

## AP-5000 HVOF AUTOMATIC SPRAY SYSTEM

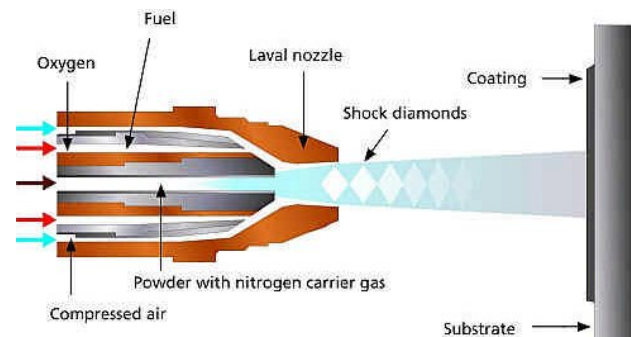
This process uses an internal combustion jet to generate supersonic gas velocities of approximately 1800 m/s, generally in the range of Mach 4-5. Combustion fuels, such as propylene, acetylene, propane, hydrogen, and kerosene, are mixed with oxygen in the gun.

When burned with pure oxygen, these fuels produce gas temperatures greater than 2,700 C.

This describes the working principle of HVOF. When the powder particles are introduced into the flame, they pick up the high energy of the flame before striking the surface to be coated. The coating is hard, dense, and has a very high bond strength.

Features of this system:

- Higher particle velocity.
- Superior coating reproducibility.
- Higher bond strength.
- Stable deposition rates.
- Lower operating cost.
- The controls and safety interlocks ensure easy, consistent, and safe operation.
- Simple more efficient particle heating.
- Higher density coating, through higher velocity.
- No material builds up in the barrel.
- The system signals any operational fault, or if the spray parameters drift out of range.



The Control Console brings together all the components of the system, providing the necessary controls and interlocks to ensure consistent and safe operation.

The user can operate the gun using another master controller, such as a robot, and use this control panel as a slave.

This controller can be further interlocked with external safety devices like doors or dust collectors, or a Robot, which prevents the gun from starting if any fault exists. The system also gives a fault signal if any operational fault or parameters are out of range.

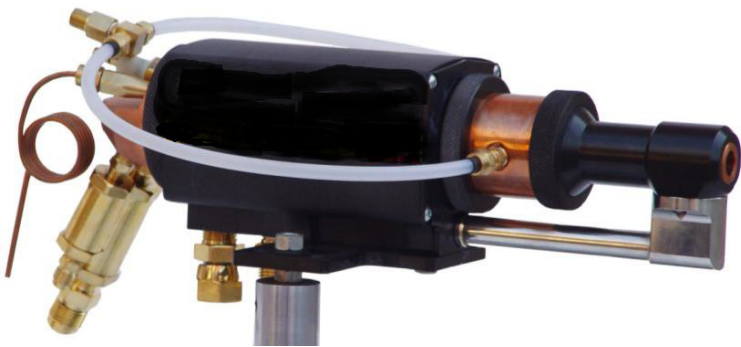
It has smart logic, which shuts off the gun in case of any safety related issues, like the gas pressure falling outside the operating pressure range, or the flame being extinguished, or, an open door. Trouble shooting messages are displayed in the PLC. These fault signals can be used externally to trigger an alarm or operate an external system. To make the console more pro-active to the user, interlocks are provided to trigger the start and stop of the spray booth & pumps.

Website: <http://aflame.homestead.com/> E-Mail [merlynp@yahoo.com](mailto:merlynp@yahoo.com)

**CAPABILITIES:** The system is more versatile for metallic and carbide coatings, which provides resistance to erosion, abrasion, sliding, fretting wear, & thermal exposure.

No.	Property	Typical Value (carbides)	Typical Value (metallic powders)
01	Coverage	0.10 – 0.20 sq. m/mm/hr	0.20 – 0.35 sq. m/mm/hr
02	Max. Thickness	2000-4000 microns	6400 microns
03	Powder Consumption	25 – 33 Kg/sq m/mm	13 – 20 Kg/sq m/mm
04	Bond strength	> 10,000 psi	> 7,000 psi
05	Micro Hardness	1000 – 1300 VPN (HV)	380 – 740 VPN (HV)
06	Oxide Content	< 3%	< 3%
07	Porosity	< 1%	< 3%

**The AP-5000** is a high-pressure, high velocity, liquid fuel system that develops a combustion chamber pressure up to 120-psi (8.27 bar). The fuel and oxygen are mixed and atomized after passing through an orifice into the combustion chamber creating a stable, clean, uniform combustion flame.



AP5000 Gun

The exit nozzle of the combustion chamber is designed and shaped to create a supersonic jet, and a low-pressure region, where the powder is introduced. The powder is uniformly mixed and accelerated along with the gas stream on to the substrate.

This pressure is translated into high velocity flame, resulting in higher coating hardness, higher coating density and higher bond strength.

There are 4" and 6" barrels, to handle spray materials with different melting characteristics, and for optimizing the spraying of different applications. The spark plug and electrode may be ignited through the control panel.

**SPECIFICATIONS:** Weight: 4.3 Kg. (9.5 lb)  
Dimensions: 6.25" (159 mm) (H) X 3.25" (83 mm) (H) X 16.5" (419 mm) (L)

Website: <http://aflame.homestead.com/>

E-Mail [merlynp@yahoo.com](mailto:merlynp@yahoo.com)

## Utility Requirements:

Cooling Water: 7 – 12 gpm Flow: 26.5 – 45.4 L/min; Min Pres: 100 psi (6.8 bar) Max Pres:150 psi (10.2 bar)

Oxygen Flow (Max) : 2300 SCFM (1086 L/min) Oxygen pressure : 180-300 psi (12.2 – 20.4 bar)

Liquid Fuel (Kerosene ATF-K-50) Flow (Max.): 8.5 gph (32 L/min)

Inert Gas (Nitrogen) Flow : 100 SCFH (2.8 m3 / hr)

## POWDER FEEDER AP-3350-A:

The AP-3350-A is specifically designed to run with the AP-5000 Automatic Control Panel. This is one of the most accurate powder feeders. The powder fills the powder container, which is pressurized by the carrier gas. The powder fills the slots of the powder wheel, which is rotating at a pre-determined rpm. The powder wheel delivers the powder from the slots to the powder feed hose where the carrier gas carries the powder to the Spray Gun.

Varying the rpm of the powder feed wheel/disk, controls the powder feed rate. The Powder Feeder is used with the Control Panel and can be controlled through the control panel as well as independently.

The powder feed is controlled by an AC variable drive system and displays the feed disk RPM digitally.

### SPECIFICATIONS:

Canister Capacity: 3,350 CC

Canister Dimension (cm) 12" (ID) x 16" (OD) x 31" (H)

Electricity: AC 220 V 1P **OR** AC 110 V 1P (on request)

Powder Consumption 100 W approx.

Net Weight: 40 Kg.



## HIGH THROUGHPUT OXYGEN & NITROGEN REGULATORS

The unit consists of precision high-pressure high flow oxygen regulator for accurate adjustment of oxygen where continuous, high-speed flow is possible, and an equal regulator for Nitrogen.

A MANIFOLD is recommended for connecting several gas cylinders together.

Pressure Range : 0 – 25 Kg/cm<sup>2</sup> (26 Bar)



Website: <http://aflame.homestead.com/>

**E-Mail** [merlynp@yahoo.com](mailto:merlynp@yahoo.com)

## **CONTROL PANEL INPUT SUPPLY PACKAGE:**

The Input supply package consists of the following:

1. 1 Water Input Hose from Chiller to Control Panel (7.5 mtr)
2. 1 Water Output Hose to Chiller from Control Panel(7.5 mtr)
3. 1 Oxygen Input Hose from Gas Regulator to Control Panel(7.5 mtr)
4. 1 Nitrogen Gas Input Hose from Gas Regulator to Powder Feeder (7.5 mtr)

## **CONTROL PANEL OUTPUT SUPPLY PACKAGE:**

The output supply package consists of the following:

1. 1 Water Hose - Control Panel to Gun (7.5 mtr)
2. 1 Water Hose - Gun to Control Panel (7.5 mtr)
3. 1 Oxygen Hose - Control Panel to Gun (7.5 mtr)
4. 1 Pressure Sensor - Tube Control Panel to Gun (7.5 mtr)
5. 1 Liquid Fuel Hose - Control Panel to Gun (7.5 mtr)
6. 1 Powder Feed Hose - Powder Feeder to Gun (5 mtr)

The total reach from the Control Panel to the gun is 5m, but this may be extended.

## **REQUIRED UTILITIES TO BE ARRANGED BY THE CUSTOMER :**

1. Liquid Fuel (Kerosene ATF-K-50)
2. Oxygen Gas in Cylinders
3. Oil & Moisture Free Compressed Air @ 5 cfm at 75 psi.
4. Thermal Spray Powders to be sprayed
5. Electric Input Power Supply 220 V AC / 1 P / 60 Hz for Control Consoles.
6. All wiring and conduit from customer's main power source to the machine control panel and proper grounding wherever required. All piping for air and water up to equipment's inlet connection.
7. To provide equipment such as overhead / portable cranes, tools and tackles necessary for installation / commissioning as applicable.
8. Unloading and storing of equipment at stores when received and shifting of equipment from store to site, unpacking and keeping ready for installation / commissioning.
9. Job loading and unloading arrangement.

Let us know if your electrical requirements are different. We can make adjustments.

Website: <http://aflame.homestead.com/>

**E-Mail** [merlynp@yahoo.com](mailto:merlynp@yahoo.com)

## **SAFETY & USE OF EQUIPMENT:**

All safety features and ergonomic principles have been considered in the design and manufacturing of the systems to keep the operator comfortable and safe as well as the coating environment.

### **General:**

It is a completely safe process when performed by a capable operator with the proper understanding of flame spraying practices, the knowledge of the equipment, the care of operation, and the one who follows the recommended precautionary measures.

Proper handling of highly pressurized fuel gases and hose connections can isolate the possibility of hazards.

**AP-5000 HP-HVLF SPRAY equipment has been expressly designed for HVLF spraying. Not intended for any other purpose such as welding, soldering, brazing and their likes.**

### **Reduction of fire & explosion hazards:**

The stream of sprayed metal is hot. Always point the lighted gun towards the job. Carelessness in pointing the gun at paper or oily rags can result in fire. Special care should be taken to protect the hoses from the spray stream.

### **Gases:**

A regular inspection is required for all gas equipment such as Fuel gas, Oxygen and airlines, compressors, regulators, etc. for leaks and loose connections. Using pure gases and regular checking of nozzles and air caps can prevent the backfire of the spray gun.

### **Equipment maintenance:**

Total maintenance schedules and procedures have been described in the AP-5000 Operation Manual and we recommend them strongly for safe and long serviceability of the system.

### **Metal dusts:**

The greatest care should be used in handling spray dust to minimize the danger of explosion resulting from flame spraying; adequate ventilation must be provided for spray booths and other confined spaces, to prevent the accumulation of fumes and dust.

**Good housekeeping** in the work area is essential. Inspect and clean regularly to assure that there is no potentially dangerous accumulation of dust. All types of dust having considerable calorific value can be explosive. This dust includes flour, starch, hard rubber dust, wool flour, aluminum dust and the dust of other metals. Aluminum and magnesium dusts are particularly hazardous. The dust must be wetted down and remain immersed in water. Accumulation of dry or partially wet dust should not be permitted.

An **ACOUSTIC CHAMBER** with a **Dry Cartridge Filtration System** is recommended to fulfill the requirements of the dust collection of system. All closed collectors should be provided with blow out holes or relief panels. All fans, pipes, dust arresters and motors should be electrically grounded.

Website: <http://aflame.homestead.com/> E-Mail [merlynp@yahoo.com](mailto:merlynp@yahoo.com)

Charged gas cylinders are potentially dangerous. Never put a gas cylinder in a hazardous position. Keep the cylinders away from heat and moisture. Always chain them to keep the cylinders from toppling. Put the valve caps on the cylinders when they are not connected for use. Do not hang a flame spray gun or its hoses on regulators or cylinder valves as a fire or explosion may result.



**Reduction of respiratory hazards:** Fumes or dusts of powders can be toxic and hazardous. Efficient spray booth and exhaust systems are therefore essential while spraying these. It is recommended that the operator wears a suitable mask with proper respiratory protection.



**Reduction of noise hazard:** The operator and other personnel close to the flame spray operation should be protected from the prolonged exposure to noise. Ear protection is required while moving near to the spray process, maintain the maximum possible isolation from the process because the noise level in a thermal spray system is an unavoidable issue, while the operator is in the working area (or within the acoustic chamber) .



**Eye protection:** Always wear eye protection when operating, or watching the flame Spray operation. Inspect the eye protectors frequently. Lenses and visors on the safety glasses, which are scratched, pitted or damaged, can impair vision and seriously reduce protection.

**A-FLAME TAKES THE SAFETY OF THERMAL SPRAY VERY SERIOUSLY. SAFETY IS NOT AN OPTION. ALL OF OUR HVOF SYSTEMS ARE ENGINEERED AND BUILT FOR PRODUCTIVE AND SAFE OPERATION. A-FLAME STRONGLY RECOMMENDS THAT THE OPERATOR FOLLOWS THE SAFETY SYMBOLS WHICH ARE AFFIXED ON EACH SUBSYSTEM WHILE OPERATING THE AP-5000 HP-HVLF SPRAY SYSTEM.**

Website: <http://aflame.homestead.com/>

**E-Mail** [merlynp@yahoo.com](mailto:merlynp@yahoo.com)