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APPROVAL REPORT

**MODELS AP-01a, AFP-01a, AFP-02a AND AFP-03a
TYPE Z & Y PRESSURIZING SYSTEMS
FOR HAZARDOUS (CLASSIFIED) LOCATIONS**

Prepared For:

**AB-CO Controls Inc.
804 Park Two Drive
Sugarland, Texas 77478**

**J.I. 3002170
(3620)
April 7, 1999**

FACTORY MUTUAL



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from

**AB-CO Controls Inc.
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I INTRODUCTION

1.1 AB-CO Controls Inc. (manufacturer) requested Factory Mutual Research Corporation (FMRC) Approval of their Models AP-01a, AFP-01a, AFP-02a and AFP-03a Type Z & Y Pressurizing Systems associated with electrical equipment in protected enclosures in Class I and II, Division 1 (Type Y) and Class I and II, Division 2 (Type Z) hazardous (classified) locations, indoors.

1.2 The FMRC Approval Guide listing of the Models described by this report will appear as follows:

AFP-01a, AFP-02a and AFP-03a Type Y Pressurizing Systems

Avialble with Model AV-1BG or AV-2BG Relief Vent.

APY/I, II /1/*/T6

AP-01a, AFP-01a, AFP-02a and AFP-03a Type Z Pressurizing Systems

Avialble with Model AV-1BG or AV-2BG Relief Vent.

APZ/I, II /2/*/T6

Option Code

a* = Pressure Switch 0 = No (Groups ABCDFG) , 1 = Yes (Groups CDFG).

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1.3 FMRC Approval of these Pressurizing Systems is based on the applicable requirements of the following.

| <u>Title</u> | <u>Author/Number</u> | <u>Date</u> |
|---|----------------------|-------------|
| Electrical equipment for use in Hazardous (Classified) Locations General Requirements | FM-3600 | 1998 |
| Purged and Pressurized Electrical Equipment Use in Hazardous (Classified) Locations | FM-3620 | 1989 |
| Purged and Pressurized Enclosures for Electrical Equipment | ANSI/NFPA-496 | 1993 |

1.4 FMRC Approval of hazardous (classified) location equipment is based on examination and tests of production model equipment and follow-up audit inspections of manufacturing facilities and quality control procedures.

1.5 As described by this report, the design and construction of these Pressurizing Systems, Models AP-01a, AFP-01a, AFP-02a and AFP-03a, provide for the degree of protection against electrical shock, fire and injury required for hazardous (classified) location applications when installed per ANSI/NFPA 496.

II DESCRIPTION

2.1 The pressurizing systems, Models AP-01a, AFP-01a, AFP-02a and AFP-03a, are designed to be used in conjunction with a protected enclosure to reduce the internal area classification of the protected enclosures.

2.2 One of the relief vents, (AV-1BG or AV-2BG), is mounted on top of the protected enclosure depending on the controller model. The relief vent prevents an over-pressure of the protected enclosure if the regulator on the controller fails. The Models AP-01 and AFP-01 requires an AV 1BG relief vent and the Models AFP-02 and AFP-03 requires an AV-2BG relief vent.

2.3 The purge controllers, Models AFP-01, AFP-02 and AFP-03 consist of a pneumatically controlled visual gage, control valve, pressure gauge, a pressure regulator and fast purge valve all mounted on the front panel of the purge controller. The pneumatically controlled color-code gauge indicates the status of the internal pressure of the protected enclosure. The control valve is adjusted to maintain a minimum protective enclosure pressure of 0.25 inches of water. The pressure regulator controls the inlet pressure to maintain a pressure of 60 psi minimum as indicated by the pressure gauge before the start of the purge cycle. The fast purge valve is manually opened during the purge cycle and provides a flow pressure of 60 psi minimum to the protected enclosure.

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These controllers can provide typical purging flow rates of 6 scfm, 16 scfm and 40 scfm respectively. The purge Models AFP-01, AFP-02 and AFP-03 are available with or without a pressure switch.

2.4 The pressurizing Model AP-01 consists of a pneumatically controlled gauge and a pressure regulator both mounted on the front panel. The pneumatically controlled color-coded gauge indicates the status of the internal pressure of the protected enclosure. The pressure regulator is adjusted to start the purge cycle and maintain a minimum enclosure pressure of 0.25 inches of water. The pressurizing Model AP-01 is available with or without a pressure switch.

2.5 The optional Pressure Switch Model 1950-0 is manufactured by Dwyer and is FMRC Approved, Report 0T5H3.AE as explosionproof for Class I, Div. 1, Groups C & D; dust-ignitionproof for Class II, III, Div. 1, Groups E, F & G hazardous (classified) locations, indoors and outdoors (NEMA Type 3).

2.6 For further description including pictures and specifications, etc., see the attached Product Literature.

III MARKING

3.1 The self adhesive label of 3M ScotchCal using 3M 467 is provided for the Pressurizing Systems and attached on the purge controller. Label drawing 1298-1 is included as an attachment to this report. This label includes:

- Manufacturer's name and address
- Model Number
- Serial Number
- Class, Division, Group
- Low Pressure Switch
- Min Purge Time
- Pressure / Flow Ratings
- Vent Type
- Installation Manual Reference 1298-4.

3.2 A separate label of the same construction is provided for the relief vent label. Label drawing 1298-2 is included as an attachment to this report. This label includes:

- Manufacturer's name and address
- Vent Type
- Serial Number
- Open pressure in W.C.
- Note that it is; "FM Approved only when used with an AB-C0 Controls Inc. System".

3.3 A separate Warning Label of the same construction is provided for the attachment to the protected enclosure. Label drawing 1298-3 is included as an attachment to this report. This label

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includes the pressurized Enclosure warning marking and the pressurizing instruction required by ANSI/NFPA 496.

IV EXAMINATION AND TESTS

4.1 Test Samples - Samples of the Models AP-01, AFP-01, AFP-02 and AF-03 Purge Controllers and Models AV-1BG and AV-2BG Relief Vents which were considered to be representative of production types were examined and compared with the manufacturer's drawing and the standards listed in Section 1.3. All test data is on file along with other documents and correspondence applicable to this program as identified in Section IX. The test samples Models AP-01, AFP-01, AFP-02 and AF-03 Purge Controllers and Models AV-1BG and AV-2BG Relief Vents were individually connected to a 2 ft³ test enclosure. The enclosure used for all testing was the Hoffman Part Number A-24H20BLP.

Examination and test paragraphs that relate to the specific clause of the ANSI/NFPA-496 are indicated in parentheses after that paragraph number.

4.2 Pressurizing Systems - General Requirements

4.2.1 (2-3.1, 2-3.2) Pressure Indicator - All systems provide a visual indicator to confirm satisfactory protected enclosure pressure of a 0.1 inches of water. The indicator is located on the front panel of the controller for convenient viewing. The indicator is installed at the output of the protected enclosure. All four test samples were individually connected to the protected enclosure and it was verified that the visual indicator showed when the pressure fell to 0.1 inches of water. This test was verified with a calibrated water column. This is satisfactory.

4.2.2 (2-3.3) Protective Gas Supply Alarm - All systems incorporate a protected enclosure output that can be used to satisfy the requirement for a protective gas supply alarm. This is satisfactory.

4.2.3 (2-3.5) Provisions for Instructions - Installation, operation and maintenance instructions are provided with each system. The Operating and Service Manual 1298-4 has been reviewed and systems installed in accordance with these instructions will conform to the requirements ANSI/NFPA-496. This is satisfactory.

4.2.4 (3-2.2) Provisions for Purging - All systems include provisions for manual purging although it may not be necessary to purge if the protected enclosure is known to be free of flammables. This is satisfactory.

4.2.5 (3-2.4) Enclosure Pressurization - The Model AP-01 provide the flow of protective gas required to maintain the minimum enclosure pressure (not less than 0.1 inches of water). This Model need only supply protective gas to compensate for any leakage from the protected enclosure. This is satisfactory.

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4.2.6 (2-2.1.1, 2-2.1.2) Overpressure Protection of Protected Enclosure - The Models AP-01 and AFP-01 are provided with an AV-1BG relief vent to be installed on the protected enclosure top to provide overpressure protection and provide a means of confirming flow through the protected enclosure. The Models AFP-02 and AFP-03 are provided with an AV-2BG relief vent to be installed on the protected enclosure to provide overpressure protection and provide a means of confirming flow through the protected enclosure. It was verified on all four systems that when connected to the maximum rated inlet pressure of 250 psi that the relief vent limited the protected enclosure pressure to a pressure of 1.2 inches of water. A metallized screen spark arrestor is provided within the relief vent to prevent the escape of sparks or burning material. This is satisfactory.

4.3 Pressurizing Systems - Specific Requirements for Type Z

4.3.1 (2-8.1) Indication of Pressurization Failure - All systems for Type Z incorporate a visual indicator for the failure of the pressurization of the protected enclosure. The operation of the indicator was verified as reported in paragraph 4.2.1. This is satisfactory.

4.3.2 (2-8.2) Provides of Alarm for Enclosures that can be Isolated from the Protective Gas Supply - Suitable provisions for an alarm have been provided should a particular installation warrant. This is satisfactory.

4.3.3 (2-8.3) Alarm - Each system has an option for an actuator (pressure switch as described in paragraph 2.6) that takes its signal independently from the protected enclosure without an in-line valve and provides a pneumatic output to the alarm output. This is satisfactory.

4.3.4 (2-8.4) Indicator - Each system takes its signal independently from the protected enclosure without an in-line valve and provides a pneumatic signal to operate a visual indicator on the front of the pressurizing system enclosure. This is satisfactory.

4.3.5 (3.4) Provisions for Purging of the AP-01 - An adjustable pressure regulator on the Model AP-01 is provided to start the purge of the enclosure. The flow of the protected gas from the relief valve is monitored to verify that the protected gas is flowing through the protected enclosure rather than just into it. It is the users responsibility to allow the purge to continue until a least 4 volumes have passed through the protected enclosure. The Model AP-01 was connected to a 150 psi inlet pressure. The adjustable pressure regulator was increased until the Relief Vent Model AV-1BG was maintained in a constant open position. A minimum purge flow of 6 cfm through the connected protected enclosure was verified with the Relief Vent Model AV-1BG. Subsequently, the inlet pressure was adjusted to maintain an enclosure pressure of 0.25 inches of water. This is satisfactory.

4.3.6 (3.4) Provisions for Purging of the AFP-01 - A manual fast purge control valve on the Model AFP-01 is provided to start the purge of the enclosure. The flow of the protected gas from the relief vent is monitored to verify that the protected gas is flowing through the protected enclosure rather than just into it. It is the user's responsibility to allow the purge to continue until a least 4 volumes have passed through the protected enclosure. The Model AFP-01 was connected

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to a 150 psi inlet pressure. Initially, the control valve was adjusted to maintain a minimum protective enclosure pressure of 0.25 inches of water and the inlet pressure regulator was adjusted for a pressure of 60 psi. The manual fast purge control valve was turned open to start the fast purge cycle. A minimum purge flow of 6 cfm through the connected protected enclosure was verified with the Relief Vent Model AV-1BG. Subsequently, the fast purge control valve was turned to the close position and an enclosure pressure of 0.25 inches of water was maintained. This is satisfactory.

4.3.7 (3.4) Provisions for Purging of the AFP-02 - A manual fast purge control valve on the Model AFP-02 is provided to start the purge of the enclosure. The flow of the protected gas from the relief vent is monitored to verify that the protected gas is flowing through the protected enclosure rather than just into it. It is the user's responsibility to allow the purge to continue until a least 4 volumes have passed through the protected enclosure. The Model AFP-02 was connected to a 150 psi inlet pressure. Initially, the control valve was adjusted to maintain a minimum protective enclosure pressure of 0.25 inches of water and the inlet pressure regulator was adjusted for a pressure of 60 psi. The manual fast purge control valve was turned open to start the fast purge cycle. A minimum purge flow of 16 cfm through the connected protected enclosure was verified with the Relief Vent Model AV-2BG. Subsequently, the fast purge control valve was turned to the close position and an enclosure pressure of 0.25 inches of water was maintained. This is satisfactory.

4.3.8 (3.4) Provisions for Purging of the AFP-03 - A manual fast purge control valve on the Model AFP-03 is provided to start the purge of the enclosure. The flow of the protected gas from the relief vent is monitored to verify that the protected gas is flowing through the protected enclosure rather than just into it. It is the user's responsibility to allow the purge to continue until a least 4 volumes have passed through the protected enclosure. The Model AFP-03 was connected to a 150 psi inlet pressure. Initially, the control valve was adjusted to maintain a minimum protective enclosure pressure of 0.25 inches of water and the inlet pressure regulator was adjusted for a pressure of 60 psi. The manual fast purge control valve was turned open to start the fast purge cycle. A minimum purge flow of 40 cfm through the connected protected enclosure was verified with the Relief Vent Model AV-2BG. Subsequently, the fast purge control valve was turned to the close position and an enclosure pressure of 0.25 inches of water was maintained. This is satisfactory.

4.4 Pressurizing Systems - Specific Requirements for Type Y

4.4.1 (2-9.1) Supplemental Requirements for Type Y - With the exception for the product label, Y-Purge units are identical to the Z-Purge units. Thus, all of the requirements for Type Z are met as reported in Section 4.3. This satisfactory.

4.4.2 (2-9.3) Ventilated Equipment - Protected equipment requiring automatic shutdown in the event of a ventilation failure may require the use of Y-Purge unit for this application unless the automatic shutdown is otherwise externally provided. This is satisfactory.

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V REMARKS

5.1 This pressurizing system is only one component of a "Purge and Pressurized Electrical Equipment" installation. Complete system installation shall be completed in accordance with the current issue of the National Electrical Code; ANSI/NFPA-70 and Purged and Pressurized Enclosures for Electrical Equipment; ANSI/NFPA-496.

5.2 Complete system installation shall be in accordance with the current issue of the manufacturer's Operating and Service Manual 1298-4.

5.3 Tampering or replacement with nonfactory components may adversely affect system safety.

VI FACILITIES AND PROCEDURES AUDIT

The design and manufacturing facility in Sugarland, Texas was visited as part of this approval program. The facilities and quality control procedures were in place to be sufficient to the manufacture product identical to that tested and Approved. This facility is subject to routine follow-up inspections.

VII MANUFACTURER'S RESPONSIBILITIES

7.1 The manufacturer shall advise FMRC of all proposed changes to the documents listed in Section IX via Form 797, Approved Product Revision Report.

7.2 The manufacturer shall provide Operating and Service Manual 1298-4 with each apparatus.

7.3 The manufacturer shall provide a Warning Label with each apparatus for the end users enclosure as shown in Label Drawing No. 1298-3.

VIII CONCLUSION

AB-CO Controls Inc. Models AP-01a, AFP-01a, AFP-02a and AFP-03a Type Z & Y Pressurizing Systems, as herein described, meet FMRC Approval requirements for Associated Purge Apparatus. Approval is effective when the Approval agreement is signed and received by FMRC.

IX DOCUMENTATION FILE

The following documentation is applicable to this equipment and is on file at FMRC. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FMRC. The Approved Product - Revision Report, FMRC Form 797, shall be forwarded to FMRC as notice of proposed changes.

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| <u>DOCUMENT NUMBER</u> | <u>DOCUMENT TITLE</u> | <u>REVISION</u> |
|------------------------|---------------------------|-----------------|
| AB-LEX980001 | MODEL AP-01 | 3 |
| AB-LEX980002 | MODEL AFP-01 | 3 |
| AB-LEX980003 | MODEL AFP-02 | 3 |
| AB-LEX980004 | MODEL AFP-03 | 3 |
| AB-LEX98000B1 | TYPICAL VENT INSTALLATION | 3 |
| 1298-1 | LABEL, PURGE CONTROLLER | 1 |
| 1298-2 | LABEL, VENT | 12-15-98 |
| 1298-3 | LABEL, WARNING | 12-15-98 |
| 1298-4 | INSTALLATION MANUAL | 1998 |

TESTS AND EXAMINATION BY: M. Stelmach

ATTACHMENTS: Operating and Service Manual: 1298-4
Product Literature.

ORIGINAL DATA Project Data Record 3002170

REPORT BY:



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REPORT REVIEWED BY:



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