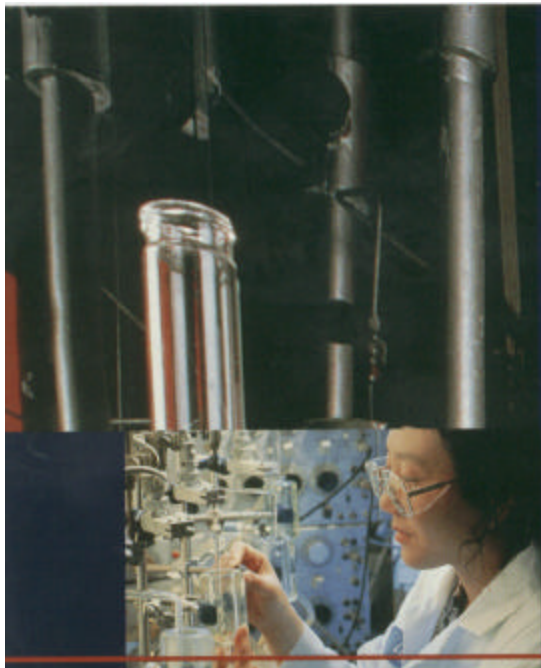


# Haskel

## The Nanojet<sup>®</sup> Series of Laboratory Homogenizers





★ Haskel Manufacturing Divisions    ● Haskel Subsidiaries & Regional Offices

Haskel International, Inc. has over 50 years of hydraulic and pneumatic engineering experience in the design and manufacturing of the widest range of air-driven liquid pumps, gas boosters, amplifiers, accessories and systems available in today's market.

Located in Burbank, California, USA with an additional manufacturing plants in Sunderland, United Kingdom, and Singapore, the company also has strategically placed subsidiaries, regional offices and dedicated distributors throughout the world.

In 1997, Haskel International, Inc. announced the acquisition of Nanojet® Engineering GmbH located in Germany. Nanojet® is a high pressure homogenizing process which was developed for the production of fine micro emulsions, nano suspensions, and stable liposomes.

A continuous investment in the most modern machinery and technology ensures that Haskel remains a leader in the field of high pressure technology.

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*Microemulsion • Nanosuspension • Biotechnology • Photographic Coatings*



## The Nanojet® Process.

Haskel's series of Nanojet® homogenizers introduce a super high-pressure process which has been developed primarily for the production of fine microemulsion, nanosuspensions and stable liposomes. In biotechnology the Nanojet® with recovery rates of 96% is an effective tool for cell disruption processes.

This new and revolutionary dispersion process opens up many possibilities. Very tight product requirements such as the smallest particle sizes with the narrowest distribution curve have now become feasible.

A high degree of flexibility is achieved by selecting various process parameters such as pressure and temperature. By choosing from a number of differently sized and shaped jets the particle reduction and distribution can be influenced.

The Nanojet® arrives at these results via an efficient utilization of the input energy. Operating at pressures up to 2000 bar or 29,000 psi, this concentrated energy is rapidly released and utilized for particle reduction.

As in all high pressure dispersion systems, the basic process steps are pressurization, rapid expansion and a sudden collision of the liquid stream. During expansion, bubbles are formed which upon collision with the surroundings implode with consequent increase of surface area.

With the Nanojet®, this action is intensified by a special zone of collision design. The expansion is achieved by 2 jets arranged in opposite positions. The liquid is released at very high velocity from each jet simultaneously. The two jetstreams collide head-on in a very narrow gap. Consequently all particles must meet and act upon each other. This results in an enhanced particle reduction and an even particle size distribution.



• *Pharmaceutical* • *Foods* • *Dairy Products* • *Cosmetics* • *Textiles* • *Paints*

**High Pressure  
Homogenizing  
By Opposing Jet  
Stream Action**

## **Nanojet® Models LAB 8H & LAB 30P.**

**Nanojet® Model LAB 8H**  
with hydraulic pressure intensifier.  
Capacity: 8 liter/hour, maximum pressure  
1600 bar.

**Nanojet® Model LAB 30P**  
with pneumatic pressure intensifier.  
Capacity: 30 liter/hour, maximum pressure  
1600 bar.

### **Additional Auxillary Features**

- Gastight construction of complete unit
- Heat resistant unit
- Gastight tank
- Pre-heater
- Feeder for viscous substance

Available on all production  
models.



**Pharmaceutical • Foods • Dairy Products • Cosmetics • Textiles • Paints**

# Nanojet® Models LAB 15H & LAB 30H.

Nanojet® Model LAB 15H  
with hydraulic pressure intensifier.  
Capacity: 15 liter/hour, maximum pressure  
1600 bar.

Nanojet® Model LAB 30H  
with hydraulic pressure intensifier.  
Capacity: 30 liter/hour, maximum pressure  
2000 bar.

High Pressure  
Homogenizing  
By Opposing Jet  
Stream Action



Microemulsion • Nanosuspension • Biotechnology • Photographic Coatings

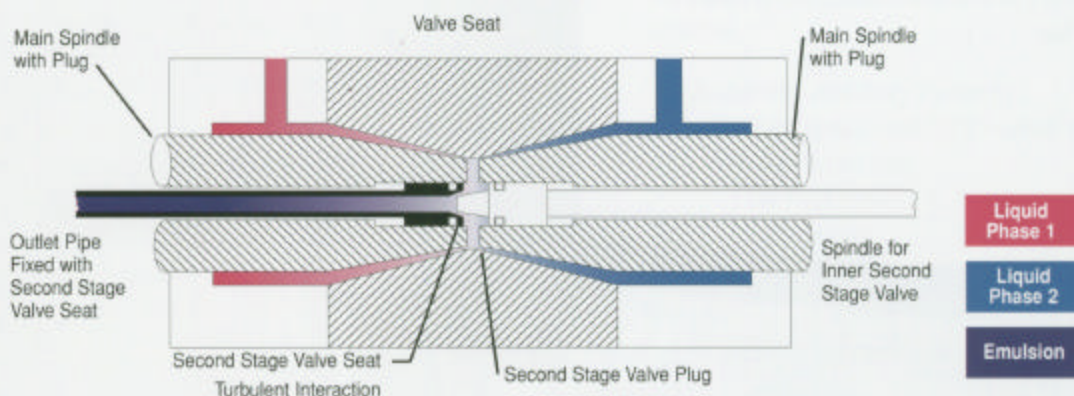
# The Nanojet® System.

The major components of the system are the patented counterflow homogenizing valve and high pressure intensifier. For certain applications, a backpressure valve is added. The homogenizing device consists of two valves which are arranged opposite each other with an axial outlet in one of the two valves.

Homogenization of a premixed raw emulsion is achieved by the following mechanism:

- Shearing of droplets and particles by forcing the fluid through a very narrow radial gap. With very high pressures, velocities up to 600 m/sec are obtained.
- Cavitation appears when the pressure of the high velocity fluid drops under the vapor pressure of the liquid. Steam bubbles are formed which immediately implode by sending out jet streams.
- By impingement mixing and dispersing within the interaction zone, the fluids flow at very high velocity towards the center outlet.

## Simplified Illustration of Opposing Jet Stream Action



### Key Features:

#### *Design Features Pressure Generation with Hydraulic Intensifiers*

Constant pressure, resulting in narrow particle size distribution. Low linear velocities warranting extensive life of plunger seals. Free-flow valves without dead spots at inlet and outlet of intensifier.

#### *Patented Opposing Jet Stream Homogenizing Valve*

Valve seat and plugs of tungsten carbide or of inchromated stainless steel.

#### *Cooling with Forced Heat Exchanger*

#### *Monitoring of Valve Position*

With incremental encoders and electric counters, which enables exact repetition of previous process parameters.

#### *Monitoring and Control of Flow*

The amount of liquid to be processed can be programmed with an electric pulse counter.

#### *Monitoring of Pressures*

For the first and second stage with pressure gauges or with transducers and electronic indicators.

#### *Monitoring of Temperatures*

Thermocouples measure the temperature behind the homogenizing valve and behind the cooler.

**Pharmaceutical • Foods • Dairy Products • Cosmetics • Textiles • Paints**

# Model Specifications

The machines are specially suited for the production of fine emulsions and suspensions requiring nano-particle sizes in a narrow distribution range. They are also utilized for efficient cell distribution.

- 4 models with different flows and pressures available.
- Hydraulic or pneumatic driven pressure intensifiers.
- Patented counter-flow homogenizing valves can homogenize in a one-step or two-step mode.
- Instrumentation for pressure, temperature and piston strokes.

## Typical Results

Fluid	Pressure bar	Cycles	Particle Size, Nanometer
Liposomes of Natural Phospholipid	800	30	40 - 50
Liposomes of Hydrated Phospholipid	1200	20	100 - 120
Artificial Blood	1000	15	100
Silicone Oil/Water Emulsion with Surfactant	600	3	260
Vegetable Oil/Water Emulsion with Surfactant	800	6	300
Fungicides/Water Suspension	1400	5	300
Vitamin Oil Emulsion	200	4	150
Photographic Coating	800	1	400
Cell Disrupture/Brewers Yeast	1400	5	95% Recovery Rate
E-Coli	800	2	99.9% Recovery Rate

## Technical Data

	LAB 8H	LAB 15H	LAB 30H	LAB 30P
Flow (Liter/Hour)	8	15	30	30
Maximum Pressure (bar)	1600	1600	1600	2000
Hydraulic Powerpack (KW)	1,1	1,5	2,5	-
Compressed Air Required (bar)	-	-	-	4 to 9
Compressed Air Flow (NI/Minute)	-	-	-	800
Material of Pump and Intensifier	SS 316 TI			SS 303
Material of Piston	SS, Ceramic Coated			Stellite
Piston Seal	UHMWPE			
Homogenizing Valve	SS 316 TI			
Valve Tip and Seat	Tungsten Carbide			
Heat Exchanger	SS			
Cabinet	SS			
Length (mm)	500	800	1000	500
Width (mm)	400	450	450	400
Height (mm)	500	480	480	500
Approximate Weight (kg)	70	115	165	48

# Haskel

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