

# Granulation



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HSM 2000

# HIGH SHEAR MIXERS HSM X•ONE series

# HSM X•ONE series

An advanced series of high-shear mixer granulators that ensure faster processing and narrow particle-size distribution, while achieving content uniformity in the dry mix. The system is equipped with the ACG X•ONE command process control system and features the unique MOST™ safety concept.

### **Applications**

Wet granulation, mixing, hot-melt granulation



Features	Benefits
Unique product bowl geometry	Facilitates uniform mixing by maintaining a roping flow regime, and faster process stabilisation due to linear scalability features – ensuring optimum mixing efficiency
Available with a Z-shaped impeller and multi-blade chopper	Superior centrifugal force means significantly fewer dead zones and achieves uniform binder distribution for higher yield and optimal particle-size distribution
A 12-bar pressure shock-resistant system featuring the Maximum Operator Safety Technology (MOST) concept approved by FSA in Germany and compliant with ATEX (Directive 2014/34/EU)	No mechanical deformation caused by pressure-shock. Production can be resumed in the shortest possible time
	A far safer working environment, thanks to a non-vented, fully contained design
Multiple systems for charging, discharging and wash-in-place (WIP)	Efficient product handling and easy cleaning, which means higher yield
ACG's exclusive X•ONE command process control system	Compliant with ATEX (Directive 2014/34/EU), GAMP 5 and 21 CFR Part 11, this advanced technology allows intuitive, secure monitoring and control of the system

Model	Working volume	
LICH 450 V. ONE	Min	451
HSM 150 X•ONE	Max	1201
HSM 300 X•ONE	Min	901
HSWI 300 X*ONE	Max	2401
HSM 400 X•ONE	Min	1201
HSWI 400 A*ONE	Max	3201
HSM 600 X•ONE	Min	1801
HSWI GOO X-CIVE	Max	4801
HSM 800 X•ONE	Min	2401
TISWI BOO A GIVE	Max	6401
HSM 1200 X•ONE	Min	3601
HSM 1200 X•ONE	Max	9601

## HSM 2000 X•ONE

An advanced series of high-shear mixer granulators that ensure faster processing and narrow particle-size distribution, while achieving content uniformity in the dry mix. The system is equipped with the ACG X•ONE command process control system and features the unique MOST™ safety concept.

The HSM 2000 X•ONE is designed for large production batches and can be integrated fully into a granulation train or used as a standalone unit.

### **Applications**

Wet granulation, mixing, hot-melt granulation



Features	Benefits
Unique product bowl geometry	Facilitates uniform mixing by maintaining a roping flow regime, and faster process stabilisation due to linear scalability features – ensuring optimum mixing efficiency
Available with a Z-shaped impeller and multi-blade chopper	Superior centrifugal force means significantly fewer dead zones and achieves uniform binder distribution for higher yield and optimal particle-size distribution  Significant utility conservation due to the use of a single chopper
A 12-bar pressure shock-resistant system featuring the Maximum Operator Safety Technology (MOST) concept approved by FSA in Germany and compliant with ATEX (Directive 2014/34/EU)	No mechanical deformation caused by pressure-shock. Production can be resumed in the shortest possible time  A far safer working environment, thanks to a non-vented, fully contained design
Multiple systems for charging, discharging and wash-in-place (WIP)	Efficient product handling and easy washing  Ensures minimal contents remain in the bowl after discharging which means better yield
ACG's exclusive X•ONE command process control system	Compliant with ATEX (Directive 2014/34/EU), GAMP 5 and 21 CFR Part 11, this advanced technology allows intuitive, secure monitoring and control of the system

Working volume	Min	6001
Working volume	Мах	1,600l

# QUEST HSM II

QUEST HSM II supports innovation at R&D level, and is designed to help ensure cGMP compliance.

### **Applications**

Wet granulation, hot-melt granulation



### Features Benefits

12-bar pressure shock-resistant system featuring the Maximum Operator Safety Technology (MOST) concept approved by ATEX and certified by FSA	No mechanical deformation caused by pressure-shock  Production can be resumed in the shortest possible time  A far safer working environment, thanks to a non-vented, fully contained design
Available with Z-shaped impeller blades	Optimum flow of material in and out of the shear zone, by providing superior centrifugal force to the material in less process time
Standalone mobile plug-and-play system	Use wherever it's needed in the lab – quickly and easily
Laser-cut multi-blade straight chopper	Breaks down lumps formed during granule formation, avoids 'dead zones', and achieves uniform binder distribution
Interchangeable bowls (2l, 5l, and 10l)	Allows fully flexible batch sizes

	Bowl size	21	51	101
Working volume	Min	0.6l	1.5l	31
Working volume	Max	1.2l	31	61

Allows fully flexible batch sizes

# **QUEST HSM III**

QUEST HSM III enables greater innovation at R&D level, and is designed to help with cGMP compliance.

### **Applications**

Wet granulation, hot-melt granulation



Features	Benefits
A 12-bar pressure shock-resistant system featuring the Maximum Operator Safety Technology (MOST) concept approved by FSA in Germany and compliant with	No mechanical deformation caused by pressure-shock  Production can be resumed in the shortest possible
ATEX (Directive 2014/34/EU)	time
	A far safer working environment, thanks to a non-vented, fully contained design
ACG's exclusive X•ONE command process control system	Compliant with ATEX, GAMP 5 and 21 CFR Part 11, this advanced technology allows intuitive, secure monitoring and control
Available with Z-shaped impeller blades	Optimum flow of material in and out of the shear zone, by providing superior centrifugal force to the material in less process time
Standalone mobile plug-and-play system	Use wherever it's needed in the lab, quickly and easily
Laser-cut multi-blade straight chopper	Breaks down lumps formed during granule formation, avoids 'dead zones', and achieves uniform binder distribution

Interchangeable bowls (15l, 30l, and 65l)

	Bowl size	151	301	65I
Min Working volume	Min	4.51	91	19.5l
Working volume	Max	91	181	391

# **HIGH SHEAR MIXERS** HSM series

### **HSM** series

An integral part of the granulation train, ACG's High-Shear Mixer (HSM) is packed with innovative features and sets new standards of performance and adaptability in conventional processing equipment. Its advanced mixer/granulator technology guarantees efficient mixing, and ensures a high-quality end product.

With experience in handling over 1,000 formulations, our ACG Lab experts can help you with all aspects of process technology (including development, transfer, scale-up and optimisation) to achieve full efficiency and productivity.

#### **Applications**

Wet granulation, mixing, hot-melt granulation

and discharge

Features	Benefits
Ergonomic design of product bowl, with perfectly positioned access platform	Provides easy access to the machine and facilitates GMP compliance
Available with a Z-shaped impeller and multi-blade chopper	Superior centrifugal force avoids dead zones and achieves uniform binder distribution – thereby ensuring higher yield and optimal particle-size distribution
Multiple systems for charging and discharging, with a highly efficient vent air filtration system for wash-in-place (WIP)	Quick, dust-free transfer of raw materials, and easy washing
Integrated cleaning nozzles for product bowl	Makes cleaning much simpler

Model	Working volume	
11514 450	Min	451
HSM 150	Max	1201
HSM 300	Min	901
H2MI 200	Max	2401
HSM 400	Min	1201
ПЗИ 400	Max	3201
HSM 600	Min	180l
TISW 000	Max	4801
HSM 800	Min	2401
TISWI 600	Max	6401
HSM 1200	Min	3601
113101 1200	Max	9601

# **HSM 2000**

The HSM 2000 is designed for large production batches. You can integrate it with your granulation train, or use it as a standalone unit.

### **Applications**

Wet granulation, mixing, hot-melt granulation



**ACG** 14

Find this information on our website:

Machinery > Granulation > High shear mixers > HSM series

Features Ber
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Ergonomic design of product bowl, with perfectly positioned access platform	Provides easy access to the machine and facilitates GMP compliance
Available with a Z-shaped impeller and multi-blade chopper	Superior centrifugal force avoids dead zones and achieves uniform binder distribution – thereby ensuring higher yield and optimal particle-size distribution
Multiple systems for charging and discharging, with a highly efficient vent air filtration system for wash-in-place (WIP)	Quick, dust-free transfer of raw materials, and easy washing
Integrated cleaning nozzles for product bowl and discharge	Makes cleaning much simpler

		Top-spray granulation
Working volume	Min	6001
	Max	1,600l

# **FLUID BEDS** FBE X.ONE series

# FBE X•ONE series

The FBE X•ONE series is our most advanced range of fluid-bed systems. Developed at our Design Centre in Mülheim, Germany, it sets a new benchmark for performance, handling and operational safety. Offering excellent top-spray granulation and drying, it has already optimised the processing of over 1,800 formulations.

### **Applications**

Top-spray granulation, wet-mass drying, hot-melt granulation



Features	Benefits
A 12-bar pressure-shock-resistant system, featuring the Maximum Operator Safety Technology (MOST) concept approved by FSA Germany, and compliant with ATEX (Directive 2014/34/EU)	No mechanical deformation caused by pressure-shock  Production can be resumed in the shortest possible time
	Far safer for the environment, thanks to a non-vented, fully contained design
Unique C-flanges	Prevents the transfer of explosion pressure beyond the machine
X•ONE inflatable seals	Safety at low pressure (as low as 4.5 bar)
QASV (Quick Action Stop Valves)	Ensures explosion is contained within 20 milliseconds of detection
ACG's exclusive X•ONE command process control system	Compliant with ATEX (Directive 2014/34/EU), GAMP 5 and 21 CFR Part 11, this advanced technology allows intuitive, secure monitoring and control
Customised charging, discharging and wash-in-place (WIP) systems – available in standalone and granulation-train configurations	Makes processing of granules highly efficient, ensures safety, and reduces changeover times

Model	Working volume	Top-spray granulation/drying
FBE 125 X•ONE	Min	331
FBE 125 A*ONE	Max	168l
FRE 250 V.ONE	Min	751
FBE 250 X•ONE	Max	3681
FBE 500 X•ONE	Min	135
	Max	6081
FBE 800 X•ONE	Min	2201
	Max	8881
FBE 1300 X•ONE	Min	3451
	Max	1,344l
FBE 1800 X•ONE	Min	5251
	Max	1,956l

# **FLUID BEDS** FBE series

# FBE series

The FBE series is our highly acclaimed range of fluid-bed machines, and is synonymous with excellent performance. Featuring technologies for drying and top-spray granulation, it's a proven set-up for pharmaceutical and nutraceutical production.

### **Applications**

Top-spray granulation, wet-mass drying, hot-melt granulation



Features	Benefits
Precisely calculated and practically tested vent	Ensures operator and equipment safety in the event of pressure-shock
A state-of-the-art filter bag shaking system	Covers the largest possible filtration area and consumes far less compressed air compared with blowback filter systems  It's also easier to handle and achieves better cleaning
Customised charging, discharging and wash-in-place (WIP) systems available in standalone and granulation-train configurations	Quick and easy formulation processing
21 CFR part 11-compliant PC control system	A regulatory-compliant, audit-friendly system

Model	Working volume	Top-spray granulation
	Min	28.51
FBE 125	Max	1601
FBE 250	Min	701
PDE 250	Max	3441
FBE 500	Min	1301
	Max	6001
FBE 800	Min	2251
FBL 800	Max	8961
FBE 1300	Min	3351
1 51 1300	Мах	1,288l

# FLUID BED COMBOS FBC X.ONE series

## FBC X•ONE series

Supreme safety with ultimate versatility – that's what you get with the FBC X•ONE series developed at our Design Centre in Mülheim, Germany. While you can use it for diverse applications, including drying, top-spray granulation and Wurster coating, its cutting-edge design and features don't compromise process or operator safety. In short, you get the very best outcomes and unbeatable protection.

### **Applications**

Top-spray granulation, wet-mass drying, hot-melt granulation, tangential spray granulation, Wurster coating



Features	Benefits
The 12-bar pressure shock-resistant system features the Maximum Operator Safety Technology (MOST) concept	No mechanical deformation caused by pressure-shock
approved by the FSA and compliant with ATEX (Directive 2014/34/EU)	Production can be resumed in the shortest possible time
	Far safer for the environment, thanks to a non-vented, fully contained design
Unique C-flanges	Prevents the transfer of explosion pressure beyond the machine
X•ONE inflatable seals	Safety at low pressure (as low as 4.5 bar)
QASV (Quick Action Stop Valves)	Ensures explosion is contained within 20 milliseconds of detection
Customised charging, discharging and wash-in-place (WIP) systems available in standalone and granulation-train configurations	Makes processing of granules and pellets highly efficient, while ensuring safety and achieving faster changeovers
ACG's exclusive X•ONE command process control system	Compliant with ATEX (Directive 2014/34/EU), GAMP 5 and 21 CFR Part 11, this advanced technology allows intuitive, secure monitoring and control
Patented nozzles developed with Düsen-Schlick GmbH, Germany exclusively for ACG	Enhanced productivity, and simplified operation and cleaning

Model	Working volume	Top-spray granulation	Wurster coating
EDC 425 V.ONE	Min		91
FBC 125 X•ONE	Max	1681	801
FDC 2F0 V.ONF	Min	751	231
FBC 250 X•ONE	Max	3681	1701
FBC 500 X•ONE	Min	1351	401
FBC 500 X*ONE	Max	6081	3651
FBC 800 X•ONE	Min	2201	851
PBC 800 A*ONE	Max	8881	5901
FBC 1300 X•ONE	Min	3451	1301
PBC 1300 A*ONE	Max	1344l	8351
	Min	5251	1801
FBC 1800 X•ONE	Max	1,956l	1,185

# QUEST FB II X•ONE

Combining great design with ergonomics, QUEST FB II X•ONE is a safe, versatile lab machine with multiple applications. Its capability and performance across drying, granulation, Wurster coating and rotor granulation cover the full range of R&D-scale studies.

### **Applications**

Drying, wet granulation, Wurster coating and rotor granulation



Features	Benefits
12-bar pressure shock resistant system featuring the Maximum Operator Safety Technology (MOST) concept approved by ATEX and certified by FSA	No mechanical deformation caused by pressure-shock  Far safer for the environment, thanks to a non-vented, fully contained design
Swivel filter housing	A versatile and portable system for drying, single-pot granulation and Wurster coating  Quick and easy to install and use anywhere in your lab. A single system for diverse applications
Unique filter change system	Reduces dust emissions to a minimum, and ensures operators' safety and ease of use
Slide-in/slide-out process inserts	Easy charging and discharging
Four process inserts	Handle varied batch sizes and multiple applications (drying, granulation, Wurster coating and rotor granulation) with greater operational flexibility

		Top-spray granulation			
	Bowl size	31	61	91	121
Working	Min	0.61	1.2l	1.81	2.41
volume	Max	31	61	91	121

		Wurster coating		
	Bowl size	31	61	91
Working volume	Min	0.61	1.21	1.8l
volume	Max	21	41	81

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# QUEST FB III X•ONE

A strong foundation for scale-up and design of experiments (DoE) studies, our QUEST FB III X•ONE is a versatile, intermediate-scale fluid-bed system featuring all aspects of typical commercial-scale equipment. This means you can establish process parameters quickly and accurately, and be confident scaling up your batches. QUEST FB III X•ONE also provides multiple applications, including drying, top-spray granulation and Wurster coating.



Features	Benefits
A 12-bar pressure shock resistant system featuring the Maximum Operator Safety Technology (MOST) concept approved by ATEX and certified by FSA	No mechanical deformation caused by pressure-shock  Far safer for the environment, thanks to a non-vented, fully contained design
Unique C-flanged X•ONE inflatable seals	12-bar-rated inflatable seals feature machined C-flanges that ensure safety at pressures as low as 4.5 bar  Lower operating costs and significantly longer lifespan
State-of-the-art twin-filter bag-shaking system	Most efficient way of removing sticky materials which prevents filter choking, thereby improving overall filter performance  Enhances yield significantly while maintaining lower compressed air consumption
ACG's exclusive X•ONE command process control system	Compliant with ATEX, GAMP 5 and 21 CFR Part 11, this advanced technology allows intuitive, secure monitoring and control
Fully integrated multi-function column	Reduced maintenance downtime and operational costs  The smart open-profile column has removable covers for swift and simple access to integrated peripherals, while a linear drive makes raising and lowering the exhaust air filter far easier  The control panel and keyboard are adjustable to operator preference

Enaturos

		Top-spray granulation	Wurster coating
Working volume	Min	12	51
	Max	551	251

# FLUID BED COMBOS FBC series

# FBC series

Our versatile FBC expands your process efficiency exponentially. With your need for flexible operations in mind, we designed our combo series to feature top-spray and Wurster coating technology in one innovative machine. It's a proven boost for the pharmaceutical and nutraceutical industries.

### **Applications**

Top-spray granulation, wet-mass drying, hot-melt granulation, tangential spray granulation, Wurster coating



Features	Benefits
Precisely calculated and tested vent	Ensures operator and equipment safety in the event of pressure shock
The state-of-the-art twin-chamber filter bag shaking system	Helps achieve continuous fluidisation via the largest possible filtration area. Meanwhile, it consumes far less compressed air compared with blowback filter systems. It's also easier to handle and achieves better cleaning results
Product container with multiple air-distribution plates	Choose the air distribution that best suits your product
Customised charging, discharging and wash-in-place (WIP) systems available in standalone and granulation-train configurations	Efficient formulation processing and easy washing

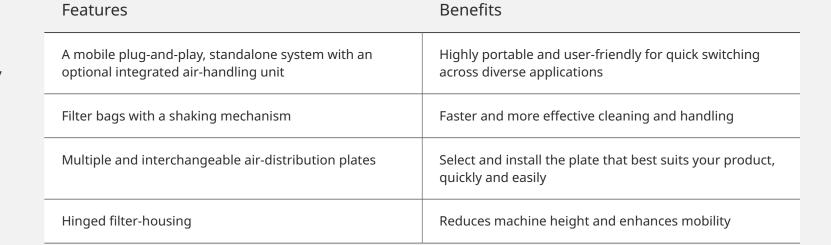
Model	Working volume	Top-spray granulation	Wurster coating
	Min	28.51	71
FBE 125C	Max	1601	801
FBE 250C	Min	701	231
FBE 250C	Max	3441	1701
FBE 500C	Min	1301	401
	Max	6001	3651
FBE 800C	Min	2251	851
	Max	8961	5901
FBE 1300C	Min	3351	1301
	Max	1,288l	8351
FBE 1800C	Min	5251	1801
	Max	1,388I	9001

# GPCG 1.1

One of the workhorses in its performance class for feasibility and scale-up studies, the remarkably versatile GPCG 1.1 has all the features of a production-scale machine. Its capabilities include drying, granulation, particle/pellet coating, dry-powder layering, spray agglomeration and hot-melt coating – plus granulation and tangential coating.

### **Applications**

Top-spray granulation, wet-mass drying, hot-melt granulation, tangential spray granulation, Wurster coating



		Top-spray granulation	Wurster coating	RGPCG
Working volume	Min	1.4l	0.51	1.51
	Max	4.71	2.41	41

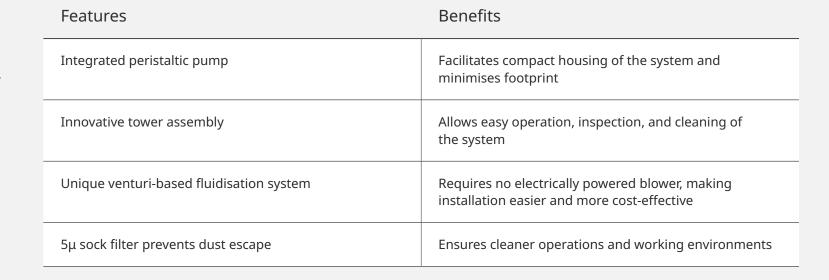


# MINIQUEST F

This unique tabletop granulation system is designed specifically for academic settings, and can handle batch sizes as small as 50g. Featuring a nozzle from Düsen-Schlick GmbH, Germany, this versatile multitasking system is ideal for drying, granulation and Wurster coating.

#### **Applications**

Top-spray granulation, wet-mass drying, hot-melt granulation, tangential spray granulation, Wurster coating



		Top-spray granulation	Wurster coating
Working volume	Min	225ml	40ml
	Max	750ml	200ml



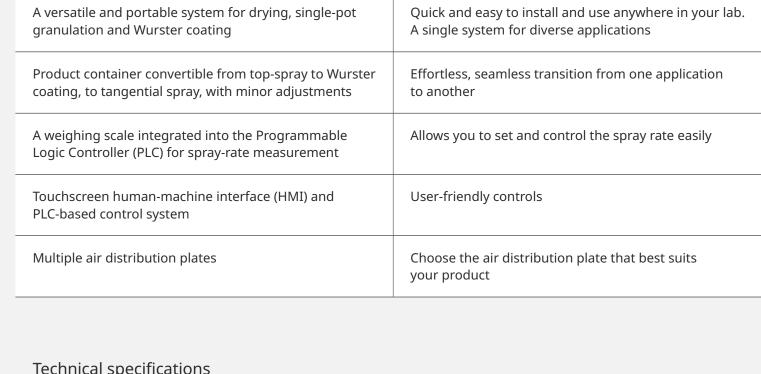
Benefits

# **QUEST FB**

QUEST FB is a highly versatile 'plug and play' fluid-bed unit for lab-scale feasibility studies, featuring a single retrofittable container for top-spray and Wurster coating applications. Its ease of use and adaptability make it ideal for R&D scientists.

### **Applications**

Top-spray granulation, wet-mass drying, hot-melt granulation, tangential spray granulation, Wurster coating



### Technical specifications

Features

		Top-spray granulation	Wurster coating
Working volume	Min	0.91	0.3l
	Max	31	1.5l



# **GRANULATION TRAINS**

# **GT** series

ACG's integrated granulation train (GT) series combines an advanced high-shear mixer (HSM) and fluid-bed (FBE/FBC) system designed in Germany. It takes manufacturing efficiency to the next level, and allows safe single-handed operation. So it not only achieves a highly efficient, dust-free wet granulation process, but also provides a cost-effective closed-loop design.



Features	Benefits
Contained product-handling supported by a vacuum charging system	A GT series with closed-loop product transfer for safe and smooth material flow  Ensures minimum product leftover. Granule sizing is far easier, with mill equipment integrated into the system
Compact machine footprint	Reduces floorspace requirements by around 50%
Through-the-wall construction	Allows clear separation between processing and technical areas, ensuring easier maintenance, cleaning and operation
Multiple systems for charging, discharging and wash-in-place (WIP)	Efficient processing of formulation and easy washing. Vastly reduces dust generation and product exposure, and reduces manual intervention significantly, thereby making GMP compliance far easier
A wide variety of combination options for HSM and FBE	Easily customisable to a wide range of product and process requirements

## **GT X•ONE series**

The GT X•ONE series is ACG's answer to the long-standing call for greater efficiency and reassurance throughout the granulation line. Combining the best of our high-shear mixer (HSM X•ONE) and fluid-bed equipment (FBE X•ONE/FBC X•ONE), GT X•ONE makes granulation more adaptable and seamless – and enhances aesthetics, safety and output.

Designed at our Design Centre in Mülheim, Germany, it's literally a shining example of how collaboration and applied insight can ensure less waste and downtime, while improving product consistency and quality... all in one highly advanced and ergonomically informed user experience.



Features	Benefits
A 12-bar pressure shock-resistant system featuring the Maximum Operator Safety Technology (MOST) concept approved by FSA in Germany and compliant with ATEX (Directive 2014/34/EU)	No mechanical deformation caused by pressure-shock. Production can be resumed in the shortest possible time. A far safer working environment, thanks to a non-vented, fully contained design
Unique C-flanges, X•ONE inflatable seals, and Quick Action Stop Valves (QASV)	Our unique seals have a longer lifespan due to significantly reduced operating pressures. Ensures safety at pressures as low as 4.5 bar
Compact machine footprint	Reduces floorspace requirements by around 50%
Through-the-wall construction	Allows clear separation between processing and technical areas, ensuring easier maintenance, cleaning and operation
Enclosed product handling, such as gravity charging or vacuum charging systems, that can be customised to suit user requirements	GT X•ONE ensures closed product-transfer points with safe and smooth material flow, and thereby reduces product leftovers. For example, a vacuum charging system provides closed-loop material transfer, and so vastly reduces dust generation and product exposure – and reduces the need for manual intervention, which makes GMP compliance far more straightforward
Superior wash-in-place (WIP) capability	Eliminates dead spots and deals effortlessly with crevices, sharp surfaces and difficult-to-access points. Ensures easy washing and quick changeover
ACG's exclusive X•ONE command process control system	Compliant with ATEX (Directive 2014/34/EU), GAMP 5 and 21 CFR Part 11, this advanced technology allows intuitive, secure monitoring and control of the system

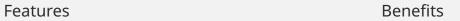
# **SPECIAL ATTACHMENTS**

# R series (rotor attachments)

The R series rotor insert is the latest innovation in ACG's fluid-bed machines. Combining different processes into a single container facilitates a wide range of applications, including pelletisation, dry-powder layering, rotor granulation/suspension coating, and spherical granulation. Ultimately, this means perfect-shaped pellets and high-density granules with narrow particle-size distribution. All this is backed by extensive process and optimisation support from our experts, who have collective experience and expertise in handling over 1,000 formulations.

#### **Applications**

Spheronisation/pelletisation, powder layering, and solution and suspension coating



Plug-and-play versatility, with interchangeable inserts retrofittable to existing fluid-bed machines	Access to cutting-edge technology without additional investment or floor space
Highly accurate powder dosing system for a wide range of applications	Highly efficient, controlled powder-dosing system
Rotor discs for the full range of applications	Enables spheronisation and drug layering
Integrates easily with a wide variety of powder feeders	Offers flexibility and is suitable for multiple applications

		R125	R250	R500	GPCG 1.1	R II
Working	Min	151	301	451	451	21
Working volume	Max	501	1001	150l	41	61





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