Application Software for Packaging Machines:
Complex Machines

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Application software libraries for complex machines

Shorten your engineering time with extensively tested application software! SoMachine™ libraries provide software functionalities which are mapping many basic common automation tasks and machine functionalities. They can be easily configured, customised, and implemented in your machine program.

Discover the built-in technology with packaging-specific functions for increased energy efficiency, mechanical reliability, and availability:

1. Winder/unwinder  
2. Infeed  
3. Printmark control  
4. Crank  
5. Multibelt  
6. Homing  
7. Positioning  
8. Cam motion  
9. Intelligent line shaft  
10. Software motion generator  
11. Current control  
12. Pack ML  
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14. Application software
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Discover the built-in technology with packaging-specific functions for increased energy efficiency, mechanical reliability, and availability:

15. Grouping/ungrouping
16. Clamping
17. Film lateral position control
18. Temperature control
19. Rotary knife
20. Flying shear
21. Torque control
Winding and unwinding foils with and without dancer

The winder/unwinder function supports the programming of any web winding and unwinding mechanisms. It can be used for classical applications with dancer or without. In the second case, the dancer arm assembly can be replaced with a rigidly mounted guide roll to incorporate a force transducer. This transducer provides feedback to perform real-time proportional integral (PI) control for tensioning.

**Benefits**

> For dancerless applications based on motor current control or sensor feedback (transducer).
> Advanced algorithm for continuous calculation of the change in web roll diameter to automatically maintain the proper synchronization between the servos of the web roll and the foil feed forward.
Equidistant stream of products or groups of products

With smart infeed, configurations of serial conveyor belts for infeed can be controlled. The first belt supplies the products, which can arrive accumulated or with different distances. The following conveyors groups the products and corrects the distances between the products/product groups. The last belt is the target belt, which feeds the products to the packaging machine.

Benefits

> Rapid development of various product feed applications with one to 10 belts in series.
> Configurable and expandable function for simple infeed belt mechanic.
> Up to 400 cycles, depending on product size.
Printmark control with different correction modes

Printing, closing/sealing, cutting – for many packaging processes an exact printmark control is needed. Printmark control provides a flexible and adaptable solution for printmark detection with optical sensors.

Benefits

> Absolute correction for each individual product or tendentious correction of small deviations, e.g. on a continuous foil feed.
> Applicable for indexed mode or continuous mode.
Transformation of crank motion

A linear motion can be stated as the transformation of a rotary motion of a crank. The crank function helps for doing such transformations, which can be necessary, for example, for creating motion solutions for sealing jaws, punching blades, and so on.

Benefits

> Easy to use transformation software brick, it just requires definition of some basic parameters.
> Optimised movements for dead center.
Rapid development of grouping or infeed applications

The multibelt function is a universal base for developing grouping or infeed applications with up to eight belts or stations. Each belt can be equipped with multiple trains. Per train, up to 127 compartments can be configured. The commission is particularly easy to handle: almost all parameters, which have been set, can be adjusted while the system is running.

Benefits

> Filtering of sensor signals.
> Warm start mode.
> Automatic collision prevention.
Homing in different modes

The homing function supports different homing modes. It can reference with a signal from a sensor, with an encoder to an absolute position, or with a shaft angle.

Benefits

- Homing modes based on signals: touchprobe input, digital signal, hardware limit switch, torque.
- Homing modes based on mechanical positions: move to absolute position, set axis, or encoder position.
- Restore axis position from retain variable or from axis encoder.
Various types of movements

Positioning is a multimotion function. It includes the homing function and can be used for generating a wide range of axis movements, which can be operated in automatic or manual mode. The user is defining distance, velocity, acceleration, etc. The motion profile is generated then based on these requirements.

Benefits

> All in one – endless feed, jogging, positioning.
> Position mode: endless, relative, absolute.
> Motion profiles can be generated with defined velocity, acceleration, deceleration, and jerk limit.
Electronic cam movement with virtual master axis

Cam motion is a graphical cam diagram editor and offers direct access to cam segment data through data structures. An axis in cam mode can follow any position source as its master, including other axes and encoders.

Benefits

> Different cam segment types can be chosen, e.g. straight, general polynomial of the fifth degree, various sinusoidal types, modified acceleration trapezoid, and more, as well as user-defined cam profiles.
> Different cold start and warm start modes, depending on direction and difference to reference position.
> An active cam diagram can be changed as needed.
> Phase shifting in relation to master axis as needed.
Intelligent line shaft

With the Application Function Block (AFB) intelligent line shaft, the machine speed or the speed of the master axis can be dynamically adjusted or changed during the machine cycle by defining velocity and acceleration limits of any cam slave axes.

Benefits
> Can be used to achieve higher overall machine speed.
> Can be used to increase machine lifespan.
> Can be used to limit forces that act upon the product/packaging process.
> Multiple limit setting for up to eight slave axes.
Overlying different motion profiles

The software motion generator allows operators to overlay motion profiles of different types and with different masters. Up to three position channels can be overlaid. The resulting position profile represents the sum of the component channels.

Benefits

> Additional motion laws (e.g. 7th degree polynomial, custom motion laws).
> Custom motion laws, implemented by the user (e.g. 11th degree polynomial).
> Possibility to adapt complex mechanics to the motion profile of a single axis.
Current control for referencing

If direct control of drive current is desired, the current control can be used for applications. Also, acceleration reference values can be sent to the drive in every Sercos cycle.

Benefits
- Very accurate and fast procedure.
- Particularly well suited for applications that require maximum synchronisation.
Pack ML compliant operation modes

For international manufacturers of consumer goods products, the Pack ML state machine plays an important role in integrating production and packaging machinery for production lines. Pack ML supports the creation of an operating mode management in compliance with the Pack ML standard (ISA TR88.00.02–2008).

Benefits

> Proven software used in thousands of packaging machines.
> Full compliance to guidelines of Pack ML.
Openness for use of PLCopen motion functions

As Schneider Electric is member of the PLCopen organisation, the standard application libraries of PLCopen motion standard can be used for its automation controllers. Different programming philosophies (standard and modular styles) are supported.

Benefits
> Full compliance to the PLCopen motion control standard.
> Single-axis and multiaxis motion control.
Modular programming framework

‘Application software’ is a preprogrammed, universal machine programming framework for creating modular and more reusable machine programs. Basic functionalities of a machine program are already in place and can be adapted to the individual application by configuring them as needed. The individual machine functions can be configured in an ‘application frame’ by using software library functions — so-called equipment modules — with standardised interfaces.

Benefits

> Many SoMachine library functions are available as AFB or as equipment modules (EMs) as well.
> Any individual IEC 1131-3 compliant software function can be mapped in an EM — providing leeway for implementing company-specific know-how.
> More transparent, modular, standardised, and reusable machine programs with less engineering time.
Grouping and ungrouping products

The grouping/ungrouping function supports the synchronisation of several conveyors to sort and organize in a predefined way (groups) products or any kind of products on a conveyor. The operation principle is suited for products arriving in random flow (accumulation conveyor), for reducing the gap to the minimum between products (buffer), for ensuring a gap between products (stripping conveyor) and for separating the product flow in defined groups/gaps (target conveyor).

Benefits

> Easy to configure, quick commissioning by setting parameters.
> Cam profile optimization reduces the mechanical stress.
> One gap or multigaps supported; multigaps table available.
> Several operation modes available, e.g. cold start/warm start.
> Three conveyor types supported.
Fix products with the clamping function

The clamping function is used whenever a product needs to be fixed for the following production process. The goal of this function is to tighten the product to ensure a fixed position. It is performed by a drive which is able to measure torque. While processing products with varying thickness, an optional sensor may be used for detection.

Benefits
> Easy to configure, quick commissioning by setting parameters.
> Several operation modes available, e.g. teach mode, cold start mode, etc.
> With or without touchprobe sensor (recommended when processing products with varying thickness).
Advanced PID control for temperature regulation

This function block is specially developed for temperature control tasks on machines, such as horizontal and vertical bagging machines, shrinking machines, labeling machines, and plastic processing in packaging machines. It is designed to monitor and control a wide variety of temperature-dependent processes (e.g. foil heating, sealing, etc.)

Benefits
- Advanced PID control, high accuracy of the temperature control by using the cycle time.
- No additional programming needed, simple controller commissioning with ‘auto-tuning’ or ‘self-tuning’ for determination of optimal controller.
- PID parameter (Kp, Tn, Tv).
- Depending on the hardware temperature sensor implementation, monitoring functions can be implemented easily.
The film lateral position control

Film lateral position control is a method to control and correct the position of a film, unwinding from a reel, in order to keep a precise position on a lateral side. This function helps the cutting device to cut film in the correct position. Typical examples of use are horizontal and vertical bagging machines, shrinking machines, and labeling machines.

Benefits

> Economical solution — two digital sensors, no analog sensors are required.
> Three possible types of sensors configuration (right, left, symmetrical).
> Different modes possible (digital or analog output, auto and manual modes).
> Programmable time for correction and for sensor de-bounce time.
Increase productivity with continuous material flow

Products of a continuous process can be cut without stopping the conveyor. During the cutting phase, the tool — rotary knives (one or more knives mounted on a wheel) — is synchronised with the velocity of the product. The machine velocity has the flexibility to be set according to the product length.

Benefits

> Thanks to the cam profile solution mechanical, stress can be reduced (smooth acceleration).
> Maximum machine performance and flexibility: the product length can be changed without stopping the machine. The function is easy to adapt to different types of machines, three different operating modes.
> Easy to implement and to configure: fast commissioning thanks to a visualisation for commissioning and monitoring and as well an error reporting function.
Increase productivity with continuous material flow

Products of a continuous process can be cut without stopping the conveyor. During the cutting phase a tool — a flying shear — is synchronised with the velocity of the product (with or without offset).

Benefits

> Thanks to the cam profile solution mechanical stress can be reduced (smooth acceleration).
> Maximum machine performance and flexibility: The product length can be changed without stopping the machine. The function is easy to adapt to different type of machines, three different operating modes.
> Easy to implement and to configure: fast commissioning thanks to a visualisation for commissioning and monitoring and as well an error reporting function.
Closing bottle caps more reliably

Torque control is a way to improve the quality of screwing processes — for example, when closing bottles with screw caps. The classic solution for limiting the torque acting on the cap is based on a slip clutch with spring. Now measuring the motor current provides a basis for controlling the screw process much more accurately.

Benefits

> Better diagnosis in case of problems, such as damaged or crooked caps.
> Profiles for crewing torque can be created.
> No wear as with springs, constant torque throughout long lifetime.
Packaging control solutions

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