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APPROVAL REPORT

Manual MPS and Automatic APS and APU Electrostatic Powder Finishing Equipment

Prepared For:

ITW GEMA
4141 West 54TH Street
Indianapolis, IN. 46254-3728

J.I. 2X0A7.AE
(7264)
June 16, 1997

FACTORY MUTUAL | 

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Norwood, Massachusetts 02062

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I INTRODUCTION

1.1 ITW GEMA (manufacturer) requested Factory Mutual Research Corporation (FMRC) Approval of their Manual MPS and Automatic APS and APU Electrostatic Powder Finishing Equipment. This equipment, used for powder finishing of electrically conductive parts, provides a spray of electrostatically charged powder particles. The equipment must be installed, operated and maintained in accordance with the manufacturer's instructions and the National Electrical Code.

1.2 The equipment described by this report is manufactured, in part, by both Gema Volstatic AG, Industrial Powder Systems, Movenstrasse 17 CH-9015, St. Gallen, Switzerland and ITW Gema, 4141 West 54TH Street, Indianapolis, Indiana 46254-3728. This equipment is labeled and marketed in the U.S.A. by ITW Gema, 4141 West 54TH Street, Indianapolis, Indiana 46254-3728.

1.3 This report in part describes the Manual MPS system and thus supplements Approval Report J.I. OW7A6.AE which describes the four, MPS1-B, MPS2-B, MPS1-F, and MPS2-F, manual powder systems. As described by this report the Manual MPS system equipment is re-examined to meet the revised requirements of the FMRC Standard Class 7260, March 1996.

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1.4 As described by this report, the construction of this equipment provides the degree of protection against electrical shock, fire, and injury required for electrostatic powder finishing applications.

1.5 The specific equipment described by this report will be listed in the FMRC Approval Guide as follows:

Model MPS1-F, P/N 111960 and MPS2-F, P/N 111961. The assemblies consist of one or two Model PG-1, P/N 110347 Electrostatic Manual Powder Applicators, one or two PGC-1, P/N 111024 Control Modules, one of two 45 lb/50 L capacity Powder Hoppers, P/N's 112009 and 112019 and a Transport Trolley, P/N 111857.

Model MPS1-B, P/N 111962 and MPS2-B, P/N 111963. The assemblies consist of one or two PG-1, P/N 110347 Electrostatic Manual Powder Applicators, one or two PGC-1, P/N 111024 Control Modules and a Transport Trolley with vibrating platform, P/N 112119.

Automatic Powder System Assemblies may consist of from one to twelve; PG-1A, P/N 111717 Electrostatic Automatic Powder Applicators and PGC-1, P/N 111024 Control Modules, one MCP-3, P/N 116944 Master Control Panel with or without a P/N 117032 Purge Drawer. The Assembly Part Numbers for the various configurations are: Primary APS 116905, 116906, 116907, 116908, 116909, 116910, 116911, 116912, 116913, 116914, 116915, 116916; Secondary APS 116917, 116918, 116919, 116920, 116921, 116922, 116923, 116924, 116925, 116926, 116927, 116928; Primary Trigger APS 117000, 117001, 117002, 117003, 117004, 117005, 117006, 117007, 117008, 117009, 117010, 117011; Secondary Trigger APS 117012, 117013, 117014, 117015, 117016, 117017, 117018, 117019, 117020, 117021, 117022, 117023; Primary Trigger Purge APS 117159, 117160, 117161, 117162, 117163, 117164, 117165, 117518, 117519, 117520; Secondary Trigger Purge APS 117169, 117170, 117171, 117172, 117173, 117174, 117175, 117176, 117521, 117522.

Automatic Powder Unit Assemblies consist of from one to six; PG-1A, P/N 111717 Electrostatic Automatic Powder Applicators and PGC-1, P/N 111024 Control Modules, a P/N 117060 Interlock Assembly and a P/N 117072 Cart Assembly. The Assembly Part Numbers for the various configurations are: 117073, 117074, 117075, 117076, 117045 and 117046.

1.6 Approval of the equipment described by this report is based on the applicable requirements of the following standards.

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<u>TITLE</u>	<u>AUTHOR-NUMBER</u>	<u>DATE</u>
Electrical Equipment for use in Hazardous (Classified) Locations General Requirements	FMRC 3600	1989
Electrical and Electronic Test, Measuring, and Process Control Equipment	FMRC 3810	1989
Electrostatic Finishing Equipment	FMRC 7260	1996

II DESCRIPTION

2.1 The equipment described by this report is intended for manual and automatic electrostatic powder coating applications. This report includes a re-examination of the MPS-1B, MPS-2B, MPS-1F, and MPS-2F manual powder systems, and the examination of the following new equipment submittal: the APS automatic multi-applicator powder system, and the APU automatic powder unit. The equipment described by this report is intended for use within the finishing area. The applicators, PG-1 and PG-1A, are for use in areas rated Class II, Division 1 and the remaining equipment is for use in either Class II, Division 2 or areas known to be non-hazardous.

2.2 Both the manual and automatic equipment share the same control unit (PGC-1) with different jumpers put in place for the control logic inputs for automatic trigger configurations. The PGC-1 control unit is same as the control unit previously approved and described by FMRC Report J.I. 0W7A6.AE with updated internal component revisions. The systems are available for supply voltages from 100 to 240 Volts, 60Hz. Control inputs are for 24 Vdc. Gaskets and sealed cable glands are used to maintain dust-ignitionproof integrity.

2.3 The manual powder applicator (PG-1), used on all the manual systems, is identical to the applicator previously Approved. The automatic applicator (PG-1A), used on all the automated systems, is identical to the manual applicator with a modified housing to remove the hand grip and trigger. Flat nozzles and round nozzles are used as in the previous Approval. The applicator contains an integral step up transformer and potted high voltage cascade to convert the 10 volt (effective) high frequency input from the PGC-1 to a high voltage (98 KV max.) output at the applicator electrode.

2.4 The Manual Powder Systems (MPS) are available with either 1 or 2 applicator/control units designated by 1B, 2B, 1F, 2F. The (F) series has a fully pneumatic fluidized hopper while the (B) series has a vibrating table system. Both systems are mounted on wheeled carts.

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2.5 The Automatic Powder System (APS) has a rack for mounting up to 10 Powder Gun Control units (PGC-1) with 1 Master Control Panel (MCP-3) and 1 Purge Drawer or a maximum of 12 PGC-1 units with 1 MCP-3.

2.6 The Master Control Panel (MCP-3) is a fused switched electrical distribution panel for distribution of power and external control signals to the multiple PGC-1 units in the APS. Gaskets and sealed cable glands are used to maintain dust-ignitionproof integrity.

2.7 The Purge Drawer controls and distributes a purge air supply to each applicator. The purged air supply provides a burst of cleaning air for the applicators. Solenoid air valves are used to control the purge air supply using a 24 Vdc signal. Gaskets and sealed cable glands are used to maintain dust-ignitionproof integrity.

2.8 The Automatic Powder Unit (APU) contains a PGC-1, PG-1A, Interlock assembly, regulator assembly, and powder hopper assembly. The system is mounted on a wheeled cart and contains up to 6 applicator/control units. The interlock assembly box shuts off power and air supply to the system based on signal inputs from a flame detector, exhaust fan, and conveyer.

2.9 Refer to the attached Sales Brochure for further specifications, description and pictures.

III MARKING

3.1 Manual Powder Systems - The following nameplate drawings with the FMRC mark of Approval are used in marking each of the system components (cart, PG-1 applicator, and PGC-1 applicator control) for the MPS-1B, MPS-2B, MPS-1F, and MPS-2F manual powder systems: 115574 thru 115578 and 116668. The warning label, p/n 116667, is used. Sample nameplate and warning labels are included as report attachments.

3.2 Automatic Powder Systems - The following nameplate drawings with the FMRC Approval mark are used in marking each of the system components (rack, PG-1A applicator, and PGC-1 applicator control) for the APS series: 121673 thru 121676. The warning label, p/n 113498, is used. Sample nameplate and warning labels are included as report attachments.

3.3 Automatic Powder Units - The following nameplate drawings with the FMRC mark of Approval are used in marking each of the system components (cart, PG-1A applicator, and PGC-1 applicator control) for the APU series: 121679 thru 121684 and 121692. The warning label p/n 113498 is used. Sample nameplate and warning labels are included as report attachments.

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IV EXAMINATION AND TESTS

4.1 General - FMRC Approval of electrostatic powder finishing equipment is based on examination and tests of production equipment and review of product documentation, production drawings and a follow-up examination of the manufacturing facilities and quality control procedures. The examination and tests conducted and the results obtained are described in the following paragraphs. Materials on file documenting the construction of the equipment include manufacturer's assembly specifications, detail drawings and instruction manuals as listed in Section IX of this report. The equipment described by this report was examined to verify compliance with the requirements for those standards listed in Section 1.4.

4.2 Manual Powder Systems - The examination of the MPS-1B, MPS-2B, MPS-1F, and MPS-2F manual powder systems is described in the following paragraphs. These systems are identical to the units previously Approved as described in Approval Report J.I. 0W7A6.AE with the exception of replacement of outdated transistors in the PGC-1 control unit. This serves as a re-examination of this equipment to the latest revision of FMRC Approval Standard Class 7260.

4.2.1 Protection Against Electric Shock - The equipment described by this report was examined and tested per FMRC Class 3810 Standard as described in Approval report J.I. 0W7A6.AE. There have been no modifications of the protective grounding, accessibility of live parts or insulation and spacings therefore no further testing was necessary.

4.2.2 Protection Against Injury - The equipment described by this report was examined to determine that it provides for the required degree of protection against injury due to high temperatures or mechanical means as described in Approval report J.I. 0W7A6.AE. There have been no modifications therefore no further testing was necessary.

4.2.3 Protection from Fire - As described in Approval report J.I. 0W7A6.AE, the equipment was operated under fault conditions to ensure that no accessible parts would become live, no spread of fire would result in emitting flames from the enclosure or explosion causing enclosure rupture and no condition would result in infringement of the protection afforded by the equipment construction and confirmed by the following test. There have been no modifications therefore no further testing was necessary.

4.2.4 Mechanical Requirement - The equipment described by this report was examined to determine if it provides for mechanical strength and stability as referenced in Approval report J.I. 0W7A6.AE. There have been no modifications therefore no further testing was necessary.

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4.2.5 Performance and Construction Requirements - The equipment satisfactorily meets the requirements of FMRC Approval Standard 7260 section 4, as follows.

4.2.5.1 Manual Spray Applicator - A steel ground plate providing over 3 square inches of contact area is provided as part of the equipment handle assembly. This is satisfactory.

4.2.5.2 Conductive Parts - The only conductive parts on the applicator are the ground plate and process connection fittings, both of which are bonded to protective ground internal to the applicator handle.

4.2.5.3 Parts Secured by Hand - The spark ignition testing described in section 4.2.6 was conducted both with and without applicator parts that are secured by hand.

4.2.5.4 Connection Cable - The low voltage power cable attached to the applicator is provided with an abrasion resistant protective cover.

4.2.5.5 Spray Applicator Switches - The hermetically sealed magnetic reed switch used in the manual applicator trigger for switching the low voltage control signal meets the requirements of Approval Standard 3611 as being nonincendive.

4.2.5.6 Examination - The equipment was examined and found to conform to the manufacturers drawings.

4.2.5.7 Adjustable Parts - Operator accessible adjustments affecting the high voltage were placed in their position to produce the worse case output. Other circuitry internal to the control unit for producing the high voltage is sealed and not operator accessible.

4.2.5.8 Grounded material supply and column - External protective ground terminals are provided on the PGC-1, carts, and hoppers. 18 inch protective ground conductors are used to interconnect these components. A 16 foot conductor is supplied for connection to the facility ground. The internal protective ground terminals of the PGC-1 control units are connected to the protective ground conductor of the power supply cables. Each applicator is grounded by a conductor in the applicator cable to the PGC-1.

4.2.5.9 High Pressure - Recommended operating pressures for the applicator are less than 145 psi (10 bar). The pressure rating is less than 1,000 psi, does not represent an injection hazard, and therefore, a trigger safety interlock is not required.

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4.2.6 Finishing Equipment Applications - The equipment described by this report was examined and tested according to the requirements as outlined in the FMRC Approval Standard 7260 Section 5 for use in electrostatic powder finishing applications.

4.2.6.1 Spark Ignition Test - The equipment described by this report was examined and tested as described in Approval report J.I. 0W7A6.AE. Test were conducted using a test gas mixture of 8.2% Methane-in-air. Each test consisted of the maximum available energy from the applicator being discharged to a grounded 1 in. (2.5 cm) diameter steel sphere at distances most favorable for ignition. All tests results were satisfactory in that no ignition of the test gas mixture occurred. The test gas mixture of 8.2% methane-in-air has a lower ignition energy than the 12 % methane-in-air mix requirement of the latest revision of standard FMRC 7260. As there have been no equipment modifications, no further spark ignition testing was necessary.

4.2.6.2 Material Compatibility - Instruction and maintenance manuals contain instruction for the proper use of solvents when cleaning.

4.2.6.3 High Voltage Dielectric Tests - The spray applicator was subjected to a dielectric test potential at 150% of its maximum rating of 98 KVdc, or 147 KVdc. The test potential of 147 KVdc was applied between the high voltage electrode and a conductive wrap applied to the applicator body bonded to the protective ground on the applicator handle. The test potential was held for one minute without arc over or dielectric breakdown occurring, this is satisfactory.

4.2.6.4 Drop Tests - The manual applicator with its various nozzle configurations and hoses attached was subjected to drop tests as described in Approval report J.I. OW7A6.AE. As there have been no equipment modifications, no further testing was necessary.

4.2.6.5 Pressure Tests - Pressure tests were conducted on the applicator consisting of a five minute application of 217 psig (15 bar), (150% of the rated 10 bar operating pressure), and a five minute application of 290 psig (20 bar), (200% of the rated 10 bar operating pressure). No leakage or rupture occurred as a result of either test. This is satisfactory.

4.2.6.6 Cord Strain Relief - The manual applicator was subjected to testing of the cord strain relief as described in Approval Report J.I. OW7A6.AE. As there have been no equipment modifications, no further testing was necessary.

4.2.6.7 Temperature Test - This requirement is for automatic spray applicators only.

4.2.6.8 Impact Test - See Section 4.3.5.4.

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4.3 Automatic Powder Systems - The examination of the Automatic Powder System (APS) is described in the following paragraphs. These systems are comprised of the following components: automatic powder gun (PG-1A), Powder Gun Control unit (PGC-1), Master Control Panel (MCP-3), Purge Drawer, and mounting rack. The PGC-1 is the same as used in the manual system. The PG-1A automatic applicator is electrically identical to the manual applicator minus the trigger switch. Mechanically the automatic applicator does not have a handle or trigger, but does have a mechanical means for mounting. Therefore, the testing and examination described in section 4.2 is valid for the automatic applicator PG-1A, and control unit PGC-1. Additionally the automatic applicator PG-1A was subjected to pressure, temperature, cord strain relief and impact testing per FMRC Approval Standard 7260 section 5.

4.3.1 Protection Against Electric Shock - The Master Control Panel (MCP-3) and Purge Drawer were examined and tested per FMRC Standard 3810, as described below, to determine if the equipment provides the required degree of protection against injury due to electrical shock.

4.3.1.2 Protection from Accessible Live Parts - There are no live parts accessible on the equipment when tested with the IC rigid and articulated finger probes. These pieces of equipment are housed in finished sheet metal enclosures having no openings or connectors with parts normally accessible to an operator. This is satisfactory.

4.3.1.3 Dielectric Tests - The Master Control Panel (MCP-3) and Purge Drawer were subjected to dielectric tests at a test potential of twice the products rated voltage of 240 volts, plus 1000 volts, or 1480 volts. In each case the test potential was applied between the power input terminals of each device, and its protective ground terminal for one minute. Each device was tested with the power switch in the on and off positions. In each case the test potential was applied without arcover or dielectric breakdown occurring, thus confirming satisfactory insulation characteristics.

4.3.1.4 Protective Grounding - The equipment was examined to assure all accessible conductive parts are reliably bonded to the protective ground connection terminal provided with each piece of equipment. Resistance from parts to the protective ground terminal on each of these devices was measured at less than 0.1 ohm, this is satisfactory. Cable connections to the spray guns and the power units are acceptable, in that they are of the tool secured type.

4.3.1.5 Leakage Current - The leakage current from all exposed conductive surfaces of the Master Control Panel (MCP-3) and Purge Drawer (with the protective grounding conductor open circuited) was measured while the unit was first connected to a 100 and subsequently to a 240 volt primary source of power input. In addition, when connected to each supply independently its On/Off switch was placed initially in first the 'On' and subsequently the 'Off' position. The meter used had an input impedance of 1500 ohms resistive shunted by a capacitance of 0.15 microfarads. In no case did the measured leakage current exceed 0.5 mA a.c. This is satisfactory.

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4.3.2 Protection Against Injury - The Master Control Panel (MCP-3) and Purge Drawer were examined and tested per FMRC Standard 3810, as described below, to determine if it provides for the required degree of protection against injury.

4.3.2.1 Moving Parts - The equipment described does not contain any moving parts accessible or not accessible which could cause personal injury to an operator.

4.3.2.2 Sharp edges - The equipment described has accessible edges, projections, corners and the like, etc., which are well rounded and therefore are not considered capable of causing a cut type injury during normal operation of the equipment.

4.3.2.3 Pressure Tests - Pressure tests were conducted on the applicator consisting of a five minute application of 217 psig (15 bar), (150% of the rated 10 bar operating pressure), and a five minute application of 290 psig (20 bar). No leakage or rupture occurred as a result of either test. This is satisfactory.

4.3.2.4 Temperature Test - In accordance with standard requirements an automatic applicator was subjected to temperature tests conducted in an ambient temperature of 72°F (22°C) under normal operating conditions and with the electrode grounded. Six thermocouples were attached to the exterior surface of the automatic applicator barrel assembly. The maximum temperature was recorded to be 88°F (31°C). This is satisfactory without requiring a temperature code marking.

4.3.2.5 Impact Test - The Master Control Panel (MCP-3) and Purge Drawer samples were subjected to an impacts test. A 4 lb. (1.8 Kg) weight, concentrated at a 1 inch (2.5 cm) diameter steel ball, was dropped from a height of 6 inch (15 cm) onto various surfaces of each piece of equipment housing. The test results were satisfactory, in that no evidence of damage to the equipment was observed.

4.3.2.6 Dust Exclusion Test - The Dust Exclusion Test was conducted in accordance with International Electrotechnical Commission (IEC) draft standard 31H to verify the suitability for Class II/III Hazardous Locations. Tests were conducted on both the Master Control Panel (MCP-3) and Purge Drawer samples. The test samples were suspended in a circulating dust atmosphere of 200 mesh talc while connected to vacuum pump adjusted to draw a vacuum of 20.5 mBar on the sample. The test lasted a total of eight hours. At the conclusion of the test, excess dust was removed from the samples exterior and the samples opened. Examination of the samples showed that it had excluded the entry of dust. This is satisfactory.

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4.3.3 Protection from Fire - The testing referenced in Approval report J.I. OW7A6.AE remains valid without the need for further testing.

4.3.4 Mechanical Requirement - The Master Control Panel (MCP-3), Purge Drawer, and mounting rack were satisfactorily tested, as described in this section, to show that they provided for the mechanical strength and stability.

4.3.4.1 Tip Stability - The mounting rack is bolted to the floor in a permanent installation thus providing sufficient stability.

4.3.4.2 Strain Relief - The power supply cables of the equipment were subject to strain relief tests. The test consisted of applying a 35 lb (156 Newtons) pulling force, for a period of one minute, to each end of each cable and cord independently at any angle possible. After each application of the force to each end of each cable and cord there was no evidence of strain transmitted to the electrical connections, no cutting or tearing of the cable or cord jacket and no slippage occurred as a result of these tests. All results were concluded to be satisfactory.

4.3.5 Finishing Equipment Applications - The automatic equipment described by this report was examined and tested according to the requirements as outlined in the FMRC Approval Standard 7260 Section 5 for use in electrostatic powder finishing applications. The testing and examination described in section 4.2 is valid for the APS applicator PG-1A, and the control unit PGC-1 with the only additional test requirement being the temperature test for the applicator per FMRC Approval Standard 7260 section 5.

4.3.5.1 Pressure Tests - Pressure tests were conducted on the applicator consisting of a five minute application of 217 psig (15 bar), (150% of the rated 10 bar operating pressure), and a five minute application of 290 psig (20 bar). No leakage or rupture occurred as a result of either test. This is satisfactory.

4.3.5.2 Cord Strain Relief - The manual applicator was subjected to testing of the cord strain relief as described in Approval Report J.I. OW7A6.AE. As there have been no equipment modifications, no further testing was necessary.

4.3.5.3 Temperature Test - Refer to paragraph 4.3.2.5 for temperature test results.

4.3.5.4 Impact Test - The automatic applicator, due to similarity of construction was considered to be representative of the manual applicator for the purposes of this test. The test consisted of a 4 lb. (1.8 Kg) weight, concentrated at a 1 inch (2.5 cm) diameter steel sphere, was dropped from a height of 6 inches (15 cm) onto various surfaces of the applicator. This resulted in an impact energy of 2.7 Joules. Subsequently the applicator was subjected to repeat spark ignition test without ignition of the test gas mixture occurring. Results were concluded to be satisfactory.

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4.3.5.5 Current Limiting Elements - The high voltage electrode was subjected to a short circuit to ground for a period of 1 hour. No damage occurred to the current limiting resistors. This is satisfactory.

4.4 APU Automatic Powder Unit - The examination of the (APU) Automatic Powder Unit is described in the following paragraphs. These systems are comprised of the following components: automatic powder gun (PG-1A), Powder Gun Control unit (PGC-1), Interlock box, regulator assembly, and powder hopper assembly, and cart. The PGC-1 and PG-1A combination is the same as used in the APS and is described in the preceding paragraphs.

4.4.1 Protection Against Electric Shock - The Interlock box was examined and tested per FMRC Standard 3810, as described below, to determine if the equipment provides the required degree of protection against injury due to electrical shock.

4.4.1.1 Protection from Accessible Live Parts - There are no live parts accessible on the equipment when tested with the IEC rigid and articulated finger probes. These pieces of equipment are housed in finished sheet metal enclosures having no openings or connectors with parts normally accessible to an operator. This is satisfactory.

4.4.1.2 Dielectric Tests - The equipment was subjected to dielectric tests at a test potential of twice the products rated voltage of 240 volts, plus 1000 volts, or 1480 volts. In each case the test potential was applied between the power input terminals of each device, and its protective ground terminal for one minute. The device was tested with the power switch in the on and off positions. In each case the test potential was applied without arcover or dielectric breakdown occurring, thus confirming satisfactory insulation characteristics.

4.4.1.3 Protective Grounding - The equipment was examined to assure all accessible conductive parts were reliably bonded to the protective ground connection terminal provided with each piece of equipment. Resistance from parts to the protective ground terminal on each of these devices was measured at less than 0.1 ohm, this is satisfactory. Cable connections to the spray guns and the power units are acceptable, in that they are of the tool secured type.

4.4.1.4 Leakage Current - The leakage current from all exposed conductive surfaces of the APU assembly (with the protective grounding conductor open circuited) was measured while the unit was first connected to a 100 and subsequently to a 240 volt primary source of power input. In addition, when connected to each supply independently its On/Off switch was placed initially in first the 'On' and subsequently the 'Off' position. The meter used had an input impedance of 1500 ohms resistive shunted by a capacitance of 0.15 microfarads. In no case did the measured leakage current exceed 0.5 mA a.c. This is satisfactory.

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4.4.2 Protection Against Injury - The APU was examined and tested per FMRC Standard 3810, as described below, to determine if it provides for the required degree of protection against injury due to high temperatures or mechanical means.

4.4.2.1 Moving Parts - The equipment described does not contain any moving parts accessible or not accessible which could cause personal injury to an operator.

4.4.2.2 Sharp edges - The equipment described has accessible edges, projections, corners and the like, etc., which are well rounded and therefore are not considered capable of causing a cut type injury during normal operation of the equipment.

4.4.2.3 Pressure Tests - The pressure tests of the APU were waived as the air system uses the same components and construction methods as the APS and MPS systems tested as described in the preceding paragraphs.

4.4.2.4 Impact Test - The Interlock Box sample was subjected to an impact test. A 4 lb. (1.8 Kg) weight, concentrated at a 1 inch (2.5 cm) diameter steel ball, was dropped from a height of 6 inch (15 cm) onto various surfaces of the equipment housing. Results were satisfactory in that no damage occurred that impaired the sample ability to pass the subsequent dust penetration tests.

4.4.2.5 Dust Exclusion Test - The Dust Exclusion Test was conducted on the Interlock Box in accordance with International Electrotechnical Commission (IEC) draft standard 31H to verify the suitability for Class II/III Hazardous Locations. The test sample was suspended in a circulating dust atmosphere of 200 mesh talc while connected to vacuum pump adjusted to draw a vacuum of 20.5 mBar on the sample. The test lasted a total of eight hours. At the conclusion of the test, excess dust was removed from the samples exterior and the sample opened. Examination of the sample showed that it had excluded the entry of dust. This is satisfactory.

4.4.3 Protection from Fire - The testing on the PG-1 and PGC-1 referenced in Approval report J.I. OW7A6.AE is valid for the APS and APU systems without the need for further testing.

4.4.4 Mechanical Requirement - The APU was satisfactorily tested, as described in this section, to show that it adequately provided for the mechanical strength and stability.

4.4.4.1 Tip Stability - The APU cart was loaded in a worst case configuration to simulate the use of 6 PGC units without the hopper. It was then placed at the center of a plane inclined at an angle of 10 degrees in a position most likely to cause instability. The equipment did not tip over as a result of this test. This is satisfactory.

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4.4.4.2 Strain Relief - The strain relief tests of the APU were waived as cord and cable glands are of the same construction used in the APS and MPS equipment tested and described in the preceding paragraphs.

4.4.5 Finishing Equipment Applications - The APU equipment meets the requirements of FMRC Approval Standard 7260 section 5 for automatic systems as described in paragraph 4.3.5.

V FACILITIES AND PROCEDURES AUDIT

The manufacturing facilities, located at St. Gallen, Switzerland and Indianapolis, IN, including quality control, manufacturing procedures, and engineering control procedures are subject to follow up audits. The facilities and quality control procedures in place were found satisfactory to manufacture a product identical to that tested and approved.

VI MANUFACTURER'S RESPONSIBILITIES

6.1 The manufacturer shall advise FMRC of all proposed changes to the documents listed in Section VIII, via form 797, Approved Product - Revision Report.

6.2 On 100% of production, the described by this report shall be dielectric tested. The power input connections shall withstand for one minute, with no insulation breakdown, the application of 1000 Vac with respect to the protective ground conductor. Alternatively, test potentials 20% higher may be applied for at least one second.

WARNING: The dielectric test required may present a hazard of injury to personnel and/or property and should only be performed under controlled conditions, and by persons knowledgeable of the potential hazards of such testing to minimize the likelihood of shock and/or fire.

6.3 The manufacturer shall conduct routine visual inspection of the protective grounding system on 100% of production.

VII CONCLUSION

The ITW GEMA Manual MPS and Automatic APS and APU Electrostatic Powder Finishing Equipment described by this report meets FMRC Approval requirements. Approval is effective when the Approval Agreement is signed and received by FMRC.