

Q. How can I precisely and accurately weigh and dispense multiple powders to a variety of containers without tying up valuable resources?

By using the **Freeslate** CM Protégé Powder Dispense System.

Weighing and dispensing of solids is still one of the most tedious and time-consuming tasks faced by laboratory scientists. The Freeslate CM Protégé Powder Dispense System is a robust, automated powder dosing system that provides an unmatched level of performance and eliminates the error-prone manual weighing and dispensing bottleneck. The system was designed to enable precise, traceable, and accurate weighing and dispensing of sub-milligram to gram quantities of a wide range of materials. Unlike other powder dispense systems that deliver a small number of powders per run, the CM Protégé Powder Dispense System is capable of dosing up to 34 different powders to a variety of containers. The System's proven, proprietary Powdernium™ powder dispense technology ensures powders are delivered with high accuracy and precision. An adaptive learning algorithm dynamically monitors and optimizes dosing parameters to compensate for variability in powder properties during the filling process. Optimized dispense parameters are stored and can be recalled for reproducible dosing day-after-day.

Built on the Freeslate CM Protégé robotics platform, the CM Protégé Powder Dispense System weighs each powder on a balance as it is being dispensed and records the weight for automatic reporting. By adding the optional Positive Displacement Pipette, liquids (including those with viscosities of 1,000 cP or higher) can be accurately dispensed in volumes as low as 10 µL or as large as 10 mL to prepare sample and standard solutions. The system is available as either a stand-alone, walk-up instrument or fully integrated into a workflow or enterprise-wide data management system with Freeslate's Lab Execution and Analysis (LEA) software. The simple user interface, with visual instructions on managing instrument set-up and the method creation wizard make the CM Protégé Powder Dispense System ideal for laboratories that may be new to automation. For walk-up applications, the system's simple queue management and "click'N'go" features extend the capabilities of the CM Protégé to multi-user environments. Typical powder dispensing applications that can benefit from the CM Protégé Powder Dispense System include polymorph screening, walk-up sample preparation, dispensing catalysts and supports, dispensing biomass, and many more.

Key Features

- Compatibility with a wide range of powders with diverse properties – including powders with various densities, particle sizes, particle shapes, and static charges
- Compatibility with almost any receiving container (e.g., vials, jars, capsules, microplates, and many other containers)
- Consistent and accurate powder dispensing with RSDs typically between 1% and 5%. (**Fig. 1**)
- Unattended operation which allows overnight dispensing to accelerate development, reduce cost, and improve consistency over manual methods
- Precise and accurate dispensing of sub-milligram to gram quantities of material using proven Freeslate Powdernium dispense technology
- A proprietary learning algorithm, which dynamically monitors and automatically controls dispense rate to compensate for variability in powder properties for accurate dispenses
- Precise delivery of small amounts of powder without cross-contamination with patented SV valve caps
- A simple user interface designed to minimize start-up time and maximize ROI
- Easy accessibility of methods, data, and information across an organization

Applications

- Biomass feedstock screening
- Dispensing catalysts and supports
- Repackaging bulk powders
- Solubility testing
- Polymorph screening
- Forced degradation testing
- Compound management
- Walk-up sample preparation
- Reference standard preparation



CM Protégé system with easy-to-lift interlocking enclosure down.

Specifications

Functional Requirements

Vial/Plate Gripper

- Vial handling:
 - Minimum vial diameter: 8 mm
 - Maximum vial diameter: 60 mm
- Plate handling:
 - Maximum plate weight: 1000 g with grooves

Solid Dispenser

- Adaptive learning algorithm allows system to remember optimum settings for materials
- Flexible dosing system allows for large dynamic range of repeatable, automated dosing using:
 - Powdernium™ powder dispense:
 - Traditional stirrer dispense mechanism
 - Hopper volume range: 10 mL to 100 mL
 - SV powder dispense:
 - Unique vibratory dispensing mechanism
 - Used for highly precise dispensing of small amounts of precious materials (as low as 0.5 mg)
 - Hopper maximum volume: 4 mL

*Contact Freeslate for a detailed list of all dispense conditions tested

Viscous Liquid Dispenser

- Positive Displacement Tip (PDT) technology ideal for precise dispensing of organic solvents and viscous materials:
 - Uses disposable tips from 10 mL to 10,000 mL capacity
 - Viscosity: 2 cP to 100 cP
 - Disposable tips: no washing required and no sample carry-over
 - Accommodates widely available tips from Eppendorf and Rainin

*Contact Freeslate for a full list of supported PDT volumes

Balance (4-place option)

- Weighing:
 - Maximum weight: 1200 g
 - Sensitivity: 0.1 mg
- Readability: 0.1 mg full range
- Repeatability (std dev):
 - At high weight (measured >200 g): 0.25 mg
 - At low weight (measured up to 200 g): 0.15 mg
- Response Time : <16 s

Balance (5-place option)

- High sensitivity option
- Weighing:
 - Maximum weight: 220 g
 - Sensitivity: 0.01 mg
- Readability: 0.01 mg (0 g to 110 g), 0.1 mg (110 g to 220 g)
- Repeatability (std dev):
 - At high weight (measured at 200 g): 0.15 mg
 - At low weight (measured at 10 g): 0.04 mg
- Response Time: <22 s

Hotel Storage Capacity (microtiter format plates)

- Maximum storage 1 mL plates: 15
- Maximum storage 2 mL plates: 15
- Maximum storage 4 mL plates: 12
- Maximum storage 8 mL plates: 12
- Maximum storage 20 mL plates: 12
- Maximum storage 40 mL plates: 9
- Maximum storage 125 mL plates: 9
- Maximum storage Rainin PDT boxes: 6
- Maximum storage shallow well plates: 15

Deck Storage Powder Source Materials

- Maximum number of SV hoppers: 24
- Maximum number of Powdernium Classic (10 mL) hoppers: 8
- Maximum number of Powdernium Classic (25, 50, 100 mL) hoppers: 12

*Contact Freeslate for a full list of CM Protégé versions

Facilities Specifications and Requirements

Envelope

- Including ventilated enclosure with table:
 - Dimensions (W x L x H): 1670 mm x 908 mm x 2000 mm

Weight

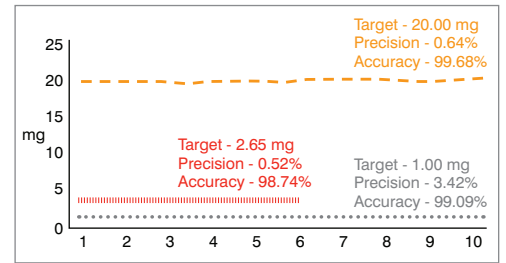
- Including integrated enclosure:
 - ~150 kg (excludes the PC)

Power

- Requires: 85 VAC to 264 VAC, 50 Hz to 60 Hz

Gases

- Requires: Clean Dry Air 0.5 MPa to 0.9 MPa (70 psi to 130 psi), 16 L/min



Acetaminophen - - - - Switchgrass - - - - Lactose SV - - - -

Fig. 1: Precision of CM Protégé Powder Dispense System with different solids.



CM Protégé delivering a plate from the integrated shoulder hotel to the balance.

CM Protégé Dimensions

