Load Cell Center Winder

CFW-11

Application Manual

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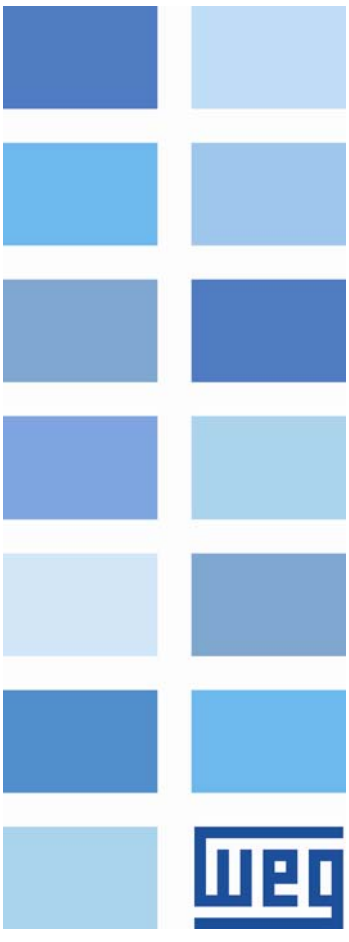

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CONTENTS

ABOUT THE MANUAL

This manual provides the necessary description for the load cell center winder application configuration developed of the CFW-11 frequency inverter SoftPLC function. This manual must be used together with the CFW-11 user manual, the SoftPLC function manual and the WLP software manual.

ABBREVIATIONS AND DEFINITIONS

PLC	Programmable Logic Controller
CRC	Cycling Redundancy Check
RAM	Random Access Memory
WLP	Ladder Language Programming Software
WSCAN	CANopen Network Configuration Software
USB	Universal Serial Bus

NUMERICAL REPRESENTATION

Decimal numbers are represented by means of digits without suffix. Hexadecimal numbers are represented with the letter ‘h’ after the number.

1. INTRODUCTION TO CENTER WINDERS

The center winder applications developed for the CFW-11 SoftPLC function provide to the user system use and configuration flexibility. They use the tools already developed for the WLP programming software, together with configuration wizards and monitoring dialog boxes.

1.1 WINDING

Winding is a stage in the productive process where webs as paper, plastic, metals or fabric are converted to a roll. Unwinding, however, is to convert the material packed in a roll back to his flat.

Sometimes the produced roll can be the final product, as, for instance, a roll of cassette ribbon or a toilet paper roll. But in most cases, the roll is part of an intermediate production process, as plastic packing for instance, where initially they are produced by the extruder, being printed by printing machines and at the end converted into the final product packing.

In order to accomplish this, it becomes necessary to have a driving system that is able to keep up with the several production stages. Therefore, we can apply in this case a frequency inverter controlling an induction motor, where, according to the web characteristics, it will be winded in one of the following manners:

- Center Winder, where the roll with the web is driven directly at its shaft;
- Surface Winder, where the roll with the web is driven indirectly through friction rollers;
- Center-Surface Winder, where the roll with the web is driven directly at the shaft and also indirectly through friction rollers.

There are two ways for the frequency inverter control the traction force applied on the web to be wound:

- Direct, a dancer or a load cell gives the feedback of the tension applied to the web during the winding;
- Indirect, it uses the physical quantities measured by the inverter, torque and speed, as the feedback of the tension applied to the web during the winding.

Regardless of quantities defined for the web tension feedback was implemented three ways to send the control reference to frequency inverter:

- Torque Limit Mode, based on the synchronism of the winder speed with the line speed, the frequency inverter receives the speed reference and torque current limit to control the web tension;
- Torque Mode, based only on the web tension required, frequency inverter receives only the torque current reference to control the web tension.
- Speed Mode, based on the synchronism of the winder speed with the line speed, the frequency inverter receives only the speed reference to control the web tension.

1.2 CENTER WINDER CONCEPT

The characteristic of a center winder or unwinder is to present a constant power kind of load torque profile. This is due to the requirement that the surface speed v (m/min) be kept constant during all the process. The roll rotation speed n (rpm) for this condition is given by:

$$n = \frac{v \times i}{\pi \times 2 \times r}$$

Where,

n = motor speed in rpm;
v = surface speed in m/min;
i = reduction ratio (gearbox ratio);
r = radius in meters.

It is noticeable that when the roll is empty the rotation is at the maximum value. As the radius increases it becomes necessary that the rotation reduce, so that the surface speed v (m/min) remains constant. Being the web tension F (kgf) also constant, the resistant torque presented by the load Tc (kgfm) is given by:

$$Tc = F \times r$$

Therefore, as the roll radius r increases, the resistant torque Tc (kgf) does also increase. It is again important to pay attention to the need of winding or unwinding speed stability, imposed by the web to be winded or unwinded, then, it is necessary to use the frequency inverter in vector control with encoder. There are also center winders or unwinders where there is no need for constant surface speed. In those cases the motor speed does not vary and the load torque increases proportionally to the roll radius.

In center winders or unwinders the web is winded or unwinded on a core or on a central shaft. The winding or unwinding is done directly by controlling the speed in the center of the roll. In order to keep the web speed constant in a winder, the motor speed is reduced with the increment in the roll diameter. However, in an unwinder, the motor speed will be increased with the reduction in the roll diameter.

1.3 TERMS USED IN CENTER WINDERS

The figure below presents some terms used in center winders and unwinders.

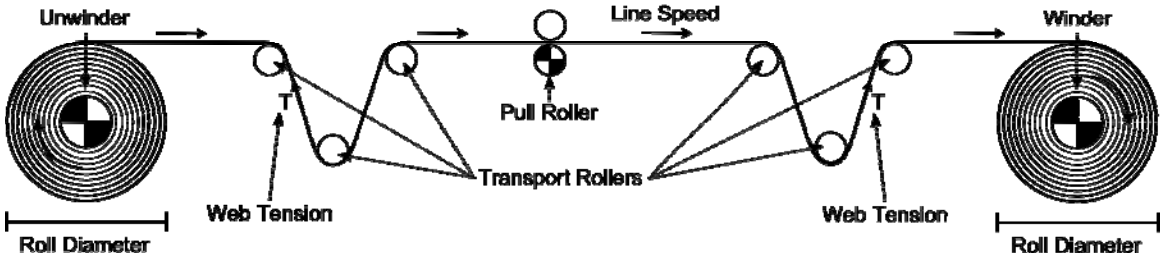


Figure 1.1 – Identification of terms used in center winders and unwinders

1.3.1 Line Speed

The line speed corresponds to the operational speed of a coordinated process, where the speed of the web being processed can be expressed in meters per minute, feet per minute, yards per minute, meters per second, etc.

The formula below shows the relationship between the line or surface speed in m/min and the motor speed in rpm.

$$v = \frac{n \times \pi \times D}{i}$$

Where,

v = line or surface speed in m/min;
n = motor speed in rpm;
D = winding roller diameter;
i = reduction ratio (gearbox ratio) between the motor shaft and the driven shaft (winding roller).

1.3.2 Web Tension

Web tension is the longitudinal traction force that is being applied to the web, i.e., how firmly the web is being pulled. The web tension can be expressed in the following units: kN/m, kgf/m, lbs/ft, lbs/in, etc.

1.3.3 Pull Roller

It is a roller that is pressed against another roller, belt or conveyor belt in order to help transport and keep the web on the correct track. The pull roller may be sized to be the main web transport mean or it can be less powerful, just to help in the web transport.

1.3.4 Transport Roller

It is a roller that has the function of helping passing and moving the web through the machine. It may also be used as the installation point for the web traction force measurement sensor (load cell or load cell).

1.3.5 Stall

"Stall" is the percentage of the tension necessary to keep the web stretched while the winding process is stopped. It has the purpose to sustain the web tension, to keep it prepared for a restart, as well as not to allow it to unwind.

1.3.6 Taper

Taper is a function that has the purpose of reducing the tension on the web being wound as the diameter of the roll increases. The formula below shows the linear equation that governs the Taper function.

$$T_{Taper} = T_{Spt} \times \left[100\% - \left(Taper_{Spt} \times \frac{D - d_i}{d_f - d_i} \right) \right]$$

Where,

T_{Taper} = web tension setpoint after the Taper function is applied;
T_{Spt} = web tension setpoint adjusted via parameter or the AI3 input;
$Taper_{Spt}$ = taper function setpoint in %;
d = actual roll diameter in mm;
d_i = initial diameter for the Taper function, in mm;
d_f = final diameter for the Taper function, in mm.

The graph below shows, in a general manner, the behavior of web tension setpoint when the Taper function is enabled.

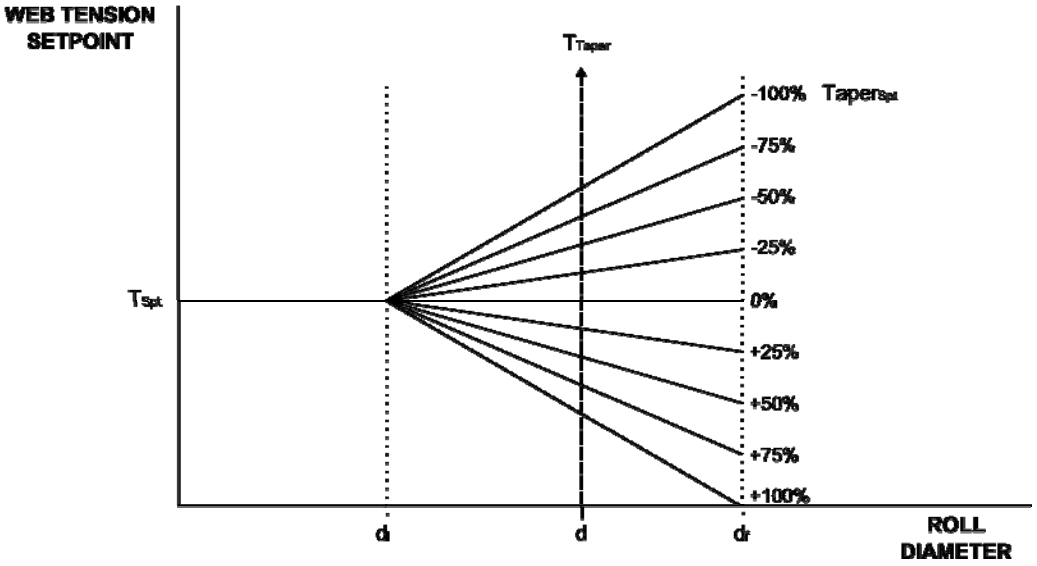


Figure 1.2 – Behavior of the web tension setpoint as the Taper setpoint function applied.

1.3.7 Inertia

Inertia is the physical quantity that expresses the tendency of a body to remain in rest or continue in motion unless disturbed by an external force. In order to move a brick with a specific mass, it must be pushed with some force. The brick could remain in movement forever, except by the friction that brakes and eventually stops it. The same inertia principle applies to rotating objects. A torque must be applied to cause a change in the angular velocity.

In order to accelerate or decelerate a motor and its load, the motor, the gearbox and other process related equipment must mechanically withstand the velocity change. If extra power is not supplied during the acceleration or deceleration, the system inertia will cause undesirable tension transients, broken web or a slack winding.

1.3.8 Roll Diameter

Knowing the diameter of a roll while winding or unwinding a web makes it possible to perform compensations that are conditioned to the diameter, such as the Taper function for instance. The diameter can also be used to be shown to the operator or for some automatic machine logic. The diameter can be measured with an ultrasonic sensor or with a contact roller connected to an analog potentiometer. The diameter can also be calculated through the relationship between line speed and roll rotation. The formula below equates this relationship:

$$D = \frac{v \times i}{n \times \pi}$$

Where,

D = winding roller diameter;
v = line or surface speed in m/min;
i = reduction ratio (gearbox ratio) between the motor shaft and the driven shaft (winding roller);
n = motor speed in rpm.

1.3.9 Dancer

It is an idler roller or wheel positioned between transport rollers, being mounted on a shaft counterbalanced by a pneumatic cylinder with air pressure adjustment. The dancer position is transmitted by a rotating potentiometer or a similar device. When the web traction force increases, the dancer is moved to a new position that is transmitted to the control, which must detect the change and correct its position by increasing or decreasing speed or torque.

1.3.10 Load Cell

Load cell or transducer for force measurement is an electromechanic sensor united to a transport roller that signalizes the tension being applied on the web. Its operation is based on the variation of the ohmic resistance of a sensor called strain gauge, when submitted to a deformation. Load cells normally use four strain gauges connected according to a Wheatstone Bridge, and its unbalance, due to the due to the deformation of the strain gauges, is proportional to the force that causes it. It is through the measurement of the unbalance that the applied force value is obtained.

The strain gauges are glued on a metallic part (aluminum, steel or cupper-beryllium alloy) denominated body of the load cell and entirely solidary to its deformation. Therefore, the force acts on the load cell body and its deformation is transmitted to the strain gauges, which on their turn will measure its intensity. The form and the characteristics of the load cell body must obviously be the object of a meticulous care in its project as well as in its execution, aiming to assure that the proportionality relationship between the intensity of the acting force and the consequent deformation of the strain gauges be preserved in the initial weighing cycle as well as in the subsequent cycles, regardless of the environmental conditions.

Two load cells are normally used for the measurement, thus assuring that the force applied on the sensor roller be indicated in its totality, regardless of the point where the force is applied. Those two load cells are connected to a signal transducer that sends the measured value, in voltage or current, to the control equipment.

1.4 GENERAL CHARACTERISTICS OF THE CENTER WINDER APPLICATIVE

The center winder or unwinder control developed for the CFW-11 with SoftPLC function presents the following characteristics:

- Synchronism of the center winder or unwinder speed with the process line speed in torque limit mode and in speed mode;
- Operation command selection for digital inputs or control word via communication networks
- Operation selection as a winder or unwinder via parameter, via digital input or via communication networks
- Web tension control with feedback through load cell, load cell or motor torque;
- Web tension setpoint via parameter, communication networks, electronic potentiometer or analog input;
- Web roll diameter measurement (through an analog input) or calculated;
- Web tension control via a PID controller resulting in speed or torque current reference for the motor (direct feedback);
- Web tension control via torque compensation from the roll diameter resulting in motor torque current limit (indirect feedback);
- Detection of the web presence through an external sensor or through an applicative logic;
- Taper function;
- Acceleration and deceleration ramps for the center winder or center unwinder;
- Minimum and maximum speed limits for the center winder or center unwinder;
- Gain, offset and filter adjustment for the control signals via analog inputs;
- Alarms indicating there isn´t web in the winder or unwinder;
- Possibility of applicative implementation or modification by the user through the WLP software.

Table 1.1 – comparison between the types of feedback for the web tension control

Type	Advantages	Disadvantages
Dancer	■ It measures during the web transportation process the tension being applied on it; ■ It allows a good precision in the reading of the web tension; ■ It makes the detection of web presence easy; ■ It attenuates small speed oscillations.	■ Mechanic installation of the equipment; ■ External adjustments for operation; ■ Not measurable measured value; ■ It may transmit a delay in the web tension reading.
Load Cell	■ It measures during the web transportation process the tension being applied on it; ■ It allows an optimum precision in the reading of the web tension; ■ Measurable measure value (in kgf); ■ It makes the detection of web presence easy; ■ It detects small speed oscillations.	■ Mechanic installation of the equipment; ■ Calibration for the correct measurement of the equipment; ■ Equipment sensitive to stress.
Motor Torque	■ It does not need mechanic installation of equipment; ■ It does not require calibration end external settings.	■ The web tension is not measured, only an estimation of the motor force; ■ The detection of web presence is more difficult (unless there is an external sensor); ■ Not measurable measured value.

2 LOAD CELL CENTER WINDER

In a center winders the web is winded on a core or on a central shaft. The winding is done directly by controlling the speed in the center of the roll. In a center winder the motor speed must be reduced with the increase of the roll diameter; however for the center unwinder the motor speed must be increased with the decrease of the roll diameter; in both the intent is to maintain the web speed constant. This control can be done in three ways: torque limit mode, torque mode or speed mode.

2.1 TORQUE LIMIT MODE

2.1.1 Control Block Diagram

The control strategy for a center winder in torque limit mode is based on synchronism the line speed with the surface winder speed through the relationship between the roll diameter and the motor speed. It is required for a winder a speed a little higher than the speed regulator remains saturated causing the motor torque current limit acting. The web tension control is done through a PID controller that increases or decreases the motor torque current limit as the signal measured by the load cell.

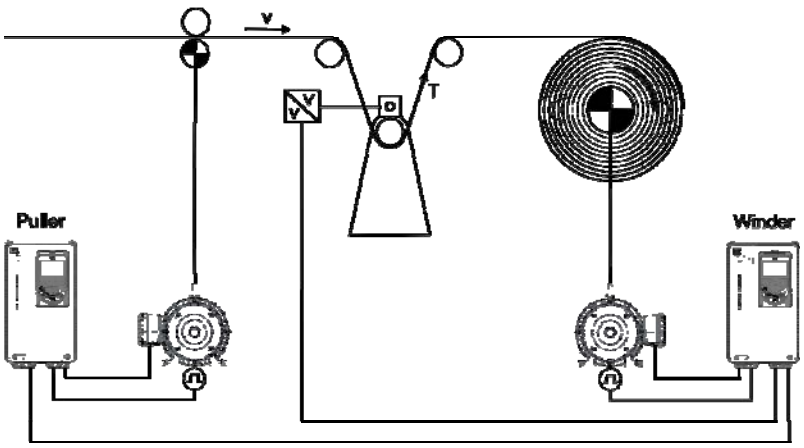


Figure 2.1 – Load cell center winder in torque limit mode

The control strategy for a center unwinder in torque limit mode is based on synchronism the line speed with the surface unwinder speed through the relationship between the roll diameter and the motor speed. It is required for an unwinder a speed a little lower that hold the same, brake the web to be unwinded by the motor torque current limitation. Right now, the drive will return power to the DC link; the DC link must be controlled via a braking resistor or via interconnection with other DC link inverters or by a regenerative inverter. The web tension control is done through a PID controller that increases or decreases the motor torque current limit as the signal measured by the load cell.

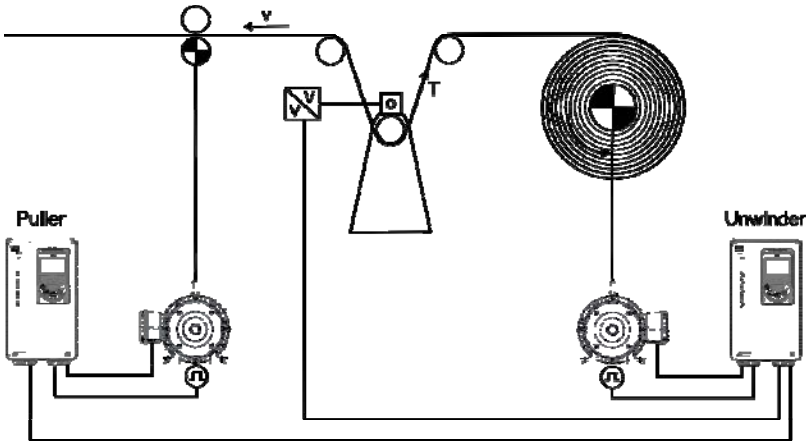


Figure 2.2 – Load cell center unwinder in torque limit mode

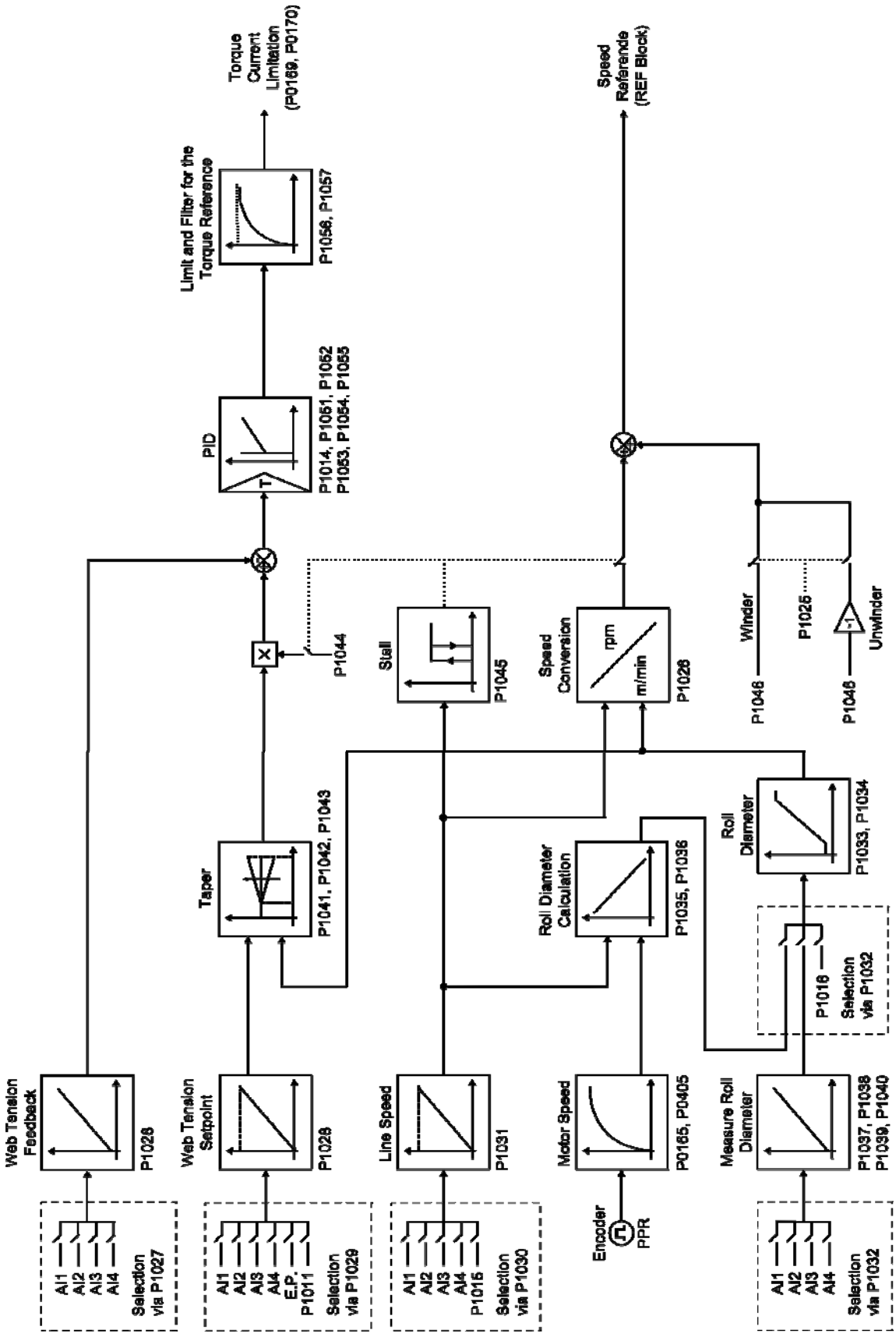
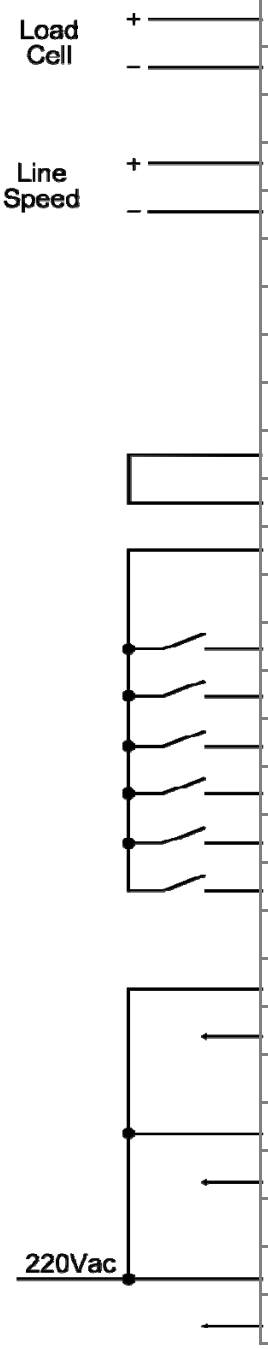


Figure 2.3 – Control block diagram in torque limit mode

NOTE!
Refer to chapter 5 for the parameter description.

2.1.2 Control Connections

The control connections (analog inputs/outputs, digital input/outputs) made at the CFW-11 control board CC11 terminal strip XC1 for a load cell center winder or unwinder in torque limit mode in the default configuration, i.e., with the parameter P1027 in 1 (load cell via AI1), P1029 in 5 (web tension setpoint via HMI (P1011)), P1030 in 2 (line speed via AI2) and P1032 in 5 (roll diameter calculation).



XC1 Terminal Strips		Default Function for Load Cell Center Winder or Unwinder
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (0-10 V): Web tension (load cell)
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): Line speed
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: Motor current
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VCC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Enable winder
16	DI2	Digital input 2: Web direction
17	DI3	Digital input 3: Diameter reset
18	DI4	Digital input 4: Web presence
19	DI5	Digital input 5: Increase EP setpoint
20	DI6	Digital input 6: Decrease EP setpoint
21	NF1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NA1	
24	NF2	Digital output 2 DO2 (RL2): Winder enabled
25	C2	
26	NA2	
27	NF3	Digital output 3 DO3 (RL3): No function
28	C3	
29	NA3	

Figure 2.4 – Terminal strip XC1 in torque limit mode

NOTE!
Refer to the CFW-11 frequency inverter manual for more information on the connections.

2.2 TORQUE MODE

2.2.1 Control Block Diagram

The control strategy for a **center winder** in torque mode is based only on the web tension control required via a PID controller that increases or decreases the motor torque current reference as the signal measured by the load cell, can be applied the taper function if the roll diameter is measured. Therefore, the frequency inverter will be run only in torque mode, i.e., with no speed control, thus, a simpler way to control.

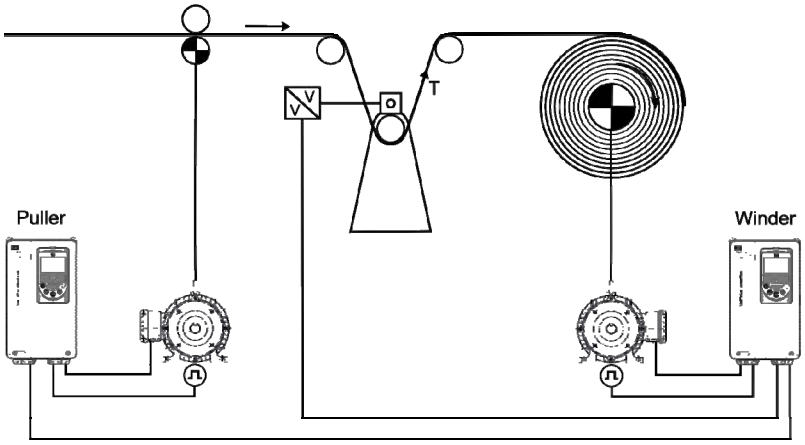


Figure 2.5 – Load cell center winder in torque mode

The control strategy for a **center unwinder** in torque mode is based only on the web tension control required via a PID controller that increases or decreases the motor torque current reference as the signal measured by the load cell. Even in the torque mode, there is the possibility of the drive return power to the DC link; the DC link must be controlled via a braking resistor or via interconnection with other DC link inverters or by a regenerative inverter. Therefore, the frequency inverter will be run only in torque mode, i.e., with no speed control, thus, a simpler way to control.

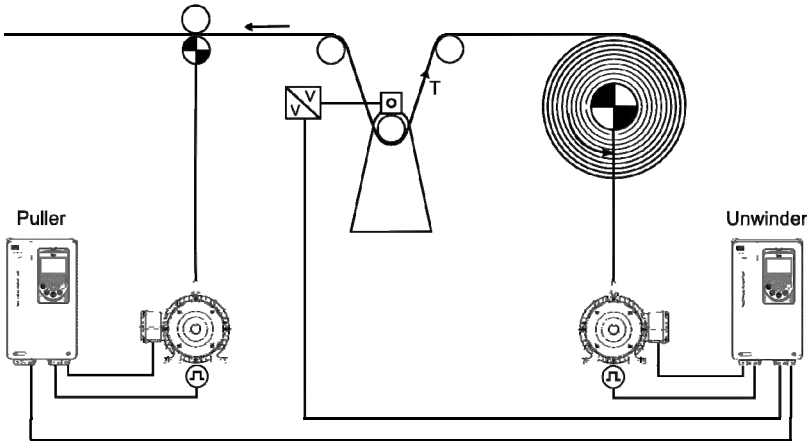


Figure 2.6 – Load cell center unwinder in torque mode

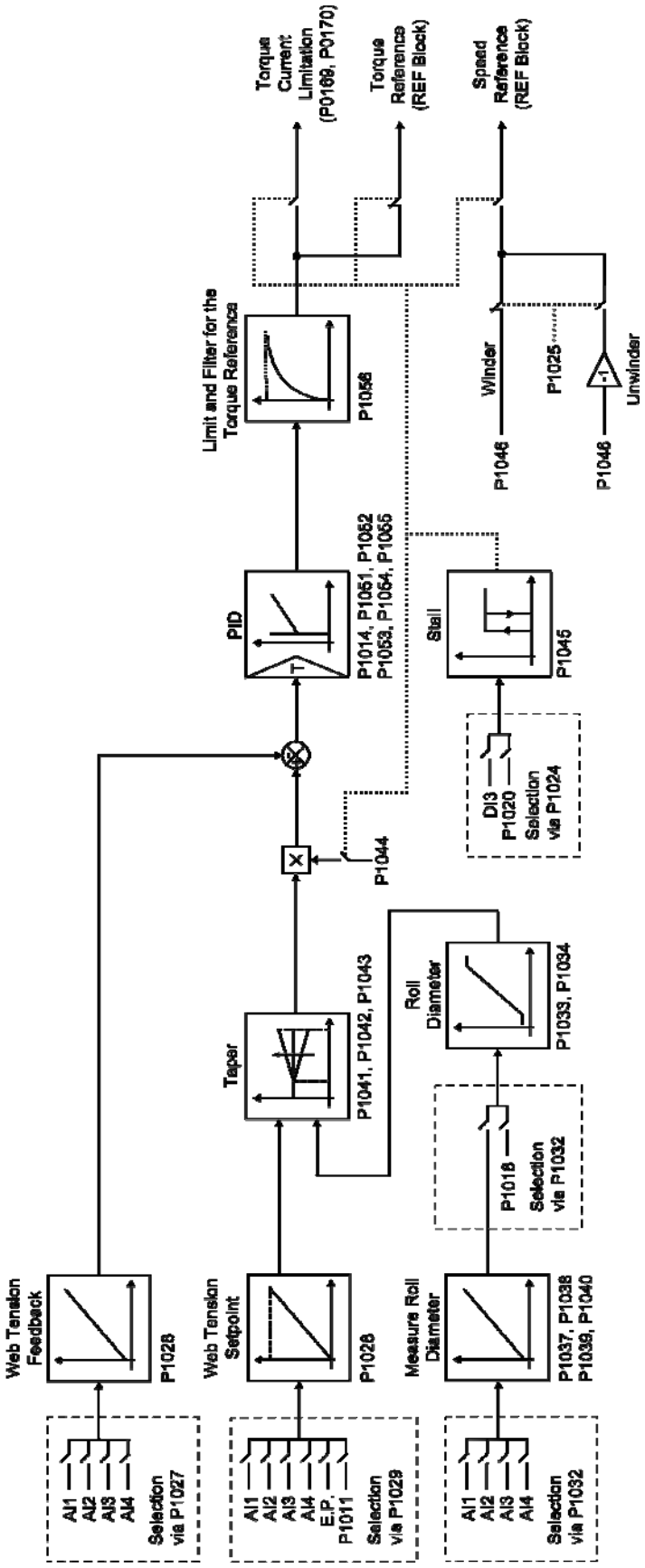
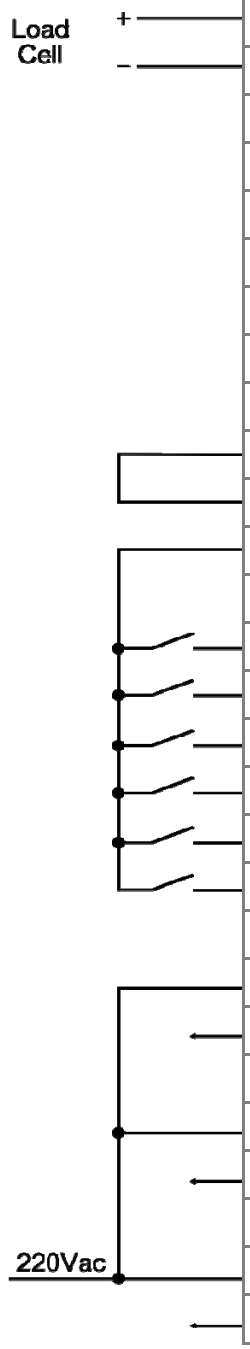


Figure 2.7 – Control block diagram in torque mode

NOTE!
Refer to chapter 5 for the parameter description.

2.2.2 Control Connections

The control connections (analog inputs/outputs, digital input/outputs) made at the CFW-11 control board CC11 terminal strip XC1 for a load cell center winder or unwinder in torque mode in the default configuration, i.e., with the parameter P1027 in 1 (load cell via AI1), P1029 in 5 (web tension setpoint via HMI (P1011)), P1030 in 0 (do not use this control mode) and P1032 in 0 (do not use this control mode).



XC1 Terminal Strip		Default Function for Load Cell Center Winder or Unwinder
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (0-10 V): Web tension (load cell)
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): No function
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: Motor current
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VCC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Enable winder
16	DI2	Digital input 2: Web direction
17	DI3	Digital input 3: Machine running
18	DI4	Digital input 4: Web presence
19	DI5	Digital input 5: Increase EP setpoint
20	DI6	Digital input 6: Decrease EP setpoint
21	NF1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NA1	
24	NF2	Digital output 2 DO2 (RL2): Winder enabled
25	C2	
26	NA2	
27	NF3	Digital output 3 DO3 (RL3): No function
28	C3	
29	NA3	

Figure 2.8 – Terminal strip XC1 in torque mode

NOTE!
Refer to the CFW-11 frequency inverter manual for more information on the connections.

2.3 SPEED MODE

2.3.1 Control Block Diagram

The control strategy for a center winder in speed mode is based on synchronism the line speed with the surface winder speed through the relationship between the roll diameter and the motor speed added the web tension control done through a PID controller that increases or decreases the winder speed as the signal measured by the load cell.

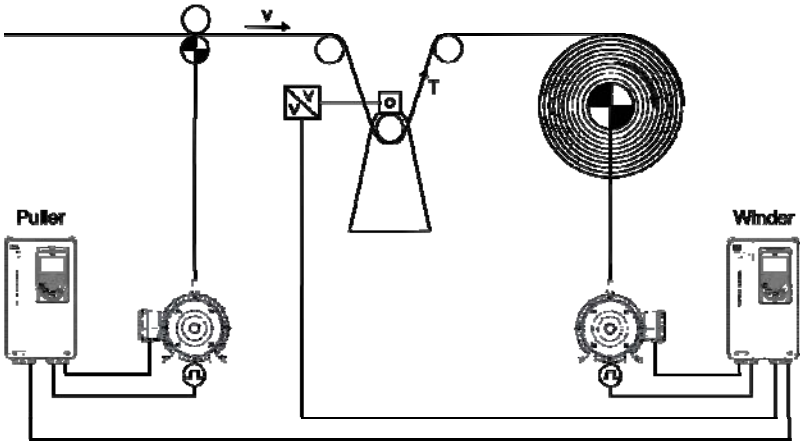


Figure 2.9 – Load cell center winder in speed mode

The control strategy for a center unwinder in speed mode is based on synchronism the line speed with the surface unwinder speed through the relationship between the roll diameter and the motor speed least the web tension control done through a PID controller that increases or decreases the unwinder speed as the signal measured by the load cell. Through this it is possible to hold, brake the web to be unwinded. Right now, the drive will return power to the DC link; the DC link must be controlled via a braking resistor or via interconnection with other DC link inverters or by a regenerative inverter.

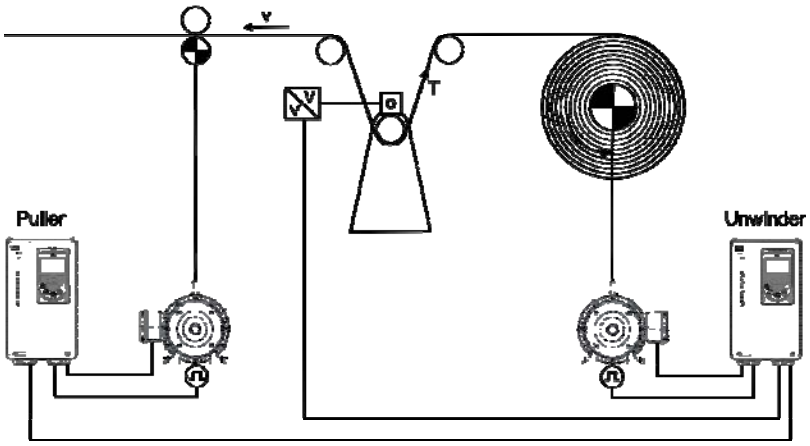


Figure 2.10 – Load cell center unwinder in speed mode

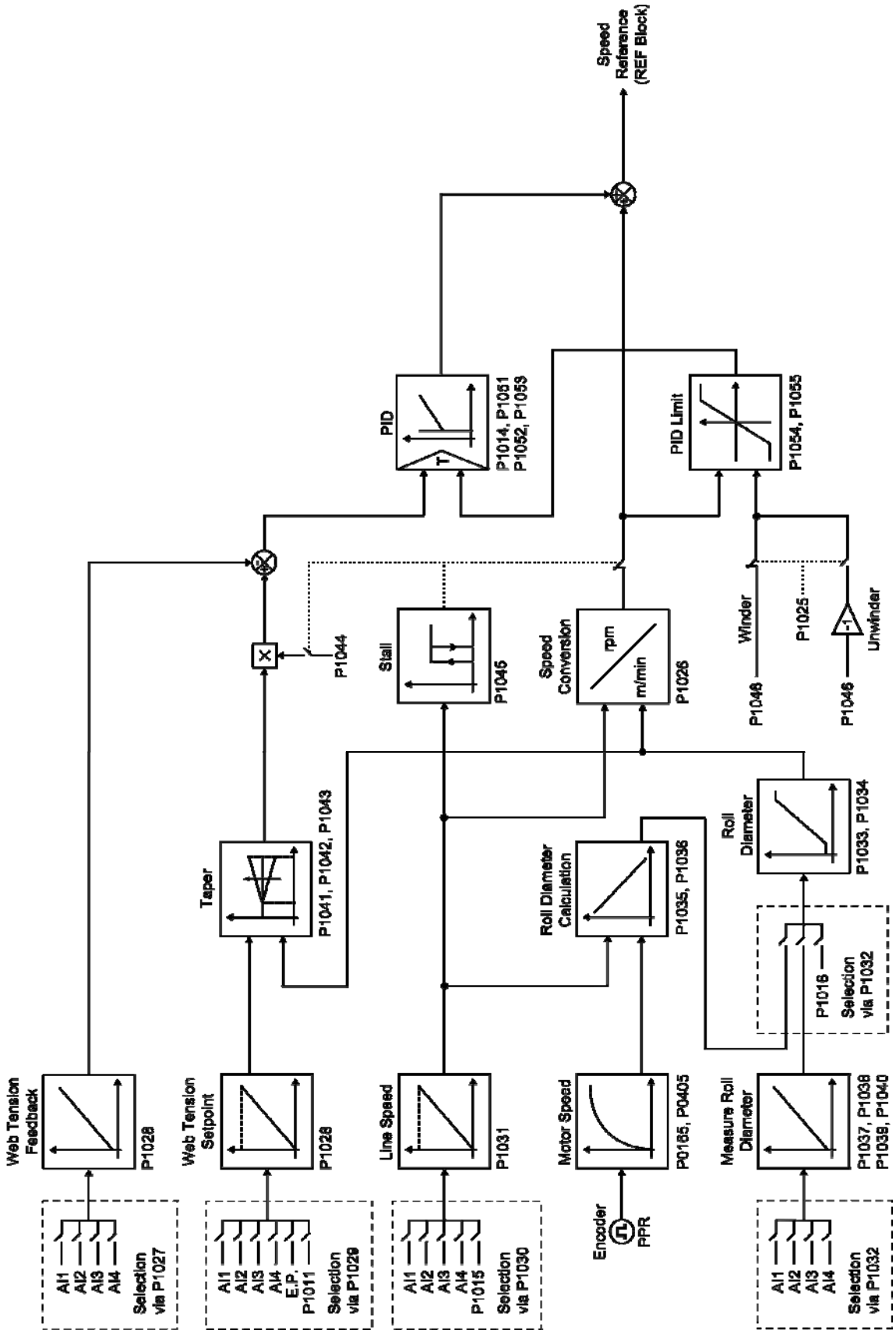
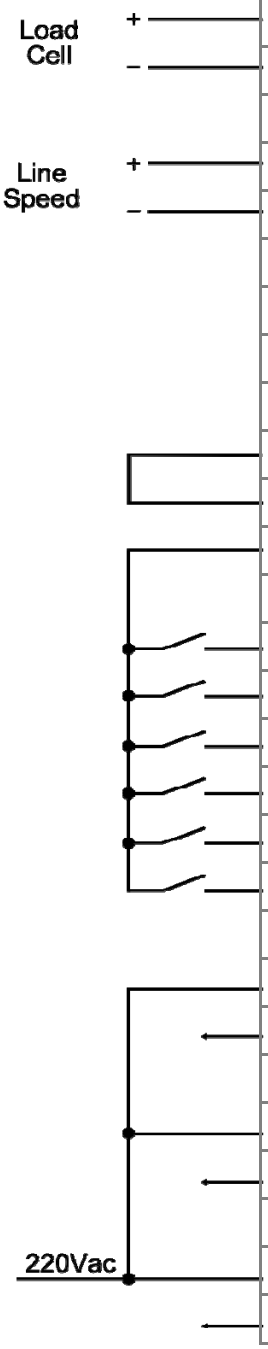


Figure 2.11 – Control block diagram in speed mode

NOTE!
Refer to chapter 5 for the parameter description.

2.3.2 Control Connections

The control connections (analog inputs/outputs, digital input/outputs) made at the CFW-11 control board CC11 terminal strip XC1 for a load cell center winder or unwinder in speed mode in the default configuration, i.e., with the parameter P1027 in 1 (load cell via AI1), P1029 in 5 (web tension setpoint via HMI (P1011)), P1030 in 2 (line speed via AI2) and P1032 in 5 (roll diameter calculation).



XC1 Terminal Strips		Default Function for Load Cell Center Winder or Unwinder
1	REF+	Positive reference for potentiometer
2	AI1+	Analog input 1 (0-10 V): Web tension (load cell)
3	AI1-	
4	REF-	Negative reference for potentiometer
5	AI2+	Analog input 2 (0-10 V): Line speed
6	AI2-	
7	AO1	Analog output 1: Motor speed
8	AGND	
9	AO2	Analog output 2: Motor current
10	AGND	
11	DGND	Reference (0 V) for the 24 VDC power supply
12	COM	Common point of the digital inputs
13	24VCC	24 VDC power supply
14	COM	Common point of the digital inputs
15	DI1	Digital input 1: Enable winder
16	DI2	Digital input 2: Web direction
17	DI3	Digital input 3: Diameter reset
18	DI4	Digital input 4: Web presence
19	DI5	Digital input 5: Increase EP setpoint
20	DI6	Digital input 6: Decrease EP setpoint
21	NF1	Digital output 1 DO1 (RL1): No fault
22	C1	
23	NA1	
24	NF2	Digital output 2 DO2 (RL2): Winder enabled
25	C2	
26	NA2	
27	NF3	Digital output 3 DO3 (RL3): No function
28	C3	
29	NA3	

Figure 2.12 – Terminal strip XC1 in speed mode

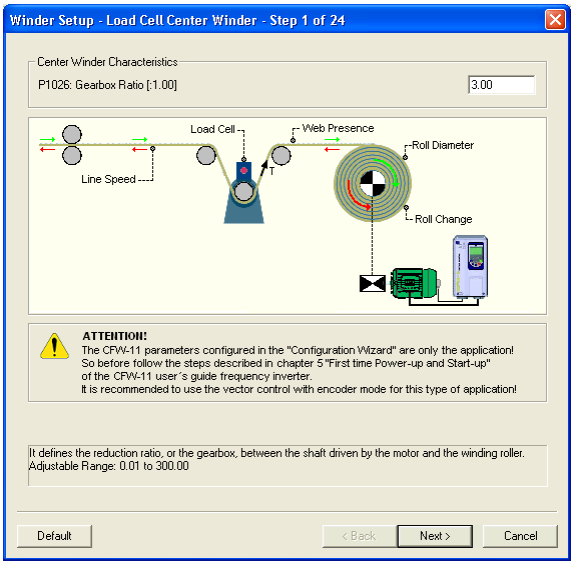
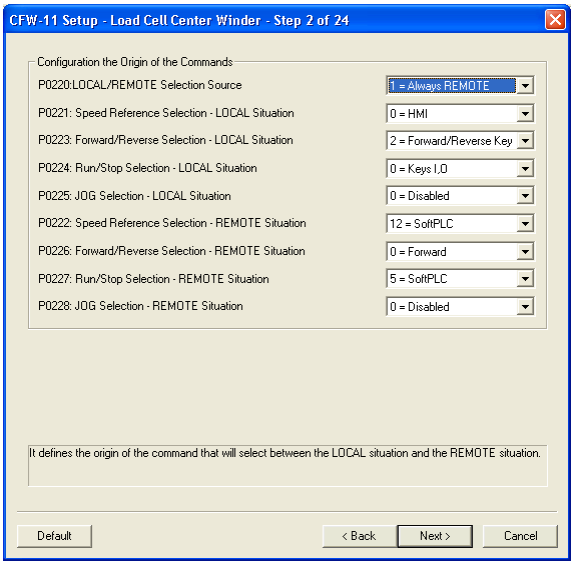
NOTE!
Refer to the CFW-11 frequency inverter manual for more information on the connections.

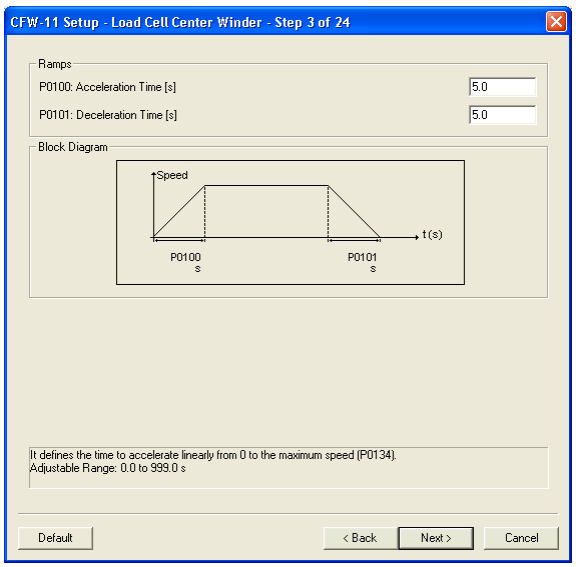
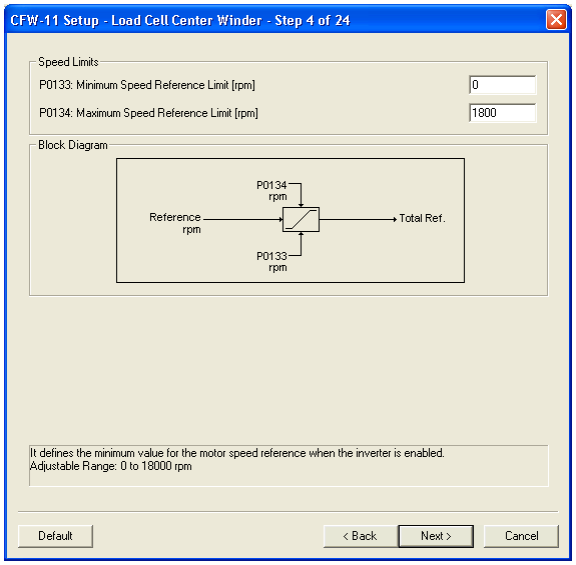
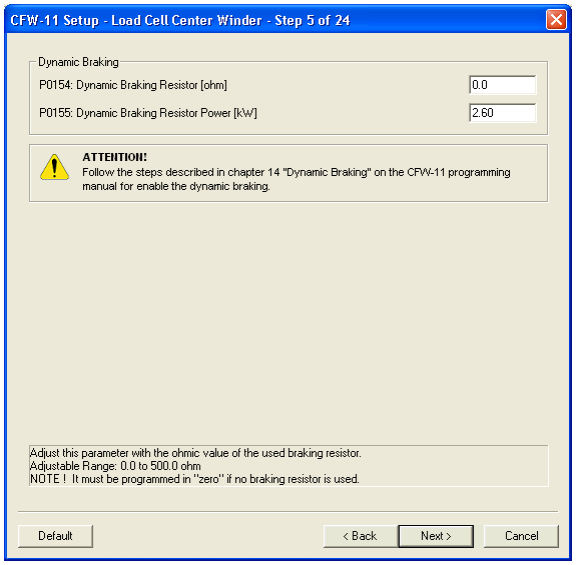
3 WLP APPLICATIVE CONFIGURATION

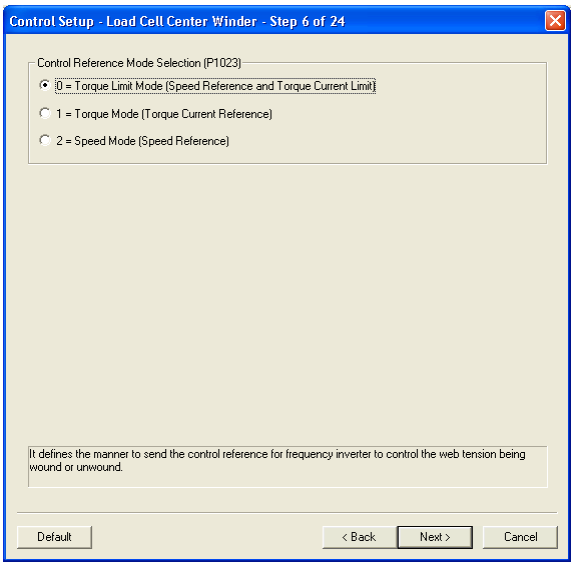
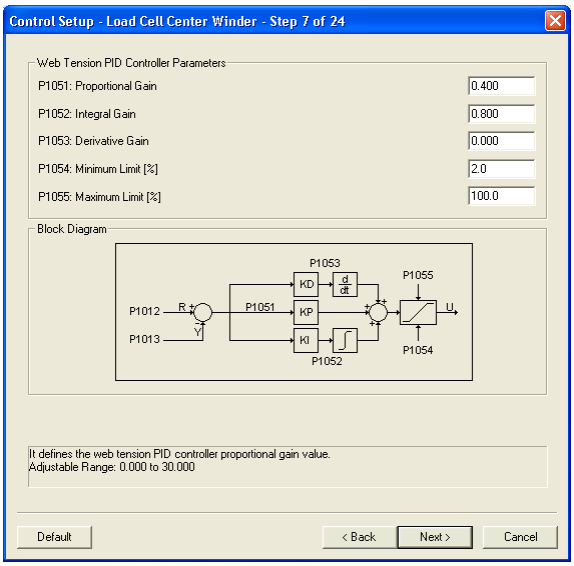
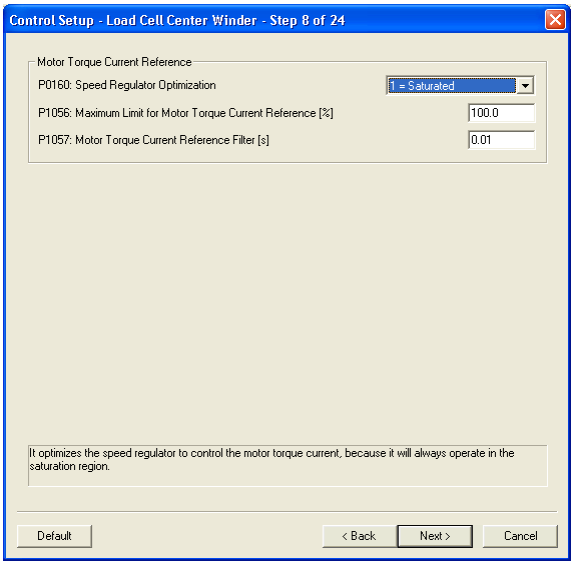
Through the WLP it is possible to create and configure the applicative for a load cell center winder or unwinder. Refer to the help topics in the WLP programming software for more details on how to create an applicative. The configuration of the applicative is done with the load cell center winder configuration wizard, which consists of an oriented step by step guide for the configuration of the parameters regarding the application.

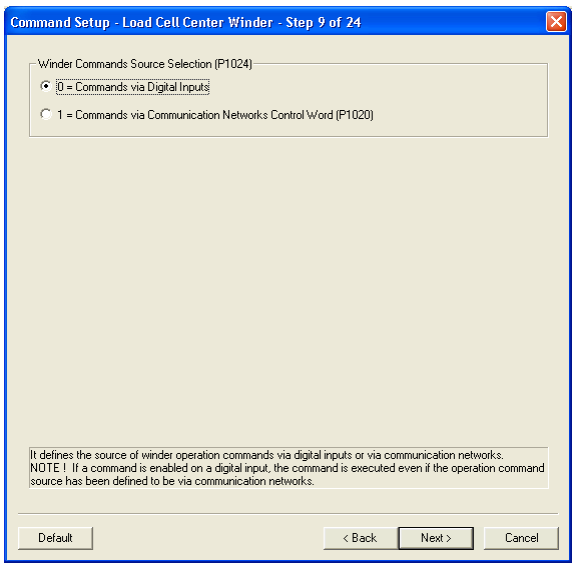
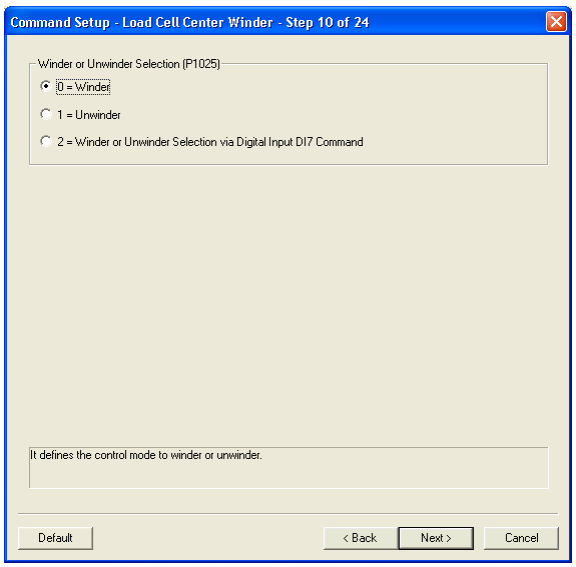
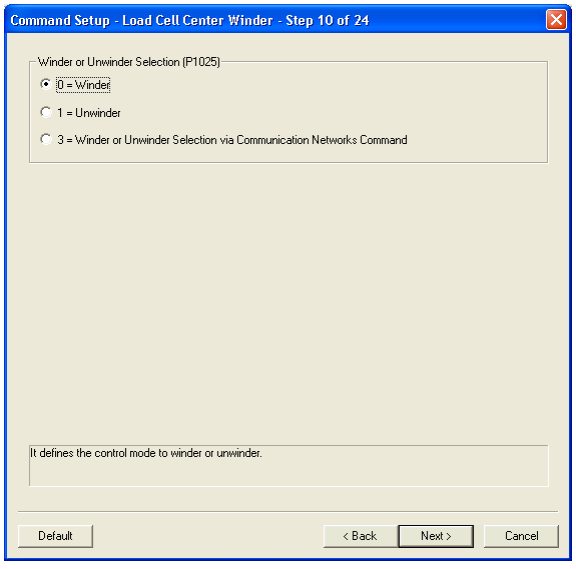
NOTE!
When powering up the inverter for the first time follow the steps described in the chapter 5 “First Time Power-up and Start-up” of the CFW-11 frequency inverter manual.
It is recommended to use the vector control with encoder mode for this type of application!

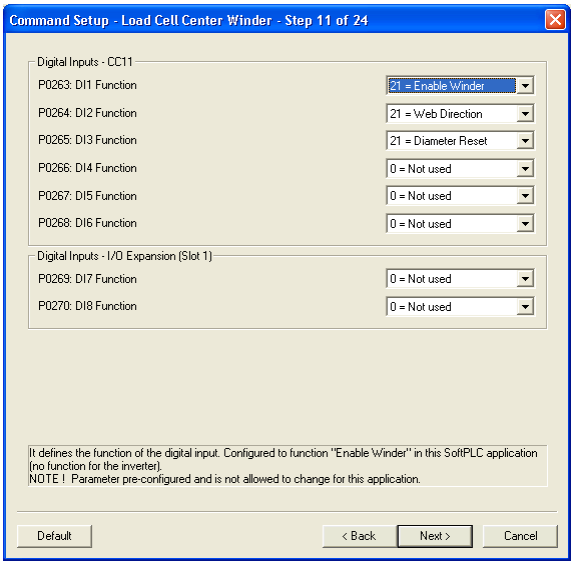
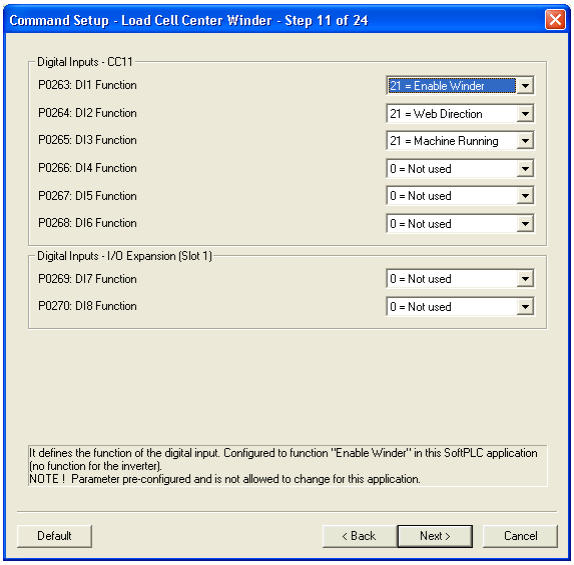
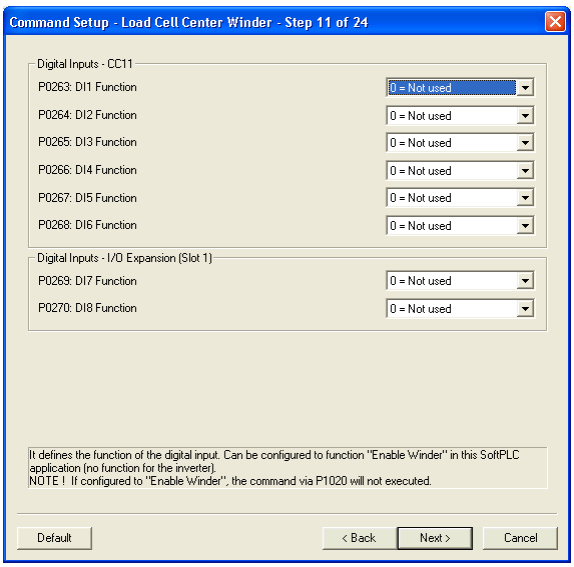
Table 3.1 – Load cell center winder or unwinder configuration wizard

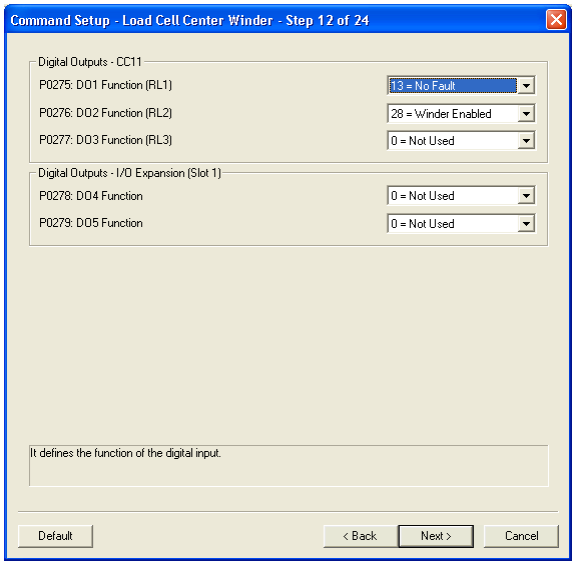
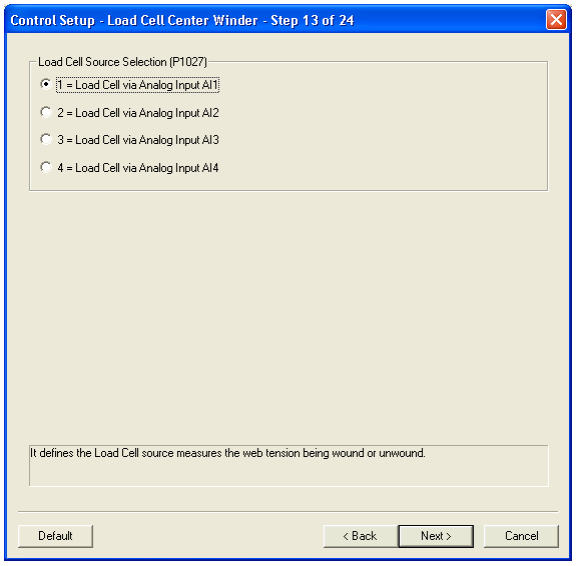
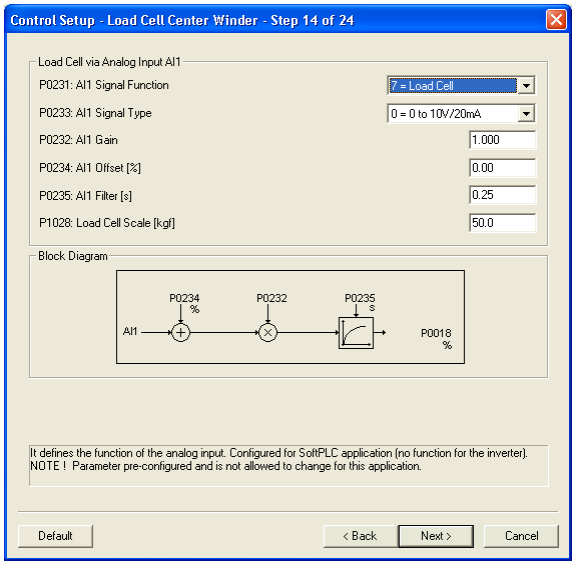
Step	Description	WLP Configuration Wizard
1	It presents the parameters for the configuration of the load cell center winder characteristics: P1026: Gearbox Ratio	
2	It presents the parameters for the configuration the origin of the commands: P0220: Local/Remote Selection Source P0221: Speed Reference Selection - Local Situation P0223: Forward/Reverse Selection - Local Situation P0224: Run/Stop Selection - Local Situation P0225: JOG Selection - Local Situation P0222: Speed Reference Selection - Remote Situation P0226: Forward/Reverse Selection - Remote Situation P0227: Run/Stop Selection - Remote Situation P0228: JOG Selection - Remote Situation	

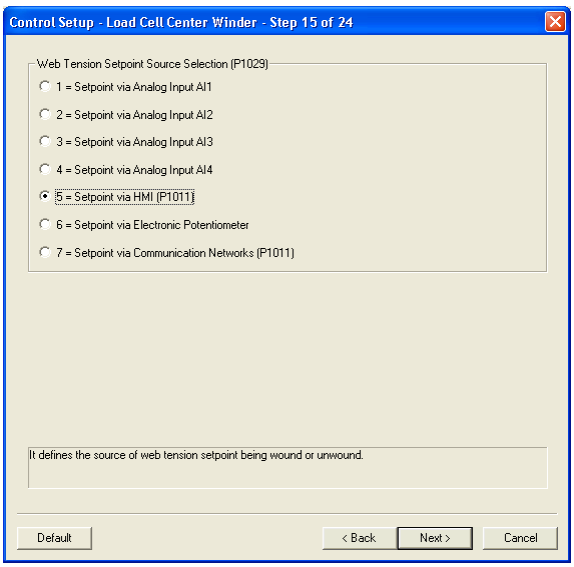
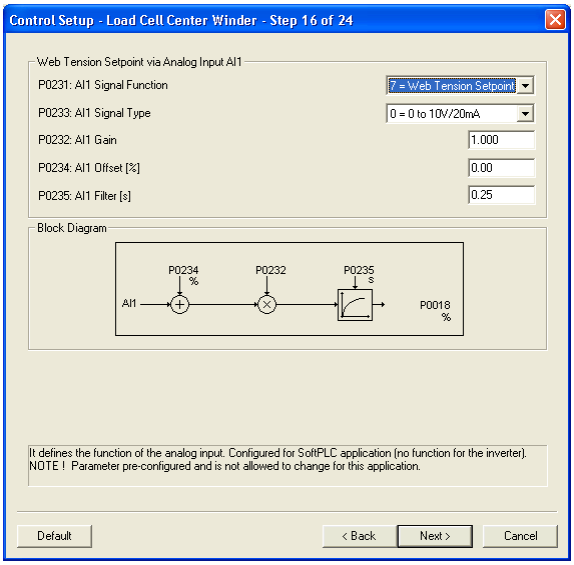
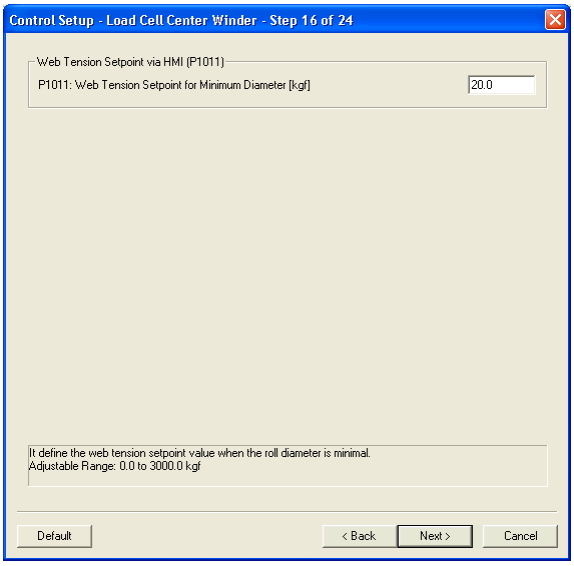
3	It presents the parameters for the configuration of the CFW-11 ramps: P0100: Acceleration Time P0101: Deceleration Time	
4	It presents the parameters for the configuration of the CFW-11 speed limits: P0133: Minimum Speed Reference Limit P0134: Maximum Speed Reference Limit	
5	It presents the parameters for the configuration of the CFW-11 dynamic braking: P0154: Dynamic Braking Resistor P0155: Dynamic Braking Resistor Power	

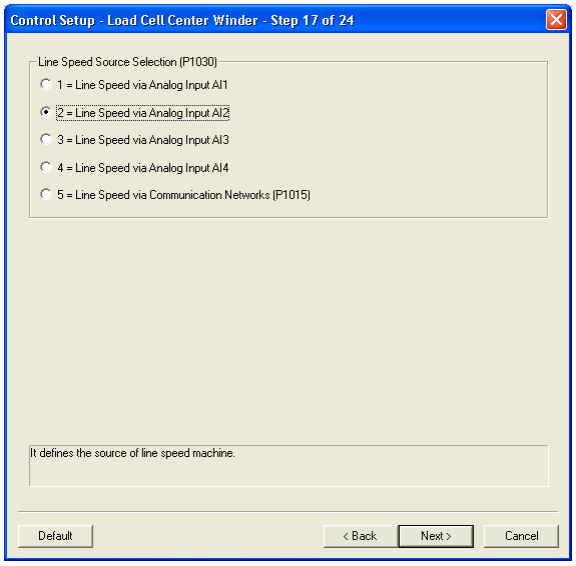
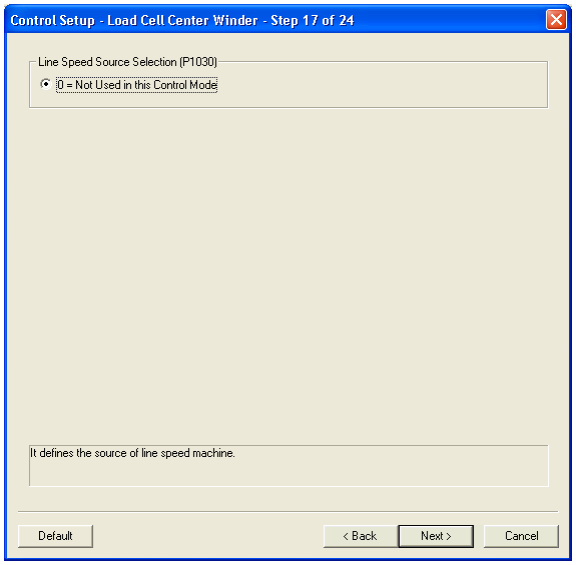
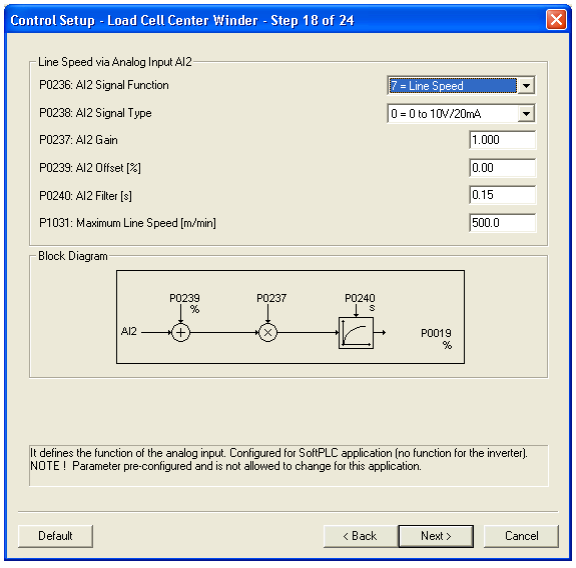
6	It presents the parameter for selecting the mode of sending the control reference for inverter control the web tension being wound or unwound: P1023: Control Reference Mode Selection	
7	It presents the parameters for the configuration of the web tension PID controller of the center winder: P1051: Proportional Gain P1052: Integral Gain P1053: Derivative Gain P1054: Minimum Limit P1055: Maximum Limit	
8	It presents the parameters for the configuration of the motor torque current reference: P0160: Speed Regulator Optimization P1056: Maximum Limit for Motor Torque Current Reference P1057: Motor Torque Current Reference Filter	

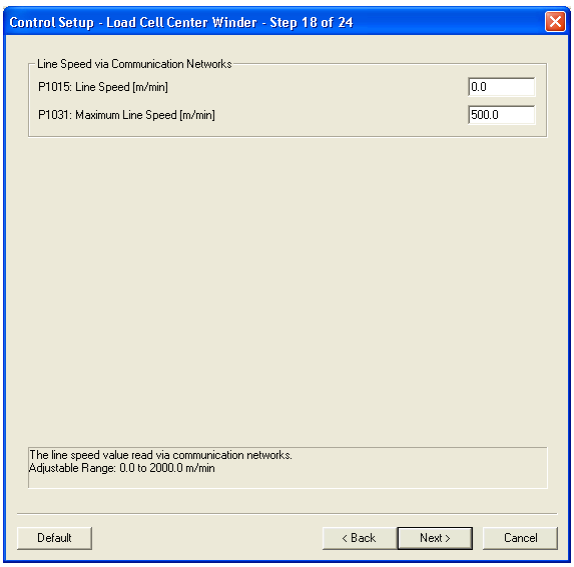
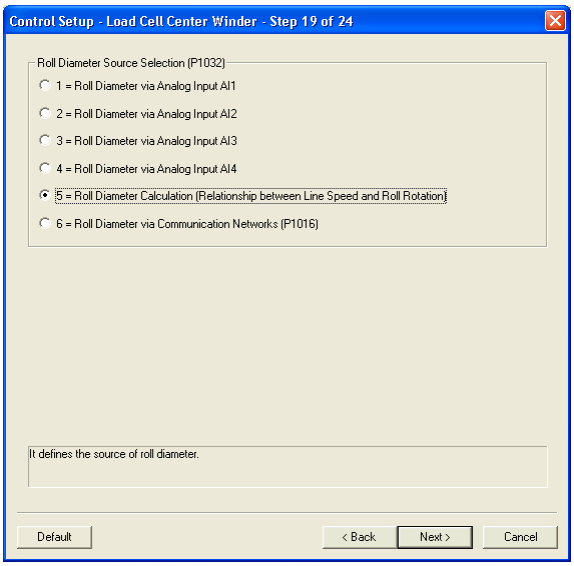
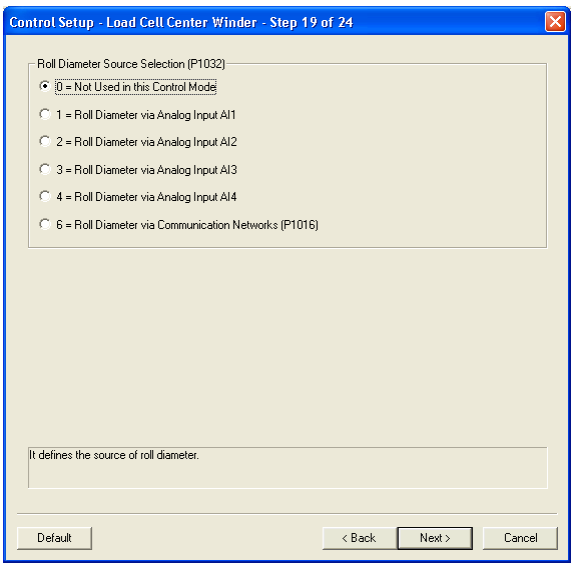
9	It presents the parameter for selecting the source of winder or unwinder operation commands: P1024: Winder Commands Source Selection	
10 - 0	It presents the parameter for selecting the winder or unwinder operation when the operation commands are via digital inputs: P1025: Winder or Unwinder Selection	
10 - 1	It presents the parameter for selecting the winder or unwinder operation when the operation commands are via communication networks: P1025: Winder or Unwinder Selection	

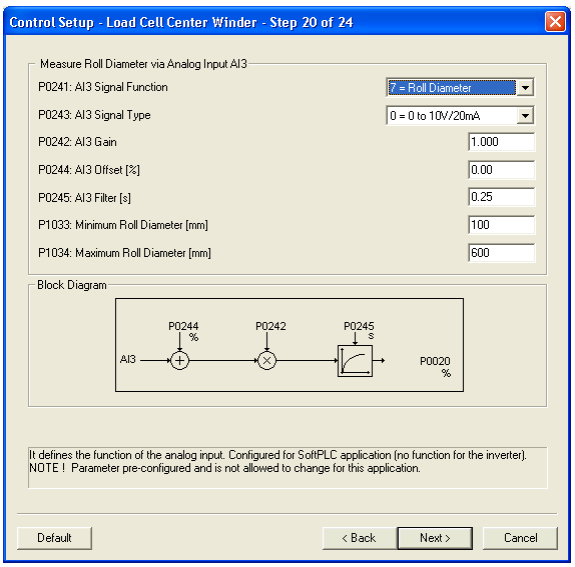
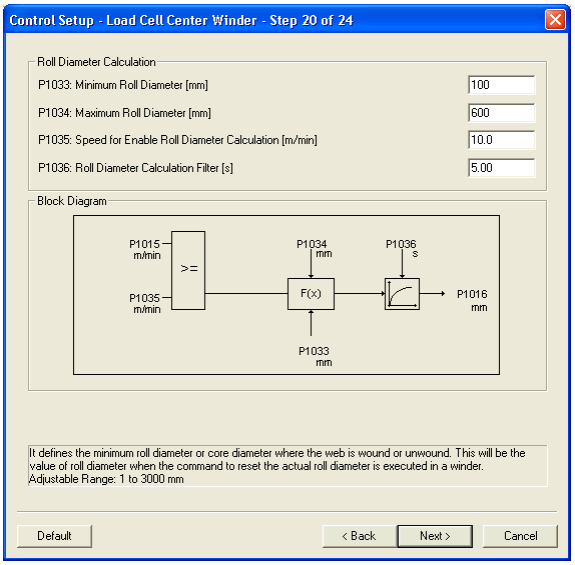
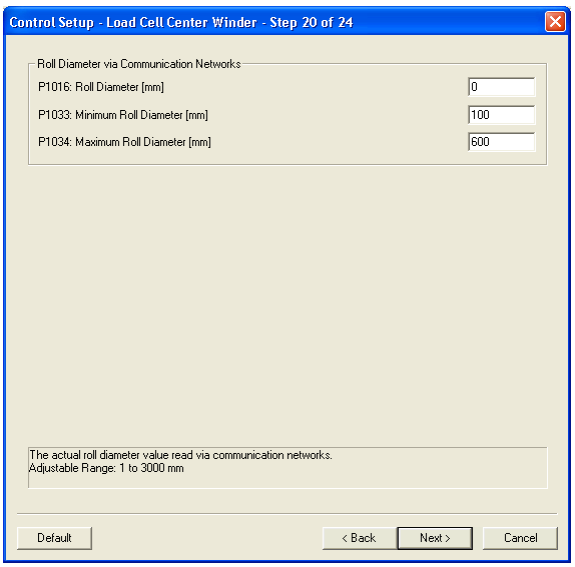
11 - 0	It presents the parameters for the configuration of the command functions via the CFW-11 digital inputs when the operation commands are via digital inputs (torque limit mode and speed mode): P0263: DI1 Function P0264: DI2 Function P0265: DI3 Function P0266: DI4 Function P0267: DI5 Function P0268: DI6 Function P0269: DI7 Function P0270: DI8 Function	
11 - 1	It presents the parameters for the configuration of the command functions via the CFW-11 digital inputs when the operation commands are via digital inputs (torque mode): P0263: DI1 Function P0264: DI2 Function P0265: DI3 Function P0266: DI4 Function P0267: DI5 Function P0268: DI6 Function P0269: DI7 Function P0270: DI8 Function	
11 - 2	It presents the parameters for the configuration of the command functions via the CFW-11 digital inputs when the operation commands are via communication network: P0263: DI1 Function P0264: DI2 Function P0265: DI3 Function P0266: DI4 Function P0267: DI5 Function P0268: DI6 Function P0269: DI7 Function P0270: DI8 Function	

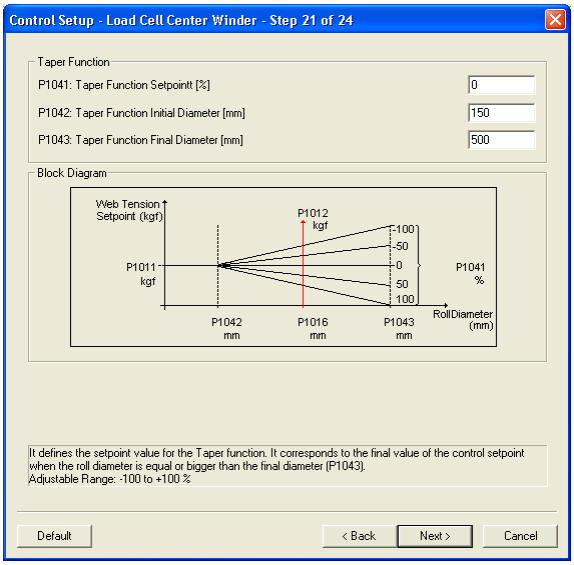
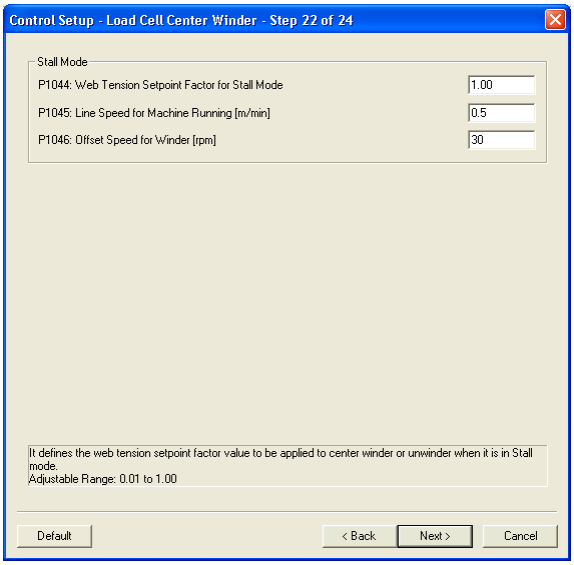
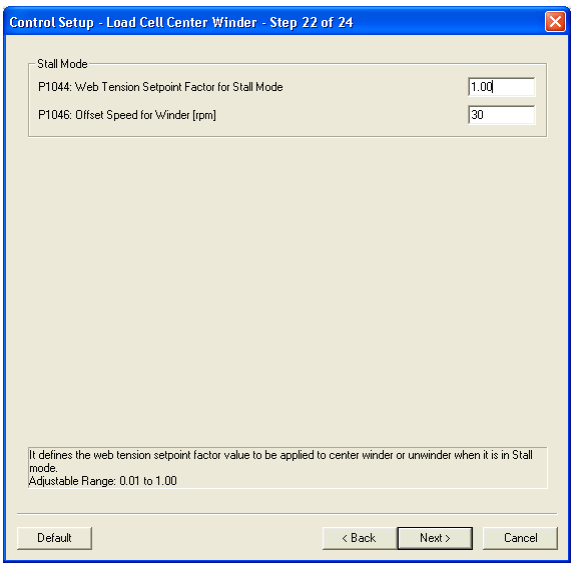
12	It presents the parameters for the configuration of the command functions via the CFW-11 digital outputs: P0275: DO1 Function (RL1) P0276: DO2 Function (RL2) P0277: DO3 Function (RL3) P0278: DO4 Function P0279: DO5 Function	
13	It presents the parameter for selecting the source of load cell (web tension feedback): P1027: Load cell Source Selection	
14 - 1 to 14 - 4	It presents the parameters for the configuration of the load cell (web tension feedback) reading via analog input AI1, AI2, AI3 or AI4: P0231, P0236, P0241 and P0246: AI1, AI2, AI3 and AI4 Signal Function P0233, P0238, P0243 and P0248: AI1, AI2, AI3 and AI4 Signal Type P0232, P0237, P0242 and P0247: AI1, AI2, AI3 and AI4 Gain P0234, P0239, P0244 and P0249: AI1, AI2, AI3 and AI4 Offset P0235, P0240, P0245 and P0250: AI1, AI2, AI3 and AI4 Filter P1028: Load Cell Scale	

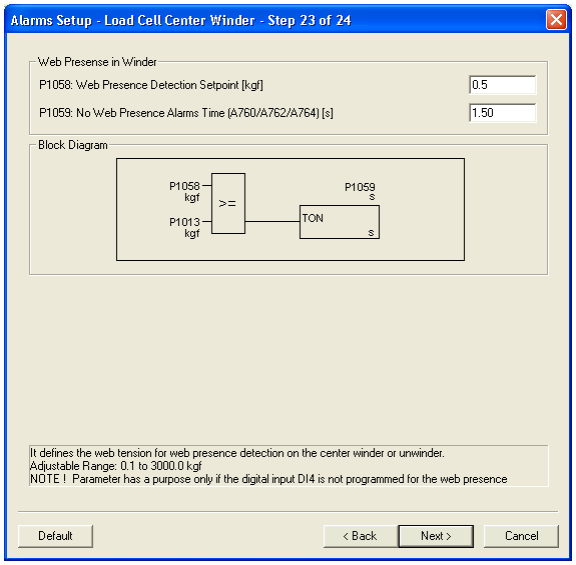
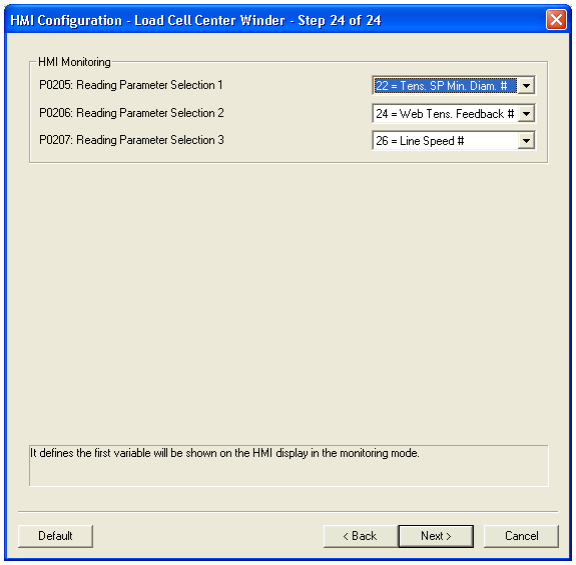
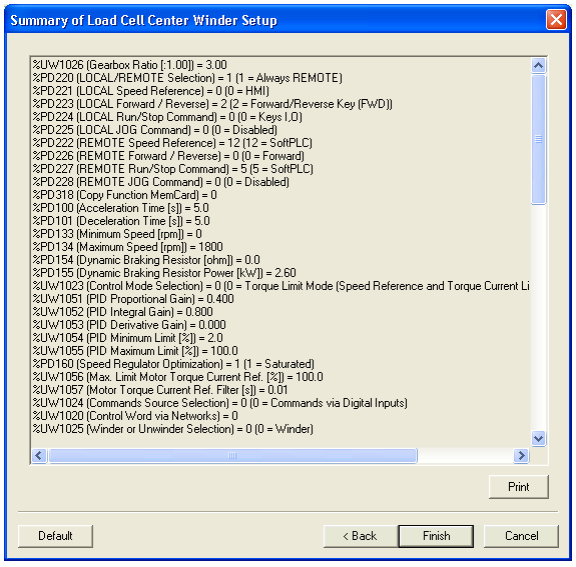
15	It presents the parameter for selecting the source of web tension setpoint: P1029: Web Tension Setpoint Source Selection	
16 - 1 to 16 - 4	It presents the parameters for the configuration of the web tension setpoint reading via analog input AI1, AI2, AI3 or AI4: P0231, P0236, P0241 and P0246: AI1, AI2, AI3 and AI4 Signal Function P0233, P0238, P0243 and P0248: AI1, AI2, AI3 and AI4 Signal Type P0232, P0237, P0242 and P0247: AI1, AI2, AI3 and AI4 Gain P0234, P0239, P0244 and P0249: AI1, AI2, AI3 and AI4 Offset P0235, P0240, P0245 and P0250: AI1, AI2, AI3 and AI4 Filter	
16 - 5 to 16 - 7	It presents the parameter for the configuration of the web tension setpoint via HMI, electronic potentiometer (E.P.) or communication networks: P1011: Web Tension Setpoint for Minimum Diameter	

17 - 0	It presents the parameter for selecting the source of line speed (torque limit mode and speed mode): P1030: Line Speed Source Selection	
17 - 1	It presents the parameter for selecting the source of line speed (torque mode): P1030: Line Speed Source Selection	
18 - 1 to 18 - 4	It presents the parameters for the configuration of the line speed reading via analog input AI1, AI2, AI3 or AI4 (torque limit mode and speed mode): P0231, P0236, P0241 and P0246: AI1, AI2, AI3 and AI4 Signal Function P0233, P0238, P0243 and P0248: AI1, AI2, AI3 and AI4 Signal Type P0232, P0237, P0242 and P0247: AI1, AI2, AI3 and AI4 Gain P0234, P0239, P0244 and P0249: AI1, AI2, AI3 and AI4 Offset P0235, P0240, P0245 and P0250: AI1, AI2, AI3 and AI4 Filter P1031: Maximum Line Speed	

18 - 5	It presents the parameters for the configuration of the line speed via communication networks (torque limit mode and speed mode): P1015: Line Speed P1031: Maximum Line Speed	
19 - 0	It presents the parameter for selecting the source of roll diameter (torque limit mode and speed mode): P1032: Roll Diameter Source Selection	
19 - 1	It presents the parameter for selecting the source of roll diameter (torque mode): P1032: Roll Diameter Source Selection	

20 - 1 to 20 - 4	It presents the parameters for the configuration of the roll diameter reading via analog input AI1, AI2, AI3 or AI4: P0231, P0236, P0241 and P0246: AI1, AI2, AI3 and AI4 Signal Function P0233, P0238, P0243 and P0248: AI1, AI2, AI3 and AI4 Signal Type P0232, P0237, P0242 and P0247: AI1, AI2, AI3 and AI4 Gain P0234, P0239, P0244 and P0249: AI1, AI2, AI3 and AI4 Offset P0235, P0240, P0245 and P0250: AI1, AI2, AI3 and AI4 Filter P1033: Minimum Roll Diameter P1034: Maximum Roll Diameter	
20 - 5	It presents the parameters for the configuration of the roll diameter calculation (torque limit mode and speed mode): P1033: Minimum Roll Diameter P1034: Maximum Roll Diameter P1035: Speed for Enable Roll Diameter Calculation P1036: Roll Diameter Calculation Filter	
20 - 6	It presents the parameters for the configuration of the roll diameter via communication networks: P1016: Roll Diameter P1033: Minimum Roll Diameter P1034: Maximum Roll Diameter	

21	It presents the parameters for the configuration of the center winder Taper function: P1041: Taper Function Setpoint P1042: Taper Function Initial Diameter P1043: Taper Function Final Diameter	
22 - 0	It presents the parameters for the configuration of the stall mode (torque limit mode and speed mode): P1044: Web Tension Setpoint Factor for Stall Mode P1045: Line Speed for Machine Running P1046: Offset Speed for Winder	
22 - 1	It presents the parameters for the configuration of the stall mode (torque mode): P1044: Web Tension Setpoint Factor for Stall Mode P1046: Offset Speed for Winder	

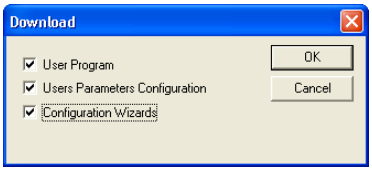
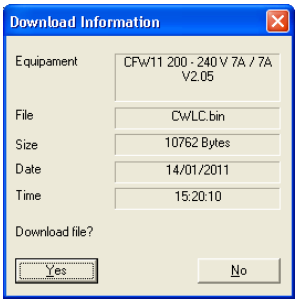
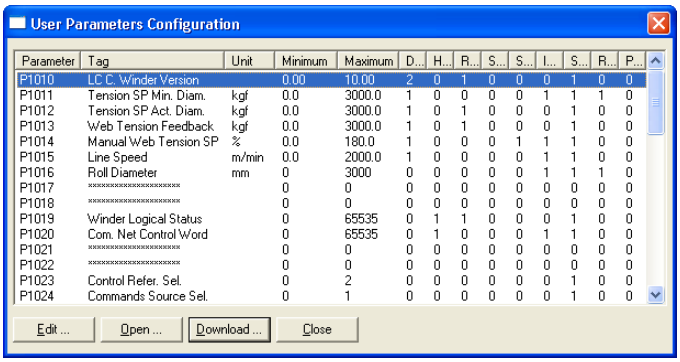
23	It presents the parameters for web presence in winder: P1058: Web Presence Detection Setpoint P1059: No Web Presence Alarms Time (A760 / A762 / A764)	
24	It presents the parameters that define which variables will be shown on the HMI display in the monitoring mode: P0205: Reading Parameter Selection 1 P0206: Reading Parameter Selection 2 P0207: Reading Parameter Selection 3	
	It presents a summary with all the parameters configured by the load cell center winder configuration wizard	

4 WLP APPLICATIVE DOWNLOAD

After the conclusion of the load cell center winder applicative configuration, it becomes necessary to download the applicative to the CFW-11 frequency inverter SoftPLC function. Then, after finishing the configuration wizard, the download dialog box will be showed, as presented below.

NOTE!
Refer to the help topics in the WLP programming software for more details on the download.

Table 4.1 – Load cell center winder or unwinder download dialog box

Description	WLP Download Dialog Box
Download dialog box of the applicative developed with the WLP containing the following options: ■ User Program; ■ Configuration of the User Parameters; ■ Configuration Wizards.	
User program download dialog box containing: ■ Characteristics of the connected equipment; ■ Name of the file to be downloaded; ■ Size of the applicative to be downloaded; ■ File compilation date; ■ File compilation hour; ■ Command to transfer or not the compiled applicative.	
Configuration of the user parameters dialog box containing: ■ Parameter number; ■ Name given to the parameter by the user; ■ Unit given to the parameter by the user; ■ Minimum and maximum values; ■ Number of decimal positions; ■ Options for visualization in hexadecimal format, with sign, ignoring the password, visualization on the HMI, retentive and for change confirmation; ■ Commands for opening, editing, performing the download and for closing the dialog box of the user parameters.	
Dialog box for the download of the values configured with the load cell center winder configuration wizard.	

5 PARAMETERS DESCRIPTION

The CFW-11 as well as the SoftPLC function parameters for the load cell center winder or unwinder application in torque limit mode, torque mode and speed mode will be presented next.

NOTE!
The adjustable range of the CFW-11 parameters has been customized for the center winder application. Refer to the CFW-11 programming manual for more details on the parameters.

Symbols for the Parameter Proprieties Description:

RO Read-only parameter
RW Read and write parameter
CFG Configuration parameter, value can be programmed only with motor stopped
Vector Available when a vector control mode is chosen

5.1 CENTER WINDER CHARACTERISTICS

This group of parameters allows the user to configure the winder mechanic characteristics that are necessary to control its speed.

P1026 – Gearbox Ratio

Adjustable Range:	0.01 to 300.00	**Factory Setting:**	3.00
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS └ 50 SoftPLC		

Description:
This parameter defines the reduction ratio, or the gearbox, existent between the shaft driven by the motor and the winding roller, always respecting the ratio of x to 1,00, i.e., for x revolutions of the shaft driven by the motor we have one revolution of the winding roller.

5.2 ORIGIN OF THE COMMANDS

This group of parameters allows the user to configure the origin of the CFW-11 inverter commands. For this application the control of the inverter in LOCAL situation is done by the HMI, and in REMOTE situation it is done via SoftPLC function.

LOCAL Situation:
It allows the user to command the winder driven by the CFW-11 inverter disregarding the control logics.

REMOTE Situation:
It enables the load cell center winder control logics, according to the programming performed by the user.

P0220 – LOCAL/REMOTE Selection Source

P0221 – Speed Reference Selection – LOCAL Situation

P0222 – Speed Reference Selection – REMOTE Situation

P0223 – FORWARD/REVERSE Selection - LOCAL Situation

P0226 – FORWARD/REVERSE Selection - REMOTE Situation

P0224 – Run/Stop Selection – LOCAL Situation

P0227 – Run/Stop Selection – REMOTE Situation

P0225 – JOG Selection – LOCAL Situation

P0228 – JOG Selection – REMOTE Situation

NOTE!
Refer to the CFW-11 programming manual for more information on the command origin parameters. Some parameter options have been removed from the configuration wizard.

5.3 RAMPS

This group of parameters allows the user to adjust the inverter ramps, so that the motor be accelerated or decelerated in a faster or in a slower manner.

P0100 – Acceleration Time

Adjustable Range:	0.0 to 999.9 s	**Factory Setting:**	5.0 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 20 Ramps		

Description:
This parameter defines the time to accelerate lineally from 0 to the maximum speed (defined in P0134).

P0101 – Deceleration Time

Adjustable Range:	0.0 to 999.9 s	**Factory Setting:**	5.0 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 20 Ramps		

Description:
This parameter defines the time to decelerate lineally from the maximum speed (defined in P0134) down to 0. It is the ramp value used when the winder or unwinder is disabled for the operation, for example, by the winder without web alarm (A760).

NOTE!
Refer to the CFW-11 programming manual for more information on the ramp parameters.

5.4 SPEED LIMITS

This group of parameters allows the user to configure the motor speed limits.

P0133 – Minimum Speed Reference Limit

Adjustable Range:	0 to 18000 rpm	**Factory Setting:**	0 rpm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 22 Speed Limits		

Description:
This parameter defines the minimum value for the motor speed reference when the inverter is enabled.

P0134 – Maximum Speed Reference Limit

Adjustable Range:	0 to 18000 rpm	**Factory Setting:**	1800 rpm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 22 Speed Limits		

Description:
This parameter defines the maximum value for the motor speed reference when the inverter is enabled. It is the value used to generate the winder over speed alarm (A766).

NOTE!
Refer to the CFW-11 programming manual for more information on the speed limit parameters.

5.5 DYNAMIC BRAKING

This group of parameters allows the user to configure the use of dynamic braking is required to web tension control in an unwinders and / or control the sttoping on the roll in a winder.

P0154 – Dynamic Braking Resistor

P0155 – Dynamic Braking Resistor Power

NOTE!
Refer to the CFW-11 programming manual for more information on the dynamic braking parameters.

5.6 WINDER CONTROL CONFIGURATION

This group of parameters allows the user to configure the control of load cell center winder or unwinder.

P1023 – Control Reference Mode Selection

Adjustable Range:	0 = Torque Limit Mode (Speed Ref. and Torque Current Limit) 1 = Torque Mode (Torque Currente Reference) 2 = Speed Mode (Speed Refererence)	**Factory Setting:**	0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the manner to send the control reference for frequency inverter to control the web tension being wound or unwound.

Table 5.1 – Description of the control reference mode

P1023	Description
0	It is based on synchronism the winder speed with the line speed and in the web tension required, defines that the frequency inverter will receive the speed reference and torque current limit to control de web tension.
1	It is based only in the web tension required, defines that the frequency inverter will receive only the torque current reference to control de web tension.
2	It is based on synchronism the winder speed with the line speed and in the web tension required, defines that the frequency inverter will receive only the speed reference to control de web tension.

P1024 – Winder Commands Source Selection

Adjustable Range:	0 = Commands via Digital Inputs 1 = Commands via Communication Networks Control Word	**Factory Setting:**	0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the source of winder operation commands.

Table 5.2 – Description of the winder commands source

P1024	Description
0	It defines that the winder operation commands will be done via frequency inverter digital inputs.
1	It defines that the winder operation commands will be done via the control word of the communicatin network by writing in the P1020 parameter.

NOTE!
If a command is enabled on a digital input, it will have priority over the command via communication networks, i.e., the command is executed even if the operation command source has been defined to be via communication networks

P1025 – Winder or Unwinder Selection

Adjustable Range:	0 = Winder 1 = Unwinder 2 = Winder or Unwinder Selection via Digital Input DI7 Command 3 = Winder or Unwinder Selection via Communication Networks Command	**Factory Setting:**	0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the control mode to winder or unwinder.

Table 5.3 – Descrption of the winder or unwinder selection

P1025	Description
0	It defines that will operate only as winder.
1	It defines that will operate only as unwinder.
2	It defines that will operate as winder or unwinder according to the state of digital input DI7 command, where logic level "0" selects for winder and logical level "1" selects for unwinder.
3	It defines that will operate as winder or unwinder according to the state of communication networks command, where logic level "0" selects for winder and logical level "1" selects for unwinder.

5.7 PID CONTROLLER

This parameter group allows the user to adjust the gains and limits of the PID controller for the web tension control.

NOTE!
The PID controller of the standard load cell center winder applicative is of the parallel type. The change of the type will lead to alterations in the controller gain values that must be done by the user.

P1014 – Web Tension Setpoint for PID Controller in Manual Mode

Adjustable Range:	0.0 to 180.0 %	**Factory Setting:**	0.0 %
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of the web tension setpoint when the PID is the selected to control in manual mode. It acts directly on the motor torque current limitation.

P1051 – Proportional Gain

Adjustable Range:	0.000 to 30.000	**Factory Setting:**	P1023 = 0: 0.400 P1023 = 1: 0.400 P1023 = 2: 0.250
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the web tension PID controller proportional gain value.

P1052 – Integral Gain

Adjustable Range:	0.000 to 30.000	**Factory Setting:**	P1023 = 0: 0.800 P1023 = 1: 0.800 P1023 = 2: 0.500
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the web tension PID controller integral gain value.

P1053 – Derivative Gain

Adjustable Range:	0.000 to 30.000	**Factory Setting:**	P1023 = 0: 0.000 P1023 = 1: 0.000 P1023 = 2: 0.050
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the web tension PID controller derivative gain value.

P1054 – Minimum Limit

Adjustable Range:	-100.0 to 180.0 %	**Factory Setting:**	P1023 = 0: 2.0% P1023 = 1: 2.0% P1023 = 2: -10.0%
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the minimum limit value of the web tension PID controller action.

P1055 – Maximum Limit

Adjustable Range:	0.0 to 180.0 %	**Factory Setting:**	P1023 = 0: 100.0% P1023 = 1: 100.0% P1023 = 2: 20.0%
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the maximum limit value of the web tension PID controller action.

NOTE!
The web tension PID controller has been configured to generate a motor torque current limitation according to the block diagram presented in the section 2.1.1 and 2.2.1 or else as a speed reference according to the block diagram presented in section 2.3.1. The other PID block input arguments can only be changed by the ladder applicative developed with the WLP. Refer to the WLP programming software help topics for more information on the PID block.

5.8 MOTOR TORQUE CURRENT REFERENCE

This parameter group allows the user to adjust the motor torque current reference for the web tension control.

P0160 – Speed Regulator Optimization

Adjustable Range:	0 = Normal 1 = Saturated	**Factory Setting:**	P1023 = 0: 1 P1023 = 1: 1 P1023 = 2: 0
Proprieties:	CFG and Vector		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 29 Vector Control ∟ 90 Speed Regulator		

Description:
When this parameter set to 1 (saturated), optimizes the speed regulator to control the motor torque current, because it will always operate in the saturation region.

NOTE!
Refer to the CFW-11 programming manual for more information on this parameter.

P1056 – Maximum Limit for Motor Torque Current Reference

Adjustable Range:	0.0 to 180.0 %	**Factory Setting:**	P1023 = 0: 100.0% P1023 = 1: 100.0% P1023 = 2: 125.0%
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the maximum limit value for the motor torque current reference, i.e., it limits the value to be written in the torque current limits parameters P0169 and P0170.

NOTE!
Refer to the CFW-11 programming manual for more information on the parameters of the motor torque current limits P0169 and P0170.

P1057 – Motor Torque Current Reference Filter

Adjustable Range:	0.00 to 16.00 s	**Factory Setting:**	0.01 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter configures the 1st order filter time constant that will be applied to the motor torque current reference for the center winder or unwinder control.

5.9 CONTROL WORD

P1020 – Communication Networks Control Word

Adjustable Range:	0000h to FFFFh	**Factory Setting:**	0000h
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the control word to winder or unwinder when the operation command is selected for communication networks (P1024 = 1).
Each bit of this word represents a command that can be executed via communication networks.

Table 5.4 – Description of the communication networks control word

Bits	15 to 12	11	10	9	8	7	6	5	4	3	2	1	0
Function	Reserved	Save Value Point 2	Save Value Point 1	Disable Alarm A760/A762/A764	Alarm Reset	PID Automatic / Manual	Select to Winder or Unwinder	Decrease Setpoint via E.P.	Increase Setpoint via E.P.	Machine Running	Roll Diameter Reset	Web Direction	Enable Winder

Bits	Values
Bit 0 Enable Winder	**0**: Disable the winder or unwinder for the operation. It is done a stop by ramp and after the inverter is general disabled. **1**: Enable the winder or unwinder for the operation. The inverter is general enabled and running as speed direction defined.
Bit 1 Web Direction	**0**: It selects that the web direction of winder will be under the roll. **1**: It selects that the web direction of winder will be over the roll.
Bit 2 Roll Diameter Reset	**0**: No function. **1**: It executes the command to reset the actual roll diameter when the roll diameter is calculated (P1032 = 5). For winder, load the minimum roll diameter value. For unwinder, load the maximum roll diameter value.
Bit 3 Machine Running	**0**: It indicates that the machine or process is stopped. **1**: It indicates that the machine or process is running, i.e., the line speed is different from zero.
Bit 4 Increase Setpoint via E.P.	**0**: No function. **1**: Command to increase the web tension setpoint via electronic potentiometer (E.P.).
Bit 5 Decrease Setpoint via E.P.	**0**: No function. **1**: Command to decrease the web tension setpoint via electronic potentiometer (E.P.).
Bit 6 Winder or Unwinder Selection	**0**: It selects to operate as winder. **1**: It selects to operate as unwinder. **Note**: The command to change the control mode is accepted only if the winder or unwinder is disabled.
Bit 7 PID Automatic / Manual	**0**: It executes the command to web tension PID controller operate in automatic mode. **1**: It executes the command to web tension PID controller operate in manual mode.
Bit 8 Alarm Reset	**0**: No function. **1**: It executes the command to reset the alarm or fault occurred in the inverter.
Bit 9 Disable Alarms A760/A762/A764	**0**: No function. **1**: It disables the alarms thar are generated by no web presence in the winder (A760/A762/A764).

Bit 10 Save Value Point 1	0: No function. 1: It executes de command to save the AIx analog input value for calibration point 1 of the roll diameter, being this value associated to diameter for calibration point 1 (P1039).
Bit 11 Save Value Point 2	0: No function. 1: It executes de command to save the AIx analog input value for calibration point 2 of the roll diameter, being this value associated to diameter for calibration point 2 (P1040).
Bits 12 to 15	Reserved.

5.10 DIGITAL INPUTS

This parameter group allows the user to configure the command function of each digital input in the load cell center winder ladder applicative.

P0263 – DI1 Function

Adjustable Range: 0 = No Function; 2 = General Enable; 19 = No External Fault; 20 = Reset; 21 = Enable Winder (PLC Use)

Factory Setting: P1024 = 0: 21; P1024 = 1: 0

Proprieties:

Access groups via HMI:
01 PARAMETER GROUPS
└ 40 Digital Inputs
or
07 I/O CONFIGURATION
└ 40 Digital Inputs

Description:
This parameter defines that the function of the digital input DI1 in the application ladder will be enabling the center winder or unwinder for the operation.

With logic level “0”, the center winder or unwinder is disabled for the operation. It is done a stop by ramp and after the inverter is general disabled.

With logic level “1”, the center winder is enabled for the operation for the web tension control. The inverter is general enabled and running as speed direction defined.

P0264 – DI2 Function

Adjustable Range: 0 = No Function; 2 = General Enable; 19 = No External Fault; 20 = Reset; 21 = Web Direction (PLC Use)

Factory Setting: P1024 = 0: 21; P1024 = 1: 0

Proprieties:

Access groups via HMI:
01 PARAMETER GROUPS
└ 40 Digital Inputs
or
07 I/O CONFIGURATION
└ 40 Digital Inputs

Description:
This parameter defines that the function of the digital input DI2 in the application ladder will be set the web input direction in roll for a winder or the web output direction of roll for a unwinder.

With logic level “0”, the web direction will be under the roll for a winder or the web diretion will be over the roll for a unwinder.

With logic level “1”, the web direction will be over the roll for a winder or the web diretion will be under the roll for a unwinder.

P0265 – DI3 Function

Adjustable Range:	0 = No Function 2 = General Enable 19 = No External Fault 20 = Reset 21 = Roll Diameter Reset (PLC Use) (P1023 = 0 or 2) 21 = Machine Running (PLC Use) (P1023 = 1)	**Factory Setting:**	P1024 = 0: 21 P1024 = 1: 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs or 07 I/O CONFIGURATION ∟ 40 Digital Inputs		

Description:
This parameter has distinct functions in the application ladder as control reference mode:

■ P1023 = 0 (torque limit mode) or 2 (speed mode), it define that the function of the digital input DI3 in the application ladder will be execute the command to reset the actual roll diameter.

With logic level “0”, no function.

With logic level “1”, it indicates that there was an exchange roll that was being wound by the center winder or unwinder. It executes a reset command in diameter calculated by doing that it takes the value of the minimum roll diameter when a winder or the value of the maximum roll diameter when an unwinder. It can also be used to disable the roll diameter calculation, thereby allowing the web tension setpoint stay the same throughout the process of winding.

■ P1023 = 1 (torque mode), it define that the function of the digital input DI3 in the application ladder will be indicate that the machine is running.

With logic level “0”, it indicates that the machine or process is stopped, i.e., the line speed is equal to zero.

With logic level “1”, it indicates that the machine or process is running, i.e., the line speed is different from zero.

NOTE!
As more faithful to reality is the machine running state better will be the winder or unwinder performance; because this condition is very important for the definition between speed control and torque current control.

P0266 – DI4 Function

Adjustable Range:	0 = No Function 2 = General Enable 19 = No External Fault 20 = Reset 21 = Web Presence (PLC Use)	**Factory Setting:**	P1024 = 0: 0 P1024 = 1: 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs or 07 I/O CONFIGURATION ∟ 40 Digital Inputs		

Description:
This parameter defines that the function of the digital input DI4 in the application ladder will be indicate the web presence in the winder or unwinder. If was programmed for another function, the detection of the web presence in the winder or unwinder will be done via logic in the ladder application by the value measured via load cell.

With logic level “0”, it indicates that there is no web to be wound in the center winder or unwound in the center unwinder; then the alarm “A762: Web not detected via DI4”, which has the function to disable the center winder or unwinder, is generated.

With logic level “1”, it indicates the web presence to be wound by the center winder or unwound by the center unwinder.

NOTE!
Refer to the section 5.19 for more details on the parameters this alarm.

P0267 – DI5 Function

Adjustable Range:	0 = No Function 2 = General Enable 19 = No External Fault 20 = Reset 21 = Increase Setpoint via E.P. (PLC Use)	**Factory Setting:**	P1024 = 0: 0 P1024 = 1: 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs or 07 I/O CONFIGURATION ∟ 40 Digital Inputs		

Description:
This parameter defines that the function of the digital input DI5 in the application ladder will be increase the web tension setpoint via electronic potentiometer (E.P.) for center winder or unwinder. It is valid only if P1029 (Web Tension Setpoint Source) is equal to 6. The value to be changed is shown by parameter P1011.

With logic level “0”, no function.

With logic level “1”, it executes the command to increase the web tension setpoint via electronic potentiometer (E.P.).

P0268 – DI6 Function

Adjustable Range:	0 = No Function 2 = General Enable 19 = No External Fault 20 = Reset 21 = Decrease Setpoint via E.P. (PLC Use)	**Factory Setting:**	P1024 = 0: 0 P1024 = 1: 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs or 07 I/O CONFIGURATION ∟ 40 Digital Inputs		

Description:
This parameter defines that the function of the digital input DI6 in the application ladder will be decrease the web tension setpoint via electronic potentiometer (E.P.) for center winder or unwinder. It is valid only if P1029 (Web Tension Setpoint Source) is equal to 6. The value to be changed is shown by parameter P1011.

With logic level “0”, no function.

With logic level “1”, it executes the command to decrease the web tension setpoint via electronic potentiometer (E.P.).

P0269 – DI7 Function

Adjustable Range:	0 = No Function 2 = General Enable 19 = No External Fault 20 = Reset 21 = Winder or Unwinder Selection (PLC Use)	**Factory Setting:**	P1025 = 0: 0 P1025 = 1: 0 P1025 = 2: 21 P1025 = 3: 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs or 07 I/O CONFIGURATION ∟ 40 Digital Inputs		

Description:
This parameter defines that the function of the digital input DI7 in the application ladder will be select to operate as winder or unwinder. It is valid only if P1025 (Winder or Unwinder Selection) is equal to 2. It is necessary to install the IOB-01 accessory module to get access to this digital input

With logic level “0”, it selects to operate as winder.

With logic level “1”, it selects to operate as unwinder.

P0270 – DI8 Function

Adjustable Range:	0 = No Function 2 = General Enable 19 = No External Fault 20 = Reset 21 = PID Controller in Automatic / Manual Selection (PLC Use)	**Factory Setting:**	P1024 = 0: 0 P1024 = 1: 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 40 Digital Inputs or 07 I/O CONFIGURATION ∟ 40 Digital Inputs		

Description:
This parameter defines that the function of the digital input DI8 in the application ladder will be select the web tension PID controller operate in automatic or manual mode. It is valid only if P1024 (Winder Commands Source) is equal to 0. It is necessary to install the IOB-01 accessory module to get access to this digital input.

With logic level “0”, It executes the command to web tension PID controller operate in automatic mode.

With logic level “1”, It executes the command to web tension PID controller operate in manual mode.

NOTE!
Refer to the section 5.7 for more details on the parameters about web tension PID controller.

NOTE!
Refer to the CFW-11 programming manual for more information on the parameters of the digital inputs. Some parameter options have been removed from the configuration wizard.

5.11 DIGITAL OUTPUTS

This parameter group allows the user to configure the command function of each digital output in the load cell center winder ladder applicative.

P0275 – DO1 Function (RL1)

Adjustable Range:	0 to 36	**Factory Setting:**	13
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 41 Digital Outputs or 07 I/O CONFIGURATION ∟ 41 Digital Outputs		

Description:
This parameter defines the function of the digital output DO1.

NOTE!
Refer to the CFW-11 programming manual for more information on this parameter.

P0276 – DO2 Function (RL2)

Adjustable Range:	0 to 36 / 28 = Winder Enabled (SoftPLC)	**Factory Setting:**	28
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 41 Digital Outputs or 07 I/O CONFIGURATION ∟ 41 Digital Outputs		

Description:
This parameter defines the function of the digital output DO2. If you selected the "28 = Winder Enabled (SoftPLC)" function, assumes the function of indicating that the load cell center winder is enabled to run. According to the section 2.1.2, section 2.2.2 or section 2.2.3, a NO contact of the DO2 relay must be used.

P0277 – DO3 Function (RL3)

Adjustable Range:	0 to 36 / 28 = Winder Enabled (SoftPLC)	**Factory Setting:**	0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 41 Digital Outputs or 07 I/O CONFIGURATION ∟ 41 Digital Outputs		

Description:
This parameter defines the function of the digital output DO3. If you selected the "28 = Winder Enabled (SoftPLC)" function, assumes the function of indicating that the load cell center winder is enabled to run. According to the section 2.1.2, section 2.2.2 or section 2.2.3, a NO contact of the DO3 relay must be used.

P0278 – DO4 Function

P0279 – DO5 Function

Adjustable Range:	0 to 36	**Factory Setting:**	P0278 = 0 P0279 = 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 41 Digital Outputs or 07 I/O CONFIGURATION ∟ 41 Digital Outputs		

Description:
These parameters define the function of the digital outputs DO4 and DO5. It is necessary to install the IOB-01 accessory module to get access to the digital outputs DO4 and DO5.

NOTE!
Refer to the CFW-11 programming manual for more information on the parameters of the digital outputs.

5.12 ANALOG INPUTS

This parameter group allows the user to configure the function of each analog input in the load cell center winder ladder applicative.

P0231 – AI1 Signal Function

Adjustable Range:	7 = Load Cell (PLC Use) (P1027 = 1) 7 = Web Tension Setpoint (PLC Use) (P1029 = 1) 7 = Line Speed (PLC Use) (P1030 = 1) 7 = Roll Diameter (PLC Use) (P1032 = 1)	**Factory Setting:**	P1023 = 0: 7 P1023 = 1: 7 P1023 = 2: 7
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter defines that the function of the analog input AI1 will be the reading of the web tension measured by a load cell (P1027=1), or the web tension setpoint (P1029=1), or the line speed (P1030=1) or the roll diameter measured (P1032=1) for the center winder or unwinder control.

P0233 – AI1 Signal Type

Adjustable Range:	0 = 0 to 10 V / 20 mA 1 = 4 to 20 mA 2 = 10 V / 20 mA to 0 3 = 20 to 4 mA	**Factory Setting:**	0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter configures the type of signal (voltage or current) that will be read by the analog input AI1. Adjust the CFW-11 control board DIP switch S1.4 according to the selected option.

P0232 – AI1 Gain

Adjustable Range:	0.000 to 9.999	**Factory Setting:**	1.000
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter applies a gain to the value read at the analog input AI1, i.e., the value obtained at the input is multiplied by the gain, thus allowing adjustments in the measured variable.

P0234 – AI1 Offset

Adjustable Range:	-100.00 % to +100.00 %	**Factory Setting:**	0.00 %
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter adds to the measured quantity a value, in percentage, in order to adjust the read variable.

P0235 – AI1 Filter

Adjustable Range:	0.00 to 16.00 s	**Factory Setting:**	0.25 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter configures the 1st order filter time constant that will be applied to the analog input AI1.

P0236 – AI2 Signal Function

Adjustable Range:	7 = Load Cell (PLC Use) (P1027 = 2) 7 = Web Tension Setpoint (PLC Use) (P1029 = 2) 7 = Line Speed (PLC Use) (P1030 = 2) 7 = Roll Diameter (PLC Use) (P1032 = 2)	**Factory Setting:**	P1023 = 0: 7 P1023 = 1: 0 P1023 = 2: 7
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter defines that the function of the analog input AI2 will be the reading of the web tension measured by a load cell (P1027=2), or the web tension setpoint (P1029=2), or the line speed (P1030=2) or the roll diameter measured (P1032=2) for the center winder or unwinder control.

P0238 – AI2 Signal Type

Adjustable Range:	0 = 0 to 10 V / 20 mA 1 = 4 to 20 mA 2 = 10 V / 20 mA to 0 3 = 20 to 4 mA	**Factory Setting:**	0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter configures the type of signal (voltage or current) that will be read by the analog input AI2. Adjust the CFW-11 control board DIP switch S1.3 according to the selected option.

P0237 – AI2 Gain

Adjustable Range:	0.000 to 9.999	**Factory Setting:**	1.000
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter applies a gain to the value read at the analog input AI2, i.e., the value obtained at the input is multiplied by the gain, thus allowing adjustments in the measured variable.

P0239 – AI2 Offset

Adjustable Range:	-100.00 % to +100.00 %	**Factory Setting:**	0.00 %
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter adds to the measured quantity a value, in percentage, in order to adjust the read variable.

P0240 – AI2 Filter

Adjustable Range:	0.00 to 16.00 s	**Factory Setting:**	0.15 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter configures the 1st order filter time constant that will be applied to the analog input AI2.

P0241 – AI3 Funtion

Adjustable Range:	7 = Load Cell (PLC Use) (P1027 = 3) 7 = Web Tension Setpoint (PLC Use) (P1029 = 3) 7 = Line Speed (PLC Use) (P1030 = 3) 7 = Roll Diameter (PLC Use) (P1032 = 3)	**Factory Setting:**	P1023 = 0: 0 P1023 = 1: 0 P1023 = 2: 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter defines that the function of the analog input AI3 will be the reading of the web tension measured by a load cell (P1027=3), or the web tension setpoint (P1029=3), or the line speed (P1030=3) or the roll diameter measured (P1032=3) for the center winder or unwinder control.

P0243 – AI3 Signal Type

Adjustable Range:	0 = 0 to 10 V / 20 mA 1 = 4 to 20 mA 2 = 10 V / 20 mA to 0 3 = 20 to 4 mA	**Factory Setting:**	0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter configures the type of signal (voltage or current) that will be read by the analog input AI3. Adjust the IOB-01 accessory module switch S3.1 according to the selected option.

P0242 – AI3 Gain

Adjustable Range:	0.000 to 9.999	**Factory Setting:**	1.000
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter applies a gain to the value read at the analog input AI3, i.e., the value obtained at the input is multiplied by the gain, thus allowing adjustments in the measured variable.

P0244 – AI3 Offset

Adjustable Range:	-100.00 % to +100.00 %	**Factory Setting:**	0.00 %
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter adds to the measured quantity a value, in percentage, in order to adjust the read variable.

P0245 – AI3 Filter

Adjustable Range:	0.00 to 16.00 s	**Factory Setting:**	0.00 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter configures the 1st order filter time constant that will be applied to the analog input AI3.

P0246 – AI4 Funtion

Adjustable Range:	7 = Load Cell (PLC Use) (P1027 = 4) 7 = Web Tension Setpoint (PLC Use) (P1029 = 4) 7 = Line Speed (PLC Use) (P1030 = 4) 7 = Roll Diameter (PLC Use) (P1032 = 4)	**Factory Setting:**	P1023 = 0: 0 P1023 = 1: 0 P1023 = 2: 0
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs		

Description:
This parameter defines that the function of the analog input AI4 will be the reading of the web tension measured by a load cell (P1027=4), or the web tension setpoint (P1029=4), or the line speed (P1030=4) or the roll diameter measured (P1032=4) for the center winder or unwinder control.

P0248 – AI4 Signal Type

Adjustable Range:	0 = 0 to 10 V / 20 mA 1 = 4 to 20 mA 2 = 10 V / 20 mA to 0 3 = 20 to 4 mA	**Factory Setting:** 0
Proprieties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs	

Description:
This parameter configures the type of signal (voltage or current) that will be read by the analog input AI4. Adjust the IOB-01 accessory module switch S3.2 according to the selected option.

P0247 – AI4 Gain

Adjustable Range:	0.000 to 9.999	**Factory Setting:** 1.000
Proprieties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs	

Description:
This parameter applies a gain to the value read at the analog input AI4, i.e., the value obtained at the input is multiplied by the gain, thus allowing adjustments in the measured variable.

P0249 – AI4 Offset

Adjustable Range:	-100.00 % to +100.00 %	**Factory Setting:** 0.00 %
Proprieties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs	

Description:
This parameter adds to the measured quantity a value, in percentage, in order to adjust the read variable.

P0250 – AI4 Filter

Adjustable Range:	0.00 to 16.00 s	**Factory Setting:** 0.00 s
Proprieties:		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 38 Analog Inputs or 07 I/O CONFIGURATION ∟ 38 Analog Inputs	

Description:
This parameter configures the 1st order filter time constant that will be applied to the analog input AI4.

NOTE!
Refer to the CFW-11 programming manual for more information on the parameters of the analog inputs. Some parameter options have been removed from the configuration wizard.

5.13 WEB TENSION VIA LOAD CELL

This parameter group allows the user to configure the measured variable via load cell (feedback) for the web tension control.

P1027 – Load cell Source Selection

Adjustable Range:	1 = Load Cell via Analog Input AI1 2 = Load Cell via Analog Input AI2 3 = Load Cell via Analog Input AI3 4 = Load Cell via Analog Input AI4	**Factory Setting:**	P1023 = 0: 1 P1023 = 1: 1 P1023 = 2: 1
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the load cell source measures the web tension.

Table 5.5 – Description of the load cell source

P1027	Description
1	It defines that the load cell source will be the value read via analog input AI1 and visualized in parameter P1013.
2	It defines that the load cell source will be the value read via analog input AI2 and visualized in parameter P1013.
3	It defines that the load cell source will be the value read via analog input AI3 and visualized in parameter P1013.
4	It defines that the load cell source will be the value read via analog input AI4 and visualized in parameter P1013.

P1028 – Web Tension Scale

Adjustable Range:	0.00 to 3000.0 kgf	**Factory Setting:**	50.0 kgf
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter configures the full scale of the load cell that measures the web tension installed at the CFW-11 analog input AI1, AI2, AI3 or AI4, i.e., the maximum value measured by the load cell in kgf that corresponds to the maximum value measured by the analog input (10V or 20mA).

5.14 WEB TENSION SETPOINT

This parameter group allows the user to configure the setpoint for the web tension control

P1011 – Web Tension Setpoint for Minimum Diameter

Adjustable Range:	0.0 to 3000.0 kgf	**Factory Setting:**	20.0 kgf
Proprieties:	RW		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter shows the web tension setpoint for the load cell center winder or unwinder when the roll diameter is minimal. With increasing of the roll diameter there is a compensation via Taper changing the web

tension setpoint, which is setpoint shown in the parameter P1012. It has the read or write function as configuration adjusted in parameter P1029.

P1029 – Web Tension Setpoint Source Selection

Adjustable Range:	1 = Setpoint via Analog Input AI1 2 = Setpoint via Analog Input AI2 3 = Setpoint via Analog Input AI3 4 = Setpoint via Analog Input AI4 5 = Setpoint via HMI 6 = Setpoint via Electronic Potentiometer 7 = Setpoint via Communication Networks	**Factory Setting:**	P1023 = 0: 5 P1023 = 1: 5 P1023 = 2: 5
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the source of web tension setpoint.

Table 5.6 – Description of the web tension setpoint source

P1029	Description
1	It defines that the setpoint source will be the value read via analog input AI1 and visualized in parameter P1011.
2	It defines that the setpoint source will be the value read via analog input AI2 and visualized in parameter P1011.
3	It defines that the setpoint source will be the value read via analog input AI3 and visualized in parameter P1011.
4	It defines that the setpoint source will be the value read via analog input AI4 and visualized in parameter P1011.
5	It defines that the setpoint source will be the value write in parameter P1011 via HMI.
6	It defines that the setpoint source will be via electronic potentiometer and visualized in parameter P1011.
7	It defines that the setpoint source will be the value write in parameter P1011 via communication networks.

5.15 LINE SPEED

This parameter group allows the user to configure the line speed.

P1015 – Line Speed

Adjustable Range:	0.0 to 2000.0 m/min	**Factory Setting:**	-
Proprieties:	RW		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter shows the value of line speed used to control the center winder or unwinder when in torque limit mode or speed mode. It has the read or write function as configuration adjusted in parameter P1030.

P1030 – Line Speed Source Selection

Adjustable Range:	0 = Not Used in this Control Mode 1 = Line Speed via Analog Input AI1 2 = Line Speed via Analog Input AI2 3 = Line Speed via Analog Input AI3 4 = Line Speed via Analog Input AI4 5 = Line Speed via Communication Networks	**Factory Setting:**	P1023 = 0: 2 P1023 = 1: 0 P1023 = 2: 2
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the source of line speed.

Table 5.7 – Description of the line speed source

P1030	Description
0	It defines that the line speed is not used when the control reference mode is programmed in torque mode.
1	It defines that the line speed source will be the value read via analog input AI1 and visualized in parameter P1015.
2	It defines that the line speed source will be the value read via analog input AI2 and visualized in parameter P1015.
3	It defines that the line speed source will be the value read via analog input AI3 and visualized in parameter P1015.
4	It defines that the line speed source will be the value read via analog input AI4 and visualized in parameter P1015.
5	It defines that the line speed source will be the value write in parameter P1015 via communication networks.

P1031 – Maximum Line Speed

Adjustable Range:	0.0 to 2000.0 m/min	**Factory Setting:**	500.0 m/min
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter configures the maximum value of line speed in m/min that corresponds to the maximum value measured by the analog input (10 V or 20 mA). It has no function when the center winder or unwinder is configured in torque mode.

5.16 ROLL DIAMETER

This parameter group allows the user to configure the roll diameter parameters.

P1016 – Roll Diameter

Adjustable Range:	0 to 3000 mm	**Factory Setting:**	-
Proprieties:	RW		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter shows the actual value of web roll diameter. It has the read or write function as configuration adjusted in parameter P1032.

NOTE!
It allows entry the value for the roll diameter case is configured to calculate the roll diameter (P1032 = 5) and the center winder or unwinder axial is disabled or is working without web.

P1032 – Roll Diameter Source Selection

Adjustable Range:	0 = Not Used in this Control Mode 1 = Roll Diameter via Analog Input AI1 2 = Roll Diameter via Analog Input AI2 3 = Roll Diameter via Analog Input AI3 4 = Roll Diameter via Analog Input AI4 5 = Roll Diameter Calculation (Relationship between Line Speed and Roll Rotation) 6 = Roll Diameter via Communication Networks	**Factory Setting:**	P1023 = 0: 5 P1023 = 1: 0 P1023 = 2: 5
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the source of roll diameter.

Table 5.8 – Description of the roll diameter source

P1032	Description
0	It defines that the roll diameter is not used when the control reference mode is programmed in torque mode.
1	It defines that the roll diameter source will be the value read via analog input AI1 and visualized in parameter P1016.
2	It defines that the roll diameter source will be the value read via analog input AI2 and visualized in parameter P1016.
3	It defines that the roll diameter source will be the value read via analog input AI3 and visualized in parameter P1016.
4	It defines that the roll diameter source will be the value read via analog input AI4 and visualized in parameter P1016.
5	It defines that the roll diameter will be calculated by relationship between line speed and center winder or unwinder motor speed (or roll rotation) when the reference control is programmes in torque limit mode or speed mode.
6	It defines that the roll diameter source will be the value write in parameter P1016 via communication networks.

P1033 – Minimum Roll Diameter

Adjustable Range:	1 to 3000 mm	**Factory Setting:**	100 mm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the minimum roll diameter or core diameter where the web is wound or unwound. This will be the value of roll diameter when the command to reset the actual roll diameter is executed in a winder.

P1034 – Maximum Roll Diameter

Adjustable Range:	1 to 3000 mm	**Factory Setting:**	600 mm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the maximum roll diameter value. This will be the value of roll diameter when the command to reset the actual roll diameter is executed in a unwinder.

P1035 – Speed for Enable Roll Diameter Calculation

Adjustable Range:	0.0 to 2000.0 m/min	**Factory Setting:**	10.0 m/min
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the line speed value for enable roll diameter calculation. With the line speed smaller, the roll diameter remains the same value (freeze).

NOTE!
A condition that must be observed in enabling the roll diameter calculation is the web presence on the winder, which may be via applicative logic or a web material sensor in the digital input DI4. Refer to the section 5.19 for more details.

P1036 – Roll Diameter Calculation Filter

Adjustable Range:	0.00 to 160.00 s	**Factory Setting:**	5.00 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter configures the 1st order filter time constant that will be applied to the roll diameter calculation.

5.16.1 Roll Diameter Calibration

This parameter group allows the user to configure the parameters for calibrate the roll diameter measuring by analog input AI1, AI2, AI3 or AI4. Through the choice of two points, where each point is represented by the actual roll diameter and the analog input AIx value, is obtained the line equation, thus allowing a good linearity in the reading of the roll diameter value. The graph below illustrates how it is done to calibrate the roll diameter.

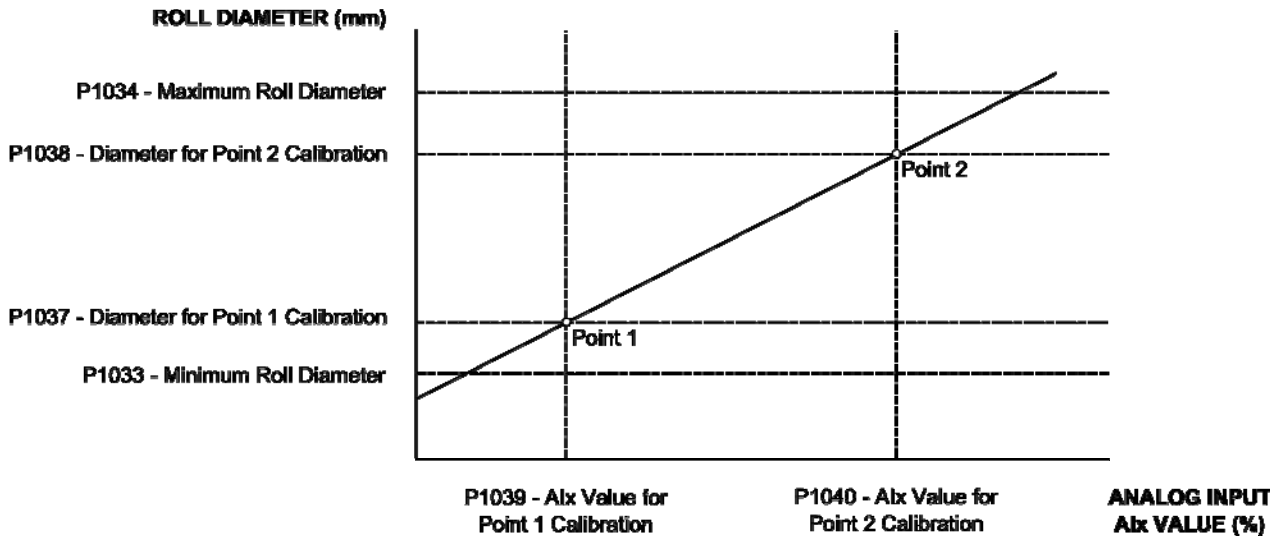


Figure 5.1 – Graph with points to roll diameter calibration

Through the roll diameter value and the analog input Aix value for point 1 and point 2, is obtained the line equation of the roll diameter:

$D = a \times AI + b$, being:

$$a = \frac{P1038 - P1037}{P1040 - P1039} \quad \text{and} \quad b = P1037 - a \times P1039$$

Where,

D = roll diameter in milimeters;
AI = analog input AI1, AI2, AI3 or AI4 value in %;
a = slope of the line;
b = y intercept of the graph of the line.

NOTE!
The line points should be so far to avoid that small errors in coordinates entail large differences in the coefficients a and b calculated.

P1037– Diameter for Point 1 Calibration

Adjustable Range:	1 to 3000 mm	**Factory Setting:**	100 mm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of diameter for point 1 calibration of the roll diameter line equation measured by the analog input AI1, AI2, AI3 or AI4 configured in parameter P1032.

P1038– Diameter for Point 2 Calibration

Adjustable Range:	1 to 3000 mm	**Factory Setting:**	500 mm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value of diameter for point 2 calibration of the roll diameter line equation measured by the analog input AI1, AI2, AI3 or AI4 configured in parameter P1032.

P1039 – Analog Input AIx Value for Point 1 Calibration

Adjustable Range:	0.00 to 100.00 %	**Factory Setting:**	10.00 %
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value read by analog input AI1, AI2, AI3 or AI4 configured in parameter P1032 for point 1 calibration of the roll diameter line equation corresponding to the diameter value set in parameter P1037.

P1040 – Analog Input AIx Value for Point 2 Calibration

Adjustable Range:	0.00 to 100.00 %	**Factory Setting:**	80.00 %
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the value read by analog input AI1, AI2, AI3 or AI4 configured in parameter P1032 for point 2 calibration of the roll diameter line equation corresponding to the diameter value set in parameter P1038.

5.17 TAPER FUNCTION

This parameter group allows the user to adjust the operation conditions of the Taper function.

NOTE!
In order that the Taper function works properly, pay close attention to the roll diameter value, if it is calculated as well as if it is measured.

P1041 – Taper Function Setpoint

Adjustable Range:	-100 to +100 %	**Factory Setting:**	0 %
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the setpoint value for the Taper function. It corresponds to the final value of the control setpoint when the roll diameter is equal or bigger than the final diameter (P1043).

NOTE!
Remember the Taper function concept. Therefore, a setpoint with positive value means decreasing the web tension as the roll diameter increases and negative setpoint means increasing it!

P1042 – Taper Function Initial Diameter

Adjustable Range:	1 to 3000 mm	**Factory Setting:**	150 mm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines at what diameter the Taper function for the web tension setpoint will be initiated.

P1043 – Taper Function Final Diameter

Adjustable Range:	1 to 3000 mm	**Factory Setting:**	500 mm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the roll diameter to which the Taper function setpoint (P1041) applies; from this diameter onwards, the Taper function setpoint value for the control remains constant.

5.18 STALL MODE

This parameter group allows the user to adjust the parameters for Stall mode operation for the load cell center winder.

P1044 – Web Tension Setpoint Factor for Stall Mode

Adjustable Range:	0.01 to 1.00	**Factory Setting:**	1.00
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the web tension setpoint factor value to be applied to center winder or unwinder when it is in Stall mode.

P1045 – Line Speed for Machine Running

Adjustable Range:	0.0 to 200.0 m/min	**Factory Setting:**	0.5 m/min
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the line speed which will be assumed that the machine is running or moving. Stall mode is active while the machine is stopped. Has no function when the center winder or unwinder is configured in torque mode, because this detection is done through digital input DI3 or via communication networks

P1046 – Offset Speed for Winder

Adjustable Range:	0 to 1000 rpm	**Factory Setting:**	30 rpm
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the increment (winder) or decrease (unwinding) of speed to web tension control.

5.19 WEB PRESENCE DETECTION IN WINDER

This parameter group allows the user to adjust the conditions to generate alarm by no web prensence in the load cell center winder or unwinder.

NOTE!
The web presence in winder or unwinder can be done via the digital input DI4 or through an applicative logic.

P1058 – Web Presence Detection Setpoint

Adjustable Range:	0.1 to 3000.0 kgf	**Factory Setting:**	0.5 kgf
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines the web tension for web presence detection on the center winder or unwinder. If the web tension value is less, will be generating a status of "No Web Presence".

NOTE!
This parameter has a purpose only if the digital input DI4 is not programmed for the web presence detection (P0266 = 21).

P1059 – No Web Presence Alarms Time (A760/A762/A764)

Adjustable Range:	0.00 to 650.00 s	**Factory Setting:**	1.50 s
Proprieties:			
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter defines a time (delay) for the "No Web Presence" condition, detected via the setpoint in P1058 (A760: Winder without web) or via the digital input DI4 (A762: Web not detected via DI4) or by roll diameter calculation error (A764: Roll diam. calc. error), in order to generate the respective alarm disabling the operation of the center winder or unwinder.

NOTE!
The value 0.00 in this parameter disables the alarm. With this alarm active, the center winder or unwinder will be disabled. This alarm can also be disabled via communication networks control word (P1020).

5.20 READING PARAMETERS

P1010 – LC Center Winder Version

Adjustable Range:	0.00 to 10.00	**Factory Setting:**	-
Proprieties:	RO		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter indicates the version of the load cell center winder applicative software.

P1012 – Web Tension Control Setpoint for Actual Diameter

Adjustable Range:	0.0 to 3000.0 kgf	**Factory Setting:**	-
Proprieties:	RO		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter indicates the web tension setpoint that is being used by PID controller for web tension control. With the taper function enabled, shows the setpoint value after that, other wise, shows the same value in the parameter P1011.

P1013 – Web Tension Feedback

Adjustable Range:	0.0 to 3000.0 kgf	**Factory Setting:**	-
Proprieties:	RO		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter indicates the web tension feedback measured by the load cell and read through the analog input AI1, AI2, AI3 or AI4.

P1019 – Winder Logical Status

Adjustable Range:	0000h to FFFFh	**Factory Setting:**	-
Proprieties:	RO		
Access groups via HMI:	01 PARAMETER GROUPS ∟ 50 SoftPLC		

Description:
This parameter allows the monitoring of the center winder or unwinder status. Each bit represents one state.

Table 5.9 – Description of the logical status via communication networks

Bits	15 to 12	11	10	9	8	7	6	5	4	3	2	1	0
Function	Reserved	With Alarm A766	With Alarm A764	With Alarm A762	With Alarm A760	PID in Automatic or Manual	Selected for Winder or Unwinder	In Stall Mode	In Alarm Condition	In Fault Condition	Speed Direction	Motor Running	General Enabled

Bits	Values
Bit 0 General Enabled	0: The inverter is general disabled. 1: The inverter is enabled and ready to run the motor.
Bit 1 Motor Running (RUN)	0: Motor is stopped. 1: The inverter is driving the motor at the set point speed, or executing either the acceleration or the deceleration ramp
Bit 2 Speed Direction	0: The motor is rotating in reverse mode. 1: The motor is rotating in direct mode.
Bit 3 In Fault Condition	0: The inverter is not in a fault condition. 1: Any fault has been registered by the inverter. Note: The fault number can be read by means of the parameter P0049 – Current Fault.
Bit 4 In Alarm Condition	0: The inverter is not in alarm condition. 1: The inverter is in alarm condition. Obs.: The alarm number can be read by means of the parameter P0048 – Current Alarm.
Bit 5 In Stall Mode	0: The center winder or unwinder is in operation. 1: The center winder or unwinder is in stall mode.
Bit 6 Selected for Winder or Unwinder	0: It is selected for operate as winder. 1: It is selected for operate as unwinder.
Bit 7 PID in automatic or manual	0: Web tension PID Controller is operated in automatic mode. 1: Web tension PID Controller is operated in manual mode.
Bit 8 With Alarm A760	0: Without winder without web alarm (A760) in the center winder or unwinder. 1: The center winder or unwinder with winder without web alarm (A760).
Bit 9 With Alarm A762	0: Without web not detected via DI4 alarm (A762) in the center winder or unwinder. 1: The center winder or unwinder with web not detected via DI4 alarm (A762).
Bit 10 With Alarm A764	0: Without roll diameter calculation error alarm (A764) in the center winder or unwinder. 1: The center winder or unwinder with roll diameter calculation error alarm (A764).
Bit 11 With Alarm A765	0: Without overspeed alarm (A766) in the center winder or unwinder. 1: The center winder or unwinder with overspeed alarm (A766).
Bits 12 to 15	Reserved.

6 FAULT AND ALARM MESSAGES

The load cell center winder applicative generates the following fault and alarm messages:

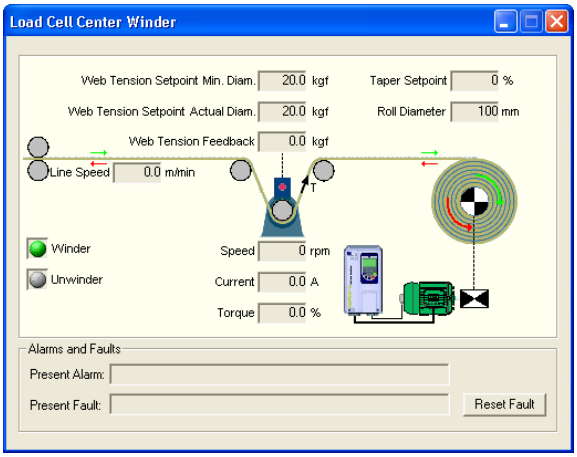
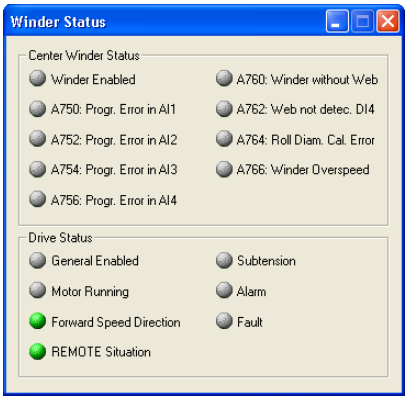
Table 6.1 – Description of the fault and alarm messages

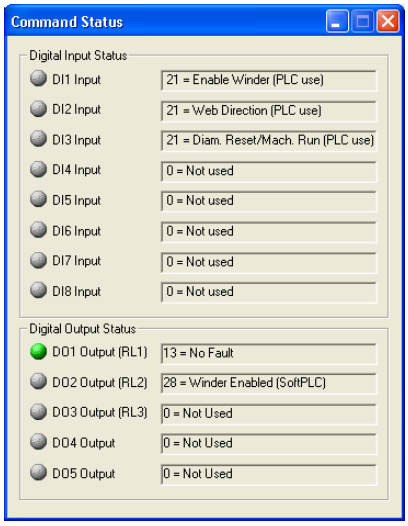
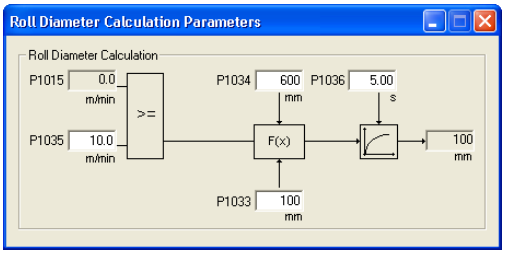
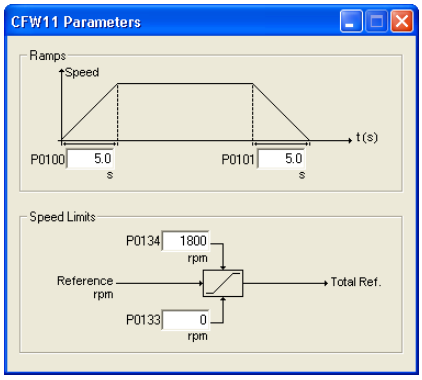
Fault / Alarm	Description	Probable causes
A750: Programming Error in AI1	It indicates that the analog input AI1 was programmed for two or more sources of control variable	Value set in P1027 and P1029 and / or P1030 and / or P1032 equal to 1, then by defining that the analog input AI1 this as a source of two or more control variables
A752: Programming Error in AI2	It indicates that the analog input AI2 was programmed for two or more sources of control variable	Value set in P1027 and P1029 and / or P1030 and / or P1032 equal to 2, then by defining that the analog input AI2 this as a source of two or more control variables
A754: Programming Error in AI3	It indicates that the analog input AI3 was programmed for two or more sources of control variable	Value set in P1027 and P1029 and / or P1030 and / or P1032 equal to 3, then by defining that the analog input AI3 this as a source of two or more control variables
A756: Programming Error in AI4	It indicates that the analog input AI4 was programmed for two or more sources of control variable	Value set in P1027 and P1029 and / or P1030 and / or P1032 equal to 4, then by defining that the analog input AI4 this as a source of two or more control variables
A760: Winder without Web	It indicates that there is no web being wound by the center winder or unwinder	The web tension feedback is lower than the setpoint for the web presence and the delay time (P1059) has elapsed.
A762: Web not detected via DI4	It indicates that there is no web being wound by the center winder or unwinder	The digital input DI4 has detected the no web presence and the delay time (P1059) has elapsed.
A764: Roll Diameter Calculation Error	It indicates that there is no web being wound by the center winder or unwinder	There was a wide variation in roll diameter calculation caused by no web presence in the center winder and waiting time (P1059) elapsed.
A766: Winder Overspeed	It indicates that the center winder or unwinder was disabled because the motor has reached the maximum speed set in P0134	Web presence not detected by logic or wrong value in the roll diameter calculation

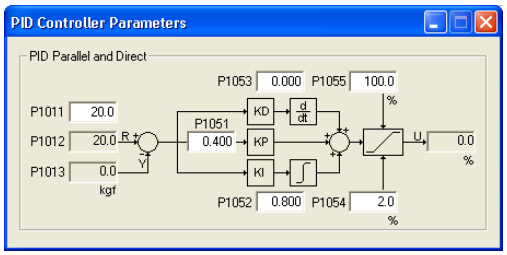
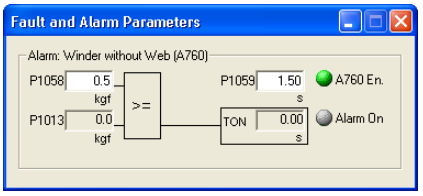
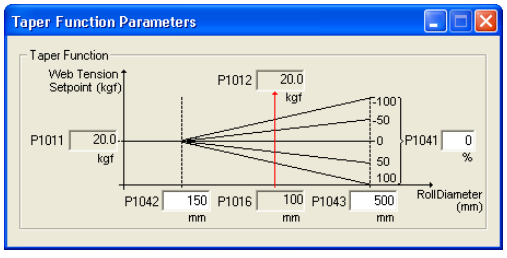
7 MONITORING DIALOGS

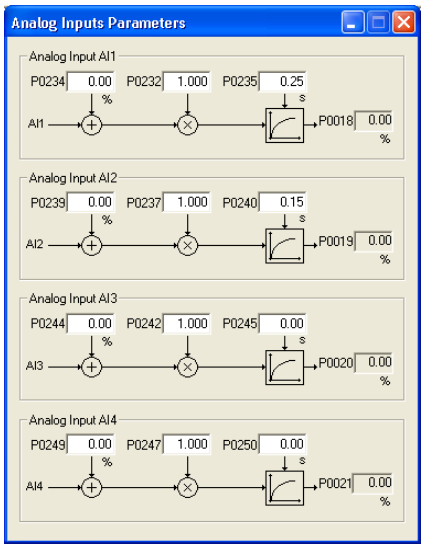
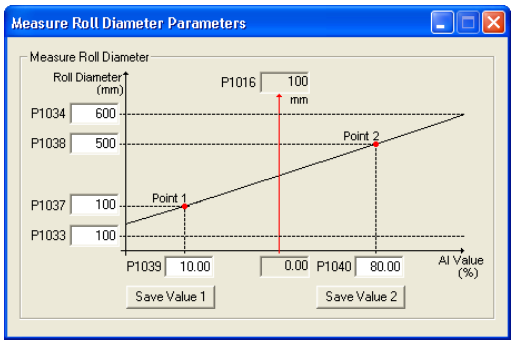
It is possible, through the WLP, to monitor and change the load cell center winder applicative parameters.

Table 7.1 – Monitoring dialog of the load cell center winder or unwinder application

Description	WLP Monitoring Dialog
Monitoring of the load cell center winder or unwinder operation. It makes possible the change and visualization of the following variables: ■ Line speed; ■ Web tension setpoint for minimum diameter, web tension control setpoint for actual diameter and web tension feedback; ■ Taper function setpoint and roll diameter; ■ Speed, current and torque of the motor winder or unwinder, driven by the CFW-11 inverter; ■ Indication of winder or unwinder operation ■ Present fault and alarm; ■ System fault reset command.	
Monitoring of the center winder or unwinder status. It shows the following variables: ■ Winder enabled status, programming error in analog input AI1 (A750), programming error in analog input AI2 (A752), programming error in analog input AI3 (A754), programming error in analog input AI4 (A756), winder without web alarm (A760), web not detected via DI4 alarm (A762), roll diameter calculation error (A764) and overspeed alarm (A766) for the center winder or unwinder; ■ The status of general enabled, motor running, forward speed direction, remote situation, subtension, alarm and fault for the center winder motor driven by the CFW-11.	

Monitoring of the commands carried out at the load cell center winder ou unwinder. It shows the following variables: ■ Current status of the CFW-11 digital inputs; ■ Function of the digital inputs for the center winder; ■ Current status of the CFW-11 digital outputs; ■ Function of the digital outputs for the center winder.	
It shows the roll diameter calculation parameters configured for the load cell center winder or unwinder. It makes possible the modification of the following variables: ■ P1015: Line Speed; ■ P1016: Roll Diameter; ■ P1033: Minimum Roll Diameter; ■ P1034: Maximum Roll Diameter; ■ P1035: Speed for enable Roll Diameter Calculation; ■ P1036: Roll Diameter Calculation Filter.	
It shows the ramp and speed limit parameters of the CFW-11 inverter, configured for the load cell center winder or unwinder. It makes possible the modification of the following variables: ■ P0100: Acceleration Time; ■ P0101: Deceleration Time; ■ P0133: Minimum Speed Reference Limit; ■ P0134: Maximum Speed Reference Limit.	

It shows the web tension PID controller adjustment and operation parameters. It makes possible the modification and visualization of the following variables: ■ P1011: Web Tension Setpoint for Minimum Diameter; ■ P1012: Web Tension Control Setpoint for Actual Diameter; ■ P1013: Web Tension Feedback; ■ P1051: Proportional Gain; ■ P1052: Integral Gain; ■ P1053: Derivative Gain; ■ P1054: Maximum Limit; ■ P1055: Minimum Limit; ■ PID controller output (U) in %.	
It shows the operation parameters of the control logic for generating faults and alarms. It makes possible the modification and visualization of the following variables: ■ P1013: Web Tension Feedback; ■ P1058: Web Presence Detection Setpoint; ■ P1059: No Web Presence Alarms Time; ■ Value of the time elapsed to generate the alarm; ■ Indication of active alarm; ■ Indication of enabled alarm.	
It shows the operation parameters of the control logic for the Taper function applied to the web tension setpoint. It makes possible the modification and visualization of the following variables: ■ P1011: Web Tension Setpoint for Minimum Diameter; ■ P1012: Web Tension Control Setpoint for Actual Diameter; ■ P1016: Roll Diameter; ■ P1041: Taper Function Setpoint; ■ P1042: Taper Function Initial Diameter; ■ P1043: Taper Function Final Diameter.	

It shows the parameters for reading the load cell center winder or unwinder control signals via the CFW-11 analog inputs. It makes possible the modification and visualization of the following variables: ■ P0018: AI1 Value; ■ P0019: AI2 Value; ■ P0029: AI3 Value; ■ P0021: AI4 Value; ■ P0232: AI1 Gain; ■ P0234: AI1 Offset; ■ P0235: AI1 Filter; ■ P0237: AI2 Gain; ■ P0239: AI2 Offset; ■ P0240: AI2 Filter; ■ P0242: AI3 Gain; ■ P0244: AI3 Offset; ■ P0245: AI3 Filter; ■ P0247: AI4 Gain; ■ P0249: AI4 Offset; ■ P0250: AI4 Filter.	
It shows the operation parameters of the logic to measure the roll diameter via analog input AI1, AI2, AI3 or AI4 for the load cell center winder or unwinder. It makes possible the change and visualization of the following variables: ■ P1016: Roll Diameter; ■ P1033: Minimum Roll Diameter; ■ P1034: Maximum Roll Diameter; ■ P1037: Diameter for point 1 calibration; ■ P1038: Diameter for point 2 calibration; ■ P1039: Analog input AIx value for point 1 calibration; ■ P1040: Analog input AIx value for point 2 calibration; ■ Value of analog input AI1, AI2, AI3 or AI4.	

8 TREND VARIABLES DIALOGS

It is possible to monitor variables of the load cell center winder or unwinder applicative through the WLP.

Analog Inputs:
It makes possible the visualization of the analog input values for an analysis of the response throughout the operation time.

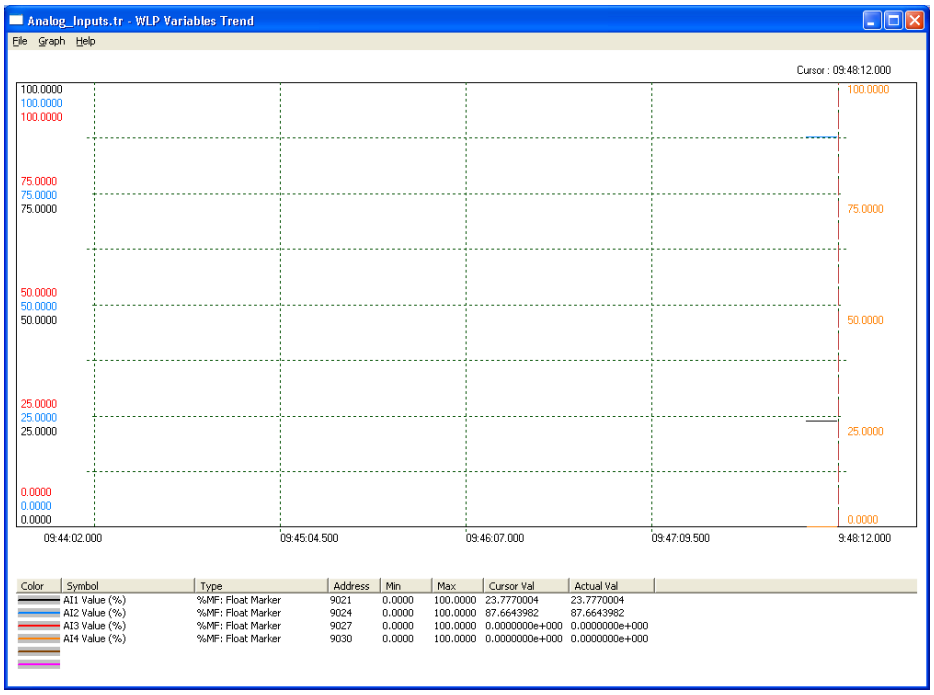


Figure 8.1 – Trend variable dialog for analog inputs

Winder Speed and Torque Control:
It makes possible the visualization of the values that generate the speed and torque current reference for the center winder or unwinder.

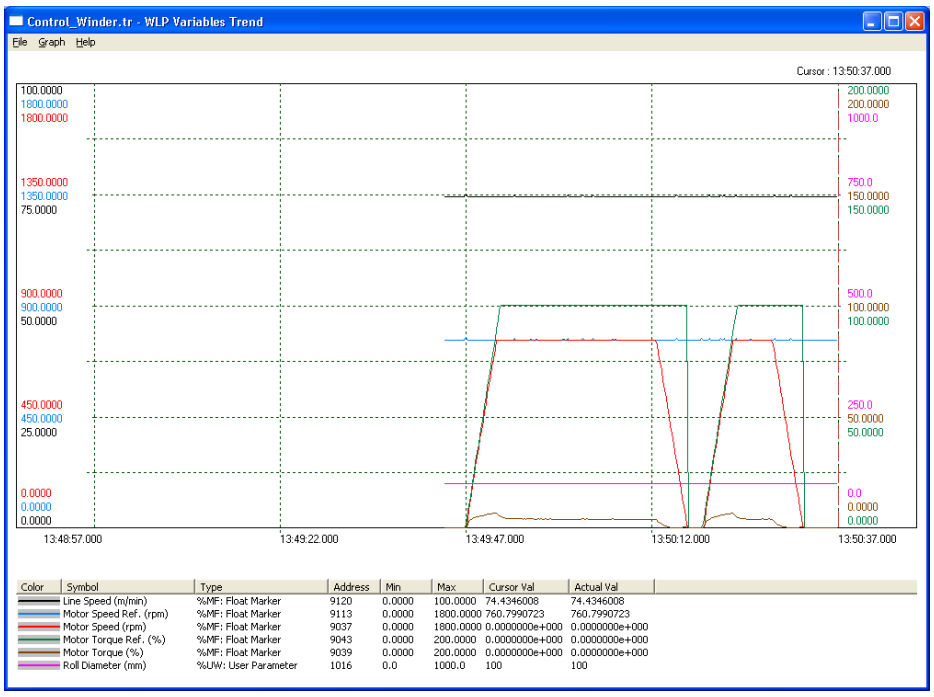


Figure 8.2 – Trend variable dialog for speed and torque control

CFW-11 Regulators:
It makes possible the visualization of the motor speed value and the response of the speed regulator (Iq*) and the flux regulator (Id*) for an analysis of the CFW-11 inverter performance.

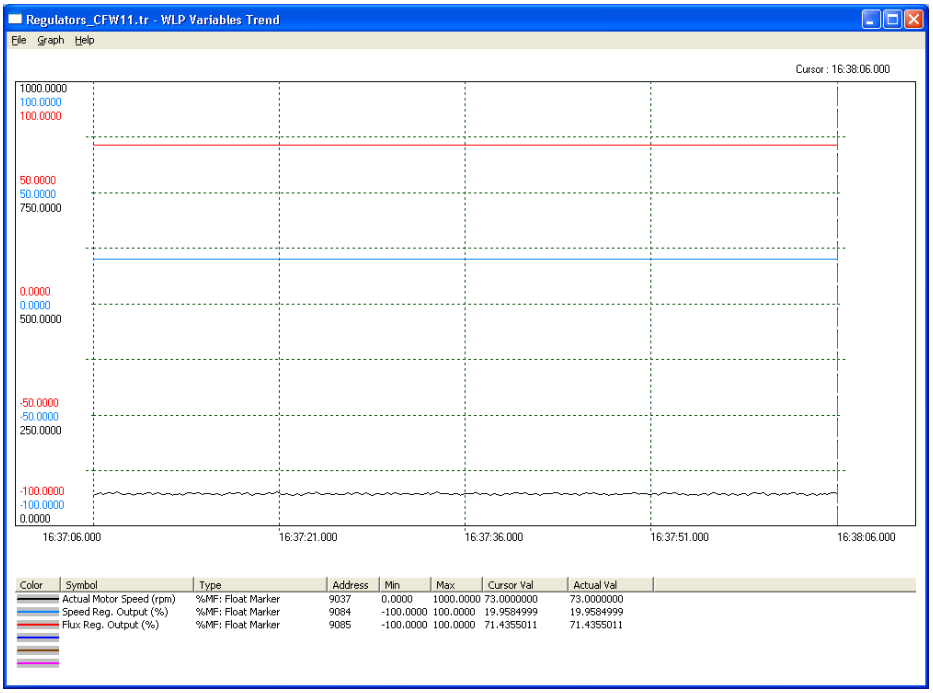


Figure 8.3 – Trend variable dialog for speed and flux regulators

PID Controller Settings:
It makes possible the visualization of the values for the web tension PID controller settings values.

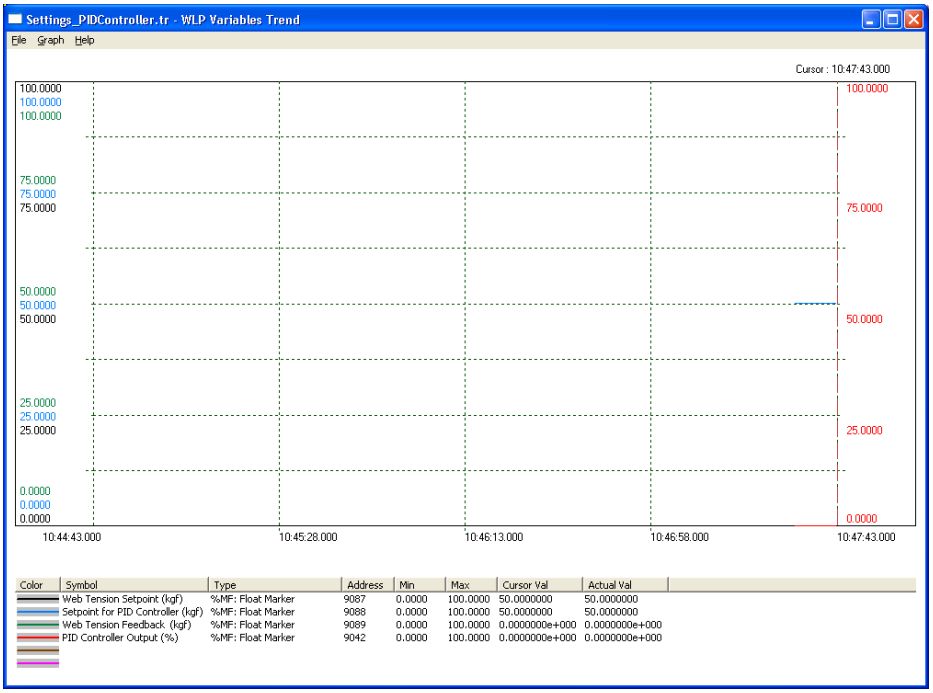


Figure 8.4 – Trend variable dialog for PID controller settings

NOTE!
Refer to the WLP programming software help topics for more information on the use of the variable trend.

9 PARAMETER VALUE DIALOGS

It is possible to save the parameters of the load cell center winder or unwinder applicative through the WLP.

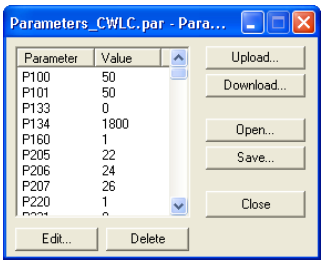


Figure 9.1 – Parameter value dialog

NOTE!
Refer to the WLP programming software help topics for more information on the use of the parameter value dialog box.

10 GENERAL NOTES

Some points must be verified in order to assure a good performance of the considered winder. Some of these points are listed next.

Analog signals: The analog signals used in the applicative (web tension feedback via load cell, web tension setpoint, process line speed and roll diameter measurement) are of extreme importance for the winder good operation. It is important to examine how and where the analog signal cable passes until reaching the CFW-11 frequency inverter, verifying the grounding and cabling quality. Therefore, it is important to analyze the oscillation level of the signal and how much this oscillation interferes with the winder control. In order to evaluate this oscillation, there is the trend of the “Analog Inputs” in the trend variable dialogs, which contains the application analog input readings. Another factor that must not be forgotten is the resolution of the analog inputs; being 12 bits for AI1 and AI3, and 11 bits + sign for AI2 and AI4 (the AI4 of the IOA-01 expansion board has a 14 bit resolution). Observe also the precision of the equipments that are sending these signals to the CFW-11.

Another important analysis variable is the value of the low-pass first-order filter time constant. Ideal values are around 100 ms to 300 ms, because they act as signal filters and do not transmit delays to the control.

Regarding the web tension external feedback signals, it is important to observe their correct operation and the positioning of their components, because if they were not correctly installed, they will transmit false signals and this will have a negative effect on the winder control.

When using load cells it is recommended that:

- The embracing angle be equal or bigger than 60 %;
- They are not mounted in a place where the web position varies, because this would be perceived by the load cells as a variation in the tension;
- Two load cells be used for the measurement, thus assuring that the force applied on the sensor roller be totally indicated, regardless of the point where the force is applied;
- The surfaces for mounting the load cells be flat and parallel;
- The value transmitted to the control never is the output with filter, because the signal transducers normally have two outputs, one with filter for display and another without filter to be used for the control.

CFW-11 Configuration: In order to get a good winder applicative performance, it is necessary first to evaluate the CFW-11 no load response, i.e., to observe its parameterization and the values estimated with the auto-tuning in the vector with encoder control mode. It is important to consider the motor overheating problem when operating at low speeds and beyond the nominal speed.

In order to evaluate the response in vector mode, in the trend variable dialogs, there is the “CFW-11 Regulators” trend that contains the motor speed reading in rpm, and the speed (Iq*) and flux (Id*) regulator outputs. Verify the response of these signals in several speeds and analyze them based on an acceptable average 2 % control oscillation. It is worthwhile to remind that in the Vector with Encoder mode, only the Iq* acts and Id* remains more stable. If bigger oscillations are present, it becomes necessary to adjust the speed regulator (Iq*) and flux regulator (Id*) parameters, according to their response, always beginning with the one that oscillates more.

NOTE!
Due to the load cell center winder control by using the variable motor torque calculated by the Inverter CFW-11 and this depends on the rated motor current and its magnetization current, at times, when it requires a web tension setpoint for controlling below 10%, it is necessary to reduce the value of the magnetization current (P0410) in order that the speed regulator, which is responsible for the torque current, has more scope for control over the total motor current. This value can be 10 to 30% less than the value calculated by the CFW-11 inverter.

PID Controller: After the verification of the analog signals and the CFW-11 response in the winder control, it will be necessary to adjust the PID controller gains. This PID has the function of controlling the web tension, as has been seen previously in the description of each winder type. In the standard applicative, there are values that have been used in some applications. There are several factors, such as gearbox ratio, maximum line speed, winder inertia, type of wound web, among others, which influence the PID controller gain values. Due to this, there will be normally corrections in the values indicated in the standard applicative, where they must serve as starting values for the winder adjustment.

In order to monitor the PID control action, in the trend variable dialogs, there is the “PID Controller Settings” trend that contains the PID controller variable readings. In order to start the settings, the derivative gain must be set zero, so that it does not interfere in the process. Start increasing the proportional gain and monitoring the web tension feedback response, if it gets worse, reduce the gain and verify the improvement in the response. After finding the value where the response does not improve nor deteriorate any longer, proceed with the integral gain in the same way as for the proportional. If after this there are still undesirable oscillations or a response delay during accelerations and decelerations, then adjust the default value for the derivative gain, always starting with small values (0,010) to avoid oscillations in the system. For the derivative gain, proceed in the same way as for the other gains. After this, it may be necessary to redo some small adjustments in the gains.
Another important factor for the PID adjustment is its sampling time. This value is introduced by the parameter directly in the PID block of the WLP applicative and it must always be longer than the program scan cycle that can be visualized in P1002.

CANopen Network: A center winder is normally not alone in a machine or application. For instance, in a plastic web extruder we have the motors for the extruder screws, the pull roller, the pre drag and the center winders.

In order to control the entire application process, we can use the CFW-11 frequency inverter optional board PLC-11, because it allows interconnecting all the drives through a CANopen communication network. This board will be assembled on one of the CFW-11 frequency inverters, thus enabling it to be the CANopen network master.

The WLP programming software allows the user to implement the control and interlocking logics necessary for the application control; and the WSCAN configuration and programming software makes the configuration and operation of the equipments in the CANopen network possible.

See below the CANopen network configuration executed via WSCAN with the inverters used in the application example mentioned above, where the PLC11 board was fitted on the pull roller. A remote unit for the acquisition of digital and analog points was also included.

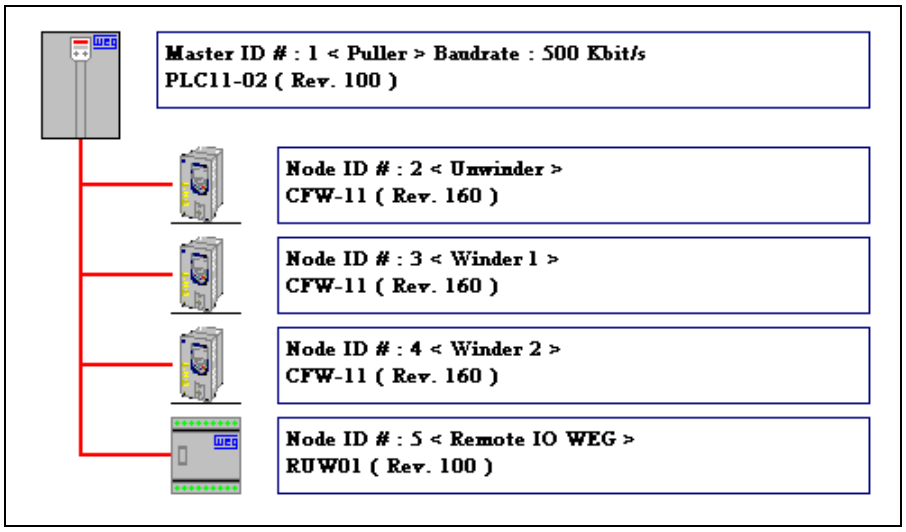


Figure 10.1 – Example of CANopen network configuration on the software WSCAN

NOTE!
Refer to the help topics in the WLP and WSCAN programming software for more information.

NOTE!
In the application example mentioned above, we can also interconnect the inverter DC link, obtaining with this a reduction of energy consumption of the machine due to the regeneration process from the unwinder, and also only use a braking resistor for the entire application, and be installed on this unwinding, which is usually the highest power inverter drive.