S FHSBATL6-3 FHSBATL6-3L FHSBATL9-.6	10°C TO 50°C (50°F TO 122°F) LiFePO4 Battery
		FHSBATCC3-3	-20°C TO 50°C (-4°F TO 122°F) LiFePO4 Battery
FHSAC1-UNV-40BLS	N/A	FHSBATL2-3.2L	0°C TO 48°C (32°F TO 118.4°F) LiFePO4 Battery
FHSAC1-UNV-40C	N/A	FHSBATL2-3.2L	0°C TO 48°C (32°F TO 118.4°F) LiFePO4 Battery
FHSAC1-UNV-40L	N/A	FHSBATL2-3.2	0°C TO 50°C (32°F TO 122°F) LiFePO4 Battery
FHSCP-UNV-10P-L-SD	N/A	FHSBATL3-1.5-SD FHSBATL3-3-SD FHSBATL9-.6-SD FHSBATL6-1.5L-SD	10°C TO 55°C (50°F TO 131°F) LiFePO4 Battery



Testing checklist:

- A total of nine thermocouples will be needed for this test.
- Thermocouple junctions should be fused.
- All thermocouples should comply with the requirement specified in ASTM MNL 12 and as listed in the table of the limits of error specified in NIST ITS 90.
- A "Certificate of Conformance" should be accompanied with thermocouples used.
- Temperature scanner with a minimum of 9 channels for thermocouple measurements is recommended. Make sure that thermocouple type selected is compatible with the temperature scanner.

Thermocouple placement:

- 6 Thermocouples shall be placed inside the luminaire at the locations specified in Figure 1; each being a distance of 2 inches away from the case and no more than 1.5 inches in height (height of the case).
- 1 Thermocouple shall be placed on the Tc point on the case of the driver, see Figure 2, this only applied to models FHSAC1-UNV-40BLS/ FHSAC1-UNV-40C/ FHSAC1-UNV-40L.
- 2 Thermocouples will be placed 18 inches away from the luminaire at opposite ends to monitor room temperature.

Test Conditions:

- Luminaire shall be placed in a room with a stable ambient temperature of 25°C (\pm 5°C) and allowed to operate for a minimum of 4 hrs. under full load conditions. This will allow enough time for temperatures inside the luminaire to increase to the maximum value and stabilize.

Temperature Measurement:

- Once 4 hours of operation have elapsed, commence recording the temperature measurements observed on the temperature scanner.
- Measurements should be take three times at 15 min intervals, temperature readings should not fluctuate more than (\pm)1°C. This will prove that temperature readings inside the luminaire have stabilized and are accurate.
- If temperature readings have not stabilized, the luminaire should be left operational until test results meet required criteria above.



Results - Maximum Operating Room Temperature:

- To obtain proper Maximum Operating Room Temperature, the following adjustments should be done:
 - The thermocouple channel with the highest measured temperature reading shall be subtracted from [Maximum Ambient Rating]
[Maximum Ambient Rating] - highest measured temperature = X.
 - The value (*designated X*) shall then be added to the room temperature and this will give you the absolute maximum operating ambient condition of the luminaire
Room Temperature + X = Maximum Operating Room Temperature

Note: Look for Maximum Ambient Rating from Table 1 for the specified model. The designated X can be negative, which means the highest measured temperature already exceeds the Maximum Ambient Rating. It will not affect the final calculations.

Results - Minimum Operating Room Temperature:

- To obtain proper Minimum Operating Room Temperature, the following adjustments should be done:
 - The [Minimum Ambient Rating] will be subtracted from the thermocouple channel with the lowest measured temperature reading
Lowest measured temperature - [Minimum Ambient Rating] = X.
 - The value (*designated X*) shall then be subtracted from the room temperature and this will give you the absolute minimum operating ambient condition of the luminaire
Room Temperature - X = Minimum Operating Room Temperature

Note: Look for Minimum Ambient Rating from Table 1 for the specified model. The designated X can be negative, which means the lowest measured temperature did not reach the Minimum Ambient Rating. It will not affect the final calculations.

Results - Maximum Tc Temperature:

- The Tc measurements only apply to models where there is a Tc max rating in Table 1.
- The reading from the thermocouple channel on the driver Tc shall not exceed the Tc max showed in Table 1, there is no adjustment needed for whatever the room temperature is.

Warranty

- Judge Criteria
 - **Operating Room Temperature shall fall within Minimum and Maximum Operating Room Temperatures values calculated above.**
 - **The measured Tc shall not exceed the Tc maximum rating in Table 1.**
- Warranty will be considered void if a subtraction needs to be done for temperature adjustments, unless the OEM and End User(s) can guarantee that room ambient temperatures will be kept within limits. All testing data results, along with proof of testing method conformity, should be submitted to Fulham Co., Inc. for approval.



Figure 1

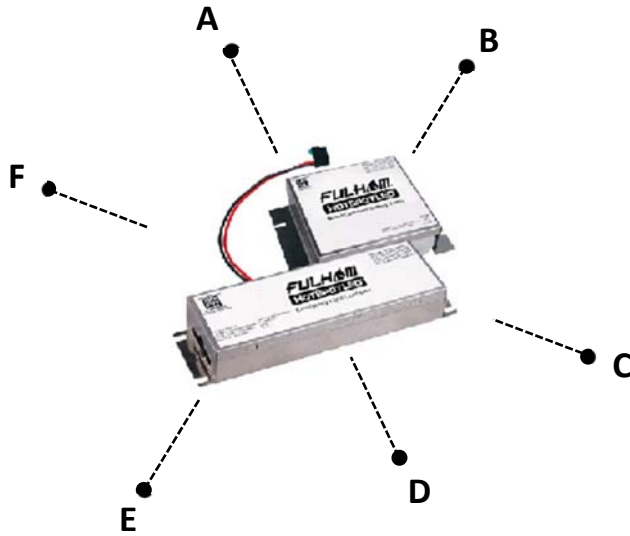


Figure 2

Add Thermocouple on Tc Point

