



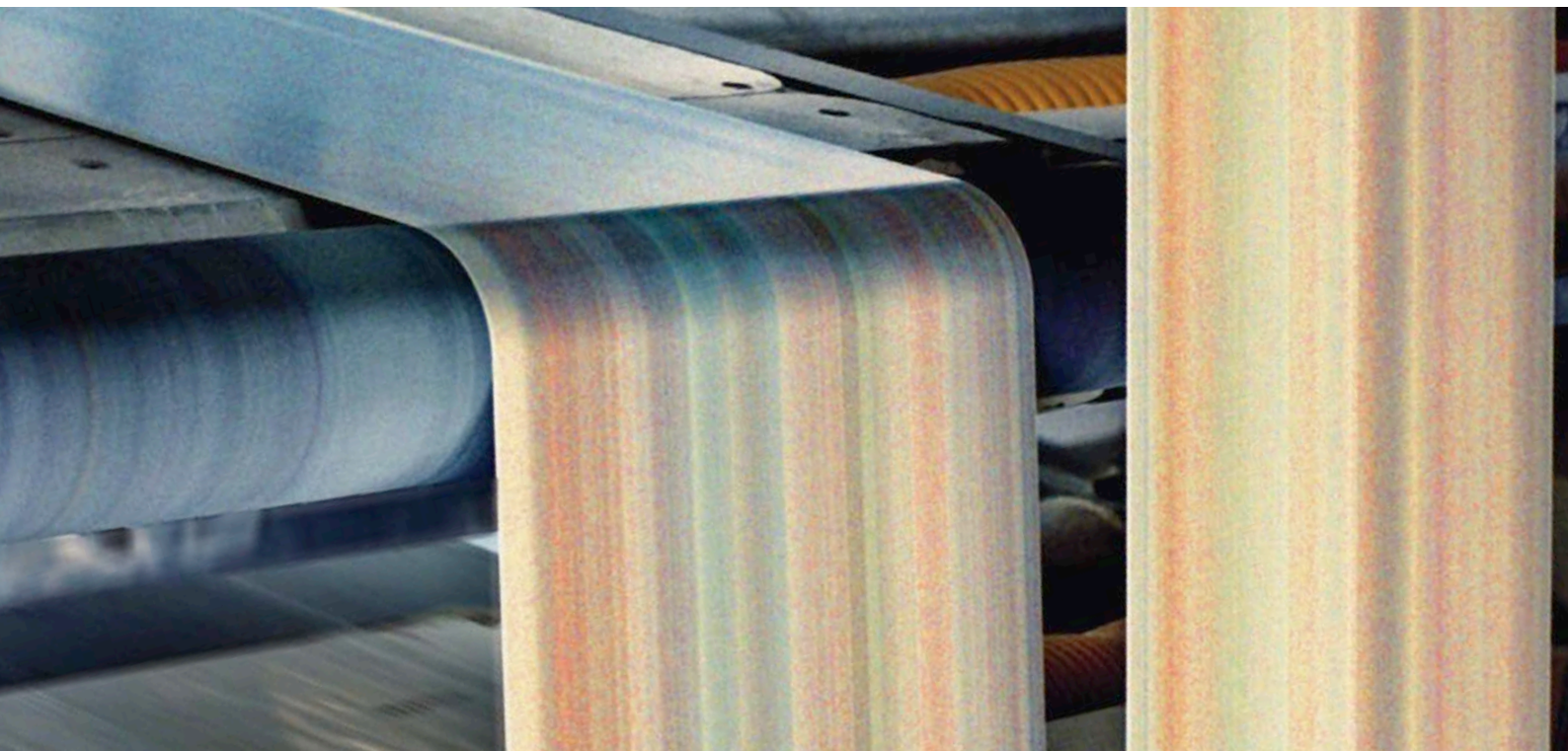
SIEMENS

Ingenuity for life

Perfect Converting Solutions in Record Time

Solutions for processing continuous material webs
with the Converting Toolbox

[siemens.com/converting](https://www.siemens.com/converting)



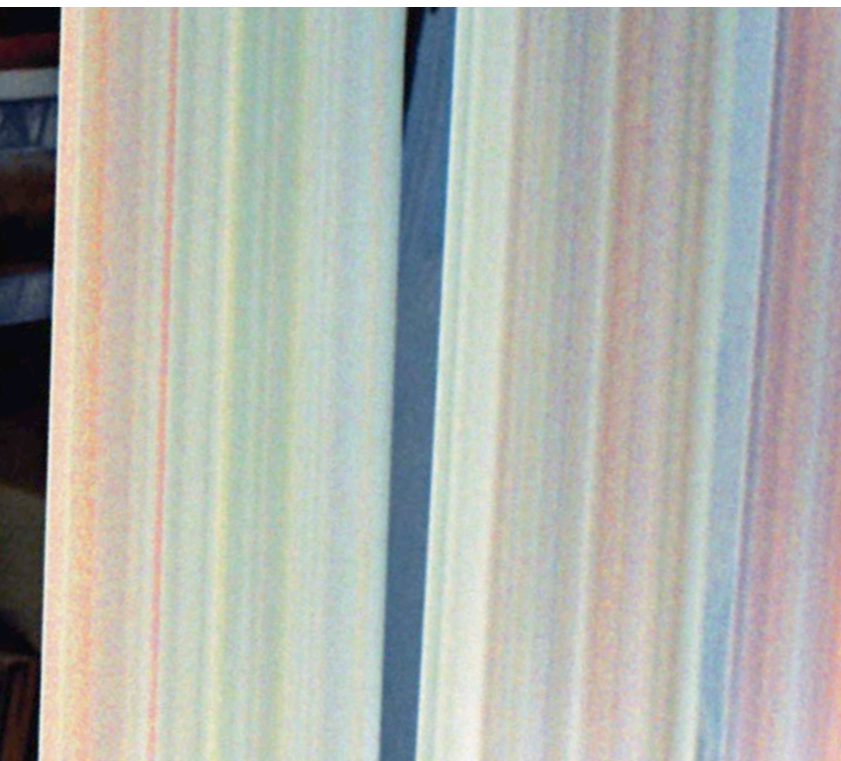
Converting solutions from Siemens – customized solutions with minimum effort

In the converting industry, the requirements are vast – and are continually increasing. Higher production rates, maximum availability and flexibility, optimum product quality as well as minimum life cycle costs are demanded. Additionally, industry-specific technologies are demanding more from the automation.

For this reason automation concepts, which do more than just fulfill the requirements of the industry, and which you as machine builder in the converting industry can quickly and reliably implement are required. Our comprehensive portfolio of control and drive components that has proven itself world-wide, forms a solid basis for innovative machine solutions, which set standards and therefore sustainably improve your competitiveness.

With our Converting Toolbox as the core element, you profit from preconfigured and tested converting functions. These can be simply modified and freely combined corresponding to your machine requirements.

The SINAMICS S120 drive system with its integrated safety functions not only allows you to achieve the specified performance data, but also to implement safety-relevant aspects of your machine in a simple fashion.



Converting solutions from a single source

- Comprehensive, scalable range of automation and drives for each and every machine type
- Pretested, standardized converting functions
 - for three platforms: SIMATIC, SIMOTION and SINAMICS
 - as a basis for quickly and simply implementing all types of high-performance converting machines
- Safety Integrated functions to easily implement efficient machine safety based on standard component
- Drives with controlled line supply infeed/regenerative feedback for energy-efficient and rugged system operation – even when connected to unstable line supplies
- Open solution, by using standard fieldbuses (PROFIBUS, PROFINET etc.)
 - for simple integration into existing automation topologies
 - for simple integration of third-party components

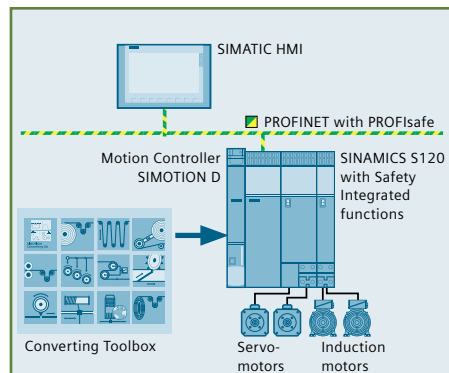
Flexible automation – safety is always integrated

Our converting solutions are available in three versions. In the PLC-based solution converting functions are executed in a SIMATIC S7 PLC. With the solution based on the SIMOTION motion control system, there are no limits when it comes to performance and flexibility of the converting functions. For the SINAMICS-based solution, the converting functions are directly executed in the control unit of the SINAMICS S120 drive system.

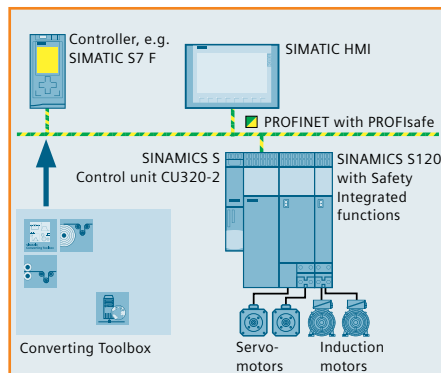
Typical applications for our solutions:

- Winding
- Laminating
- Cross cutting
- Calendering
- Perforating
- Embossing
- Coating
- Slitting & Winding
- Flying saw
- Web accumulator
- Die cutting
- Traversing

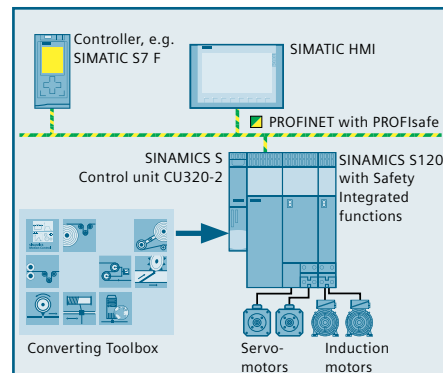
Converting in the **SIMOTION** motion control system



Converting in the **SIMATIC** industrial automation system



Converting in the **SINAMICS S120** drive system



Value-added for machine and plant



Converting solutions based on standard components that are established
both worldwide and in all industrial sectors

As your partner, we can offer you all of the components that you require to implement first-class solutions for processing and finishing continuous material webs.

SIMATIC HMI: transparent plant and system operation and visualization

The complete range of integrated, globally leading products, available in different performance levels, stands for ergonomic and transparent system operating control.

SIMATIC S7: efficient control of machine operations

The modular PLC system is admirably suited for applications with central and distributed topologies. Based on this system, in addition to the machine control, safety-related functions can also be simply implemented. The controller can optionally handle motion control tasks.

SIMOTION: precise, dynamic motion control of drives

The innovative motion control system is the ideal solution for basic applications as well as also precise synchronization of many drive axes; it is available in three versions: Controller, PC and our drive-based (SIMOTION D).

SINAMICS S120: precise motor control

The flexible and modular SINAMICS S120 drive system gives converting axes the necessary drive – and is therefore a permanent element in our converting solutions. It precisely controls induction motors as well as servomotors with a high dynamic performance. Controlled line supply infeed and energy equalization via the DC link ensure energy-efficient operation and a high degree of ruggedness with respect to line fluctuations; in turn, this reduces the risk of machine downtimes due to instable line supplies.

SINAMICS Safety Integrated allows effective safety concepts to be simply implemented. Using SINAMICS Drive Control Chart and the integrated positioning functions, motion control functions can also be implemented in the drive.

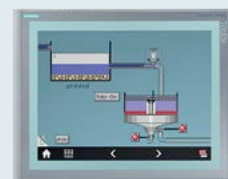
SIMOTICS: motors for every level of dynamic performance and precision

When it comes to dynamic performance and precision, SIMOTICS motors are optimally adapted to the SINAMICS S120 drive system, and ensure that your machine performs reliably in-line with the specified performance data.

The compact SIMOTICS M-1PH8 main motors or SIMOTICS S-1FK7 servomotors are admirably suited for converting applications. The compact and rugged SIMOTICS T-1FW3 torque motors are predestined for direct drives (e.g. gearless roller drives with the highest precision). Encoders are already integrated into all of the SIMOTICS motors. Further, they fulfill all of the requirements for use as Safety Integrated components. In addition to their outstanding properties as a result of their perfect interaction – our components set themselves apart through the consequential use of well-proven communication standards such as PROFIBUS and PROFINET.

Global service and support

When required, our experienced application engineers can provide you with consulting services and support when designing and implementing the optimum solution for your machine. Further, our global support and spare part service guarantees a high degree of availability and productivity of your machines.



SIMATIC HMI



SIMATIC S7



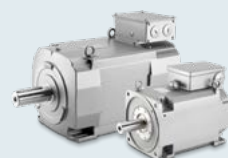
SIMOTION



SINAMICS S120



SIMOTICS S servomotors



SIMOTICS M main motors

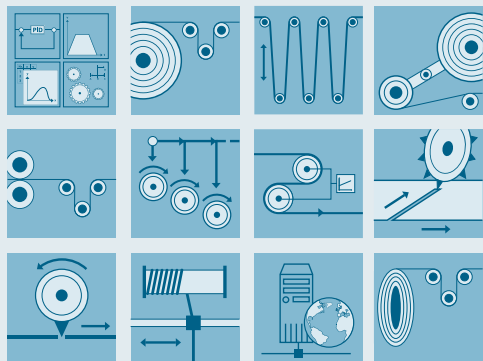


SIMOTICS T torque motors



Outstanding: The Converting Toolbox

Our Converting Toolbox is completely unique: with the standardized automation package, which we have specifically created for you, you can depend on completely functional solutions and tested know-how – perfectly documented and already tested. This significantly simplifies applications involving processing material webs – and opens up a new degree of flexibility when it comes to pricing and deadlines.



Converting Toolbox

The Converting Toolbox includes standard functions and can run on the following automation platforms:

■ **SIMOTION**: for high performance motion control applications with central intelligence in conjunction with the SINAMICS S120 drive system

■ **SIMATIC**: for applications with a PLC as central control system, in which process controls are implemented

■ **SINAMICS**: for drive-based applications with process-related implementation of the control in the SINAMICS S120 drive system using DCC (Drive Control Chart) and DCB Extension.



Converting Toolbox for quickly implementing powerful machine functions

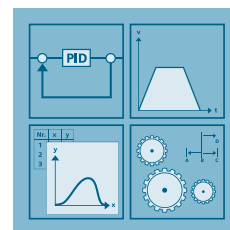
- Available for SIMOTION, SIMATIC and SINAMICS
- Fast and reliable automation of converting functions
 - by using preconfigured and tested function blocks
 - using program generation with project generator
 - through simple adaptation using parameterization
- Simple adaptation to individual requirements
 - using freely combinable function blocks
 - by simply modifying standard function blocks
 - by simply adding your own function blocks
- Protection of company know-how through access protection

Converting Library

The Converting Library is intended to help users when engineering and programming production machines to process continuous material webs. The library provides typical, open standards that can be adapted to specific plants/systems and applications. For example, for foil-making systems, printing machines, coating machines, paper finishing systems, textile machines and post press machines.

Highlights:

- General tools
Ramp-function generator, characteristic blocks, linear interpolation
- Drive functions
Friction characteristic, interface activation
- Closed-loop control functions
PID controller, integrator, differentiator, deadband

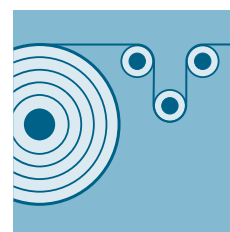


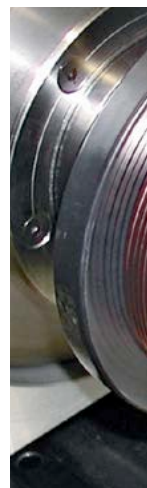
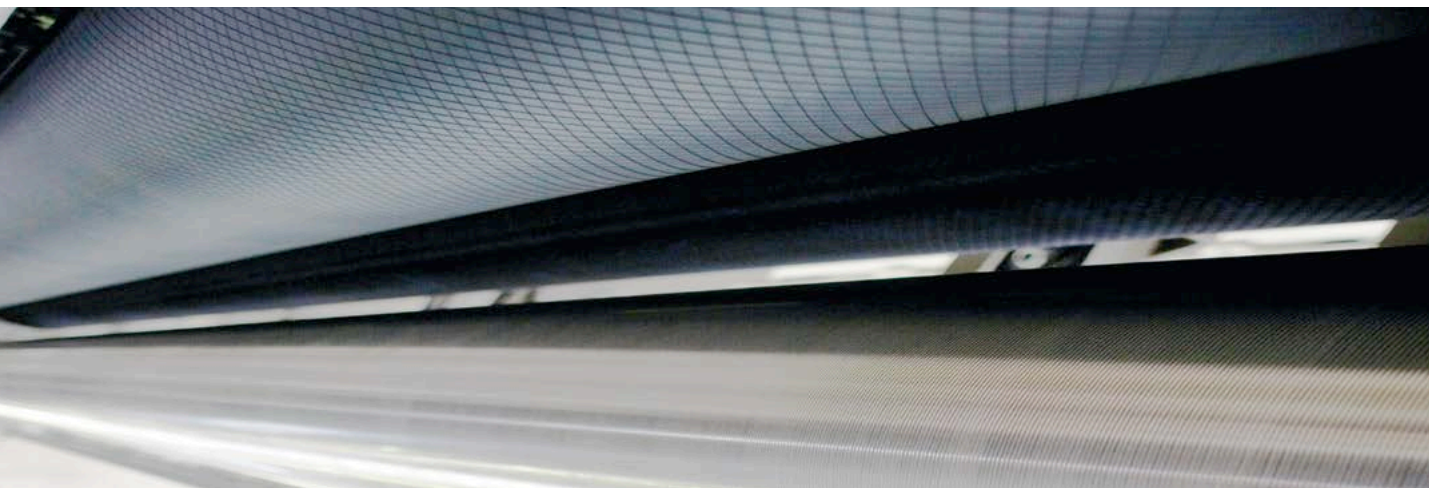
Axial winder

Axial winders form the central technology in machines used to process continuous material webs from roll to roll. They typically comprise an axis driven by one or several motors, with which the material to be processed or finished is wound or unwound. In this case, the speed or torque of the drive is adapted to the diameter, in order to achieve maximum tension precision and constancy. Using the applications in the Converting Toolbox, axial winders can be implemented for a wide range of machines and the widest range of materials – for instance, paper, plastic foil, metal foil, cardboard, textiles, tissue, etc.

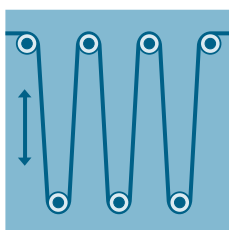
Highlights:

- Control techniques: dancer roll and/or tension control using velocity adaptation or torque limiting – and indirect tension control using torque limiting, selectable via parameter
- Diameter calculation: by measuring or calculating – using the ratio between the material web velocity and the winder speed, or using the ratio between the material length and the winding angle (to fulfill the highest demands)
- Winding hardness characteristic: linear, table of interpolation points or hyperbolic
- Torque precontrol
- Tension/dancer roll position and/or speed controller adaptation
- SIMOTION option: prismatic winding
- Option: safety-related diameter sensing and tracking the SLS limit for winders





Accumulator

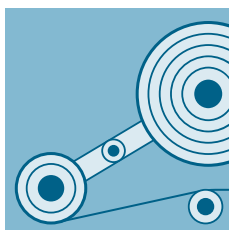


Accumulators are used when flying roll changes are to be made while the machine is operational. Contrary to an automatic roll change using a turret winder, when a roll is to be changed the wound roll is braked and the machine process supplied by either emptying (unwinder) or filling (winder). After the change has been completed, the accumulator is returned to the neutral position until the next roll change. As the capacity of the accumulator is restricted by its length, it is only suitable for lower machine speeds.

Highlights:

- Can be used for winders and unwinders
- Control of the draw-off/feed
- Control of the accumulator storage drive
- Automatically loading and unloading the accumulator
- Brake control of the accumulator storage drive
- Closed-loop tension control in the accumulator
- The fill level is calculated
- Monitoring the accumulator position
- Web break monitoring
- Optional: Machine encoder is used to determine the accumulator position

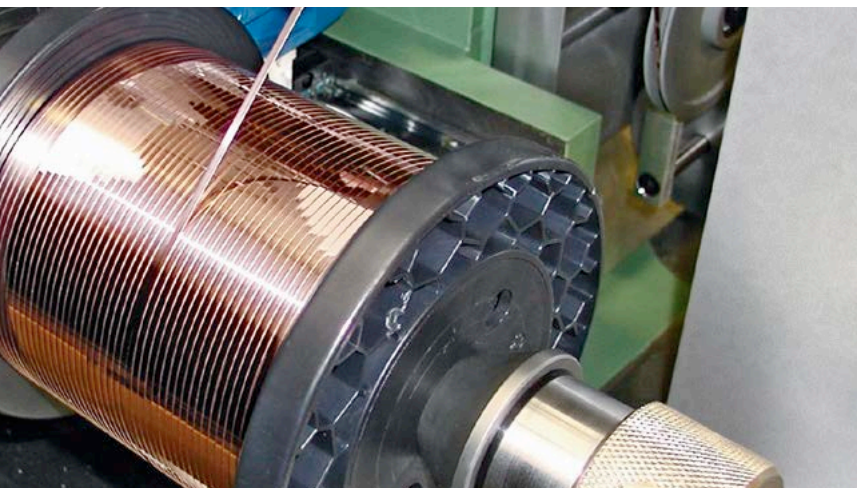
Automatic roll change – splice control



To achieve the highest productivity, axial winders are equipped with an automatic roll change function (splice control). This speeds up the roll change and stabilizes the machine process, as unnecessary disturbances caused when braking and accelerating should be avoided during the roll change. In this case, the roll is changed while the machine is operational by gluing and cutting the new material web. The old roll is then moved to the change position. It can then be easily changed without having to interrupt the process.

Highlights:

- Position-based calculation of the switching signals for highest precision and repeatability for minimum overlap
- No additional automation components
- Compensation of the rotary turret motions



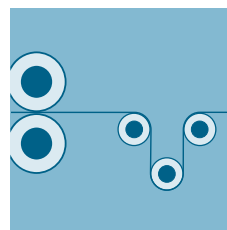
Tension control

In addition to the winding control, tension control is the second most important function in a converting machine. It is used to keep the material tension constant and when required, to control it. This avoids damaging the material web or even breaking it.

Typically, the components involved in the control are part of a larger machine or system, which can include several tension zones and also winders. Various open or closed control techniques for various measuring systems are implemented in the function – e.g. dancer roll systems.

Highlights:

- Technique for closed control loops: tension control using torque limiting or using velocity adaptation; dancer roll control using speed adaptation
- Technique for open control loops: indirect tension control using torque limiting, draw control (velocity relationship)
- Torque precontrol (tension, friction, acceleration)
- Line operation without closed-loop control
- Integrated controller with setpoint processing



Traversing drive

Traversing drives are typically coupled to the winder drives (winders) through a position or velocity reference. They are used to precisely position the material being wound on a core or similar – for example, in order to achieve a defined structure of the edge of a coil. Traversing winders are used, for example: when winding flat materials, such as flat wire, shaped wire or foils.

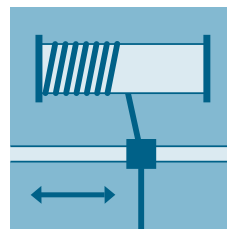
The Converting Toolbox includes a solution based on SIMOTION for demanding applications as well as a SINAMICS S120-based solution for basic applications.

Highlights:

- All of the traversing parameters can be changed in the process
- Plausibility check of the parameters
- Immediate direction reversal in operation
- Definition of the traversing profile using the winding step, waiting distance, acceleration angle

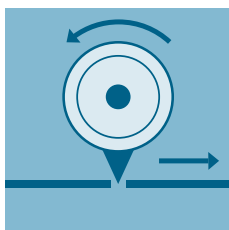
In addition for SIMOTION Traversing Drive:

- Offset angle control
- Independent and adaptable spikes
- Advance
- Angle-based high precision coupling to the winding process





Rotary knife

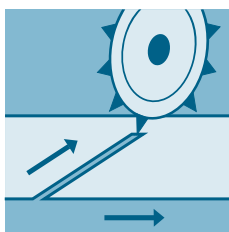


Rotary knives are used to cut or perforate continuous material webs (paper, metal, plastic, etc.). Generally, they comprise one or several rotating rolls equipped with knives. The motion profile of the rolls is subdivided into two ranges: in the synchronous range, the tool is synchronized with the material, in the simplest case this being synchronized speed. In the format range, equalization motion to adapt the cutting length takes place and the tool is not in use. The system can be optionally expanded to include energy management functions.

Highlights:

- Suitable for drum-type shears and eccentrics
- Motion profiles can be selected via parameter: e.g. constant acceleration, jerk limiting, polynomial, sinusoidal or a combination
- Cutting profile: linear, overspeed or freely-definable using interpolation points – for example, for cosine correction
- Operating mode manager: automatic operation, immediate cut, single cut, cutting program
- Suitable for multi-knife systems
- Print mark correction with shift register
- Energy management, kinetic energy buffering
- Format can be changed in operation
- Coupling either through a machine encoder or internal synchronous operation coupling

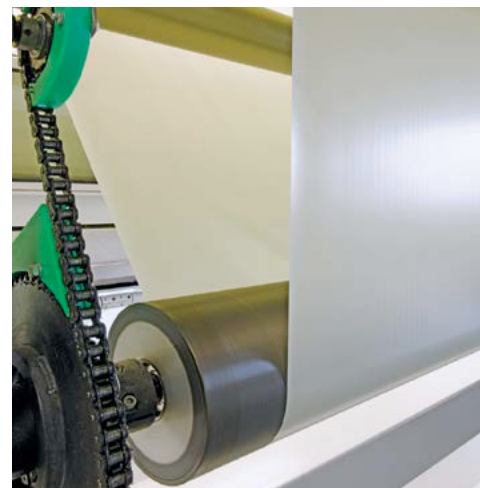
Flying saw/flying shear



Flying saws and shears are used in order to cut endless material webs into sections – especially if the material being produced cannot be wound. They comprise of a driven slide, which is synchronized to the material. This means: The saws or shears are moved with the same velocity as the material itself. After the cut has been made, the slides are moved back to the initial position. In addition to cutting, other operations are possible – for example, drilling, embossing or die cutting.

Highlights:

- Operating mode manager: automatic operation, immediate cut
- Cutting to length or to a print mark
- Inserting a gap
- Synchronizing to a precise position
- Coupling either through a machine encoder or internal synchronous operation coupling

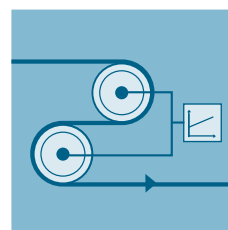


Load sharing

Coupled axes are used in a wide variety of applications – e.g. winder axes with several drive motors. The coupling can either be rigid (direct) or flexible (through the material web itself). In cases such as these, the load must be distributed between the coupled drives.

Highlights:

- Torque coupling
- Overcontrol of the speed controller with torque limiting
- Droop and compensation



Diagnostic pages

The diagnostic pages allow defined variables of converting applications to be monitored and diagnosed. A connection is established to the dialog page using a standard web browser. The selected function can be monitored and diagnosed using the configured status variables.

Highlights:

- No additional software required
- Integrated web server functions are used
- Customized web pages can be integrated

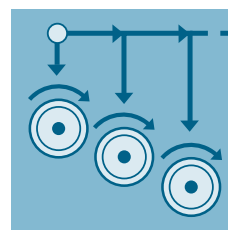


Axis control

The basic axis control of the drive forms the foundation for each and every application; whether enabling or inhibiting the axis, fault handling, jogging, etc. This function block provides the basic functionality for motion control tasks. It also forms the basis for the axis control in conjunction with the following converting applications, based on the SIMOTION and SIMATIC platform.

Highlights:

- Enabling and inhibiting the axis
- Operation with speed interface
- Jogging mode
- Positioning mode
- Synchronous operation
- Cams
- Higher-level positioning for print mark operation



Availability:



**Published by
Siemens AG 2016**

Siemens AG
Digital Factory
P.O. Box 3180
91050 Erlangen, Germany

Subject to change without prior notice
Article No.: E20001-A1570-P620-V1-7600
Dispo 06372
LMB/1000059260 WS 08162.0
Printed in Germany
© Siemens AG 2016

The information provided in this brochure contains merely general descriptions or characteristics of performance which in case of actual use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract. All product designations may be trademarks or product names of Siemens AG or supplier companies whose use by third parties for their own purposes could violate the rights of the owners.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. For more information about industrial security, please visit [siemens.com/industrialsecurity](https://www.siemens.com/industrialsecurity)