

Power and Control Applications for Calendering and Slitting Machinery

Battery Manufacturing



Are you involved in Battery Manufacturing for an original equipment manufacturer or contract manufacturer?

ABB Applications help to simplify and reduce design time for OEMs for calendering and slitting processes and serve as a reference designs guide.

What are calendering and slitting applications?

Calendering and Slitting machines are used in the process of battery manufacturing for cell assembly and are essential to cell production

Calendering is the process where the main electrode roll is unwound and passes through multiple rollers to increase the bonding strength between the electrodes in the web layers.

Slitting is a separation process where the rewound roll from the calendering process is 'slit' into smaller width rolls.

Why is power and control important in calendering and slitting machinery?

Power and control is essential during the calendering and slitting process for safety provisions of the critical steps during the bonding, compacting, and strengthening stages to establish stability and consistency with the battery material.

The proper controls provide reliable switching to maintain the right tension for the winding and re-winding of the rolls. Machine protection components makes certain that the machines are running at the established voltage and temperature requirements.

Main benefits



Continuous operation

Equip your system with circuit breakers featuring advanced trip units or contactors with smart modules to detect voltage instabilities, enhancing system reliability and power quality to keep rollers operating properly.



Energy efficiency

Boost control panel energy efficiency and sustainability with our AF coil technology, which reduces energy consumption and dissipates less heat, leading to a reduction in temperature rise and increasing panel density, while reducing energy consumption in calendering and slitting machines.



Compact and easy to install

Save space in the control panel, thanks to narrower designs in MCCBs, mini circuit breakers, and contactors. Simplify installation using our starter connection kits, push-in spring terminals, and snap-in accessories for compact, efficient connections.



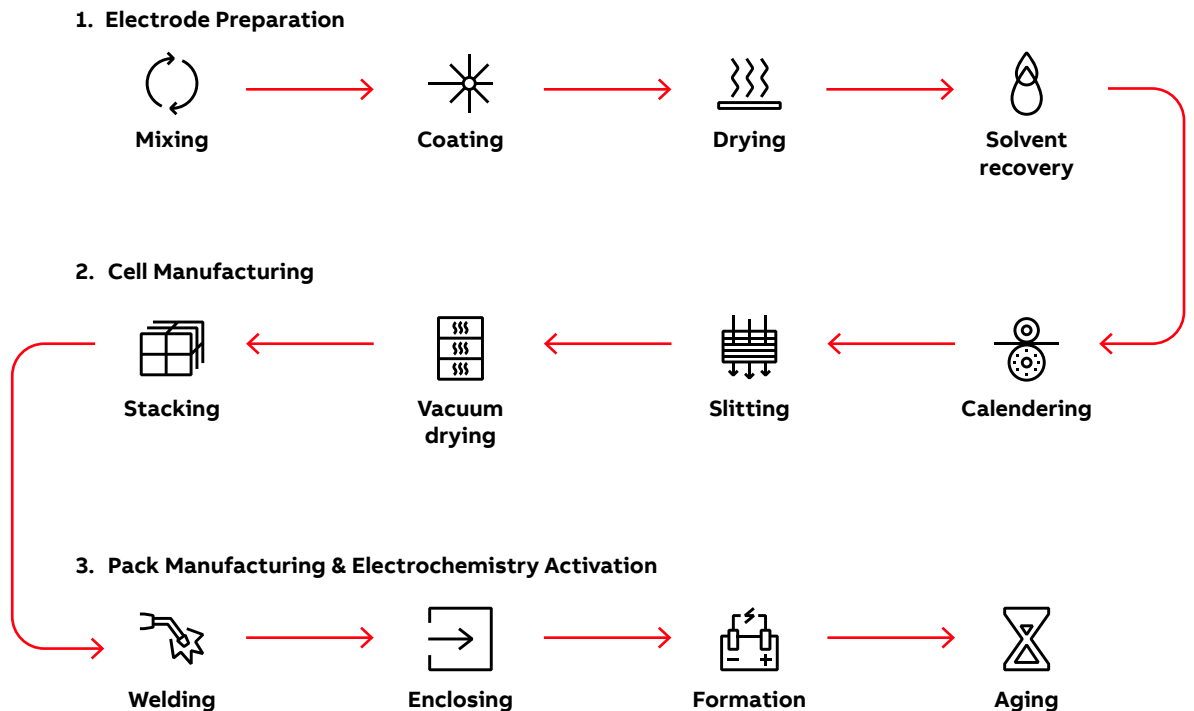
Safety and protection

Enhance safety and thermal management, reduce hazards and fires, and prevent downtime using circuit breakers, surge protection devices, relays, or Jokab safety components.

Battery manufacturing process overview

Battery manufacturing is a complex process that involves multiple steps. This process is divided into three main components: electrode preparation, cell manufacturing, pack manufacturing, and electrochemistry activation. The reason for focusing on calendering and slitting processes, which are a part

of pack manufacturing and electrochemistry, is that these processes are established conventional methods within the industry. These processes are used to determine the physical properties of the electrodes, increase their bonding strength, and fix their width after being bonded within the rewind web.



Calendering application

— The main objective of the calendering process is to increase the strength of electrode bonding through compaction

— Next, compaction will reduce the porosity during the calendering process, which will increase the material bonding and reduce separation in the process of being covered with electrolytes

— By strengthening and compacting during the rolling process, the battery material will accomplish the desired thickness and density based on the chemistry used

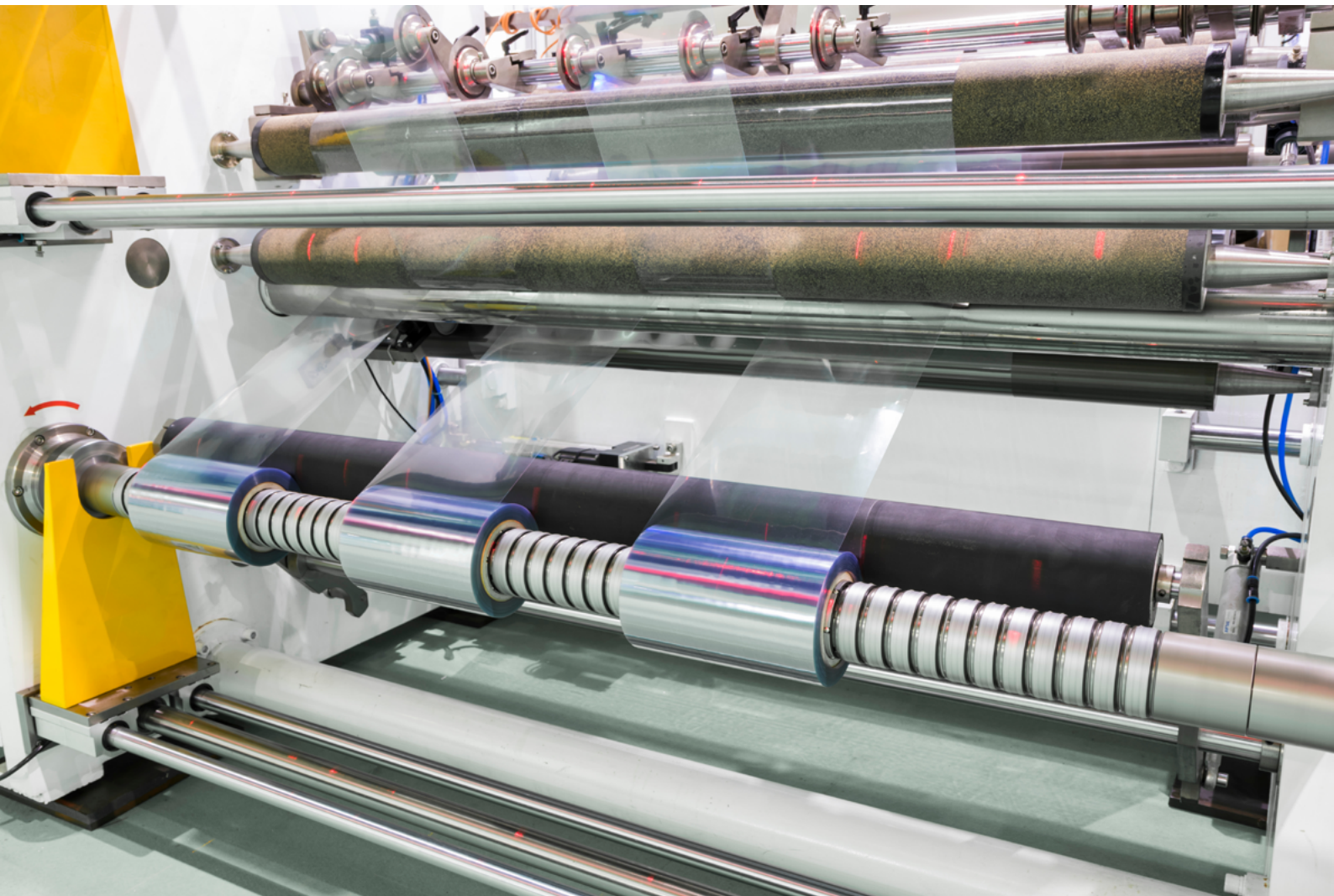


Slitting application

At the front end of slitting machines, an unwind section is used to mount the parent roll from the calendering area to begin the unwind process.

Next, the slitting section is where the web is cut into smaller width rolls. To achieve this, the web is passed through a series of dancer rolls, tension rollers, and slitter knives. Pressure rollers, edge guides, and other tension devices are also used to keep the web straight and ensure tightly wound rolls of high quality.

Lastly, once the parent roll is cut into the necessary widths, the individual sections of the web are rewound onto smaller cores on the rewind tension roll shafts to achieve the desired lengths or diameters. The rolls are wound using speed control and feedback devices to ensure that the tension remains consistent throughout the process.



Calendering and slitting overview

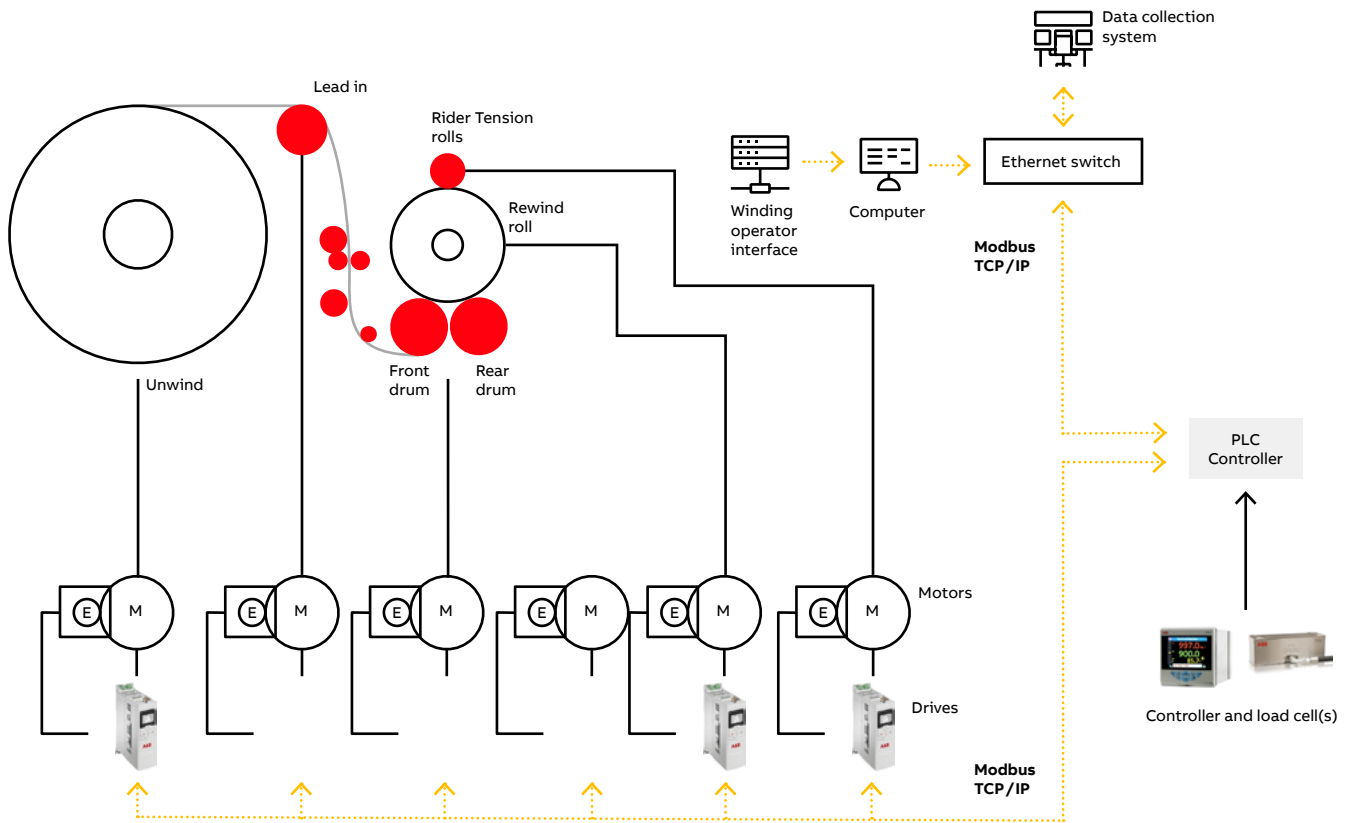
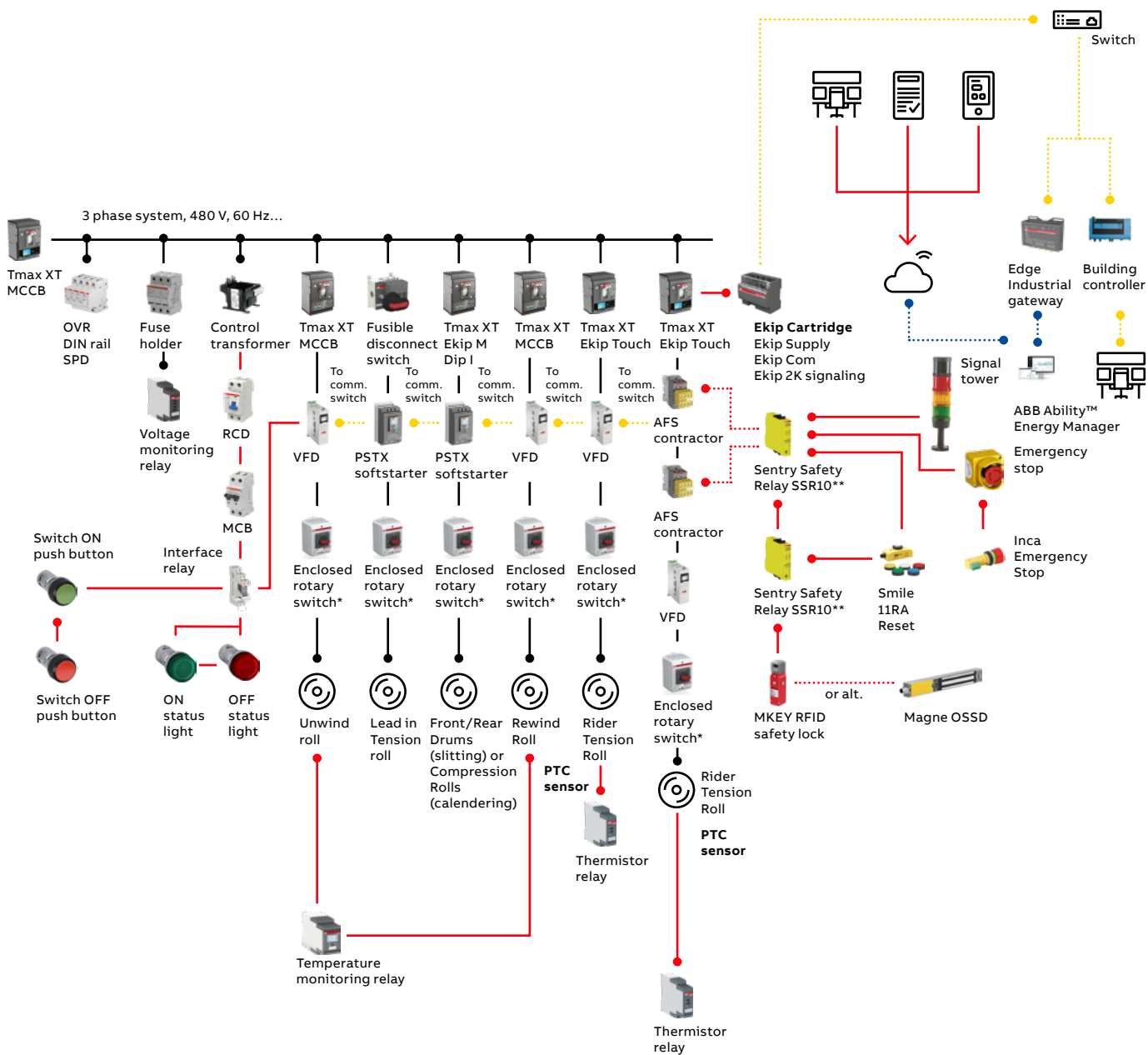


Figure includes the technologies for the application steps of calendering, unwinding, slitting and rewinding within the cell assembly area.

Power and control solutions for calendering and slitting processes



- ABB Ability EAM
- Modbus TCP
- Power circuit
- Control circuit

* The type of enclosed switch used depends on the application and environment.
 ** The safety circuit can be used to stop multiple motors in a machine. For advanced safety protection, a Pluto PLC can be used instead of the Sentry Safety Relays.
 Note: this configuration is for a generic system and is not representative of existing manufacturers.

Main components and functions

Primary Functional Requirements

- Circuit breakers, surge protectors, residual current devices, and fuses to prevent equipment damage or fires
- Machine safety, including safety relays, emergency stops, signaling devices, door sensors, and light curtains for users and service personnel

Secondary Optional Requirements

- Metering and temperature monitoring to track motor performance to prevent overheating and other issues
- ABB Ability offers remote and condition monitoring to allow for troubleshooting and maintenance

Calendering

Power and control components and functionalities

Application	Electrical Components	Functional Description
Power circuit	Main circuit breaker	Overload and short circuit protection
Power circuit	Surge protection device	Prevent damage from electrical surge
Unwind	Circuit breaker	Overload and short circuit protection
Unwind	Variable frequency drive (VFD)	Prevent motor damage and control speed
Lead-in tension roll	Fusible switch	Short circuit protection
Drum roll	Softstarter	Prevent damage to motor by ramping up speed
Compression rolls	Circuit breaker (Instantaneous only)	Short circuit protection
Compression rolls	Softstarter	Ramp up speed to control startup torque
Rewind roll	Circuit breaker	Overload and short circuit protection
Control circuit	Voltage monitoring relay	Monitor for over/under voltage
Control circuit	Temperature monitoring relay	Monitor the temp of the rollers/environment inside the machines
Control circuit	Residual current device	Ground fault protection
Control circuit	Miniature circuit breaker	Overload and short circuit protection
Control circuit	Push buttons/pilot lights	Provide visual status and machine control
Control circuit	Control transformer	Reduces voltages from higher to lower
Safety circuit	Safety contactors	Redundant contactors stop dangerous machine function
Safety circuit	Safety products	Prevents people from machine hazards (i.e., monitor door, machine status, emergency stop)
Digital circuit	ABB Ability Energy Manager	Remotely monitor machine status and troubleshoot

Slitting

Power and control components and functionalities

Application	Electrical Components	Functional Description
Power circuit	Main circuit breaker	Overload and short circuit protection
Power circuit	Surge protection device	Prevent damage from electrical surge
Unwind roll	Circuit breaker	Overload and short circuit protection
Lead-in tension roll	Fusible switch	Short circuit protection
Tension roll	Circuit breaker	Overload and short circuit protection
Front/rear drum rolls	Circuit breaker (instantaneous only)	Short circuit protection
Front/rear drum rolls	Softstarter	Prevent damage to roll by ramping up/down speed
Rider tension rolls	Circuit breaker	Overload and short circuit protection
Control circuit	Voltage monitoring relay	Monitor for over/under voltage
Control circuit	Temperature monitoring relay	Monitor the temp of the rollers/environment inside the machines
Control circuit	Residual current device	Ground fault protection
Control circuit	Miniature circuit breaker	Overload and short circuit protection
Safety circuit	Safety contactors	Redundant contactors stop dangerous machine function
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Product offering

Tmax XT MCCBs



Softstarters



Residual current devices



AF Contactors



Surge protection devices



Fuse holders



Control transformers



Miniature circuit breaker



Product offering

Disconnect switches



Measuring and monitoring relays



Interface relays and optocouplers



Assorted pilot devices



Enclosed rotary switches



ABB Ability™ Edge Industrial Gateway



ABB Ability™ Energy Manager



Jokab Safety Products





CONTACT US

Do you have a similar project and are you searching for the right Application configuration? Contact us and talk to our experts!

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