

# Product note

## Winder control program for ABB high performance machinery drives



### **ABB winder control program delivers all functions commonly needed in winding applications**

The winder control program is a ready-made application program for ABB high performance machinery drives, covering a power range from 0.75 kW to 160 kW. The program incorporates all functions commonly required in winding applications and in most cases eliminates the need for an external PLC, resulting in cost savings. The program is an optimal solution for precise winder control in textile and plastic manufacturing lines, and also paper converting and steel processing machines, ensuring high-quality material handling. The control program can be used both for the winder/unwinder sections and the in-feed sections.

ABB high performance machinery drives with winder control program use direct torque control (DTC) technology for both synchronous and asynchronous motors. This allows accurate control of speed and torque with or without feedback from the motor shaft. If higher speed and torque control accuracy is needed, motors can be equipped with a high-resolution Sin/Cos (1Vpp) encoder, a TTL/HTL encoder, or a resolver.

### **Tension control**

Good tension control is essential to maintain the desired tension of the web and to achieve roll hardness and quality. When accurate tension control is required, it can be implemented based on tension feedback with a dancer or load cell. If tension feedback is not available, indirect tension control can be implemented by means of motor torque control. This enables cost effective and simple implementation of the winding system, eliminating the need for a dancer or load cell.

### **Tension control with dancer**

The dancer control function can be utilized to trim the web speed in winding applications where dancer position feedback is available. Based on the dancer position feedback, the dancer PI regulator calculates the error correction needed to return the dancer to the set point position by trimming the speed of the section. The dancer PI regulator can be set so that its P-gain is linearly adaptive to the changing roll diameter. A taper tension function is available to control roll hardness. This reduces tension as the diameter builds, and is used to prevent the roll from telescoping or crushing the core.

### Tension control with load cell

The tension control function can be utilized to trim the web speed or torque in winding applications where tension feedback is available from a load cell. Based on the difference between the tension feedback and tension set point, the tension PI regulator calculates the error correction required for the speed or torque control loop to keep the tension at the optimal value. The tension control PI regulator can be set so that its P-gain is linearly adaptive to the changing roll diameter. A taper tension function is available as with dancer control.

### Tension control without feedback

Tension control can be also implemented by using direct control of the motor torque. Tension reference is converted to torque reference, which is used as a limit for the speed controller torque output. Open-loop tension control can be used when the web dimensions are constant with limited variations in width and density, and accurate system and material inertia data are available. Built-in friction compensation also improves the control accuracy.

### Roll diameter calculator

The winder control program can calculate the roll diameter as the web is wound on a center core – no external device is needed. It is also possible to use a sensor to measure the roll diameter, and input the measurement to the drive for further scaling. The calculated diameter value is stored in memory and retained in the event of power loss. This helps to minimize tension disturbances when work has to be stopped and restarted with partial rolls. The calculated diameter value can be adjusted manually; for example, it can be reset, increased, or held constant. The diameter calculation can be held constant by digital input for operations which require the diameter to remain unchanged, such as during automatic roll changes and when jogging speed is activated.

### Inertia compensation

The inertia compensation function is essential to keep stable web tension during acceleration and deceleration. This function is available in both speed and torque modes. Inertia is calculated online as the roll is wound, and takes into account the inertia of the shaft, motor, gearbox and roll. The calculation is based on the physical parameters of the driven roll, i.e. roll diameter, web density, and web width.

### In-feed control

The drive can also be configured to control in-feed sections of the processing line e.g. nip-rolls. The line speed is modified by load cell or dancer feedback in order to keep the required line tension. The line speed reference can be transmitted by means of analogue I/O interface or by using a drive-to-drive communication link.

### Control interfaces

The drive can be interfaced to the upper control system via analogue and digital I/O, or fieldbus interface (CANopen, PROFIBUS, DeviceNet, Ethernet). Various type of Human Machine Interface (HMI) can also be connected to drive.

### Programming

DriveStudio and its Winder wizard can be used to commission the winder control program. ABB high performance machinery drives also feature a programming tool, DriveSPC (Solution Program Composer), which allows customers to further develop the winder control program. The program is based on ready-made winder technology functions, and with DriveSPC tool it can be easily modified or extended using IEC-61131 function blocks.

For more information please contact:

[www.abb.com/drives](http://www.abb.com/drives)

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