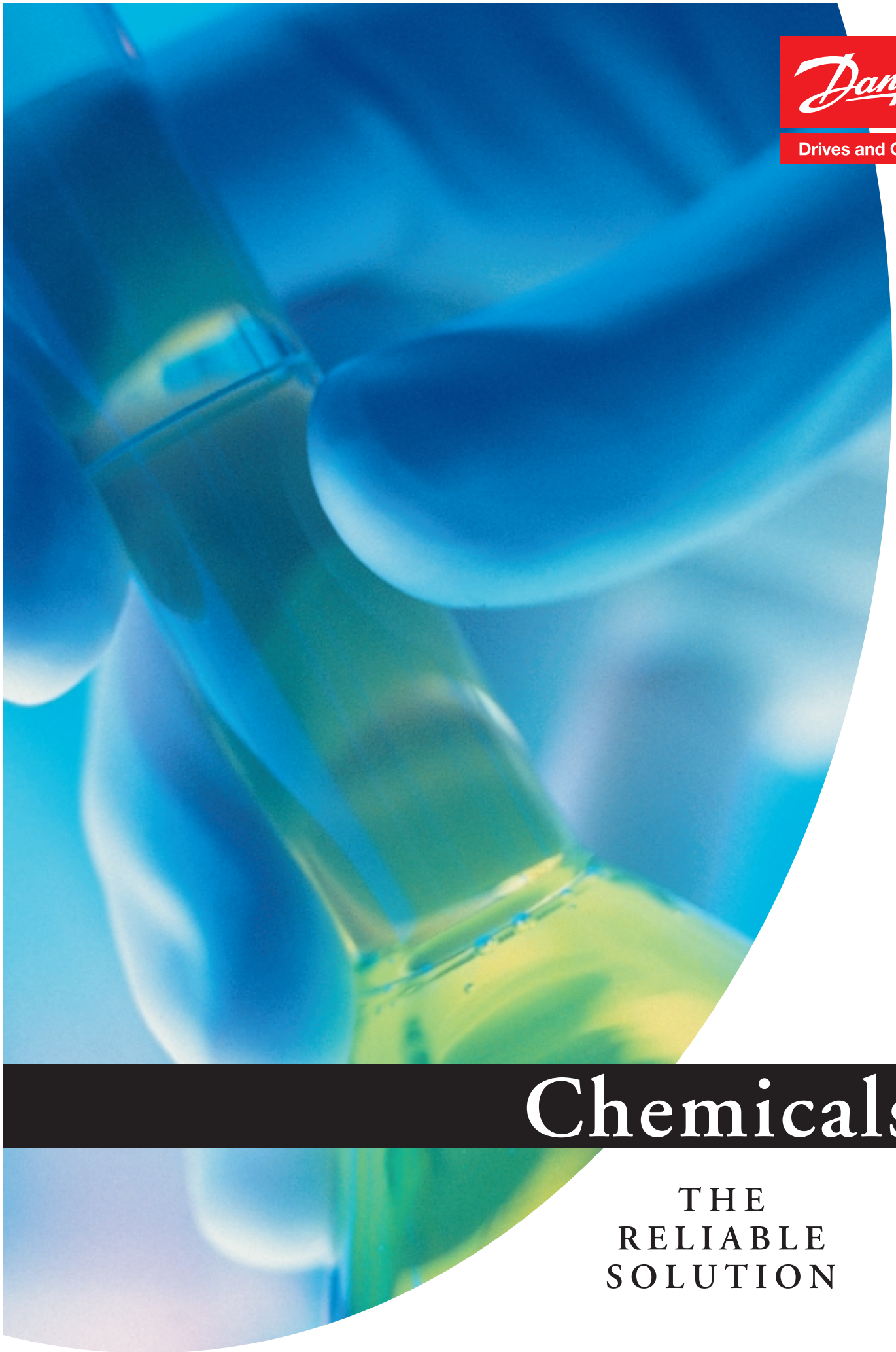


Drives and Controls

Chemicals

THE
RELIABLE
SOLUTION

BAUER gear motors

VLT frequency converters

RELIABLE SOLUTIONS

VLT frequency converters

- Built-in DC link chokes for minimum mains harmonic distortion and long capacitor lifetime.
- Long motor cables – up to 150 metres of screened cable as standard or longer with options, allowing speed control of motors remotely mounted in hazardous areas – far away from the control room in a safe area.
- Control signals configured according to NAMUR and isolated according to PELV level – ensuring safe and uniform control wiring.
- LC motor filters, providing 100% sinusoidal motor voltage, thus ensuring voltage peaks and transients are below NAMUR recommendations.
- IP 54 enclosures and circuit boards with conformal coating – tailored for harsh environments.

Bauer Geared motors

- A complete range of geared motors, based on four technologies.
- Motors in EEx [d] flame proof (for VLT duty) and EEx [e] increased safety (not for VLT duty) versions for hazardous areas.
- Motors and gears in cast iron or special resistant aluminium with corrosion resistant coating, suitable for all operating environments.
- Long service interval between oil changes (15,000 hrs).
- Full range of encoders, brakes and accessories.

MODULAR COMPLETE

VERSATILE EXTENSIVE

NON-STOP

RELIABLE SOLUTIONS

PRODUCTION

At Danfoss, a reliable solution is an uncompromising, well-tested solution you can count on. A solution that offers customers the "peace of mind" that comes from using products that have demonstrated their ability to operate without hassle over the long term – even in harsh environments.

Reliable one-stop shopping
We offer you a complete program of geared motors, frequency converters and soft starters for a host of applications in the chemical industry. All from one supplier who is just round the corner – worldwide.

Reliable consultancy
We have extensive knowledge of your business and can offer our process expertise in all stages of application planning, development and implementation. Our experts will work with you to design the optimal solution for your needs.

Reliable product range
With our modular product range, we are able to combine relatively few components into a multitude of variations and solutions – while passing the economic benefits onto you.

Reliable operation
Using our high-quality frequency converters, soft starters and geared motors – designed for virtually every purpose in your industry – our comprehensive solutions put an end to costly downtime.

CONTINUOUS MIXING AND BLENDING

– with substantial energy savings

This application mixes a main ingredient (water), an active substance (in the form of powder) plus subsidiary materials. All ingredients are mixed continuously in a small balance tank, ensuring a constant buffer store for further production. The process runs as follows:

- Water is supplied by a centrifugal pump, controlled by a VLT 2800 frequency converter.
- The flow is measured by an electromagnetic flowmeter which provides the measuring signal (typically 4-20 mA) to the built-in PID controller of the converter.
- Simultaneously, the measuring signal is returned from the converter to the PLC via field bus communication (i.e. the converter's I/O is used as remote I/O for the PLC).
- Powder is added from a feed screw, driven by a BG series helical geared EtaDrive motor with a built-in frequency converter.
- The PLC ensures that powder and water is mixed at the correct ratio.
- A liquid additive is mixed with a displacement pump, also driven by a BG series helical geared EtaDrive motor.
- The agitator is controlled by a BF series parallel shaft flat gear (shaft mounted) with an EtaDrive motor. The speed is determined by the flowrate of the medium, the concentration and the recipe.

A major asset of this set-up is energy savings, not least compared to the widespread use of control valves for controlling the flow in centrifugal pump applications – an extremely energy consuming process since the pump runs at full speed. By reducing the speed instead of throttling the pump, major energy savings are obtained.

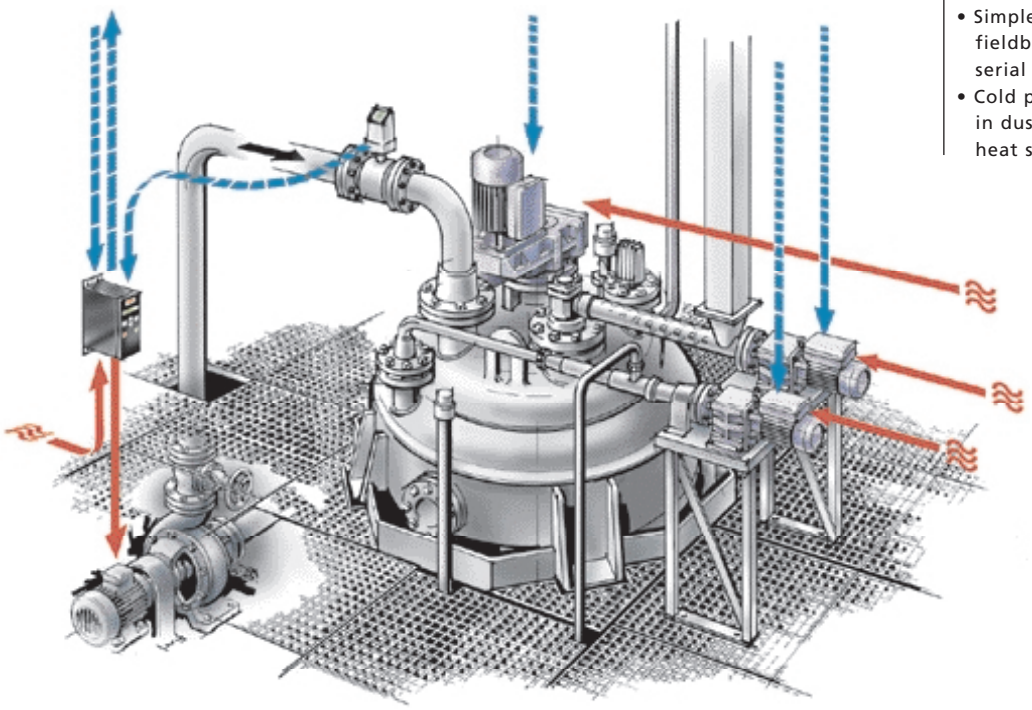
Tangible Benefits

BG series helical geared motor
- High efficiency due to two-stage design.
- Compact size – completely closed gearbox without assembly cover.
- Easy installation thanks to built-in flange-free footprint.

BF series shaft mounted geared motor
- Long life within aggressive media thanks to double shaft seals on agitator application.
- Very low height and no dirt collecting gaps.
- Few moving parts.

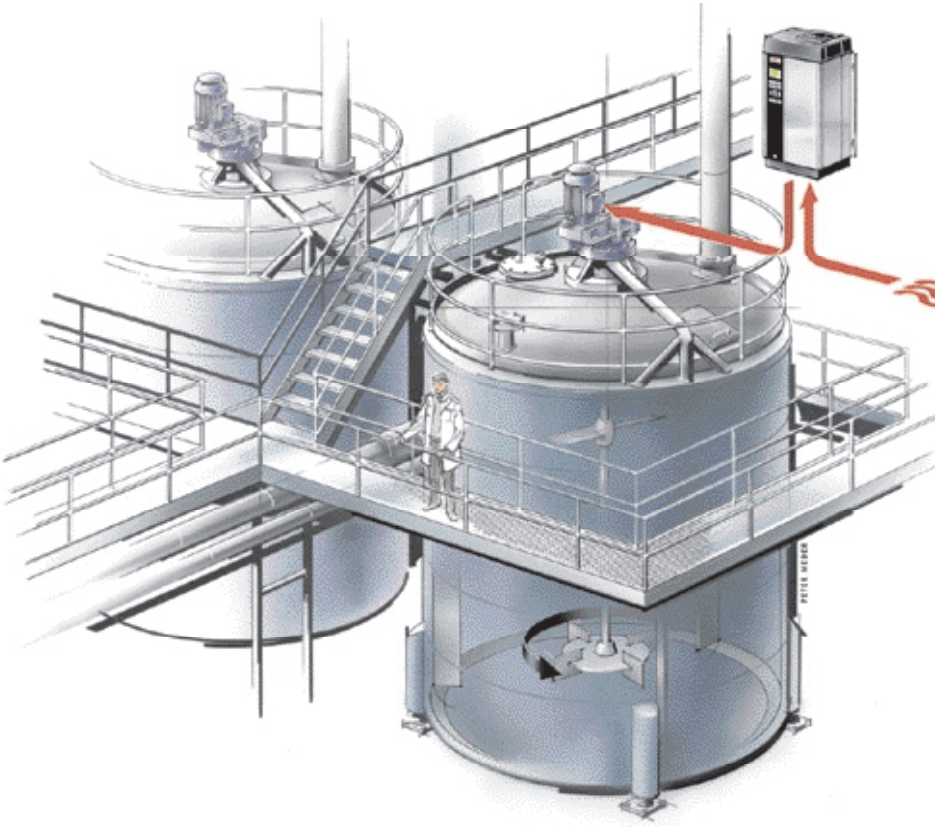
EtaDrive motor
- High efficiency solution achieved by optimized speed control with integral frequency converter.
- No need for encoder feedback due to accurate slip compensation.
- Simple wiring thanks to the Fieldbus communication or RS 485 serial communication.

VLT 2800
- Built-in PID controller.
- Analogue inputs and outputs.
- Simple wiring thanks to the fieldbus communication or RS 485 serial communication.
- Cold plate cooling for installation in dust tight enclosure with external heat sink.



BATCH MIXING AGITATORS AND STIRRERS

– executing any recipe in detail



A widespread application for processing ingredients in a reactor tank – mixing the whole batch for a period until the chemical reaction is completed. Subsequently the content is discharged to the next process tank.

To ensure a homogeneous mixture and a uniform process development, nearly all tanks are equipped with agitators and stirrers. They perform a range of different operations determined by varying recipes and parameters to match, e.g. speed, direction of rotation and mixing time.

Typical requirements of a batch mixing agitator and stirrer are:
- High starting torque (products with high initial viscosity).
- Continuous high load.
- Frequent reversing of agitator rotation.
- Protection against electrical or mechanical resonance increasing the wear on mechanical parts.

In many cases accurate mixing results can only be obtained by using variable speed drives with controlled direction reversal. The application shown is equipped with a VLT 5000 frequency converter in a dust tight IP 54 enclosure, supplemented with a BF series shaft mounted geared motor.

Tangible Benefits

VLT 5000
- Ability to start mixing even the toughest mass thanks to 180% starting torque.
- Prolonged life of motor and gear due to anti resonance feature.
- Full protection against short circuits and earth leakage.
- Long motor cables enabling placement of the converter in a dust-free control room.
- Safe installation in non-hazardous production areas with the IP 54 enclosure option.

BF series shaft mounted geared motors
- Built-in weather protection (rain/dust) due to the IP 66 motor.
- Prevention of motor burn-out by blocked cooling thanks to a built-in thermistor.
- Long life without maintenance due to double shaft seals and heavy duty bearings towards the agitator.
- Resistance to aggressive environments thanks to corrosion class Corro3 coating.

Once you set a reliable solution in motion, the road is clear for non-stop production.

MATERIAL PROCESSING AND MOTION CONTROL

– synchronizing and positioning with maximum accuracy

Many processes in the chemical industry require accurate motion control, e.g. synchronizing and positioning. For these applications Danfoss offer three very powerful motion controllers:

- The synchronizing controller for easy set-up of synchronizing different processes.
- The positioning controller for easy set-up of positioning items or markers.
- The programmable SyncPos motion controller for synchronizing and positioning, as well as programming several speed curves, setting infinite gear ratios and programming a number of sequences – freely programmable.

The application shown is an obvious solution for plastics and converting purposes. It performs a defined stretching of extruded materials for optimum strength and elasticity. The set-up includes a stretching profile with six rollers at different velocities, each powered by an electric motor.

For maximum accuracy, VLT 5000 drives with synchronizing controllers are controlling the BG series helical geared motors, each equipped with an encoder. The drive controlling the first roller is appointed virtual master and set to a given speed. The virtual master acts as a reference for the "slave" drives, comparing the master set point with the feedback from their encoders.
Each of the "slave" drives can have a programmable gear ratio providing different stretching profiles for the line.

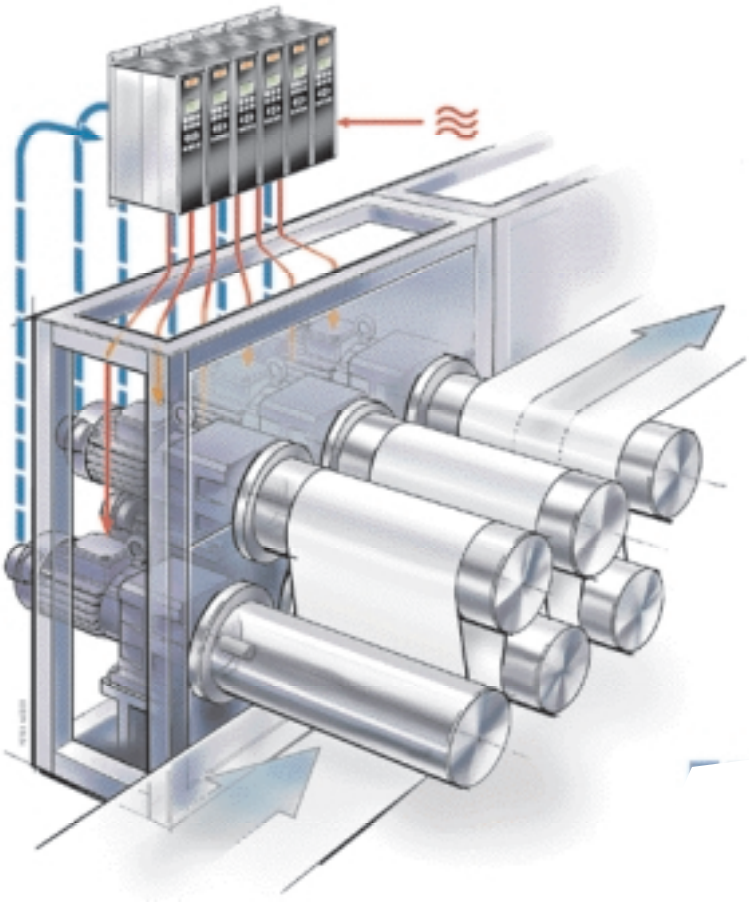
Tangible benefits

VLT 5000 with synchronizing controller

- Accurate speed of each motor thanks to speed closed loop control with feedback from the encoders.
- Substantial energy savings due to a common DC link bus distributing the DC power between all drives (load sharing).
- Easy changing of individual set point of each converter.
- No changing of gearwheel since the VLT 5000 frequency converter acts as a stepless, electronic gearbox.

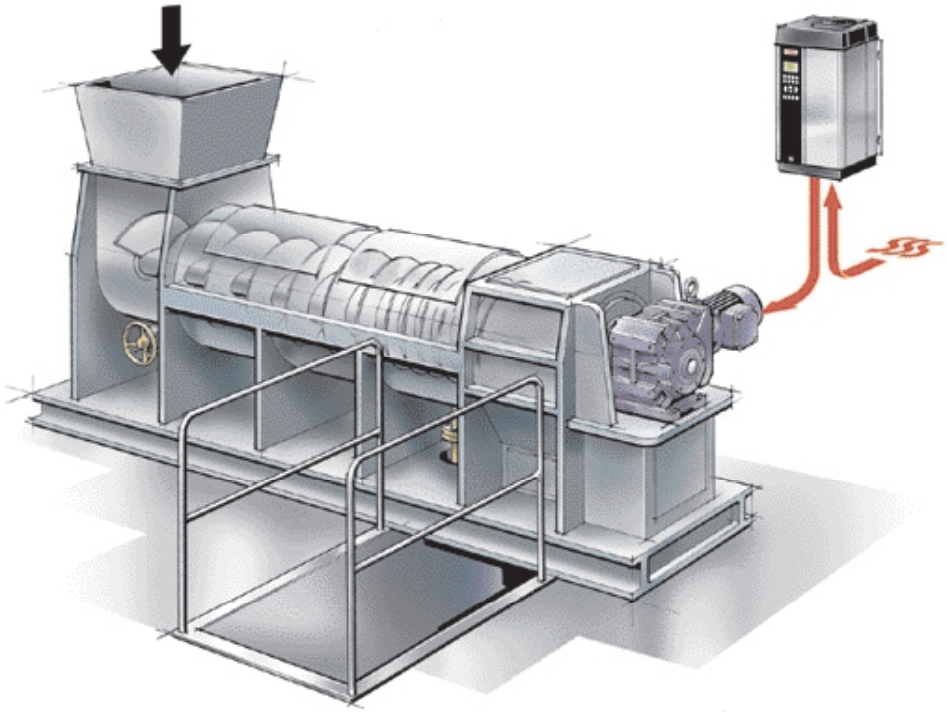
BG series helical geared motor

- Very low overall height with special footprint at side of gearbox allows compact machine design.
- High quality incremental encoder.
- No risk of encoder overheating as encoder is separated from hot motor parts.



SEPARATION AND FILTRATION

– torque control going to extremes



Separation is a widespread process in all chemical industries. The application shown is a screw filter press, used to increase the concentration of e.g. fine grain crystalline sludge. It operates as follows:

- Raw sludge is loaded into the hopper and compressed by the rotating screw.
- Liquid is pressed through the filtering material.
- Concentrated sludge is taken out from the bottom of the press.

The filter press application makes heavy demands on the motor control by requiring an extremely accurate torque control. Consequently, a VLT 5000 frequency converter is applied. This solution also ensures a high degree of personal security and protection of connected equipment, since the converter, including a built-in relay option, meets the tough NAMUR requirements (NE 37/38):

- All inputs and outputs are set up for the required functions as standard.
- The PELV (Protective Extra Low Voltage) insulation requirements – a must from NAMUR – are likewise met.

In addition, the application is equipped with a BK series bevel geared motor that is offered within a large power range from 0.03 to 75 kW.

Tangible benefits

VLT 5000

- High breakaway torque at start-up due to a 180% starting torque.
- Screw and filter protection thanks to accurate torque monitoring.
- Optional combination with selected EEx[e] motors for application in hazardous areas.

BK series bevel geared motor

- Optimum sealing thanks to a completely closed construction (IP 65).
- Great flexibility due to nine gear sizes for torques from 170 Nm to 16.800 Nm.
- Universal mounting possibilities.
- Competitive price thanks to a special two-stage bevel gear design.

A reliable solution is one that just keeps on going and going and going.

AIR AND FLUID HANDLING

– increased product quality and reduced energy consumption

Air and fluid handling applications are critical to a range of processes in chemical manufacturing, e.g. cooling of liquids, which must be accurately controlled without downtime.
At the same time these applications belong to the most energy-extensive equipment in the chemical industry.

To meet the requirement for accuracy and reliability as well as minimum energy consumption, the application shown is equipped with VLT 5000 frequency converters for speed control of the fans according to demand. The main benefit is a stable manufacturing process, completely independent of the ambient temperature thanks to an extensive dynamic control range.

In addition to product quality improvement, this solution is greatly superior to the widespread throttling by dampers and control valves regarding energy consumption. For example, by using a VLT 5000 to reduce the speed and hence flowrate of a pump or fan by merely 20%, provides energy savings (measured in kWh) of 50%.
In comparison, reducing the flowrate by 20% with a control valve renders only a minimal reduction in energy consumption (maximum approximately 10%).

Moreover, reliable operation of the cooling system is secured by a BG helical geared motor with much longer life than traditional belt transmission.

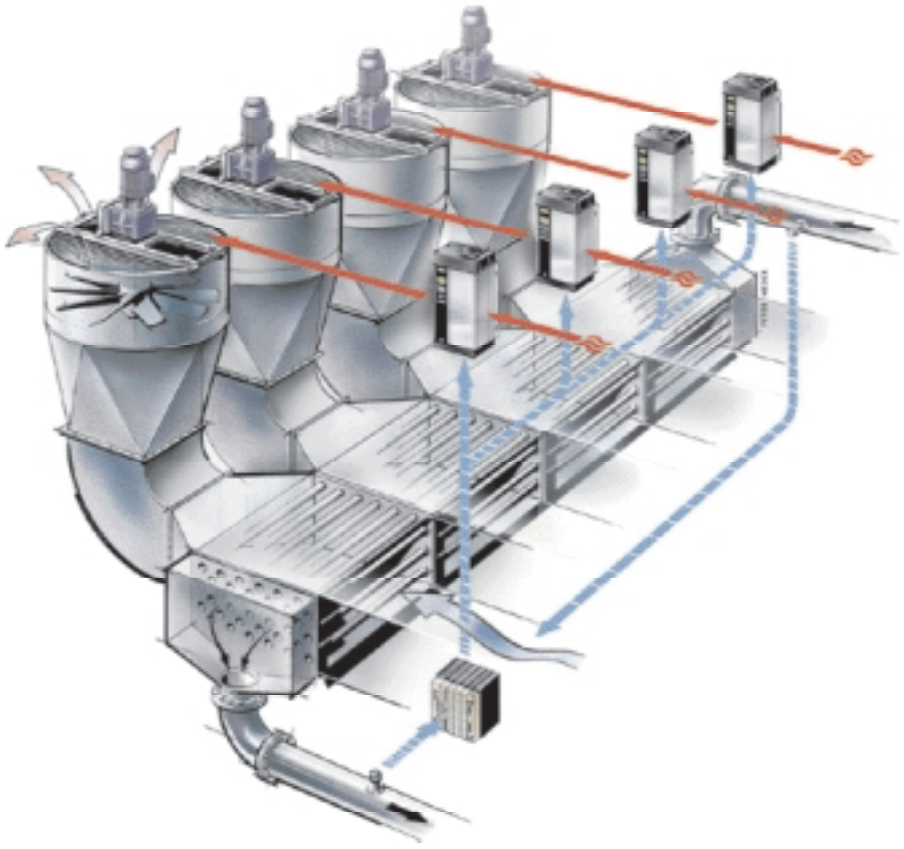
Tangible Benefits

VLT 5000

- Reliable trip-less operation thanks to effective flying start function after short mains drop-outs (brown-outs)
- Substantial energy savings thanks to a variable torque curve.
- Longer motor life and reduced noise level due to variable speed.
- Further reduced motor noise level thanks to LC filters.

BG series helical geared motor

- Extreme robustness: EEx [d] motor, IP 65 enclosure and built-in weather protection (rain/dust proof enclosure).
- Resistance to aggressive environments thanks to corrosion class Corro3 coating.



PRODUCT SURVEY

NAME	DATA	BENEFITS
VLT 2800 Series 	Power range: 0.37–7.5 kW • No interference: • Very robust design: • Powerful controller: • Aggressive environments:	RFI filters and DC chokes built-in. Full protection against short circuits and earth leakage currents. PID controller with analogue inputs/outputs and accurate start/stop functions. Cold Plate cooling for installation in sealed enclosures with external cooling.
VLT 5000 Series 	Power range: 0.75–500 kW • Long motor lifetime: • Safety first: • Drives any application: • Fast communication:	VVC^{plus} Vector Drive System ensures high shaft performance without oversizing the motor. Wiring configuration and galvanic isolation voltage (PELV) according to the German NAMUR chemical industry guideline. The accessory list includes motion controllers, additional LC motor filters. Wide range of fieldbus communication options, like Profibus, Interbus and DeviceNet.
VLT DriveMotor FCM 300 	Power range: 0.55–7.5 kW • Combined Frequency Converter and Motor • Easy to install: • Fits anywhere: • Saves energy:	No cable between frequency converter and motor. Can be mounted in any position. A high efficiency motor with an efficient frequency converter.
MCD 3000 Soft Starter 	Power range: 7.5–800 kW • Protects the machine: • Smooth power supply: • Soft starting/stopping:	Prevents shock loads causing unnecessary wear on mechanical parts. Eliminating high starting currents disturbing the mains supply. Smooth acceleration and deceleration with braking control.
Helical Geared Motor BG Series 	Power range: 0.03–75 kW Torque range: 20–16,800 Nm	Motor benefits: • High standard enclosure rating: IP 65. (Optional IP 66). • Hazardous areas: EEx [e] increased safety motors available up to 18.5 kW according to the new ATEX 100 CE Regulations. EEx [d] flame proof motors available up to 75 kW. • Corrosive environments: Cast iron or special grade aluminium with corrosion resistant Corro3G coating. • Multiple options: EtaDrive integral frequency converter, VIK version, brake systems, forced fan cooling, dust/rain cover, encoder.
Shaft Mounted Geared Motor BF Series 	Power range: 0.03–75 kW Torque range: 200–16,800 Nm	Gearbox benefits: • Heavy duty applications: Strong housing and robust design. • Easy to clean: Less gaps and crevices. • No oil leakage: Less covers and gaskets. • Low maintenance: 15,000 hours between oil changes. • Long lifetime: Less moving parts.
Bevel Geared Motor BK Series 	Power range: 0.03–75 kW Torque range: 170–16,800 Nm	
Worm Geared Motor BS Series 	Power range: 0.03–5.5 kW Torque range: 25–1,000 Nm	

RELIABLE SOLUTIONS JUST ROUND THE CORNER

By recently adding the powerful range of Bauer geared motors as an organic increase to the product programme of frequency converters and soft starters, Danfoss has made reliability a one-stop shopping deal to the chemical industry. And even better: thanks to our wide global presence it is within reach round the corner, round the world.

To you, this means easy access to unsurpassed reliability, no matter which continent you are on. Among the benefits at hand are:

- The most comprehensive range of high-quality components in the marketplace.
- Fast and dependable supply worldwide.
- Qualified consultancy, service and support from local experts with a global perspective.
- Hassle-free operation that puts an end to costly downtime.

Behind this favourable offer is one of the most experienced and reliable suppliers of quality products to the chemical industry. For decades we have been a partner for innovation of processes and technical solutions throughout the industry.

With our greatly strengthened product range and organisaton we are stronger, better and more reliable than ever.

www.danfoss.com

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