

SINAMICS DCC Winder V3.2



Converting Toolbox

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The application SINAMICS DCC Winder was developed with the objective to address many of the known winder applications using one application software.

If required, the application can be configured and/or also changed.

Using the application SINAMICS DCC Winder allows winders and un-winders to be implemented in a wide range of applications, e.g. foil making machines, printing machines, coating machines...

The winder application can be used on the following devices:

SINAMICS S120, S150, G130, G150

SINAMICS DCM

SINAMICS Integrated in SIMOTION D4xx-2

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- Shorter engineering and service times (same look & feel)
- Industry standards are used
- Supported by the various PM Application Centers
- Continuously updated in the Intranet
- Essentially open source code so that you can adapt the functions to your requirements
- User Manuals in English and German
- Free of Charge

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- PowerPoint presentation (English / German)
- Programming in CFC
- User Manuals (English / German)
- Feedback sheets (English / German)

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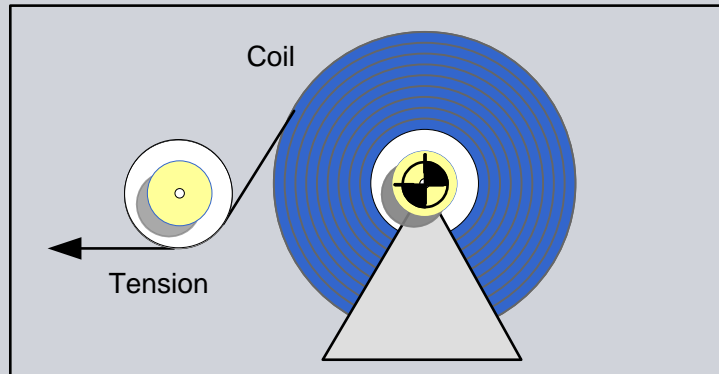
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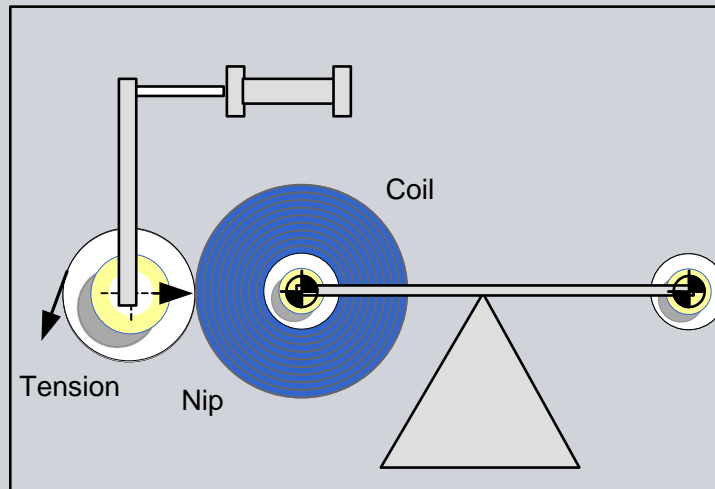
Example Configuration

Tools



Center Winder or tandem center winder

- winds material around a core or mandrel
- the coil is driven by a motor
- the motor can be operated in torque or speed controlled mode
- dancers or load cells for tension control are optional
- Roll hardness controlled by web tension and optional by nip pressure



Turret winder

- two or more centerwinds on a rotating axis
- Roll change on the fly
- A flying knife will slice the material and automatically hold it while it starts to wrap a new coil

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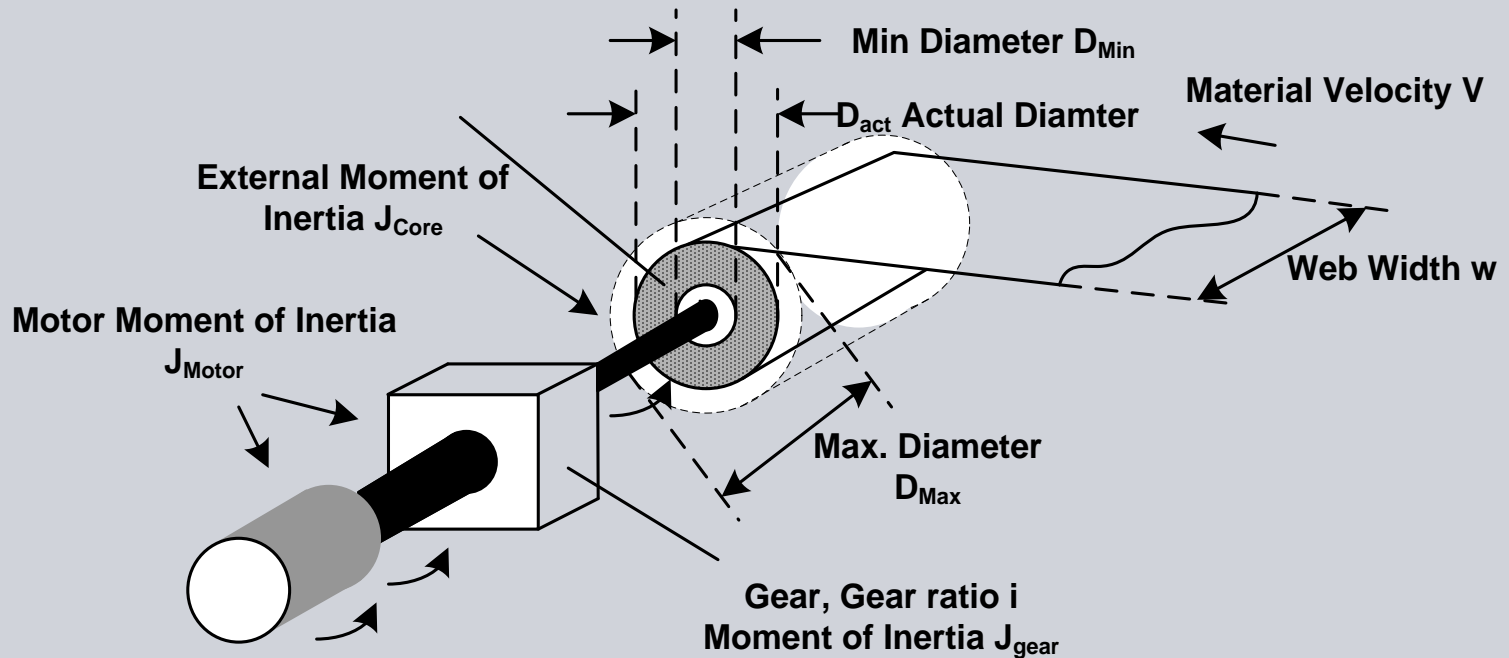
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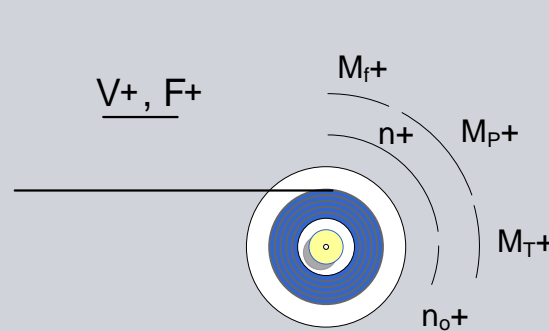
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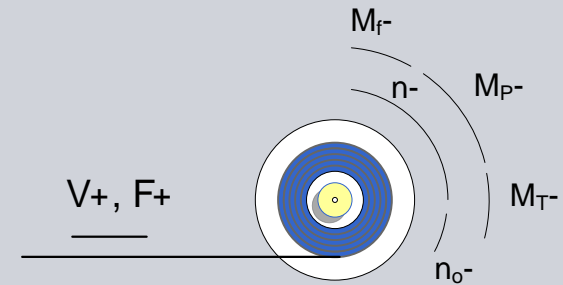
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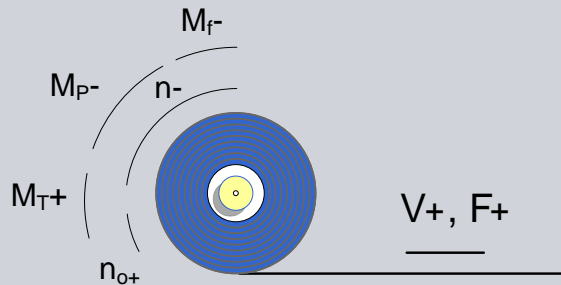
Tools



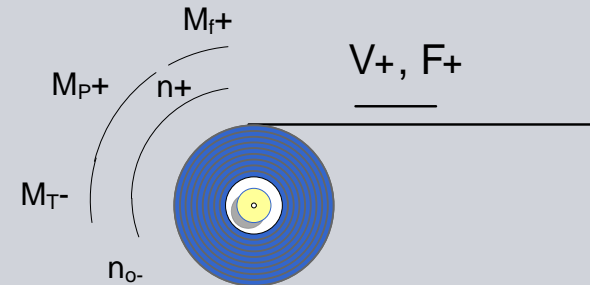
Winder from above



Winder from below



Unwinder from below



Unwinder from above

Mf: Friction Torque
 MP: Torque Precontrol
 MT: Tension
 n: winder speed
 no: speed override

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The Winder Function Block covers the common control modes and is an open function for adjustments or build in your own Know-how!

Control modes:

- indirect tension control
- dancer roll control with speed correction
- tension control with speed correction
- tension control with torque limiting
- constant v-control

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Scope of Functionality – Indirect Tension Control

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- No tension feedback required
- Web speed is set via nip
- Tension Torque pre-controlled via torque setpoint
- Good Inertia and friction torque compensation required
- Diameter ratio app. 10:1
- Tension ratio app. 6:1
- Winder torque ration app. 40:1
- Web speed up to app. 600 m/min
- Material: foil, textile, paper

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Scope of Functionality – Indirect Tension Control

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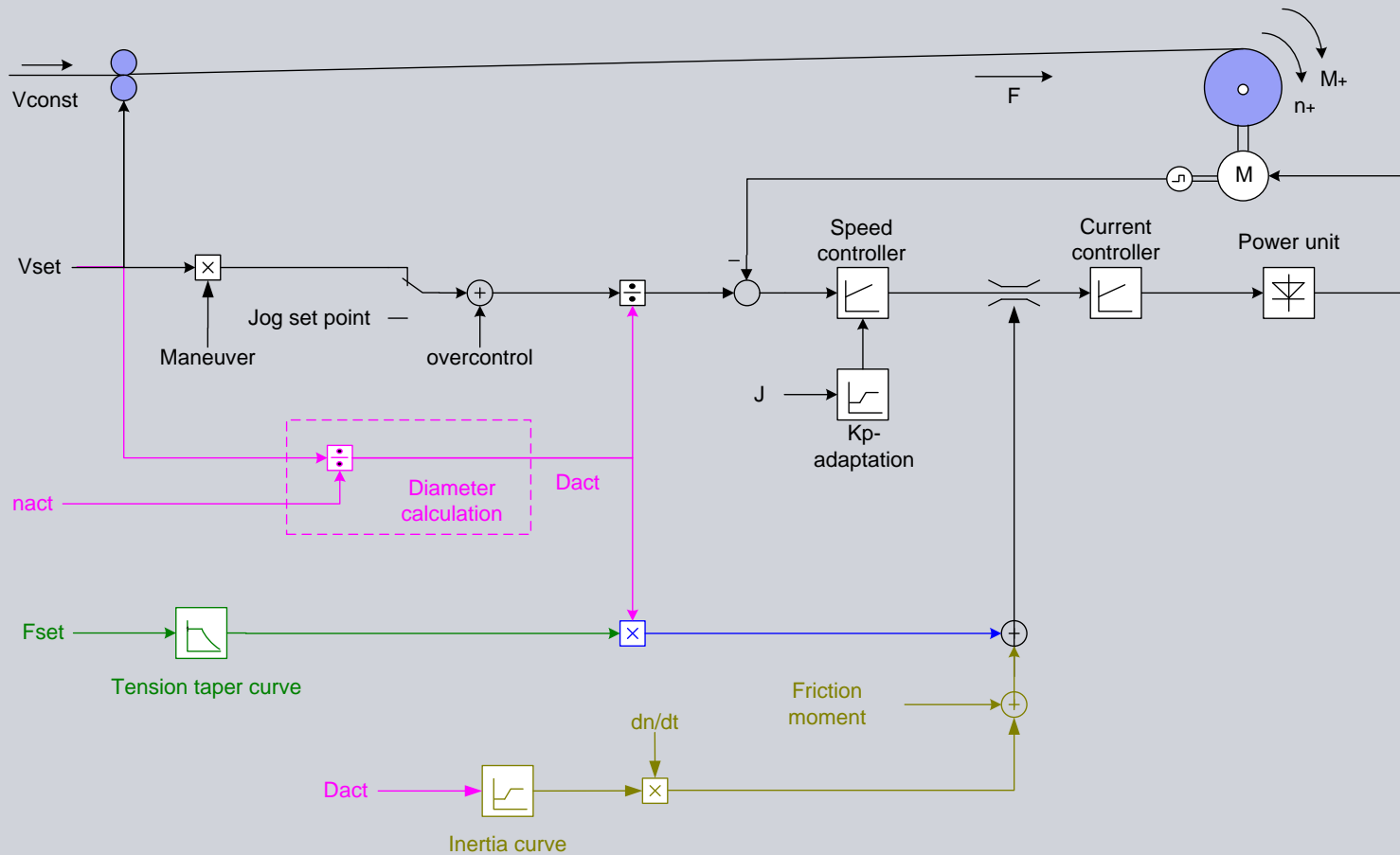
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Scope of Functionality - Tension control with torque limiting



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- Tension measuring device required
- Web speed is set via nip
- Tension Torque pre-controlled via torque set point
- Nip required, tension capsule is very damageable
- Good Inertia and friction torque compensation required
- Diameter ratio app. 15:1
- Tension ratio app. 20:1
- Winder torque app. 100:1
- Web velocity up to app. 2000 m/min
- Tension control via torque limitation
- Material: paper, thin film

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Scope of Functionality - Tension control with torque limiting

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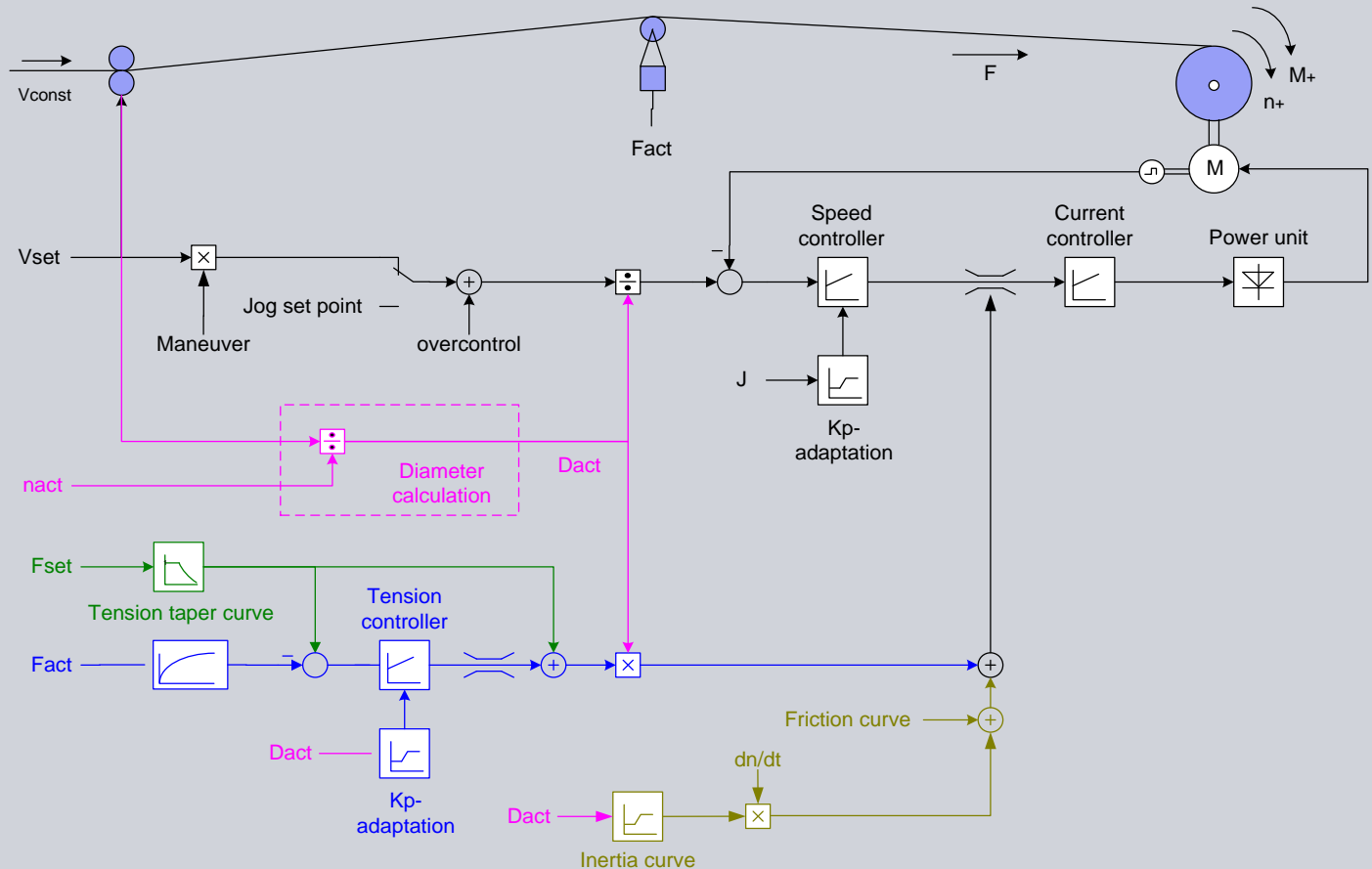
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Scope of Functionality - Dancer position control with speed setpoint-correction

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- Dancer position measuring device required (e.g. potentiometer, encoder)
- Web speed is set via nip
- Web tension is controlled via additional speed setpoint
- Nip required, dancer influences the web path
- Diameter ratio up to app. 15:1
- Tension ration controlled via dancer
- Winder torque ratio up to app. 40:1, depending on the dancer system
- Web speed up to app. 2000 m/min
- Material: rubber, cable, textile, film and paper

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Scope of Functionality – constant v-control

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- Web velocity input via web tachometer
- Web speed isn't set via nip
- Tension can't be affected by winder
- No nip required
- Diameter ratio up to app. 15:1
- Web velocity is depending on the mechanical construction
- Especially for sorter

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Scope of Functionality – constant v-control

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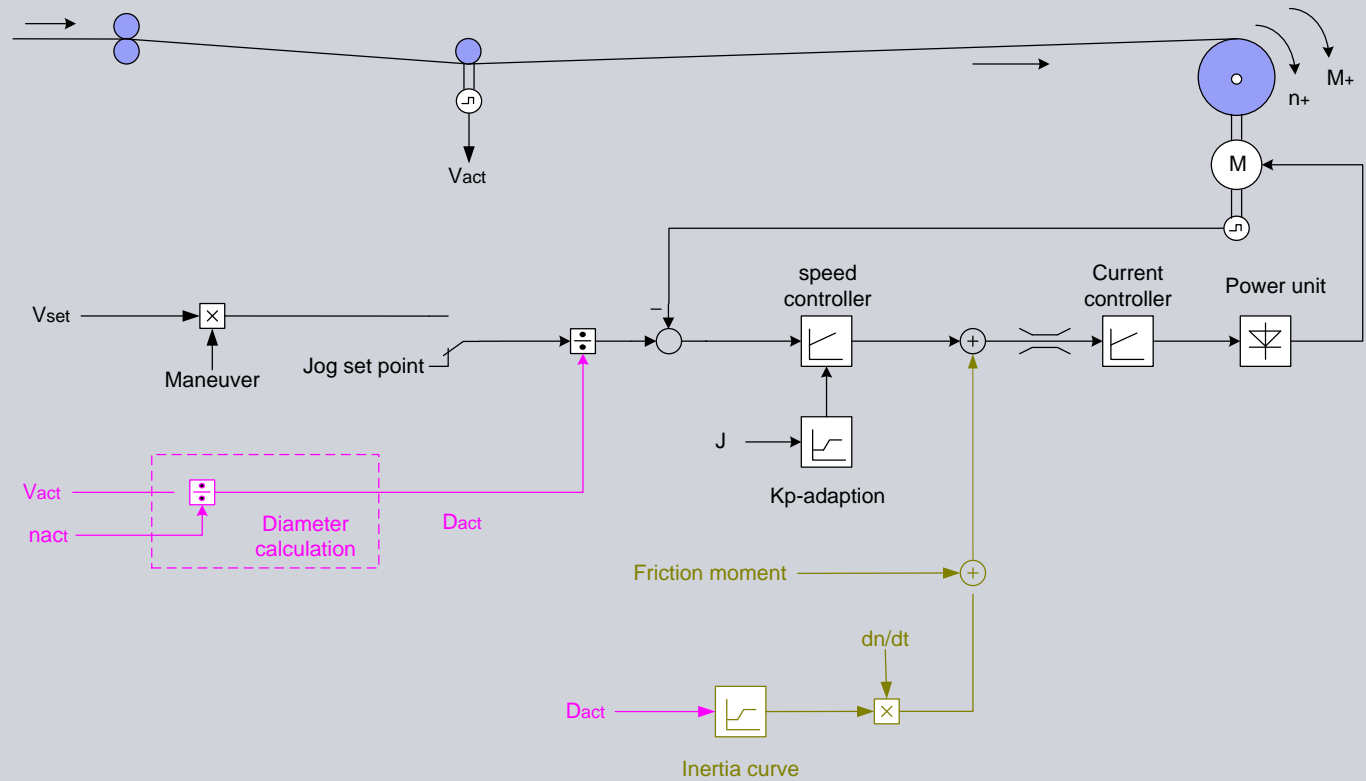
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Scope of Functionality – Diameter calculation

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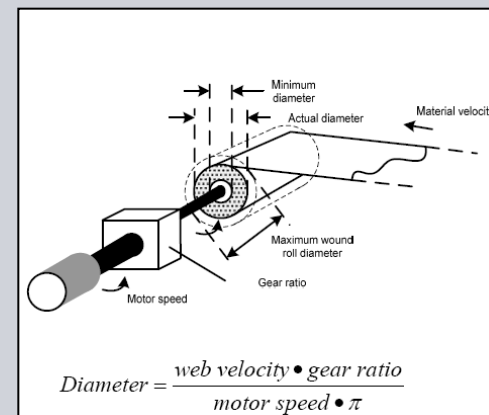
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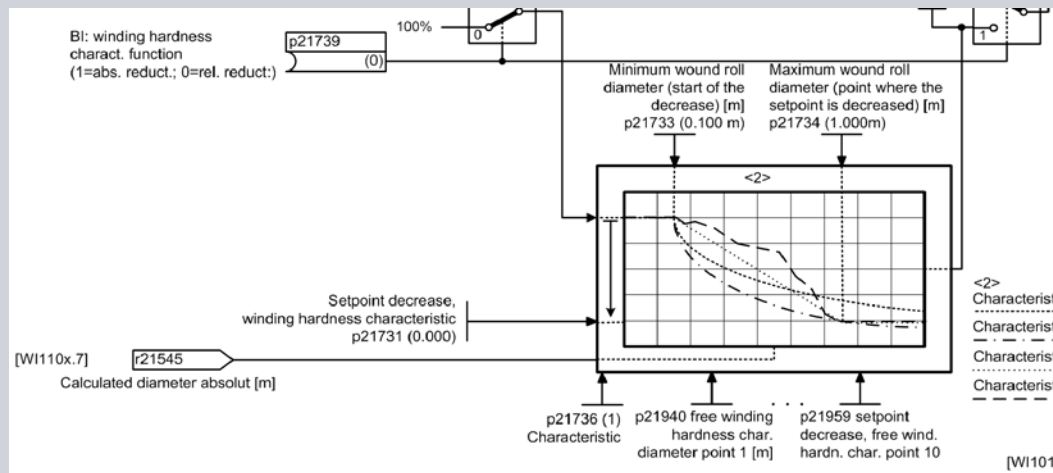
- Diameter calculation based on ratio between web velocity and winder rotational speed
- The diameter is required to e.g. calculate the correct speed of the winder axis from the machine speed
- optional there is an integrating calculation method, a division method, the possibility to interconnect a diameter sensor or a method with layer counting available



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Scope of Functionality – Taper characteristic

- Optional for rewinder, if the tension is reduced with increasing diameter
- Taper characteristic depends on the actual diameter
- Decrease can be absolute (N) or relative (% of tension setpoint)
- four characteristics are implemented:
 - Hyperbolic characteristic with:
 - Max. tension reduction at infinite diameter
 - Max. tension reduction at specified diameter
 - Linear characteristic with tension reduction when maximum diameter is reached
 - Personal characteristic using 10 points along the characteristic



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Scope of Functionality – Controller adaption

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- Controller gain of the tension/position controller is adaptable based on the actual diameter
 - higher gain at higher diameter
- Controller gain of the speed controller is adaptable based on the moment of inertia of the roll
 - higher controller performance with high load conditions

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Scope of Functionality – Torque pre-control

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- Optional compensation of the acceleration/ deceleration torque, resulting of the moment of inertia to improve the dynamic reaction of the drive
- Inertia compensation reduces tension fluctuation based on speed changes
- Inertia compensation is required if indirect tension control is used and recommended in tension control mode via load cell
- Inertia compensation is set up during commissioning
- Inertia compensation is calculated based on the diameter, the web width, the gear ratio und the material density

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Scope of Functionality – tension operation

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- Tension operation can only be enabled if the control is in operation and web break detection is not signaling an error
- It is recommended to only enable tension operation in machine stand still
- Tension or position setpoint will be enabled using adaptable ramp functions
- If tension operation is not active, the diameter computer and the speed override are disabled

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Scope of Functionality – Maneuvering input

The maneuvering input can e.g. be connected with an analog input to influence the internal speed setpoint.

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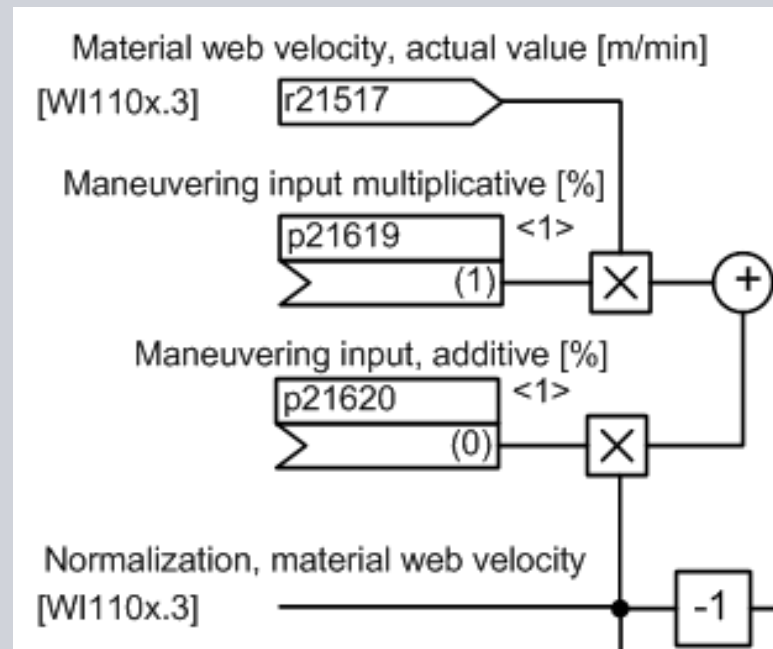
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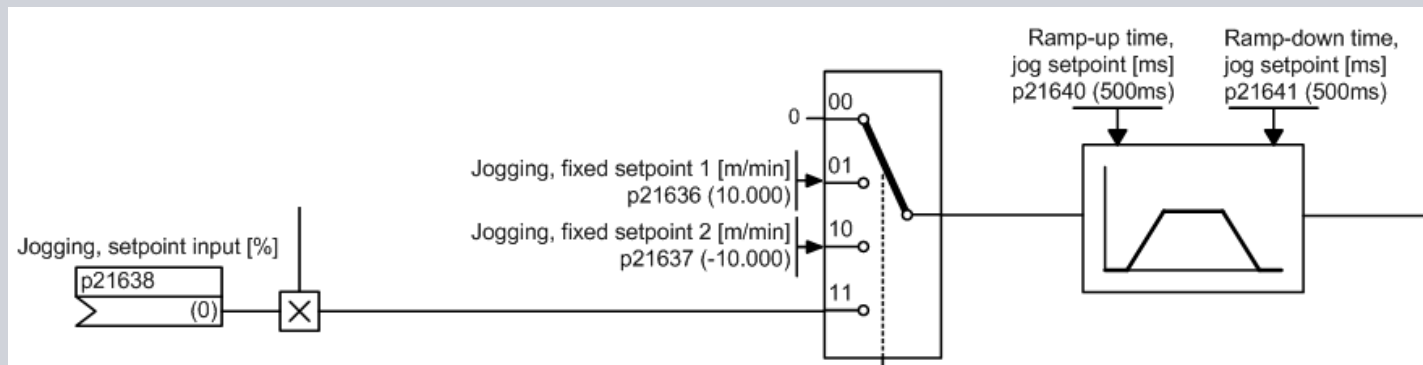
Tools



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Scope of Functionality – Jog

- Jog operation is only enabled when tension operation is disabled
- Jog speed setpoint either via fixed setpoint or via connectable input
- During jog operation, the maneuvering mode is disabled
- separate ramp function generator



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Converting Toolbox Scope of Functionality – Velocity master, synchronize and stop web setpoint

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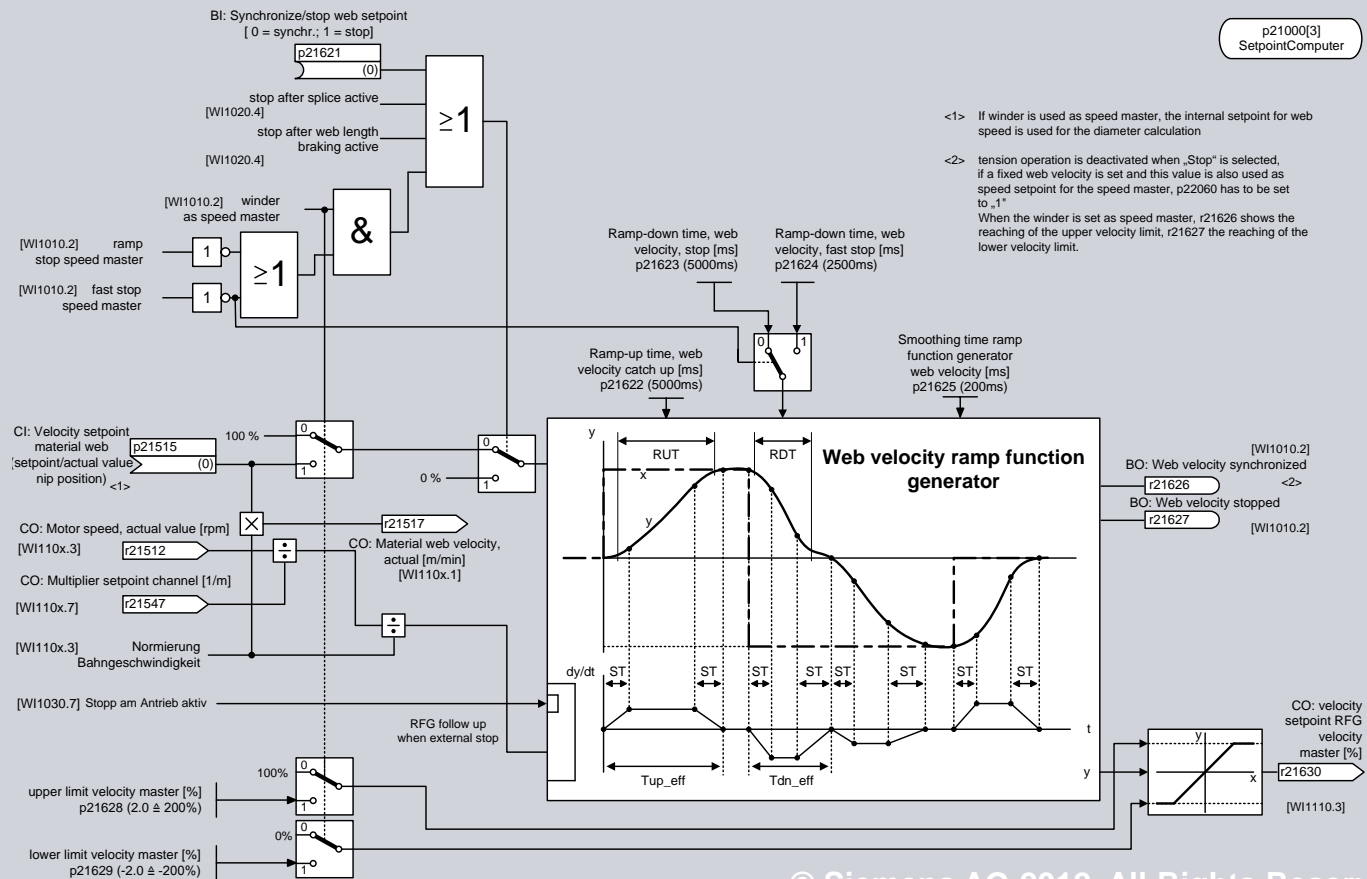
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- winder can operate as velocity master for the whole machine
- stop the winder on continuing web, e.g. after flying roll change
- synchronize a stopped winder to the web, e.g. before splicing



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Scope of Functionality – web length and braking distance

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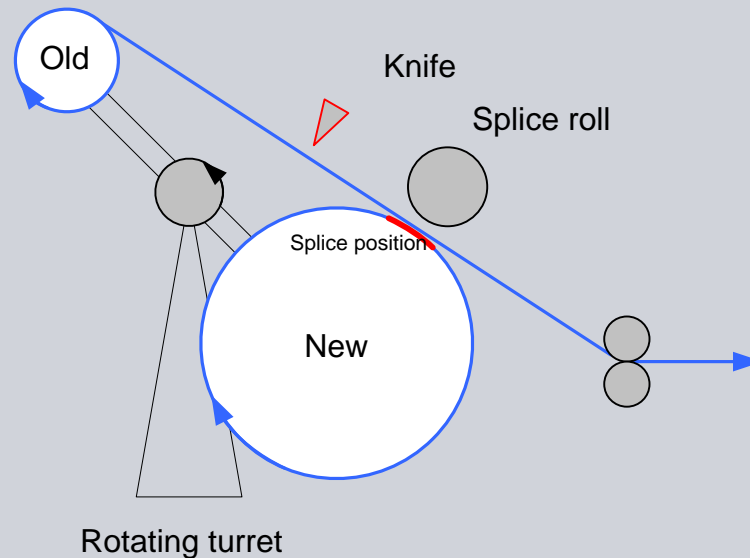
Tools

- calculation of the actual web length by integration of the material web velocity
- stop the winder when reaching a set web length setpoint

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Scope of Functionality – Splice control

- flying roll change with optional application splice control (precondition is active position controller for position sensing)
- cam outputs to control knife and splice roll
- “rewinding after splice” for unwinder



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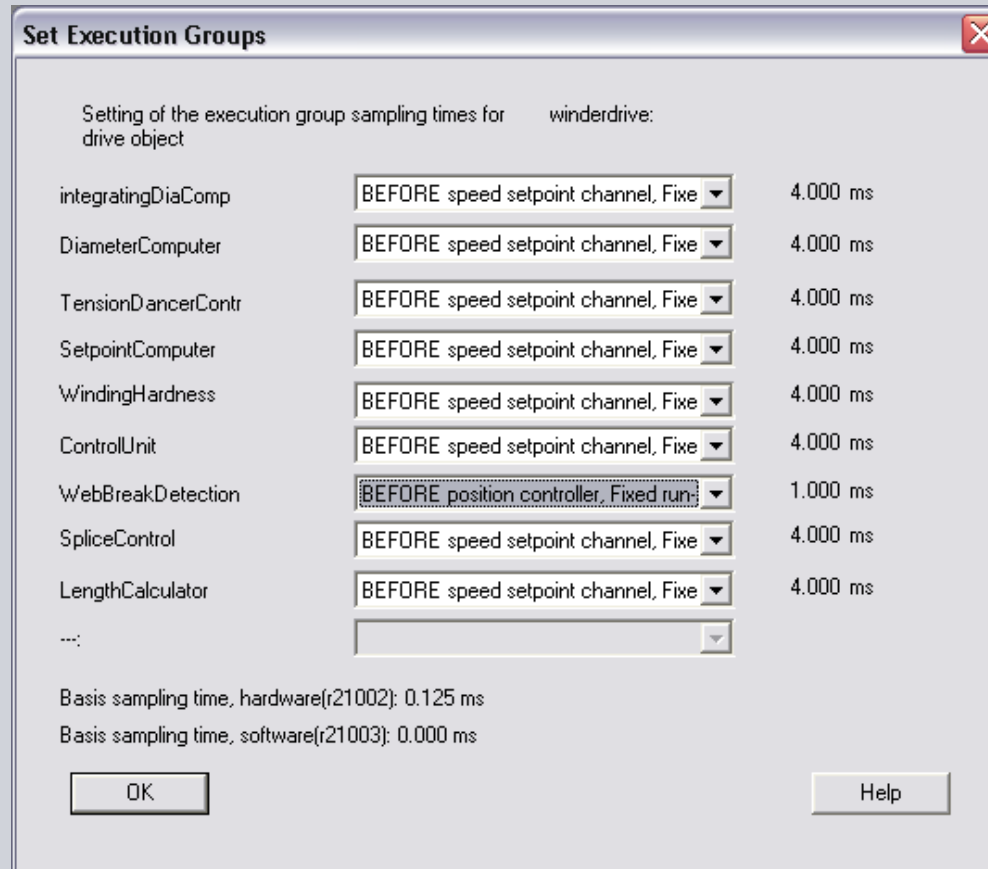
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Scope of Functionality – Execution groups

The required components of the application are enabled via execution groups:

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Scope of Functionality – Execution groups

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- The execution groups “Diameter computer”, “Setpoint calculator”, “Control unit” are always required, the execution group “TensionDancerContr” not for indirect closed-loop tension control, the execution groups “Winding hardness calculator”, “Integrating diameter computer” and “Web break detection” - only if the functions are actually required.
- For drive systems with the CU320-2 Control Unit, sampling times of **4ms** are recommended; for standard settings, this corresponds to the clock cycles of the execution group “**BEFORE speed setpoint channel**” for servo - or “**BEFORE position controller**” for servo and vector (This execution group is available independent of the activated basic positioner function module).
- Sampling times of 8ms or 16ms are recommended for the SINAMICS DCM drive system.

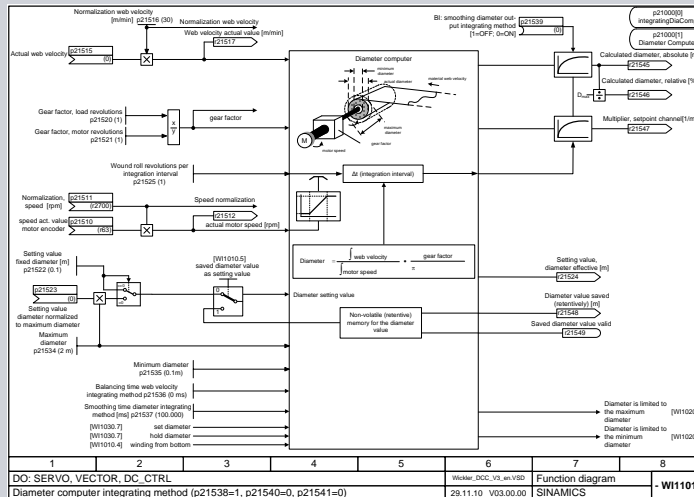
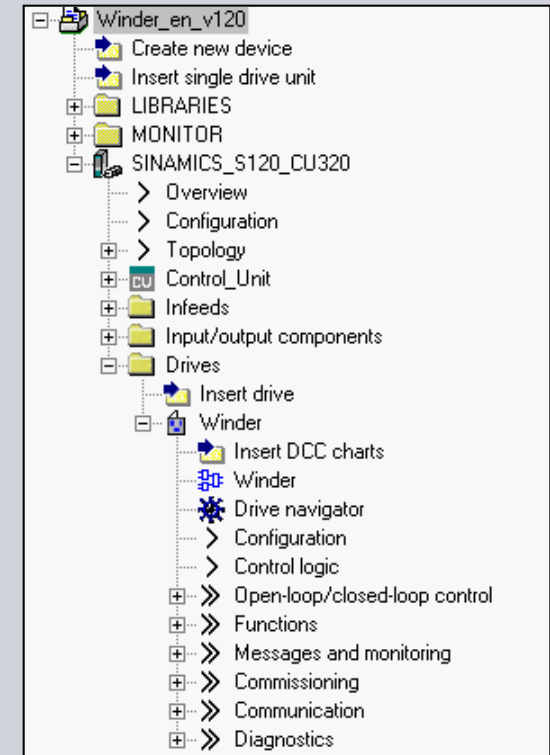
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The winder functionality is part of the application SINAMICS DCC Winder.

The application is implemented in DCC.

The documentation is based on function plans.



1	2	3	4	5	6	7	8	
DO: SERVO_VECTOR_DC_CTRL					Winder_DCC_v3_en_V03		Function diagram	- W1101 -
Diameter computer integrating method (p21538=1, p21540=0, p21541=0)					29.11.10 V03.00.00		SINAMICS	

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Example Configuration

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Example Configuration:

- SINAMICS CU310 DP/PN
- SINAMICS S120 PM340 AC/AC
- TM31 (analog input)
- Breaking resistor (optional)
- e.g. 1PH8 motor

Standards:
SINAMICS DCC Winder



HMI



PROFIBUS



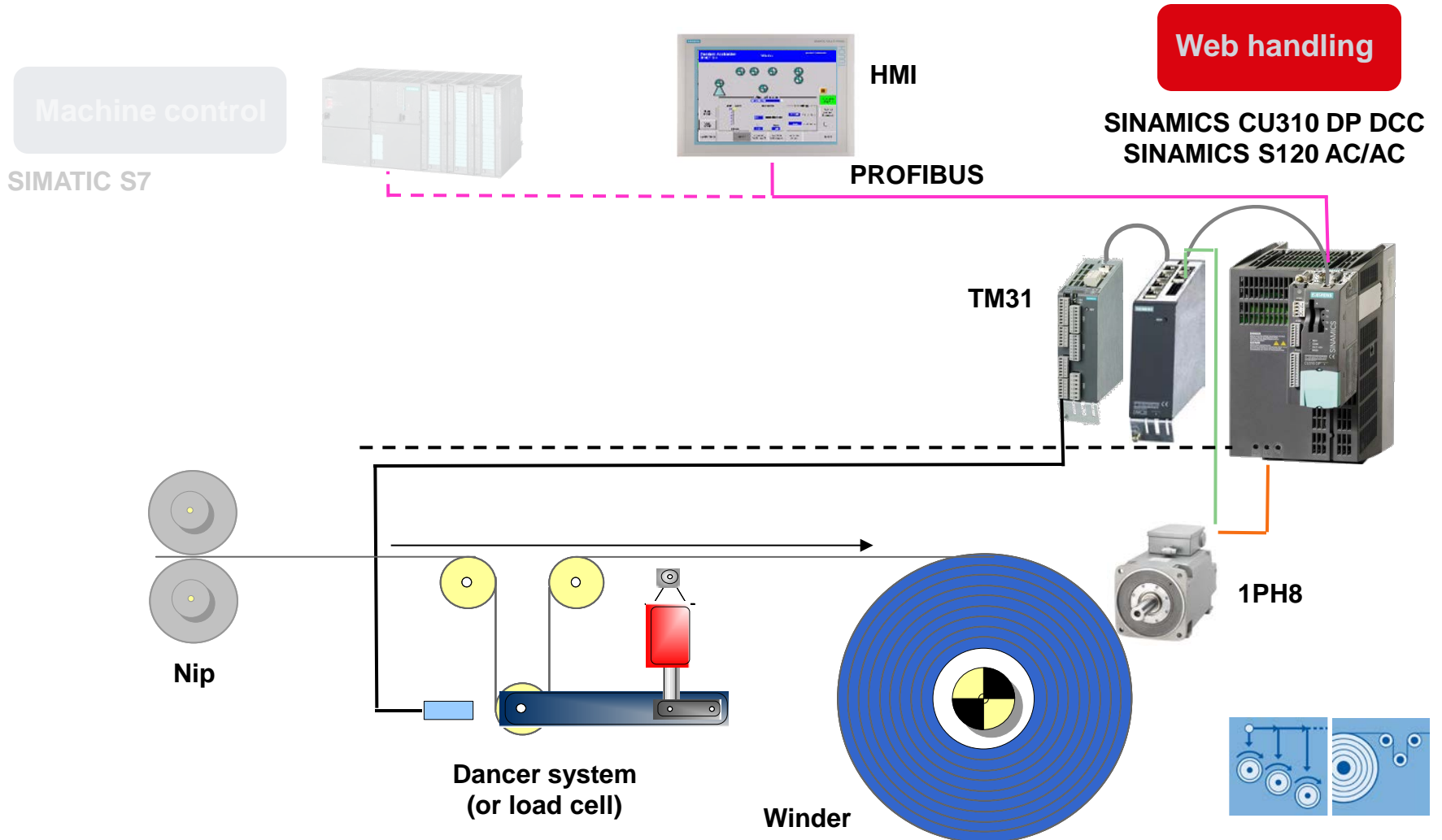
Winder
e.g. 1PH8

Benefits:

- Cost effective and simple „stand alone“ solution
- Integrated I/O and Safety functions (STO)
- Integrated TTL/HTL/SSI encoder interface
- No PLC required for simple applications

Converting Toolbox Example Configuration

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Example Configuration

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Example Configuration:

- SINAMICS CU320 (1 Winder / CU)
- SINAMICS S120 DC/AC
- TB30 or TM31
- e.g. 1PH8 motor

Standards:
SINAMICS DCC Winder
SINAMICS DCC
Load Sharing
(Tandem Winder)



SIMATIC S7
(Machine control)

PROFINET / PROFIBUS



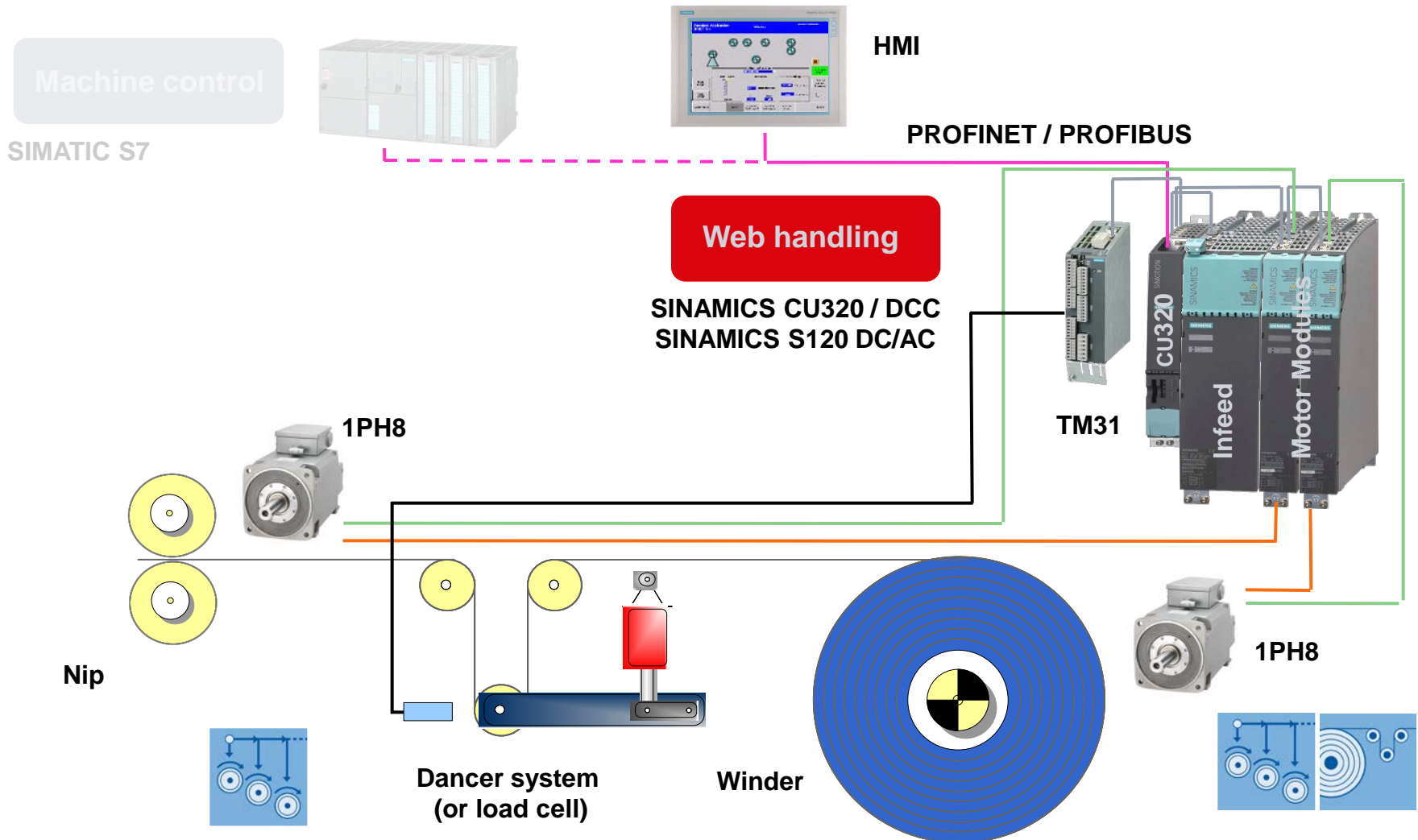
**Winder
(Master)
e.g. 1PH8**

Slave

Benefits:

- Modular solution based on standard products
- High hardware integration (no external traversing controller required)
- No programming necessary
- No PLC required for simple applications

Converting Toolbox Example Configuration



Converting Toolbox Tools

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The screenshot shows the 'SINAMICS MICROMASTER SIZER' software interface. A 'Motor wizard 1PH7 Step 1' dialog box is open, displaying a navigation tree on the left with steps: Start (checked), Application (selected), Mechanics, Traversing profiles, Gearbox data, Load cycle data, Power data, Drive system, Basic data 1, Motor/basic type, Basic data 2, and Motor list. The 'Application selection' section on the right lists applications: Travel drive / hoist drive / conveyor, Ball screw, Slewing drive / horizontal rotary table, Axial winder (highlighted), and Other mechanical systems. Below the list is a schematic diagram of an axial winder drive system, showing a motor (M) connected to a gearbox, which is connected to a load (J, e.g., clutch) on a rotating drum. An arrow labeled 'Material' indicates the direction of rotation. At the bottom of the dialog are buttons for '< Back', 'Next >', 'Accept', 'Cancel', and 'Help'. The background of the main window shows a 'WELCOME' banner and a 'siz' logo.

Thank you for your attention!

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