System-based highest performance, quality and availability
Innovative concepts to address your requirements
Solutions for the printing industry
The demands placed on state-of-the-art machines are continually increasing – requiring the highest performance, quality and availability. At the same time, machines must be able to handle an increasing number of tasks, the number of axes is continually rising and they are subject to continually shorter innovation cycles. And finally, the price of machines and operating costs must be kept as low as possible. This has resulted in a clear trend in the printing press market: Mechanical components are being increasingly replaced by electronic ones.

In order to become and remain successful in this complex area of conflict, the printing industry requires a reliable technology partner with well-founded sector know-how: Siemens.
Siemens – your competent partner in the printing industry

Comprehensive portfolio from a single source

As technology leader in automation, we are continually driving innovation in this area. Whether it involves open-loop and closed-loop control, commanding and signaling or evaluating and responding: With a comprehensive range of products and systems, we supply optimum solutions to address all printing industry requirements – all from a single source.

SIMOTION motion control system

Whether for central or distributed machine concepts or for PC, controller or drive-based solutions: With our scalable, modular and powerful SIMOTION® motion control system, you can always depend on the highest degree of flexibility, user-friendly engineering and fast commissioning.

SINAMICS drive family

With SINAMICS® we supply a seamless and integrated system family that covers all power and performance classes, and offers the optimum solution for each and every application area: From basic single-motor drives through coordinated drives up to multi-axis drives and sophisticated motion control tasks.

Sector-specific Print Standard software package

Our open Print Standard software package simplifies and speeds up engineering and implementing printing press solutions. It includes block libraries and program examples for motion control applications, takes into consideration the wide range of technological requirements, and can be adapted to individual requirements at any time. We make our know-how accessible to you through global training courses and support in the regional application centers.

SIMOTION register control

Reliable and precise detection of print marks is the basis for high-performance register control. Siemens offers various sensor-based solutions for wedge marks as well as a camera-based solution for dot marks. Machines automated with SIMOTION benefit as the register control is directly integrated into the closed-loop drive control.

SIMATIC automation system

Today, SIMATIC is No. 1 worldwide in automation, and has a complete range of well-proven products to address a wealth of applications in the process and production industries. Well-proven SIMATIC components are also available for the printing industry, for extended machine and process automation as well as for machine operation.

Precision motors with a high dynamic performance for all applications: SIMOTICS

You can always depend on the highest efficiency with a Siemens motor. We cover the complete range of motors – both synchronous and asynchronous: From standard induction motors, through servomotors for motion control applications, up to linear and torque motors. Our SIMOTICS S servomotors, SIMOTICS M main motors and SIMOTICS T direct drives set themselves apart as a result of their highest dynamic performance and precision. Every motor for motion control applications is further characterized as a result of its compact envelope dimensions and high efficiency. With our extensive range of power & performance classes and frame sizes, we can offer you precisely the optimum motor for your specific motion control task.
The market for commercial printing demands increasingly wider and faster presses. At the same time, the level of automation and number of axes is continually increasing. Our broad range of products is the optimum basis for integrated solutions: From line shaft drives up to electronic line shafts with several drives for each printing unit and electronic cam curves in the folder. All of the individual stations of the press can be implemented in a standard way using just one system.

System-based for the optimum solution

In conjunction with our AC motors, SINAMICS drives cover the complete power and performance range of commercial printing presses. SIMOTION executes the motion control commands and coordinates the axes. This drive system is admirably suited to address the high, specific requirements, especially for electronic shafts. The hardware facilitates a distributed, modular topology based on AC/AC devices as well as a central topology with controlled or uncontrolled infeed units, DC link and DC/AC devices.

Integrated register control

Optionally the color and cut-off register can be integrated in the machine automation using the camera-based register control SIMOTION TRC5000. This integration leads to the highest dynamic performance and accuracy.

Print Standard for commercial printing

- Virtual and real master with machine ramp generator
- Plate cylinder positioning
- Color register and cut-off register adjustment
- Unwinder with flying splice
Simpler and more efficient communication with PROFINET

Using just one cable, the open industry standard PROFINET allows automation data to be used in parallel via the standard Ethernet and isochronous drive axis data for distributed synchronous operation. As a consequence a separate drive bus can be eliminated. This means that your machine has a standard network structure and cabling.

Mechatronic team – your partner when it comes to innovation

The development of printing presses with higher speeds and larger formats places the highest technological requirements on the mechanical and electronic design. Our mechatronic team supports you with outstanding know-how about printing presses. For instance, by simulating the electromechanical system, the dynamic behavior of a printing unit can already be assessed in the conceptual phase.

Advantages at a glance

- Modular, scalable hardware and software
- Open Print Standard software package
- High precision and reliable synchronization of the individual drives
- Standard system platform for all printing press stations
- One bus system for synchronization and communication
- Safety functions available as Safety Integrated modules
- Standard components from well-proven system families
- Extremely wide product and power range of synchronous and induction motors as well as converters
- Integrated color and cut-off register control as option
Outstanding adaptability

Drives from the SINAMICS S120 series are used for all of the machine axes. Their high dynamic performance and precise encoder evaluation allow the closed-loop control to be simply adapted to changed form cylinder circumferences and weights. Especially when using two-axis motor modules an extremely compact drive lineup is obtained. The safety functions integrated in the drives can be flexibly activated using fail-safe SIMATIC controllers or favorably-priced terminal modules. The scope of our portfolio ranges from low-cost, uncontrolled line modules up to controlled line modules with minimum line harmonics; technology that can be adapted to the particular machine type and prevailing line conditions – for a distributed, modular architecture as well as for a central infeed.

Extensive range of motors

From standard through servo- and torque motors up to linear motors suitable for innovative direct drives – in both synchronous and induction versions: Our extensive range of motors offers the ideal solution for all machine types. For instance, slow-running rotors with low current demand facilitate more compact power units and lower costs.

For form cylinders and winder axes, which are operated at a constant power, we recommend our adapted induction servomotors. For small positioning drives, our synchronous servomotors are the perfect fit – as a result of their high overload capability in positioning operation.

Integrated register control

The register control optimally integrated in the drive system improves the register accuracy as a result of the patented algorithm. It is based on innovative camera technology, which is directly connected to the SIMOTION CPU via Ethernet. The list of resulting advantages is long: Operating control, sequence control as well as process and production data management are standardized and the actuator signals are superimposed continuously without any delay on the angular synchronism of the electrical shaft. Further, material, engineering and commissioning costs are reduced by using common software and hardware.

Flexographic printing

Whether simple stack-type presses, sophisticated multi-cylinder presses in unit design or high-quality central impression cylinder presses: Our portfolio is the first choice when implementing tailored solutions for flexographic printing – modular automation structures arranged in a distributed topology at the machine as well as components centrally accommodated in a control cabinet or in a container.

No matter what the topology, you always profit from well-proven components and tested applications: From the integrated register and temperature control as well as certified safety functions.
Print Standard for flexographic printing

- Virtual master function
- Encoder for real master
- Continuous format adjustment and electronic circumferential register
- Operating standstill at the cylinder sleeve change position
- Electronic clutch for continuous operation of the anilox cylinder
- Positioning of the form cylinder and anilox cylinder with format-dependent position calculation
- Web winding with positioning functionality and integrated flying splice
- Web storage for mechanical zero-speed web splicer

Advantages at a glance

- Integrated drive-based SIMOTION motion control system
- SINAMICS drives with a high dynamic performance in different versions
- Wide selection of motors – both synchronous and induction
- Can be expanded by SIMATIC operating and control components
- Open, tested software applications for printing, winding and positioning axes
- Integrated register control with innovative camera technology
- Software for temperature control of the dryer and cylinder
- Standard communication via PROFIBUS and PROFINET
- Integrated safety technology for manual sleeve/cylinder change while the drive stays switched on
Tasks involving ink-jet and electrophotographic digital printing presses can be simply implemented using SIMOTION D drive-based control system. Here, the free configurability in various programming languages can be combined with tested and proven technological functions: Both drive-related motion control functions as well as open-loop control and communication tasks – including data communication to the HMI – can be implemented using just one system.

First choice for the highest performance

The angular synchronism of the drives and servodrives involved in transporting the material web ensures low speed ripple and constant tension, therefore securing the best print results. Frequently used applications and functions, such as winders, tension control, multi-axis drives, positioners, winders etc., can be taken from the Print Standard and integrated in machine programs. Further, by networking all of the various press stations via PROFINET, the basis is created for achieving the highest performance of the complete machine, and at the same time, simplifying diagnostics and maintenance.

Advantages at a glance

• Flexible configuration of open-loop control, motion control and communication tasks
• Tested motion control functions
• One drive system for linear and rotary drives
• High speed stability
• Parameterizable incremental pulse output
• Scalable hardware
• Can be simply networked via PROFINET
Innovative and cost-effective solutions in the post press area can only be implemented with a high degree of automation and more complex, individual drive solutions. You will certainly find the answers to these challenges in our portfolio.

No matter what your demands are on the performance of the automation and drives system: As a result of its modularity, our product and system portfolio offers the highest degree of flexibility when implementing tailored solutions – and at the same time, sets itself apart as a result of maximum engineering efficiency.

Application Areas
- Gatherer-stitcher
- Three-knife trimmer
- Casemaking machines
- Book production line
- Perfect binding machines

Advantages at a glance
- Solutions can be efficiently configured using our SIMOTION control system with the Print Standard software package
- Dynamic address assignment facilitates, for example, for gatherer-stitcher systems, that the feeders can be flexibly located at the stitcher, without having to take into account the different feeder functions
- Central, distributed or mixed automation architectures are possible, for instance, the PC-based SIMOTION P motion control system in a central automation topology combines closed-loop control, PLC functionality and HMI in one and the same device
- Any number of feeders is possible in the gatherer-stitcher system – it goes without saying that customized solutions are possible
Flexible system configuration

The flexible hardware and software configuration enables various system philosophies to be implemented: Our system supports a central control cabinet concept as well as the direct integration of the automation components into the various machine stations. And PROFINET can be used to network all of the components. The printing press can be efficiently controlled from central and distributed operator panels.

High register precision

Individually driven rotogravure machines represent a complex structure involving factors that mutually influence one another: Web length, transport and web stretch must be taken into account in order to guarantee a high quality print. The virtual master axis forms the electronic shaft, and ensures the precise synchronization of the printing cylinders, which are also responsible for transporting the material web. As a consequence, every drive axis has a direct influence on the web tension and executes the register adjustment. In turn, this changes the web tension, which has a negative impact on the register stability of the following printing units. DRD – our dynamic register decoupling function – eliminates this effect in the form of a software solution by networking all of the drive axes. This makes a precise and fast register control possible in the first place.
Preconfigured and tested software modules

Print Standard includes tested software modules to address typical applications in rotogravure printing presses. This includes function blocks for winding and unwinding, flying splice, tension control and cross-cutters.

Advantages at a glance

• Integrated safety functions
• Integrated register control
• High register precision
• Open and tested Print Standard applications for printing cylinder, winding and positioning tasks

Integrated register control

High register precision is made possible by our control technique that has been specifically optimized for rotogravure printing. Here, the closed-loop control benefits because it quickly accesses internal process variables and also transfers the actuator signals instantaneously to the drive control. Integrating the register control and sensors into the drive system significantly reduces the waste when starting up rotogravure machines. This is achieved by incorporating the measured register values into the machine starting sequence. As a consequence, the register stability can be guaranteed within a machine length, and the printing machine can go into automatic operation.

We are the only manufacturer that can equip the integrated register control with various sensor systems. For the well-proven wedge mark, we can offer a favorably-priced basis contrast probe, which is suitable for most colors. A high-performance contrast probe with RGB evaluation offers complete data acquisition reliability for the inks, lacquers and materials generally used today. On the other hand, dot marks – which reduce the amount of material used – can be reliably identified using a camera system. All of the sensors can handle the automatic mark search function, are directly connected to the motion controller and are certified according to ATEX for use in hazardous zones.
The open SIMOTION Print Standard software package is perfectly tailored to address the requirements of printing machines. For the various motion control tasks, it includes specific solutions in the form of application examples and a unique mode management. Whether it is for a real or virtual axis, it facilitates significantly a simpler and faster engineering – harmonized with the particular printing technique.

Well elaborated to the finest detail

Print Standard forms the axis-related functions of a printing press using predefined operating modes. The virtual master axis is used as machine master (GM) with positioning functionality – or for an axis group (LM) with synchronous operation functionality. The GM can also be generated from a position encoder (real master) to follow an existing machine. Additional advantages: Every operating mode can be intuitively selected as well as specific, active parameters that can be changed in operation and directly executed. It is also possible to make a flying transition between the various operating modes and an open interface makes expansions simple, without having to modify the standard.

Offset printing

The modular machine architecture with free web allocation is reflected in the modular controller architecture with redundant communication – and in the virtual, freely assignable web and group masters for machine modules.

Rotogravure printing

The varying format and the necessity to rotate the cylinders independent of the web, maintaining in register, is guaranteed using the web master (GM) and the format master (LM). Format adaptation is allowed by a variable gearing between the two virtual axes.

Unwinding

Option modules are available for the various unwinding types. The axis winder function permits positioning in order to simplify loading the new reel. The function of the web storage is simply and precisely implemented by adding the web and storage speed.

Engaging cylinders for flexographic printing units

The 4 positioning axes for engaging the cylinders of flexographic printing units come with misalignment and collision monitoring functions. Also integrated: the geometry calculation for precise positioning when changing formats.

Advantages at a glance

- Open software: can be flexibly expanded and adapted
- Simple entry and fast implementation of specific machine solutions
- Application examples for demonstration purposes – can run on standard hardware
- Operating screen forms for application examples and operating the interface
Integrated register control

A powerful register control enhances the value of every printing machine. For multi-color printing, the simpler, faster and more precise the register is reached, the less waste is incurred – which translates into more time for productive printing and higher print quality.

Integration – the key to register quality

Our register controls are fully integrated into the SIMOTION controller and Print Standard software package as function modules. This means the following: You can eliminate a central control as well as an additional control cabinet. As a consequence, the register control becomes an elementary component of the machine control. To sense print marks, we can offer you various sensor-based solutions for wedge marks as well as a camera-based solution for dot marks. Using the open, customer-specific, adaptable SIMATIC WinCC flexible user interface, the register control can also be integrated into the machine operating control and the automated machine sequence control.

SIMOTION TRC1000 register control

The high-performance entry-level solution can be recommended for especially price-sensitive segments in the printing press market. It operates with a high-quality monochrome sensor, which automatically detects all of the usual wedge and block marks, measures up to two marks with respect to one another and communicates with the integrated register control via PROFINET IO with IRT.

SIMOTION TRC3000 register control

With this solution a high-performance RGB sensor reliably detects special colors and lacquers, even printing on materials that either have a weak contrast or are reflective. This intelligent sensor automatically measures up to 20 print marks, and is directly connected to the SIMOTION controller of the printing unit via PROFINET IO with IRT.

SIMOTION TRC5000 register control

The SIMOTION TRC5000 register control senses dot marks using an intelligent CCD camera, which – different than a sensor-based system – detects all of the marks in a printed area at a sampling instant. The result: An especially high measuring and repeat accuracy. Live camera images make it easier to set up and monitor the material and print mark detection.
With SIMOTION and SINAMICS, we are addressing the demand for increased flexibility in newspaper printing. These are integrated system modules, perfectly tailored to implement the widest range of drive concepts. SIMOTION controllers, available in different versions and scalable performance levels, manage the synchronization, open-loop and closed-loop control of the axes. The modular SINAMICS drive system – with servo and vector control for complex drive applications – covers versions for single-axis and multi-axis applications extending from 0.12 up to 4500 kW.

**Flexible and redundant communication: PROFINET**

PROFINET allows a wide range of network infrastructures to be created with different topologies such as ring, tree, line or star-type structures. In order to secure the highest level of system availability, using a ring-type topology, redundant communication structures can be established based on the bumpless Media Redundancy Protocol (MRPD).

**Higher cost-effectiveness and energy efficiency**

Converters capable of energy recovery feed braking energy back into the line supply, therefore providing this energy to other users in the system. Using inverters with coupled drives, the energy is directly exchanged via the common DC link. This minimizes the power loss in the system. As a consequence, the infeed can have a significantly lower power rating with a corresponding smaller frame size. Transient power peaks can be covered or avoided by using additional capacitors in the DC link.

**Drive diagnostics with Print Diag**

Print Diag permanently acquires all of the important motor and converter data – to secure full transparency of the drive system. The system allows all of the parameters to be optionally read and write accessed as well as recorded in real time and using a long-time trace. A comprehensive signaling and analysis system with help texts, fault clearance procedures and statistical functions speeds up and simplifies troubleshooting, and also helps identifying weak points in the press. This means that you always have the overview, even when it comes to complex systems.

**Print Standard**

- Virtual and real master axes with ramp generator
- Motion superimposition, e.g. for ribbon and color register adjustment
- Positioning and referencing functions
- Winding and unwinding functions
Well-conceived concept for seamless safety:

Safety Integrated

As response to the ever-increasing demands relating to safety of man, machine and the environment, we can offer you a well-conceived concept, which directly integrates safety-related applications into the standard automation: Safety Integrated.

Intelligent and cost-effective

From the sensor through the evaluation equipment up to safe shutdown: With Safety Integrated you can rely on maximum protection in the case of a fault, and as a consequence, on highest availability. This means that all of the components in the system can be combined using safety-related communication via PROFIBUS and PROFINET. The extremely short response times that can be achieved is certainly one of the main reasons why the consequential integration of safety functions in the standard automation has proven itself in the printing industry. Further, the “Safe Operating Stop” or “Safely Limited Speed” functions offer reliable protection, for instance, when changing plates or washing print cylinders. To meet increased demands on the press availability, hardware and electromechanical components or wear parts can be replaced by software and electronics, without any complex and expensive parallel wiring.

Drive technology with integrated safety functions

The SINAMICS S120 drive family is equipped with additional safety functions that allow safety concepts to be simply implemented in conformance with the applicable standards. SINAMICS drives fulfill the following safety levels:

- Safety Integrity Level SIL 2 (EN 61508),
- Performance Level d (EN ISO 13949-1: 2006)

Safety Integrated with encoder

This safety concept is based on an encoder that generates two signals that are independent of each other. The encoder signals are redundantly evaluated in order to detect possible faults and errors reliably and safely. If a safety-relevant fault is identified, then the system safely stops the potentially hazardous motion – or the power to the motor is contactlessly and immediately disconnected. The drive is always optimally stopped, adapted to the particular machine operating state.

<table>
<thead>
<tr>
<th>Safety Integrated function</th>
<th>Application</th>
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</thead>
<tbody>
<tr>
<td>Safe Torque Off (STO)</td>
<td>Safe disconnection from the line supply (e.g. when carrying out maintenance work)</td>
</tr>
<tr>
<td>Safe Stop 1 (SS1)</td>
<td>Safe stop (for fast stopping with subsequent STO)</td>
</tr>
<tr>
<td>Safe Stop 2 (SS2)</td>
<td>Safe stop (and full torque available at n = 0)</td>
</tr>
<tr>
<td>Safe Brake Control (SBC)</td>
<td>Safe brake control</td>
</tr>
<tr>
<td>Safe Brake Ramp (SBR)</td>
<td>Safely monitored braking ramp</td>
</tr>
<tr>
<td>Safe Operating Stop (SOS)</td>
<td>Safe standstill monitoring (e.g. when changing sleeves)</td>
</tr>
<tr>
<td>Safely-Limited Speed (SLS)</td>
<td>Safely limited speed (e.g. when loading plates)</td>
</tr>
<tr>
<td>Safe Speed Monitor (SSM)</td>
<td>Safety enable signal when a specific speed is fallen below</td>
</tr>
</tbody>
</table>

Advantages at a glance

- No complex wiring for diagnostics and maintenance
- Standard bus system for standard and safety applications eliminates the necessity to use additional hardware components, and increases the space available in the control cabinet
- Simple generation of the safety verification using the safety evaluation tool
- Extremely short response times by integrating safety functions into the standard automation
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