

ATO

MODEL - STC858A

AUTOMATIC TENSION CONTROLLER

TENSION CONTROLLER

Ver 3.0

INSTRUCTION MANUAL

English version



Cautions on Safety

(Make sure to read this page before using the unit.)

To assure safety

>Make sure the user thoroughly read this instruction manual before using the unit, and pay attention in assuring safety while using the unit.

>The unit is manufactured under the severe quality control. When a severe accident or loss is expected in the equipment used due to failure of the unit, provide a backup function or the fail-safe function in the system.

In this manual, cautions of safety are classified into "DANGER" and "CAUTION".

 **Danger:** When the unit is handled incorrectly, a dangerous situation may occur and the possibility of death or serious injury is expected.

 **Caution:** When the unit is handled incorrectly, a dangerous situation may occur and the possibility of medium or slight injury is expected or property damage exclusively is expected.

Even an item is classified as "CAUTION", its contents are important and it may lead to a serious result depending on the situation. Make sure to observe every item.

 **Danger** Turn off all the phases of the external power supply before starting installation and wiring.

 Otherwise, electrical shock or damage in the unit may occur. Make sure to turn off all the phases of the external power supply before starting installation and wiring.

 **Danger** Design the installation plan using the wire size suitable to the current capacity.

 Use the wire size suitable to the current capacity to supply the power to the load. If a wire having smaller current capacity is used, the insulation sheath will be melted and insulation will become defective. In this situation, electrical shock or a short-circuit may occur, and fire may occur.

 **Danger** Perform grounding (grounding resistance 100Ω or less).

 Otherwise, electrical shock may occur. Perform grounding (grounding resistance 100 Ω or less) to the unit using a wire of 2 mm² or more, otherwise, electrical shock may occur. Never share the grounding with a strong electric system.

 **Danger** Set up the emergency stop circuit independently of the product.

 Otherwise, the unit may become out of order and an accident may occur when malfunction occurs in the tension controller. Make sure to assemble the emergency stop circuit outside the tension controller.

 **Danger** Never open the covers while the power is supplied to the unit or when the unit is operating.

 Never supply the power to the unit nor operate the unit while the main body cover and the terminal cover are open. When the covers are open, a high voltage area may be exposed and electrical shock may occur.

 **Danger** Never use the unit in an atmosphere where inflammation or explosion can occur.

 Otherwise, inflammation or explosion may occur.

 **Danger** Never touch a switch with a wet hand.

 Never touch a switch with a wet hand, otherwise, electrical shock may occur.

 **Caution** Separate the wiring of the strong electric system from the wiring of the weak electric system.

Separate the wiring of the strong electric system from the wiring of the weak electric system, and make sure that noises are not superimposed on the wiring of the weak electric system. Otherwise, the unit may not operate correctly.

 **Danger** Never drop cutting chips and wire chips while screw holes are tapped and wiring work is performed.

 Damage, fume, fire, malfunction or others may be caused in the unit.

 **Caution** Confirm the ambient environments.

Never install the unit with an environment where dusts, soot, conductive dusts or corrosive gas is present or a place exposed to high temperature, condensation or wind and rain. Otherwise, the unit may be damaged, malfunction or be deteriorated.

 **Danger** Never modify nor disassemble the unit

 Never modify nor disassemble the unit. Otherwise, the unit may become defective or an accident such as fire, damage, etc. may occur.

 **Caution** Do not use any unused terminals for any external lines.

Correctly connect the AC power cable to the specified terminal, and do not use any unused terminals for any external lines. Improper connection may seriously damage the product.

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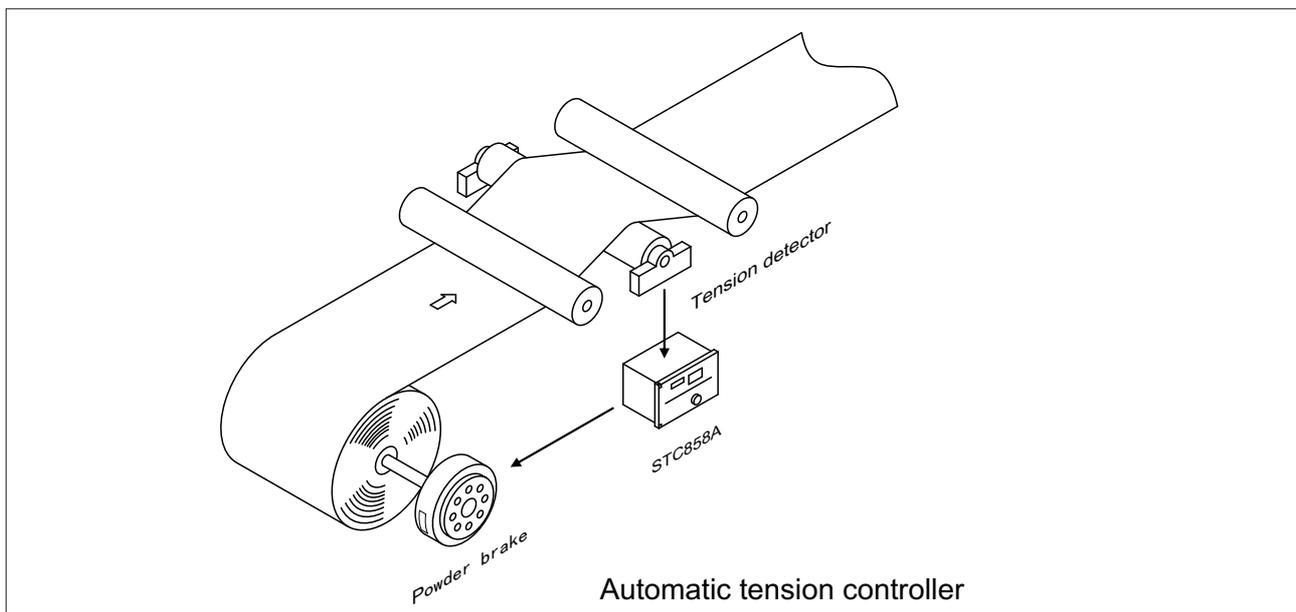
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Chapter 1 Product outline

1.1 Outline

STC858A tension controller is a full digital tension controller with high precision and multi-function which to match up tension detector to form a closed-loop tension controller system and then receives the signal from LS series tension detector after intelligent PID operation processing internally, regulating implementing structure and to automatically control the tension of the long material at the unwinder, feed reel, and winder.

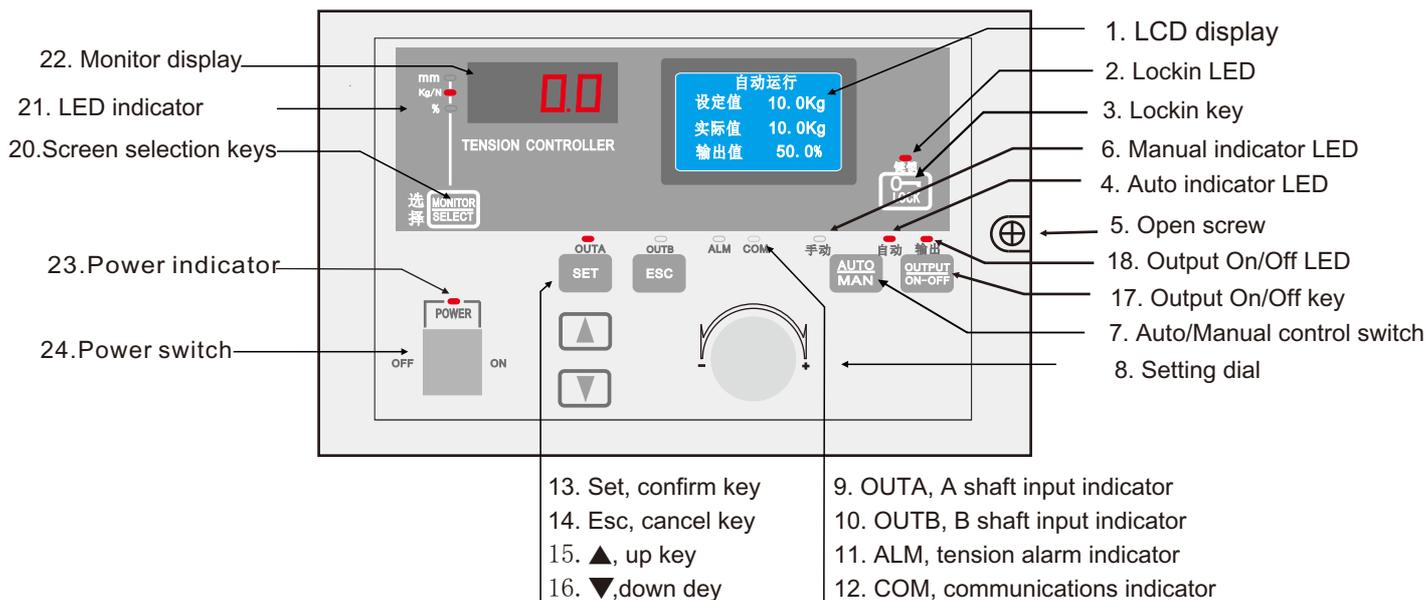
STC858A tension controller uses a new graphical LCD display which Chinese and English display clearer and then generates a control voltage of 0 to 24V DC to control the powder clutch/brake and the hysteresis clutch/brake, or generates the torque command voltage of 0 to 10V to send to the servo amplifier.



1.2 Features

- Graphical LCD display 128x96 with the capability of display Chinese and English characters, it has simple programming and easy to operate.
- Multi-function select: automatic tension controller with taper tension controlling function.
- Using high precision D/A converter, and the output precision reach to 0.1%, and which makes the tension controller with high precision, more stable and reliable.
- Can drive the powder clutch/brake directly, also can control frequency converters, servo motor and electro-pneumatic converter...
- Can receive the single-way or double-way input signal from tension detector and with automatic zero set and automatic calibration.
- With Dual axis switching and speed up/slow down controlling function .
- With password settings function which can avoid changing set parameter when it operated incorrectly.
- With memory cassette which can backup various parameter.
- With human interface design which is very easy to operation.

1.3 Panel configuration



1. **Set/Esc key**: using these two keys to select or to confirm settings.

Set key: enter sub-menu or confirm operation.
 Esc key: Return to previous menu or confirm return.

2. **Auto/Manual control switch**

Using this key to switch to auto control mode or manual control mode freely.

3. **Output On/Off LED & key**

Pushing this key to control output on & off, repeat this key, the output will be swift to on or off.
 When the output on/off indicator lighting which allows output;
 When the output on/off indicator unlighting, then the LED display is off and the output value is 0.0%.

4. **Screen selection keys & LED indicator**

When pushing this key, there will display tension measuring value(kg/N indicator lighting), output power (% indicator lighting), roll diameter(mm indicator lighting).

5. **Lockin key**

When the tension controller is at "auto control" or at "manual control" interface, the key is to lock (avoid operating incorrectly) or unlock. Once the key is locked, then the up key, down key, auto/manual control switch, output On/Off key and setting dial will not work.

When the lockin indicator lighting which means it locked, when the lockin indicator unlighting which means it unlocked.

6. **Output indicator :**

It's green indicator, and the lightness of the indicator is connected to the output power, the lighter of the indicator the higher of the power.
 When the power is zero, then the output indicator will turn off.

7. OUTA : A shaft output indicator

It's red indicator. when the A shaft outputting, the indicator will light.

8. OUTB : B shaft output indicator

It's red indicator. When the B shaft outputting, the indicator will light.

9. ALM : tension alarm indicator

It's red indicator. During tension system working, when the tension is less than tension alarm value[04]* AL1,ZT relay works and generates alarm signal. When system starting/stopping, aixnl, zero tension alarm will not alarming.

10. COM:communications indicator

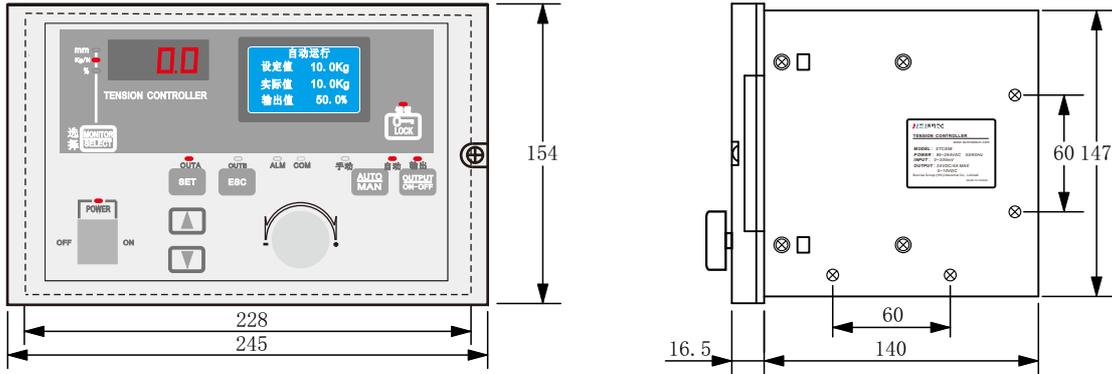
It's red indicator. When LTC858A receives the valid command response- return data from upper station, then COM indicator lights.

*[04]parameter of tension controller , numbers inside[] shows parameter serial number. All the parameter show this way.

Chapter 2 installation and wiring

2.1 Dimensions

Unit:mm

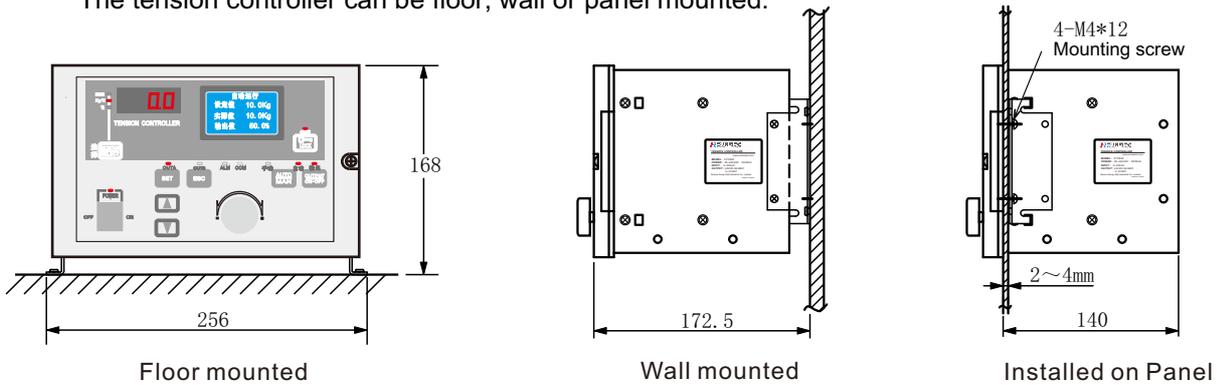


Danger

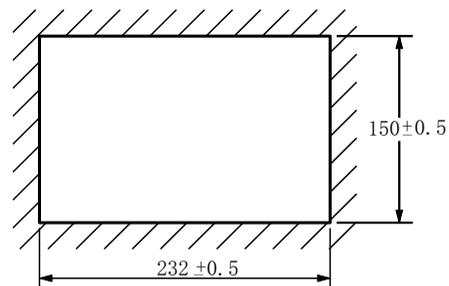
- ▶ Never drop cutting chips or wire chips while screw holes are tapped and wiring work is performed. Otherwise, damage, fume, fire, malfunction or other may be caused in the unit.
- ▶ Make sure to turn off all the phases of the power supplies outside before starting and wiring. Otherwise, electric shock or serious damage to the unit may occur.

2.2 Installation

The tension controller can be floor, wall or panel mounted.



Dimensions of screw holes for floor or wall mounting.



Panel cutting dimensions for panel mounting

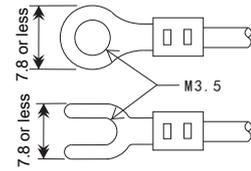
CAUTION

- When you install the controller to the floor or wall, be sure to use the screws supplied with the controller to fix the plate to the controller main body. If you use screws 10 mm or longer, the screws may contact the inner parts of the controller main body. Screw tightening torque = 0.5 to 0.8 N m.
- Using a screw hole where no screw is tightened to fix the mounting plate, perform grounding (grounding resistance 100Ω or less) of the sheet metal area.

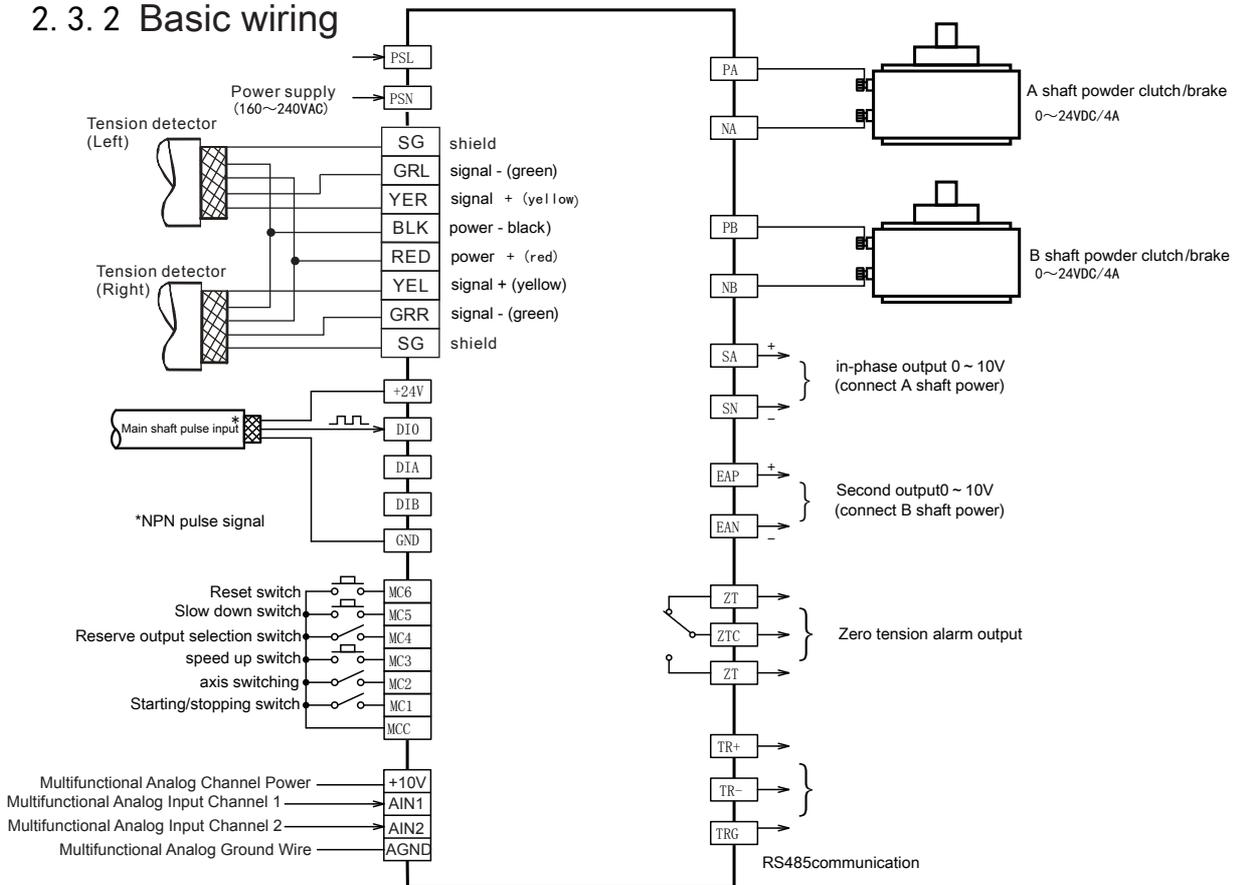
2.3 Wiring

2.3.1 Wiring method and cautions

- ❶ Use the crimp-style terminals. Dimensions shown in the right figure.
- ❷ Apply a torque of 0.5 to 0.8 Nm to each terminal, and carefully tighten each terminal so that abnormal operation cannot be caused.
- ❸ Use the shielded cables for the analog input/output line signal and the winding roll pulse input line, and perform grounding (grounding resistance 100Ω or less) on the signal receiving side.
- ❹ Do not insert both the input/output cable and the power cable into the same duct. Do not bind these cables together.
- ❺ Generally, set the cable length to 10 m or less to protect the controller from noises.

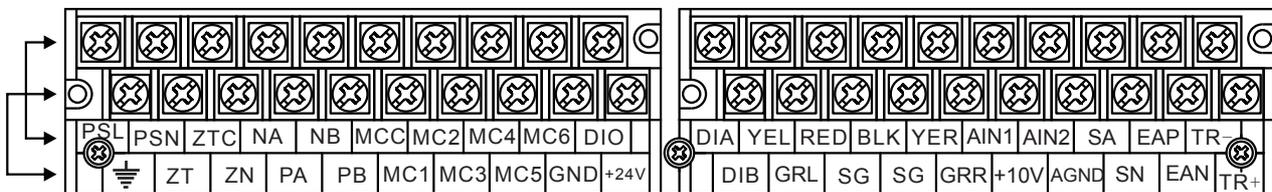


2.3.2 Basic wiring



Wiring 1:

Wiring 2:



⚠ CAUTION

- ❶ Correctly connect the AC power cable to the specified terminal, and do not use any unused terminals for any external lines. Improper connection may damage the product.
- ❷ Separate the low power cables from the high power cables, and do not connect both types of cables to the same grounding terminal. The noise of the high power cable may be superimposed on the low power cable, hence abnormal operation may be caused.
- ❸ Even if the cable is too long, do not insert the remaining part of the cable into the casing of this tension controller to prevent abnormal operation.
- ❹ Do not lay the AC power cable on the panel to prevent abnormal operation.

DANGER

- ⚠ Before installing the controller or performing the wiring work, be sure to externally cut off the power of all the phases. If the power of all the phases is not cut off, you may receive an electric shock, or the product may be seriously damaged.
- ⚠ For the grounding terminal of the product and for the sheet metal area of the casing, be sure to perform grounding (grounding resistance 100Ω or less) using wires of 2 mm² or more. If grounding is not performed properly, you may get an electric shock.
- ⚠ Determine each cable diameter depending on the current capacity. If a cable is too thin, the insulating sheath of the cable may melt. Use of such a cable may cause electric shocks, electric leakage, or fires.
- ⚠ At the completion of wiring, be sure to attach the terminal cover supplied with the product to prevent electric shocks, and then supply power to the product.

2. 3. 3 Wiring terminal

Wiring 1:

Item	Name	Type	Technique parameter	Specification
1	PSL, PSN	Input	Voltage 85~264VAC	Connecting 220VAC power
2	ZT, ZTC,ZTN	Output		Zero tension alarm output
3	PA, NA	Output	Output 24VDC/4A	Connecting A shaft powder clutc/brake
4	PB, NB	Output	Output 24VDC/4A	Connecting B shaft powder clutc/brake
5	MCC	Input		Common terminal for external output on/off singnal
6	MC1	Input		Input terminal for external starting/stopping controlling signal
7	MC2	Input		Input terminal for external double axis controlling signal
8	MC3	Input		Input terminal for external speed-up controlling signal
9	MC4	Input		Input terminal for reserve output selection switch
10	MC5	Input		Input terminal for external slow down controlling signal
11	MC6	Input		Input terminal for taper reset
12	+24V, GND	Output		Power supply for external proximity switch(rotary encoder)
13	DI0	Input	Max. frequency 15kHz	Input terminal for main shaft proximity switch

Wiring 2:

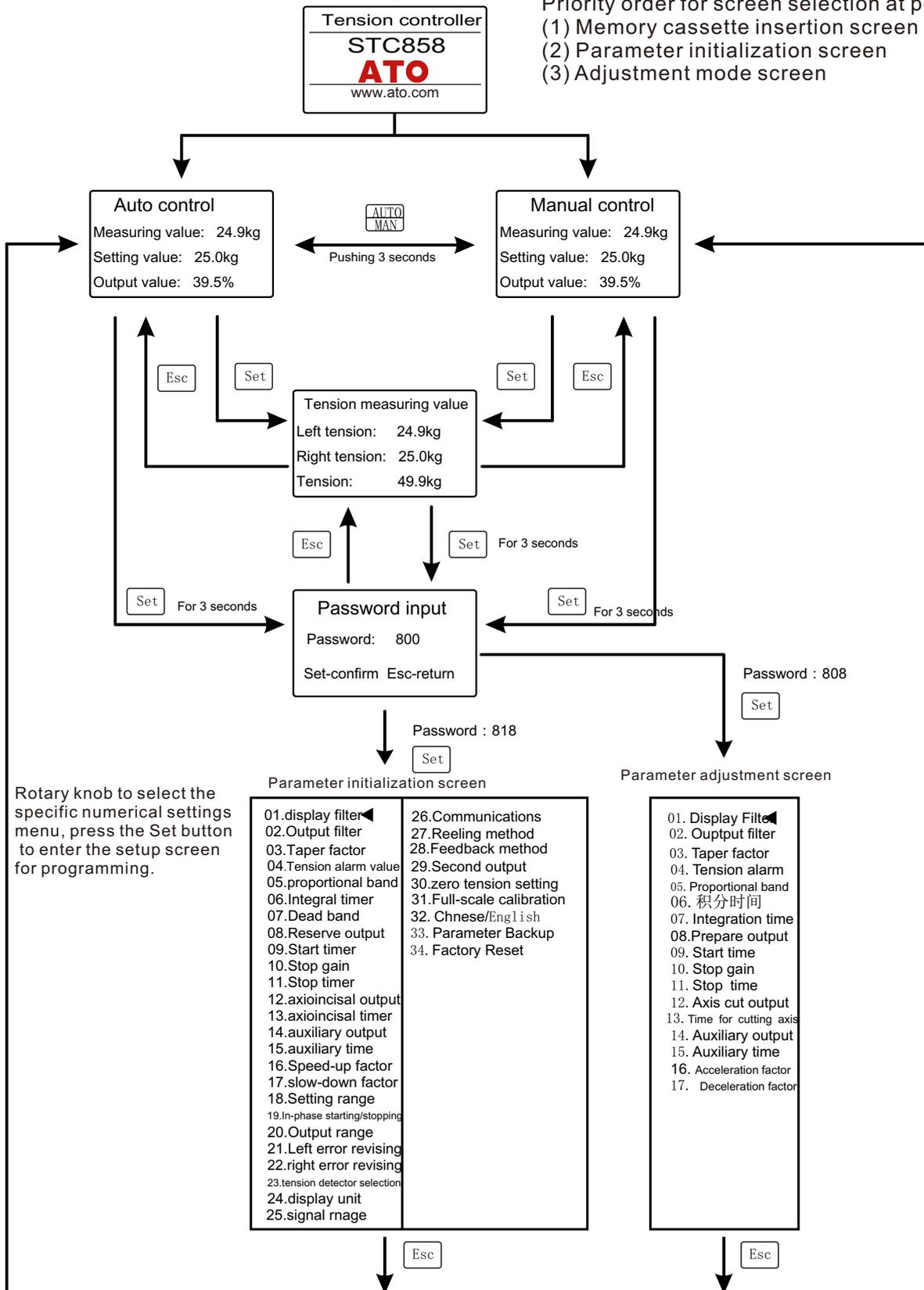
Item	Name	Type	Technique parameter	Specification
1	YEL	Input	Input signal range 0~300mV or 0~30mV	Input signal + of left tension detector
2	GRL	Input		Input signal - of left tension detector
3	RED	Output	Output power voltage 5V or 10V	Power supply+ of left tension detector
4	BLK	Output		Power supply- of left tension detector
5	YER	Input	Input signal range 0~300mV or 0~30mV	Input signal + of right tension detector
6	GRR	Input		Input signal - of right tension detector
7	SA, SN	Output	0-10V	In-phase output 0-10V (connecting A shaft power)
8	EAP, EAN	Output		Second output 0-10V (connecting B shaft power)
9	TR+,TR-	Output	Connecting RS485	Rs485 communication port
10	+10V, AGND	Output	10V/50mA	Backup power
11	AIN1, AIN2	Input		Standby Analog Interface

Chapter 1 Screen system

3. 1 Overall of screen system

Power-on

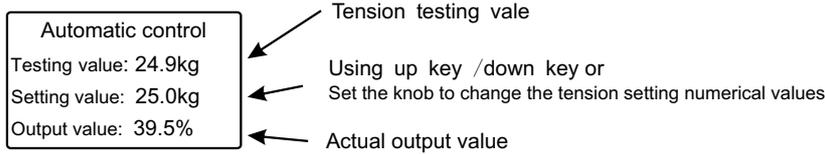
Priority order for screen selection at power-on.
 (1) Memory cassette insertion screen
 (2) Parameter initialization screen
 (3) Adjustment mode screen



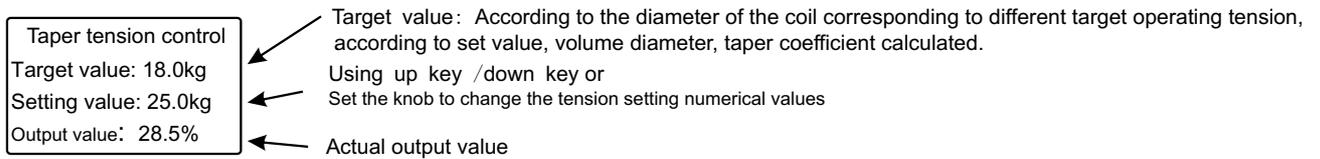
Rotary knob to select the specific numerical settings menu, press the Set button to enter the setup screen for programming.

3.2 Main Screen Introduction

(1) Automatic control - constant tension mode screen

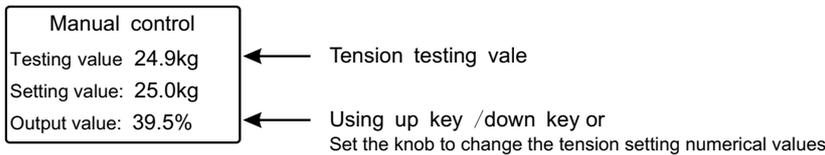


(2) Automatic Control - taper tension mode screen

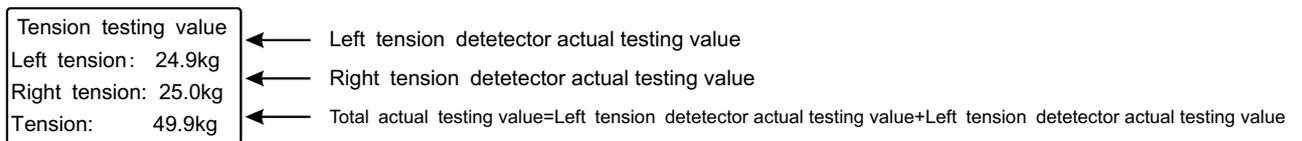


Tip: When kg / N indicator light, LED display will show testing value.

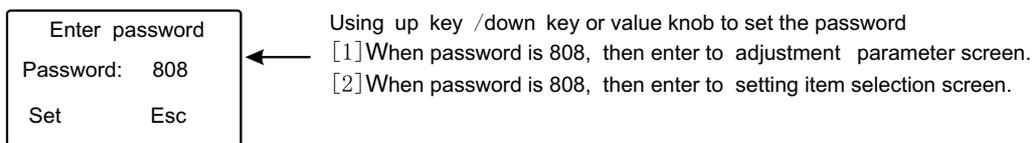
(3) Manual control mode



(4) Monitoring tension testing value

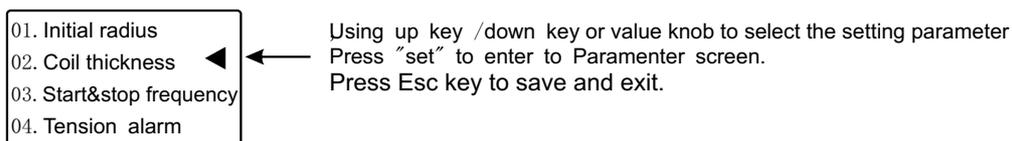


(5) Password setting



Note: To prevent the controller parameters from misusing, please change the password to others after finished the parameters.

(6) Parameter screen



3.3 Parameter Description

The following table have been classified based on function parameters.

Parameter NO	Parameter Name	Adjusting range	Factory default	Description
Function selection parameters: the basic parameters of the following parameters should be set according to the actual situation of the first.				
03	Taper factor	0.01~1.00	0.00	For taper tension control, taper tension control of the rate of change in tension.
29	Second output	Synchronization Output Axis cutting auxiliary output Tension transmission output	Synchronous control output	The second output type selection
Tension measuring parameters: the following parameters affect tension measurement, when choosing automatic tension control, the following parameters must be set .				
21	Left error correction	-50.0~50.0kg	0.0kg	Left tension detector error correction, for small error correction, if the error is too large then need to be re-calibrated tension
22	Right error correction	-50.0~50.0kg	0.0kg	Right tension sensor error correction, ditto
23	Tension detector selection	Left Tension detector selection Right Tension detector selection Left +right Tension detector selection	Left +right Tension detector selection	Select tension detector installation configuration options based on the actual situation.
24	Show unit	kg Newton	kg	This parameter will affect all the parameters associated with the display unit.
25	Signal range	±30 mV ±300 mV	±300 mV	Teonsion detector signal range, was set based on tension sensor output signal range.
01	Display Filter	0.01 ~ 99.99	3.00	The larger the value, the more stable of the display
30	Zero Tension Calibration	0.0kg	0.0kg	Zero linear calibration
31	Full-scale calibration	0.0 ~ 999.9kg	50.0kg	Full-scale linear calibration
Adjustable parameters: the following parameters influence tension control accuracy, when choosing automatic tension control, the following parameters must set up correctly.				
05	Proportional band	0.1 ~ 999.9kg	100.0kg	When automatic operation, it will affect the accuracy of the tension control.
06	Integration time	0.1 ~ 10.0 seconds	1.0 Seconds	
07	Dead space	0.1 ~ 999.9kg	5.0kg	
20	Output range	0.0 ~ 100.0%	100.0%	Upper and lower output power controller
28	Feedback method	Normal mode Active send volume mode	Normal mode	Positive control / anti-control options
02	Output filter	0.1 ~ 100.0 seconds	0.5 seconds	This parameter limits the rate of change of output
27	Winding Mode	Winding, unwinding	Unwinding	Winding / unwinding set
Tension setting value limitation parameter				
18	Setteing range	0.0 ~ 999.9kg	50.0kg	Tension limitation setting of upper and lower
Axis cutting parameters: the following parameters affect the outputhe, when the systeim have the axis cutting function, then it should be set up correctly.				
12	Axis cutting output	0.0 ~ 100.0%	30%	Meaning of the parameters, see page 18: 4.2.5-axis switch.
13	Axis cutting time	0.1 ~ 25.0 Second	2 Second	
14	Auxiliary output	0.0 ~ 100.0%	0.0%	
15	Auxiliary time	0.1 ~ 25.0 Second	0.1 Second	
Communication parameter				
26	Communication address			Controller Communications
Additional function parameters				
04	Tension alarm	0.0 ~ 999.9kg	0.0kg	Runtime to alarm, when the axis switching and starting / stopping will not alarm
32	Chinse/English	Chinse/English	Chinse	Language selecting
33	Parameter Backup	Recovery backup		Backup & recovery parameter
34	Factory Reset	Recovery		Restore factory settings, so the current settings will be lost

Continued on Page Form

Start / stop parameters: The following parameters affect the output when the system starts, it should be properly set according to actual situation (for details see page 17: 4.2.4 System Startup and Shutdown)				
19	Start and stop synchronization	0.1 ~ 100Hz	0Hz	The system through clinical testing the spindle speed to automatically start/stop operation, When synchronous start-stop at 0Hz, synchronous start-stop function closed.
08	Prepare output	0.0 ~ 100.0%	0.0%	The output value when the system starts
09	Start time	0.1 ~ 25.0 seconds	0.1 seconds	System start time
10	Stop gain	01 ~ 400%	100%	
11	Stop time	0.1 ~ 25.0 seconds	0.1 seconds	System sopt time
16	Acceleration factor	0.01 ~ 2.00	1.0	Meaning of the parameters, see page 20: 4.2.6
17	Deceleration factor	0.01 ~ 2.00	1.00	Acceleration / deceleration control.

Chapter 4 Automatic tension controller

Follow below steps to debug

- [1] Powering on after making sure the tension Controller were installed and wired properly.
- [2] Ensure that the tension detector installation and wiring is correct, check and determine the tension detector signal is normal.
- [3] To process program settings for the relevant parameters of tensnion testing.
- [4] To calibrate the zero and full-scale for the tension signal , and make sure the tension displayed normally, if the tension does not displayed normally, go back to step [2].
- [5] Through manual adjustment, operation to check the system, to confirm the tension displayed normally and actuating element is operating normally.
- [6] If the above steps work properly, switching to automatic control mode, to adjust the parameters of the PI based on the operation, to ensure the system of tension running smoothly.

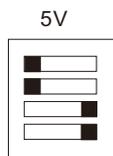
4. 1 Tension testing

4. 1. 1 Tension detector installation and wiring

STC858A accept a variety of tension detector input signals, to make the appropriate jumper settings for different detectors:

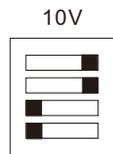
- [1] Micro displacement special tension detector, the input signal range is 300mV, 5V power supply (such as the LS series, and mitsubishi tension sensor compatible)

Sw1 switch settings are as follows:



- [2] Bridge strain-specific tension sensor, the input signal range is 30mV, 10V power supply:

Sw1 switch settings are as follows:



4. 1. 2 Related parameters of tension testing Settings

In order to measure the coil tension of tension controller correctly, it is necessary to set the relevant parameters of tension testing correctly:

1. Tension detector selection [23]

This controller can choose one or two tension detectors to work which based on tension detector installation conditions Settings.

2. Display unit [24]

STC858A can choose two units showing tension measuring value: "kg (kg)" and "N (Newton)"

3. Signal range [25]

The controller can choose two signals, $\pm 30\text{mV}$ and $\pm 300\text{mV}$ which depending on the installation of the detector selecting corresponding signal range.

If LS series tension detector was selected, the signal range [25] should be set to $\pm 300\text{mV}$.

If SUP/ZC series tension detector was selected, the signal range [25] should be set to $\pm 30\text{mV}$.

4. Left error correction [21] / right error correction [22]

When measured values occurring zero offset, if offset error is smaller, then to modify the detector error, and can revise the zero point via modifying, and also the revised value can be added to tension displaying value. If offset error is bigger which should re-calibrate the tension controller.

When processing tension calibration, the correction value reset to 0.

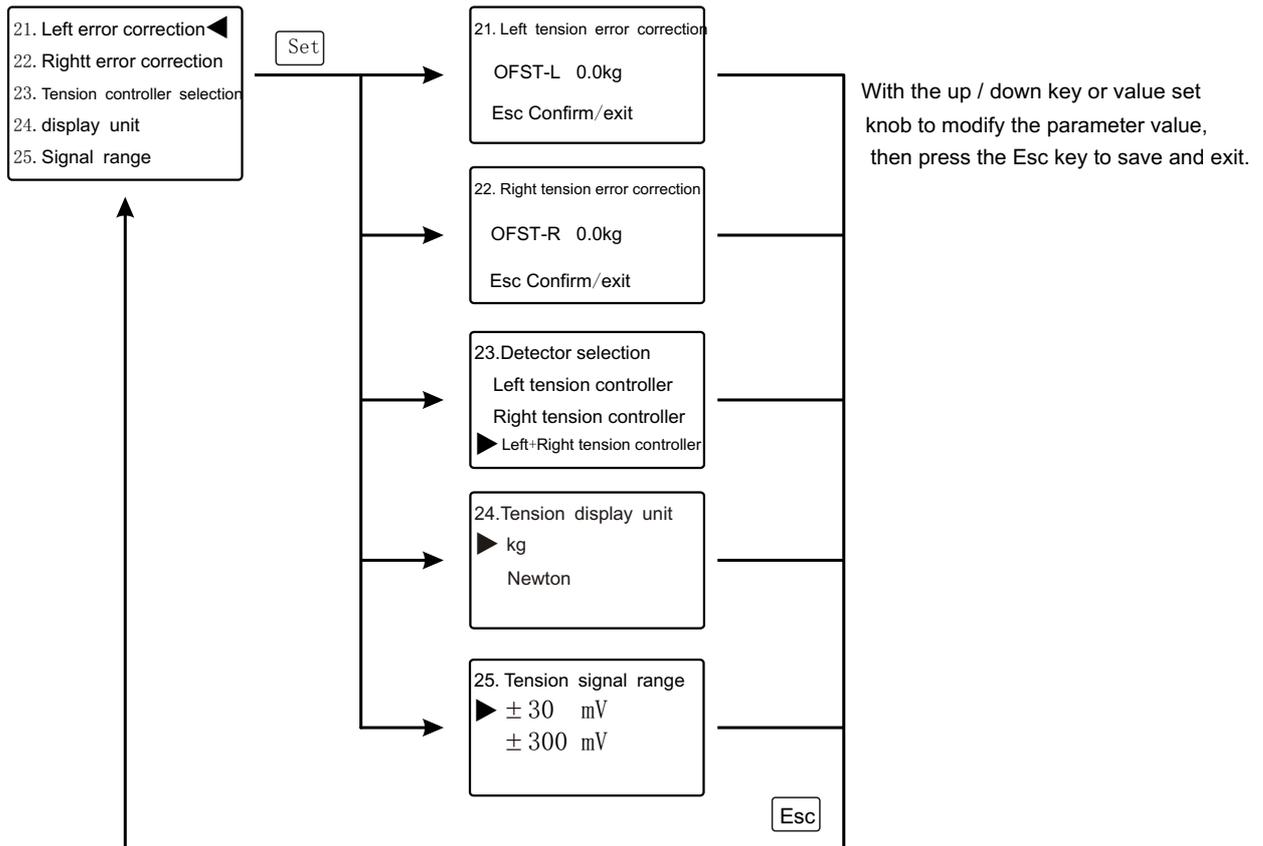
5. Display filter [01]

Controller with digital filtering algorithm which can remove the measurement signal interference and transition to make the measurements showing stable.

The larger the filter coefficients, the measurements will show more stable, but the reaction will turn to slow, usually set at 2.00.

With up/down key or value set knob

Selecting the parameters to be set, then pressing Set button to enter



4. 1. 3 Tension calibration

In order to perform closed-loop tension control correctly, the tension must be accurate, must to perform the calibration for the tension control, in this case, the well calibrated tension controller will achieve the perfect precision. STC858A tension controller are adopted two linear calibration which calibration process is very simple.

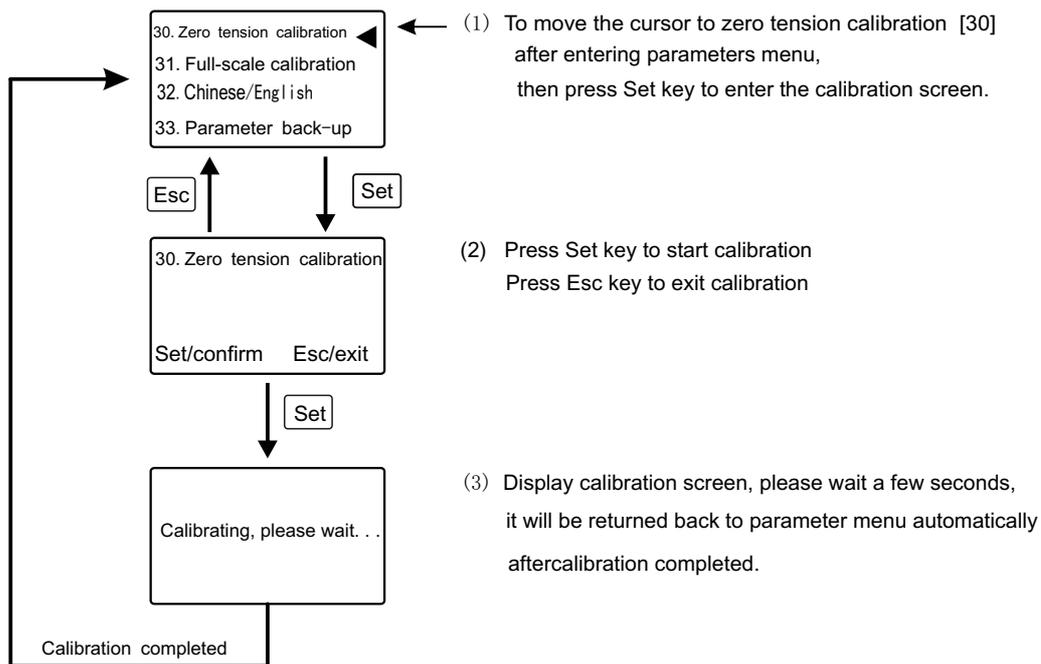
(1) Note

- [1] Before calibration, ensure that tension detector is wiring correctly, confirm the tension detector works properly, the tension signal is within the selected range.
- [2] Using a multimeter to measure the output signal of the detector with 300mV gear, it's about 0mV, when the detector was without forcing. And the output signal will be changed, when the detector was with forcing, but it can't exceed the maximum output signal of the detector. For LS series tension detector which can't exceed 300mV, or the detector will be failure which need to replace, install and calibrate again.

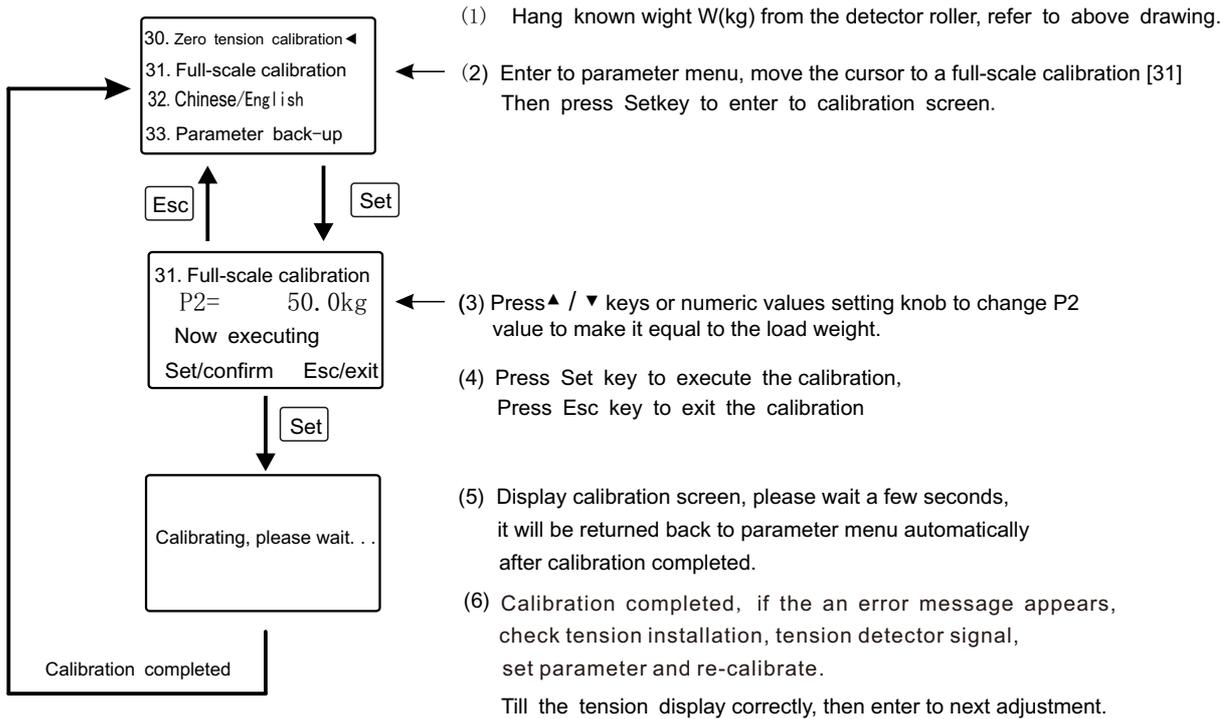
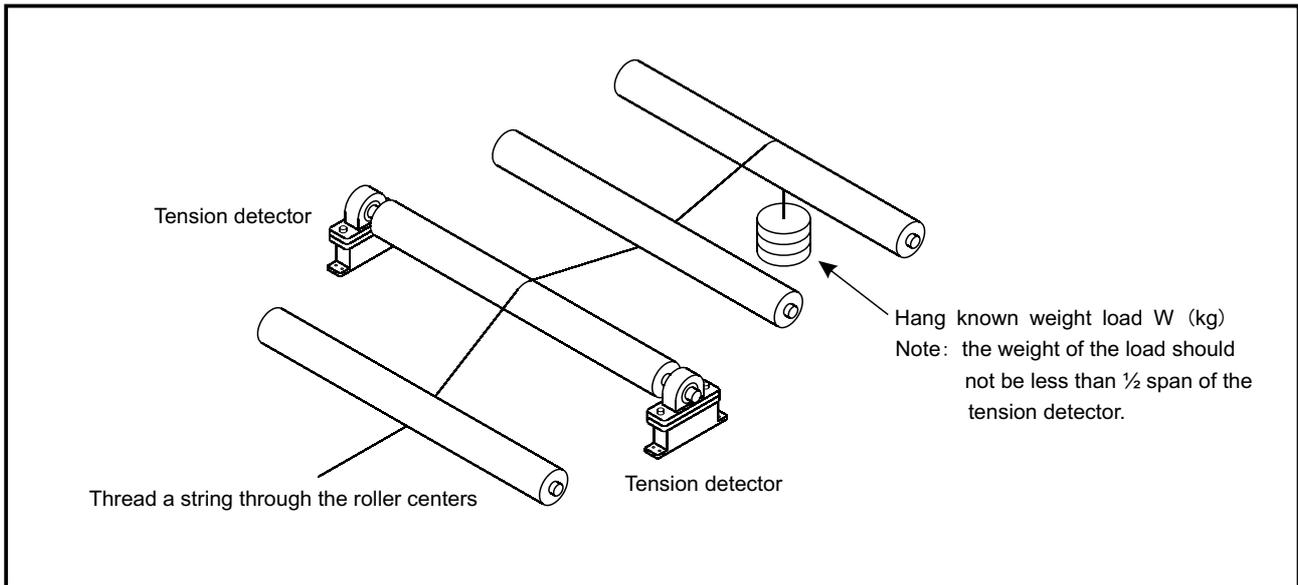
(2) Zero tension calibration

Purpose: to perform revision for the bearings and the detector roller.

Note: Zero tension calibration should be performed in condition of installing detector roller, but without loading coil.



(3) Full-scale calibration



4. 2 Adjustment operation

When tension was measured correctly, then enter to the automatic and manual operation mode of controller for adjustment. firstly operate it with manual control mode, when manual operation works normally, coil achieves proper and stable tension, then switch it to automatic control mode.

4. 2. 1 Manual control

When the controller is in automatic control mode, press the AUTO / MAN key, MANUAL indicator light, the controller move to manual control mode, Press▲ / ▼ keys or numeric values setting knob to modify the output power value directly, modifying range was limited by maximum output value [20]

As the output value changes, the tension measured values will be changed accordingly, coil achieves proper and stable tension, then switch it to automatic control mode.

Manual control	
Testing value: 24.9kg	← Please observe the changes of measured value, when modifying the output value.
Setting value: 25.0kg	
Output value: 39.5%	← Press▲ / ▼ keys or numeric values setting knob to modify the output value.

4. 2. 2 Automatic control

When the controller is in manual control mode, press the AUTO / MAN key, AUTO indicator light, the controller move to automatic control mode, Press▲ / ▼ keys or numeric values setting knob to modify the tension setting value, modifying range was limited by maximum setting value [20]

When the controller switch to automatic control mode from manual control mode to , the controller will set the measured value as setting value then, achieved disturbance-free switching.

Tension setting value is to achieve the target tension ffor coil during controlling. In automatic operation, the controller will perform the calculation after adjustment output based on setting value, measured values and parameter proportional band [05], the integration time [06], the static area [07] which to make the tension tends near to the actual setting value , to achieve the control effect.

When there is an error of tension testing value appears , and fault code will display, then it can't be switched to automatic mode even through pressing AUTO / MAN key.

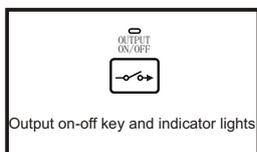
Controller in stop condition, AUTO light blinking.

Manual control	
Testing value: 24.9kg	← Tension actual testing value
Setting value: 25.0kg	← Press▲ / ▼ keys or numeric values setting knob to change tension testing value.
Output value: 39.5%	← Actual output value

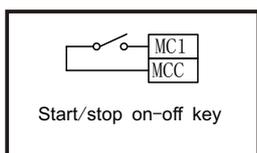
Taper tension control	
Target value: 18.0kg	← According to different reel diameter corresponding to operation tension target value was calculated based on setting value, reel diameter, taper coefficient.
Setting value: 25.0kg	← Press▲ / ▼ keys or numeric values setting knob to change tension testing value.
Output value: 28.5%	← Actual output value

Automatic control - constant tension mode screen

Automatic Control - taper tension mode screen



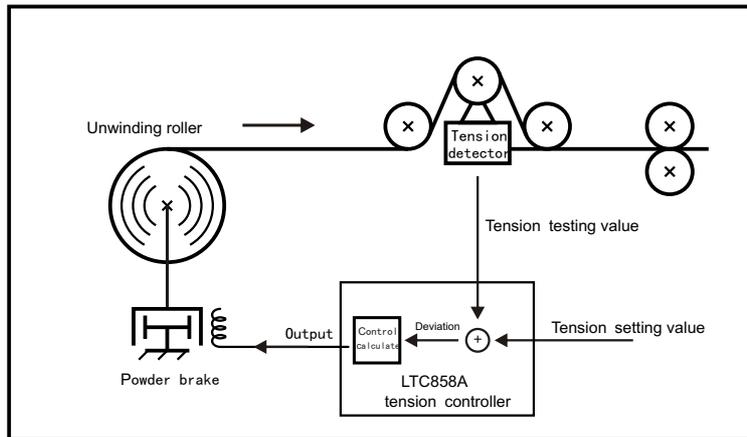
Controller output was controlled by output key, re-press this button, the output will be switched between on/off. OUTPUT ON/OFF LED lights: allowed output; OUTPUT ON/OFF LED off: Not allow output, LED display shows OFF, output value is 0.0%.



Make MC1 connected, when perform automatic control
If MC1 switches off, the controller will be transferred to stop condition, then AUTO LED blinking, the output preparing output value P.on.
When the synchronization start and stop [19] function starting, the system start / stop switch will not only controlled by the MC1, but also controlled by the spindle speed.

4.2.3 Proportion integral parameter Settings

When STC858A in automatic control mode, proportion, integral, static area parameter values influence the stability and control precision of system, such as tension control is unstable which need to adjust and set the appropriate proportion, integral and static area parameter values.



Tension controller comparative with the deviation of tension setting value and tension measurement value, after calculated via the proportion integral algorithm, adjust the output which make the tension of coil tended to setting value an to achieve the goal of constant tension control. Therefore, set proper parameter of proportion, integral, static area is very important for the stability of the tension system.

(1) Proportional band

05. Proportional band
PROP= 150.0kg
Set/confirm Esc/exit

To revise the output is based on the proportion of deviation between tension setting value and actual tension. setting range: 0.1~999.9.

The smaller the proportional band, the faster the system responses, but it's easy to oscillations and the system is unstable.

The larger the proportional band, the slower the system responses, the more stable of the system. In general, the proportion band [05] set as 2 to 3 times of the tension.

(2) Integration time

06. Integration time
INTT= 1.0 seconds
Set/confirm Esc/exit

Integration time is used to eliminate static error, setting range: 0.1 to 10.0 seconds.

The smaller the integration time, the faster the speed responses, but it's easy to oscillations and resulting unstable to the system.

The larger the integration time, the slower the system responses, the system more stable. In general, the integration time [06] is set to 1.0 seconds.

(3) Static area

07. static area
DB= 5.0kg
Set/confirm Esc/exit

The larger the static area, the more stable the system, but it responses slowly.

In general, static area [07] to set the value as 0.5 to 1.0 times.

(4) Output filter coefficients

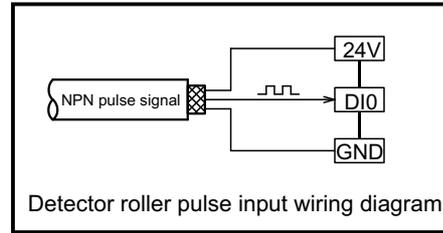
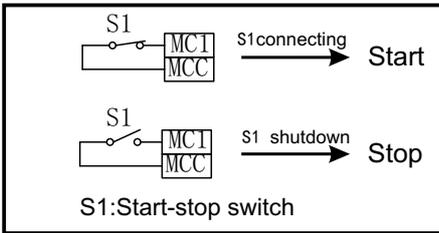
43. Output filter coefficients
FIL= 10.0 seconds
Set/confirm Esc/exit

Output filter coefficients can limit the rate of change of output, making the output does not change rapidly, so as to avoid tension oscillation.

The larger the Coefficient, the slower the output changes, usually set as 10.0 seconds.

4. 2. 4 System start and stop

(1) Start and stop control



Start, stop of STC858 Tension Controller is controlled by the terminal MC1, MCC, MC1, MCC terminals connect to a switch which switch (S1) is the system start-stop switch, connecting or shutdown of S1 switch will start or stop the tension system operation.

When the synchronization start and stop [19] started, start / stop of the system will be not only controlled by switch S, but also control by the operating frequency of the spindle.

Using start and stop synchronization function, a proximity switch must be installed on the spindle, the controller will monitor the operation frequency of the spindle .

When the start-stop switch S1 connected, the operating frequency of spindle is larger than the frequency of start and stop[19], start running, AUTO LED lights up.

When the start-stop switch S1 connected, the operating frequency of spindle is smaller than the frequency of start and stop[19], stop running, AUTO LED blink.

In the automatic tension control system, generally short the MC1 and the MCC, the system will control start/stop of the system automatically based on the operating frequency of detector roller.

(2) Start-up process

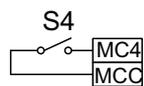
When the start-stop switch S1 connected, the system start running, the controller put into operation automatically , to perform constant tension close-loop control based on tension of setting, AUTO LED lights up.

(3) Stop process

During operation, at the moment of S1 start /stop switch is off, the controller will then get the output value P multiplied by the stop gain stop [10] G as the moment output which making the operation speed of system decreased rapidly, meanwhile. stop the timer starting timing, and automatic controlled during stop process, the controller will put into open-loop operation when approaching to stop time, to output prepare output P.on, to generate prepare tension.

When controller is in condition of stopping, AUTO LED is blinking.

(4) Prepare output selection



Prepare output selection switch S4

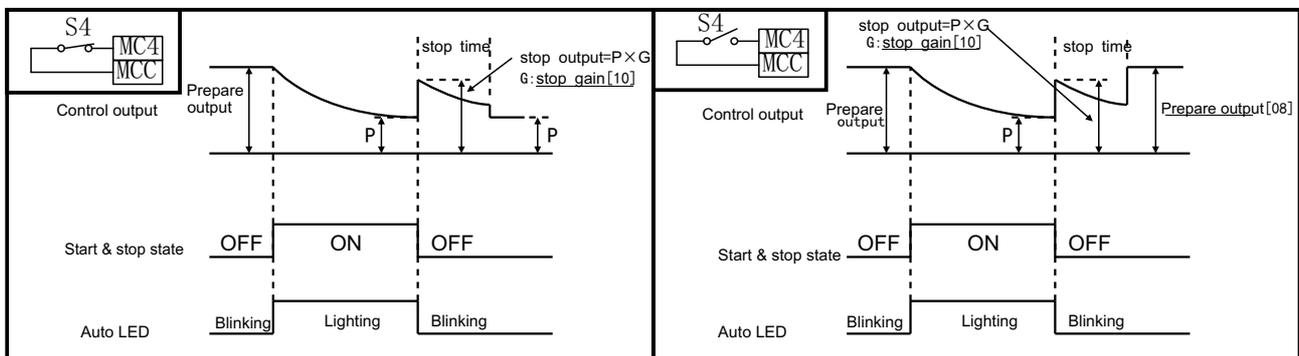
Prepare output of system is controlled by prepare output selection switch S4 .

When switch S4 is connected, the output valueP of stopping moment (the moment that MC1 and MCC is disconnected) of the system is the prepare output.

When switch S4 is disconnected, the prepare output [08] which preset in the controller memory is prepare output.

Generally the prepare output switch S4 will be used in below mode:

1. When suspended machine, connecting to S4, using the output memory function to start from stopping output value.
2. When replacing material volume, disconnect the S4, to start operation from the output which preset in the controller memory, then prepare output [08] will be the output value of corresponding initial diameter.

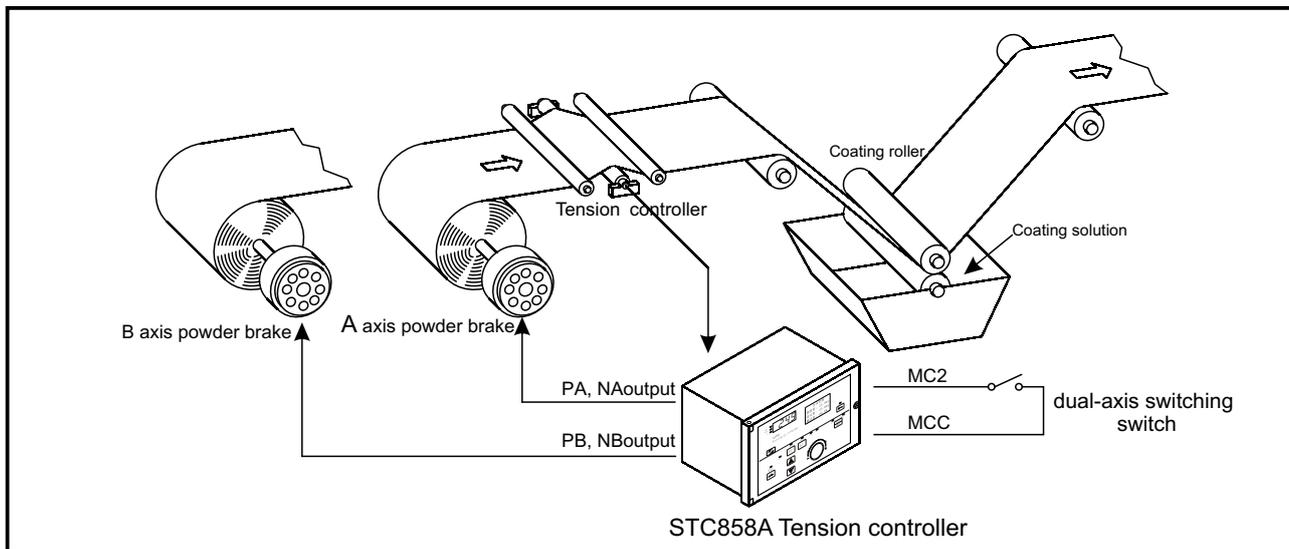


Start/stop process – Prepare output selection switch connected

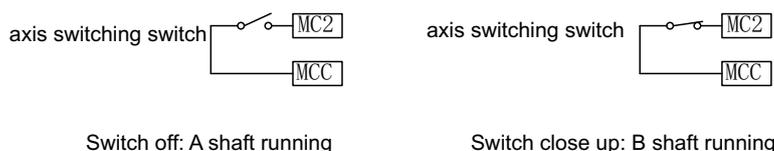
Start/stop process – Prepare output selection switch disconnected

4. 2. 5 Axis switching

When the system using dual-axis (A, B axis) to run in turn, need to switch the reel when the material in unwinding reel is near to completed. or when the material in the rewinding reel is almost full.



(1) Axis switching control



The axis switching of STC858A tension controller is controlled by terminals MC2, MCC when MC2, MCC terminals switch is on/off which means the axis switching switch of the system will be on/off. When the axis switching switch is off, then A axis runs; when axis switching switch is shorted, then B axis runs.

(2) Unwinding axis switching process

When winding method [27] is unwinding, follow below steps to complete the axis switching process:

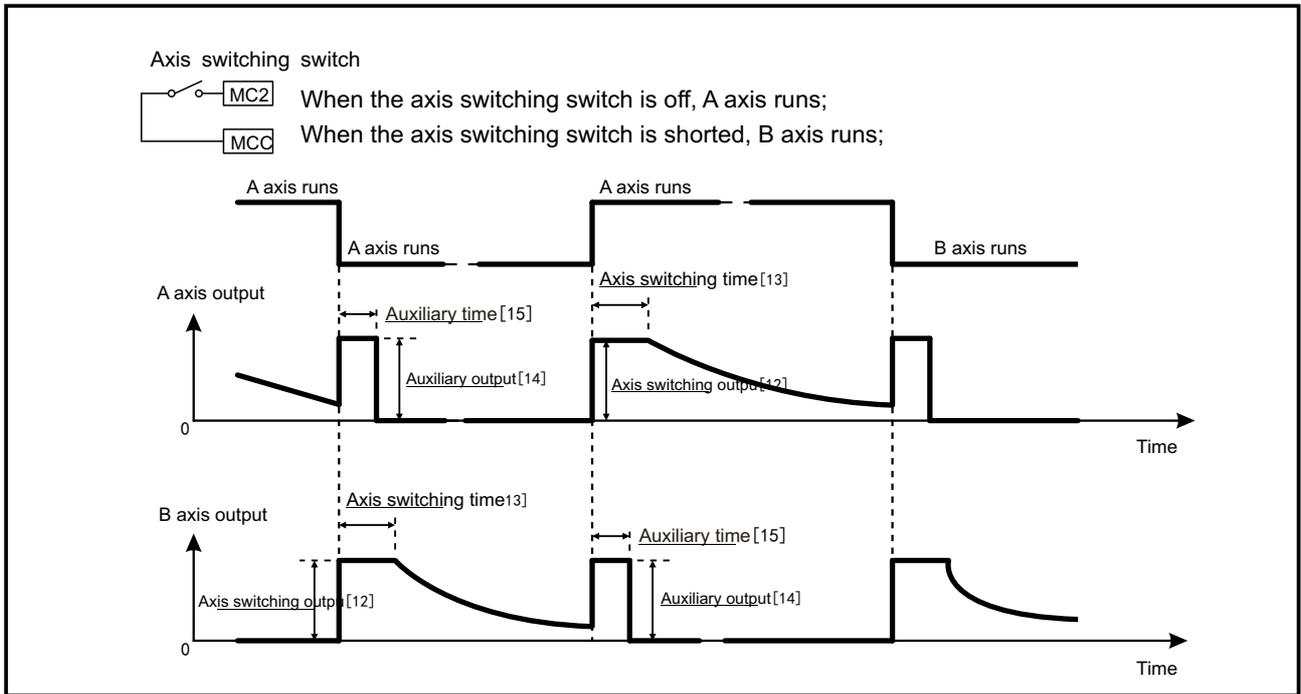
Assuming A axis is running, then to connect axis switching, and then the output of controller will be output to B axis, rather than A axis, at this time, the axis switching output [12] of output preset, meanwhile, axis switching timer start to timing, when reach to the end of axis switching time [13], the controller put into operation, to perform the constant tension closed-loop control based on setting tension. At the same time, the auxiliary output [14] with in the auxiliary time [15] of preset to output current to A axis which to stop A axis running quickly. If the axis switching switch to disconnection state from connection state, namely, switch to A axis in waiting from B axis in running which the control process is the same, just need to interchange A axis and B axis as above.

(3) Rewinding axis switching process

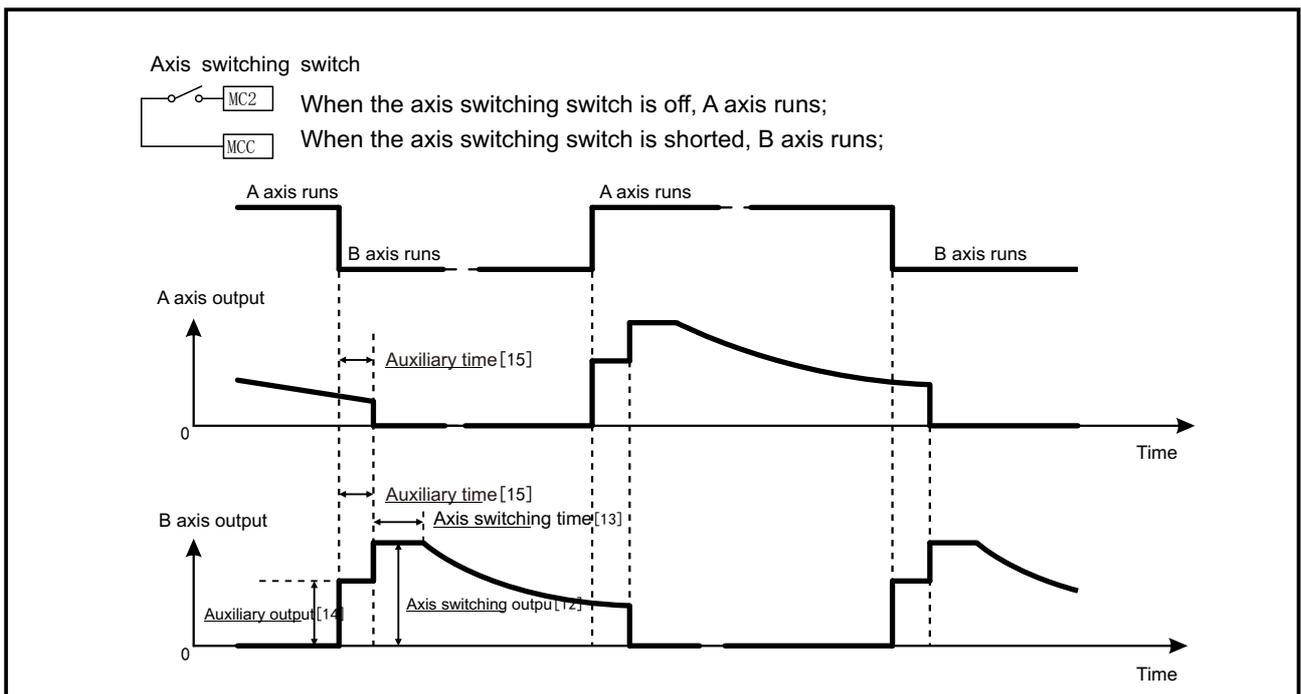
When winding method [27] is rewinding, follow below steps to complete the axis switching process:

Assuming A axis is running, then to connect axis switching, and then auxiliary output [14] output to B axis which to make B axis running, meanwhile auxiliary timer start timing, when auxiliary time reach the end, and then the output of controller will be output to B axis, rather than A axis, at this time, the axis switching output [12], mean while the axis switching timer start timing, when reach the end axis switching time [13], the controller put into operation automatically, to perform the constant tension closed-loop control based on setting tension.

If the axis switching switch to short state from disconnection state, namely, switch to A axis in waiting from B axis in running which the control process is the same, just need to interchange A axis and B axis as above.



Axis switching process-Unwinding



Axis switching process-Rewinding

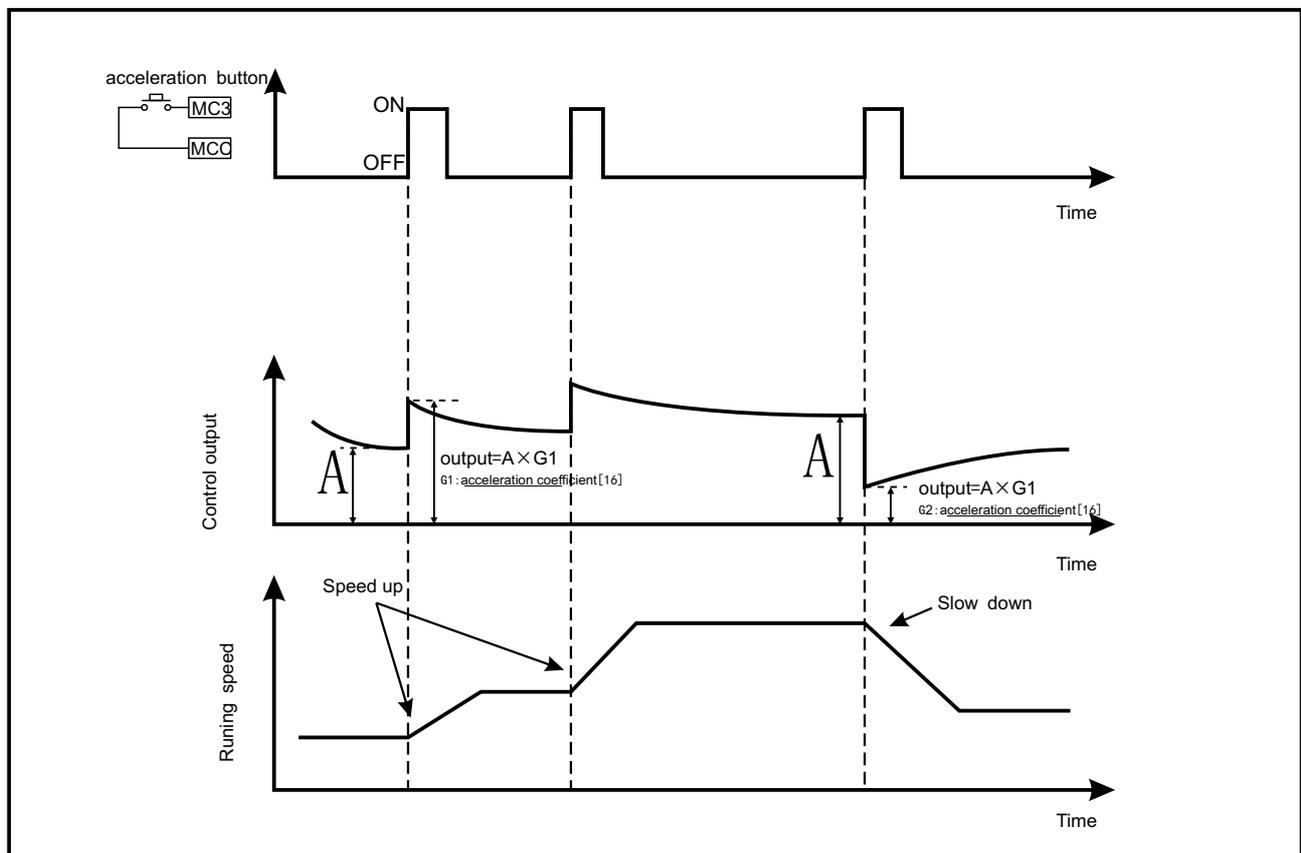
4. 2. 6 Acceleration / deceleration control

Connect a button to MC3, MCC, when the system needs to speed (the acceleration/deceleration), press the button, then the output value is output value of cut moment multiplied by accelerated coefficient [16], make the system acceleration and deceleration.

In rewinding system, acceleration coefficient [16] is less than 1.00, the system speeds up , acceleration coefficient [16] is larger than 1.00, then the system slows down.

In unwinding system, acceleration coefficient [16] is less than 1.00, the system slows down, acceleration coefficient [16] is larger than 1.00, then the system speeds up .

In the biaxial switching, standby or start state, the controller will not response to acceleration/ deceleration controlling. Only when the LTC858 in running state, then the will be response to acceleration / deceleration controlling.

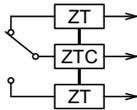


Acceleration / deceleration operation diagram

4. 2. 7 Alarm function

04. Tension alarm value
 AL1= 0.0kg
 Set/confirm Esc/exit

When tension measurement value is less than set tension alarm value [4], zero tension alarm relay will suck close, meanwhile tension alarm ALM indicator n the panel light up.



Zero tension alarm value

4. 2. 8 Feedback method

40.Feedback method
 ▶ Normal mode
 Active passing coil mode

This parameter controls feedback of STC858A :

Normal mode: When the tension measurement value is larger than the tension set value, then the output decreases which is negative feedback method.

Active passing coil mode: When the tension measurement value is larger than the tension set value, then the output increases which is positive feedback method.

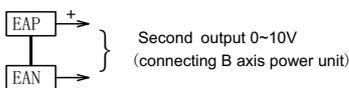
4. 2. 9 Second output

42.Second output
 ▶ Synchronization control output
 Axis switching auxiliary output
 Tension transmission output

When the second output [29] select as synchronization control output, then the output value is the same as main output.

When the second output [29] select as axis switching auxiliary output, then the output is auxiliary output.

When the second output [29] select as tension transmission output, then the output is actual measuring output, the transmission range is set range [18] the minimum set value-maximum set value.



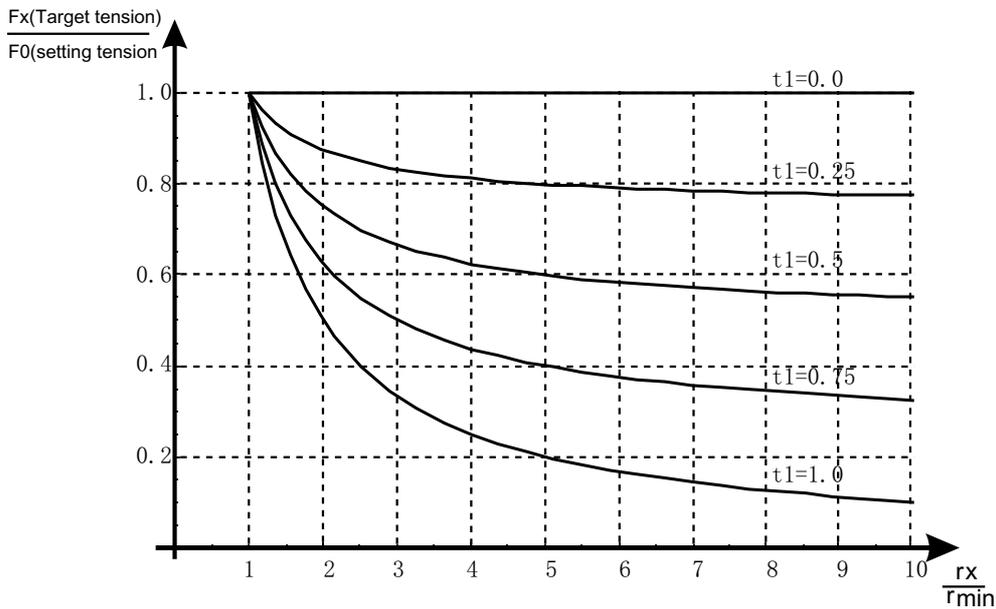
4. 3 Tapper tension control

4. 3. 1 Taper Control Overview

In rewinding system, along with the increase of reel diameter, making the control of the coil material tension reduced gradually called as taper tension control, taper control can make inner lining of rewinding membrane lining very tightly, and make the outer membrane very loose, thus make coil material film between layers without slippage , to prevent materials winding roll from too tightly and coil winding skewed.

The larger the tapper coefficient [03] t1, the larger the tensin, when the tapper coefficient [03]t1 is 0 which is constant tension control mode.

When the tension controller using for unwinding control, then the controller should be set as constant tension control mode.



4. 3. 2 Taper tension mode running screen

Taper tension control
 Target value: 18.0kg
 Setting value: 25.0kg
 Output value: 28.5%

- ← Target value Fx: according to different reel diameter is corresponding to target value of running tension. Was calculated based on setting value, volume diameter, taper coefficient.
- ← Setting value F0: Using ▲/▼ keys or numerical set knob to change tension setting value.
- ← Actual output value

Tip: When kg / N the indicator lights, then LED display can show measurement value.

4. 3. 3 Taper tension control debugging step

- [1] Ensure tension measurements is correct, if the tension does not display normally, then go back to Chapter 4.
- [2] Set taper coefficient and run the system to make sure to achieve the quality requirements of the rewinding.

Chapter 5 Other Functions

5.1 Language selection

32.Chinese/English
 ► Simplified Chinese
 Traditional Chinese
 English

STC858A can choose Chinese or English interface

- (1) Enter into Simplified / Traditional / English [32] parameter screen
- (2) Using ▲/▼ keys or numerical set knob to select language
- (3) Press ESC to exist

5.2 Parameter back-up

33.Parameter back-up
 ► Recovery?
 Back up ?
 Set/confirm Esc/exit

This function to back up and recovery current parameter of the controller, when the system works normally, to save the current parameter for backup which can recovery the parameter value of the backup, if needed (such as parameter settings are out of order).

Note: When the system testing completed, the system runs normally, perform a "backup" operation;

After the implementation of "recovery"operation, the parameter values will return to the last backup of the

5.3 Factory Reset

34.Factory Reset value
 ► Recovery?
 No recovery
 Set/confirm Esc/exit

This function can be restored all the parameters of the controller to factory default values

All the current parameters will be lost once implementing this function.

Chapter 6 Inspection and maintenance

Problem	Possible malfunction	Solution
When the power is turned on, the power indicator LED (3) is not lit	<ul style="list-style-type: none"> > Power problem > the fuse may be melted by insertion of foreign objects or abnormal. 	Make sure the supply voltage of the controller is 180-264 V/AC 1.If this value is not correct, perform the correct wiring. 2.Replace the fuse(4A)
Can not measure, shows "A / D fault "	A / D chip damaged	Need to repair
Can not measure, shows "signal error "	<ul style="list-style-type: none"> 1.Signal range don't match with the tension detector 2.Tension detector signal is malfunction or wiring is error 	<ul style="list-style-type: none"> 1. Set the correct signal range [25] 2. Check the wiring and determine the detector signal malfunction, then replace the detector.
Can not measure, shows "Beyond the full-scale"	<ul style="list-style-type: none"> 1. Perform the calibration incorrectly. 2.Tension detector signal is malfunction or wiring is error 3. Tension detector selection [23] does not match with the actual installation. 	<ul style="list-style-type: none"> 1.Perform the calibration correctly. 2. Check the wiring and determine the detector signal malfunction, then replace the detector. 3.To set the detector selection [23] parameter correctly.
Tension display is not stable in manual and automatic control mode.	<ul style="list-style-type: none"> 1.Detector roller is not round, bearing is damaged and detector roller is bended. 2.Clutch / brake and the drive part have problem. 3.Tension detector signal is malfunction or calibration is error 	<ul style="list-style-type: none"> 1. Perform machinery re-installation. 2. Replace appropriate actuators. 3.Chosse the correct detector and re-calibrate it correctly.
The tension is stable in manual control mode, and is unstable in automatic control mode.	<ul style="list-style-type: none"> 1. Selected the inappropriate tension detector. 2. Selected the inappropriate Clutch / brake and the drive part 3. Proportional, Integral, static area parameter set incorrectly. 	<ul style="list-style-type: none"> 1.Chosse the correct detector and re-calibrate it correctly. 2. Replace appropriate actuators. 3. Adjust proportional, Integral, static area parameter.
Controller is without output	<ul style="list-style-type: none"> 1. The Out put was closed. 2. Output is shorted for protection. 3. A / B-axis Output is wired incorrectly. 	<ul style="list-style-type: none"> 1. Confirm the OUTPUT ON / OFF indicator LED lights up. 2. Turn off the power and then turn on the power after 30 seconds. 3. Connect the output device correctly.
Buttons or numeric knobs does not work.	Buttons are locked.	Check the Lock light status, when the lights is on, namely, it's locked.
Mc1 does not run after connected.	<ul style="list-style-type: none"> 1.The Function [19]of synchronous start-stop is open . 2. The feedback method[28] is set incorrectly. 	Set the feedback method [28] correctly.
Can not switch to automatic control mode	Can't be switched to automatic control mode in malfunction status. <ul style="list-style-type: none"> 1. Measured value is incorrect. 2.Buttons are locked. 	<ul style="list-style-type: none"> 1. Check the detector, wiring, parameter, re-calibration, till the it's measured correctly. 2. Buttons are locked, unlock it.
Re-start after the machine halts, the tension is larger or smaller.	<ul style="list-style-type: none"> 1. When the system is stopped, the start / stop switch MC1 didn't turn off. 2.MC4 switch is not shorted and the prepare output is without memory. 	<ul style="list-style-type: none"> 1.Keep the start/stop switch MC1 off , when machine is stopped 2. Disconnect the prpare output switch Mc4.
When switching from manual mode to automatic mode, the setting value changes.	When the controller swifts from the manual control mode to automatic control mode, the controller will set the measurement value as setting value to achieve disturbance-free switching.	Normally, this function makes tension control system to achieve disturbance-free switching.

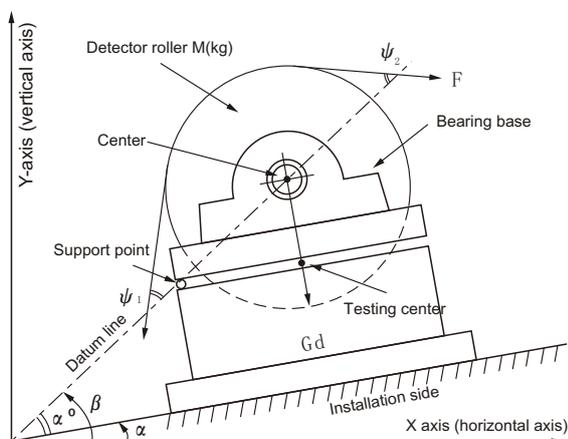
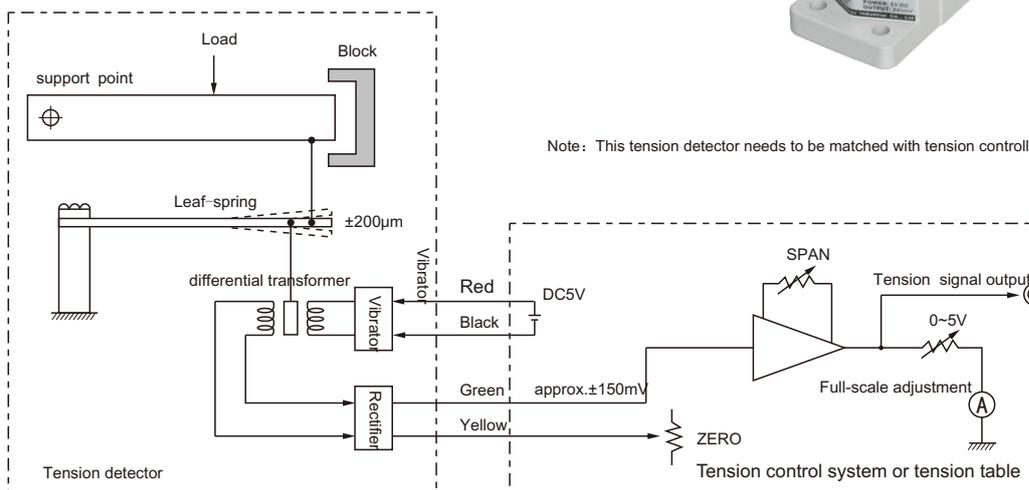
Chapter 7 Appendix

7.1 Parameter screen

01.Display filter coefficients FIL= 3.00 Set/confirm Esc/exit	02.Output filter coefficients FIL= 0.0second Set/confirm Esc/exit	03.Tapper coefficients t1= 0.00 Set/confirm Esc/exit	04.Tension alarm value AL1= 0.0kg Set/confirm Esc/exit	05.Proportional band PROP= 100.0kg Set/confirm Esc/exit
06. Integration time INTT= 2.0 second Set/confirm Esc/exit	07.Static area DB= 5.0kg Set/confirm Esc/exit	08.Prepare output P.on= 0.0 % Set/confirm Esc/exit	09. Start time T.on= 0.1second Set/confirm Esc/exit	10. Stop gain G.st= 100 % Set/confirm Esc/exit
11. Stop time T.st= 0.1 second Set/confirm Esc/exit	12. Axis switching output P.ch= 30.0 % Set/confirm Esc/exit	13. Axis switching output T.ch= 2 second Set/confirm Esc/exit	14.Auxiliary output P.aux= 0.0 % Set/confirm Esc/exit	15. Auxiliary time T.aux= 0.1 second Set/confirm Esc/exit
16. Acceleration factor G1= 1.00 Set/confirm Esc/exit	17. Deceleration factor G2= 1.00 Set/confirm Esc/exit	18. Setting range Mini.= 0.0kg Max.= 50.0kg Set/confirm Esc/exit	19. Synchronization start /stop F0= 0.0Hz Set/confirm Esc/exit	20. Output range Mini.= 0.0% Max.= 100.0% Set/confirm Esc/exit
21.Left tension error correction OFST-L 0.0kg Set/confirm Esc/exit	21.Right tension error correction OFST-R 0.0kg Set/confirm Esc/exit	23.Tension detector selection Left tension detector Right tension detector ▶ Left+rightdetector	24.Tension disply unit ▶ kg Newton	25.Zero tension calibration ±30 mV ▶ ±300 mV
26. Communication Set/confirm Esc/exit	27.Winding method Rewinding ▶ Unwinding	28.Feedback method ▶ Normal mode Active sending coil mode	29.Second output ▶Synchronization control output Auxiliary output axis cutting Tension transmission output	30.Zero tension calibration P1= 0.0kg Execute? Set/confirm Esc/exit
31. Full-scale calibration P2= 50.0kg Execute? Set/confirm Esc/exit	32.Chinese/English ▶ Simplified Chinese Traditional Chinese English	33.Parameter back up ▶ Recovery? Back up ? Set/confirm Esc/exit	34.Factory Reset value ▶ Recovery? Set/confirm Esc/exit	

7.2 Tension detector work principle

- LS – □ □ □ TD tension detector is a measuring instruments which using high precision differential transformer to test the leaf-spring bending degree(approx. $\pm 200 \mu m$) when it roles by load.
- Related load is 50--1000N.



- Tension detector, for example, according to the installation drawing shows on the left, material tension F(N) and testing load Gd should in accordance with following formula relationship.

M is the quality of detector roller.

$$Gd = K0 \cdot F + KMg \dots \dots \dots \textcircled{1}$$

$$K0 = (\sin\psi_1 + \sin\psi_2) / \cos\alpha^\circ \quad g = 10 \text{ m/s}^2$$

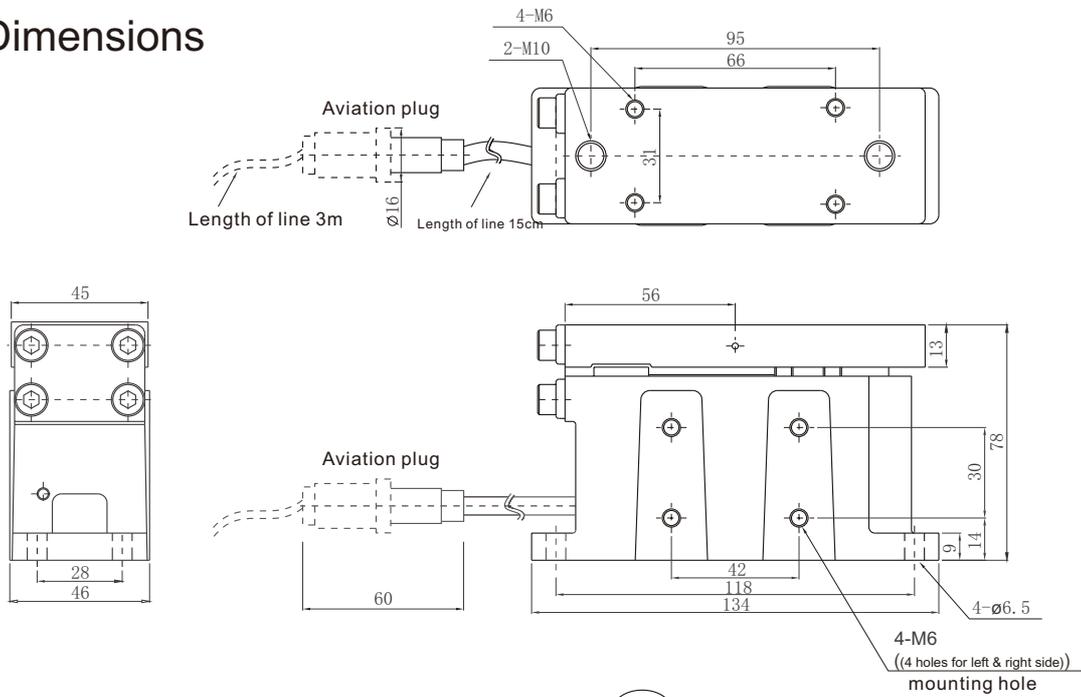
It is proportionality constant of change which along with paper angle ψ_1 , ψ_2 to pass the paper at the tensile load side, then the K0 is negative value.

$$K = \cos\beta / \cos\alpha^\circ$$

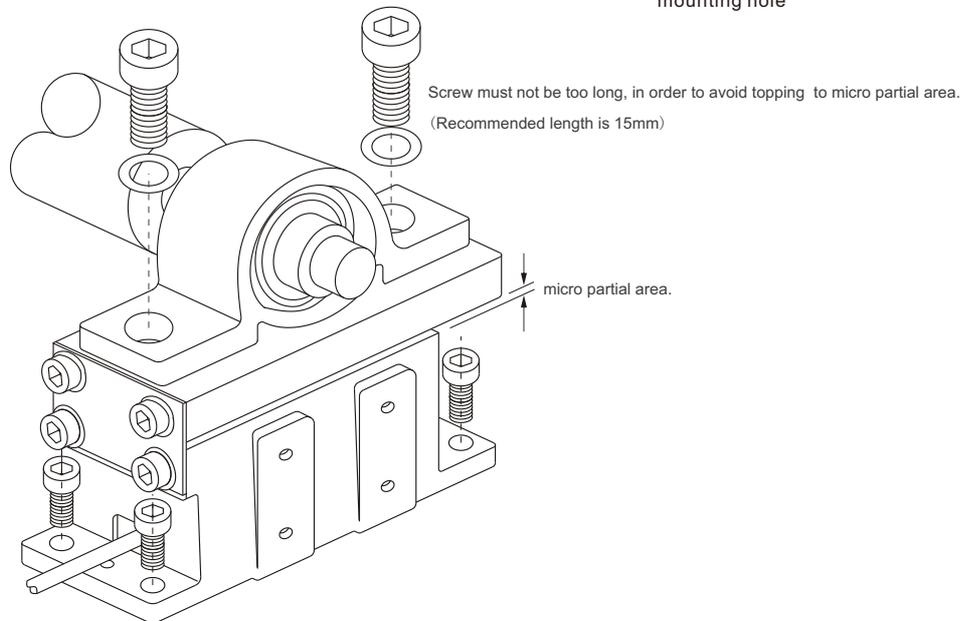
It is proportionality constant of change which along with base angle β , according to different installation direction, sometimes, it's negative value.

- The fixed load KMg is zero within tension table from detector roller to provide value of reverse bias to be canceled. Moreover, to perform span adjustment for based on the proportionality constant K0 value of corresponding tension, to achieve 0-5V output signal which is proportional to measured tension.
- Each detector uses one tension table when processing wire, rope and other products
However, when processing of wide-format film products, two detectors are needed at each end of the detector roller. There only set one set for a tension table, so the output of these 2 sets will be synthesis within the tension table. In addition, the wide-format film of the material was tensiled by one side which should take into account for the unbalanced load of the forced detector, the detector should be used within 80% of the related load.

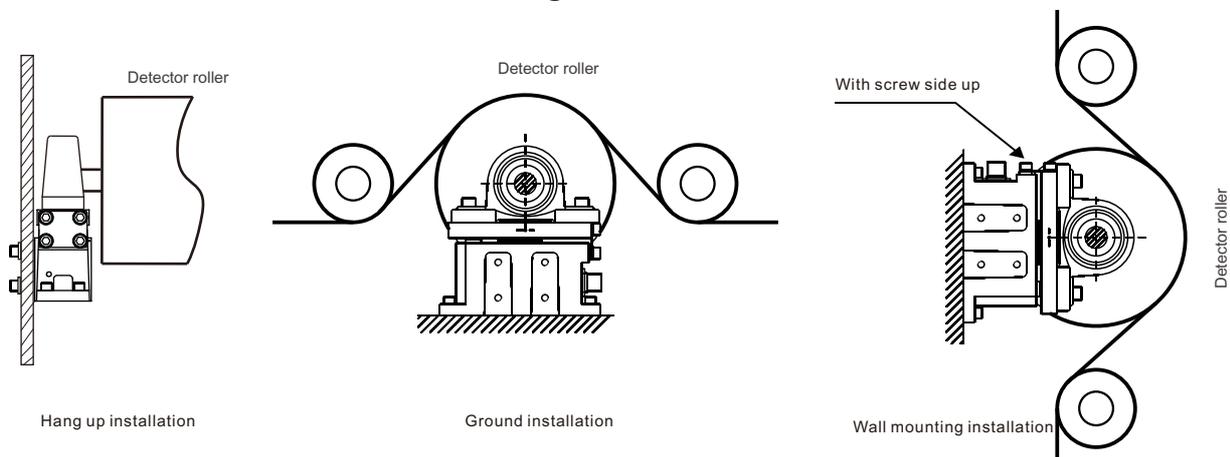
7.3 Dimensions



7.4 Assembling



7.5 Tension detector mounting



7.6 Specifications

Tension signal	Tension detector special for slight movement (input signal 200mV, Power supply 5VDC0
Measuring precision	$\pm 0.2\%FS \pm 1$
Sampling period	100ms
Control calculation	PI(PI calculation)
Main output	Two 24VDC/4A output, drives magnetic clutch / brake directly
Auxiliary output	Two 0 ~ 10V or 0 ~ 20mA output, which can connect transducer or electric / air converter and other actuators
Alarm	Keep relay on
Communications	RS485 (Customized)
Dimensions	246(W)x154(H)x156.5(D)mm
Power supply	85~264VAC 50/60Hz