



REVISED – March 4, 2013

Approval No. 22-A130001-0
A&CC PAR No. 0097781

February 20, 2013

Mine Safety Appliances Company
Attention: Mr. Ken Thompson
1000 Cranberry Woods Drive
Cranberry Township, PA 16066

Dear Mr. Thompson:

The review of your application dated January 7, 2010, Company Code No. 490026 for the Model Altair4X Permissible Multi-Gas Detector, is complete.

The design of this Model Altair4X Permissible Multi-Gas Detector meets the requirements of Title 30 Code of Federal Regulations, Part 22 and is approved as permissible for use in gassy underground mines. We assign Approval No. 22-A130001-0 to the Model Altair4X Permissible Multi-Gas Detector.

The following apply to Approval No. 22-A130001-0:

1. You must build each Model Altair4X Permissible Multi-Gas Detector bearing this approval number according to the drawings and specifications on file at our Center. Enclosed is a list of these drawings and specifications.
2. Our approval label information must be legibly reproduced with permanent lettering on a wear resistant material and must be prominently displayed on an exterior surface of the Model Altair4X Permissible Multi-Gas Detector display unit and sensor unit (see the enclosed official approval label information required for these units). All of the approval label information must appear on the approval label.
3. You are not permitted to make changes to the design of this Model Altair4X Permissible Multi-Gas Detector without our approval.
4. We may require you to make changes to the design, or to modify the Model Altair4X Permissible Multi-Gas Detector in the field, in the interest of safety.
5. We have the right to revoke this approval, for cause, at any time.

6. **You must provide, to the user, a copy of the calibration instructions as found in Document Number 10128754, Revision 1, with each Model Altair4X Permissible Multi-Gas Detector.**
- 7 The following requirements apply to the use of the Model Altair4X Permissible Multi-Gas Detector:
 1. MSHA approved for use with the Sanyo UF103450PN battery. The battery is not user-replaceable. Charge in above ground locations only.
 2. For compliance determinations required by 30 CFR Part 75, Subpart "D", the Altair4x must display methane in the percent-by-volume (0-5%) mode.
 3. Not approved for use with the MSA Universal Pump Probe assembly.
 4. **The Altair4x is to be calibrated according to the procedures in the instruction manual, Document Number 10128754.**

You will receive an invoice for the cost to process your application.

If you have any comments or questions relative to this letter, please contact Matthew Heightland at 304-547-2314 or by email heightland.matthew@dol.gov.

Sincerely,



Kenneth A. Sproul
Acting Chief, Approval and Certification Center

Enclosures

Mine Safety Appliances Company
Model Altair4X
Permissible Multi-Gas Detector



APPROVAL NO. 22-A130001-0

TESTED FOR INTRINSIC SAFETY IN METHANE-AIR MIXTURES ONLY

WARNINGS:

1. MSHA APPROVED FOR USE WITH THE SANYO UF103450PN BATTERY. THE BATTERY IS NOT USER-REPLACEABLE. CHARGE IN ABOVE GROUND LOCATIONS ONLY.
2. FOR COMPLIANCE DETERMINATIONS REQUIRED BY 30 CFR PART 75, SUBPART "D", THE ALTAIR4X MUST DISPLAY METHANE IN THE PERCENT-BY-VOLUME (0-5%) MODE.
3. NOT APPROVED FOR USE WITH THE MSA UNIVERSAL PUMP PROBE ASSEMBLY.
4. THE ALTAIR4X IS TO BE CALIBRATED ACCORDING TO THE PROCEDURES IN THE INSTRUCTION MANUAL, DOCUMENT NUMBER 10128754.



Revised Approval Modification Program (RAMP) Acceptance issued to:

Company: Mine Safety Appliances Company	Investigation No.: GD-23939
Attention: Johnny Lee	Co Appl Code No.: 490523
Address: 1000 Cranberry Woods Drive	Approval/Cert. No.: 22-A130001-0
Cranberry township, Pa 16066	

Model(s): Altair 4X Permissible Multi-Gas Detector

Description of change(s): The following changes are included in this RAMP:

- The Infrared Transceiver, U1, was changed from a Sharp, Part Number GP2W0110YP0F, IR Transceiver (8-Pin) to a Vishay, Part Number TFBS4650, IR Transceiver (7-Pin). The thermal impedance remains the same as the previously approved value of 812°C/W.
- To accommodate the new IR Transceiver, the component layout was changed for the Main PCB.
- Current Limiting Resistor, R7, was changed from 36.5 Ω 1% 1W to 100 Ω 1%, 1W. The maximum current through the resistor was calculated as 53.96 mA $((6.7V)/(25.16 \Omega + 99 \Omega))$. The maximum power dissipated by R7 is 291.17mW $((53.96mA)^2 * 100 \Omega)$. This is well under 2/3 of its rated power of 1 Watt.
- The capacitance value for C6 was changed from 1uF to 0.1uF on the Main PCB.
- A date stamp was added to the Main PCB.
- Test results from the battery encapsulation adhesion test were added to the controlled drawings.

Note: The changes listed above do not affect intrinsic safety.

<u>Title</u>	<u>Drawing No.</u>	<u>Revision</u>
Altair4x MSHA	SK3098-1138, Sheets 1-9	1
Artwork, MSHA Altair4x Main Board	SK3098-1225, Sheets 1-8	1
Approval, XCell Echem Sensor, MSHA	SK3098-1102, Sheets 1-11	1

<u>Title</u>	<u>Drawing No.</u>	<u>Revision</u>
Altair4x Master Drawing List, MSHA	SK3098-1243	1

Attachments (check all that are applicable):

☐ Evaluation Report ☐ Test Sheet(s) ☐ Revised Approval Plate Design ☐ Revised Conditions of Use

Approved by: <i>Kevin Hedges</i>	Date: <i>5-8-13</i>
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Revised Approval Modification Program (RAMP) Acceptance issued to:

Company:	Mine safety Appliance Company	Investigation No.:	GD-23939
Attention:	Mr. Johnny Lee	Co. Appl. Code No.:	490434
Address:	1000 Cranberry Woods Drive Cranberry Township, PA 16066-5296	Approval/Cert. No.:	22-A130001-0

Model(s): Altair4X

Description of change(s): The following changes are included in this RAMP:

- Addition of Galaxy 2 calibration system
- Update drawing

The modifications and additions introduced in this RAMP have no impact on the intrinsic safety or required performance of the Altair4X.

<u>Title</u>	<u>Drawing No.</u>	<u>Revision</u>
APPROVAL, XCell ECHEM SENSOR, MSHA	SK3098-1102 (11 Sheets)	2
ALTAIR4X MASTER DRAWING LIST, MSHA	SK3098-1243	2

Attachments (check all that are applicable):

☒ Evaluation Report ☐ Test Sheet(s) ☐ Revised Approval Plate Design ☐ Revised Conditions of UseApproved by: *Kevin F. Adair*Date: *06-19-2014*

U.S. Department of Labor

Mine Safety and Health Administration
Approval and Certification Center
765 Technology Drive
Triadelphia, West Virginia 26059



Approval No. 22-A130001-0
A&CC PAR No. 0103902

July 17, 2014

Mine Safety Appliances Company
Attention: Mr. Johnny Lee
1000 Cranberry Woods Drive
Cranberry Township, PA 16066

Dear Mr. Lee:

Enclosed is a revised RAMP acceptance letter for a change requested to the Altair4X approved under Investigation GD-23939, Approval No. 22-A130001-0, referencing your original request received on 8/29/2013.

Revision of this document is necessary to update the conditions of use for the Altair4X which have been modified to accommodate the following changes to the Drawing List Drawing No. SK3098-1243.

The Conditions of Use, Item 6 has been changed to:

6. You must provide, to the user, a copy of the calibration instructions as found in Document Number 10128754 with each Model Altair4X Permissible Multi-Gas Detector.

Item Number 6, shown above, will be an addition to reference the calibration procedures as found in the Altair4X Manual Revision 2.

Drawing No. SK3098-1243, Rev 2, "Drawing List" which was submitted on 6/4/2014 incorrectly identified Document Number 10128754, Rev1, "ALATAIR 4X MSHA Multigas Detector Instruction Manual". The revised Drawing No. SK2098-1243, Rev 2, "Drawing List" has corrected this error and is shown as:

User's Manual: See Document Number 10128754, Rev 2, "ALTAIR 4X MSHA Multigas Detector Instruction Manual"

Please insert the enclosed document in your files to replace the RAMP acceptance letter previously sent to you. The revised approval documentation is attached.

If you have any comments or questions relative to this letter, please contact Ronald Gast at 304-547-2030 or by email gast.ronald@dol.gov.

Sincerely,


Kevin D. Dolinar
Chief, Electrical Safety Division

Enclosures

INVESTIGATION NO. GD-23939

DRAWING LIST

HLS

Mine Safety Appliances Co. Model Altair4X
Multi-Gas Detection Instrument Built
According to Drawing No. SK3098-1243

Approval Number 22-A130001-0

<u>TITLE</u>	<u>DRAWING NO.</u>	<u>REVISION</u>
ALTAIR4X MASTER DRAWING LIST, MSHA	SK3098-1243	2
ALTAIR4X MSHA	SK3098-1138, Shts. 1-9	1
ARTWORK,MSHA ALTAIR4X MAIN BOARD	SK3098-1225, Shts. 1-8	1
APPROVAL, XCell Ex COMBUSTIBLE SENSOR MSHA	SK3098-1086, Shts. 1-18	-
ARTWORK, MSHA XCELL COMBUSTIBLE ASIC BOARD	SK3098-1224, Shts. 1-8	-
ARTWORK, MSHA XCELL COMBUSTIBLE HEADER BOARD	SK3098-1223, Shts. 1-4	-
APPROVAL, XCell, ECHEM SENSOR, MSHA	SK3098-1102, Shts. 1-11	2
ARTWORK, MSHA XCELL ECHEM BOARD	SK3098-1222, Shts. 1-6	-

Certified Performance Statement: See certified statement from Paul Jung dated December 20, 2012, filed in the Correspondence Folder filed under this investigation.

User's Manual: See Document Number 10128754, Rev 2, "ALTAIR 4X MSHA Multigas Detector Instruction Manual"



Revised Approval Modification Program (RAMP) Acceptance issued to:

Company:	Mine safety Appliance Company	Investigation No.:	GD-23939
Attention:	Mr. Johnny Lee	Co. Appl. Code No.:	490434
Address:	1000 Cranberry Woods Drive	Approval/Cert. No.:	22-A130001-0
	Cranberry Township, PA 16066-5296		

Model(s): Altair4X**Description of change(s):** The following changes are included in this RAMP:

- Addition of Galaxy 2 calibration system
- Update drawing

Revised Conditions of Use:

6. You must provide, to the user, a copy of the calibration instructions as found in Document Number 10128754, with each Model Altair4X Permissible Multi-Gas Detector.

The modifications and additions introduced in this RAMP have no impact on the intrinsic safety or required performance of the Altair4X.

<u>Title</u>	<u>Drawing No.</u>	<u>Revision</u>
APPROVAL, XCell ECHEM SENSOR, MSHA	SK3098-1102 (11 Sheets)	2
ALTAIR4X MASTER DRAWING LIST, MSHA	SK3098-1243	2

Attachments (check all that are applicable):

☒ Evaluation Report ☐ Test Sheet(s) ☐ Revised Approval Plate Design ☒ Revised Conditions of Use

Approved by:

Date: Original Issuance
6/19/2014

Revised: 7/16/2014



Revised Approval Modification Program (RAMP) Acceptance issued to:

Company: Mine Safety Appliance Company	Investigation No.: GD-23939
Attention: Mr. Warren Bennett	Co Appl Code No.: ACR490721
Address: 1000 Cranberry Woods Drive	Approval/Cert. No.: 22-A130001-0
Cranberry Township, PA 16066-5296	

Model(s): Altair4X, Permissible Multi-Gas Detector**Description of change(s):** The following changes are included in the RAMP:

- Modification to Drawing No. SK3098-1138, changing liquid crystal display reflector note to "ADHESIVE OR NONADHESIVE LIQUID CRYSTAL DISPLAY REFLECTOR".
- Update Drawing No. SK3098-1243, Drawing List to reflect the above revision change.

The modifications and additions introduced in this RAMP have no impact on the intrinsic safety or required performance of the Altair4X.

Title	Drawing Number	Revision
ALTAIR4X MASTER DRAWING LIST, MSHA	SK3098-1243	3
ALTAIR4X MSHA	SK3098-1138 (9 Shts.)	2

Attachments (check all that are applicable):

☐ Evaluation Report ☐ Test Sheet(s) ☐ Revised Approval Plate Design ☐ Revised Conditions of Use

Approved by:

Date:

08-19-2014



Revised Approval Modification Program (RAMP) Acceptance issued to:

Company: Mine Safety Appliances Company

Investigation No.: GD-23939

Attention: Mr. Johnny Lee

Co Appl Code No.: ACR491191

Address: 1000 Cranberry Woods Drive
Cranberry Township, PA 16066-5296

Approval/Cert. No.: 22-A130001-0

Model(s): Altair4X Multi-Gas Detector**Description of change(s):** The following changes are included in the RAMP:

- Update to drawing number SK3098-1138, sheet 8, to add a clear protective overlay to the approval label.
- Update to drawing number SK3098-1138, sheet 8, to add a note allowing the use of an optional thread locking compound for the belt clip mounting screw.
- Update to master drawing list, drawing number SK3098-1243 to reflect listed changes.

The modifications and additions introduced in this RAMP have no impact on the intrinsic safety or required performance of the Altair4X.

Title	Drawing Number	Revision
Altair4X MSHA	SK3098-1138 (9 sheets)	3
Altair4X Master Drawing List, MSHA	SK3098-1243	4

Attachments (check all that are applicable):

☐ Evaluation Report ☐ Test Sheet(s) ☐ Revised Approval Plate Design ☐ Revised Conditions of UseApproved by: *Kevin Deeds*Date: *05-06-2015*



Revised Approval Modification Program (RAMP) Acceptance issued to:

Company: Mine Safety Appliances Company

Investigation No.: GD-23939

Attention: Mr. Warren Bennett

Co Appl Code No.: ACR491309

Address: 1000 Cranberry Woods Drive

Approval/Cert. No.: 22-A130001-0

Cranberry Township, PA 16066-5296

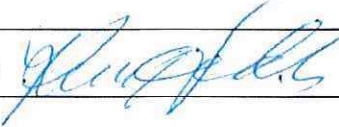
Model(s): Altair4X Multi-Gas Detector**Description of change(s):** The following changes are included in the RAMP:

- Update to drawing number SK3098-1138, sheet 2. The update adds an alternate part number (335-BCPZ) for component U15.
- Update to master drawing list, drawing number SK3098-1243, to reflect listed changes.

After a detailed technical review, it was found that the modifications and additions introduced in this RAMP have no impact on the intrinsic safety or required performance of the Altair4X.

Title	Drawing Number	Revision
Altair4X MSHA	SK3098-1138 (9 sheets)	4
Altair4X Master Drawing List, MSHA	SK3098-1243	5

Attachments (check all that are applicable):

☐ Evaluation Report ☐ Test Sheet(s) ☐ Revised Approval Plate Design ☐ Revised Conditions of UseApproved by: 

Date: 10-22-2015



Revised Approval Modification Program (RAMP) Acceptance issued to:

Company: Mine Safety Appliances (MSA) Company	Investigation No.: GD-23939
Attention: Mr. Warren Bennett	Co Appl Code No.: 000492
Address: 1000 Cranberry Woods Drive	Approval/Cert. No.: 22-A130001-0
Cranberry Township, PA 16066	

Model(s): Altair4X, Permissible Multi-Gas Detector

Description of change(s):

- Addition of alternate bottom copper layer of Main Board PCB, this alternate bottom layer does not present a spacing hazard nor impede the intrinsic safety, ruggedness, or required performance of the Altair4X Permissible Multi-Gas Detector.
- Drawing List revised to incorporate revision above.

<u>Title</u>	<u>Drawing No.</u>	<u>Revision</u>
Altair4X Master Drawing List	SK3098-1243	6
Artwork, MSHA Altair 4X Main Board	SK3098-1225 (8 shts)*	2

* Multi-sheet drawing filed as a single entry

Attachments (check all that are applicable):

☐ Evaluation Report ☐ Test Sheet(s) ☐ Revised Approval Plate Design ☐ Revised Condition(s) of Use

Approved by:

Date: 04-06-2017

**Revised Approval Modification Program (RAMP) Acceptance issued to:**

Company: Mine Safety Appliance Company
Attention: Mr. Craig Gestler
Address: 1000 Cranberry Woods Drive
Cranberry Township, PA 16066

Investigation No.: GD-23939
Co. Appl. Code No.: GCA1788
Approval/Cert. No.: 22-A130001-0

Model(s): Altair4X, Permissible Multi-Gas Detector

Description of change(s): The following change is included in this RAMP:

- Added an alternate mechanical design for the sintered metal frit that eliminates the chamfered edge on the inside corner of the part, part # 10103791, reference drawing SK3098-1186, sheet 10.
- Added an alternate thermal impedance, $R_{th JA}$, with a lower maximum limit for components of the EChem sensor pcb, reference drawing SK3098-1102, sheet 5.

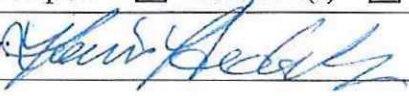
The changes introduced in this RAMP has no impact on the intrinsic safety of the Model Altair4X, Permissible Multi-Gas Detector.

Title	Drawing No.	Revision
ALTAIR4X MASTER DRAWING LIST, MSHA	SK3098-1243	8
Approval, XCell Ex Combustible Sensor, MSHA	SK3098-1086, (Sheets 1- 18)*	1
Approval, XCell Ex ECHEM Sensor, MSHA	SK3098-1102, (Sheets 1-11)*	3

* Multi-sheet drawing filed as a single entry.

Attachments (check all that are applicable):

☐ Evaluation Report ☐ Test Sheet(s) ☐ Revised Approval Plate Design ☐ Revised Conditions of Use

Approved by: 

Date: 5-1-19