A Complete Range of R&D Solutions for Solid Dosage Applications

designing for a better world
GEA Group is a global specialist in solid and liquid dose technology. Combining trusted technology with an ongoing programme of innovation and price/performance leadership, GEA has a long history of expertise and an unparalleled depth of experience in the fields of batch and continuous granulation, drying, pelletizing and coating, contained materials handling, tablet compression, pharmaceutical freeze drying, fermentation and liquid formulation, separation, homogenization and cell disruption.

With manufacturing and technology centres all over the world, GEA provides the services that the pharmaceutical industry needs, including technical know-how, test facilities for product development and process evaluation, project management, market-leading equipment, customer service and support.

Working closely with its customers to develop new products, reduce time to market and enhance clinical effectiveness, GEA’s scope of supply ranges from R&D-scale and standalone production equipment to the installation of completely integrated production lines and continuous processing technology. GEA is your single-source supplier of robust, flexible and cost-effective pharmaceutical manufacturing solutions that maximise operational reliability and productivity.

GEA is your one-stop-shop for pharma R&D technology.
Innovate, Partner, Prosper

Innovation never stops at GEA
It’s what we do!

A Complete Range of Technologies for R&D
Designed for specific applications, our R&D range covers every aspect of oral solid dosage production, from high shear mixers, fluid bed dryers and single pot systems to extruders and spheronizers, blenders and containment solutions, right through to tablet compression.

Innovation is Key
GEA believes that by continually stretching the boundaries of pharmaceutical processing, we can help our customers to enhance the health and well-being of millions of people all over the world. This is what drives our business — and yours.

We innovate to increase production and reduce costs, to improve containment and safeguard the workforce, to achieve better clinical effectiveness and to enhance quality control.
PharmaConnect™

At the heart of GEA’s small-scale and R&D approach is PharmaConnect™, which allows a number of diverse process modules to be docked to one control unit.

Based on GEA’s market-leading granulation technologies and designed for laboratory through to pilot plant scale, the PharmaConnect™ can process batches from 200 g to 25 kg or more, all from a single control unit.

The PharmaConnect™ is not just limited to granulation; its unique design allows any number of process technologies to be operated from the single operator interface, including

- **PMA™** - bottom-driven high shear granulation
- **Gral™** - top-driven high shear granulation
- **NICA™** - extrusion and spheronization
- **BUCK®** - IBC blending systems and containment
- **TRV** – high shear inhalation blending.

**Control Unit**

Two versions of the control unit are available: a through-the-wall option and a mobile module. The unit also features a touchscreen user interface, one of the module drive motors and GEA’s Module Recognition System (MRS), which automatically detects the type and capacity of the connected module, seamlessly displaying an image of the process on-screen and both enabling and defining the correct operational set points and parameters.

PharmaConnect™ is a PAT-compatible, cGMP-compliant, plug-and-play solution for the busy formulation scientist.

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<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Equipment Size</th>
<th>Typical Minimum <a href="mailto:Batch@0.6sg">Batch@0.6sg</a></th>
<th>Typical Maximum <a href="mailto:Batch@0.6sg">Batch@0.6sg</a></th>
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<td><strong>Development</strong></td>
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<td></td>
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</tr>
<tr>
<td>1</td>
<td>240 g</td>
<td>450 g</td>
<td>1.35 kg</td>
</tr>
<tr>
<td>3</td>
<td>720 g</td>
<td></td>
<td>2.25 kg</td>
</tr>
<tr>
<td>5</td>
<td>1.2 kg</td>
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</table>

| **Intermediate** |                |                             |                             |
| 10               | 2.4 kg         | 4.5 kg                      |                             |
| 15               | 3.6 kg         | 6.75 kg                     |                             |

| **Pilot**        |                |                             |                             |
| 20               | 4.8 kg         | 9 kg                        |                             |
| 30               | 7.2 kg         | 13.5 kg                     |                             |
| 60               | 14.4 kg        | 27 kg                       |                             |
**Granulation, Blending and Pelletizing**

### PMATM - Bottom-Driven High Shear Granulation
Offering a wide range of processing capacities, standard module sizes for the bottom-driven PMATM are set at 1, 3, 5, 10, 15, 20, 30 and 60 L, with each unit being geometrically scalable. Critically, each of these modules features its own impeller drive motor, maintaining a consistent energy input per unit volume and enabling true scale-up data to be generated, even at the 1 L level, for commercial expansion.

### TRV - High Shear Blending
For more than 40 years, Turbo Rapid machines have delivered high intensity blending solutions for dry powders. The unique, high speed, TRV impeller blades provide the homogeneity and stability that are key factors in the production of inhalable drugs. Available with working capacities from 150 g up to 30 kg, the TRV is available in standalone or PharmaConnect™ options.

### NICA™ IPS-5 Extrusion and Spheronization
Designed specifically as a pelletization system for the pharmaceutical industry and able to pelletize small batches (50 g) using the operating principles of larger pilot-scale and production machines, the NICA™ IPS-5 extruder and spheronizer is the perfect development partner for the PharmaConnect™.

### Gral™ - Top-Driven High Shear Granulation
The state-of-the-art Gral™ top-driven granulation system is renowned worldwide for its high quality, robust design and scalability. The UltimaGral™ comes with a 10 L bowl and can be scaled-up to provide 25 and 75 L capacities, facilitating the move to production-scale equipment. Furthermore a specially adapted drive mechanism integrates the Gral with the PharmaConnect control system for complete process flexibility.

### IBC Blending Systems
Featuring the unique, removable Blending Prism™ and designed to handle a complete range of laboratory sized IBCs (3–75 L) using a single process module, NIR technology can also be applied to provide online blend homogeneity detection. The Prism™ adds low shear mixing to the rotating IBC, adding to the turbulence of the tumbling product and reducing the blend time.
Contained Processing

A complete small-scale production system, from powder to tablet press, the plant includes high shear granulation (PMA™), pelletization, drying, pellet coating (FlexStream™) and blending.

Furthermore, by using GEA’s inspired containment technologies, complete solutions can be tailored to suit user-specific requirements, from process integration to loading and discharge via a rigid split valve (BUCK™ MC Valve) or the Hicoflex® disposable bag system.
High Shear Granulators
The GEA high shear mixers and granulators are multipurpose processors that are equally suitable for the high speed dispersion of dry powders, aqueous or solvent granulations, effervescent production and melt pelletization.

Process Overview
In addition to GEA’s modular granulation and blending system (PharmaConnect™), FlexStream™ is an innovative, robust and scalable process technology for spray granulation and pellet coating, delivering unbeatable benefits in terms of productivity and reduced running costs.

Containment Valves and Disposable Containment Interfaces
GEA offers both rigid and disposable product transfer technologies that provide containment down to nanogram levels:
• the cost-effective, disposable Hicoflex® products that significantly reduce capital and running expenditure compared with rigid IBC technology and enable rapid product changeover for improved plant utilisation
• the unique and modular BUCK® MC valve, with its simple design, offers complete flexibility when charging and discharging APIs
• the high containment BUCK® TC valve is the highest performing split valve available on the market; by introducing a wash step prior to valve separation, the BUCK® TC valve is capable of low nanogram level performance.

Integrated Approach
Combined, these technologies comprise an integrated process system that replicates the hundreds of large-scale plants provided by GEA globally. We guarantee that our customers are provided with the same technology — from laboratory through to production — using the same containment and process technologies, ensuring seamless scale-up and flexible process capabilities.
For 50 years, GEA has supplied the pharmaceutical industry with advanced solids processing plants for blending, granulating, drying, pelletizing and coating, including small capacity systems for R&D as well as industrial size plants for cGMP-compliant batch production.

Based on a long history of experience, thousands of completed tests and with plants installed around the world, we have established a solid base of manufacturing plant and pharmaceutical process expertise. Highlighting the importance of R&D, GEA offers three complementary laboratory scale units, capable of processing batch sizes from 100 g to more than 25 kg.

## Multi-Processor™ MP-1

For true flexibility and as an introduction to production-scale processing, the MP-1 is the machine of choice. Capable of performing any fluid bed process, the MP-1 features a diverse range of options, including high efficiency drying, top spray granulation, bottom spray pellet coating (Precision Coater™) and side spray granulation/coating (FlexStream™).

With a batch range from 500 g to more than 5 kg, the MP-1 complements other GEA granulation and pelletization equipment and, in addition, benefits from being mobile. To provide more scale-up capability, the MP-1-size product container can also be used with the pilot-scale MP-2, expanding its drying range from 1–25 kg in a through-the-wall, GMP design.

## Flexstream™

The ultimate in fluid bed flexibility, offering granulation, drying and coating in a single processor with built in linear scale-up, the FlexStream™ requires no mechanical adjustment when switching between drying, granulating and coating modes.
Combining versatility with benchtop practicality, the STREA-1™ is one of the most recognisable process machines in the pharmaceutical industry. Specifically designed to process fine powders, pellets, granules, crystals and tablets, the STREA-1™ is the flexible choice when taking the first steps towards process optimisation.

Product drying, top spray granulating and coating — from 200 mL to 2 L — are all possible, thanks to its interchangeable components and containers. Continuing GEA’s strong commitment to research and development and high quality standards, the STREA-1™ is a vital addition to the laboratory bench.

<table>
<thead>
<tr>
<th>STREA-1™</th>
<th>MP-1</th>
<th>MP-2</th>
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</thead>
<tbody>
<tr>
<td>Typical Capacity</td>
<td>100 g to 1 kg</td>
<td>500 g to 5 kg</td>
</tr>
<tr>
<td>Drying</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Top Spray Granulation</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Top Spray Pellet Coating</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Precision Coating™</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Bottom Spray Pellet Coating</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>FlexStream™ Granulation</td>
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<td>•</td>
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<tr>
<td>Side Spray Granulation</td>
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<td>•</td>
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<tr>
<td>FlexStream™ Coating</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Side Spray Pellet/Tablet Coating</td>
<td>•</td>
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</table>
Single-Pot Processing

Single- or one-pot technology is the result of integrating mixing, granulation and drying into a single processing vessel. For development purposes, the GEA UltimaPro™ 10 and 25 have batch capacities of 1–9 kg and provide all the key characteristics, granulation and drying options of a production-scale machine; both are compact, mobile and easy to install, offering plug-and-play functionality.

The UltimaPro™ combines high-shear granulation with highly efficient vacuum and optional microwave drying technologies, resulting in ultimate flexibility for both pharmaceutical R&D and production. Single-pot processing is ideal for

- ecological, organic solvent-based solid dosage processing: UltimaPro™-Eco
- the efficient processing of effervescent formulations especially for water-based reaction methods: UltimaPro™-FZ
- high containment solid dosage processing for oncology, hormone and other highly potent products: UltimaPro™-HC

Flexible Processing

Whether for wet or melt granulation or effervescent production, combined with vacuum or microwave drying, a single-pot processor can achieve the required result. For complex applications, such as drying ethanol- or acetone-based suspensions of potent ingredient, we also have a safe and effective solution. The swinging bowl option enhances this flexibility even further by processing older formulations to high quality standards and, with easy and efficient CIP-based cleaning, quick product changeover is achievable.

Contained Processing

By definition, a single-pot process is contained, requiring no transfers between process steps (except to load the raw materials and unload the dry granules). This not only protects the operators from potent products, it also protects the products from external influences such as heat, light or moisture. Specific solutions are available for product loading and discharging to achieve the desired level of containment for the whole process.

Compact and Cost-Effective Processing

As single-pot technology combines several processing steps in one machine, it’s compact and cost-effective, reducing equipment expenditure as well as decreasing the cGMP and technical space required for granule production, thereby reducing overall project costs.
Spray drying is a technique preferred by a growing number of pharmaceutical companies to produce better drugs. This ultrafast and gentle drying technology offers unique ways to define particle characteristics.

GEA offers a range of spray dryers designed specifically for R&D, product development and small volume production. A pioneer in all aspects of spray drying with more than 10,000 contracted and installed plants worldwide, we can help you to choose the most suitable equipment, assessing each project on its individual needs and tailor the process and the spray dryer to match your specific requirements.

GEA has developed a dedicated series of pharmaceutical spray dryers. The PHARMASD™ (PSD) dryers have been designed using standard modules that incorporate all the features required for cGMP production in the drug manufacturing environment. Available in a range of sizes (1–7), PSD dryers offer capacity ranges from 80 to 4000 kg/h of drying process gas.

ASD-Micro™
For small-scale aseptic production, the ASD-Micro™ offers maximum process values as follows:
- nominal drying gas rate: 30 kg/h
- nozzle gas rate: 6 kg/h
- inlet temperature: 220 °C
- outlet temperature: 120 °C
- water evaporation rate: 1 kg/h.

SDMicro™
The SDMicro™ is a fully functional small-scale spray drying plant designed with the smallest possible spray drying chamber. Retaining the same airflow pattern as a production-scale spray dryer, reliable tests can be done with small volumes (100–200 mL). Key features include
- designed for R&D
- ideal for low volumes of high-value products
- designed for organic solvent or water-based formulations
- uses inert process gas or compressed air as the drying medium
- easy to dismantle for cleaning and fast changeover
- compact dimensions.

In our test facilities around the world, including the world’s largest and most advanced spray drying technology centre, we have 75 pilot plants where we can dry your product — be it an emulsion, a suspension or a solution — into a dry product. No one knows more about spray dryers and the associated spray drying technology than GEA.

Key Benefits
By nature, spray drying is a continuous process and is designed to offer both high productivity and uniform product quality during sustained periods. Spray drying can also help to better commercialise your discoveries by providing
- modified release and taste masking
- increased bioavailability
- aseptic production
- products for inhalation
- direct compressibility.
From Powder to Press

ConsiGma™-1: inspired laboratory scale continuous processing for fast and easy R&D. Revolutionise the way you develop and produce tablets.

ConsiGma™ is an innovative continuous manufacturing concept from powder to (coated) tablet. It specifically minimises any start-up and shutdown waste. Using the same system for both development and production work, there’s no need for scale-up as the determining factor for batch size is time — not equipment capacity. Batch sizes ranging from a few hundred grams up to several tonnes can be produced.

For early research and formulation development, when API availability is limited, equipment that can process just a few hundred grams of material is essential. To fulfil this need, GEA developed the ConsiGma™-1, the lab-scale version of the ConsiGma™ concept. Consisting of the patented continuous high shear granulator and equipped with a drying segment equal to one drying segment of the ConsiGma™ production dryer and capable of handling 0.5–1.5 kg of granules, the system has integrated controls and can be used to develop a continuous granulation process.

Designed for fast and easy deployment in R&D labs, the ConsiGma™-1 is capable of running batches of a few hundred grams up to 5 kg (or more if necessary), with less than 10 g of product held up in the process and product losses of less than 80 g. With fast processing times, minimal retention times and inherent flexibility, it is ideal for developing formula and process parameters using DoE. The process parameters developed with ConsiGma™-1 can be directly transferred to the full-scale ConsiGma™-25 system.
ConsiGma™ Tablet Coater
Innovative tablet coating technology for continuous pharmaceutical production.

GEA has a market leading position in the development, realisation and commercialisation of advanced continuous manufacturing lines for oral solid dosage production based on its ConsiGma™ concept.

The ConsiGma™ coater from GEA is a revolutionary, new, high performance tablet coating technology that accurately deposits controlled amounts of coating materials on tablets — even if they are hygroscopic or friable. Designed specifically to be an integral part of the ConsiGma™ continuous high shear granulation, tableting and drying system, this groundbreaking machine is able to coat small quantities of tablets at very high rates, offering improved heat and mass transfer and using much less coating material than traditional technologies.

Presenting a paradigm shift in tablet coating, this new type of coater subjects tablets to a cascading tablet movement that enables greater fluid application rates (higher coating build-rates) than traditional coating pans. In addition, it is PAT-compatible, efficient — warm up and drying times are faster than conventional coaters — and reliable, delivering a consistent, homogenous and even tablet weight gain and coating distribution. And, because the coater operates at higher speeds and temperatures than other products on the market, higher spray rates and improved tablet mixing can be achieved, expanding its application potential to polymer coatings and beyond what is currently possible. It can even be used to dedust tablet cores prior to coating.

With more tablet movement within the coating barrel, the revolutionary design and the application of enhanced process conditions, the small-volume ConsiGma™ coater concentrates the tablet coating process, enabling faster throughput, time and cost savings, increased efficiency and a higher quality finished product, all of which are fundamental aspects of the drive towards continuous processing.

Designed to be an integral part of the ConsiGma™ line, the coater offers

- a twin wheel design to ensure continuous processing at rates of up to 25 kg/h
- a 7 minute total batch time for aesthetic coats (5.5 minutes of coating)
  - integrated dispensing hoppers with optional volume control
- exchangeable coating wheels offering two nominal batch sizes of 1.5 and 3.0 kg
- integrated liquid feed systems with peristaltic pumps and mass flow meters
  - an air-knife system to create the tablet cascade
- a wide range of tablet shape and weight capabilities
- inline coating thickness monitoring with the Kaiser Raman probe.
NICA™ Pellet Processing

The NICA™ pelletizing system is a unique modular concept comprising a mixer/granulator, extruder and spheronizer, which can be supplied as a complete integrated pellet production plant or as individually selected units to meet your specific process optimisation requirements.

For maximum operational flexibility, the modules can be operated in either batch or continuous mode, as standalone units or with other up- or downstream equipment — such as fluid bed processing systems. Ideal for both product development and full-scale production, scale-up is easy; it’s simply a factor of processing time.

NICA™ Extruder

Ideally suited for sensitive products that could be damaged by more intensive systems, the NICA™ Extruder is based on efficient, low-shear technology and is designed to minimise work input and temperature rise. A wide range of extrusion screen sizes and configurations are offered to optimise pellet diameter, surface quality and size distribution.

Used for both batch and continuous production, the NICA™ Extruder has no stagnant areas and no significant product hold-up. A compact design and small footprint facilitates installation and cleaning and, with a simple reconfiguration, formulations that require a high level of work input can be processed.

NICA™ Spheronizer

The Nica™ Spheronizer features a smooth-edged, close-fitting friction wheel for good sphericity and a tight size distribution. This patented design eliminates edge-milling problems and the undesirable fines that are associated with traditional technologies. Process optimisation is achieved by selecting the appropriate cycle time, wheel speed, product load and friction pattern, and regulating the airflow past the wheel periphery.

The NICA™ Spheronizer is fed directly by the NICA ™ Extruder and, for high volume applications, two batch spheronizers may be fed by a single continuous extruder. The versatile design is also easy to operate and clean.

<table>
<thead>
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<td>0.5–2.0 kg/min</td>
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<tr>
<td>Minimum Batch Size</td>
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<table>
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<tr>
<th>Spheronizing</th>
<th>S Connect</th>
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<th>S450</th>
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<tbody>
<tr>
<td>Typical Batch Range</td>
<td>50–250 g</td>
<td>200 g–1.0 kg</td>
<td>400 g–2.0 kg</td>
</tr>
</tbody>
</table>
Integrated Ease

Building on GEA’s renowned integrated granulation systems, NICA™ is available as five fully equipped pelletization systems.

Based on the groundbreaking PharmaConnect™ technology, the IPS5 is a true mini-production machine for product development. Providing batch capacities from less than 50 g, you can now formulate small quantities of rare or expensive materials and test them with equipment that mimics production-scale machinery.

For small pilot batches of 250 g to continuous production at more than 25 kg/h, the IPS25 can be combined with the E140 and S450 modules to form an integrated system. Operating in manual mode, the user controls the dosing of the extrudate into the spheronizer and the overall spheronization time. Once optimised, these timings are automated to ensure product consistency from the first to the final pellet.

Further complementing the IPS range, the IPS50 combines an E140 and two S450s to produce pellets at rates of up to 50 kg/h, and the IPS100 incorporates the E220 and S700 modules to provide production rates of up to 100 kg/h. Similarly, the 200 kg/h IPS200 combines the E220 extruder with two S700 spheronizers.
Featuring the innovative Exchangeable Die Disc (EDD), the PERFORMA™ P is a flexible tablet press for small- to medium-scale production.

The PERFORMA™ P benefits from an easily removable turret, including punches and dies, which can be replaced with a duplicate turret in less than 30 minutes. Alternatively, the turret removal arm can be used to lift out the upper punch guide, enabling the manual removal of the lightweight EDD holding the dies; a duplicate disc can then replace the EDD, with the entire exchange procedure taking less than 30 minutes.

The EDD offers additional benefits compared with an exchangeable turret:

• fast and easy format changeover: a duplicate EDD allows off-line fitting and locking of the dies in the die disc
• more economical alternative to the exchangeable turret: only the die disc needs to be duplicated instead of the entire turret.

In addition to the exchangeable turret and the EDD, the PERFORMA™ P features a swivelling tablet chute for fast turret removal and ejection set-up. And, an optional easy-to-install kit enables the effortless conversion of the PERFORMA™ P from single-layer to bilayer machine.

The PERFORMA™ P is available with the latest process control developments:

• six different compression modes, including equal porosity tableting (EPT); EPT is the ideal compression method for novel solid dosage forms such as ODT and MUPS
• adjustable dwell time at pre-compression, for improved deaeration of the powder bed and optimal particle rearrangement prior to main compression.

The PERFORMA™ P is now available with an easy-to-install bilayer kit, which quickly transforms the standard machine into one capable of both single and bilayer production.
The small-scale MODUL™ P tablet press is the most versatile and powerful tablet compression machine for development and clinical trial production work.

Various tablet compression methods:
- the MODUL™ P has six different compression modes
- the equal porosity compression method is ideal for novel solid dosage forms, such as ODT, MUPS, etc.
- the force versus time compression profile is fully controllable and, once set up, is kept constant irrespective of machine speed.

Tooling type flexibility:
- the turret can be equipped with a customised and mixed number of D, B and BB punch positions
- the most common configuration for formulation development and research purposes is a turret with 10 B and 10 D punch positions; blank dies are supplied to seal off unused positions.

Special features for small powder quantities (down to 1 kg):
- special ‘low-volume’ powder feeder with slide-in wear plate to minimise powder loss
- the machine can work with just one punch
- dust extraction can be switched off.

Different Exchangeable Compression Modules (ECMs) can be used in the same machine with the same control system:
- C-ECM (contained ECM) for non-potent products
- WOL-ECM (Wash-off-Line ECM) for potent/toxic products
- BL-ECM (bilayer ECM) for bilayer tablet production (up to 100,000 tablets/h).

All ECMs offer unmatched operator protection and extremely fast product changeover.

The highly sophisticated DAAS (Data Acquisition and Analysis System) measures and samples the following signals at high frequency:
- pre-compression force
- main compression force
- ejection force (optional)
- pre-compression displacement
- main compression displacement
- punch stroke (optional)

A large number of advanced signal analysis functionalities are included, such as automatic calculation of the compression energy exerted on and absorbed by the tablets, and Heckel plots.
**Contained Product Transfer**

**MC Valve for rigid transport containers**

For more than 20 years, GEA has supplied dust- and contamination-free containment interfaces for the safe transfer of powders, particulates and tablets in the pharmaceutical industry.

These interfaces ensure both operator and product protection when charging and discharging highly potent APIs. The BUCK® MC Valve concept combines all the current requirements in high containment equipment:

- modular containment: with a 1–10 μg/m³ (STTWA) containment level offered as standard, the system is also available with an advanced air cleaning actuator to further improve containment levels down to <1 μg/m³ (STTWA)
- full GMP design
- robust centering
- free orientated docking
- tool-free quick release as standard.

The most innovative step, however, is the idea of using only identical half valves driven by a modular actuation ring.
Disposable Materials Handling

By combining the benefits of bags with split valve containment performance, Hicoflex® represents an industry first! Its simple yet effective design provides levels of containment that are normally associated with more expensive and complicated technologies.

Clear and flexible bags allow users to physically agitate product flow and visually confirm full product transfer. Providing 100% yield on material transfers without putting operator safety at risk, your equipment no longer needs to sit unused while the process areas are cleaned.

No More Cleaning Concerns

- Zero risk of cross-contamination
- No expensive wash media or detergent needed
- No effluent treatment required
- No expensive swab testing
- Keep your operators free to do their jobs.

Disposable containment enables your operators to perform the jobs they should be doing, not changing in and out of air suits, not washing small containers and not waiting for cleaning validation.

Safer, flexible and more cost-effective, Hicoflex® gives you the power to work more effectively and efficiently — by reducing overheads and running costs while improving yield and output, and getting product to market faster.

Hicoflex® products

**Hicoflex® Charge Bag**

- Fully contained powder transfer bag for contamination-free charge/discharge of hazardous materials.
- Available sizes: 1, 5, 10, 15, 25, 50 L

**Hicoflex® Adaptor**

- Process equipment adaptor that fits all Hicoflex® bags.
- Tri-clamp size: 2, 4, 6”

**Hicoflex® Spray Bag**

- Unit to rinse the internal surfaces of the adaptor before removal to ensure full operator protection.

**Hicoflex® Sample Bag**

- Fully contained sampling device for sampling the process through an adaptor or bulk material out of a Hicoflex® Charge Bag.

**Hicoflex® Charge Bag with Flush Connector**

- Hicoflex® Charge Bag with Flush Connector ensures a full yield discharge because of an internal rinsing device.
- Available sizes: 5, 10, 15, 25, 50L
GEA takes customer partnership and R&D to new levels at its Technology Centres. Offering a complete range of R&D and product testing services, customers can analyse and optimise existing processes, develop new procedures and perform pilot-scale production tests with any aqueous or solvent-based pharmaceutical product. Comparative process studies can also be done. Furthermore, our centres have full demonstration and training facilities, making GEA your obvious choice as a pharmaceutical process partner.

The GEA Technology Centre (GEA TC) in Bubendorf, Switzerland, helps pharmaceutical companies to scale-up and bring new products to market quickly and effectively. The Centre is equipped with a full range of GEA solid dosage batch process equipment, including contained materials handling, dispensing, blending and powder mixing, granulation and drying, extrusion, spheronization, pelletization, tablet production and coating.

Batch Processes
GEA benefits from unrivalled in-house experience with all commonly used wet granulation methods. Therefore, at the GEA Technology Centre, your material can be tested in a fluid bed spray granulator, top or bottom drive high shear granulator with fluid bed drying, in development, pilot-scale plant or small-scale production machinery, depending on your needs.

Product volumes from 20 g to 100 kg can be processed at any GEA Technology Centre.

Our Technology Centre staff are very experienced and dedicated people with a background in engineering, chemistry and pharmacy. They can answer any questions you might have regarding our equipment, facilities or processing capabilities.
The Process Development Centre (PDC) in Wommelgem, Belgium, plays a major role in the partnership between the customer and GEA. This fully equipped laboratory allows you to benefit from our years of experience in wet granulation, pelletizing and drying.

**Single Pot Processing**
R&D-scale equipment is available at the PDC for customers to test their own products and formulations. In addition, for interested parties who prefer to run trials in their own facilities, a number of mobile processors are available to rent. A full range of single pot processing options can be provided to meet your specific requirements.

**From Powder to Tablet**
The PDC has played a key part in developing the revolutionary new concept — ConsiGma™ — which integrates different tablet production techniques in a continuous manner, such as continuous high shear granulation or continuous blending for direct compression.

You can benefit from this innovation by running trials on the ConsiGma™ unit. ConsiGma™ is a wet granulation system for early process development. ConsiGma-25™ is a continuous wet granulation line with an integrated GEA Modul™ P for compression. The ConsiGma™-CDC is a direct compression system, integrating continuous blending and GEA compression technology.

**Analytical Tools**
As well as process equipment, a wide range of analytical equipment is available to characterise granulates and tablets. PAT tools can be fitted to all process equipment in the PDC for monitor critical quality attributes online.

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### High Shear Granulation

High Shear Granulation can be single process or combined with an integrated fluid bed dryer.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Scale</th>
<th>Average Batch Size</th>
<th>Fluid bed integration for drying</th>
</tr>
</thead>
<tbody>
<tr>
<td>UltimaGral™ 75</td>
<td>development/pilot</td>
<td>20 kg</td>
<td>Size 2 fluid bed</td>
</tr>
<tr>
<td>UltimaGral™ 300</td>
<td>pilot/small scale production</td>
<td>100 kg</td>
<td>Size 4/5 fluid bed</td>
</tr>
<tr>
<td>PharmaConnect™</td>
<td>development/pilot</td>
<td>0.2-20 kg</td>
<td>Size 2 fluid bed</td>
</tr>
<tr>
<td>PMA™ 300</td>
<td>small-scale production</td>
<td>100 kg</td>
<td>Size 4/5 fluid bed</td>
</tr>
</tbody>
</table>

### Fluid Bed Processing
Granulation, Drying Pelletizing and Coating.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Scale</th>
<th>Batch Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>STREA-1™</td>
<td>development</td>
<td>0.2-2 kg</td>
</tr>
<tr>
<td>MP-1™</td>
<td>development</td>
<td>0.2-6 kg</td>
</tr>
<tr>
<td>FlexStream™ size 2</td>
<td>development</td>
<td>1-30 kg</td>
</tr>
<tr>
<td>MP-2/3</td>
<td>pilot</td>
<td>1-30 kg</td>
</tr>
<tr>
<td>FlexStream™ size 4</td>
<td>small-scale production</td>
<td>30-100 kg</td>
</tr>
<tr>
<td>MP-4/5</td>
<td>small-scale production</td>
<td>30-100 kg</td>
</tr>
</tbody>
</table>

### NICA™ Pelletizing
Although more challenging to produce, pellets offer a lot of advantages compared with normal tablets.

*Equipment: NICA™ E140 & S450*

<table>
<thead>
<tr>
<th>Extrusion</th>
<th>E140</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Production Rate</td>
<td>0.5-2.0 kg/min</td>
</tr>
<tr>
<td>Minimum Batch Size</td>
<td>200 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spheronizing</th>
<th>S450</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Batch Range</td>
<td>400 g-2.0 kg</td>
</tr>
</tbody>
</table>

### Tablet Compression
For small-scale tablet production and formulation development, using the same press for R&D work means avoiding a lot of scale-up issues.

*Equipment: MODUL™ P: single and bilayer tableting.*
Process Analytical Technology

Process Intelligence

Optical methods such as UV/Vis-, NIR-, IR- or Raman spectroscopy are tried and tested technologies in many areas of the chemical, pharmaceutical and food industries, particularly for off-line applications. A significant drawback with the online use of these optical methods is the problem of “window fouling.” The observation window becomes covered with bulk solids, adhesive material and pulpy products, for example, and needs to be cleaned.

In response, GEA has developed the Lighthouse Probe™ in co-operation with J&M Analytik AG. The combination of GEA’s expertise in containment, automation and pharmaceutical processing and J&M’s expertise in optics has resulted in a robust and reliable probe with inline calibration and cleaning capabilities. The Lighthouse Probe™ is the only probe on the market that cleans its observation window online.

Thanks to its large observation area, the analysed sample volume is consistent with normal sampling volumes, providing a more stable measurement. The Lighthouse Probe™ has been adapted to fit the entire range of GEA machinery and comes with a manual version for R&D equipment, a mechanical window cleaning system for pilot plants and a fully automated version for production or high-containment systems.

The Lighthouse Probe™ is multipurpose and multifunctional:

• for moisture detection, the probe is configured with an NDC system to provide online LOD monitoring; the NDC moisture detection algorithm is both robust and precise, reducing calibration to the adjustment of two parameters and considerably decreasing the investment, installation and maintenance cost
• GEA recognises and respects the end-user’s choice of spectrometer and can modify the probe to work with various brands
• as real process understanding comes from combining different parameters, we also understand that online models need more than spectra; the Lighthouse Probe™ can be delivered and configured with the necessary software to make this possible.
Talk to us. We’re here to answer your questions.
We live our values.
Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 index.

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