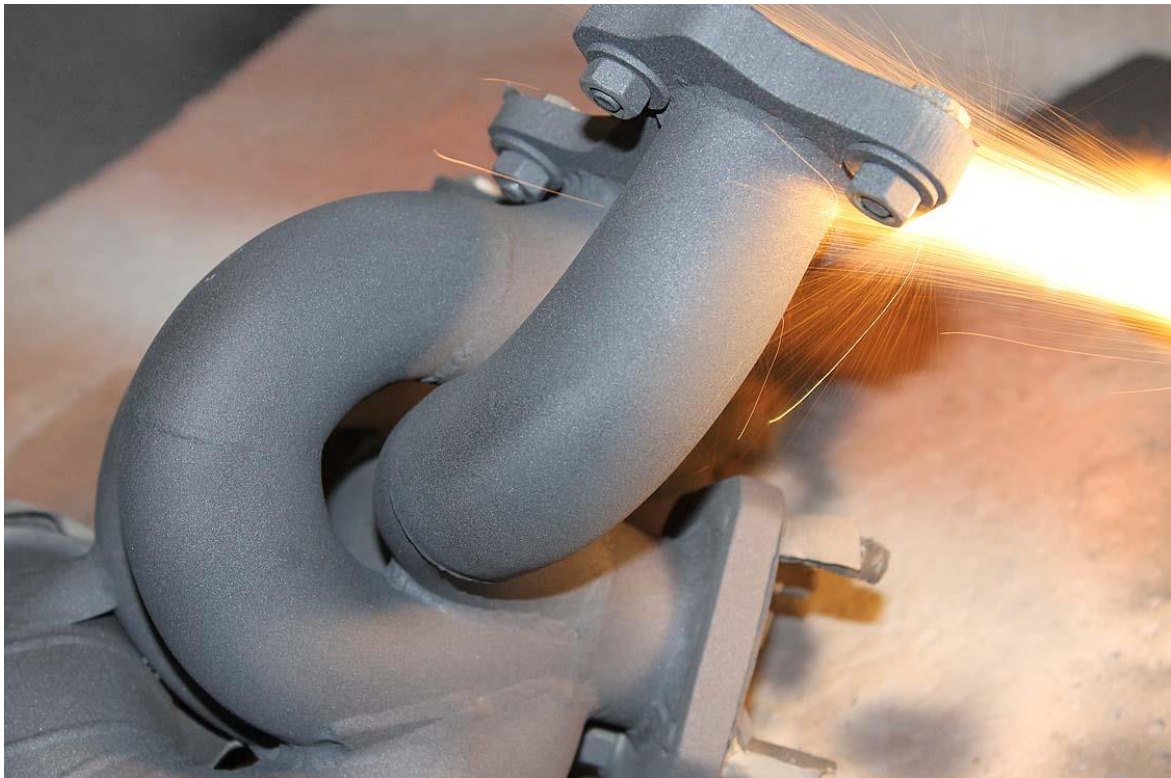


# THERMAL BARRIER COATINGS ONTO EXHAUSTS SYSTEMS

Application Data Sheet AU-TB-001

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## **INTRODUCTION:**

Thermal Barrier Coatings (TBCs) are ceramic materials which are widely used on modern aero engines and land based turbines. They can also be applied to vehicle exhausts, turbocharger casings, heat shields and other vehicle components to reduce heat transfer and improve vehicle performance.

Heat soak from hot exhaust systems transfers into other vehicle components causing reduced performance or damage.

Thermal Barrier Coatings (TBCs) are used in motorsport and on high-performance vehicles to reduce this effect. The TBC's give two benefits: Keeping the heat in the exhaust system reduces

under bonnet temperatures and also keeps the heat energy in the exhaust gas which improves the thermodynamic performance of the turbocharger. Both effects enable more power to be produced and improve reliability.

The TBC coating system is applied with the MK74 Powder Pistol. The Mk74 Powder pistol is hand held with the delivery of the powder through a small gravity fed hopper mounted on the pistol or a separate powder feeder (2007MF-PF). Fully automated versions of the MK74 are also available.

The TBC coating is typically a two part process with a bond coat of Ni/Al or Ni/Cr type layer and a top coat of a suitable ceramic.

Powder flame applied TBC's are an excellent solution for the majority of exhaust related applications. However, for extreme performance applications, the thermal barrier coatings can also be applied by the plasma spraying process, producing coatings that are denser and with higher bond strengths than with powder flame spray.

## EQUIPMENT:

Metallisation MK74 Powder Flamespray Pistol

## MATERIALS

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### Bond Coat:

- |              |  |
|--------------|--|
| <b>99815</b> | Self-bonding, high bond strength, low shrink Powder, service temp $\leq$ 980 °C (1796°F) |
| <b>99636</b> | Self-bonding, high bond strength, low shrink Powder, service temp $\leq$ 800 °C (1472°F) |
| <b>99627</b> | Self-bonding, high bond strength, low shrink Powder, service temp $\leq$ 650 °C (1200°F) |

### Top Coat:

- |  |   |
|--|---|
| <b>99220, 99255, 99205, 99216 or 99275</b> | Ceramic Powders used as a thermal barriers. 99275 will give the best TBC properties.<br>Typical coating Thermal Conductivity properties can be up to 1.0 – 1.5 W/mK |
|--|---|

### Typical Colours:

- 99220 – Dark Blue – Service Temperature  $\leq$  540 °C (1000°F)
- 99255 – White – Service Temperature  $\leq$  1650 °C (3000°F)
- 99205 – Light Grey - Service Temperature  $\leq$  1100 °C (2010°F)
- 99216 – Grey - Service Temperature  $\leq$  540 °C (1000°F)
- 99275 – Creamy White - Service Temperature  $\leq$  900 °C (1650°F)

# PROCESS

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## Preparation:

The exhaust should be clean and free from any grease or oil.

Degreasing - Any approved industrial solvent may be used to completely remove grease or oil from the surface.

It is normal to grit blast the components surface prior to applying the coating system; this is to produce the ideal receptive surface.

Blasting- The standard of surface cleanliness required is as Swedish Standard SA3. Surfaces not being treated should be masked before blasting.

## Application:

Spraying should begin as soon as possible after preparation and before any visible sign of deterioration occurs.

- (A) The Flamespray Equipment should be set up in accordance with the Metallisation Manual for the spraying each of the Flamespray Materials.
- (B) The Area to be sprayed should be cleaned with a vacuum cleaner or clean air blast to remove any loose particles of grit.
- (C) The Flamespray Pistol should be set so that the spray stream is at 90° to the surface being coated and traversed at an even speed giving a uniform coating.
- (D) Apply each of the coatings to the required thickness

## Spraying Parameters:

Material	Nozzle	DISC No	Spray Distance	Air Cap	Pressures			Before Lighting		Coating Thickness
					Air	Gas	Oxy	Gas	Oxy	
99627 99636 99815	M	5	175– 225mm (7" – 9")	STD	10/20	12	30	5.0	6.5	50 – 75 µm (0.002"- 0.003")
Ceramics	C	4	75mm (3")	Spreader	40	13	24	4.0	6.0	125 –250 µm (0.005"- 0.010")

There should be the minimum of interruption from commencement of preparation to completion of spraying. At all times, the prepared surface should be protected from dust, dirt, moisture etc.



## Finishing

No finishing required, component to be used in the As-Sprayed condition.

If a colour is required on the exhaust system then the application of high temperature silica ceramic coating (paint) can be applied

## REFERENCE TECHNICAL BULLETIN No :-

Metallisation 99815/12 Nickel Chrome 80/20 Powder

Metallisation 99627/16 Nickel Aluminium Moly Powder

Metallisation 99636/16 Nickel Aluminium Powder

Metallisation 99205/32 Grey Alumina 91% Powder

Metallisation 99216/32 Aluminium Oxide 87% Titanium Dioxide 13% Powder

Metallisation 99255/32 White Alumina Powder

Metallisation 99220/32 Aluminium Oxide 60% Titanium Dioxide 40%. Powder

Metallisation 99275/32 Magnesium Zirconate Powder