



## **Model 120 Moudi-II™** **Model 125B NanoMoudi-II™**

**Second-generation Micro-Orifice Uniform-Deposit Impactors for collecting size-fractionated aerosol particle samples from 0.01µm to 18µm for gravimetric and chemical analysis**



### **INTRODUCTION**

The Model 120 Moudi-II™ and 125B NanoMoudi-II™, like their predecessors, the Models 100 and 110 Moudi™, are precision cascade impactors. They are referred to as Micro-Orifice Uniform Deposit Impactors, or Moudis™. They feature large numbers of small micro-orifices in the lower stages to reduce jet velocity, particle bounce, pressure drop and evaporative loss from collected particle samples containing semi-volatile material. They use rotating impactor plates to spread out the particle deposit uniformly over a large collection area on the substrate, thus minimizing particle build-up under each nozzle and reduce possible particle blow-off by the gas jets. The collected particle mass can be greatly increased before over-loading occurs.

The original 1<sup>st</sup>-generation Moudi™ is noted for its aerodynamic stage design that results in sharp cut-off characteristics and low inter-stage particle losses. These desirable features, along with stringent quality control, have made the 1<sup>st</sup>-generation Moudi™ the impactor of choice by researchers for whom high quality sample and high data quality are of the utmost importance. These are also the key features for the 2<sup>nd</sup>-generation devices.

Moudi™ Impactors are now synonymous with high-quality, precision, research impactors. Their popularity and widespread use have helped to generate numerous high-quality aerosol size distribution data reported in the literature. In the 2<sup>nd</sup>-generation Moudi™ all desirable features of the 1<sup>st</sup>-generation devices are retained, while new features are added to make the device more useful and user-friendly.

### **PRODUCT HIGHLIGHT**

The 2<sup>nd</sup>-generation Moudi-II™ and NanoMoudi-II™ use stepper-motors embedded in the individual stages to rotate the impaction plates to achieve uniform particle deposits. Previously, the entire stage bodies rotated, and due to the large frictional torques generated by the O-ring seals, only stages with cut-point diameters of 0.056 µm and larger have the uniform deposit feature. The Model 115 Nano-Moudi™ with stage cut-points of 10, 18 and 32 nm is available in the non-rotating form only because of the high stage pressure drop and large torques required.

The new 2<sup>nd</sup>-generation Moudi™ has rotating stages over the entire size range from 10nm to 10,000nm, or 0.01µm to 10µm. Additionally, built-in sensors provide continuous monitoring of ambient temperature and atmospheric pressure. Absolute pressure sensors for the micro-orifice stages monitor flow stability and indicate possible nozzle clogging during use. Built-in electronics oversees the entire instrument operation and records environmental and pressure data generated for post-sampling review.

With these features, the Moudi-II™ and NanoMoudi-II™ have become the thoroughly modern, advanced cascade impactors for aerosol and environmental research. Together with their predecessors, they will provide the highest quality impactor data for aerosol and environmental research.

## FEATURES

- Flow rate:
  - Moudi-II™: 30 L/min
  - NanoMoudi-II™: 10 L/min
- Stages and cut-sizes:
  - Moudi-II™: 11 impactor stages with cut-point diameters from 0.056µm to 18µm plus final filter
  - NanoMoudi-II™: 13 impactor stages from 10nm to 10,000nm—or 0.01 to 10.0 µm—plus final filter
- Easily removable collection substrates allow for rapid run turn-around times for high productivity
- Volumetric flow control
- Programmable logic controller (PLC) controls instrument operation including start- and stop-times. Temperature and pressures are measured and stored at pre-determined time intervals.
- Absolute pressures are monitored on the lower stages to provide indication for possible clogging of nozzles as small as 50 µm in diameter
- Sharp cut-off characteristics
- Low inter-stage losses

## APPLICATIONS

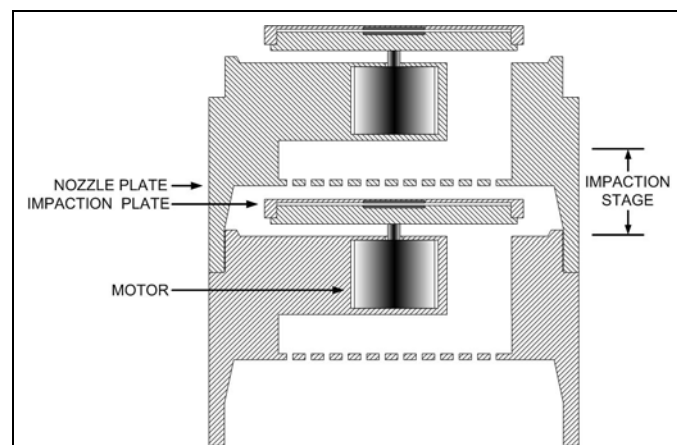
- Sampling of atmospheric aerosols for research and environmental monitoring
- Work place aerosol analysis
- Diesel and gasoline emission analysis and monitoring
- Exposure monitoring
- Industrial hygiene studies

## DESCRIPTION

The Moudi-II™ and NanoMoudi-II™ are 2<sup>nd</sup>-generation versions of the widely used Moudi™ and NanoMoudi™ cascade impactors. However, the Moudi-II™ and NanoMoudi-II™ are not meant to replace the first generation units, but to offer unique features not possible with the first generation. In both the 1<sup>st</sup>- and 2<sup>nd</sup>-generation devices, the nozzles of corresponding stages are the same to allow for easy data correlation between Moudi™ impactors of both generations.

In the Moudi-II™ and NanoMoudi-II™, as in the original Moudi™ and NanoMoudi™, multiple nozzles at each stage provide for the desired flow conditions through the nozzles, resulting in low pressure drop, sharp-cut efficiency curves, and stable, predictable cut points. The rotation of the impaction plates spreads out the deposits on the plates, allowing maximum sample to be collected before overloading occurs.

One unique feature of the Moudi-II™ and NanoMoudi-II™ is that individual stepper motors internal to each stage provide for impaction-plate rotation to achieve uniform particle deposit on the impaction plates (Figure 1). Power for the stepper motors comes from a single electronic package in the cabinet of the impactor, with power being distributed to each motor by miniature flat-ribbon cables from stage to stage.



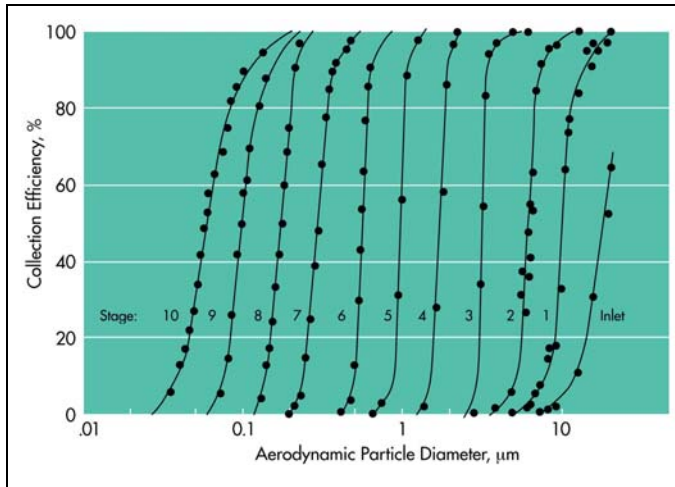
**Figure 1. Typical Moudi-II™ and NanoMoudi-II™ Stage**

Another unique feature of these impactors is a cabinet that houses the electronics for controlling the volumetric flow (Moudi-II™ only), providing readout of six pressure transducers to monitor the absolute pressure at the more critical micro-orifice stages and record the data. The absolute pressure data provide indication of flow stability and possible nozzle clogging or leakage in the stack of stages.

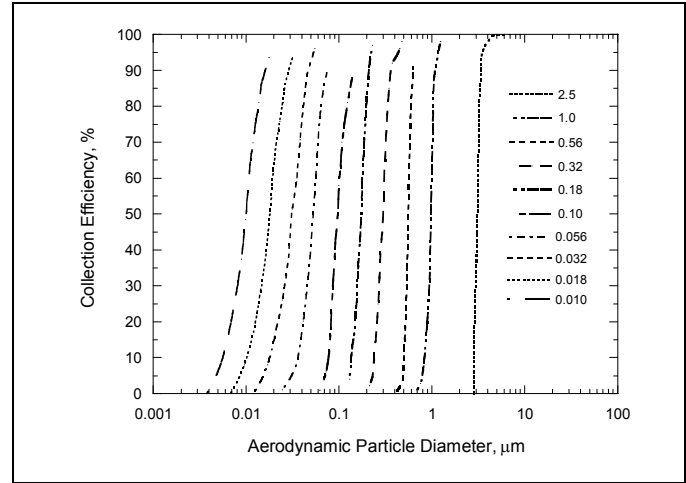
The Model 120 Moudi-II™ cascade impactor has a flow rate of 30 L/min and cut sizes from 18 µm at the inlet to 0.056 µm at the lowest stage. The standard configuration is ten stages with cut sizes of 10, 5.6, 3.2, 1.8, 1.0, 0.56, 0.32, 0.18, 0.10 and 0.056 µm (Figure 2). Because individual motors internal to each stage are used to rotate the impaction plates, individual stages may be added or removed as desired to suit the measurement needs. However, since the cumulative pressure drop to a stage affects the stage cut-size, it is important to note that only the upper, low pressure-drop stages can be added or removed without affecting the stage cut-size downstream. If higher pressure-drop stages need to be removed, the cut-size of the downstream stages need to be re-calculated to account for the influence of pressure drop on stage cut-size.

The Model 125B NanoMoudi-II™ cascade impactor has a sampling flow rate of 10 L/min and cut sizes spanning

the range from 10.0 to 0.01  $\mu\text{m}$ . The standard configuration is thirteen stages with cut sizes of 10, 5.6, 3.2, 1.8, 1.0, 0.56, 0.32, 0.18, 0.10, 0.056, 0.032, 0.018 and 0.010  $\mu\text{m}$  (Figure 3). Since the cumulative pressure drop to a given stage influences the cut-size at the stage, particularly for the lower stages, it is recommended that all thirteen stages be used if the standard cut-size of the individual stages be kept constant.



**Figure 2. Moudi-II™ Stage Efficiency Curves**



**Figure 3. NanoMoudi-II™ Stage Efficiency Curves**

## SPECIFICATIONS

(Subject to change without notice)

	<b>Moudi-II™</b>	<b>Model 125B NanoMoudi-II™</b>
Flow rate, L/min	30	10
Impactor Stages	11	13
Cut-point Diameter, $\mu\text{m}$	0.056, 0.10, 0.18, 0.32, 0.56, 1.0, 1.8, 3.2, 5.6, 10, and 18	0.010, 0.018, 0.032, 0.056, 0.10, 0.18, 0.32, 0.56, 1.0, 1.8, 3.2, 5.6 and 10
Dimensions (WxDxH)	210mmX210mmX641mm	210mmX210mmX641mm
Weight, kg (lb)	13.7 (30)	13.7 (30)
Power	100-240VAC, 50-60 Hz, 30W	100-240VAC, 50-60 Hz, 30W
Environmental Conditions	0-50 °C (32-122 °F) 10%-90% RH (non-condensing)	0-50 °C (32-122 °F) 10%-90% RH (non-condensing)
Pump Requirements	13.6 m <sup>3</sup> /h, 135 mbar ultimate pressure, 0.56 kW (equivalent to GAST 0823 oil less series)	17 m <sup>3</sup> /h, 1.5 mbar ultimate pressure, 0.75 kW (equivalent to Leybold Sogevac SV-16, available in 100 to 230 VAC, 50 to 60 Hz)



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**MSP Corporation**  
5910 Rice Creek Parkway  
Suite 300  
Shoreview, MN 55126-5023

Tel 651-287-8100  
Fax 651-287-8140  
E-mail: [sales@mspcorp.com](mailto:sales@mspcorp.com)  
Internet: [www.mspcorp.com](http://www.mspcorp.com)