

# Equipment Specification

## PS50M-PC Plasma Spray System



## 1 GENERAL

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The following specification covers the standard range of the PS50M-PC system. For the specific offer, please refer to the attached quotation and cross-reference the part numbers for each piece of equipment.

**Safety:** The equipment quoted will produce levels of noise, ultra violet light and dust that will require safety measures to be taken by those using the equipment. It will use pressurised gases these can be flammable and Inert. Careful consideration should also be given to the positioning of this equipment. It is the responsibility of the user to ensure that all appropriate measures are taken to ensure safe operation in accordance with local requirements. Metallisation will be pleased to advise as appropriate.

## 2 BENEFITS

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### 2.1 Overview

The Metallisation PS50M-PC is the latest development to our 50kW Atmospheric Plasma Spray (APS) system. All of the great features of the PS50M have been retained: the system is still mass flow controlled for repeatable coating quality and the operator interface is still very simple. The latest developments are to the powder feeder and operator interface. The powder feeder has mass flow controlled carrier gas and closed loop motor control for reliability and repeatability of powder feed rates. The operator interface is still simple to follow but is now via touch screen rather than pushbuttons. The result is a high quality, compact and easy to use Plasma system.

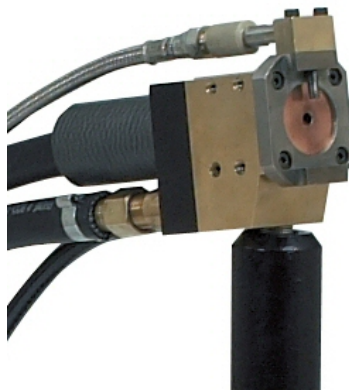
- ✦ Mass flow control of primary, secondary and carrier gases = repeatability
- ✦ Inverter power supply = stability
- ✦ Easy to use, intuitive operator interface
- ✦ PC control with touch screen operator interface
- ✦ Optional keyboard control or operator interface unit
- ✦ Unlimited recipes and parameter recording
- ✦ Manual or fully sequenced start-up, operation and shut-down
- ✦ Straight, 90 degree and extension guns
- ✦ Internal and external powder ports
- ✦ Safety interlocks to prevent running without coolant and gases
- ✦ Argon primary and Nitrogen, Helium or Hydrogen secondary gases
- ✦ Can operate non-Metallisation pistols

## 2.2 Typical Applications

- ✦ Print rolls
- ✦ Analox rolls
- ✦ Paper rolls / Yankee driers
- ✦ Mechanical seals
- ✦ Aerospace engine
- ✦ Aerospace airframes
- ✦ Wire drawing capstans
- ✦ Automotive valves
- ✦ Non-stick cookware

## 3 PS50 PISTOL

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Part No	Description
PLA5000	PLA5000 Plasma Torch (50 kW)
PLA5000-90	Plasma Torch 50Kw (90'Option)

### 3.1 Technical overview:

- ✦ Compact design for small access areas
- ✦ 90 degree option for use with a manipulator or robot
- ✦ 50kW capacity (suited for the majority of plasma spray applications)
- ✦ Internal and external nozzles allow optimum parameters for a range of materials
- ✦ Simple pistol maintenance for reduced downtime when changing consumables
- ✦ Ample cooling allows extended lifetime of consumables
- ✦ Optional cooling jets can be fitted to the pistol
- ✦ Robot mounting interface

### 3.1.1 Technical data:

Description	Characteristics
Weight – PLA5000	1.76kg (3.87lbs)
Dimensions – PLA5000 (mm)	L-158 x W-80 x H-70
Weight – PLA5000-90	1.76kg (3.87lbs)
Dimensions – JET4L-200 (mm)	L-103 x W-80 x H-124

### 3.1.2 Typical performance figures for the PS50M-PC system:

MATERIAL	Reference	Throughput g/min	Deposit efficiency %
Grey Alumina	99205	20	67
Alumina Titania	99220	24	76
Chrome Oxide	99225	39	47
Magnesium/Zirconium Oxide	99275	38	75
Nickel Aluminium Moly	99627	51	67
Tungsten Carbide Cobalt	99735	55	75

All figures are approximate and dependent on many factors including powder type and parameters

## 4 SUPPLIES PACKAGE

Part No	Description
SUP-PLASMA	Plasma supplies package

### 4.1 SUP-PLASMA consists of:

- ✦ 1 x +ve water cooled cable from the gas box to the pistol
- ✦ 1 x -ve water cooled cable from the gas box to the pistol
- ✦ 1 x powder feed hose (max length of 5m) from powder feeder to the pistol
- ✦ 1 x power supply control cable from the gas box to the power supply
- ✦ 1 x heat exchanger control cable from the gas box to the chiller
- ✦ 1 x heat exchanger water hose from chiller to gas box. Fitting 1/2" BSP
- ✦ 1 x heat exchanger water hose from gas box to chiller. Fitting 1/2" BSP
- ✦ 1 x powder feeder control cable from gas box to powder feeder
- ✦ 1 x carrier gas hose from gas box to powder feeder
- ✦ 1 x argon gas hose from regulator to gas box. Fitting 9/16"-18UNF
- ✦ 1 x nitrogen gas hose from regulator to gas box. Fitting 9/16"-18UNF
- ✦ Or 1 x hydrogen gas hose from regulator to gas box. Fitting 9/16"-18UNF-LH

Note: the fittings stated are those at the free ends of the hoses and not the interface at the supplied items.

Cabling to link the operator interface to the gas box and powder feeder is included, 10m length plus the required plugs. Maximum distance 250m.

All hose/cable lengths are 5m as standard.

A 240/110v 1ph, 8A/15A supply will also be required to both the gas box and the powder feeder.

## 5 CONTROL SYSTEM

Part No	Description
PS50PC-CTRL	PS50M-PC control interface and gas box



The control system is shown with the powder feeder mounted onto the gas box for pictorial purposes only. The operator interface is also shown connected to the gas box for pictorial purposes only. In a typical installation, the gas box would be inside the spray booth. The powder feeder would either be inside or outside the spray booth. The operator interface would be outside the spray booth.

## 5.1 Technical overview:

The control system for the PS50M-PC consists of a PC with a touch-screen operator interface and a gas box.

The PC provides a means of operator interface and overall system control. For reliability of operation, the individual operations of the system are actually controlled by PLC's in the gas box and powder feeder. The PC and PLC's are all linked by serial bus to minimise wiring and increase reliability.

### 5.1.1 Gas box contains:

- ✦ Primary gas mass flow controller
- ✦ Secondary gas mass flow controller
- ✦ Control PLC with relevant input/output interface
- ✦ Control valves and switching for sequencing and safe operation of the system
- ✦ E-stop circuit with external interface to integrate into the safety circuit of the spray booth. Signals from the booth door, extraction system, robot, gas detectors etc. can all be linked into the system
- ✦ Interlocks to inhibit system operation unless the following are within preset limits: coolant pressure, temperature and flow; primary gas pressure and flow; secondary gas pressure and flow; carrier gas pressure and flow
- ✦ Fault indication strobe
- ✦ Interface between the gas box, powder feeders and robot by serial bus interface. Up to 255 items can be interfaced, allowing multiple powder feeders to be linked
- ✦ Fixing points to floor or wall mount

## 5.1.2 Specification and supply requirements

Description	Characteristics
Primary gas – Argon	50 l/min (max) @ 4 bar
Secondary gas – Nitrogen	10 l/min @ 4bar
Secondary gas – Helium	50 l/min @ 4bar
Secondary gas – Hydrogen	10 l/min @ 4bar
Coolant – deionised water	12 l/min thru the system @ 6bar
Max. coolant inlet temperature at the pistol	16 degrees Celsius
Electrical - console	240/110V 1ph, 8A/15A
Weight	Gas box – 100kg : Operator interface – 20kg
Dimensions (mm)	Gas box - W-700 x D-600 x H-900 Operator interface - W-560 x D-175 x H-410
Cooling requirements	35kW at 30 degrees C ambient

### 5.1.3 Operator interface:

- ✦ Integrated PC with 15” touch screen, mounted into an industrial enclosure
- ✦ Mounting system for operator interface as shown for wall mounting. Additional or alternative mounting methods are possible
- ✦ Security levels, password protected for operation or programming
- ✦ Comes with Windows XP as an operating system that is widely familiar
- ✦ Real time data logging with programmable intervals. System logs the required parameters and actual operating parameters (gas flows, powder feeder speeds, voltage and current) against time and also logs sequence events and faults
- ✦ Data log output via .csv data format through USB or ethernet to enable remote SPC analysis
- ✦ If touch screen operation is not desirable, USB interfaces are included to allow connection of a keyboard, mouse or other generic/custom USB input devices
- ✦ Full, on screen diagnostics to advise operator of the system status

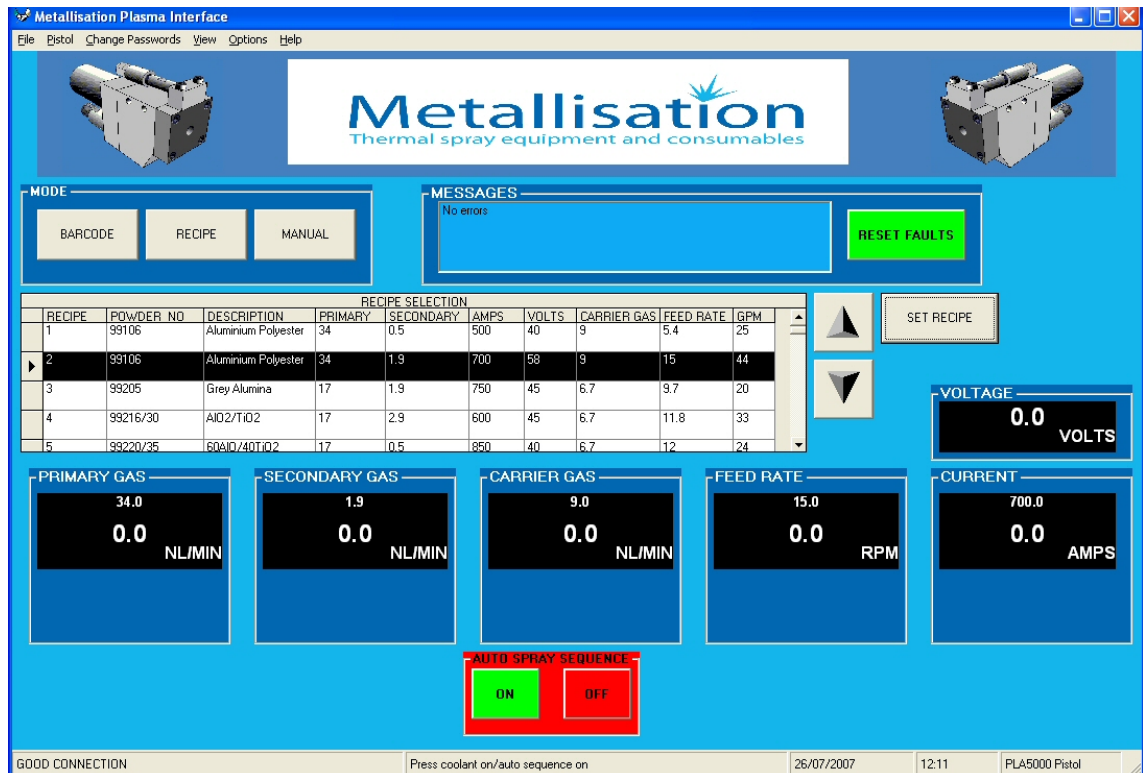
As the operator interface is PC based, it is extremely flexible to control. The functionality can be as complex or as simple as needed. However, as standard, the system can run in 3 modes of operation: manual; recipe or external interface

## 5.1.4 Manual operation:



- Operator first selects MANUAL from the 'MODE' box
- Operator manually sets the desired parameters for primary gas, secondary gas, current, carrier gas and powder feed rate. This can be done with either the + or – buttons or by pressing the Set button which displays a calculator style keypad
- Once parameters are set, the green buttons are manually sequenced through from left to right, first starting the coolant
- Once the coolant is flowing and the system detects that coolant flow, pressure and temperature are within limits, the primary gas button can be pressed
- The sequence continues from left to right until the powder is feeding and if appropriate, the robot sequence is started. Operation of the next button in sequence is inhibited until the interlocks are satisfied, e.g, the system cannot be ignited until the main power is switched on
- During running, the gas and current parameters plus powder feed rate can be adjusted
- To stop the system, the button sequence must be actuated in reverse
- Operating status and faults are displayed in the messages box

## 5.1.5 Recipe operation:



- Operator first selects RECIPE from the 'MODE' box
- Operator scrolls the recipe screen (that has a familiar Excel look to it) and selects the required recipe. The recipe selection screen is programmable so it can show recipe numbers or recipe descriptions. For example, the description could be the name of the part being sprayed
- Once the recipe is chosen, the operator presses the SET RECIPE button. The parameters are loaded
- Once the operator is happy that the components are ready to spray, the green AUTO SPRAY SEQUENCE button is pressed
- The system automatically sequences the spraying cycle, starting the coolant, primary gas, main power, ignition, secondary gas and powder sequence.
- If manually manipulating the pistol, the system will spray until the operator presses the OFF button
- If automatically manipulating the pistol, the system will interface with the robot or automation and start the spraying sequence. Once complete, the system will automatically sequence through to shutdown
- Operating status and faults are displayed in the messages box and data logging can be activated during spraying
- Pre-loading of up to 10 recipes is included

## 5.1.6 External interface operation:

The system is capable to interface via USB to an external interface source. This could, for example, be a barcode reader, an interlocked signal to production automation or a manual component selection switch box.

If, for example the system is barcode interfaced, once the barcode is scanned, it will set the correct parameters and advise the operator which powder to load into the powder feeder. Once the component is ready to spray, the system is started in an automatic sequence in the same way as recipe operation above.

If a multiple coating is required, the system can sequence through the bond coat and top coat, automatically selecting multiple powder feeders if required or stopping to prompt the operator to change powders.

Data can be logged against individual bar-codes and stored to produce traceability of the coating and component.

External interface integration and programming can be quoted to your exact specification.

## 6 POWDER FEEDER

Part No	Description
2007MF-PF	Mass flow powder feeder



### 6.1 Technical overview

- ✦ Mass flow control of carrier gas = repeatability
- ✦ Volumetric feed via hopper and rotating disc design
- ✦ Two disc variants to allow optimum feeding of a wide range of powders
- ✦ Parameters are displayed on the powder feeder and also relayed to the operator interface unit for display and logging
- ✦ Contains PLC for control and integration to operator interface unit
- ✦ Feed disc rotational speed is controlled via a closed loop AC inverter for improved feeding accuracy
- ✦ Control can either be via the operator interface or directly at the powder feeder for stand-alone operation
- ✦ Multiple power feeders can be integrated into the system

### 6.2 Specification and supply requirements

Description	Characteristics
Canister capacity	3,350cc
Electrical supply	220/240v 1ph
Weight	40kg
Dimensions (mm)	W-400 x D-400 x H-700

## 7 POWER SUPPLY

Part No	Description
PS50M*DIPS	1000A inverter power supply



### 7.1 Technical overview

- ✦ Direct current inverter power supply
- ✦ Maximum power output 50kW, 1000A @ 50Vdc (or 500A @ 100Vdc)
- ✦ Runs off normal factory three-phase electrical supply
- ✦ Capable to run either medium or high current operation – enables use with a wide range of gases
- ✦ Possible to link units to obtain higher outputs, e.g. 2000A@50V or 1000A@100V = flexibility to run higher power pistols if required

### 7.2 Specification and supply requirements

Description	Characteristics
Electrical supply	380/480V, 3ph, 80A/ph
Weight	105kg
Dimensions (mm)	W-445 x D-775 x H-640

## 8 MINI-PLASMA PISTOL EXTENSION

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Part No	Description
<b>MINIGUN-A</b>	68 degree angled mini-plasma extension gun
<b>MINIGUN-S</b>	Straight mini-plasma extension gun



### 8.1 Technical overview

- ✦ 7-15kW maximum operating range
- ✦ Compact 50mm diameter – excellent for difficult access areas and internal bores
- ✦ Low power – low substrate heating
- ✦ Simple nozzle/electrode design – quick changeover of consumable parts
- ✦ Large surface area of nozzle = longer service life
- ✦ 400mm length standard (maximum 900mm available)

## 9 TOOLKIT AND ACCESSORIES

Part No	Description
<b>TKPS50</b>	PS50M-PC toolkit and accessories

- ✦ Contains all tools for routine maintenance

## 10 REGULATORS/ARRESTORS

Part No	Description
<b>21239</b>	Argon regulator
<b>21240</b>	Hydrogen regulator
<b>21244</b>	Nitrogen regulator
	Helium regulator

- ✦ Argon, helium and nitrogen bottle connection =  $\frac{5}{8}$ " BSP
- ✦ Argon, helium and nitrogen =  $\frac{9}{16}$ " UNF
- ✦ Hydrogen bottle connection =  $\frac{5}{8}$ " BSP Left Handed
- ✦ Hydrogen outlet connection =  $\frac{9}{16}$ " UNF Left Handed

## 11 REFRIGERATED HEAT EXCHANGER

Part No	Description
<b>PS50CHILL-45</b>	PS50M-PC refrigerated chiller, 45 Celsius ambient

### 11.1 Technical overview

The Metallisation packaged water chiller is a complete, factory assembled unit, designed to provide chilled water for cooling Plasma systems.

- Self contained, including all control items
- Despatched with a running charge of refrigerant
- Cool water is produced within the chiller and used to cool the pistol water via a water/water heat exchanger
- Demineralised water is pumped to the Plasma system via an integral pump
- Units are designed to run continuously and will circulate chilled water as long as the unit is switched on.
- The chiller is rated for operation at the ambient temperatures stated. Other ambient temperatures can be accommodated. Please contact Metallisation for a specific quotation

