



G023507

Flame simulator

FS-1200

Part no. 5201272-00A

This information folder contains:

- Data Sheet Spectrex FS-1200
- User Guide Spectrex FS-1200
- Spectrex Battery 380004 Letter of Conformance
- Spectrex Battery 380004 Safety Datasheet



SPECTREX

KEEP A SHARPEYE
ON YOUR SAFETY



FS-1200 FLAME SIMULATOR

.....
FOR ALL SPECTREX UV AND
UV/IR FLAME DETECTORS
.....

*Providing foolproof, full loop testing
of your flame detection system in
Zones 1 and 2 hazardous areas at up
to 23ft (7m) testing distance*



BECAUSE YOU NEED TO BE ABSOLUTELY SURE!

To be fully secure against fire, flame detector self-testing is not enough. According to most local jurisdictional authorities and as required for SIL2 compliance, you need to test and ensure the integrity of your entire flame detection system at least once per year. That means performing a full system loop test from the detector, through the wiring to the controller, and up to the actual alarm notification. The only way to do so, without lighting a real fire, is with an external flame simulator.

Complete End-to-End Testing Using our Flame Simulator

The FS-1200 FLAME SIMULATOR is the essential complimentary tool to the self-testing capabilities of your Sharpeye™ UV and UV/IR Flame Detectors. It brings fire prevention safety to a higher level by giving you the ability to fully test the operational readiness of your entire fire detection system:

- **Test the integrity of all the system components:** all alarm outputs, all cabling and connections and the fire alarm panel functionality.
- **Test clear line of sight:** By using the Spectrex Flame Simulator, you will ensure that no object is obstructing the field of view, and that the detector's window lens is not obscured.

Therefore, by simulating a fire that actually triggers the detector outputs, the model FS-1200 verifies the correct operation of the UV and UV/IR flame detector, performs an essential end-to-end loop test and verifies window cleanliness.

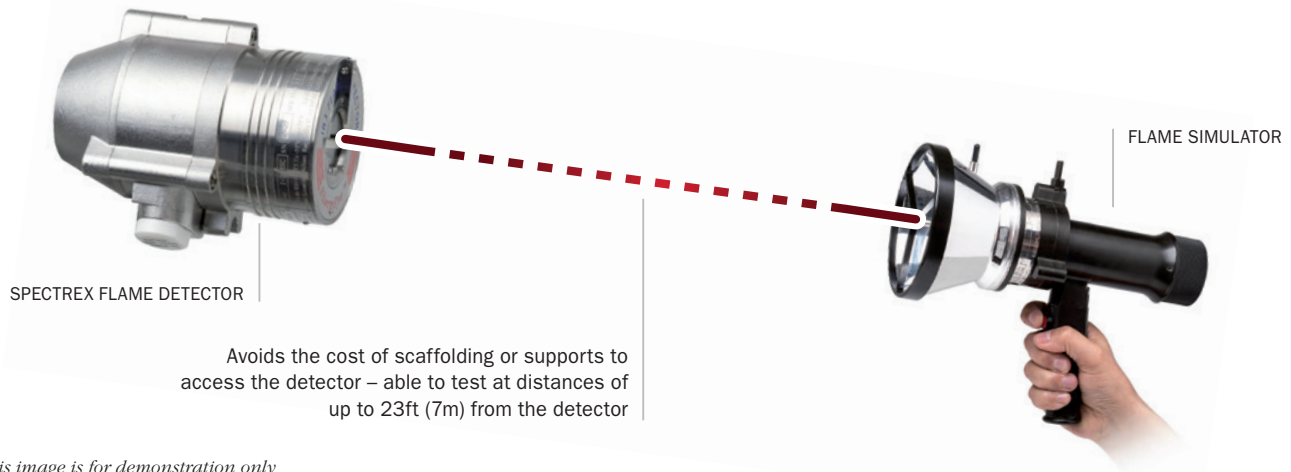
The robust and reliable FS-1200 FLAME SIMULATOR allows remote testing of flame detectors, which are often located in difficult to access and/or classified hazardous areas (Zones 1 and 2).

Key Benefits

- Long-range flame detector activation – at a range up to 23ft (7m) – a 33% increase compared to previous simulator models.
- Reduced maintenance costs with easy access for testing detectors, in hard to reach places, from floor/deck level without the need for scaffolding or ladders
- Highly portable – for hand held operation by a single operator
- ATEX/IECEx approved for use in Zones 1 and 2 hazardous areas
- Single charge is sufficient to test up to 100 detectors

FS-1200 Flame Simulator at Work

The Spectrex flame simulator emits IR radiation in a unique pattern corresponding to, and recognizable as fire by your SharpEye Flame Detector. This allows the detector to be tested under “real” fire conditions without the associated risks of an open flame.



ABOUT **SharpEye**™

The SharpEye range of Optical Flame Detectors includes a wide variety of technologies such as IR3, Multi-IR, UV/IR, all providing reliability, performance and durability. These flame detectors are equipped with a range of output options, ensuring maximum compatibility, and a wide range of approvals to ensure suitability for a variety of industries, from high risk to commercial.



Technical Specifications

The Flame Simulator Kit, Part No. 380114-2 includes the FS-1200 Flame Simulator, battery, charger, tool kit and user guide TM380102 in carrying case.

SIMULATOR MODELS

Detector Types	Sensitivity Setting	Min. Testing Distance	Testing Distance
40/40U-UB, 40/40L-LB, 20/20ML	50ft (15m)	2.5ft (0.75m)	20ft (6m)
40/40L4-L4B	93ft (28m)	2.5ft (0.75m)	8ft (2.5m)
40/40UFL	60ft (20m)	2.5ft (0.75m)	23ft (7m)

GENERAL SPECIFICATIONS

Operating Temperature	+32°F to +122°F (0°C to +50°C)
Vibration protection	1g (10-50Hz)
Activations between charges	100 max.

ELECTRICAL SPECIFICATIONS

Power	14.8V (4 x 3.7V rechargeable lithium-ion battery)
Maximum current	4A
Battery capacity	2.2AH
Charging time	2hr at 2A

MECHANICAL SPECIFICATIONS

Dimensions	9 x 7.3 x 5.35" (230 x 185 x 136 mm)
Weight	5.5 lb (2.5 kg)
Enclosure	Aluminum, heavy-duty copper-free, black painting
Explosion-proof enclosure	ATEX and IECEx approved Ex II 2 G Ex db ib op is IIB + H2 T5 Gb -20°C to +50°C (-4°F to +122°F)
TR CU (EAC)	Ex db ib op is IIB + H2 T5 Gb Ex ib op is tb IIIC T135°C Db -20°C to +50°C
Water and dust tight	IP65

Specifications subject to change

For more information view manual or website www.spectrex.net



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Model FS-1200

UV/IR Flame Simulator

User Guide



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Legal Notice

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Warranty

SPECTREX agrees to extend to Purchaser/Distributor a warranty on the SPECTREX supplied components of the SharpEye products. SPECTREX warrants to Purchaser/Distributor that the products are free from defects in materials and workmanship for a base period of two (2) years for the Flame Simulator, twelve (12) months for the battery and six (6) months for the charger, commencing with the date of delivery to Purchaser/Distributor. SPECTREX expressly excludes damage incurred in transit from the factory or other damage due to abuse, misuse, improper installation, or lack of maintenance or "Act of God" which are above and beyond its control. SPECTREX will, upon receipt of any defective product, transportation prepaid, repair or replace it at its sole discretion if found to have been defective when shipped. Said repair or replacement is SPECTREX'S sole liability under this warranty and SPECTREX'S liability shall be limited to repair or replacement of the component found defective and shall not include any liability for consequential or other damages. The customer is responsible for all freight charges and taxes due on shipments both ways. This warranty is exclusive of all other warranties express or implied.

TM380102 Rev. (Ad), September 2020

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1 About this Guide

This guide describes the SharpEye Flame Simulator and its features, and provides instructions on how to operate and maintain the simulator.

1.1 Release History

Rev	Date	Revision History	Prepared by	Approved by
0	December 2015	First Release	Ian Buchanan	Eric Zinn
1	December 2015	Second Release	Ian Buchanan	Eric Zinn
2	January 2016	Third Release	Ian Buchanan	Eric Zinn
3	March 2016	Fourth Release	Ian Buchanan	Eric Zinn
4	April 2016	Fifth Release	Ian Buchanan	Eric Zinn
5	May 2016	Sixth Release	Ian Buchanan	Eric Zinn
6	May 2016	Seventh Release	Ian Buchanan	Eric Zinn
7	July 2016	Eighth Release	Ian Buchanan	Eric Zinn
8	January 2017	Ninth Release	Jay Cooley	Ian Buchanan
9	February 2017	Tenth Release	Jay Cooley	Ian Buchanan
10	February 2017	Eleventh Release	Jay Cooley	Ian Buchanan
11	April 2017	Twelfth Release	Jay Cooley	Shaul Serero
Aa	August 2017	Thirteenth Release	Jay Cooley	Shaul Serero
Ab	March 2018	Fourteenth Release	Michal Heller	Udi Tzuri
Ac	December 2019	Fifteenth Release	Michal Heller	Udi Tzuri
Ad	September 2020	Sixteenth Release	Michal Heller	Udi Tzuri

1.2 Glossary and Abbreviations

Abbreviation/Term	Meaning
Analog Video	Video values are represented by a scaled signal
ATEX	Atmosphere Explosives
AWG	American Wire Gauge
BIT	Built-In-Test
CMOS	Complementary Metal-Oxide Semiconductor image sensor
Digital Video	Each component is represented by a number representing a discrete quantization
DSP	Digital Signal Processing
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EOL	End of Line
FOV	Field of View
HART	Highway Addressable Remote Transducer – communications protocol
IAD	Immune at Any Distance
IECEX	International Electro-Technical Commission Explosion
IP	Internet Protocol
IPA	Isopropyl Alcohol
IR	Infrared
IR3	Refers to the 3 IR sensors
JP5	Jet Fuel
LED	Light Emitting Diode
MODBUS	Serial communications protocol using Master-Slave messaging
N/A	Not Applicable
N.C.	Normally Closed
NFPA	National Fire Protection Association
N.O.	Normally Open
NPT	National Pipe Thread
P/N	Part Number
RFI	Radio Frequency Interference
RTSP	Real Time Streaming Protocol
SIL	Safety Integrity Level

Abbreviation/Term	Meaning
UNC	Unified Coarse Thread
VAC	Volts Alternating Current

2 Product Overview

To comply with local standards and jurisdictional authorities, "end-to-end" loop testing of fire protection alarm systems, including detectors, should be performed periodically. Many safety authorities and plant managers of high-value/high-risk assets and facilities insist on quarterly "end-to-end" testing of their entire fire protection systems using an external flame simulator.

SPECTREX flame simulators emit electromagnetic radiation in a unique sequential pattern corresponding to and recognizable as fire by specific SharpEye Flame Detector models. This allows for testing under real fire conditions without the associated risks of an open flame. SPECTREX flame simulators are ATEX certified EExd for use in hazardous zones 1 and 2, and are powered by rechargeable lithium-ion batteries. When fully charged, the flame simulator operates for at least 100 tests without recharging.

The SPECTREX flame simulator is the only non-hazardous and safe method to test the flame detector's sensors, internal electronics, alarm activation software, cleanliness of the viewing window/lens, wiring integrity, actual relay activation, and proper functionality of any other outputs used (mA, RS-485, HART).



Warning:

The Simulator is not field-repairable due to the meticulous alignment and calibration of the sensors and the respective circuits. Do not attempt to modify or repair the internal circuits or change their settings, as this will impair the system's performance and void the SPECTREX product warranty.

2.1 Flame Simulator Compatibility with Flame Detector Models

The FS-1200 Flame Simulator is compatible with several detector types:

Simulator	P/N	Compatible with:
UV/IR Flame Simulator	FS-1200	40/40L-LB, 40/40L4-L4B, 40/40C-LB, 40/40C-L4B, 40/40D-LB, 40/40D-L4B, 40/40U-UB, 40/40UFL 20/20ML

2.2 Features and Benefits

- Used for maintenance and testing of flame detectors
- Ability to activate the flame detector from a distance of up to 10m
- Rechargeable battery included
- Operates at least 100 tests before battery recharge is necessary

2.3 Principles of Operation

The **FS-1200** includes a halogen lamp that emits UV and IR energy. This energy is accumulated by a reflector and directed towards the detector.

The **FS-1200** does not include a laser diode. It includes only a mechanical sight, as the user can see the spot from the simulator and should aim the spot toward the center of the detector.

2.4 Product Certification

The Flame Simulator has the following certifications:

- ATEX, IECEx, page 14
- cCSAus, page 14
- TR CU/EAC, page 14

2.4.1 ATEX, IECEx

Ex II 2 G D

Ex db ib IIB + H2 T4 Gb

Ex ib tb IIIC T135°C Db

-4°F to +122°F / -20°C to +50°C

2.4.2 cCSAus

Class I, Zone 1, AEx db ib op is IIB+H2 T4 Gb

$-20^{\circ}\text{C} \leq T_a \leq +50^{\circ}\text{C}$

2.4.3 TR CU/EAC

1Ex db ib op is IIB+H2 T5 Gb X

$-20^{\circ}\text{C} \leq T_a \leq +50^{\circ}\text{C}$

This product is suitable for use in hazardous zones 1 and 2 with IIB + H2 gas group vapor present.

2.5 Simulator Structure

The flame simulator has a black-coated aluminum ex-proof enclosure. It includes the following components:

- Reflector
- Electronic compartment
- Battery compartment
- Handgrip

The electronic compartment includes the internal optical and electronic parts of the device.

The battery compartment includes a battery pack containing 4 lithium-ion batteries, measuring a total of 14.8VDC and 2.6Ah.

To charge or replace the battery pack, follow the instructions in section 3.6 on page 23.



Figure 1: Flame Simulator Side View

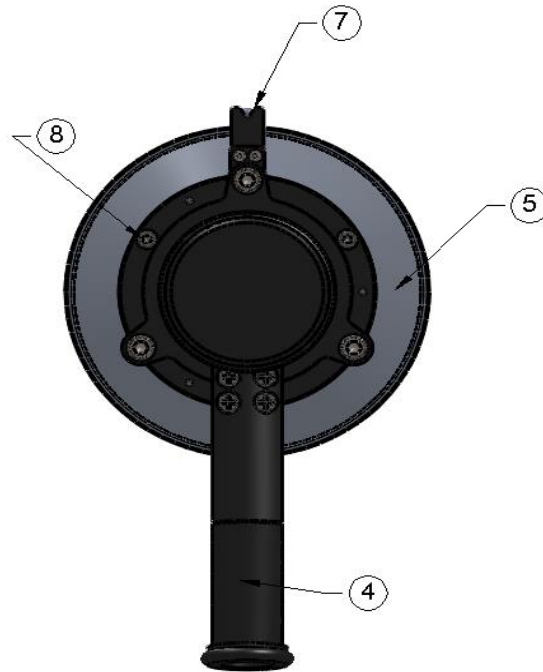


Figure 2: Flame Simulator Rear View

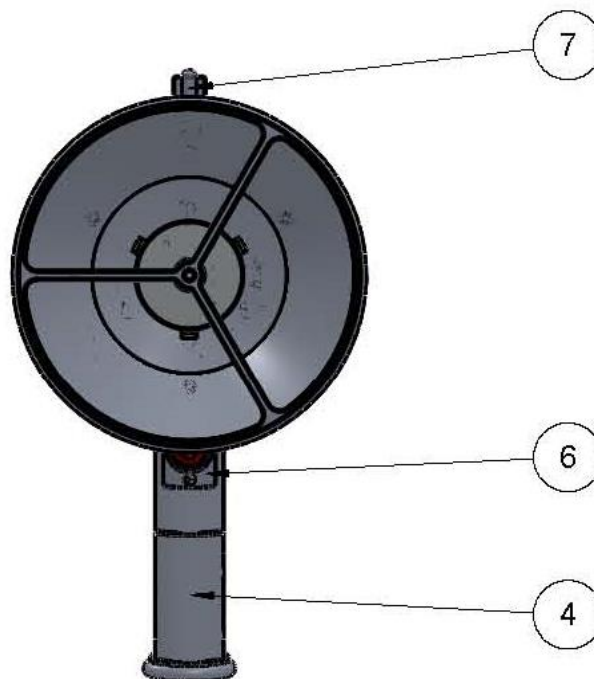


Figure 3: Flame Simulator Front View

1	Electronic Compartment	5	Reflector
2	Battery Compartment	6	Push Button
3	Battery Back Cover	7	Sight
4	Handgrip	8	Back Cover Locking Screw

2.6 Certification Instructions

2.6.1 General Instructions

The equipment marking is defined as follows:

Ex II 2 G D

Ex db ib IIB + H2 T4 Gb

Ex ib tb IIIC T135°C Db

-20°C to +50°C / -4°F to +122°F

- The equipment may be used with flammable gasses and vapors with apparatus groups IIA and IIB+H2 T4 in the ambient temperature range of -4°F to +122°F / -20°C to +50°C.
- Inspection and maintenance of this equipment should be performed by suitable trained personnel, in accordance with the applicable code of practice, e.g. EN 60079-17.
- Repair of this equipment should be performed by suitable trained personnel, in accordance with the applicable code of practice e.g. EN 60079-19.
- Certification of this equipment relies upon use of the following materials in its construction:
 - Enclosure: Aluminum 6061T6
 - Window: Sapphire glass
 - Seals: EPDM
- If the equipment is likely to come into contact with aggressive substances (described below), then it is the responsibility of the user to take suitable precautions (described below) to prevent the equipment from being adversely affected. This ensures that the type of protection provided by the equipment is not compromised.
 - Examples of aggressive substances: acidic liquids or gases that may attack metals or solvents, or may affect polymeric materials.
 - Examples of suitable precautions: routine inspections, establishing resistance to specific chemicals from the material's data sheets.

2.6.2 Specific Conditions of Use

- The dimensions of the flameproof joints are other than the relevant minimum or maximum values required by Table 3 of IEC/EN 60079-1:2014 for IIB + H2, as detailed below:

Flamepath Description	Type of Joint	Minimum Width "L" (mm)	Maximum Gap "ic" (mm)
Joint formed by window against the enclosure	Flanged	10.75	0.02
Enclosure end-cap spigot	Cylindrical	15	0.08

Gaps should not be machined to be any larger than the values of "ic," and width should not be modified to be any smaller than the values of "L," as shown in the table above.

- The equipment should only be charged in a safe area. Batteries must be removed from the flameproof enclosure. The charge conditions are as follows:
 - Maximum charge voltage: 16.8V
 - Maximum charge current: 4A

The charge voltage and current should not exceed these values.

3 Operation Instructions

3.1 Ordering Information

The P/N of the Flame Simulator Kit is 380114-2.

The kit is supplied in a carry case that includes:

- Flame Simulator FS-1200
- Charger
- Tool Kit
- Technical Manual TM380102

3.2 Unpacking

Verify that you have received the following components:

- Delivery form
- Flame simulator with integral battery
- Battery charger
- Tool keys
- User manual
- FAT forms
- EC declaration
- Storage case

**Note:**

The FS shall be stored in a suitable suitcase to prevent possible damage during handling

**Warning:**

Do not open when an explosive atmosphere is present. Use only replaceable battery pack P.N. 380015

3.3 Operating Instructions

- 1 Verify you are using the correct simulator that fits the tested detector, per section 2.1 on page 13
- 2 Verify you are at the correct distance from the detector according to the type of detector and the detector sensitivity (See Simulator Status on page 22).
- 3 Using the mechanical sight, aim the flame simulator toward the center of the detector.
- 4 Push the activate button; direct the halogen beam toward the center of the detector.
- 5 Once the trigger is pressed, with an initial 2 seconds delay, the equipment will operate for a maximum period of 60 seconds, following which the equipment cannot be operated for a minimum period of 30 seconds.

3.4 Simulator Status

During the first 5 seconds of operation, the simulator performs self-test for operating status.

3.4.1 Normal Status

When switching to normal status, the equipment will operate for a maximum period of 60 seconds, following which the equipment cannot be operated for a minimum period of 30 seconds.

3.4.2 Fault Status

- **Low Battery** – When the battery is lower than 12.3 VDC, the lamp won't be activated.

3.5 Detection Ranges

Table 1: Detection Ranges per Detector/Flame Simulator

Model	Detector Types	Detector Sensitivity Setting (ft/m)	Testing Distance (ft/m)
FS-1200	40/40C-LB	10/3	3/1
		50/15	23/7
	40/40C-L4B	42/13	12/4
	40/40D-LB	10/3	3/1
		50/15	23/7
		93/28	46/14
	40/40D-L4B	42/13	12/4
	40/40U-UB, 40/40L-LB, 20/20ML	50/15	20/6
	40/40L4-L4B	93/28	8/2.5
	40/40UFL	60/20	23/7



Notes:

- The minimum distance from the detector is 30"/75cm.
- At extreme temperatures there is a 15% reduction in the testing range.



Warning:

Keep the flame simulator in a safe place when not in use.

3.6 Charging the Battery

The flame simulator uses lithium-ion batteries as a rechargeable power source. When the batteries are fully charged, under normal conditions (room temperature) the simulator can be activated 1,000 times without recharging. When the voltage from the batteries is lower than the required operational level, the simulator will not operate.

■ **To charge the battery:**

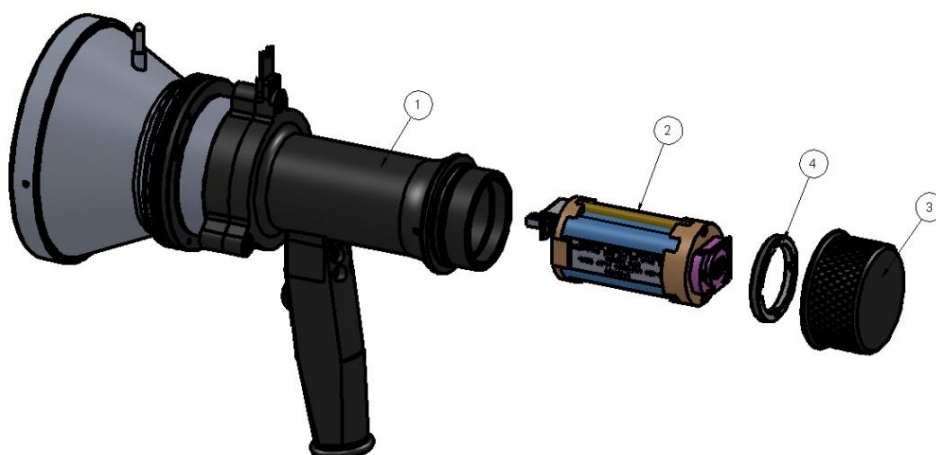
- 1 Place the flame simulator on a table in a safe area, not exceeding 104°F/40°C.

- 2 Release the locking screw (Figure 1, Item 8).
- 3 Unscrew the battery compartment cover counterclockwise (Figure 1 and Figure 4, Item 3).
- 4 Unscrew the locking disc clockwise using 1.5mm hex key (Figure 4, Item 4).

**Warning:**

The battery must be charged only after being removed from the flame simulator.

- 5 Pull out the battery from the flame simulator (Figure 4, Item 2). The LED will flash twice to indicate that the battery is fully charged.
 - 6 Connect the battery to the charger. Verify that the charger is supplied with the flame simulator.
 - 7 Charge for a maximum of 2–3 hours.
 - 8 Disconnect the charger.
 - 9 Insert the battery into the flame simulator (Figure 4, Item 2).
 - 10 Screw on the locking disc using 1.5mm hex key (Figure 4, Item 4).
 - 11 Screw on the back compartment cover (Figure 1 and Figure 4, Item 3).
 - 12 Lock the back cover with the locking screw (Figure 1, Item 8).
- **To replace the battery:**
- 1 To remove the battery, follow steps 1-4 in **"To Charge the Battery"** section.
 - 2 Insert the new battery pack in the simulator housing. Use only a SPECTREX battery pack, P/N 380004.
 - 3 Follow steps 9-11 in **"To Charge the Battery"** section.



1	Simulator
2	Battery Pack

3	Back Compartment Cover
4	Locking Disc

Figure 4: Flame Simulator Battery Replacement

3.7 Maintenance

- Ensure the flame simulator is charged before operation. The LED will flash twice to indicate that the battery is fully charged.
- Ensure the reflector and window are clean.
- Before replacing the battery, check that you have a SPECTREX Battery Pack, P/N 380004.
- When the simulator is not in use, remove the battery pack and recharge every 6 months.
- The typical Li-on battery lifetime is 2-3 years under normal conditions.

**Warning:**

Use only a SPECTREX Replacement Battery Pack, P/N 380004.

3.8 Troubleshooting

Model	Problem	Solution
FS-1200	LED flashes 3 times	1. Recharge the battery.
	LED flashes 5 times	2. Disconnect and reconnect the battery. Operate the flame simulator again.
	LED does not turn on	3. Recharge the battery. 4. Replace the battery.
	Flame simulator seems to work properly but does not activate the detector	5. Verify that you are aiming the flame simulator beam to the center of the flame detector 6. Verify that you are at the correct distance. 7. Verify that the flame detector is at the correct sensitivity. 8. Verify that the flame detector is operating. 9. Verify that the flame detector window is clean.

3.9 Technical Specifications

3.9.1 General Specifications

- Operating temperature: +32°F to +122°F / 0°C to +50°C
- Vibration protection: 1g (10–50Hz)

3.9.2 Electrical Specifications

- Rechargeable four cell lithium-ion battery:
 - Power: 14.8V (4 x 3.7V), max current 0.2A
 - Charging: 16.8V (4 x 4.2V), max current 4A
- Battery capacity: 2.6Ah
- Charging time: 2hr at 2A

3.9.3 Physical Specifications

- Dimensions: 9" x 7.3" x 5.35" / 230 x 185 x 136 mm
- Weight: 5.5lb/2.5kg
- Enclosure: aluminum, heavy duty copper free, black zinc coating.

- Explosion proof enclosure:
ATEX and IECEx
Ex II 2 G D
Ex db ib IIB + H2 T4 Gb
Ex ib tb IIIC T135°C Db
-20°C to +50°C / -4°F to +122°F
cCSAus
Class I, Zone 1, AEx db ib op is IIB+H2 T4 Gb
-20°C ≤ Ta ≤ +50°C

TR CU/EAC
1Ex db ib op is IIB+H2 T5 Gb X
-20°C ≤ Ta ≤ +50°C
- Water and dust tight: IP65

3.9.4 EMI Compatibility

Immunity Tests		
Title	Basic Standard	Level to be tested
Electrostatic Discharge (ESD)	IEC 61000-4-2	6kV/8kV contact/air
Radiated Electromagnetic Field	IEC 61000-4-3	20V/m (80MHz–1GHz) 10V/m (1.4–2GHz) 3V/m (2.0–2.7GHz)
Conducted Disturbances	IEC 61000-4-6	10 Vrms (150kHz–80MHz)
Immunity to Main Supply Voltage Variations	MIL-STD-1275B	

Emission Tests			
Title	Basic Standard	Level to be Tested	Class
Radiated Emission	IEC 61000-6-3	40dbuv/m (30–230MHz), 47dbuv/m (230MHz–1GHz)	Like Class B of EN 55022

Technical Support

For technical assistance or support, contact:



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Email: spectrex.csc.rmtna@emerson.com

Website: www.spectrex.net



Emil Cohen
Senior Product & Customer Support Manager

Spectrex Flame & Gas Detection
6021 Innovation Boulevard
Shakopee, MN 55379-9795
United States

Emil.cohen@Emerson.com

February 5th, 2020

Re: Letter of conformance
Product Model: 380004 Li – ion 14.8V, 2.2Ah
Serial Numbers: A0261÷A0268
Test report No.: 20151102-1018

Dear Valued Customer,

We hereby confirm that the above detailed product has completed the following tests in an A2LA certified lab as listed below:

No.	Test	Standard /Paragraph	Status
1.	Altitude	UN Transport of dangerous goods 2009 Rev.5 Test 1, Paragraph 38.3.4.1	PASS
2.	Thermal	UN Transport of dangerous goods 2009 Rev.5 Test 2, Paragraph 38.3.4.2	PASS
3.	Vibration	UN Transport of dangerous goods 2009 Rev.5 Test 3, Paragraph 38.3.4.3	PASS
4.	Shock	UN Transport of dangerous goods 2009 Rev.5 Test 4, Paragraph 38.3.4.4	PASS
5.	External Short Circuit	UN Transport of dangerous goods 2009 Rev.5 Test 5, Paragraph 38.3.4.5	PASS
6.	Over- Charge	UN Transport of dangerous goods 2009 Rev.5 Test 7, Paragraph 38.3.4.7	PASS



Basic product characteristics:

No.	Items	Unit	Spec.	Notes
1.	Nominal Voltage	V	14.8	The average value of voltage during the discharge period (with standard charge and discharge).
2.	Nominal Capacity	Ah	Typ:2200mAh Min:2090mAh	@ 0.2CmA discharging
3.	Standard Charge		CC/CV	Current =1.1A Final charge voltage = 16.8V Final charge Current = 0.01C
4.	MAX charging voltage	V	16.8	
5.	Discharge Cut-off Voltage	V	12.5	
6.	Standard Charge Current	V	1.0	
7.	Max Continue Discharge Current	A	3.0	
8.	Weight/Mass	g	180	
9.	Impedance	mΩ	≤350	measure two sides of the drawing line after assembling. (Red B+, Black B-)
10.	Assemblage Dimension	mm	70× 37.5× 37.5	(L × W × T)
11.	Operating Temperature	Discharge	°C	-20°C~ +50°C
		charge	°C	0°C~ +45°C
12.	Storage Temperature			-5 °C~+35°C
13.	Ambient Humidity			45~75%RH
14.	PCM	PCS	YKB110402T	

Yours Sincerely,

Emil Cohen
Senior Product and Customer Support Manager



Spectrex Battery 380004 SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

1.1 Product Identification

Product Name: Spectrex battery 380004
Nominal Voltage: 14.8V
Nominal capacity: 2.2Ah
Nominal Pack Wh: 32.56Wh

1.2 Recommended Use

The intended or recommended use of this preparation is as a Lithium-Ion battery.

1.3 Supplier Information

Address: Spectrex, Inc.
218 Little Falls Road
Cedar Grove, NJ 07009
USA

Phone: +1 (973) 239-8398
Fax: +1 (973) 239-7614
Email: Spectrex@spectrex.net
Internet/Home Page: www.spectrex.net
Date of Issue: December, 2015

1.4 Emergency Telephone

+1 (973) 239-8398

2. HAZARDS IDENTIFICATION

Route(s) of Entry

There is no hazard when the measures for handling and storage are followed.

Signs and Symptoms of Exposure

In case of cell damage, possible release of dangerous substances and a flammable gas mixture.
OSHA Hazard Communication: This material is not considered hazardous by the OSHA Hazard Communication Standard 29CFR 1910.1200.

Carcinogenicity (NTP): Not listed
Carcinogenicity (IARC): Not listed
Carcinogenicity (OSHA): Not listed

Special hazards for human health and environment

There is no hazard when the measures for handling and storage are followed. In case of cell damage, possible release of dangerous substances and a flammable gas mixture.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Hazardous components

CAS-No.	Chemical name	Quantity
1307-96-6	Cobalt oxide	< 30 %
1313-13-9	Manganese dioxide	< 30 %
1313-99-1	Nickel oxide	< 30 %
7440-44-0	Carbon	< 30 %
	Electrolyte (*)	< 20 %
24937-79-9	Polyvinylidene fluoride(PVdF)	< 10 %
7429-90-5	Aluminium foil	2 - 10 %
7440-50-8	Copper foil	2 - 10 %
	Aluminium and inert materials	5 - 10 %

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Further Information

For information purposes: (*) Main ingredients: Lithium hexafluorophosphate, organic carbonates
Because of the cell structure the dangerous ingredients will not be available if used properly.
During charge process a lithium graphite intercalation phase is formed.
Mercury content: Hg < 0.0.4mg/kg
Cadmium content: Cd < 4mg/kg
Lead content: Pb < 40mg/kg

4. FIRST AID MEASURES

General information

The following first aid measures are required only in case of exposure to interior battery components after damage of the external battery casing. Undamaged, closed cells do not represent a danger to the health.

Eye Contact: Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical treatment by eye specialist.
Skin Contact: In case of contact with skin wash off immediately with plenty of water. Consult a physician.
Inhalation: Ensure of fresh air. Consult a physician.
Ingestion: Drink plenty of water. Call a physician immediately.

5. FIRE- FIGHTING MEASURES

5.1 Suitable extinguishing media

Cold water and dry powder in large amount are applicable. Use metal fire extinction powder or dry sand if only few cells are involved.

5.2 Special hazards arising from the chemical

May form hydrofluoric acid if electrolyte comes into contact with water. In case of fire, the formation of the following flue gases cannot be excluded: Hydrogen fluoride (HF), Carbon monoxide and carbon dioxide.

5.3 Protective equipment and precautions for firefighters

Wear self-contained breathing apparatus and protective suit.

Additional information

If possible, remove cell(s) from firefighting area. If heated above 125°C, cell(s) can explode/vent. Cell is not flammable but internal organic material will burn if the cell is incinerated.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions

Use personal protective clothing. Avoid contact with skin, eyes and clothing. Avoid breathing fume and gas.

6.2 Environmental precautions

Do not discharge into the drains/surface waters/groundwater.
Methods for cleaning up/taking up
Take up mechanically and send for disposal

7. HANDLING AND STORAGE

7.1 Handling

Advice on safe handling

Avoid short circuiting the cell. Avoid mechanical damage of the cell. Do not open or disassemble.
Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.

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7.2 Storage

Requirements for storage rooms and vessels

Storage at room temperature (approx. 20°C) at approx. 20~60% of the nominal capacity (OCV approx. 14.4 – 15.6 V/Pack). Keep in closed original container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredient	Risk Codes	Safety Description	Hazard	Exposure Controls/Personal Protection
Cobalt oxide	R22;R43;R50/53	S24;S37; S60;S61	Xn(Harmful) N (Dangerous for the environment)	0.1 mg/m3 (TWA)
Manganese (VI) oxide	R20/22	S25	Xn(Harmful)	Airborne Exposure Limits: - OSHA Permissible Exposure Limit (PEL): 5 mg/m3 Ceiling for manganese compounds as Mn - ACGIH Threshold Limit Value (TLV): 0.2 mg/m3 (TWA) for manganese, elemental and inorganic compounds as Mn
Nickel oxide	R43,R49,R53	S45 S53 S61	T(Toxic)	Airborne Exposure Limits: For Nickel, Metal and Insoluble Compounds, as Ni: - OSHA Permissible Exposure Limits (PEL) - 1 mg/m3 (TWA). For Nickel, Elemental / Metal: - ACGIH Threshold Limit Value (TLV) - 1.5 mg/m3 (TWA), A5 - Not suspected as a human carcinogen. For Nickel, Insoluble Compounds, as Ni: - ACGIH Threshold Limit Value (TLV) - 0.2 mg/m3 (TWA), A1 - Confirmed human carcinogen
Carbon	R36/37/38, R36/37 R20, R10	S22;S24/25	F(Highly Flammable) Xn(Harmful) Xi(Irritant)	Airborne Exposure Limits: - OSHA Permissible Exposure Limits (PELs): activated carbon (graphite, synthetic): Total particulate = 15 mg/m3
Aluminium foil	R17,R15,R36/38, R10,R67,R65,R62,R5 1/53, R48/20,	S7/8,S43,S26, S62,S61, S36/37,S33,S2 9,S16,S9	F(Highly Flammable) Xn(Harmful) Xi(Irritant)	Airborne Exposure Limits: -OSHA Permissible Exposure Limit (PEL): 15

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	R38,R11,			mg/m3 (TWA) total dust and 5 mg/m3 (TWA) repairable fraction for Aluminum metal as Al - ACGIH Threshold Limit Value (TLV): 10 mg/m3 (TWA) Aluminum metal dusts
Copper foil	R11 R36 R37 R38	S5,S26,S16,S61, S36/37	F(Highly Flammable) N(Dangerous for the environment) Xn(Harmful) Xi(Irritant)	Copper Dust and Mists, as Cu: - OSHA Permissible Exposure Limit (PEL) - 1 mg/m3 (TWA) - ACGIH Threshold Limit Value (TLV) - 1 mg/m3 (TWA) Copper Fume: - OSHA Permissible Exposure Limit (PEL) - 0.1 mg/m3 (TWA) - ACGIH Threshold Limit Value (TLV) - 0.2 mg/m3 (TWA)
Polyvinylidene fluoride (PVdF)		S22;S24/25		

Additional advice on limit values

During normal charging and discharging there is no release of product.

Occupational exposure controls

No specific precautions necessary.

Protective and hygiene measures

When using do not eat, drink or smoke. Wash hands before breaks and after work.

Respiratory protection

No specific precautions necessary.

Hand protection

No specific precautions necessary.

Eye protection

No specific precautions necessary.

Skin protection

No specific precautions necessary.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Appearance:

Form: Solid
Color: Various
Odor: Odorless

9.2 Important health, safety and environmental information

Test method
pH Value: n.a.
Flash point: n.a.
Lower explosion limits: n.a.
Vapor pressure: n.a.
Density: n.a.
Water solubility: insoluble
Ignition temperature: n.a.

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10. STABILITY AND REACTIVITY

Stability

Stable

Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Do not puncture, crush or incinerate.

Materials to avoid

No materials to be especially mentioned.

Hazardous decomposition products

In case of open cells, there is the possibility of hydrofluoric acid and carbon monoxide release.

Possibility of Hazardous Reactions

Will not occur

Additional information

No decomposition if stored and applied as directed.

11. TOXICOLOGICAL INFORMATION

Empirical data on effects on humans

If appropriately handled and if in accordance with the general hygienic rules, no damages to health have become known.

12. ECOLOGICAL INFORMATION

Further information

Ecological injuries are not known or expected under normal use. Do not flush into surface water or sanitary sewer system.

13. DISPOSAL CONSIDERATIONS

Advice on disposal

For recycling consult manufacturer.

Contaminated packaging

Disposal in accordance with local regulations.

14. TRANSPORT INFORMATION

With regard to transport, the following regulations are cited and considered:

- The International Civil Aviation Organization (ICAO) Technical Instructions, Packing Instruction 965, Section I B or II (2015-2016 Edition),
- The International Air Transport Association (IATA) Dangerous Goods Regulations, Packing Instruction 965, Section I B or II (56th Edition, 2015)
- The International Maritime Dangerous Goods (IMDG) Code (2014 Edition),
- [Special provision 188, 230]
- US Hazardous Materials Regulations 49 CFR (Code of Federal Regulations)
- Sections 173.185 Lithium batteries and cells,
- The UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria 38.3 Lithium batteries, Revision 3, Amendment 1 or any subsequent revision and amendment applicable at the date of the type (latest version is Revision 5, Amendment 2)
- **UN No. 3480**

If those lithium-ion batteries are packed with or contained in an equipment, then it is the responsibility of the shipper to ensure that the consignment are packed in compliance to the latest edition of the IATA Dangerous Goods Regulations section II of either Packing Instruction 966 or 967 in order for that consignment to be declared as NOT RESTRICTED (non-hazardous/non-Dangerous). **If those lithium-ion batteries are packed with or contained in an equipment, UN No. is UN3481**

Our products are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to all the applicable international and national governmental regulations, not

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limited to the above mentioned. We further certify that the enclosed products have been tested and fulfilled the requirements and conditions in accordance with UN Recommendations (T1 – T8) on the Transport of Dangerous Goods Model Regulations and the Manual of Testes and Criteria.

Test results of the UN Recommendation on the Transport of Dangerous Goods

Manual of Test and Criteria (38.3 Lithium battery)		Test Results	Remark
NO	Rest item		
T1	Altitude Simulation	Pass	
T2	Thermal Test	Pass	
T3	Vibration	Pass	
T4	Shock	Pass	
T5	External Short Circuit	Pass	
T6	Impact/Crush	Pass	
T7	Overcharge	Pass	For pack and single cell battery only
T8	Forced Discharge	Pass	

15. REGULATORY INFORMATION

15.1 U.S. Regulations

National Inventory TSCA

All of the components are listed on the TSCA inventory.

SARA

To the best of our knowledge this product contains no toxic chemicals subject to the supplier notification requirements of Section 313 of the Superfund Amendments and Reauthorization Act (SARA/EPCRA) and the requirements of 40 CFR Part 372.

15.2 Regulatory information EU

Labeling

Hazardous components which must be listed on the label As an article the product does not need to be labeled in accordance with EC directives or respective national laws.

EU regulatory information

1999/13/EC (VOC): 0 %



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16. OTHER INFORMATION

16.1 Hazardous Materials Information Label (HMIS)

Health: 0

Flammability: 0

Physical Hazard: 0

16.2 NFPA Hazard Ratings

Health: 0

Flammability: 0

Reactivity: 0

Unique Hazard:

16.3 Full text of R-phrases referred to under sections 2 and 3

R10 Flammable.

R20/22 Harmful by inhalation and if swallowed.

R22 Harmful if swallowed.

R34 Causes burns.

R40 Limited evidence of a carcinogenic effect.

R43 May cause sensitization by skin contact.

R48/23 Toxic: danger of serious damage to health by prolonged exposure through inhalation.

R49 May cause cancer by inhalation.

R50 Very toxic to aquatic organisms.

R53 May cause long-term adverse effects in the aquatic environment.

Further Information

Data of sections 4 to 8, as well as 10 to 12, do not necessarily refer to the use and the regular handling of the product (in this sense consult package leaflet and expert information), but to release of major amounts in case of accidents and irregularities. The information describes exclusively the safety requirements for the product

(s) and is based on the present level of our knowledge. This data does not constitute a guarantee for the characteristics of the product(s) as defined by the legal warranty regulations. "(n.a. = not applicable; n.d. = not determined)"

The data for the hazardous ingredients were taken respectively from the last version of the sub-contractor's safety data sheet.

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT, BUT DOES NOT PUPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. GREENEX SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT
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