nexen

WEB CONTROL PRODUCTS

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RSTC1000 HMI/PLC Design Guide

DANGER

Read this manual carefully before installation and operation.

Follow Nexen's instructions and integrate this unit into your system with care.

This unit should be installed, operated and maintained by qualified personnel ONLY.

Improper installation can damage your system or cause injury or death.

Comply with all applicable codes.

In accordance with Nexen's established policy of constant product improvement, the specifications contained in this manual are subject to change without notice. Technical data listed in this manual are based on the latest information available at the time of printing and are also subject to change without notice.

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ISO 9001 Certified

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MODBUS RS485 COMMUNICATIONS

NOTE: This manual assumes familiarity with the Modbus RTU over Serial Line protocol. If you are not familiar with this protocol, then the following documents must be read: Modbus Application Protocol Specification and Modbus over Serial Line Specification & Implementation Guide found at http://www. modbus.org.

Modbus RTU is a master/slave protocol that allows the RSTC1000 to send information only after it has been requested from the master device, typically the RSTC Operator Panel (ROP), Programmable Logic Controller (PLC), or Human Machine Interface (HMI). There can be up to 247 devices on one network all communicating with just one master. Each device on the network must share the same communication settings and have a unique address in the range of 1 to 247 with the exception of the master, which does not require an address.

The RSTC1000 default communication settings are as follows:
• Network Address: 24
• Baud Rate: 19200
• Parity: none
• Stop Bits: 2

These settings can be changed via the RSTC Communications Software, or must first be used by the master to establish communication with the RSTC1000 and then changed as desired. The ROP has been programmed with the same communication parameters and will, upon connecting to the RSTC1000, be able to communicate without any changes. Because the ROP is a master device there can be no other masters on the same Modbus network.

Any address in the range of 1 to 247 can be assigned to the RSTC1000.

Baud rates, which designate the message transmission speed in units of bits per second, can be set for 4800, 9600, 14400, 19200, 38400, or 56000. The larger the baud rate the less time it takes for a message to travel across the network and the less time a device spends sending or receiving the message. However, the trade off is typically reduced communication cable length. The Modbus standard specifies the maximum communication cable length as 1000 meters using a 4-wire implementation (500 meters for a 2-wire implementation), 26 AWG or larger wire, shielded, at 9600 baud. Cable capacitance and wire resistance affect baud rates, and as cable lengths increase so does the capacitance and resistance. This can cause a reduction in the speed that a message can travel across the network.

Each message byte that is sent using the Modbus RTU protocol is eleven bits long with the message data byte being eight bits and then encapsulated by three other bits: start, parity, and stop. The start bit marks the beginning of the message byte. Parity is used for error detection and is often not necessary as another error detection method, Cyclical Redundancy Checking (CRC), is also performed on the message byte to check for errors. The stop bit marks the end of the message byte.

Parity can be set for none, odd, or even.

Stop Bits must be set to 1 for use with odd or even parity or 2 for use with no parity.

Load Termination Resistors (LTR) are necessary to reduce noise and are applied to the devices at the remote ends of the network. These resistors can be installed at the RSTC1000's Modbus RS485 port connector (refer to Figure 1). Typical values for LTRs are 150 ohms and 0.5 watts.

CONNECTION DIAGRAMS

FIGURE 1
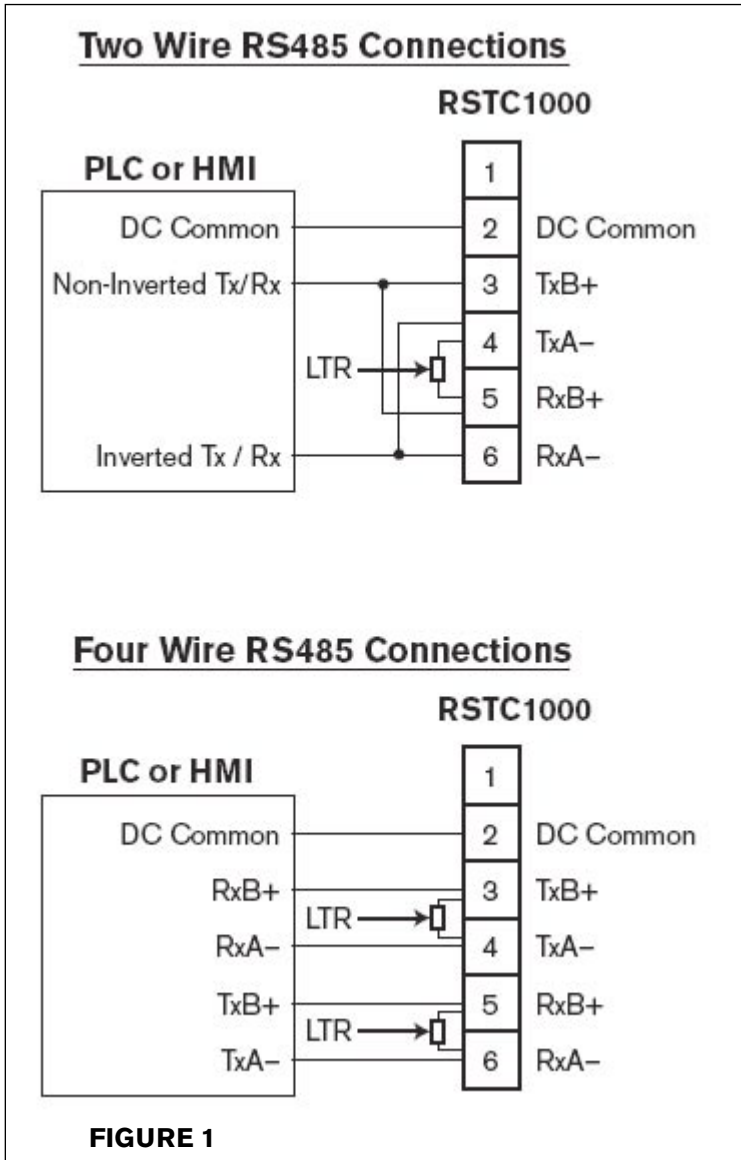
RSTC1000 REGISTERS

All values written to or read from the RSTC1000 must be in Imperial units. Conversion of values from other units of measure are done within the HMI or PLC.

The following Modbus registers are numbered per the Modbus standard. Many PLCs use an alternate numbering scheme and the Modbus register numbers can be converted to the PLC numbering scheme by adding 40,001 to each Modbus register number.

Common Definitions and Abbreviations:
        lsb: least significant byte
        msb: most significant byte
        lsw: least significant word
        msw: most significant word
        byte: 8 bits, 0-255 range
        word: 2 bytes, 0-65535 range

PRODUCT INFORMATION

1 – 4: **Product Name** Sent as ASCII values, read only.
        Example: RSTC1000
        Register 1: R (msb), S (lsb)
        Register 2: T (msb), C (lsb)
        Register 3: 1 (msb), 0 (lsb)
        Register 4: 0 (msb), 0 (lsb)

6 – 7: **Product Number** Sent as long integer, read only.
        Example: 964523
        Register 6: 14 (msw)
        Register 7: 47019 (lsw)
        964523 = (14 * 65536) + 47019

8 – 9: **Serial Number** Sent as long integer, read only.
        Example: 1234567
        Register 8: 18 (msw)
        Register 9: 54919 (lsw)
        1234567 = (18 * 65536) + 54919

10 – 11: **Software Part Number** Sent as long integer, read only.
        Example: 12345
        Register 10: 0 (msw)
        Register 11: 12345 (lsw)
        12345 = (0 * 65536) + 12345

12: **Software Revision** Sent as ASCII value, read only.
        Example: A
        Register 12: 0 (msb), 65 (lsb)

MODBUS COMMUNICATION PARAMETERS

Writing to registers 15-18 changes the communication parameters. New paramter values take effect immediately after writing to register 19, or after turning the RSTC1000 power off and back on.

15: **Baud Rate** Sent as integer, read & write. Supported baud rates are 4800, 9600, 14400, 19200, 38400, 56000).
> Example: 19200
> Register 15: 75 (msb), 0 (lsb)
> 19200 = (75 * 256) + 0

16: **Device Address** Sent as integer, read & write. Address values are 1–247.
> Example: 24
> Register 16: 0 (msb), 24 (lsb)

17: **Parity** Sent as integer, read & write. Parity values are 1 = even, 2 = odd, 3 = none.
> Example: 3
> Register 17: 0 (msb), 3 (lsb)

18: **Stop Bits** Sent as integer, read & write. Stop Bit values are 1 = 1 stop bit, 2 = 2 stop bits.
> Example: 2
> Register 18: 0 (msb), 2 (lsb)

19: **Remote Communications Reset** Sent as integer, write only. Writing a 1 will cause RSTC1000 to begin using updated communication parameters immediately. Reading this variable will return a zero.
> Example: 1
> Register 19: 0 (msb), 1 (lsb)

DIAGNOSTICS

30: **Alarm Status** Sent as integer, read only.

Web Break: value = 128, total loss of web tension.
No Control: value = 72, control signal output has reached 0% or 100% during automatic operation and web tension is not at set point.
High Tension: value = 64, web tension is greater than the high-tension limit.
Low Tension: value = 32, web tension is less than the low-tension limit.
Max Output: value = 16, control signal output has reached maximum output limit, typically 100%.
Min Output: value = 8, control signal output has reached minimum output limit, typically 0%.

> Example: 32
> Register 30: 0 (msb), 32 (lsb)

31 - 32: **Load Cell 1 Tension** Floating point number sent as long integer * 1000 in units of lbs, read only, tension range is 0.000 to 10,000.000 lbs.
> Example: 543.812 lbs
> Register 31: 8 (msw)
> Register 32: 19524 (lsw)
> Load Cell 1 Tension = ((8 * 65536) + 19524) / 1000 = 543.812 lbs

33 - 34: **Load Cell 2 Tension** Floating point number sent as long integer * 1000 in units of lbs, read only, tension range is 0.000 to 10,000.000 lbs.
> Example: 543.000 lbs
> Register 33: 8 (msw)
> Register 34: 18712 (lsw)
> Load Cell 2 Tension = ((8 * 65536) + 18712) / 1000 = 543.000 lbs

35: Control Output % Floating point sent as integer * 10, read only. Control Output % range is 0.0 to 100.0.
>   Example: 45.6%
>   Register 35: 1 (msb), 200 (lsb)
>   Control Output = ((1 * 256) + 200) / 10 = 45.6%

36 – 37: Roll Diameter Floating point number sent as long integer * 1000 in units of inches, read only, diameter range is 0.000 to 400.000.
>   Example: 34.835 inches
>   Register 36: 0 (msw)
>   Register 37: 34835 (lsw)
>   Roll Diameter = ((0 * 65536) + 34835) / 1000 = 34.835 inches

38: Run/Stop Sent as integer, read & write. Run/Stop values are 1 = run and 0 = stop. Writing a 1 to the RSTC1000 will place it in the run mode and writing a 0 will place it in the stop mode. Reading this register provides the RSTC1000's current operating mode.
>   Example: 1
>   Register 38: 0 (msb), 1 (lsb)

39: Splice A Sent as integer, read & write. Write 1 to make Control Output A the controlling output and Control Output B the standby output. Register 39 can be read immediately after initially writing 1 and the returned value will be 1 for approximately one second before returning to zero.
>   Example: 1
>   Register 39: 0 (msb), 1 (lsb)

40: Splice B Sent as integer, read & write. Write 1 to make Control Output B the controlling output and Control Output A the standby output. Register 40 can be read immediately after initially writing 1 and the returned value will be 1 for approximately one second before returning to zero.
>   Example: 1
>   Register 40: 0 (msb), 1 (lsb)

41: Adaptation Floating point number sent as integer * 10, read only. Read the current calculated adaptation value. Used for diagnostic work. Adaptation ranges from 0.0 to 100.0.
>   Example: 8.9
>   Register 41: 0 (msb), 89 (lsb)
>   Adaptation = ((0 * 256) + 89) / 10 = 8.9

43 – 44: Taper Tension Setpoint Floating point number sent as long integer * 1000 in units of lbs, read only, range is 0.000 to 10,000.000 lbs but restricted by Maximum and Minimum Tension Setpoint values. Reads the calculated taper tension setpoint which decreases as roll diameter increases, calculation is always performed regardless of Taper Tension Enable. Taper Tension Setpoint is a function of Taper Factor and a condition of Taper Delay.
Example: 543.812 lbs
>   Register 43: 8 (msw)
>   Register 44: 19524 (lsw)
>   Taper Tension Setpoint = ((8 * 65536) + 19524) / 1000 = 543.812 lbs

TUNING

45: Taper Tension Enable Sent as integer, read & write. Taper Tension Enable has values of 0 for off and 1 for on. When set to 1, web tension will decrease with increasing roll diameter as a function of Taper Factor and a condition of Taper Delay, when set to 0, web tension remains at Tension Setpoint value.
>   Example: 1
>   Register 45: 0 (msb), 1 (lsb)

46 – 47: Tension Setpoint Floating point number sent as long integer * 1000 in units of lbs, read & write, range is 0.000 to 10,000.000 lbs but restricted by Maximum and Minimum Tension Setpoint values. Read the current tension setpoint or write a new tension setpoint value.

>   Example: 543.812 lbs
>   Register 46: 8 (msw)
>   Register 47: 19524 (lsw)
>   Tension Setpoint = ((8 * 65536) + 19524) / 1000 = 543.812 lbs

48: Taper Factor Sent as integer, read & write. Taper Factor has a range of 0 to 100. Taper Factor controls how much the tension setpoint is decreased for an increase in roll diameter. Larger values of Taper Factor will increase the rate of decrease and smaller values will decrease the rate of decrease. A value of 0 will result in no tension setpoint decrease.

>   Example: 37
>   Register 48: 0 (msb), 37 (lsb)

49 - 50: Taper Delay Floating point number sent as long integer * 1000 in units of inches, read & write, range of 0.000 to 100.000. This value specifies the roll diameter at which tension tapering is to begin.

>   Example: 34.835 inches
>   Register 49: 0 (msw)
>   Register 50: 34835 (lsw)
>   Taper Delay = ((0 * 65536) + 34835) / 1000 = 34.835 inches

51: Gain Floating point number sent as integer * 10, read & write. Gain has a range of 0.0–10.0.

>   Example: 8.9
>   Register 51: 0 (msb), 89 (lsb)
>   Gain = ((0 * 256) + 89) / 10 = 8.9

52: Stabilization Floating point number sent as integer * 10, read & write. Stabilization has a range of 1.0–50.0.

>   Example: 5.3
>   Register 52: 0 (msb), 53 (lsb)
>   Stabilization = ((0 * 256) + 53) / 10 = 5.3

53: Initial Adaptation Floating point number sent as integer * 10, read & write. Initial Adaptation has a range of 1.0–20.0.

>   Example: 11.4
>   Register 53: 0 (msb), 114 (lsb)
>   Initial Adaptation = ((0 * 256) + 114) / 10 = 11.4

54: Splice Adaptation Floating point number sent as integer * 10, read & write. Splice Adaptation has a range of 1.0–20.0.

>   Example: 11.4
>   Register 54: 0 (msb), 114 (lsb)
>   Splice Adaptation = ((0 * 256) + 114) / 10 = 11.4

55: Adaptation Rate Floating point number sent as integer * 10, read & write. Adaptation Rate has a range of 2.0–20.0.

>   Example: 11.4
>   Register 55: 0 (msb), 114 (lsb)
>   Adaptation Rate = ((0 * 256) + 114) / 10 = 11.4

56: Tension Output Enable Sent as integer, read & write. Tension Output Enable has values of 0 for Off and 1 for On. Set to 1 for actual tension to be available on Control Output B. Set to 0 for the controlling or standby outputs to be available on Control Output B. Splice B register command and hardware input is ignored when Tension Output Enable is set to 1.

>   Example: 1
>   Register 56: 0 (msb), 1 (lsb)

SETUP

60: **Remote Tension Setpoint Enable** Sent as integer, read & write. Remote Tension Setpoint Enable has values of 0 for Off and 1 for On. Set to 1 for the Tension Setpoint value to be read from the Remote Tension Setpoint analog input. Set to 0 for the Tension Setpoint value to be sent over the Modbus network.
> Example: 1
> Register 60: 0 (msb), 1 (lsb)

61: **Tension Alarm Tolerance** Sent as integer, read & write. Tension Alarm Tolerance has a range of 0–100%.
> Example: 25%
> Register 61: 0 (msb), 25 (lsb)
> Tension Alarm Tolerance = (0 * 256) + 25 = 25%

62: **Alarm Output Type** Sent as integer, read & write. Alarm Output Type has values of 0 for Normally Open and 1 for Normally Closed.
> Example: 1
> Register 62: 0 (msb), 1 (lsb)

63: **Torque Actuator** Sent as integer, read & write.
Torque Actuator has the following values:
> > 1 – Pneumatic Brake
> > 2 – Pneumatic Clutch
> > 3 – Magnetic Particle Brake
> > 4 – Magnetic Particle Clutch
> > 5 – Electric Brake
> > 6 – Electric Clutch
> > 7 – Motor-Drive System
> Example 2 – Pneumatic Clutch
> Register 63: 0 (msb), 2 (lsb)

64: **Torque Actuator Inertia** Sent as integer * 100 in units of lb-ft^2, read & write. Torque Actuator Inertia has a range of 0.00 to 100.00
> Example 21.37 lb-ft^2
> Register 64: 8 (msb), 89 (lsb)
> Torque Actuator Inertia = ((8 * 256) + 89) / 100 = 21.37 lb-ft2

65: **Tension Zone Selection** Sent as integer, read & write. Tension Zone Selection has values of 1 for Unwind and 2 for Wind.
> Example 2 – Pneumatic Clutch
> Register 65: 0 (msb), 2 (lsb)

66: **Minimum Output %** Sent as intger, read & write. Minimum Output has a range of 0–100 %.
> Example 32%
> Register 66: 0 (msb), 32 (lsb)

67: **Maximum Output %** Sent as intger, read & write. Maximum Output has a range of 0–100 %.
> Example 10%
> Register 67: 0 (msb), 10 (lsb)

68: **Standby Output %** Sent as intger, read & write. Standby Output has a range of 0–100 %.
> Example 67%
> Register 68: 0 (msb), 67 (lsb)

69: **Web Material Selection** Sent as integer, read & write. Web Material Selection has values of 1 for paper and plastic, 2 for aluminum, and 3 for steel.
> Example 2 – aluminum
> Register 69: 0 (msb), 2 (lsb)

70: **Average Web Width** Floating point number sent as integer * 10 in units of inches, read & write. Average Web Width has a range of 1.0–400.0 inches.

> Example 287.2 inches
> Register 70: 11 (msb), 56 (lsb)
> Average Web Width = ((11 * 256) + 56) / 10 = 287.2 inches

71: **Large Roll Diameter** Floating point number sent as integer * 10 in units of inches, read & write. Large Roll Diameter has a range of 0.0–400.0 inches.

> Example 40.5 inches
> Register 71: 1 (msb), 149 (lsb)
> Average Web Width = ((1 * 256) + 149) / 10 = 40.5 inches

72: **Core Roll Diameter** Floating point number sent as integer * 10 in units of inches, read & write. Core Roll Diameter has a range of 0.0–50.0 inches.

> Example 3.5 inches
> Register 71: 0 (msb), 35 (lsb)
> Average Web Width = ((0 * 256) + 35) / 10 = 3.5 inches

77: **Tension Calibration Set** Sent as integer, read & write. Tension Calibration Set has values of 1 for Calibration Set 1, 2 for Calibration Set 2, and 3 for Calibration Set 3. Writing a value to this register selects the desired calibration set.

> Example 3 – Tension Calibration Set 3
> Register 80: 0 (msb), 3 (lsb)

78: **Display Units** Sent as integer, read & write. Display Units has values of 0 for Imperial (English) and 1 for Metric. Display Units has no effect on the RSTC as it only stores the value, and register values are communicated in Imperial units only. Any Imperial to Metric or Metric to Imperial conversion is done in the HMI or PLC.

> Example 1 – Metric
> Register 77: 0 (msb), 1 (lsb)

79: **Language** Sent as integer, read & write. Language has values of 0 for English, 1 for Spanish, 2 for French, 3 for German, and 4 for Italian. Language is used primarily to select the language in which the RSTC Operator Panel displays text and has no effect on the RSTC.

> Example 0 – English
> Register 78: 0 (msb), 0 (lsb)

80: **Panel Write Enable** Sent as integer, read & write. Panel Write Enable has values of 0 for disable and 1 for enable. RSTC1000 sets this register to 0 whenever the RSTC Communications Software is connected to the RSTC1000. An HMI can read this register and when equal to 0, any values sent by the HMI will be ignored by the RSTC1000. After the RSTC Communications Software is disconnected, the RSTC1000 sets this register to 1 and the HMI can again send values to the RSTC1000. This handshaking can be used to prevent two devices from sending register value changes to the RSTC1000 at the same time.

> Example 1 – Enable
> Register 79: 0 (msb), 1 (lsb)

CONTROL

81: **Manual/Automatic Mode** Sent as integer, read & write. Manual/Automatic Mode has a value of 0 for Manual and 1 for Automatic. When mode is set to Manual the RSTC1000 control output can be controlled using the Manual Output Level register. When mode is set to Automatic the RSTC1000 control output is automatically controlled and writing to Manual Output Level has no effect.

> Example 1 – Automatic
> Register 81: 0 (msb), 1 (lsb)

82: Manual Output Level % Sent as integer, read & write. Manual Output Level has a range of 0 to 100%. When the RSTC1000 is in manual mode, writing to this register will immediately change the Control Output's signal level.

>   Example 67%
>   Register 82: 0 (msb), 67 (lsb)

83: Alarm Acknowledge Sent as integer, write only. Alarm Acknowledge has a value of 1 to acknowledge an alarm. Writing a 1 to this register will turn off all alarm outputs until the alarm condition is satisfied and occurs again.

>   Example 1
>   Register 83: 0 (msb), 1 (lsb)

84: Output On/Off Sent as integer, read & write. Output On/Off has a value of 0 for Off and 1 for On. Writing to this register will affect both RSTC1000 control outputs.

Example 0 – Output Off

>   Register 84: 0 (msb), 0 (lsb)

SIGNAL SELECTION

85: Run/Stop Signal Selection Sent as integer, read & write. Run/Stop Signal Selection has the following values:

>   1 – run/stop maintained
>   2 – run/stop momentary
>   3 – run only momentary
>   4 – run pulsed (encoder)
>   5 – run/stop signal via Modbus Communications
>
>   Example 4 – run pulsed (encoder)
>   Register 85: 0 (msb), 4 (lsb)

DIAMETER CALIBRATION

When calibrating the roll diameter signal, send registers 87 through 90 in the order shown here.

87: Diameter Sensor Installed Sent as integer, write only. Diameter Sensor Installed has a value of 0 for no sensor installed and 1 for sensor installed. When Diameter Sensor Installed is set to 0, values for registers 89 and 90 are ignored and Roll Diameter register is always 0.

>   Example 1
>   Register 87: 0 (msb), 1 (lsb)

88: Diameter – Core Size Floating point value sent as integer *10 in units of inches, read & write. Core Size is the outside diameter of roll's core or any roll diameter that is smaller than the roll diameter used for Large Roll Size. It has a range of 0.0 to 50.0 inches

>   Example 3.5 inches
>   Register 88: 0 (msb), 35 (lsb)
>   Core Size = ((0 * 256) + 35) / 10 = 3.5 inches

89: Diameter – Large Roll Size Floating point value sent as integer *10 in units of inches, read & write. Large Roll Size is the outside diameter of any roll used for diameter calibration that is larger than the diameter used for Core Size. It has a range of 0.0 to 400.0 inches

>   Example 42.7 inches
>   Register 89: 1 (msb), 171(lsb)
>   Large Roll Size = ((1 * 256) + 171) / 10 = 42.7 inches

90: Diameter Measure Flag Sent as integer, read & write. Diameter Measure Flag is only to be used after registers 87, 88, and 89 have been written.

    1.   Apply the voltage representing the Core Size to the Diameter Sensor Input terminal and then write a 1 to Diameter Measure Flag register. RSTC1000 will measure this voltage and calibrate the smaller roll size.
    2.   Read Diameter Measure Flag to determine when previous calibration step is complete. Calibration step is complete when flag = 0.
    3.   Apply the voltage representing the Large Roll Size to the Diameter Sensor Input terminal and then write a 2 to Diameter Measure Flag register. RSTC1000 will measure this voltage and calibrate the larger roll size.
    4.   Read Diameter Measure Flag to determine when previous calibration step is complete. Calibration step is complete when flag = 0.

The diameter measurement is now calibrated and ready for use.

91: Diameter Sensor – Core Voltage Floating point number sent as integer * 100, read only. Core Voltage has a range of 0.00 to 12.00 Volts and provides the diameter voltage measurement taken during the core size calibration.

        Example 2.13 V
        Register 91: 0 (msb), 213 (lsb)
        Core Voltage = ((0 * 256) + 213) / 100 = 2.13 Volts

92: Diameter Sensor – Large Roll Voltage Floating point number sent as integer * 100, read only. Large Roll Voltage has a range of 0.00 to 12.00 Volts and provides the diameter voltage measurement taken during the large roll size calibration.

        Example 7.45 V
        Register 92: 2 (msb), 233 (lsb)
        Large Roll Voltage = ((2 * 256) + 233) / 100 = 7.45 Volts

120: Diameter Measurement Voltage Floating point number sent as integer * 100, read only. Diameter Measurement Voltage has a range of 0.00 to 12.00 volts and provides the voltage seen at the Diameter Sensor Input terminal.

TENSION CALIBRATION

Set the Maximum Tension Setpoint before calibrating the tension sensors. Afterwards, re-calibration of tension sensors is necessary whenever Maximum Tension Setpoint is changed.

73 – 74: Minimum Tension Setpoint Floating point number sent as long integer * 1000 in units of lbs, read & write, range is 0.000 to 10,000.000 lbs. Minimum Tension Setpoint value must be less than Maximum Tension Setpoint value. Read the current minimum tension setpoint or write a new minimum tension setpoint value.

        Example: 55.742 lbs
        Register 73: 0 (msw)
        Register 74: 55742 (lsw)
        Tension Setpoint = ((0 * 65536) + 55742) / 1000 = 55.742 lbs

75 – 76: Maximum Tension Setpoint Floating point number sent as long integer * 1000 in units of lbs, read & write, range is 0.000 to 10,000.000 lbs. Maximum Tension Setpoint value must be greater than Minimum Tension Setpoint value. Read the current maximum tension setpoint or write a new maximum tension setpoint value.

        Example: 324.742 lbs
        Register 75: 4 (msw)
        Register 76: 62598 (lsw)
        Tension Setpoint = ((4 * 65536) + 62598) / 1000 = 324.742 lbs

When calibrating the tension sensor signal, the registers for each calibration set must be written in the order shown here.

Calibration Set 1

94 – 95: **Tare Tension** Floating point number sent as long integer * 1000 in units of lbs, read & write. Tare Tension is typically set to 0 and represents the web tension at the tare condition when the load cells measure only the weight of the tension sensing roller and its associated hardware.

      Example: 324.742 lbs
      Register 94: 4 (msw)
      Register 95: 62598 (lsw)
      Tare Tension = ((4 * 65536) + 62598) / 1000 = 324.742 lbs

96 – 97: **Span Tension** Floating point number sent as long integer * 1000 in units of lbs, read & write. Span Tension has a range of 1 to 10,000 lbs and represents the load seen by the load cells when a known web tension is applied that is less than the Maximum Tension Setpoint.

      Example: 350.000 lbs
      Register 96: 5 (msw)
      Register 97: 22320 (lsw)
      Span Tension = ((5 * 65536) + 22320) / 1000 = 350.000 lbs

93: **Load Cell Measure Flag** Sent as integer, read & write. Load Cell Measure Flag is only used after Tare Tension and Span Tension registers have been written.

    1.   Remove any web tension from the tension sensing roller and then write a 1 to Load Cell Measure Flag. This calibrates the load cell tare condition.
    2.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the tare calibration takes 10 seconds. Calibration step is complete when flag = 0.
    3.   Apply the web tension load that was sent to Span Tension register and then write a 2 to Load Cell Measure Flag. This calibrates the load cell span condition.
    4.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the span calibration takes 6 seconds. Calibration step is complete when flag = 0.
    5.   Remove any web tension from the tension sensing roller and write a 3 to Load Cell Measure Flag. This checks the load cell tare condition.
    6.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the tare check takes 2 seconds. Calibration step is complete when flag = 0.

Load Cell Calibration Set 1 is now calibrated.

Calibration Set 2

98 – 99: **Tare Tension** Floating point number sent as long integer * 1000 in units of lbs, read & write. Tare Tension is typically set to 0 and represents the web tension at the tare condition when the load cells measure only the weight of the tension sensing roller and its associated hardware.

100 – 101: **Span Tension** Floating point number sent as long integer * 1000 in units of lbs, read & write. Span Tension has a range of 1 to 10,000 lbs and represents the load seen by the load cells when a known web tension is applied that is less than the Maximum Tension Setpoint.

93: **Load Cell Measure Flag** Sent as integer, read & write. Load Cell Measure Flag is only used after Tare Tension and Span Tension registers have been written.

    1.   Remove any web tension from the tension sensing roller and then write a 4 to Load Cell Measure Flag. This calibrates the load cell tare condition.
    2.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the tare calibration takes 10 seconds. Calibration step is complete when flag = 0.
    3.   Apply the web tension load that was sent to Span Tension register and then write a 5 to Load Cell Measure Flag. This calibrates the load cell span condition.

4.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the span calibration takes 6 seconds. Calibration step is complete when flag = 0.

5.   Remove any web tension from the tension sensing roller and write a 6 to Load Cell Measure Flag. This checks the load cell tare condition.

6.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the tare check takes 2 seconds. Calibration step is complete when flag = 0.

Load Cell Calibration Set 2 is now calibrated.

Calibration Set 3

102 – 103: **Tare Tension** Floating point number sent as long integer * 1000 in units of lbs, read & write. Tare Tension is typically set to 0 and represents the web tension at the tare condition when the load cells measure only the weight of the tension sensing roller and its associated hardware.

104 – 105: **Span Tension** Floating point number sent as long integer * 1000 in units of lbs, read & write. Span Tension has a range of 1 to 10,000 lbs and represents the load seen by the load cells when a known web tension is applied that is less than the Maximum Tension Setpoint.

93: **Load Cell Measure Flag** Sent as integer, read & write. Load Cell Measure Flag is only used after Tare Tension and Span Tension registers have been written.

1.   Remove any web tension from the tension sensing roller and then write a 7 to Load Cell Measure Flag. This calibrates the load cell tare condition.

2.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the tare calibration takes 10 seconds. Calibration step is complete when flag = 0.

3.   Apply the web tension load that was sent to Span Tension register and then write a 8 to Load Cell Measure Flag. This calibrates the load cell span condition.

4.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the span calibration takes 6 seconds. Calibration step is complete when flag = 0.

5.   Remove any web tension from the tension sensing roller and write a 9 to Load Cell Measure Flag. This checks the load cell tare condition.

6.   Read Load Cell Measure Flag to determine when previous calibration step is complete. Under normal conditions, the tare check takes 2 seconds. Calibration step is complete when flag = 0.

Load Cell Calibration Set 3 is now calibrated.

WARRANTY

Warranties

Nexen warrants that the Products will be free from any defects in material or workmanship for a period of 12 months from the date of shipment. NEXEN MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FIT-NESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty applies only if (a) the Product has been installed, used and maintained in accordance with any applicable Nexen installation or maintenance manual for the Product; (b) the alleged defect is not attributable to normal wear and tear; (c) the Product has not been altered, misused or used for purposes other than those for which it was intended; and (d) Buyer has given written notice of the alleged defect to Nexen, and delivered the allegedly defective Product to Nexen, within one year of the date of shipment.

Exclusive Remedy

The exclusive remedy of the Buyer for any breach of the warranties set out above will be, at the sole discretion of Nexen, a repair or replacement with new, serviceably used or reconditioned Product, or issuance of credit in the amount of the purchase price paid to Nexen by the Buyer for the Products.

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Warranty Claim Procedures

To make a claim under this warranty, the claimant must give written notice of the alleged defect to whom the Product was purchased from and deliver the Product to same within one year of the date on which the alleged defect first became apparent.

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