



## Technical Specification of CVD Machines— IVA4070

### Isobaric Vapour Aluminising

The IVA4070 is designed for the vapour aluminising of nickel based gas turbine components. The out-of-pack process results in uniform and defect free coatings over the most complex shapes. Post coating heat treatments are also possible in the reactor. The total permitted weight of work and fittings is 900kg.



#### Overview

Vapour aluminising (IVA) is a form of out-of-pack aluminising operated at a low constant pressure to achieve good throwing power and uniformity of layer thickness. The process operates at temperatures between 900 and 1050°C and at pressures in the range 1 to 50 mbar. The aluminium content of the resulting layer can be adjusted by the process conditions and also by the subsequent heat treatment which can be carried out in the same furnace.

IVA has a number of advantages over pack aluminising:

1. More rapid cycle time because the parts are not surrounded by pack.
2. Better coating uniformity on each part.
3. Less variation in coating thickness from one place in the retort to another.
4. No coating defects caused by pack inclusions.
5. Lower cost of operation because less pack material is used.
6. Less pack material to be dumped safely.

The IVA 4070 consists of a double-pumped vacuum furnace and retort. The normal operating temperature range 900-1150°C. The normal operating pressure range is 1 to 50 mbar. The double pumping arrangement is necessary to ensure that the inner hot retort wall does not collapse.

The retort is loaded upwards into the base of the furnace. This arrangement makes it possible to load and unload the retort rapidly even when hot. In normal operation the furnace is kept close to the working temperature, and the retorts are loaded and unloaded whilst the furnace is hot. Several retorts and base units are required for continuous operation.

The furnace is supported on a steel frame which also provides a platform for maintenance work. The retort is lifted up into the furnace by a hydraulic system. The retort can be lowered away from furnace the while it is still hot. It is mounted on wheels so that it can be moved away to a cooling station, and replaced by an-



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## Specification

| Criteria                   | Specification   |
|----------------------------|---|
| Reactor Overall Dimensions | Ø39" x 118" (Ø1010 x 3000mm)  |
| Reactor Working Zone       | Ø37" x 63" (Ø960 x 1600mm)  |
| Temperature Range          | 900-1150°C  |
| Temperature Measurement    | 5-Type Pt/Rh thermocouple in each zone  |
| Temperature Control        | 3 zones with PID control  |
| Pressure Range             | 1-50mBar (standard control range)<br>Lowest operating pressure: 1mBar<br>Highest operating pressure: 1000mBar |
| Pressure Measurement       | Absolute pressure transducer  |
| Pressure Control           | Motorised line valve  |
| Vacuum Pump                | Rotary oil Piston Pump<br>Capacity: 500m <sup>3</sup> /Hr (300 cfm) approx.                                   |
| Gas Control                | Argon purge controlled by mass flow controller  |
| Materials of Construction  | Furnace shell: Carbon steel<br>Retort: Inconel 601<br>Heaters: Kanthal<br>Vacuum lines: Stainless steel       |
| Electricity                | 300KVA  |
| Cooling Water              | 30 US gallons/min   |

