3400HD Series
Unwind Tension Controllers

montalvo
Better Web Control®

TECHNICAL MANUAL

X-3400HD

X-3400ce
(Circuit Board Version)

DTI-3400HD

DTI-3400ce
(Circuit Board Version)

D-3400HD

D-3400ce
(Circuit Board Version)

3400HD Unwind (using 3400ce Circuit Board)

PID Web Tension Controller

Version 1.0 / Pub. Date 04/01/12 / v1

Notes:

Table of Contents

1 General Description

The Montalvo 3400 Unwind PID analog controller provides precise automatic control of web tension. The progressive PID regulator automatically compensates for roll diameter. The controller is used in a closed loop, of which the load cell roller, dancer roller (or both), and a brake (or other tension-affecting device) are part.

To properly set up and operate the controller and to take advantage of all its available features, it is important to have a general understanding of the controller and its place in the tensioning system (please refer to the diagram on the following page). A typical pneumatic system is displayed; however, the same principles apply to any other closed-loop control system. The controller outputs of 4 to 20 mA and 0 to 10V enable the 3400 Unwind to interface with a variety of output devices to control web tensioning brakes, clutches, or motors.

Load Cell Function (Only for X-3400 or DTI-3400) Two load cells (also called transducers) are normally used. The signals from the load cells are summed together to indicate total web tension across the entire web. Each load cell contains two strain gauges connected in a series. The two load cells are connected so that the four strain gauges form a Wheatstone bridge configuration supplied with 2.5V. The web tension transfers a force to the load cell roll, changing the resistance values in the bridge. The resulting voltage change is amplified and calibrated to display actual web tension.

Dancer Function (Only for D-3400 and DTI-3400) A dancer with one or more wrap rollers can be applied. The controller receives a signal from a potentiometer that is placed at the pivot point of the dancer. The resulting change in voltage is amplified and calibrated at the controller.

Converter Function (Brake)
The I/P converts the 4 to 20 mA regulator output to a proportional 0 to 75 PSI (0 to 6 bar) to control the brake. Other converters may be used, depending on the application.

Brake Function
One or more brakes may be controlled, converting the pneumatic output pressure from the I/P into torque. This torque in turn changes the web tension.

Diameter signal (recommended for D-3400 and DTI-3400)
To optimize the dancer system, a diameter signal is recommended. Diameter can be calculated by signals from two proximity switches or it can be connected from an analog device such as an ultrasonic sensor or other device.

I/P Converter Function (Air Cylinder) (only for DTI-3400)
The I/P converter is connected to the air cylinder, which applies force to the dancer arm. The converter is set with a 4 to 20 mA signal that is generated from the auto setpoint potentiometer.

Air Cylinder Function (DTI-3400)
The pneumatic cylinder changes web tension by changing the force of the dancer arm.

Auto Mode Function (Closed Loop)

X-3400:
The operator sets the desired tension with the auto setpoint potentiometer. The controller compares actual tension to the auto setpoint, and adjusts output until the actual tension and setpoint are equal. Because the web itself is part of the feedback loop, the X-3400 can quickly compensate for speed and diameter changes, and for other factors that affect tension during the process.

D-3400:
The controller receives a signal from the position of the dancer potentiometer and automatically regulates the pressure to the brake until the dancer is in center position. The dancer indicates the difference in speed between the machine and the unwind roll. The movement of the dancer can be dampened either by means of a shock absorber or by the flow control valves of an air cylinder. Only the force of the dancer, which can be changed by weights, springs, or air cylinders, creates web tension.

DTI-3400:
The auto setpoint potentiometer sets tension by adjusting the force on the dancer roll. The dancer roller potentiometer sends a signal to the controller, which automatically regulates the air pressure to the brake until the dancer roller is in center position. The load cell signals are calibrated in the controller for the display of actual web tension. Because the web itself is part of the closed loop, the DTI-3400 can quickly compensate for speed and diameter changes, and for other factors that may affect web tension.

Manual Mode Function (Open Loop)

X-3400:
The operator sets the desired brake pressure with the manual potentiometer. The web tension is still measured and displayed on the tension meter, but is not regulated in this mode. To maintain tension, the operator must make constant adjustments.

D- and DTI-3400:
No automatic regulation is done in manual mode. To set the brake pressure, and to maintain the dancer in the center position, the operator must make constant adjustments with the manual potentiometer.

X-3400HD-U

Unwind

Web Direction ▷

◁ Electrical Supply
INPUT (electrical signal) ▷

I/P Converter
Option
◁ OUTPUT
(electrical signal)

Pneumatic
Brake or Clutch
◁ Regulated Air (single line - one torque range)

Automatic
Range Expander
Option

Load Cell

Air Supply ▷   I/P Converter

P-3000HD-RE

◁ Regulated Air (2, 3 or 4 lines - multiple torque ranges)

◁ Air Supply

◁ COMMUNICATION ▷
RS-232 (PLC / PC)

D-3400HD

Unwind

Web Direction ▷

Proximity
Switches
Option

INPUT (electrical signal) ▷

Ultrasonic
Sensor
Option

DPS-1 Position Sensor Option
Dancer Potentiometer Option

Pneumatic
Brake

INPUT (electrical signal) ▷

I/P Converter
◁ Regulated Air (single line)

Reg. Air ▷   Air Cylinder

I/P Converter
Option

Air Supply ▷

◁ OUTPUT (electrical signal)

P-3000-HD-RE
◁ Regulated Air (2, 3 or 4 lines)

Reg. Air ▷

Automatic
Range Expander
Option

◁ COMMUNICATION ▷
RS-232 (PLC / PC)

◁ Air Supply

DTI-3400HD

Unwind

Web Direction ▷

Proximity
Switches
Option

Load Cell

INPUT (electrical signal) ▷
INPUT (electrical signal) ▷

Ultrasonic
Sensor
Option

DPS-1 Position Sensor Option
Dancer Potentiometer Option

Pneumatic
Brake

INPUT (electrical signal) ▷

Air Supply ▷   I/P Converter

Air Cylinder

◁ OUTPUT (electrical signal)

I/P Converter
◁ Regulated Air
(single line)

I/P
Converter
Option

◁ OUTPUT (electrical signal)

P-3000-HD-RE

Automatic
Range Expander
Option

◁ COMMUNICATION ▷
RS-232 (PLC / PC)

◁ Regulated Air (2, 3 or 4 lines)

General Function and Standard Operation

Enclosure version (X-3400HD-U and DTI-3400HD-U)

1. Manual Setpoint	Sets controller output at a constant level when the controller is in **manual** mode. (Manual setpoint on a 0 to 100% scale produces 0 to 100% output.)
2. Auto Setpoint	In **auto** mode, the X-3400 automatically regulates the output so that actual tension reaches the tension setpoint. With the DTI-3400 the Auto Setpoint sets the load on the dancer and the regulated output regulates to keep the dancer in center position.
3. Actual Tension	Displays actual tension on a scale of 0 to 100%.
4. Controller Output Meter	Displays controller/regulator output on a scale of 0 to 100%.
5. Manual / Auto Switch	Switches between **manual** and **auto** mode.
6. Tension On/Off Switch	Turns tension on and off. Output is zero when off.
7. Green Power LED	Indicates that power is on.

Enclosure version (D-3400HD-U)
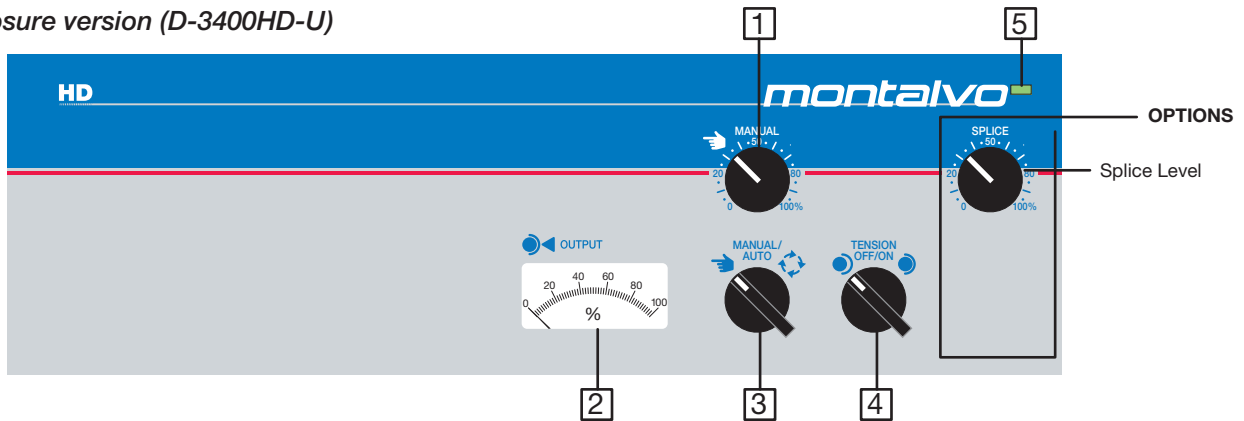
1. Manual setpoint	Sets controller output at a constant level when the controller is in manual mode. (Manual setpoint on a 0 to 100% scale produces 0 to 100% output.)
2. Controller Output Meter	Displays controller/regulator output on a scale of 0 to 100%.
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2 Mechanical Installation

2.1 Mechanical Dimension PCB (3400ce)
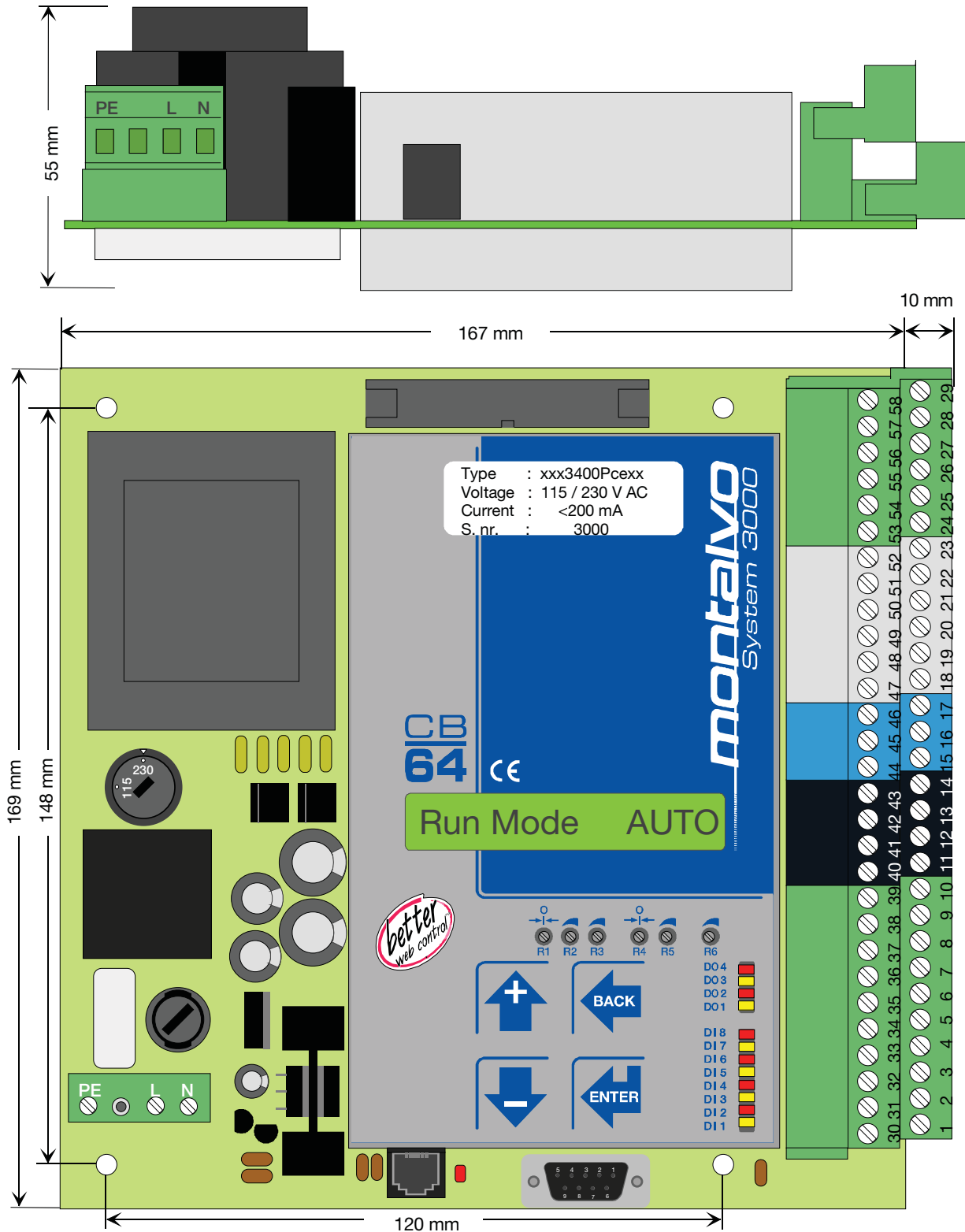
2.2 Enclosure Dimension (3400HD)

Avoid mounting the controller Enclosure close to drive controllers or any other equipment producing large amounts of EMI.

Ø 0.31 (8)

8.00 (203)
10.00 (254)

Typical connector

12.0 (305)
12.75 (324)
13.50 (331)

0.07 (1.8) 5.00 (127) 0.59 (15)

20.00 (508)

Door Latch
Holds door open while servicing controller.

15.00 (381)
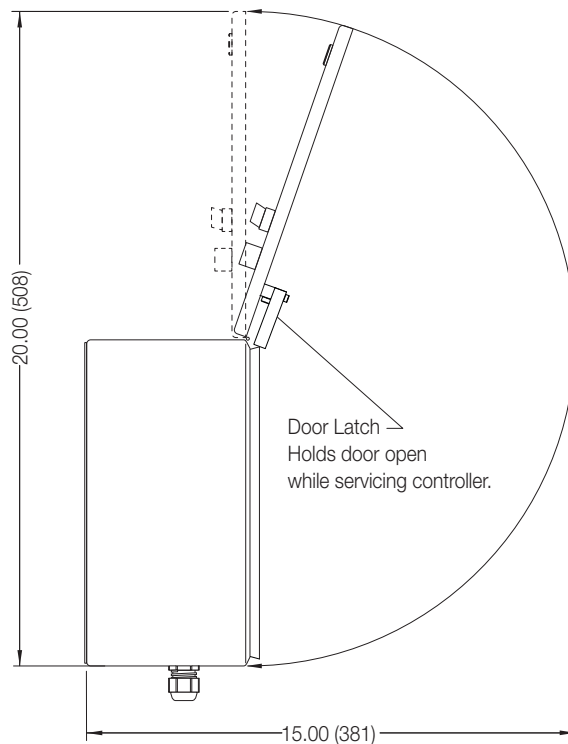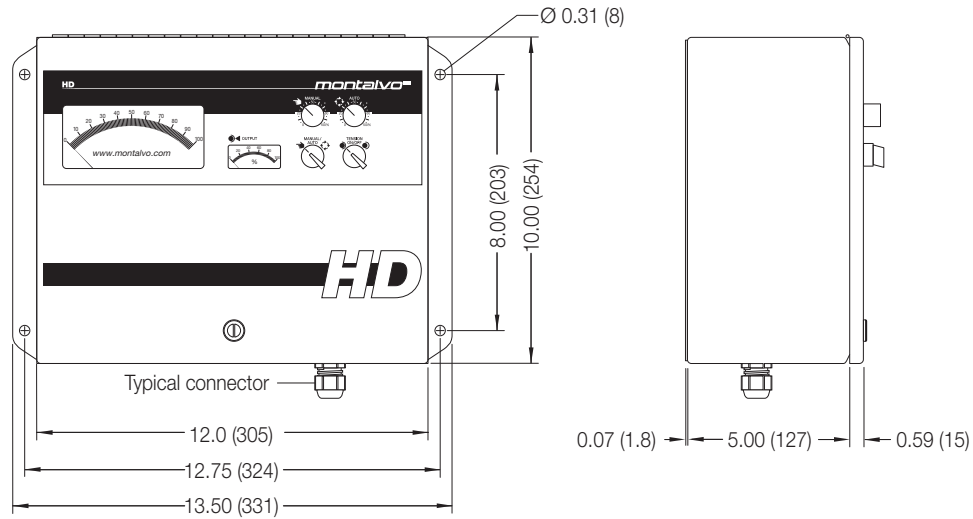
3 Electrical Installation

3.1 Warning, EMC, and Safety

Warning: Electrical installation must be done by skilled personnel. Wiring must meet all applicable codes and standards.

Refer to the appropriate wiring and terminal descriptions for external connections.

Be sure that the voltage selector on the regulator PCB is in the correct position for the voltage supplied.

Select the PCB fuse size according to the input voltage selected. The maximum external fuse on the input is 10A.

Note: 0V and PE are internally connected.
Note: Double-check the accuracy of all wiring connections before applying power to the controller. Damage caused by improper wiring is not under warranty.

EMC Requirements: Connect the protective ground wire to the terminal marked PE. Ground wires should be as short as possible. Connect the PE, mounting plate, and Enclosure to a common ground.

Use only shielded cables for all external connections. For analog signals, terminate the shield at the controller end; for digital signals, terminate the shield at both ends. For Enclosure versions, connect the shield to the Enclosure at the entering point of the cable, whether to a bus bar or to the connector housing. Keep the shield as short as possible (do not exceed 10 mm or 0.4 inches). For the best results, clamp the un-insulated shield directly to the bus bar using the strain relieves provided.

Keep signal cables away from supply cables or any wires that conduct high current. For the best noise immunity, run signal cables close to the machine frame, mounting plates, or other grounded structures.

SAFETY INFORMATION
The following safety symbols appear in this manual.

Caution
Failure to follow installation and setup instructions in this manual may result in equipment damage or personal injury.

Electrical Hazard
Failure to follow wiring instructions in this manual may result in equipment damage, personal injury, or death.

3.2 Basic Diagrams Non-Enclosure Version (X-3400ce-UW)

Power supply 115 / 230V AC

TENSION output

Voltage 0 - 10V

Auto setpoint 10 K

Manual setpoint 10 K

Run

Fast stop

| L | N | PE | 44 | 45 | 46 | 18 | 19 | 20 | 47 | 48 | 49 | 34 | 36 | 6 |

PE is connected to 0V

| 12 | 13 | 14 | 43 | 42 | 41 | 4 | 15 | 16 | 17 | 31 | 33 | 32 |

black   white   red or brown

red or brown   white   black

**See note below

Manual

Tension off

Loadcell 1

Loadcell 2

Current 4 - 20mA

Voltage 0 - 10V

REGULATED output
**Connect wire if converter uses 24V power supply

*Type 1 connector 3 pole MIL std. (a-c)
*Type 2 connector 6 pole DIN std. (1-3)
*Type 3 connector 4 pole Din std. (1, 2, 4)

3.3 Basic Diagrams Enclosure Version (X-3400HD-U)

Front Panel

Tension

Output

Manual
10 K
0V   10V

Auto Setpoint
10 K
0V   10V

100 K

100 K

0V   10V

Manual   Tension Off

24V

27   28   4   17   5   19   Multi connector   1   12   13

Multi Cable

Multi Connector

Run   Fast Stop

24V

34   36   6

Power Supply
115 / 230V AC

L   N   PE

PE is connected to 0V

12   13   14

43   42   41

4   15   16   17

black   white   red or brown

red or brown   white   black

24V

**See note below

Loadcell 1

Loadcell 2

Current 4 - 20mA

- Voltage +
0 - 10V

REGULATED OUTPUT
**Connect wire if converter uses 24V power supply

*Type 1 connector 3 pole MIL std. (a-c)
*Type 2 connector 6 pole DIN std. (1-3)
*Type 3 connector 4 pole DIN std. (1,2,4)

3.4 Basic Diagrams Non-Enclosure Version (D-3400ce-UW)

Power supply 115 / 230V AC

Manual setpoint
10 K

Manual

Tension Off

Run

Fast Stop

| L | N | PE | | 47 | 48 | 49 | | 31 | 33 | 32 | | 34 | 36 | 6 |

PE is connected to 0V

| 12 | 13 | 14 | | 4 | 15 | 16 | | 17 | | 33 | 5 | 1 | | 35 | | 50 | 51 |

+24V   0V

10 K

Dancer Potentiometer

10K

**See note below

REGULATED output
Current 4 - 20mA
Voltage 0 - 10V

Proximity switches

+24 S 0V
PNP
Web pulse

+24 S 0V
PNP
Brake pulse

or

Aux1 Input 0-10V
Analog input 0-10V

Diameter

**Connect wire if converter uses 24V power supply

3.5 Basic Diagrams Enclosure Version (D-3400HD-U)

3.6 Basic Diagrams Non-Enclosure Version (DTI-3400ce-UW)

Power supply	Tension Output	Auto setpoint	Manual setpoint		Run	Faststop	Manual	Tension off
115 / 230V AC	Voltage 0 - 10 V − +	10 K	10 K	Dancer Load 0-10V				

| L | N | PE | 44 | 45 | 18 | 19 | 20 | 47 | 48 | 49 | 57 | 58 | 34 | 6 | 31 | 32 | 36 |

PE is connected to 0V

| 12 | 13 | 14 | 43 | 42 | 41 | 26 | 25 | 27 | 4 | 28 | 29 | 4 | 15 | 16 | 17 | 33 | 5 | 1 | 35 | 50 | 51 |

black white red or brown   red or brown white black

24V   0V   0V

Loadcell 1

Loadcell 2

CW
10 K

Dancer Potentiometer

See note below

Current 4 - 20mA

Dancer Load

See note below

Current 4 - 20mA

Voltage 0 - 10 V
− +

Regulated output

24 S0V
PNP
Web pulse

24S0V
PNP
Brake pulse

Proximity switches
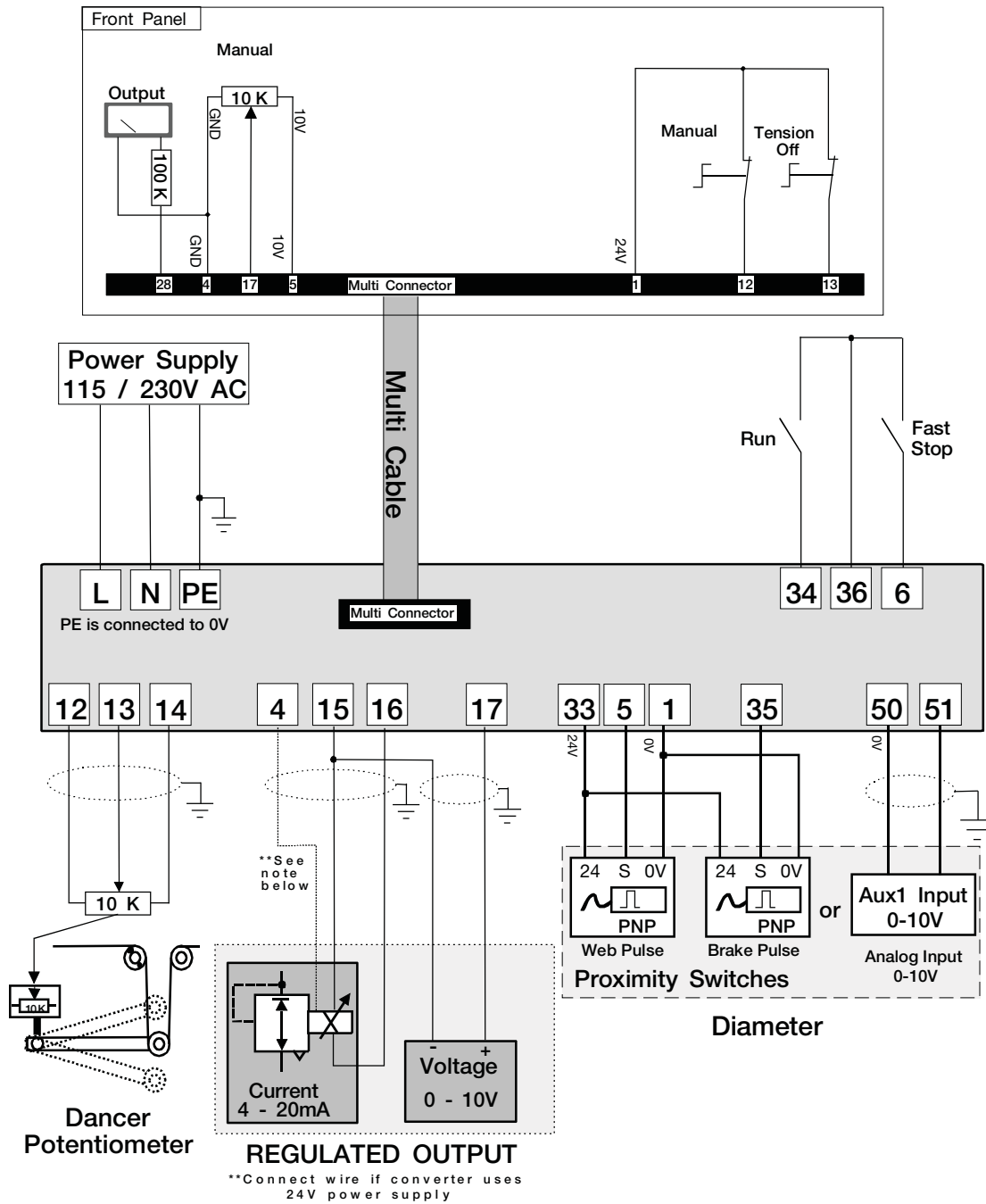
or

Aux1 Input 0-10V
Analog input 0-10V

Diameter
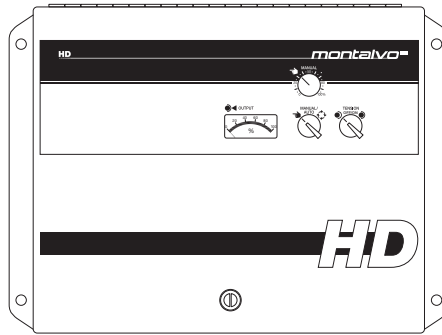
Type 1 connector 3 pole MIL std. (a-c)
Type 2 connector 6 pole DIN std. (1-3)
Type 3 connector 4 pole DIN std. (1,2,4)

**Connect wire if I/P converter uses 24V power supply.*

3.7 Basic Diagrams Enclosure Version (DTI-3400HD-U)

Type 1 connector 3 pole MIL std. (a-c)
Type 2 connector 6 pole DIN std. (1-3)
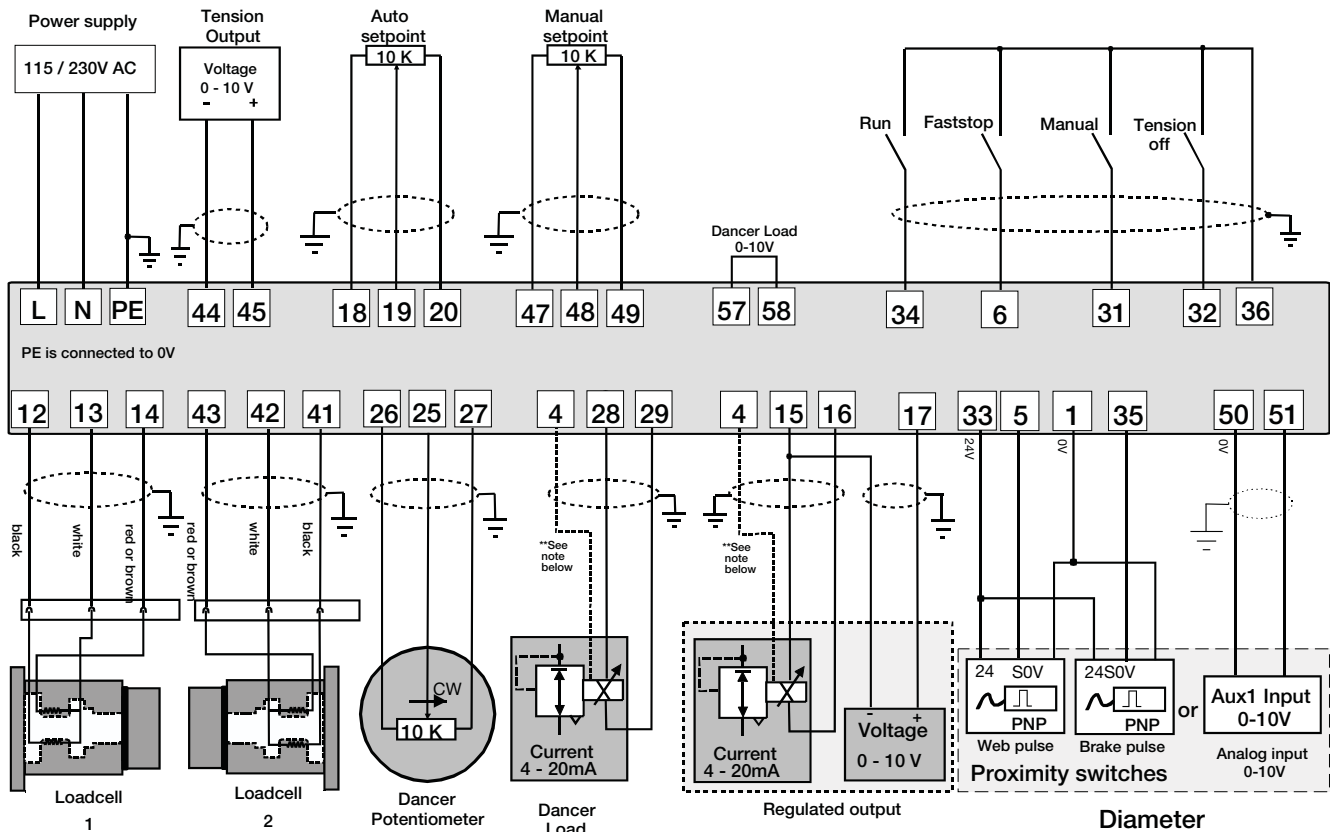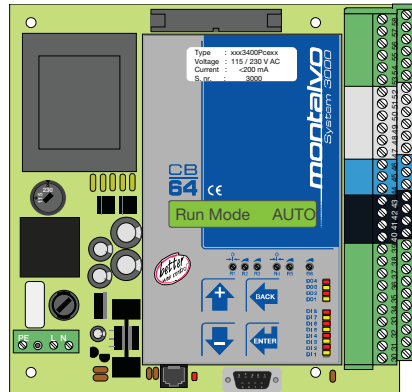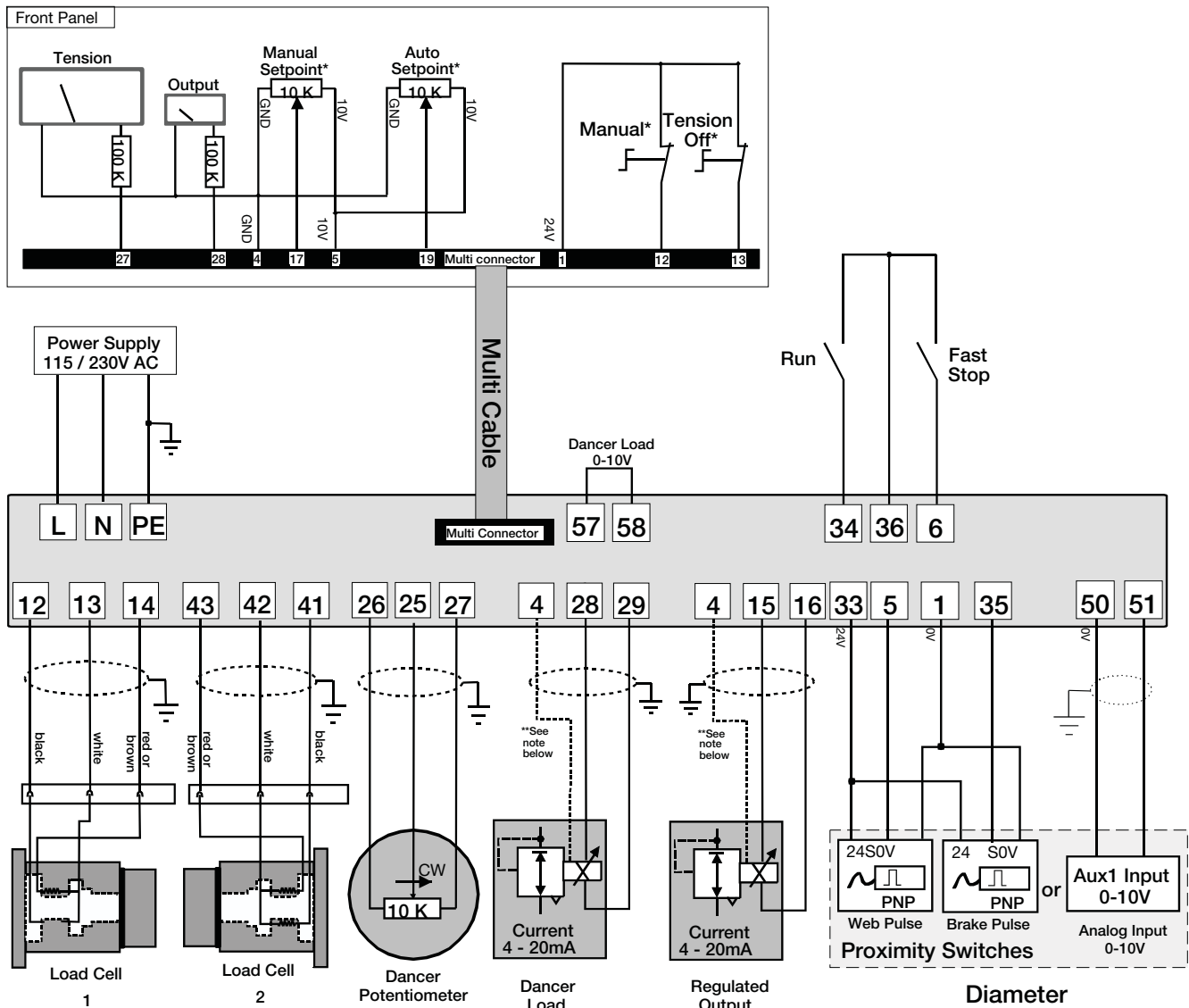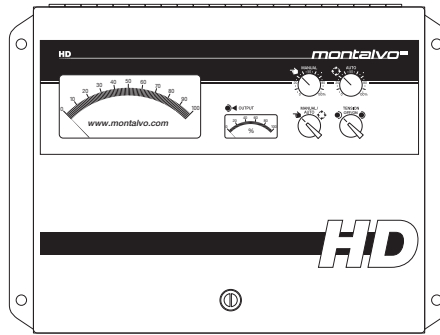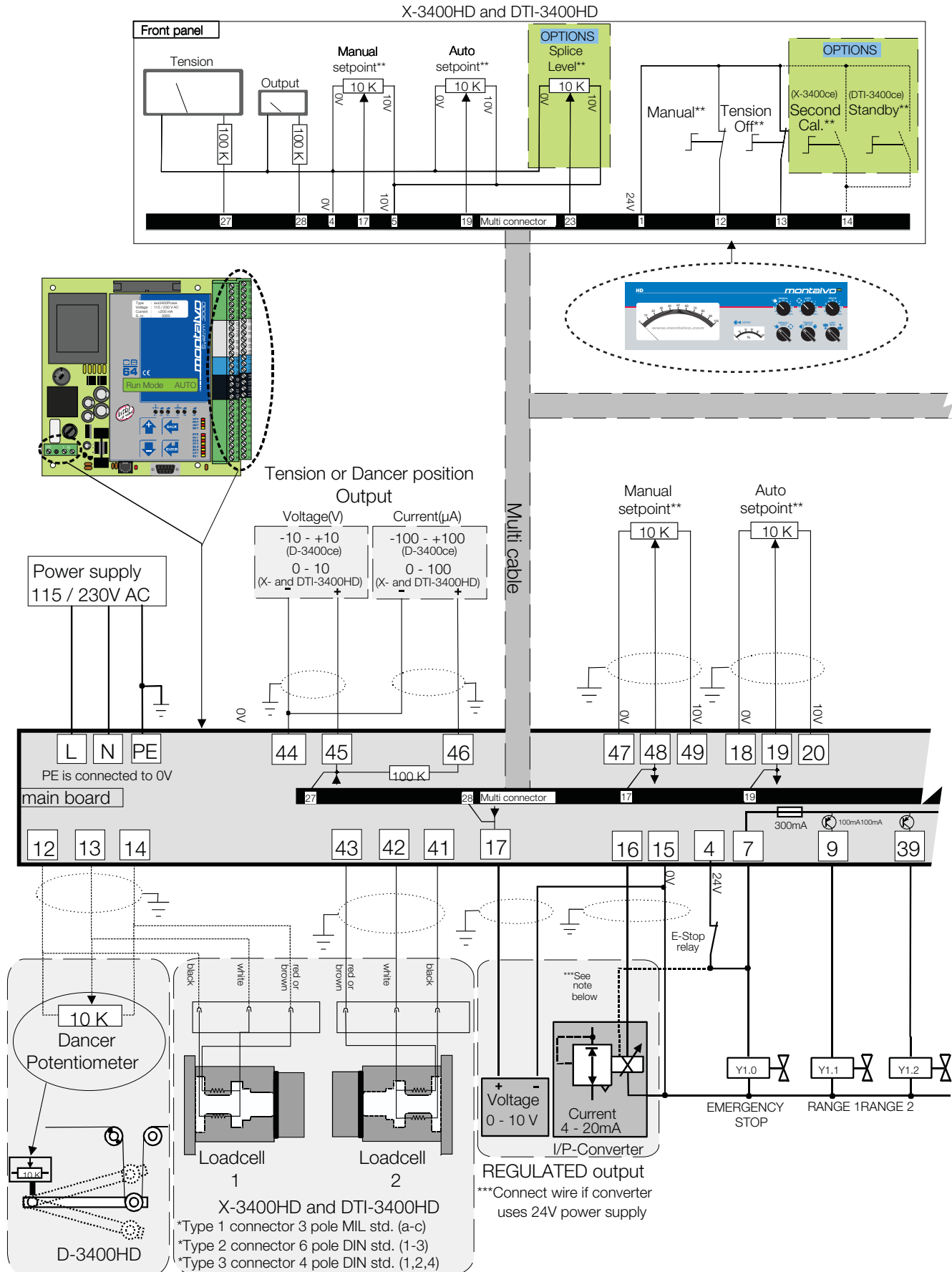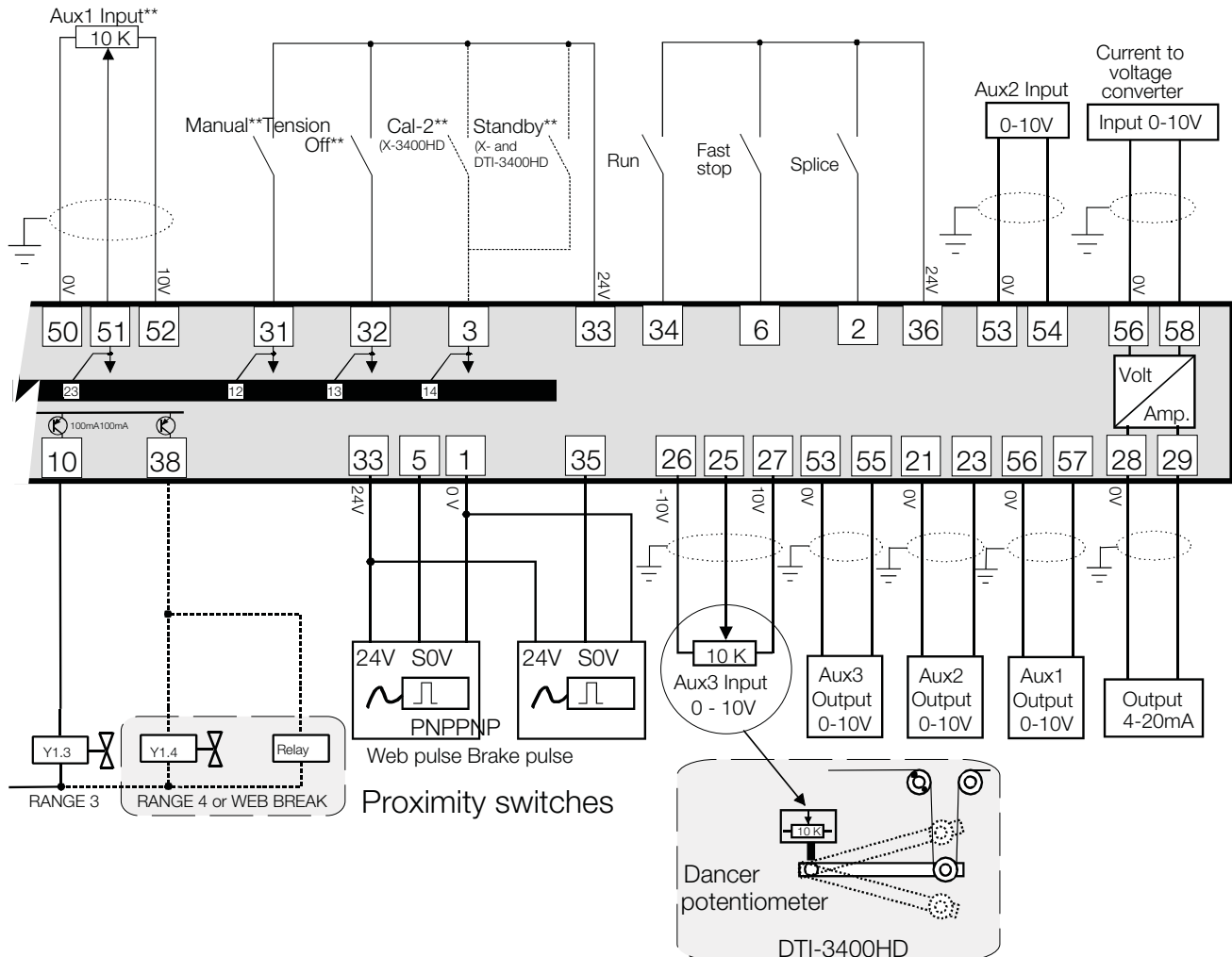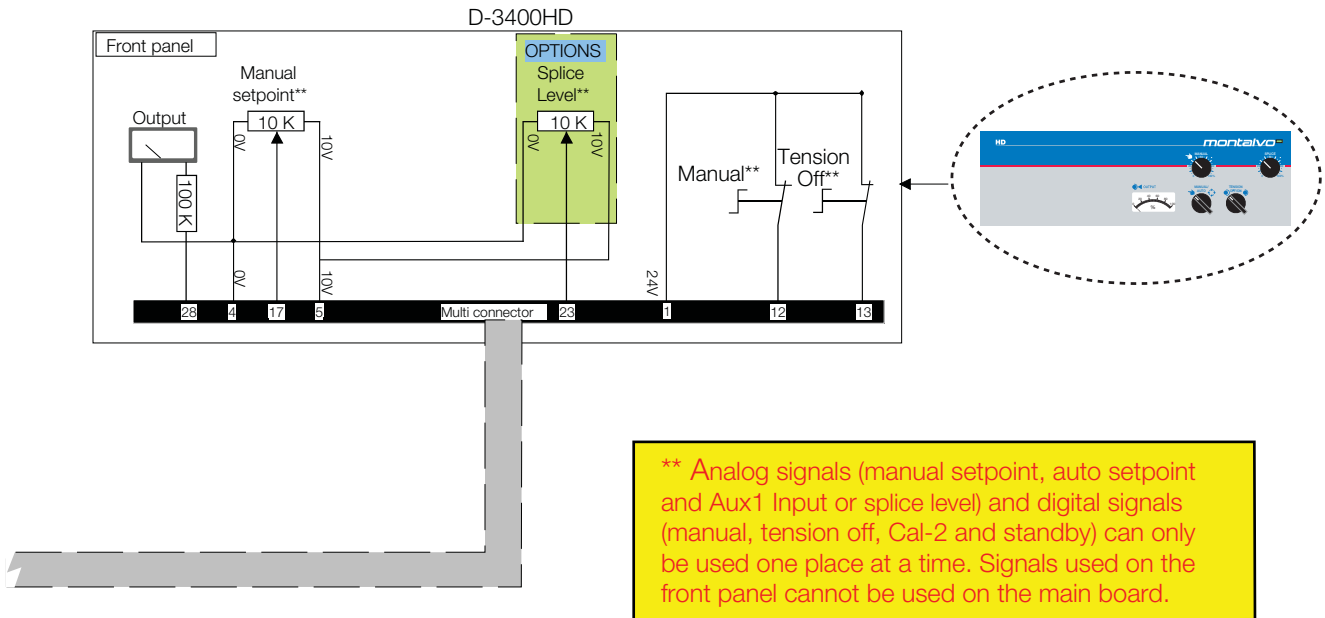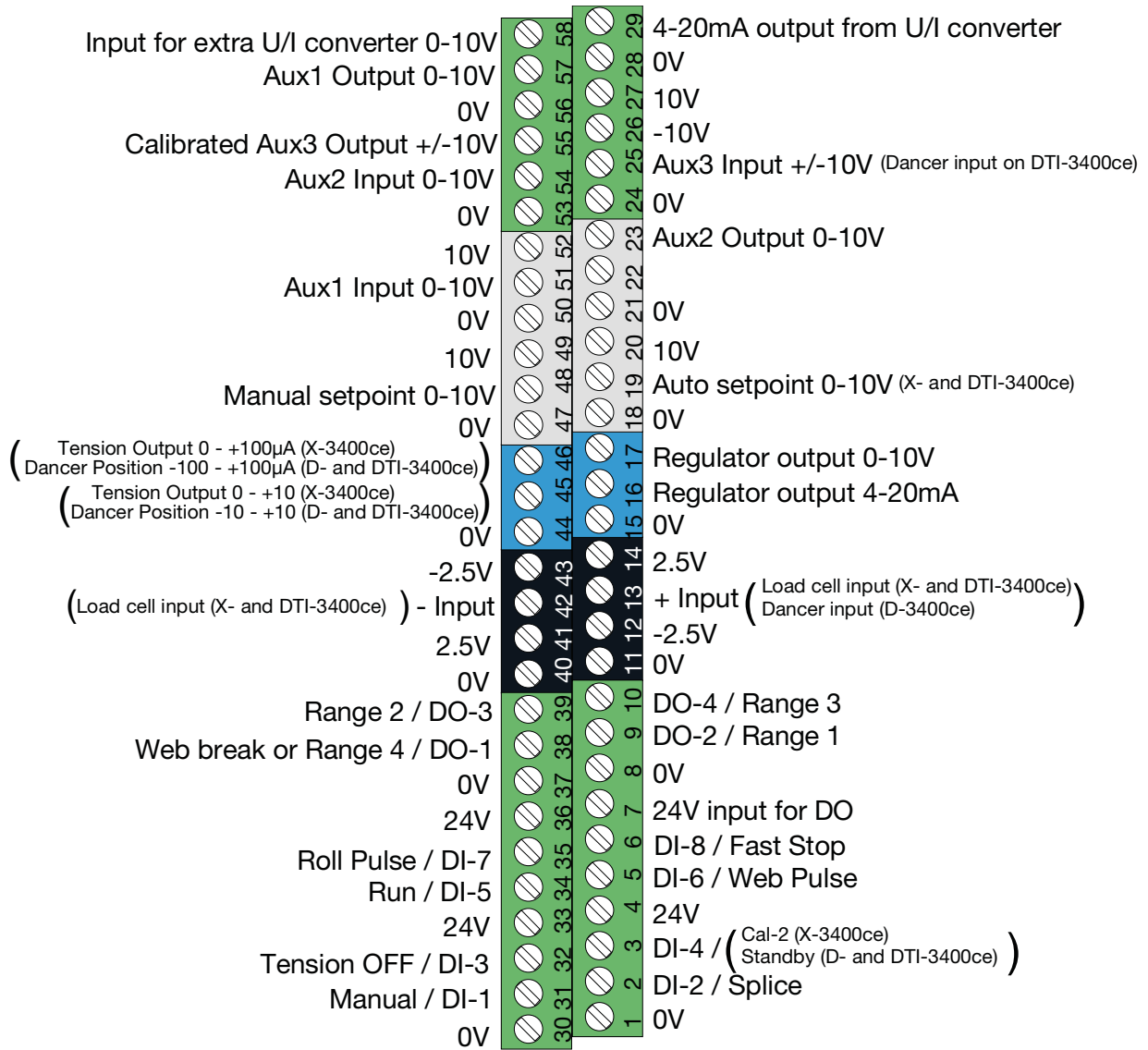*Type 3 connector 4 pole DIN std. (1,2,4)*

**Connect wire if I/P converter uses 24V power supply.
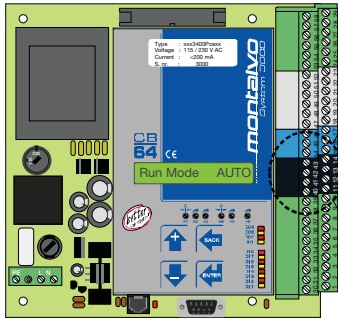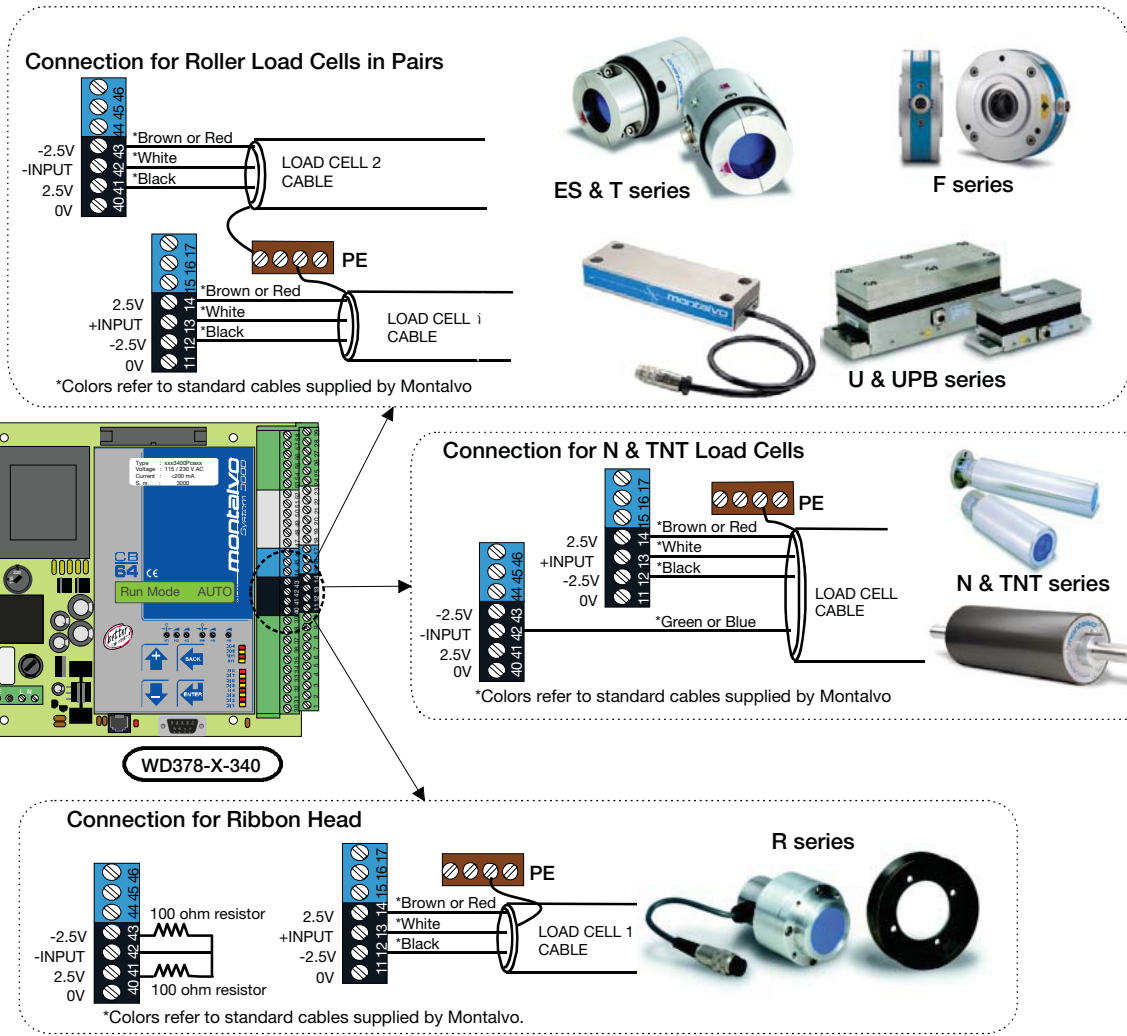
3.8 Total Wiring Diagram

X-3400HD and DTI-3400HD

Front panel

Tension

Output

Manual setpoint**
10 K
0V   10V

Auto setpoint**
10 K
0V   10V

OPTIONS
Splice Level**
10 K
0V   10V

Manual**   Tension Off**

OPTIONS
(X-3400ce) Second Cal.**   (DTI-3400ce) Standby**

100 K   100 K

0V   10V   24V

| 27 | 28 | 4 | 17 | 5 | 19 | Multi connector | 23 | 1 | 12 | 13 | 14 |

HD   montalvo
www.montalvo.com

Type : xxx3400Pcase
Voltage : 115 / 230 V AC
Current : <200 mA
S. n : 3000
CB 64 CE
Run Mode   AUTO

Power supply
115 / 230V AC

Tension or Dancer position Output

Voltage(V)
-10 - +10 (D-3400ce)
0 - 10 (X- and DTI-3400HD)
−   +

Current(µA)
-100 - +100 (D-3400ce)
0 - 100 (X- and DTI-3400HD)
−   +

Manual setpoint**
10 K

Auto setpoint**
10 K

0V   0V   0V   10V   0V   10V

Multi cable

| L | N | PE | | 44 | 45 | | 46 | | 47 | 48 | 49 | 18 | 19 | 20 |

PE is connected to 0V

100 K

main board

| 27 | 28 Multi connector | 17 | 19 |

| 12 | 13 | 14 | | 43 | 42 | 41 | 17 | | 16 | 15 | 4 | 7 | 9 | 39 |

300mA   100mA100mA

0V   24V

E-Stop relay

***See note below

black   white   red or brown   red or brown   white   black

10 K
Dancer Potentiometer

10 K

Loadcell 1   Loadcell 2

+   −
Voltage 0 - 10 V

Current 4 - 20mA
I/P-Converter

REGULATED output
***Connect wire if converter uses 24V power supply

Y1.0   Y1.1   Y1.2

EMERGENCY STOP   RANGE 1   RANGE 2

D-3400HD

X-3400HD and DTI-3400HD
*Type 1 connector 3 pole MIL std. (a-c)
*Type 2 connector 6 pole DIN std. (1-3)
*Type 3 connector 4 pole DIN std. (1,2,4)

D-3400HD

Front panel

Output

Manual setpoint**
10 K

OPTIONS Splice Level**
10 K

Manual** | Tension Off**

100 K

0V | 10V

0V | 10V

24V

Multi connector

| 28 | 4 | 17 | 5 | 23 | 1 | 12 | 13 |

** Analog signals (manual setpoint, auto setpoint and Aux1 Input or splice level) and digital signals (manual, tension off, Cal-2 and standby) can only be used one place at a time. Signals used on the front panel cannot be used on the main board.

Aux1 Input**
10 K

Manual**Tension Off**

Cal-2** (X-3400HD)

Standby** (X- and DTI-3400HD)

Run

Fast stop

Splice

Aux2 Input
0-10V

Current to voltage converter
Input 0-10V

0V | 10V

24V

24V

0V

0V

| 50 | 51 | 52 | 31 | 32 | 3 | 33 | 34 | 6 | 2 | 36 | 53 | 54 | 56 | 58 |

| 23 | | 12 | 13 | 14 | | | | | | | | | Volt / Amp. |

100mA 100mA

| 10 | 38 | 33 | 5 | 1 | 35 | 26 | 25 | 27 | 53 | 55 | 21 | 23 | 56 | 57 | 28 | 29 |

24V | 0V | -10V | 10V | 0V | 0V | 0V | 0V

24V S0V | 24V S0V | 10 K

Aux3 Input 0 - 10V

Aux3 Output 0-10V

Aux2 Output 0-10V

Aux1 Output 0-10V

Output 4-20mA

PNPPNP

Web pulse Brake pulse

Y1.3 | Y1.4 | Relay

RANGE 3 | RANGE 4 or WEB BREAK

Proximity switches

Dancer potentiometer

10 K

DTI-3400HD

3.9 Terminal Blocks

Left label	Terminal	Terminal	Right label
Input for extra U/I converter 0-10V	58	29	4-20mA output from U/I converter
Aux1 Output 0-10V	57	28	0V
0V	56	27	10V
Calibrated Aux3 Output +/-10V	55	26	-10V
Aux2 Input 0-10V	54	25	Aux3 Input +/-10V (Dancer input on DTI-3400ce)
0V	53	24	0V
10V	52	23	Aux2 Output 0-10V
Aux1 Input 0-10V	51	22	
0V	50	21	0V
10V	49	20	10V
Manual setpoint 0-10V	48	19	Auto setpoint 0-10V (X- and DTI-3400ce)
0V	47	18	0V
Tension Output 0 - +100µA (X-3400ce) / Dancer Position -100 - +100µA (D- and DTI-3400ce)	46	17	Regulator output 0-10V
Tension Output 0 - +10 (X-3400ce) / Dancer Position -10 - +10 (D- and DTI-3400ce)	45	16	Regulator output 4-20mA
0V	44	15	0V
-2.5V	43	14	2.5V
- Input (Load cell input (X- and DTI-3400ce))	42	13	+ Input (Load cell input (X- and DTI-3400ce) / Dancer input (D-3400ce))
2.5V	41	12	-2.5V
0V	40	11	0V
Range 2 / DO-3	39	10	DO-4 / Range 3
Web break or Range 4 / DO-1	38	9	DO-2 / Range 1
0V	37	8	0V
24V	36	7	24V input for DO
Roll Pulse / DI-7	35	6	DI-8 / Fast Stop
Run / DI-5	34	5	DI-6 / Web Pulse
24V	33	4	24V
Tension OFF / DI-3	32	3	DI-4 / (Cal-2 (X-3400ce) / Standby (D- and DTI-3400ce))
Manual / DI-1	31	2	DI-2 / Splice
0V	30	1	0V

3.10 Installation - Load Cell (X and DTI-3400)

The following terminals are for load cell connections and are used for both X-3400 and DTI-3400. The standard cable from Montalvo is supplied with a connector for the load cell. Wire the other end into the terminal block of the circuit board.

Terminal	Connection
12	- 2,5V Supply
13	+ Load Cell Input
14	+ 2,5V Supply
41	+ 2,5V Supply
42	- Load Cell Input
43	- 2,5V Supply

Connection for Roller Load Cells in Pairs

-2.5V
-INPUT
2.5V
0V

*Brown or Red
*White
*Black
LOAD CELL 2 CABLE

PE

2.5V
+INPUT
-2.5V
0V

*Brown or Red
*White
*Black
LOAD CELL 1 CABLE

*Colors refer to standard cables supplied by Montalvo

ES & T series

F series

U & UPB series

WD378-X-340

Connection for N & TNT Load Cells

2.5V
+INPUT
-2.5V
0V

*Brown or Red
*White
*Black

PE

-2.5V
-INPUT
2.5V
0V

*Green or Blue

LOAD CELL CABLE

N & TNT series

*Colors refer to standard cables supplied by Montalvo

Connection for Ribbon Head

-2.5V
-INPUT
2.5V
0V

100 ohm resistor

100 ohm resistor

2.5V
+INPUT
-2.5V
0V

*Brown or Red
*White
*Black

PE

LOAD CELL 1 CABLE

R series

*Colors refer to standard cables supplied by Montalvo.

3.11 Installation - Tension Calibration (X- and DTI-3400)

Status Menu
   Version
    Tension

1. Check that load cells are mounted and oriented properly. Refer to the load cell installation instructions.

2. Before applying power, check that tension meter is mechanically zerod. If not, adjust the small screw below the meter scale until the meter reads zero.
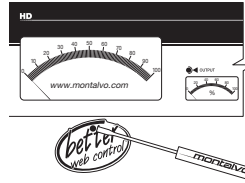
3. Apply power to the controller and let it warm up for at least 10 minutes.

4. With web removed and no tension applied to the sensing roller, adjust potentiometer R1 until analog tension meter reads zero. (If non-Enclosure version is used, see digital display: tension should read 0%.) If value is below zero, turn R1 clockwise; if above, turn counter clockwise.

Load cell
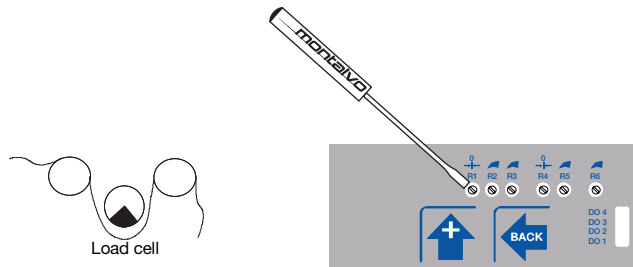
Note: R1 and R2 are 25-turn potentiometers, so many rotations may be required.

5. Thread a rope over the center of the tension-sensing roller following the exact path of the web. Make sure that the rope extends at least one roller before and one roller after the sensing roller. Make sure that the rope does not pass over any dead bars or non-freewheeling rollers. Fasten one end of the rope securely.

6. Attach a weight of known value to the other end of the rope. For best results, the weight should be at least 25% of the analog meter's full-scale value. A tension value below 0% with the weight hung indicates that the signal from the load cells is reversed. In the event of such a reversal, switch wires 12 & 14 and 41 & 43 on the terminal block. To eliminate friction, rotate rollers in the direction of the weight.

3.11 Installation - Tension Calibration (X- and DTI-3400)

Status Menu
   Version
   Tension

7.   Adjust potentiometer R2 until analog meter reading is identical to the hanging weight. (If non-Enclosure version is used, see digital display: tension will appear as a percentage value [%]).

Load cell   KG
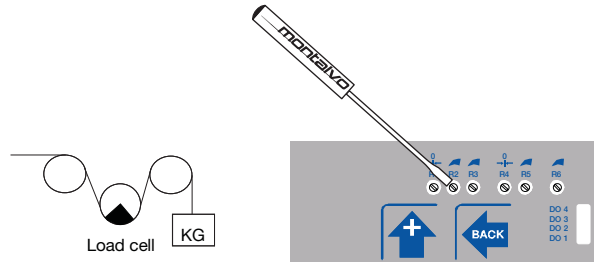
8.   Remove weight and check that tension meter returns to zero. If not, repeat steps 4 to 7.

9.   If a second calibration range is used, repeat steps 4 to 8, using potentiometer R3 for calibration of the second range.

3.12 Installation - Dancer Potentiometer (D-3400)

The following terminals are for dancer potentiometer connections. A standard dancer potentiometer from Montalvo is delivered with a cable. The other end must be wired into the terminal block of the circuit board.

Terminal	Connection
12	-2,5V Supply
13	Dancer Input
14	+2.5V Supply

Ground / Shield

2.5V
+Input
-2.5V
0V

11 12 13 14

Cable from Controller to Dancer Potentiometer
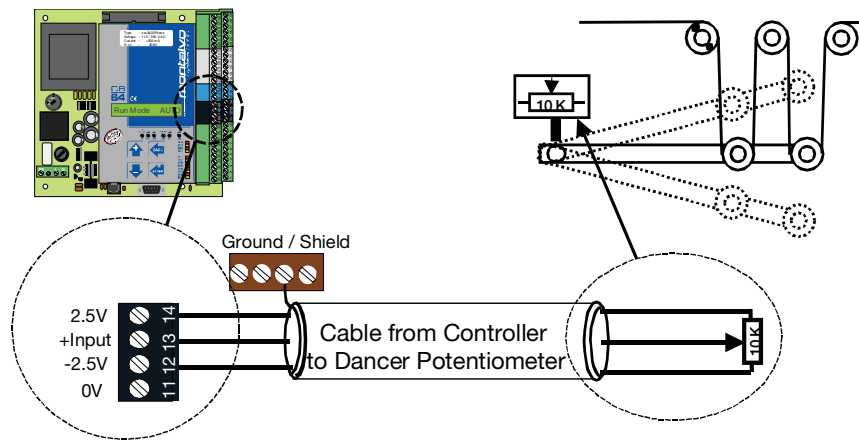
3.13 Installation - Dancer Calibration (D-3400)

1.   Check for correct installation of the dancer potentiometer.

2.   Place the dancer in center position, loosen the potentiometer coupling, and turn the potentiometer shaft until it is approximately in center position (5K between the two wires – see below). Tighten the coupling.

Ohm-meter

10 K
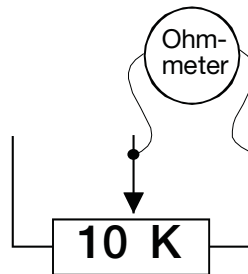
3.   Apply power to the controller and let it warm up for at least 10 minutes. Scroll to the [Dancer X.X%] parameter in the [Status Menu].

Status Menu
  Version
  Tension
  Dancer

4. Place the dancer in center position and adjust potentiometer R1 until the digital display shows [Dancer 0.0%] under the [Status Menu].
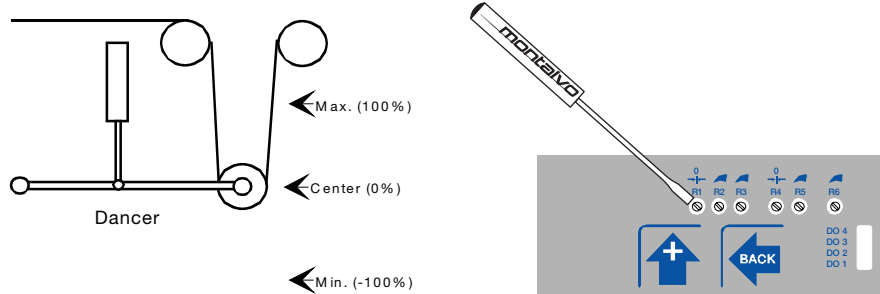
Max. (100%)

Center (0%)

Dancer

Min. (-100%)

Note: R1 and R2 are 25-turn potentiometers; so many rotations may be required.

5. Place the dancer in maximum position. If a negative value is displayed, switch the two wires in terminal 12 and 14 coming from the potentioeter, and repeat step 4. Adjust potentiometer R2 until [Dancer 100.0%] appears. If the value is below 100%, turn R2 clockwise; if above, turn counter clockwise.
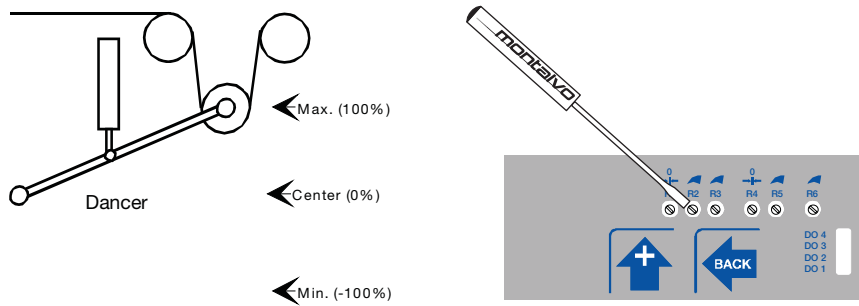
Max. (100%)

Center (0%)

Dancer

Min. (-100%)

6. Move the dancer to minimum position. The display should show -100%.

    • If the value is under -100%, ***move*** center position towards minimum position.

    • If the value is over -100%, ***move*** center position towards maximum position.

    • To ***readjust*** center position, ***return*** to step 4.

3.14 Installation - Dancer Potentiometer (DTI-3400)

The following terminals are for dancer potentiometer connections if the controller is a DTI-3400. A standard dancer potentiometer from Montalvo is delivered with a cable. The other end must be wired into the terminal block of the circuit board.

Terminal	Connection
25	Dancer Input
26	- 10V Supply
27	+ 10V Supply

Cable from Controller to Dancer Potentiometer
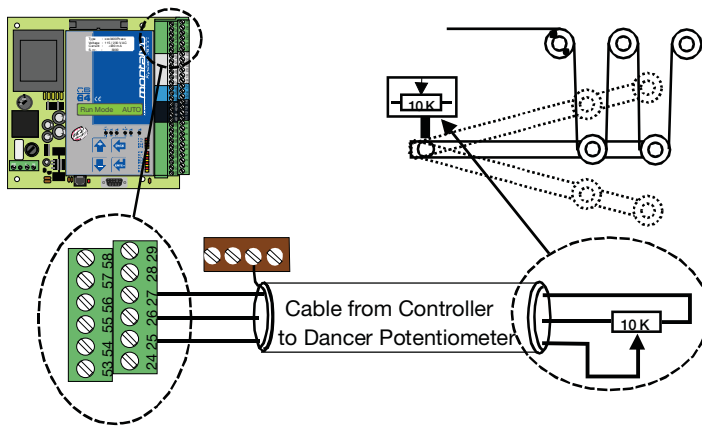
3.15 Installation - Dancer Calibration (DTI-3400)

1. Check for correct installation of the dancer potentiometer.

2. Place the dancer in center position, loosen the potentiometer coupling, and tur the potentiometer shaft until it is approximately in center position (5K between the two wires – see below). Tighten the coupling.

Ohm-meter

10 K

3. Apply power to the controller and let it warm up for at least 10 minutes. Scroll to the [Dancer X.X%] parameter in the [Status Menu].

4. Place the dancer in center position and adjust potentiometer R4 until the digital display shows[Dancer 0.0%] under the [Status Menu] - see diagram on the next page.

Status Menu
    Version
    Tension
    Dancer
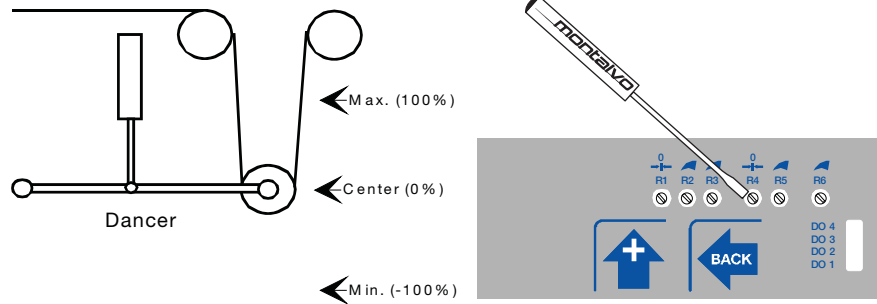
Note: R4 and R5 are 25-turn potentiometers, so many rotations may be required.

5.   Place the dancer in maximum position. If a negative value is displayed, switch the two wires in terminal 26 and 27 coming from the potentiometer, and repeat step 4. Adjust potentiometer R5 until [Dancer 100.0%] appears. If the value is below 100%, turn R5 clockwise; if above, turn counter clockwise.
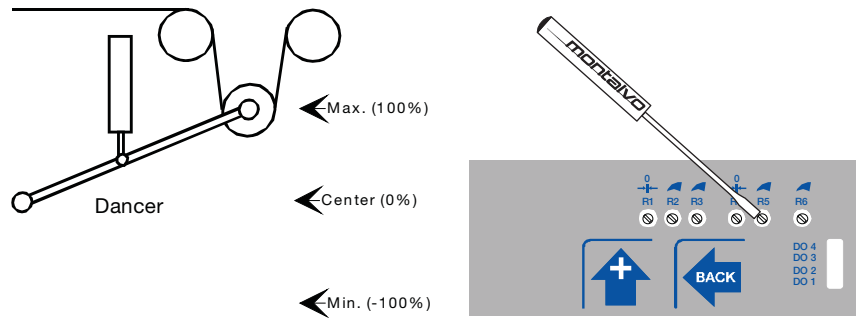
6.   Move the dancer to minimum position. The display should show -100%.
    • If the value is under -100%, *move* center position towards minimum position.
    • If the value is over -100%, *move* center position towards maximum position.
    To *readjust* center position, *return* to step 4.

3.16 Installation – Dancer Load (DTI-3400)

Status Menu
    ↓
    Aux1 Output Menu
      ↓
      Aux1 Max

Analog Aux1 Output is used to set the load on the dancer. The setpoint for the dancer is coming directly from the auto setpoint, but can be scaled in the [Aux1 Output Menu] (a description follows).
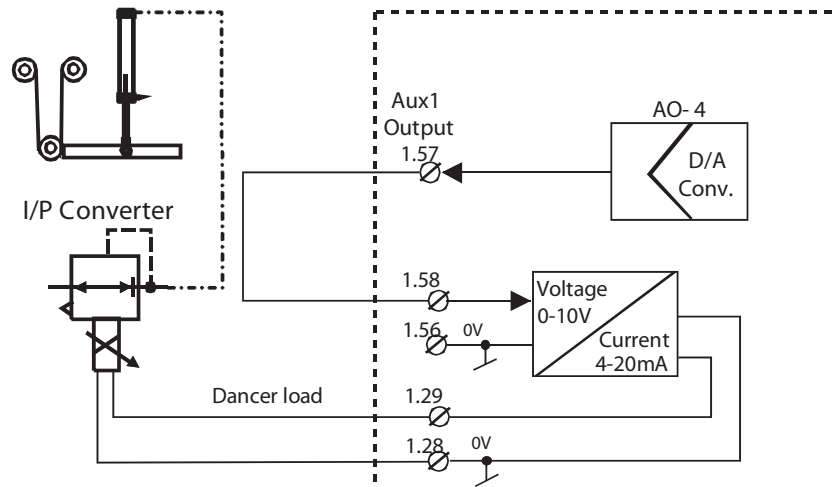
Setup Menu
↓
Dancer Menu
Ten Min

Aux1 Output Menu
↓
Aux1 Max

7. Thread a rope that follows the path of the web through the machine. Thread the rope at least one roller before and one roller after the dancer rollers. Check that the rope does not pass over any dead bars or non-freewheeling rolls. All rollers in contact with the rope must be able to rotate freely. Fasten both ends of the rope securely, so that the dancer is in center position. (See diagram below.)

I/P Converter   Fasten   Fasten
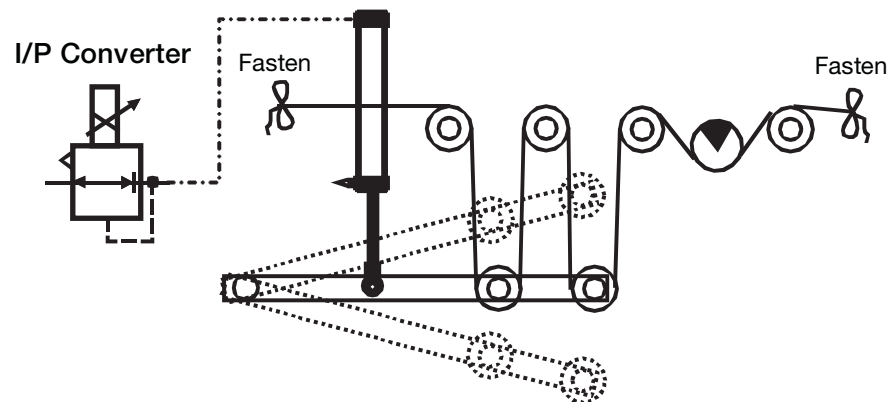
Note: Turn on the air supply before performing the following steps:

8. Set auto setpoint to 50%.

9. Check that tension meter reads more than 50%; if not, the air cylinder is under capacity.

10. Adjust by increasing or decreasing the [Aux1 Max] in the [Aux1 Output Menu] until the tension meter displays 50%.

11. Set auto setpoint to 100%.

12. Adjust by increasing or decreasing the [Aux1 Max] in the [Aux1 Output Menu] until the tension meter displays 100%.

13. Set auto setpoint to 0% and lift up the dancer until it is free of the rope. Lower the dancer slowly until the rope once again supports it.

14. Note displayed tension, scroll to [Dancer Menu], and enter the displayed minimum tension in to the parameter [Ten Min].

3.17 Installation – Regulated Output

15 0V	Common signal (0V) for regulated voltage or current output. Connects to input ground of the converter.
16 Regulated Current	Regulated 4–20 mA current signal to an I/P or other converter.
17 Regulated Voltage	Regulated 0–10V output. Can be used for a 0–10V I/P or other converter. Can control motor drives operating in torque mode. Maximum load: 5 mA.

Wiring diagram for I/P converter and P-3000HD (signal = 4-20mA).
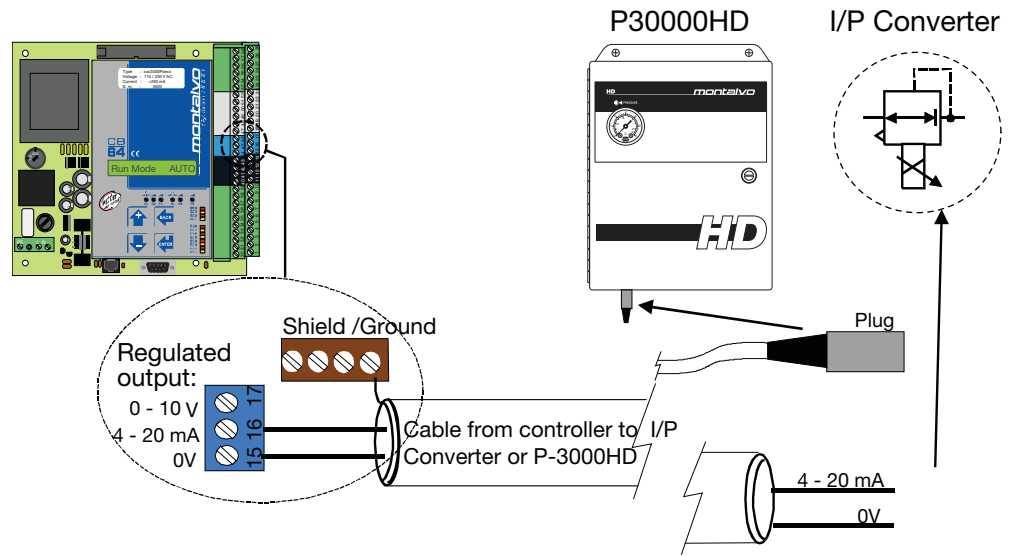
Wiring diagram for I/P converter and P-3000HD (signal = 4-20mA and 24V supply).
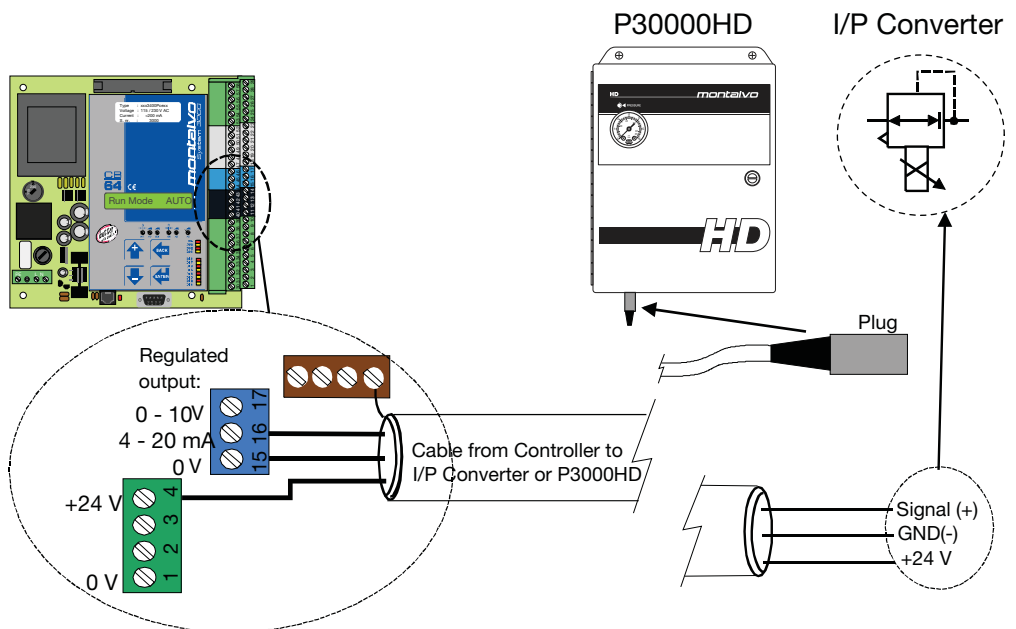
3.18 Installation – Power Supply (V AC)

The controller must be supplied with a 115/230V AC power supply. Set the voltage selector switch in the right position. For actual voltage, be sure to plug in the correct fuse.

L	Supply Voltage
N	Supply Voltage
PE	Ground

Voltage Switch (In 230V Position)

Fuse Holder

FUSE SIZE:
115V -160mA T (slow blowing type) Dim. 5 x 20 mm
230V - 80 mA T (slow blowing type) Dim. 5 x 20 mm

Max. 10mm

3.19 Digital Input (24V)

Fast Stop (DI-8)	This input is used to control the regulator when the machine is making a fast stop. (See the Stop Menu section.)
Roll Pulse (DI-7)	A proximity switch is mounted to sense pulses per revolution on the roll, which is used for diameter calculation. (See the Diameter Menu section.)
Web Pulse (DI-6)	A proximity switch is mounted to sense the web length/pulse, which is used for diameter calculation. (See the Diameter Menu section.)
Run (DI-5)	The **run** signal from the machine has to be connected to this input. This is used to control the starting sequence, at start and to release the regulator when the machine is running. When the signal is deactivated and the machine is at zero speed, the regulator is held on a constant stored level. (See the Start and Hold Menu sections.)
(DI-4) **Cal-2**	**X-3400** When activated by a 24V signal, the controller will change to a second calibration range for the load cell input. This is typically used if a double tension scale is necessary or if the web runs 2 ways with different wrap angles.
Standby	**D- and DTI-3400** When activated by a 24V, the output goes to zero. All parameters are still stored in the memory and used again when the 24V input is removed. (See the Roll Change section).
Tension Off (DI-3)	When activated by a 24V signal, the output goes to zero and the regulator is reset. This function is used at roll change. When the input goes low, the regulator is set to the new roll parameter. (See the Roll Change Menu section.)
Splice (DI-2)	This input is used to control the regulator in the splice sequence. (See the Splice Menu section.)
Manual (DI-1)	When activated by a 24V signal, the controller switches to **manual** mode. Manual setpoint then sets the output level. When deactivated, the controller regulates from the manual level.

Run - Digital Input 5 (terminal 34)

Digital Input 5 (34)

[Invert] — [NO/YES]   (Run)

The *run* input serves the following purposes:

1. To control and release the regulator at start-up.
2. To stop and hold the regulator when the machine is not running.

(For set-up, see the Start and Hold Menu sections.)

Electrical Wiring

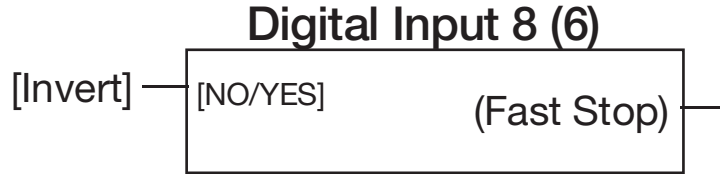Below a typical example of how to connect the run signal:

Fig. 1

Fig. 2

Fig. 3
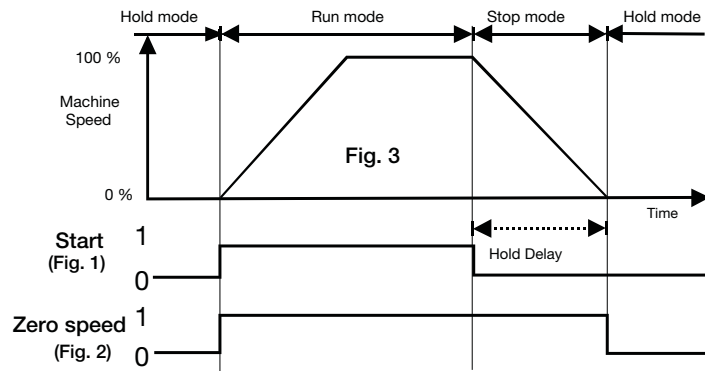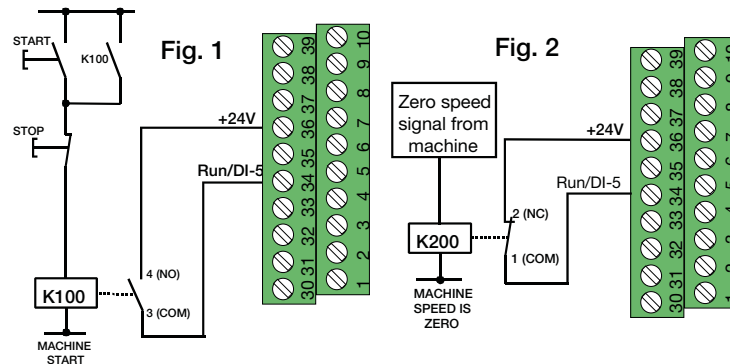
Parameter Descriptions

[DI-5 Invert]   Select: NO / YES

The *run* signal is activated with a high (24V) signal. If the inverted function is needed, then change the parameter [DI-5 Invert] to [YES]. Default is set to [NO].

Fast Stop - Digital Input 8 (terminal 6)

Digital Input 8 (6)

[Invert] — [NO/YES]   (Fast Stop)

This signal is used if the machine has a fast stop function or if it stops with a short ramp-down time. The signal is used to avoid tension drop (X-3400) or drop in the dancer (D- and DTI-3400), when the machine is stopping. (For set-up, see the Stop Menu section.)

Electrical Wiring

Here is a typical example of how to connect the fast stop signal.
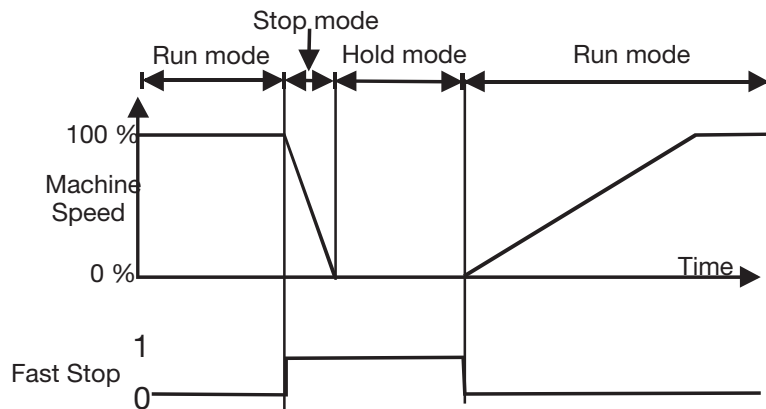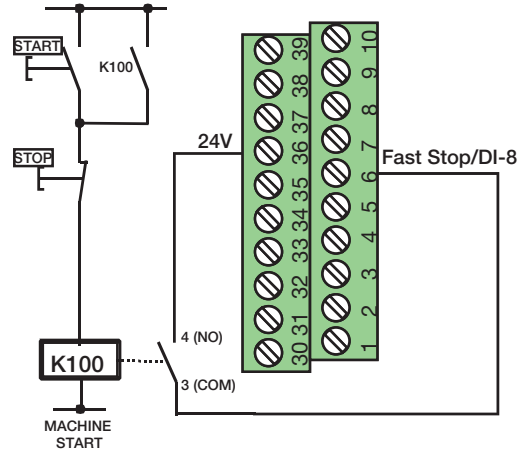
Parameter Descriptions

[DI-8 Invert] Select: NO / YES
The stop signal is activated with a high (24V) signal. If the inverted function is needed, then change the parameter [DI-8 Invert] to [YES]. Default is set to [NO].

3.20 Digital Output (24V)

Digital Output 4 (10)

Digital Output 3 (39)

Digital Output 2 (9)

Digital Output 1 (38)

DO 4
DO 3
DO 2
DO 1

Digital Outputs

DO-1,DO-2,DO-3 and DO-4	All digital outputs not used for range expander can be used for web break or diameter alarm. (See Digital Output Menu section.) Range expander uses the following: 2 Ranges (RE2): DO-2,DO-3 (DO-4+DO-1:free) 3 Ranges (RE3): DO-2,DO-3,DO-4 (DO-1 is free) 4 Ranges (RE4): DO-2,DO-3,DO-4,DO-1 (None is free)

3.21 Analog Input (0-10V)

Analog Aux2 Input (54)

[Aux2 Calc]
[Aux2 Raw]

[Raw2 Min]   [0.0-100.0]
[Raw2 Max]   [0.0-100.0]
[Calc2 Min]   [0.0-100.0]
[Calc2 Max]   [0.0-100.0]
[Calc2 Invert] [NO / YES]

Analog Input 4 (48)

[Manual]

Analog Aux1 Input (51)

[Aux1 Calc]
[Aux1 Raw]

Analog Input 6 (25)

[Diameter]

Pot.meter R4 — (Offset)
Pot.meter R5 — (Calibration)

[Raw1 Min]   [0.0-100.0]
[Raw1 Max]   [0.0-100.0]
[Calc1 Min]   [0.0-100.0]
[Calc1 Max]   [0.0-100.0]
[Calc1 Invert] [NO / YES]
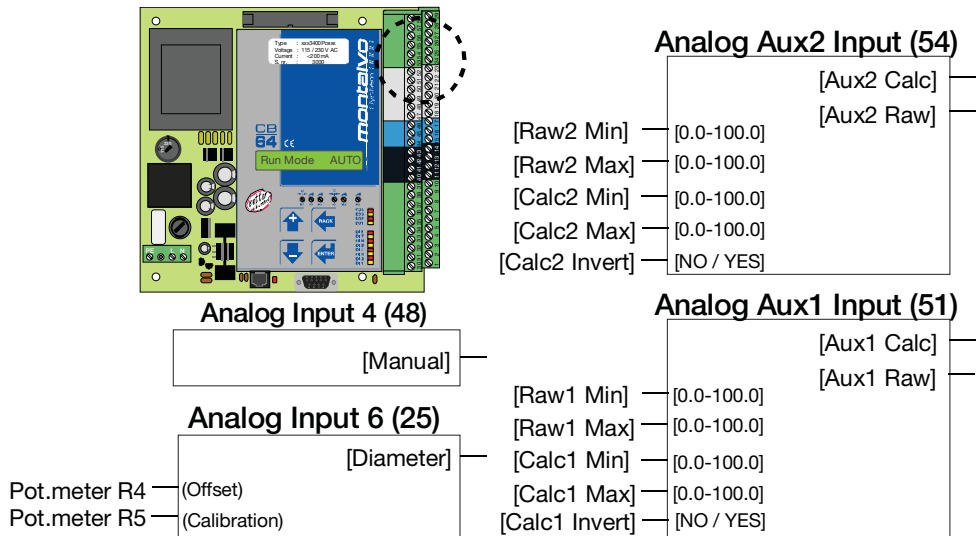
Setup Menu
↓
  Aux1 Input Menu
    Aux1 Calc
    Aux1 Raw
    Raw1 Min
    Raw1 Max
    Calc1 Min
    Calc1 Max
   Calc1 Invert

Manual Input (0-10V)

Analog Input 4 (48)

[Manual]

When the controller is in manual mode, the output level is set from the manual input. A manual input level from 0–10V gives 0–100% on the output. If the controller is a Enclosure version, this signal is already connected from the manual potentiometer on the front panel. (Note: can only be used at one place.)

The manual input can come from a potentiometer or from another external source. (See wiring diagram below.)
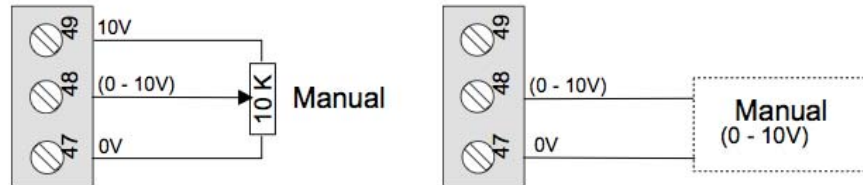
Aux1 Input (0-10V)

Analog Aux1 Input (51)

[Aux1 Calc]
[Aux1 Raw]

[Raw1 Min] — [0.0-100.0]
[Raw1 Max] — [0.0-100.0]
[Calc1 Min] — [0.0-100.0]
[Calc1 Max] — [0.0-100.0]
[Calc1 Invert] — [NO / YES]
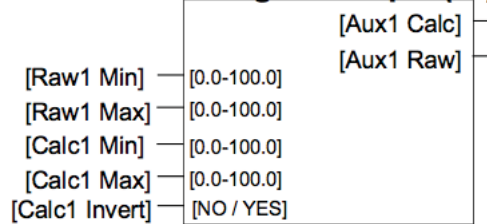
The Aux1 input is an analog input that can be used for more purposes. The input level can come from a potentiometer or other external source. (See wiring diagram below).
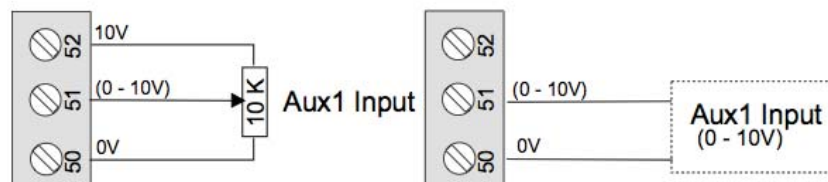
Note: For parameter set-up, see the Aux1 Input section.

Aux2 Input (0-10V)

Analog Aux2 Input (54)

[Raw2 Min] — [0.0-100.0]
[Raw2 Max] — [0.0-100.0]
[Calc2 Min] — [0.0-100.0]
[Calc2 Max] — [0.0-100.0]
— [NO / YES]

[Aux2 Calc]
[Aux2 Raw]
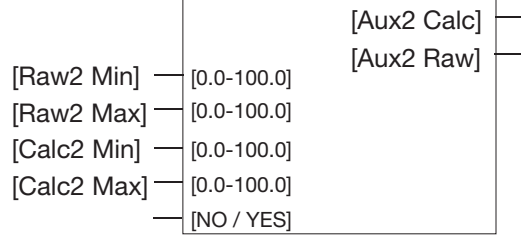
The Aux2 input is an analog input that can be used for more purposes. The input level can come from a potentiometer or another external source. (See wiring diagram below.)

54 — (0 - 10V) — Aux2 Input
53 — 0V — (0 - 10V)
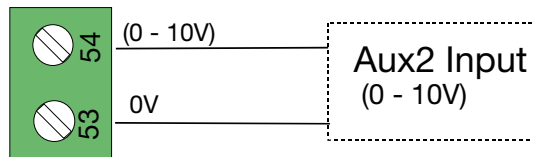
Note: For parameter set-up, see the Aux2 Input Menu section.

Aux3 Input

Analog Input 6 (25)

Pot.meter R4 — (Offset)
Pot.meter R5 — (Calibration)
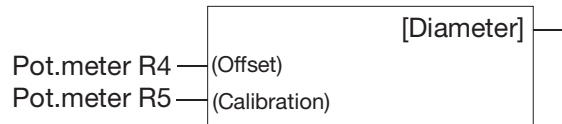
[Diameter]

The Aux3 input on terminal 25 can be zero and span adjusted on R4 and R5. (See wiring diagram below.)

R4 ZERO
27 +10V
25
24 0V
Aux3 Input
R5 Span.
Input AI-6 to micro-processor
Calibrated Aux3 Output 55
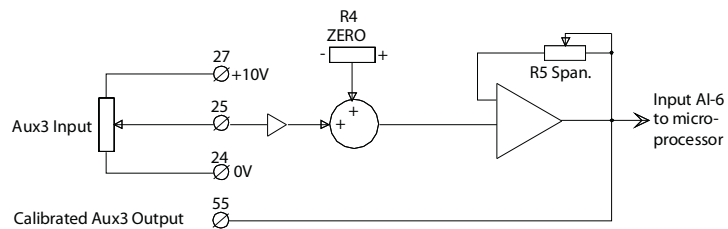
Parameter Descriptions

Zero Adjustment (R4)
The signal on terminal 25 can be offset adjusted on R4.

Span Adjustment (R5)   Range: 1-50
The signal on terminal 25 can be span adjusted on R5.

3.22 Analog Output
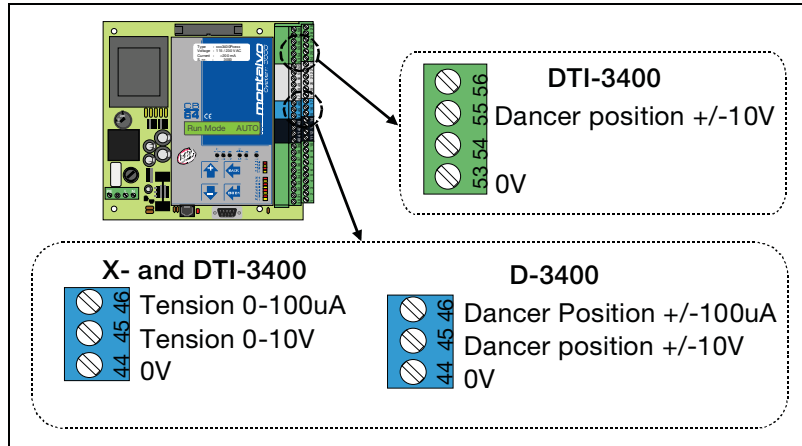
Tension Outputs (X-3400 and DTI-3400)

44 0V	Common 0V for tension outputs.
45 Tension 0 to 10V	0 to 10 volt output proportional to 0 to full-scale tension.
46 Tension 0 to 100μA	0 to 100 μA output proportional to 0 to full-scale tension.

Dancer Position Outputs (D-3400)

44 0V	Common for dancer position outputs.
45 Dancer -10 to +10V	Indicates the dancer position -100 to +100%
46 Dancer -100 to +100μA	Indicates the dancer position -100 to +100%

Dancer Position Outputs (DTI-3400)

53 0V	Common for tension outputs.
55 Dancer -10 to +10V	Indicates the dancer position -100 to +100%

3.23 Analog Output (Aux1 Output)
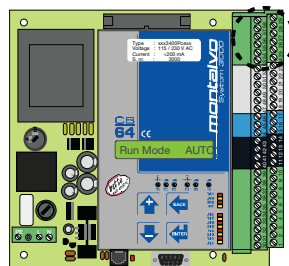
The Aux1 Output is an analog output that can be used for more purposes. The source selection makes it possible to use for different purposes. (See Aux1 Output section.)

3.24 Voltage to Current Converter

The controller has a voltage to the current converter. A 0 – 10V can be converted to 4 – 20 mA. (See diagram below.)

Input 0-10V		58	Amp.	29		Output 4-20mA
	0V	56	Volt	28	0V	
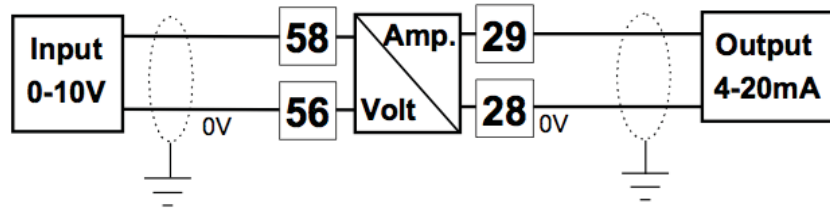
58 Input 0-10V	Input for voltage to the current converter. Converts 0-10V into 4-20mA on terminal 29.
56 0V	0V for analog signal.
29 Output 4-20mA	Output from voltage to the current converter. Converts 0-10V on terminal 58 into 4-20mA.
28 0V	0V for analog signal.

4 Tuning

Setup Menu
↓
  Regulator Menu
    Gain Menu
      Gain Min
      Gain Max
      Source
      Gain Level
    PID Menu
      P Level
      I Level
      D Level
Roll Change Menu
↓
Start Menu
  Start Lev
Stop Menu
  Activated
  Source
  F-Stop Min
  F-Stop Max
Hold Menu
  Hold Delay
  Hold Level

4.1 Tuning of X-3400

1. Calibrate load cells as described in the Installation – Tension Calibration (X- and DTI-3400) section.

2. If used, set up the range expander before running.

3. If used, set up the diameter in the [Diameter Menu] described in the Diameter Menu section.

4. Tune when the machine is running at low speed. Place a small roll in the unwind stand, and adjust [Gain Min] until tension is stable but still responsive to errors.

5. Place a large roll in the unwind stand and adjust [Gain Max] until tension is stable but still responsive to errors.

6. Scroll to the[Start Menu] and adjust the [Start Lev] to set up the right level at start (see the Start Menu section).

7. Scroll to the [Hold Menu] and adjust the [Hold Delay] to fit the deceleration speed of the machine.

8. If used, set up and adjust splice, web break, diameter alarm or other options.

4.2 Tuning of DTI- and D-3400

Setup Menu
  ↓
  Regulator Menu
    Gain Menu
      Gain Min
      Gain Max
      Source
      Gain Level
    PID Menu
      P Level
      I Level
      D Level
  Roll Change Menu
  ↓
  Start Menu
    Start Lev
  Stop Menu
    Activated
    Source
    F-Stop Min
    F-Stop Max
  Hold Menu
    Hold Delay
    Hold Level

DTI-3400
1. Calibrate load cells as described in the Installation – TensionCalibration (X- and DTI-3400) section.

2. Calibrate dancer as described in the Installation – Dancer Calibration (DTI-3400) section.

D-3400
3. Calibrate dancer as described in the Installation – Dancer Calibration (D-3400) section.

D-3400 and DTI-3400
4. Set up the diameter in the [Diameter Menu] described in the Diameter Menu section.

5. If used, set up the range expander before running.

6. Tune when the machine is running at low speed. Place a small roll in the unwind stand, and adjust [Gain Min] until tension is stable but still responsive to errors.

7. Place a large roll in the unwind stand and adjust [Gain Max] until tension is stable but still responsive to errors.

8. Scroll to the [Start Menu] and adjust the [Start Lev] to set the right start level after roll change.

9. Scroll to the [Hold Menu] and adjust the [Hold Delay] to fit the deceleration speed of the machine.

5 Configuration and System Setup

5.1 Configuration Menu [ConfigMenu]

Setup Menu
  Config Menu
    Ctrl Type
    Amplifier
    Restore Config
  Options Menu

The [Config Menu] consists of three parameters. They are described in the following:

[Ctrl Type] (read-out)

This parameter shows the controller type set by the factory. See the following:

Name:		
X-UW	Load Cell	Unwind Controller
D-UW	Dancer	Unwind Controller
DTI-UW	Dancer and Tension Indicator	Unwind Controller

[Amplifier]   *Select: X1 / X10*

The amplifier for the tension / dancer input signal can be selected to either x1 or x10. Typical x10 is used for load cell (X- and DTI-3400) and x1 for dancer (D-3400).

[X1]   = Gain: 1 to 48
[X10] = Gain: 11 to 480

[Restore Config]   *Select: NO /YES*

The factory-stored configuration can be restored with this parameter. Select YES to restore the configuration.

5.2 Options Selection Menu [OptionsMenu]

Setup Menu
  Config Menu
    Options Menu
      Use Stop
      Use Taper
      Use Dig Out
      Use Splice
      Use Rng Exp
      Use Aux1 In
      Use Aux2 In
      DI Mode Menu
  Regulator Menu

This menu offers a number of optional functions, to be enabled or disabled (choose YES or NO), and as such is building a supplement to the basic functions of the controller. If a controller is ordered including one or more options, they will be set up by the factory.

Note: If enabled, an optional function will appear in the menu tree, and if disabled, it will disappear from the menu tree.

Set up the parameter as follows:
[NO] = option is disabled
[YES] = option is enabled

Name:	Function Description:
Use Stop	The **stop** option is used to prevent a drop in the tension when the machine is stopping. Typically it is necessary if the machine has a **fast stop** function or if the machine is stopping with a short ramp-down time.
Use Taper	The **taper** options are only used in a single zone machine.
Use Dig Out	The [Digital Out Menu] offers the options **web break** or **diameter alarm**.
Use Splice	The **splice** option is used to control a splice sequence (automatic roll change).
Use Rng Exp	The **range expander** option is used to divide the torque capabilities of a braking system into multiple ranges. The advantage of this function is that the required torque is controlled automatically.
Use Aux1 In	When this parameter is enabled, the analog Aux1 input is available to use.
Use Aux2 In	When this parameter is enabled, the analog Aux2 input is available to use.
Use Aux1 Out	When this parameter is enabled, the analog Aux1 output is available to use.
DI Mode Menu	Different modes for DI can be set up under this menu.

5.3 Regulator Parameter [RegulatorMenu]
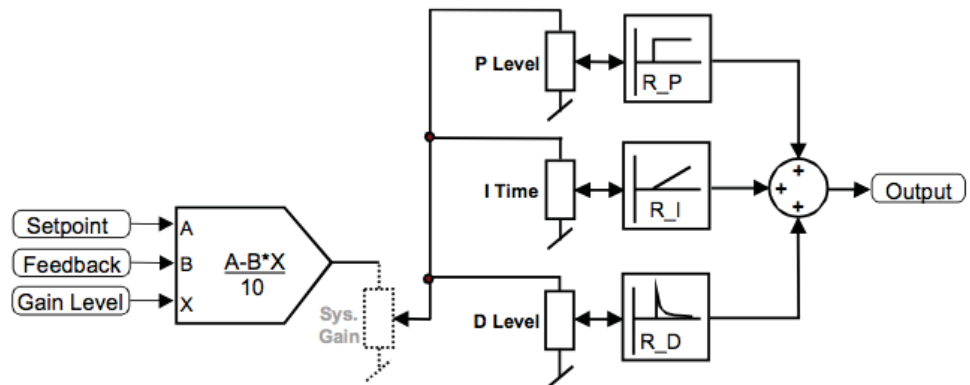
System Descriptions

The 3400 is a progressive PID regulator. The system is built upon a PID regulator, the gain being controlled from the output or diameter.

Setpoint (X-3400)   Range: 0.0-100.0%

The setpoint is an analog input where 0-10V = 0.0-100.0%.

Setpoint (D- and DTI-3400)   Range: 0.0-100.0%

The setpoint on the dancer system is set to 0% (0V).

Feedback (X-3400)   Range: 0.0-100.0%

The feedback from the tension system is adjusted to give:

      0%   at no tension
    100%   at maximum tension.

(See the Installation - Tension Calibration section.)

Feedback (D- and DTI-3400)   Range: +/-100.0%

The feedback on the dancer system is adjusted to give:

   −100%   at minimum position
     0%   at center position
  +100%   at maximum position.

(See the Dancer Calibration section.)

Gain Level   Range: 0.0-100.0%

The gain level is a parameter that is used to control a perfect regulation from maximum roll size to empty core. (See set-up and adjustment under the parameter description.)

Output   Range: 0.0-100.0%

The output level is connected to a brake, clutch or other output device.

Parameter Descriptions

[Gain Menu]

[Gain Min]   *Range: 0-100*
This parameter adjusts the speed of the response of the regulator to errors on the minimum roll diameter. The higher value, the faster the reaction towards errors. Not recommended: parameters lower than 5.

[Gain Max]   *Range: 0-500*
This parameter adjusts the speed of the response of the regulator to errors on the maximum roll diameter. The higher value, the faster the reaction towards errors. Not recommended: parameters lower than 15.

[Gain Src]
Using this parameter, the source for the gain is selected. Output or diameter can be selected. (Note: Default an X-3400 is set up to use output whereas the D-and DTI-3400 are set up to use diameter.)

[Gain Level]   *Range: 0-100*
This parameter, shows the actual gain level. (Read-out parameter.)

[PID Menu]

[P Level]   *Range: 0-255*
Proportional gain level of the PID regulator. The higher value, the larger P- level within the PID regulator.

[I Time]   *Range: 0-255*
Integral time of the PID regulator. The higher value, the longer integral time within the PID regulator.

[D Level]   *Range: 0-255*
Derivative gain level of the PID regulator. The higher value, the larger D -level within the PID regulator.

Sidebar menu:

Setup Menu
 Config Menu
 Options Menu
 Regulator Menu
  Gain Menu
   Gain Min
   Gain Max
   Source
   Gain Level
  PID Menu
   P Level
   I Time
   D Level
 Roll Change Menu

5.4 Roll Change [RollChangeMenu]

System Descriptions

How perfect a start-up can be after a roll change depends on the information given by the controller at roll change.

1. The digital input signal tension off is used to set the output level at zero at roll change.

2. When the signal is removed again, the controller uses this information to prepare and set up the new roll.

The controller is using the following calculation to prepare and set up a new roll after roll change:

$$Output = \frac{New\ Output \times Setpoint^* \times Diameter}{10000}$$

$$Output = \frac{100 \times 100^* \times 100}{10000} = 100\%$$

*On the D-3400 controller the setpoint is default set to 100%.

Parameter Setting and Adjustment:

[New Output] *Range: 0-500%*

1. This parameter is used as a scaling factor for the new output after roll change, i.e. the output level with which the controller starts when tension is switched on. This output is applied in two situations: 1) after power-up, and 2) tension-on.

To set the correct value:

a) Place a roll with 75% maximum diameter.

b) Start the machine and run it at slow speed. Note the output level when tension has become steady.

OUTPUT LEVEL   TENSION OFF
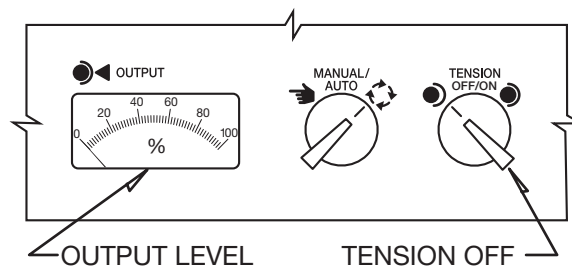
c) Stop the machine and increase or decrease the [New Output] parameter to the level noted in step b). To see the new output level after changing the [New Output] parameter, switch tension off and then on again.

[Cal-2 Scale]   *Range: 20-50%*

2. This parameter is used to scale the output in the second calibration range. (Normally only used in X-3400 applications.)

Note: The parameter [Cal-2 Scale] is only visible if the DI-4 is set up to Cal-2 (default for X-3400). If the controller is a D- and DTI-3400 type, this input is default set up to [Stdby]. The function **standby** is used to release the roll in cases where the roll data may not be reset.

[New Roll D]   *Range: 0-100%*

3. New roll diameter is the diameter to which, after roll change, the controller is set until calculation of the correct diameter has been made when running again. The new roll diameter is automatically set to maximum diameter when a new maximum diameter is entered (in the Diameter Menu section). If the application does not require maximum diameter, the parameter can be adjusted.

Note: This parameter is only used if the diameter source is either [OUTPUT] or [PULSE].

5.5 Starting the Machine [StartMenu]

Starting and Stopping Descriptions

When the machine is running and the **run** signal is deactivated, the output level will be stored. This level will then be used for [Hold Level] and for the next start-up.

When the machine is stopped, the controller is in **hold** mode and output is held at a constant level [Hold Level].

To compensate for roll inertia at the next start-up, the output must be reduced by a percentage of the stored level (typically 10 to 25%).

Running Example:

The Machine:	
- is starting - and running	When the **run** signal is activated by 24V, output will change from hold level to start level [Start Lev] and the regulator will begin to regulate from that level. ([Start Lev] = stored level **-** %).
- is stopping	When the **run** signal is deactivated, the controller switches to **stop** mode. In **stop** mode the controller is still regulating until time [Hold Delay] has run out.
- has ramped to stop	When time [Hold Delay] has run out, the controller changes to **hold** mode. In **hold** mode, the controller is not regulating and the desired output is set to a constant level = [Hold Level]. [Hold Level] = stored level + x%.
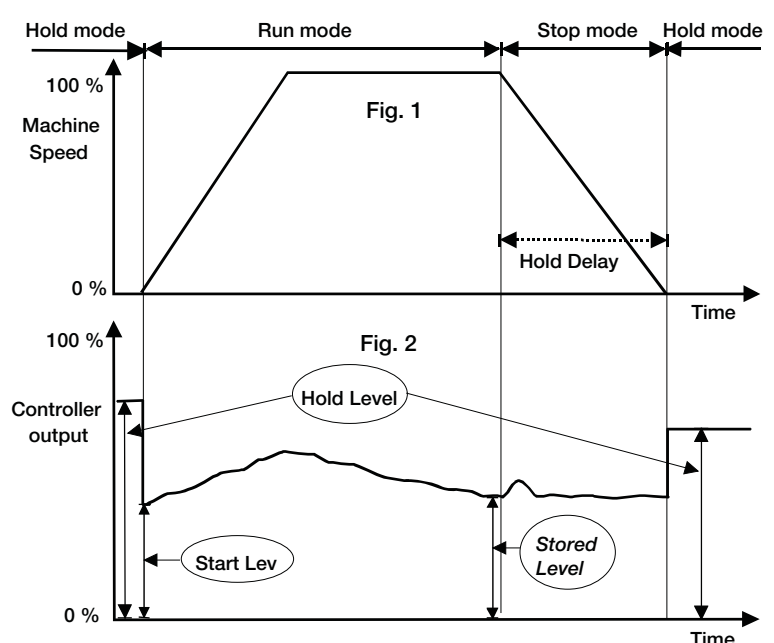
Parameter Setting and Adjustment:

[Start Lev]   *Range: 0-200%*

When the run signal is activated by 24V, output changes to a percentage (%) of the stored level. This percentage is set up in the following parameter.

To set the correct level:

a) Start the machine at slow speed and stop after approximately 30 seconds.

b) Re-start the machine.

c) Note tension.

d) If tension rises too much (X-3400) or if the dancer moves towards +100% (D- and DTI-3400), decrease [Start Lev]; if tension drops too much (X-3400) or if the dancer moves towards -100% (D- and DTI-3400), increase [Start Lev].

e) If adjustment in d) has been made, return to step b).

5.6 Stopping the Machine [Stop Menu]

Stop Descriptions

When a machine is stopping with a short ramp-down time, it can be necessary to make some compensation. If the right compensation is made, it is possible to prevent tension from dropping. The digital input called fast stop is used to control that compensation.

To prevent a drop in tension or dancer position, the fast stop signal has to be activated exactly when the machine begins to ramp down (see fig. 1).

Fig. 2 below shows how tension or dancer will drop if this signal is not used.
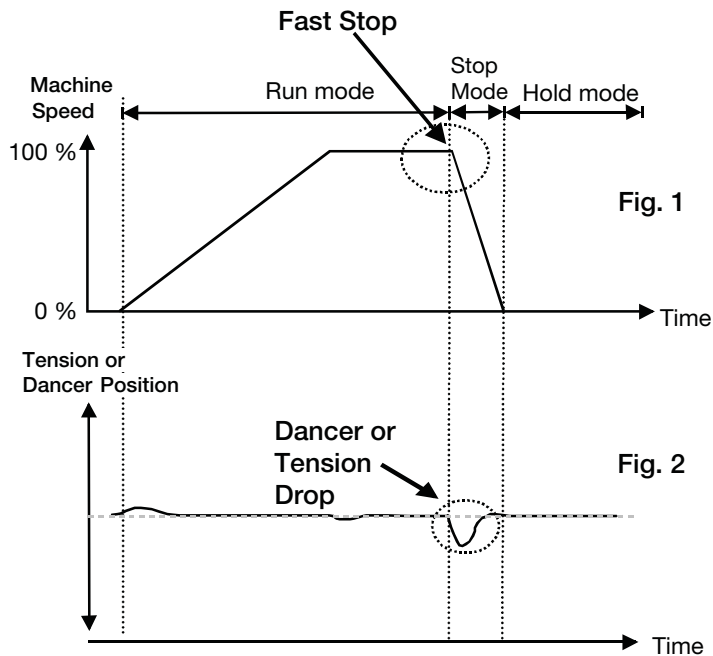
When the fast stop input is activated by 24V, the output increases to a higher level and then starts to regulate again. The level is set by the fast stop parameter. Typical set-up for X-3400 is [Source = OUTPUT] and for D- and DTI-3400 it is [Source = DIA].

Possible Sources for Fast Stop:

[OUTPUT]	*Note: This source is primarily used on load cell applications. The torque required for* **fast stop** *is calculated from the output level scaled by an adjustable factor that fits the actual ramp-down time of the machine.*
[DIA]	The diameter is used to control the required torque for **fast stop**. The torque level is calculated from the actual diameter scaled by an adjustable factor that fits the actual ramp-down time of the machine. *Note: Diameter has to be set up and adjusted in the* [Diameter Menu].

Parameter Setting and Adjustment:

[Source]
The source for fast stop must be set up under the following parameters:

[Source = OUTPUT]	*Note: This source is primarily used on load cell applications. The torque required for **fast stop** is calculated from the output level scaled by an adjustable factor that fits the actual ramp-down time of the machine.*
[Source = DIA]	The diameter is used to control the required torque for **fast stop**. The torque level is calculated from the actual diameter scaled with an adjustable factor that fits the actual ramp-down time of the machine.

[F-Stop Min]   *Range: 0-20%*

1. Set up the minimum necessary level for the torque at fast stop with this parameter. See graph below.
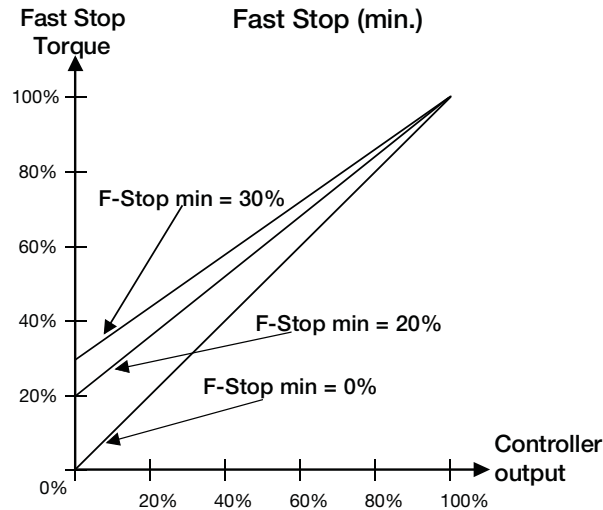
To set the correct value:

a) Place a small roll. Set tension setpoint at about 50% (X- and DTI- 3400) and set the dancer load (D-3400) to the most used tension.

b) Start the machine and run it at maximum speed.

c) When tension or dancer has stabilized for 10 seconds, stop the machine by using the function that activates the fast stop signal.

d) Note the tension reaction.

e) Decrease[F-StopMin]iftensionrises(X-3400) or if dancer moves towards +100% (D- and DTI-3400); increase [F-Stop Min] if tension drops (X-3400) or if dancer moves to wards -100% (D- and DTI-3400).

f) If the adjustment has been made in step e), return to step b).

[F-Stop Max]   *Range: 0-300%*

2. Set up the maximum necessary level for the torque at fast stop with this parameter. See graph below.
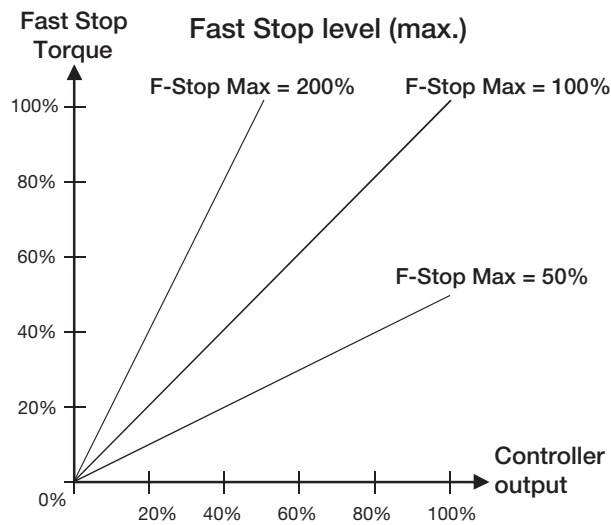
To set the correct value:

a) Place a large roll. Set tension setpoint at about 50% (X- and DTI-3400) and set the dancer load (D-3400) to the most used tension.

b) Start the machine and run it at maximum speed.

c) When tension or dancer has stabilized for 10 seconds, stop the machine by using the function that activates the ***fast stop*** signal.

d) Note the tension.

e) Decrease ***[F-StopMax]*** if tension rises (X-3400) or if dancer moves towards +100% (D- and DTI-3400); increase ***[F-Stop Max]*** if tension drops (X-3400) or if dancer moves towards -100% (D-and DTI-3400).

f) If the adjustment has been made in step ***e)***, return to step ***b)***.

5.7 Machine at Stop [HoldMenu]

Hold Descriptions

1. When the machine is running and the *run* input is deactivated, the out put level will be stored and the controller will go into *stop* mode.

2. In *stop* mode the controller is still regulating until time [Hold Delay] has run out.

3. When time has run out, the controller changes to *hold* mode.

4. In *hold* mode the controller is not regulating and the desired output is held at a constant level = [Hold Level].

[Hold Level]= stored level + x%

Parameter Setting and Adjustment:

[Hold Delay]   **Range: 0-99.9**

1. If there is a delay from the time where the run signal is deactivated until the time where the machine reaches zero speed, enter the time as folows.

To set the correct time:

      a) Run the machine at maximum speed.

      b) Measure the time from activation of stop to zero speed.

      c) Enter this time + 0.2 seconds in this parameter.

Note: If this time is longer than 10 seconds, use a zero speed signal.

[Hold Level]   **Range: 0-200%**

2. When the *run* signal is deactivated, the controller stores the output level, but contiues to regulate until [Hold Delay] has run out. If a longer time is set up, the output will change after that time. In hold mode, the output is at a constant hold level.

To keep the roll in the same position in *hold* mode, the stored level is increased by x% to create a holding output [Hold Level]. Typically Hold Level = Stored Level +50%.

Example of the output level in *hold* mode:

Hold Menu: [Hold Level 100%] => Stored Level
Hold Menu: [Hold Level 150%] => Stored Level + 50%

5.8 Diameter [DiameterMenu]

The diameter is in some cases useful and necessary, such as in the following instances:

- Control of gain
- Reduction of tension (taper) on rewinder
- Control of stop level at fast stop
- Control of range expander in some special versions

The diameter can be selected from five different sources:

[OUTPUT]	The processor calculates a diameter from tension and output. This way will not work in applications requiring a wide web tension range.
[PULSE]	Diameter calculated from two digital input signals (2 proximity switches).
[AUX1]	Diameter from external analog source (Terminal 51).
[AUX2]	Diameter from external analog source (Terminal 54).
[AUX3]	Diameter from external analog source (Terminal 25).

1. **Diameter Calculated From Tension and Output [OUTPUT]**

A function most often used in standard load cell applications. The diameter calculated is approximate, and not useful in applications requiring precise diameters.

2. **Diameter Calculated From 2 Proximity Switches [PULSE]**

The roll diameter is calculated during running from 2 proximity switches, one that senses roll revolutions (location 1) and another that senses web speed locations (2, 3 or 4). If the application is with dancer, it is recommended to use position 2 for the web pulse. At the start-up after roll change, the diameter of the new roll is calculated when the controller has received 2 pulses from the new roll. Pulse diameter calculations are recommended for machines with a wide web tension range; these calculations also improve the fast stop function.

Calculation of Roll Diameter
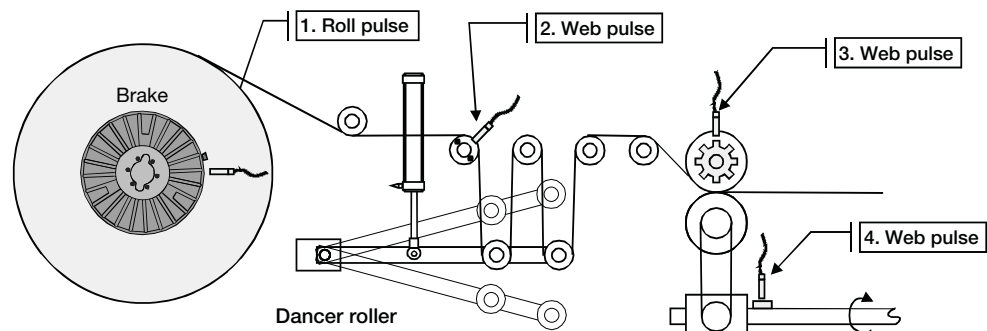
Warning: *Do not place the proximity switch at a place where it will be overheated by the brake!*
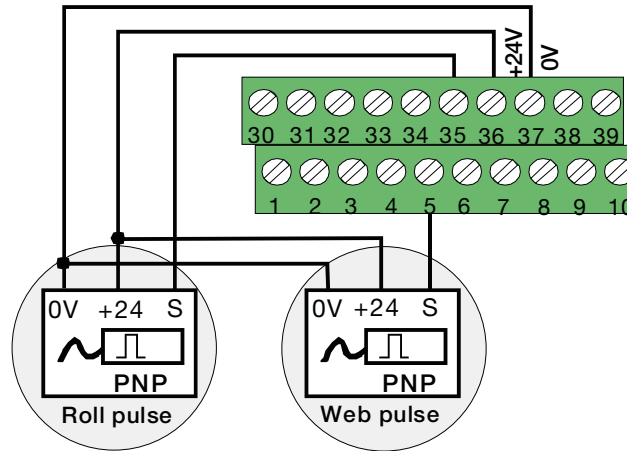
a) Roll Pulse (terminal 35)

A proximity switch that pulses 1 to 4 times per revolution during rotation of the roll is mounted on the unwind stand. The best way is to mount it at a place where you can sense a keyway, a screw, or a bored hole in the shaft; other possible sensing locations are the safety chucks and the brake.

Note: The maximum input frequency must not exceed 80Hz.

b) WebPulse(terminal5)

A proximity switch is mounted to sense the web length/pulse. The proximity switch can be installed in position 2, 3 or 4. The recommended web length/pulse is between 10 and 250 mm/pulse. For better resolution, use a short distance between the pulses. Note: The maximum input frequency must not exceed 15KHz.

3. Diameter from external analog source [AUX1, AUX2 or AUX3] Three analog inputs are available for diameter connection. Depending on the unwind type, however, they can also be used for other purposes.

X-3400 and D-3400	AUX1: Free to use (if not used for taper or splice level) AUX2: Free to use AUX3: Free to use
DTI-3400	AUX1: Free to use (if not used for taper or splice level) AUX2: Free to use AUX3: Used to connect the dancer position signal.

All the Aux inputs are default factory setup or adjusted to use a 0-10V input signal. It is possible to adjust Aux3 with 2 potentiometers, if zero or offset adjustment is needed (see diagram under analog input). If Aux1 and Aux2 are input, and if other than 0-10V signal is needed, software parameter changes must be made. (See the Aux1 or Aux2 Input section.)

Parameter Setting and Adjustment

To set up parameters in the diameter menu, go to the [Diameter Menu] in the [Setup Menu] and do the following:

1. [Dia Source] (Diameter source)

Select one of five modes for **diameter:**

[OUTPUT]	The processor calculates a diameter from the tension and output. This way will not work in applications requiring a wide web tension range.
[PULSE]	Diameter calculated from two digital input signals (2 proximity switches).
[AUX1]	Diameter from external analog source (Terminal 51).
[AUX2]	Diameter from external analog source (Terminal 54).
[AUX3]	Diameter from external analog source (Terminal 25).

a) If [OUTPUT] is source, set up the following parameters:

[Dia Min]	(Minimum diameter). Minimum roll size must be set up in percentages (0 - 100%).
[Dia Max]	(Maximum diameter). Maximum roll size must be set up in percentages (0 - 100%).

1. Place a roll and measure its diameter (0-100%).
2. Go to the parameter "Diameter factor auto setup" [DF Auto set].
3. Run the machine at low speed until tension has stabilized for 10 seconds.
4. Input actual diameter; press [Enter]. When [Enter] is pressed, factor for the diameter will be calculated.

a) If [PULSE] is source, set up the following parameters:

[P/Rev Roll]	The number of pulses per revolution on the roll.
[mm/Pulse]	Mm between pulses on the main machine.
[Dia Min]	Minimum roll size in mm.
[Dia Max]	Maximum roll size in mm.

c) If [Aux1] or [Aux2] is source, set up the following parameters:

	Maximum roll size in % (0-100%).

d) If [Aux3] is source, set up the following parameters:

[Dia Min]	Minimum roll size in % (0-100%).
[Dia Max]	Maximum roll size in % (0-100%).

1. Go to the parameter [Diameter].

2. Adjust on potentiometer R4 until 0% [Diameter] is displayed.
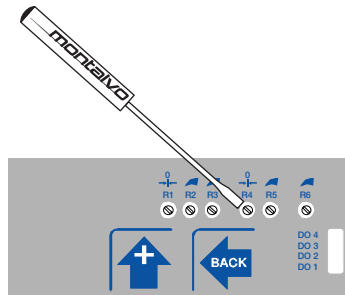
3. Adjust on potentiometer R5 until 100% [Diameter] is displayed.
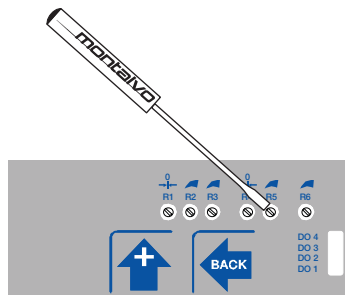
2. [New Roll D] (New Roll Diameter)

New Roll Diameter is the diameter to which, after roll change, the controller is set until calculation of the correct diameter by running again. The New Roll Diameter is automatically set to the maximum diameter when a new maximum diameter is entered. If the application does not require maximum diameter, the parameter can be adjusted.

3. Diameter

The current calculated or actual analog diameter, based upon previous parameter settings, is shown in this parameter.

5.9 DigitalOutput[DigitalOutputMenu]

All four digital outputs can be selected as either **web break** or **diameter alarm**.
Important: If **range expander** is used and the output is needed for that, it is not possible to use **web break** or **diameter alarm**. See the following table.

Ranges:	Name:	DO use:	Terminal:
2	P3000ce-**RE2**	DO-2, DO-3	9, 39
3	P3000ce-**RE3**	DO-2, DO-3, DO-4	9, 39, 10
4	P3000ce-**RE4**	DO-2, DO-3, DO-4, DO-1	9, 39, 10, 38

Digital Output Selection [DO Selection Menu]

[Web Break] or [Diameter] In those parameters the selection of the digital output is done. Set up one of the following: [None, DO-1, DO-2, DO-3 or DO-4].

Web Break

Description:
The **web break** function can be used to stop the machine if the web breaks. The output will typically activate a customer-supplied relay that stops the machine (maximum 100 mA load for the digital output).

When the **run** signal (machine is starting) is activated, the **web break** function will be active after time [Wbr Delay] has run out. (Default set to 10 sec.) This time period allows start-up with new rolls when little or no tension is present.
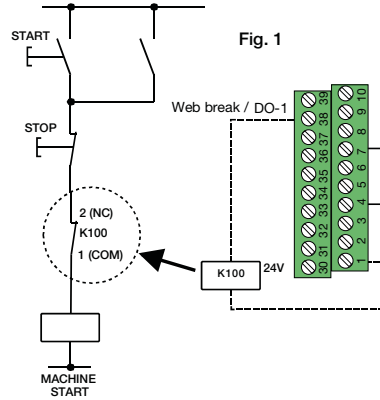
When **web break** is active, and tension or dancer goes below web break level [Wbr Level] longer than web break time [Wbr Time], output will be activated (i.e. go high). See fig. 1.
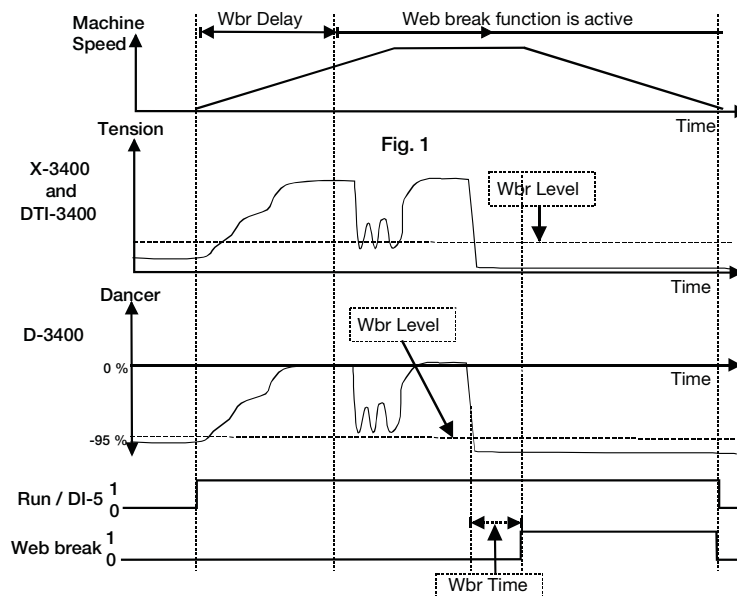
Fig. 1

Electrical Wiring

Below is an example of how to connect web break on terminal 38 (DO-1):

Parameter Setting and Adjustment

To set up parameters in the web break menu, scroll to the [Web Break] menu under the [Setup Menu]:

[Wbr Delay]   *Range: 0.0 – 20.0 sec.*
1. When the run signal is activated, the web break function will be active after this time has run out.

[Wbr Level]   *Range: -95 – 25%*
2. Tension or dancer position below this level will activate output after the web break time. The factory setting of 5% (X- and DTI-3400) and -95% (D-3400) applies to most applications.

[Wbr Time]   *Range:0.0 – 5.0 sec.*
3. The time where the tension or dancer position is beyond web break level before output is activated (goes high).

To adjust this parameter, time should be:
• long enough to prevent small tension or dancer drops from stopping the machine.
• short enough to minimize material waste before stop. Diameter Alarm

Diameter Alarm

Description and Setup:
[Dia Alarm]   *Range:0.0 – 100.0% or 0 –3000 mm*
When a diameter is beyond the level set up in this parameter, this will activate the digital output.

Note: If the diameter is using [PULSE] as source, this is in mm. Otherwise the diameter is displayed in %.
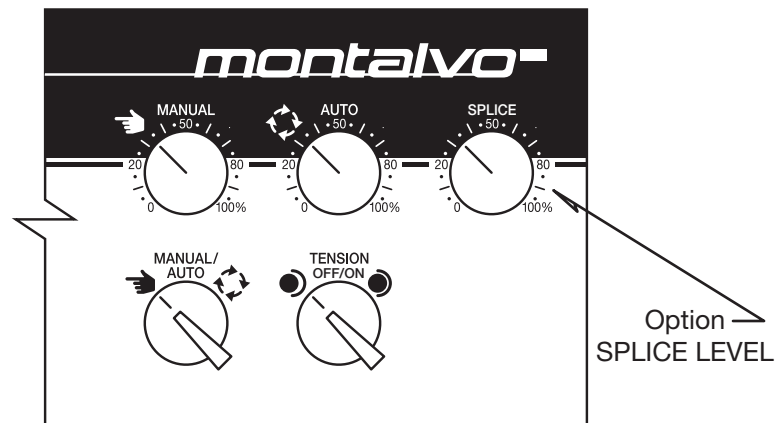
5.10 Splice [SpliceMenu]

This function controls the regulator in the splice sequence. The following sequence diagram shows a flying splice:

1. A new roll is ready and in splice position when the operator activates the splice sequence. (Typically, the new roll will be accelerated up to web speed.)
2. Splice arm moves down; the new roll is spliced onto the running web.
3. Knife cuts the web off the old roll.
4. Knife and splice arm retract. The splice is finished.
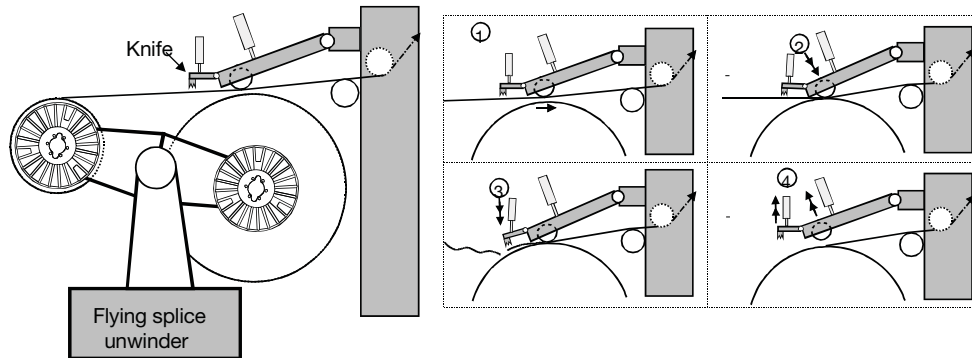
In a splice sequence, the output level must change from the regulated output level on the old (or expiring) roll to a new output level for the new roll. The output level on the expiring roll will normally be low, while, on the new roll, the output will change to a much higher level.

If the diameter of a new roll is approx. the same at every splice, the splice level will always be the same. If the diameter that is being spliced varies to a high degree, the splice level will also vary each time. In a standard application, the splice level in a software parameter is fixed at the same level for every splice. As an option, the diameter for the new roll can be set up either from an analog input signal or from a potentiometer on the front of the Enclosure version. The option should be used in cases where splice levels vary to a high degree.
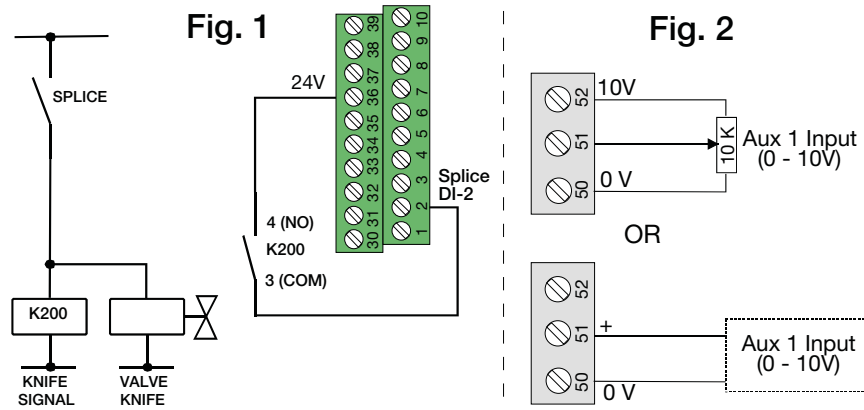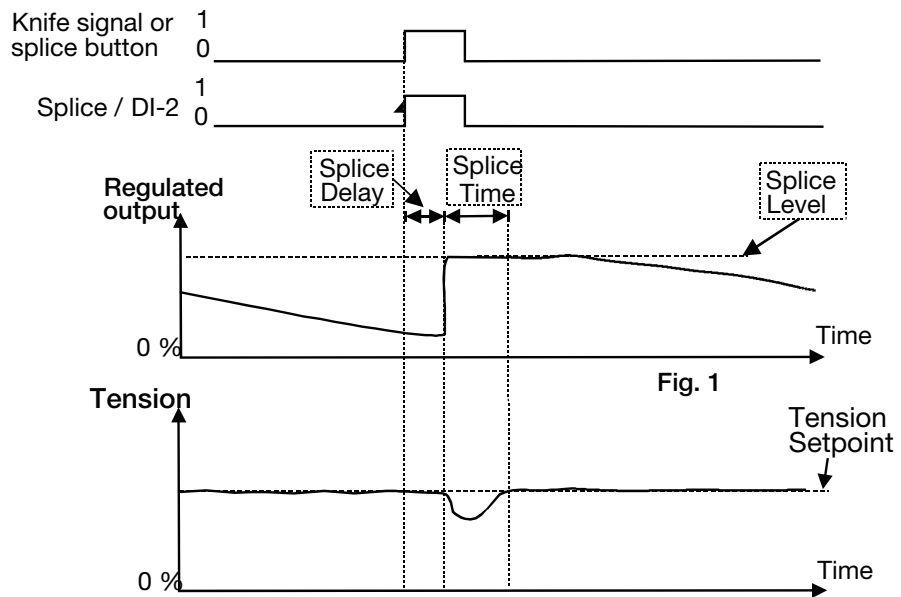

Option
SPLICE LEVEL

Electrical Wiring

Below is an example of a splice signal connection. Typically a knife signal is used.

Optional: If an external diameter is used for the new roll diameter, then wire it on Aux1 according to fig. 2.

In splice mode the regulator is held at a constant level [Spl Level] for some time [Spl Time], and then starts regulating from that level again (see diagram below). Optional: A delay between the knife signal and the cutting of the web can be set up in the parameter [Spl Delay], if required.

Parameter Setting and Adjustment

1. [Spl Source] (Splice Source)
Set up the source for the splice.

[NONE]	Set up if splice is not used.
[Spl Level]	With **[S.LEV]** as the source, the splice level is set up in a menu parameter. Choose this source if the diameter of the new roll is approx. the same at every splice.
[AUX1]	With the **[AUX1]** as source, the splice level comes from an analog signal (0-10V). The analog signal can either be wired on terminal 51, or come from a potentiometer on the front panel in the cabinet version (see drawing below). Choose this source for large changes of the diameter of the new roll.
[AUX2 or AUX3]	The analog input from **[AUX2]** or **[AUX3]** can also be selected as diameter. See Analog Input section. (0 – 10V = 0 -100% diameter.)
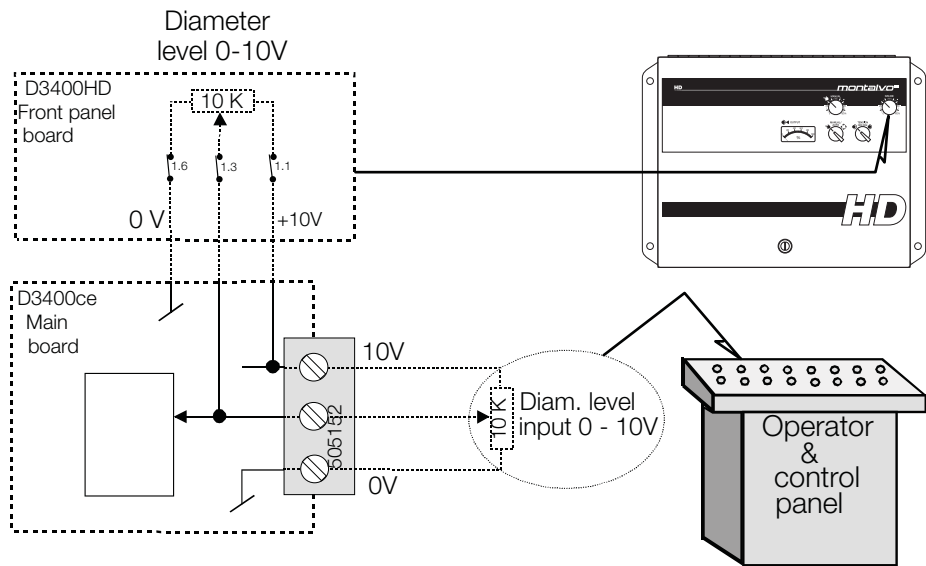
Note: The diameter of the Enclosure front and the diameter input on terminal 51 cannot be used at the same time.

2. [Spl Delay] (Splice Delay)
In the event of delay from activation of the knife signal to the cutting of the web, time can be set up within this parameter.

3. [Spl Level] (Level from the Splice Menu Parameter)

[Spl Source = S.LEV]	Set up the splice level in this parameter. A new output level is required when the knife cuts the web. This level depends upon the diameter of the new roll. If the diameter of the new roll is approx. identical, the splice level can be set at a constant value.

To set the correct value:

a) Place a roll with a maximum diameter.
b) Start the machine at slow speed. Note the output level when tension or dancer has stabilized.
c) Adjust [Spl Level] to the output noted in step b). (Note: If the controller is an X- or DTI-3400, the output level is scaled with the setpoint.)

4. **Level from Analog Aux1 Input**

[Spl Source = AUX1]

The signal on terminal 51 can either come from the front of the cabinet version or from an analog input signal. 0 to10V on this analog input will give 0 to 100% diameter. Once the knife cuts the web, a new output level will be needed. The new output level is calculated in the following way:

$$Output = \frac{Spl. \text{ Level} \times Setpoint* \times Diameter}{10000}$$

$$Output = \frac{100 \times 100* \times 100}{10000} = 100\%$$

*On the D-3400 controller the setpoint is default set to 100%.

To set the correct values:
a) Place a full roll with the required "tension setpoint".
b) Start the machine at slow speed. Note the output level when tension or dancer has stabilized.
c) Stop the machine and write down the diameter, output level, and setpoint (X and DTI-3400). The noted output level should be the correct splice level for this diameter.
d) Perform steps a) to c) with different diameters and list them as well.

Production:	"Tension Setpoint"	Splice Level	Diameter
Paper (40 grams/25 lbs.)	35%)	60%	100%
Paper (40 grams/25 lbs.)	35%	45%	75%
Paper (40 grams/25 lbs.)	35%	30%	50%
Paper (80 grams/50 lbs.)	60%	80%	100%

5. [Spl Time] (Splice Time)

During this time, output is set to a constant level before returning to automatic regulation. Typical setting for this parameter is about 1.0 sec.

Checking the Splice Settings:
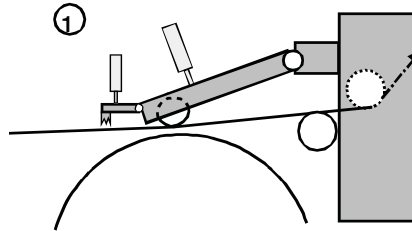
To set the correct values:

a)   Put a new roll in splice position.
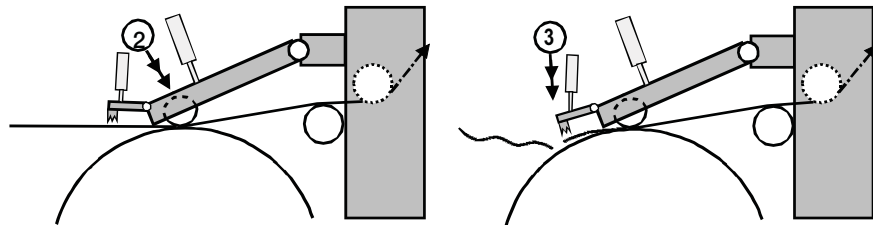
b)   Run the machine at splice speed, and make a splice. Tension or dancer position should resemble the one represented in fig. 2 below.

Fig. 1

Splice time

Splice level

Regulated output

Time

Fig. 2

Tension Setpoint

Tension

Time

5.11 Range Expander [RangeExpMenu]

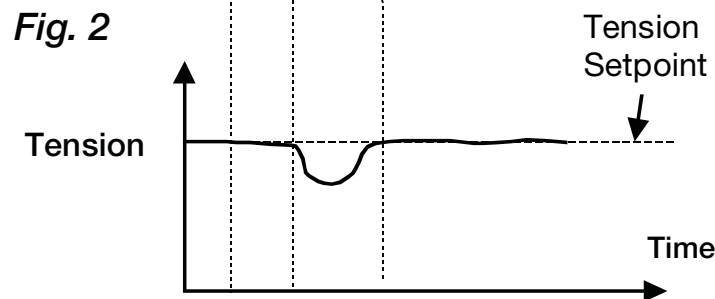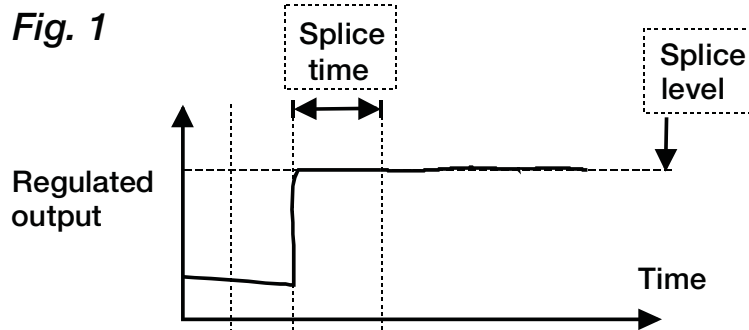Range expansion divides the torque capabilities of a braking system into multiple ranges. Only ranges required for a desired torque are active at any given time. This feature allows a braking system to run a much wider scope of materials and tension settings. Each combination uses the braking system to its maximum potential and efficiency. In a normal braking system, each brake pad is connected in parallel to the regulated air output. The pads may be divided into groups called ranges using the range expander, which requires a P-3000HD RE Pneumatic Interface. There can be between 2 and 4 ranges. Each range is driven from a separate valve switch within the enclosure. Using this method, only the ranges required for adequate torque within the linear range of brake functionality are active. The range expander will automatically switch in the number of ranges that are required and raise or reduce the pressure on the brake accordingly. This will maintain the same tension across the ranges.

Possible applications include:

Large Web Tension Variance	Small rolls/light material through large rolls/heavy material on the same machine.
Fast Stop with High Inertia Rolls	Large rolls with low tension.

Standard vs. Range Expander Brake System
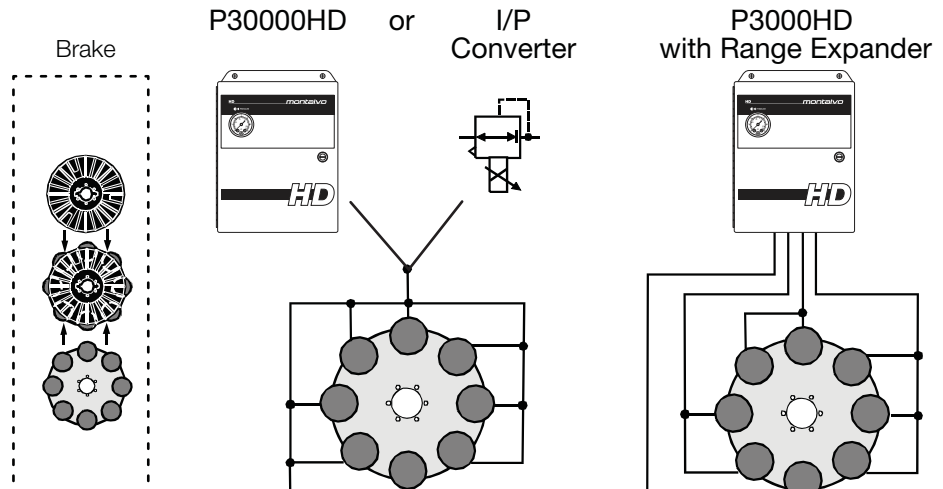
The range expander can operate by two possible modes, by output or by diameter.

Changing Ranges by Tracking Output Pressure

Output Mode: The range expander will change to a lower range when output pressure regulates below 20% [Dn Level] for more than 20 seconds (range time) or to a higher range when output pressure regulates over 80% [Up Level] for more than 20 seconds (range time). During a range shift, the pressure is changed automatically to keep the same torque on the brake.
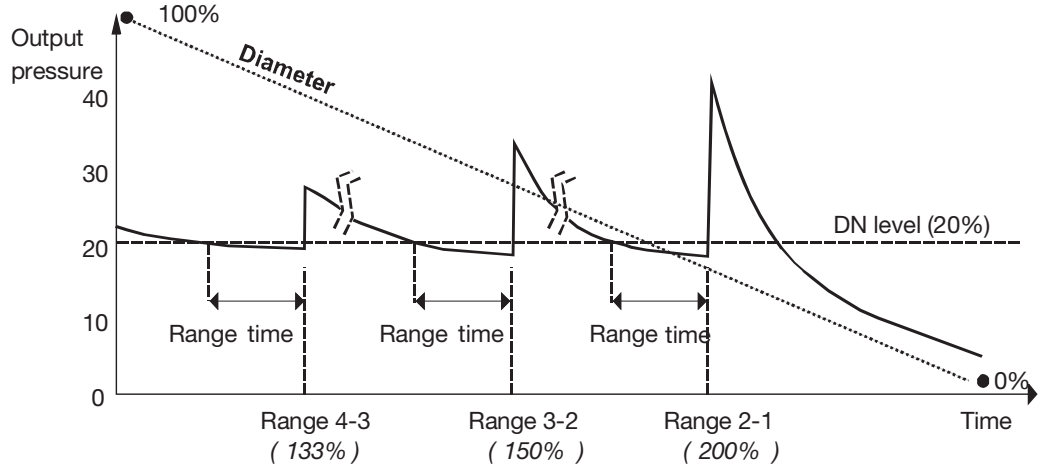
Illustration of diameter, range, and pressure changes during typical unwind cycle under the output pressure control.

Changing Ranges by Tracking Diameter

Diameter Mode: The range expander will change to a lower range when the roll diameter is smaller than the switching diameter, or change to a higher range shift-up when the roll diameter is greater than the switching diameter. The controller automatically calculates the best switching diameter based on brake geometry. During a range shift, the pressure is changed automatically to keep the same torque on the brake.
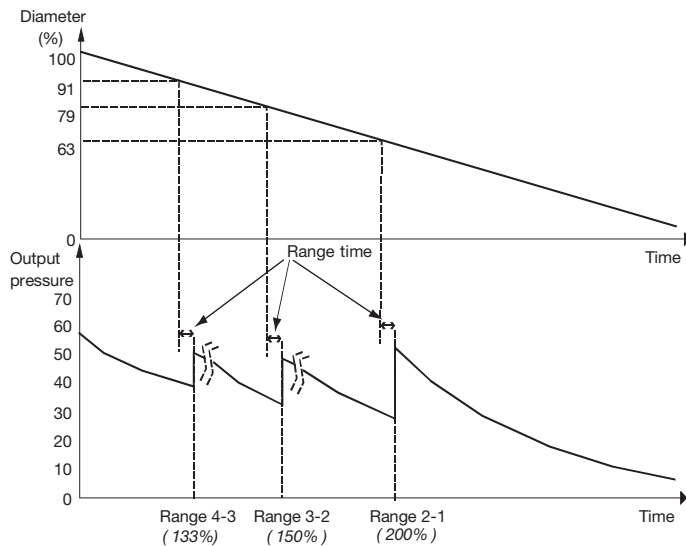
Illustration of diameter, range, and pressure changes during typical unwind cycle under the diameter control.

Electrical Wiring of P3000HD-RE2, 3 or 4.

Without Emergency Stop (Wire between 4 and 7)
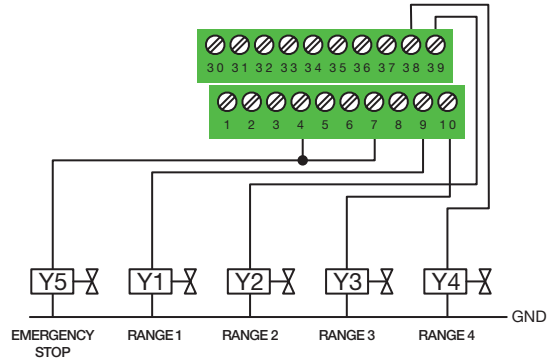
With Emergency Stop (E-Stop Relay between 4 and 7)

Pneumatic Diagram

1 Air Supply, 6-8 bar
2 Air Filter
3 I/P Converter, 0-6 Bar
4 Emergency Stop Valve
5 Manometer
6 Range 1 Valve
7 Range 2 Valve
8 Range 3 Valve
9 Range 4 Valve
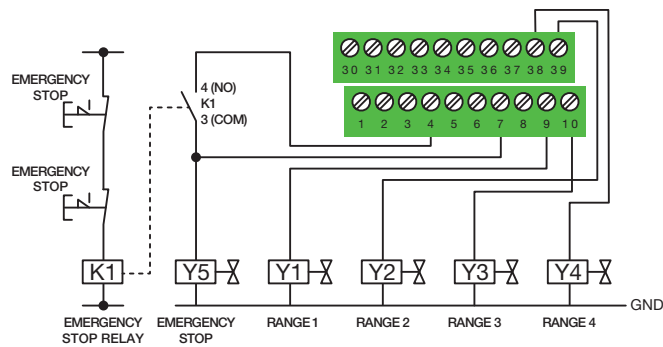
Typical pneumatic connection.

Parameter Setting and Adjustment

To set up parameters in the range expander menu, go to the [Range Exp Menu] under the [Setup Menu] and do the following:

1. **[RE Source] (Range Expander Source)**

   Select one of three modes of operation for the range expander:

[NONE]	Range expander not used
[DIA]	Range expander runs under diameter control
[OUTPUT]	Range expander runs under output pressure control

   Note: The factory recommends the following set-up:

   - X-3400 = [OUTPUT] or [DIA]
   - D-3400 = [DIA]

   Note: All remaining range expansion parameters must be set in **tension off** mode.

2. **[Ranges]**

   Select the number of ranges in your system: 2, 3 or 4.

3. **[Start No.]**

   Select the starting range number: 1, 2, 3 or 4. This is the range used after a range expander re-set, which occurs after the following three conditions:
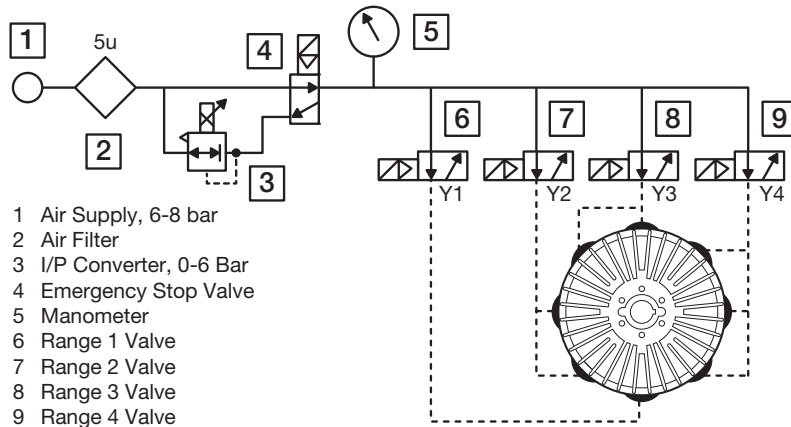
   - Power has been applied to the controller.
   - Tension has been switched on (new roll).
   - Controller has performed a splice operation.

   Recommended: choose this value to reflect most frequently used materials and roll diameters.

4. **[Dn Level] when[RE Source = OUTPUT]**
   If output level is below [Dn Level] and longer than [Range Time], the controller will switch down one range.

5. **[Up Level] when [RE source = OUTPUT]**
   If output level is over the [Up Level] and longer than [Range Time], the controller will switch up one range.

6. **[Range Time]**

This is the delay time before the controller switches one of the ranges in or out. The following criteria will start the time delay:

[RE source = OUTPUT]

 a) If output is under [Dn Level],[RE source = OUTPUT].
 b) If output is over [Up Level],[RE source = OUTPUT].
 c) If a diameter switch-point is reached, [RE source = DIA].

Note: In all conditions, the controller must run in auto mode before switching.

7. **Enter the [Brake Menu] sub-menu**

[Pads R1] [Pads R2] [Pads R3] [Pads R4]	The number of brake pads in each of the possible ranges. You do not need to set values for ranges that are > [Ranges].

For example: If [Ranges] = 2, only [Pads R1] and [Pads R2] should be set.

[Randomize YES] or [Randomize NO]

For equal wear of brake pads, randomize the starting range.

If [Randomize YES] is selected, the controller will rotate among the lowest ranges with equal numbers of brake pads. (Range 1 is lowest range, range 4 highest.)

8. **[Range Dia Menu] when (RE Source = DIA)**

[4/3 Dia] [3/2 Dia] [2/1 Dia]	The best diameter switch points for the controller. The switch points are calculated from the information set up in the brake menu.

Note: This is only a read-out parameter.

5.12 Aux1 Input [Aux1InputMenu]

This analog input can be used with a potentiometer, an ultrasonic sensor or other output device. Typical use:

Analog Aux1 Input (51)

Default the input is set to use 0 – 10V = 0 - 100%. If the voltage is with a smaller range, then follow this set-up:

Unwinder	Actual diameter or new diameter (splice)
Rewinder	Taper %

Parameter Setting and Adjustment:

[Aux1 Calc] (Read-Out)   *Range: 0.0-100.0%*
The calculated result of this input function is shown in this parameter.

[Aux1 Raw] (Read-Out)   *Range: 0.0-100.0%*
The input level on terminal 51 is shown directly in this parameter.
(0.0 – 10.0V = 0.0 -100.0%.)

[Raw1 Min]   *Range: 0.0-50.0%*
Note the minimum level in[Aux1 Raw]and set it up in this parameter.
(If 0 – 10V signal is used, set up 0.0%.)

[Raw1 Max]   *Range: 0.0-100.0%*
Note the maximum level in[Aux1 Raw] and set it up in this parameter.
(If 0 – 10V signal is used, set up 100.0%.)

[Calc1 Min]   *Range: 0.0-50.0%*
Set up the minimum (%) that should be calculated at the [Raw1 Min] level.
(If 0 – 10V signal is used, set up 0.0%.)

[Calc1 Max]   *Range: 0.0-100.0%*
Set up the maximum (%) that should be calculated at the [Raw1 Max] level.
(If 0 – 10V signal is used, set up 100.0%.)

[Calc1 Invert]   *Select: NO / YES*
The Analog Input signal can be inverted with this parameter.
[NO] 0 – 10V = 0.0 – 100.0%.
[YES] 10 – 0V = 0.0 – 100.0%.

5.13 Aux2 Input [Aux2InputMenu]

This analog input can be used with a potentiometer, an ultrasonic sensor or other output device. Typical use:

Analog Aux2 Input (54)
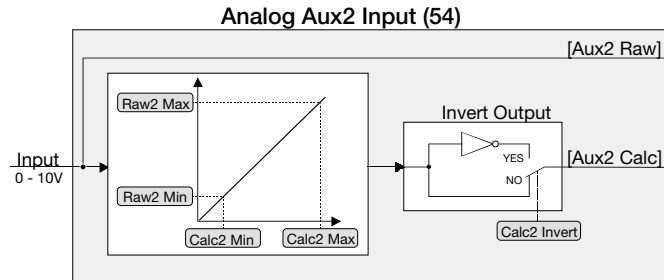
This analog input can be used with a potentiometer, an ultrasonic sensor or other output device. Typical use:

Unwinder	Actual diameter or new diameter (splice)
Rewinder	Line speed

Default the input is set to use 0 – 10V = 0 - 100%. If the voltage is with a smaller range, then follow this set-up:

Parameter Setting and Adjustment:

[Aux2 Calc] (Read-Out)   *Range: 0.0-100.0%*
The calculated result of this input function is shown in this parameter.

[Aux2 Raw] (Read-Out)   *Range: 0.0-100.0%*
The input level on terminal 54 is shown directly in this parameter.
(0.0 – 10.0V = 0.0 -100.0%.)

[Raw2 Min]   *Range: 0.0-50.0%*
Note the minimum level in[Aux2 Raw]and set it up in this parameter.
(If 0 – 10V signal is used, set up 0.0%.)

[Raw2 Max]   *Range: 0.0-100.0%*
Note the maximum level in[Aux2 Raw]and set it up in this parameter.
(If 0 – 10V signal is used, set up 100.0%.)

[Calc2 Min]   *Range: 0.0-50.0%*
Set up the minimum (%) that should be calculated at the [Raw2 Min] level.
(If 0 – 10V signal is used, set up 0.0%.)

[Calc2 Max]   *Range: 0.0-100.0%*
Set up the maximum (%) that should be calculated at the [Raw2 Max] level.
(If 0 – 10V signal is used, set up 100.0%.)

[Calc2 Invert]   *Select: NO / YES*
The Analog Input signal can be inverted with this parameter.
[NO] 0 – 10V = 0.0 – 100.0%.
[YES] 10 – 0V = 0.0 – 100.0%.

5.14 Aux1 Output [Aux1OutputMenu]

Aux1 output is an analog output 0 – 10V. It is possible to select one of the following parameters:

[SP]	The internal setpoint from the controller. *(Typically used for controlling the load on a dancer with air cylinder).*
[DIA]	The internal diameter.
[OUTPUT]	The regulated output level.
[RPM]	The RPM for rewind applications.
[ODR]	Used for special applications.

Parameter Setting and Adjustment:

[Source]
Select [Source] for the output in this parameter. Default the output is set up to use the diameter.

[Output] (Read Out)   *Range: 0.0-100.0%*
The actual output level is shown in this parameter.

[Aux1 Min]   *Range: 0.0-50.0%*
The minimum parameter sets the output level at 0%. If [Aux1 Min] is set to 10.0%, the output level will be 1.0V at 0%.

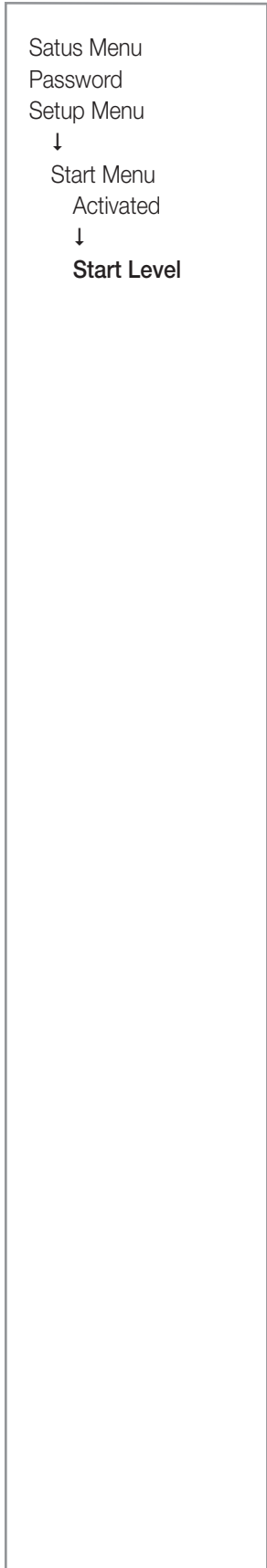**[Aux1 Max]**   *Range: 0.0-100.0%*
The maximum parameter sets the output level at 100%. If [Aux1 Max] is set to 90.0%, the output level will be 9.0V at 100%.
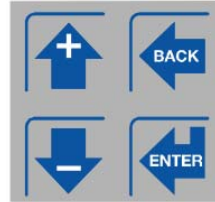
5.15 Aux2 Output

Aux2 output is an analog output 0 – 10V. This output is always setup to give the actual diameter.

6 Operation of the Controller Menu

6.1 Operation of the Controller Menu

The controller operates in two modes:	and has four types of menu items:
• **Scroll Mode** • **Edit Mode (the cursor blinks)**	• *parent menu* • *submenu* • *numeric parameter* • *textual parameter.*

Menus are arranged in a hierarchical tree structure. The controller starts in scroll mode. A **submenu** is any menu below the current menu. A **parent menu** is any menu above the current menu. Scroll moves through the menu items; **edit** changes the numeric or textual parameter value.

Scroll Mode

Up↑:	**Moves** to the **previous** menu item.
Down↓:	**Moves** to the **next** menu item.
Back Space←:	**Moves** to the **previous** parent menu.
Enter↵:	**Enters** the **previous** parent menu**,** if a submenu, or **changes** to *edit mode,* if a numeric or textual parameter.

Edit Mode

Up↑:	**Increases**	the numeric parameter value or **moves** to the **previous** textual parameter value.
Down↓:	**Decreases**	the numeric parameter value or **moves** to the **next** textual parameter value.
Back Space←:	**Cancels**	*edit mode*, returning to the **previous** value ***.**
Enter↵:	**Stores**	entered value and **changes** to *scroll mode.*

* Note: *The cancel function of* **Back Space** *is not applicable in connection with "live" edit parameters. Here the value is automatically stored when a change is made, and you cannot return to the previous value.* **Go to the section Customer Parameter Settings to find out which parameters are "live" edit parameters.**

Example: in the following instance, the user increases the value of [Start Level] to 80.0 %. With the controller displaying [Status Menu], the required steps are as follows:
(First open [Setup Menu] with password level 5.)

a) Press **Down** (↓) ....until [Password] appears on the display
   - Press **Enter** (↵) .... to open edit mode (the cursor will blink)
   - Press **Up** [↑] ....until 5 appears in the display
   - Press **Enter** (↵) .... to activate password level 5
b) Press **Down** (↓) .... until [Setup Menu] appears in the display
   Press **Enter** (↵) ....to enter the submenu
c) Press **Down** (↓) .... until [Start Menu] appears in the display
   Press **Enter** (↵) ....to enter the submenu
c) Press **Down** (↓) .... until [Start Level] appears
d) Press **Enter** (↵) .... to edit the parameter (the cursor will blink)
e) Press **Up** or **Down** [↓↑] ....until 80.0 appears in the display
f) Press **Enter** (↵) ....to store the change

6.2 Menu Tree [StatusMenu]

Submenu	Description
`Version`	Software version
`Run Mode`	Shows the actual **run** mode (see below).
`Tension`	Analog input No. 2, tension -110% to 110%
`Dancer`	Analog input No. 1, dancer position -110% to 110%
`Setpoint`	Analog input No. 1, setpoint 0% to 110%
`Output`	Analog input No. 8, output 0% to 110%
`I-Level`	Analog input No. 3, integrator 0% to 110%
`Gain Level`	Shows gain level 0% to 110%
`Manual`	Analog input No. 4, manual level 0% to 110%
`Diameter`	Calculated diameter 0 -100%
`Aux1 In`	Shows level on analog auxiliary 1 input.
`Aux2 In`	Shows level on analog auxiliary 2 input.
`Aux3 In`	Shows level on analog auxiliary 3 input.
`Aux1 Out`	Shows level on analog auxiliary 1 output.
`Aux2 Out`	Shows level on analog auxiliary 2 output.
	When parameter **[Password]** is entered, access is given to set-up and factory menus. To enter the **[Setup Menu]**, use password 5.

6.3 Description [RunMode]

Name	Description
[AUTO]	The controller is in **auto** mode. The controller compares actual tension to the auto setpoint, and adjusts output until the actual tension and setpoint are equal.
[MANUAL]	The controller is in **manual** mode. Constant output level is set with manual setpoint.
[START]	When the **run** signal is activated and output changes from **[Hold Level]** to **[Start Level]**. After that the controller goes into **auto** mode and starts to regulate.
[FSTOP]	When the **fast stop** signal is activated, the controller applies the fast stop level to the output level and continues to regulate.
[WAIT]	**1. Fast stop** (terminal 6) is activated and the controller is waiting for **[Hold Delay]** to run out. **2.** The **start** signal (terminal 34) is deactivated and the controller is waiting for **[Hold Delay]** to run out.
[HOLD]	When **[Hold Delay]** has run out and the machine has stopped. The output is then set to **[Hold Level]**.
[TENOFF]	**Tension off** is activated and the output level is set to zero.
[STDBY]	The output level is set to zero.
[SPLICE]	The **splice** signal (terminal 2) is activated and the controller is performing a splice.

6.4 Menu Tree [SetupMenu]

Submenu 1	Description
Config Menu	Submenu for configuration parameters. Enter menu to change parameters.
Options Menu	Submenu for selection of optional functions. Enter menu to change parameters.
Dancer*	Submenu for dancer minimum tension parameter. Enter menu to change parameters.
Regulator Menu	Submenu for regulator parameters. Enter menu to change parameters.
Roll Change Menu	Submenu for parameters related to roll change. Enter menu to change parameters.
Start Menu	Submenu for parameters related to the starting process on the machine. Enter menu to change parameters.
Stop Menu	Submenu for parameters related to the stopping process on the machine. Enter menu to change parameters.
Hold Menu	Submenu for parameters related to the **hold** mode menu where the machine is in stillstand (stopped). Enter menu to change parameters.
Diameter Menu	Submenu for set-up diameter parameters. Enter menu to change parameters.
Taper Menu	Submenu for the **taper** parameter. Enter menu to change parameters.
Digital Out Menu	Submenu for digital output. Enter menu to change parameters.
Splice Menu	Submenu for **splice**. Enter menu to change parameters.
Range Exp Menu	Submenu for **range expander**. Enter menu to change parameters.
Aux1 Input Menu	Submenu for the analog auxiliary 1 input. Enter menu to change parameters.
Aux2 Input Menu	Submenu for the analog auxiliary 2 input. Enter menu to change parameters.
Aux1 Output Menu	Submenu for the analog auxiliary 1 output. Enter menu to change parameters.
Com. Menu	Parameters used with optional communications packages, RS232 and FieldBus.

Dancer is only visible in the DTI-3400 controller.

6.5 Total Menu Tree

```
Run Mode                                DF AutoSet
Status Menu                             Diameter
  Version                         Taper Menu
  Tension                           Type
  Dancer                            Taper Begin
  Setpoint                        Digital Out Menu
  Output                            DO Select Menu
  I-Level                               Web Break
  Manual                                Diameter
  Splice                            Wbr Delay
  Diameter                          Wbr Level
  Aux1 In                           Wbr Time
  Aux2 In                           Alm Dia
  Aux3 In                         Splice Menu
  Aux1 Out                          Spl Source
  Aux2 Out                          Spl Delay
Password                            Spl Level
Setup Menu (access with Password 5)   Spl Time
  Config Menu                     Range Exp Menu
      Ctrl Type                     RE Source
      Amplifier                     Ranges
      Restore Config                Start No.
  Options Menu                      Dn Level
      Use Stop                      Up Level
      Use Taper                     Range Time
      Use Dig Out                   Brake Menu
      Use Splice                        Pads R1
      Use Rng Exp                       Pads R2
      Use Aux1 In                       Pads R3
      Use Aux2 In                       Pads R4
      Use Aux1 Out                      Randomize
      DI Mode Menu                  Range Dia Menu
  Regulator Menu                        4->3 Dia
      Gain Menu                         3->2 Dia
          Gain Min                      2->1 Dia
          Gain Max              Aux1 Input Menu
          Source                 Aux1 Calc
          Gain Level             Aux1 Raw
      PID Menu                   Raw1 Min
          P Level                Raw1 Max
          I Time                 Calc1 Min
          D Level                Calc1 Max
  Roll Change Menu               Calc1 Invert
      New Output               Aux2 Input Menu
      Cal-2 Scale                 Aux2 Calc
      New Roll D                  Aux2 Raw
  Start Menu                      Raw2 Min
      Start Lev                   Raw2 Max
  Stop Menu                       Calc2 Min
      Source                      Calc2 Max
      F-Stop Min                  Calc2 Invert
      F-Stop Max              Aux1 Output Menu
  Hold Menu                       Source
      Hold Delay                  Output
      Hold Level                  Aux1 Min
  Diameter Menu                   Aux1 Max
      Dia Source                  Aux1 Offst
      P/Rev Roll             Com Menu
      mm/Pulse                    Com Type
      Dia Min                     Baud Rate
      Dia Max
      Dia Factor
```

Please note that not all menus appear all the time. Menus either irrelevant to the mode or without the correct password will not appear.

6.6 Customer Parameter Settings

*Visible if and only if source = PULSE. **Visible if and only if source = OUTPUT. ***
"Live" edit parameter*

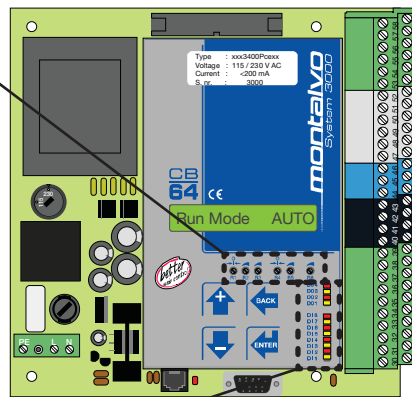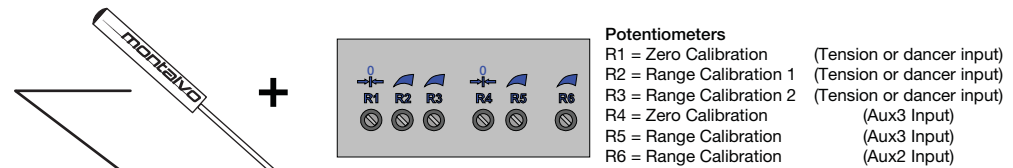|	Parameter Name		Value	Min.	Max.	Unit
Config Menu	Ctrl Type			–	–	–
	Amplifier			X1	X10	–
	Restore Confg			NO	YES	–
Options Menu	Use Stop			NO	YES	–
	Use Taper			NO	YES	–
	Use Dig Out			NO	YES	–
	Use Splice			NO	YES	–
	Use Rng Exp			NO	YES	–
	Use Aux1 In			NO	YES	–
	Use Aux2 In			NO	YES	–
	Use Aux1 Out			NO	YES	–
	DI Mode Menu	DI-5 Invert		NO	YES	–
		DI-8 Invert		NO	YES	–
Regulator Menu	Gain Menu	***Gain Min		0	50	%
		***Gain Max		0	500	%
		Source		–	–	–
		Gain Level		0.0	100.0	%
	PID Menu	***P Level		0	255	–
		***I Time		10	255	–
		***D Level		0	255	–
Roll Change Menu	New Output			0.0	500.0	%
	Cal-2 Scale			20.0	50.0	%
	New Roll D			0.0	100.0	%
Start Menu	Start Lev			0.0	200.0	%
Stop Menu	Source			–	–	–
	F-Stop Min			–	–	–
	F-Stop Max			0.0	50.0	%
Hold Menu	Hold Delay			0	99.9	S
	Hold Level			0	200	%
Diameter Menu	Dia Source			–	–	–
	*P/Rev Roll			0	8	–
	*mm/Pulse			0	400	Mm
	Dia Min			5	3000	mm,%
	Dia Max			5	3000	mm,%
	**Dia Factor			0.0	900.0	%
	**DF AutoSet			0.0	100.0	%
	Diameter			0.0	100.0	%
Taper Menu	Type			LIN	EXP	–
	Tap Begin			5.0	50.0	%
Digital Out Menu	DO Select Menu	Web Break		–	–	–
		Diameter		–	–	–

Note: Customer Parameter Settings List to be continued on the next page.

Customer Parameter Settings - Continued

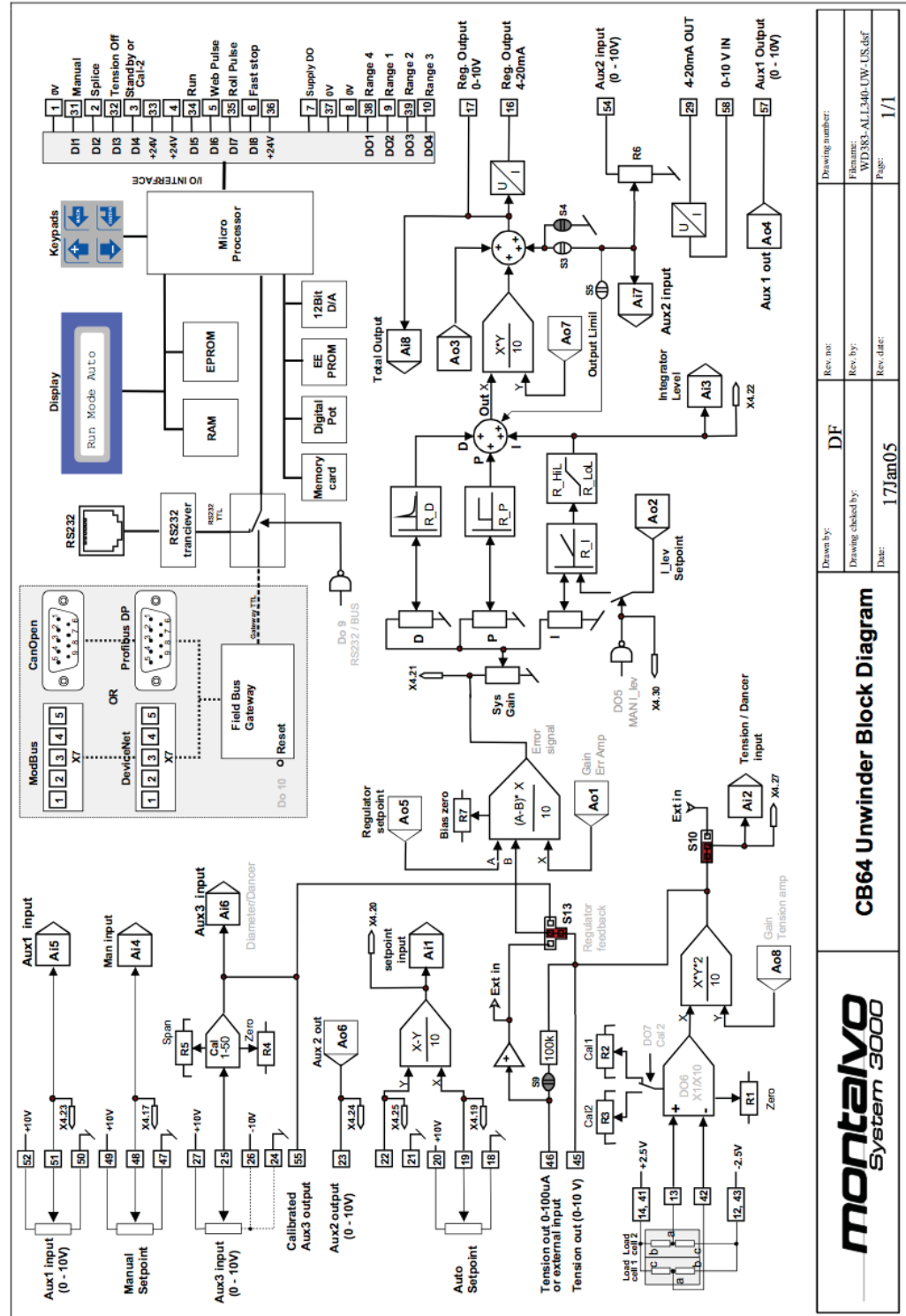|	Parameter Name		Value	Min.	Max.	Unit
	Wbr Delay			0.1	20.0	S
	Wbr Level			-95.0	25.0	%
	Wbr Time			0.0	5.0	S
	Alarm Dia			0.0	100.0	%
Splice Menu	Spl Source			-	-	-
	Spl Delay			0.0	3.0	S
	Spl Level			0.0	200.0	%
	Spl Time			0.0	9.9	S
Range Exp Menu	RE Source			-	-	-
	Ranges			1	4	-
	Start No.			1	4	-
	Dn Level			0	100	%
	Up Level			0	100	%
	Range Time			0	60	S
	Brake Menu	Pads R1		0	20	-
		Pads R2		0	20	-
		Pads R3		0	20	-
		Pads R4		0	20	-
		Randomize		NO	YES	-
	Range Dia Menu	4->3 Dia		0.0	100.0	%
		3->2 Dia		0.0	100.0	%
		2->1 Dia		0.0	100.0	%
Aux1 Input Menu	Aux1 Calc			0.0	100.0	%
	Aux1 Raw			0.0	100.0	%
	Raw1 Min			0.0	100.0	%
	Raw1 Max			0.0	100.0	%
	Calc1 Min			0.0	100.0	%
	Calc1 Max			0.0	100.0	%
	Calc1 Invert			NO	YES	-
Aux2 Input Menu	Aux2 Calc			0.0	100.0	%
	Aux2 Raw			0.0	100.0	%
	Raw2 Min			0.0	100.0	%
	Raw2 Max			0.0	100.0	%
	Calc2 Min			0.0	100.0	%
	Calc2 Max			0.0	100.0	%
	Calc2 Invert			NO	YES	-
Aux1 Output Menu	Source			-	-	-
	Output			0.0	100.0	%
	Aux1 Min			0.0	100.0	%
	Aux1 Max			0.0	100.0	%
	Aux1 Offst			0.0	25.0	%
Com Menu	Com Type			-	-	-
	BaudRate			4800	38400	-
	Remote Menu	Enable Menu				
		Value Menu				

7 Hardware Adjustment and LEDs

R1 Zero Range	Used to adjust zero of tension (X- and DTI-3400) or adjustment of center position for dancer controller (D-3400). See the Installation – Tension Calibration section or Dancer Calibration section.
R2 Calibration Range	Adjusts tension to show actual web tension (X- and DTI-3400) or adjust the dancer maximum position. See the Installation – Tension Calibration section or Dancer Calibration section.
R3 Calibration Range	Adjusts tension to show actual web tension on the high scale, when the second calibration is selected.
R4 Zero	Used to adjust center position on the dancer controller if it is a DTI-3400 type or to adjust the minimum level on the Aux3 input.
R5 Range	Used to adjust maximum position on the dancer if it is a DTI-3400ce type or to adjust the maximum level on the Aux3 input.
R6 Range	*(Hardware range adjustment on Aux2 Input.)*

Potentiometers
R1 = Zero Calibration   (Tension or dancer input)
R2 = Range Calibration 1   (Tension or dancer input)
R3 = Range Calibration 2   (Tension or dancer input)
R4 = Zero Calibration   (Aux3 Input)
R5 = Range Calibration   (Aux3 Input)
R6 = Range Calibration   (Aux2 Input)

Digital Output	**Terminal**
DO-4 = Range 3, Web. Break or Dia. Alarm	10
DO-3 = Range 2, Web. Break or Dia. Alarm	39
DO-2 = Range 1, Web. Break or Dia. Alarm	9
DO-1 = Range 4, Web. Break or Dia. Alarm	38

Digital Input	**Terminal**
DI-8 = Fast Stop	6
DI-7 = Roll Pulse	35
DI-6 = Web Pulse	5
DI-5 = Run	34
DI-4 = Cal.2 or Standby	3
DI-3 = Tension Off	32
DI-2 = Splice	2
DI-1 = Manual	31

8 Troubleshooting

Symptom	Cause	Check for
Tension or dancer unstable both in AUTO and MANUAL modes...	*Mechanical problem*	Bad roll, bad bearings, bent shafts, worn gears, missing teeth, loose chains or belts, line speed variations, brake, clutch or drive problems.
	Pneumatic problem	Fluctuating air input, air leaks, water or oil in airlines.
Tension or dancer and output stable in MANUAL, but unstable in AUTO...	*Tuning problem*	Check the regulator tuning. See the Tuning section.
	Regulator problem	Check terminal points - if faulty, consult the factory or replace the circuit board.
	Converter problem	If signal voltage is OK, replace the converter.
Tension meter fails to read zero when web is slack (does not adjust to zero position).	*Adjustment problem*	See the Installation – Tension Calibration section.
Dancer does not regulate to center position...	*Adjustment problem*	See the Installation – Dancer Calibration section.
Tension or dancer position too low both in AUTO and MANUAL modes...	*Pneumatic problem*	Check input air pressure and for air leaks. The I/P converter may be defective.
	Regulator problem	Check terminal points - if faulty, consult the factory or replace the circuit board.
	Brake/drive problem	Brake/clutch too small, not enough pads activated, motor too small, drive current limit set too low.
Tension or dancer position increases at small roll diameters both in AUTO and MANUAL modes...	*Mechanical problem*	Bearings in unwind defective, too much friction.
	Pneumatic problem	I/P converter may be defective.
	Regulator problem	Check terminal points, replace regulator if defective.
	Brake problem	Brake too large, too many pads activated.

If you need further assistance, please contact us.

9 Technical Data

9.1 Electrical

AC Input	115 or 230 V AC ±10% (IEC 60204) 48 to 62 Hz
Fuse Size	115 V-160 mA T (slow-blowing type) Dim. 5 x 20 mm 230 V-80 mA T (slow-blowing type) Dim. 5 x 20 mm
Over Voltage Category	II (IEC 664) 3.75 kV in 1 minute, primary to secondary
Pollution Degree	2
Maximum Power Consumption	12VA
Maximum Fuse Input	10A
Noise Immunity	EN 61000-6-2
Noise Emission	EN 50081-2
Load Cell / Dancer Supply	±2.5V ±5%
Load Cell / (Dancer) Input	0 to ±250mV / (0 to ±2,5V)
Zero Range "Load Cell" (Tare)	100% of load cell rating (±250 mV)
Zero Range "Dancer" (Tare)	100% dancer signal (±2.5V)
Calibration Range	Gain: 1 to 48 for dancer and 11 to 480 for load cell
Temperature Range	0 to 50° C (32 to 122° F) operating -10 to 80° C (14 to 176° F) storage
Degree of Protection	IP 54 / IP 10 for non-cabinet version
Regulator Outputs	0 to 10V Maximum load - 5 mA 4 - 20 mA / 0-20 mA RL = 0 to 1000Ω
Meter Outputs	0 to 100 µA RO = 100 KΩ 0 to 10V Maximum load - 5 mA
Analog Input Voltage	0 to 10V RI = 100 KΩ
Digital Input Voltage	15 to 30V RI = 10KΩ
Digital Output Voltage	24V ±15% Imax for a digital output: 100mA Total Imax for all 4 outputs: 250mA (if internal power supply is used).

9.2 Mechanical (enclosure "HD")
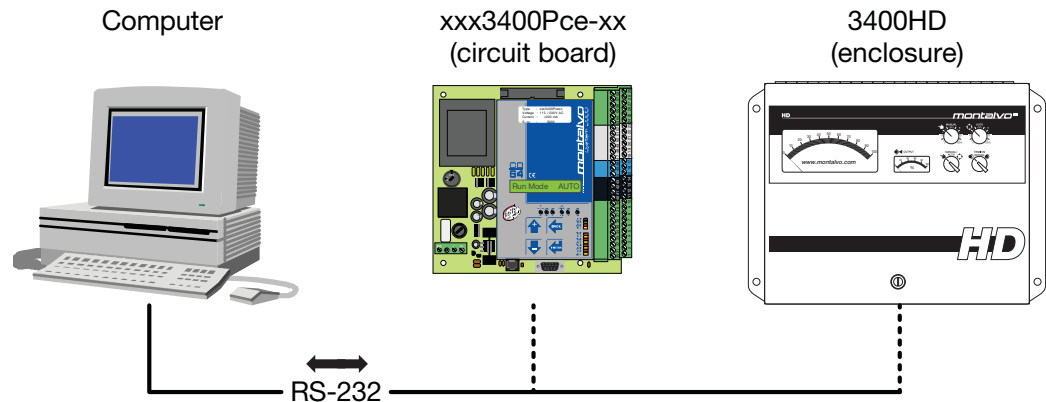

Ø 0.31 (8)

8.00 (203)

10.00 (254)

12.0 (305)

12.75 (324)

13.50 (331)

Weight 2.2 lb (1kg)

0.07 (1.8)   5.00 (127)   0.59 (15)
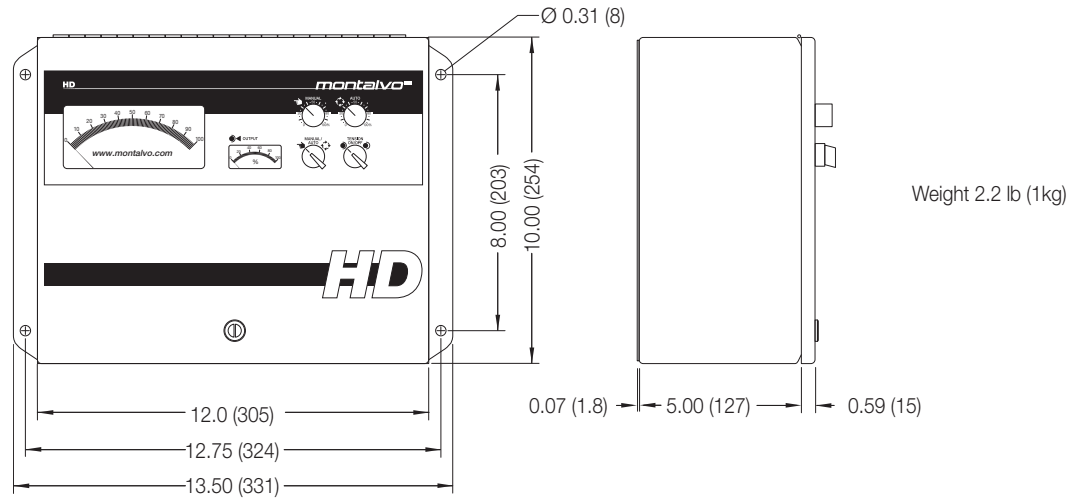
9.2 Mechanical (circuit board "ce")

6.65 (169)

6.97 (177)

1.06 (27)

2.80 (71)

Weight 2.2 lb (1kg)
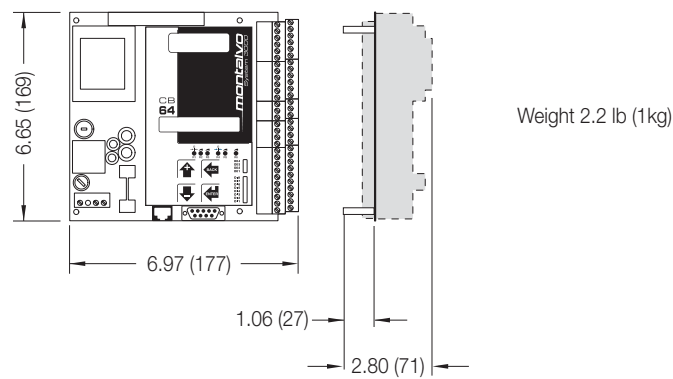
10 Communication

10.1 RS-232 Communication Package (optional)

| Computer | xxx3400Pce-xx (circuit board) | 3400HD (enclosure) |

RS-232

Montalvo 3400 series controllers have an optional RS-232 communications package for setting up and viewing the status of parameters by a computer. All items necessary for using RS-232 are included in the package.

The RS-232 communications package contains the following:

- CD-ROM (software and PDF manual)
- RS-232 Cable (RJ-45 to D-SUB 9 pin [2.1 / 6.3 ft.])
- Installation & Startup Instructions (hard copy version)

The software package features two modes of operation:

- Parameter setup: sets up and backs up all parameters by a PC or a laptop.
- Remote control: monitors the status of controller signals online.

Technical Specifications for the RS-232:

- RS-232: baud rate 4800-38400, 8 data bits, 1 stop bit and no parity (default 9600).
- Remote setup: all parameters on the controller are available for remote configuration.
- Remote monitor (status): for all digital and analog signals from the controller.

10.2 Fieldbus Communications Package (optional)

PLC | xxx3400Pce-xx (circuit board) | 3400HD (enclosure)
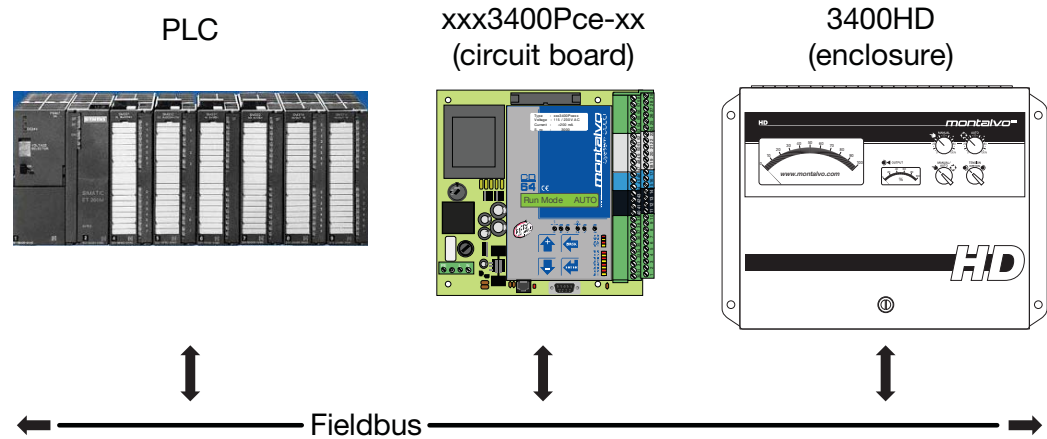
Fieldbus

Montalvo 3400 Series controllers can be delivered with an optional fieldbus communications package and will be indicated by the letters PB in the product TYPE description.

Example: xxx3400xx-xx-PB

The Fieldbus option includes the following:

- CD-ROM (software for communication and PDF manual)
- Installation and Startup Instructions (hard copy version)
- Technical Specifications for Field Bus:
    Remote monitor (status): all digital, analog, and internal signals from the controller.
    Process control: all digital and analog signals can be controlled from the master device (PLC).

Notes:

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