



SYNTEGON

PROCESSING & PACKAGING

Pharma Solid. ▣

Mixing. Drying. Granulating. Coating.
Capsule Filling. Tablet Pressing.

5.800

employees

64.000

machines in the installed base

Count
on it.

30

locations

1.4 billion

euros annual sales

1.100

service specialists

1.700

patented inventions

Syntegon Technology is your reliable partner for process and packaging technology in the global pharmaceutical and food industries. Whether you are an aspiring start-up or a global market leader, we offer intelligent and sustainable solutions for everyone.

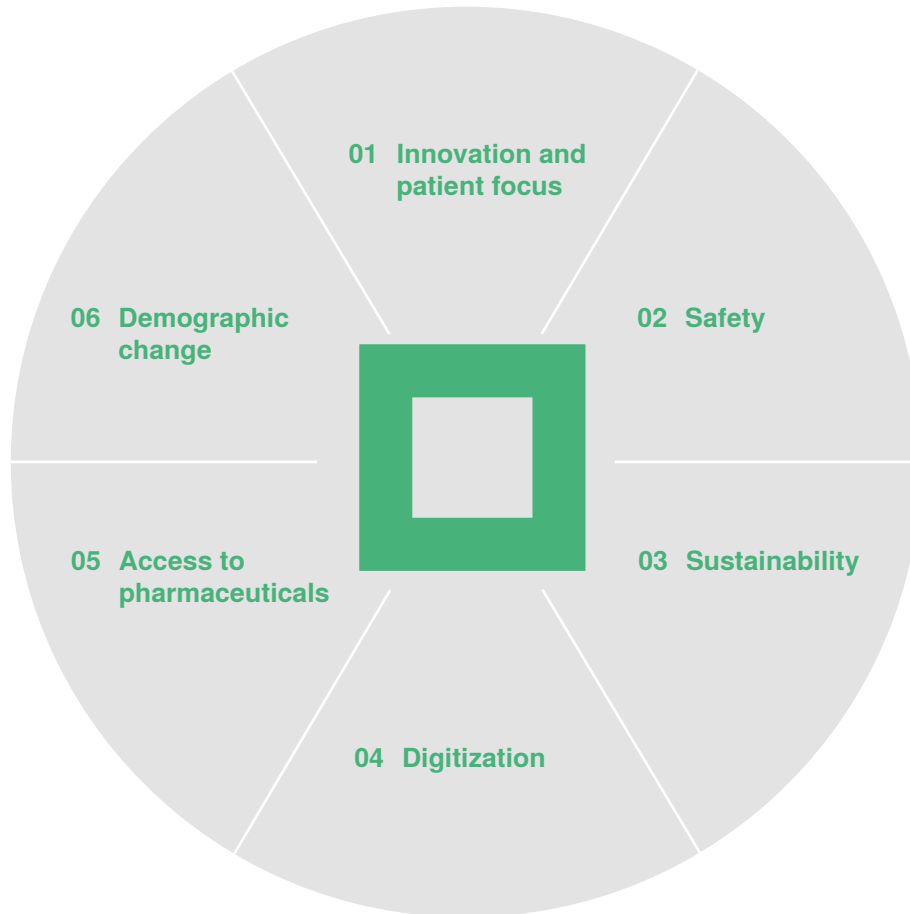
Individual machines, systems or services – as a full-service provider, we take responsibility right up to fully integrated end-to-end solutions. Fields of application in the pharmaceutical industry are the production, processing, filling, inspection and packaging of liquid and solid active ingredients in all common

packaging materials. In the food industry, we offer solutions for the primary and secondary packaging of dry, liquid and frozen food as well as process technology for the production of confectionery.

We are at your side from project planning, development and implementation to comprehensive digitization, qualification and validation services. In addition, you always have access to our worldwide network of service specialists who support you throughout the entire machine life cycle.

Global megatrends in the pharmaceutical industry

Global population is growing by 80 million people per year.



01



Change in development pipelines: faster cycles with more products and less blockbuster for smaller patient groups, higher demand for individualized medicines

02



Production of pharmaceuticals according to highest safety standards in a changing environment and increasing demands

03



Growing importance of efficient resource usage, decrease waste and spoilage

04



New therapies for chronic diseases, more patient data, I 4.0 solutions, digital protocols for batches

05



Rising demand for cost-effective medicines in an increasingly competitive environment

06



Increasing life expectancy, growing number of older people, higher demand for medication

Welcome to Pharma Solid

All processes and services from a single source

Pharma line competence for solid dosage forms

Drying, granulating
and pellet coating

Tablet
coating

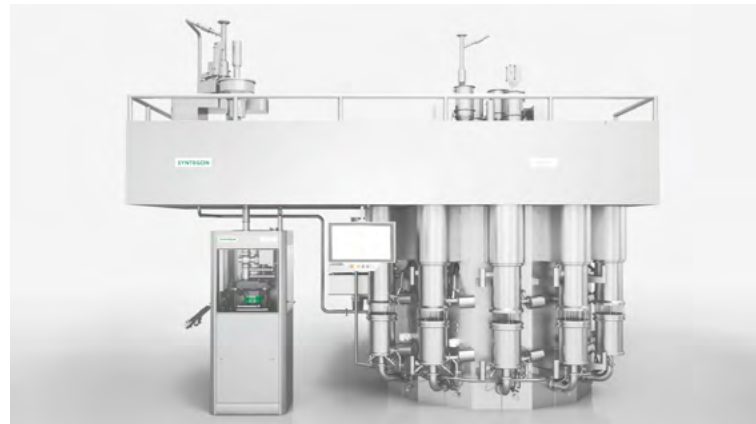


Capsule
filling

Tablet
compression

Continuous manufacturing

We provide Pharma Services in our four OSD Customer Centers in Wablingen (Germany), Schopfheim (Germany), Hangzhou (China) and Minneapolis (USA) as well as in partner labs around the world. Our services amongst others include hands-on technology, product characterization support, drug and process development, process optimization and trainings.



Mixing, drying and granulating

High-shear mixer granulator technology

- Hüttlin high-shear mixer technology is available with either top or bottom drive granulators
- Batches up 720 kg at a density of 0.5 kg/l
- The innovative Gentlewing agitator offers the flexibility to use 20 - 80 % of the gross volume and minimizes the residues
- A metal filter offers high safety during charging
- Purged shaft seals and an inflatable seal at the lead guarantee a closed process
- The load of the wet mill adjusts the speed of the impeller and enables a maximum discharge without blockage of the mill
- The high-shear mixer can also be equipped with a standard 3-blade agitator
- For special products as effervescent, e.g., Single Pot versions are available



HTG
Hüttlin top drive granulator

HBG

Hüttlin bottom drive granulator



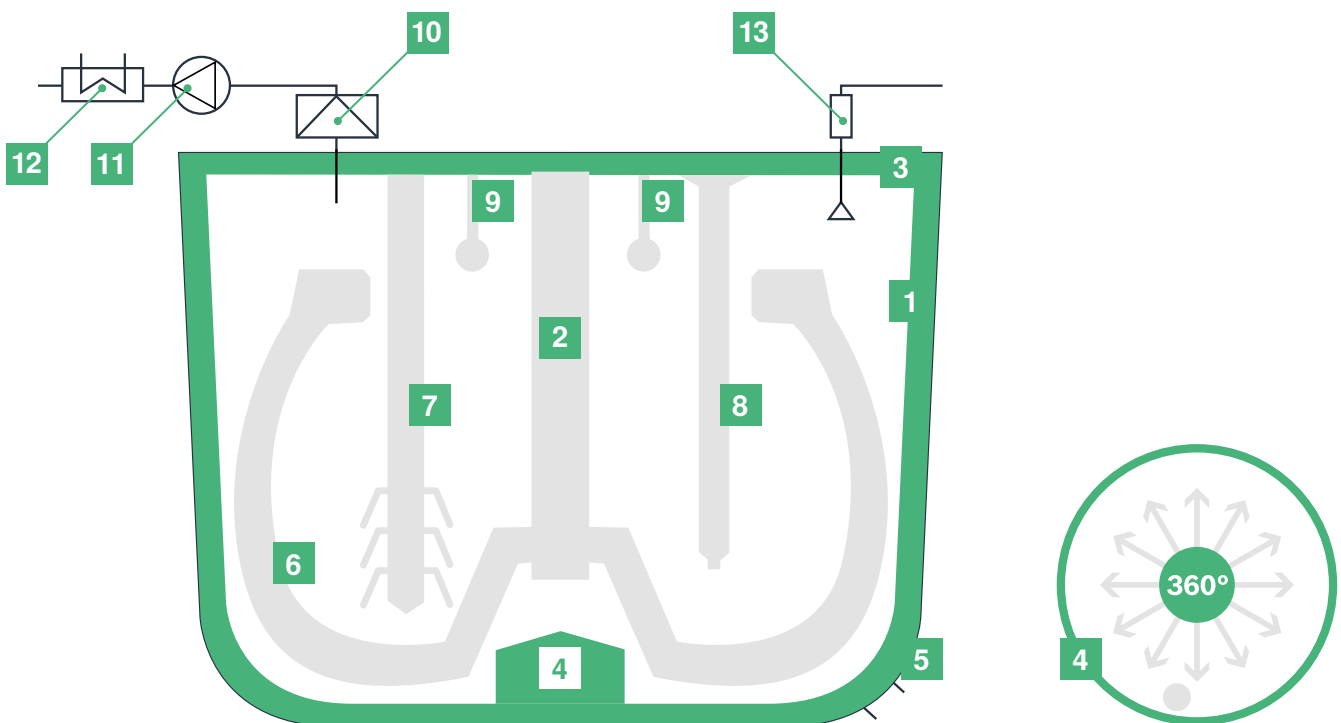
Mixing, drying and granulating

High-shear mixer Single Pot

The Single Pot version of the Hüttlin high-shear mixer granulator combines all of the benefits of the top drive concept with the specific features as e.g SmartFlow, heating jacket, product temperature regulation and vacuum drying with solvent recovery.



- 1 Heated product container
- 2 Heated impeller shaft
- 3 Heated lid
- 4 SmartFlow, 360° strip gas feeding
- 5 Discharge valve
- 6 Gentlewing
- 7 Chopper
- 8 Temperature measurement
- 9 Cleaning nozzles
- 10 Filter
- 11 Vacuum pump
- 12 Condensation unit
- 13 Video camera



Drying, granulating and pellet coating



HD
Hüttlin Dryer

HDG
Hüttlin Dryer Granulator

HDGC
Hüttlin Dryer Granulator Coater

- ❑ The Hüttlin fluid bed technology provides drying, granulating and coating in one product container for batch sizes of up to more than 1,600 kg
- ❑ Unique air distribution plate Diskjet guarantees very efficient mixing and drying due to a high velocity of process air
- ❑ Hüttlin bottom-spray system reduces process times significantly
- ❑ 3-component nozzles ensure long operation times without interruption, as the tip of the nozzels are protected by Microclimate
- ❑ Process filter system operates with a sequential blow back
- ❑ Ultra Clean metal filters available
- ❑ Pressure shock resistant design is standard
- ❑ Scale-up software NexStep ensures a successful scale-up

R&D equipment

Mycromix

- ❑ This table-top device can be equipped with interchangeable bowls from 0.5 to 10 l
- ❑ Each of the bottom driven bowls is equipped with our unique Gentlewing agitator
- ❑ Vertical chopper is inserted into the lid
- ❑ The Mycromix can be upgraded for the use of organic solvents
- ❑ All process parameters can be set by the integrated HMI



Solidlab 1

- ❑ The table top unit Solidlab 1 can be equipped either with a fluid bed, or a drum coater process module
- ❑ Based on two exchangeable drum sizes, the Solidlab 1 drum coater processes batch sizes from 0.2 to 1.2 kg
- ❑ The fluid bed module can be equipped with two different product containers for batches from 0.05 to 1 kg
- ❑ The common control system for fluid bed and drum coater facilitates the work significantly
- ❑ This unit supports you in developing your products and in examining your recipes. All important parameters and results are recorded by software. This makes the Solidlab 1 the ideal solution for your feasibility studies



Solidlab 2

- ❑ The Solidlab 2 Plus is the only fluid bed solution available on the market for the development of both batch and continuous manufacturing processes
- ❑ Fast scale-up from lab to batch-production volume without intermediate steps
- ❑ Combined with the feeder-blender-unit the Solidlab 2 Plus becomes the Xelum R&D for continuous manufacturing – no scale-up required (see page 18)
- ❑ The fluid bed module can process up to 12 kg and minimal 250 g (density 0.5 kg/l)
- ❑ Containment and automated cleaning for operator safety
- ❑ The Solidlab 2 technology allows either the use of a fluid bed or a drum coater module which share one air handling and control system
- ❑ The Solidlab 2 drum coater module is equipped with exchangeable drums and handles batch sizes from 0.8 to 12.8 kg (density 0.8 kg/l)



R&D equipment

FlexiTab XL*

Single punch tablet press

Capable of manufacturing single, two and three layer tablets for R&D and clinical trial materials (operation non GMP or GMP compliant)

Output

- 1 Layer: 900 tablets/h
- 2 Layer: 600 tablets/h
- 3 Layer: 300 tablets/h

Flexibility

Different modes of operation allow the formulation development scientists to manually or automatically sequence tablet production

Product development

Single punch machine that enables the initial screening of powders and granules for subsequent product development

Standard punches and dies

Ability to use standard TSM/Euro B/D punches and dies



* In cooperation with Röltgen, Germany

GKF 60

New R&D capsule filling machine

Platform with highest flexibility and various operator protection concepts (containment) and a clear focus on PAT and QC technologies

Flexibility

Three individual dosages possible (fixed dose combinations)

PAT Technology

Gravimetric 100 % net weighing of each dosed component

Cabin options

- OEB 4 containment with open aperture and air exhaust (no gloves, air exhaust unit with H14 filter installed separately)
- OEB5 with gloves and controlled/monitored vacuum

Small foot print

- (approx. W 1.0 m x D 0.9 m x H 1.9 m)
Fully automatic capsule handling, up to 60 capsules/minute

Cleaning

Wetting (OEB 4) or WIP (OEB 5), focus on avoidance of cross contamination



Containment solutions

Containment is all about the safety of the operator. Only a combination of modern and highly efficient systems with automated cleaning and proven processes form the basis for successful containment.

OEL	Toxicity Characteristics	OEB	CAT.
< 0.1 µg/m³	Extremely high pharmacological and toxic effects	6	G 5
0.1 – 1 µg/m³	Very high pharmacological and toxic effects	5	G 4
1 – 10 µg/m³	High pharmacological and toxic effects	4	G 3b
10 – 100 µg/m³	Medium pharmacological and toxic effects	3	G 3a
100 – 1000 µg/m³	Low pharmacological and toxic effects	2	G 2
1000 – 5000 µg/m³	Very low pharmacological and toxic effects	1	G 1

AI depends on the limit value

By means of NOEL (No Observed Effect Level) and the required safety factors, the Occupational Exposure Limit (OEL) can be determined in micrograms per cubic meter for active substances. The OEL is the time-weighted average concentration of a substance in the air at the workplace at which no acute or chronic damage to the health of employees is to be expected.



The path to safe containment

- ❑ Modular system with different technical containment solutions, e.g. split valves and safe change filters
- ❑ Right selection to completely fulfill the containment requirements
- ❑ Assessment of real operator intake (ROI) in consideration of API, dilution and volatility
- ❑ Perfect balance from a safety and economic point of view

Compliance with the limit values

- ❑ SMEPAC test during SAT
- ❑ According to *ISPE Assessing the Particulate Containment Performance of Pharmaceutical Equipment*
- ❑ Operator training
- ❑ Regular maintenance ensures the compliance with limit values

Capsule dosing and tablet compression



Capsule dosing

- ❑ Capsule filling machines for powder, pellets, (micro-) tablets, liquids and combination fillings
- ❑ Manufacturing quality control through the capacitive sensor NWDS (Net Weight Detection System), PAT Classic (Process Analytical Technology) and counting systems for tablets
- ❑ Modular and flexible machine design
- ❑ Integrated IPC control system (gravimetric scale)
- ❑ Automatic high-precision capsule checkweighing
- ❑ Various operator protection concepts (up to OEB 5)



Tablet compression

- ❑ Modular 2 or 3 paddle feeder for various powder characteristics facilitates perfect powder distribution
- ❑ Data Acquisition System (DAQ) available to see pre-compression, main compression, punch tightness, ejection force and punch displacement
- ❑ Integrated die plate (higher capacity, improved yields, faster cleaning)
- ❑ Counting (number of tablets)
- ❑ WHT (weight, hardness, thickness)
- ❑ Same compression roller diameter and same software package on all TPRs guarantee a safe scale-up
- ❑ Robust design with a closed rigid compression frame and cast iron body
- ❑ 120° accessibility due to swing open compression rolls



Capsule dosing

GKF 702

Low speed capsule filling machine

Lab applications, clinical trial materials and scale-up to small batch production.

Output:

Powder/pellets 3,000 - 42,000 caps/h
Liquid up to 35,000 caps/h



GKF 720

Low speed capsule filling machine

Compact and highly flexible platform for R&D and small batch production. State-of-the-art PAT technologies and Automated Process Development based on DoE.

Output:

Powder/pellets 3,000 - 43,500 caps/h
Liquid up to 35,000 caps/h



GKF 1400

Medium speed capsule filling machine

Compact and flexible platform for medium batch production.

Output:

Powder/pellets up to 84,000 caps/h
Liquid up to 70,000 caps/h



GKF 2500

High performance capsule filling machine

Compact and flexible platform for medium and large batch production.

Output:

Powder/pellets up to 150,000 caps/h
Liquid up to 120,000 caps/h



Capsule dosing



GKF 2600

High speed capsule filling machine

Compact and highly flexible platform for medium and large batch production. Versatile dosing technologies, quality control and state-of-the-art PAT technologies.

Output:

Powder/pellets up to 150,000 caps/h

Liquid up to 120,000 caps/h



GKF Containment Series

High level operator protection and washable containment for products up to OEB 5

GKF 720 ProTect (OEB 4) | GKF 2600 ProTect (OEB 4)

GKF 1700 HiProTect (OEB 5) | GKF 720 HiProTect (OEB 5)



Capsylon Series

GKF technology “design to cost”

Ideal for the capsule filling of health and nutrition products.

GKF 705 Output up to 42,000 caps/h

GKF 1505 Output up to 92,400 caps/h

GKF 3005 Output up to 176,400 caps/h



KKE

Syntegon capsule checkweigher

Ideal for the high-precision capsule checkweighing.

KKE 1700 Output up to 103,200 caps/h

KKE 2500 Output up to 154,800 caps/h

KKE 3800 Output up to 232,000 caps/h

Tablet compression

From formulation development to small batch manufacturing

TPR 200

Highly efficient tablet press

Compact and economic, ideal for pilot to mid-size production batches, for single or double layer tablets

- ❑ **Output:** Up to 230,400 tablets/h
- ❑ **Modularity:** Modular and interchangeable 2 or 3 paddle feeder with centrally or individually controlled paddle speeds together with a choice of rectangular or round paddle blades, simple and repeatable setup
- ❑ **Fast product changeovers:** The hygienic design with exchangeable turret offers increased flexibility of tablet sizes on the same machine
- ❑ **State-of-the-art:** Off the shelf Beckhoff control linked with our latest HMI operating software



TPR 200 Plus

New industrial machine design

Upgraded TPR 200 with new additional features, ideal for R&D, clinical and small/medium batch production, for single or double layer tablets

- ❑ **Output:** Up to 230,400 tablets/h
- ❑ **Containment:** Light Containment concept for operator protection up to OEB 3, with glove port access, dry cleaning possibility and turret design for external wash-down
- ❑ **Optimized media and electrical cabinet:** Clear separation of process connection and electrical components for better dust tightness
- ❑ **APD feeder for automated process development:** An automated systematic approach to find the most suitable production parameters in the formulation development of OSD forms (esp. tablets): to determine the optimal manufacturing parameters for a specific product, to ensure quality and minimize product loss.

Tablet compression

TPR 500

High productivity and quality tablet press

Medium to large production batches on a small footprint

- ❑ **Output:** Up to 403,200 tablets/h
- ❑ **Modularity:** Modular 2 or 3 paddle feeder with interchangeable paddles, extended filling length & drive options
- ❑ **Fast changeover:** Quick and simple turret removal with integrated crane system
- ❑ **Flexibility:** High flexibility with a precisely adjustable and modular powder feeding system
- ❑ **Usability:** Exceptional usability through intuitive HMI and state-of-the-art control (separate and movable or cantilevered attached to the TPR)
- ❑ **Hygienic design:** Outstanding hygienic design with two level production zone: easy access, less cleaning



TPR 700

Fully automated double sided tablet press

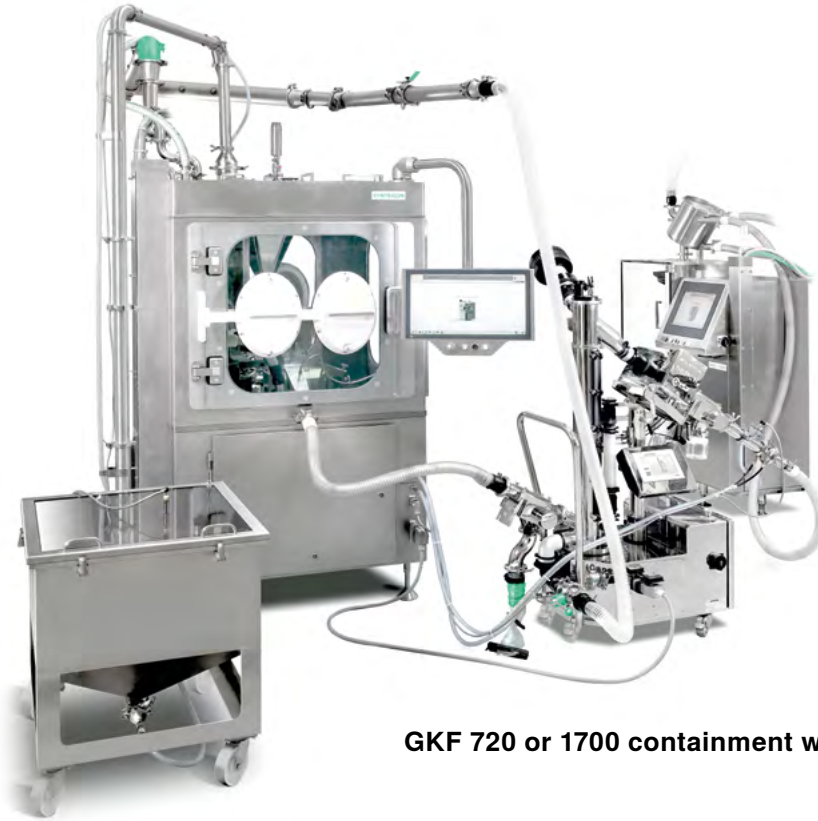
High volume output for single or double layer tablets

- ❑ **Output:** Up to 1,008,000 tablets/h (single layer tablet)
- ❑ **Modularity:** Modular 2 or 3 paddle feeder with interchangeable paddles
- ❑ **Fast changeover:** Quick and simple turret removal with integrated crane system
- ❑ **Diverse:** Suited for a wide range of compressible products including non-pharmaceutical materials
- ❑ **Usability:** Exceptional usability through intuitive HMI and state-of-the-art control (separate and moveable or embedded in GMP room)
- ❑ **Mobility:** Air cushion available for improved mobility of the press



Containment solutions

Capsule filling and tablet compression



GKF 720 or 1700 containment with peripheral equipment

High level operator protection and washable containment

- ❑ Equipment for handling products up to OEB 5 requirements
- ❑ Modular design provides dosing flexibility for specific applications (even fixed dose combinations)
- ❑ Automated cleaning system provides processes which can be validated
- ❑ Integrated gravimetric weighing for in process quality control, can be combined with an inbuilt 100 % net weight control or a separate 100 % cross-weight control
- ❑ Integrated gloves ensure best access for troubleshooting and cleaning
- ❑ Suction nozzle for manual pre-cleaning reduces amount of contaminated cleaning water
- ❑ Washing in Place (WIP)
- ❑ Air inlet filter HEPA H13/H14
- ❑ Special exhaust system with HEPA H13/H14 filter
- ❑ Safe exchange of filters and gloves
- ❑ Inflatable seals on machine doors
- ❑ RTP (Rapid Transfer Port) for tool and part transfer
- ❑ Sophisticated sampling strategy via gates



Tablet coating

Since Sepion is designed for closed charging, sampling and discharging, a containment upgrade for coating of tablets with highly potent active ingredients is facilitated.

An extended drum length provides a shallower tablet bed, but also space for an increased number of spray guns. The combination of both enables high spray rates and shorter process times.



- Flexibility in batch size varying from 10 % to 100 %
- Mixing uniformity in < 8 min
- Fast charging and discharging
- Automated spray arm adjustment with gun-to-bed distance measurement
- Short process times due to high spray rates and effective drying
- Very low RSD (Relative Standard Deviation) of applied coating
- Closed material handling
- Streamlined containment upgrade
- Completely 21 CFR Part 11 compliant
- Recipe controlled cleaning system
- Available in six sizes from 175 to 1,000 l

Xelum

Your shortest way to continuous manufacturing

In continuous manufacturing, the processes take place successively without interruption while the product is charged and discharged simultaneously. The main challenge is the precise dosing of the starting materials in a constant mass flow rate of milligrams per second. Syntegon has a different approach.

The Xelum platform doses active ingredients and excipients as discrete masses and not as a continual mass flow. The system doses, mixes and granulates individual packages, so-called X-keys, which continuously run through the process chain and are discharged successively as granules, tablets or capsules. This way, even smallest amounts of APIs of less than 1 % can be dosed precisely.

- ❑ Smart control strategy
- ❑ APIs of less than 1 % can be dosed precisely
- ❑ Granules with superior characteristics due to fluid bed granulation
- ❑ Unimodal particle size distribution
- ❑ No transfers of wet granules
- ❑ No scale-up, direct transfer of process parameters
- ❑ Software support for DoE
- ❑ Traceability based on X-key principle
- ❑ Minimized start-up and shut-down losses
- ❑ Good cleanability
- ❑ Production scale: nominal capacity 30 kg/h
- ❑ Xelum R&D: minimum amount of product 250 g, maximum rate 10 kg/h enables also pilot production



Xelum R&D consisting of the feeder-blender-unit and the Solidlab 2 Plus fluid bed



Xelum production unit

Innovative services tailored to your needs.

A comprehensive service portfolio lays the foundation for smooth production processes. We at Syntegon support you throughout the entire machine life cycle, from spare parts management to digital line optimization. Service agreements are a key element of our portfolio structure. We minimize production risks and maximize the efficiency of your equipment by working with you as equal partners.

Together, we tailor our solutions to your individual needs. You benefit from fixed conditions and guaranteed services.

Our global network of experts supports you with maintenance planning, technical support, and modernizations, as well as operator training and expert services. With our digital solutions, you gain control over your production processes and create transparency on product and machine data – anytime, anywhere. Whether it is switching to sustainable materials or upgrading to automated technologies, together with us you will take the next steps towards the factory of the future.

How can we help you? Please get in touch with us: www.syntegon.com/services



Connect with our team.



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