

WADEGO

 **WIRE AUTOMATIC DEVICE CO.,LTD.**

It's because of our experience in the industry that we can provide you with a user-friendly Digital Tension Controller.



**DIGITAL TENSION
CONTROLLER**

MODEL

TC-6B

PAT.

Introduction

In the pursuit of excellence, the popular TC-6's design is handed down to the new TC-6B making it more reliable and easier to handle.

The TC-6B has an output relay, that actuates at zero reading. This unit receives both a bobbin rotating pulse and a length counting pulse from which it calculates the total radius. Automatically deducting the barrel radius it displays the wound thickness.

When the empty and full bobbin tension output is preset to the thickness value, the tension output will change from one to another in proportion to the thickness value.

In combination with a tension control device, ie, powder brake, you can keep continuous control of the tension in coiling and uncoiling, without the use of a dancer roller.

Special features

- When the empty and full bobbin tension output is preset to the thickness value, the tension output will change from one to another in proportion to the thickness value so that the tension control can be kept smooth and continuous. Also before operating, you can see the tension for each thickness value and anytime while operating, you can check the thickness value and the tension.
- This has an output relay, that actuates at zero reading.
- Both power output and voltage output are provided. The power output can directly control a powder brake, etc, while the voltage output can control devices such as a voltage regulator.
- An optional tension setter and calculator can be connected to the TC-6B in order to compensate for the inertia during starting and stopping.
- The TC-6B has an auxiliary input terminal, which can receive positive and negative signals from the dancer roll. The TC-6B will mix the signal with that of the thickness value and give the correct output voltage.
- The digital output display can be switched from a voltmeter to an ammeter and vice versa.
- After resetting the inhibit circuit, the first gate pulse will begin entering the unit. Upon receiving the first pulse the unit will begin calculating the wound thickness. As a result of this process the correct thickness will be displayed throughout the whole operation.
- The presence of both counting and gate pulses is readily seen on the indicator.
- The tension setters are precision dials with a lock so that the preset value can be locked, and tension can be finely adjusted.
- The power supply of DC 15V, 50mA for sensor and DC $\pm 15V$, 10mA of auxiliary power supply are built in.
- An in-built battery allows the thickness value to be kept in memory.
- The TC-6B's display is easy on the operator's eyes because of green LED light and the large digital indicator. Each number is 13.46mm by 7.64mm, also push-button preset makes it easy to change the number.
- Unnecessary zeros are suppressed so as to avoid confusion for the operator.
- Light and compact.

Specifications

Model: TC-6B

Control power supply: AC 200V $\pm 10\%$, 50/60Hz

Power consumption: 8VA

Except for the consumption of sensor and auxiliary power supply.

Main power supply: Max. AC 30V, 50/60Hz or DC 24V.

Power output: DC 0 ~ 24V, 4A

Voltage output: DC 0 ~ 10V, 10mA

Thickness output: DC 0 ~ 10V, 10mA

Thickness indicator: 3-digit 999mm, Green LED.

Output meter: 3-digit, Green LED.

Voltmeter 00.0 ~ 99.9V

Ammeter 0.00 ~ 9.99A

Full thickness setter: 3-digit 999mm

Barrel radius setter: 3-digit 999mm

Maximum counting speed

Counting input: 2KCPS, non-contact input, switching ratio: 1/1

Gate input: 200CPS, non-contact input, switching ratio: 1/1

Counting input: To be counted when OFF \rightarrow ON, "H" \rightarrow "L"

H: Over 5V, L: Under 3V.

Auxiliary input: $\pm 10V$

Control output: AC 250V, 3A ($\cos\phi=1$), 1C

Hold or momentary (500msec.)

The output relay will be actuated at zero with one signal or one continuous signal.

Power supply for sensor: DC 15V, 50mA

Auxiliary power supply: DC $\pm 15V$, 10mA

Memory function: Over 500 hours

Ambient temperature: $-10^{\circ}C \sim 50^{\circ}C$

Finish color: Black

Weight: 2.3Kg



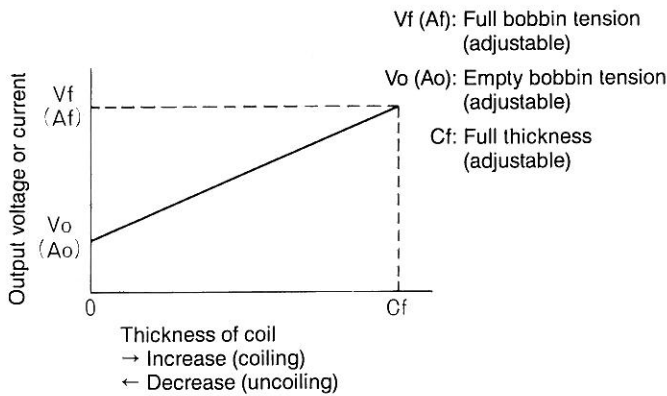
Preset and adjustment

Switches and rheostats at the back should be preset or adjusted as follows.

1. Output meter as a voltmeter:
The output meter is factory set as a voltmeter (V), however it can be changed to an ammeter (A) by using the switch (DS1) on the back.
2. Output meter as voltmeter:
When used as a voltmeter, it can measure two kinds of circuits, power voltage output (PV) or signal voltage output (SV), by selecting the switch (DS2) that is factory set at (PV).

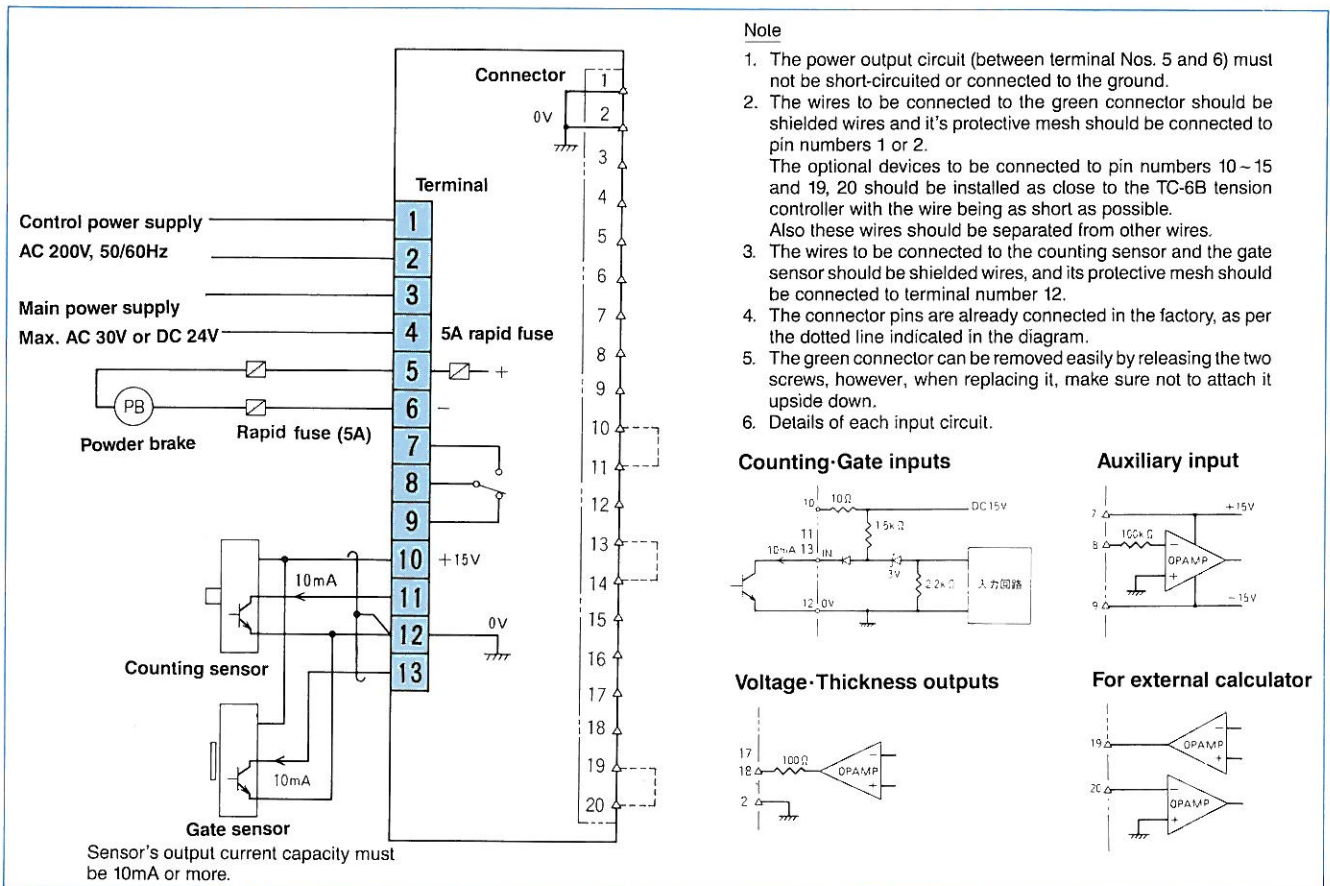
3. Thickness gain adjustment:
This tension controller should be adjusted so as to obtain the maximum output at the maximum thickness value of the wound wire.
It is factory adjusted at the maximum thickness value of 150mm.
 - ① Set the maximum thickness with the digital switch ⑧.
 - ② Press the load button ⑥. The thickness indicator ① will automatically show the thickness that was set by the digital switch ⑧.
 - ③ Turn the empty bobbin tension dial ⑤ counter clockwise to the position "0".
 - ④ Turn the full bobbin tension dial ④ clockwise to the position "10".
 - ⑤ The value of the output meter will increase when the counting gain adjusting rheostat ⑨ is turned clockwise. Stop turning when the output value of the meter has stopped rising.

Operation



- To set the dials, push the lock levers ① counter clockwise.
- Push the reset button ⑦ and thickness indicator ① will automatically indicate "0".
- While reading the output meter ③, set the empty bobbin tension (Vo) with the empty bobbin tension dial ⑤. The empty bobbin tension should be set prior to setting the full bobbin tension.
- Set the digital switch ⑧ to the full thickness (Cf) to be processed.
- Press the load button ⑥, the thickness indicator ① will automatically indicate the value (Cf) entered from the digital switch.
- While reading the output meter ③, set the full bobbin tension (Vf) with full bobbin tension dial ④.
- To lock the dials, push the lock levers clockwise.
- Set the digital switch ⑩ to the barrel radius of bobbin (mm).
- In the coiling process, start the machine after pushing the reset button ⑦. In the uncoiling process, start the machine after pressing the load button ⑥.

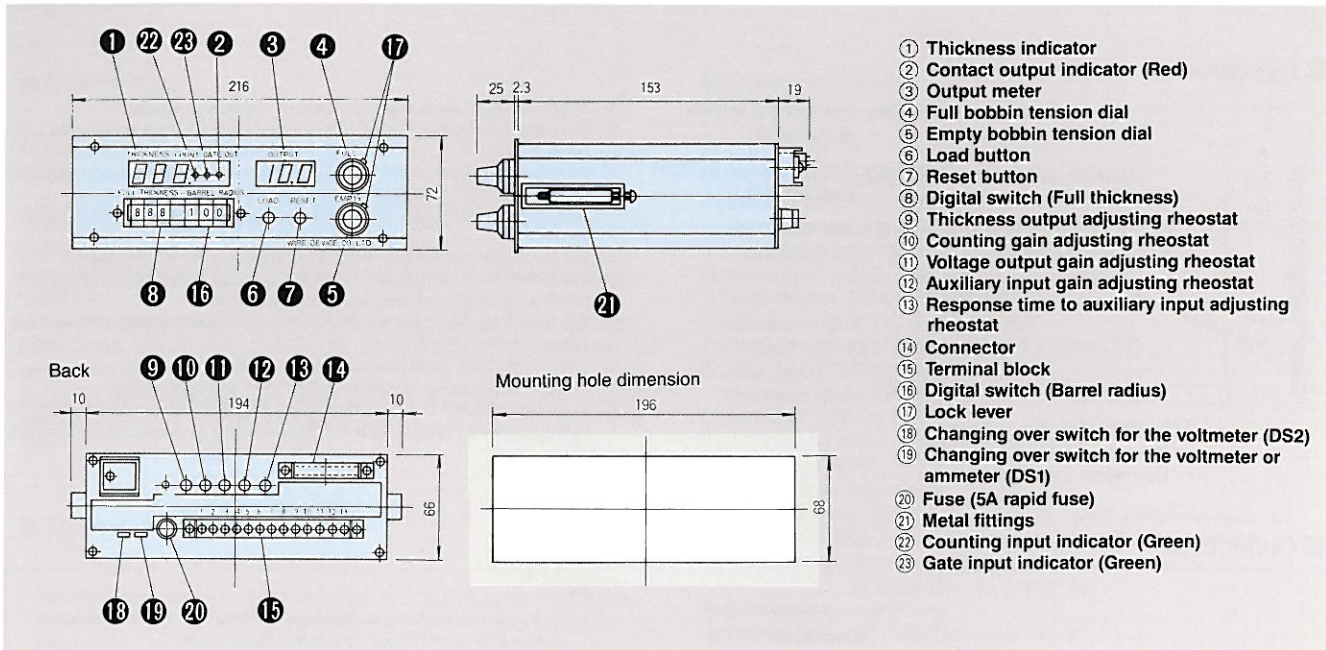
Connection



Terminal description

Nos.	Name	Description	Nos.	Name	Description
1-2	Control power supply	To be connected to the supply of the AC 200V.	5-6	Hold and momentary change over	Closing between 5 and 6 makes the output relay hold and opening makes it a momentary.
3-4	Main power supply	To use power output, connect them to the maximum of AC 30V or a DC 24V power supply.	7	Auxiliary power supply ⊕	DC +15V, Max. 10mA
5-6	Power output	DC load such as powder brake can be connected with max. DC 24V, 4A.	8	Auxiliary input signal pin	Used for auxiliary input
7-8-9	Output contact	This can be actuated at "0".	9	Auxiliary power supply ⊖	DC -15V, Max. 10mA
10-12	Power supply for sensor	The DC 15V power supply for sensor, with up to a max. of 50mA.	10-11-12	Pins for external full bobbin tension dial	When an external full bobbin tension is required, remove the jumper between pin numbers 10 and 11 and connect the option.
11	Counting input	The output of the counting sensor is connected.	13-14-15	Pins for external empty bobbin tension dial	When an external empty bobbin tension is required, remove the jumper between pin numbers 13 and 14 and connect the option.
13	Gate input	The output of the gate sensor is connected.	16	Inhibit input pin	Closing between 16 and 2 inhibits the entry of counting and gate pulses.
1	Common pin	"0" V	17	Voltage output pin	Output voltage 0 ~ 10V, 10mA, useable for controlling voltage regulator.
2	Common pin	"0" V	18	Thickness output pin	0 ~ Full thickness (0 ~ 999)/0 ~ 10V, 10mA
3	Load pin	Closing between 3 and 2 enters the preset value to the counter.	19-20	Pins for external calculator	Optional external calculator can be connected. When connected, remove the jumper between pin numbers 19 and 20.
4	Reset pin	Closing between 4 and 2 resets the counter.			

■ Dimensions



- ① Thickness indicator
- ② Contact output indicator (Red)
- ③ Output meter
- ④ Full bobbin tension dial
- ⑤ Empty bobbin tension dial
- ⑥ Load button
- ⑦ Reset button
- ⑧ Digital switch (Full thickness)
- ⑨ Thickness output adjusting rheostat
- ⑩ Counting gain adjusting rheostat
- ⑪ Voltage output gain adjusting rheostat
- ⑫ Auxiliary input gain adjusting rheostat
- ⑬ Response time to auxiliary input adjusting rheostat
- ⑭ Connector
- ⑮ Terminal block
- ⑯ Digital switch (Barrel radius)
- ⑰ Lock lever
- ⑱ Changing over switch for the voltmeter (DS2)
- ⑲ Changing over switch for the voltmeter or ammeter (DS1)
- ⑳ Fuse (5A rapid fuse)
- ㉑ Metal fittings
- ㉒ Counting input indicator (Green)
- ㉓ Gate input indicator (Green)

■ Application

1. General

The powder brake, which is constantly slipping, maintains constant tension in the wire as it is paid off. Before operating, preset the empty bobbin, the full bobbin tension, the barrel radius and the full thickness. Then press the load button and the current thickness indicator will initialize with the full thickness to start the machine. The tension controller receives both a bobbin rotating pulse (gate pulse) and a length counting pulse (counting pulse) from which it calculates the current thickness. It gradually reduces the braking torque in proportion to the wound thickness in order to keep the tension constant until all wire is paid off. Additionally it automatically stops the machine at zero thickness.

2. How to choose the number for both length counting and bobbin rotating pulses.

Suppose 1000mm of wire is paid off with one revolution of the bobbin we can calculate the thickness of the wound wire with the following formula.

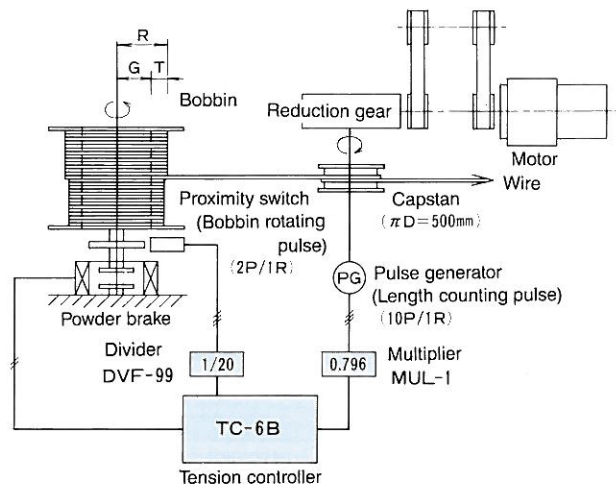
$$T \text{ (mm)} = \frac{1000}{\pi} \times \frac{1}{2} - G \text{ (mm)}$$

As with every 1000mm of wire paid off there will be $\frac{500}{\pi}$ (≈ 159.2) length counting pulses, therefore the number of length counting pulses with every revolution of the bobbin will display the total radius. Deducting the barrel radius it shows wound thickness. Using electronic multiplier and/or divider and in accordance with the illustrated example, choose the number of length counting and bobbin rotating pulses.

- ① How to choose number of bobbin rotating pulses.
This will decide the thickness determining frequency of the revolving bobbin. Choosing the number of pulses of the bobbin rotation will determine how often the thickness is updated. A high frequency may result in unstable thickness readings. A lower frequency will make the period between successive determinations longer. In this example, we have chosen for the bobbin 1 pulse per 10 revolutions.
 - Momentarily suppose that initially there are 2 pulses per revolution of the bobbin and in order to make it 1 pulse per revolution it is required to divide it with a $\frac{1}{2}$ divider.
 - Then in order to get 1 pulse/10 revolutions it is necessary to add a further $\frac{1}{10}$ divider. Therefore $\frac{1}{2} \times \frac{1}{10} = \frac{1}{20}$ divider is necessary.
- ② How to choose the number of length counting pulses.
 - As in the above, in order to update the thickness of the bobbin every 10 revolutions a $\frac{1}{10}$ divider is added. Therefore the number of length counting pulses will be $159.2 \times \frac{1}{10} = 15.92$.

In this example the pulse generator rotates 2 revolutions/1000mm of wire. Therefore, the pulse generator must output $15.92 \times 2 = 7.96$ pulses/rotation.

- There is no such pulse generator on the market therefore a 10 pulse/revolution generator may be used setting a multiplier at 0.796.
- The preset value of multiplier (MUL-1) must be less than 0.9999 to make it accept a higher speed pulses.
- To prevent the wire passing through the machine reduce the preset value of barrel radius by the desired thickness to remain on the bobbin.
- In the case that we have the situation where wire is being wound on a significant core of wire with a given pitch it is necessary to reduce the preset value of barrel radius to allow for the extra length of wire not included in the above.



- The pulse generator should be connected to the capstan in order to avoid any slip. Do not connect to measuring roller.
- With the use of optional units (TC-OP2, TC-OP1) the tension during accelerating and decelerating can also be easily controlled.

This specification may be changed without notification.



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