

Subject: Winding Overview	Product: Motion Products	Doc#: AO.MCD.06.M68
Title: Winding		

## Winding

### Application Overview

Winding is a procedure to take up and package material in roll form, for more efficient handling or in preparation for a subsequent operation. In a typical industrial use, a winder is employed to roll up a continuous or limited length of material such as wire, paper, film, metal or textiles. The winder and finished roll are referred to by different names in different industries.

<u>Industry</u>	<u>Winder Name</u>	<u>Roll Name</u>
Paper, Textile, Film	Winder	Roll
Wire	Takeup, Reeler	Reel
Wire	Spooler	Spool
Metal	Coiler	Coil
Textile	Beamer	Beam

Wound materials may be stretchable or non-stretchable. Winding of stretchable materials is more complex and critical than non-stretchable materials.

#### Materials typically wound include:

Wire and Cable	Textile Materials
Paper	Glass Fiber Materials
Business Forms	Plastic Film
Metals and Foils	
Metal	
Textile	

Generally, plastic film is extensible (stretchable) material, most other materials can be considered non-extensible. Rolls may be wound by applying drive torque at its center or its surface. As a result the two major categories of winders are:

- Center Winders
- Surface Winders

Winder drives are designed to improve the wound package and eliminate material breakage.

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### Application Challenges:

- Control of a motor under dynamically changing requirements
- Acceleration to a fixed speed, deceleration to zero speed
- Changes in speed and torque during operation
- Detailed sequencing for flying slices and roll changing
- Speed and torque need to be controlled
- High process speed
- Wide speed range
- Changes in processed material

### Yaskawa Products:

Product	Feature	Benefit
<b>MP2300 (multi-axis)</b>	48 axis of servo amplifier control from one controller	Complex Winding applications easily handled
	Ethernet, DeviceNet, Profibus modules all available.	One controller for varying customer specifications
	Integrated Machine Controller	PLC, I/O, Motion, and Networking functionality in one unit minimizes integration issues.
	Pre-configured function blocks	Streamlines programming
<b>SMC-4000 (multi-axis)</b>	2 or 4 axis control	One program can synchronize the necessary tension between processes on the same line, and/or coordinate other precision operations (e.g., cutting).
	Ethernet –Telnet protocol, Modbus TCP master	Auxiliary functions from an unlimited number of additional axes possible via Ethernet.
	Absolute Encoder Support	Recovery from total system power loss is streamlined – eliminating downtime.
	Virtual master capability	Eliminates the mechanical disturbances typical with mechanical line shafting – improving tension control.
<b>MP940 (single-axis)</b>	Machine control capabilities in single-axis controller	Reduce third-party devices by combining machine control with motion control
	DeviceNet communication Option	Sigma II w/ MP940 can act a master or slave device
	MotionWorks+ Programming Software	Icon based programming makes new production runs only a few mouse clicks away
	Variable ratio digital gearing	Independently driven axes can be perfectly synchronized

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<b>SMC-3010 w/LEGEND Amplifier</b>	Ethernet –Telnet protocol, Modbus TCP connectivity	2-axis distributed control (master / slave) possible in wind/unwind application. Also control / program from a remote location.
	Electronic gearing with two commands	“Basic” style programming language easy to use
	Positioning superimposed on gearing possible	Correct for mechanical system disturbances - allows for tighter control
	S-curve acceleration	Smooth starts and stops for difficult winding mediums such as fine threads.
<b>Sigma II Servomotors</b>	High resolution serial encoder	Up to 17-bit resolution translates into excellent speed and torque ripple characteristics. High noise immunity if afforded by serial encoder technology utilizing error-checking algorithms.
	High torque to inertia ratio	Dynamic performance in a small space saving design
	High IP ratings available	IP67 on some models permits both solid debris and liquid containments easing machine design requirements
	Auto ID Encoder	Machine commissioning requires no loading of motor data into the amplifier – plug and play operation

### Application Details:

The winder drive supplies the necessary torque at a controlled speed to accomplish material windings. Different materials require different tensions during winding, with plastic films very light and cable and steel very heavy tensions. Some materials such as plastic films and papers will elongate and separate if over-tensioned.

Winder drives are classified by their method of control and include:

- Constant Tension Center Winder (CTCW)
- Line Speed
- Dancer Position (pot or transducer)
- Torque Regulated Speed Follower (TRSF)
- Hyperbolic or Differential

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Typical processes or sectional machines that include winders:

- Printing press in paper and film
- Wire insulation line in wire
- Galvanizing line in metals
- Casting or extruding line in film