

Encapsulation Unit – VARD2Go



Lord Rayleigh has developed the following theory in the year 1878: A laminar jet of liquids falls apart into drops of equal size, if you superimpose a vibration with a wave length, longer than the girth of the undisturbed jet on the liquid. In order to superimpose the vibration either you can vibrate the nozzle itself or you can superimpose the vibration on the liquid with a suitable device before it passes the nozzle. Our single nozzle units use the first possibility.

For the **VARD2Go Unit** a wide range of single nozzles (for matrix encapsulation) and coaxial nozzles (for core shell encapsulation) are available. A syringe pump or another device produces a steady pulsation free flow through the vibrating nozzle. The generated drops can be observed by means of an LED-stroboscopic light as a stationary chain of drops. The stroboscopic light is automatically synchronised with the adjusted vibration frequency. The bead sizes are somewhere between 0.025 and 4mm depending how the unit is equipped. The deviations between the applications depend on the density and the surface tension of the matrix. Roughly, you can estimate that the smallest achievable drop diameter is 2 times larger than the used nozzle diameter.

Nisco Engineering AG
Wehntalerstrasse 562
CH-8046 Zurich, Switzerland

Tel: +41 44 380 06 30
Fax: +41 44 380 06 31
e-mail: mailbox@nisco.ch
<http://www.nisco.ch>

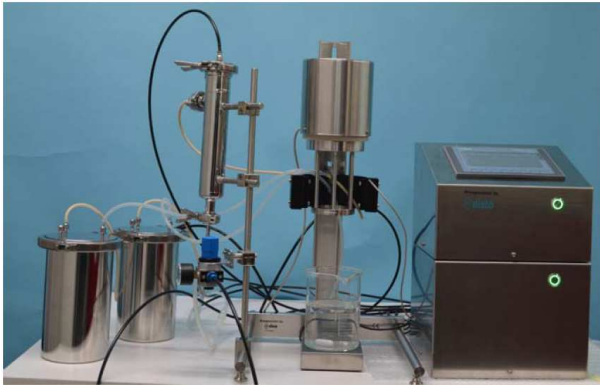
The average productivity per nozzle is 400ml per hour, whereas this can significantly differ in function of the nozzle diameter and the jet speed. These factors, together with the vibration frequency determine the size of the bead you generate (within the physical limitations given by the properties of the liquid to be dropletised). Such a physical limitation is the pressure drop, which can unrealistically increase with a small nozzle diameter and high viscosity. As a conclusion, the size of the beads you want to generate greatly influences the productivity per nozzle.

The bead generator is basically made of stainless steel 1.4435 (equivalent 316L) and can withstand most chemicals and high temperatures, which makes the unit very suitable for any disinfecting / cleaning method including autoclave cleaning. As gaskets O-rings made of EPDM are delivered. Material certificates are available on request.

A range of standard accessories are available:

- Agitator for hardening solution
- Syringe, gear or dual-headed peristaltic pumps
- Pressurised glass tube 60ml, pressurized flasks 100, 250, 500 and 1000ml and stainless steel vessels 350ml, 2L and 5L
- Height adjustable air accelerator

Encapsulation Unit – VARD2Go Aerodynamic Option



The **VARJ30** is the aerodynamically assisted jetting equipment. The product enters through a central needle. The exit orifice, which is centrally in line with the axis of the needle, has been counter sunk externally. The counter sunk leads to the aerodynamical effect resulting in a jet with smaller diameter when it is passing the orifice than the needle diameter. The needle is enclosed in a pressure chamber with an exit through the orifice. The size of the drops is determined by the product flow rate and the pressure inside the chamber. The product flow rate is typically controlled by a high precision addition system to the product nozzle. The pressure in the pressure chamber is controlled by the Nisco pressure control unit consisting of a pressure sensor and a pressure controller. The pressure set point and actual value can be fixed and visualised on the HMI*.

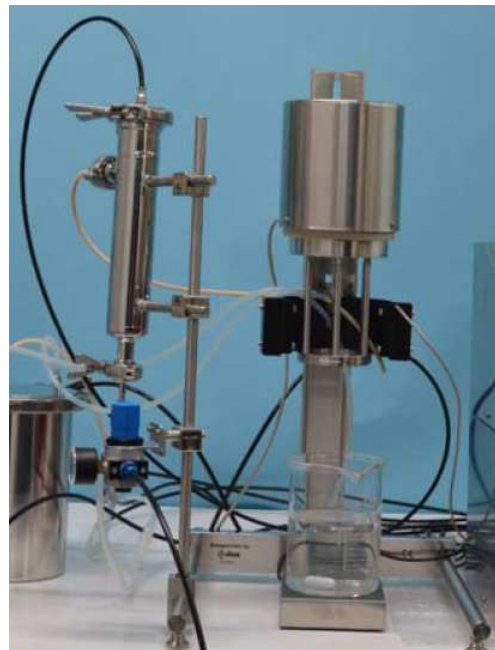
The basic usage of **VARJ30** without vibration is possible. During the work with very low pressure the drops won't be produced, but there will be a laminar jet smaller than the nozzle applied. If the vibration would be superimposed the even sized beads down to half size of the applied nozzle could be produced.

to half the size of the applied nozzle could be produced.

A range of standard parts for this application are available:

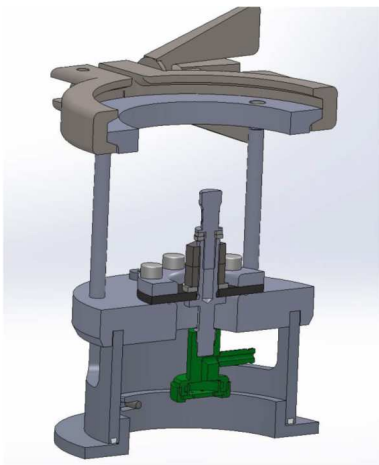
- Frame for **VARJ30** application with **VARD2Go**
- **VARJ30 Pressure Chamber**
- **VARJ30 Coaxial Nozzles**
- **Aerodynamic Vibrating Titanium Nozzles** with diameter from 0.05 till 0.35mm
- **Single use PEEK nozzles**

* Human machine interface



Encapsulation Unit – VARD2Go Multi Nozzle

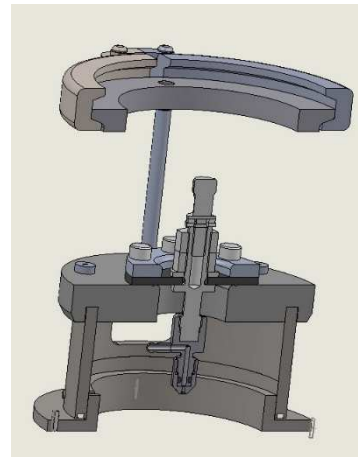
This electromagnetically driven multi nozzle unit based on the laminar-jet-break-up is suitable for a large number of encapsulation applications (e.g. enzyme / drug immobilisation, cell encapsulation, cosmetic applications and many more), which open many new technological possibilities.



The advantages of head for multi nozzle application:

- There are two heads available in one. One for the single nozzle (low flow rate) and one for the multi nozzle (high flow rate) application.
- The change of mechanical parts is not needed.
- The stroboscope holder and the clamp are the same parts which can be mounted without tools.
- The green marked nozzle holder is made in titanium with the required material
- The nozzle sizes can be exchanged for your process development.
- 6-nozzle holder with 6 nozzle plate as well as a 12 nozzle holder with 12 nozzle plate can be mounted on the unit.

With the supplied **adaptation piece** which can be mounted on the head for multi-nozzle the work with the single nozzle for the process development purpose is possible



For work with two different liquids **coaxial 6 nozzle head** is available.

6-nozzle holder



12 nozzle holder



Encapsulation Unit – VarD2Go Thermal

The unit with its sophisticated multipurpose design and the flexible modular expandability has been tailored to the process developer's requirements. The modular approach in the design allows to change the unit repeatedly according to the changing requirements and to combine components delivered by us with equipment and devices already available in your laboratory.

With the optional heating chamber the dropletising of low melting products such as agarose and similar materials is possible.

The **Coaxial or Triple Nozzles** are available for this application.

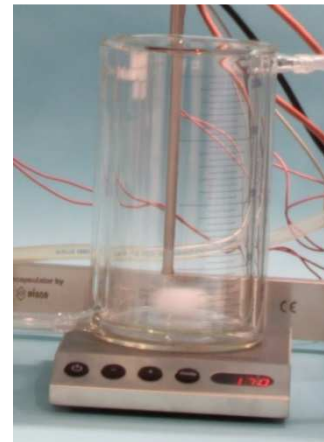
Heated Head and Vessel – Aerodynamic Option



Heating Jacket for Vibrating Head



Beaker 3L with jacket for hardening solution



Circulation Cooler (Chiller)

