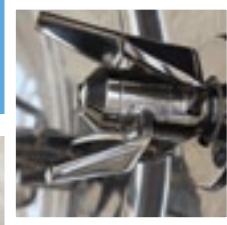
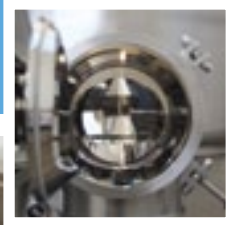


# NicoBed NicoMixer



# NicoBed FLUID BED DRYER-FLUID BED PROCESSOR



## NicoBed-NicoMixer

### NICOBED: FLUID BED DRYER-FLUID BED PROCESSOR

Over the past years, fluid bed technology has been progressed from a process to dry a granule quickly to a new technology that can be used for drying, granulation, particle coating and pelletizing.

The improvement in the technology is driven by the pharmaceutical industry asking for faster, consistent and re-producible process with less handling of the product. Nicomac, with more than 35 years of experience in coating process, focused in a continuous innovation philosophy, designed the state of the art of fluid bed technology: NicoBed with unique TWISTER™ it. Patent pending system

FBD is a bed of granules with a stream of air passing through particles at a right speed enough to fluidize the product. A uniform air movement is able to ensure a fast, gentle and uniform spraying and drying guaranteeing a homogenous and reproducible product quality.

The heart of a Fluid Bed Dryer or Fluid Bed Processor is the air flow. Nicomac technical department, in the past years dedicated deep studies and many trails to design and optimize the best technology to control the air flow. TWISTER™ it. Patent pending, is the innovative, original, winning system.



TWISTER™ System it. Patent pending is made by welded flaps to create a slot, at a preset slope, able to move the air in a controlled turbulence motion through the product bed. A net on the top, very easy to be dismantled, is able to guarantee that no particles will go down in the air distribution container.

The winning key of TWISTER™ system, it. Patent pending, is the right combination of an accurate controlled air direction flow with the exact air speed to minimize the pressure drop to ensure a perfectly balanced process preventing granule agglomeration and allowing a uniform and fast growing of the granule with low and controlled moisture residual. The TWISTER™ action, with low pressure drop, improves the efficiency of filters and allow very fast process.





## HIGH TECH SPRAYING SYSTEM

- Dosing Group includes a Watson Marlow peristaltic pump and high tech spray guns with double effect, controlled atomization air and "AIR BUBBLE SYSTEM" able to create the perfect condition to deliver the right quantity of solution on each granule avoiding any clogging. Spray guns are placed in the same air direction, on the top of the net for a perfect bottom spray, that combined with "AIR BUBBLE SYSTEM" guarantee even distribution of binder solution on each single granule for an innovative fluid bed processor able to produce homogeneous and reproducible granule. In a NicoBed processor with Twister System starting from 100 microns powder, as for example

lactose powder, in less than an hour including heating and cooling, is able to get a uniform granule that doesn't require and size calibration through the mill before adding the lubricant, that can also be fed directly in the NicoBed. Granules coming from NicoBed have optimal compressibility properties for tableting.

- We can handle powders with diameter from 15 $\mu$  up to 1000 $\mu$  (1 mm) or more.

NicoBed is prearranged to also install top-spray system with multi-head spray gun able to guarantee uniform spray.



# NicoBed FLUID BED DRYER-FLUID BED PROCESSOR



## PROCESS SEQUENCE

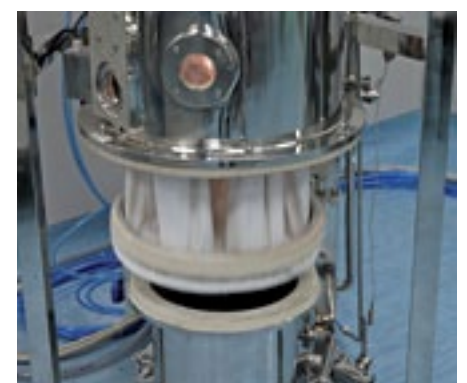
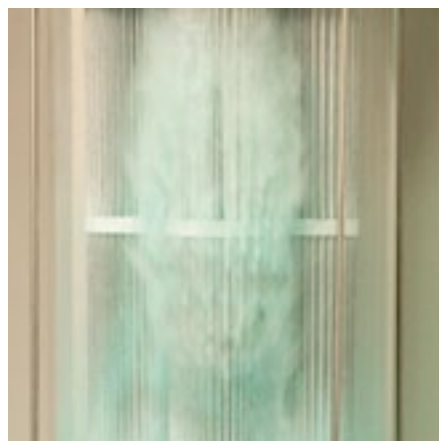
### Filtration

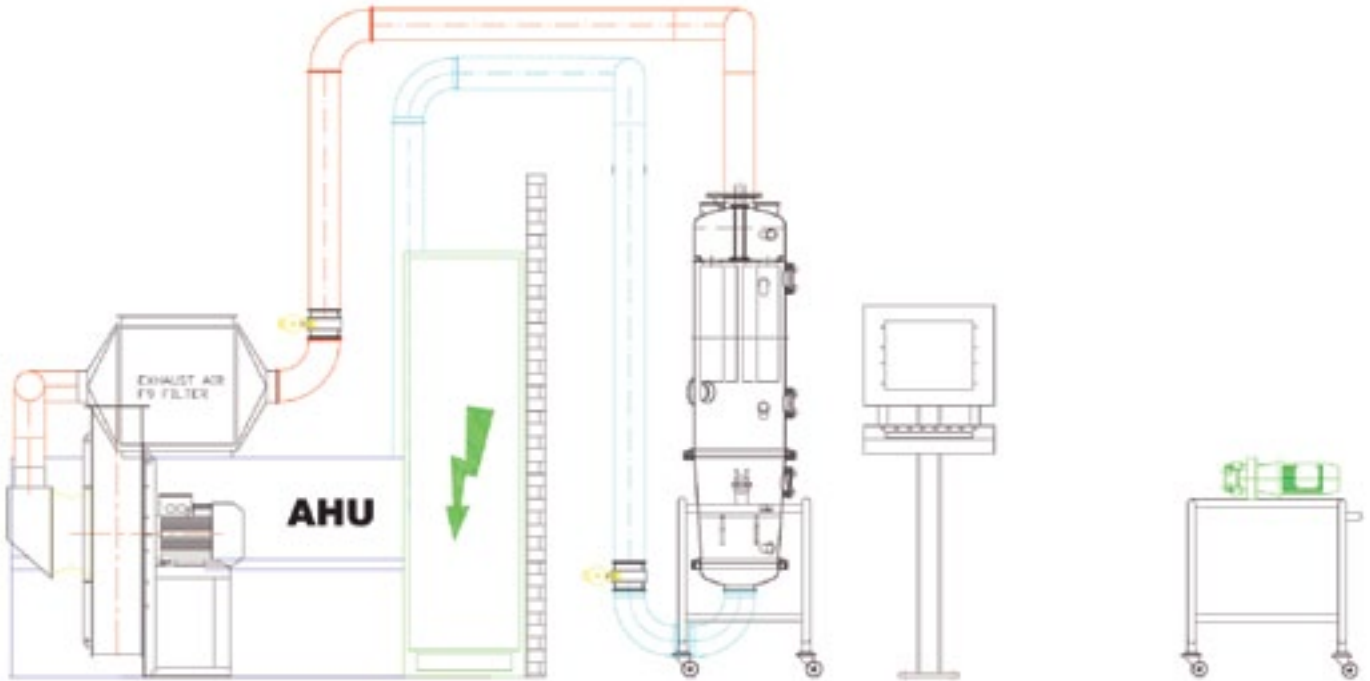
Filters retain the product in the Fluid bed dryer and processor. Filter bags are still used in Pharmaceutical, but filtration is not very accurate thus causing product loss.

Nicomac developed Nicobed based on cartridge filtration. The cartridges are cleaned by compressed air during the process, blowing the powder one by one, in a controlled sequence, with no interruption of fluidization, returning the powder to the granule bed. Cartridges can be supplied in different materials and they can also be washable. Processing potent compounds requires an automatic WIP-CIP system.

TWISTER™ SYSTEM it. Patent pending with High tech spraying system and Sequence filtration allows for:

- Perfect control of air turbulence in tangential way with very low pressure drop.
- Full control of uniformity of granule.
- Uniform distribution of binder solution on each single granule
- The ability to granulate soluble and hygroscopic materials
- The ability to granulate fine particles
- A more stable, reliable, repeatable, consistent granulation process
- Very fast processing time.
- No clogging of the guns and the filters
- No product loss and high yield
- With the majority of formulations it is possible to avoid the use of the high shear mixer and the sizing mill.





NicoBed TW - Models	Unit	8	12	65	125	205	310	605
Container Volume	lt.	20	34	165	330	520	810	1380
Dimensions								
diameter Ø	mm.	500	600	700	850	1060	1200	1600
standard height	mm.	1850	2200	3000	4280	4730	4920	5600
standard weight	kg.	500	850	1500	2800	3100	3550	4600

## Loading and unloading

Product can be loaded and discharged in manual mode or automatically using the FBD fan with dust-free operation.



## NIR- Infrared spectroscopy

Nicomac developed together with an international Company a more accurate and reliable system able to monitor the moisture content inside the granule.

The on-line infrared NIR spectroscopy, guarantees the process optimization measuring the humidity, step by step, ending the process only when the preset moisture level inside the granule or any other product is reached.

NIR can be installed outside the NicoBed avoiding any contamination to the product.

# NicoBed FLUID BED DRYER-FLUID BED PROCESSOR



## CLEAN-IN-PLACE- WASHING IN PLACE

Nicomac can supply semiautomatic or automatic cleaning system.

By providing a WIP-CIP skid, strategically placing cleaning nozzles and washable cartridge-filter, the fluid bed can be supplied with an automatic cleaning system.

Cartridges or filter bags, twister system with net and spray guns, can be easily dismantled, if needed. Introduction of one spraying ball in the upper chamber downstream the filters and in the granulation chamber allows a full cleaning.

WIP\_CIP recipe is set according to client and product specification.

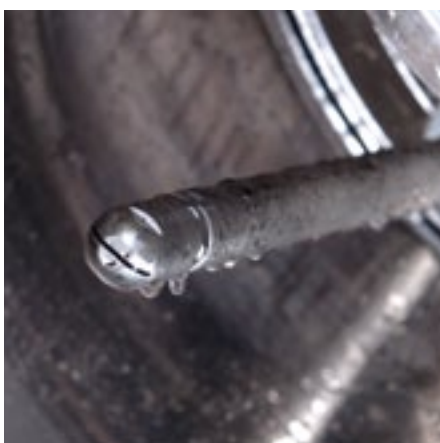
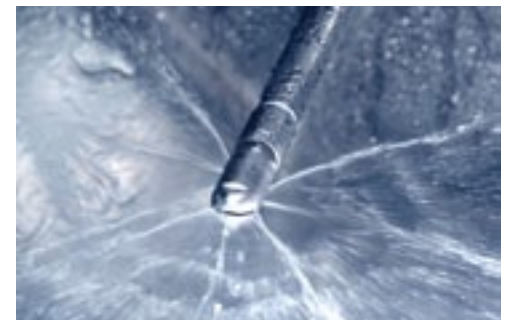
The following is the standard recipe:

WIP-CIP starts with a pre-washing without detergent in the chamber downstream of the filters and continues with the load of washing fluid, mixed with detergent, if required, in the granulation chamber.

Once the preset level of fluids is reached, the washing cycle starts through a pump that recycles the washing fluid.

After this operation, the fluid is discharged and the whole machine is rinsed starting from the top, downstream filters, up to the granulation chamber.

The final phase consists of drying and cooling through the air heating system of the machine.





## AIR-HANDLING UNIT

The drying capacity of the air depends on its temperature, humidity, and volume. The end point of a fluid bed drying or granulating process can be set by monitoring the temperature of the exhaust air stream or the humidity. The reproducibility of the process is determined by a combination of bed temperature, exhaust air temperature, and drying time. **Air Heating, Ventilation and Conditioning system** is included in the basic machine.



## CONTROL SYSTEM

**NicoBed is designed only with PLC-PC** system, with flexible, user friendly CFR21 part 11 compliant software to achieve a full control and data acquisition. Access to all user-configured data is protected by security levels, with passwords permitting individuals access only to selected functions. HMI with touch screen for flawless data acquisition and storage. Up to 49 different recipes with 99 discrete phases.

The most important sensors for control of the drying process are sensors for inlet and exhaust air temperature and airflow sensor located in the inlet air. Other important parameters monitored and recorded for agglomeration and coating are product temperature, atomizing air pressure, air dew point or humidity, and spray rate of the binder solution.

Other critical variables can be filter and product-bed pressure drop and filter cleaning frequency. All of these sensors provide constant feedback of the information to the operator and the control system. All main parameters are monitored, recorded and can be printed, as a batch report.



# NicoMixer HIGH SHEAR MIXER



## NICOMIXER HIGH SHEAR MIXER

Dry powder mixing, wet powder mixing and granulation can achieve high performance with the Nicomac unique planetary mixer, the "Nicomixer™".

Nicomac high shear mixer - granulator, can be provided with both automatic and manual dosing system for powders or binding solution.

NicoMixer has a very compact sturdy design and strong, heavy structure. The tight tolerance between the bowl and impeller allows the efficient mixing and high yield.

The Nicomixer™ line of granulating equipment combines 3-blades impeller with design able to ensure a very good movement of the granules even at low speed. The blade tips are positioned tangentially to avoid any dead spots.

The cutting edges of customized chopper are located in the area with the highest circumferential speed which allows the best densification of granules and accurate control of particle size. This guarantees full batch powder mixing capability with no dead point in the mixing action and full size mixing. The Nicomac rapid mixer design allows a perfect and uniform granulation thanks to the Tulip design of the bowl that also allows to work from 30-40% up to 100% of the batch size.

Also very thick and dense products can be easily handled thanks to the impeller profile, the power of the motors and strong construction. It's easy to validate, clean in place either through a built in system or through Nicomac CIP WIP movable Skid™. Nicomac rapid granulator can be designed to be installed in high containment granulation lines for both R&D labs and production scale.

- Pharmaceutical execution for cGMP compliance
- Rapid mixer design to avoid mechanical friction with the product
- Dust free loading and unloading operation by gravity or by vacuum
- In house R&D for your product development
- Excellent powder mixing for granule size uniformity
- Tight mechanical seal.
- Granulators available in large variety of capacities
- Worldwide network for excellent after sale service and fast trouble shooting
- Siemens PLC based control system with touch screen HMI. CFR21 PART 11 software.





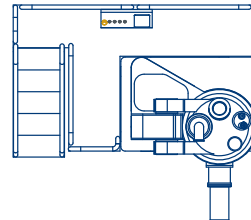
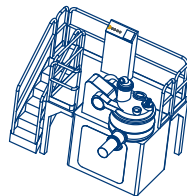
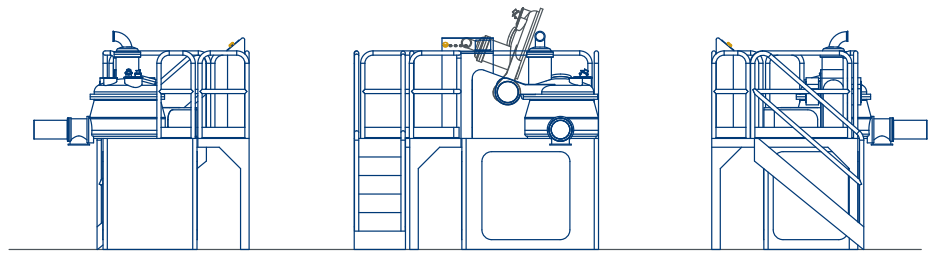
Description	Unit	NicoMix 15	NicoMix 25	NicoMix 50	NicoMix 100	NicoMix 250	NicoMix 400	NicoMix 600	NicoMix 800
Geometric capacity	lt.	14.5	25	50	100	190	464	600	800
Batch max. capacity	lt.	10	20	35	80	150	370	480	640
Batch min. capacity 1	lt.	5	8	17	37	63	150	200	270
Batch max. capacity (bulk density of 0,5)	kg.	5	10	17.5	50	75	185	240	320
Width with platform	mm.	930	1250	1400	1600	2860	3200	3570	3700
Depth with discharging valve	mm.	1478	1540	2215	2640	2830	3057	3367	3445
Total height with lid open 70%	mm.	1300	1350	1875	2200	2518	2750	3083	3100
Weight	kg.	180	355	425	622	1285	2100	2850	3670

## PROCESSING VESSEL AND LID

The vessel has a flat bottom, guaranteeing no dead spots, thus ensuring a good product movement, avoiding sticking layer formation for an easy cleaning. Either the vessel or the lid can be jacketed for special applications as Melt Granulation.

The loading of the product into the vessel is carried out by gravity, pneumatic transfer or by vacuum.

The vessel and the lid are designed to withstand 2 bar pressure.



# NicoMixer HIGH SHEAR MIXER



## THE LID

For NicoMixer 15, 25, 50 only, the lid opens manually by a counterweight only for the NicoMixer 15-25-50. For all other models the lid is operated automatically by motor and it is supplied with an inflatable gasket for a dust free vacuum tightness. The inflation of the gasket is automatically performed once the lid is closed.

For the operator safety, the moving parts (impeller and chopper) are not enabled while the lid is open.



The lid is also equipped with:

- a sight glass with lamp for checking the process
- 1 port of 2.5" for the introduction of the spray nozzle or other utilities. Silicon gasket and stainless steel Aisi 316 stopper with clamp are included
- 1 port of 2.5" including a vent filter (upon request)
- in case of loading under vacuum, a pressure release valve and a st. st 316 filter box with a special textile antistatic filter will be located on the lid.

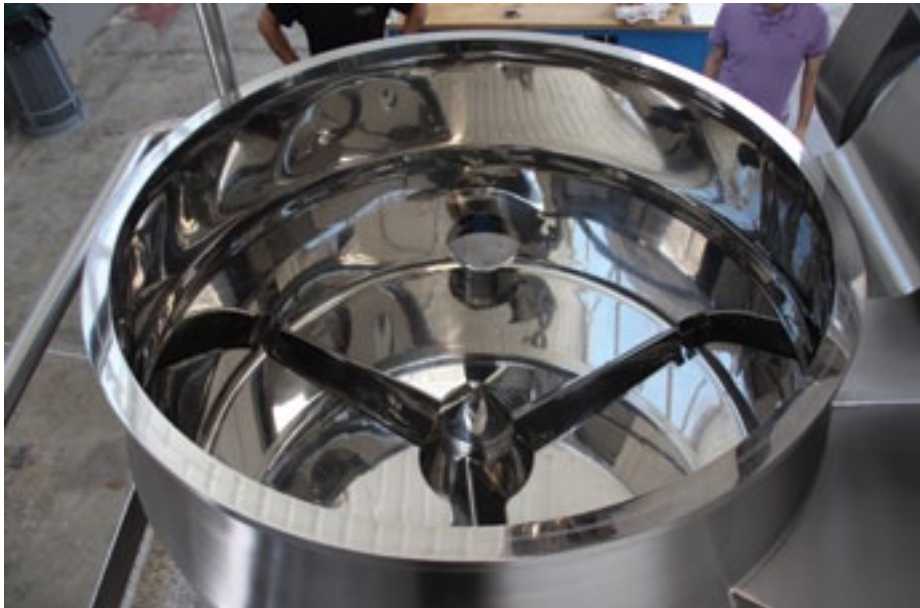


## DISCHARGE VALVE

The discharge valve has a flush design to allow the complete product discharge.

The valve can be full inspected and cleanable, and it is pneumatically activated.

A safety grate and switch are also provided.



## CHOPPER

The chopper is placed horizontally in order to be very close to the mass to ensure the best impact. The chopper has a radial mechanical shaft double lip seal, Gylon (FDA approved) and is purged by compressed air or Nitrogen as well as in the impeller seal.

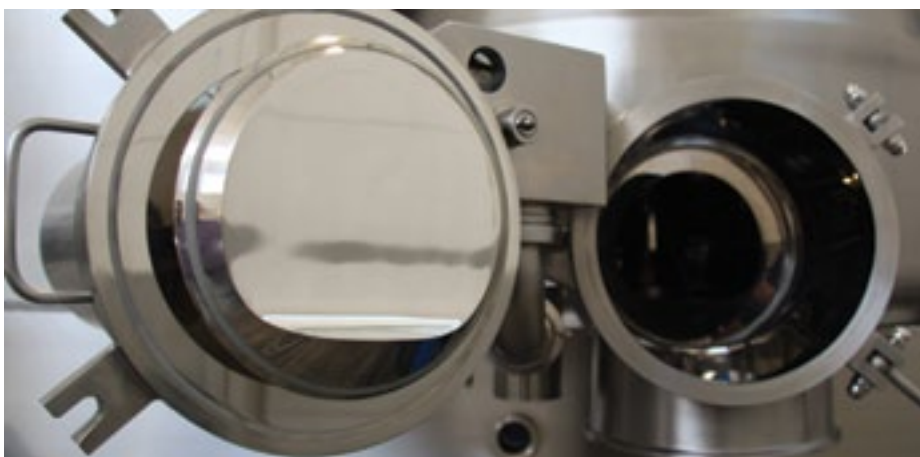
Different chopper blades shapes are available and can be offered as option.

## 3-BLADE IMPELLER

The uniquely shaped 3B impeller scrapes the bottom, to achieve optimal mixing and smooth granulation. The impeller is moved by two speed electric motor with high specific power (about 0,15÷0,20 kW/kg) and high TIP speed (Peripheral) 9÷10 m/sec, which transmits a high energy input to the product, and therefore, less mixing time, and less energy consumption. Upon request, the speed of the impeller can be controlled by means of an AC inverter. Profiles can be custom designed for special and difficult products.



The impeller can be easily removed for inspection and cleaning when required. The impeller radial mechanical shaft seal is a double lip type in Gylon (FDA approved) and is purged by compressed air or Nitrogen to avoid cross contamination.



## BINDER SOLUTION

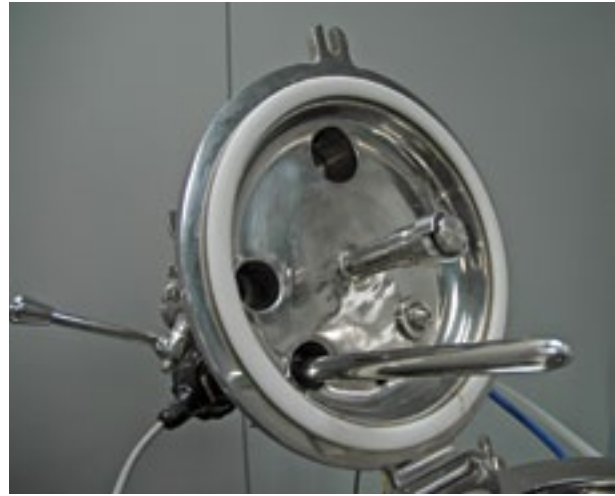
NicoMixer can be supplied with manual or automatic loading of powder and binder solution. Fast dispersion of binder agent will be delivered with an automatic dosage group including peristaltic pump, tank, spray system, integrated with PLC system.

# NicoMixer HIGH SHEAR MIXER



## CLEANING IN PLACE (WIP) Manual version including:

- WIP spray-ball connected to the service flange of the machine lid, fed by water at minimum 6 bar pressure (supplied by the customer) 100 l/min flow rate. The spray-ball is moved by the water pressure.
- A manual manifold.
- A pneumatic valve to feed the spray-ball.



## Automatic CIP

The NICOMIXER washing cycle is divided in several phases in order to complete cleaning in a fully automatic way set in the PLC recipe.

The first phase, the system performs washing by forcing water inside the impeller's gaskets. After that, the impeller is put in operation to guarantee, by mechanical action, the water passing through the whole gasket contributing to proper washing fluids distribution in any point of the container.

After that, the gaskets are blown by compressed filtered air and the washing fluids are evacuated by the discharge valve.

During second phase, the detergent is mixed with the water and pumped into the container by a rotating nozzle.

During the discharging, the continuous flushing of purified water ensures the perfect removal of the waste water.

Further washing and rinsing can be set in the PLC even without adding detergent.

The NicoMixer can be also dried through a vacuum pump.



## CONTROL PANEL

The standard control panel is PLC-PC control system. The panel includes an emergency push-button and key selectors, and furthermore, 3 spy lamps (line, emergency and fault). It is made of stainless steel AISI304, to be installed on the wall, on the wall. The type of protection is IP 56. The panel includes an Operator Interface with touch screen monitor and membrane type keyboard for process operations (manual commands). The following parameters are displayed:

- impeller speed set and actual values
- chopper speed set and actual values
- impeller and chopper working time
- product temperature actual values
- amperage of the impeller electric motor, and therefore, the possibility to set the end point of the phase (wetting and granulation phases).

The set values will be stored into the PLC memory and the control loops (PID) will ensure the ramp of different parameters.



## DOCUMENTATION

Customer User Requirements evaluation

Certificate ISO EN UNI 9001

URS response

Video pages functional specification

Functional Specification

- HW design specification
- SW design specification
- SW module design specification
- SW module test specification and test reports
- SW integration test specification and test reports

Signal list

Operating Manual

Spare Parts List

Installation Drawing

P & I D

Pneumatic diagram

WIP machine layout Drawing

P & ID WIP

Electrical diagram Coating System

Electrical diagram preheating cabinet

Declarations of Conformity Collection

Instruments Calibration Test

Data Sheets Collection

Pre requisite Protocol

Installation Qualification Protocol

Operational Qualification Protocol

Alarms List

Passwords Access List

Components List coating system



# NicoMixer HIGH SHEAR MIXER



## EXPLOSION

Fluid bed processing involves dust-solvent mixture that can create a risk of explosion. Such an explosion creates a momentary overpressure inside the processor. NicoBed is designed to prevent damages to people and machines. Nicomac realized tailored risk analysis, starting from the 2 bar pressure shock resistance to the full contained systems.

Standard FBD is designed with 2 bar pressure shock resistance and is equipped with a pressure-relief duct to vent the over-pressure in case of an explosion. Based on years of experience Nicomac is able to dimension the explosion vent, gas detectors and grounding system as per latest ATEX requirement. In case of client specification or high potency products NicoBed can be supplied twelve bars pressure-shock resistance for contained system, that doesn't require pressure-relief duct. A quick action stop valve will be incorporated in the exhaust air duct to protect components that are not pressure-shock resistant.

## ATEX

Nicomac can supply equipment designed following ATEX directive 94/9/CE (Explosion hazard areas) in conformity to EN14491 or latest for the use of hybrid mixture: solvent and powders ST1 Pmax10.





## CONTAINMENT

From feeding the NicoMixer to discharging the NicoBed into a IBC, integration of downstream and upstream for product transfer will be in a complete closed process, dust-free, system. Vacuum with dedicated valves for this kind of application guarantees a full containment.

Nicomac designed and successfully installed a complete granulation line contained in a single isolator working in negative pressure with a capacity of 5 kg of cytotoxic drug used in chemotherapy for cancer care with Operator Exposure Level (OEL)  $0,01 \mu\text{g}/\text{m}^3$

Machines are designed in order to have the best technology integrated in an ergonomic workspace with isolator. Pass-through box to enter with raw material and RTP to go out with finished product with any contact with the operator.

Nicomac is able to supply a complete contained solid dosage form line up to coating system.

## SERVICE

### OUR CLIENTS ARE OUR PARTNERS

NICOMAC EUROPE supplies only top class service with qualified and professional specialists with extensive experience. We are able to provide full process consulting for any kind of formulation and we are able to improve and optimize existing working recipe and process. Fast, qualified and prompt after sales service.

Our mission is to serve our clients with:

- Kindness
- Promptness
- Professional attitude

Customer satisfaction in the industry for 35 years in more than 40 countries all over the world.

Try our 400 m<sup>2</sup> of Certified Clean Room laboratory! We can run any kind of trials.



*Nicomac reserves the right to change the submitted technical data.  
Data in this catalogue is not binding. 06.2011*



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