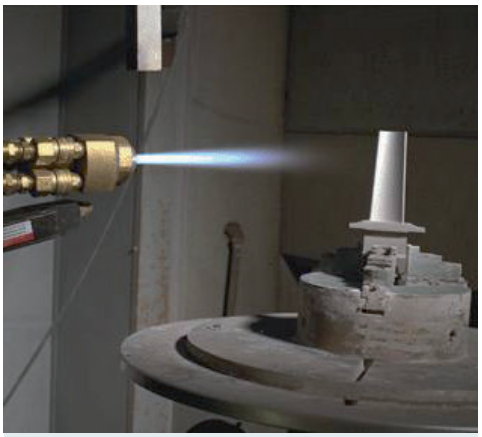
Plasma Spraying

Application note A015-ST03-1216C

- Vanes of a jet engine
- Pump casing
- Engine block cylinders

In for example the automotive and aerospace industries some mechanical parts are highly loaded with temperatures, corrosion and erosion. To protect them against these heavy influences, plasma spraying is the solution.

Plasma spraying is a flexible process and can be effective on ultra small to very big parts. Bronkhorst understands the market needs and can provide customized solutions to control the plasma spray process.



Plasma spray in a jet engine vane, to protect it against hot gas corrosion

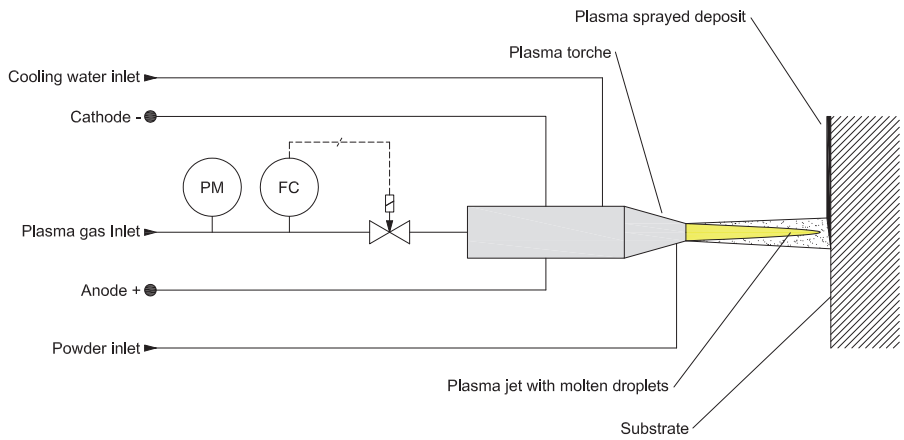
Application requirements

The plasma spraying process needs a high accuracy and stability of the plasma gas flow. Also the monitoring of the gas pressure is important for a good control of the plasma process. Bronkhorst can provide mass flow controllers and pressure controllers that are suitable for this.

Bronkhorst also understands that a customized solution can be very functional for systems like plasma spraying.

Important topics
- High accuracy
- Stable control
- Digital communication
- Complete, compact sub-systems

Process solution



Flow scheme

Plasma spraying principle

In a special torch, a plasma jet will be created for example by the plasma gas Argon. In the plasma jet the temperature will reach almost 10.000 degrees Celsius. We can introduce a powder (sometimes liquid) into the plasma jet. Because of the high temperature the powder will melt, and propelled towards a substrate. There, the molten droplets flatten, rapidly solidify and form a deposit.

The introduced powder can be made of various metals, depending on layer thickness, function of the deposit or physical properties. The range of layer thickness at plasma spraying is 20 micrometers to several millimetres, depending on the process and powder. There are a large number of technological parameters that influence the interaction of the particles sprayed on the substrate. Parameters such as torch offset, flow rate and energy input are important. Because the plasma jet is created by a controlled flow rate of the plasma gas, flow controllers are crucial.

Monitoring the pressure is important to control the system and detect an empty plasma gas cylinder. Often the system will be expanded with filters to be sure no other particulates will be involved in the plasma spraying process. ■

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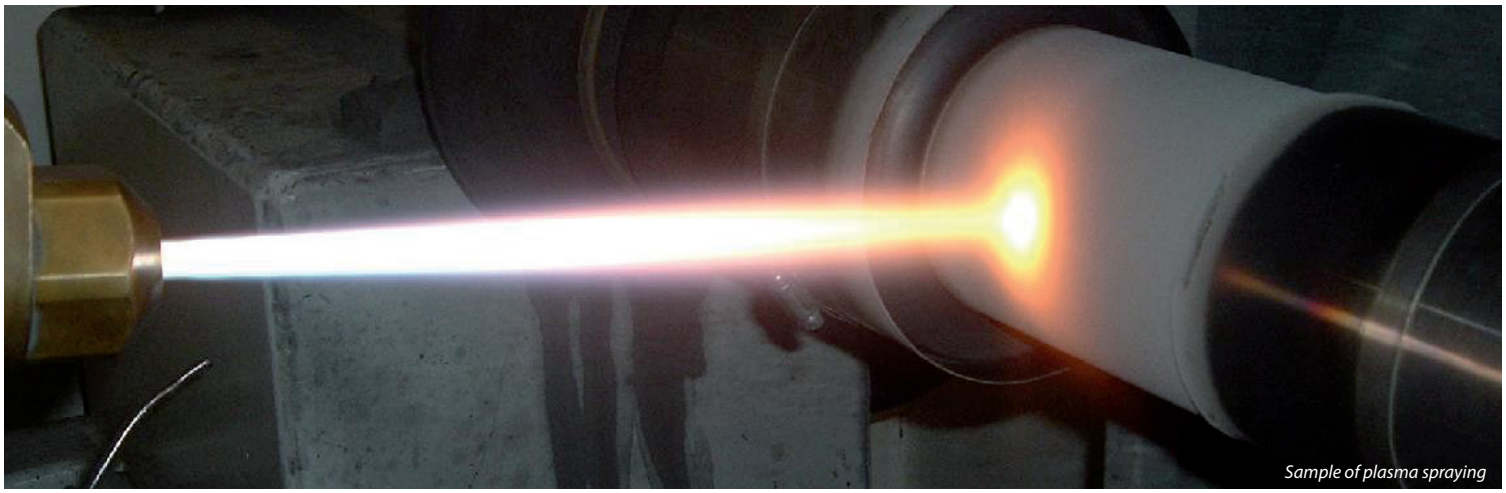


Sample of plasma spraying

Recommended products

EL-FLOW Select

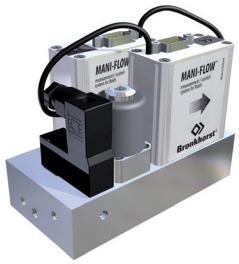
Mass Flow Meters and Controllers have a housing designed for laboratory and clean processing conditions. The instruments are truly unique in their capability to measure and control flow ranges between 0…1 ml_n/min and 0…1670 l_n/min with pressure rating between vacuum and 400 bar – all in one range of instruments.

- Fast response, excellent repeatability
- High accuracy
- Virtually pressure and temperature independent
- Also available with IP65 housing
- Stability and maintainability
- Standard RS232 output
- Optional fieldbus interface

EL-PRESS

The EL-PRESS series electronic Pressure Meter has a well-proven compact thru-flow design and is available in pressure ranges from 2…100 mbar up to 8…400 bar.

- High accuracy and repeatability
- High pressure capability up to 400 bar
- Suitable for gases and liquids
- Optional metal sealed and down-ported constructions
- Standard analog 0…5(10) V / 0(4)…20 mA and digital RS232 communication
- Optional field bus interface: DeviceNetTM / Profibus-DP® / EtherCat® / Modbus / FLOW-BUS



MANI-FLOW

Combines various functions into one compact device. On a compact manifold one or more mass flow or pressure sensors modules can be combined with control valves, two- or three-way valves, shut-off valves, filters or any other functional module as per customer's request.

- High accuracy (typical 0.8% of Rd plus 0.2% of FS)
- Pressure ratings up to 700 bar (higher on request)
- Electro-chemical polished of all surfaces
- Rugged, weatherproof housing (IP65)
- No moving parts
- Analog or digital communication (RS232 or fieldbus interface)

mini CORI-FLOW M14

mini CORI-FLOW series, compact Coriolis Mass Flow Meter / Controller for liquids and gases. Both analog and digital output. Housing according to IP65 classification. World's smallest Coriolis Mass Flow Controller! Flow ranges from 0-20 g/h up to 0-30 kg/h.

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- Pressure ratings up to 700 bar (higher on request)
- Electro-chemical polished of all surfaces
- Rugged, weatherproof housing (IP65)
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ST: Surface Treatment
03: Tooling Production