Powder Feeder for Advanced Manufacturing

POWDER FEEDER
for Ultra Fine powders
Plasma & Cold Spray Application

Advantages
Specially designed to feed powders that are hard to feed with conventional feeders in Advanced Manufacturing applications, the Polycontrols’ M4 feeder produces a more even particle concentration than any other conventional powder/material feeder leading to:

- More consistent and reproducible deposition
- Better uniformity and reproducibility in coating thickness
- Improved surface finish
Technical Specifications

Solution for hard to feed Material and Powders

- The M4 feeder uses vibration to fluidize the powder to a resonance frequency that amplifies the powder flowability - Does not use a wheel type feed system
- Feeds powders as small as 0.5μm reliably and uniformly (no pulsing or unstable rates)
- Configurable for both Low and High feed ratios (Existing applications from 10 g/min to 500+ g/min);

Reduced down time

- Easy to clean
  - No need for disassembly - No small mechanism or orifice to accumulate material
  - No clogging - All internal surfaces are coated to prevent powder/material accumulation
- Easy to refill
  - Designed to be refilled in seconds – fast opening access; no tool required
  - Drop in powder cartridge design – Uses refillable cartridges;
- Easy to operate & maintain
  - Powder/material can be heat treated directly within the cartridge - Powder/material can be stored several days in the feeder pending its use
  - Built per North American standards, designed to be maintained in-house

Industrial Characteristics

- Meets all North American Regulations (ASME, CRN, NFPA, UL, CSA, ...); Hazardous classification (Class 1, Div2 &Class 2, Div1) and EH&S (Environmental Health & Safety) requirements
- No clogging: extensive data on successful deposition achieved with powders that usually clog conventional volumetric feeders in the first few seconds of operation.
- Designed to fit with third party equipment
  Transparent integration with most commercially available Cold Spray and Thermal Spray equipment
- Possibility to be customized to meet the customer’s unique application needs.
- Available High resolution, Intrinsically safe Weight Scale for closed loop control and advanced feedback/diagnostic
- Existing application for critical component repairs for aircraft engines
- Patent granted

Technical Data

- Nominal Powder capacity: Two sizes available: 0.8 liter and 1.6 liter
- Maximum allowable working pressure: 2000 psig
- Maximum allowable working temperature: 350F
- Meet North American pressure-vessel regulations (ASME & CRN), NFPA Standards & Hazardous classification (Class 2, Div 1)
- Safety equipment according to EN 60204-1 (Category 1) Standard
- ASME Standards compliant (Section VIII, Div 1 & ASME B31.3)
- UL Approval for Canada & USA
Examples of material fed

<table>
<thead>
<tr>
<th>Material</th>
<th>Source</th>
<th>Median particle size</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>Plasma Giken</td>
<td>55 µm</td>
<td>Partially spherical</td>
</tr>
<tr>
<td>Copper alloys</td>
<td>Custom powder</td>
<td>24 µm</td>
<td>Spherical</td>
</tr>
<tr>
<td>Nickel</td>
<td>H.C. Starck Amperit</td>
<td>22 µm</td>
<td>Spherical</td>
</tr>
<tr>
<td>Aluminium Alloys</td>
<td>Valimet Al-Si S10</td>
<td>23 µm</td>
<td>Spherical</td>
</tr>
<tr>
<td>Aluminium</td>
<td>Valimet H30 to H3</td>
<td>31 to 4.5 µm</td>
<td>Spherical</td>
</tr>
<tr>
<td>Zinc</td>
<td>Alfa-Aesar</td>
<td>9 µm</td>
<td>Spherical</td>
</tr>
<tr>
<td>WC-Co</td>
<td>Fujimi</td>
<td>6 µm</td>
<td>Irregular</td>
</tr>
<tr>
<td>Ceramics (YSZ)</td>
<td>Inframat</td>
<td>&lt;1µm</td>
<td>Angular</td>
</tr>
</tbody>
</table>

Example of surface roughness for hard to feed Material

Profilometry of Cold Sprayed CP Aluminum (Valimet AlSi S10)

![3D view](image1.png)
![Top view](image2.png)

<table>
<thead>
<tr>
<th>Material</th>
<th>Average thickness (mm)</th>
<th>Standard deviation on thickness (mm)</th>
<th>Relative thickness variation (%)</th>
<th>Maximal thickness (mm)</th>
<th>Minimal thickness (mm)</th>
<th>Maximal Thickness variation (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AlSi –S10</td>
<td>3.20</td>
<td>0.16</td>
<td>5.0</td>
<td>3.7</td>
<td>2.9</td>
<td>0.8</td>
</tr>
</tbody>
</table>
Commercial applications

**Cold Spray process**
Uses of the M4 powder feeder opens the door to different applications requiring thinner coatings than those currently carried out by cold spraying. This includes increasing the number of applications in aerospace and energy sectors but also in other industries such as electronics, automotive & photovoltaics.

**Thermal spray (HVOF, Plasma)**
The spraying of submicron size powders (up to 0.5 micron) without resorting to suspensions enables productivity gains compared to traditional suspension plasma spray systems by eliminating the extensive time required to prepare the suspension slurry, by reducing common clogging problems and by reducing system control parameters.

In addition, the M4 Feeder allows bypassing the buoyancy problems of some powders and reduces the production costs of protective or functional coatings by increasing the deposition rate of these powders to values traditionally obtained with plasma spray.

Safety

We take your safety concerns seriously by complying with North American regulations concerning electrical and pressurized installations. (cULus, CSA, CE, ASME, CRN)

![Certifications](images/certifications.png)