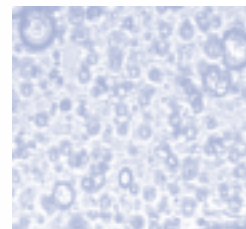


High-Pressure Pumps and Homogenizers



Niro Soavi

Niro Soavi established in 1947 is today an international leader in High-Pressure Pumping and Homogenization. It is part of GEA, a global technology leader with more than 150 operating companies worldwide.

In North America, Niro Soavi is a division of Niro Inc. The latter specializes in food, dairy, pharmaceutical, biotechnology and chemical processing equipment – manufacturing of dryers and agglomerators, evaporators, membrane filtration plants, powder packaging and handling systems and liquid processing.

Niro Soavi North America is a full service technology center covering all your needs for units, systems, service and application development.

A reliable partner in your industry demonstrating an unmatched degree of application knowledge and expertise with more than 400 machines installed in North America and 4,000 worldwide.



Niro Soavi North America in Hudson, WI., USA



NS5160H VHP 5-piston production unit.



NS5160H Sanitary 5-piston production unit.



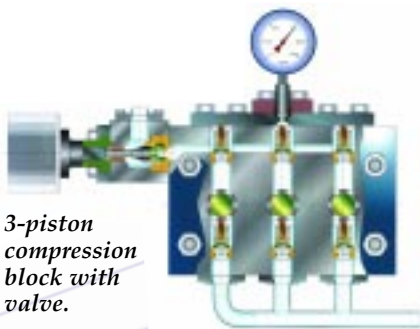
NS1001L 2K Panda 2K laboratory table-top homogenizer.

Niro Soavi is a world leader in high pressure pumping and homogenization technology and offers an unparalleled range of high-efficiency machines i.e. operating pressures, flow rates and features to match your specific production and regulatory requirements.

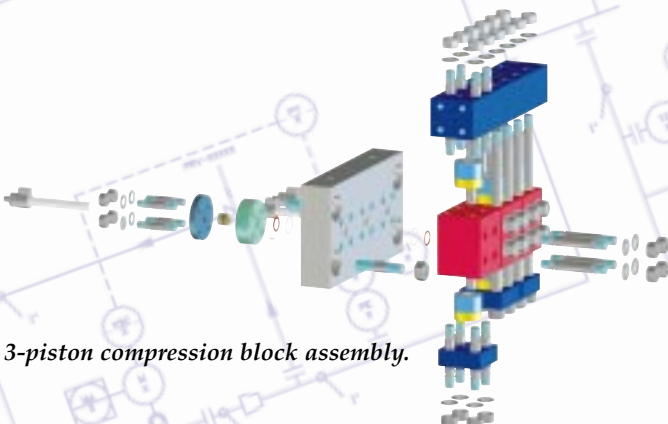
- High-pressure pumps
- High-pressure homogenizers
- Homogenizing valves – including NanoValve® technology
- Homogenizer cGMP skid systems
- Homogenizer parts and spare parts
- Controls and automation

Special design features and options include:

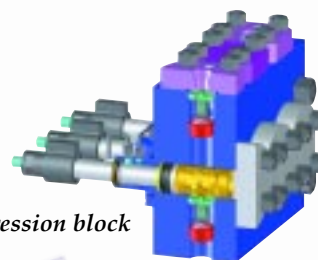
- Pumping valves can be changed freely between poppet and ball valves depending on the application.
- First and second stage homogenizer valves are adaptable modular parts prepared for easy reconfigurations.
- Non aseptic machines can be upgraded to full aseptic design.
- Interchangeable pumping pistons (plungers) - chrome plated, tungsten carbide or ceramic.
- The ceramic pumping pistons are made of solid ceramic and can be turned around for usage at both ends. Thermal cracking is less likely to occur with solid ceramic as opposed to coated ceramic plungers.
- The homogenizer valve parts can be changed to suit your applications as they develop.



3-piston compression block with valve.



3-piston compression block assembly.



Aseptic design compression block

Applications...

Niro Soavi technology can be used in numerous applications in the food, dairy, beverage, pharmaceutical and biotechnology industries. Thousands of Niro Soavi machines have been installed in these markets. Following are some of the main process applications all involving Niro core technologies.

...for Food, Dairy, and Beverage Industries



- Niro Soavi homogenization system, in aseptic design, integrates with UHT and HTST systems.
- Niro Soavi high-pressure pumping and homogenization system integrated with Niro evaporation and spray drying technologies.
- Niro Soavi high-pressure pumping integrates in meat and poultry high pressure processing systems.
- Niro Soavi VHP technology provides stable flavor emulsions for both liquid and solid flavor applications.
- Niro Soavi VHP technology enables the extraction of valuable nutraceuticals for health food formulations.



Infant formula plant



...for Pharmaceutical, Biotechnology and Cosmetics Industries

- Homogenization of cosmetic products in order to secure stable emulsions with micron level particle sizes and high water content.
- Homogenization of dispersions providing a stable and even distribution of particles.
- Niro Soavi VHP technology for high-efficient particle and cell rupture applications.
- Niro Soavi VHP technology for extraction of intracellular materials.

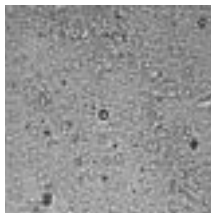


Multi-purpose biotechnology cell rupture skid system

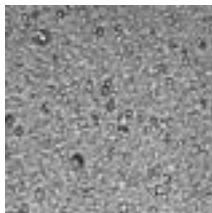


Testing

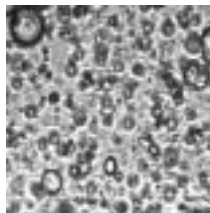
- Pilot plant testing facility.
- Comprehensive rental machine program including tabletop, pilot-, skid- and production size units.
- Particle size distribution analysis and digital photo analysis.



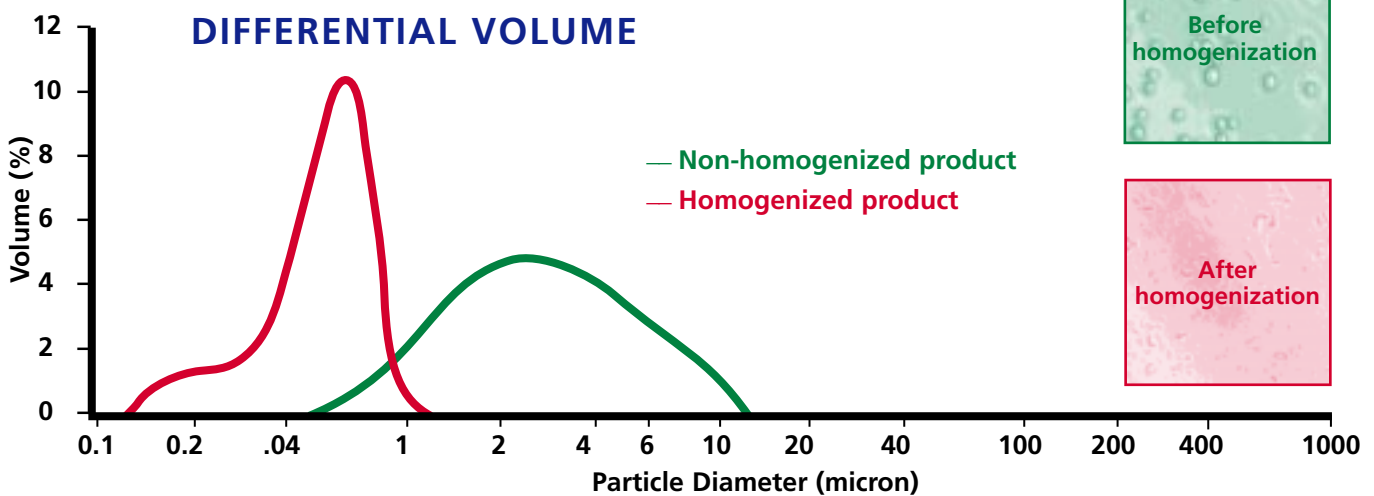
Baby lotion at 250 bar with 20% water added



Baby lotion at 250 bar



Baby lotion



Services

Engineering

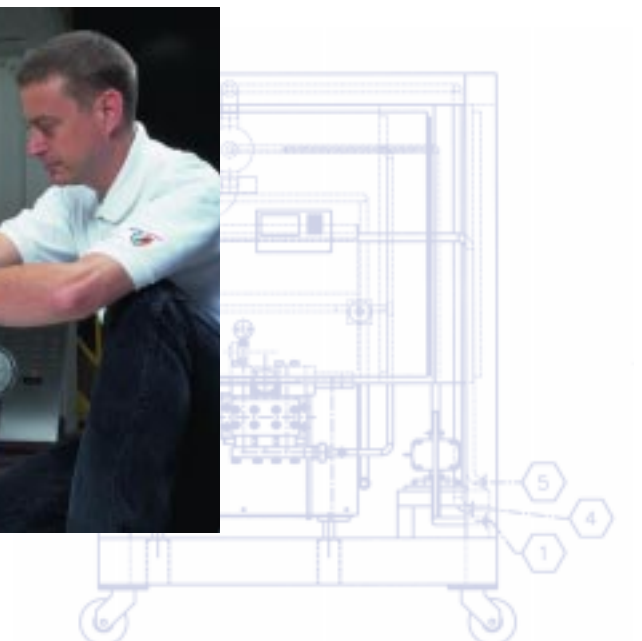
- Full process integration
- Skid fabrication
- Commissioning and training in conjunction with product delivery
- Instrumentation and control customization
- Complete engineering and documentation solutions

Validation

- Equipment Qualification (EQ) packages
- Factory Acceptance Test (FAT)

After Sales Service and Spare Parts

- Full spare parts coverage and service
- 24-hour emergency spare parts and technical service
- Preventive maintenance programs



High-Pressure Technology – *Pumping and Homogenization*

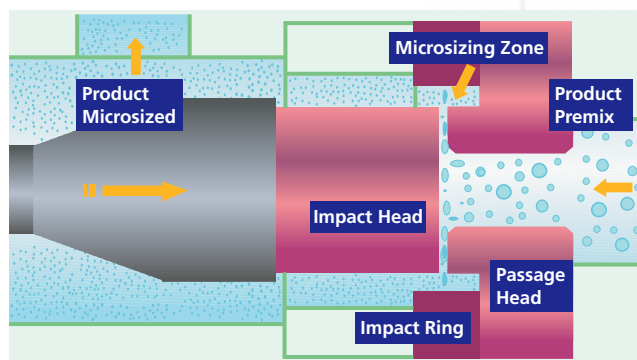
Handling fluids under high pressure, up to 1,500 bar / 21,750 psi under continuous full-scale operation, is a technology in its own right. This incorporates the disciplines of machine design, strength of materials, and a significant fluid mechanical knowledge, which combines the highest skills in mechanical engineering and more than 50 years of expertise.

Homogenization is a fluid mechanical process that involves the subdivision of particles or droplets into micron sizes to create a stable dispersion or emulsion for further processing.

This is an important stage in the treatment for many products. It provides improved product stability, shelf life, digestion, and taste. Homogenizing can also significantly reduce the amount of additives required. It prepares feeds so that subsequent spray drying produces the best quality of powders. This is especially important for baby foods and many dairy and food products.

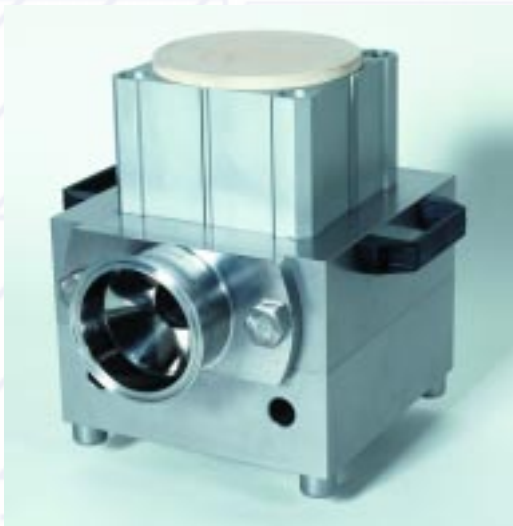
After homogenization, the particles are of a uniform size, typically from 0.2 to 2 micron, depending on the operating pressure. The homogenizer is the most efficient device for particle and droplet size reduction. The actual properties of the product vary with pressure and product type in a complex relationship. In general, higher processing pressure produces smaller particles.

The process occurs in a special homogenizing valve, the design of which is the heart of the homogenizing equipment. The fluid passes through a minute gap in the homogenizing valve. This creates conditions of high turbulence and shear, combined with compression, acceleration, pressure drop, and impact. Causing the disintegration of particles and dispersion throughout the product.



Homogenizing valve

The patented NanoValve® enables homogenization in standard milk applications to take place at a lower homogenizing pressure through a more efficient valve design for low pressure and a high flow rate application.



The special Niro Soavi rupture type (R-type) valve is particularly suitable for cell rupture applications. This proprietary Niro Soavi technology can also be applied to existing production units in order to improve performance on old machines.

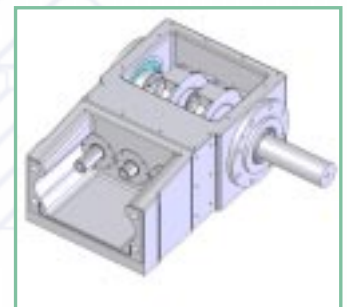
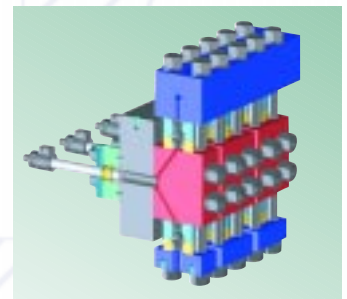
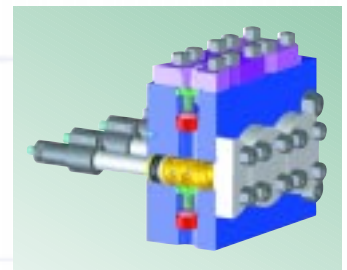


Homogenizing valve group

A properly designed positive displacement pump is crucial to the homogenization process. This involves Finite Element Method (FEM) and Finite Volume Method (FVM) for mechanical structure and fluid mechanical analysis. A constant sourcing of the best stainless steel, high alloy compositions and new ceramic materials enables the incorporation of highly abrasive resistant and durable components.

Operating continuously at full industrial scale from 600 to 1,500 bar (8,700 to 21,750 psi) requires a unique mechanical design. Niro Soavi identifies this class of machines as VHP (Very-High-Pressure).

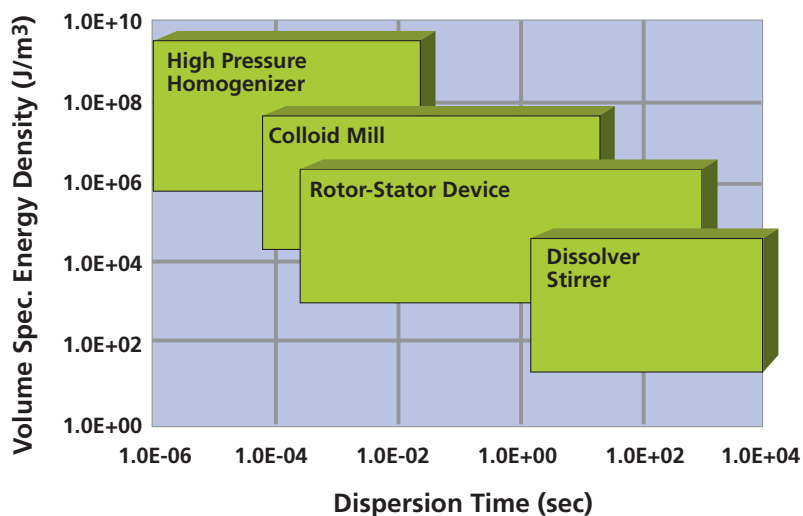
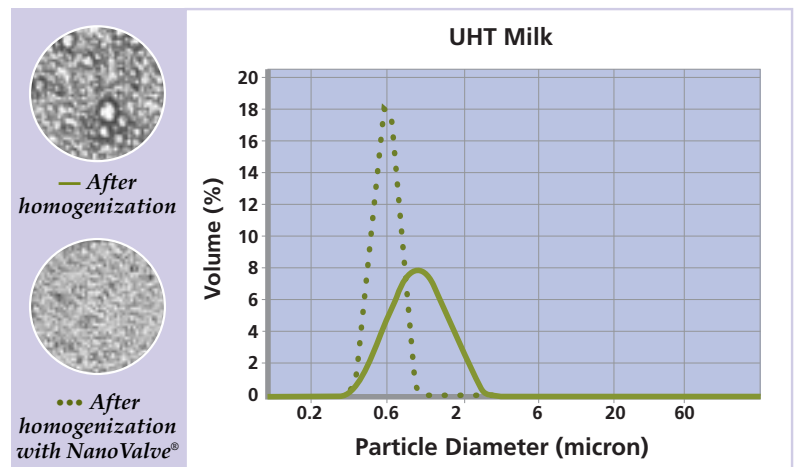
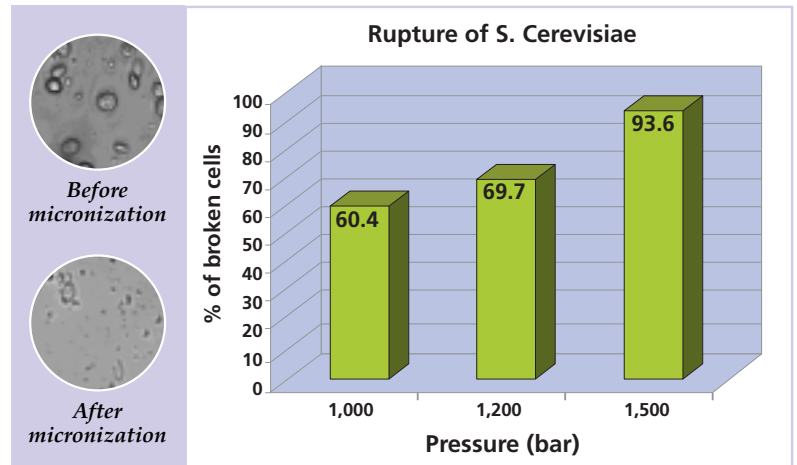
The Soavi crankcase is heavy duty cast iron, containing the power end components that create the reciprocating movement of the pumping plungers. The crankshaft is machined from a solid forged bar and supported by roller bearings at the ends, and by sleeve bearings between each crank pin.



Homogenization compared to Mixing and Blending

Homogenization is often wrongly categorized together with mixers, mills and other low pressure blending devices. Niro Soavi is bench marking high-pressure homogenization and has for a long time educated the industry via the leading technology forums about the substantial differences between traditional blending devices and the added benefits that can only be achieved in a Niro Soavi high-pressure homogenizer.

The difference is considerable from a technological point of view and more importantly the result in any product application is dependent on the right choice of technology. The increasingly more complex food and dairy recipes as well as biotech cell rupture applications require true and reliable high-pressure technology.



Niro Soavi Machine Models

The relationship between capacity and operating pressures is given in the table below.

Metric Units (EU)

Machine Model	Max. Pressures (bar)															Max. kW	Machine Size W x D mm
	100	120	150	180	200	250	300	350	400	450	600	700	1000	1200	1500		
	Maximum Flow Capacity (l/h)																
NS1001	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	1.0	415 x 780
NS2006L/Pony	80	80	80	80	80	80	80	80	80	80	80	80	80	30	30	1.0	790 x 1195
NS3006L/Panther	120	120	120	120	120	120	120	120	120	120	120	120	120	50	50	1.0	790 x 1195
NS2006	650	650	650	420	420	320	250	250	180	180	120	80	80	80	35	5.5	655 x 800
NS3006	1000	1000	1000	750	700	550	400	400	300	300	200	120	120	120	50	5.5	745 x 850
NS3011	2800	2700	2200	1800	1600	1300	1100	900	800	700	550					11.0	925 x 940
NS3015	4000	3700	3000	2500	2200	1800	1500	1200	1100	850	750	600	400	300	180	15.0	1115 x 1440
NS3018	5500	4600	3700	3000	2700	2200	1800	1500	1300	1000	900	750	500	350	350	18.5	1180 x 1485
NS3022	5800	5800	4800	4000	3500	2800										22	1390 x 1925
NS3030	8000	8000	6500	5400	4800	3800	3200	2700	2400	2100	1600					30	1390 x 1925
NS3037	9500	9500	8000	6600	6000	4800	4000	3400	3000	2600	2000	1700	1200	900	800	37.0	1390 x 1925
NS3045	10000	10000	9800	8000	7300	5800	4800	4200	3600	3200						45.0	1470 x 2035
NS3055	12000	12000	12000	10000	9000	7200	6000	5000	4500	4000	3000					55.0	1470 x 2035
NS3075	14000	14000	14000	12000	11000	9500	7000	6000	4800	4800	3800	2000	1500	1400	1000	75.0	1470 x 2035
NS3090	17000	17000	17000	16000	14500	11500	9500	8000	7200	6500	4800					90.0	1800 x 2445
NS3110	22000	22000	22000	19000	17000	14000	11000	9500	8500	7000	5500	4500	2600	2500	1800	110.0	1800 x 2445
NS5132	28000	28000	28000	23000	21000	17000	14000	12000	10500	9500	7000					132.0	2010 x 2890
NS5160	36000	36000	34000	28000	25000	20000	17000	14500	13000	11500	8500	7000	4500	4000	3000	160.0	2010 x 2890
NS6200	40000	40000	40000	35000	32000	25000	20000	17000	15000	14000	10000	9000				200.0	2100 x 3090
NS8315	50000	50000	50000	45000	45000	36000	27000	26000	23000	20000	14000					315.0	2350 x 3105

Imperial Units (GB & US)

Machine Model	Maximum Presssure (psi)																Max. HP	Machine Size W x D inches
	1,500	1,700	2,200	2,600	2,900	3,600	4,400	5,100	5,800	6,500	8,700	10,000	15,000	17,000	22,000			
	Maximum Flow Capacity (GPH)																	
NS1001	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	1.3	16.3 x 30.7	
NS2006L/Pony	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	7.9	7.9	1.3	31 x 47	
NS3006L/Panther	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	31.7	13.2	13.2	1.3	31 x 47	
NS2006	172	172	172	111	111	85	66	66	48	48	32	21	21	21	9	7	25.8 x 31.5	
NS3006	264	264	264	198	185	145	106	106	79	79	53	32	32	32	13	7	29.3 x 33.5	
NS3011	740	713	581	476	423	343	291	238	211	185	145					15	36.4 x 37.0	
NS3015	1057	978	793	661	581	476	396	317	291	225	198	159	106	79	48	20	43.9 x 56.7	
NS3018	1453	1215	978	793	713	581	476	396	343	264	238	198	132	92	92	25	46.5 x 58.5	
NS3022	1532	1532	1268	1057	925	740										29	54.7 x 75.8	
NS3030	2114	2114	1717	1427	1268	1004	845	713	634	555	423					40	54.7 x 75.8	
NS3037	2510	2510	2114	1744	1585	1268	1057	898	793	687	528	449	317	238	211	50	54.7 x 75.8	
NS3045	2642	2624	2589	2114	1929	1532	1268	1110	951	845						60	57.9 x 80.1	
NS3055	3170	3170	3170	2642	2378	1902	1585	1321	1189	1057	793					74	57.9 x 80.1	
NS3075	3699	3699	3699	3170	2906	2510	1849	1585	1268	1268	1004	528	396	370	264	101	57.9 x 96.3	
NS3090	4491	4491	4491	4227	3831	3038	2510	2114	1902	1717	1268					121	70.9 x 96.3	
NS3110	5812	5812	5812	5020	4491	3699	2906	2510	2246	1849	1453	1189	687	661	476	147	70.9 x 96.3	
NS5132	7398	7398	7398	6077	5548	4491	3699	3170	2774	2510	1849					177	79.1 x 113.8	
NS5160	9511	9511	8983	7398	6605	5284	4491	3831	3435	3038	2246	1849	1189	1057	753	214	79.1 x 113.8	
NS6200	10568	10568	10568	9247	8454	6605	5284	4491	3963	3699	2642	2378				268	82.7 x 121.6	
NS8315	13210	13210	13210	11889	11889	9511	7133	6869	6077	5284	3699					422	92.5 x 122.2	

Machine Model Nomenclature:

- N

S

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7

5

H
- Niro

- Soavi

- Number of pistons, e.g. 3

- Motor size, e.g. 75 kW (100 HP)

- Homogenizer (H), High-Pressure Pump (P), Laboratory Unit (L).

The capacity data are subject to updates and revisions.

Setting Standards

The Niro name stands for quality, reliability and a sustained presence in the pharmaceutical and biotechnology industries.

The Niro Soavi product and service range provides the best of both European and North American standards.



- **FDA approved materials.**

FDA approved and certified materials, in addition to 3A approved plastic and rubber materials, are available.



- **ISO 9001 approved.**

The Niro Soavi machines are manufactured and tested in accordance with the ISO9001 credited QA program. This includes full testing of each machine verified by a test certificate audited by Det Norske Veritas (DNV).



- **3A sanitary standard.**

Niro Soavi has an active role in the continuous fulfillment and improvement of the 3A sanitary standards.



- **USDA accepted.**

Niro Soavi has obtained an acceptance based on a focused cooperation with the USDA.



- **cGMP compliance.**

Niro Soavi is designing its products in compliance with cGMP. Customized control systems are available in line with GAMP guidelines.

This total knowledge base is unmatched in the industry and secures the optimum solution for our customers' specific needs.

WWW.NIROINC.COM



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