



**New impulses –**  
drive technology for the chemical industry

# drives

## CHEMICAL INDUSTRY

**SIEMENS**



**Aggressive atmospheres and the most stringent safety standards – more than in any other sector, the automation and drives technology in the chemical industry must satisfy the toughest requirements, in order to protect personnel, machines and the environment.**

**Siemens offers a comprehensive portfolio for this purpose, intended for a wide variety of applications – from basic chemicals to petrochemical and from reaction to absorption. Whether frequency converter or distributed drive technology, low-voltage standard motor or tailor-made special version: your requirements determine how we act. This also includes special drives from Loher, the technology leader in special drives for the chemical industry or gear units for agitators, ventilators and water screw pumps from Flender, one of the world's leading suppliers of components for mechanical and electrical drive systems.**

**In each case, the solutions comply with the standards according to NAMUR and PELV – putting your plant on a more efficient basis: for maximum security and productivity over the entire life of your plant, scalable from a few kilowatts right up to the megawatt band.**



## Your lever for greater efficiency: complete solutions for the chemical industry

Our complete range for the chemical industry comprises a wide range of products and systems. In order to design drive solutions even more efficiently, we are focusing on the following three levers:

### Frequency converters for the chemical industry

Especially in the chemical industry – with its numerous pumps, ventilators, compressors, mixers and similar units – it is worth equipping motors with frequency converters for variable speed operation. On the one hand, this guarantees an exact conveying and dosing process, protecting the mechanical systems and pipes – while on the other hand saving up to 50% of energy. With our MICROMASTER® and SINAMICS® product series – as well as DYNAVERT® special converters from Loher GmbH – we cover all conceivable applications in the chemical industry – and meet all the industry-specific requirements: These are characterized by the simplest handling, uniform parameter sets, menu-driven commissioning tools and documented factory settings. The converters are equipped with NAMUR functionalities as well as NAMUR terminal strips. Operation by means of the PROFIBUS profile PROFIdrive 4.0, “process engineering” operating mode, is also possible. Safety isolation in accordance with PELV is guaranteed. LC output filters or dV/dt filters are available for limiting the voltage peaks and gradients. Subsequent adaptations can be implemented without any expense. A flexible interconnection of inputs and outputs permits optimum connection of both digital and analog signals. All major protection and overload functions are integrated as standard.

### Motors that now perform even better

Our full selection of motors and geared motors from Flender covers a power range from 0.06kW up to 100MW. We can also offer motors with corrosion- and chemical-proof paint – as well as those with a specially high level of efficiency. Specifically for applications in the chemical industry you have a very wide choice of motors: either with explosion protection – or as energy-saving motors for an efficient energy balance. Likewise, we offer you NEMA motors for the North American market as well as individual specifications. And not least, the Loher CHEMSTAR® motors are also available to you, with their branch-specific design, complete documentation and ATEX certificates for the chemical and petrochemical industry. All these motors and gear units are produced at locations certified in accordance with DIN EN ISO 9001 – and even in their standard versions they are equipped with a wide variety of features that ensure safe, reliable and, above all, profitable operation.

### Part of Totally Integrated Automation

All Siemens standard drives can be integrated via PROFIBUS into Totally Integrated Automation (TIA). This integrated automation platform facilitates both vertical and horizontal integration of all operating processes – for best possible optimization of your complete systems. In this way you reduce your total costs of ownership and improve your competitive capability with lasting effect. With our automation solutions you are best able to meet the special challenges of the chemical industry.

*Details on our drive solutions for the chemical industry can be found on the following pages.*



*From frequency converter to geared motor: our drive solutions offer the full range of functions for the chemical industry.*

## SINAMICS drive family: the right drive for every task

SINAMICS converters offer the right drive for every application – with an impressive array of options and properties: Safety Integrated function, capability for energy regeneration and communication via PROFIBUS, extreme robustness – and not least, simple engineering. Positioning and Motion Control functions can be performed on a drive-oriented basis or by using a separate controller. Specifically for the chemical industry we recommend the SINAMICS G150 and G130 frequency converters – as well as G120, the new modular and very robust device for the performance range up to 90kW.

### Engineering tools that think of everything

SIZER and STARTER – the two engineering tools of the SINAMICS family systematically follow the general SINAMICS philosophy: Providing maximum levels of integration, flexibility and scalability. Both tools are based on a uniform operator control concept and are best tailored to the requirements arising from configuring and commissioning:

- SIZER supports you in the planning and configuring phase, irrespective of the drive tasks you have to solve.
- STARTER is designed for commissioning, optimizing and analyzing all SINAMICS drives.

*For drive tasks demanding several Megawatts and exceeding the potential of the frequency converters described below, we offer the SINAMICS GM150 frequency converter and ROBICON Perfect Harmony. Further information can be found on the Internet at:*

[www.siemens.com/sinamics](http://www.siemens.com/sinamics)

### SINAMICS drive family – technological highlights

- Broad performance spectrum from 120W to 28MW
- Available in both low-voltage and medium-voltage version
- Integrated functionality due to common hardware and software platform
- A common engineering concept for all drives – with just two tools: SIZER for configuration and STARTER for parameterization and commissioning
- High level of flexibility and combination options
- Complete integration in terms of configuration, commissioning and operation



# SINAMICS G120 frequency converter: great performance right up to the mid-range

SINAMICS G120 is a modular frequency converter up to 75kW (HO) for a wide variety of applications for different branches. The converter is extremely robust for the toughest industrial conditions. For the chemical industry the converter offers control units with safety integrated functionality, PROFINET and PROFIBUS communication with the NAMUR extension in PROFIdrive, Profile 4. Power Modules with regenerative energy feedback up to 690V save costs for additional devices, heat dissipation and wiring. They save space in the cabinet and reduce energy consumption.

## Typical applications

The SINAMICS G120 frequency converter is suitable for numerous applications in the chemical industry – wherever a wide range of functionality and flexibility is demanded. For example in mixers and agitators, in the processing area – or for sheet extruders in the plastics industry.

## Functional basis for SINAMICS G120 with PM250 and PM260

- Modular system comprising power module and control unit
- Worldwide unique usage of silicon carbide in the power semiconductors of PM260 for 690V
- Pulse frequency: 16kHz with PM260 and 4–16kHz with PM250
- High volume/power density
- High overload capability
- Low-noise operation
- Up to 300m (PM260) and 100m (PM250) unshielded motor cable possible
- Four skip frequencies protect machine in event of resonances
- Automatic restart and motor-protecting flying restart function
- Three drive data records
- Free function blocks
- Belt failure detection mode
- Electrical isolation according to PELV

## Technological highlights

- Power modules PM250 and PM260 with energy-optimized regeneration of generator energy from the motor:
  - Significantly improved efficiency compared to conventional frequency converters
  - Braking resistors not needed as energy is regenerated, line commutating reactor not required
  - Reduced conductor cross-section
- Extremely robust due to innovative cooling concept. Heat dissipation of the power electronics via heat sinks, other electronics cooled by convection
- Control units with optional Safety Integrated functionality:
  - Safe Torque off
  - Safe Stop 1
  - Safely Limited Speed
  - Safe Brake Control
- Consistently high drive quality, even in the event of sudden load changes on the basis of sophisticated vector control (speed/torque)
- Maximal controlled torque even at lowest speeds, not only in encoderless mode and with pulse encoder evaluation
- PM260 with integrated sinusoidal filter
- Comprehensive interference immunity, e.g. due to evaluation of the motor temperature for motor protection and temperature monitoring of the power module
- Communication via PROFINET or RS 232 and PROFIBUS with NAMUR extension in PROFIdrive Profile 4 or via USS with RS 485
- Guided commissioning with “Starter” software. In addition: wide variety of commissioning options via Basic Operator Panel and Micro Memory Card (cloning option)



## SINAMICS G120 – overview of technical data

<b>Voltage and power ranges</b>	PM250 3AC 380V–480V ± 10% 5.5 kW – 75kW (HO)	PM260 3AC 660V–690V ± 10% 7.5 kW – 37kW (HO)
<b>Line frequency</b>	47 to 63Hz	
<b>Output frequency</b>	0 to 200Hz	
<b>Operating temperature</b>	HO: 0°C to +50°C; LO: 0°C to +40°C	
<b>Process control</b>	Internal PID controller (Auto-tuning)	
<b>Types of control</b>	Vector Control, FCC, Multipoint characteristic, V/f, torque control	
<b>Inputs</b>	Up to 9 DI, 2 AI; failsafe: 6 standard DI + 2 failsafe DI	
<b>Outputs</b>	Up to 3 DO, 2 AO	
<b>Degree of protection</b>	IP20	
<b>Automation link</b>	The ideal partner for your process automation with SIMATIC PCS 7	

# SINAMICS G150 and G130 frequency converters: for individual, high-performance drives

Standard solutions with high power levels can be effortlessly implemented with our SINAMICS G150 and G130 frequency converters. The G150 switchgear cabinet is suitable for a power range from 75 to 1500kW and available in two versions: with sufficient installation space for all available options – or as a particularly compact solution. The G130 chassis units cover the power range from 315 to 800kW. Higher performances can be implemented by parallel connection of several units. The G130 consists of a power module and control unit, which can be physically separated or constructed as a single unit.

## Typical applications

SINAMICS G150 and G130 converters are designed for single drives with a high output and without energy regeneration. In the chemical industry they are particularly relevant to pumps, fans, compressors, extruders, mixers and grinders.

## Functional basis

- Simple installation
- Compact housing
- Guided commissioning
- Belt failure detection mode
- High overload capability
- Automatic restart
- Four skip frequencies protect machine in event of resonances
- Motor-protecting switching to turning motor (flying restart)
- Free function blocks
- Prepared for use on IT networks
- Securely electrically isolated according to PELV protective measure
- dV/dt-filter for limiting the voltage peaks and gradients

## Technological highlights

- Compact and quiet operation thanks to the latest IGBT power semiconductors and innovative cooling concept:
  - up to 70% smaller footprint than conventional converters
  - Noise level of just 69 db(A) in full operation
- Depending on requirements, cabinet units with or without line connection components and chassis units available
- Higher plant availability thanks to service-friendly concept with good accessibility and clear, modular structure
- Easily integrated into higher-level automation systems – by means of PROFIBUS or PROFINET interface and various analog and digital interfaces
- Simple commissioning and parameterization, menu-driven on the user-friendly AOP 30 operator panel with graphical LCD and plain text display
- PROFIBUS communication with NAMUR extension in the PROFIdrive, Profile 4

## Other SINAMICS frequency converters

SINAMICS G150 units are designed for voltage classes up to 690V – and for outputs up to 1500kW – and thus cover the lion's share of standard drive tasks in the chemical industry. In the case of coordinated drives, in which released braking energy has to be fed back into the network – for example on conveyor belts, sheet extruders, chemical fiber plants and packaging machines – another SINAMICS series shows its full strength:

Designed for multi-motor operation, SINAMICS S120 is capable of four-quadrant operation. For drive tasks that demand several megawatts, e.g. for very large mixers or extruders, medium-high voltage frequency converters are the most economical solution. For this task, we offer you SINAMICS GM150, GL150 and ROBICON Perfect Harmony.



## SINAMICS G150 and G130 – overview of technical data

<b>Voltage and power ranges</b>	380 – 480V, ± 10%, 500 – 600V, ± 10%, 660 – 690V, ± 10%	3 AC, 110kW – 900kW 3 AC, 110kW – 1000kW 3 AC, 75kW – 1500kW
<b>Operating temperature</b>	75kW – 1500kW: 0°C to +50°C	
<b>Process control</b>	Internal PID controller (Auto-tuning)	
<b>Types of control</b>	Vector Control, with or without encoder or V/f control	
<b>Inputs</b>	8 digital inputs, 4 bidirectional digital inputs/outputs, 2 analog inputs, 1 PTC/KTY input, optional NAMUR-terminal strip	
<b>Outputs</b>	2 analog outputs, 2 relay outputs	
<b>Degree of protection</b>	IP00/IP20 (optional: IP21, IP23 and IP54)	
<b>Automation link</b>	The ideal partner for your process automation with SIMATIC PCS 7	

# MICROMASTER 440 frequency converter: comprehensive functionality for every application

Maximum drive quality in the event of sudden load changes – even complex requirements can be safely met with our MICROMASTER 440 frequency converters. An intelligent vector control and fast-reacting inputs/outputs enable targets to be achieved even without encoders. In addition, the integrated brake chopper ensures maximum precision – whether for braking processes or for the minimum deceleration times.

## Typical applications

Specifically when conveying fluids, transporting gases and solids, in dosing, mixing and other processes – the MICROMASTER 440 show their true colors.

### Functional basis

- Compact housing
- Simple installation
- Available with or without integrated EMC filter
- System of expansion options
- CT (constant torque) and VT (variable torque) dimensionable
- Guided commissioning
- Automatic restart
- Belt failure detection mode
- High overload capability (200% in CT mode)
- Four skip frequencies protect machine in event of resonances
- Motor-protecting switching to turning motor (flying restart)
- Free function blocks
- Prepared for use on IT networks
- Securely electrically isolated according to PELV protective measure
- Can be supplied in version complying with NAMUR Standard NE37/NE38
- Evaluation of the motor temperature for integrated motor protection

### Technological highlights

- LC output filter for limiting the  $V_{max}$  and  $dV/dt$
- Consistently high drive quality, even in the event of sudden load changes on the basis of sophisticated vector control (speed/torque)
- Maximum controlled torque at lowest speeds down to zero by means of optional evaluation of motor pulse encoders
- Motors can be operated at a distance of up to 300m in explosion-protected areas
- Use with 200m unshielded cables maintaining Class A limit values (to EN 55011) is possible
- Kinetic buffering in event of system voltage dips
- Compound braking for controlled rapid deceleration
- Integrated brake chopper for outputs up to 90kW
- PROFIBUS and DeviceNet available as communication modules: with PROFIBUS option can be incorporated in Totally Integrated Automation (TIA)
- Connection to SIMATIC PCS 7 via DriveES PCS 7 possible, including faceplates

## MICROMASTER 440 – overview of technical data

<b>Voltage and power ranges</b>	200 – 240V, $\pm 10\%$ , 1AC, 0.12kW – 3kW 200 – 240V, $\pm 10\%$ , 3AC, 0.12kW – 55kW 380 – 480V, $\pm 10\%$ , 3AC, 0.37kW – 250kW 500 – 600V, $\pm 10\%$ , 3AC, 0.75kW – 90kW
<b>Operating temperature</b>	0.12kW to 75kW (CT): $-10^{\circ}\text{C}$ to $+50^{\circ}\text{C}$ ; 90kW to 200kW (CT): $0^{\circ}\text{C}$ to $+40^{\circ}\text{C}$
<b>Process control</b>	Internal PID controller (Auto-tuning)
<b>Types of control</b>	Vector Control, FCC (flux current control), Multipoint characteristic (parameterizable $V/f$ characteristic), $V/f$ characteristic
<b>Inputs</b>	6 digital inputs, 2 analog inputs, 1 PTC/KTY input
<b>Outputs</b>	2 analog outputs, 3 relay outputs
<b>Automation link</b>	The ideal partner for your process automation with SIMATIC PCS 7





# Explosion-protected motors: maximum safety with greatest efficiency

In areas subject to explosion hazard and corrosive gases in the chemical industry motors must meet the highest safety standards in order to protect operators, machines and the environment. With Siemens explosion-protected motors, you will always be playing more than safe, even in dust ignition-proof protection areas. Because our robust EEx motors run for extremely long periods without faults, even under the harshest conditions – as has been proven thousands of times in worldwide use. More than this: our EEx range of motors is complete: for all requirements with maximum safety and greatest efficiency in operation.

### Range of types

- Integrated grey cast iron range for standard and explosion-protected motors
- VIK version available as option
- Type of protection "Increased Safety" – "e" (EEx e II)
- Explosion-proof encapsulation – "d" (EEx de IIC)
- Non-sparking – "n" (EEx nA, Ex nA)
- Protection against dust ignition

### Quality tested

Our explosion-protected motors are developed, manufactured and certified in accordance with the EU directive 94/9/EG (ATEX 95). In addition, they are tested by the German Federal Testing Laboratory (PTB) or by Deutsche Montan Technologie GmbH (DMT). They therefore offer certified reliability and efficiency for every drive application.



### Explosion-protected motors – overview of technical data

Motors	Type of protection "e"	Type of protection "d"	Type of protection "n"	Dust ignition protection
<b>Size</b>	63M...315L	71M...450	63M...450	56M...450L
<b>Performance range</b>	0.12...165kW	0.25...950kW	0.09...1000kW	0.06...1000kW
<b>Number of pins</b>	2/4/6	2/4/6/8	2/4/6/8	2/4/6/8
<b>Temperature class</b>	T1–T3	T1–T4	T3	-
<b>Type of protection</b>	II 2 G EExe II to IEC/EN 60079-0 IEC/EN 60079-7	II 2 G EEx de II to IEC/EN 60079-0 IEC/EN 60079-1	Ex nA II 3 G EEx nA to IEC/EN 60079-15	Zone 21: II 2D IP65 T 125°C Zone 22: II 3D IP55 T 125°C to EN 50281/IEC 61241
<b>Directive</b>	94/9/EG, ATEX 95	94/9/EG, ATEX 95	94/9/EG, ATEX 95	94/9/EG, ATEX 95
<b>Degree of protection</b>	IP55	IP55	IP55	Zone 21: IP65 Zone 22: IP55
<b>Voltages</b>	All usual voltages	All usual voltages	All usual voltages	All usual voltages
<b>Frequency</b>	50 and 60Hz	50 and 60Hz	50 and 60Hz	50 and 60Hz
<b>Design</b>	All usual designs	All usual designs	All usual designs	All usual designs
<b>Housing</b>	BG 63 M...160 L aluminum BG 100 L...315 L gray cast iron	BG 71 M...315 L gray cast iron BG 355...450 steel	BG 63 M...160 L aluminum BG 100 L...450 gray cast iron	BG 56 M...225 M aluminum BG 100 L...450* gray cast iron
<b>Cooling type</b>	Surface-cooled	Surface-cooled	Surface-cooled	Surface-cooled
<b>Temperature class</b>	F utilized to B	F utilized to B	F utilized to B	F utilized to B
<b>Insulation system</b>	DURIGNIT IR 2000	DURIGNIT IR 2000 converter-suitable up to 500V, 690V	DURIGNIT IR 2000 converter-suitable up to 500V, 690V	DURIGNIT IR 2000 converter-suitable up to 500V, 690V

\* Zone 21 only up to size 315 L

## Best arrangement: Flender and Loher supplement the Siemens portfolio

The global market for industrial drives is characterized by the convergence of electrical and mechanical drive components – a trend that we are addressing by the integration of products from Flender AG, Flender Tübingen GmbH and Loher GmbH. The supplementary geared motors, gear units, clutches and special drives now round off our product portfolio for the chemical industry. This puts us in a position to make you an offer that is unique worldwide: from controller and converters to motors and gear units – we offer a complete selection of all drive components from a single source. What links the variety of our products, systems and solutions? They all have an impressive level of efficiency and first-class quality – with an excellent price-performance ratio. In addition that can be combined as modules for almost any range of torque values and are compatible across all the series. Let us present you with a brief overview of the new product ranges.

### Flender Tübingen GmbH: FLENDER MOTOX geared motor series

The FLENDER MOTOX series of geared motors from Flender Tübingen GmbH offers solutions for process-engineering applications that frequently have to satisfy the explosion-protection directive ATEX 95. The gear units are equipped with reinforced bearings and appropriate flange construction – for a long life and high shaft loads.

- Agitator gears are designed as helical gear motors. All gear ratios of the basic series are possible. The gears have a strongly dimensioned end bearing that absorbs high radial or axial loads. The end bearing can be lubricated by means of a lubricator.
- For use in mixer systems, the FLENDER MOTOX parallel shaft and bevel helical gear motors can be fitted with a mixer flange. Both series can be supplied in solid and hollow-shaft versions and can reliably withstand high shaft loads.
- FLENDER MOTOX cooling tower geared motors are designed for the cooling of industrial water or for air-conditioning systems in harsh industrial environments. They are characterized by high operational reliability.
- All gear and motor options – e.g. hollow-shaft cover, reinforced bearing or oil level monitoring – are also available for geared motors with agitator, mixer or cooling tower flanges.
- With helical gear, bevel helical gear, helical worm gear or parallel shaft gear, the FLENDER MOTOX range of geared motors complies with the 94/9/EG Directive – and offers EEx protection in Categories 2 and 3.

### Products and systems supplied by A. Friedr. Flender AG

On the mechanical side, gears and clutches from A. Friedr. Flender AG complete our range of products and systems for the chemical industry. They have been in use here for more than 30 years – for the widest range of applications: as agitator, ventilator and water screw pump gears. They are particularly quiet in operation and boast a high level of efficiency, reinforced bearings and are therefore absolute oil-tight. In combination with the ARPEX and N-EUPEX clutches, that have proven successful particularly for drives used for conveying or pumping corrosive or hot media, they represent a technically sophisticated solution that helps to protect the environment. Both gear units and clutches can be executed according to ATEX 95. Close collaboration with customers, moreover, is the basis for meeting the typical loading criteria with an optimum level of economy.





### **The Loher GmbH – technology leader in customized drive solutions**

As a technology leader in special drives for the chemical industry, Loher GmbH stands for maximum flexibility and tailor-made custom solutions. Highlights of the product range, for example, are the proven Loher CHEMSTAR motors that are available in all Ex degrees of protection – also double protection EEx e and EEx d, gas- plus dust explosion-proof. They not only have a special design, for example chemically high resistant painting and a galvanized fan cowl, but also a complete documentation including ATEX certificates for the chemical and petrochemical industry. The Loher CHEMSTAR Motors are designed for an ambient temperature from  $-55^{\circ}\text{C}$  to  $70^{\circ}\text{C}$  and can be delivered up to enclosure IP67. Or the DYNAVERT T frequency converters. Specially developed for the chemical and petrochemical industry, they are available in all usual voltage classes for the chemical industry and meet all industry-specific requirements – from NAMUR and PELV to the  $dV/dt$ -filters. A safe standstill compliant with EN 954-1 Cat. 3, as well as an ATEX-certified electronic shutdown device with PTC thermistor evaluation for explosion-protected motors in Zone 1 and 2, can be integrated as an option without a change of volume. Up to performance class 75kW at 690V, a lockable main control switch is available – as an isolating device for the compact unit. The Windows-based, self-instruction software IMS is available as a download free of charge for parameterization and error diagnostics. This enables all device parameters to be used in the offline mode as well, including the terminal block representation of the current parameter setting. In the online mode, an oscilloscope function with eight analog and various digital signals is available. Loher is a specialist for explosion-protected drives. The combination of DYNAVERT T converters and Loher CHEMSTAR motors for the EExn, EExe and EExd types of protection is also ATEX-certified.

### **Chemicals and the environment**

In the Industrial Drive Applications Competence Center, the sector-related competence for drive engineering focuses on the field of chemical and environmental technology within the FLENDER product range.

Decades of experience combined with state-of-the-art engineering and development tools generate competitive and market-oriented drive solutions in close cooperation with the customers.

In the field of chemical and environmental engineering, however, we are not just a supplier of components such as gears, motors, converters or clutches. Primarily, we give support to the customer from the project planning phase through the delivery stage to commissioning and after-sales service in all aspects of engineering.

# Service worldwide. It all revolves around you.

Whether you are carefully planning your drive, delivery, assembly, commissioning or maintenance, our experts are always there for you – on site in more than 130 countries around the world. In concrete terms, this means:

## Easy shopping with the Siemens Mall

Our range of products can be conveniently ordered via the Internet. You will find all the information you require clearly arranged at [www.siemens.com/automation/mall](http://www.siemens.com/automation/mall). From selection and ordering of products to the online tracking – EDIFACT enables you to follow the processing of your order online.

## Service & Support

Do you need support from a service specialist, spare parts, advice from a product expert or are you simply looking for the answer to a question? Via our Hotline or the Internet, you will quickly receive the right answer.

## Your high-speed contact

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