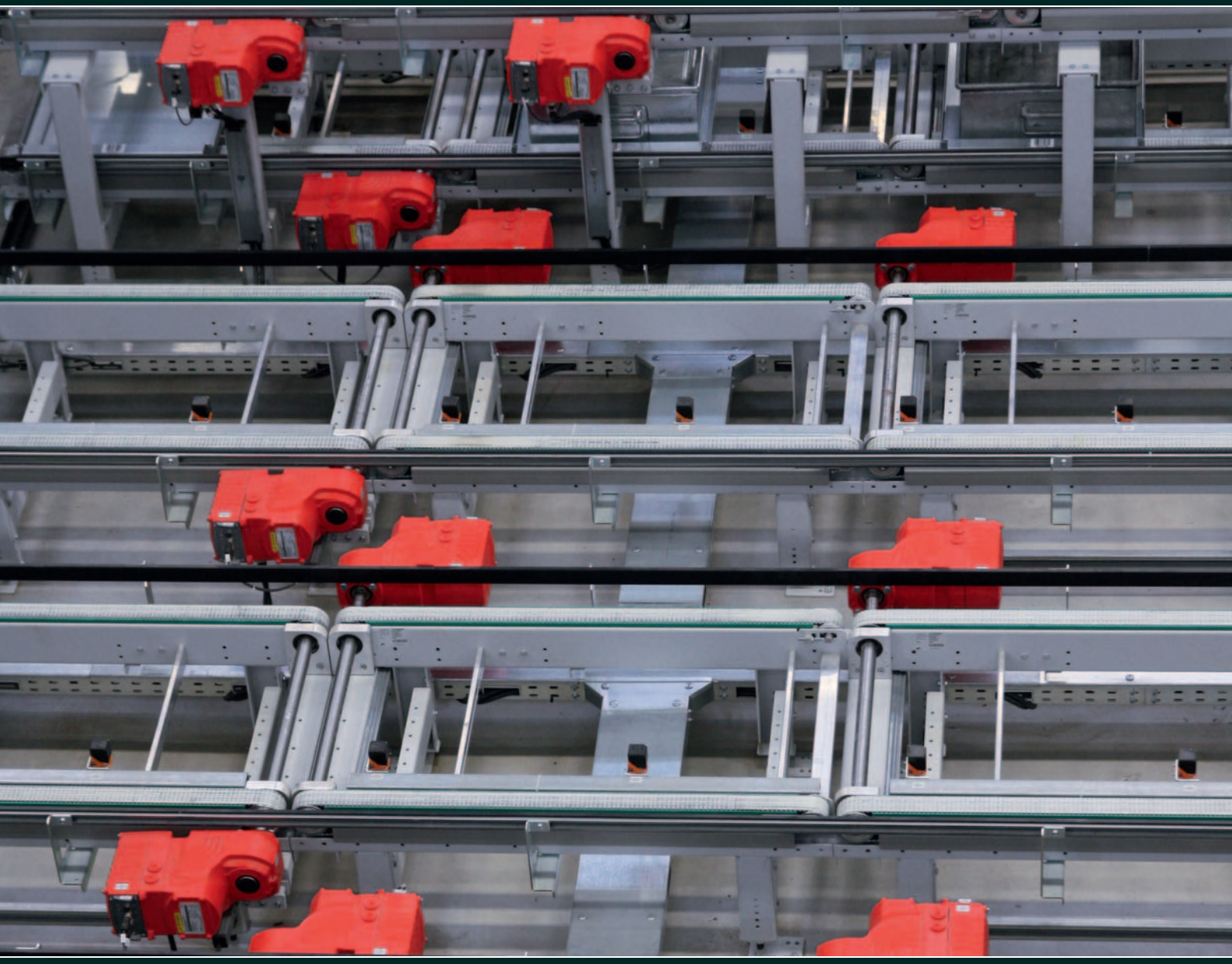
SEW EURODRIVE

Drive Engineering - Practical Implementation



Efficient Plant Automation
With Mechatronic Drive Solutions

Edition 03/2011

17051215/EN


KKFU 144794 3
42G1

Contents

1 Introduction

1.1 Motivation and background

1.1.1 Megatrends

Current megatrends such as

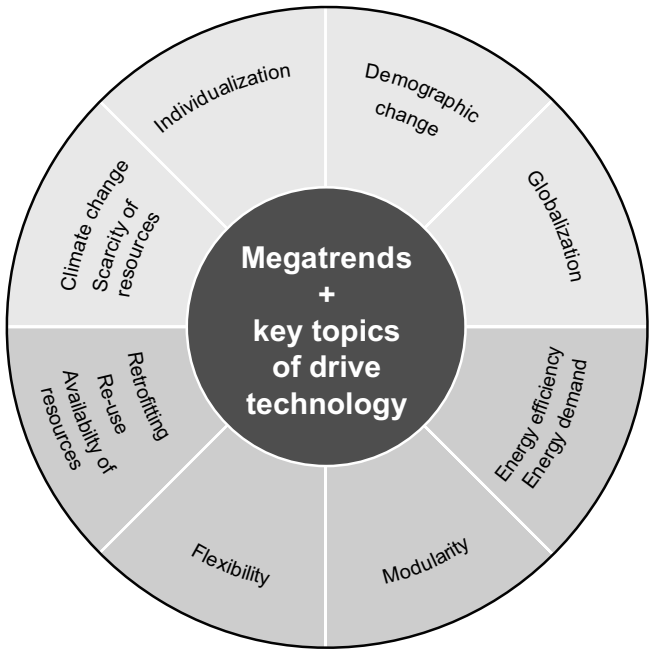
- Globalization
- Demographic change
- Individualization
- Climate change
- Scarcity of resources

are setting the course also for technical innovations and strategies for the future. These much talked about global developments will have or are already having a significant effect on various areas of our society.

These megatrends are also visible in fields of technology such as communication, automation, and logistics, where they create new innovation steps. The rapid development of the Internet showed that trends such as globalization are only made possible by this technology in the first place. Analogous to the Internet, the model of the "Internet of Things" is applied in intralogistics. According to this concept, material things (goods) are transported from point A to point B through a worldwide, decentralized logistics network. This network provides its users with a logistics infrastructure that offers optimized routes of transport.

Some of these technology trends have already had an impact on industrial automation and plant engineering, and they will continue to do so to an even larger extent in the future. Electrical drive technology is playing an important role in the realization of these concepts.

In addition to the purely technical aspects of drive technology in industrial plants, decisive criteria for planning and implementing drive concepts are energy efficiency, energy demand, modularity, flexibility, retrofitting, re-use, and the availability of resources.



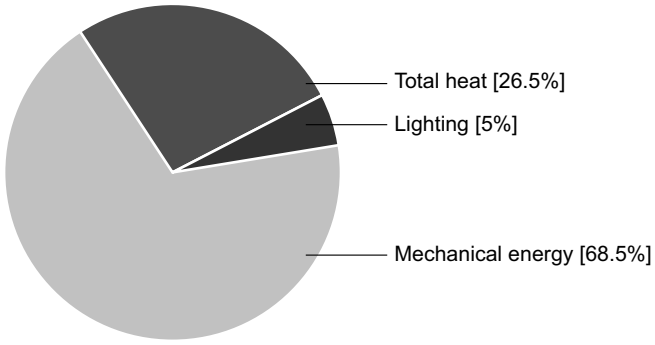
3824118539

1.1.2 Energy efficiency, energy demand

The consumption of electrical energy is steadily increasing, and the energy demand is expected to rise even more in the future. Electric drives consume the largest share of electrical energy in industrial applications.

As a rule, electric drives use the supplied power much more efficiently than internal combustion engines and hydraulic or pneumatic motors.

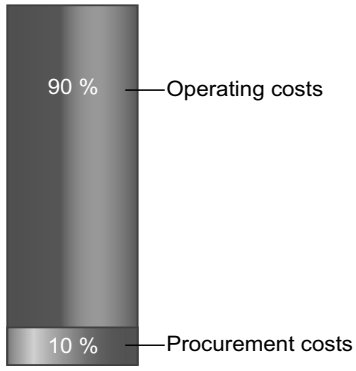
Electric drives/motors account for more than two thirds of the total industrial power requirements, according to a study conducted by the German Electrical and Electronics Manufacturers' Association, ZVEI.



3655926155

In the worldwide effort to increase energy efficiency, electric motors constitute a decisive variable. The consumption of electrical energy is significantly affected by the use of energy-efficient electric motors. Depending on the application and the motor output, up to 50% of energy can be saved in comparison with conventional solutions. These savings also reduce the energy costs significantly.

When considering the life cycle costs for an electric drive, the energy consumption during operation accounts for about 90% of the total costs.



Life cycle costs

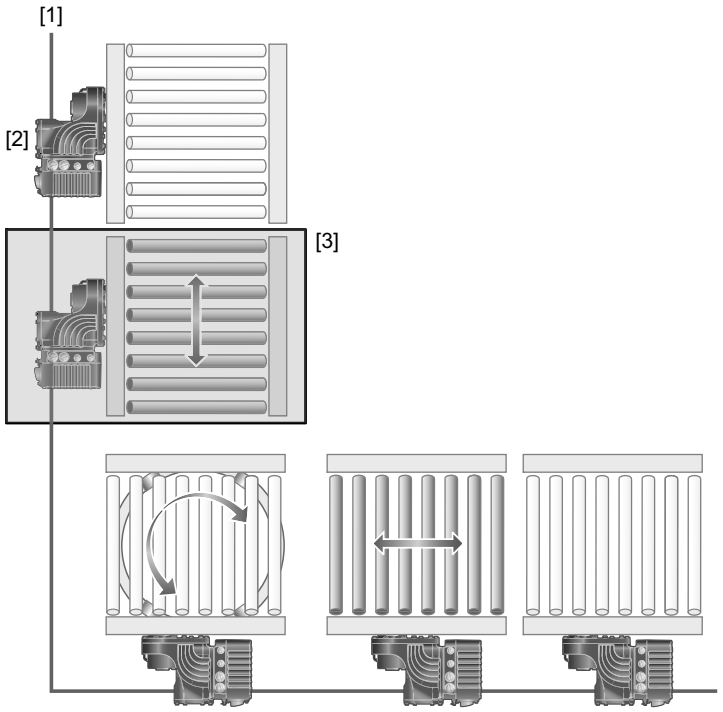
3782585611

In addition to improving the efficiency of electric motors (IE2, IE3, IE4), innovative drive systems (gear unit, motor, and electronics) also offer a higher overload capacity, which means that motors with a lower power rating can be installed. This reduces the basic power requirements of a plant. The limited energy resources of emerging markets, for example, can be accommodated in this way.

This characteristic of the electric drives helps to reduce energy consumption and CO_2 emissions, making a positive contribution to climate protection.

1.1.3 Modularization

The increasing productivity of industrial plants also involves an increasing complexity of planning, configuration, startup and operation. Cost pressures during planning and implementation of a production plant call for modular plant concepts. The overall functionality of a plant is broken down into scalable modules and divided into mechanical and electrical function blocks. Decentralized drive technology is an ideal implementation basis for this modular plant concept. In a modular plant module, the drive with electronic drive and function control (→ decentralized intelligence) is directly integrated with the mechanical elements (e.g. conveyor).



2913331979

[1] Power supply / network connection
[2] Mechatronic drive unit
[3] Plant module

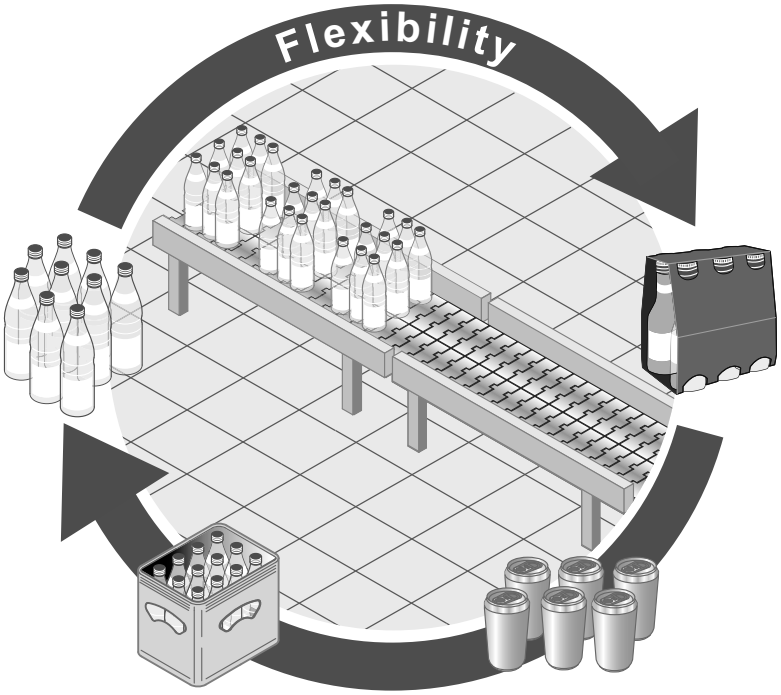
A plant module has defined interfaces for mechanical and electrical elements and control technology. These simple modules with different characteristics allow for straightforward planning and implementation of complex overall systems.

1.1.4 Flexibility

Following the megatrend of individualization, a high degree of flexibility is required for the technical and logistical design of industrial plants. The design and handling of consumer products is increasingly tailored to the individual requirements of the users. In the food and beverage industry, for example, the same product leaves the production plant in various fill quantities and different packaging. This means the batch sizes of the individual products are smaller, and the production system must be as flexible as possible.

Electric drives offer an ideal feature for this requirement. Variable-speed electric motors in connection with frequency inverters and intelligent motion control enable modular plant concepts with utmost flexibility. Extremely short conversion times make it possible to adjust the format, speed, and throughput of a production plant to the requirements of a product.

Here, too, the properties of decentralized drive technology offer decisive advantages for the implementation of these plant concepts. This technological trend is reinforced by the innovation steps towards mechatronic drive systems. The integration of mechanical components (gear unit, motor) with electronic components creates an overall system that is optimized with respect to energy efficiency, compactness, and functionality.

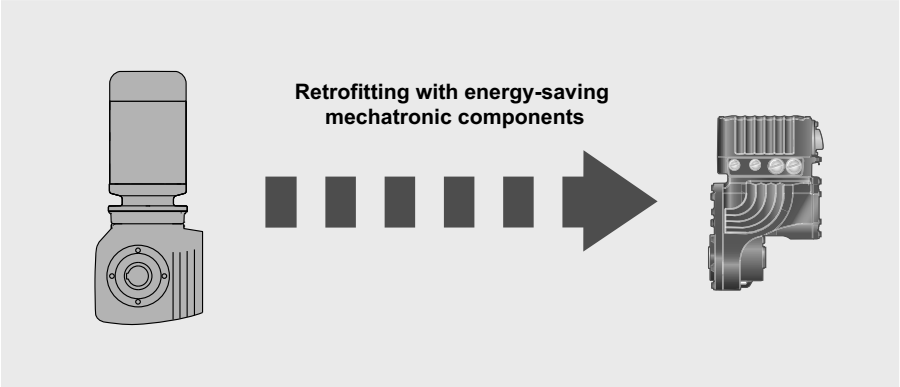


3782901131

1.1.5 Retrofitting and re-use

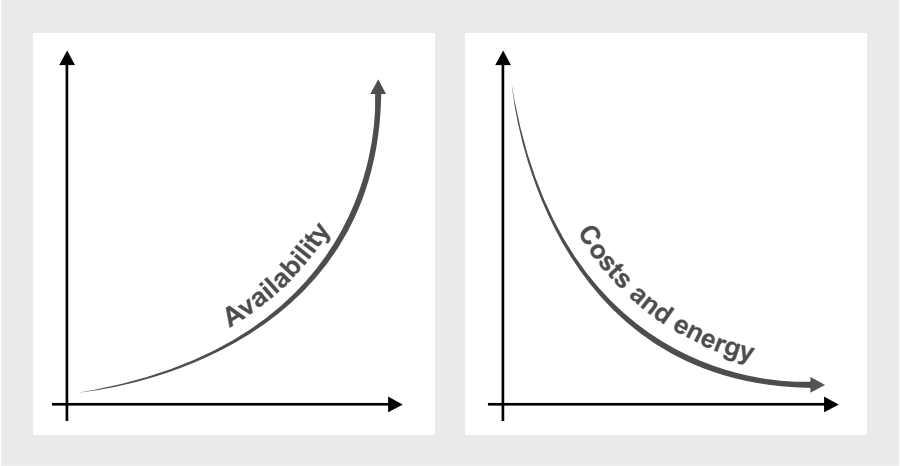
The limited availability of resources (electricity, coal, gas, etc.) and materials, such as metals and rare-earth elements, requires a fundamental shift in the use of industrial plants.

Electric drives can make a significant contribution to reduce the energy consumption. Worldwide directives and laws stipulate the future use of energy-efficient motors in new plants. However, the volume of already installed electric motors offers an even larger potential for saving energy. Electric motors with lowest energy efficiency levels are still in use all over the world today. Innovative motor concepts and drive systems offer an interesting incentive to replace the old motors with energy-efficient motors in the course of a retrofitting measure.



3782904331

Retrofitting the drives not only helps to save energy costs, but also improves the functionality, performance and availability of the system.



3685184907

Depending on the application, the period of operation and the power range, the retrofitting costs pay off within a short time.

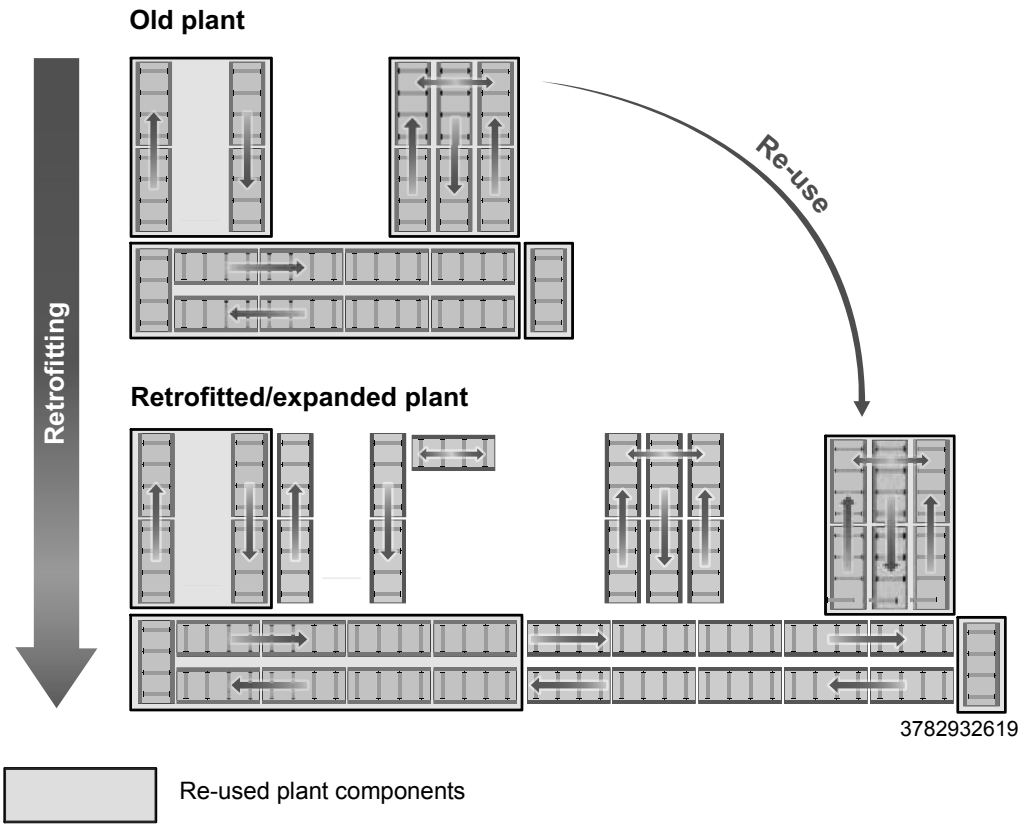
Specific examples show that additional costs for energy-efficient drive systems are amortized already after less than 2 years.

The old motors offer a large potential for recycling, as their steel, iron, copper and aluminum components can be reintroduced into the material flow. This means there are both economic and ecological incentives to modernize old plants.

Today's technology and quality of drive systems offer a component service life of ≥ 10 years. However, the actual plant operating time is much shorter for many products. As a result, existing plants are more and more often expanded and/or converted into new plants once they reach the end of their production time. With modular plant concepts, this re-use of existing plants is very easy.

Electric drives in connection with frequency inverters for speed adjustment and programmable motion controllers offer convenient functions and allow for an efficient retrofitting or re-use of old plants.

Both the retrofitting and re-use of electric drive systems offer energy saving potential in production and operation, making a positive contribution to reducing CO_2 emissions and protecting the environment.



1.2 Content and structure of this publication

1.2.1 Content

This publication presents current questions, issues and trends, such as

- Saving energy
- Flexibility
- Efficient plant technologies
- Ambient conditions
- Logistics processes
- Process optimization

and guides you to the right and efficient mechatronic drive solution for you.

1.2.2 Structure

This guide always starts with the situation and requirements of your installation site, based on our expertise from numerous, successfully implemented projects.

It focuses on

- Situation at customer site
- Customer requirements
- Solution approach
- Customer benefits
- SEW-EURODRIVE solution
- Realization examples / verification

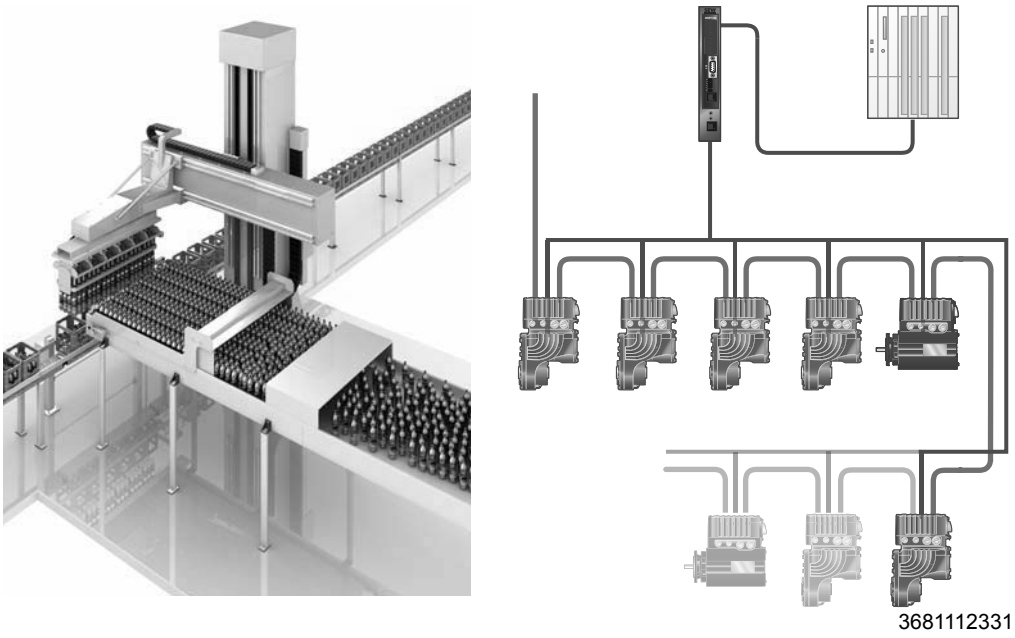
and leads you step by step to the ideal solution from SEW-EURODRIVE and the advantages offered by that.

1.2.3 Target group

This publication is intended for plant manufacturers and operators who use decentralized plant automation for horizontal or vertical conveyor applications and the area in front of machines:

Example: Plant automation in the area in front of a machine

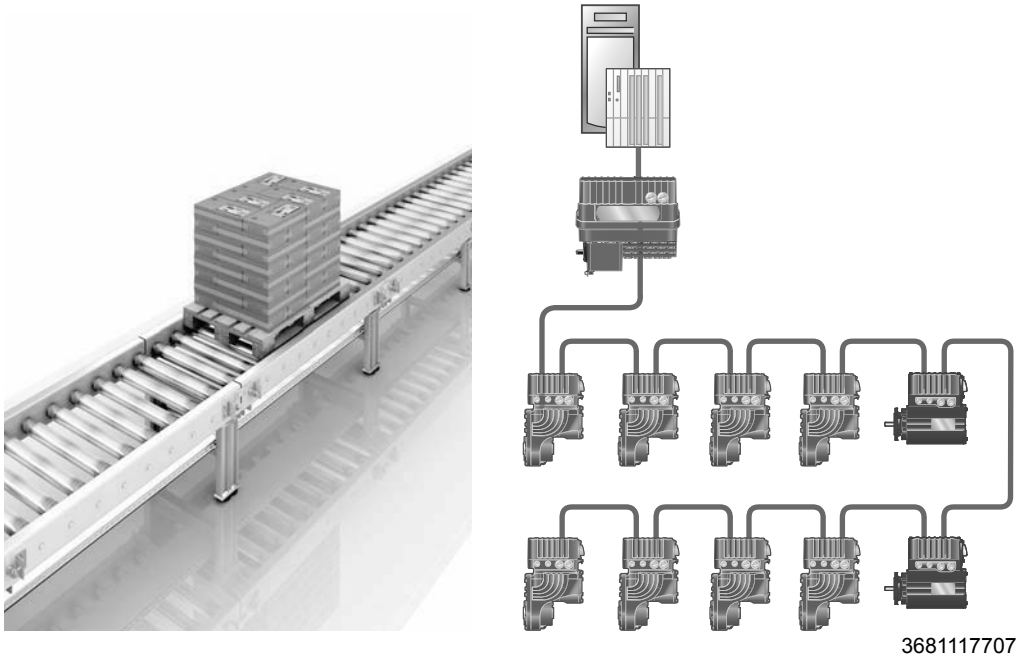
With SBus installation topology and controller in the control cabinet:



3681112331

Example: Plant automation in horizontal conveyor systems

With SNI installation topology (Single Line Network Installation) and decentralized controller:



3681117707

1.3 Additional information

1.3.1 Publications

For detailed information about the mechatronic drive solutions illustrated in this publication, refer to the following publications, which you can order from **www.sew-eurodrive.com** free of charge or download in PDF:

- "Drive System for Decentralized Installation" catalog
- "MOVIGEAR® B" catalog
- "MOVIMOT® Gearmotors" catalog

1.3.2 Microsites

- MOVIGEAR®

  → **www.sew-eurodrive.de/movigear/englisch**
- MOVIFIT®

  → **www.sew-eurodrive.de/movifit/englisch**
- Saving energy

  → **www.sew-energy-saving.com**

1.4 Copyright notice

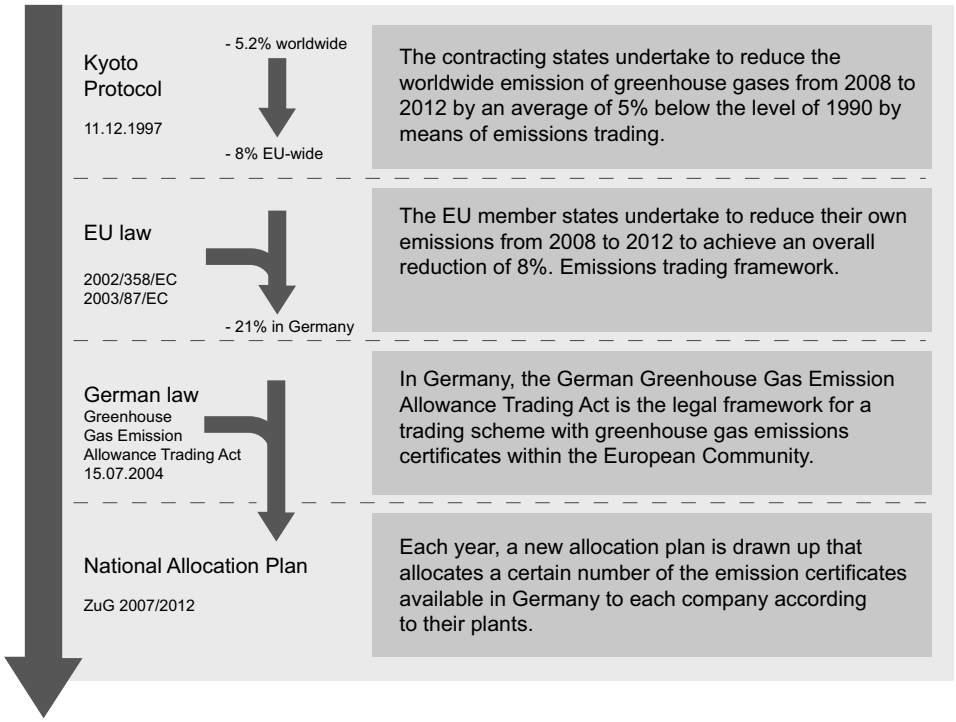
2 Saving Energy

2.1 Situation at customer site

2.1.1 Legal CO_2 requirements

The Kyoto Protocol from December 11, 1997 forms the basis for today's most important greenhouse gas emission laws. The following figure shows the implementation of the law for the EU member states on the basis of the Protocol, using Germany as an example.

Overview of greenhouse gas emission laws:



3663985419

The Kyoto Protocol stipulates the worldwide reduction of emissions by 5% on average compared to 1990, distributing this reduction to individual regions. The EU member states are required to reduce their greenhouse gas emissions by 2012 by an average of 8% from the 1990 level. Furthermore, it was decided that the savings can be achieved through an international trading system with certificates that allow for the emission of greenhouse gases. The EU Directives 2002/358/EC and 2003/87/EC require the member states to meet the country-specific emission targets that were negotiated shortly after the Kyoto Protocol in order to achieve the 8% overall reduction target; in case of Germany, the target is 21%. The directive also contains a list of criteria for plants whose emissions are subject to certification. At present, the Directive is still limited to very energy-intensive industry sectors.

Agreements negotiated after the Kyoto Protocol set even stricter standards. For example, the European Union set the eco-political goal to reduce the greenhouse gas emissions by 2020 by 20%.

2.1.2 Worldwide efficiency regulations

In recent years, a number of countries have implemented efficiency regulations for asynchronous motors. Many of their efficiency levels or calculation methods vary only slightly. However, this causes substantial costs to motor manufacturers for the adaptation of the motors and for approval and certification. For export-oriented plant manufacturers, the multitude of worldwide standards and their exceptions form an extremely complex system of regulations. SEW-EURODRIVE supports its customers in selecting the right motor with personal consulting and by offering the tool "IE Guide", which shows the currently applicable efficiency standards for the country that the customer has selected in a concise way.

SEW-EURODRIVE actively participated in shaping the new IEC standard in order to harmonize the many different existing energy efficiency standards for asynchronous motors all over the world.

Goals:

- Increased utilization of motors with high (High) and very high (Premium) efficiency leads to reduced CO_2 emission and energy costs.
- Focus on motor sizes and variants that use the most energy and for which it therefore makes the most sense from an ecological and economic point of view to introduce energy-efficient designs.
- Standardization of efficiency classes in order to:
  - Increase market transparency
  - Eliminate or avoid country-specific regulations and the resulting trade barriers
  - Reduce the product diversity of international manufacturers and OEMs
  - Reduce the time and effort required for approvals and certifications
- Provision of international standards that are technically and practically feasible.
- Clear formulation of exceptions made necessary due to technical requirements.

IEC 60034-30

The new part 30 of the AC motor directive IEC 60034 defines the energy efficiency classes IE1 to IE3. The efficiency class "Super Premium Efficiency" (IE4) is described in part 31.

The abbreviation IE stands for "International Efficiency". The numbers were reversed in comparison to the previous EFF classes to open the designation for even higher levels:

3654939147

Directive 2009/125/EC (ErP directive, eco-design directive)

The Directive 2009/125/EC of the European Parliament, also known as ErP directive (Energy-related Products) or eco-design directive, has several goals:

- Improved environmental compatibility of energy-using products
- Climate protection
- Harmonized standards

The standard defines only the affected product groups. It forms the basis for product-specific regulations. With this directive, the EU created the legal framework for eco-relevant product requirements.

On the basis of the Directive 2009/125/EC, the specific regulations of the European Commission (product requirements, energy efficiency, area of application, dates, etc.) are drawn up for each product group.

The implementing regulation for low voltage AC motors has already come into force and must be complied with as of the stipulated dates.

Regulation 640/2009: "Motor Regulation"

The implementing regulation (motor regulation) for the EU directive (640/2009/EC) is based on the two new parts of IEC 60034 (measurement methods 2.1 and efficiency classes 30).

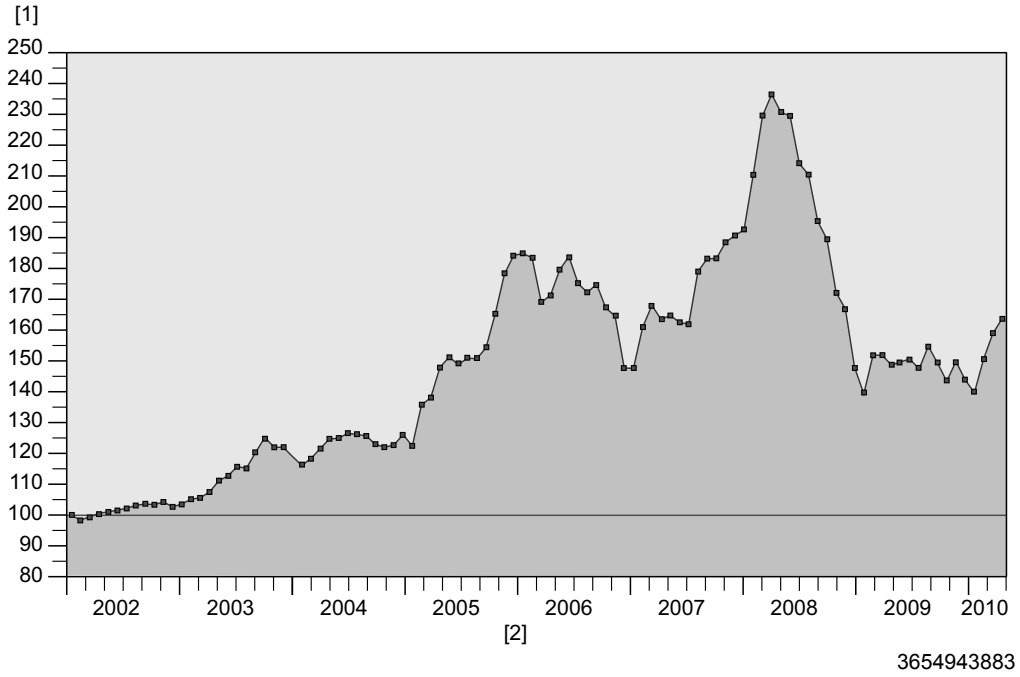
- The European Economic Area (EEA) stipulates minimum efficiency levels for AC motors as of June 16, 2011.
- From this date, the initial distribution of Standard Efficiency motors (IE1) for use in the EEA will be prohibited. The implementing regulation stipulates the mandatory use of energy-efficient motors (IE2).
- In a first step, 2-, 4- and 6-pole AC motors in the power range 0.75 – 375 kW must achieve at least level IE2.
- As of January 1, 2015, motors in the power range from 0.75 – 375 kW must either meet IE3 requirements, or they can be operated as IE2 motors on a frequency inverter.
- As of January 1, 2017, this provision will apply to all motors with a power rating of 0.75 kW and higher.

2.1.3 Cost pressures due to the development of energy prices

In the years 2002 – 2008, the price levels for energy increased continuously. In mid-2008, the energy price peaked at an unprecedented level, which was more than twice than that of early 2002. Due to the worldwide economic crisis and declining production output, the energy price index of the VIK (the German Association of the Energy and Power Generation Industry) dropped to below 150 points again.

However, the prices for energy are expected to increase significantly again in the next few years. For industrial consumers, the energy price development has become a cost factor that is very difficult to calculate.

The implementation of sustainable energy-saving measures helps to counter rising energy prices in the future and to reduce additional costs for production.



[1] VIK index: January 2002 ≙ 100
[2] Year
Source: VIK (German Association of the Energy and Power Generation Industry)

2.1.4 Saving energy as a marketing strategy

Many companies have already realized that focusing their marketing strategy on topics such as sustainability and the conservation of resources have quite a positive effect on the company image.

What makes the communication difficult is that, for example, options for saving energy require very detailed explanations. Especially the different technologies and conditions must be presented to the customer in a comprehensible and convincing way. The right energy-saving components, convincing consulting, and a clear presentation of saving potentials can create a very positive corporate image and achieve the desired sales targets.

2.2 Customer requirements

The individual background of each customer is the reason for different requirements and approaches to save energy.

- Green image

  Plant manufacturers or producers have integrated measures for consumption reduction into their company goals. Their objective is a positive corporate image and differentiation from competitors. Energy-saving measures and successfully implemented projects are used for marketing activities to create a "green image".

- Reducing energy costs

  Plant operators want to sustainably lower their actual costs for energy. The saving targets can be based on the annually required power in kilowatts, for example, or the amount of energy required for each produced item.

- Small investments → efficient ROI

  A short amortization time is the objective of all investments. Investments in energy-saving technologies are only made if a specified amortization time is achieved. In addition to the amortization time, the rate of return over a longer period should also be considered, see chapter "Amortization and rate of return" (page 27).

- Compliance with legal regulations

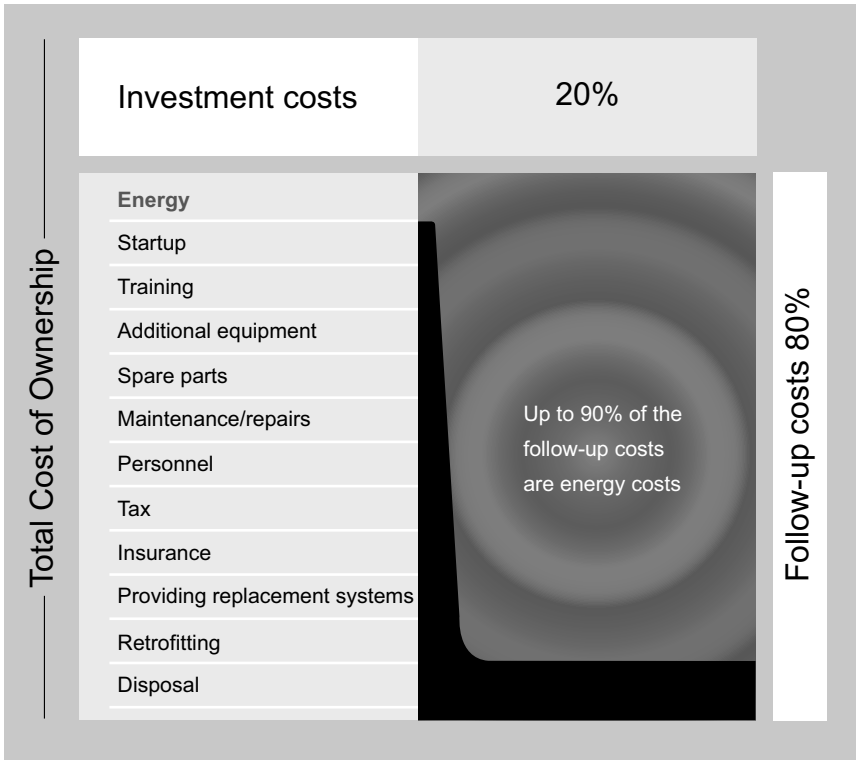
  Plant manufacturers who export their plants must meet the efficiency level requirements for electric motors that apply in the respective foreign country. The focus here is on compliance with the standard while keeping the adaptation effort and additional costs as low as possible.

2.3 Solution approach

2.3.1 Analysis of life cycle costs (LCC) and total cost of ownership (TCO)

In many investment decisions, one fact is still neglected: The investment costs for a plant in relation to its entire life cycle often account for only a small proportion (about 20%) of the total costs. This is why the focus during the planning and tendering for a plant should not be exclusively on the purchase costs. The many different follow-up costs of a plant throughout its life cycle must be considered as well. In case of an electric motor, up to 90% of the follow-up costs can be made up by energy costs, depending on the application and motor type.

The following figure shows the share of energy costs in the total cost of ownership:



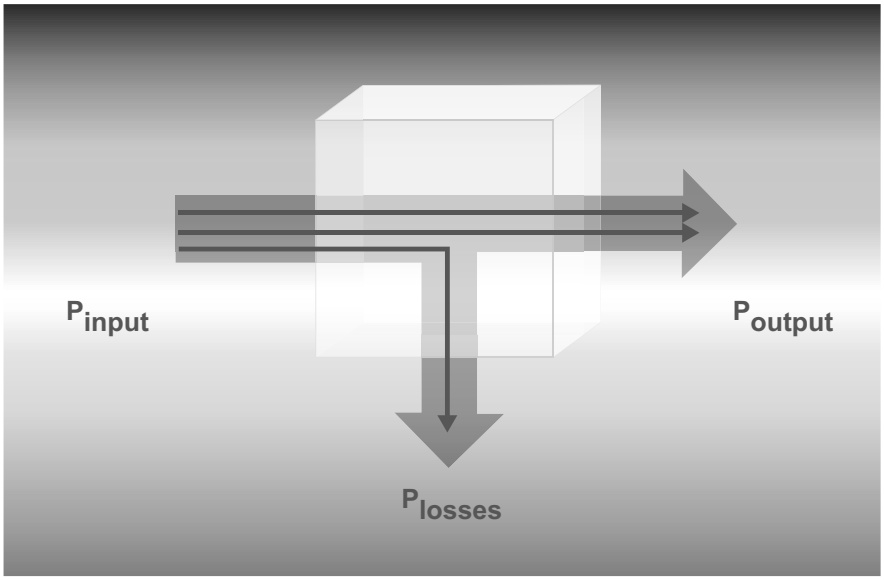
3655198091

Procurement decisions must no longer be based on the investment costs only. The sum of initial and follow-up costs over a defined period of time has become more and more a decisive factor for purchase decisions.

2.3.2 Optimizing the consumption, reducing the losses → lowering the energy costs

The optimum energy-saving solution depends on the customer-specific application and is best determined on the basis of individual consulting and a detailed analysis of the system.

The focus is on the overall system, and the goal is to optimize the output power (P_{out}) and the power losses (P_{loss}) by using the right drive technology while taking existing processes into account (see energy saving checklist).



3655271307

$P_{in} = P_{out} + P_{loss}$

Energy and costs are saved by reducing P_{out} (effective) and/or P_{loss} (losses).

Measures derived from this approach guarantee a customized energy saving solution tailored specifically to the individual application.

Energy saving checklist

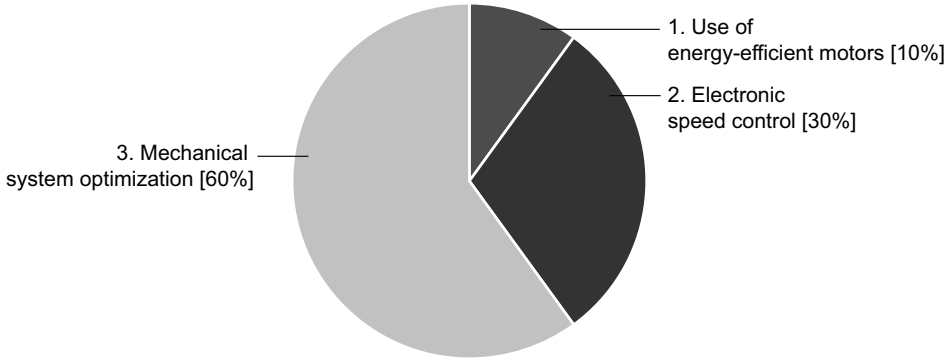
The energy-saving checklist ensures a comprehensive review and consistent implementation of all energy-saving factors coming into consideration.

Optimizing the power output P_{out}	**Reducing the power loss** P_{loss}
• Reduced the output speed (control) • Reduced load torque • Rigid transmission elements • Use of counterweights • Minimization of friction in the process • Energy-saving mode (automatic switch-off, stand-by)	• Increasing the gear unit and motor efficiency • Improved inverter efficiency • Energy-efficient design of options/functions (e.g. brake) • Using regenerative energy • Direct energy consumption in other axes • Braking energy is fed back • Energy buffer • Dimensioning in line with demand

2.3.3 Saving potentials in electrical drive engineering

There are 3 main areas that offer opportunities to reduce the energy consumption:

1. Increased use of energy-efficient motors
2. Electronic speed control via frequency inverter
3. Mechanical system optimization



Source: ZVEI 3783717131

Total 1 + 2:

- 27.5 billion kWh
- 11 power plant units of the 400 MW class
- 16.9 million tons of CO_2 / year

EuP target:

- 39 million tons of CO_2 / year

2.3.4 Increased use of energy-efficient motors

About two thirds of the industry's energy consumption is used for the operation of electric motors. The motors convert the electric energy to mechanical energy. Increased utilization of energy-efficient motors can account for up to 10% of the energy saving potential, according to a ZVEI study.

The efficiency of energy-efficient motors compared to older, standard asynchronous motors is about 5% higher for low power ratings, and about 2% for higher power ratings. Especially at nominal load, the energy-efficient motors have a much better efficiency. When purchasing new motors (for new plants or as replacement drives), the efficiency and the related energy savings must be included in the cost calculation.

2.3.5 Electronic speed control via frequency inverter

The following effects occur with a variable-speed drive (AC motor + FI):

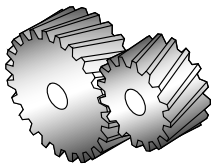
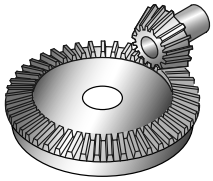
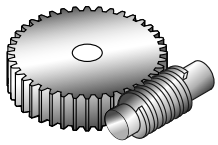
- Processes are improved by introducing variable process parameters that make the entire process more flexible
- The speed can be adjusted to the relevant application
- Dynamic energy-saving function:

  Magnetization of the asynchronous motor is controlled depending on the load by adjusting the voltage/frequency ratio
- Mechanical wear is reduced by ramps
- In case of brake operation, energy is fed back into the DC link or into the supply system (regenerative power supply module)
- The drive is stopped or disconnected when it is not in use

2.3.6 Mechanical system optimization

Saving potential of the gear unit

The efficiency of gear units is influenced by the sealing of the input and output shafts and the losses within the gear unit. Ideally, the gearing is a steel/steel material pairing.

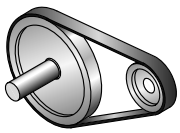
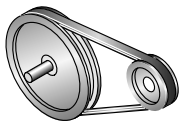
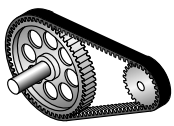
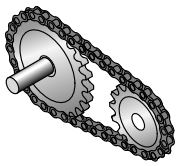
Characteristic value per stage of the gear type	Helical gear	Bevel gear	Worm gear
Schematic representation			
Max. reduction ratio	About 7	About 5	About 50
Efficiency	About 98%	About 98%	About 50 – 96%

The higher the input speed, the higher the friction losses in the bearings and the churning losses in the oil. The correct oil quantity and oil grade ensures minimum losses and long, wear-free operation:

Conclusion: For most applications, the 2-stage helical gear units are the ideal solution with respect to costs and efficiency.

Saving potential of the power transmission

In many cases, additional belts or chains are used. V-belts should be avoided because of the lower level of efficiency. If chains are used, ensure sufficient lubrication during operation.

Characteristic value Gear unit type	Flat belt	V-belt	Toothed belt	Chain
Schematic representation				
Max. reduction ratio	5	8	8	6
Efficiency	96 - 98 %	92 - 94 %	96 - 98 %	96 - 98 %

Additional power transmission elements should not be used at all, if possible. Ideally, power is transmitted via a rigid coupling, and the necessary reduction ratio is realized in the mounted gear unit with minimized losses. There are virtually no other losses.

Conclusion: The solution to this is a shaft-mounted gear unit with hollow shaft, which is connected directly with the input shaft of the driven machine.

Brakes

Mechanical brakes are nowadays usually integrated in the drive unit. In this type of brake, the braking power is generated by a spring. The brakes must be released during operation by means of an electric current. This current flows permanently as long as the drive is running.

Depending on the size of the motor and the brake, between 20 and 200 Watt are required to release the pressure plate. From an energy-related point of view, mechanical brakes should not be used if safety requirements permit this.

Conclusion: An electrodynamic deceleration function can be the ideal solution for horizontal applications. The plant can be stopped without any additional energy.

2.3.7 Amortization and rate of return

There are several ways to assess an investment. In practice, however, the amortization period is usually used as the criterion. The amortization period only specifies when the invested capital has been regained, but does not say anything about the actual rate of return. Often, investment projects fail because they stipulate short amortization times. As a result, a company might miss considerable energy saving potentials in case of investments related to energy, which are characterized by a long life cycle. To avoid this, it is better to look at the rate of return. A suitable gauge for the rate of return is the return on capital (internal interest).

The following table shows which profitable investment options are ruled out when using a defined amortization period (here: 3 years) as the sole criterion for profitability. "Profitable" was defined here as offering an internal interest of at least 10 percent.

Investments in energy efficiency, life cycle of the plant: 15 years[1)]		
Desired amortization period / payback time	**Internal interest / return on invested capital**	**Comment**
2 years	50%	With amortization periods of up to three years and a life cycle of 15 years, energy efficiency measures have a very high return on capital.
3 years	33%	
4 years	24%	Even with amortization periods that are twice as long, such investments offer a good rate of return.
5 years	18%	
6 years	15%	
7 years	12%	
8 years	9%	Investments with an internal interest below 10 percent are not regarded as profitable by companies.

1) Source: Guide for the efficient use of energy in industry and trade, published by: Bavarian State Office for the Environment

2.4 Customer benefits

2.4.1 End customer / plant operator

The use of energy-efficient drive technology offers numerous benefits to end customers and/or operators. Many aspects can be assessed directly in terms of money and contrasted with the necessary investment:

- Effectively reduced energy costs with energy savings of up to 50%.
- Reduced life cycle costs (LCC) for operation and maintenance of the machine or plant, because the use of frequency inverters takes strain off of the mechanical components.
- Improved corporate image, because production is more eco-friendly.
- Some countries offer tax incentives or shorter depreciation periods for energy-efficient technology.
- Less input power is required due to the increased efficiency. This means that smaller fuses and transformers can be used under certain circumstances.
- When expanding a plant, it is often not necessary to invest in an upgrade of the power supply, as the existing supply system is sufficient.

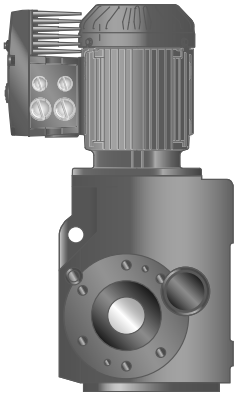
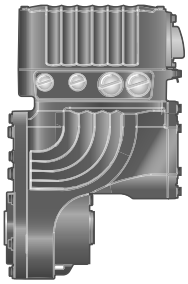
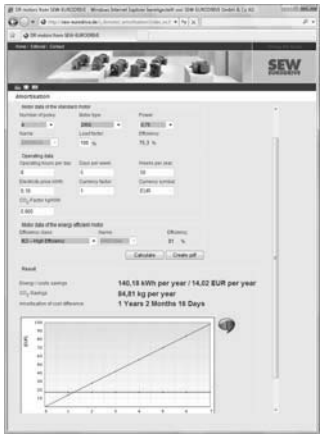
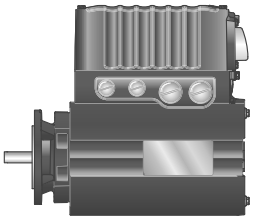
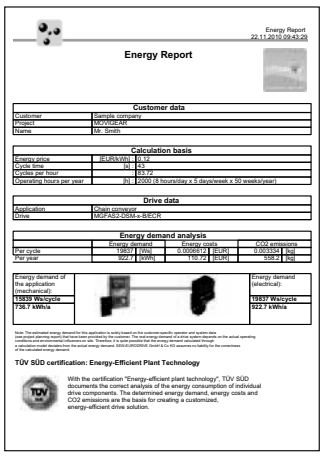
2.4.2 OEM / plant manufacturer

The use of energy-efficient drive technology offers numerous benefits to OEMs, integrators and plant manufacturers.

- As the power requirement of the drive technology in the machine or plant is reduced, it is possible to use cables with a smaller cross section and cheaper electrical installation components.
- Costs can be saved as less input power is required.
- Clear differentiation from competitors (OEM).
- Offering energy-saving and eco-friendly plants creates a positive corporate image.
- Future market requirements can be met early. This offers competitive advantages and increased sales potential.

2.5 SEW-EURODRIVE solution

2.5.1 Overview of mechatronic components and tools

Components	Tools
Helical-bevel gearmotor with energy-efficient DRE or DRP motor and integrated MOVIMOT® frequency inverter 	IE Guide on the Internet and as iPhone app: 
MOVIGEAR® – the mechatronic drive system 	Energy saving calculator: the new Web application 
Electronic motor (in preparation) 	SEW Workbench: the comprehensive project planning tool with energy consumption analysis and energy report 

2.5.2 Energy-efficient motors

Using energy efficient motors of the DRE or DRP series significantly improves the energy balance. SEW-EURODRIVE is the first company worldwide that has implemented die-cast copper technology in an industrial high-volume production. Result: highly efficient energy saving motors. All this comes at a surprisingly economic price, which enables amortization within one or two years.

In a baggage handling system, the replacement of helical-worm gear units with efficiency-optimized helical-bevel gear units in combination with the highly efficient energy saving motors and the resulting increase in motor efficiency can save up to 10% of energy.

3790201867

2.5.3 The mechatronic MOVIGEAR® drive system

The mechatronic MOVIGEAR® drive system combines motor, gear unit and electronics in one product. With optimized interfaces between the inverter, motor and gear unit, minimized friction and current losses, and intelligent control modes, this system provides a higher overall efficiency than any previously achieved, between 10 and 25 percentage points above that of conventional drive solutions.

Using this, system manufacturers can achieve an efficiency that surpasses efficiency class IE4 (Super Premium Efficiency) today, reducing their energy costs by up to 50% on average.

3790199947

2.5.4 DynaStop® – the electrodynamic deceleration function for MOVIGEAR®

DynaStop® allows for generating a speed-dependent torque when the motor is de-energized or "controller inhibit" is activated. This prevents the application from excessive acceleration due to external forces (e.g. sagging on inclining tracks)

MOVIGEAR® has the following function when the drive is running: In the event of a voltage failure, the kinetic energy is used to supply the frequency inverter via regeneration. This allows for controlled deceleration. DynaStop® is activated when the regenerative power is insufficient.

→ DynaStop® requires no energy!

Dispensing with a mechanical brake additionally reduces the energy consumption. Conventional brakes of this size constantly require about 30 – 50 W to release the pressure plates.

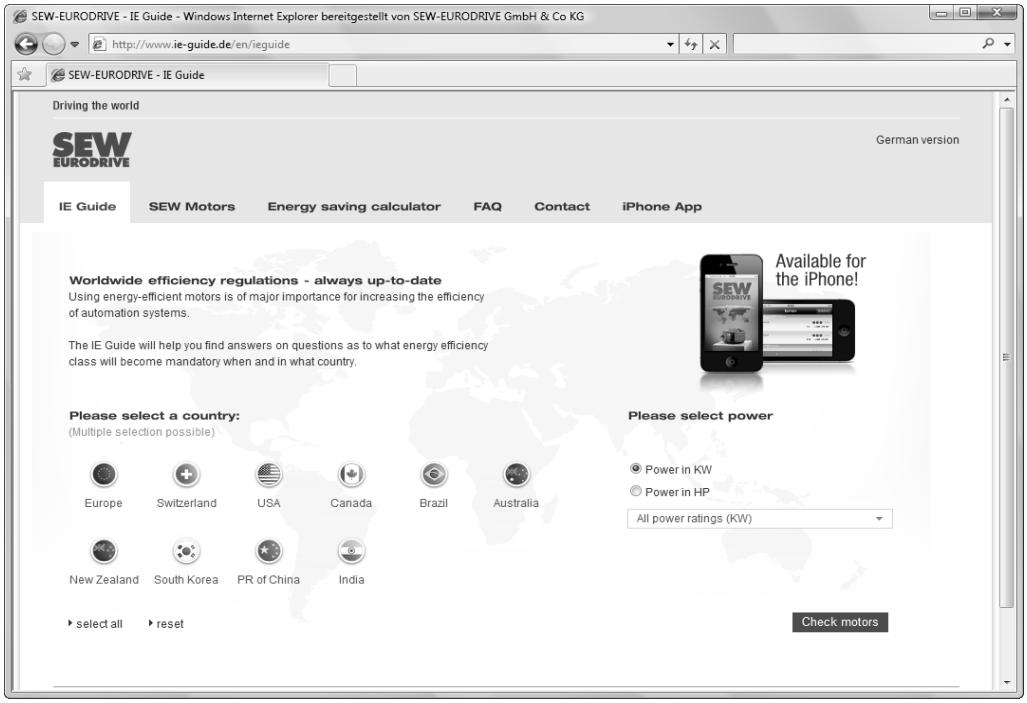
The electrodynamic deceleration function DynaStop® does not allow for a stop at a definitive position though. This is why the electrodynamic deceleration function cannot be used for hoists, and it must only be used for inclining tracks on the basis of a risk assessment.

2.5.5 IE Guide on the Internet and as iPhone app

Meeting tomorrow's worldwide efficiency requirements already today:

The IE Guide on the Internet or for the iPhone informs users quickly and easily about the worldwide applicable and future IE standards and the corresponding exceptions.

The IE Guide app for the iPhone is available for download from the iTunes Store free of charge.

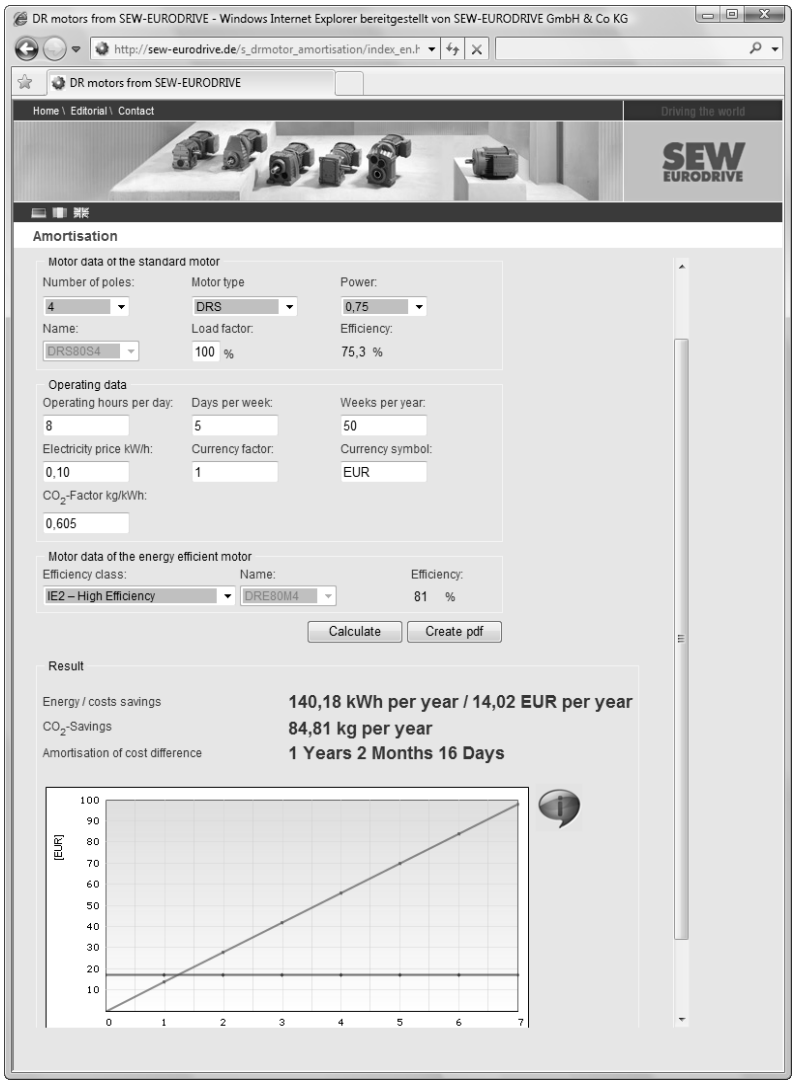


3662026379

2.5.6 Energy saving calculator on the Internet and as iPhone app

The energy saving calculator is another free-of-charge web application that determines energy saving potentials offered by using energy-efficient motors (also available as iPhone app).

- Quick and user-friendly
- You can compare the energy consumption of standard motors (IE1 = Standard Efficiency) with that of energy-efficient motors (IE2 = High Efficiency, IE3 = Premium Efficiency) with one mouse click and calculate the respective amortization periods for the investment.
- The calculation log can be downloaded in PDF.



3658904971

2.5.7 SEW Workbench project planning tool

A new function in the SEW Workbench project planning tool (version 2.7) is available to customers of SEW-EURODRIVE that helps them to find an energy-efficient drive solution. This function is referred to as energy consumption analysis. The "energy report" created during this analysis shows the total energy consumption for the specific application and the configured drive train and forms the basis for selecting the most energy-efficient drive technology components.

With the certification "Energy-efficient plant technology" for the SEW energy report, TÜV SÜD (German Technical Control Board) documents the correct analysis of the energy consumption of individual drive components. The determined energy demand, energy costs and CO_2 emissions are the basis for generating a customized, energy-efficient drive solution.

Energy Report
22.11.2010 09:43:29

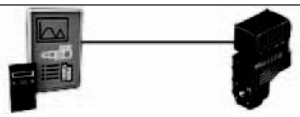
Energy Report

Customer data	
Customer	Sample company
Project	MOVIGEAR
Name	Mr. Smith

Calculation basis		
Energy price	[EUR/kWh] :	0.12
Cycle time	[s] :	43
Cycles per hour	:	83.72
Operating hours per year	[h] :	2000 (8 hours/day x 5 days/week x 50 weeks/year)

Drive data	
Application	Chain conveyor
Drive	MGFAS2-DSM-x-B/ECR

Energy demand analysis	Energy demand		Energy costs		CO2 emissions	
Per cycle	19837	[Ws]	0.0006612	[EUR]	0.003334	[kg]
Per year	922.7	[kWh]	110.72	[EUR]	558.2	[kg]

Energy demand of the application (mechanical):		Energy demand (electrical):
15839 Ws/cycle		**19837 Ws/cycle**
736.7 kWh/a		**922.7 kWh/a**

Note: The estimated energy demand for this application is solely based on the customer-specific operator and system data (see project planning report) that have been provided by the customer. The real energy demand of a drive system depends on the actual operating conditions and environmental influences on site. Therefore, it is quite possible that the energy demand calculated through a calculation model deviates from the actual energy demand. SEW-EURODRIVE GmbH & Co KG assumes no liability for the correctness of the calculated energy demand.

TÜV SÜD certification: Energy-Efficient Plant Technology

With the certification "Energy-efficient plant technology", TÜV SÜD documents the correct analysis of the energy consumption of individual drive components. The determined energy demand, energy costs and CO2 emissions are the basis for creating a customized, energy-efficient drive solution.

3659854731

2.6 Realization examples / verification

2.6.1 Comparison calculations

Helical-worm gear unit with standard motor compared with a helical-bevel gear unit with energy-efficient motor:

Comparison between	Standard variant	Energy-saving solution
Components for a project with 100 drive units each	Helical-worm gear unit with standard motor SA57 DV100 L4	Helical-bevel gear unit with energy-efficient DRE motor KA37 DRE100 L4
Investment	77%	100%
Energy costs/year[1)]	71 750 €	65 560 €
Energy consumption	110%	100%
Amortization time		Approx. 2.2 years
CO_2 reduction/year		40 t
The energy-efficient solution with helical-bevel gear units and energy-efficient motors saves a total of EUR 17 300 after only 5 years of operation.		

1) Calculation basis: 3500 hours of operation/year x 0.10 €/kWh x plant power

Helical-worm gear unit with standard motor compared with the mechatronic MOVIGEAR® drive system:

Comparison between	Standard variant	Energy-saving solution
Components	105 helical-worm gearmotors with standard motors and standard frequency inverters in the control cabinet	Mechatronic drive system MOVIGEAR® SNI with 105 MOVIGEAR® drive units
Investment	94%	100%
Energy costs/year[1)]	44 150 €	34 500 €
Energy consumption	128%	100%
Amortization time		1.3 years
CO_2 reduction/year		65 t
The energy-efficient solution with MOVIGEAR® saves a total of EUR 35 700 after only 5 years of operation.		

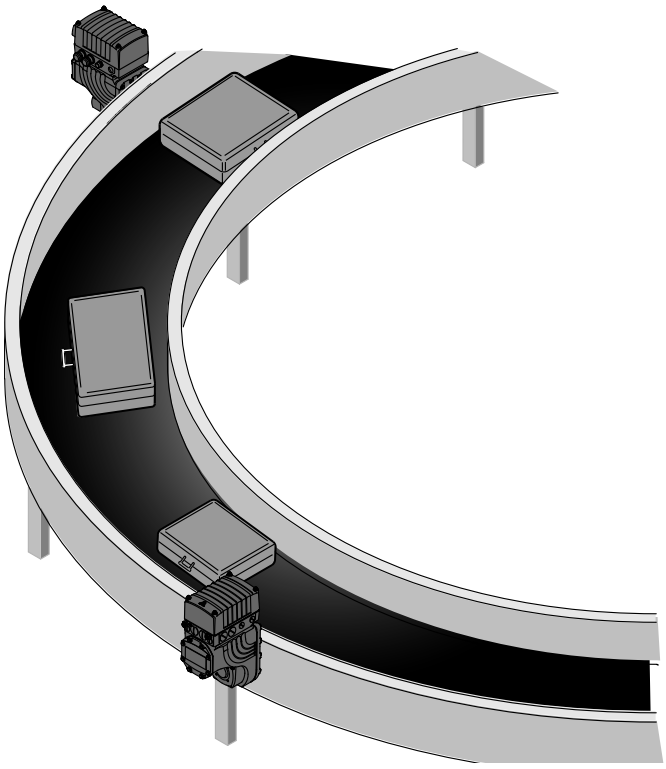
1) Calculation basis: 3500 hours of operation/year x 0.10 €/kWh x plant power

2.6.2 Comparison measurements

The advantages of the high efficiency of MOVIGEAR® and the real energy savings in customer applications have been confirmed by numerous measurements.

Example A

Belt conveyor as part of a baggage handling system in a European airport.

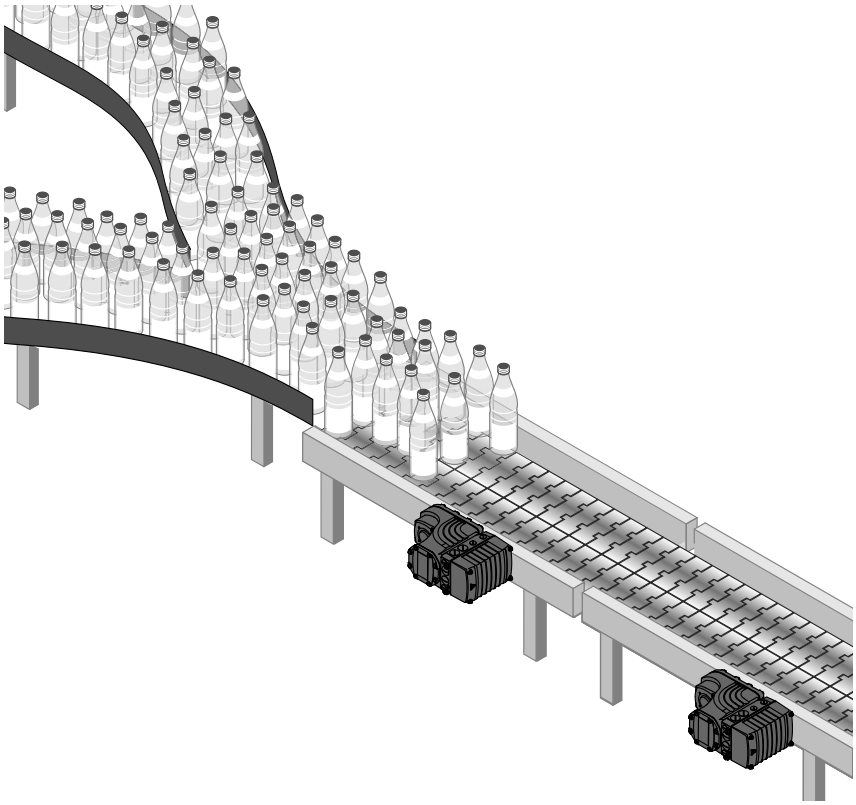


3284628107

Drive type	Minimum power consumption [watt]	Maximum power consumption [watt]	Mean power consumption [watt]
KA47DT90S4 BMG2 (Supply system operation)	0	1751	1218
MOVIGEAR® MGFAS4-DSM-DSC	10	943	549

Hours of operation per year	6570 hours
Costs per kWh	EUR 0.122
Average energy consumption reduction	55%
Saved energy costs per drive	EUR 536/year
CO_2 reduction per drive	2391 kg/year

Example B Bottle conveyor in a filling line of a German mineral water spring.



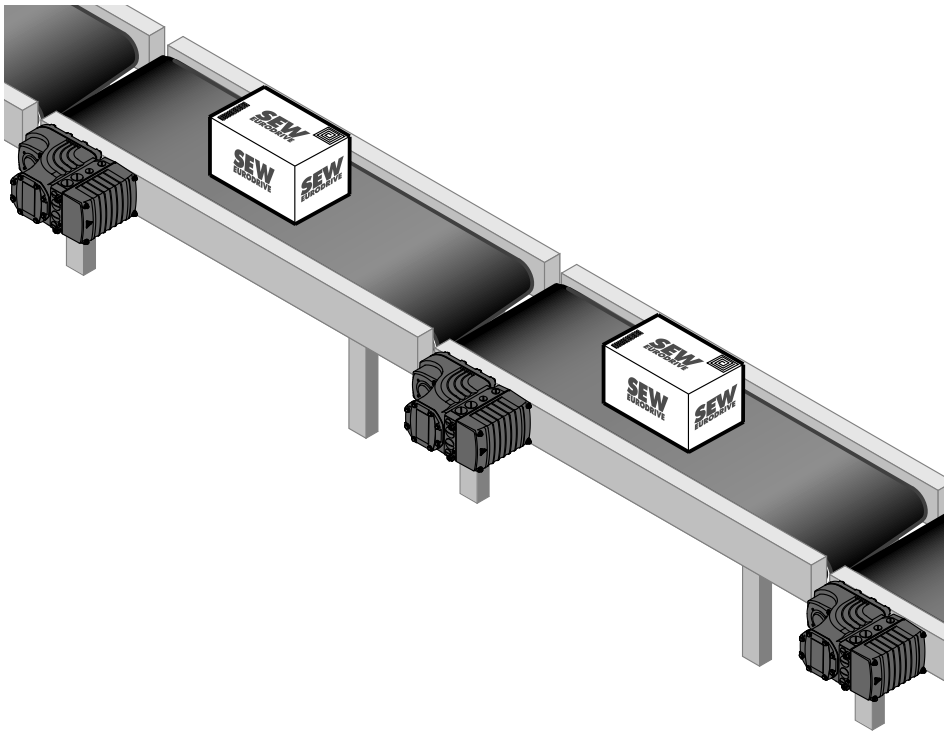
9007202539808139

Drive type	Position	Nominal power/ nominal torque	Maximum power consumption [watt]	Mean power consumption [watt]
Helical-worm gearmotor with frequency inverter in the control cabinet	1	1.5 kW	537	443
	2	2.2 kW	698	386
	3	3.0 kW	1305	675
MOVIGEAR® MGFAS4-DSM-DSC	1	169 Nm	256	227
	2		410	149
	3		635	251

Hours of operation per year	4800 hours
Costs per kWh	EUR 0.10
Average energy consumption reduction	52%
Saved energy costs per drive	EUR 108/year
CO_2 reduction per drive	620 kg/year

Example C

Belt conveyor in a logistics line for unit loads with regular start/stop cycle.



3284630027

Drive type	Load [kg]	Mean power consumption [watt]
0.75 kW helical-bevel gearmotor with frequency inverter in the control cabinet	0	515
	25	716
	45	950
MOVIGEAR® MGFAS2-DSM-DSC	0	310
	25	425
	45	600

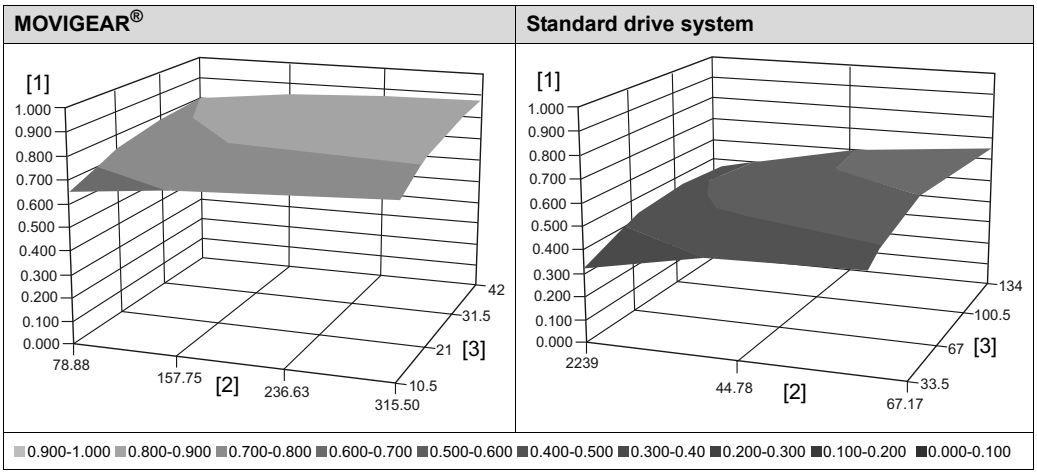
Hours of operation per year	2800 hours
Costs per kWh	EUR 0.11
Average energy consumption reduction	40%
Saved energy costs per drive	EUR 90/year
CO_2 reduction per drive	465 kg/year

2.6.3 Independent comparison measurements

Fachhochschule Kaiserslautern
Fachbereich Angewandte Ingenieurwissenschaften

Mechatronic MOVIGEAR® drive unit

The high overall efficiency and the resulting energy savings of MOVIGEAR® was measured and confirmed by the University of Applied Sciences of Kaiserslautern as an independent institution. The results confirm an energy-saving potential of up to 50%. Quotation from the final report: "A comparison of the test results shows a significant efficiency advantage of the MOVIGEAR® drives … over the entire load range."



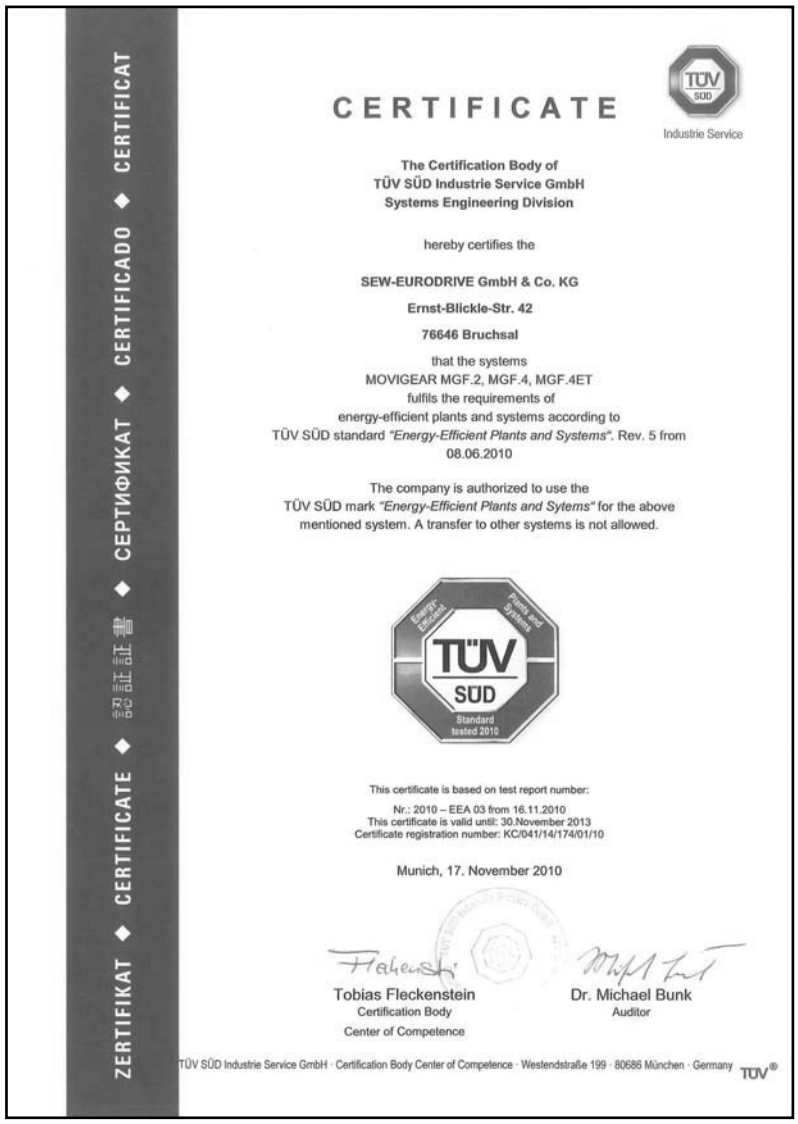
[1] Efficiency
[2] Speed [rpm]
[3] Load torque [Nm]

2.6.4 TÜV certificate "Energy-Efficient Plant Technology" for MOVIGEAR®

The mechatronic MOVIGEAR® drive system is an energy-efficient solution that was certified in accordance with the TÜV SÜD standard "Energy-Efficient Plant Technology". SEW-EURODRIVE is the first drive manufacturer to have the high energy efficiency of its products certified by an independent body.

The excellent energy-saving properties of MOVIGEAR® result from the efficiency-optimized parallel-shaft helical gear unit, the permanent-field synchronous motor that meets energy efficiency class IE4 (Super Premium Efficiency), and the intelligent control mode of the integrated frequency inverter.

The certification for the mechatronic drive system is a product-specific certification. It offers customers an additional point of orientation for the selection of an energy-efficient drive unit.



ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

CERTIFICATE

TÜV SÜD Industrie Service

The Certification Body of
TÜV SÜD Industrie Service GmbH
Systems Engineering Division

hereby certifies the

SEW-EURODRIVE GmbH & Co. KG
Ernst-Blickle-Str. 42
76646 Bruchsal

that the systems
MOVIGEAR MGF.2, MGF.4, MGF.4ET
fulfils the requirements of
energy-efficient plants and systems according to
TÜV SÜD standard *"Energy-Efficient Plants and Systems"*. Rev. 5 from
08.06.2010

The company is authorized to use the
TÜV SÜD mark *"Energy-Efficient Plants and Sytems"* for the above
mentioned system. A transfer to other systems is not allowed.

Energy Efficient Plants and Systems
TÜV SÜD
Standard tested 2010

This certificate is based on test report number:
Nr.: 2010 – EEA 03 from 16.11.2010
This certificate is valid until: 30.November 2013
Certificate registration number: KC/041/14/174/01/10

Munich, 17. November 2010

Tobias Fleckenstein
Certification Body
Center of Competence

Dr. Michael Bunk
Auditor

TÜV SÜD Industrie Service GmbH · Certification Body Center of Competence · Westendstraße 199 · 80686 München · Germany TÜV®

3663068171

2.6.5 Saving energy – Application example

Conveyor line for PET bottles and packaging units [1)]

Energy savings and CO_2 reduction are the key objectives for the modernized conveyor line for PET bottles and packaging units described below.

In the area from the shrink packer to the palletizer, PET bottles from 0.3 to 2 l fill quantity are processed. The public utility Wien Energie GmbH has been involved in the conception of the complete renovation right from the start with detailed energy consumption calculations to achieve the best energy efficiency possible for this system.

The installed, comprehensive drive technology from SEW-EURODRIVE will enable the plant to save an impressive amount of energy and CO_2.

Tested and confirmed by Wien Energie GmbH:

- Total energy savings of about 75% due to the systematic use of 40 MOVIGEAR® units with SNI technology (Single Line Network Installation) and other measures, such as switch off during idle times.
- CO_2 reduction by about 39 000 kg/year.
- The SNI technology allows for energy and data transfer in a 4-core power cable, which reduces the number of components and in this way minimizes the installation effort.

3814904843

1) Photo source: Coca-Cola HBC Austria GmbH, Vienna, Austria

3 Flexibility / Scalability

3.1 Situation in production logistics

Logistics in production plants is concerned with the connection of individual core processes, which makes it essential for the overall success of a production plant. The entire process chain is always subject to cost pressures. Continuous increases in efficiency are necessary for production sites to keep or improve their competitiveness.

Shorter throughput times, optimum utilization, and a larger variance of produced goods with smaller batch sizes require highly automated, flexible and efficient production logistics. The efficient just-in-time production without intermediate storage after the production process calls for ever increasing automation levels.

A customer-oriented differentiation of production goods often requires:

- Scalable packaging units
- Different packaging unit sizes and forms
- Short response times to order changes
- High demands on plant flexibility

3.2 Requirements of the plant operator

The market situation demands more and more flexibility from plant operators, while low costs remain a key requirement. The plant structures must allow for short conversion and setup times in case of a product change. It must be possible to quickly change over a production plant from large, heavy containers to small, light ones by adapting the throughput speed and scaling the dimensions of the material being transported via the central computer.

This makes it possible to keep production batches small without placing a disproportionate strain on unit costs as a result of the setup times involved in a product changeover. Just-in-time production should not be affected at all by setup times. Other important requirements for a production plant are modularity and long-term expandability.

Requirements for efficient product logistics:

- Low expenses for operation and maintenance
- Conversion without affecting the operation is possible
- Expandability of the plants
- Re-use of plant components
- Cost efficiency

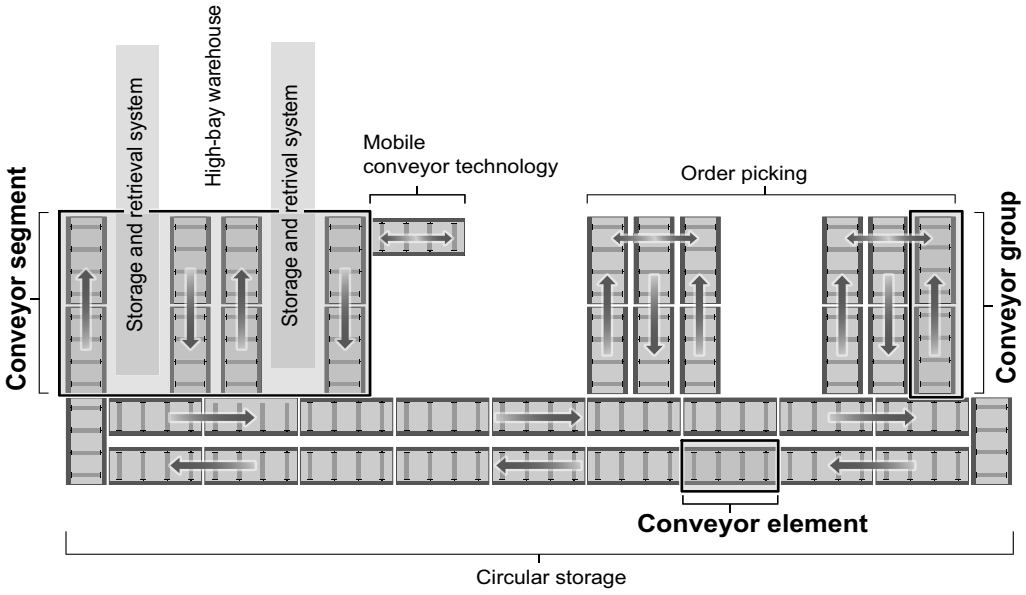
3.3 Solution approaches

3.3.1 Modularization as a philosophy

The fundamental philosophy of decentralized drive concepts is based primarily on the modularization and standardization of components and functions.

A scientific working group developed the intralogistics system architecture, which offers systematic support for planning and implementation of decentralized infrastructures.

This basic concept is, among other things, intended to facilitate the dialog between scientists and users.

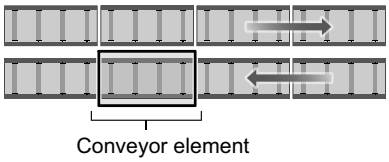


3.3.2 Basic philosophy of modularization

- Different modules can be combined as required
- Each module has a clear function and works independently
- The interfaces with neighboring modules are standardized
- Communication and control modules are platform-independent
- Local failures have only local effects
- Startup of individual modules and sub-areas is possible

Elements

The following figure shows a schematic illustration of an element:



3650634379

Requirements and characteristics

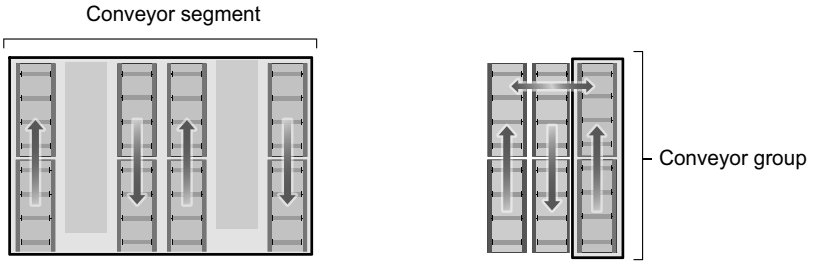
- Integrated solutions for all parts of the plant
- Integration in machine or plant automation
- High degree of integration for hardware
- Simple conversion of current plant layouts (I/Os, etc.)
- Decentralized, configurable intelligence
- Compliance with all legal requirements (e.g. efficiency)

Communication and control

- Different requirements for machine and plant automation
- Integrated drive concept
- Standardized interfaces between the individual modules
- Reduced interfaces for material flow control
- Remote maintenance access

Groups and segments

The following figure shows a schematic illustration of a group or segment:



3650636299

Requirements and characteristics

- Groups and segments constitute a functional separation from systems
- Sequence control of individual elements
- Integration of specific external units (RFID, bar code, etc.)
- Lean interfaces with higher-level warehouse management systems or production controllers
- Remote maintenance access to each segment

3.4 Customer benefits

3.4.1 Benefits in production logistics

Product differentiation is a decisive competitive advantage today. The scaling of different packaging unit sizes or conveyed good dimensions can be sent to the individual modules via the communication link in parallel with the process operation. Without downtimes, a production plant can be changed over very quickly from large, heavy packaging units to small, light ones, so that the setup times for a product change have no excessive impact on the unit costs.

Efficient product logistics allow for:

- Flexibility of the plant and for scaling
- Minimal standstill and conversion times
- Short response times to orders
- Different packaging unit sizes
- Commissioned orders
- Promotional packages and seasonal products

3.4.2 Benefits for plant automation specialists

Innovation cycles for consumer goods are getting shorter and shorter. New products demand changes to or expansion of production processes. In earlier plants, it was often necessary to replace entire plant sections in case of a product change. Given consistent use of decentralized installation, existing modules can simply be rearranged in order to adapt the system to modified production sequences.

New modules with the same interface can easily be combined with existing units – even in case of a change in functionality – to expand the system or integrate additional processing stations.

The main advantages are:

- Short implementation and project times
- Less project planning effort required
- Multiple use of standard modules
- Modular planning and design possible
- Quotation and calculation reliability

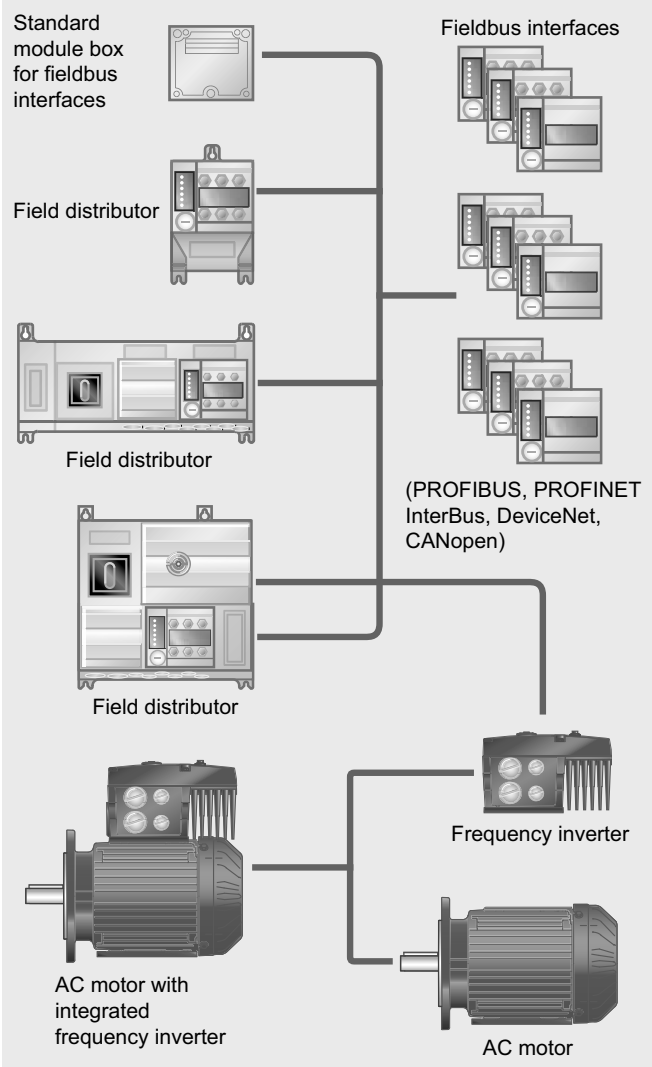
3.5 Solutions from SEW-EURODRIVE

3.5.1 MOVIMOT® / MOVIFIT® modular system

The modular gearmotor system from SEW-EURODRIVE, proven and continuously expanded for decades, offers an almost unlimited range of combination options and optimized solutions. The logical continuation of this success story is the modular MOVIMOT® system.

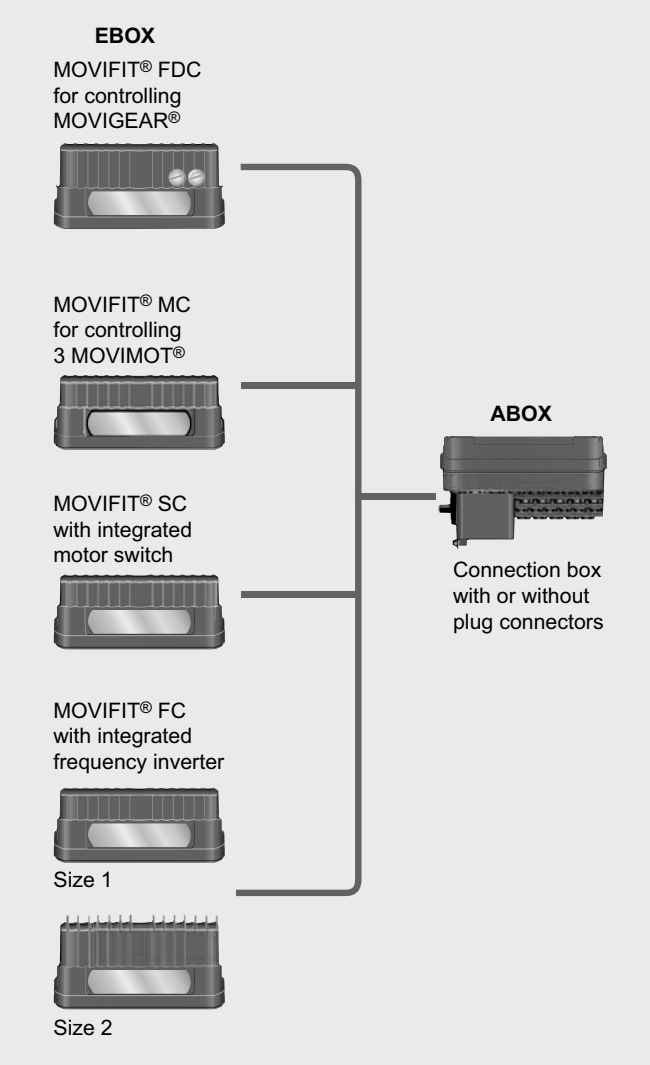
The decentralized MOVIMOT® frequency inverter was consistently integrated in the system. It can be installed instead of the connection box in combination with the multitude of gear motor variants. Different controller and field distributor variants allow for universal communication integration and optimized power supply for the drives.

This modular system guarantees utmost flexibility in connection with scalable functions and customized cost structure.



3650644107

The MOVIFIT® system combines the well-known advantages of decentralized installation technology from SEW-EURODRIVE with modern, application-oriented drive and communication functions:



3789077771

3.5.2 Example of a plant modularization with MOVIFIT® MC / MOVIMOT®

The following describes an installation example with MOVIFIT® MC controller and MOVIMOT® gearmotors, divided by function groups:

Functional group "Roller conveyor 1"

3 x roller conveyor segments with

- 2 x sensors for stop position (per segment)
- 2 x sensors for changeover between fast/slow movement (per segment)
- 1 x control light (per segment)

1 x MOVIFIT® MC to control MOVIMOT® with

- 3 x MOVIMOT® units
- 12 x DI
- 3 x DO

Functional group "Rotary table"

1 x rotatable roller conveyor segment with

- 2 x sensors for rotation stop position
- 2 x sensors for fast/slow changeover rotation
- 2 x sensors for roller conveyor stop position
- 2 x sensors for fast/slow changeover roller conveyor
- 1 x control light

1 x MOVIFIT® MC to control MOVIMOT® with

- 2 x MOVIMOT® units
- 8 x DI
- 1 x DO

Functional group "Roller conveyor 2"

2 x roller conveyor segments with

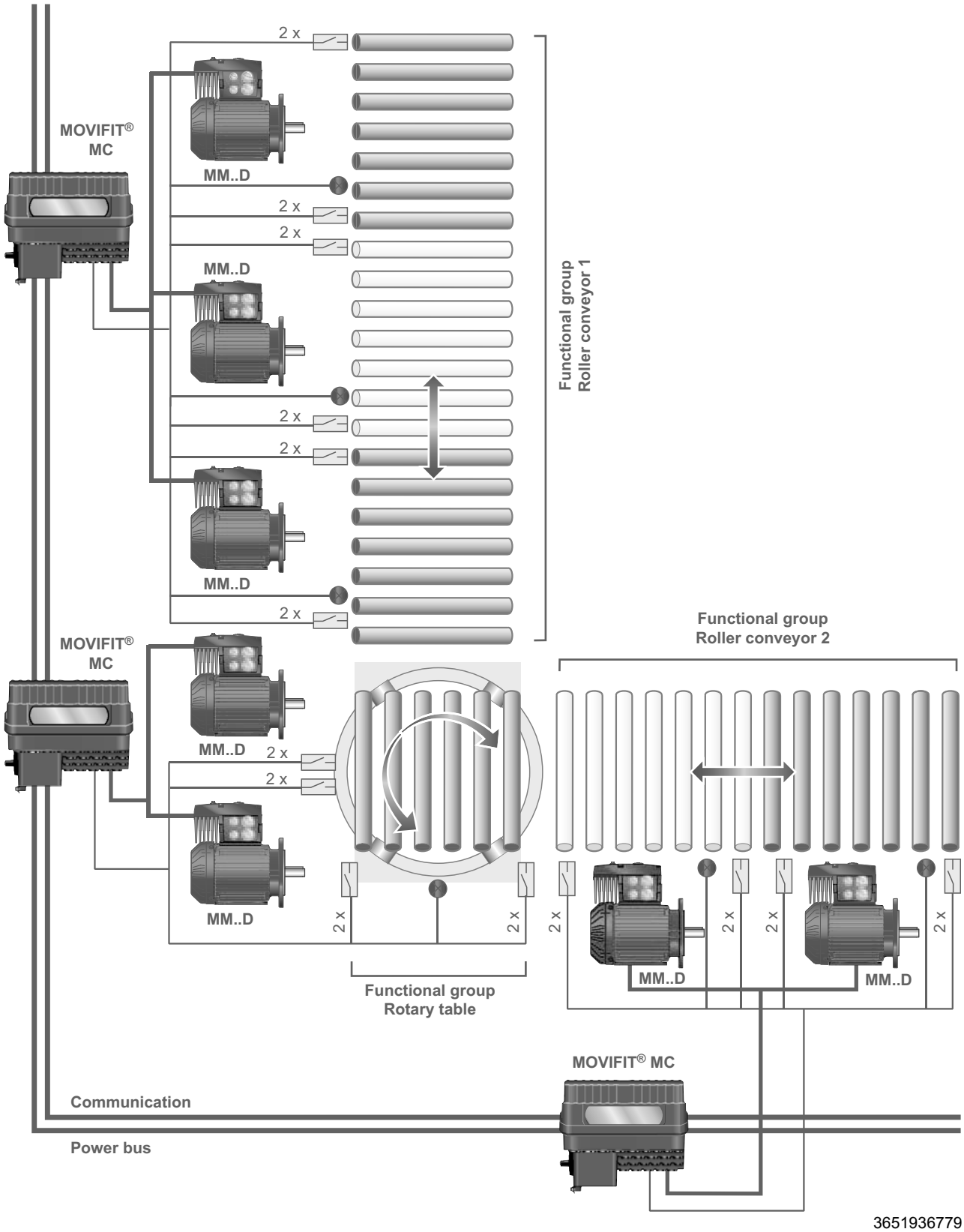
- 2 x sensors for stop position (per segment)
- 2 x sensors for changeover between fast/slow movement (per segment)
- 1 x control light (per segment)

1 x MOVIFIT® MC to control MOVIMOT® with

- 2 x MOVIMOT® units
- 8 x DI
- 2 x DO

Schematic representation

The following figure shows the described plant modularization example with MOVIFIT® MC / MOVIMOT®:



3.5.3 Application packages

With the VARIOLUTION® packages, SEW-EURODRIVE establishes itself as a solution partner for drive and automation tasks. The innovative solution concepts of the VARIOLUTION® packages offer our customers a technological advantage over the competition for their systems and the safety of a tested and proven functionality.

Customers benefit from faster solutions and simpler processes when relying on the predefined VARIOLUTION® packages. At the same time, the VARIOLUTION® packages from SEW-EURODRIVE ensure technical solution expertise for systems and machines all over the world at the same high level.

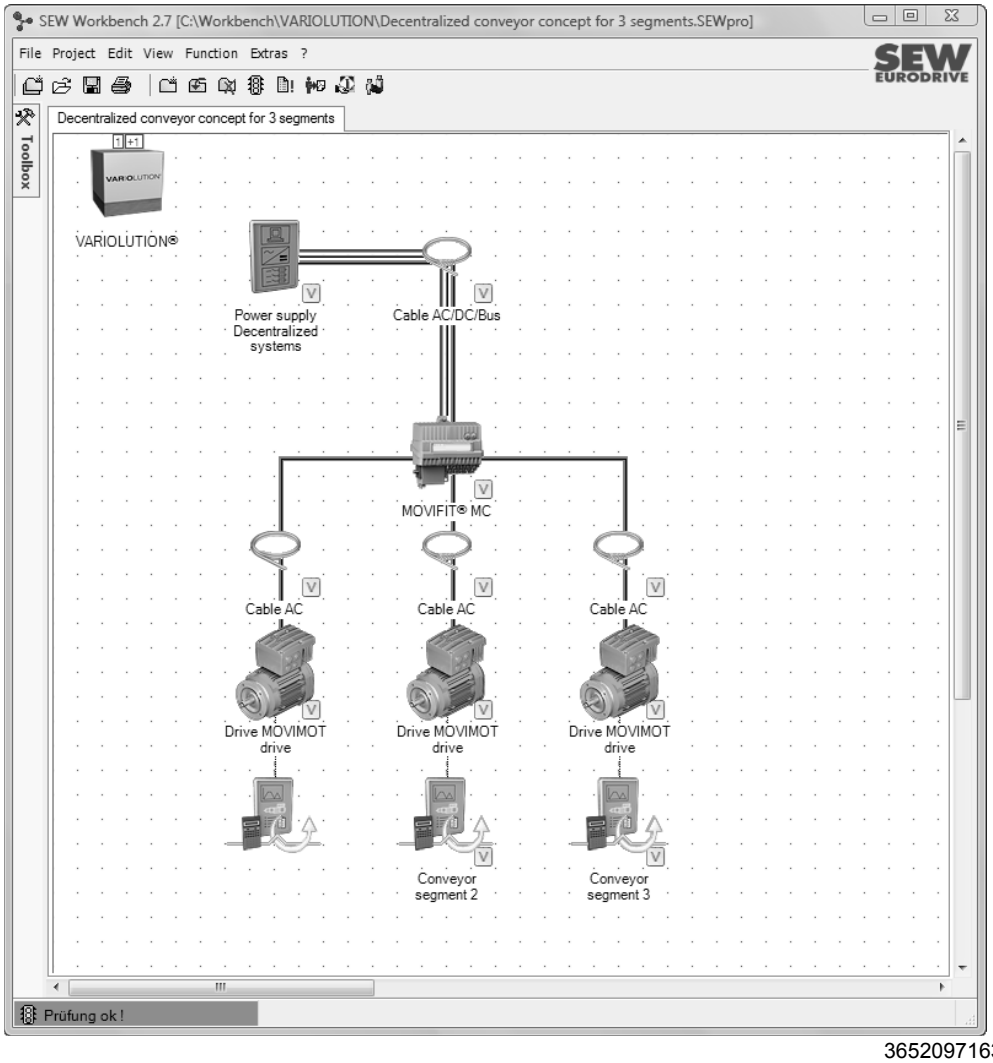
Example: Decentralized conveyor line with synchronization

Description:

3 locally networked conveyor segments, decentralized installation with synchronization and rapid/creep speed positioning. The following products are used:

- 1 x MOVIFIT® MC
- 3 x MOVIMOT® drives

Installation diagram:



3652097163

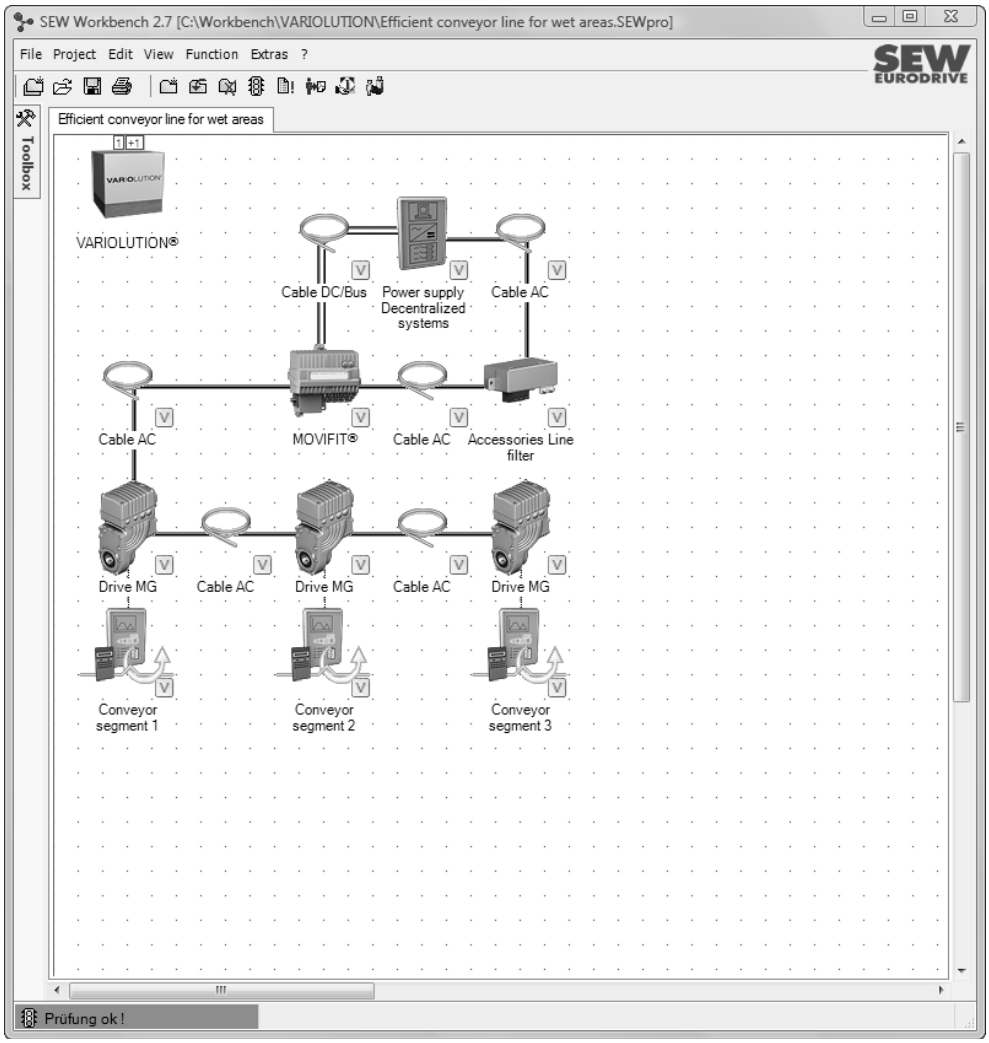
Example: Item transport for wet areas

Description:

Up to 10 energy-efficient, decentralized conveyor segments optimized for wet areas connected via innovative SNI field wiring. The following products are used:

- 1 x MOVIFIT® FDC SNI controller
- Up to 10 MOVIGEAR® SNI-B drives

Installation diagram:



3652095243

Other VARIOLUTION® packages

Other packages for decentralized plant automation from SEW-EURODRIVE:

- Corner transfer unit
- Scissor lift table
- Vertical conveyor
- Functional conveyor lines

3.5.4 Overview of SEW-EURODRIVE control technology

Flexible solutions for effective drive automation

Controlling motions efficiently and individually – this is at the focus of control technology from SEW-EURODRIVE for functional and economical automation of machines.

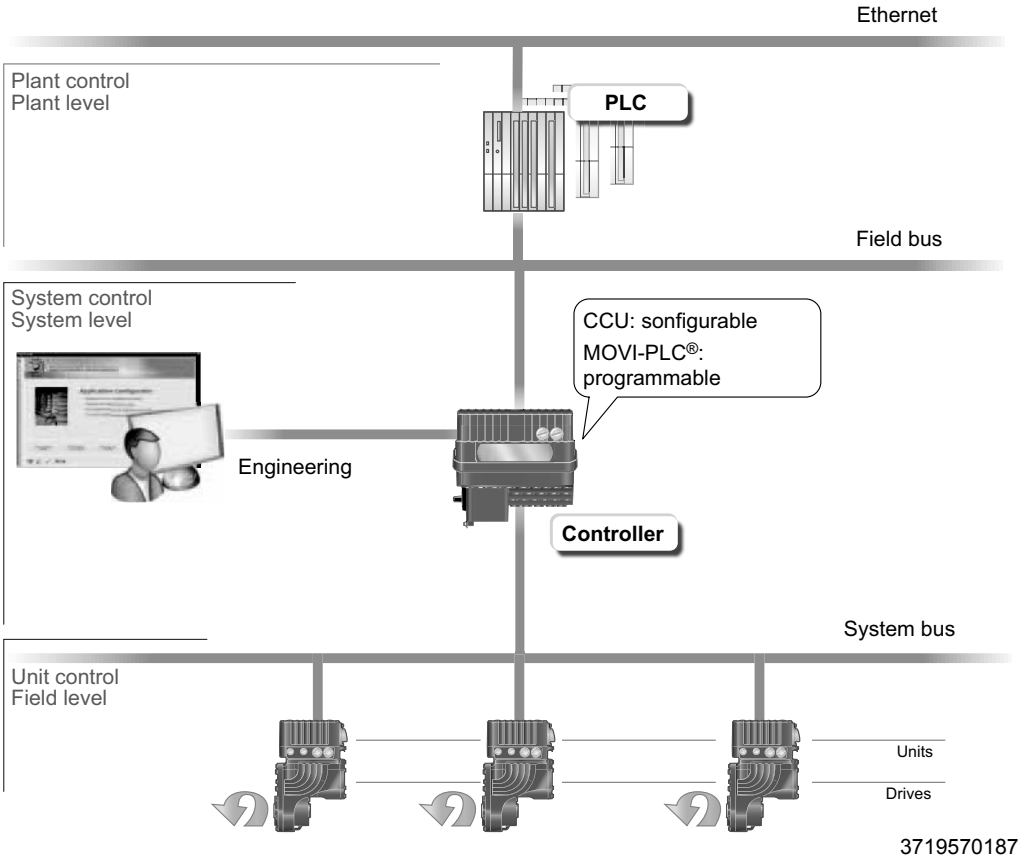
This control technology excels by offering a universal, scalable, and powerful range of controllers and software optimally matched to the drives and drive electronic components of the modular system. The practical benefits are great both in terms of functionality and cost effectiveness.

Control technology from SEW-EURODRIVE offers a wide variety of flexible components that can be combined to form efficient drive solutions that can be easily integrated into a great number of automation concepts. In this way, new functional and economic potentials can be created in many machine automation projects, including the reduction of investment and startup costs, production capacities, or possible follow-up costs for maintenance and repair.

System overview

The following figure shows the basic system overview of control technology from SEW-EURODRIVE:

Controllers from SEW-EURODRIVE are available in "configurable" (CCU) or "programmable" (MOVI-PLC®) variants. In addition, the controllers offer different installation options (control cabinet installation or decentralized installation) and different performance classes.



3.5.5 Configurable control technology with the Configurable Control Unit (CCU)

Easy configuration of applications

Control technology from SEW-EURODRIVE includes the configurable control unit (CCU) for easily configurable applications with standardized and immediately executable application modules, which merely have to be parameterized. The functions match the specific application and can be configured easily and quickly without any programming knowledge. An integrated diagnostic function enables quick and simple startup.

There is no faster way: Standardized and immediately executable application modules.

Application Configurator

The Application Configurator is a tool that lets users carry out configurations and diagnostics. This practice-oriented solution is independent of the required application module and the SEW-EURODRIVE drive and control components used. All applications are operated in the same easy manner.

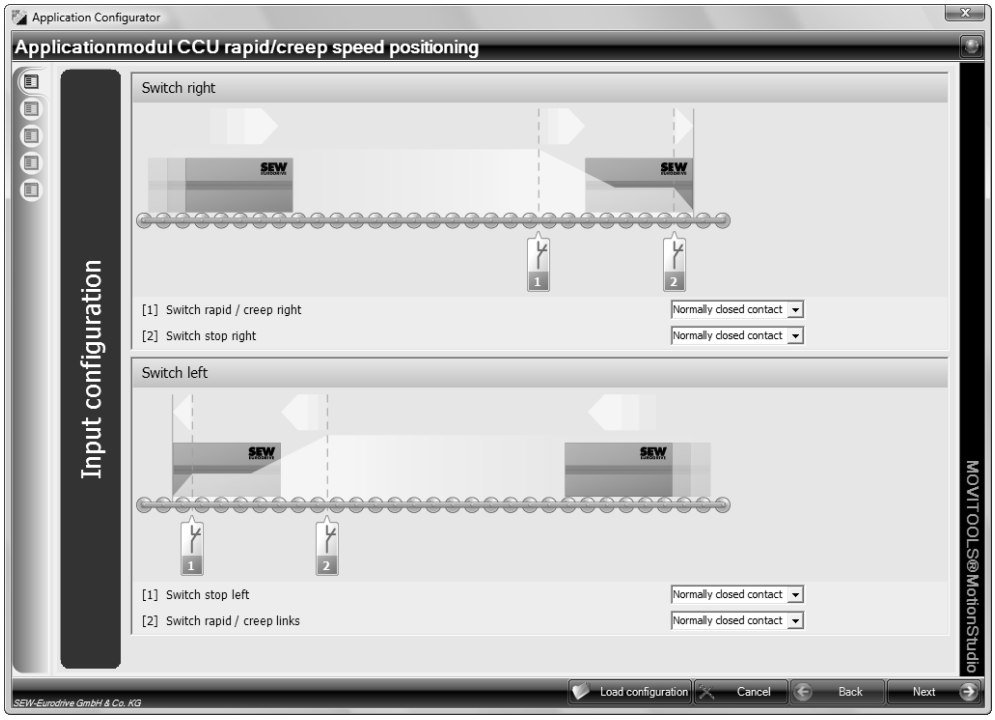
Example of a Configurable Control Unit (CCU)

Rapid/creep speed positioning

The "rapid/creep speed positioning" application module is used for simple positioning tasks in materials handling technology (e.g. roller conveyor or rotary table).

3637572491

Positioning is carried out via 2 initiators with 2 speeds. The first initiator determines the switching point from rapid to creep speed, and the second one determines the stop position. Applications that must position in two directions require 4 initiators.



3652494731

The following operating modes are supported:

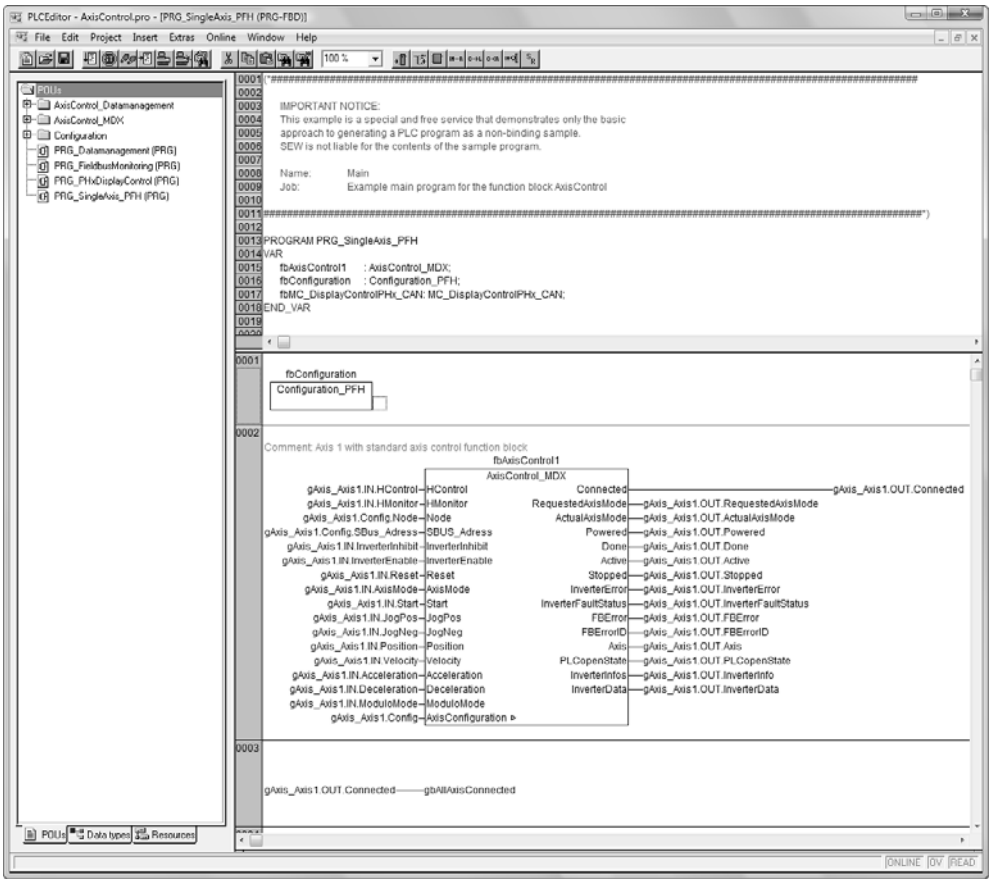
- Jog
- Feed-in (positioning)
- Feed-out
- Lifting/rotating

3.5.6 Free programming with MOVI-PLC®

Free programming of applications

All controllers with integrated MOVI-PLC®, such as MOVIPRO® ADC, offer easy access to the complete range of drive functions. They are perfectly tailored to the drive electronics. They provide scalable functions, from simple single-axis functions over universal program modules to application solutions for multiple axes. The integrated standard modules of a PLC additionally provide full logic control.

The MOVI-PLC® motion and logic controller is therefore the number one choice for free programming of applications. Users can choose between parameterizable function modules, which can be easily programmed in accordance with IEC 61131, and program modules, which combine comprehensive drive functions.



3652582795

3.6 Realization example / verification

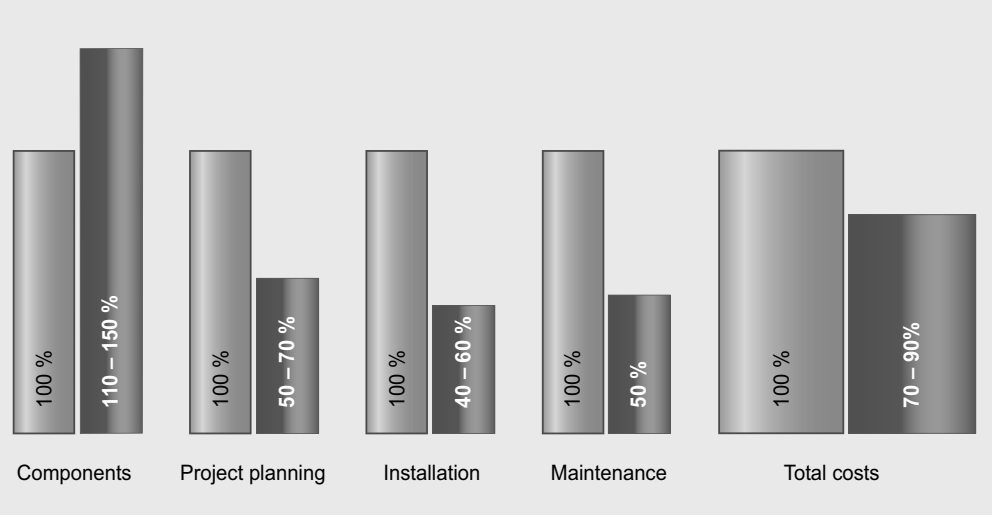
3.6.1 Cost comparison for extensive systems in production logistics

The decisive factors for the cost structure of a plant are the project planning phase and the individual engineering effort. As material handling applications in production logistics often have comparable requirements, the synergy effects of decentralized plant structures can be fully utilized.

It was confirmed in countless plants over many years that the use of modular and standardized functional units reduces the project planning effort for extensive plants to 50-70% of the individual effort.

Decentralized installation is very flexible due to its modular structure, and it can be adapted subsequently to new requirements within a very short time.

Compared to central installation technology, decentralized drive installations can save 40-60% during assembly, installation and startup.



3652589323

Centralized installation

Decentralized installation

3.6.2 Plant infrastructure with modules and local segments[1)]

Shorter changeover or setup times during product changes can be achieved by using decentralized production systems with a consistent modular design and frequency inverters with communication links throughout (see picture below). The modules are often grouped into segments, provided with a linear energy supply, and linked via AS-Interface at a low cost. This creates an independent logic segment, which can be linked with other segments via a controller to form an overall infrastructure. Plant operators not only benefits from the lower costs but also from greater flexibility in their plants.

The throughput speed can be adjusted and the dimensions of the transported items can be scaled via the communication link, this means that a production plant can very quickly be changed over from large, heavy containers to small, light ones. This makes it possible to keep production batches small without placing a disproportionate strain on unit costs as a result of the setup times involved in a product changeover. The economics of just-in-time production without interim storage at the end of the production line can be made even more favorable by shortening and automating setup procedures using decentralized system concepts.

3699467531

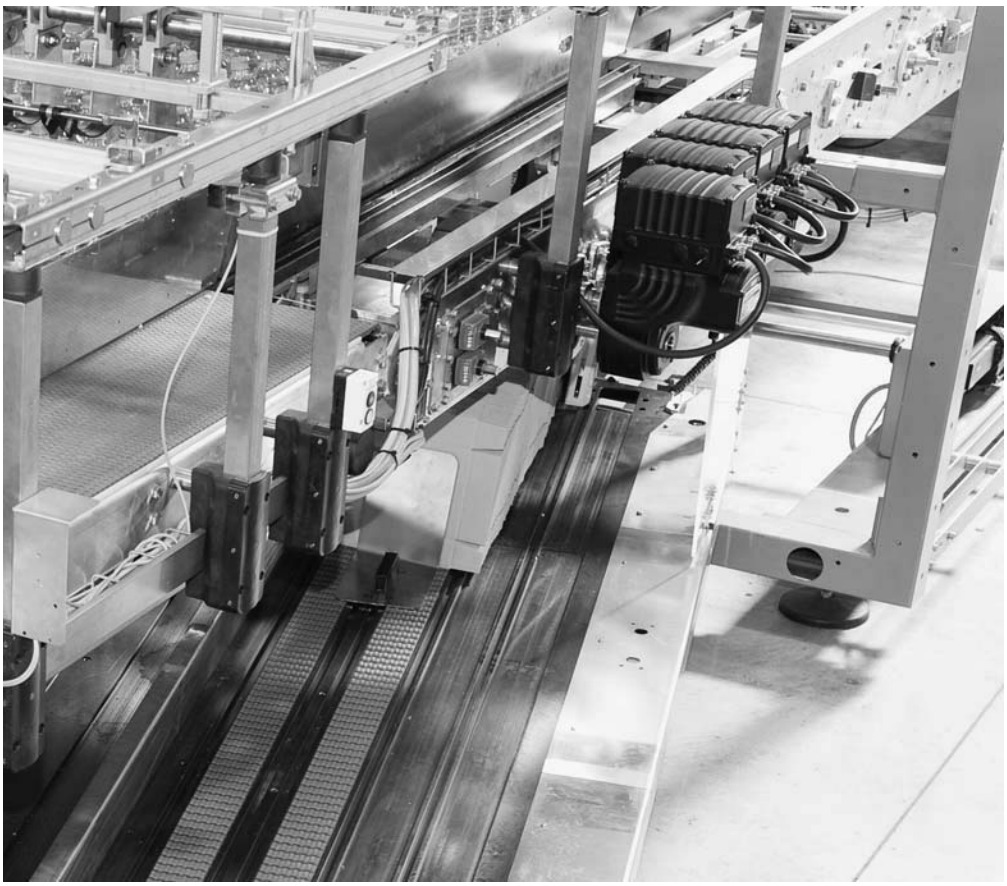
1) Photo source: TRANSNORM SYSTEM GmbH, Germany

3.6.3 Container feeder for light-weight packaging[1)]

Flexibility is key in packaging systems for the beverage industry to secure efficient processes. The plant in this example can package square bottles and light-weight containers in very different batch sizes using film of variable thickness. Depending on the system, the packaging unit conveyor has one or two tracks, which can be used in parallel.

Drive technology from SEW-EURODRIVE ensures the necessary performance and the high degree of efficiency:

- Implemented with decentralized technology
- Up to 12 MOVIGEAR® DSC SBus as single-track drives, connected to the machine controller via a decentralized SBus controller.
- The MOVIGEAR® drives permit a wide speed control, which allows for separate back pressure control for each container track.
- SEW system bus technology (SBus) ensures high performance and fast bus communication via CAN.



3265476619

1) Photo source: Krones AG, Neutraubling, Germany

4 Efficient Plant Topology

4.1 Situation in the intralogistics market

As products become more and more comparable, individual logistics are often the decisive differentiation criterion. In a closely linked and transparent world, competitive advantages can often only be realized through situation-oriented logistic services. Today, the market demands a high degree of flexibility and reliability along with continuous cost reductions and improved goods distribution efficiency.

Today, customers expect from their logistics provider:

- Comprehensive, international logistics network
- Just-in-time delivery of goods and production parts
- Guaranteed 24 h delivery for express orders
- Order-specific commissioning for consumer markets
- Increasing number of small deliveries due to online orders

4.2 Requirements of the logistics provider

At the core of intralogistics operations are distribution centers and logistics hubs. They have long ceased to be just places were goods are delivered to, sorted, and then forwarded again. Today's customer requirements call for state-of-the-art plants with the highest degree of flexibility and permanent availability. Apart from the actual material handling, consistent data acquisition, continuous adjustment, and visualization are the key to success. The consistent use of modular structures and linked individual elements allows for the efficient realization and control also of very complex logistics processes. Different requirements must be considered for this:

- Seamless, prompt traceability of the flow of goods
- Continuous route optimization of the individual packages
- Traceability of origin (e.g. for food)
- Minimization of failures and transport damage
- Condition monitoring for optimization and preventive maintenance
- Remote maintenance of plants and securing plant availability

4.3 Solution approaches

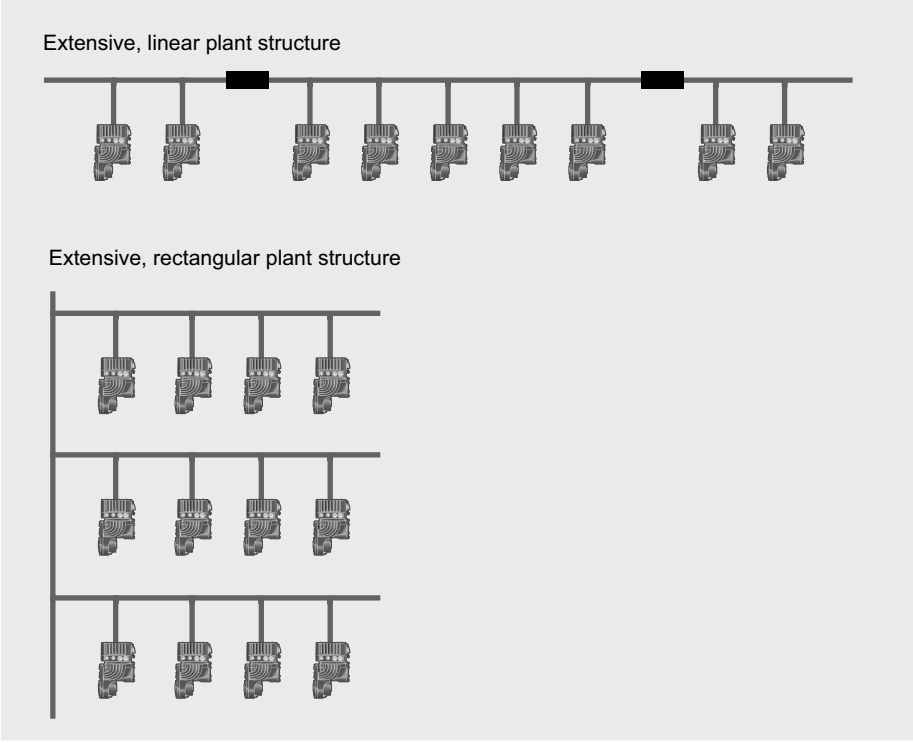
4.3.1 Consistent use of decentralized plant topology

The consistent use of decentralized plant topology is often the preferred approach for the considerable requirements in intralogistics.

Decentralized installation technology has spread rapidly over the past few years. In Europe today, practically all industrial logistics plants are set up using this technology, particularly those covering a large area and with many identical or similar system components (see figure below).

The main criteria in determining suitability are:

- Space taken up by the plant, linear layout of the drive sections, e.g. one large conveyor line, machine elements divided into segments, e.g. one manufacturing plant with individual processing stations.
- Standardized machine elements which can be combined according to the requirements of the plant.
- Plant automation and visualization of the flow of goods by efficiently combining and networking drive components and sensors.

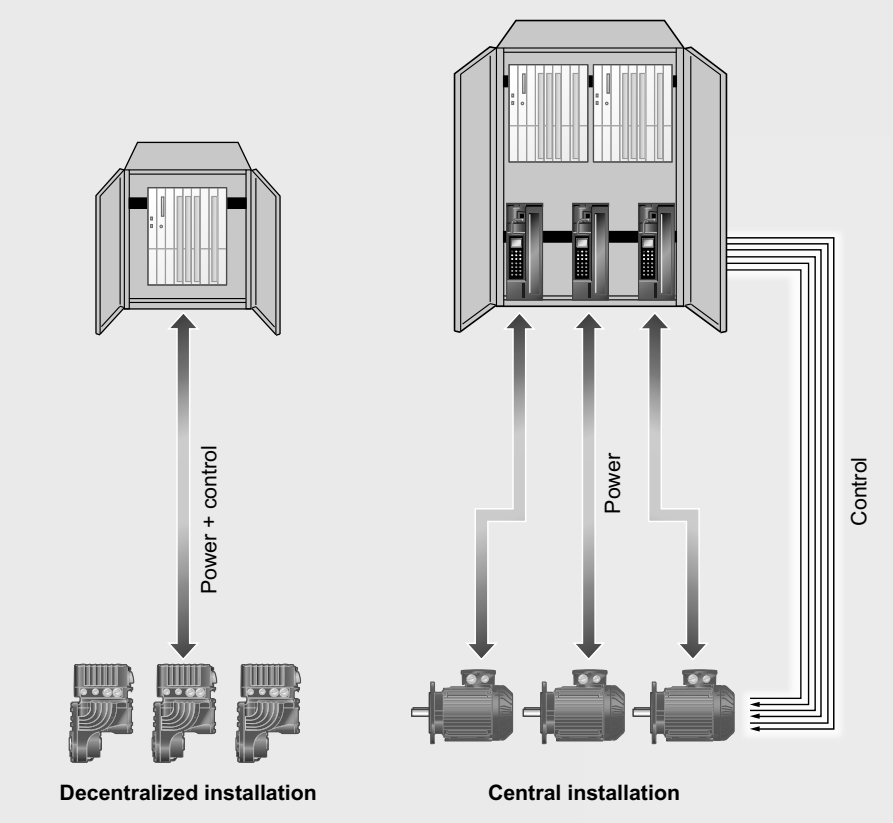


3653207819

Characteristics of decentralized installation

The objective of decentralized installation (following figures) is to remove from control cabinets all power distribution, drive control and monitoring units as well as speed control systems, which are employed to an ever increasing extent. The sole remaining purpose of the control cabinet is to house control components for signal processing and diagnostics. The latest generation of drive units is installed in the field, i.e. at specific locations in the plant where functions are implemented. These are mechatronic drive systems with integrated power and signaling electronics for monitoring, actual value acquisition and communication.

Power distribution to the individual drives also takes place in the field by means of specially developed cable systems with pluggable or permanently connected power outputs. A communication link is used for control and diagnosis of the decentralized drive units. Usually, this takes the form of an established fieldbus system or Ethernet-based network.



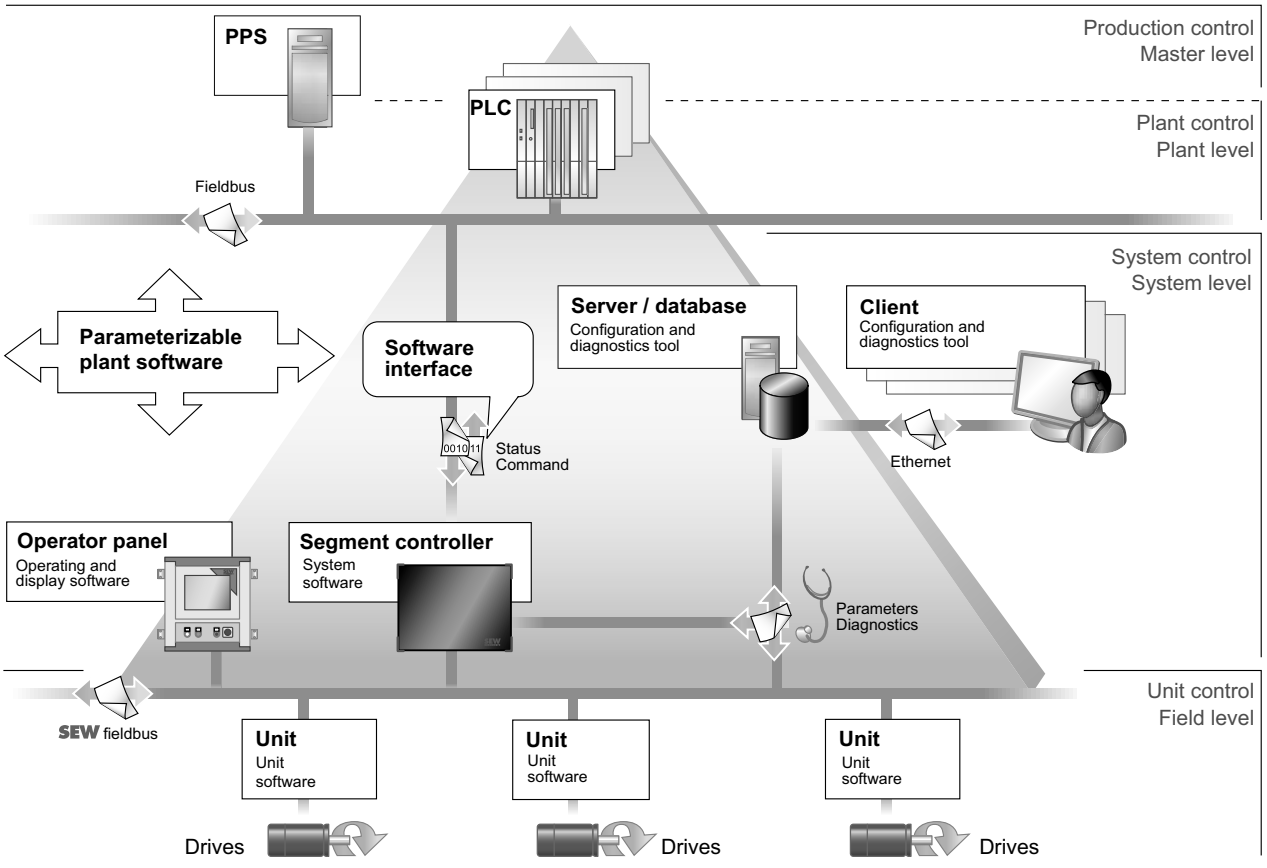
3653210635

4.3.2 Intelligent network – decentralized intelligence as a logical consequence

Plant automation can only function safely and reliably if all the information and process status data in the system are available at any time. For this purpose, sensors measure all conditions that occur during operation and transmit this information to the controller. Transported goods are scanned continuously; the flow of materials and the plant utilization are constantly optimized.

This is the only way to ensure the required flexibility and the constantly high level of reliability. As a rule, the proportion of the program code devoted to recording and evaluating unusual operating states currently represents at least 50 percent of the entire software, rising to more than 90 percent in individual cases.

The amount of software is increasing continuously, as are the levels of data exchange between the controller and sensors or actuators. As a result, there is a move towards pre-processing the sensor signals in the field directly at the information source, thereby transferring a large part of the control functions to the drive units in the field. The decentralization of power components has been put into practice successfully and economically for years, and now the decentralization of intelligence is just a logical consequence.



3704300811

The decentralization of the software makes sense for drive or sensor-specific functions such as:

- Positioning of motors
- Operating several drives at synchronous angles
- Processing sensor signals with a direct influence on the actuator
- Identifying goods using identification systems
- Pre-processing of sensor signals where a lot of information has to be handled
- Responding to production deviations and faults

The central controller can then focus on material management and the plant-specific interlinking of the individual processing and conveyor lines.

In the future, individual, decentralized intelligence will increasingly be implemented in the form of neuronal networks with evolutionary algorithms, which means that self-learning control clients with fuzzy logic can constantly monitor and optimize themselves.

4.4 Customer benefits

4.4.1 Benefits for logistics providers and plant operators

The consistent use of efficient, decentralized plant structures allows the service provider to realize modern, flexible logistics concepts with profitable, additional benefits. Other important factors in addition to the basic requirements of goods receiving, sorting and distribution are traceability, adherence to schedules and flexibility.

The right plant topology offers the following advantages:

- Legal security due to traceability of the flow of goods
- Visualization of the delivery progress
- Guaranteed delivery times (just-in-time)
- Flexible responses to different packaging unit sizes
- Reduced downtimes and increased availability
- Plants remain manageable

4.4.2 Benefits for plant manufacturers and system integrators

Often, the investment costs and the amortization period are the decisive factors for the realization of a plant. Future-oriented planning, however, is often neglected. The motto of most investors is: "This is my basic specification. I will take the cheapest offer from a system integrator." Future utilization concepts, flexible adaptations to other platforms, or seasonal peak throughput are often not considered and specified in detail by the customer.

The use of efficient, decentralized installation with modular plant technology offers considerable options to reduce costs while maintaining flexibility for future requirements to plant manufacturers or system integrators:

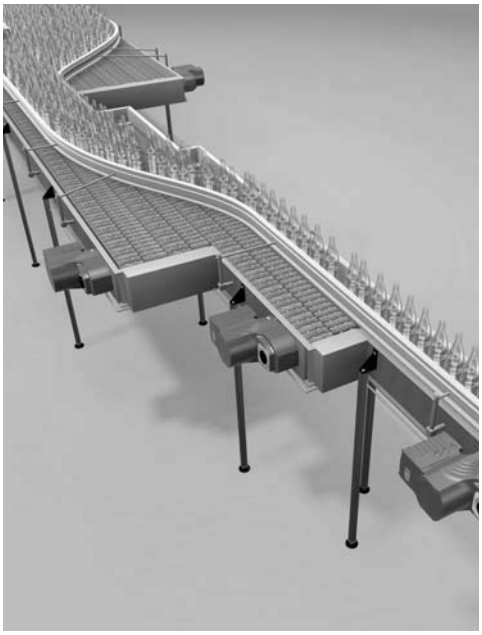
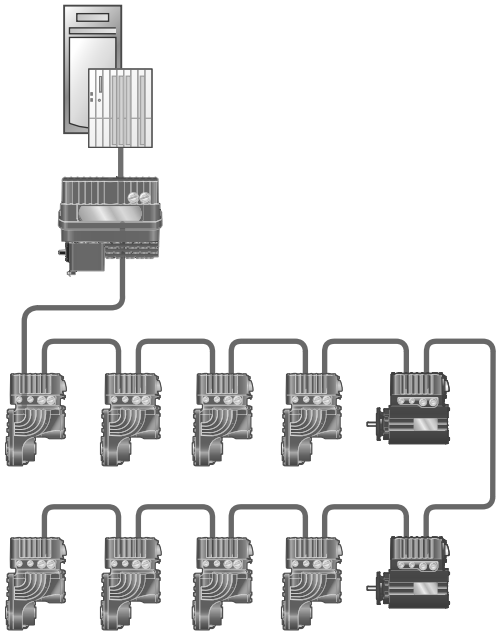
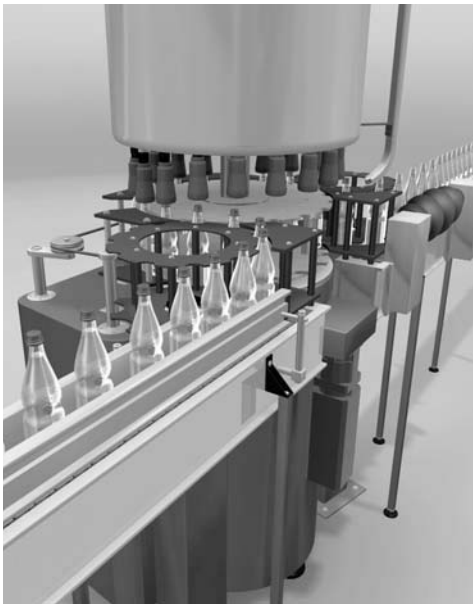
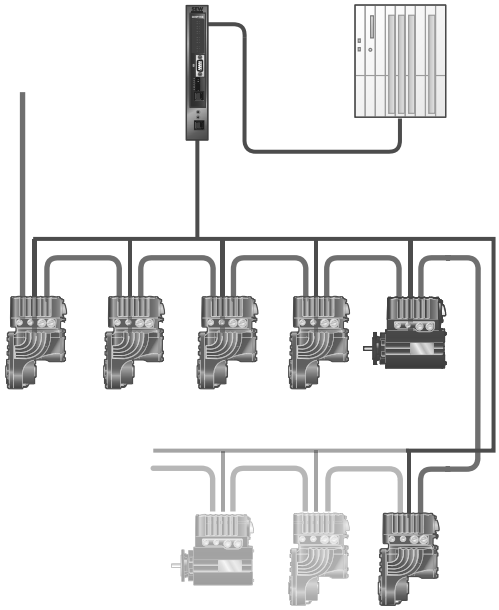
- Short project planning times due to modular design
- High calculation reliability due to multiple use
- Savings due to shortened project times
- Successive startup of plant components
- Inexpensive interfaces for expansions
- Remote and preventive maintenance
- Quick response to malfunctions

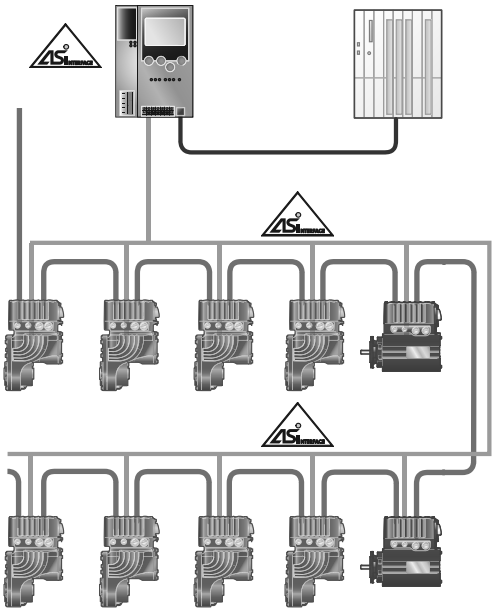
4.5 Solutions from SEW-EURODRIVE

4.5.1 Overview of installation topologies

The table shows an overview of efficient installation topologies with mechatronic drive components from SEW-EURODRIVE.

Further information can be found in the following chapters:

Typical application example	Topology/principle
Materials handling – e.g. bottle conveyor	**Single-line Network Installation (SNI)**
 3699592715	 3704496011
Area in front of a machine – e.g. feeding conveyors	**System bus installation (SBus)**
 3704600587	 3704693003

Typical application example	Topology/principle
Extensive plants – e.g. baggage handling	**AS-Interface installation**
 3704602507	 3704691083

4.5.2 Single-line Network Installation (SNI)

Description

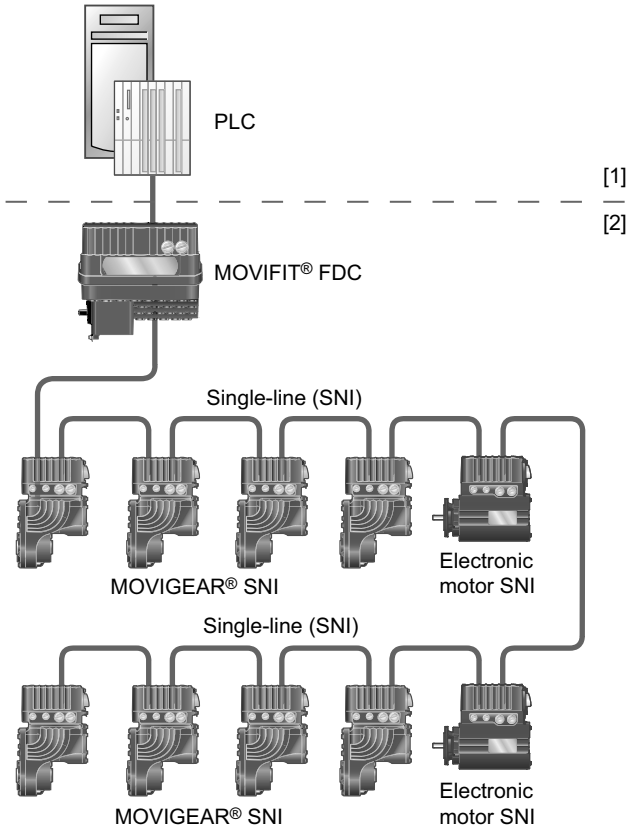
SNI stands for Single-line Network Installation and is based on the principle of using a single-line for power supply and communication. The signals required for communication are modulated onto the power line the high-frequency range and are available for each connected station.

The innovative Single-line Network Installation (SNI) concept allows for a completely new plant topology for a consistent plant decentralization. Compared to conventional decentralized technology, this new technology reduces installation effort, time and cost. Only one power cable must be routed instead of three lines (400 V, 24 V, bus). This reduces the time and costs for installation, which decreases the total costs of the plant. The single-line principle also reduces the risk of hidden faults in the wiring for the communication lines.

Single-line Network Installation (SNI) makes separate bus cables almost completely redundant.

Topology

The following figure shows the basic installation topology with SNI (Single-line Network Installation):



3653542027

[1] Control cabinet level

[2] Field level

Components:
MOVIFIT® FDC in the field
MOVIGEAR® SNI

Characteristics

- Power and communication through one power cable
- Reduction in the number of components
- No fieldbus wiring necessary
- No risk of hidden faults in the bus cabling
- Reduced startup times
- Shorter project runtimes/reduction of project costs
- Optional motion control inputs (via plug connector) for local mode or sensor inputs

Application examples

- Belt conveyors
- Pallet conveyors
- Roller and wheel conveyors
- Screw conveyors
- Container and packaging unit transports
- Chain and drag-chain conveyors

Application options

- As a drive for applications with high breakaway and starting torques.
- Conveyor systems with variable speeds
- As drive for applications that require soft and/or defined startup behavior.
- As group drive for easier implementation of synchronous operation
- Applications with/without STO safety function

4.5.3 AS-Interface installation

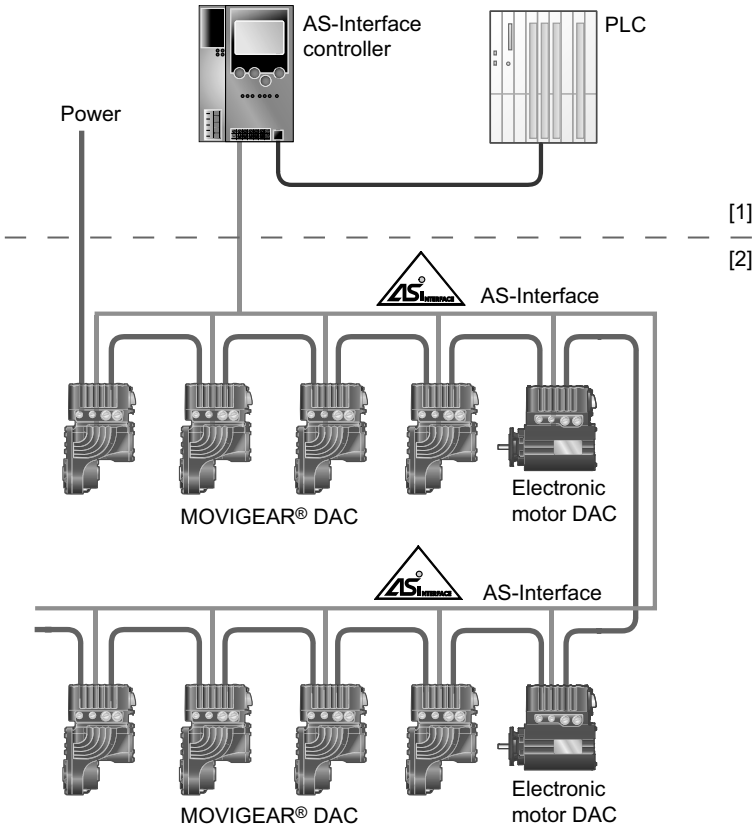
Description

MOVIGEAR® AS-Interface allows for a simple communication connection via the standard AS-Interface protocol. Parameterizable fixed speeds and ramps, integrated STO safety function and connection options for external sensors ensure fast and extremely efficient implementation of material handling systems.

For MOVIGEAR® DAC, you can choose between the variants binary slave GLK30 or double slave GLK31. For MOVIMOT®, options MLK30 and MLK31 are available with very similar functions.

Topology

The following figure shows the basic installation topology with AS-Interface:



3701258635

[1] Control cabinet level

[2] Field level

Components:
AS-Interface controller in the control cabinet
MOVIGEAR® DAC / MOVIMOT®

Characteristics

- Simple communication connection
- Parameterizable fixed speeds and ramps
- Control via worldwide standard AS-Interface
- Connection of external sensors to the actuator
- Voltage supply for connected sensors
- Local mode via binary inputs
- Interface for diagnostics and parameterization

Application examples

- Accumulating roller conveyor
- Roller and wheel conveyors
- Pallet conveyors
- Rotary tables

Application options

- For applications that require soft startup behavior
- Signal feedback of connected sensors
- For applications that require a lot of space
- Applications with/without STO safety function

4.5.4 System bus installation

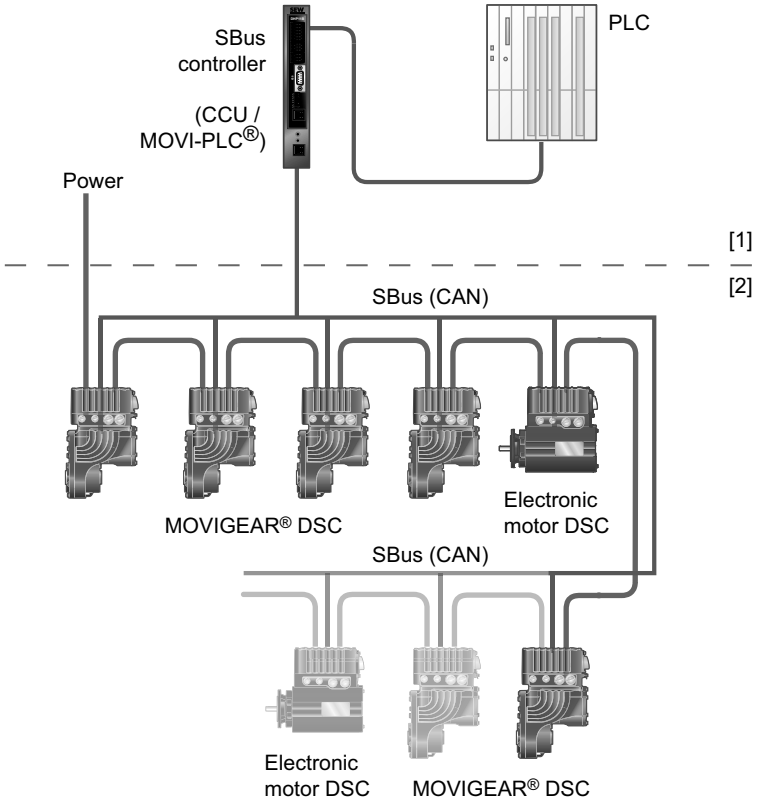
Description

MOVIGEAR® with SEW system bus allows for a functional integration of the mechatronic drive system in applications close to the machine.

High performance and short response times distinguish this variant and enable reliable implementation of challenging drive tasks in the field of machine automation.

Topology

The following figure shows the basic installation topology with SEW system bus:



3701495051

[1] Control cabinet level

[2] Field level

Components:
MOVIFIT® FDC in the field or CCU / MOVI-PLC® in the control cabinet (as illustrated)
MOVIGEAR® DSC

Characteristics

- Integrated system interface
- Fast communication for short cycle times
- Hybrid cable for minimum installation effort
- System bus controller for control cabinet or fieldbus installation with integrated PLC
- High drive dynamics and performance
- Optional motion control inputs (via plug connector) for local mode or sensor inputs

Application examples

- Pallet conveyors
- Machine-integrated conveyor belts
- Feeding conveyors
- Synchronized feeder conveyors
- Reversing drives

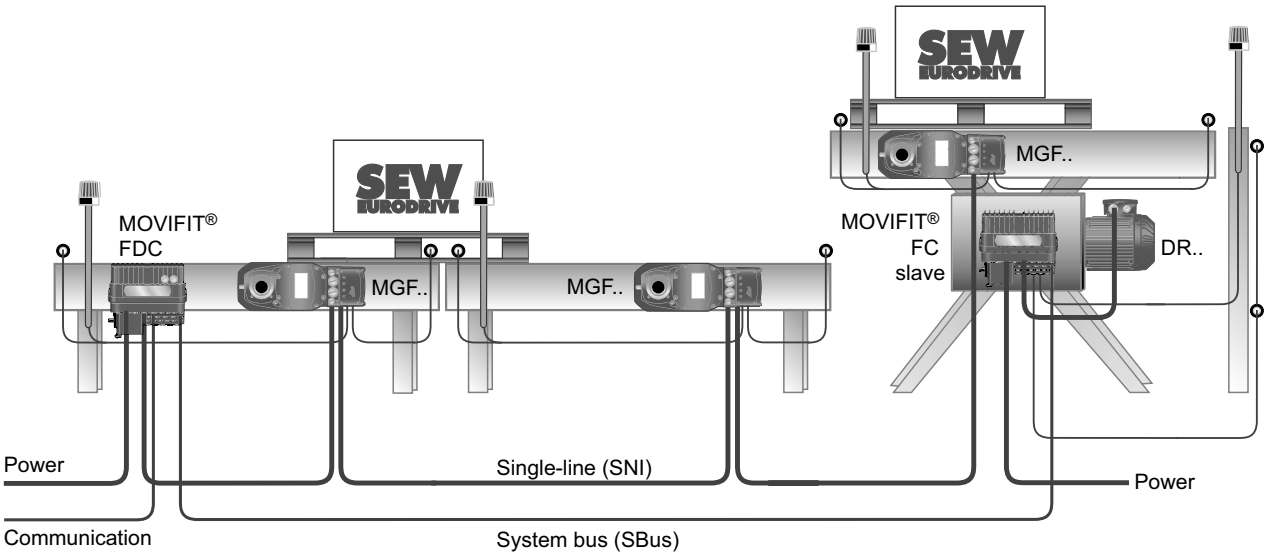
Application options

- As a drive for applications with high breakaway and starting torques
- As a drive for conveyor systems that must be operated dynamically at varying speeds
- Forming intelligent function groups
- Universal application due to large control range of 1: 2000
- Applications with/without STO safety function

4.5.5 Combination of different topologies

The following example shows a requirement-specific combination of a complex hoist element and simple conveyor lines.

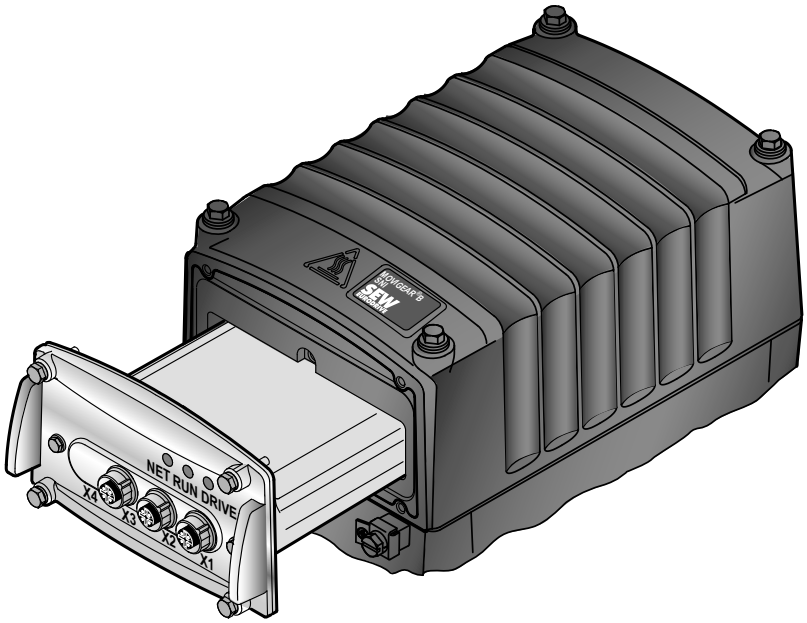
- Conveyor line: MOVIFIT® FDC and MOVIGEAR® via single line
- Hoist element: with MOVIFIT® FC with DR motor as SBus slave on MOVIFIT® FDC



4.5.6 Integration of sensors and actuators

Sensors are needed, for example, for detecting or positioning items on roller conveyers. Actuators are used, for example, for displaying a status (control light). They can be integrated into a decentralized drive system using field I/O modules.

The mechatronic MOVIGEAR® drive unit makes it possible to connect sensors and actuators directly to the drive unit via digital inputs and outputs of different application options and to process their signals. This reduces the installation and project planning effort:



3703187083

4.5.7 Software support with MOVITOOLS® MotionStudio

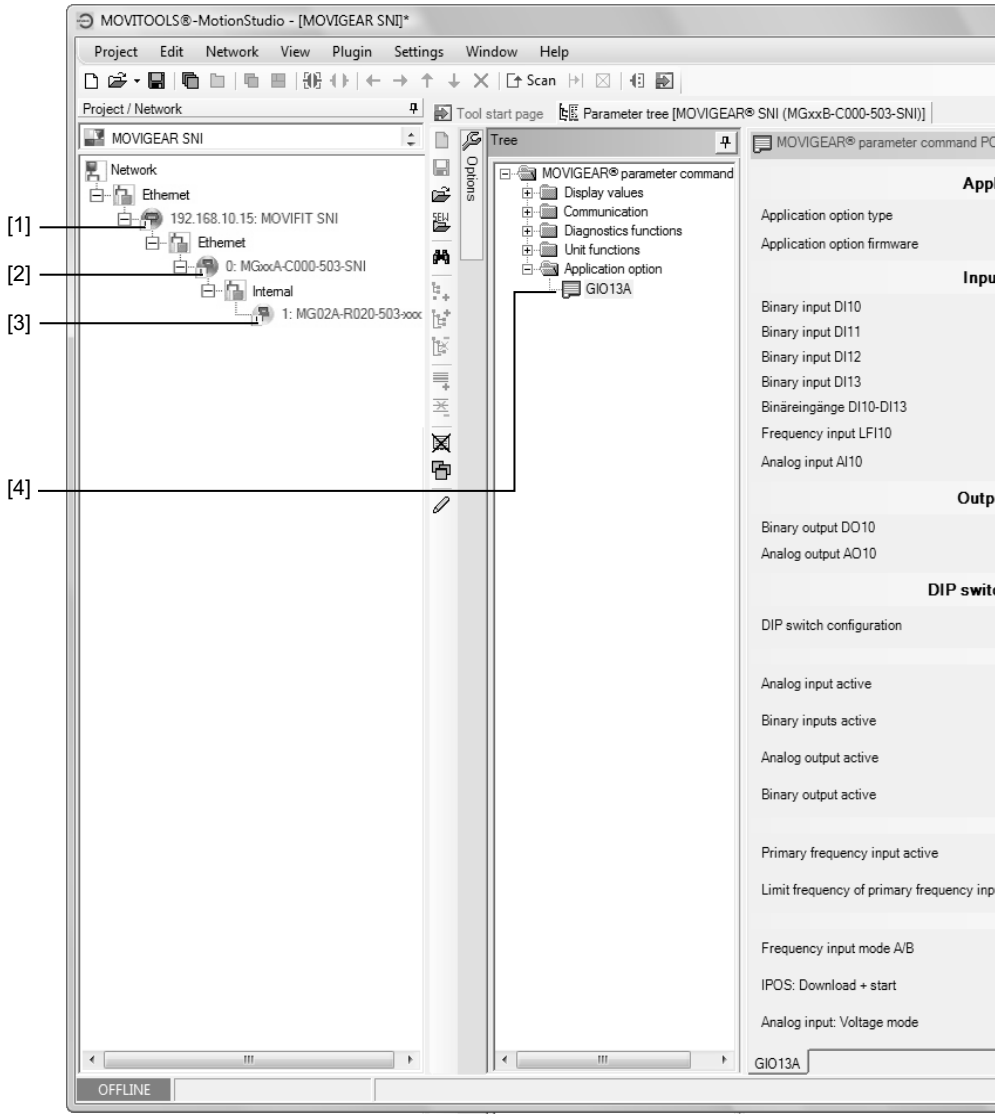
MOVITOOLS® MotionStudio offers complete and consistent software support for the solutions described in the previous chapters:

Example

[1] Controller, e.g. MOVIFIT®

[2] + [3] Actuator, e.g. MOVIGEAR®

[4] Options



3796673163

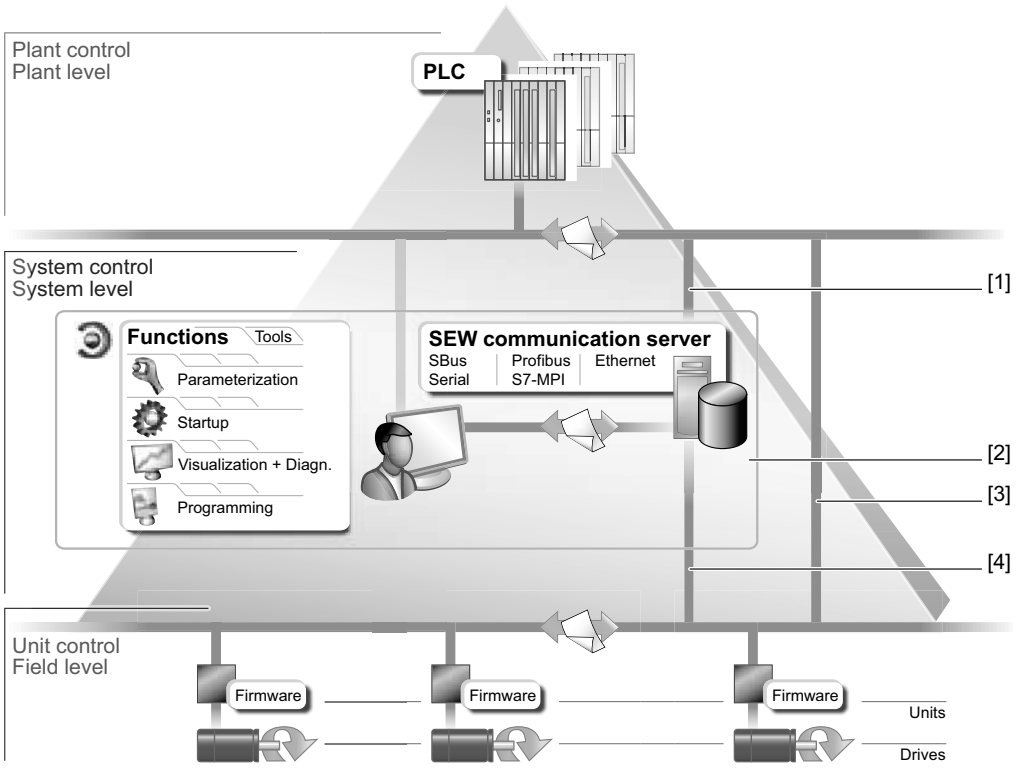
Tasks

The software package enables you to perform the following tasks with consistency:

- Establishing communication with units
- Executing functions of the units

Overview of functions of MOVITOOLS® MotionStudio:

The following figure illustrates the functional principle of the MOVITOOLS® MotionStudio software package:



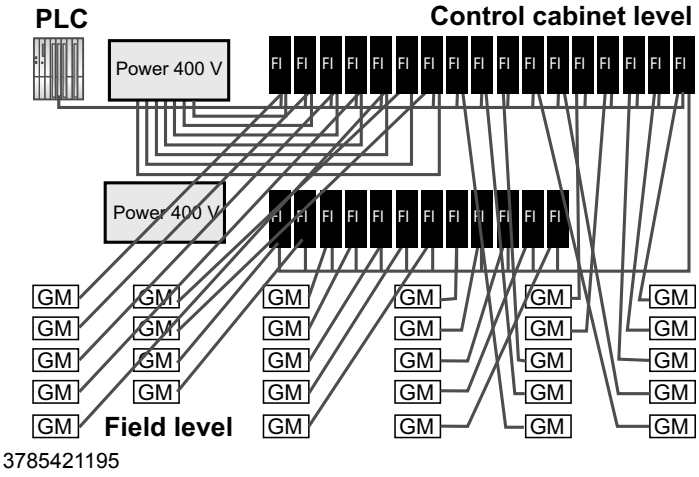
3704119691

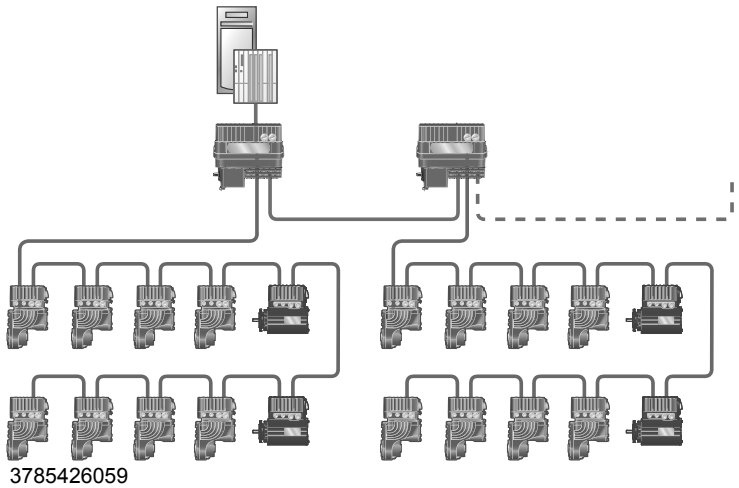
[1] Communication channel for fieldbus or Industrial Ethernet
[2] MOVITOOLS® MotionStudio software package with integrated SEW Communication Server
[3] Communication between fieldbus stations or Industrial Ethernet
[4] Communication channel via interface adapter to SBus (CAN) or serial

4.6 Realization example / verification

4.6.1 Calculating the cabling effort

Based on a real project, the installation cables needed for conventional, central installation were calculated and then compared with an installation with MOVIGEAR® SNI technology.

Centralized installation with conventional gearmotors
Principle    3785421195
Cable length 7897.2 m
Control cabinets 12 additional control cabinets are required

Decentralized installation with MOVIGEAR®
Principle  3785426059
Cable length 3292.8 m
Control cabinets –
Installation effort reduced up to 60%

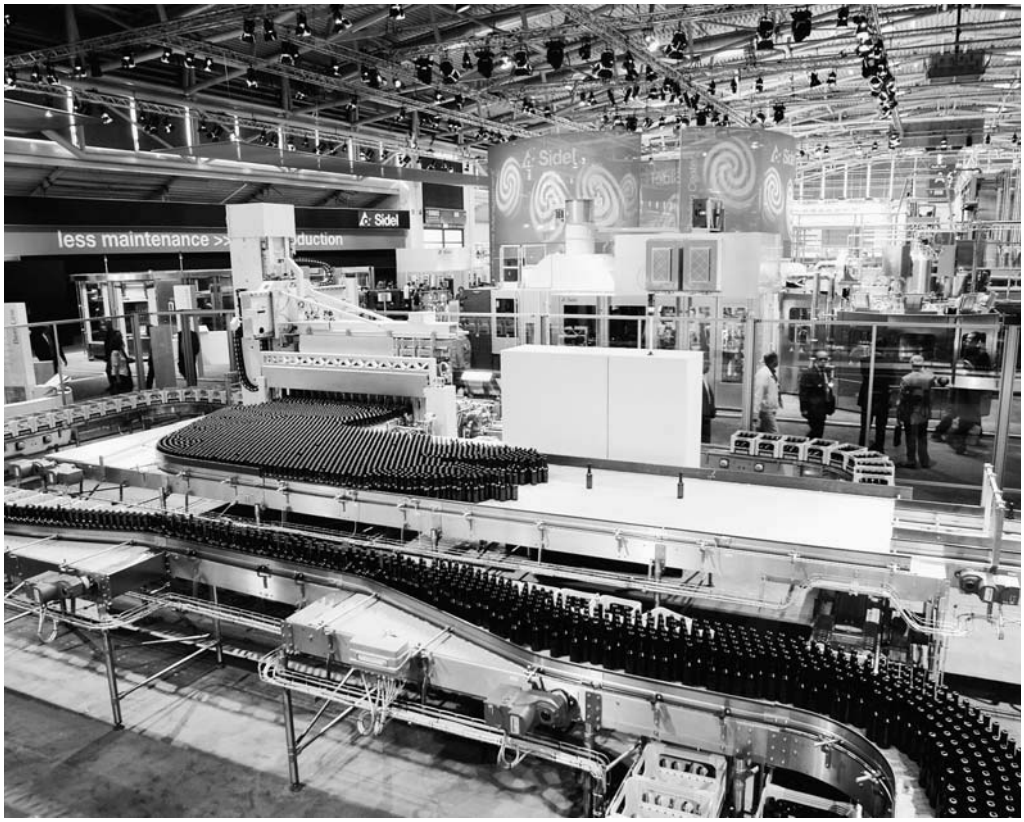
4.6.2 Application example of a beer bottling line[1)]

The beer bottling plant described below can process up to 60 000 beer bottles per hour. However, a high throughput and innovative technology are not the only important aspects.

The plant manufacturer is producing particularly responsible system solutions that satisfy all reduction categories: Costs, energy, material, space required for the machines, use of chemicals, and non-renewable resources.

In accordance with this concept, all transport drives of the horizontal plant components are equipped with corresponding, energy-efficient drive solutions from SEW-EURODRIVE:

- 45 MOVIGEAR® SNI (Single-line Network Installation)
- 6 MOVIFIT® SNI
- The SNI technology allows for energy and data transfer in a 4-core power cable, which reduces the number of components and in this way minimizes the installation effort.



3265472779

1) Photo source: Sidel Conveying SAS, France

5 Ambient Conditions

5.1 Situation at customer site

5.1.1 Legal requirements (hygienic regulations)

The Machinery Directive 2006/42/EC, which came into effect on December 29, 2009, defines specific regulations for the design of a food-processing machine. It states that: "Agri-foodstuffs machinery and machinery for the cosmetics and pharmaceuticals industries must be so designed and constructed as to avoid any risk of infection, sickness or contagion."

It also says that: machines and materials must "be easily cleaned" each time before they are used. However, the Machinery Directive stipulates no detailed constructive features.

DIN EN 1672-2:2005 is useful for the implementation of these provisions. For example, it divides the hygienic areas in 3 groups:

- Food zone
- Splash zone
- Non-food zone

In addition, it specifies hygiene risk assessment and detailed information about the hygienic design of components.

5.1.2 Conditions for environmental protection and occupational safety

Stricter regulations for environmental protection and occupational safety are to protect workers and the environment, but they also mean that certain aggressive chemical cleaning agents may no longer be used. The level of hygiene necessary for production must therefore be achieved with less aggressive cleaning agents.

5.1.3 Contaminated food and its consequences

If contaminated food enters the market and is discovered, the producer or polluter usually faces very extended financial damage. Recall campaigns and possible claims for damages are often only part of the problem, however. Frequently, the company image of the manufacturer is damaged for a long time. The costs for such a damage to the company image can hardly be estimated, and the effects of the public perception of the company can still be felt for years.

5.1.4 Sensitive products

So-called "sensitive" food, such as minced meat, egg products, meat and meat products, poultry, but also confectionary are still at the top of the list of origins of food poisoning. When processing such food, it is therefore essential to employ eco-friendly cleaning processes with a minimal amount of cleaning agents and designs that are not sensitive to dirt.

The increasing trend towards natural and organic food also makes it necessary to rethink hygiene and cleaning concepts. Germ-killing processes such as ultra-high temperature treatment or the addition of preserving agents are more and more often avoided. This increases the requirements for a hygienic production environment in which a certain level of germs must not be exceeded.

5.1.5 Clean rooms

Clean room technology has been used for decades in classic applications of microelectronics, pharmaceutics, and medicine. Now, there a new areas of application in semiconductor and solar panel production, in the printing industry, in biological research, and also in the food industry. All application areas have one thing in common: The particle concentration in fresh air and the particle emissions of people and machines are serious sources of interference with the production process.

Suitable clean room technology ensues particle- and germ-free air in restricted work zones. For compliance with the permitted limit values, it is important to use components that emit very few particles and that are easy to clean.

ISO EN 14644-1	VDI 2083	US Fed. Std. 209	GMP	Micro-organ./m^3	0.1 µm/m^3	0.2 µm/m^3	0.3 µm/m^3	0,5 µm/m^3	1 µm/m^3	5 µm/m^3
ISO class 1	–	–			10	2	–	–	–	–
ISO class 2					100	24	10	4	–	–
	–	–			150	33	14	–	–	–
ISO class 3					1000	237	102	35	8	–
	1				1500	330	140	45	10	–
		1			1240	265	106	35,3	–	–
ISO class 4					10000	2370	1020	352	83	–
	2				15000	3300	1400	450	100	–
		10			12400	2650	1060	353	–	–
ISO class 5					100000	23700	10200	3520	832	29
	3				–	33000	14000	4500	1000	–
		100			–	26500	10600	3530	–	–
			A	< 1	–	–	–	3500	–	–
			B	5	–	–	–	3500	–	–
ISO class 6					1000000	237000	102000	35200	8320	293
	4				–	–	–	45000	10000	300
		1000			–	–	–	35300	–	247
ISO class 7					–	–	–	352000	83200	2930
	5				–	–	–	450000	100000	3000
		10000			–	–	–	353000	12461	2470
			C	100	–	–	–	350000	–	–
ISO class 8					–	–	–	3520000	832000	29300
	6				–	–	–	4500000	1000000	30000
		100000			–	–	–	3530000	124610	24700
			D	500	–	–	–	3500000	–	–
ISO class 9					–	–	–	35200000	8320000	293000

5.2 Customer requirements

5.2.1 Reduced noise

All installed plants and machines must usually not exceed a certain noise level. Especially at manual work stations, compliance with noise protection limits is important, for example, to avoid that workers have to wear ear protectors.

5.2.2 Preventing air swirls

Dust and dirt that accumulates on plant components and the floor during production must not be swirled up by excessive air flow and be carried to open areas of the production process.

5.2.3 Preventing product contamination

None of the used components may pose a risk of contaminating the manufactured product. This means for the used drive technology that no parts or particles (e.g. paint or oil) may end up in the manufactured product.

5.2.4 Easy to clean

All used components must be cleanable according to the Machinery Directive 2006/42/EC. Cleaning should be as easy as possible to ensure short cleaning cycles with sparing use of resources (e.g. water, cleaning agents).

5.2.5 Cleaning agent resistance

All used components and materials must be permanently resistant to the used cleaning agents and disinfectants.

5.3 Solution approach

5.3.1 Surface design of the products

The design of the used components should be in accordance with the Hygienic Design guidelines. Basic guidelines are described in DIN EN 1672-2:2005. The goal is to prevent undercuts and grooves where dirt could accumulate and which are difficult or impossible to clean. Inclined surfaces support the so-called "self-draining" effect, so that liquids drain off on their own.

5.3.2 Cooling concept of the products

Electric machines generate heat due to losses, which must be dissipated to the environment. This is often achieved with fans. Efficient components create fewer heat losses, so that forced cooling is not always necessary. Cooling fins or cooling strips should be designed in such a way that the space in between is easy to clean (min. distance: a finger's breadth).

5.3.3 Surface/corrosion protection

Surfaces must be protected from corrosion. This can be done in different ways. In addition to conventional coating, corrosion protection can also be achieved by selecting a suitable, corrosion-proof material or by treating the surface. Stainless steel is an ideally suited material for many machines and plants in the food industry. Due to high and ever increasing raw material prices, however, the price for components made of stainless steel can exceed that of components made of a standard material many times over. Cost-effective alternatives to stainless steel are suitable surface treatments, which ideally provide anti-adhesive properties to support the cleaning process. The crucial difference to conventional coatings here is that the surfaces are treated before the parts are assembled, and so the treatment agent is permanently bonded with the carrier material. This permanently prevents paint flaking at interfaces.

5.3.4 Approved materials (FDA)

The Food and Drug Administration (FDA) is the authority responsible for food safety (also drug approvals) in the USA. It is an agency of the United States Department of Health and Human Services. The FDA approves materials for utilization in the food or medical industry. An FDA approval is required for materials that might come into contact with the manufactured product (e.g. food).

5.3.5 Tested materials

During the daily cleaning processes, the components are permanently exposed to aggressive cleaning agents and chemicals. To ensure the reliability of a plant even after many years of operation, the used materials must be permanently resistant to the used cleaning agents and disinfectants. The resistance especially of seals (polymer materials) and different sealing systems can be simulated for the desired durability in special tests over a shortened period.

5.3.6 Position of the components in the plant

An important factor for hygiene requirements can be the position of the components in the plant. Installation situations in which, for example, the drive components are mounted directly above an open production process must be prevented. It is better to place the drive components in the splash zone or non-food zone according to DIN EN 1672-2:2005. The greater the distance between a critical component and the production process, the smaller is the risk of cross-contamination.

5.4 Customer benefits

5.4.1 End customer

- Less cleaning effort

  Easy and quick cleaning of machines and plants reduces the time required for the cleaning process, the energy and water consumption, human resources, the amount of cleaning agents, and all associated costs. Cleaning processes can be performed in a reproducible way; cleaning validation provides safe results and increases overall process safety.

- Long service life of the components and high plant availability

  Reliable components with a high degree of protection that are also permanently resistant to the used cleaning agents have a low failure quota, which increases the overall availability of the plant. In addition, the costs for replacement and maintenance work are reduced.

- High production quality and safety

  Hygienic components reduce the risk of contamination for the manufactured product. Product contaminations and resulting complaints and recalls are prevented. In the end, all this improves consumer protection, which is an advantage for every consumer.

5.4.2 OEM

- Simple design

  Hygienic Design is based on simple design principles, which are applied right from the start throughout the entire development process.

- Cost-saving design

  Additional protection devices are not necessary when using Hygienic Design components. This kind of drive technology does not require expensive protection covers made of stainless steel, which are very common to protect standard drive components from aggressive cleaning agents.

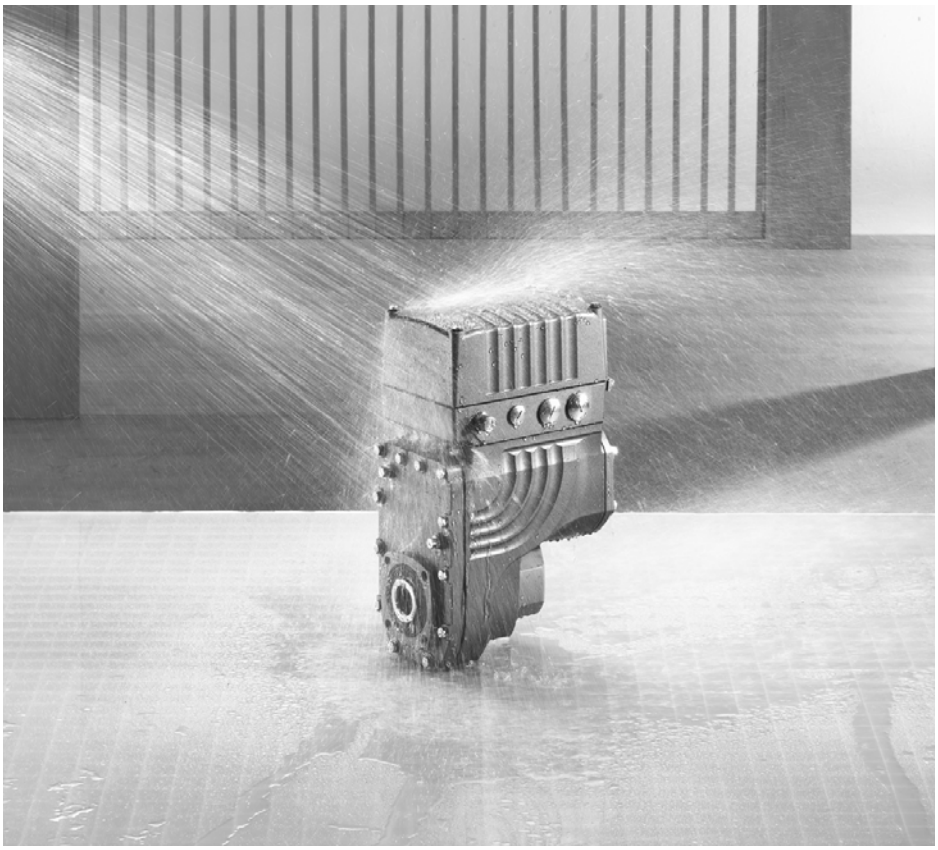
- Increased competitiveness

  Reliable and efficient machines and plants that save operating costs are a key factor for the future competitiveness of a company. Manufacturers of machines and plants in Hygienic Design can win new orders in the market for high-quality production plants.

5.5 SEW-EURODRIVE solution

5.5.1 Mechatronic MOVIGEAR® drive unit variant for wet areas

- Due to its high efficiency level, MOVIGEAR® is designed with a completely sealed housing and without additional fan, which means there is no risk of air, dirt, or germ swirls.
- The smooth surface meets all applicable hygienic design requirements
- Inclined surfaces support the "self-draining" effect and are easy to clean.
- All materials and seals are resistant to standard industrial cleaning agents, chemicals and disinfectants.
- High degree of protection: IP66 according to EN 60529.
- The durable anti-adhesive surface treatment agent HP200 is baked into the housing parts before the drive is assembled, this ensures a permanent bonding with the housing material. All interfaces between housing parts are equipped with external seals according to the hygienic design guidelines and are easy to clean.



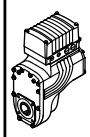
3674151307

5.5.2 Food-grade lubricants

There are optional, approved lubricants and greases available for the food industry (so-called food-grade lubricants) for all conventional gearmotors from SEW-EURODRIVE and for the MOVIGEAR® drive system. The food-grade lubricants have the designation NSF-H1.

A food-grade lubricant is recommended for applications in which there is a risk that oil can come into contact with food in case of a failure.

In addition to food-grade lubricants [1], bio-degradable lubricants [2] are also available as an option. A bio-degradable lubricant is recommended for applications in which there is a risk that oil can get into the ground water or waste water in case of a failure.

	6) °C -50 0 +50 +100	DIN (ISO)	ISO,NLGI	Mobil®	Shell	Klüber	ARAL	TEXACO	Tribol	Optimol Castrol	FUCHS	TOTAL
MGF 	Standard -20 +60	CLP HC	VG 220	Mobil SHC 630	Shell Omala HD 220	Klüberoil GEM 4-220 N	Aral Degol PAS 220	Pinnacle EP 220	Tribol 1510/220	Optigear Synthetic X 220	Renolin Unisyn CLP 220	
	-40 +40	CLP HC	VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N		Pinnacle EP 150		Optigear Synthetic X 150	Renolin Unisyn CLP 150	Carter SH 150
	4) -40 +20	CLP HC	VG 68	Mobil SHC 626	Shell Omala HD 68						Renolin Unisyn CLP 68	
	4) -40 0	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32		Cetus PAO 46		Optileb HY 32	Renolin Unisyn OL 32	
	-10 +40	CLP HC NSF H1	VG 460		Shell Cassida Fluid GL 460	Klüberoil 4UH1-460 N				Optileb GT 460	Geralyn SF 460	Dacnis SH 32
	-20 +30		VG 220		Shell Cassida Fluid GL 220	Klüberoil 4UH1-220 N				Optileb GT 220		
	4) -40 0		VG 68		Shell Cassida Fluid GL 68	Klüberoil 4UH1-68 N				Optileb HY 68		
	4) -20 +40	E	VG 460			Klüberbio CA2-460			Tribol Bio Top 1418/460		PLantogear 460 S	

[1] [2]

3674651147

[1] Food-grade lubricant
[2] Bio-degradable lubricant

5.5.3 MOVIFIT® FDC variant for wet areas

The MOVIFIT® FDC variant for wet areas is the ideal complement to the MOVIGEAR® SNI or MOVIGEAR® DSC variants for wet areas.

- IP65 degree of protection according to EN 60529
- Easy-to-clean housing with smooth surface (self-draining effect)
- Surface treatment HP200 with anti-adhesive properties
- High impact resistance of the surface against mechanical damage
- Mounting rail made from stainless steel

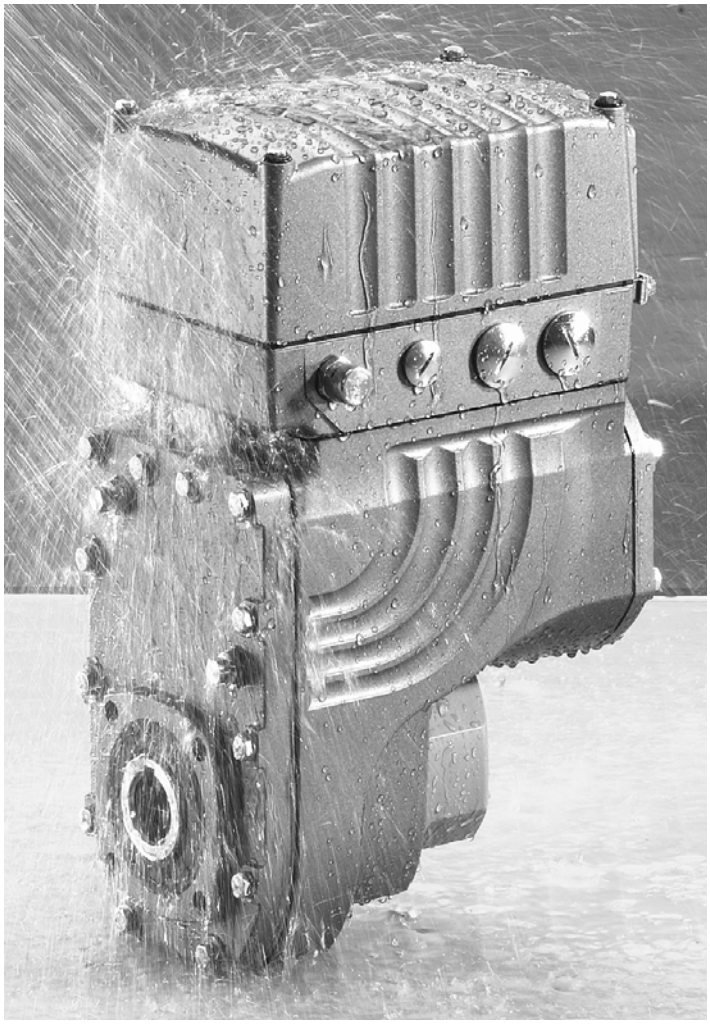
3675123723

5.5.4 Surface treatment HP200 with anti-adhesive properties

The durable anti-adhesive surface treatment agent HP200 is baked into the housing parts before the drive components are assembled, this ensures a permanent bonding with the housing material. HP200 is a thermoplastic fluoropolymer agent that creates a nearly non-porous surface with excellent anti-adhesive properties and chemical resistance. HP200 is approved by the FDA for contact with food.

Surface treatment HP200	Conventional coating
Hydrophobic surfaces form water drops with a contact angle > 90°	Hydrophilic surfaces form a thin water film, contact angle 0 to 9°
 3675304715	 3675306635

The following detail shot shows how the water rolls off due to the excellent anti-adhesive properties of the HP200 surface treatment:

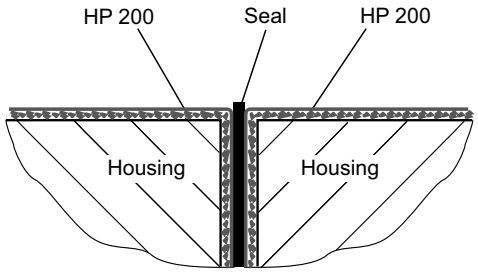
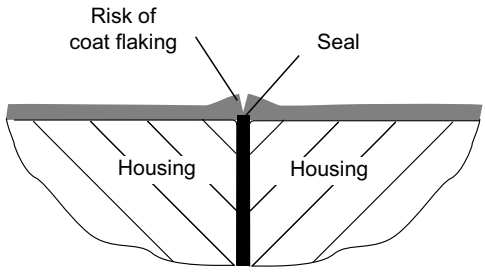


3675255435

Design

In conventional coating processes, the seals are often covered by the coat as well. Mechanical stress and motion can cause the coat surface to crack in these places and moisture can penetrate it. This can lead to corrosion and coat flaking.

In contrast to conventional coatings, the HP200 agent is applied before the product is assembled. This ensures that the surface is protected also at the housing edges. This permanently prevents paint flaking at interfaces. Since the surface treatment agent is baked into the housing surface, even mechanical damage to the surface cannot cause any significant subsurface corrosion damage.

HP200 surface treatment	Conventional coating
	

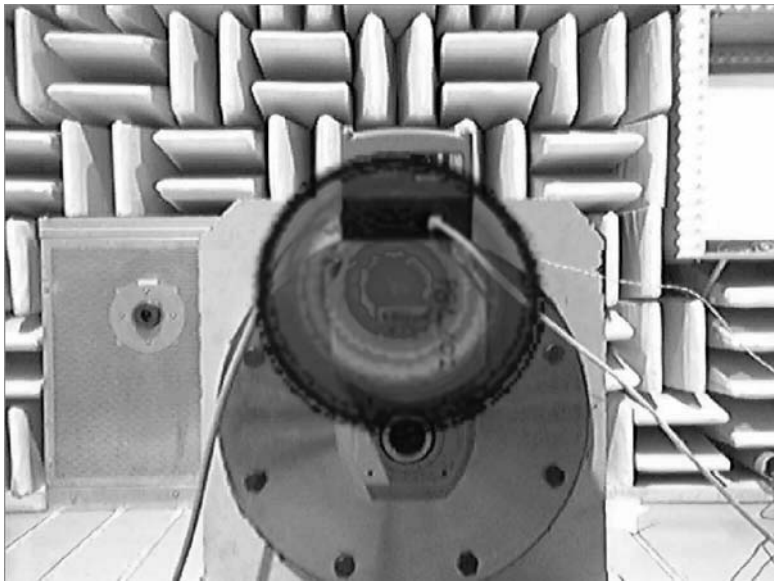
Characteristics

The HP200 anti-adhesive treatment used for MOVIGEAR® and MOVIFIT® has the following characteristics:

HP200 surface treatment characteristics	
Anti-adhesive properties	Very good
Wear resistance	Good, not suitable for abrasion or high pressure
Chemical resistance	Very good
Solvent resistance	Not soluble
Corrosion resistance	DIN 50021, > 1000 h depending on layer structure
Flammability	Not flammable
Temperature resistance	–40 to +200 °C, thermoplastic behavior
Layer thickness	Approx. 25 µm
Color	Silver gray
Food grade approval	Approved according to German Federal law and US FDA (no. 21 CFR 175.300)

5.5.5 Low-noise MOVIGEAR® drive for sensitive areas

The following figure shows the use of an acoustic camera in a sound measurement room:



3675777163

Characteristics

- No fan and completely enclosed → no noise due to air swirls and vibrations of the fan guard
- MOVIGEAR® is significantly quieter than conventional drive solutions
- Enables compliance with normative or customer-specific limit values
- MOVIGEAR® helps to comply with noise protection limits

5.6 Realization example / verification

5.6.1 Clean room certificate

With the certificate in German shown below, the Fraunhofer Institute certifies that the MOVIGEAR® drive for clean room applications meets the requirements up to air cleanliness class 2 according to ISO 14644-1, depending on the motor speed, and that the drive can be operated in such applications.

Fraunhofer

TESTED® DEVICE

SEW-EURODRIVE
MOVIGEAR
Report No. SE 1001-503

Qualifizierungsurkunde

Hiermit wird bescheinigt, dass für untengenanntes Produkt, untersucht im Auftrag der Firma

SEW-EURODRIVE GmbH & Co KG

Ernst-Blickle-Straße 42
76646 Bruchsal

das Fraunhofer-Zertifikat TESTED DEVICE Nummer SE 1001-503 vergeben wurde.

Das Antriebssystem MOVIGEAR ist bei seiner Verwendung in folgend angegebenen Motordrehzahlen geeignet, um in Reinräumen der jeweils zugeordneten Luftreinheitsklasse gemäß ISO 14644-1 eingesetzt zu werden.

Motordrehzahl	**Luftreinheitsklasse** (gemäß ISO 14644-1)
500 U/min	2
1.000 U/min	2
1.500 U/min	4
2.000 U/min	4

Detaillierte Informationen sowie die Parameter der Prüfumgebung entnehmen Sie bitte dem Prüfbericht des Fraunhofer IPA.

Die Gültigkeit dieser Bescheinigung bezieht sich ausschließlich auf obenstehendes Produkt in unveränderter Form.
Weitere Informationen: www.ipa-qualification.com.

Stuttgart, den 3. Februar 2010

i. A.
Projektleiter

Fraunhofer IPA

3675840523

5.6.2 Certificate for resistance to cleaning agents

With the certificate shown below, Ecolab® Deutschland GmbH confirms the resistance to cleaning agents of the HP200 surface of MOVIGEAR® and MOVIFIT®:

ECOLAB®

SEW EURODRIVE

Ecolab Deutschland GmbH
P.O. Box 13 04 06
D-40554 Düsseldorf

certifies that

a material resistance test

was performed for

SEW-EURODRIVE GmbH & Co. KG
Ernst-Blickle-Straße 42
D-76646 Bruchsal

with the following cleaning agents and disinfectants:
P3-topax 19, **P3-topax 56**, **P3-topax 58**, **P3-topax 686**, **P3-topactive 200**, **P3-topactive 500**, **P3-topactive DES**, **P3-topax 990** and **P3-oxysan ZS**, and **demineralized water**.

The protective properties of the **High Protection surface treatment HP 200** tested against the above-mentioned Ecolab products used in the test can be considered to be positive according to the cleaning procedures mentioned overleaf.

Düsseldorf, 14 August 2009

Ecolab Deutschland GmbH

i.V.

Thomas Wershofen
Manager Corporate Service RD&E
Center of Excellence EMEA
Food & Beverage Division

i. A.

Karin Uhlenbrock
Service Engineer RD&E
Center of Excellence EMEA
Food & Beverage Divsion

3785950091

5.6.3 FDA approvals for surface treatment and lubricants

- The HP200 surfaces of MOVIGEAR® and MOVFIT® are approved for contact with food according to German Federal Law and the US FDA (Food and Drug Administration No. 21 CFR 175.300).
- The various food-grade lubricants for the gear units from different manufacturers all have NSF-H1 approval.
- SEW-EURODRIVE supplies a free amount of NOCO® fluid corrosion protection and lubricant with every hollow shaft gear unit. The application of NOCO® fluid between the hollow shaft and the customer shaft during assembly prevents contact corrosion and facilitates disassembly at a later date. NOCO® fluid is also suitable for protecting machined metal surfaces that do not have corrosion protection. NOCO® fluid is a food-grade substance according to NSF-H1 (Reg. No. 142195).

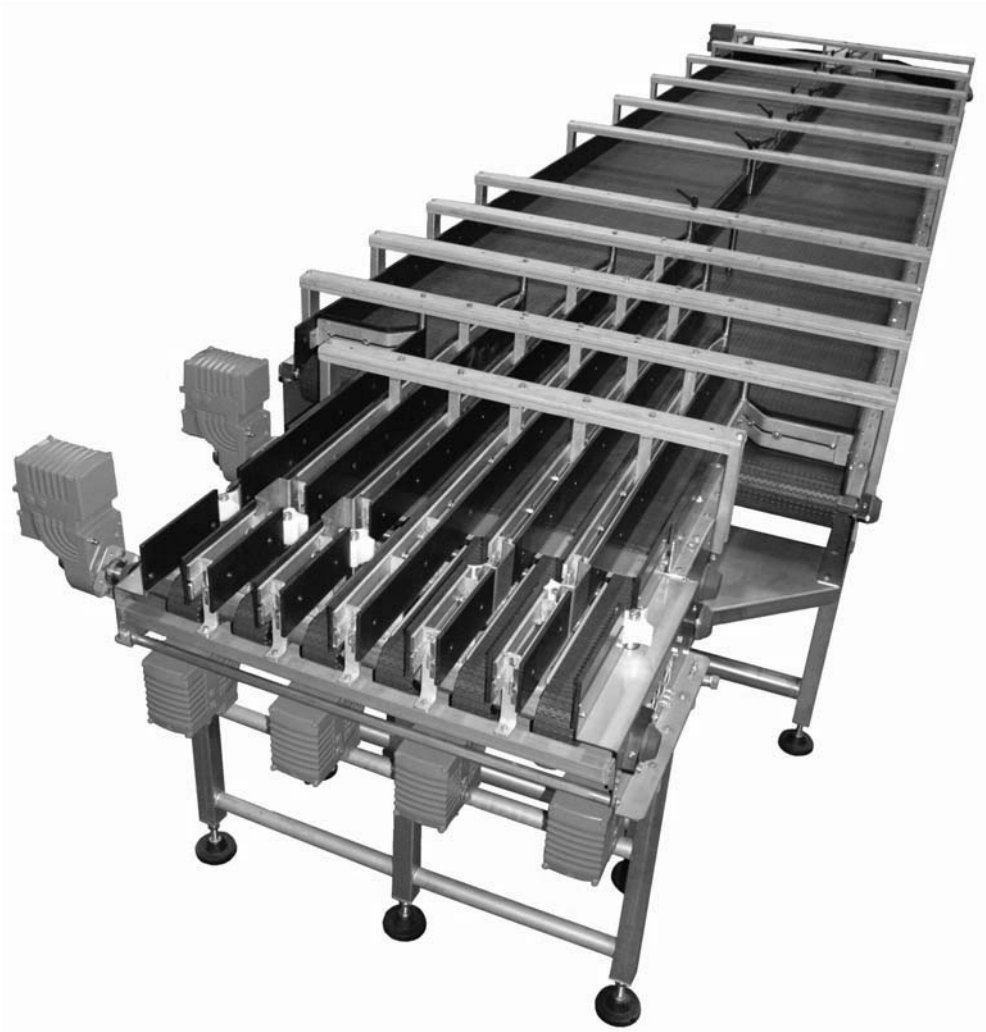
5.6.4 Application example[1)]

Feed table for feeding cans into the sterilizer

The following application example shows a feed table that feeds cans into a sterilizer.

The reduction of energy consumption and of the installation effort are very important factors for the manufacturer to keep up with the competition in terms of profitability and saved operating costs. SEW-EURODRIVE provides the suitable, energy-efficient and easy-to-install drive technology for this purpose:

- 6 MOVIGEAR® with SNI technology (Single-line Network Installation) per feed table
- The SNI technology allows for energy and data transfer in one standard cable, reduces the number of components, makes separate field wiring of bus cables redundant, and in this way minimizes the installation effort.
- The hygienic design of the MOVIGEAR® drives supports the hygienic production of cans.



3265520779

1) Photo source: Secma-Cabon, Quimper, France

6 Standardization of Components

6.1 The situation in the plant

System availability is the key assessment criterion in production processes with high labor costs, e.g. car assembly. As long as a line shutdown is the worst-case scenario involving disproportionately high financial losses, large on-site spare parts stores will continue to be needed to hold replacements for all components used. As the number of components in production lines has continuously increased over the past few years, the spare parts store often ties up a great deal of capital and space.

The administration effort to keep all components in stock, to find the required components when needed, and to maintain the components in stock is enormous.

If a component needs to be replaced, the necessary persons must be available who can replace the component and who can start up the new component.

The increasing complexity and variety of installed components also calls for more specialists for the maintenance of a plant. The necessary training for the specialists ties up more resources.

6.2 Criteria of the ideal component

It is not surprising that visionaries aim at using a single, highly reliable component that is easy to replace and start up in their manufacturing plant. In addition, this component should automatically and reliably report necessary maintenance work or an imminent failure to the responsible specialist.

The globalization of production sites makes it necessary that spare parts are available worldwide within a very short time.

Existing plant segments must often be re-arranged or integrated in new plants in order to respond quickly to new requirements and to save costs. This requires a flexible communication link between the components.

6.3 Solution approach

A plant with 100% availability based on a single, universal component is likely to always remain a dream. However, our goal is to come as close to this ideal as possible.

6.3.1 Condition monitoring

The availability of the plant can be improved through preventive maintenance at regular intervals. Condition monitoring is a tool that helps to optimize these maintenance cycles. Previously, an oil change was scheduled after a certain period of time. Nowadays, the oil temperature is used to determine the actual oil aging. This allows the operator to change the oil when it is actually necessary. The maintenance intervals can be extended without any danger to the plant, and costs are saved. An integrated plant communication network including the drive level with a powerful, self-learning diagnostic system can indicate imminent failures at an early stage so that the necessary measures can be taken in time.

6.3.2 Decentralized installation topologies

A significant factor for the reduction of variants and complexity is the installation of decentralized technology. Decentralized installation enables a modular plant design and offers a comprehensive network with defined interfaces. This simplifies project planning and engineering, and it also means that plant segments can be re-arranged quickly and without much effort.

6.3.3 Standardization of interfaces

Mechanical components, such as gearmotors, are a major reason for the large number of variants. Different power ratings, gear ratios, mounting positions and shafts quickly add up to a multitude of variants that is no longer manageable. This is why it is so important to create standardized mechanical interfaces already during the design stage of the plant, or to use components that can be installed in different mounting positions, for example.

6.3.4 The use of frequency inverters

The systematic use of frequency inverters not only helps to optimize the drive or to save energy, but it can also reduce the number of necessary gear unit ratios significantly. Synchronous motors offer additional optimization potential, since they provide a constant torque over their entire speed range. Their high overload capacity constitutes an additional power reserve, which makes overdimensioning unnecessary.

The basic approaches are:

- Reducing the number of gear unit ratios by using frequency inverters
- Reducing the number of gear unit ratios by using components with a high overload capacity
- Using components with a universal mounting position / oil fill quantity
- Standardization of mechanical connection interfaces
- Flexible communication link

6.4 Benefits of standardization

Standardization not only reduces the spare parts store, but also minimizes all costs related to a large variety of components. Be it part number administration, order logistics, or goods receiving: Fewer individual components to be managed means reduced costs, time and effort. This also involves less training for employees in the different areas.

Summary of key advantages:

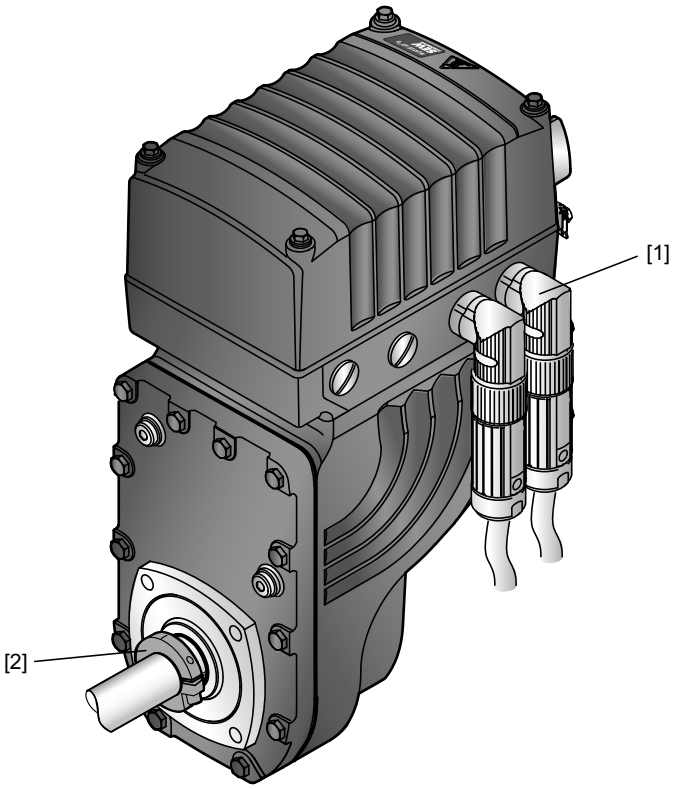
- Standardization minimizes the necessary training
- Optimization of order logistics
- Optimization of goods receiving
- Simplification of part number administration
- Fast responses to service calls
- Saving costs

6.5 Solutions from SEW-EURODRIVE

6.5.1 Standardization based on the mechatronic concept

As a decentralized component for plant automation, the mechatronic MOVIGEAR® drive unit meets the demand for a reduced number of variants in all aspects.

MOVIGEAR® drive units are made up of 3 core components: gear unit, motor and drive electronics. These 3 core components are perfectly matched and included in one die-cast aluminum housing.

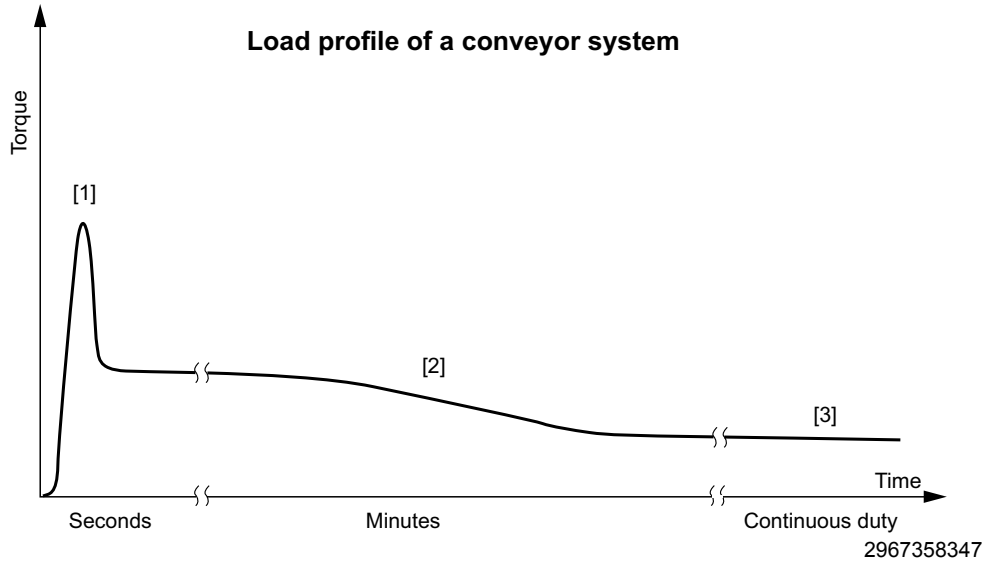


3705687179

[1] Electronic connection interfaces
[2] Mechanical connection interfaces

6.5.2 Standardization due to integrated frequency inverter, high overload capacity and constant torque over the entire control range

MOVIGEAR® is equipped with a permanent-field synchronous AC motor. This means the torque is constant over the entire control range. In connection with the integrated frequency inverter, this makes it possible to reduce the gear unit ratio. Due to the high overload capacity of the drive electronics and a sufficiently dimensioned gear unit, the MOVIGEAR® unit can provide starting torques and peak torques of up to 3.5 times the nominal torque.

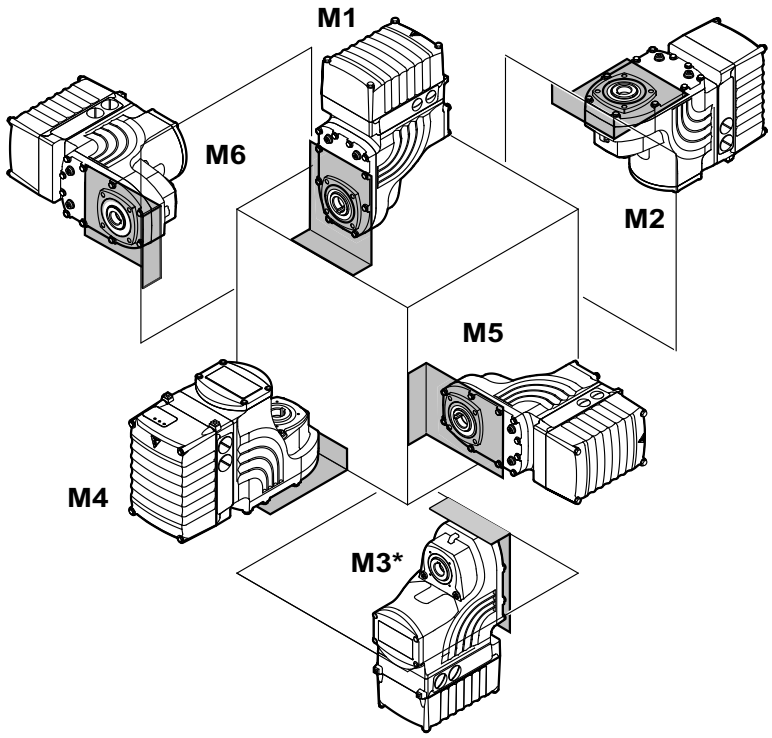


MOVIGEAR® type	Operating range [1] (static breakaway torque, 5 s)	Operating range [2] (5 min.)	Operating range [3] (duration)
MGF.2	350% M_a	200% M_a	100% M_a
MGF.4	350% M_a	200% M_a	100% M_a

6.5.3 Standardization due to universal mounting position / oil fill quantity

Universal mounting position

The following figure shows the position of MOVIGEAR® in mounting positions M1 to M6.



2387957387

***** = Mounting position M3 only after consultation with SEW-EURODRIVE

Universal oil fill quantity

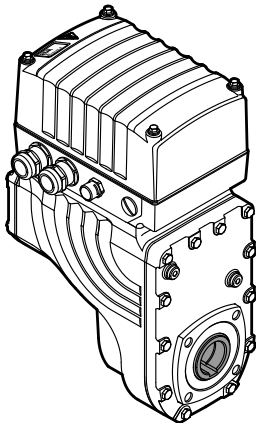
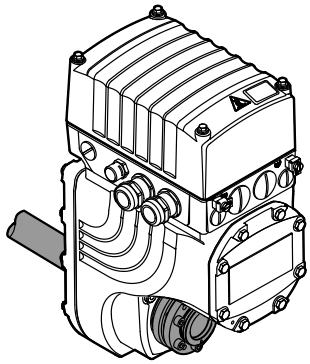
With MOVIGEAR® "B", it was possible to make the oil fill independent of the mounting position. With the MX mounting position, customers can operate MOVIGEAR® in M1, M2, M4, M5 or M6 mounting position after having positioned the breather valve according to the mounting position. An option with integrated pressure compensation is in preparation. This makes the mounting position completely universal (M1–M6) without the customer having to take any measures.

Standardization of mechanical connection interfaces

2 shaft designs are available for MOVIGEAR® B:

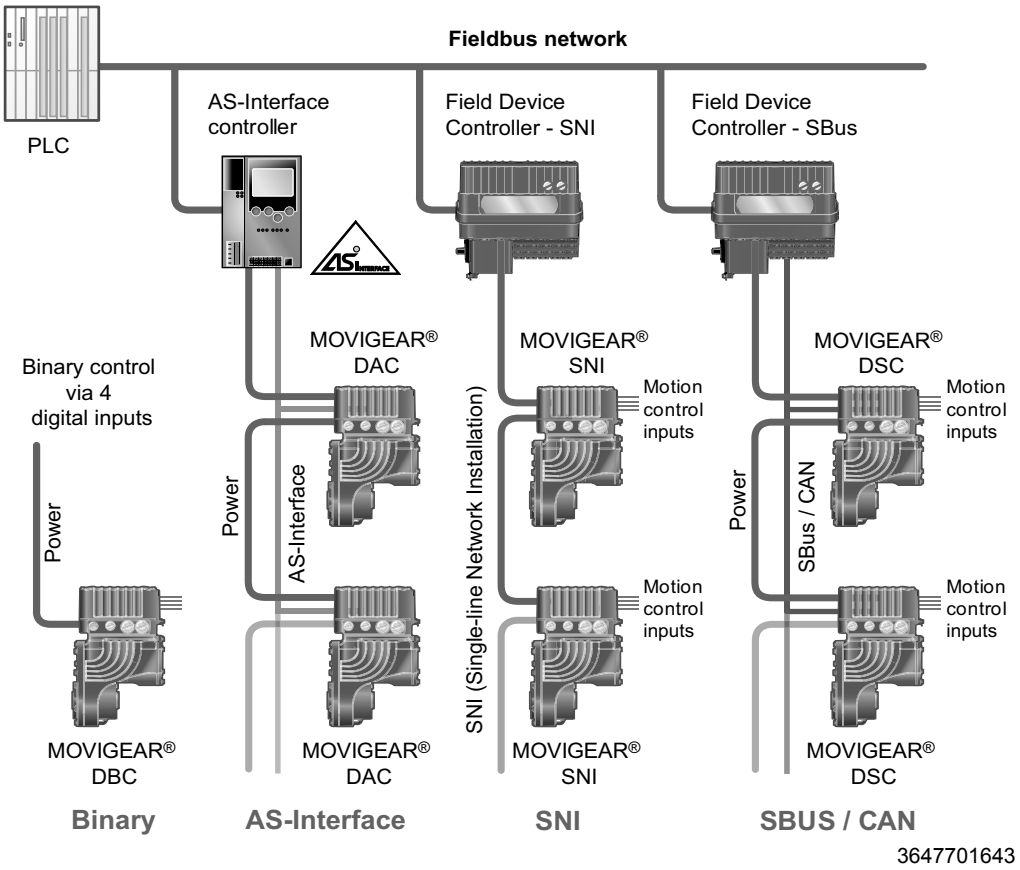
- Hollow shaft with key with shaft end diameters
  - 25 mm and 30 mm for MGF..2
  - 30 mm, 35 mm and 40 mm for MGF..4
- TorqLOC® hollow shaft mounting system with standard diameters of
  - 30 mm for MGF..2
  - 40 mm for MGF..4

Using TorqLOC® as a universal clamping connection allows for adapting the drive to various hollow shaft diameters. Various bushings are used depending on the diameter. Both the drive and the hollow shaft remain the same.

Hollow shaft with keyway	TorqLOC® hollow shaft mounting system
 9007201945561611	 9007201945563531

Standardization due to flexible communication link

The mechatronic MOVIGEAR® drive system is available in 4 different communication variants. This allows you to realize very different drive tasks with great technical and economic efficiency depending on the requirements. The flexible drive system can be implemented in individual applications, in widespread plants, and in applications close to the machine.



6.6 Cost saving due to standardization

6.6.1 Cost saving due to reduced number of variants

The reduced number of variants of MOVIGEAR® drives makes it possible to save a significant amount of costs. The number of variants is in so far important for system manufacturers as they have to create a separate part number for every variant and have to manage these part numbers. Furthermore, a large amount of costs can be saved with regard to purchase, storage and item management:

In one specific example, it was possible to reduce the number of variants in a plant with a total of 150 drives from previously 15 different drives to 3 drive variants with MOVIGEAR®. For spare parts storage, only 3 x 3 = 9 MOVIGEAR® units are planned instead of 15 x 2 = 30 drives as before. This reduces the value of stored spare parts by 2/3 to about 30% of the originally planned value.

6.6.2 Reduced costs due to lower storage costs

A reduced number of variants also has a positive effect on the storage costs. This is true both for the plant manufacturer (OEM) and the plant operator, who has to keep fewer different components in stock.

Assuming storage costs of EUR 20 per year and drive, this would mean for the example above that with 15 variants and 2 drives per variant, the storage costs would add up to EUR 600 per year.

In contrast, the 3 variants of MOVIGEAR® with 3 replacement units each cause storage costs of EUR 180, less than a third of the original solution.

6.6.3 Application example for materials handling and storage technology[1)]

The following example shows the logistics unit in the goods receiving area of the SEW-EURODRIVE industrial gear unit plant in Bruchsal. It consists of an intermediate tray buffer with a subsequent conveyor line with vertical conveyor for storing the received goods in the small parts warehouse.

Perfect interplay between the different drive technology components is ensured by:

- 60 MOVIGEAR® SNI in only two variants
- in connection with one MOVIFIT® SNI controller variant.

3265474699

1) Photo source: psb intralogistics GmbH, Pirmasens, Germany

7 Services from SEW-EURODRIVE

7.1 Market situation/trends

Intensified, dynamic competition and increasing complexity of product and value creation structures require a stronger focus on processes.

Flexible and adjustable solutions play an increasingly important role in established markets. Format changeovers due to different product variants and a scalable plant capacity to always provide the right capacity for the cyclically fluctuating market conditions are just two examples for necessary adaptation.

Supported by information technology trends, the solutions have an increasingly variable structure, and the supply times are getting shorter. As a result, the factors "software" and "services" are becoming much more important. They make sure that the increased demands for flexibility and throughput times can be met in an efficient way.

At the same time, unnecessarily high costs due to complexity must be avoided. These costs are irrevocably defined at a very early stage of the value creation process. More variance in the material master, for example, causes more costs and in the end limits the competitiveness of the company.

The enormous price pressure in plant manufacturing with quality remaining a core requirement mean that the focus is no longer on production and component costs only. Other areas of a company must also be analyzed to evaluate their cost saving potential.

Today, these important goals must be achieved in a global context. Global availability of the solutions and the right balance between standardization and local agility are therefore essential requirements.

7.2 Plant automation requirements

A supplier must not only deliver products reliably, but also offer quick and convenient solutions that simplify in-house processes. Necessary information about products, such as technical data and CAD drawings, must be easily accessible and clearly structured to reduce the lead time in the engineering process. Innovative selection options facilitate standardization in the material master, so that downstream processes such as storage and in-house material flows can be optimized

The elimination of manual processes and media discontinuity especially in administrative processes is analyzed to enable increased focus on value-creating activities.

The special requirements of plant automation can be divided into 4 core elements:

- Optimization of master data management
- Automated order processes to reduce manual processes
- Easy identification of products in the goods receiving area an in-house material handling
- Reliable and efficient processing of service calls

7.3 Global player

SEW-EURODRIVE is a global player with a dedicated sales and service network. More than 14,000 employees worldwide are working to solve your tasks and optimize your processes.

With 15 production plants and 75 Drive Technology Centers worldwide, we are always close to you to solve challenging drive tasks together with you.

Production plants (examples)

USA | Brazil | Germany | France | China

3787008779

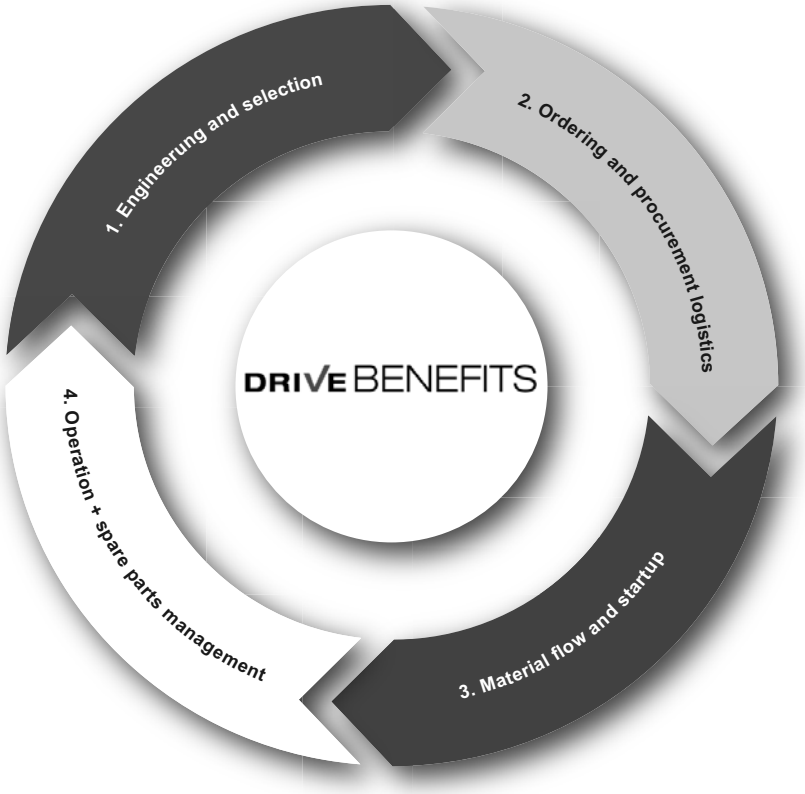
7.4 DriveBenefits – Customized process solutions

Good drive technology products alone are not sufficient.

SEW-EURODRIVE offers an innovative range of services that ensures day-to-day operation of all drives and provides tailor-made solutions for optimizing the customers's processes.

DriveBenefits stands for a holistic approach towards process optimization throughout the entire value creation chain. Complete drives and spare parts are quickly available worldwide thanks to the global presence of SEW-EURODRIVE. Service at SEW-EURODRIVE, however, does not only start after the purchase.

The DriveBenefits modules of SEW-EURODRIVE can be combined individually to form an overall concept that will give customers sustainable benefits.



3707245707

Overview of advantages:

- Measurable cost savings
- Less expenditure of time
- Increased process safety
- Increased efficiency
- Enhanced process automation

7.4.1 Engineering and selection

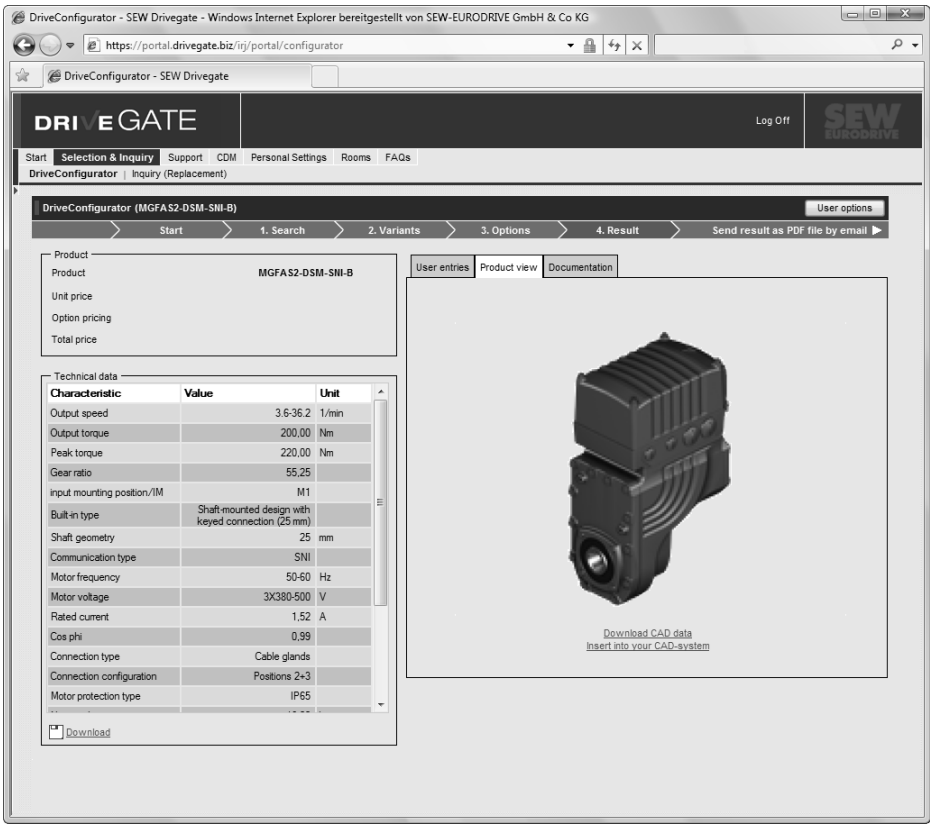
The ideal online tool for engineering and selection is the DriveConfigurator, which facilitates quick and safe selection of drive components.

The guided selection process enables easy navigation through all available drives and drive options. All the required documents (operating instructions, parts lists) as well as CAD models and dimension sheets are available after the download.

However, the tool not only offers a download function. Customers can upload the selected CAD data from the DriveConfigurator directly to their own CAD system. This offers substantial efficiency advantages for designing a plant.

Direct upload can be used for all common CAD systems (among others AutoCAD, CATIA, SolidWorks).

You can also directly initiate a request for quotation. A template management function lets you save drive configurations so you can use them later for other order inquiries. Without Internet access, the DriveConfigurator can also be used offline.

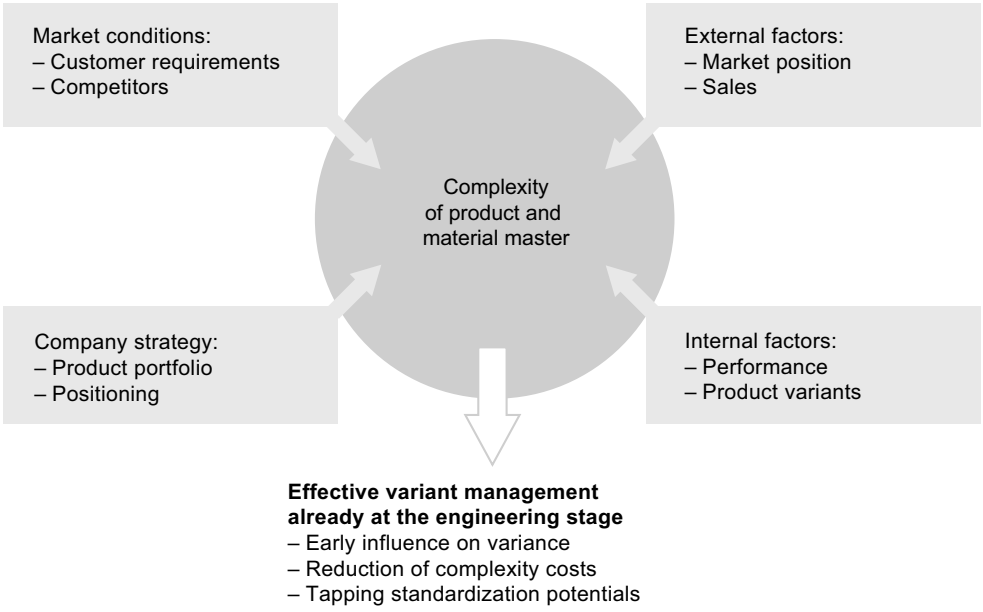


3710479499

Effective variant management in the DriveConfigurator

Due to various internal and external factors, the complexity of product and material masters continues to increase. As a result, it has become necessary to identify and tap standardization potential already during the development stage of a plant or machine and when selecting the right drive solution for it. SEW-EURODRIVE offers support for this with an optional function in the DriveConfigurator, the selection tool for SEW drive technology.

Factors that influence the complexity in the product and material master:



3791422731

Comprehensive filter and comparison options, e.g. according to technical product data or material numbers, help you to quickly find the ideal drive solution. You can also add your own characteristics and classifications, e.g. a project designation or an evaluation of a product. A plant designer can search already used or quoted products for the required drives and re-use them under his or her own material number. Similar components can be compared to illustrate what they have in common and what their differences are. This shows quickly whether an existing product can be used for the current project, which means tapping the full standardization potential.

This helps to reduce variance already during product selection, which in turn reduces the follow-up costs, e.g. for master data management and storage.

Advantages of the DriveConfigurator at a glance:

- Simple and guided online configuration of drives
- All the information about a product is available at a glance
- 3-D view of the configured product
- Individual designations and saving of template
- CAD models can be uploaded directly to the customer's CAD environment
- Advanced powerful functions to efficiently reduce the number of variants

Other DriveBenefits modules for engineering and selection:

- SEW Workbench
- DriveCAD
- EPLAN macros

7.4.2 Ordering and procurement logistics

Optimized processes save costs, accelerate work flows throughout the entire value creation chain, and reduce processing errors.

Electronic data interchange is the fastest and most efficient way for transmitting order, delivery, and invoice data. SEW-EURODRIVE will gladly advise you on how to benefit from automated order processing and other modules in the "order and procurement logistics" process step.

SEW-EURODRIVE offers various templates (order, order confirmation, invoice, etc.) and formats for electronic data exchange (EDI), which allow for a direct connection. In this way, the entire order management can be handled directly and electronically, rendering manual process steps and media discontinuity obsolete. Doing so will increase process safety and lets you save costs. Connection to external order platforms is also supported.

The advantages of EDI at a glance:

- Individual connection options
- Increased process safety
- Significant cost savings potential when placing the order electronically

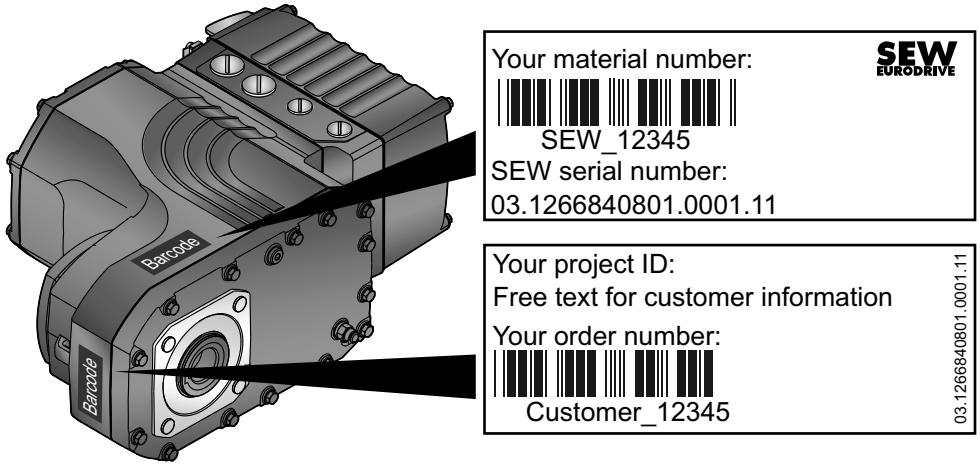
Other DriveBenefits modules for ordering and procurement logistics:

- Customized procurement logistics
- Electronic invoicing

7.4.3 Material flow and startup

In the process step concerned with material flow and startup, the intelligent material flow tool DriveTag supports processes in the areas of purchasing, materials management and intralogistics. DriveTag involves barcode labels that can be attached to drives and packages from SEW. The tags hold information for the identification of the drives, simplify the correct assignment of component at the customer site, and save valuable time in the goods receiving area, in the warehouse, or during assembly processes. However, DriveTag is not only convenient for incoming goods, but it also helps to automate the several identification steps in the in-house material flow process. All product deliveries and their further in-house processing can be controlled efficiently using DriveTag. This process module is not only suitable for comprehensive projects and for optimizing the supply chain, but also for each OEM customer who orders SEW drives on a regular basis.

Electronic incoming goods identification is state of the art today. The DriveTag system from SEW-EURODRIVE supports all customary barcode types. The barcode for the drive label can be different for that of the package. A DriveTag not only contains machine-readable information, but also plain text. This is a great advantage when a customer quickly wants to read an order number. Customers who have automated incoming goods identification, scanners for barcode reading and automatic entering of material in their ERP system benefit the most from DriveTag.



3710469643

The advantages of DriveTag at a glance:

- Fast and efficient identification of products
- Automated incoming goods process
- Less expenditure of time and reduced error rate

Other DriveBenefits modules for material flow and startup:

- Order tracking
- Order-specific documentation

7.4.4 Operation and spare parts management

The shutdown of a plant always causes great economic losses. For this reason, components and spare parts are often stored on site for quick replacement. Quick and reliable spare parts management is offered by the DriveGate online platform, a portal for a variety of process solutions.

Customers only enter the serial number of the relevant drive to get a parts list with all necessary spare parts. A n exploded view of the product helps you to find the necessary part. You can send an inquiry or order for this part with just a few mouse clicks. The selected spare parts are put into a shopping basket, where you can check them again and the parts are given a reference number that facilitates easy identification when you receive the delivery. Just click on the send button and SEW-EURODRIVE will ship them as quickly as possible.

Advantages of spare parts ordering at a glance:

- Efficient spare parts management
- Convenient online ordering
- Fast processing by entering the serial number

Another DriveBenefits module for operation and spare parts management:

- Spare drive inquiry

7.5 CDS® – Complete Drive Services

Plant operators depend on smoothly running production processes, now more than ever. No one can afford downtimes. The process solutions of SEW-EURODRIVE go far beyond the delivery of our products. Our after-sales service offers a complete range of services worldwide.

The CDS® – Complete Drive Services package is a portfolio of after-sales service modules that are based on many decades of practical expertise.

Simply select the specific modules to obtain a tailor-made CDS® service package. In this way you always have the right solution to avoid downtimes and reduce malfunctions to a minimum.

In other words, green light for your production.

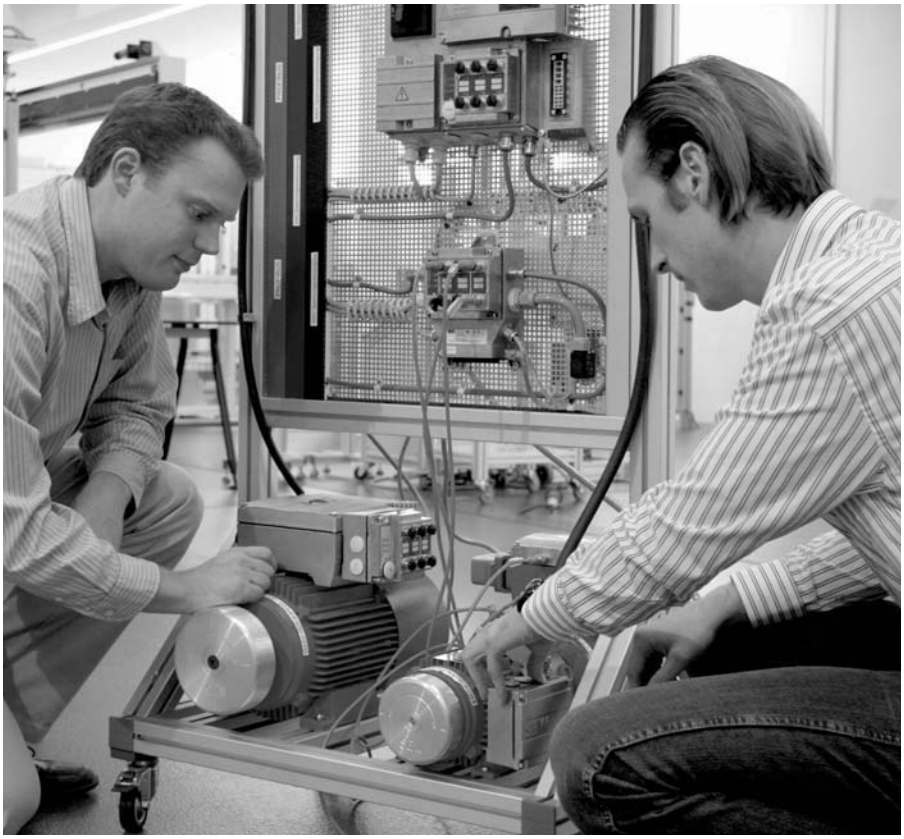
3710482315

Your advantages at a glance:

- Worldwide availability of spare parts
- Condition monitoring solutions
- Long-term planning security due to service contracts

7.6 DriveAcademy® – Training made by SEW

The increasing complexity and variety of components also calls for more specialists for the maintenance of a plant. A specific training program offered by the DriveAcademy® meets these requirements with product training courses, process consulting, and personnel development seminars. Our global network of trainers provides the same high training standard all over the world.



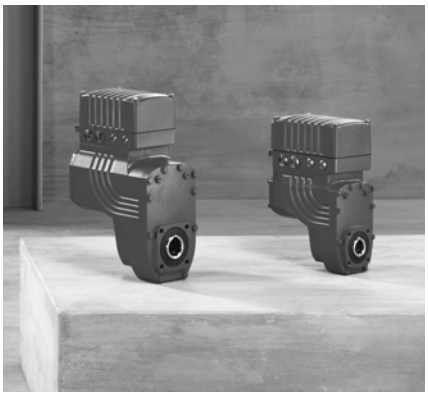
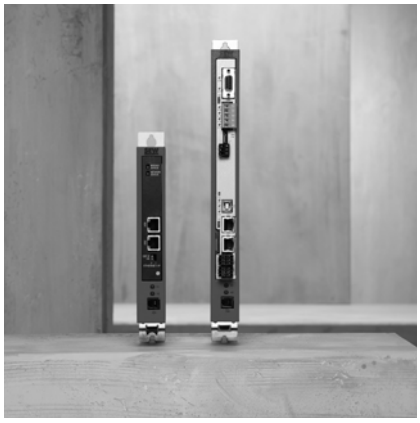
3710486155

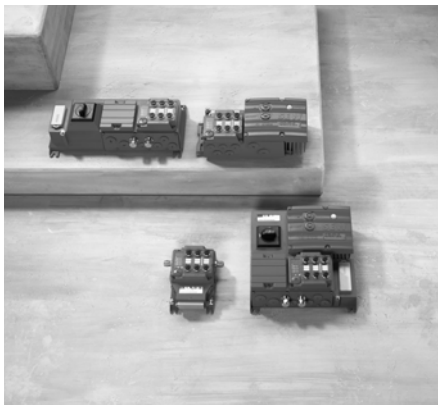
8 Appendix

8.1 Product overview

This publication describes solutions for efficient plant automation, which also involves innovative products from SEW-EURODRIVE, of course.

The following is an overview of the mechatronic products suggested in this document including a short description:

Product	Brief description
MOVIGEAR® with corresponding controllers/gateways	
 2875741451	MOVIGEAR® is a compact mechatronic drive system comprising a gear unit, a motor and drive electronics. MOVIGEAR® provides a high level of system efficiency contributing to reducing the overall energy expenses. • MOVIGEAR® DBC – Direct Binary Communication • MOVIGEAR® DAC – Direct AS-Interface Communication • MOVIGEAR® DSC – Direct SBus Communication • MOVIGEAR® SNI – Single Line Network Installation
 3261035659	MOVIFIT® FDC is a decentralized drive controller that can control up to 16 drive units, 10 of which can be MOVIGEAR® SNI. • Configurable CCU variant • User-programmable MOVI-PLC® variant
 2940861707	Control cabinet controllers and fieldbus gateways For connecting a drive system with MOVIGEAR® DSC-B to a fieldbus or Ethernet system: • Fieldbus gateway variant • Configurable CCU variant • User-programmable MOVI-PLC® variant

Product	Brief description
MOVIMOT® with corresponding controllers/gateways	
 3790638987	MOVIMOT® is the proven, ingeniously simple combination of a gearmotor and a digital frequency inverter in a power range from 0.37 to 4.0 kW.
 1507300747	MOVIFIT® MC is a decentralized drive controller that controls up to 3 MOVIMOT® gearmotors. • Fieldbus gateway variant with function level "Classic" • User-programmable (MOVI-PLC®) with function level "Technology"
 1507298827	Field distributors establish an efficient connection between the drives and the power supply system, the 24 V control voltage and the fieldbus. They are based on decentralized fieldbus interface technology with additional connection technology for power distribution.

Index




SEW-EURODRIVE
Driving the world

SEW-EURODRIVE GmbH & Co KG
P.O. Box 3023
D-76642 Bruchsal/Germany
Phone +49 7251 75-0
Fax +49 7251 75-1970
sew@sew-eurodrive.com
→ www.sew-eurodrive.com