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1 How to Read these Operating Instructions

1.1.1 How to Read These Operating Instructions

These Operating Instructions will help you get started, program, and troubleshoot your Center Winder Option. Please read these operating instructions in full and, in order to be able to work with the system safely and professionally, particularly observe the hints and cautionary remarks.

Chapter **How to Read these Operating Instructions** introduces the manual and informs you about the approvals, symbols, and abbreviations used in this literature.

Chapter **Safety Instructions and General Warnings** entails instructions on how to handle the Center Winder Controller correctly.

Chapter **Introduction to Center Winder Controller** informs you in general about center winders and different methods of rewinding and unwinding.

Chapter **How to Install** informs you how to start up the Center Winder Option. This section includes the description of the terminals and the parameters.

Chapter **Center Winder Calibration** informs how to calibrate the winder. Detailed instructions on how to proceed can be found in this section.

Chapter **Troubleshooting** assists you in solving problems that may occur when installing and using the Center Winder Controller.

Chapter **Appendix** provides information about parameters in clearly arranged lists. Please see the Parameter Reference in the MCO 305 Design Guide for more details.

1.2.1 Additional Literature for VLT AutomationDrive, MCO 305 and MCT 10 Motion Control Tool

The MCO 305 Operating Instructions provide the necessary information for build-in, set-up, and optimize the controller.

The VLT AutomationDrive FC 300 Operating Instructions provide the necessary information for getting the drive up and running.

The VLT AutomationDrive FC 300 Design Guide entails all technical information about the drive and customer design and applications.

The VLT AutomationDrive FC 300 MCT 10 Operating Instructions provide information for installation and use of the software on a PC.

Danfoss Drives technical literature is also available online at www.danfoss.com/drives.

1.3.1 Approvals

1.4.1 Symbols

Symbols used in this Operating Instructions.

NB!
Indicates something to be noted by the reader.

Indicates a general warning.

1

Indicates a high-voltage warning.

* Indicates default setting

1.5.1 Abbreviations

Automatic Motor Adaptation	AMA
Build-up Ratio	BUR
Direct Current	DC
Frequency Converter	FC
Local Control Panel	LCP
Milliampere	mA
Millisecond	ms
Minute	min
Motion Control Option	MCO
Motion Control Tool	MCT
Parameter	par.
Proportional Integral Derivative Control	PID
Pulses per Revolution	PPR
Revolutions per Minute	RPM
Second	s
Tension limit detection	TLD
Volts	V
Quad Counts	qc

2 Safety Instructions and General Warnings

VLT Center Winder MCO352
Operating Instructions
Software version: 1.xx

These Operating Instructions can be used for the VLT Center Winder MCO352 with all FC 300 frequency converters with software version 4.9x.
The software version of FC 300 can be read in parameter 15-43.

2.2.1 High Voltage Warning

The voltage of the VLT AutomationDrive is dangerous whenever the converter is connected to mains. Incorrect fitting of the motor or the VLT AutomationDrive may cause damage to the equipment, serious injury or death. Consequently, it is essential to comply with the instructions in this manual as well as local and national rules and safety regulations.

2.2.2 Safety Instructions

- Make sure the VLT AutomationDrive is properly connected to earth.
- Do not remove mains plugs or motor plugs while the VLT AutomationDrive is connected to mains.
- Protect users against supply voltage.
- Protect the motor against overloading according to national and local regulations.

Motor overload protection is not included in the default settings. To add this function, set par. 1-90 *Motor thermal protection* to value *ETR trip* or *ETR warning*.
For the North American market: ETR functions provide class 20 motor overload protection, in accordance with NEC.

The earth leakage current exceeds 3.5 mA.

The [OFF] key is not a safety switch. It does not disconnect the VLT AutomationDrive from mains.

2.2.3 Before commencing repair work

1. Disconnect VLT AutomationDrive from mains.
2. Disconnect DC bus terminals 88 and 89.
3. Wait at least 4 minutes.
4. Remove motor plugs.

2.2.4 Avoid Unintended Start

While VLT AutomationDrive is connected to mains, the motor can be started/stopped using digital commands, bus commands, references or via the LCP.

Disconnect the VLT AutomationDrive from mains whenever personal safety considerations make it necessary to avoid unintended start.

To avoid unintended start, always activate the [OFF] key before changing parameters. Unless terminal 37 is turned off, an electronic fault, temporary overload, a fault in the mains supply, or lost motor connection may cause a stopped motor to start.

2.2.5 Safe Stop of VLT AutomationDrive FC302

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The VLT AutomationDrive FC 302 can perform the Designated Safety Function Uncontrolled Stopping by removal of power (as defined by draft IEC 61800-5-2) or Stop Category 0 (as defined in EN 60204-1). It is designed and approved suitable for the requirements of Safety Category 3 in EN 954-1. This functionality is called Safe Stop. In order to install and use the Safe Stop function in accordance with the requirements of Safety Category 3 in EN 954-1, the related information and instructions of the VLT AutomationDrive FC 300 Design Guide MG.33.BX.YY must be followed! The information and instructions of the Operating Instructions are not sufficient for a correct and safe use of the Safe Stop functionality!

2.2.6 General Warning

WARNING:

Touching the electrical parts may be fatal – even after the equipment has been disconnected from mains.

Also make sure that all voltage inputs have been disconnected, such as load-sharing (linkage of DC intermediate circuit), as well as the motor connection for kinetic back-up.

Using VLT AutomationDrive FC 300 wait at least 15 minutes.

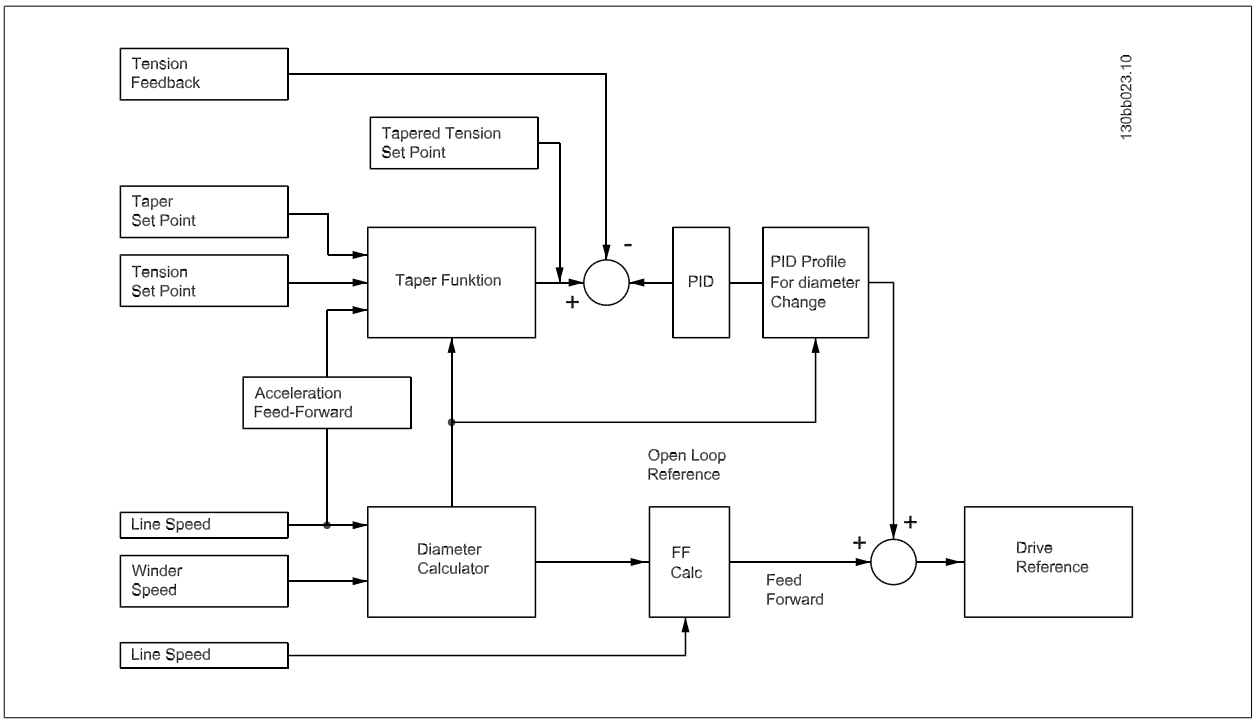
3 Introduction to Center Winder Controller

3.1.1 MCO 352 Center Winder Controller

The MCO 352 Center Winder Controller uses the speed winder method with a diameter calculation and either a load cell or dancer feedback. Below is a simplified block diagram of a tension controlled winder system. The system would be identical if a dancer were used except that the Taper Function block would have a 0/4-20 mA output used to load the dancer air cylinder proportional to the tapered tension set point. The drive is fed an open loop speed reference based on the calculated diameter of the roll. This signal is summed with a signal generated by a PID amplifier comparing the actual tension feedback with a tapered tension set point. The tapered tension set point is actually the tension set point modified based on the roll diameter and the taper set point. Taper generally reduces the tension set point hyperbolically with a change in diameter. The PID amplifier output is also reduced with increasing diameter since the same change in reference will have a larger surface speed change as the roll increases in diameter. Ideally, the open loop reference signal is scaled at core so that the surface speed of the core matches line speed. The diameter value is calculated by the ratio of line speed verse winder speed.

$$Roll\ diameter = core\ diameter\left(\frac{Line\ speed}{Winder\ speed}\right)$$

This calculation needs to be updated fairly quickly since the roll can change diameter very quickly when near the core. If the true diameter changes faster than the diameter is calculated, the open loop reference speed will lag too far behind the required speed and the tension PID will need to make up too much of the difference.



The Tension PID updates every 30 ms and should be updated at least 3 times faster than the diameter calculation. This is because the tension PID block must be allowed to stabilize system tension before a new diameter is calculated, since the calculated diameter is used by both the open-loop reference and as an input to the tension PID block.

3.1.2 Additional Features

Several features have been included to increase the overall stability of the winder and to increase control and monitoring of the winding process.

- Acceleration Feed-Forward: The Winder block diagram includes an acceleration feed-forward function that allows a shift in the tension/taper set point based on changes in line speed. This provides a tension boost during initial acceleration to help compensate for system inertia.
- Tension-Taper Set-Point Ramp: The tapered tension set point generator will integrate any changes to the tension or taper set points over multiple program scans. A parameter is provided to increase or decrease response time.
- Diameter Calculator Limiter: The diameter calculator includes a similar integration technique. A maximum rate of diameter change can be adjusted by parameter. In addition, the calculated diameter is restricted from moving in the wrong direction to only 20 % of the rate applied to the expected change in diameter. For example, if the station is rewinding a roll, the diameter is not expected to reduce in diameter.
- Diameter Calculator Minimum Speed: There is also a minimum speed requirement to enable the diameter calculator. At low speeds, the line and winder speeds may not have enough resolution to accurately calculate diameter. A parameter is provided to define a minimum line speed required for the diameter calculator to function. Until that speed is reached, the diameter value will not change.
- Programmable Analog Inputs: The VLT AutomationDrive has two analog inputs. Inputs 53 and 54 are analog inputs with a voltage range of ±10 VDC or a current range of 0/4-20mA. Use DIP-switch S201/S202 to select configuration. The source of the tension and taper set-points can be adjusted by either analog input or parameter setting. The tension feedback and initial diameter measurement can only use analog inputs. Parameters are provided to select the source of each input. Care must be taken not to program a single input for more than one function.
- Initial Diameter Measurement: In many winding applications there are very few variations in starting core diameter or initial roll size. A choice of three programmable starting diameters can be programmed and logically selected. For applications where the starting diameter can vary regularly, the Winder will allow the initial diameter to be measured through an analog input signal. Scaling parameters are provided to set the analog level at core and at full roll. This function assumes a linear change in the diameter measurement signal.
- End of Roll Detection: An output is provided to indicate a diameter limit. For rewinding applications, the diameter limit occurs when the calculated diameter exceeds a set limit. For unwinding applications, the diameter limit occurs when the calculated diameter is less than the set limit. The station will continue to run after a diameter limit is detected. This output can be used to stop the line for a roll change.
- Tension Limit Detector: The Winder includes a tension limit detection (TLD) feature. This feature allows the Winder to trip if a low-tension or high-tension feedback exists for a period of time. The trip delay includes a normal running delay as well as a secondary starting delay.

3.2.1 System Requirements

The center winder system has some minimum requirements for proper operation.

- Frequency converter: VLT AutomationDrive with VLT Center Winder MCO 352. It is also recommended that the drive have dynamic braking option capabilities to allow a quick stop of a large roll.
- Winder motor: The motor needs to be inverter duty with a wide speed range (>100:1). The motor should be geared or belted so that top motor speed at core does not exceed 4500 RPM. Generally, the motor maximum constant horsepower speed will be the limiting factor.
- Winder Encoder: The winder encoder needs to be mounted on the winder motor. The encoder must have a differential, quadrature TTL/5VDC output. The encoder PPR should be selected such that the channel frequency is as close to 400 kHz at the winder motor top speed.
- Line Encoder: The line speed encoder output circuitry needs to be the same as the winder encoder. Again, the encoder PPR should selected such that the channel frequency is as close to 400 kHz at the maximum line speed.
- Tension Feedback: The tension feedback is required from either a load cell or dancer. If load cells are used they need to be calibrated for a either a 0-20 mA or 0-10 V signal from zero to maximum tension. If a dancer is used the calibration should be 0-20mA/0-10V from bottom to top of the dancer movement.
- Logic Inputs: The digital inputs for tension on, over/under etc. are 24 VDC, sinking inputs. The drive has a 24VDC/200mA supply available if dry contacts are used. Logic commands can also be sent to the drive serial port. Note that a third party HMI/operator display such as EXOR or Red Lion can be used in place of the digital inputs. It is possible to serially access logic parameters through the VLT AutomationDrive USB or RS485 port.
- Tension and Taper set-points: The tension and taper set-points are available on the display of the drive as parameters and can also be accessed serially through the VLT AutomationDrive USB or RS485 port. These set points can also be set using any unused 0-20mA/0-10VDC drive input, using an analog signal or potentiometer

Maximum Winder Motor speed	4500 RPM
Tension Loop Scan Time	30 ms
TLD Time Resolution	25 ms
Quick Stop Scan time	1 ms
Coast Scan Time	<1 ms
Tension Loop Response Time	25 ms
Line encoder frequency	100 kHz - 410 kHz
Winder Encoder frequency	100 kHz – 410 kHz
Winder Speed resolution	±16384 qc counts @ 4500 RPM
Digital inputs	24 VDC, sinking
Digital outputs	24 VDC, sourcing
Analog Tension & taper set points	0-10 VDC, 0-20 mADC, 1000 count resolution
Load cell or dancer feedback	0-10 VDC, 0-20 mADC, 1000 count resolution

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4 How to Install

4.1.1 VLT AutomationDrive Terminals

The VLT AutomationDrive control card contains input and output logic terminals used by the Winder Option. The Winder Option does not assign a function to all of the inputs and outputs on the control card. The terminals required for proper Winder operation are discussed in this manual. See the VLT AutomationDrive Operating Instructions for further details.

Analog Inputs
53 Multifunction input 1
54 Multifunction input 2
55 A/I common

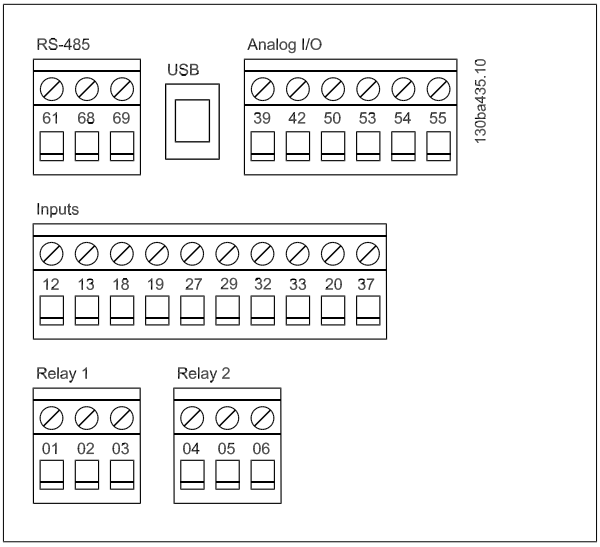
Inputs
27 Quick Stop
37 Safe Stop

Relay 1
Running on tension

Relay 2
Ready

Analog Outputs
42 Taper Tension Setpoint

Supply Voltage
50 10 V DC max. load 15 mA



4.1.2 Center Winder Option Terminals

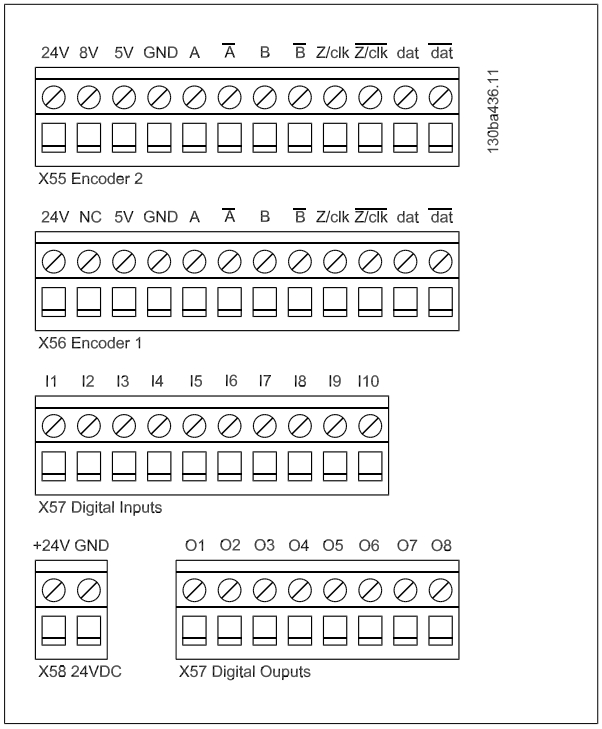
The figure below shows the five green terminal strips on the MCO 305 Option Card. The 24V supply on the digital input and output terminal strips are internally connected to the VLT AutomationDrive +24V supply available at terminals 12 & 13. The COM is connected to VLT AutomationDrive terminal 39. An external 24 VDC power supply can be used. See the MCO 305 Instruction Manual for details on setting MCO Supplied by external 24 VDC (parameter 33-85). The isolated 5V/400mA and 8V/250mA encoder supply is generated on the MCO 305 Card from the 24 V power supply.

X55
is always used for winder/unwinder speed

X56
is always used for line speed

X57 Digital Inputs
I1 Over/under winding
I2 Winder jog reverse
I3 Winder jog forward
I4 Partial roll select
I5 Tension on/off (reset)
I6 Material select
I7 Core select
I8 Diameter reset

X59 Digital Outputs
O1 End of roll indicator
O2 TLD indicator
O3 Running on tension
O4 Ready



4.2 Digital and Analog I/Os

4.2.1 MCO 352 I/O

X57/1 Input MCO352 Over/Under

Option: **Function:**

Determines whether the winder will operate for over or under winding. The motor direction will need to change depending on whether the material is wrapping over or under the winder core. The direction selected will also affect the jog directions.

NB!
This input is scanned only when tension is OFF.

X57/2 Input MCO352 Winder Jog Reverse

Option: **Function:**

Jogs winder in the reverse winding direction at the speed programmed in par. 19-07 (Winder Jog Speed).

NB!
This input is scanned only when tension is OFF.

X57/3 Input MCO352 Winder Jog Forward

Option: **Function:**

Jogs winder in Forward winding direction at the speed programmed in par. 19-07 (Winder Jog Speed).

NB!
This input is scanned only when tension is OFF.

X57/4 Input MCO352 Partial Roll Select

Option: **Function:**

Selects new setting in parameter 19-04 as the preset starting diameter when the Diameter Reset (Input 8) is energized, rather than using one of the two preset core diameters. If the initial diameter is to be measured by an analog signal, this input must be held ON along with the correct setting in parameters 19-13 to 19-16.

NB!
This input is scanned only when tension is OFF.

X57/5 Input MCO352 Tension On/Off (Reset)

Option:

Function:

Turns the tension controller ON and OFF. This input should be energized while the line is at zero speed. The core will be released when this input is not energized. This input is also used to reset fault conditions.

X57/6 Input MCO352 Material Select

Option:

Function:

Selects the Material Type (PAPER/POLY). Different material types such as paper verses poly require different Tension loop PID settings and Speed loop proportional gain settings. Changing this input toggles the values in parameters 19-41 to 19-50. If the PID parameter values are changed this input must be switch to initiate saving the new values.

NB!

This input is scanned only when tension is OFF and when the material selection is to be made by digital input (see par. 19-23).

X57/7 Input MCO352 Core Select

Option:

Function:

Selects one of two preset core sizes set in parameters 19-05 and 19-06. Core 1 = OFF, Core 2 = ON. This input is checked when the Diameter Reset (Input 8) in energized and the partial roll select (Input 4) is not energized. If unwinding, Core 2 can be used as an alternate initial roll diameter, but Core 1 must always be set for the smallest core diameter used.

NB!

This input is scanned only when tension is OFF.

X57/8 Input MCO352 Diameter Reset

Option:

Function:

Resets diameter to a new value. If the New Diameter Set (Input 4) is energized, the partial core diameter value set in parameter 19-04 is used, otherwise the diameter is reset to core1 or core2 values based on Core Select (Input 7).

NB!

This input is scanned only when tension is OFF.

4.2.2 VLT I/O

Input 27 Quick Stop

Option:

Function:

Terminal 27 must be closed for the drive to run. If this input is opened while running, the frequency converter will ramp to a stop at a rate set by the Quick Stop Deceleration time (parameter 3-81).

Input 37 Safe Stop

Option: **Function:**

Terminal 37 must be closed for the frequency converter to run. If this input is opened while running the frequency converter will coast to a stop.

Output O1 End of Roll Indicator

Option: **Function:**

This output turns ON to indicate that the diameter has reached the value programmed in parameter 19-12. This output turns OFF when Diameter is reset (Input 8) to a value in normal operating range.

Output O2 TLD Indicator

Option: **Function:**

This output is turned ON when the Tension Limit Detector has sensed that tension has been out of range as set in parameters 19-08 and 19-09 for the number of scans set in parameter 19-10. A Tension Limit results in a Winder fault. Turning the tension OFF resets this fault and the output.

Output O3 Running on Tension

Option: **Function:**

This output is turned ON when the winder is regulating tension. The output is turned OFF when tension is switched off or if there is a station fault. Turning the tension OFF resets this fault and the output.

Output O4 Ready

Option: **Function:**

This output is turned ON when the station is ready to run. The output turns OFF if there is a TLD fault, an FC Alarm, an MCO 305 Error, Commanded Quick Stop, or Commanded Coast. Note: Outputs 5-8 are not used.

Relay 01 Running on Tension

Option: **Function:**

This relay output (01, 02, 03) is energized when the winder is regulating tension. The relay output is de-energized when tension is switched off or if there is a station fault.

NB!

Parameter 5-40 must be set for MCO controlled [51] for this function to work as described.

Relay 02 Ready

Option: **Function:**

This relay output (04, 05, 06) is energized when the station is ready to run. The relay will de-energize on a TLD fault, an FC Alarm, an MCO 305 Error, Quick Stop, or Coast.

NB!

Parameter 5-40 must be set for MCO controlled (51) for this function to work as described.

4.2.3 Analog Inputs

Parameters 19-14, 19-19 to 19-21 allow setting the two analog inputs from the VLT AutomationDrive for any of the following.

- Tension Set Point
- Taper Set Point
- Tension Feedback
- Initial Diameter measurement

Input 53 Multi-function Input 1

Option: **Function:**

This analog input functions according to the setting of parameter 19-19 to 19-21. Use DIP-switch S201 to select a current (0-20 mA) or a voltage (-10 V to 10 V) configuration.

Input 54 Multi-function Input 2

Option: **Function:**

This analog input functions according to the setting of parameter 19-19 – 19-21. Use DIP-switch S201 to select a current (0-20mA) or a voltage (-10 V to 10 V) configuration.

Terminal 55 Analog Input Common

Option: **Function:**

This terminal is the common for the two analog inputs 53/54.

Terminal 50 Analog Input +10V Out

Option: **Function:**

This terminal is a supply of +10V/30 mA for the analog inputs.

Output 42 Tapered Tension Set-Point

Option: **Function:**

When a Dancer system is used, the calculated Tapered Tension Set Point should control the loading of the dancer air cylinder. This 0/4-20mA output can be used as input for the I-P transducer regulating the load on the dancer air cylinder. Parameter 6-50 must be set for either OPTION 0-20 mA or OPTION 4-20 mA.

NB!

If using a dancer, the Taper set point will have no affect if this output is not used to control the dancer air cylinder.

Terminal 39 Analog Output Common

Option: **Function:**

This terminal is used as a common for the analog output signals.

4.3.1 Parameters

19-01 Winder Mode Selection

Option:		Function:
		Sets the station as either a rewinder or unwinder.
[0] *	Rewinder	
[1]	Unwinder	

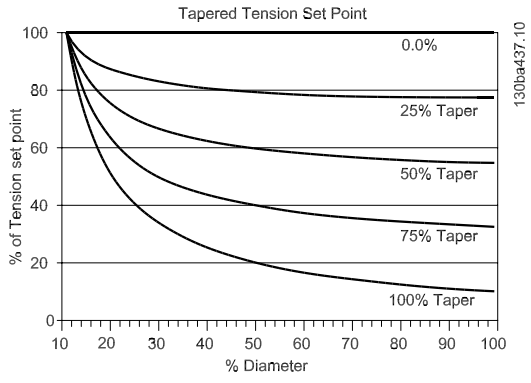
19-02 Tension Set-Point

Range:		Function:
0	[0-1000]	1000 = 100.0% of full tension. Full tension is the point at which the load cell or dancer produces a 20 mA or 10 V signal. Sets the desired running tension. Note that the taper setting will affect the actual tension on the web. If a dancer system is used, this value sets the dancer running position which would normally be 500 or center of movement. This parameter is only active if par. 19-19 is set to 0.

19-03 Taper Set-Point

Range:		Function:
0	[-1100 – 1100]	The Taper set-point is used to change the tension set-point as the diameter increases. The result of the taper function is called the tapered tension set-point. The tapered tension set-point is always equal to the tension set-point at core. This parameter is only active if parameter 19-20 is set to a value of 0. A value of 0 = no taper or the tapered tension set-point will always be equal to the tension set-point. A value of 1000 is 100.0 % taper or each time the diameter doubles from core the tapered tension set-point will be decreased to 50 % of the previous value. Negative tapers are also possible.

NB!
Taper is not required in unwinding applications. For unwinding applications, leave this parameter set to 0.



19-04 Partial Roll Diameter Value

Range:		Function:
5000	[5000 – 100000]	100,000 = 100 % of full roll. Example: If drive has been set-up for a full roll dia¬meter of 40 inches and the roll loaded on rewind = 10 inches, then the value entered into this parameter would be $\frac{10}{40} \times 100,000 = 25,000$

This parameter is intended to preset the diameter when a partial roll is loaded on the rewinder. If Input 4 is ON when the diameter is reset with Input 8, the diameter will be preset to the value programmed in this parameter. For unwinding applications, this parameter can be used to set the full roll diameter.

19-05 Core1 Diameter

Range:

5000* [5000 – 100000]

Function:

100000 = 100 % of full roll, see parameter 19-04.

This parameter is programmed with the main core value to be used on the winder. This parameter must be set for the smallest core diameter for both rewind and unwind applications.

NB!

Note: Parameter 19-05 must be less than parameter 19-06.

19-06 Core2 Diameter

Range:

5000* [5000 – 100000]

Function:

100000 = 100 % of full roll, see Parameter 19-04.

This parameter allows programming a secondary core diameter if rewinding or a secondary full roll diameter if unwinding.

NB!

Parameter 19-05 must be less than parameter 19-06.

19-07 Winder Jog Speed

Range:

0%* [0 – 100%]

Function:

Winder jog speed 100 = 100 % of the speed set in parameter 3-03 (MAX REFERENCE RPM).

This parameter sets the winder jog speed percentage. This speed is used for both forward and reverse jogging. The jog ramp is fixed at 4 seconds.

NB!

Diameter is not taken into account to determine surface jog speed.

19-08 TLD Low Limit

Range:

0* [-200 – 2000]

Function:

1000 = 100.0 % tension.

This parameter is the low limit for the Tension Limit Detector.

NB!

Setting the value to -200 will disable the low tension limit trip.

NB!
If the tension detection reaches the TLD Low Limit for more than TLD Timer (par. 19-10), output 2 is turned on and a trip is forced.

19-09 TLD High Limit

Range:

0* [0 – 2200]

Function:

1000 = 100.0 % tension.

This parameter is the high limit for the Tension Limit Detector.

NB!
Setting the value to 2200 will disable the high tension limit trip.

NB!
If the tension detection reaches the TLD High Limit for more than TLD Timer (par. 19-10), output 2 is turned on and a trip is forced.

19-10 TLD Timer

Range:

1* [1 – 200]

Function:

Each program scan is approx 25 ms.

Sets the number of consecutive program scans that the tension must exceed the high or low tension limit before the Tension Limit Output will be energized and the station coasts to a stop. This function is only active when tension is on.

19-11 TLD on Delay

Range:

0* [-500 – 0]

Function:

Each program scan is approx 25 ms.

When tension is first turned on, the tension limit timer can be preset to a negative value to allow time for the winder to stabilize web tension. As soon as the tension moves within the low and high tension limits, the TLD function begins operating normally. This function can be useful during a quick machine start with a slack web. This function is only active when tension is on.

19-12 Diameter Limit Detector

Range:

0* [-100 – 100000]

Function:

100,000 = 100 % of full roll

When the calculated roll diameter reaches the set diameter, digital output 1 will turn ON to indicate the end of the roll. This indicates a full roll when rewinding and an empty roll when unwinding.

NB!
The station will not stop automatically when the end of roll is detected.

4

19-13 Initial Diameter Measurement

Option:		Function:
		It is possible to connect a roll diameter sensor to one of the frequency converter's analog inputs. This signal can be used to have the controller use a measured initial diameter, rather than a diameter size set by parameter. This is particularly useful in applications where non-uniform roll sizes are the norm.
[0] *	Set diameter when diameter reset	Parameters 19-04 to 19-06 set the diameter when the diameter is reset.
[1]	Set diameter based on analog signal	The frequency converter sets the diameter based on an analog signal. The diameter can only be reset when the tension is OFF.

19-14 Diameter Measurement Input

Option:		Function:
		This parameter sets the analog input used for diameter measurement.
[1]	Input 53 (0-10 VDC or 0-20 mA)	
[2]	Input 54 (0-10 VDC or 0-20 mA)	

19-15 Reading at Core

Range:		Function:
0*	[-1100 – 1100]	If a signal of 1.50 V results from measuring the smallest core, set this parameter to 150.
		This parameter sets the analog input signal reading at the smallest core used. The value needs to be multiplied by 100 to allow maximum resolution.

19-16 Reading at Full Roll

Range:		Function:
0	[-1111 – 2111]	If a signal of 9.50 V results from measuring the full roll, set this parameter to 950.
		This parameter sets the analog input signal reading at the largest roll size used. The value needs to be multiplied by 100 to allow maximum resolution.

19-19 Tension Set-Point Input

Option:		Function:
		This parameter sets the source of the tension set-point.
[0] *	Parameter 19-02	
[1]	Input 53 (0-10 VDC or 0-20 mA)	
[2]	Input 54 (0-10 VDC or 0-20 mA)	

19-20 Taper Set-Point Input

Option:		Function:
		This parameter sets the source of the taper set-point.
[0] *	Parameter 19-03	
[1]	Input 53 (0-10VDC or 0-20mA)	
[2]	Input 54 (0-10VDC or 0-20mA)	

19-21 Tension Feedback Input

Option:		Function:
		Sets analog input used for tension feedback.
[1] *	Input 53 (0-10 VDC or 0-20 mA)	
[2]	Input 54 (0-10 VDC or 0-20 mA)	

19-22 Tension Feedback Type

Option:		Function:
		Selects type of tension feedback device.
[0] *	Load cell	
[1]	Dancer	

19-23 Command Source

Option:		Function:
		Determines if the digital inputs 1-8 are to be active or parameters 19-61 through 19-68 are used for these functions. When a third party display is used to control these functions, changing a parameter is the most efficient method.
[1] *	Par. 19-61 to 19-68 for controlling	Entered for the parameters 19-61 through 19-68 to control the functions.
[2]	Digital input control	Entered for digital input control.

19-24 Line Speed Scale

Range:		Function:
200*	[200 – 18000]	Display value: $par.\ 19-24 = \frac{(max.\ Line\ \ encoder)\ Hz \times 4}{50}$

Scales line speed for 100,000 counts at max speed. These counts can be read in parameter 19-96.

19-25 Speed Match Scale

Range:		Function:
500*	[500 – 10000]	Matches surface speeds of line and winder at core while running line at 100 % speed.

19-26 Winder Speed Scale

Range:		Function:
200*	[200 – 18000]	Display value: $par.\ 19-26 = \frac{(max.\ Winder\ \ encoder)\ Hz \times 4}{50}$

Scales winder speed for 100,000 counts at max speed. These counts can be read in par. 19-95.

19-27 Diameter Accel Rate

Range:		Function:
1*	[1 – 50]	Sets amount of changes allowed for the diameter in each program scan. This setting depends on maximum material thickness and max line speed at core. The diameter change is scaled based on 100,000 = 100%.

Description of display value (calculation example):

$Max.\ core\ speed = 10\frac{rev}{s}$

Material thickness = 0.01 inches

Roll diameter = 25 inches

Scan time = 25 ms

$\frac{Counts}{Scan} = \left(10\frac{rev}{s}\right)\left(\frac{0.01\ inch}{rev}\right)\left(\frac{100000\ counts}{25\ inches}\right)\left(\frac{25\,ms}{scan}\right)$

$\frac{Max.\ counts}{scan} = 10$

NB!

If the diameter can vary from the selected reset value, a larger value will allow the calculator diameter to move more quickly to the correct value.

19-28 Tapered Tension Accel Rate

Range:

1* [1 – 10]

Function:

A value of 1 means a maximum taper tension set point change of 0.1 % of full scale is possible each program scan time.

Sets the amount the Taper and Tension Set-Points can vary each scan period. This function ramps the tapered tension set-point to the preset value when the user changes either the tension or taper set-points. This ensures stability during step changes in set-points.

19-29 Diameter Calculator Minimum Speed

Range:

500* [500 – 200000]

Function:

100,000 = 100 % line speed

Sets minimum line speed to be achieved before the diameter calculator will be activated. At low line speeds, the resolution of the line and winder speed will be too low to accurately calculate the diameter.

19-30 Line Acceleration Feed-Forward

Range:

0* [-20000 – 20000]

Function:

The tension PID output is summed with the change per scan of line speed multiplied by this factor.

$$PID\ output + \frac{(Line\ speed) \times (par.\ 19-30)}{1000}$$

Helps compensate for tension changes caused by line speed acceleration and deceleration.

19-31 Velocity Sampling Time (ms)

Range:

50* [50 – 500]

Function:

The speed values are averaged over the sampling time.

Sets sampling time for both line speed and winder speed.

19-40 Tension PID Limit

Range:

0* [0 – 200000]

Function:

16,384 = 100 %

Sets maximum Tension PID loop output that can be added to the open loop speed reference. The value is normally set to limit the contribution of the tension PID loop to 10 % of the maximum reference speed.

19-41 PID Profiles

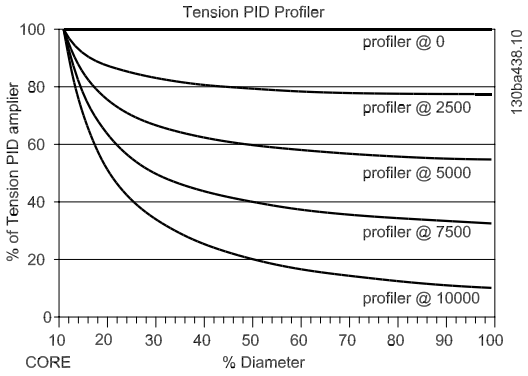
Range:

0* [0 – 10000]

Function:

A value of 10,000 = fully profiled.

Allows scaling the tension loop PID output to compensate for roll diameter. Ideally, the output from the tension loop PID amplifier is halved each time the diameter doubles, this is considered fully profiled. In some cases it might be desirable to be less than fully profiled which would give over compensation as the diameter increases.



19-42 PID Proportional Gain

Range: 0* [0 – 5000]

Function: Sets proportional gain for tension loop PID amplifier.

19-43 PID Derivative Time

Range: 0* [0 – 1000]

Function:

0 = OFF

Sets derivative time for tension loop PID amplifier.

19-44 PID Integral Time

Range: 10* [10 – 20100]

Function:

>20000 = OFF

Sets Integral time for tension loop PID amplifier.

19-45 PID Integral Limit

Range: 0* [0 – 100000]

Function: Sets limit for the integral part in the tension loop PID amplifier.

19-47 PID Der. Gain Limit

Range: 1000* [1000 – 50000]

Function: Sets limit for derivation gain in tension loop PID amplifier.

19-48 PID Anti Wind-Up

Option:

Function: Activates Anti Wind-up in tension loop PID amplifier.

[0] *	Anti Wind-Up disabled
[1]	Anti Wind-Up enabled

19-49 Speed Loop Prop Min.

Range: 0* [0 – 10000]

Function:

A value of 100 used in parameter 19-49 or 19-50 will be translated to 0.100 in parameter 7-02.

Speed Loop Prop Gain used at core diameter. The value used for the speed loop proportional gain (Par. 7-02) is modified as the roll diameter changes. Parameters 19-49 and 19-50 are the minimum and maximum values determined at core and full roll. They can be different for each material select by parameter or digital input. As the diameter increases, the actual speed loop prop gain will be calculated and written to the associated parameter (7-02).

19-50 Speed Loop Pro Max.

Range: **Function:**

0 [0 – 10000]

A value of 100 used in parameter 19-49 or 19-50 will be translated to 0.100 in parameter 7-02.

Speed Loop Prop Gain used at full roll diameter. More information see parameter 19-49.

19-51 Save Speed Prop Values

Option: **Function:**

Allows saving speed proportional gain values and tension PID values in memory. The values should be saved after completing changes to parameters 19-41 – 19-50. The values are automatically stored when a different material is selected.

[0] *	No function	
[1]	Initiates saving	Initiates the save. The value will return to 0 after the save has completed. This function can only be used when tension if OFF.

19-61 Over Under Winding

Option: **Function:**

Parameter 19-61 - 19-68 can replace the digital Inputs 1-8 when parameter 19-23 is programmed to 1. When this is the case the digital inputs are not used and their functions are transferred to parameter 19-61 through 19-68. These parameters act just the same as if they were the digital inputs with values of 0 and 1.

[0] *	Selects over winding	
[1]	Selects under winding	

19-62 Winder Jog Reverse

Option: **Function:**

See Parameter 19-61.

[0] *	No function	
[1]	Selects winder jog reverse	

19-63 Winder Jog Forward

Option: **Function:**

See Parameter 19-61.

[0] *	No function	
[1]	Selects winder jog forward	

19-64 New Diameter Select

Option: **Function:**

See Parameter 19-61.

[0] *	No function	
[1]	Preset diameter to programmed value in par. 19-04	Diameter is preset to the value programmed in parameter 19-04 when parameter 19-68 is changed to 1.

19-65 Tension On/Off

Option: **Function:**

See Parameter 19-61.

[0] *	Turns tension off	
[1]	Turns tension on	

19-66 Material Select

Range: **Function:**

1* [1-9]

See Parameter 19-61.

There is a possibility of 9 material types. Each material type has its own set of parameters 19-41 to 19-50. These parameters will display the stored values for the material number selected. Any changes to these parameter values are not saved permanently until the material type is changed to a new value while the tension is off.

19-67 Core Select

Option: **Function:**

See Parameter 19-61.

The core select parameter is used in conjunction with the diameter reset. When a new roll is started, it is important to reset the diameter to the proper core value.

[0] * Setting 1

[1] Setting 2

19-68 Diameter Reset

Option: **Function:**

See Parameter 19-61.

1 resets the diameter to either core 1 or 2 or the partial diameter depending on parameters 19-64 and 19-67. Parameter 19-68 will be reset to a value of zero when tension is turned on. The table below shows what the diameter will be set to base on the state of parameters 19-64 and 19-67.

[0] * Core 1

[1] Core 2

Par 19-64	Par 19-67	DIAMETER
0	0	Par 19-06 (Core 2)
0	1	Par 19-05 (Core 1)
1	0	Par 19-04 (Partial core)
1	1	Par 19-04 (Partial core)

4.4.1 Read-only Application Parameters

Parameters 19-92 to 19-99 are special read-only parameters. They can be monitored on LCP lines 1 to 3 as controlled by parameters 0-20 – 0-24. Looking at the values shown in parameters 19-92 –19-99 will not allow dynamic monitoring. When setting parameters 0-20 – 0-24, the read-outs are selected as user parameter 19-92 – 19-99.

19-92 Winder Software Version

Option: **Function:**

This is a read only parameter indicating the Winder program software version.

19-93 Winder Error Status

Option: **Function:**

This parameter indicates the error status of the Winder Option. Several different conditions can be detected.

NO ALARM	[0]
TENSION LIMIT DETECTED	[1]
FC ALARM	[2]
MCO305 ERROR	[3]
QSTOP	[4]
LOCAL MODE	[5]

Turning the tension off resets all fault conditions while in remote mode.

19-94 Program Loop Scan Time

Option: **Function:**

Read only parameter used to display the time[ms] per program loop scan.

19-95 Winder Speed Counts

Option: **Function:**

Read only parameter used to display the winder speed counts. 100000 counts = 100 % winder speed.

19-96 Line Speed Counts

Option: **Function:**

Read only parameter used to display the line speed counts. 100000 counts = 100 % line speed.

19-97 Diameter Size

Option: **Function:**

Read only parameter used to display the diameter of the roll. 100000 counts = 100 % diameter.

19-98 Tapered Tension Set-Point

Option: **Function:**

Read only parameter used to display the Tapered tension set point 1000 = 100.0% tension.

19-99 Tension Feedback

Option: **Function:**

Read-only parameter used to display the actual tension feedback. A reading of 1000 = 100.0 % of the 20 mA, or 10 V signal from the load cells or dancer.

5 Center Winder Calibration

5.1.1 Frequency Converter Checkout

The VLT AutomationDrive frequency converter should be checked out before installing the Winder software.

1. Ensure proper wiring
2. Power-up the drive.
3. Perform an Automatic Motor Adaptation (AMA) after programming motor nameplate information (parameters 1-20 to 1-26). Inputs 27 and 37 should be turned ON. Use the [Hand On], [Off] and [Reset] keys for local mode control.
4. Determine max speed of winder (RPM) and program into parameter 3-03. Calculate the actual maximum winder speed at the smallest core and set par. 3-03 for 10 % higher than that value. This value cannot exceed 4,500 RPM.
5. Insure that the winder motor encoder is rated for the maximum RPM used. Enter the winder motor encoder resolution (PPR) into parameter 32-01.
6. It is suggested that the ramp times be increased for initial testing. Set parameters 3-41 and 3-42 to a few seconds. These settings will be changed later.
7. Determine proper encoder wiring. Set the local reference = 100 RPM. Use the [Hand On] and [Off] keys for local mode control. Check that the motor runs stable at 100 RPM. If the drive indicates a Warning 12 Torque Limit or Alarm 61 Tracking error while attempting to run at low speed, the encoder is most likely wired backwards. Swap the A and A' leads and test again. The direction the motor rotates is the forward direction. This direction can be reversed by removing power and swapping two motor phases and swapping the A and A' encoder leads.
8. Tune the speed loop PID: The VLT AutomationDrive will run in a Speed Closed-Loop Mode (par. 1-00). The speed loop PID values (par. 7-00 – 7-08) need to be set to allow stable operation at all speeds and loads. It is expected that the speed proportional gain will need to be increased at larger roll diameters. The goal of this test is to determine an integral value (par. 7-03) that works well under all conditions and find the proportional gain values (par. 7-02) that work best at core and at full roll.

a. Running the motor in local mode is the simplest way to test changes in PID settings. Experienced MCO users may choose to use the APOSS program Testrun function. If using the Testrun function, program for the encoder used return the drive to remote mode and reset the ramp times (par. 3-41 and 3-42) to 0.05 s. Turn the MCO BANDWIDTH to 0 and use the feed forward velocity factor only for each test-run. This will show turn off the closed-loop positioning controller and show the response and stability of the FC 300 drive speed PID control.

b. Begin running with an empty core. Adjust the parameters 7-02 and 7-03 for the best performance at low and high speeds. Use the local reference to adjust the speed if not using Testrun. Note the proportional setting.

c. Now place a full roll on the winder. Adjust the parameters 7-02 and 7-03 for the best performance at low and high speed. Again note the proportional setting. If any others settings were changed, repeat test with core only and this time only change proportional setting to the value that was used before at core.

d. Once the values for core and full roll are found, set them into the parameter 19-49 (core) and 19-50 (full roll). A value of 0.100 used in parameter 7-02 has to be set to 100 in parameter 19-49 or 19-50. The proportional gain values for the intermediate diameters are calculated internally in the Center Winder option program. Parameter 19-49 = min. speed prop gain (core prop) Parameter 19-50 = max. speed prop gain (full roll prop)

NB!
Note that there may be a need to modify these settings for different materials or roll widths. The Winder Option will allow unique speed Proportional values as well as the Tension PID values for each of up to nine materials.

NB!
Parameters 19-41 to 19-50 must be saved with parameter 19-51.

NB!
If parameter 19-96 is negative, encoder channels A and B have to be switched.

5.1.2 Preset Winder Function Parameters

NB!
The following procedure assumes that digital input control will be used. If serial control will be used, issue logic commands by writing values to the appropriate parameter (19-61 – 19-68).

Par.	Function	Range	Value to preset to
3-41	Ramp-up Time 1	0.01 – 3600.00 s	0.05 s
3-42	Ramp-down Time 1	0.01 – 3600.00 s	0.05 s
19-01	Winder Mode	0 – 1	Set according to application
19-02	Tension Set Point	0 – 1000	0
19-03	Taper Set Point	-1100 – 1100	0
19-04	Partial roll diameter value	5000 – 100000	Calculate if used
19-05	Smallest core to be used	5000 – 100000	Calculate Calculate if used
19-06	Secondary core	5000 – 100000	5
19-07	Winder jog speed %	0 – 100	-200
19-08	TLD Low Limit	-200 – 2000	2200
19-09	TLD High Limit	0 – 2200	200
19-10	TLD Out of Range Timer	1 – 200	
19-11	TLD Timer Start Value	-500 – 0	-200
19-12	Full Roll Detector	-100 – 100000	100000 for rewind, 0 for unwind
19-13	Initial Diameter Measurement	0 – 1	Set based on application
19-14	Diameter Measurement Input	1 – 2	Set based on application
19-15	Reading at Core x 100	-1100 – 1100	Will Be Determined if used
19-16	Reading at Full Roll x 100	-1111 – 2111	Will Be Determined if used
19-19	Tension Setpoint Input	0 – 2	Set according to application
19-20	Taper Setpoint Input	0 – 2	Set according to application
19-21	Tension Feedback Input	1 – 2	Set according to application
19-22	Tension Feedback Type	0 – 1	Set according to application
19-23	Discrete Functions Source	1 – 2	2
19-24	Line Speed	200 – 18000	Will Be Determined
19-25	Scale Speed	500 – 10000	Will Be Determined
19-26	Match Winder Speed	200 – 18000	Will Be Determined
19-27	Scale Diameter Change Rate	1 – 50	20
19-28	Tapered Tension Change Rate	1 – 10	2
19-29	Diameter Calculator Minimum Speed	500 – 200000	500
19-30	Acceleration Feed-Forward	-20000 – 20000	0
19-31	Velocity Sampling Time (ms)	50 – 500	50
19-40	PID Limit	0 – 200000	0
19-41	PID Profiles	0 – 10000	
19-42	PID Proportional Gain	0 – 5000	
19-43	PID Derivative Time	0 – 1000	
19-44	PID Integral Time	10 – 20100	
19-45	PID Integral Limit	0 – 100000	
19-47	PID Der. Gain Max	1000 – 50000	
19-48	PID Anti Wind-Up	0 – 1	
19-49	Speed Loop Prop Min.	0 – 10000	
19-50	Speed Loop Prop Max.	0 – 10000	
19-51	Save Values	0 – 1	

5.1.3 Winder Scaling Factor Calibration – Open loop Speed Adjustments

The procedure for setting the next three scaling parameters requires that the machine is able to run the line without material. If this is not possible, empirical calculations can be performed.

1. Set parameter 19-24 "Line Speed Scale"

- Place the smallest empty core on the winder station.
- Issue a Tension-ON command to the Winder. This will require an input at terminals 27, 37, and I5.
- Run the line up to max speed.
- Adjust Line Speed Scale parameter 19-24 so that Displayed Line Speed Counts displayed on the LCP indicates 100,000 counts.
- If the values are negative, turn the line off, power-down the drive and re-wire the line speed encoder A and A' leads.
- Re-test after changing encoder wiring.

Empirical calculation: The Line Speed Scaling factor can be calculated according to this formula

$$Par.\ 19-24 = \frac{(Max.\ Line\ \ encoder\ pulse\ \ frequency) \times 4}{50}$$

The maximum pulse frequency (Hz) can be found if the encoder resolutions in pulses-per-revolution (PPR) and maximum encoder speed in RPM are known.

$$Hz = \frac{rpm}{60} \times ppr$$

2. Set parameters 19-25 "Speed Match" & 19-26 "Winder Speed Scale"

- Verify that the smallest core size (parameter 19-05) has been programmed correctly. The value entered is a percentage of the 100,000 full roll value. For example, if using a 20 inch full roll with a 3.75 inches core,

  $$Par.\ 19-05 = \frac{3.75}{20} \times 100,000 = 18,750$$

- Open Input 7 "CORE SELECT"
- Open Input 4 "PARTIAL ROLL DIAMETER"
- Momentarily close Input 8 "DIAMETER RESET" Confirm that the displayed Diameter is the value set in parameter 19-05.
- Close Input 5 "TENSION ON"
- Return to maximum line speed to again obtain 100,000 line speed encoder counts. The winder should begin running along with the line speed encoder.
- Adjust parameter 19-25 "Speed Match" so that core surface speed matches the surface speed of the main line section.

Empirical calculation: Assuming that parameter 3-03 is set to 110 % of the maximum winder speed required at maximum line speed, this will result in a 90 % reference signal to the Winder drive. The value 16384 (4000Hex) is a scaled value representing 100 % reference.

$$Par.\ 19-25 = \frac{16384 \times 0,9 \times par.\ 19-05}{100,000}$$

Remaining at maximum line speed, adjust parameter 19-26 "Winder Speed Scale" so that Winder Speed reads from the LCP reads 100,000 counts.

Empirical calculation: The winder encoder pulse frequency will need to be calculated for operation at maximum line speed on the smallest core.

$$Par.\ 19-26 = \frac{(max.\ winder\ encoder\ pulse\ \ frequency) \times 4}{50}$$

- Turn line off so line encoder is zero.
- Open Input 5 "TENSION OFF".
- Enable the diameter calculator by reducing the setting of parameter 19-29 to 500.
- Close Input 5 "TENSION ON" and re-start the line. If the scaling parameters are set correctly, the diameter should remain very close to the core diameter value.
- Stop the line and open Input 5 "TENSION OFF".

5.1.4 Check Inputs

1. Check Input 3 "Winder Jog Forward":

- Close Input 3. The winder should jog in the forward (over) direction.
- Open Input 3.
- The jog speed can be adjusted in parameter 19-07.

2. Check Input 2 "Winder Jog Reverse":

- Close Input 2. The winder should jog in the reverse (under) direction.
- Open Input 2 "Jog Reverse".
- The jog speed can be adjusted in parameter 19-07.

3. Check Input 1 "Over/Under Wind":

- Close Input 1 "Over /Under Wind".
- Close Input 3 winder should jog in the under direction.
- Open Input 3 "Jog Forward".
- Open Input 1 "Over /Under Wind".

5.1.5 Calibration of Diameter Measurement Signal

1. Parameter 19-13 should be set to 1 to enable this feature.
2. Mount the smallest core used on the winder.
3. Set the LCP to display the signal at the analog input selected in parameter 19-14.
4. Close Input 4 "Partial Roll Diameter".
5. Close Input 8 "Diameter Reset".
6. Record the voltage or current input value resulting from core diameter.
7. Multiply the value by 100 and enter into parameter 19-15.
8. Set the LCP to display Diameter.
9. Mount a full roll or simulate a full-roll.
10. Increase the value of parameter 19-15 until the displayed Diameter is as close to 100,000 as possible.
11. The displayed Diameter should now sweep from the core diameter to the full-roll diameter (100,000) as the analog input moves through its full range.
12. Open Inputs 4 and 8 unless the Diameter will always be initially measured.

5.1.6 Check Tension Correction Direction

1. Make sure that the taper and tension set points are set to zero. With no web, the tension should be at zero as well.
2. Close Input 5 “Tension ON”
3. Increase PID limit parameter 19-40 to 5000.
4. The Winder should not be moving since Tension PID values are set to zero.
5. Run the line at some slow speed, the Winder should follow at slow speed.
6. Increase Proportional Gain parameter 19-42 to 50.
7. Increase the Tension Set Point 20% through the input means selected in parameter 19-19.
8. If rewinding, the Winder should increase in speed. If the station is used as an unwinder, the speed should decrease. If there is no change in speed, increase par 19-42 until a speed change is noticeable.
9. Applied load to load cells or dancer to indicate a tension feedback over 20 % (200). The Winder should decrease in speed if rewinding and increase in speed if unwinding.
10. Stop the line.
11. Open Input 5 “Tension off”

5.1.7 Winder Closed Loop Calibration

1. Web up the machine.
2. Verify the starting diameter:
   - If rewinding with an empty core, the value set in parameter 19-05 should be the starting diameter. Open Input 4 “Partial Core” and Input 7 “Core Select.”
   - If starting with a partial roll or if unwinding, the diameter value should be measured and the percentage of 100,000 calculated. This value should be entered into parameter 19-04. Close Input I4.
   - Reset the diameter with Input I8. (If using the initial diameter measurement function, no special action is required.)
3. Close Input 5 “Tension ON”.
4. Set the Tension Set Point to a proper tension for the material being used. If using a dancer, set the tension set point to 500, which represents the mid-point dancer position.
5. Increase tension proportional gain parameter 19-42 until the winder starts to develop tension. Continue to increase until the displayed Tapered Tension Set Point matches the LCP displayed Tension Feedback. Note proportional gain value. Continue to increase until winder becomes unstable when a tension disturbance is introduced by pushing on the web. Note this value and set the proportional gain between these two values.
6. Slowly increase line speed to about 10 % of max. Adjust the integral time parameter 19-44 until tension is stable.
7. Slowly increase line speed to max speed. Fine-tune parameters 19-43 – 19-47 for stable tension.
8. Adjust par 19-30 “Acceleration Feed-Forward” so that tension remains stable during acceleration or deceleration. This adjustment should be optimized when line ramps are set to minimum values required.
9. Check that the displayed Diameter is changing with the roll diameter.
10. If the Tension Limit Detection (TLD) is to be used, determine appropriate settings for parameters 19-08 to 19-11.
11. Determine desired setting for parameter 19-12, End-of-roll output.
12. Ensure tuning is appropriate from core to full roll. If tension regulation changes with roll diameter, adjust the PID profiler parameter 19-41. A higher setting will result in a reduction of PID output at larger roll diameters.
13. If various materials are run on the winder, repeat steps 5 through 9 with all additional material types or widths. Input 6 is provided to allow switching between two different material types or nine material types if using parameter 19-66.

6

6 Troubleshooting

Parameter 19-93 indicates the error status of the Center Winder Controller. Several different conditions can be detected.

NO ALARM	[0]
TENSION LIMIT DETECTED	[1]
FC ALARM	[2]
MCO305 ERROR	[3]
QSTOP	[4]
LOCAL MODE	[5]

Table 6.1: **Center winder error, par. 19-93**

Turning the tension off resets all fault conditions while in remote mode.

All messages are shown in the LCP display of the FC 300 in short and in the APOSS software in plain text.
You can find brief information on the error messages in the table or detailed information in the following section.

The tables contain the messages in numerical order. Letters following a % sign represent variables which can be used in plain text at the corresponding locations

Error no	Error Text	Description
103	Illegal axis num.	Axes not in system
105	Error not reset	Error not cleared
106	Home not done	Failed to move to HOME position
107	Home vel. zero	Home was executed with Home Velocity set to zero
108	Position error	Position error
109	Index not found	Index pulse (encoder) not found
110	Unknown cmm.	Unknow command
111	SW end limit	Software end limit activated
112	Unknown param.	Illegal parameter number
113	FC not enabled	FC 300 is not ready but the PID controller is active
114	Too many loops	Too many nested loops
115	Par. save failed	Parameter save failed
116	Param. memory	Parameters in memory are corrupted
117	Progr. memory	Programs in memory are corrupted
118	Reset by CPU	Reset by CPU
119	User abort	User abort
125	HW end limit	HQ end limit activated
149	Too many inter.	Too many interrupt functions
150	No ext. 24V	External supply is missing
151	Too many gosub	Too many nested GOSUB commands
152	Too many return	Too many RETURN commands
154	D. out overload	Digital Output overloaded
155	LINK failed	LINKGPAR command failed
162	Memory error	Error in veryfying; EEPROM: address % defect
170	Array size (DIM)	Error in DIM command
171	Array too small	Attempt was made to cross array bounds
179	Waitndx timeout	Timeout while waiting for index
184	Too many ontime	Too many time interrupts
187	Out of memory	No more room for variables
190	Memory locked	The program memory is write-protected
191	Illegal cam array	Curve array wrong
192	Encoder error	Encoder error
199	Internal MCO fault	Internal MCO fault

7

7 Appendix

7.1.1 Center Winder Settings

Par. No.	Parameter Description	Default Value	Changes During Operation	4 set-up	Conversion Index	Type
Basic Winder Settings						
19-01	Winder Mode Selection	[0] Rewinder	TRUE	-	-	-
19-02	Tension Set-Point	0	TRUE	-	-	-
19-03	Taper Set-Point	0	TRUE	-	-	-
19-04	Partial Roll Diameter Value	5000	TRUE	-	-	-
19-05	Smallest Core Used	5000	TRUE	-	-	-
19-06	Secondary Core	5000	TRUE	-	-	-
19-07	Winder Jog Speed	0	TRUE	-	-	-
19-08	TLD Low Limit	0	TRUE	-	-	-
19-09	TLD High Limit	0	TRUE	-	-	-
19-10	TLD Out of Range Timer	1	TRUE	-	-	-
19-11	TLD Timer Start Value	0	TRUE	-	-	-
19-12	End of Roll Detector	0	TRUE	-	-	-
19-13	Initial Diameter Measurement	[0] Set diameter when diameter reset	TRUE	-	-	-
19-14	Diameter Measurement Input	[1] Input 53	TRUE	-	-	-
19-15	Reading at Core	0	TRUE	-	-	-
19-16	Reading at Full Roll	0	TRUE	-	-	-
19-19	Tension Set-Point Input	[0] Par. 19-02	TRUE	-	-	-
19-20	Taper Set-Point Input	[0] Par. 19-03	TRUE	-	-	-
19-21	Tension Feedback Input	[1] Input 53	TRUE	-	-	-
19-22	Tension Feedback Type	[0] Load cell	TRUE	-	-	-
19-23	Discrete Functions Source	[1] Par. 19-61 to 19-68	TRUE	-	-	-
19-24	Line Speed Scale	200	TRUE	-	-	-
19-25	Speed Match Scale	500	TRUE	-	-	-
19-26	Winder Speed Scale	200	TRUE	-	-	-
19-27	Diameter Change Rate	1	TRUE	-	-	-
19-28	Tapered Tension Change Rate	1	TRUE	-	-	-
19-29	Diameter Calculator Minimum Speed	500	TRUE	-	-	-
19-30	Line Acceleration Feed-Forward	0	TRUE	-	-	-
19-31	Velocity Sampling Time (ms)	50	TRUE	-	-	-
Tension PID Settings						
19-40	Tension PID Maximum Contribution	0	TRUE	-	-	-
19-41	PID Effect Verses Diameter	0	TRUE	-	-	-
19-42	PID Proportional Gain	0	TRUE	-	-	-
19-43	PID Derivative Time	0	TRUE	-	-	-
19-44	PID Integral Time	10	TRUE	-	-	-
19-45	PID Integral Limit	0	TRUE	-	-	-
19-47	PID Der. Gain Limit	1000	TRUE	-	-	-
19-48	PID Anti Wind-up	[0] Anti Wind-up disabled	TRUE	-	-	-
19-49	Speed Loop Prop Min.	0	TRUE	-	-	-
19-50	Speed Loop Prop Max.	0	TRUE	-	-	-
19-51	Save Speed Prop Values	[0] No Function	TRUE	-	-	-
19-6* Command Parameters						
19-61	Over Under Winding	[0] Over Winding	TRUE			
19-62	Winder Jog Reverse	[0] No Function	TRUE			
19-63	Winder Jog Forward	[0] No Function	TRUE			
19-64	New Diameter Select	[0] No Function	TRUE			
19-65	Tension On/Off	[0] Turns tension off	TRUE			
19-66	Mat Select	1	TRUE			
19-67	Core Select	[0] Core 1	TRUE			
19-68	Diameter Reset	[0] Core 1	TRUE			
19-9* Read Only Application Parameters						
19-92	Winder Software Version	-	read only	No	0	Int32
19-93	Winder Error Status	-	read only	No	0	Int32
19-94	Program Loop Scan Time	-	read only	No	0	Int32
19-95	Winder Speed Counts	-	read only	No	0	Int32
19-96	Line Speed Counts	-	read only	No	0	Int32
19-97	Diameter Size	-	read only	No	0	Int32
19-98	Tapered Tension Set-Point	-	read only	No	0	Int32
19-99	Tension Feedback	-	read only	No	0	Int32

7.1.2 MCO Basic Settings

Par. No.	Parameter Description	Default Value	Changes During Operation	4 set-up	Conversion Index	Type
32-0* Encoder 2 - Slave						
32-00	Encoder Type	[1] RS422	TRUE	1set-up		Uint8
32-01	Incremental Resolution	1024 PPR	TRUE	1set-up		Uint32
32-02	Absolute Protocol	[0] None	TRUE	1set-up		Uint8
32-03	Absolute Resolution	8192 PPR	TRUE	1set-up		Uint32
32-05	Absolute Encoder Data Length	25 Bit	TRUE	1set-up		Uint8
32-06	Absolute Encoder Clock Frequency	262.000 kHz	TRUE	1set-up		Uint32
32-07	Absolute Encoder Clock Generation	[1] On	TRUE	1set-up		Uint8
32-08	Absolute Encoder Cable Length	0	TRUE	1set-up		Uint16
32-09	Encoder Monitoring	[0] Off	TRUE	1set-up		Uint8
32-10	Rotational Direction	[1] No action	TRUE	1set-up		Uint8
32-11	User Unit Denominator	1	TRUE	1set-up		Uint32
32-12	User Unit Numerator	1	TRUE	1set-up		Uint32
32-3* Encoder 1 - Master						
32-30	Incremental Signal Type	[1] RS422	TRUE	1set-up		Uint8
32-31	Incremental Resolution	1024 PPR	TRUE	1set-up		Uint32
32-32	Absolute Protocol	[0] None	TRUE	1set-up		Uint8
32-33	Absolute Resolution	8192 PPR	TRUE	1set-up		Uint32
32-35	Absolute Encoder Data Length	25 Bit	TRUE	1set-up		Uint8
32-36	Absolute Encoder Clock Frequency	262.000 kHz	TRUE	1set-up		Uint32
32-37	Absolute Encoder Clock Generation	[1] On	TRUE	1set-up		Uint8
32-38	Absolute Encoder Cable Length	0	TRUE	1set-up		Uint16
32-39	Encoder Monitoring	[0] Off	TRUE	1set-up		Uint8
32-40	Encoder Termination	[1] On	TRUE	1set-up		Uint8
32-5* Feedback Source						
32-50	Source Slave	[2] Enc2	TRUE	1-setup		
32-6* PID Controller						
32-60	Proportional Factor	30	TRUE	1-setup	0	Uint32
32-61	Derivative Value for PID Control	0	TRUE	1-setup	0	Uint32
32-62	Integral Factor	0	TRUE	1-setup	0	Uint32
32-63	Limit Value for Integral Sum	1000	TRUE	1-setup	0	Uint16
32-64	PID Bandwidth	1000	TRUE	1-setup	0	Uint16
32-65	Velocity Feed-forward	0	TRUE	1-setup	0	Uint32
32-66	Acceleration Feed-forward	0%	TRUE	1-setup	0	Uint32
32-67	Maximum Tolerated Position Error	20000 qc	TRUE	1-setup		Uint32
32-68	Reverse Behavior for Slave	[0] Reversing	TRUE	1-setup		Uint8
32-69	Sampling Time for PID Control	1 ms	TRUE	1-setup		Uint16
32-70	Scan Time for Profile Generator	[1] 1 ms	TRUE	1-setup		Uint8
32-71	Size of the Control Window (Activation)	0 qc	TRUE	1-setup		Uint32
32-72	Size of the Control Window (Deactivation)	0 qc	TRUE	1-setup		Uint32
32-8* Velocity & Acceleration						
32-80	Maximum Velocity (Encoder)	1500 RPM	TRUE	All set-ups		Uint32
32-81	Shortest Ramp	1000 ms	TRUE	All set-ups		Uint32
32-82	Ramp Type	0	TRUE	All set-ups		Uint8
32-83	Velocity Resolution	100	TRUE	All set-ups		Uint16
32-84	Default Velocity	50	TRUE	All set-ups		Uint16
32-85	Default Acceleration	50	TRUE	All set-ups		Uint16

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