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APPROVAL REPORT

AUTOMATIC POWDER APPLICATOR GA02 AND MANUAL POWDER APPLICATOR GM01 WITH OPTITRONICS CONTROL UNIT MODEL NUMBERS CG02 AND CG03 FOR USE IN ELECTROSTATIC POWDER FINISHING APPLICATIONS

Prepared for:

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I INTRODUCTION

1.1 ITW GEMA (manufacturer) requested FM Approvals examination of their OptiTronic Electrostatic Powder Finishing Equipment consisting of the OptiTronics CG02 and CG03 Control Units for use with the Automatic Powder Applicator Model GA02 and Manual Powder Applicator Model GM01 for use with Class II Spray Materials with an indoor environmental rating of IP6X. This equipment, used for powder finishing of electrically conductive parts, provides an atomized spray of electrostatically charged powder particles. The equipment must be installed, operated and maintained in accordance with the manufacturer's instructions and the National Electric Code. The Manual Powder Applicator Model GM01 was previously examined and satisfactorily tested for use with the EasyTronics CG01 Control Unit under FM Approvals project ID 3010607. Therefore, the additional testing required for the Manual Powder Applicator model number GM01 for use with the OptiTronics CG02 or CG03 Control Units are the arc carbonization and spark ignition testing.

1.2 This report may be freely reproduced only in its entirety and without modifications.

1.3 The specific models described by this report will appear in the Approval Guide, a publication of FM Approvals, as follows.

GA02 Automatic Powder Applicator and GM01 Manual Powder Applicator with the OptiTronics CG02 and CG03 Control Units for use in Electrostatic Finishing Applications using Class II, Spray Materials. The Control Units are rated for use in Class II, Division 2 hazardous (classified) locations with an indoor environmental rating of IP6X.

1.4 The equipment described by this report was shown to comply with the applicable requirements of the following standards.

Title	Author-Number	Issue Date
Electrical Equipment for Use in Hazardous (Classified) Locations General Requirements	FM Approvals-Class 3600	Nov. 1998
Electrostatic Finishing Equipment	FM Approvals-Class 7260	March 1996
Electrical and Electronic Test, Measuring and Process Control Equipment	FM Approvals-Class 3810	January 2005
Degrees of Protection Provided by Enclosure	ANSI/IEC 60529	Nov. 2004

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

II DESCRIPTION

2.1 **General** - The equipment included in this report consists of GA02 Automatic Powder Applicator, GM01 Manual Powder Applicator, and the OptiTronics CG02 and CG03 Control Units. The applicators are provided with either a 150mm or 300mm nozzle length or various nozzle and deflector configurations for setting the powder spray pattern. Connection between the applicator and the OptiTronics CG02 or CG03 Control Unit is with a Low Voltage Cable Assembly. The GM01 is intended for manual operation and the GA02 is intended for automatic operations where it is intended to be attached to the end users robot arm or reciprocating machine located in the hazardous (classified) location powder booth. The OptiTronics CG02 and CG03 Control Units are intended for installation in a Class II, Division 2, hazardous (classified) location outside the powder booth.

2.2 **GA02 Automatic Powder Applicator** - The GA02 Automatic Applicator consists of a 40mm, 150mm or 300mm long nozzle bodies for use with either a flat jet spray nozzle, round jet spray nozzle or with a deflector plate. The automatic applicator is intended for fixed mounting to a robot or manipulator. The applicator operates at a maximum output voltage of 98kV and maximum current of 100μA at a maximum ambient temperature of 40°C (103°F). The high voltage cascade is retained within the body of the applicator and receives the low voltage drive signal by way of a low voltage cable p/n 393827, 393819, and 393800. The high voltage cascade contains an integral voltage step up transformer, cascade multiplier circuit and current limiting resistor which produces the electrostatic voltage. The high voltage generation with transformer, cascade and current limiting resistors are completely cast in epoxy resin. The high voltage output is fully adjustable to the maximum limits specified from the front control panel of the OptiTronics CG02 or CG03 Control Units.

2.3 **GM01 Manual Powder Applicator** - The GM01 Manual Applicator consists of a 40mm, 150mm, or 300mm long nozzle body for use with either a flat jet spray, round jet spray nozzle or with a deflector plate. The applicator is intended for manual operation by an operator. The applicator operates at a maximum output voltage of 80kV and maximum current of 150μA at a maximum ambient temperature of 40°C (103°F). The high voltage cascade is retained within the body of the applicator and receives the low voltage drive signal by way of a 6-meter or 12-meter low voltage cable (p/n's 378232 or 378240). The high voltage cascade contains an integral voltage step up transformer, cascade multiplier circuit and current limiting resistor that produces the electrostatic voltage. The high voltage generation with transformer, cascade and current limiting resistors are completely cast in epoxy resin. The high voltage output is fully adjustable to the maximum limits specified from the front control panel of the OptiTronics CG02 or CG03 Control Unit

2.4 **OptiTronics CG02 Control Unit** - The OptiTronics CG02 Control Unit has a 24VDC power input and can control the GA02 Automatic Powder Applicator and the GM01 Manual Powder Applicator. The CG02 Control Unit provides the necessary output voltage/current to the HV Cascade within the GA02 Automatic Powder Applicator and the GM01 Manual Powder Applicator. The control unit is a microprocessor-based controller that generates a Pulse Width Modulating (PWM) signal that is processed through a switching regulator. The regulator generates an output voltage from 0-12 VDC that is used by the oscillator circuit on the main

board as a supply voltage. The controller has 2 output voltage connections. The "Nominal Output Gun 1" connection has a max voltage of 10 V eff. and is for use with the GA02 Automatic Applicator, GM01 Manual Applicator, and the "Nominal Output Gun 2" connection has a max voltage of 12 VDC and is for use with the GM01 Manual Applicator. The CG02 control unit is labeled FM Approved and is provided with a flexible power cord with plug. The control module has a digital display that displays operational parameters. The front panel has 7 membrane switches for activation and deactivation of control unit, changing operating parameters, scrolling menus, changing programs, diagnostic functions, or validating values. Rear mounted power cord receptacle, protective ground terminal, pneumatic inlet and outlets for providing shaping air to the applicators. The control unit is intended for operation at a maximum ambient temperature of 40°C (104°F). The CG02 Control Unit cabinet is approximately 7.75 inches wide, 9.75 inches deep, and 6.75 inches high and is intended for installation in a Class II, Division 2, hazardous (classified) location outside the powder finishing area and has an environmental rating of IP6X.

2.5 **OptiTronics CG03 Control Unit** - The OptiTronics CG03 Control Unit has a 100-240VAC power input and can control the GA02 Automatic Powder Applicator and the GM01 Manual Powder Applicator. The CG03 Control Unit provides the necessary output voltage/current to the HV Cascade within the GA02 Automatic Powder Applicator and the GM01 Manual Powder Applicator. The control unit is a microprocessor-based controller that generates a Pulse Width Modulating (PWM) signal, which is processed through a switching regulator. The regulator generates an output voltage from 0-12 VDC that is used by the oscillator circuit on the main board as a supply voltage. The controller has two output voltage gun connections. The "Nominal Output Gun 1" connection has a max voltage of 10 V eff. and is for use with the GA02 Automatic Applicator, and "Nominal Output Gun 2" connection has a max voltage of 12 VDC and is for use with the GM01 Manual Applicator. The CG03 control unit is labeled FM Approved and is provided with a flexible power cord with plug, limiting applications to this input voltage. The control module has a digital display that displays operational parameters. The front panel has 6 membrane switches for changing operating parameters, scrolling menus, changing programs, diagnostic functions, or validating values. Rear mounted power switch, power cord inlet, protective ground terminal, pneumatic inlet and outlets for providing shaping air to the applicators. The control unit is intended for operation at a maximum ambient temperature of 40°C (104°F). The CG03 Control Unit cabinet is approximately 7.75 inches wide, 9.75 inches deep, and 6.75 inches high and is intended for installation in a classified location outside the powder finishing area and has an environmental rating of IP6X.

2.6 **Low Voltage Cable** - The low voltage cable provides the low voltage connection from the OptiTronics CG02/CG03 Control Units to the GA02 Automatic Powder Applicator and the GM01 Manual Powder Applicator. The GA01 Automatic Applicator uses a 3 conductor highflex cable that comes in three lengths, 11m (p/n 393800), 15m (p/n 393819), and 20m (p/n 393827). The GM01 Manual Powder Applicator uses a 5 conductor cable that comes in two lengths, 6 m (p/n 378232) and 12 m (p/n 378240). All cables provide suitable protection from abrasion and are similar to other cables used by this manufacturer for FM Approved electrostatic finishing equipment. Connection is made internal to the applicators and a suitably rated dustight cable strain relief is provided at the rear of the applicator to secure its mounting. The low voltage applicator cable connection at the rear of the CG02 and CG03 Control Unit is made with a NRTL mating plug that is keyed with a threaded connection around the body of the plug to ensure mechanical retention to the mating receptacle on the rear of the control unit.

2.7 **Air and Paint Lines** - The air and paint lines for use with the applicator are the standard type used in the spray industry and are properly rated for use in their intended application. No further examination was deemed necessary as these hoses are similar to those used in the painting industry and used on previously FM Approved electrostatic finishing equipment for this manufacturer.

2.8 **Additional Information** - For further descriptive information of the OptiTronics CG02 and CG03 Control Unit, GA02 Automatic Powder Applicator, and the GM01 Manual Powder Applicator refer to the attached sales literature

III EXAMINATION AND TEST

3.1 **General** - Approval of the electrostatic paint finishing equipment is based on the examination and testing of production equipment and a review of product documentation, and production drawings. The test 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 VIII of this report. The equipment described by this report was examined to meet the intent of the requirements for the standards listed in Section 1.4. Testing was performed at FM Approvals' West Glocester, RI facility.

3.2 **Test Samples** - The OptiTronics CG02 and CG03 Control Units, the GA02 Automatic Powder Applicator, and the GM01 Manual Powder Applicator with optional 150mm and 300mm long nozzle bodies and various nozzle and deflector configurations with low voltage cable and associated paint and air lines were submitted as test samples and considered representative of the production models. The CG02 and CG03 Control Units have the same internal circuitry, the only difference is the input power requirements. Therefore, all testing was conducted with the CG03 Control Unit.

3.2.1 **Limiting Resistors** - For the purpose of conducting the tests described in Section 3.2 the resistive elements within the GA02 Automatic Powder Applicator assemblies were replaced with resistive elements which would reduce their total value to less than their low end tolerance. The total series resistance from the output of the cascade to the tip of each applicator is 181 Megohms +/- 5% and is located in the electrode. The 181 Megohm resistors were replaced with a 169 Megohm resistors for the single head Applicator configuration

3.2.2 **Ignition Test, GA02 Automatic Powder Applicator** - The GA02 Automatic Powder Applicator was subjected to spark ignition testing in accordance with the requirements of Class 7260 paragraph 5.1. For the purpose of conducting the test the CG03 Control Unit was modified by the manufacturer to disable the current limiting circuits. Prior to ignition testing the applicator was subjected to arc carbonization test for a period of 15 minutes. The ignition test was performed with the applicator nozzle inserted in a test vessel along with the gas in, gas out and test probe consisting of a 1 inch grounded stainless steel ball. The test vessel was constantly purged during the entire test with a test gas mixture of methane and air with a concentration by volume of 12%. The test gas was allowed to flow through the test vessel for a period of 5 minutes prior to conducting the ignition test. The applicator was energized and the test probe was manipulated in the vicinity of the nozzle for a period of 10 minutes. Test was repeated with and without hand removable items consisting of the nozzle nut, and nozzle assembly. At no time during the test was there an ignition of the test gas. This is satisfactory

3.2.3 **Ignition Test, GM01 Manual Powder Applicator** - The GM01 Manual Powder Applicator was previously examined and satisfactorily tested for use with the EasyTronics CG01 Control Unit under FM Approvals project ID 3010607. Therefore, the only additional testing required for the Manual Powder Applicator model number GM01 for use with the OptiTronics CG02 or CG03 Control Units are the Arc Carbonization and Spark Ignition Testing. The GM01 Manual Powder Applicator was subjected to spark ignition testing in accordance with the requirements of Class 7260 paragraph 5.1. For the purpose of conducting the test the CG03 Control Unit was modified by the manufacturer to disable the current limiting circuits. Prior to ignition testing the applicator was subjected to arc carbonization test for a period of 15 minutes. The ignition test was performed with the applicator nozzle inserted in a test vessel along with the gas in, gas out and test probe consisting of a 1 inch grounded stainless steel ball. The test vessel was constantly purged during the entire test with a test gas mixture of methane and air with a concentration by volume of 12%. The test gas was allowed to flow through the test vessel for a period of 5 minutes prior to conducting the ignition test. The applicator was energized and the test probe was manipulated in the vicinity of the nozzle for a period of 10 minutes. Test was repeated with and without hand removable items consisting of the nozzle nut, and nozzle assembly. At no time during the test was there an ignition of the test gas. This is satisfactory

3.2.4 **Impact Test** - The GA02 Automatic Powder Applicator and GM01 Manual Powder Applicators, were subjected to a 2.7 Joule impact resulting from a test mass of a 4 pound (1.8 kg) steel hemisphere of 1 inch (2.4 cm) in diameter falling from a height of 6 inches (150 mm). The sample was resting on a concrete stop and was impacted on the side of the body, nozzle, and end cap. No visual damage occurred to the applicators, or its components as a result of the impact test which would cause the applicator to fail repeated ignition testing conducted in paragraphs 3.2.2 and 3.2.3 and/or cause the applicator to become electrostatically energized. This is satisfactory.

3.2.5 **HV Dielectric Test, GA02 Automatic Powder Applicator** - The GA02 Automatic Powder Applicator was subjected to a dielectric test potential of 147kV, equal to 150% of its maximum rating of 98kV to verify that the applicator is effectively insulated from ground. The test potential was held for one minute without dielectric breakdown occurring. This is satisfactory.

3.2.6 **Temperature Tests** - In accordance with the requirements of the Class 7260 Standard, the GA02 Automatic Powder Applicator, was subjected to temperature tests. Tests were conducted in an ambient temperature of 71°F (22°C) with all active current limiting circuits disabled and the electrodes grounded. The temperature was monitored on the surface of the cascade at three locations considered to produce the largest temperature rises. The unit was powered at the maximum HV output of 98kV attainable with automatic protection circuits disabled until temperatures stabilized. The maximum temperature was recorded to be 76°F (24°C) on the exterior surface of the HV Cascade. When linearly compensated for an ambient temperature of 40°C and including a +5K correction for measurement error the maximum temperature was 47°C. The temperatures were found to be well below the 85°C T6 Temperature Code, and are therefore not required to be marked with the Temperature Class.

3.2.7 **Pressure Tests** - The OptiTronics CG03 Control Units pneumatic system was tested in accordance with paragraph 5.6 of the Class 7260 Standard. This configuration was tested because its rated pressure is 5 bar. The pneumatic line was hydrostatic tested to 150% (7.5bar) and 200% (10 bar) of the maximum rated pressure of 5 bar for 5 minutes at each test pressure. Test at 150% of maximum was an operational test conducted while the air line was energized and de-energized.

Test at 200% was a static test only. The test sample did not leak or rupture and continued to operate properly at the conclusion of the test. This is satisfactory.

3.2.8 **Cable Pull Tests** - The GA02 Automatic Powder Applicator low voltage cable was subjected to a pulling force of 35 lbs, once at 180 degrees from its attachment for one minute, and once from 90 degrees from another angle. Tests were conducted at the applicator end, and the same test repeated at the OptiTronics CG03 Control Unit. At the conclusion of the cable pull tests there was no observed strain being transmitted to the electrical connections, no visible movement of the cable in their strain relief/end assembly connections and no cutting or tearing of the cable. This is satisfactory.

3.3 **Class II Tests** - The following tests verified the suitability of the OptiTronics CG02 and CG03 Control Units for Class II powder finishing applications.

3.3.1 **Impact Test** - The OptiTronics CG02 and CG03 Controllers utilize the same enclosure, therefore the impact test was conducted on one sample considered to be representative of both controller enclosures. The OptiTronics CG03 enclosure test sample was subjected to a 2.7 Joule impact resulting from a test mass of a 4 pound (1.8kg) steel hemisphere of 1 inch (2.4 cm) in diameter falling from a height of 6 inches (150 mm) at an ambient temperature of 20C. Results were satisfactory in that no damage occurred to the samples that would impair their ability to pass the dust exclusion test.

3.3.2 **Dust Exclusion Test, OptiTronics CG03** - The OptiTronics CG03 Control Unit was suspended in a circulating dust atmosphere of 200-mesh talc. The sample was connected to a vacuum pump adjusted to draw a vacuum of 20mbar. The test lasted at least eight hours. At the conclusion of the test, the sample was removed from the test chamber, excess dust was removed from the surface and the applicator was opened. Results are satisfactory as the sample was found to have excluded the entry of dust.

3.3.3 **Dust Exclusion Test, OptiTronics CG02** - The OptiTronics CG02 Control Unit was suspended in a circulating dust atmosphere of 200-mesh talc. The sample was connected to a vacuum pump adjusted to draw a vacuum of 20mbar. The test lasted at least eight hours. At the conclusion of the test, the sample was removed from the test chamber, excess dust was removed from the surface and the applicator was opened. Results are satisfactory as the sample was found to have excluded the entry of dust.

3.3.4 **Dust Temperature Test** - This test was performed as described in Section 3.2.8. The temperature was found to be satisfactory for a T6 Temperature code rating.

3.4 **Environmental Protection IP6X** - This test was performed as described in Sections 3.3.2 and 3.3.3. Results are satisfactory as the sample was found to have excluded the entry of dust.

3.5 **Protection From Electrical Shock Tests** - The following tests verify the protection afforded by the OptiTronics CG02 and CG03 Control Units against electrical shock. The equipment was examined as Pollution Degree 2, Overvoltage Category II for maximum working voltages of up to 300Vrms. The OptiTronics CG03 Control Unit is rated for maximum working voltages up to 240Vrms.

3.5.1 **Dielectric Test (Hazardous Live Circuits)** - The insulation of the AC main supply circuit were tested to verify compliance with Table 9 for Basic Insulation of ANSI/ISA-61010-1 (82.02.01) 2004. Dielectric tests were conducted at the minimum values of 1390 Vrms for Basic Insulation, for working voltages up to 300 Volts with a clearance of 1.5 mm. During the tests, the Basic Insulation test potential was applied between the hazardous live input power terminals and the protective ground. Tests were conducted for one minute without arcing or dielectric breakdown of the insulation occurring. This is satisfactory.

3.5.2 **Dielectric Test (Extra Low Voltage)** - The 24 VDC extra low voltage circuits were tested to verify compliance with Table 9 for Basic Insulation of ANSI/ISA-61010-1 (82.02.01) 2004. Dielectric tests were conducted at the minimum values of at least 420 Vrms for Basic Insulation. During the tests, the Basic Insulation test potential was applied between the hazardous live input power terminals and the protective ground. Tests were conducted for one minute without arcing or dielectric breakdown of the insulation occurring. This is satisfactory

3.5.3 **Leakage Current** - The CG03 Control Unit is cord connected and is also provided with an external redundant protective ground terminal requiring the use of permanent hard wire ground connection for proper operation. The open circuit potential and leakage current were measured between: accessible conductive parts and the grounded pole of the supply circuit, with the protective grounding conductor open: and with the supply circuit connected normally and reversed. The open circuit potential was measured on the control unit and was below the maximum accepted value of 3.5 mA. This is satisfactory.

3.5.4 **Protective Grounding** - Protective ground terminal is adequately marked and provided on the rear panel of the OptiTronics CG02 and CG03 Control Units for user/installer ground connection. All interior and exterior metal surfaces of the OptiTronics CG02 and CG03 Control Units which could become hazardous live in the event of a fault are connected to the protective ground terminal with a resistance of less than 0.1 ohms. This is satisfactory.

3.5.5 **Protection from Accessible Hazardous Live Parts** - There are no hazardous live parts which could become accessible on the OptiTronics CG02 and CG03 Control Units, when tested with the IEC rigid and articulated finger probes.

3.5.6 **Creepage and Clearance** - The main line hazardous live voltage circuits of the OptiTronics CG03 Control Units were examined and measured to verify compliance with Table 4 for Basic Insulation of ANSI/ISA-61010-1-2004. In all cases the creepage and clearance measurements were in excess of the minimum requirement of 1.5 mm in circuits requiring Basic Insulation with working voltages up to 300Vrms. Creepage and clearance of the hazardous live circuits were further validated by conducting Dielectric Test described in paragraph 3.5.1. This is satisfactory.

3.5.7 **Spacings of Field Wiring Terminals** - The OptiTronics CG02 utilizes an NRTL listed mating connector and cord, while the CG03 Control Units are cord connected utilizing an NRTL Listed Power Cord and mating receptacle. OptiTronics CG02 and CG03 Control Units do not contain field wiring terminals. This is satisfactory.

3.6 **Protection Against Mechanical Hazards** - Protection against mechanical hazards was waived for the OptiTronics CG02 and CG03 Control Units as there are; 1.) No moving parts which would cause injury, 2.) The equipment is not considered portable requiring provisions for lifting or carrying, and 3.) The equipment has no parts likely to be expelled.

3.7 **Mechanical Resistance to Shock, Vibration, and Impact**

3.7.1 **Rigidity Test** - The enclosure of the OptiTronics CG02 and CG03 Control Units is of sufficient construction that a force of at least 30 Newtons when applied to the equipment enclosure via a hard hemispherical rod of 12 mm diameter did not cause damage or distortion to the enclosure or reduce the clearances of internal components or cause hazardous live circuits to be accessible. This is satisfactory.

3.7.2 **Impact Test** - The enclosure of the OptiTronics CG02 and CG03 Control Units is of sufficient construction that an impact 0.5 Joules when applied to the equipment enclosure via an impact hammer specified in IEC 817 did not cause damage or distortion to the enclosure which would reduce the clearances of internal components or cause hazardous live circuits to be accessible. This is satisfactory.

3.7.3 **Drop Tests** - Testing was waived on the OptiTronics CG02 and CG03 Control Units because the equipment is not considered hand-held equipment. This is satisfactory.

3.8 **Equipment Temperature Limits and Protection Against the Spread of Fire**

3.8.1 **Temperature Tests** - Temperature test of the OptiTronics CG03 Control Unit was conducted as under the conditions described in paragraph 3.2.6 with the exception that temperatures were measured on the exterior surface of the OptiTronics CG03 Control Unit. Since the CG03 Control Unit is mains powered from a 90-264VAC source, this was considered representative of the worse case. Test results were satisfactory in that the maximum temperatures on the exterior of the enclosure were below the maximum limit of 70°C (158°F) allowed by ANSI/ISA-61010-1 (82.02.01) 2004 for parts which could be touched by the operator. This is satisfactory.

3.8.2 **Over-current Protection, OptiTronics CG03** - Over-current protection for connection to the 100-240 VAC mains of the OptiTronics CG03 Control Unit is protected by an inline fuse. The AC voltage passes through a power adapter board (p/n 388297) which also provides over-current protection, the AC voltage is then fed to a 24 volt NRTL Listed power supply which provides over-current protection internal to the power supply. This is satisfactory.

3.8.3 **Over-current Protection, OptiTronics CG02** - Over-current protection for connection to the 24 VDC mains of the OptiTronics CG02 Control Unit is protected by an inline fuse. This is satisfactory.

3.8.4 **Fault Testing** - Fault testing of the main line power circuits supplying power to the OptiTronics CG03 Control Unit was waived as the AC input power receptacle, power switch and 24Vdc power supply were found to be NRTL Listed components operating within their specifications. This is satisfactory.

3.8.5 **Power Requirements Test** - The OptiTronics CG03 Control Units were tested to verify that the power requirements are within the manufacturer's specification. The tests were conducted at a maximum/minimum line voltage of 100/240Vrms with the control unit set to deliver the maximum power to the GA02 Applicator. The maximum input current was measured to be 0.332 amps at 100Vrms. This is within the manufacturers declared amperage rating. This is satisfactory.

3.9 **Resistance to Heat**

3.9.1 **Integrity of Clearances and Creepage Distances** - The temperature rise of the OptiTronics CG02 and CG03 Control Units under both normal and fault conditions will not compromise the integrity of the spacings.

3.9.2 **Resistance to Heat of Non-Metallic Enclosures** - The OptiTronics CG02 and CG03 Control Units do not use non-metallic enclosures.

3.9.3 **Resistance to Heat of Insulating Materials** - The temperature ratings of the insulating materials employed are adequate for the applications.

3.10 **Resistance to Moisture and Liquids** - Testing was waived as the OptiTronics CG02 and CG03 Control Units are intended for installations in dry indoor locations.

3.11 **Protection Against Radiation, Including Laser Sources, and Against Sonic and Ultrasonic Pressure** - Testing was waived as the OptiTronics CG02 and CG03 Control Units have no internal sources of these types of energy.

3.12 **Protection Against Liberated Gases, Explosion, and Implosion** - The OptiTronics CG02 and CG03 Control Units are not a source of liberated gases and does not contain components likely to implode and cause injury.

3.13 **Components** - The following critical components, which are part of the primary or secondary hazardous live circuits or assemblies, were verified by component marking or appropriate component directory to be Listed or Recognized by a Nationally Recognized Testing Laboratory, and were found to be suitably rated for their intended application with no limits of acceptability. No additional testing was deemed necessary.

Description	Manufacturer, Model or Part Number
Reed Switch	Breed Electronics, MDSR-7
Power Supply	Mean Well, PS-65
Male Connector	Binder, 693
Female Connector	Binder, 693
Male Connector	Binder, 423
Female Connector	Binder, 423
Male Connector	Hirschman, GSA 300
Female Connector	Binder, Series M-A
Male Connector	Hirschman, GSSNA 300
Female Connector	Binder, Series M-A
Fuseholder	Schurter, FPG1
Mains Switch	Telemecanique, Harmony 6

3.14 **Protection by Interlocks** - Energized parts located in the the OptiTronics CG02 and CG03 Control Units are adequately enclosed to provide physical protection from contact by the operator. The OptiTronics CG02 and CG03 Control Units require the use of a tool to gain access. This is satisfactory.

IV MARKINGS

The equipment described by this report is labeled with the manufacturer's name, equipment identification, part number, ratings, and the FM Approvals Approval mark as shown on the attached label drawing number's MAB01-A045-4, MPC01-A080-3, MPC01-A035-3, ZAB01-Z011-2, and ZAB01-Z001-2.

V REMARKS

The manufacturer's installation instructions supplied with the GA02 Automatic Powder Applicator and the GM01 Manual Powder Applicator, and OptiTronics CG02 and CG03 Control Units as well as the National Electric Code shall be followed when installing this equipment.

VI FACILITIES AND PROCEDURES AUDIT

ITW Gema design and manufacturing facilities in St. Gallen, Switzerland, and are subject to follow-up audit inspections. The facilities and quality control procedures examined as part of this project have been found to be satisfactory to manufacture products identical to that tested and Approved.

VII MANUFACTURER'S RESPONSIBILITIES

7.1 The manufacturer shall advise FM Approvals of all changes to the documentation file in Section VIII. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The Approved Product-Revision Report, FM Approvals Form 797, shall be forwarded to FM Approvals as notice of proposed changes.

7.2 On 100% of production the manufacturer shall conduct a routine continuity test and inspection of the protective grounding system.

VIII DOCUMENTATION FILE

The following documentation is applicable to this equipment and is on file at FM Approvals under Project ID 3016374.

Document No.	Description	Rev
379778	CG02 MAINBOARD V2.0, ZAB07-A003-4	6/13/02
379778	CG02 MAINBOARD V2.0, MAB05-T001-4	6/13/02
379875	CG02 SWITCH PANEL MAB07-A005-4	6/16/00
379875	CG02 SWITCH PANEL MAB07-T003-4	7/4/00
382078	BLOCKSCHEMA CG02, MAB07-A002-4	12/14/00
388297	POWER ADAPTER V2.0 KPL, ZAB05-T029-4	8/13/02
389331	BLOCKSCHEMA CG03, MAB07-A021-4	12/12/01
389340	STROMLAUFPLAN CG03, MAB07-A022-4	8/14/02

393568	AUTOMATIK PISTOLE OPTIGUN GA02 NEG MPC07-A009-3	3/4/03
MAB01-A045-4	GERATESCHILD FM	02/21/06
MPC01-A035-3	HANDPISTOLE GM01	10/7/05
MPC01-A080-3	BESCHRIFTUNG SCHAFT GA02	10/7/05
ZAB01-T019-1	RUCKWAND KPL. CG03	3/21/05
ZAB01-T019-A1	RUCKWAND KPL. CG03	3/23/05
ZAB01-T019-A2	RUCKWAND KPL. CG03	3/23/05
ZAB01-Z001-01	PISTOLENEINHEIT KPL, CG02-VAR.15	2/21/05
ZAB01-Z001-2	PISTOLENEINHEIT KPL, CG02	10/7/05
ZAB01-Z001-E1	PISTOLENEINHEIT KPL, CG02-VAR.5	2/21/05
ZAB01-Z001-F1	PISTOLENEINHEIT KPL, CG02-VAR.6	2/21/05
ZAB01-Z001-G1	PISTOLENEINHEIT KPL, CG02-VAR.7	2/21/05
ZAB01-Z001-H1	PISTOLENEINHEIT KPL, CG02-VAR.8	2/21/05
ZAB01-Z001-K1	PISTOLENEINHEIT KPL, CG02-VAR.11	2/21/05
ZAB01-Z001-L1	PISTOLENEINHEIT KPL, CG02-VAR.12	2/21/05
ZAB01-Z001-P1	PISTOLENEINHEIT KPL, CG02-VAR.16	2/21/05
ZAB01-Z001-Q1	PISTOLENEINHEIT KPL, CG02-VAR.17	2/21/05
ZAB01-Z001-R1	PISTOLENEINHEIT KPL, CG02-VAR.18	2/21/05
ZAB01-Z011-2	PISTOLENEINHEIT KPL, CG03	10/7/05
ZAB01-Z011-A1	PISTOLENEINHEIT KPL, CG03-VAR.1	2/21/05
ZAB01-Z011-B1	PISTOLENEINHEIT KPL, CG03-VAR.2	2/21/05
ZPC01-T040-2	PISTOLENKORPER KPL. GA02	3/3/03
ZPC01-T040-A1	GA02/NEGATIV	3/4/03
ZPC01-T040-B1	GA02/POSITIV	4/15/03
ZPC01-T043-3	KASKADE KPL, GA02	4/15/03
ZPC01-T043-A1	KASKADE KPL, GA02-./NEGATIV	3/4/03
ZPC01-T043-B1	KASKADE KPL, GA02-./POSITIV	4/15/03
ZPC02-T006-4	UBERWURFMUTTER KPL, PUO1	3/4/03
ZPC02-T008-4	FLACHSTRAHLDUSE KPL	2/4/03
ZPC02-T010-3	RUNDSTRAHLDUSE NSO2 KPL	2/4/03
ZPC06-T010-3	PISTOLENKORPER KPL. GA02	3/4/03
ZPC06-T010-A1	PISTOLENKABEL KPL. 11M, GA02	4/16/03
ZPC06-T010-B1	PISTOLENKABEL KPL. 15M, GA02	4/16/03
ZPC06-T010-C1	PISTOLENKABEL KPL. 20M, GA02	3/4/03
396 800	OPTIGUN 2-A (X) AUTOMATIC POWDER GUN (GA02)	10/4/05
396 796	OPTITRONIC POWDER GUN CONTROL UNIT (CG02)	8/5/05
396 788	OPTITRONIC POWDER GUN CONTROL (CG03)	8/5/05
396 818	GM01 MANUAL GUN	8/5/05

IX CONCLUSION

The ITW Gema Electrostatic Powder Finishing System consisting of the GA02 Automatic Powder Applicator and the GM01 Manual Powder Applicator, with the OptiTronics CG02 and CG03 Control Units as described meets FM Approvals requirements. Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective the date of this report.

EXAMINATION BY: Richard DiMaria

TESTING BY: Richard DiMaria, Richard Fontaine, and Kashif Mansoor, FM Approvals

ORIGINAL DATA: Project Data Record 3016374

ATTACHMENTS:
Label Drawing, MAB01-A045-4
Label Drawing, MPC01-A035-3
Label Drawing, MPC01-A080-3
Label Drawing, ZAB01-Z001-2
Label Drawing, ZAB01-Z011-2
Sales Literature OPTIGUN
Sales Literature OPTITRONIC
Sales Literature OPTISYSTEM

REPORT BY:

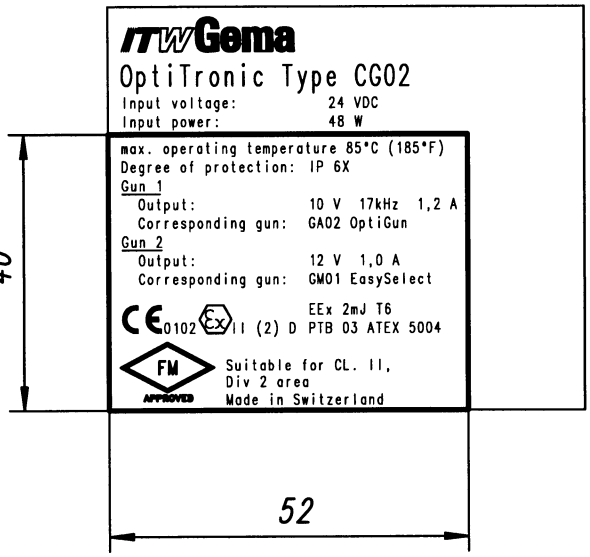
Richard DiMaria
Engineer
Hazardous Locations

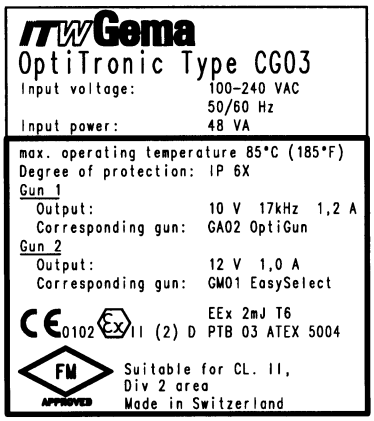
REVIEWED BY:

Richard A. Fontaine
Senior Engineer
Hazardous Locations

Genauigkeitsgrad	Toleranzen für Längenmasse Nennmass (mm) bis 6	über 6 bis 30	über 30 bis 120	über 120 bis 400	über 400 bis 1000	über 1000 bis 2000	über 2000 bis 4000
fein	±0.05	±0.1	±0.15	±0.2	±0.3	±0.5	-
mittel	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2
grob	±0.3	±0.5	±0.8	±1.2	±2	±3	±4

Toleranzen für Winkel Nennmass (mm) = Länge der kürzeren Schenkel bis 10	über 10 bis 50	über 50 bis 100	über 100
±1°	±30'	±20'	±10'





FILMLEGENDE		
POS (FARBREIHENFOLGE)	SYMBOL	BEMERKUNGEN
	Grund	Lichtgrau RAL 7035, ohne Film
1	Schrift	

Prüfstelle	Eingereicht
Atex : ☐ FM : ☒	☒
Betreffende Zeichnung: siehe unten	

- auf Trägerband geschlitzt
- rückseitig mit Kleber

	Folie 0,1mm		Mat.Nr.3	Norm 245956
Pos.	Gegenstand	Menge	Werkstoff	Zeich.-/Art.-Nr. / Bemerkung

Änd.						
7664	A	7754	B		C	separate Stückliste
07.10.05	KU	21.02.06	KU			
	D		E		F	
						Genauigkeitsgrad mittel
	G		H		I	

Massstab	Gez./Gepr.		
1:1		06.07.2005	TS
Ersatz für:			

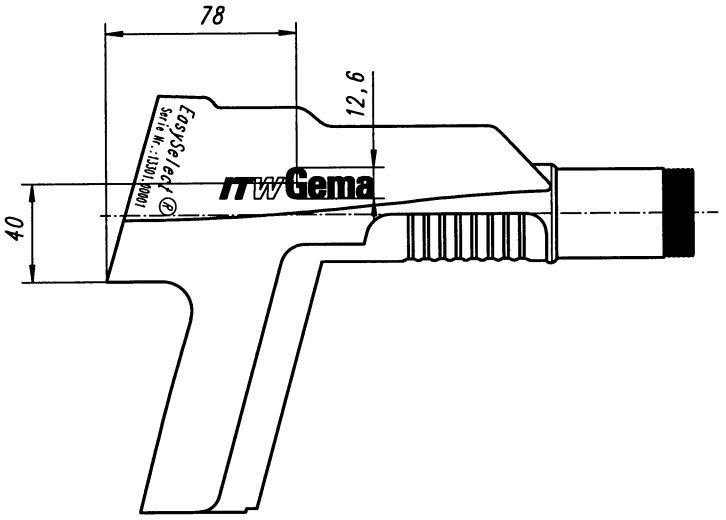
ITW Gema

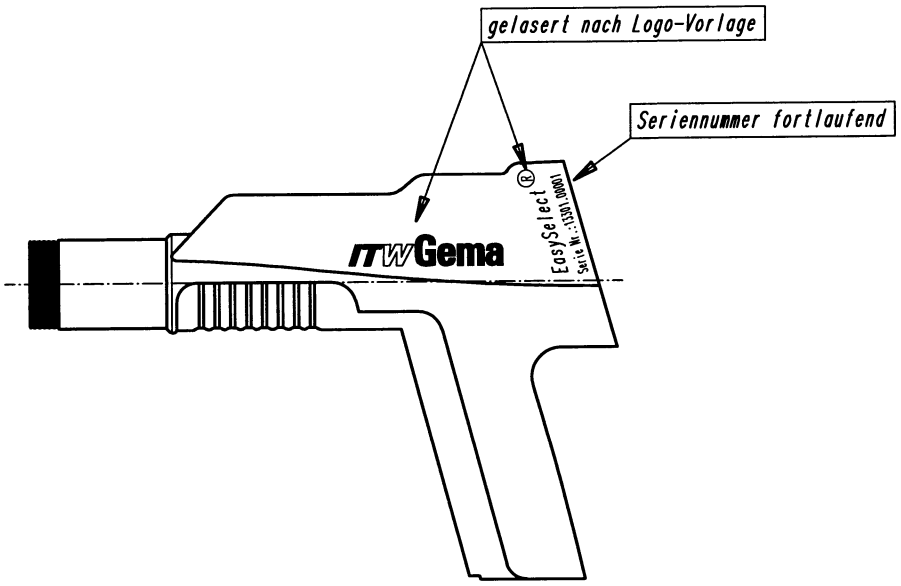
GERÄTESCHILD FM

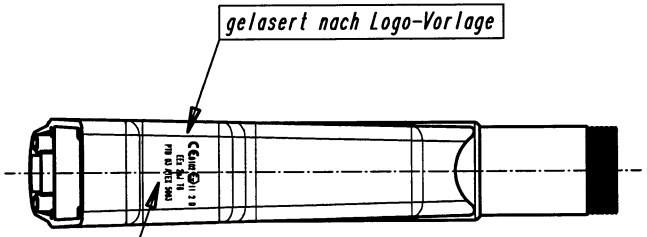
CG02/CG03

Art.-Nr.: 396770

MAB01-A045-4 B







Bei Pistolen in FM-Ausführung (USA) muss das Klebschild Art.-Nr.396893 angebracht werden

Präfstelle	Eingereicht
Atex : ☒	☐
FM : ☒	
Betreffende Zeichnung: MPC01-A019-3	

[...] : Ex-Spezifisch

Genauigkeitsgrad	Toleranzen für Längenmasse Nennmass (mm) bis 6	über 6 bis 30	über 30 bis 120	über 120 bis 400	über 400 bis 1000	über 1000 bis 2000	über 2000 bis 4000
fein	±0.05	±0.1	±0.15	±0.2	±0.3	±0.5	–
mittel	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2
grob	±0.3	±0.5	±0.8	±1.2	±2	±3	±4

Toleranzen für Winkel Nennmass (mm) = Länge der kürzeren Schenkel bis 10	über 10 bis 50	über 50 bis 100	über 100
±1°	±30'	±20'	±10'

Pos.	Gegenstand						Menge	Werkstoff	Zeich.-/Art.-Nr.	Bemerkung
Änd.	6261	A	6274	B	7186	C		ohne Stückliste	Massstab 1:2	Gez./Gepr. 09.02.2000 KU
	07.03.00	KU	31.03.00	KU	26.05.03	TS				
	7664	D		E		F				
	07.10.05	KU						Genauigkeitsgrad mittel		Ersatz für:
		G		H		I				

ITW Gema

BESCHRIFTUNG/LETTERING

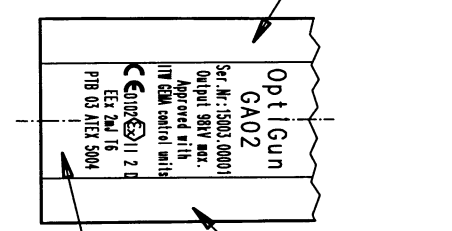
HANDPISTOLE GM01

Art.-Nr.: -----

MPC01-A035-3 D

Detail X

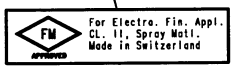
M 1:1

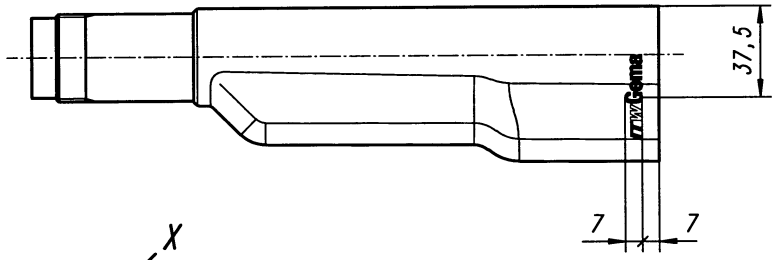


Seriennummer fortlaufend

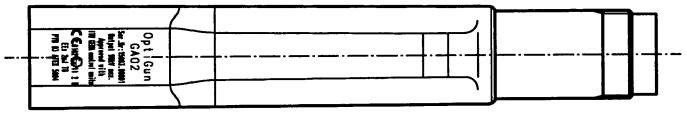
gelasert nach LOGO-Vorlage

Bei Pistolen in FM-Ausführung (USA) muss das Klebschild Art.-Nr.396893 angebracht werden

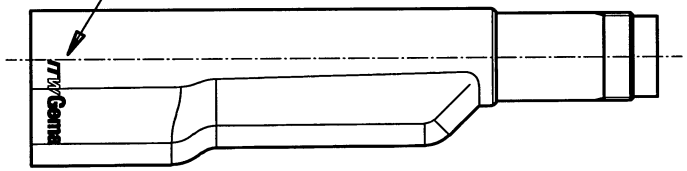




X



gelasert nach LOGO-Vorlage



Prüfstelle	Eingereicht
Atex : ☒	☐
FM : ☒	
Ex	Betreffende Zeichnung: MPC01-A079-1

[...] : Ex-Spezifisch

Pos.	Gegenstand	Menge	Werkstoff	Zeich.-/Art.-Nr.	Bemerkung
	Änd. 7186 A 7664 B C; 09.05.03 TS 07.10.05 KU; D E F; G H I		ohne Stückliste	Massstab 1:2 (1:1)	Gez./Gepr. 21.02.2003 TS
			Genauigkeitsgrad mittel	Ersatz für:	

ITW Gema

BESCHRIFTUNG/LETTERING

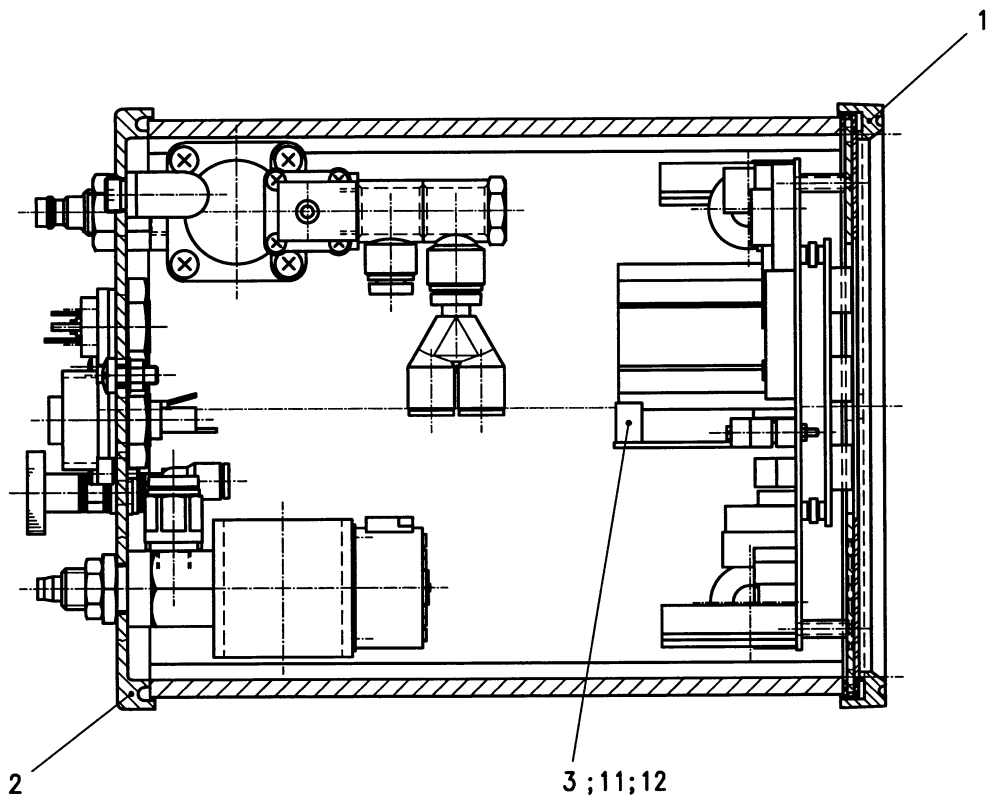
SCHAFT/SHAFT GA02-.

Art.-Nr.: -------

MPC01-A080-3 B

Genauigkeitsgrad	Toleranzen für Längenmasse Nennmass (mm) bis 6	über 6 bis 30	über 30 bis 120	über 120 bis 400	über 400 bis 1000	über 1000 bis 2000	über 2000 bis 4000
fein	±0.05	±0.1	±0.15	±0.2	±0.3	±0.5	-
mittel	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2
grob	±0.3	±0.5	±0.8	±1.2	±2	±3	±4

Toleranzen für Winkel Nennmass (mm) = Länge der kürzeren Schenkel bis 10	über 10 bis 50	über 50 bis 100	über 100
±1°	±30'	±20'	±10'



Schutzart	: IP 54 (FM IP 6X)
Max. Gehäuseaussentemperatur	: T_G = < 65°C

[...] : Ex-Spezifisch

Prüfstelle Atex : ☒ FM : ☒	Eingereicht ☒
Ex	Betreffende Zeichnung: siehe unten

Variantenschlüssel:

FC : Flow Control => Durchflussmessung
SL : System Lock => Bedienungsverriegelung
DB : Digital Bus => Parallele Schnittstelle für Kommunikation
CB : CAN Bus => Serielle Schnittstelle für Kommunikation
G1 : Gun 1 => Anschluss zur PG../GA02 - Pistolenreihe
G2 : Gun 2 => Anschluss zur GA01/GM.. - Pistolenreihe

ART.NR.	KOMBINATIONSMÖGLICHKEITEN							BEMERKUNG
	CG02 -	FC	SL	DB	CB	G1	G2	
384 569	VAR. 5		X				X	
384 577	VAR. 6		X					
384 585	VAR. 7			X			X	
384 593	VAR. 8			X				
384 623	VAR.11	X		X			X	
384 631	VAR.12	X		X				
388 874	VAR.15				X		X	
388 882	VAR.16				X	X		
388 890	VAR.17	X			X		X	
388 904	VAR.18	X			X	X		

Stromlaufplan MAB07-A002-4

Pos.	Gegenstand	Menge	Werkstoff	Zeich.-/Art.-Nr.	Bemerkung
			separate Stücklste	Massstab 1:1	
			Genauigkeitsgrad mittel	Gez./Gepr. 21.02.2003 TS	
				Ersatz für:	

Änd.					
	7684	A	B	C	
	07.10.05	KU			
		D	E	F	
		G	H	I	

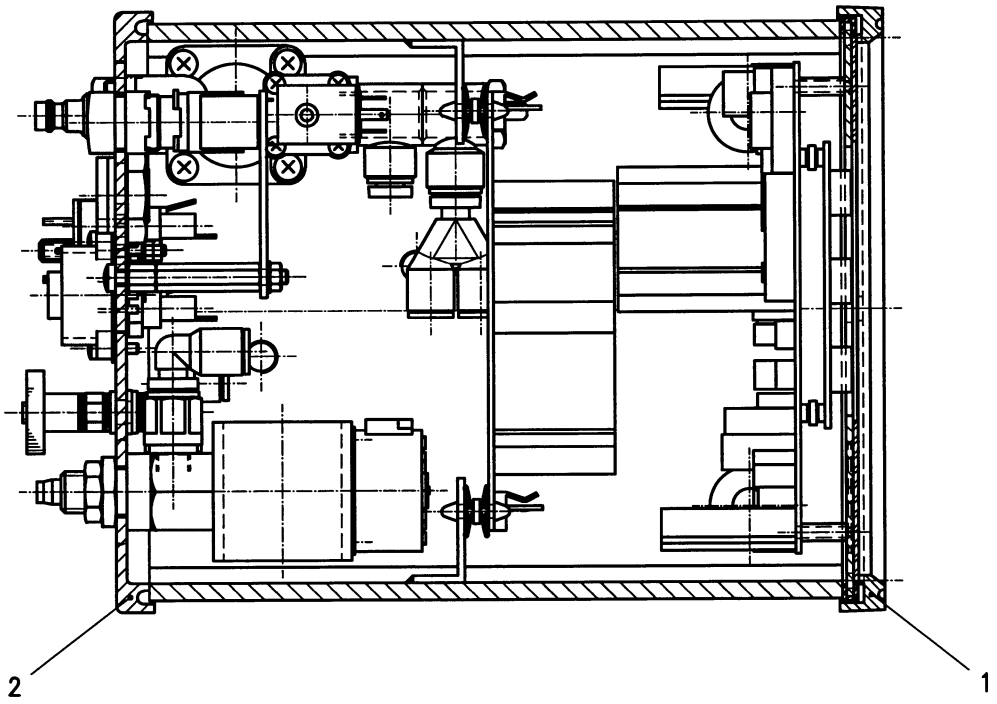
ITW Gema

PISTOLENEINHEIT KPL.
CG02

Art.-Nr.: (01Z001)
ZAB01-Z001-2 | A

Genauigkeitsgrad	Toleranzen für Längenmasse Nennmass (mm) bis 6	über 6 bis 30	über 30 bis 120	über 120 bis 400	über 400 bis 1000	über 1000 bis 2000	über 2000 bis 4000
fein	±0.05	±0.1	±0.15	±0.2	±0.3	±0.5	-
mittel	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2
grob	±0.3	±0.5	±0.8	±1.2	±2	±3	±4

Toleranzen für Winkel Nennmass (mm) = Länge der kürzeren Schenkel bis 10	über 10 bis 50	über 50 bis 160	über 160
±1°	±30'	±20'	±10'



Schutzart	: IP 54 (FM IP 6X)
Max. Gehäuseaussentemperatur	: T_G = < 65°C

[...] : Ex-Spezifisch

Prüfstelle	Eingesetzt
Atex : ☒	☒
FM : ☒	
Ex	Betreffende Zeichnung: siehe unten

Variantenschlüssel:

G1 : Gun 1 => Anschluss zur PG../GA02 - Pistolenreihe
G2 : Gun 2 => Anschluss zur GA01/GM.. - Pistolenreihe

ART.NR.	KOMBINATIONSMÖGLICHKEITEN			BEMERKUNG
	CG03 -	G1	G2	
384 640	VAR.1		X	
386 162	VAR.2	X		

Stromlaufplan MAB07-A022-4

Pos.	Gegenstand	Menge	Werkstoff	Zeich.-/Art.-Nr.	Bemerkung
			separate Stücklste	Massstab 1:1	
			Genauigkeitsgrad mittel	Gez./Gepr. 21.02.2007 TS	
				Ersatz für:	

Änd.												
	7664	A		B		C						
	97.10.05	KU										
		D		E		F						
		G		H		I						

ITW Gema

PISTOLENEINHEIT KPL.
CG03

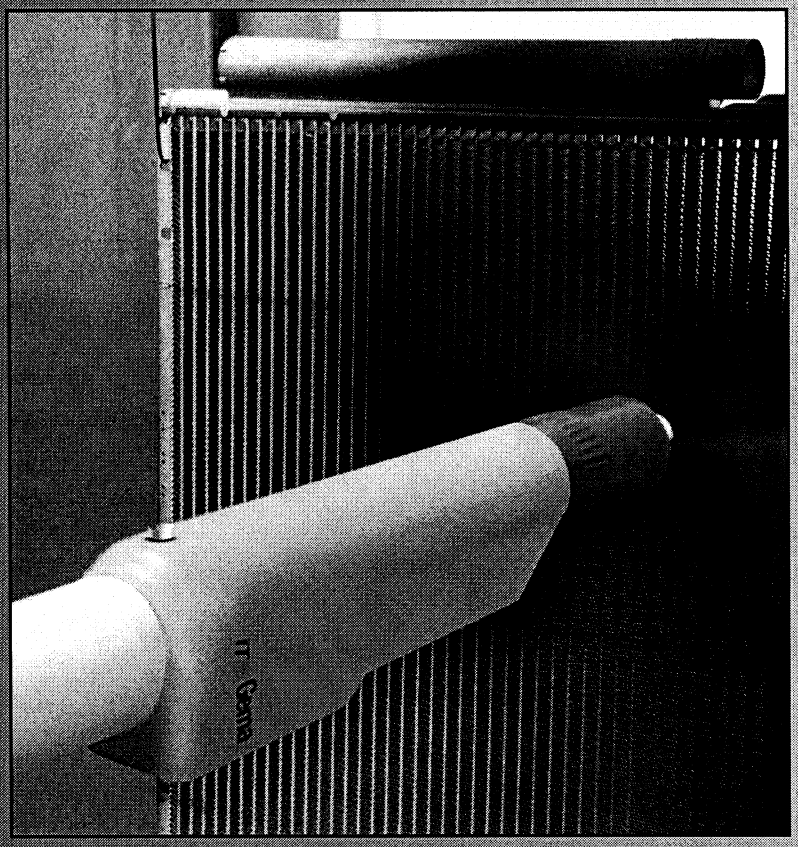
Art.-Nr.: (01Z011)
ZAB01-Z011-2 A

Genauigkeitsgrad	Toleranzen für Längenmasse Nennmass (mm) bis 6	über 6 bis 30	über 30 bis 120	über 120 bis 400	über 400 bis 1000	über 1000 bis 2000	über 2000 bis 4000
fein	±0.05	±0.1	±0.15	±0.2	±0.3	±0.5	-
mittel	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2
grob	±0.3	±0.5	±0.8	±1.2	±2	±3	±4

Toleranzen für Winkel Nennmass (mm) bis 10	über 10 bis 50 – Länge der kürzeren Schenkel	über 50 bis 100	über 100
±1°	±30'	±20'	±10'

OPTIGUN™
AUTOMATIC POWDER GUN

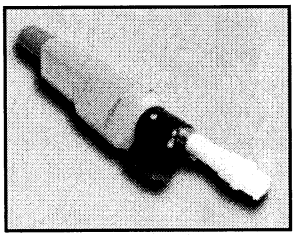
The World Leader in Powder Coating Systems



OPTIGUN™ Automatic Powder Coating Guns

Once again, ITW Gema has set the technological standard by which all powder coating guns will be measured. Introducing the OPTIGUN automatic powder gun, designed to work exclusively with Gema's OptiSystem™ automatic powder system.

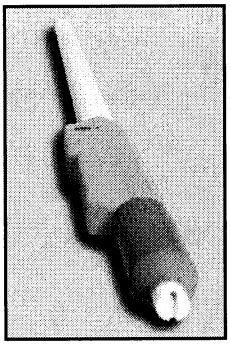
ITW Gema



The OPTIGUN™

For more than a decade, ITW Gema's PG Series powder guns set the technology standard for the powder coating industry. Many companies have attempted to emulate the design and performance of the PG gun, but they cannot match the gun's capabilities. Building upon the field-proven success of the PG series, ITW Gema is excited to introduce the OPTIGUN—setting the standard again for automatic powder-coating guns.

The latest advancements in gun technology lie in the OPTIGUN's integrated, cascade power-supply and patented, self-cleaning electrode. Together, these two components ensure a uniform charge to the powder particles, delivering a high level of transfer efficiency and even application of powder.



The OPTIGUN AX™

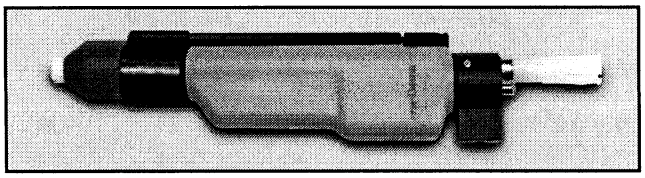
The Extended OPTIGUN (OPTIGUN AX™) is designed for even faster cleaning required by XTreme Color Change Environments.™ A fiberglass-reinforced extension tube acts as a gun bar while enclosing the cables and hoses. The rinse air, power cable, and powder feed connections are all outside the booth, eliminating the potential for contamination and making cleaning easier. Like the standard OPTIGUN, OPTIGUN AX uses the quick-disconnect powder-hose attachment and an easy-to-remove cable assembly. The extension tube is available in standard lengths ranging from 650 mm to 1650 mm, allowing the gun to be used in a variety of powder coating booths.

OPTIGUN features

Both guns feature a streamlined body design that prevents powder from collecting, making it easier to clean. The hermetically sealed gun body stops powder from entering the internal cavity, eliminating potential voltage and color contamination problems. The powder hose quick-change connector and replaceable, threaded powder-tube speed up and simplify cleaning and maintenance. The guns utilize the quick-disconnect power-cable connection, allowing for quick removal and streamlining maintenance. The powder tube diameter has been enlarged, providing softer spray patterns and allowing for compatibility with all nozzles and extensions for the EasySelect™ manual powder guns. Unique to the standard version of the OPTIGUN, the new quick-release connection allows the gun to be removed and installed without losing the desired coating position.

Optional SuperCorona®

An optional SuperCorona ring can be added to either version of the OPTIGUN to minimize orange peel and improve penetration. A SuperCorona ring is easy to install and fits directly onto the gun barrel.

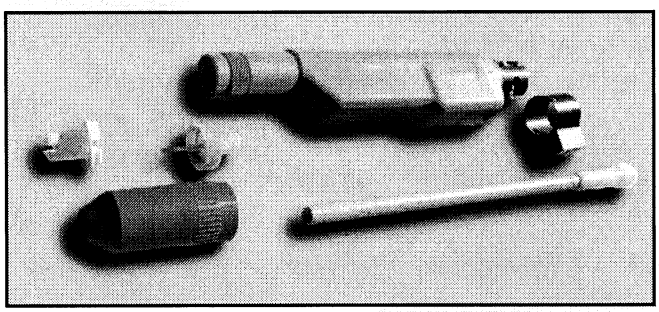


The OPTIGUN and OPTIGUN AX automatic guns are designed to achieve high-transfer efficiency and a uniform film build. Rugged, dependable and easy to use, they perform efficiently and effectively.

Find out more

Find out more about the OptiSystem line of products by contacting your local ITW Gema representative at 1-800-628-0601, or visit us at www.itwgema.com for additional information. And if you would like to discuss how you can increase your powder coating profitability give us a call and we'll be glad to discuss our Application Systems Analysis Program (ASAP™) and schedule an initial consultation at that time.

ITW Gema's ASAP provides you with a comprehensive review of your finishing system, determining opportunities that will improve your bottom line. After a thorough analysis of your operation, our representatives will present a cost/benefit analysis custom tailored to your needs, including anticipated return on your investment.



The OPTIGUN is quickly taken apart for fast and easy cleaning. When removing or installing the gun, correct coating position is maintained with the unique gun-bar connection.

All units are covered by ITW Gema's unique 5-year warranty.

ITW Gema

Superior By All Measures

ITW Gema An Illinois Tool Works Company P.O. Box 88220 Indianapolis, IN 46208 Phone 800-628-0601 Fax 317-298-5010 www.itwgema.com

OPTIGUN™

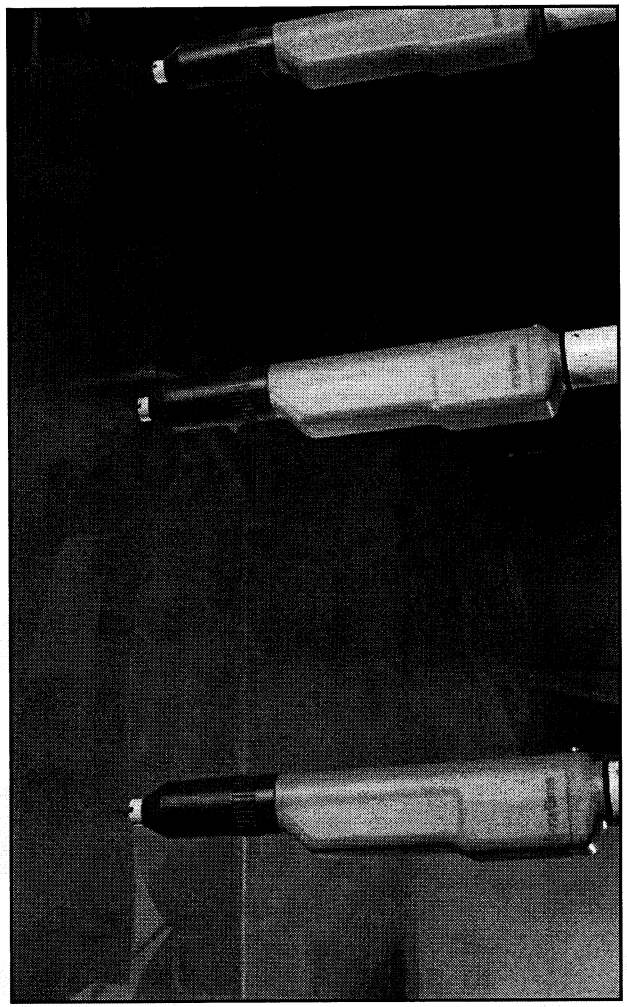
AUTOMATIC POWDER GUN

Features

ITW Gema

Superior By All Measures

Optimal Performance–Repeatable Results



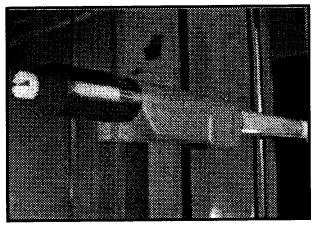
Building upon their leadership in gun technology, ITW Gema is excited to introduce the OPTIGUN—setting the standard again for automatic powder-coating guns.

ITW GEMA'S 5 YEAR WARRANTY

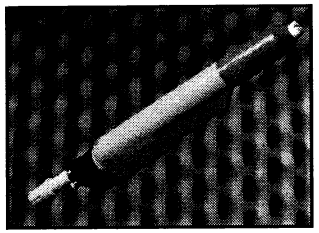
All units are covered by ITW Gema's unique 5-year warranty.

OPTIGUN: the most advanced automatic powder gun in the world.

- ITW Gema's integrated cascade power supply provides maximum charging at the tip of the gun.
- Improved design ensures longer life and better reliability.
- Contoured-body design prevents powder from collecting, making cleaning easier.
- Improved cascade design no longer requires grease, simplifying maintenance and repairability.
- Enlarged tube diameter provides softer spray patterns, allowing the electrostatics to have greater control and increased transfer efficiency.
- Quick-change hose connector and replaceable, threaded powder-tube enable quick removal and easy maintenance.
- Compatibility with all nozzles and extensions for the EasySelect™ manual powder guns, simplifying replacement of wear parts.
- Optional Super Corona™ ring can be added to minimize orange peel and improve penetration.
- Designed for challenging applications, such as porcelain enamel.
- Part of ITW Gema's industry-leading OptiSystem.™



The Extended OPTIGUN (OPTIGUN AX™) is designed for even faster cleaning required by XTreme Color Change Environments.™



ITW Gema's integrated cascade power supply provides maximum charging at the tip of the gun.

OPTIGUN

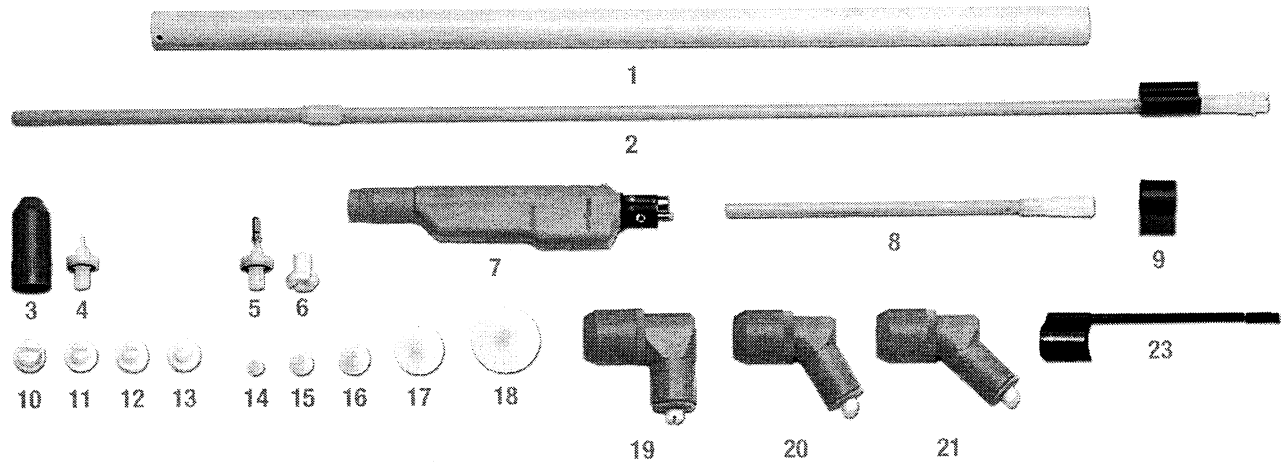
AUTOMATIC POWDER GUN

Components and Accessories

ITW Gema

Superior By All Measures

OPTIGUN Components and Accessories

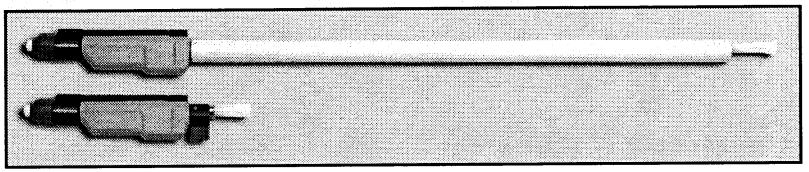


1 AX Gun Bar Extension Tube
2 AX Powder Tube with Hose Connection Clamp
3 Threaded Sleeve
4 Electrode Holder (Round Jet)
5 Electrode Holder (Flat Jet)
6 Round Jet Nozzle
7 OPTIGUN Powder Gun
8 Powder Tube with Hose Connection Clamp
9 Powder Gun Mounting Clamp
10 Flat Jet Nozzle (Enlarged Slot)
11 Flat Jet Nozzle (Standard)
12 Flat Jet Nozzle (Oval Slot)
13 Flat Jet Nozzle (Blank)
14 Deflector Plate – 16mm
15 Deflector Plate – 24mm
16 Deflector Plate – 32mm
17 Deflector Plate – 50mm
18 Deflector Plate – 70mm
19 Angled Nozzle 90°
20 Angled Nozzle 60°
21 Angled Nozzle 45°
22 Super Corona™ Ring

If you're making 6 or more color changes in an 8-hour shift, you need equipment designed...

X FOR XTREME COLOR CHANGE ENVIRONMENTS

The OPTIGUN AX delivers quick cleaning and efficient powder usage to keep your down-time to a minimum and operating costs low.



The OPTIGUN and OPTIGUN AX automatic guns are designed to achieve high-transfer efficiency and a uniform film build. Rugged, dependable, and easy to use, they perform efficiently and effectively.

ITW GEMA'S 5 YEAR WARRANTY

All units are covered by ITW Gema's unique 5-year warranty.

ITW Gema
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OPTITRONIC™

AUTOMATIC CONTROL UNIT

Features

ITW Gema

Superior By All Measures

Optimal Performance–Repeatable Results

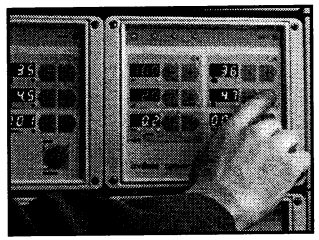
ITW Gema sets the standard for powder coating technology once more, with the OPTITRONIC Automatic Control Unit.

	GUN CONTROL UNIT	PLC	FUNCTIONALITY
LEVEL ONE	OPTITRONIC	AUTOTRACKER LEVEL 1	Remote Trigger & Purge
LEVEL TWO	OPTITRONIC PLUS	AUTOTRACKER LEVEL 2	Remote Trigger & Purge Strobe Programs Diagnostic Warning
LEVEL THREE	OPTITRONIC PLUS	AUTOTRACKER LEVEL 3	Remote Trigger & Purge Strobe Programs Unlimited # of Programs Full Diagnostic Reporting
ITW Gema System Functionality			

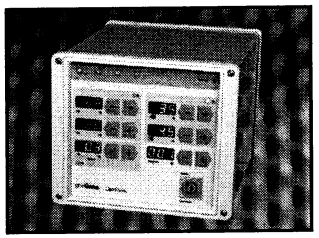
Use the OPTITRONIC for level-1 functionality or upgrade to the OPTITRONIC PLUS for level-2 or level-3 functionality.

OPTITRONIC: the most sophisticated control unit in the world.

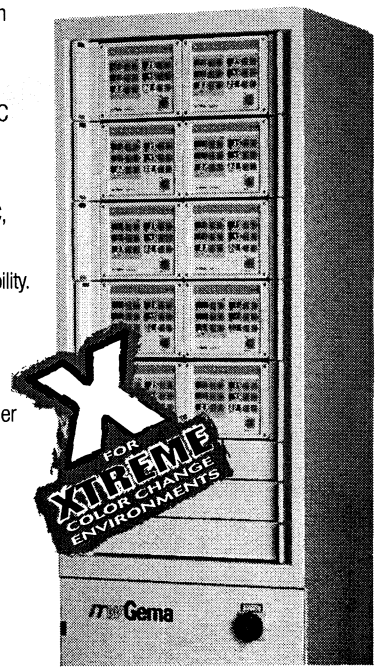
- OPTITRONIC's digital technology offers a new standard of precision and more uniform film thickness, resulting in lower operating costs.
- Patented Stepper Motor ensures accuracy to +/- 3%.
- High-level diagnostics give detailed information for simple troubleshooting.
- Uniform volume control and industry-leading first-pass transfer efficiency saves powder and results in a more consistent finish.
- Unmatched program storage capacity–up to 255–allows for fast recall of all settings for any application.
- Remote gun triggering and purging can be operated from the Programmable Logic Controller (PLC).
- OPTITRONIC and OPTITRONIC PLUS™ models available.
- OPTITRONIC PLUS communicates with your PLC, allowing for advanced diagnostics and programmability.
- Optional Flow-Control Module™ for closed-loop control of the total air volume for consistent powder delivery and increases accuracy to +/- 1%.
- Part of ITW Gema's industry-leading OptiSystem.™



The simple-to-use interface gives you unprecedented control over voltage, current, electrode rinsing air, powder output, and air volume give you the ability to repeat quality performance–every time.



The OPTITRONIC can be customized to give you optimum coating results for any part configuration or type of powder.



OPTITRONIC™

AUTOMATIC CONTROL UNIT

User Interface

ITW Gema

Superior By All Measures

Setting the Technological Standard

Electrostatic Fault LED
Should there be a problem with the electrostatic operation of the OPTITRONIC,™ this LED will glow red.

Diagnostic LEDs
These simple indicators give you constant feedback on the status of your system and assist in troubleshooting.

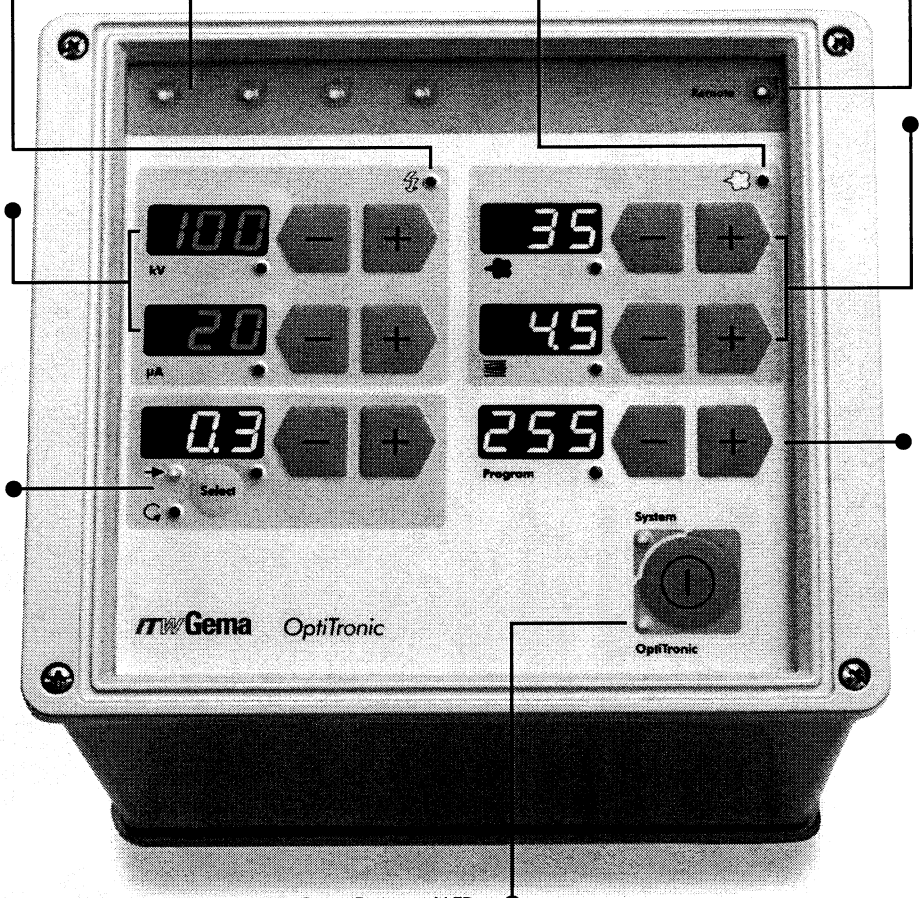
Pneumatic fault LED
Should there be a problem with the pneumatic operation of the OPTITRONIC, this LED will glow red.

Remote LED
When the booth's PLC is remotely engaged and controlling the OPTITRONIC, this LED will glow green.

Electrostatic Settings
The digital display and controls on top are voltage, the ones below are current.

Powder and Air-Mixture Settings
ITW Gema's innovative design separates the powder output control from the air volume control. The touch pad on top allows you to adjust powder output, the one below regulates the air volume.

Rinse-Air Setting
ITW Gema's patented rinse-air feature cleans the electrode with a steady stream of air, ensuring a uniform charge to powder particles, optimizing transfer efficiency.



Program & Diagnostic Display
The robust, on-board memory of the OPTITRONIC can store as many as 255 different coating programs. Each program contains a snapshot of all your settings, allowing you to achieve repeatable performance–every time. If the OPTITRONIC encounters a problem, the error code will appear here for you to reference in the technical manual.

Power Button and LEDs
When the system is engaged and ready to spray powder, the "System" LED will light. When the OPTITRONIC is powered on, the "OPTITRONIC" LED will light.

ITW GEMA'S 5 YEAR WARRANTY

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If you're making 6 or more color changes in an 8-hour shift, you need equipment designed...

X FOR XTREME COLOR CHANGE ENVIRONMENTS

The OPTITRONIC delivers precision and speed to keep your down-time to a minimum.

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OPTISYSTEM
AUTOMATIC POWDER TECHNOLOGY

™ OPTIMAL PERFORMANCE–REPEATABLE RESULTS

The World Leader in Powder Coating Systems

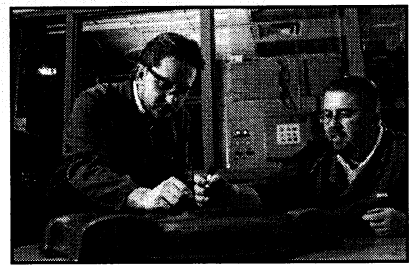
Intelligence, Integration, Automation

Once again, ITW Gema has developed revolutionary technology for automatic powder coating. The OPTISYSTEM™ is the most advanced grouping of powder coating equipment available. OPTISYSTEM delivers optimal results—every time.

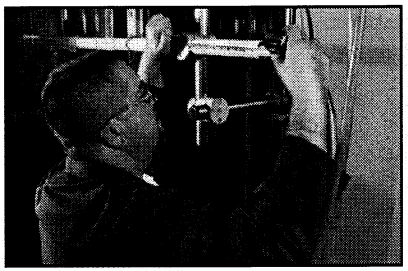
ITW Gema

ITW Gema's Application Expertise Delivers Optimal Results

Planning – Using our proprietary diagnostic tools, ITW Gema will configure your system to meet the exact requirements of the parts and powder you use.



Processing – After the initial test runs, our technicians measure the powder thickness and consistency of coated parts. These details tell us how to further optimize the system for the best possible coating results.



Programming – Armed with the information from the Planning and Processing phases, our technicians perform the final few adjustments to give you the optimal results the industry has come to expect from ITW Gema.

Greater Skill - Greater Service - Greater Value

When you partner with ITW Gema, you gain access to decades of application expertise and know-how. Unlike any company in our industry, ITW Gema spends significant time and money in the pre- and post-installation phases, working with our customers to ensure they are getting the most out of their ITW Gema powder coating system.

Our team of experts will provide you with a comprehensive assessment of your finishing system requirements, informing you of opportunities to improve your efficiency and your bottom line. Using ITW Gema's proprietary software, we will examine your process requirements and goals to determine what system configuration will best meet your needs – and generate the highest return on investment.

Once the system is installed, our experts spend time on-site measuring everything from film thickness to reclaim efficiency; testing your various substrates and parts; and adjusting your gun positions. They will synchronize your equipment to meet your production needs, while ensuring the system is operating at peak efficiency.

In addition to an optimized powder coating system, ITW Gema provides advanced-level training. Our technicians will turn you and your staff into experts in the operation and maintenance of your equipment. We will also consult with you on an appropriate ServiceNet support plan to keep your system running like new for years to come.

With ITW Gema, you don't just get industry-leading equipment...You get industry-leading equipment, support, and expertise. What else would you expect from the world leader in powder coating equipment

servicenet℠
24 HOUR SUPPORT

Whether you have an emergency, want to learn more about your system, or need assistance with a preventive maintenance plan; a ServiceNet℠ Support Agreement can get you the answers to maximize your uptime. ServiceNet provides:

- Protection Against Breakdowns
  Detect and correct minor problems before they become major repairs.
- Expert System Care
  Factory-recommended maintenance-checks keep equipment in top-running shape.
- Worry-Free Convenience
  Scheduled maintenance-checks are handled automatically – no need to call!
- Budgetable Simplicity
  A fixed annual fee means unexpected and expensive repairs are practically eliminated.
- Priority Service
  You'll receive precedence in emergency-service situations.
- Economic Benefits
  Production time is maximized with equipment maintained at peak efficiency.
- Longer Equipment Life
  Equipment life is extended, as scheduled maintenance prevents excessive wear.

ASAP™
APPLICATION SYSTEM ANALYSIS PROGRAM

Member of The Powder Coating Institute

Member of The Chemical Coaters Association International

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ITW Gema™

Superior By All Measures

Optimal Performance–Repeatable Results

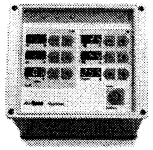
ITW Gema's OPTISYSTEM™ Optimizes Your Automatic Powder Coating Operation

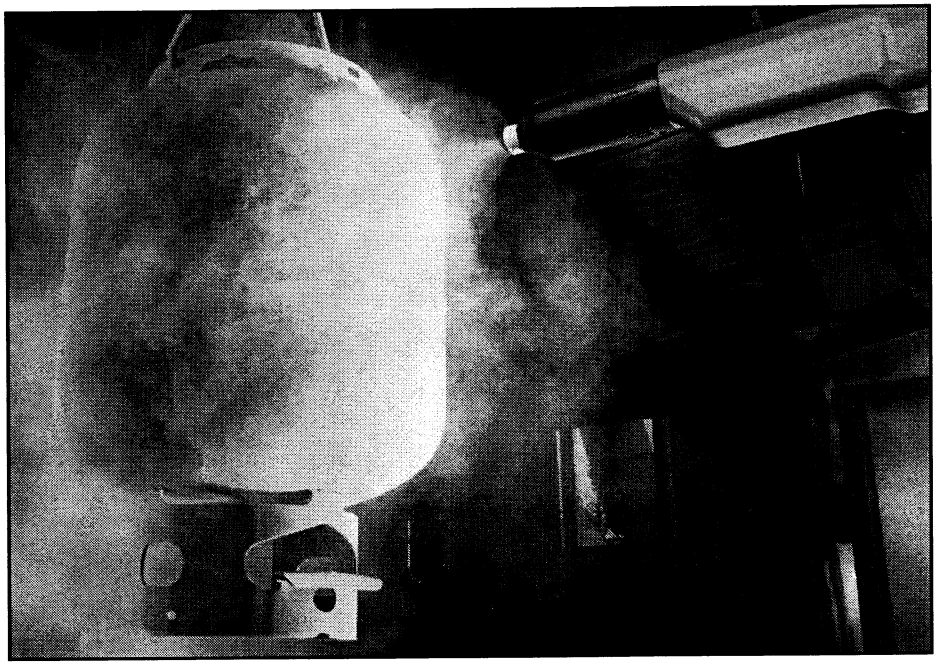
- The OPTISYSTEM **improves profitability** by making your operation more efficient.
- The simplified user interface gives operators **total control flexibility** without having to worry about balancing several different settings.
- Quick, easy-to-learn procedures **reduce training requirements** with operators.
- The OPTISYSTEM **decreases your down time** by automating coating configurations.
- The OPTISYSTEM's group of high-tech components are designed to **save time** in an XTreme Color Change Environment.™
- The intelligent automation and the latest powder coating technology increases transfer efficiency, **reducing the amount of powder wasted**.
- The OPTISYSTEM **improves productivity**, even in more challenging applications such as porcelain enamel.

If you're making 6 or more color changes in an 8-hour shift, you need equipment designed...

X FOR XTREME COLOR CHANGE ENVIRONMENTS

The OPTISYSTEM delivers intelligence, integration, and automation to keep your down-time to a minimum.

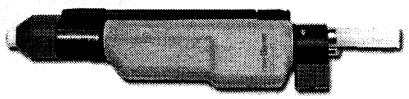




The industry-leading design of the OptiGun ensures longer life and high-level reliability.

The OPTIGUN™

- ITW Gema's **integrated cascade power supply** provides maximum charging at the tip of the gun.
- Improved design ensures **longer life and better reliability.**
- **Contoured-body design** prevents powder from collecting, making cleaning easier.
- **Sealed gun-body design** stops powder from entering the internal cavity, eliminating potential voltage and color-change contamination problems.
- Improved cascade design no longer requires grease, **simplifying maintenance and repairability.**
- **Enlarged tube diameter** provides softer spray patterns, allowing the electrostatics to have greater control and increased transfer efficiency.
- Quick-change hose connector and replaceable, threaded powder-tube enable quick removal and **easy maintenance.**
- **Compatibility** with all nozzles and extensions for the EasySelect™ manual powder guns, simplifying replacement of wear parts.
- **Optional Super Corona™** ring can be added to minimize orange peel and improve penetration.

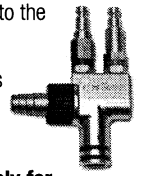


The OPTITRONIC™

- OPTITRONIC's digital technology offers a new standard of precision and more uniform film thickness, resulting in **lower operating costs.**
- Patented Stepper Motor ensures **accuracy to +/- 3%.**
- High-level diagnostics give detailed information for simple troubleshooting.
- Uniform volume control and industry-leading first-pass transfer efficiency saves powder and results in a **more consistent finish.**
- **Unmatched program storage capacity**–up to 255–allows for fast recall of all settings for any application.
- Unprecedented control over voltage, current, electrode rinsing air, powder output, and air volume give you the ability to **repeat quality performance**–every time.
- **Remote gun triggering and purging** can be operated from the Programmable Logic Controller (PLC).
- **OPTITRONIC and OPTITRONIC PLUS™** models available.
- OptiTronic Plus communicates with your PLC, allowing for **advanced diagnostics and programmability.**
- **Optional Flow-Control Module™** for closed-loop control of the total air volume for consistent powder delivery and accuracy to +/- 1%.

The OPTIFLOW™

- Advanced engineering of OPTIFLOW™ Pump ensures **uniform powder delivery** for every application.
- Keyed quick disconnects facilitate **fast installation and removal.**
- Need for **only two major wear parts** keeps spare parts and operational costs exceptionally low.
- Plug-in design promotes a **reliable fit and easy maintenance.**
- Check valves **prevent powder migration** into the OPTITRONIC Control Unit.
- Precision-manufactured injector jet eliminates impact fusion, wear, and **facilitates quick color change.**
- Easy-to-clean design requires **no disassembly for most color changes.**
- Use of two "O" rings provides **improved, dependable sealing.**

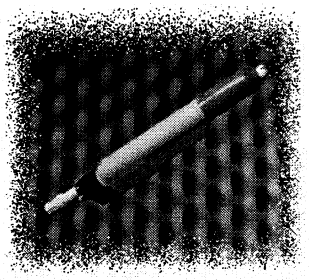


ITW GEMA'S 5 YEAR WARRANTY

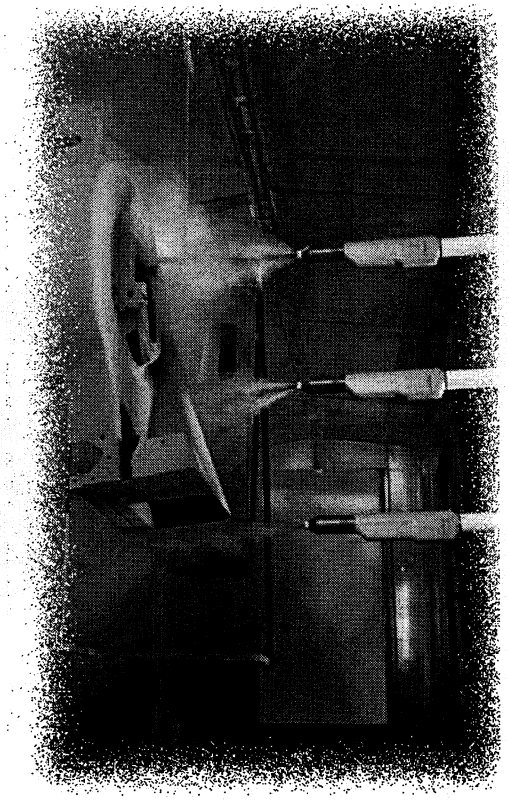
All units are covered by ITW Gema's unique 5-year warranty.

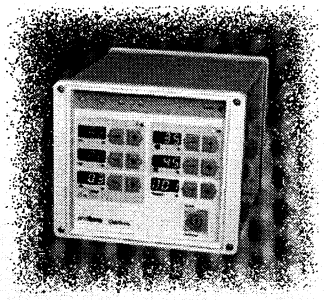
The OPTISYSTEM is Optimum for YOU.

When you combine the OPTIGUN, the OPTITRONIC, and the OPTIFLOW, you've just arrived at the future of powder coating. These three high-tech components deliver to you three important benefits: repeatability, results, and ROI.

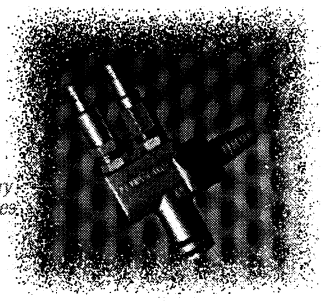


The OPTIGUN features the field-proven design of an integrated cascade power supply for superior charging efficiency. The improved contoured-body design prevents powder from collecting, making cleaning easier and faster.





The OPTITRONIC Control Unit offers a simple selection of options to give operators the versatility they need for any job...without having to constantly re-adjust and balance various settings.



The OPTIFLOW Pump assures uniform powder delivery in every application. Its advanced features speed installation and removal, while making cleaning and maintenance extremely simple.

OPTISYSTEM
AUTOMATIC POWDER TECHNOLOGY

TM OPTIMAL PERFORMANCE-REPEATABLE RESULTS

What Makes the OPTISYSTEM So Optimal?

The OPTISYSTEM's advanced technology combined with its easy-to-use interface leads to optimal results–every time.

The flexibility of the OPTITRONIC enables you to store your voltage, current, powder output, and air volume settings for up to 255 applications. Simply select the program number and you're ready to coat.

The design of the OPTIGUN, with its quick-release connections, makes for easier and faster cleaning and maintenance allowing you to spend more time coating.

Add the advanced and easy-to-maintain OPTIFLOW Pump to provide consistently uniform powder delivery–and your powder coating operation has just become optimized.

What makes the OPTISYSTEM so optimal? The intelligence, integration, and automation that only ITW Gema provides.

Call an ITW Gema representative today at 800-628-0601 to discover how the OPTISYSTEM can help you.