MITSUBISHI ELECTRIC

Tension Controller

MODEL

LE-30CTN

APPLICATION MANUAL

Safety Precautions

(Read these precautions before using.)

Before installation, operation, maintenance or inspection of this product, thoroughly read through and understand this manual and the associated manuals. Also, take care to handle the module properly and safely.

This manual classifies the safety precautions into two categories: ⚠WARNING and ⚠CAUTION.

⚠WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Depending on the circumstances, procedures indicated by ⚠CAUTION may also cause severe injury.
In any case, it is important to follow all usage directions.
Store this manual in a safe place so that it can be taken out and read whenever necessary. Always forward it to the end user.

DESIGN PRECAUTIONS

⚠ WARNING

- Make sure to have the following safety circuits outside of the TENSION CONTROLLER to ensure safe system operation even during external power supply problems or TENSION CONTROLLER failure.
  Otherwise, malfunctions may cause serious accidents.
  Note that when an error occurs in a transistor output device, the output could be held either ON or OFF.
  For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such cases.

⚠ CAUTION

- Do not bundle the control line together with or lay it close to the main circuit or power line.
  As a guideline, lay the control line at least 100mm (3.94") or more away from the main circuit or power line.
  Otherwise, noise may cause malfunctions.
- Install the product so that no force is applied on the power connector and terminal blocks.
  Otherwise, wire breakage and failure may occur.
- Make sure to perform single point grounding on the tension controller side to the shield of the shielded wire or shielded cable connected to the tension controller.
  Never perform common grounding with a strong electrical system.
  Otherwise, noise may cause malfunctions.

Safety Precautions

(Read these precautions before using.)

INSTALLATION PRECAUTIONS

⚠ WARNING

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.
  Failure to do so may cause electric shock or damage to the product.

⚠ CAUTION

- Use the product within the generic environment specifications described in this manual.
  Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl_2, H_2S, SO_2 or NO_2, etc), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind.
  If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.
- Do not touch the conductive parts of the product directly.
  Doing so may cause device failures or malfunctions.
- Install the product securely using mounting screws.
- Install the product on a flat surface.
  If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformities.
- When drilling screw holes or wiring, make sure that cutting and wiring debris do not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Securely connect I/O cables and power cable to predetermined connectors.
  Otherwise, poor contact may cause malfunction.
- Make sure to turn OFF the power before attaching or removing equipment.
  Otherwise, failure and malfunction may occur.

WIRING PRECAUTIONS

⚠ WARNING

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.
  Failure to do so may cause electric shock or damage to the product.

Safety Precautions

(Read these precautions before using.)

⚠ CAUTION

- Connect the power supply wiring to the dedicated terminals described in this manual.
- Do not wire vacant terminals externally. Doing so may damage the product.
- Perform Class D grounding (Grounding resistance: 100Ω or less) to the grounding terminal.
  Never perform common grounding with a strong electrical system.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
- Noise may cause malfunction in the tension controller. Make sure to observe the following items.
  - Keep the power cable and twisted shielded cables away by 100mm or more from the main circuit line, high voltage line and load line. Do not bundle the power cable and twisted shielded cables together with such lines. Otherwise, the power cable and twisted shielded cables can be easily affected by noise and surge induction.
  - Make sure to perform single point grounding on the signal receiving side to the shield of twisted shielded cables. Never perform common grounding with a strong electrical system.
- Make sure to properly wire to the terminal block board in accordance with the following precautions.
  Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - Treat exposed cable ends to be 9mm.
  - Use an M3.5 crimp terminal for wiring and tighten the terminal with the torque 0.5 to 0.8N•m.
  - Do not connect more than the specified number of wires or electrical wires of unspecified size.
  - Affix the electrical wires so that neither the terminal block nor the connected parts are directly stressed.

STARTUP AND MAINTENANCE PRECAUTIONS

⚠ WARNING

- Do not touch any terminal while the TENSION CONTROLLER's power is ON.
  Doing so may cause electric shock or malfunctions.
- Before DIP switch setting, cleaning or retightening terminals, cut off all phases of the power supply externally.
  Failure to do so may cause electric shock.

⚠ CAUTION

- Do not disassemble or modify the TENSION CONTROLLER.
  Doing so may cause fire, equipment failures, or malfunctions.
  * For repair, contact your local Mitsubishi Electric distributor.
- Turn OFF the power to the TENSION CONTROLLER before connecting or disconnecting any extension cable.
  Failure to do so may cause equipment failures or malfunctions.

Safety Precautions

(Read these precautions before using.)

DISPOSAL PRECAUTIONS

⚠ CAUTION

- Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.

■ Outline Precautions

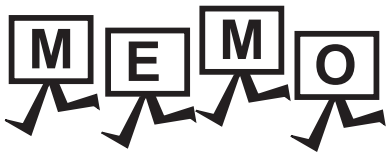
- This manual provides information for the use of the TENSION CONTROLLER. The manual has been written to be used by trained and competent personnel. The definition of such a person or persons is as follows;
  - (a) Any engineer who is responsible for the planning, design and construction of automatic equipment using the product associated with this manual should be of a competent nature, trained and qualified to the local and national standards required to fulfill that role. These engineers should be fully aware of all aspects of safety with regards to automated equipment.
  - (b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local and national standards required to fulfill that job. These engineers should also be trained in the use and maintenance of the completed product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices.
  - (c) All operators of the completed equipment should be trained to use that product in a safe and orderly manner in compliance with established safety practices. The operators should also be familiar with documentation related to the actual operation of the completed equipment.

Note:

The term 'completed equipment' refers to a third party constructed device which contains or uses the product associated with this manual.

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi Electric.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.
- When combining this product with other products, please confirm the standard and the code, or regulations with which the user should follow. Moreover, please confirm the compatibility of this product with the system, machine, and apparatus that the user is using.
- If in doubt at any stage during the installation of the product, always consult a professional electrical engineer who is qualified and trained to the local and national standards. If in doubt about the operation or use, please consult the nearest Mitsubishi Electric distributor.
- Since the examples indicated by this manual, technical bulletin, catalog, etc. are used as a reference, please use it after confirming the function and safety of the equipment and system. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.
- This manual content, specification etc. may be changed without a notice for improvement.
- The information in this manual has been carefully checked and is believed to be accurate; however, if you have noticed a doubtful point, a doubtful error, etc., please contact the nearest Mitsubishi Electric distributor.

■ Registration


MEMO

Tension Controller

MODEL

LE-30CTN

APPLICATION MANUAL

Note to Users

This manual describes how to handle the tension controller LE-30CTN.
Read this manual and manuals of related products before using the LE-30CTN, understand sufficiently the specifications of all products, and use them properly.
See to it that this instruction manual is delivered to the end user.

Introduction

Thank you very much for puchasing the tension controller.
Thoroughly read this manual before using the tension controller, understand sufficiently its functions and performance, and use it properly.

Table of Contents

1. Outline

The LE-30CTN tension controller receives signals from a tension detector and automatically controls tension of long materials at winding, unwinding, and intermediate axis.
The controller generates a control voltage of 0 to 24 V to the powder clutch/brake, or the hysteresis clutch/brake, and generates a torque command voltage of 0 to 5 V to the servo amplifier.

1.1 Functions and Features

(1) Eight types of operation data can be memorized or read by the menu function.

(2) The operation data can be read and written to other LE-30CTN tension controllers by using the memory cassette.

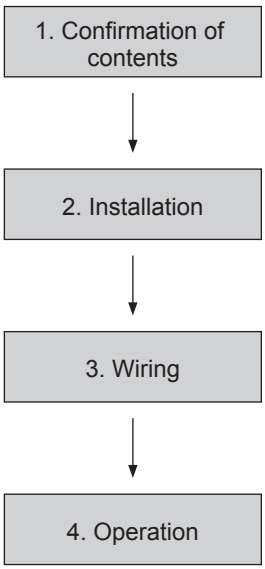
(3) The controller has a weak excitation function, which is applied to the powder clutch/brake.
This function accelerates torque at low-speed operation or at the startup of the controller.

(4) Polarities of the detector signals are automatically recognized.
Wiring without considering compression and tension is possible.

(5) Japanese, English, and Simplified Chinese can be displayed with the dot matrix-type LCD.

1.2 Steps Prior to Operation

The figure below shows the steps to perform prior to operation.



(1) Confirmation of contents
Open the package, and confirm contents.

☞ Manual packed together with product

(2) Installation
Install the tension controller to the control panel, etc.

☞ Chapter 5 Mounting

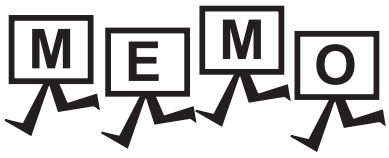
(3) Wiring
Wire the power cable and input/output cables.

☞ Chapter 6 Wiring

(4) Operation
Operate the tension controller.

☞ Chapter 8 Adjustment and Initial Setting

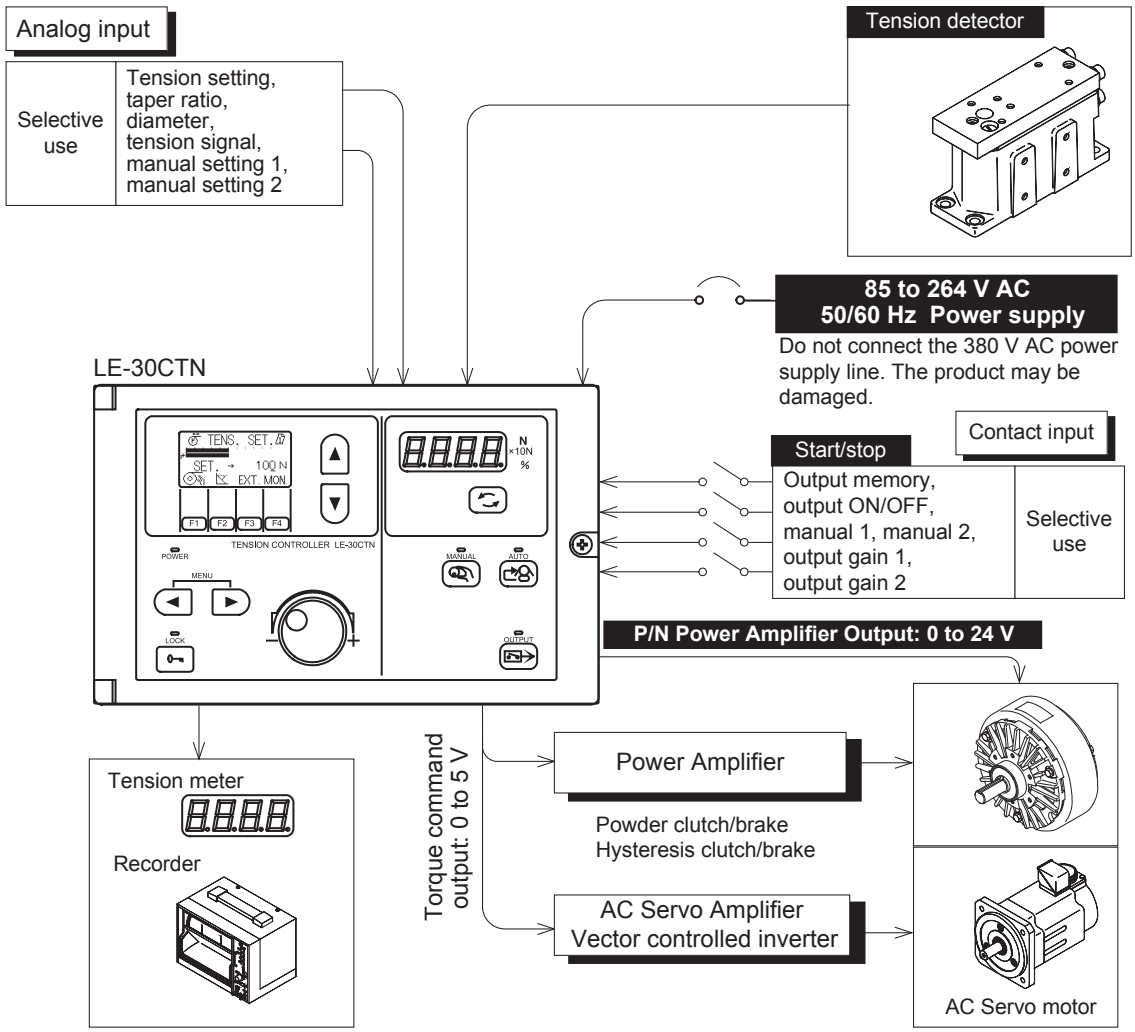
☞ Chapter 9 Operation and Function of Automatic Operation


MEMO

2. System Configuration

2.1 Overall Configuration

The figure below shows the overall configuration.

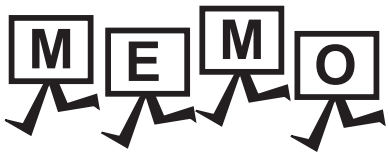


2.2 Components

The table below shows available components.

Name	Model name
Tension controller	LE-30CTN
Tension detector	LX-□□□TD, LX-□□□TD-9□□
Memory casette	FX-EEPROM-□*1

*1. Discontinued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3. Specifications

3.1 Input/Output Specifications

Item		Terminal name	Specification		
Power supply	Input	L N ⏚	100 to 240 VAC (-15 to +10 %), 50/60 Hz, power consumption: 400 VA (at 24 VDC, 3 A) power supply fuse: 250 V, T5AH×2 built-in, rush current: 30 A for 300 ms, allowable instantaneous power interruption: 10 ms		
	Output	RED BLK	5 VDC, power supply for the tension detector Connect a red lead wire (+) to RED and a black lead wire (-) to BLK. One LX-TD tension detector can be connected for the left and right side, each.		
		+5V AIC	Service power supply for the external variable resistor, 5 VDC, 50 mA or lower		
Contact signal	Input	MIC	Contact input common terminal		8 VDC 4.5 mA/input Internal power supply
		RUN	Run/Stop: ON = Automatic operation, OFF = Stop		
		MI1 MI2 MI3	Select one from the following functions. • Output memory • Output gain 1 • Output gain 2 • Output ON/OFF • Manual output 1 • Manual output 2	Assign the function using parameters.	
	Output	ZT ZT	Zero tension detection output: Setting value 0 to 2000 (N, ×10 N) Output is on when tension is the same as the setting value. Output is always off when the setting value is 0 250 VAC, 0.5 A or 30 VDC, 0.5 A		
Analog signal	Input	GRL WHL	Left	Tension detector input Connect a green lead wire to GR and a white lead wire to WH. When only one side is used, GR and WH on the unused side must be shorted. Compression or tension load is automatically recognized.	
		GRR WHR	Right		
		AIC	Analog input common terminal		
		AI1 AI2	Select one from the following functions. • Tension setting signal • Reel diameter signal • External tension signal • Taper rate setting signal • Manual setting signal 1 • Manual setting signal 2 • Voltage signal of 0 to 5 VDC, or variable resistore of 10 kΩ		Assign the function using parameters.
	Output	AOC	Analog output common terminal		
		TOUT	Output for controlling the power amplifier and AC servo amplifier of 0 to 5 VDC		Load resistance: 1 kΩ or more
		AO1	Output for the tension monitor and tension setting monitor 0 to 5 VDC, set functions with the DIP switches.		
		PP PN	For 24 VDC powder clutch/brake, or hysteresis clutch/brake, 0 to 24 VDC, 3 A or lower		

3.2 Environmental Specifications

Item	Specification
Ambient operating temperature	0 to +40 °C
Ambient operating humidity	35 to 85 %RH (Condensation is not allowed)
Vibration resistance	10 to 55 Hz, 0.5 mm (4.9 m/s^2 at max.) in three axes for two hours each
Impact resistance	98 m/s^2 … 3 times in each of X, Y and Z axis directions
Power-supply noise resistance	By noise simulator with 1000 Vp-p noise voltage, 1 μs noise width and 30 to 100 Hz frequency
Withstand voltage	1500 VAC, 1 min: Measured between entire terminals and ground terminal
Insulation resistance	5 MΩ or more using 500 V DC insulation resistance tester: Measured between each terminal and ground terminal
Grounding	Class D grounding (Grounding resistance: 100 Ω or less, Grounding together with high power system is not allowed).
Operation atmosphere	Free of corrosive and flammable gases and conducting dust. Dust should be minimum.
Operating altitude*1	0 to 2000m
Installation location	Inside a control panel*2
Overvoltage category*3	Less than or equal to II
Pollution degree*4	Less than or equal to 2

*1. Cannot be used in an environment under pressure higher than the atmospheric pressure. There is a risk of failure.

*2. The tension controller itself is expected to be installed in an environment equal to the inside of a building.

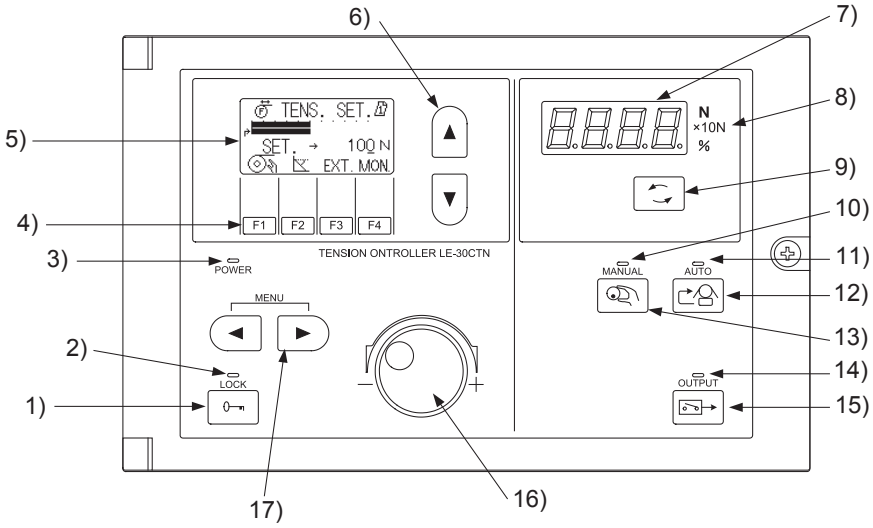
*3. Indicates to which power distribution section the equipment is connected, between the public electrical power distribution network and the machinery inside the factory. Category II is applied to such equipment as a device to which power is supplied by a fixed facility. The surge voltage withstand for a device whose rated voltage is up to 300V is 2500V.

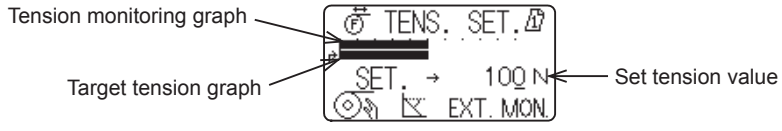
*4. Indicator of the occurrence degree of inducing substances in an environment where the device is used. For pollution degree 2, only nonconductivity pollution occurs. However, pollution degree 2 suggests an environment where accidental coagulation may cause temporary electric conduction.

4. Parts Names and Outside Dimensions

4.1 Part Names

4.1.1 Panel side



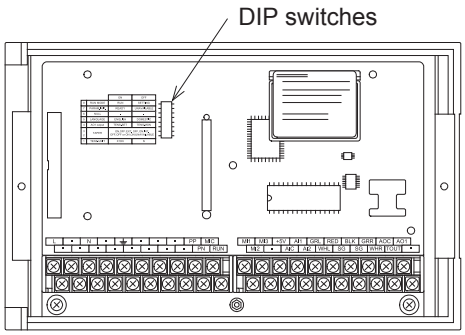
No.	Name	Contents
1)	Keyin Lock key	Prohibits the operator from changing the set values.
2)	Keyin Lock indicator LED	-
3)	Power indicator LED	-
4)	Function keys	Used for switching the screen shown on the liquid crystal display. The function of each key depends on the displayed screen.
5)	LCD display	-
6)	Screen selection keys	Used for switching the screen shown on the liquid crystal display or moving the cursor upward or downward.
7)	Monitor display	-
8)	Unit of monitoring item	-
9)	Monitor item selection key	Switches the item to be displayed on the monitor display. Pressing this key will switch the monitor item between "tension (N or ×10N)". and "output (%)".
10)	MANUAL indicator LED	-
11)	AUTO indicator LED	-
12)	Automatic control mode key	Switches the control mode to automatic control mode. When switched to automatic control mode, the tension setting screen will appear on the liquid crystal display, and the AUTO indicator LED(11) will light. In this mode, you can set the tension value using the setting dial. 

No.	Name	Contents
13)	Manual control mode key	Switches the control mode to manual control mode. When switched to manual control mode, the manual setting screen will appear, and the MANUAL LED will be lit. In this mode, manual operation is possible. 
14)	Output ON/OFF LED	-
15)	Output ON/OFF key	Turns the control output on and off.
16)	Setting dial	Using the setting dial, the user can control output within the range of 0 to 100 %. For the set output of 0 to 100 %, the following voltage will be output: • Powder clutch/brake control output (PP - PN): 0 to Approx. 30 V • Power amplifier and AC servo amplifier control output (TOUT - AOC): 0 to 5 V
17)	Menu selection key	Selects a menu item. Use this key to read out the operation data of the selected menu item. This operation is working under stop situation of [RUN] contact input signal.

* The controller has no power supply switch on the body.
Set a switch to open or close all phases on the wiring side of the power supply.

4.1.2 DIP switches

Open the door of the panel, and you can see a printed circuit board on the main body side. At the upper left section of this printed circuit board, there are 8-pole DIP switches.
When the power is turned on, the set conditions of these switches will be read out.
Each switch has the following function:



- No.1: Sets the tension unit to (N) or (×10N).
- No.2: Sets the taper control method.
- No.3: Sets the taper control method.
- No.4: Sets the function of the AO1 output.
  ON (Set tension monitor): Outputs the target tension value in the automatic control mode.
  OFF (Tension monitor): Outputs the material tension value detected by the tension detector.
- No.5: Sets the language to be displayed on the liquid crystal display.
- No.6: (No function is assigned.)
- No.7: Resets data to the initial values for factoring default settings. (When not initializing data, turned OFF.)
- No.8: Sets the operation mode or the adjustment mode. (This switch should be turned ON after adjustment.)

SW. No.6 is set ON and other SW are set OFF when the product is delivered from the factory.

SW. No	ON		OFF
8	Operation	Operation mode	Tuning
7	initialization	Data initialization	No initialization
6		Language selection	
5			
4	Set tension monitor	AO1 output	Tension monitor
3		Resource of diameter for taper control	
2			
1	×10N	Unit of tension	N

Before changing the set position of a switch, be sure to turn the power off.

Item \ SW. No	2	3
No taper control	ON	ON
External reel diameter calculation method	ON	OFF
Internal reel diameter calculation method	OFF	ON
No taper control	OFF	OFF

Setting for taper control method

Language \ SW. No	5	6
English	ON	OFF
Chinese	OFF	OFF
Japanese	ON	ON
	OFF	ON

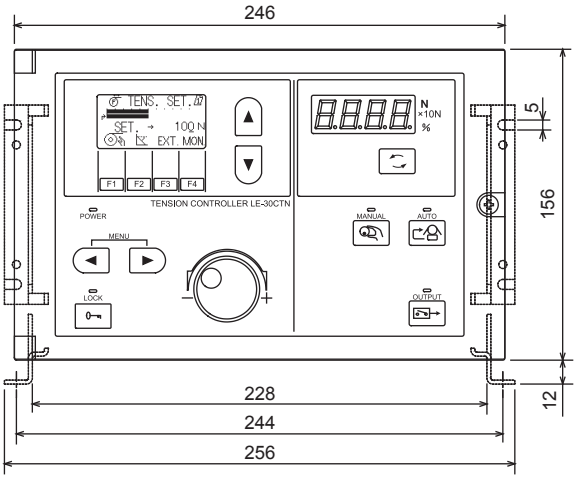
Setting for language

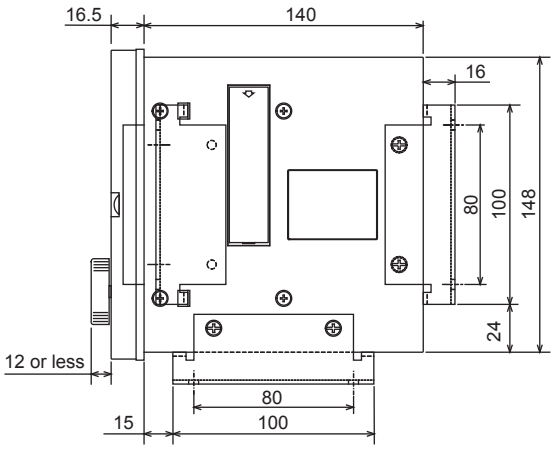
⚠ WARNING

- Before DIP switch setting, cleaning or retightening terminals, cut off all phases of the power supply externally. Failure to do so may cause electric shock.

4.2 Outside Dimensions

The figure below shows the outside dimensions.





Unit: mm
Mass: Approximately 3.5 kg
Outer coating color: Munsell 7.5Y 7.5/1

5. Mounting

INSTALLATION PRECAUTIONS

⚠ WARNING

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.
  Failure to do so may cause electric shock or damage to the product.

⚠ CAUTION

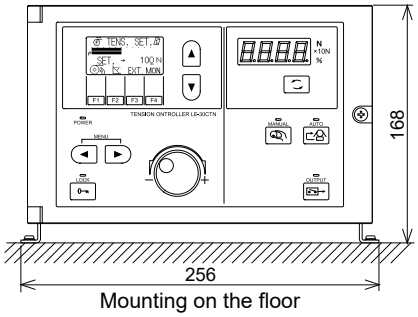
- Use the product within the generic environment specifications described in this manual.
  Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl_2, H_2S, SO_2 or NO_2, etc), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind.
  If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.
- Do not touch the conductive parts of the product directly.
  Doing so may cause device failures or malfunctions.
- Install the product securely using mounting screws.
- Install the product on a flat surface.
  If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformities.
- When drilling screw holes or wiring, make sure that cutting and wiring debris do not enter the ventilation slits.
  Failure to do so may cause fire, equipment failures or malfunctions.
- Securely connect I/O cables and power cable to predetermined connectors.
  Otherwise, poor contact may cause malfunction.

5.1 Mounting

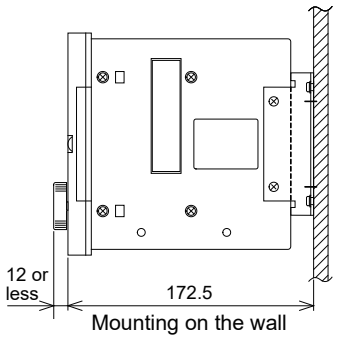
This tension controller can be mounted on the floor, the wall, or to the panel.
This tension controller conforms to CE marking.
For details of conformity with CE marking, refer to the following.

☞ Chapter 16 Compliance with EC Directive (CE marking)

5.1.1 Mounting on the floor and the wall

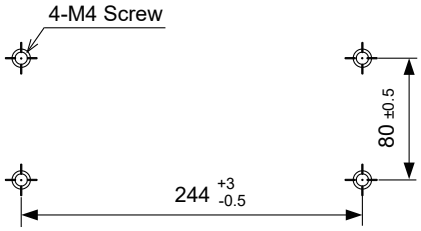


Mounting on the floor

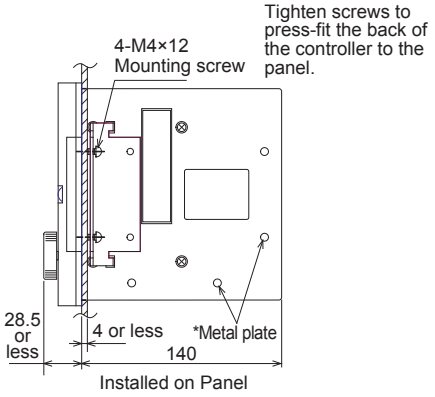


Mounting on the wall

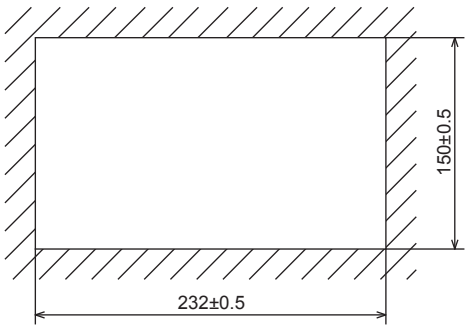
Dimensions of screw holes
for floor or wall mounting.



5.1.2 Mounting to the panel



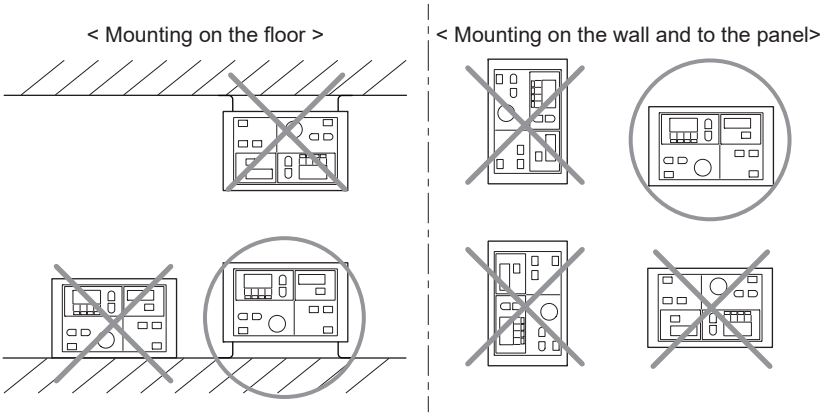
Installed on Panel



Perform grounding (grounding registance 100Ω or less) at either position marked with * in which the main unit mounting plate is not fixed.

5.1.3 Installation direction

To prevent temperature from rising, install the tension controller horizontally.
As shown in the following figure, fix it to the panel with brackets provided as accessories.

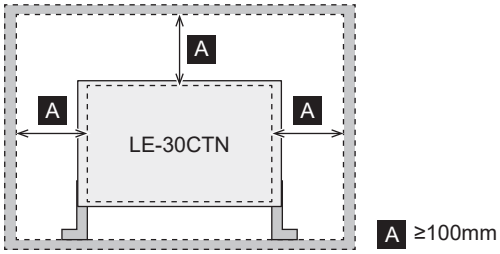


5.1.4 Space required inside the control panel

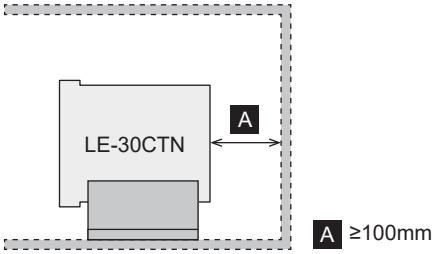
Secure a space of 100mm or more between the LE-30CTN and other devices or structures. If a device is to be added, secure the necessary space on each of the left, right, top, bottom, and rear sides.

Mounting on the floor

<Front>

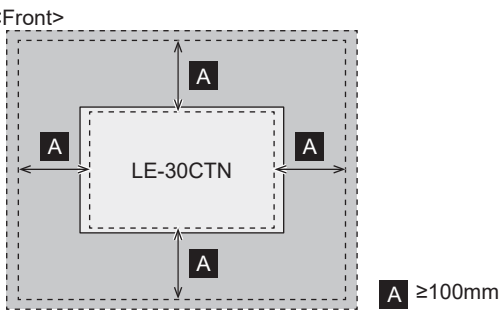


<Side>

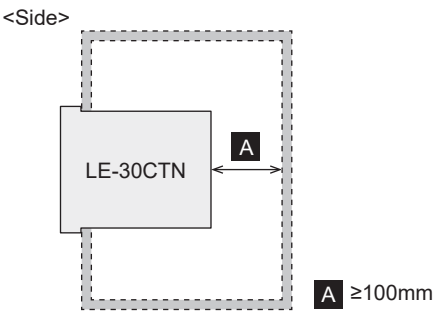


Mounting to the panel

<Front>

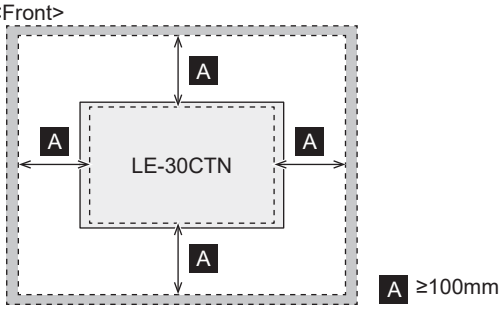


<Side>



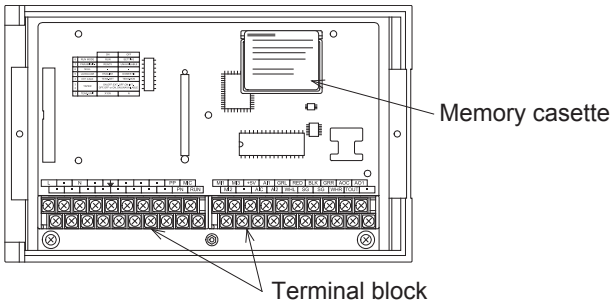
Mounting to the wall

<Front>



5.1.5 Attaching a memory cassette

Attach a FX-EEPROM-4[*1] or FX-EEPROM-8[*1] memory cassette in the following position.



*1. Discontinued

⚠ WARNING

- Make sure to turn OFF the power before attaching or removing equipment.
  Otherwise, failure and malfunction may occur.

6. Wiring

WIRING PRECAUTIONS

⚠ WARNING

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.

⚠ CAUTION

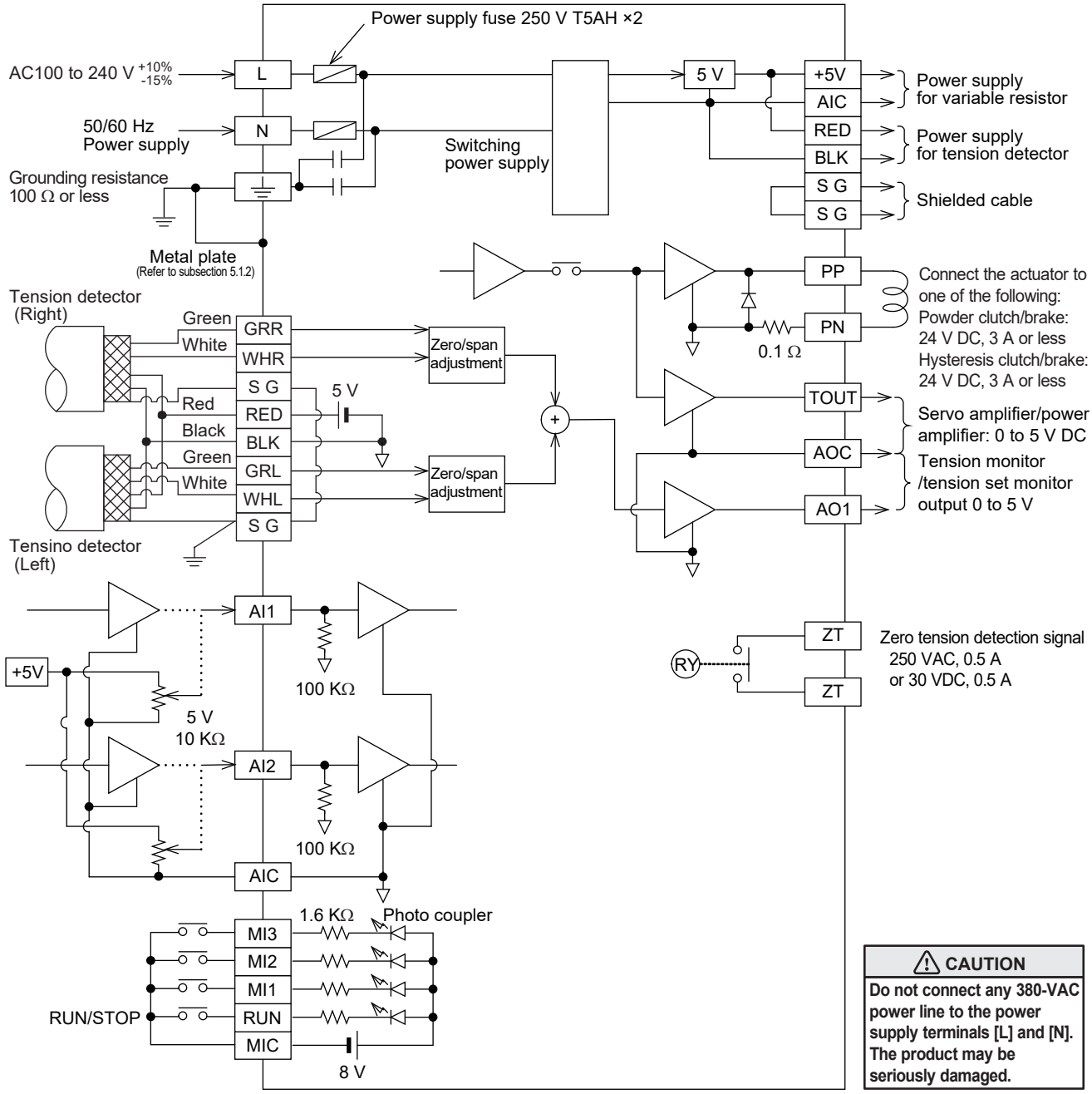
- Connect the power supply wiring to the dedicated terminals described in this manual.
- Do not wire vacant terminals externally. Doing so may damage the product.
- Perform Class D grounding (Grounding resistance: 100Ω or less) to the grounding terminal. Never perform common grounding with a strong electrical system.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits.
- Noise may cause malfunction in the tension controller. Make sure to observe the following items.
  - Keep the power cable and twisted shielded cables away by 100mm or more from the main circuit line, high voltage line and load line. Do not bundle the power cable and twisted shielded cables together with such lines. Otherwise, the power cable and twisted shielded cables can be easily affected by noise and surge induction.
  - Make sure to perform single point grounding on the signal receiving side to the shield of twisted shielded cables. Never perform common grounding with a strong electrical system.
- Make sure to properly wire to the terminal block board in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - Treat exposed cable ends to be 9mm.
  - Use an M3.5 crimp terminal for wiring and tighten the terminal with the torque 0.5 to 0.8N•m.
  - Do not connect more than the specified number of wires or electrical wires of unspecified size.
  - Affix the electrical wires so that neither the terminal block nor the connected parts are directly stressed.

6.1 Wiring

Configure the wiring by referring to the external wiring diagram and terminal arrangement.
This tension controller conforms to CE marking.
For details of conformity with CE marking, refer to the following.

☞ Chapter 16 Compliance with EC Directive (CE marking)

6.1.1 External wiring diagram and terminal arrangement

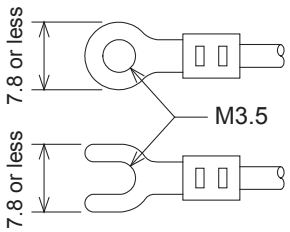


L	•	N	•	⏚	•	ZT	•	PP	MIC
•	•	•	•	•	•	ZT	•	PN	RUN

MI1	MI3	+5V	AI1	GRL	RED	BLK	GRR	AOC	AO1
MI2	•	AIC	AI2	WHL	SG	SG	WHR	TOUT	•

⏚ represents the functional ground terminals.

- Use the crimp terminal with the dimension on the right.
- Make sure to tighten the terminals with torque of 0.5 to 0.8 N•m to prevent any malfunction.
- For input/output cables of analog signals and input cables of winding shaft pulse, use shielded cables and perform Class D grounding at the receiving side.
- Do not pass the input/output cables through the same duct or bundle them together.
- The wiring must be 10 m or shorter for the safety against noises.
- A recommended cable for the input/output wiring is AWG22-14.
- For the powder clutch/brake, use the cable whose size fits the rated current value.
- For the tension detector, use the dedicated cable accompanied with the detector (standard: 7 m, explosion-proof: 20 m).



6.1.2 Wiring of tension detector

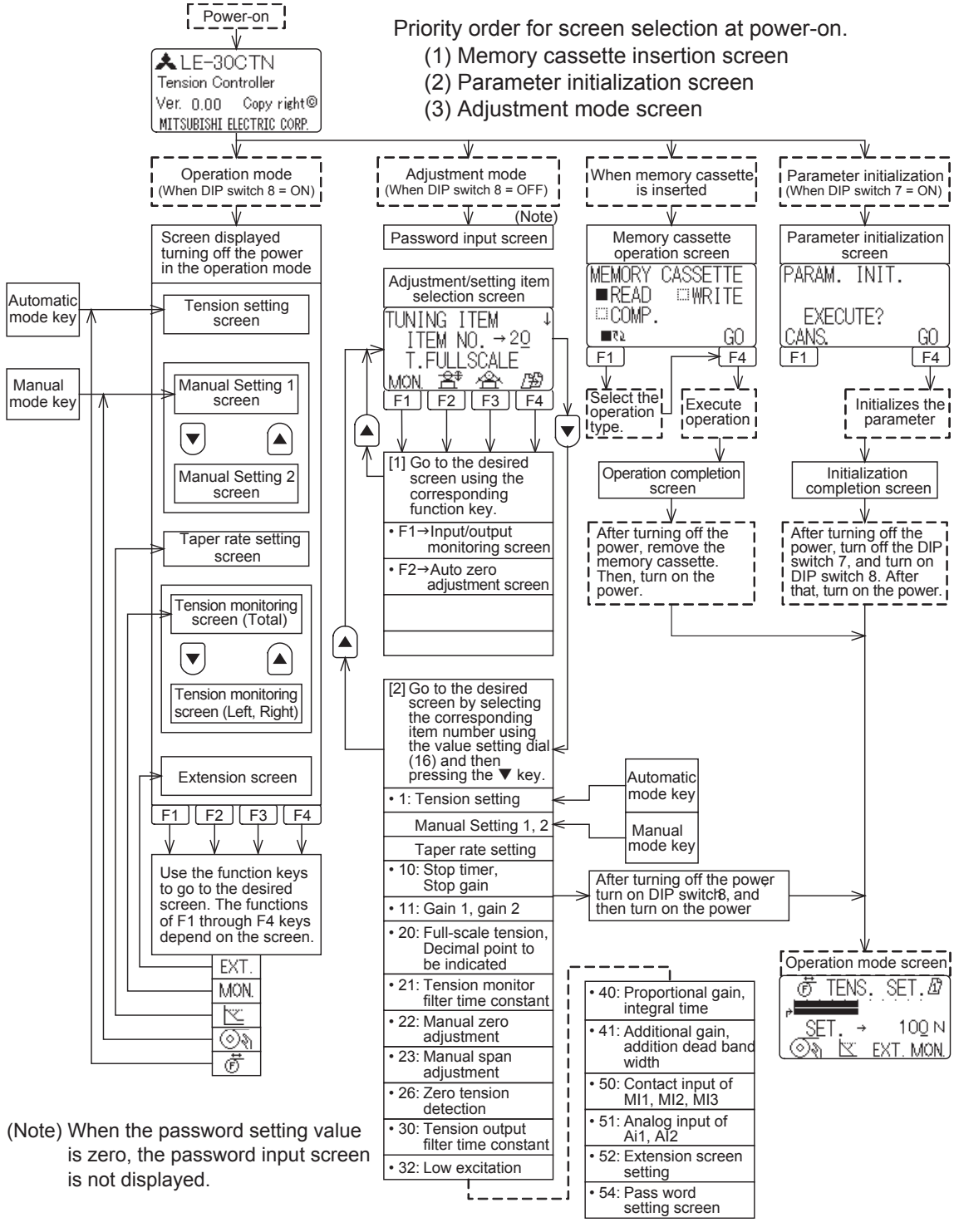
Connect cables of the tension detector referring to the figure above regardless of the load direction (compression or tension).
The load direction is automatically recognized.
When using only one tension detector, short the input terminals (between [GRR] and [WHR], or [GRL] and [WHL]) on the unused side.

7. Screen Structure and Screen Switching Way

7.1 Screen Structure

7.1.1 Overall structure of screens

The following shows the overall structure of the screens displayed on the LCD display. Switch screens by using the function keys (F1 to F4) or the screen selection keys (▲ and ▼).

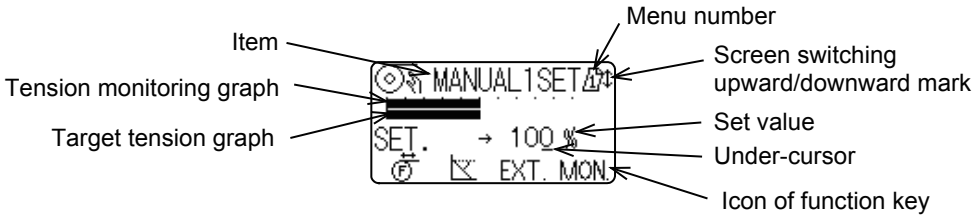


(Note) When the password setting value is zero, the password input screen is not displayed.

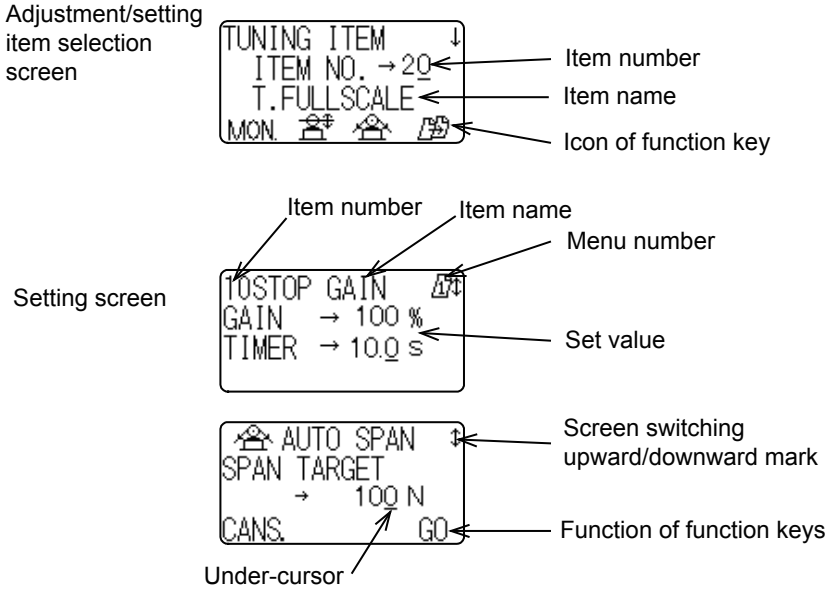
7.1.2 Displayed contents on the screen

The following shows the contents displayed on the LCD display.

(1) Operation mode screen (DIP SW8: ON)



(2) Adjustment mode screen (DIP SW8: OFF)



(a) Tension monitoring graph
Displays the current tension while regarding the full-scale tension as 100 %.

(b) Set tension graph
Displays the set tension in the automatic control mode while measuring the full-scale tension as 100 %.

(c) Menu number
Displays the menu number. This number will appear only if the screen is stored in the menu function memory.

(d) Screen switching upward/downward mark
Displays the [⇕] mark only if the screen selector keys(6) can switch the screen upward and downward.

(e) Under-cursor
Displays the under-cursor only if the set value can be changed. If changing the set value is not possible, this cursor will not displayed.

(f) Icon of function key
This icon indicate screen switching function assign to function key.

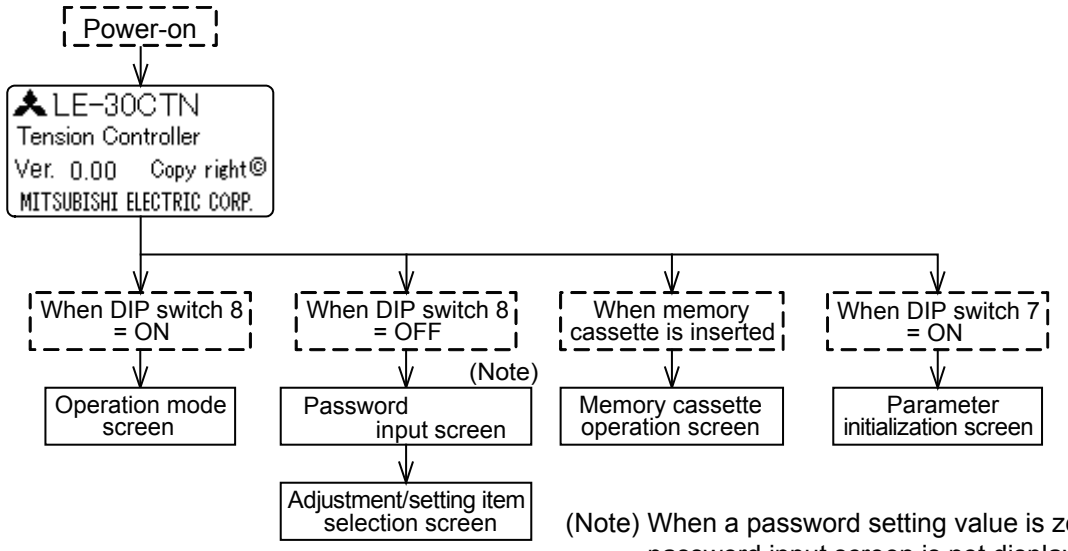
(g) Item number
Displays the corresponding item number.

7.2 Screen Switching Method

7.2.1 Screen when the power supply is ON

- The initial screen displayed just after power-on depends on the memory cassette insertion condition, ON/OFF status of DIP switch 7, and ON/OFF status of DIP switch 8 as shown below.
  - (1) When the memory cassette is inserted. →Memory cassette operation screen
  - (2) When DIP switch 7 is ON. →Parameter initialization screen
  - (3) When DIP switch 8 is OFF. →Adjustment mode screen
  - (4) When DIP switch 8 is ON. →Normal operation mode screen

- If two or more modes are set, the following priority order will be observed to display the screen.
  - [1] Memory cassette operation mode
  - [2] Parameter initialization mode
  - [3] Adjustment mode



(Note) When a password setting value is zero, password input screen is not displayed.

7.2.2 Functions of the function keys

- The four function keys (F1 to F4) are provided under the LCD display. The following functions are assigned to the icon on the LCD display up of the bottom. Pressing a key starts an assigned operation.
- The assigned function differs depending on the screen.

 - - - Moves to the tension setting screen.

 - - - Moves to the manual setting screen.

 - - - Moves to the taper setting screen.

EXT. - - - Moves to the extension screen.

MON. - - - Moves to the tension monitoring screen or input/output monitoring screen.

 - - - Moves to the auto zero adjustment screen.

 - - - Moves to the auto span adjustment screen.

 - - - Moves to the menu copy screen.

GO - - - Execute the operation command.

CANS. - - - Cancels the operation command.

SET. - - - Set the function.

 - - - Switches the selected item.

7.2.3 Screen switching

Switch the screens by either of the following way.

(1) Using the function keys (F1 to F4)
Pressing a function key displays the screens corresponding to the function assigned to the pressed function key.

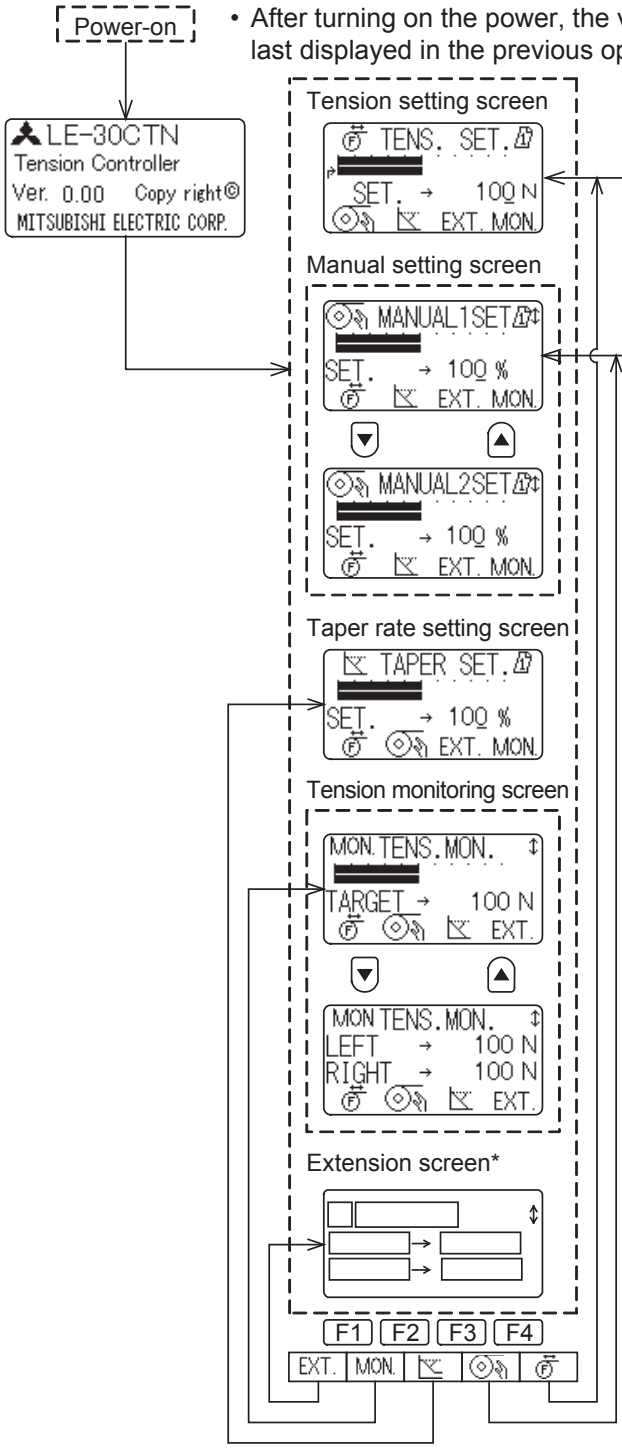
(2) Using the screen selection keys (▲ and ▼)

(a) When a vertical double-headed arrow [⇕] is displayed at the upper right of the screen, the screen can be switched upward or downward with the screen selection key.

(b) When one screen has two types of setting values, the setting item selected is switched.

7.2.4 Operation mode

Turn on DIP switch 8 and turn on the power.



- After turning on the power, the version number will appear, and then the screen last displayed in the previous operation (before turning OFF the power) will appear.

Automatic mode key

- Press the automatic mode selection key to move to the tension setting screen.

Manual mode key

- Press the manual mode selection key to move to the manual setting 1 screen.
- Use the screen selection keys (▲ and ▼ keys) to switch between the manual setting 1 screen and the manual setting 2 screen or between the tension monitoring (total) screen and the tension monitoring (right, left) screen.
- Set the tension or manual output values using the setting dial.
- If “No taper control” is set by the DIP switch, the taper rate setting screen and the icon “ ” will not appear.
- Use the screen selection keys (▲ and ▼ keys) to switch between the manual setting 1 screen and the manual setting 2 screen or between the tension monitoring (total) screen and the tension monitoring (right, left) screen.
- Use the corresponding function key(F1 to F4) to move to the desired screen.

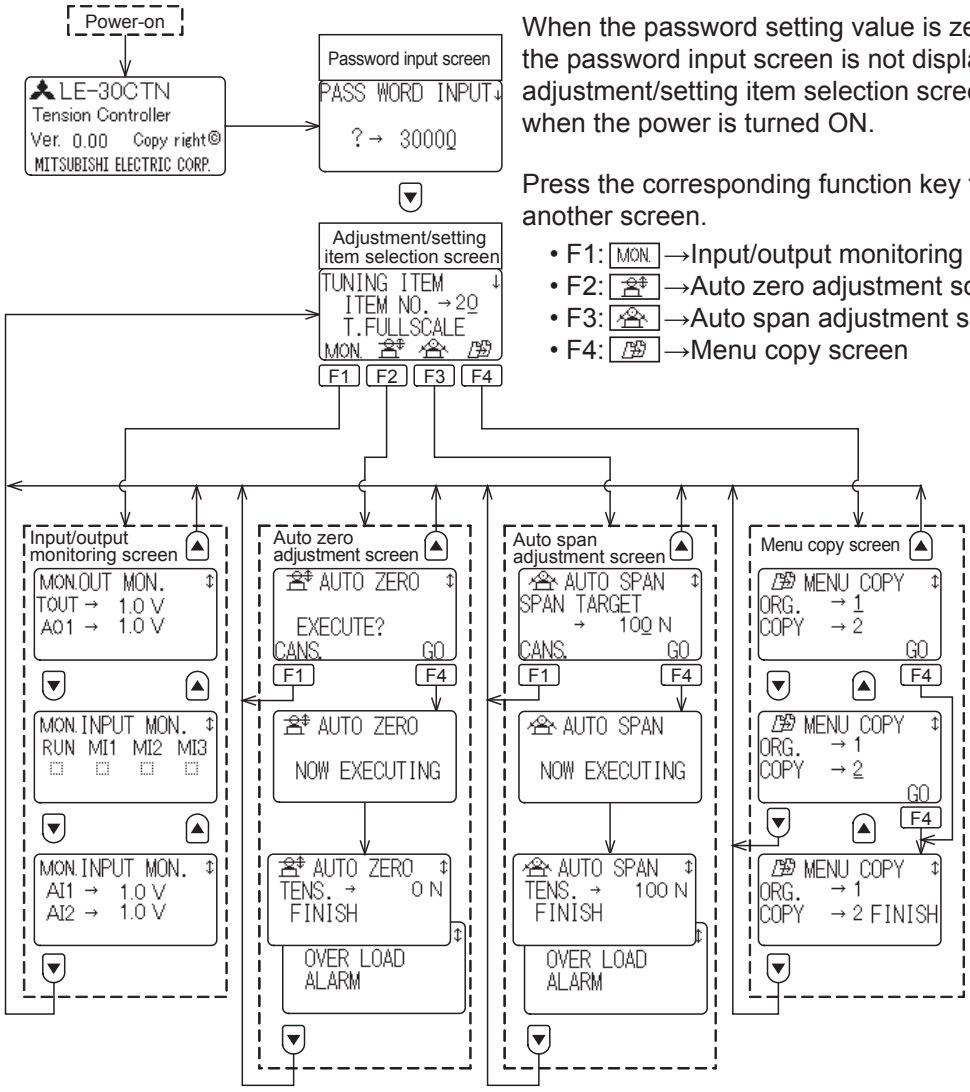
*Extension screen

- The screen set for an extension screen using item number 52 of the adjustment mode.
- When an extension screen is not set, the extension screen and the icon “EXT.” will not appear.

7.2.5 Adjustment mode

Turn off DIP switch 8 and turn on the power.

(1) When using the function keys (F1 to F4) to switch screens



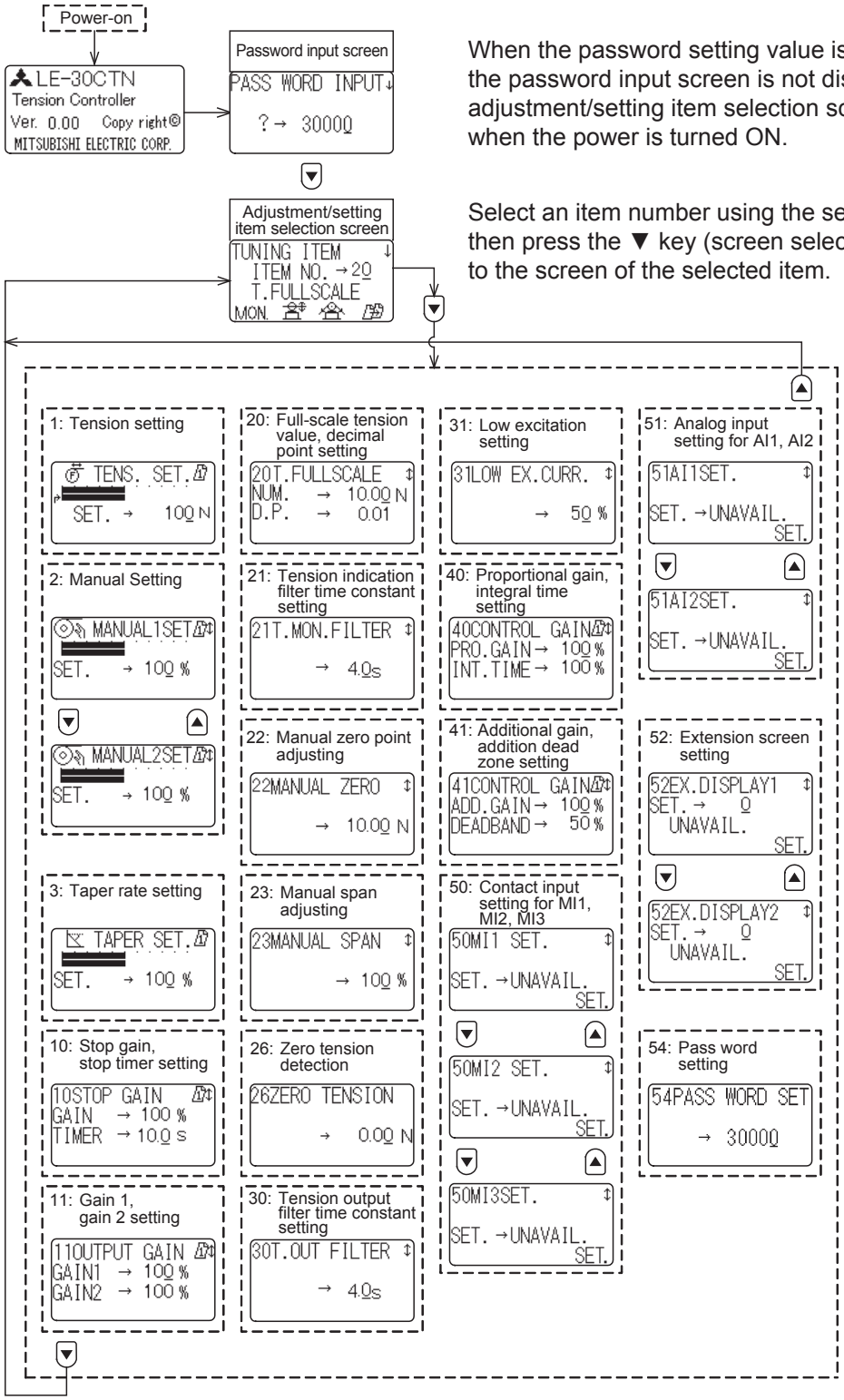
When the password setting value is zero (default), the password input screen is not displayed, and the adjustment/setting item selection screen is displayed when the power is turned ON.

Press the corresponding function key to move to another screen.

- F1: MON. →Input/output monitoring screen
- F2: →Auto zero adjustment screen
- F3: →Auto span adjustment screen
- F4: →Menu copy screen

Switch the screens by using the screen selection keys (▲ and ▼). When a top (bottom) screen in the figure above is displayed, use the ▲ (▼) key to return to the adjustment/setting item selection screen.

(2) When using the item numbers to switch screens



When the password setting value is zero (default), the password input screen is not displayed, and the adjustment/setting item selection screen is displayed when the power is turned ON.

Select an item number using the setting dial, and then press the ▼ key (screen selection key) to move to the screen of the selected item.

(a) Set the setting value using the value setting dial.

(b) When an item has one screen, pressing ▼ or ▲ key returns to the adjustment/setting item selection screen.

(c) When several screens are used for one item, use the ▼ or ▲ key to switch screens. When a top (bottom) screen in the figure above is displayed, use the ▲ (▼) key to return to the adjustment/setting item selection screen.

(d) On the screen for setting several numerical values, pressing the ▲ (▼) key moves the under-cursor among the numerical values, then returns the screen to the adjustment/ setting item selection screen.

8. Adjustment and Initial Setting

8.1 Setting Item List

Setting		Unit	Setting range		Initial Setting	Setting management		Setting during operation	Keylock	Item number
			Minimum	Maximum		Menu	System			
Tension	Tension setting value	N, ×10N	1	Full scale tension	200	✓	N/A	✓	✓	1
	Full-scale value	N, ×10N	1	2000	500	N/A	✓	N/A	✓	20
	Decimal point	-	0.01, 0.1, 1		1	N/A	✓	N/A	✓	
	Zero point tuning	-	0	0	0	N/A	✓	N/A	N/A	24
	Span adjustment target value	N, ×10N	1 to full scale tension (One third or more of the full scale value is required).		500	N/A	✓	N/A	N/A	25
	Manual zero point adjusting	N, ×10N	-999	+999	0	N/A	✓	N/A	✓	22
	Manual span adjusting	%	50	300	100	N/A	✓	N/A	✓	23
	Zero tension setting	N, ×10N	0	2000	0	✓	N/A	✓	✓	26
Tension display filter time constant		s	0.2 to 4.0		2.0	N/A	✓	✓	✓	21
Tension output filter time constant		s	0.2 to 4.0		2.0	N/A	✓	✓	✓	30
Manual output setting 1		%	0	100	20	✓	N/A	✓	✓	2
Manual output setting 2		%	0	100	20	✓	N/A	✓	✓	
Taper rate (internal calculation method)		%	0	80	0	✓	N/A	✓	✓	3
Taper rate (external signal method)		%	0	100	0	✓	N/A	✓	✓	
Gain 1		%	5	400	100	✓	N/A	✓	✓	11
Gain 2		%	5	400	100	✓	N/A	✓	✓	
Stop gain		%	5	400	100	✓	N/A	✓	✓	10
Stop timer		%	0.0	30.0	0.0	✓	N/A	✓	✓	
Low excitation setting value		%	0	50	0	N/A	✓	✓	✓	31
Control gain	Proportional gain	%	0	100	50	✓	N/A	✓	✓	40
	Integral time	%	1	100	50	✓	N/A	✓	✓	
	Additional gain	%	0	100	0	✓	N/A	✓	✓	41
	Dead band width	%	0	50	50	✓	N/A	✓	✓	

Setting		Unit	Setting range		Initial Setting	Setting management		Setting during operation	Keylock	Item number
			Minimum	Maximum		Menu	System			
Selection item	MI1 contact input setting	-	• Output memory • Output ON/OFF • Manual output 1 • Manual output 2 • Output gain 1 • Output gain 2		Not set	N/A	✓	N/A	✓	50
	MI2 contact input 50 setting				Not set	N/A	✓	N/A	✓	
	MI3 contact input setting				Not set	N/A	✓	N/A	✓	
	AI1 analog input setting	-	• Tension setting signal • Taper rate setting signal • Winding diameter signal • Manual output setting signal 1 • Manual output setting signal 2 • External tension signal		Not set	N/A	✓	N/A	✓	51
	AI2 analog input setting				Not set	N/A	✓	N/A	✓	
Operation screen additional setting 1		-	10	53	0	N/A	✓	N/A	N/A	52
Operation screen additional setting 2			10	53	0	N/A	✓	N/A	N/A	
Menu copy		-	Copy sources: 1 to 8		0	N/A	✓	N/A	✓	53
			Copy destinations: 1 to 8		0	N/A	✓	N/A	✓	
Password setting		-	0	30000	0	N/A	✓	N/A	✓	54

*1. The items marked with [✓] in the [Menu] column of setting management can be memorized and read using the menu function.

*2. The items marked with [✓] in the [System] column of setting management can be set only in the adjustment mode.
Those items cannot be set in the other modes.

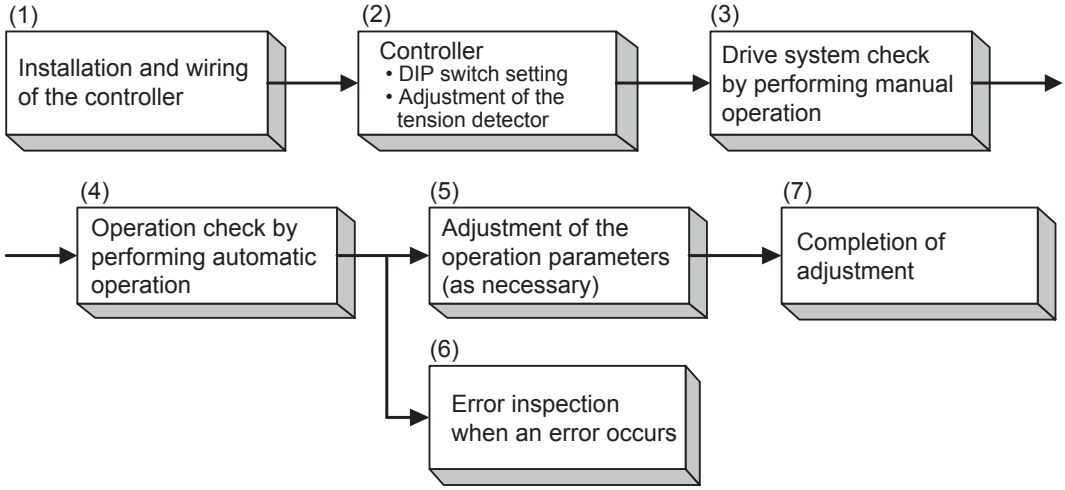
*3. The items marked with [N/A] in the column of setting during operation cannot be changed when the Run/Stop signal [RUN] is ON.

*4. The keylock function can be enabled for the items marked with [✓] in the [Keylock] column.

*5. The setting items may not be displayed depending on the DIP switch setting.

8.2 Flowchart of Test Run and Adjustment

Perform the following startup adjustments as preparation for automatic operation.



(1) Installation and wiring of the controller

☞ Chapter 5 Mounting

☞ Chapter 6 Wiring

(2) Controller

(a) DIP switch setting

(b) Adjustment of the tension detector

☞ Section 8.4 Adjustment of Tension Detector

(3) Drive system check by performing manual operation

☞ Subsection 8.5.1 Operation check for drive system in manual operation

(4) Operation check by performing automatic operation

☞ Subsection 8.5.2 Operation check in automatic operation

(5) Adjustment of the operation parameters (as necessary)

(6) Error inspection when an error occurs

☞ Chapter 15 Troubleshooting

(7) Completion of adjustment

8.3 Password Setting

In adjustment mode, a password can be set for displaying the adjustment/setting item selection screen. When a password is set, turning on the power in adjustment mode (turning on the power the DIP switch 8 OFF) displays the password input screen. The screen does not switch to the adjustment/setting item selection screen unless the password set on the setting screen is input.

8.3.1 Password setting

Setting a password (Item number: [54])

(1) In adjustment mode (turn OFF the DIP switch 8 and turn ON the power), select item number [54] to set a password.

(2) When setting a password is not required, do not change the initial setting value (= 0).

(a) Set item number [54], then press the ▼ key on the adjustment/ setting item selection screen.

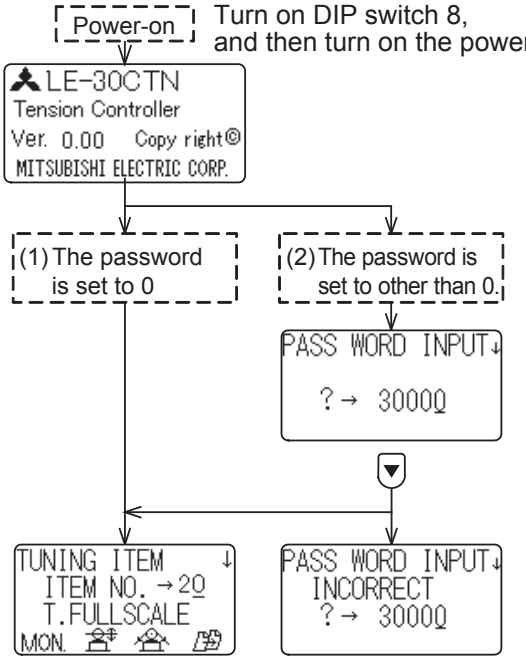
(b) Set a numerical value on the password setting screen. Setting range: 0 to 30000 (initial setting value = 0)

(3) As a password, "4095" is initially set. After value set in the above procedure, "4095" becomes valid as the password.

8.3.2 Switching to the adjustment mode screen

(1) When no password has been set (the initial value 0 is set), turning ON the power in adjustment mode (DIP switch 8 is OFF) displays the adjustment/setting item selection screen.

(2) When values other than 0 are set as password, turning ON the power in adjustment mode (DIP switch 8 is OFF) displays the password input screen. The screen does not switch to the adjustment/setting item selection screen unless the password set on the password setting screen is input.



(a) When no password has been set (the initial value 0 is set)
The adjustment/setting item selection screen is displayed, and each adjustments and settings are available.

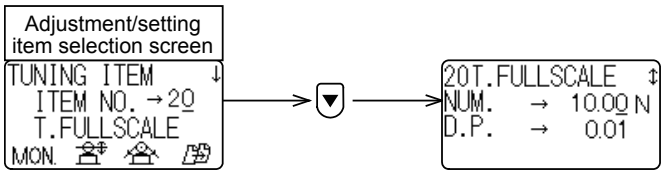
(b) When values other than 0 are set as password
The password input screen is displayed. Input the password set on the password setting screen then press the ▼ key.
- When the correct password is input, the adjustment/setting item selection screen is displayed and each adjustment and setting is available.
- When the wrong password is input, [INCORRECT] is displayed. Input the correct password, then press the ▼ key.

8.4 Adjustment of Tension Detector

8.4.1 Setting the tension full scale value and decimal point

Setting the tension full scale value and decimal point (Item number: [20])

- Set the maximum tension value of the controller and decimal point for tension display. The tension full scale value must be larger than the actual maximum tension. (approximately 1.2 to 1.5 times larger than the actual maximum tension)
- The tension full scale value set here corresponds to the maximum value for the tension setting of the analog input signal and for the tension monitoring/tension setting monitoring.
  Analog input signal (AI1 and AI2): Input voltage = 0 to 5 V, setting tension = 0 to full scale value
  Output signal (AO1): Output voltage = 0 to 5 V, monitor value = 0 to full scale value
- Setting range
  Tension full scale value: 1 to 2000 (N, × 10N) (initial setting = 500)
- Decimal point: 0.01, 0.1, 1 (initial setting = 1)
- Set the tension full scale value considering the tension unit set with the DIP switch 1 (N, or ×10N) and the actual maximum tension value.
- Setting method
  In the adjustment mode (turn OFF the DIP switch 8 and turn ON the power), select item number [20] to set the items in the following screen.



Using the value setting dial, set the item number to [20], and then press the ▼ key.

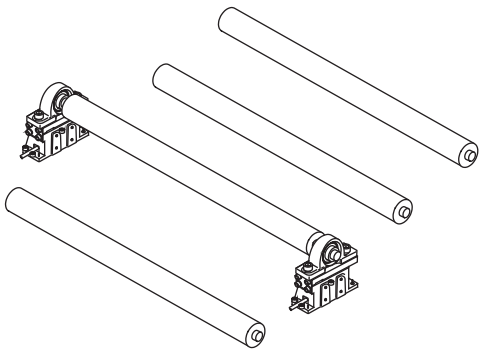
Using the ▲ or ▼ key, move the under-cursor to the desired item, and then set the value using the value setting dial.

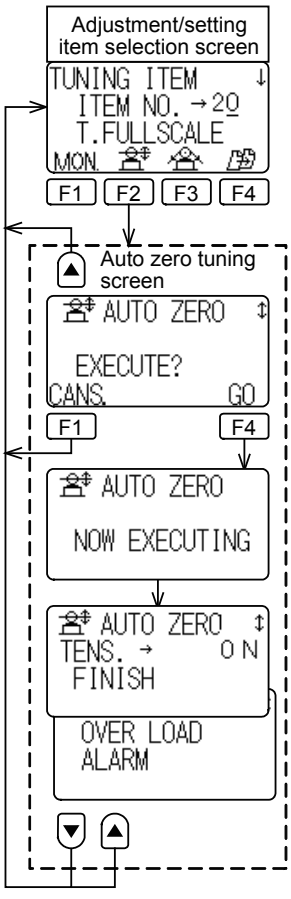
* When the setting value of the tension full scale is changed, adjust zero point and span.

8.4.2 Adjustment of zero point and span for the tension detector

Turn OFF DIP switch 8, then turn ON the power to activate adjustment mode.

(1) Zero point adjustment of the tension detector
Correct tare weight of the detection roller and bearing.
Before the zero point adjustment, check that the detection roll is assembled and materials are not being passed.





(a) Press the function key [F2] to switch the screen to the auto zero adjustment screen.

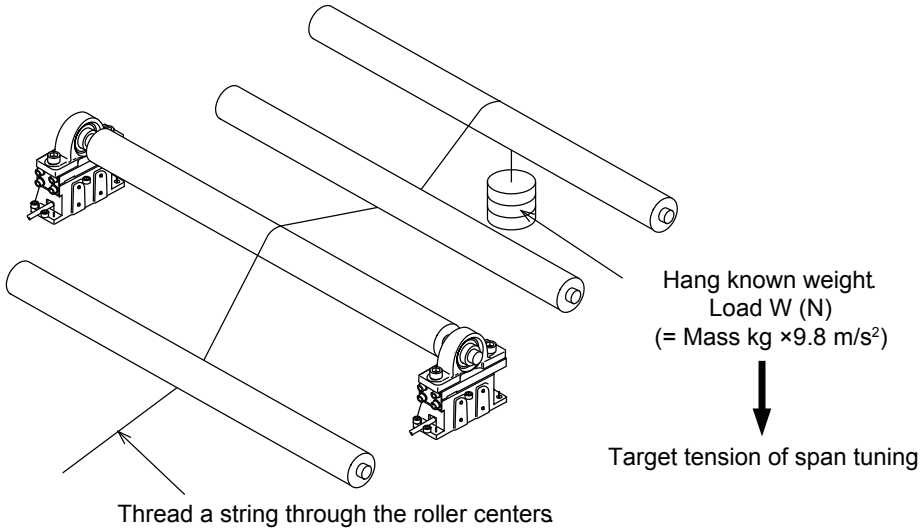
(b) Press the [GO] key [F4] while materials are not being passed and tare weights of the detection roller and bearing are applied.

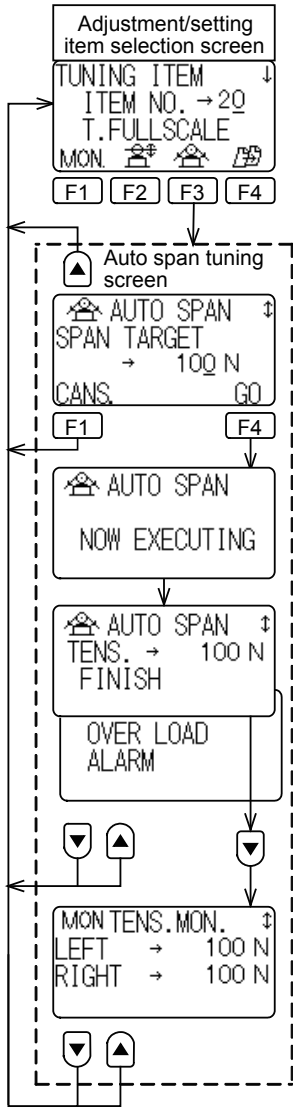
(c) [NOW EXECUTING] is displayed for approximately two seconds.

(d) [FINISH] or an error message is displayed.
When an error message is displayed, refer to the following to check errors.

☞ Chapter 15 Troubleshooting

(2) Span adjustment of the tension detector
The load to the tension detector caused by the material tension depends on the installation angle of the detector and the angle of the material. Therefore, adjust span to correct the load.





(a) Press the function key [F3] to switch the screen to the auto span adjustment screen.

(b) Hang a weight whose load W (N) is known on the detection roll.
Set a static load which is near the tension full scale value as much as possible (set a static load of one third to 100 % of the tension full scale and within 20 to 80 % of the rated load of the tension detector at tension full scale).

(c) Input the value equivalent to the load W (N) and press the [GO] key [F4].
(Example) When a weight of 10 kg is hanged, multiple 10 by 9.8 m/s^2 (gravitational acceleration) and input the result 98 (N).

If the load changes during the adjustment, the adjustment may fail or a margin of error may occur.

(d) [NOW EXECUTING] is displayed for approximately two seconds.

(e) [FINISH] or an error message is displayed.
When an error message is displayed, refer to the following to check errors.

☞ Chapter 15 Troubleshooting

8.5 Automatic Operation Confirmation

After the tension full scale setting and the zero point and span adjustments of the tension detector have been completed, all the basic settings for automatic operation are finished.
Turn ON DIP switch 8 (operation mode) and check the basic operation in the following procedures.

8.5.1 Operation check for drive system in manual operation

(1) Turn ON the power.
→ The power indicator lamp lights up.

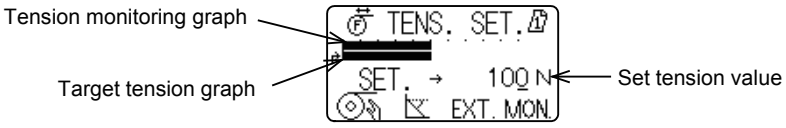
(2) Press the manual control mode key to activate manual mode.
→ The MANUAL indicator LED lights and the manual setting 1 screen is displayed.

(3) Operate the machine and change the setting value of the manual output with value setting dial to check the operation.
   (a) Check the operation status of the machine.
   (b) The tension monitoring graph of the LCD display and the monitor value of the monitor display change corresponding to the change of the setting value.
   (c) Other operations

8.5.2 Operation check in automatic operation

(1) Turn ON the power.
→ The power indicator lamp lights up.

(2) Press the automatic control mode key to activate automatic mode.
→ The AUTO indicator LED lights and the tension setting screen is displayed.



(3) Operate the machine and turn ON the [RUN] input signal to start automatic operation and change the tension setting value with the value setting dial to check the operation.
   (a) The tension monitoring graph of the LCD display becomes equivalent to the target tension graph.
   (b) The tension setting value of the LCD display becomes equivalent to the tension monitor value of the monitor display.
   (c) Each display varies corresponding to the change of the setting value.
   (d) Others

POINT

When using automatic operation, turn ON or OFF the [RUN] input signal corresponding to the status of the machine (running or stopping).
If the [RUN] input signal remains ON, the material tension becomes too high when the operation is restarted, and the material may be damaged.

9. Operation and Function of Automatic Operation

The basic settings for automatic operation are completed by Adjustment and Initial Setting.
The following describes the operations and functions at operating and stopping. Set and use each function as required.

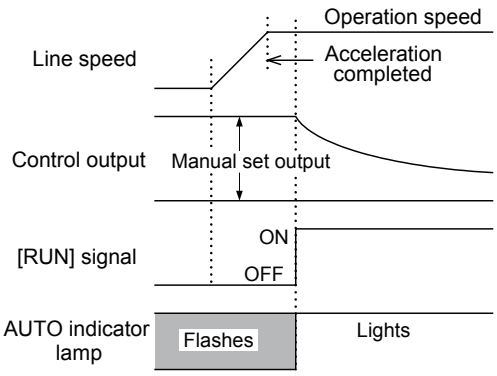
9.1 Operation at Run or Stop

9.1.1 Operation at machine start

- Turn ON or OFF the [RUN] input signal corresponding to the status of the machine (run or stop).
- When the [RUN] signal is OFF, either the manual setting output or the memory output is generated.

  ☞ Section 9.2 Output Setting at Stopping
- In automatic control mode, when the [RUN] input signal is turned from OFF to ON, the automatic operation starts from the value that is output just before the signal was turned ON and continues while the [RUN] input signal is ON.
- At start of the machine operation, turning on the [RUN] input signal after the machine acceleration is completed fixes the output and reduces the tension fluctuation caused by acceleration at startup. Refer to the right figure.
- The similar operation is available by using the function of manual output 1.

  ☞ Subsection 10.1.2 General contact signal



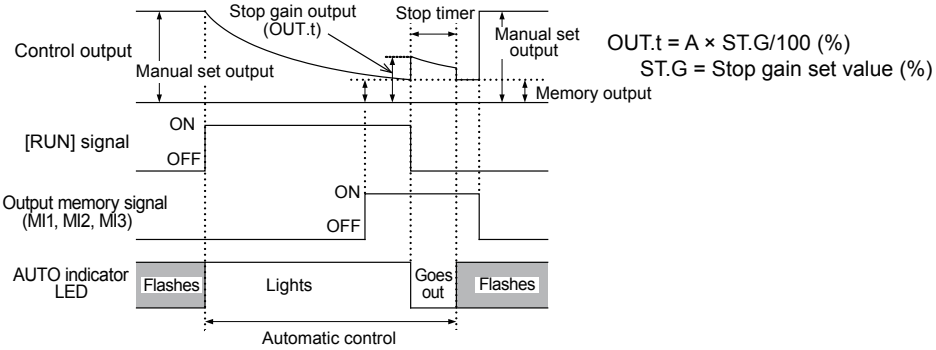
9.1.2 Operation at stopping

At stop of machine operation, activate the stop timer and stop gain to reduce the tension fluctuation caused by the inertia of the winding reel.

- When the [RUN] input signal is turned from ON to OFF during the automatic operation, the stop timer starts operating at the moment the signal turns OFF.
- At the moment when the stop timer is activated, the output is multiplied by the following value.
  "Output value just before the [RUN] contact is turned off" × "stop gain set value"
  Then, the automatic control will continue for the time set on the stop timer starting from this multiplied value.
- After operation of the stop timer is completed, the memory output (the output just before the [RUN] input signal is turned OFF) or the manual setting 1 or 2 output is generated corresponding to the ON/OFF status of the output memory signal (assigned to MI1, MI2, or MI3).

☞ Section 9.2 Output Setting at Stopping

- The AUTO indicator LED and MANUAL indicator LED are not lit while the stop timer is operating.
- The stop timer does not operate during the manual operation (while the manual control mode key is pressed)



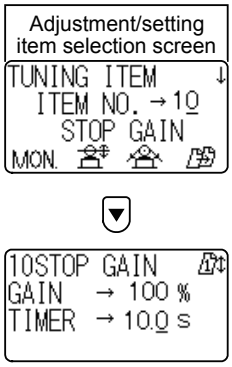
- The control output right after the stop timer has started operating is described with the following formula. (The maximum value is 100 %).

  OUT.t = A × ST.G/100 (%) OUT.t = The control output right after the stop timer starts (%)
  A = The control output just before the stop timer starts (%)
  ST.G = The setting value of the stop gain (%)

9.1.3 Setting of the stop timer and stop gain

Setting of the stop timer and stop gain (Item number: [10])

- In adjustment mode (turn OFF DIP switch 8 and turn ON the power), select item number [10] to set the stop timer and stop gain.
- When the inertia compensation at stop is not required, do not change the initial setting value.



(1) Set item number [10], then press the ▼ key on the adjustment/setting item selection screen.

(2) Setting range
  (a) Stop gain: 5 to 400 % (initial setting value = 100 %)
  (b) Stop timer: 0 to 30 seconds (initial setting value = 0)

- Set the stop gain to 100 % or more for winding and 100 % or less for unwinding.

9.2 Output Setting at Stopping

9.2.1 Switching manual output 1 and 2

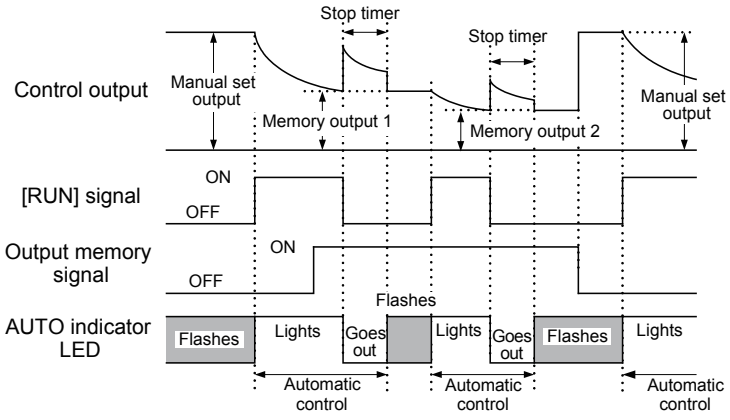
- When the [RUN] signal is OFF, the setting value of manual setting 1 is output.
- When the manual output 2 switching signal is input, the setting value of manual output 2 is output.
- Assign the function of the manual output switching signal to the contact input terminal (MI1, MI2, and MI3) of item number [50] in adjustment mode.

☞ Subsection 10.1.2 General contact signal

9.2.2 Output memory function

- When the [RUN] input signal is turned from ON to OFF while the output memory signal is ON, the output value just before the [RUN] input signal is turned OFF is stored and this stored value is output while the [RUN] input signal is OFF after operation of the stop timer is completed.
- When the [RUN] input signal is repeatedly turned ON and OFF while the output memory signal is ON, the stored value is overwritten every time the [RUN] input signal is turned OFF.
- The stored value is not reset when the power is turned OFF.
- When the power is turned ON while the output memory signal is ON, the stored output value is output.
- When the [RUN] input signal is turned from OFF to ON while the output memory signal is ON, the automatic control restarts from the stored output value.
- When the output memory signal is turned OFF, the setting value of manual setting 1 or 2 is output when the [RUN] input signal is OFF.
- Assign the output memory signal function to the contact input terminal (MI1, MI2, and MI3) of item number [50] in adjustment mode.

☞ Subsection 10.1.2 General contact signal



9.2.3 Proper situation for using the manual output and output memory signal

The proper situation for using the manual output and the output memory signal are as follows.

- When starting the operation from the initial diameter after the winding reel is replaced, start the operation from the manual setting value after turning OFF the output memory signal.
  In this case, the manual setting value is output corresponding to the initial diameter (the maximum diameter for winding and the minimum diameter for unwinding).
- When the machine is stopped and restarted without replacement of the winding reel, the operation is restarted from the stored value by the output memory function.

9.3 Correction at Acceleration/Deceleration

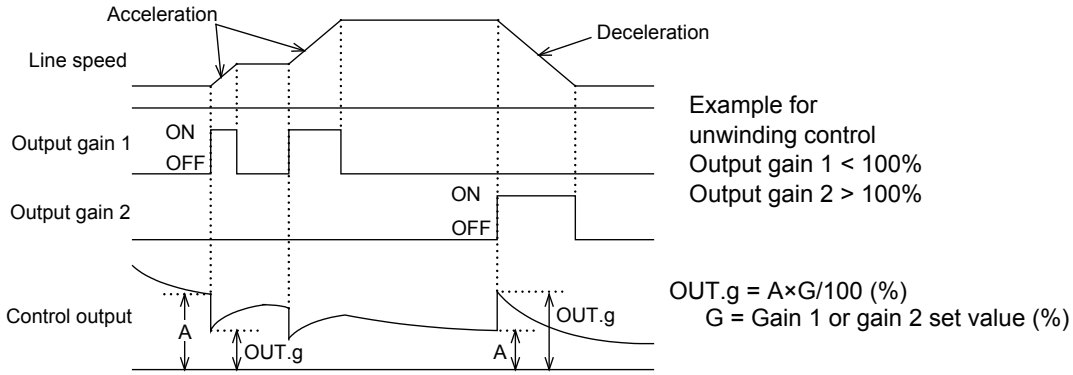
9.3.1 Operations of gain 1 and 2

Use the function of gain 1 and 2 to reduce the tension fluctuation caused by inertia of materials at rapid acceleration/deceleration of the machine.

- When either of output gain 1 or 2 signal is turned ON during automatic control, output at the moment when the signal is turned ON is generated corresponding to the setting value of gain 1 and 2. After that, automatic control is continued based on this output value.
- Assign the output gain 1 and 2 signal function to the contact input terminal (MI1, MI2, and MI3) of item number [50] in the adjustment mode.

☞ Subsection 10.1.2 General contact signal

- The functions of gain 1 and 2 do not function during manual operation.
- When the inertia compensation for acceleration/deceleration is not required, this setting is not required.



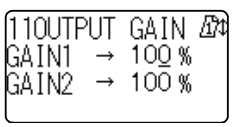
- The control output right after the gain 1 or 2 signal is turned ON is described with the following formula. (The maximum value is 100 %).
  OUT.g = A × G/100 (%)
  OUT.g = The control output generated right after the gain signal is turned ON (%)
  A = The control output generated just before the gain signal is turned ON (%)
  G = The setting value of the gain 1 or 2 (%)

9.3.2 Setting of gain 1 or 2

Setting of gain 1 or 2 (Item number: [11])

- In adjustment mode (turn OFF DIP switch 8 and turn ON the power), select item number [11] to set gain 1 or 2.
- When the inertia compensation for acceleration/deceleration is not required, do not change the initial setting.

Adjustment/setting item selection screen



(1) Set item number [11], then press the ▼ key on the adjustment/setting item selection screen.

(2) Setting range
  (a) Gain 1: 5 to 400 % (initial setting value = 100 %)
  (b) Gain 2: 5 to 400 % (initial setting value = 100 %)

9.4 Taper Control Function

9.4.1 Taper control

- Taper tension control (taper control) changes the operating tension corresponding to the change of the reel diameter.
- The taper control is mainly used for winding control. The purpose is to reduce the operating tension at unwinding materials according to the increase of the reel diameter to prevent the materials from being wound too tight or too loose.
- Provide the reel diameter signal with either of the following two methods.

(1) Internal reel diameter calculation method

(a) In automatic control, the control output to keep the tension constant is proportional to the reel diameter.
The controller estimates the reel diameter from this proportional relation assuming that the increase of the control output is the increase of the reel diameter.

(b) This method does not require the reel diameter signal, but friction on the machine side (mechanical loss) or the torque characteristic change of the actuator affects the machine operation.

(2) External reel diameter calculation method
The analog voltage signal that is proportional to the reel diameter is externally input.
The taper control that is proportional to the reel diameter is available.

9.4.2 Selecting the resource of diameter to taper control

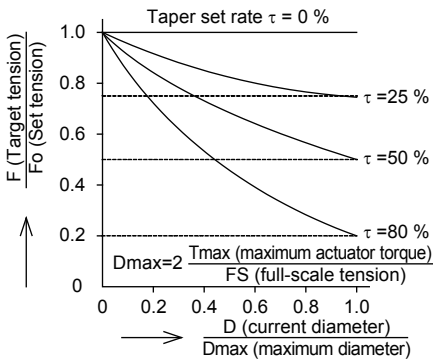
Select either of the internal reel diameter calculation method or external reel diameter calculation method and whether to use taper control or not using DIP switch 2 and 3.

Item \ SW. No	2	3
No taper control	ON	ON
External reel diameter calculation method	ON	OFF
Internal reel diameter calculation method	OFF	ON
No taper control	OFF	OFF

9.4.3 Internal reel diameter calculation method

Refer to the right figure for the tension characteristic.

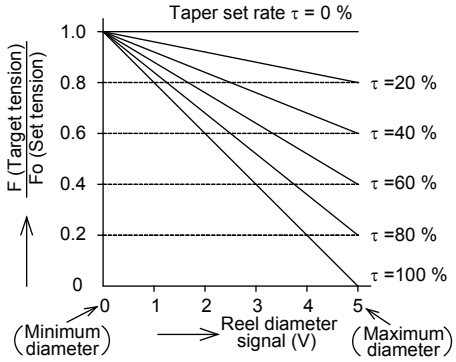
- The target tension is reduced according to the increase of the reel diameter assuming the tension for the reel diameter of 0 mm (virtual reel diameter) as 100 % (setting tension).
  The winding is started from the reel diameter larger than 0 mm, thus the target tension at the start of the winding is smaller than the setting tension.
- The target tension is reduced according to the reel diameter calculated from the formula on the right assuming torque of the actuator generated when the control output of the tension controller is 100 % as [Tmax].



9.4.4 External reel diameter calculation method

- Signals of 0 to 5 V are input to the input terminal (AI1 or AI2) to which the function of the reel diameter signal is assigned corresponding to the minimum diameter (diameter at the beginning of winding) to the maximum diameter (fully loaded roll).
- Target tension varies corresponding to the reel diameter signal as shown in the right diagram (linear characteristic).
- Assign the function of the reel diameter signal to the AI1 or AI2 terminal by item number [51] in adjustment mode.

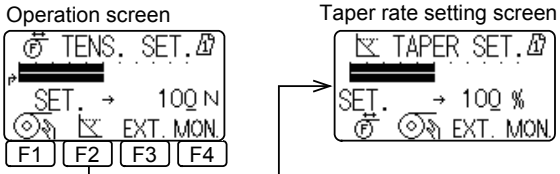
☞ Section 10.2 Analog Input Signal



9.4.5 Setting the taper rate

- Set the taper rate using either of the following way.

(1) Setting the taper rate in the taper rate setting screen
On the normal operation mode screen, press the function key to which [ ] is assigned to switch the screen to the taper rate setting screen. Then set the taper rate with the value setting dial.



(ex.) From tension setting screen in automatic operation mode to taper rate setting screen.

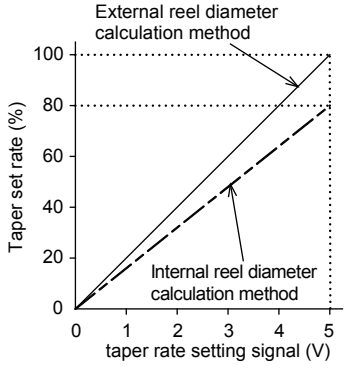
(2) Setting the taper rate with the external analog voltage signal

(a) When the function of the taper rate setting signal is assigned to AI1 or AI2, the taper rate can be set with this signal.
- The input voltage in the internal reel diameter calculation method is 0 to 5 V, thus the taper rate is 0 to 80 %.
- The input voltage in the external reel diameter calculation method is 0 to 5 V, thus the taper rate is 0 to 100 %.

(b) Assign the function of the reel diameter signal to the AI1 or AI2 terminal by item number [51] in the adjustment mode.

☞ Section 10.2 Analog Input Signal

- After the function of the taper rate setting signal is assigned to AI1 or AI2, the taper rate cannot be set with the value setting dial on the panel.



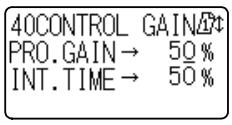
9.5 Adjusting Feedback Control Gain

When the tension is not stable during feedback control, adjust the proportional gain and integral time. When too much time is required for the tension to reach to the target tension at startup or after the tension setting value is changed, adjust the additional gain and addition dead band width.

9.5.1 Proportional gain and integral time

Proportional gain and integral time (Item number: [40])

- When the tension is not stable during the automatic control, adjust the proportional gain and integral time to adjust the control gain.
  - (1) Proportional gain
    - (a) The output value is corrected in proportion to the deviation between the target tension and the actual tension value.
    - (b) When a larger value is set to the proportional gain, the tension reaches the target tension earlier, but hunting occurs more easily.
    - (c) Setting range: 0 to 100 % (initial setting value = 50 %)
    - (d) For the change of +12 %, the output correction is doubled.
  - (2) Integral time
    - (a) Set the temporal responsiveness against the deviation between the target tension and actual tension value.
    - (b) When a smaller value is set, the responsiveness improves more, but hunting occurs more easily.
    - (c) When a larger value is set, the control is more stable, but the responsiveness at startup or after the tension setting value is changed becomes worse.
    - (d) Setting range: 0 to 100 % (initial setting value = 50%)
    - (e) For the change of +12 %, the time constant is doubled.
- Change the integral time and proportional gain gradually and alternately for the adjustment.
- Setting screen



9.5.2 Additional gain and addition dead band width

Additional gain and addition dead band width (Item number: [41])

- When too much time is required for the tension to reach to the target tension at startup or after the tension setting value is changed, adjust the additional gain and addition dead band width. (Usually, the initial value is not required to be changed).

  (1) Additional gain

  (a) The additional gain is added to the proportional gain when the current tension value is outside the range of the addition dead band width against the target tension.

  (b) When a larger value is set, the time required for the tension to fall within the range of the addition dead band width can be shorter. However, a too large setting value may cause hunting. Adjust the setting value, addition dead zone width, and the proportional gain to keep proper responsiveness.

  (c) Setting range: 0 to 100 % (initial setting value = 0 %)

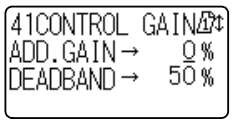
  (2) Addition dead band width

  (a) Set the deviation between the current tension value and the target tension for switching the proportional gain.

  (b) When a smaller value is set, the time required to add the additional gain to the proportional gain increases and the responsiveness improves more, but hunting occurs more easily.

  (c) Setting range: 0 to 50 % (initial setting value = 50 %)

- Setting screen



10. Function of I/O Signal

10.1 Contact Input Signal

10.1.1 Run/stop signal

Run/Stop signal: [RUN] - [MIC]
- Turn ON or OFF the signal corresponding to the status of the machine (running or stopping).
- Turning ON the [RUN] input signal in the automatic control mode starts automatic operation.
- Refer to the following for the operations corresponding to this signal.

☞ Section 5.1 Mounting

POINT

When using automatic operation, turn ON or OFF the [RUN] input signal corresponding to the status of the machine (run or stop).
If the [RUN] input signal remains ON, the material tension becomes overmuch when the operation is restarted, and failure may occur including damage of the material.

10.1.2 General contact signal

General contact signal: ([MI1], [MI2], [MI3]) - [MIC]
- The general contact signal (MI1, MI2, and MI3) can be assigned to either of the following signals in adjustment mode (Item number: [50]).
- When the following signals are not used, the setting with item number [50] is not required.

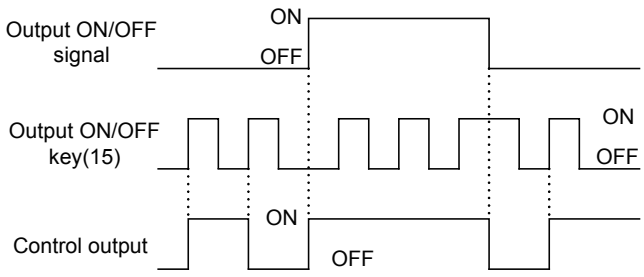
(1) Output memory signal
A signal which memorizes the output at which the [RUN] input signal is turned OFF.

☞ Subsection 9.2.2 Output memory function

(2) Output gain 1 and output gain 2 signals
A signal which corrects the tension fluctuation caused by the inertia of the winding reel at the acceleration/deceleration.

☞ Section 9.3 Correction at Acceleration/Deceleration

(3) Output ON/OFF signal
(a) Turning ON this signal generates the control output regardless of the ON/OFF status of the output ON/OFF key on the panel.
(b) Turning OFF this signal activates the output ON/OFF key on the panel. Pressing the output ON/OFF key turns ON or OFF the control output.
(c) When the control output is ON, the output indicator LED lights.



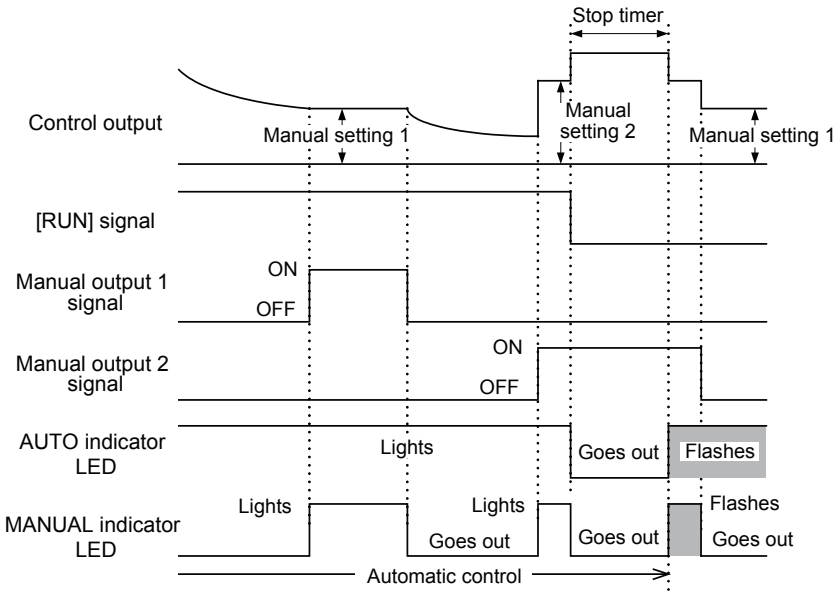
(4) Manual output 1 signal and manual output 2 signal

(a) The output during the manual control is switched to manual output setting 1 or 2 by the external signal.

(b) When this signal is OFF, manual output 1 is activated.

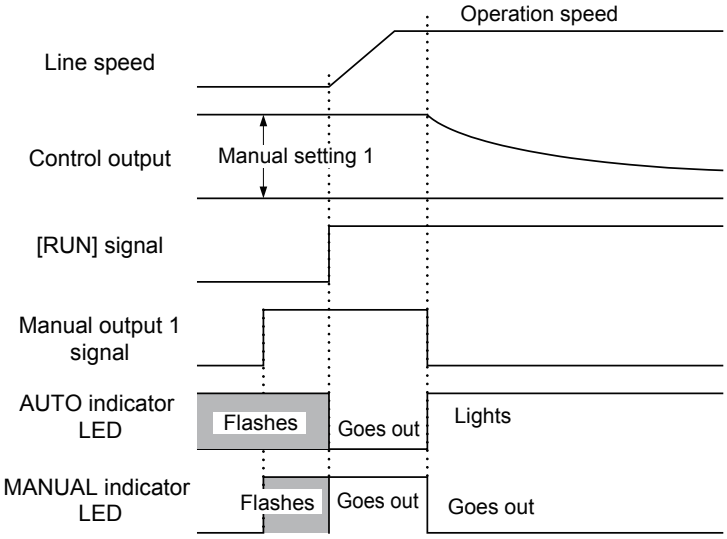
(c) When this signal turns ON during automatic control, the control output is fixed to manual output 1 or 2.

(d) When this signal turns OFF during automatic control, automatic control is started from the output at which the signal turns OFF.



- When starting operation of the machine, turning on the manual output 1 signal and the [RUN] input signal with the following sequence fixes the control output during acceleration and reduces the tension fluctuation caused by acceleration at start.

☞ Subsection 9.1.1 Operation at machine start



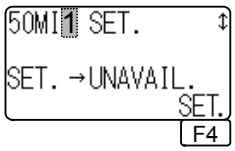
10.1.3 Setting functions

Setting functions (Item number: [50])

- In adjustment mode (turn OFF DIP switch 8 and turn ON the power), select item number [50] to set functions to the contact input signals (MI1, MI2, and MI3).

Adjustment/setting item selection screen

(1) Set item number [50], then press the ▼ key on the adjustment/setting item selection screen.



(2) After selecting either of MI1 to MI3 with the screen selection keys (▲or ▼), turn the value setting dial to select a function then press the [SET.] key ([F4]) to set the function.
When the function which has been already set is specified, "UNAVAIL." is displayed on the function setting screen.

- Turning the value setting dial displays the functions in the following order. Select either one to assign the function.
  - (1) Output memory
  - (2) Output gain 1
  - (3) Output gain 2
  - (4) Output ON/OFF
  - (5) Manual output 1
  - (6) Manual output 2

10.2 Analog Input Signal

10.2.1 Functions of analog input signals

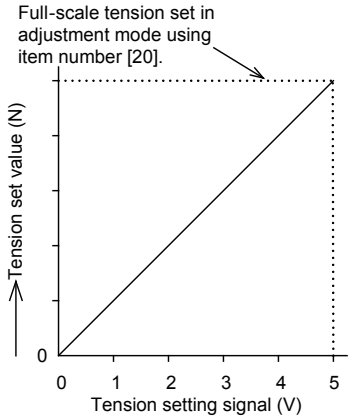
Functions of analog input signals: ([AI1], [AI2]) - [AIC]
The analog input signal (AI1 or AI2) can be assigned to either of the following signals in adjustment mode (Item number: [51]).
When the following signals are not used, the setting with item number [51] is not required.

(1) Tension setting signal

(a) Set the tension at automatic operation by the external analog voltage.

(b) The setting range of the set tension is 0 to the full scale tension corresponding to the input voltage (0 to 5 V).

(c) After assigning the function of the tension setting signal to the AI1 or AI2 terminal, the tension cannot be set with the value setting dial on the panel.

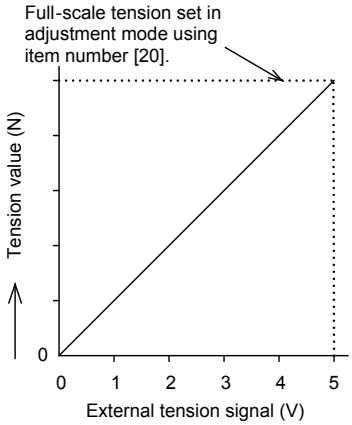


(2) External tension signal

(a) Input a tension signal which is output from other than the LX-TD tension detector.

(b) Input the signal of 0 to 5 V corresponding to the tension of 0 to the full scale tension.

(c) When the function of the external tension signal is assigned to AI1 or AI2, the signal from the tension detector to [GRL] and [WHL], or [GRR] and [WHR] is ignored.

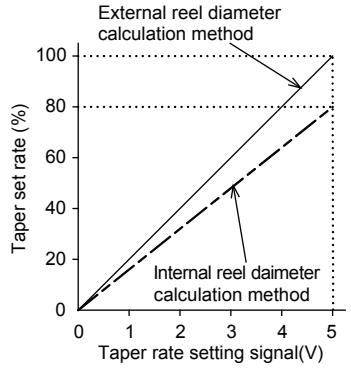


(3) Taper rate setting signal

(a) Set the taper rate at the taper control by the external analog voltage.

- The input voltage in the internal reel diameter calculation method is 0 to 5 V, thus the taper rate is 0 to 80 %.
- The input voltage in the external reel diameter calculation method is 0 to 5 V, thus the taper rate is 0 to 100 %.

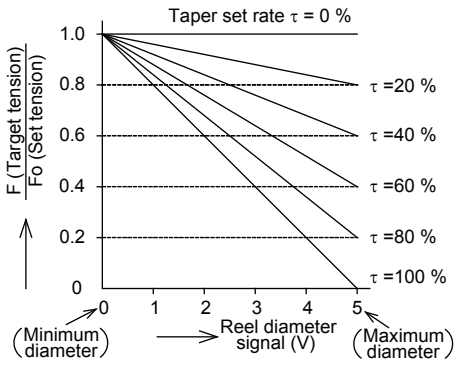
(b) After assigning the function of the taper rate setting signal to the AI1 or AI2 terminal, the taper rate cannot be set with the value setting dial on the panel.



(4) Reel diameter signal

(a) Input the reel diameter signal at the taper control in the external reel diameter calculation method.

(b) Input the signal of 0 to 5 V corresponding to the minimum diameter to maximum diameter.

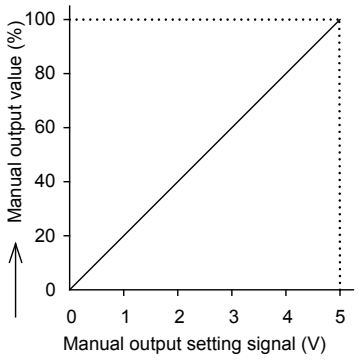


(5) Manual output setting 1 signal and manual output setting 2 signal

(a) Set the manual output by the external analog voltage.

(b) The setting range of the output is 0 to 100 % corresponding to the input voltage (0 to 5 V).

(c) After assigning the function of the manual output setting signal to the AI1 or AI2 terminal, the manual output 1 or 2 cannot be set with the value setting dial on the panel.



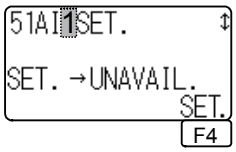
10.2.2 Setting functions

Setting functions (Item number: [51])

- In adjustment mode (turn OFF DIP switch 8 and turn ON the power), select item number [51] to set functions to the analog input signals (AI1 and AI2).

Adjustment/setting item selection screen

(1) Set item number [51], then press the ▼ key on the adjustment/setting item selection screen.



(2) After selecting either of AI1 or AI2 with the screen selection keys (▲or ▼), turn the value setting dial to select the function then press the [SET.] key ([F4]) to set the function.
When the function which has been already set is specified, "UNAVAIL." is displayed on the function setting screen.

- Turning the value setting dial displays the functions in the following order. Select either one to assign the function.

(1) Tension setting signal

(2) External tension signal

(3) Taper rate setting signal

(4) Reel diameter signal

(5) Manual output setting 1

(6) Manual output setting 2

10.3 Output Signals

10.3.1 Control output for clutch/brake

Control output for powder clutch/brakes: [PP] - [PN]
This control output is for the powder clutch/brakes with 24 VDC and 3 A or less.

10.3.2 Control output for power amplifier and AC servo amplifier

Control output for power amplifier and AC servo amplifier: [TOUT] - [AOC]

(1) When using the power clutch/brake with the rated current 3 A or more, input this signal to the power amplifier which satisfies the rated current of the powder clutch/brake, then connect the powder clutch/brake to the output terminal of the power amplifier.

(2) When using a servo amplifier which can be controlled by torque, input this signal to the torque setting input terminal of the servo amplifier.

10.3.3 Output for tension monitoring

Output for tension monitoring: [AO1] - [AOC]

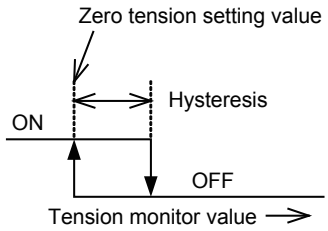
- Output the voltage which is proportional to the target tension value at the automatic control or the material tension value detected by the tension detector.
- Set the signal type with DIP switch 4.
  (1) DIP switch 4 = ON (output for tension setting monitoring)
  (2) DIP switch 4 = OFF (Output for tension monitoring)
- The output voltage (0 to 5 V) corresponds to 0 to the full scale tension setting value.

10.4 Zero Tension Detection Signal

10.4.1 Function of zero tension detection signal

Function of zero tension detection signal: [ZT] - [ZT]

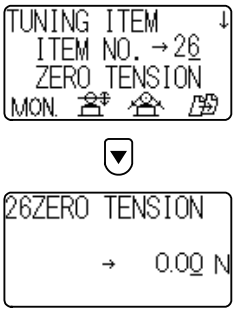
- When other than 0 (initial value) is set to the zero tension setting value, the interval between the output contacts turns ON when the tension monitor value is the zero tension setting value or lower.
- When the setting value is 0 (initial value), the interval is always OFF.
- When the tension increases, the output contact turns OFF when the tension monitor value is [zero tension setting value + hysteresis value] or more.
  Hysteresis value: 1/64 of the tension full scale value
  Minimum value is 5 N.



10.4.2 Setting zero tension detection value

Setting the zero tension detection value (Item number: [26])
In adjustment mode (turn OFF DIP switch 8 and turn ON the power), select item number [26] to set the zero tension detection value.

Adjustment/setting item selection screen

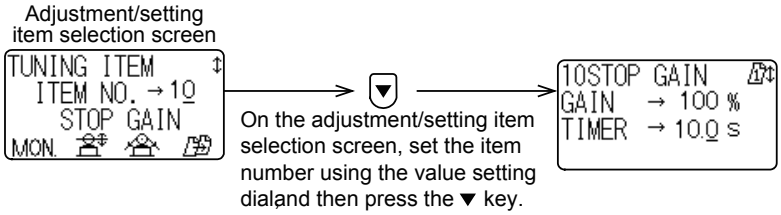


(1) Set item number [26], then press the ▼ key on the adjustment/setting item selection screen.

(2) Setting range: 0 to 2000 N (Initial setting value = 0)
The maximum value is the tension full scale value.

11. Setting Items and Each Functions

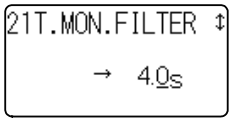
In adjustment mode (turn OFF DIP switch 8 and turn ON the power), select an item number to set the following function.
When the function is unnecessary, the initial setting is not needed to be changed.



11.1 Filter Time Constant Setting

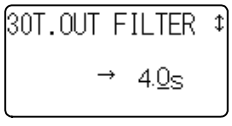
11.1.1 Tension display filter time constant

Tension display filter time constant (Item number: [21])
- Filter setting for the operating tension display to be displayed on the monitor display
- When a larger value is set, the display responds more slowly.
  When the indicated value fluctuates and is difficult to set a large value to the setting value so the indicated value can be read easily.
- Setting range: 0.2 to 4.0 seconds (initial setting value = 2.0 seconds)
- Setting screen



11.1.2 Tension output filter time constant

Tension output filter time constant (Item number: [30])
- Set the filter time constant for the output for tension monitor [AO1] - [AOC].
- Setting range: 0.2 to 4.0 seconds (initial setting value = 2.0 seconds)
- Setting screen

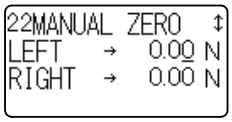


11.2 Zero and Span Adjustments for Tension Detector

11.2.1 Manual zero adjustment

Manual zero adjustment (Item number: [22])

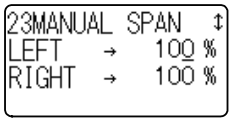
- Misaligned zero point can be adjusted manually when a misalignment occurs after the operation is started.
  The displayed zero point can be adjusted manually.
- The automatic control is performed according to the tension signal from the tension detector to which the correction value is added.
- The adjustment value is reset to zero after executing the automatic zero adjustment or span adjustment.
- Setting range: -1000 to +1000 (N, ×10 N) (initial setting = 0)
- Setting screen



11.2.2 Manual span adjustment

Manual span adjustment (Item number: [23])

- When the automatic span cannot be completed due to an error, such as "OVER LOAD", "LESS LOAD", or "UNBALANCE", the span can be adjusted manually.
- Set the following adjustment value when (Wd) is displayed for the load at the span adjustment (Wt).
  Manual span adjustment value = (Wt/Wd) × 100 %
- The adjustment value is reset to 100 % after executing the automatic zero adjustment or span adjustment is completed.
- Setting range: 50 to 300 % (initial setting = 100 %)
- Setting screen



POINT

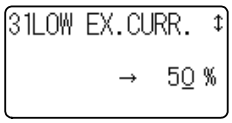
Performing the manual span adjustment allows the test run. However, the problem such as insufficient control accuracy or overload may occur.
Start the operation after solving the problem corresponding to the error display and completing the automatic span adjustment.

11.3 Weak Excitation Setting when Output is OFF

11.3.1 Weak excitation setting when the output is OFF

Weak excitation setting when the output is OFF (Item number: [31])

- This setting enables energizing the powder clutch/brake when the control output is OFF by the output ON/OFF key on the panel or the contact input signal to which the output ON/OFF function is assigned.
- This setting is effective for startup of torque at low revolution or reducing torque hindrance at startup.
- Adjust the weak excitation so that the winding shaft rotates even with the material removed (usually 5 to 10 %).
- Setting range
  Weak excitation setting range: 0 to 50 % (initial setting value = 0 %)
- Setting screen

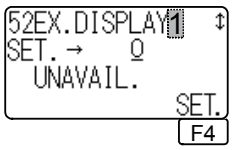


11.4 Extension Screen Setting (Addition of Operation Mode Screen)

11.4.1 Extension screen setting (addition of the operation mode screen)

Extension screen setting (adding the operation mode screen) (Item number: [52])

- Setting the extension screen enables displaying up to two adjustment item setting screens, which can be displayed only in adjustment mode, in the normal operation mode screen.
- A screen where the adjustment item No. is assigned can be set.
- Set a value with the value setting dial and press the [SET.] key to set the screen corresponding to the value.
- When the screen that has been already set is specified, "UNAVAIL." (0) is displayed for the setting.
- Setting screen



- Pressing the function key to which [EXT.] is assigned in the operation mode displays the extension screen.
  When two screens are set, press the screen selection key to switch the displayed screen.
- Icons which indicate the function of the function key are displayed at the bottom of the extension screen.

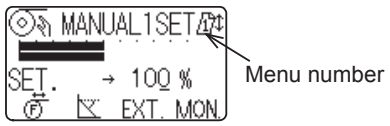
12. Other Functions

12.1 Menu Function

Eight profiles of the operation data can be stored or read and data among the menu number can be copied by using the menu function.
This function is useful for processing materials in different operation conditions.

12.1.1 Switching Menu Number

- Pressing the ► (◄) key of the menu selection keys on the panel increases (decreases) the number of the currently displayed menu. The operation data corresponding to the menu number becomes valid. However, when the menu number is 8, pressing the ► key switches the number to 1, and when the menu number is 1, pressing the ◄ key switches the number to 8.
- The menu number is displayed on the upper right of the LCD display.
  (The menu number is displayed only on the screen whose operation data is stored by the menu function).
- This operation is working under stop situation of [RUN] contact input signal.

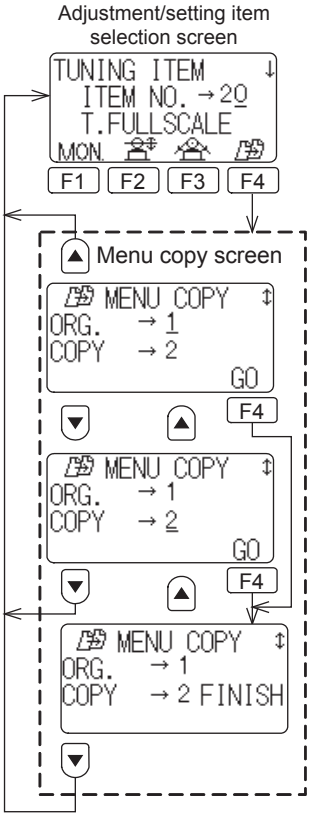


12.1.2 Storing Data

- The items marked with ✓ in the "Setting management - Menu" column of the setting item list can be stored.

  ☞ Section 8.1 Setting Item List
- The data which are displayed on the screen corresponding to the menu number on the screen can be stored.
- Initial setting value is set to each menu number.

12.1.3 Copying data among the menu



(1) Turn OFF DIP switch 8, then turn ON the power to activate the adjustment mode.

(2) Press the function key [F4] to switch the screen to the menu copy screen.

(3) Select the menu number of the copy source (current menu number) with the menu selection keys (► or ◄).

(4) Set the menu number of the copy destination with the value setting dial.

(5) Press the [GO] key ([F4]).

12.1.4 Keyin lock function

Using the keyin lock function prevents the setting value change caused by incorrect operation during operation.
The keyin lock function can be enabled for the items marked with [✓] in the [Keylock] column of the setting item list.

☞ Section 8.1 Setting Item List

(1) Keyin lock way

(a) Display the target item on the LCD display and press the keyin lock key for five seconds or longer.

(b) The keyin lock indicator LED lights during the keyin lock and the under-cursor for changing the setting value is not displayed under the last digit of the setting value.

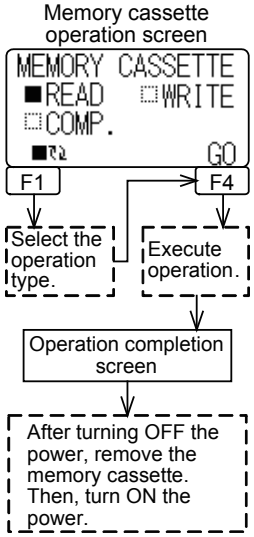
(2) Canceling keyin lock
Pressing the keyin lock key for five seconds or longer again cancels the keyin lock, and the keyin lock indicator LED is unlit.

12.2 Memory Cassette

All setting data except the external input signal can be written, read and compared between the LE-30CTN tension controller and memory cassettes.
Refer to the following for installing the memory cassette.

☞ Subsection 5.1.5 Attaching a memory cassette

12.2.1 How to write, read, and compare data



(1) Install the memory cassette, turn ON the power, and enter the memory cassette operation mode.

(2) Press the function key [F1] to switch the operation contents and determine the operation contents with [■].

(a) READ
Reads the data in the memory cassette to the tension controller.

(b) WRITE
Writes the setting data in the tension controller to the memory cassette.

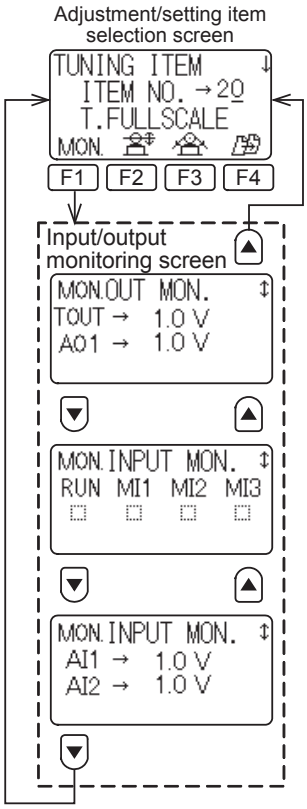
(c) COMP.
Compares the data in the tension controller and in the memory cassette.

(3) Press the [GO] key ([F4]) to execute the operation.

(4) Turn OFF the power and remove the memory cassette.

12.3 Monitoring I/O Signal

In adjustment mode, the input signal status can be monitored on the LCD display. (In operation mode, monitoring is unavailable).



(1) Turn OFF DIP switch 8, then turn ON the power to activate adjustment mode.

(2) Press the function key [F1] to switch the screen to the input/output monitoring screen.

(3) Select the screen of the target item to be monitored with the screen selection keys.

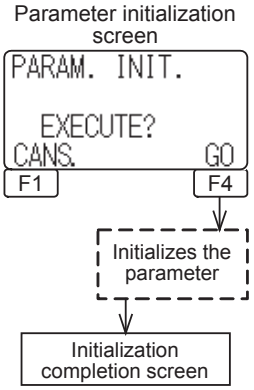
(a) Output signal monitoring screen
Monitors output for control ([TOUT]) and the voltage of the output for the tension monitor and tension setting monitor ([AO1]).

(b) Contact input signal monitoring screen
Monitors the ON/OFF status of the Run/Stop signal [RUN] and the general contact signals [M1], [M2], and [M3]. When the signal is ON, [■] is displayed.

(c) Analog input signal monitoring screen

12.4 Initializing Data to Default

All setting data can be initialized to the factory default.
Note that all the setting data returns to the factory default by performing this function.



(1) Turn ON DIP switch 7 and turn ON the power to start the parameter initialization mode.

(2) Press the [GO] key ([F4]) to execute the initialization.

12.5 AUTO/MANUAL Indicator LED Status

(1) AUTO indicator LED

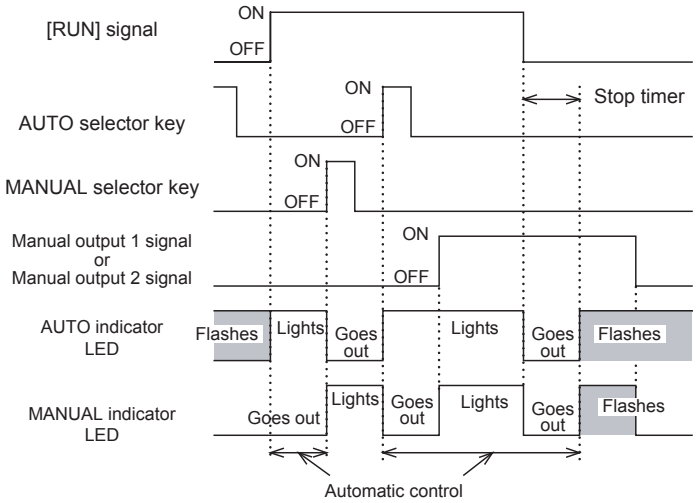
(a) This LED lights during the automatic control mode. This LED is unlit while the stop timer is operating.

(b) This LED flashes when the [RUN] input signal is OFF.

(2) MANUAL indicator LED

(a) This LED lights during the manual control mode or when the manual setting 1 or 2 is output by the external contact signal.
However, this LED flashes when the [RUN] input signal is OFF in the above condition.

(b) This LED is unlit while the stop timer is operating.



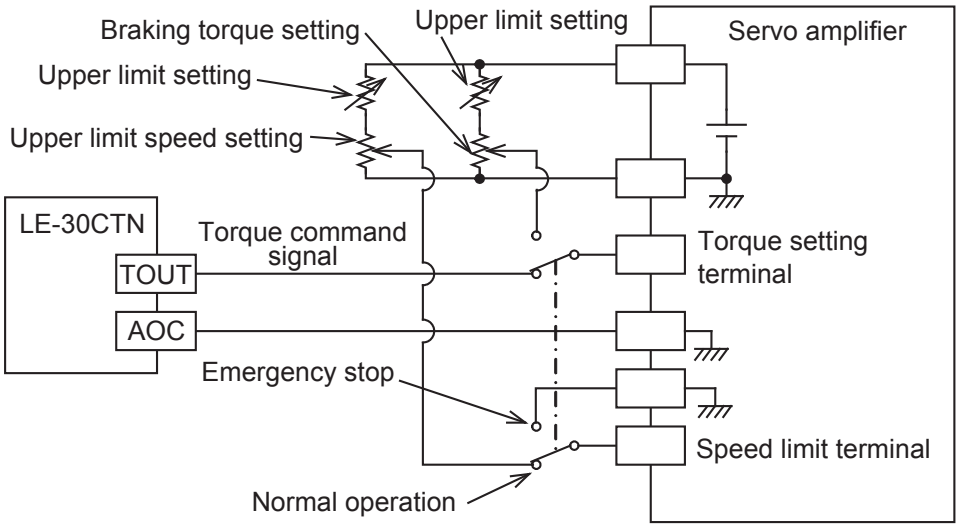
13. Application Example

13.1 When Using Drive Equipment such as AC Servo Motor

Applying control output signal [TOUT] - [AOC] enables the tension controller to be used with the drive equipment such as AC servo motors that enable torque control.

(1) Wiring example
Input the following signals to the torque setting terminal and speed limit terminal.

	Torque setting terminal	Speed limit terminal
During operation and during normal stop	[TOUT] - [AOC] signal of LE-30CTN	Upper speed limit setting signal
Emergency stop	Braking torque setting signal	0V



(2) Setting
Set the following items for the servo motor.

(a) Control mode: Set the torque control mode.

(b) Output torque: Set the output torque of the servo motor at the torque command signal of 5 V as the rated torque.

POINT

- For details of the wiring or setting, refer to the manual of the servo amplifier.
- Consider revolution speed range to be used or torque range to be used necessary for the machine to select the servo motor.

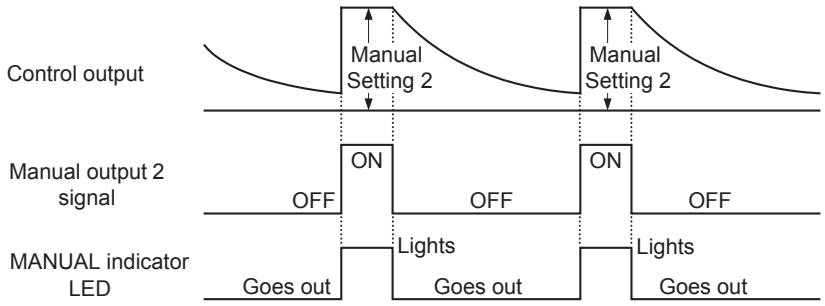
13.2 When Using Two-Axis Switching Control

The function of manual output 2 enables switching in two-axis operation.

(1) Select item number [50] in the adjustment mode and assign the function of manual output 2 signal to the contact input terminals (MI1, MI2, and MI3).

(2) Set manual setting 2 to the optimal output value for when control is switched to the new axis.

(3) Operate manual output 2 signal with the following sequence in automatic control.



[RUN] signal: Keep ON

AUTO indicator LED: Keep lights

(a) When manual output 2 signal is OFF, automatic control is executed.

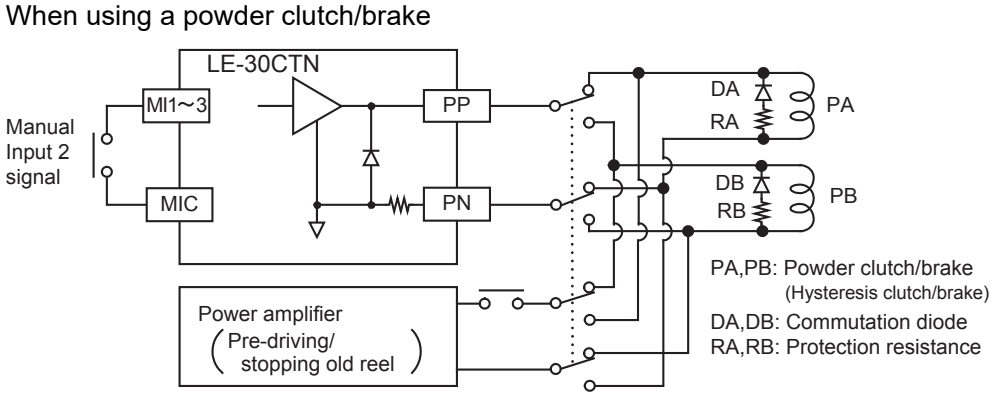
(b) The manual output 2 signal is turned ON when control is switched to the old axis from the new axis.

(c) When the manual output 2 signal is turned ON, the value of the control output is reset to the setting value of manual output setting 2. While manual output 2 is ON, this output value is held.

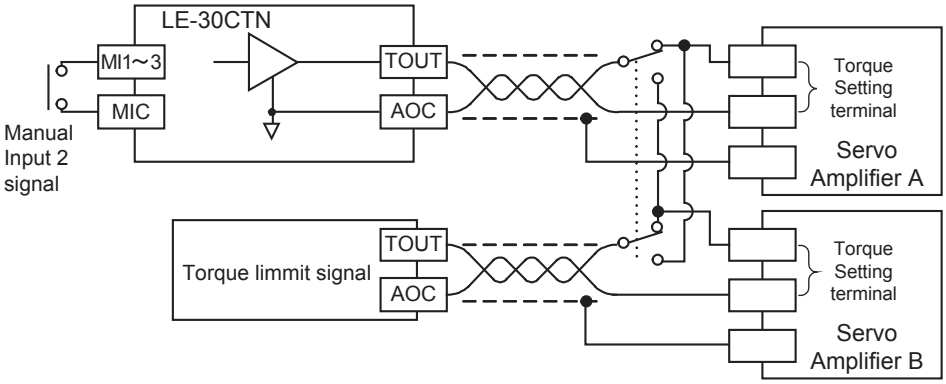
(d) When the manual output 2 signal is turned OFF from ON, the automatic control is restarted from the setting value of manual setting 2.

■ Wiring example

(1) When using a powder clutch/brake



(2) When using an AC servo motor



14. Inspection and Maintenance

14.1 Initial Inspection

14.1.1 Confirmation of selection

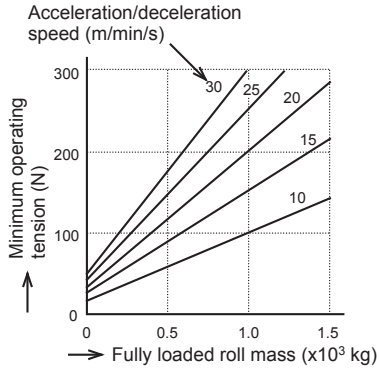
- Confirm that the tension detector, actuator, power amplifier, and servo amplifier are selected properly, before starting the operation.
- The actuator capacity is determined based on the "line speed × operating tension".
- Tension which exceeds the operating tension can be set with the LE-30CTN. However, if such a value is set, the actuator capacity is exceeded and the actuator may be burned out.
  Therefore, confirm that the operator knows the available upper tension and set the operating tension corresponding to the actuator capacity.
- When the tension setting value is too small, tension fluctuation caused by the inertia of materials is excessive against the operating tension at startup/stop or acceleration/deceleration, and the operation becomes difficult.
  Confirm that the operator knows the minimum operating tension.
- In the tension control with the torque control method, the minimum available tension is determined based on the following formula.

$$\frac{f}{W+0.2} > 8.5\ (\frac{v}{t})$$

f : Minimum operating tension (N)

W : Fully loaded roll mass (×10^3 kg)

$(\frac{V}{t})$: Acceleration/deceleration speed (m/min/s)



14.1.2 Check the operation sequence

- Check the operation sequence and the emergency stop sequence.
- Especially when the servo motor is used as the actuator, the operation of the motor becomes unstable if the material is cut. (The motor rotates at the upper limit revolution speed set for the speed limit terminal).
  Set the upper limit speed with the upper speed limit setting signal and set the speed limit input of the motor to zero when the material cut detector detects that material is cut.

☞ Section 13.1 When Using Drive Equipment such as AC Servo Motor

14.1.3 Check the wiring.

- Misconnection of the power supply terminal (pay attention to a phase sequence for the motor system), unintentional contact of the input/output cables and power supply cables, and short-circuit of the output cables cause enormous damage.
- Before turning on the power, make sure that the power and ground are connected correctly and that the input/output cables are wired correctly.
- Do not perform the megger test (measurement of insulation resistance).

14.2 Maintenance and Inspection

14.2.1 Periodic inspection

Inspect the following items carefully.

(1) Make sure that the temperature inside the panel is not abnormally high caused by a heating body or direct sunlight.

(2) Make sure that powder dusts and conductive dusts are not present inside the panel.

(3) Make sure that abnormality in the wiring, loose terminals, and other abnormalities are not detected.

14.2.2 TENSION DETECTORS

Zero adjustment or span adjustment should be executed again at the periodic inspection.
Especially when a used tension detector has a large rated load against the practical tension, the aging deterioration caused by mechanical stress affects considerably the tension detector.

14.3 Cleaning

Wipe off dirt on the tension controller with a dry cloth.

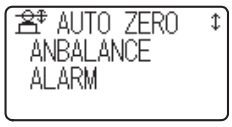
15. Troubleshooting

15.1 Error Display

Take the following corrective actions to solve errors displayed on the LCD display.

15.1.1 During zero adjustment of the tension detector

The tension detector roller may be heavy against the rated load of the detector.
Check the mass of the roller. Reduce the mass of the roller or select a proper tension detector as necessary.



(1) The difference of the signal voltages of the left and right detectors exceeds 50 % of the output voltage of when the rated load is applied to the detector.
Check the specifications of the left and right tension detectors, and check the detectors for core gaps.

(2) When only one detector is used, "ANBALANCE ALARM" may be shown, but this is not an error.
Press the ▼ key. The adjustment is completed.

15.1.2 During span adjustment of the tension detector

The static load applied to the tension detector during span adjustment is too large. The rated load of the tension detector may be small against the operating tension. Check the full scale setting value and the rated load of the detector.

(1) The static load applied to the detector during span adjustment is 30 % or less and it is too small.
Increase the load and perform the adjustment again.

(2) The rated load of the tension detector may be too large against the operating tension.
Check the rated load of the tension detector.

(3) When only one detector is used, press the ▼ key.
The adjustment is completed.

(1) The difference of the signal voltages of the left and right detectors exceeds 50 % of the output voltage of when the rated load is applied to the detector.
Check whether a rope hanging a weight is located at the center of the detector roller, check the specifications of the left and right tension detectors, and check the detectors for errors such as core gaps.

(2) When only one detector is used, "ANBALANCE ALARM" may be shown, but this is not an error.
Press the ▼ key. The adjustment is completed.

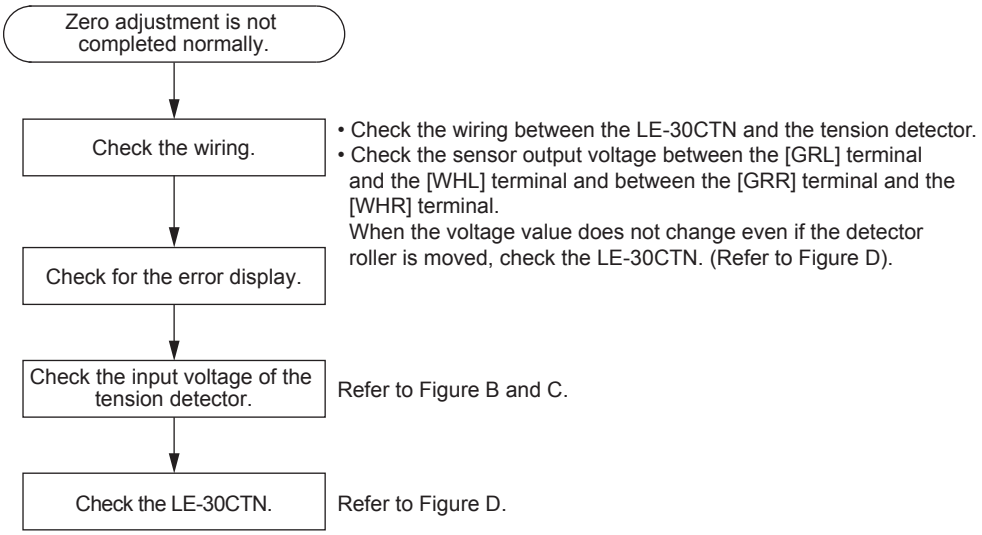
15.2 When the Power Is Not Turned ON or Nothing Is Displayed

Phenomenon	Confirmation item	Countermeasure
100 to 240 VAC power is not supplied to the tension controller.	The 100 to 240 VAC power supply unit does not give output.	Turn ON the switch of the 100 to 240 VAC power supply unit.
		Replace the 100 to 240 VAC power supply unit.
	The voltage between the [L] terminal and the [N] terminal is not within 100 to 240 VAC (-15 % to +10 %).	Wiring between the 100 to 240 VAC power supply unit and the tension controller is bad.
100 to 240 VAC power is supplied to the tension controller.	The voltage of 100 to 240 VAC (-15 % to +10 %) is applied to the voltage between the [L] terminal and the [N] terminal.	The internal fuse is blown out. → Repair is required. The internal power supply circuit is failed. → Repair is required.

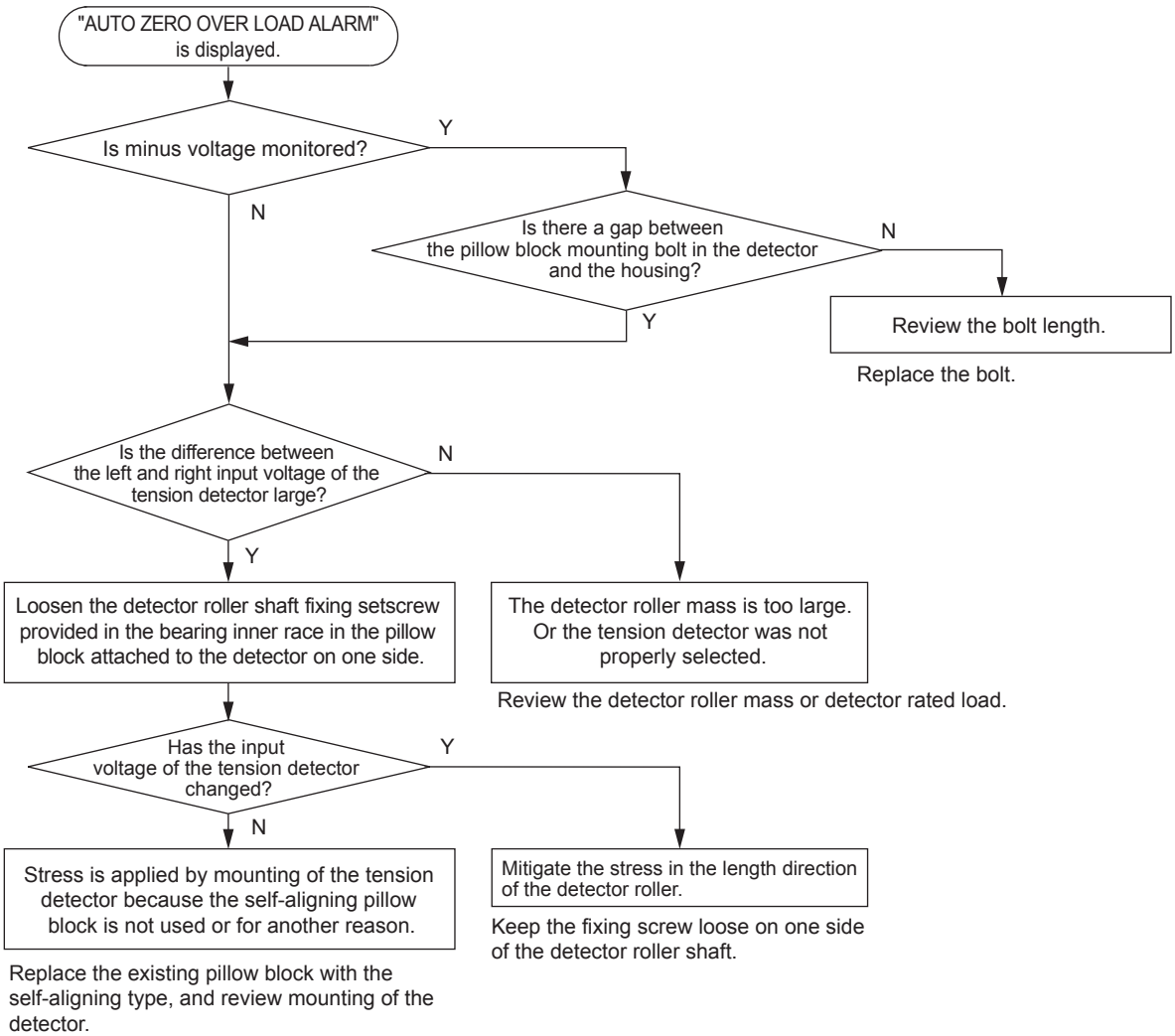
15.3 When Zero Adjustment Is Not Completed Normally

Phenomenon	Confirmation item	Counter-measure
Zero adjustment is not completed normally (Figure A).	• Check the wiring between the LE-30CTN and the tension detector. • Check the sensor output voltage between the [GRL] terminal and the [WHL] terminal and between the [GRR] terminal and the [WHR] terminal. (Connect the plus side of the tester to the [GRL] terminal or the [GRR] terminal, and the minus side to the [WHL] terminal or the [WHR] terminal). When the voltage value does not change even if the detector roller is moved, check the LE-30CTN. • When the voltage value changes by movement of the detector roller, check for the error display.	Figure D
	• When a minus voltage is measured as the input voltage of the tension detector and "AUTO ZERO OVER LOAD ALARM" is displayed, check whether the pillow block mounting bolt is too long and pushing up the pillow block. • When "AUTO ZERO OVER LOAD ALARM" is displayed, the input voltages on the left/right exceed ±120 mV. When there is a difference between the voltage value on the left and the voltage value on the right and the voltage value exceeds ±120 mV only on either side, stress may be applied on the tension detector. Check the mechanical installation of the tension detector (whether self-aligning is effective, and whether expansion and contraction caused by temperature changes in the detector roller are mitigated). When the input voltage is large on both the left and the right, the detector roller mass is too large. Review the rated load and mounting position of the tension detector.	Figure B
	• When "AUTO ZERO UNBALANCE ALARM" is displayed, there is a difference in the input voltage between the left and the right. Check the mechanical installation of the tension detector (whether self-aligning is effective, and whether expansion and contraction caused by temperature changes in the detector roller are mitigated).	Figure C
	• Check whether the voltage is 5 V between the [RED] terminal and the [BLK] terminal of the LE-30CTN. Disconnect the wiring from the terminal block while the power is OFF, and check the voltage again. If 5 V is still output, something is wrong with the tension detector. If 5 V is not normally output while the wiring is not connected, the LE-30CTN power supply may be failed.	Figure D

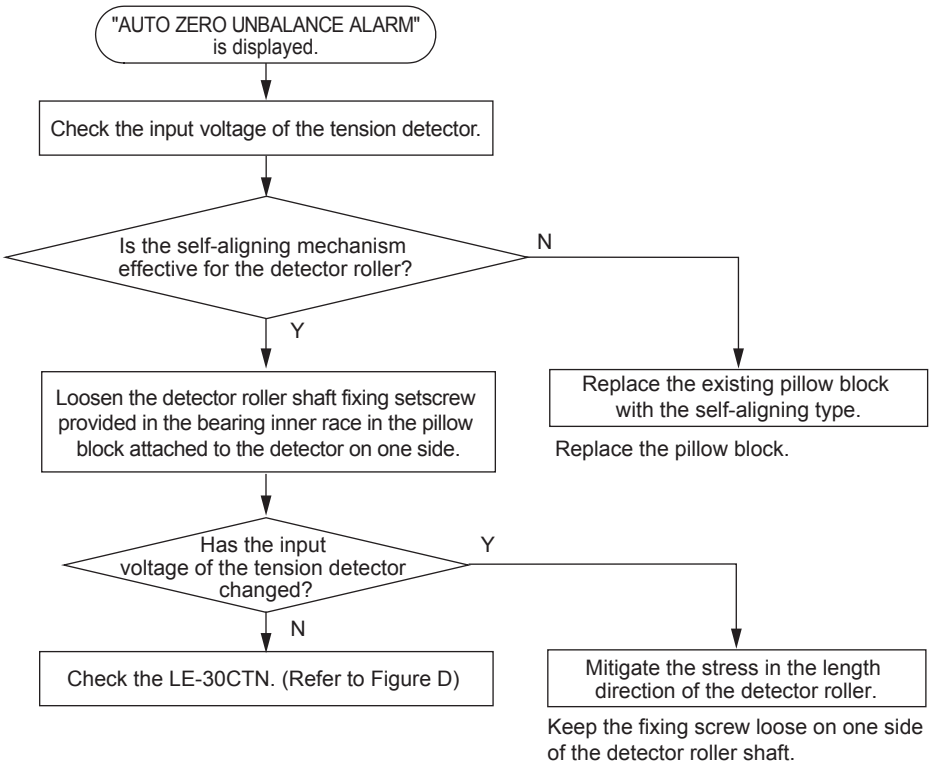
(Figure A)



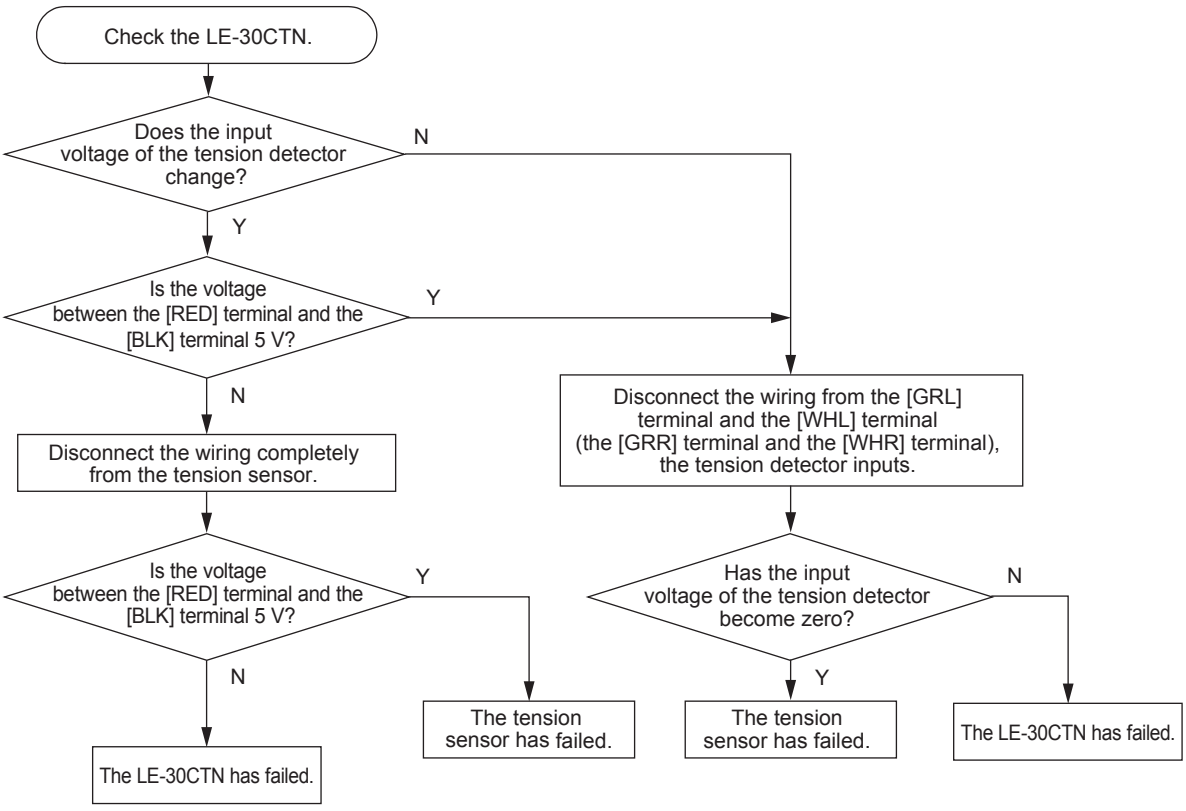
(Figure B)



(Figure C)



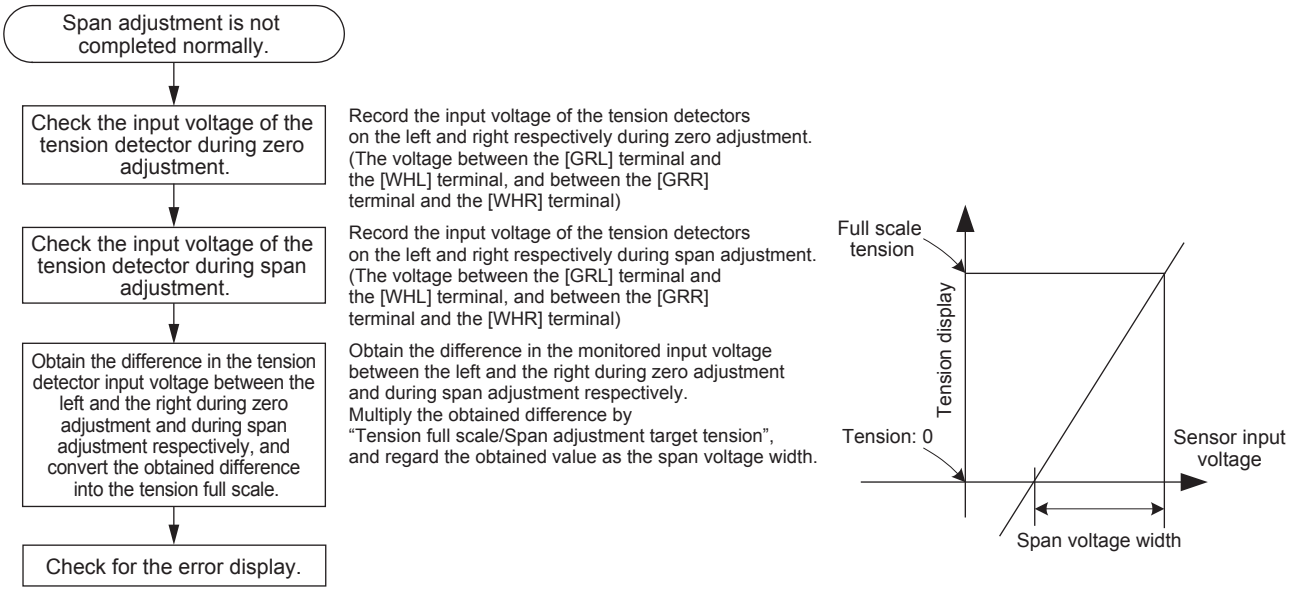
(Figure D)



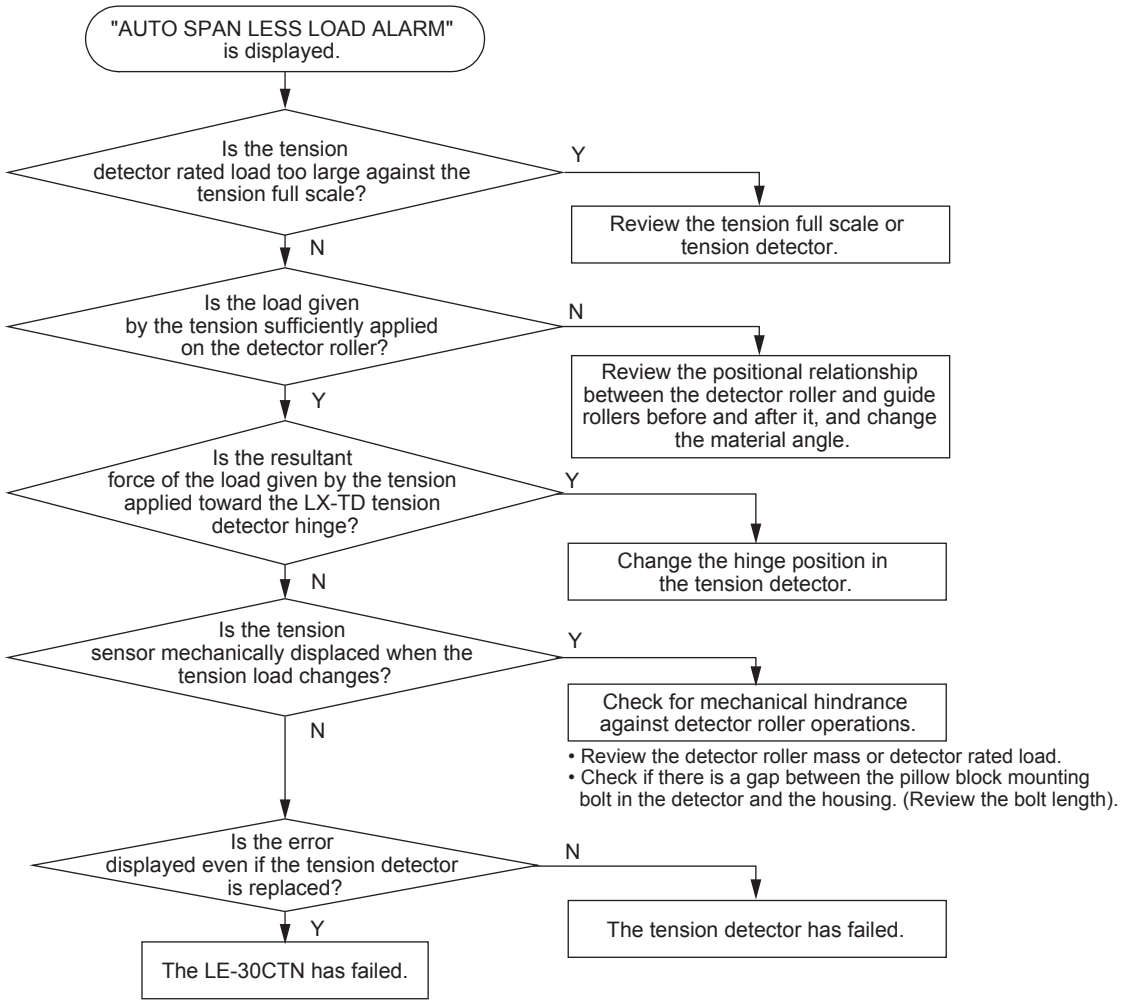
15.4 When Span Adjustment Is Not Completed Normally

Phenomenon	Confirmation item	Counter-measure
Span adjustment is not completed normally (Figure A).	• When only one tension detector is used, "AUTO SPAN UNBALANCE ALARM" is displayed, but ignore the display. The input on the side on which the tension sensor is not connected is automatically ignored. • Check the sensor output voltage between the [GRL] terminal and the [WHL] terminal and between the [GRR] terminal and the [WHR] terminal. (Connect the plus side of the tester to the [GRL] terminal or the [GRR] terminal, and the minus side to the [WHL] terminal or the [WHR] terminal). When the voltage value does not change even if the detector roller is moved, check the LE-30CTN.	-
	• Record the difference in the input voltage between the tension detectors on the left and right during zero adjustment and during span adjustment respectively. Multiply the difference by "Tension full scale/Span adjustment target tension". Regard the obtained value as the change in the span voltage converted into the tension full scale.	
	• When "AUTO SPAN LESS LOAD ALARM" is displayed, the rated load of the tension detector is too large. Or the material is set at an angle such that the change in the load in the tension sensor caused by the tension is small. When the material input angle and material output angle are not symmetrical to the detector roller, the nonconformity may be eliminated by changing the hinge spring position (on the cable protruding side) in the tension detector. When the material input angle and material output angle are symmetrical, review the rating of the tension detector.	Figure B
	• When "AUTO SPAN OVER LOAD ALARM" is displayed, the rated load of the tension detector is small, the material winding angle around the detector roller is large, or the input voltage value of a tension detector on the left or right exceeds ±80 % (= ±120 mV) of the tension detector rating during span adjustment. The nonconformity may be eliminated by setting a smaller tension full scale. If the nonconformity is not eliminated, however, it is necessary to review the tension detector rating or machine installation condition.	Figure C
	• When [AUTO SPAN UNBALANCE ALARM] is displayed, there is a difference in the input voltage of the tension detectors between the left and the right during span adjustment. Check the mechanical installation of the tension detector (whether self-aligning is effective, and whether expansion and contraction caused by temperature changes in the detector roller are mitigated).	Figure D

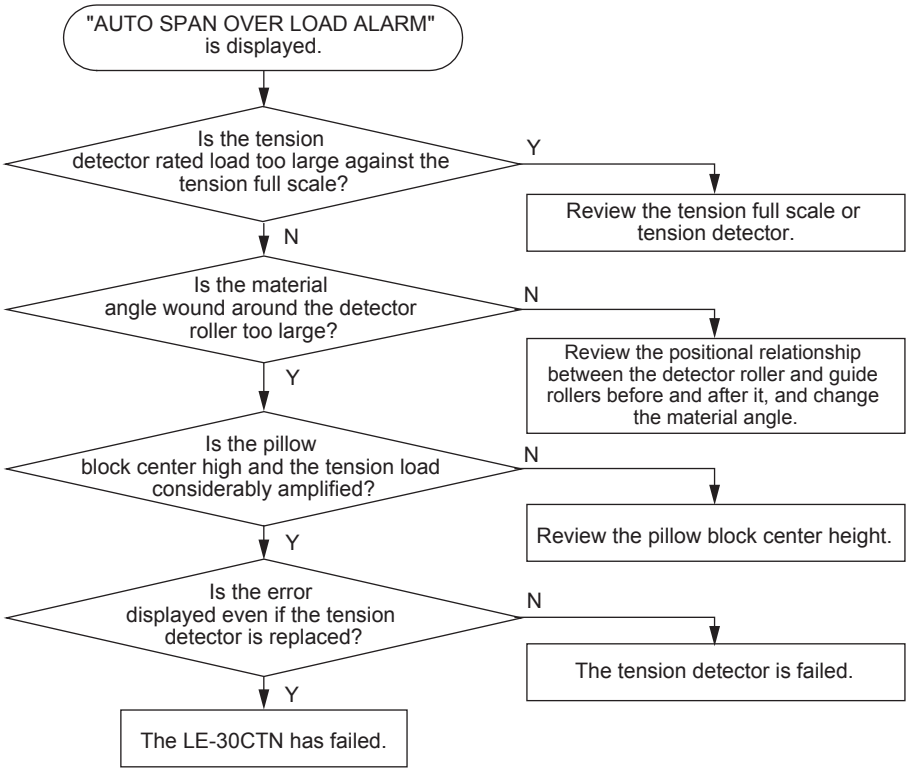
(Figure A)



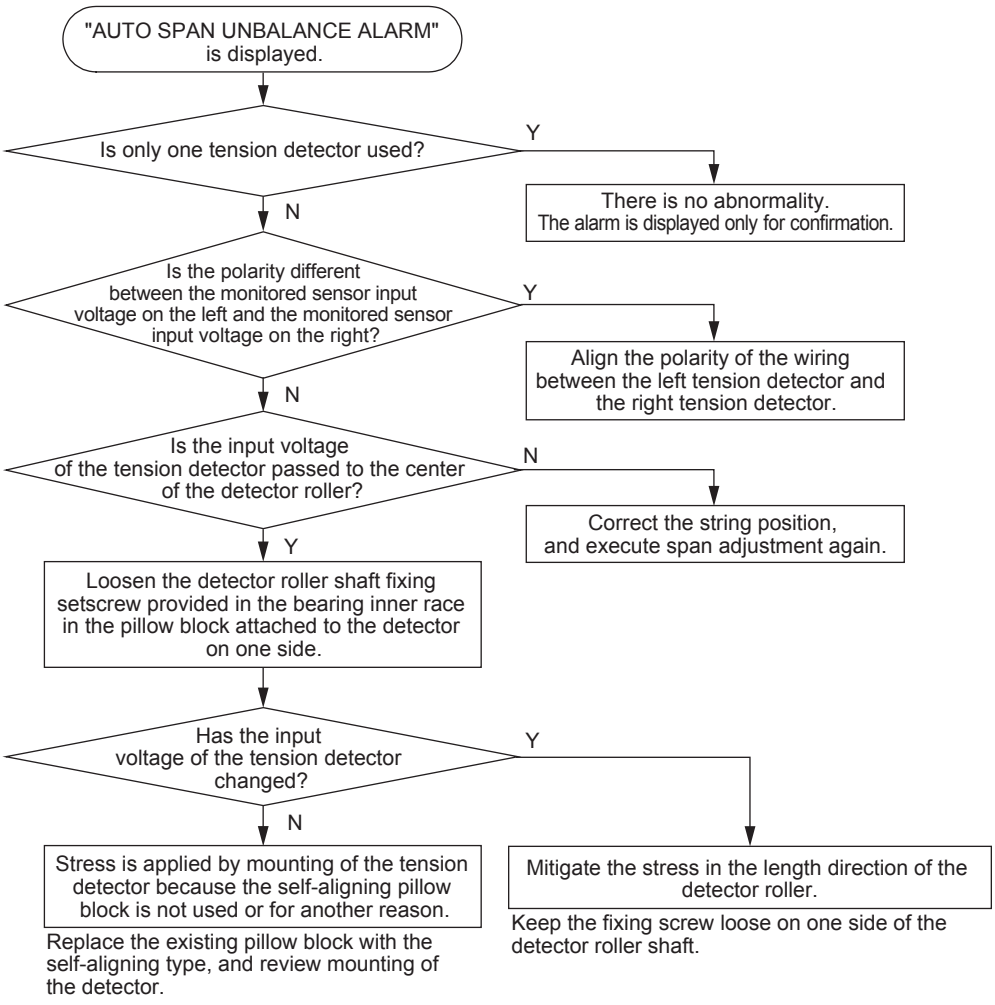
(Figure B)



(Figure C)



(Figure D)



15.5 Input Signal Error

Phenomenon	Confirmation item/Countermeasure
Contact signals and analog voltage signals are not correctly input.	• Compare the ON/OFF status of the contact input signals and the monitoring screen. Check for poor contact on the input contacts. If the ON/OFF status is not displayed on the monitoring screen when the input signal is certainly turned ON/OFF, the LE-30CTN has failed. • Compare the voltage of the analog input terminal and the voltage display value on the monitor. Check whether noise occurs in the input. Check the above referring to the following. ☞ Section 12.3 Monitoring I/O Signal

15.6 Output Error

Phenomenon	Confirmation item/Countermeasure
Output increases during stop.	• The [RUN] input signal may be turned ON. • Turn OFF the [RUN] input signal during stop.
Control output is not generated.	• When the control output is not generated even if the output ON/OFF key on the panel is switched, check the rated voltage of the clutch/brake (the rated voltage must be 3 A or lower.) and whether the wiring is faulty or not (such as a short-circuit). • When short-circuit has occurred in the load, remove the cause, turn OFF the power for several minutes, and turn ON the power again. Then, the error is eliminated. • When the output voltage is not generated between the [PP] terminal and the [PN] terminal even if the wiring to the powder clutch/brake is disconnected, the LE-30CTN has failed. • When the output voltage is not generated between the [TOUT] terminal and the [AOC] terminal, check that the load resistance is 1 kΩ or more.

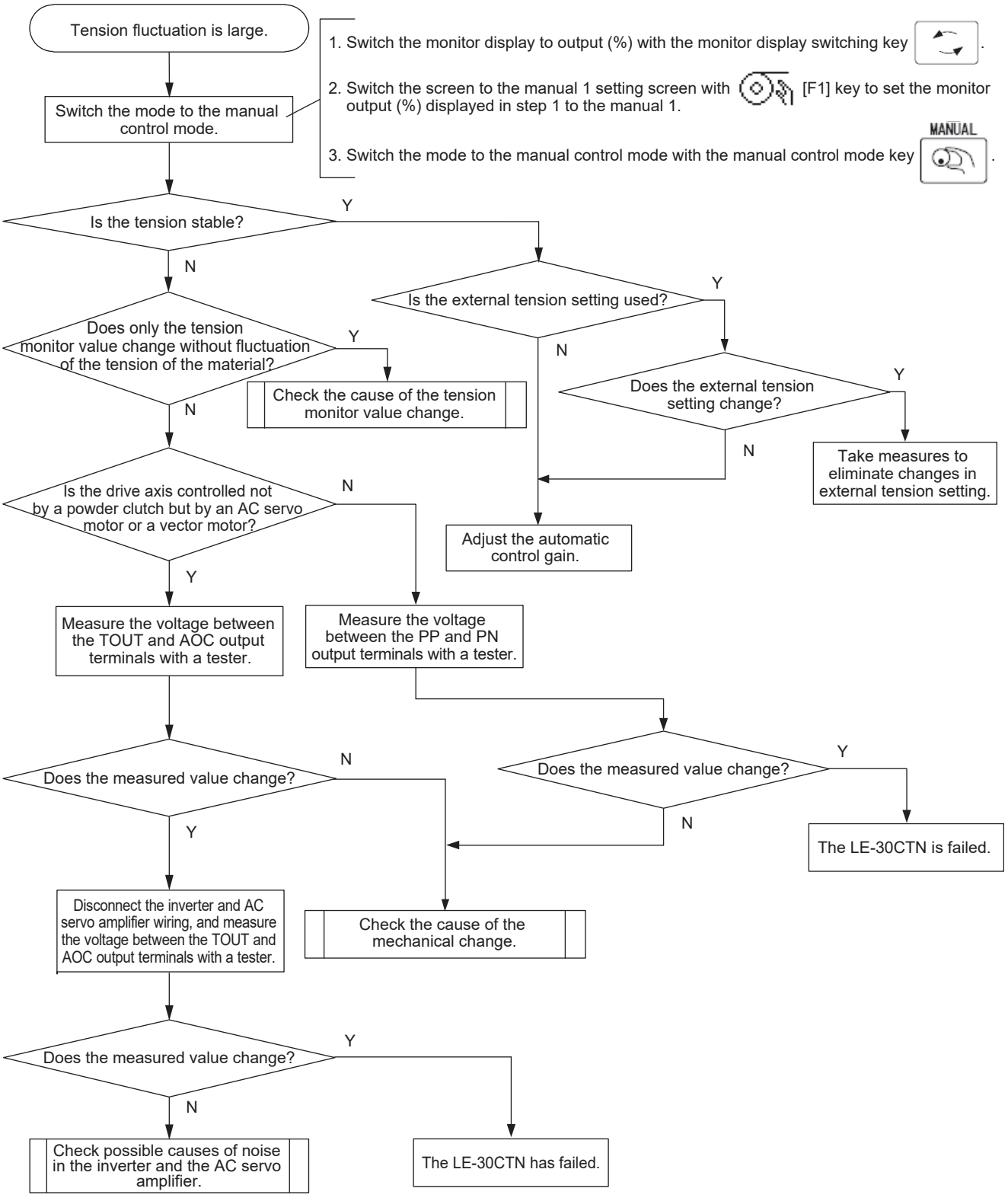
15.7 Tension Error

Phenomenon	Corrective action
When the tension detector is restarted from the operation stop, the tension value exceeds the tension setting value from the beginning.	• Turn ON or OFF the [RUN] input signal according to the status of the machine (operating/ stopping). When the [RUN] input signal remains ON, the control output becomes the maximum at restart and causes excess tension. • When the timing where the [RUN] input signal is turned OFF at stop is late, the control output becomes large and causes excess tension at operation start. Turn OFF the [RUN] input signal at the same time when the machine is stopped.
Hunting occurs in the tension (Figure C) (Figure D).	• Change the mode to the manual operation and check whether hunting occurs or not. • When hunting occurs even in manual operation mode, tension fluctuation due to vibration on the machine side or mechanical loss fluctuation causes the hunting. Check the machine. • When hunting does not occur in manual operation mode, the control gain of the LE-30CTN may be high. Adjust the control gain referring to the following. ☞ Section 9.5 Adjusting Feedback Control Gain
After replacement of the material, the tension becomes too large or too small.	• Check that the output setting of when the [RUN] input signal is OFF is appropriate for the reel diameter after replacement of the material. • Check that the output memory at stop is canceled. ☞ Section 9.1 Operation at Run or Stop ☞ Section 9.2 Output Setting at Stopping

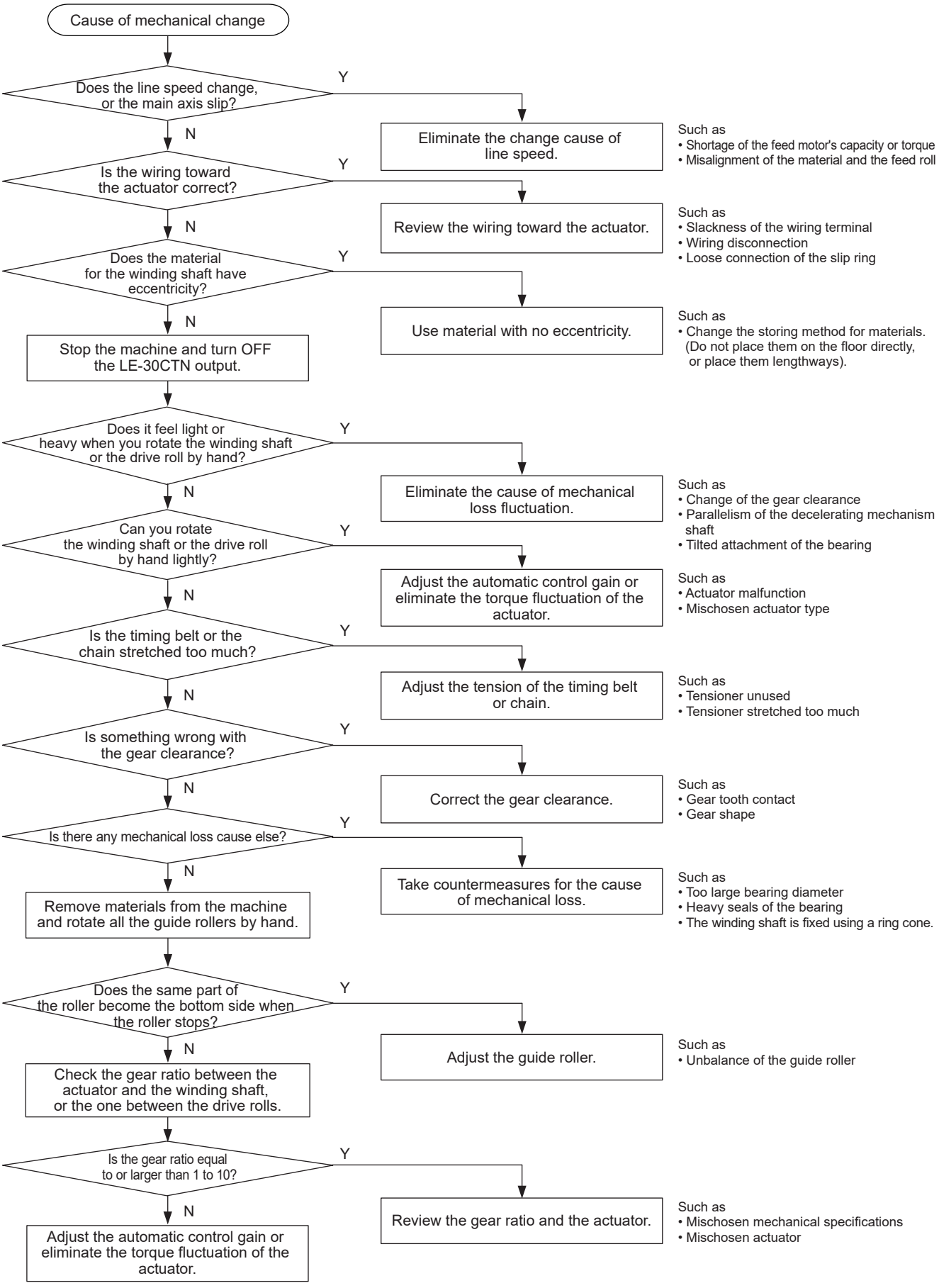
15.8 Tension display or the units for tension flashes

Phenomenon	Corrective action
The tension display or the units for tension flashes.	• The tension signal is too large. The rated load of the tension detector may be exceeded. Set a lower tension value. • Check the rated load of the tension detector. When there is no problem for the rated load, set a larger value for the tension full scale. (When the tension full scale is changed, adjust zero point and span).

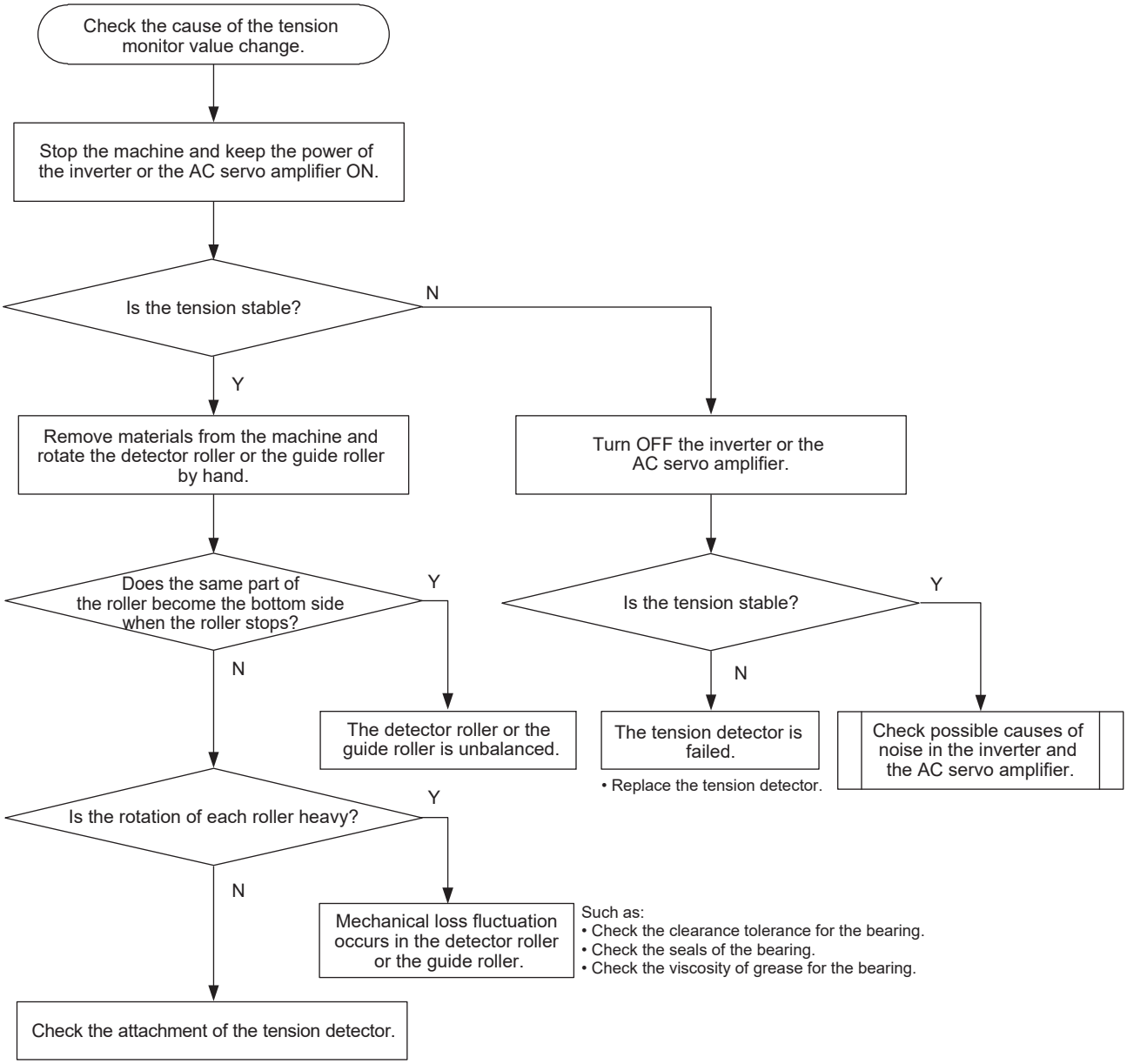
(Figure A)


Tension fluctuation is large.
Switch the mode to the manual control mode.
1. Switch the monitor display to output (%) with the monitor display switching key .
2. Switch the screen to the manual 1 setting screen with [F1] key to set the monitor output (%) displayed in step 1 to the manual 1.
3. Switch the mode to the manual control mode with the manual control mode key .
MANUAL
Is the tension stable?
Y
N
Is the external tension setting used?
Y
N
Does only the tension monitor value change without fluctuation of the tension of the material?
Y
N
Check the cause of the tension monitor value change.
Does the external tension setting change?
Y
N
Take measures to eliminate changes in external tension setting.
Is the drive axis controlled not by a powder clutch but by an AC servo motor or a vector motor?
N
Y
Adjust the automatic control gain.
Measure the voltage between the TOUT and AOC output terminals with a tester.
Measure the voltage between the PP and PN output terminals with a tester.
Does the measured value change?
N
Y
Does the measured value change?
Y
N
The LE-30CTN is failed.
Disconnect the inverter and AC servo amplifier wiring, and measure the voltage between the TOUT and AOC output terminals with a tester.
Check the cause of the mechanical change.
Does the measured value change?
Y
N
Check possible causes of noise in the inverter and the AC servo amplifier.
The LE-30CTN has failed.

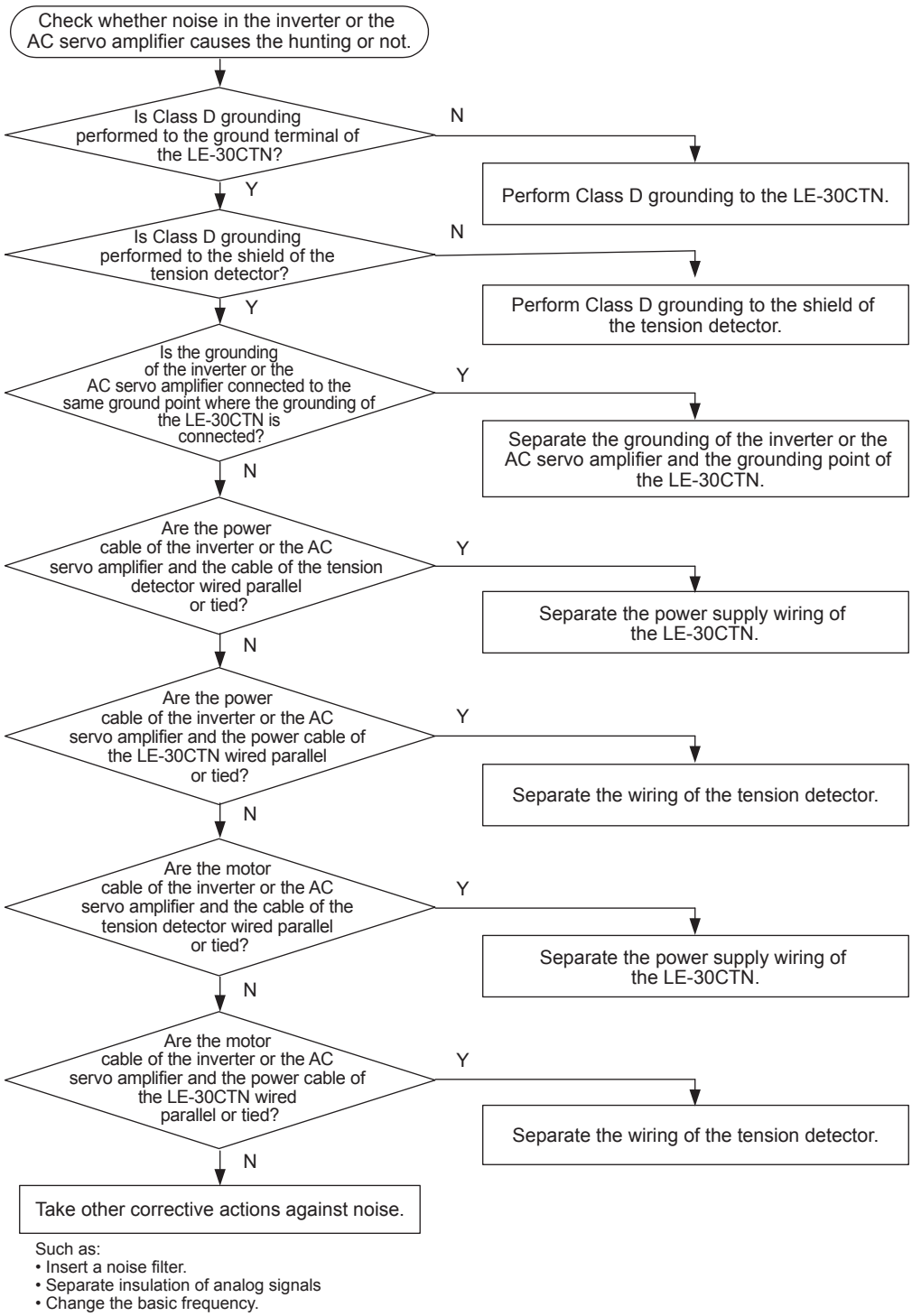
(Figure B)


Cause of mechanical change
Does the line speed change, or the main axis slip?
Y
Eliminate the change cause of line speed.
Such as
• Shortage of the feed motor's capacity or torque
• Misalignment of the material and the feed roll
N
Is the wiring toward the actuator correct?
Y
Review the wiring toward the actuator.
Such as
• Slackness of the wiring terminal
• Wiring disconnection
• Loose connection of the slip ring
N
Does the material for the winding shaft have eccentricity?
Y
Use material with no eccentricity.
Such as
• Change the storing method for materials. (Do not place them on the floor directly, or place them lengthways).
N
Stop the machine and turn OFF the LE-30CTN output.
Does it feel light or heavy when you rotate the winding shaft or the drive roll by hand?
Y
Eliminate the cause of mechanical loss fluctuation.
Such as
• Change of the gear clearance
• Parallelism of the decelerating mechanism shaft
• Tilted attachment of the bearing
N
Can you rotate the winding shaft or the drive roll by hand lightly?
Y
Adjust the automatic control gain or eliminate the torque fluctuation of the actuator.
Such as
• Actuator malfunction
• Mischosen actuator type
N
Is the timing belt or the chain stretched too much?
Y
Adjust the tension of the timing belt or chain.
Such as
• Tensioner unused
• Tensioner stretched too much
N
Is something wrong with the gear clearance?
Y
Correct the gear clearance.
Such as
• Gear tooth contact
• Gear shape
N
Is there any mechanical loss cause else?
Y
Take countermeasures for the cause of mechanical loss.
Such as
• Too large bearing diameter
• Heavy seals of the bearing
• The winding shaft is fixed using a ring cone.
N
Remove materials from the machine and rotate all the guide rollers by hand.
Does the same part of the roller become the bottom side when the roller stops?
Y
Adjust the guide roller.
Such as
• Unbalance of the guide roller
N
Check the gear ratio between the actuator and the winding shaft, or the one between the drive rolls.
Is the gear ratio equal to or larger than 1 to 10?
Y
Review the gear ratio and the actuator.
Such as
• Mischosen mechanical specifications
• Mischosen actuator
N
Adjust the automatic control gain or eliminate the torque fluctuation of the actuator.

(Figure C)


Check the cause of the tension monitor value change.
Stop the machine and keep the power of the inverter or the AC servo amplifier ON.
Is the tension stable?
N
Y
Remove materials from the machine and rotate the detector roller or the guide roller by hand.
Turn OFF the inverter or the AC servo amplifier.
Does the same part of the roller become the bottom side when the roller stops?
Y
N
Is the tension stable?
Y
N
The detector roller or the guide roller is unbalanced.
The tension detector is failed.
• Replace the tension detector.
Check possible causes of noise in the inverter and the AC servo amplifier.
Is the rotation of each roller heavy?
Y
N
Mechanical loss fluctuation occurs in the detector roller or the guide roller.
Such as:
• Check the clearance tolerance for the bearing.
• Check the seals of the bearing.
• Check the viscosity of grease for the bearing.
Check the attachment of the tension detector.

(Figure D)



Such as:
- Insert a noise filter.
- Separate insulation of analog signals
- Change the basic frequency.

15.9 Setting items and setting values cannot be changed

Phenomenon	Confirmation item/Countermeasure
Setting items and setting values cannot be changed.	• When the Run/Stop signal [RUN] is ON, or when the detector is in adjustment mode, only limited items can be set. ☞ Section 8.1 Setting Item List

16. Compliance with EC Directive (CE marking)

This product complies with EC directive, however, this document does not guarantee that a mechanical system including this product will comply with EC directive.
Compliance with EMC directive and LVD directive of the entire mechanical module should be checked by the user/manufacturer. For more details please contact to the local Mitsubishi Electric sales site.

16.1 Requirements for compliance with EMC Directive

The following products have shown compliance through direct testing (of the identified standards below) and design analysis (through the creation of a technical construction file) to the European Directive for Electromagnetic Compatibility (2014/30/EU) when used as directed by the appropriate documentation.
Type: Tension controller (Open-type equipment)
Applicable product: LE-30CTN manufactured in September, 2009 or later

Electromagnetic Compatibility (EMC) Directive	Remarks
EN61000-6-4:2007+A1:2011 EN61000-6-2:2005	Of the following test items, testing was conducted for the items related to this product. EMI • Radiated emission • Conducted emission EMS • Radiated electromagnetic field • Fast transient burst • Electrostatic discharge • High-energy surge • Voltage drop and interruptions • Conducted RF • Power frequency magnetic field

16.2 Requirements for compliance with Low Voltage Directive (LVD)

The following products have shown compliance through direct testing (of the identified standards below) and design analysis (through the creation of a technical construction file) to the European Directive for Low Voltage (2014/35/EU) when used as directed by the appropriate documentation.
Type: Tension controller
Applicable product: LE-30CTN manufactured in September, 2009 or later

Low Voltage Directive (LVD)	Remarks
EN61010-1:2010+A1:2019	The LE-30CTN is tested as a component installed inside a proper control box which meets the conditions specified in the EN61010-1:2010+A1:2019.

16.3 Precautions for compliance with EC Directive

- Use a tension controller while installed in conductive shielded control panels under a general industrial environment.
- The tension controller is the open-type equipment and must be used by being installed in a conductive control panel. The control panel and the control panel lid must be then connected (conducted). Installing a tension controller in a control panel is greatly effective not only because safety is assured but also because noise generated from the tension controller is shielded by the control panel.
- Control panel
  (1) Ensure that the control panel is conductive.
  (2) Ground the control panel with a ground cable as thick as possible.
  (3) Secure an electric contact between the control panel and the control panel lid.
  For that purpose, connect (conduct) the control panel and the control panel lid with a thick connecting wire.
  (4) To suppress radio wave leaks, design a control panel by removing empty space in it as much as possible.
  In addition, cover such an area as a cable lead-in hole with a shield cover.
  (5) Design the control panel so that space between the control panel and the control panel lid is removed as much as possible by attaching an EMI gasket.
  (6) Use a control panel with sufficient strength, fire resistance, and good shielding performance for the installation environment.
- Cables
  (1) For cables pulled out of the control panel, use shielded cables.
  (2) For cables connected to the power supply and analog signals of this product, use shielded twisted cables.
  (3) For the shielding of the analog signal and contact signal shielded cables, ground both sides.
  (4) For the shielding of the power supply shielded cable, ground only one side.
  (5) For the shielding of shielded cables, connect cables to the grounded control panel.
- For external connection ports except for AC power supply terminals, connect the circuit separated from hazardous voltage by the double/reinforced insulation.
- Ground the tension detector (sensor) by utilizing a screw hole (M4) for grounding. If the screw hole has been coated, remove the coating before the grounding cable is connected using a screw.

16.4 Measures for EMC

16.4.1 Basic measures for EMC

Perform the following methods securely to achieve the electromagnetic compatibility.

(1) Install the equipment inside a closed metallic control box (so that radiated noise is sealed).

(2) Install a noise filter (so that conduced noise is reduced).

(3) Perform grounding securely (so that the equipment cannot work as a noise antenna).

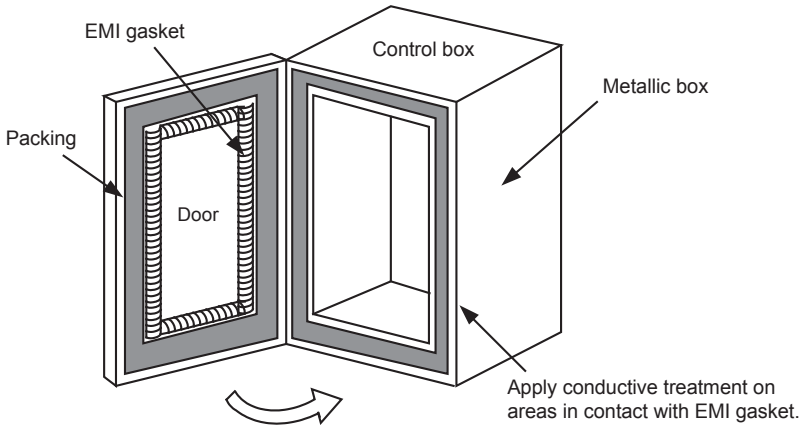
(4) Shield power cables and control cables (so that radiated noise is sealed).

(5) Assure sufficient distance between a noise source and counterpart equipment, or install a noise source individually inside a control box (so that radiated noise is sealed).

(6) Insulate circuits (so that noise is not conducted).

16.4.2 Control box design and EMC tests

The LE-30CTN is so designed as to be incorporated in other equipment. Make sure to install it inside a control box (to assure safety, restrain noise radiation and shield noise).
The control box design, internal equipment layout and wiring layout are extremely important to achieve the electromagnetic compatibility. Design the control box under sufficient consideration of the following items.
Make sure to perform EMC tests using the entire machine or system.



(1) The control box should be made of metal.

(2) We recommend using a control box having the electromagnetic compatibility.

(3) If the control box does not have the electromagnetic compatibility, completely remove the coating inside the control box main body and on the rear side of the control box cover when performing grounding using a grounding strap or shielding mesh.

(4) The control box door should get secure grounding to the control box main body.
If the control box door is poorly grounded, the door itself will work as a large antenna and emit noise.
Take the following action.

(a) Make sure that the door is made of metal.

(b) Connect the door to the control box main body with braided wires at as many points as possible.

(c) Use EMI gasket and conductive packing in areas where the door is in contact with the control box main body.

(5) Make sure that the inside of the control box is free from metals and conductors whose electrical connection is insufficient.

(6) Complete grounding of the control box is highly effective to achieve the electromagnetic compatibility.

(7) If the control box has holes, remove the coating from areas around holes, and completely close holes so that metal is connected between the control box main body and the door.
If an exhaust fan is required, select the electromagnetic shield type. (However, note that an exhaust fan deteriorates the noise radiation restraining effect and noise shielding effect.)

(8) Install bus bars inside the control box, and concentrate the grounding of various equipments on bus bars. At this time, connect the grounding terminal of each equipment to a bus bar using a thick and short wire, dedicated grounding strap or shielding mesh.
*** It is important also to enhance the grounding inside the control box.**

(9) For the control box main body, perform one-point grounding from a bus bar inside the control box to the ground using a wire as thick and short as possible, dedicated grounding strap or shielding mesh.
The grounding resistance should be 100 Ω or less, and 10 Ω or less if possible.
*** It is most important for achieving the electromagnetic compatibility to enhance the grounding of the control box main body.**
Use a bus bar inside the control box only for the LE-30CTN. Install other bus bars inside the control box for noise-generating equipments such as inverter and servo amplifier.
The grounding cable from the bus bar for the LE-30CTN to the outside of the control box should not be shared by other bus bars for inverter and servo amplifier. Use an independent wire, grounding strap or shielding mesh.
If problems may be caused by common use of one bus bar between the LE-30CTN and the PLC, perform grounding separately to the bus bar for the LE-30CTN and the bus bar for the PLC.

(10) Weld connection areas between the ceiling and a side box of the control box without leaving any gap. Or eliminate the gap using shielding gasket, and then tighten connection areas with screws.

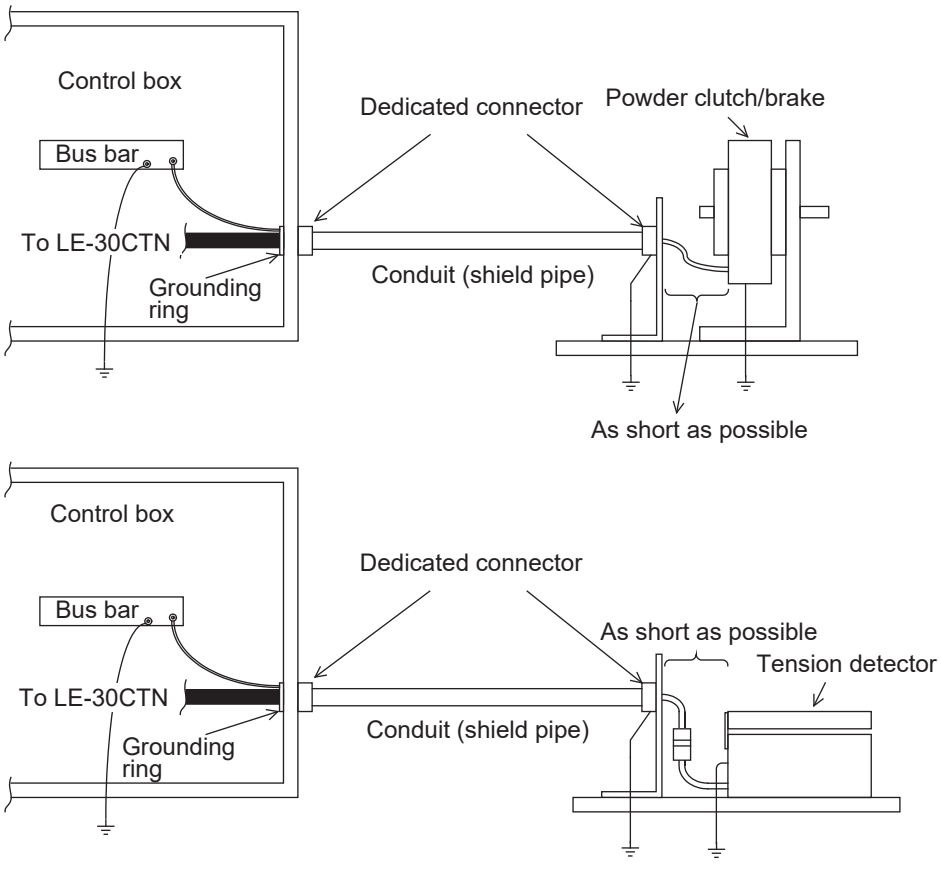
16.4.3 Cable treatment

(1) For secure countermeasures against noise in the input power cable, separate the input power area from other areas inside the control box so that the input power cable is not affected by radiated noise.

(2) Cables offered as accessories of the tension detector (sensor) do not have sufficient shielding effect.
Provide overall shielding using a dedicated shielding cable or conduit (pipe) without disconnection.
Perform grounding to the overall shielding on the both sides (control box and tension detector).
Makesure to perform grounding also to the tension detector itself by utilizing a screw hole (M4) for grounding. At this time, remove the coating from the screw hole, and then tighten the grounding cable with a screw.

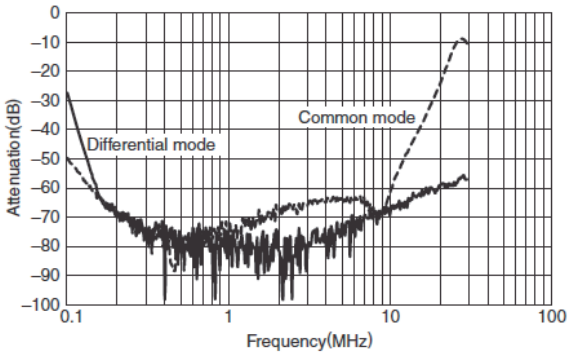
(3) When connecting the LE-30CTN to an actuator such as powder clutch/brake, hysteresis clutch/brake, AC servo amplifier and vector inverter, perform electromagnetic shielding using a shielded cable or conduit (pipe).
Perform grounding to the electromagnetic shield on the both sides (control box and actuator).
Make sure to perform grounding also to the actuator itself.
Utilize the mounting plate for an actuator without dedicated screw hole for grounding such as powder clutch/brake. Use a dedicated screw hole for grounding in an actuator such as servo motor.
If the screw hole for grounding has coating, remove the coating before tightening the grounding cable with a screw.

(4) Connect the grounding cable to the control box using a dedicated connector and grounding ring.
Perform grounding to the cable shield at 100 Ω or less from the grounding ring by way of the bus barinside the control box.

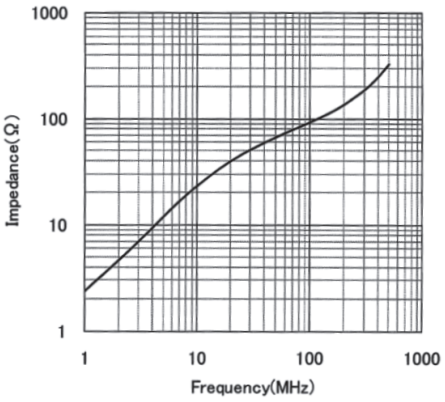


16.4.4 Parts for EMC

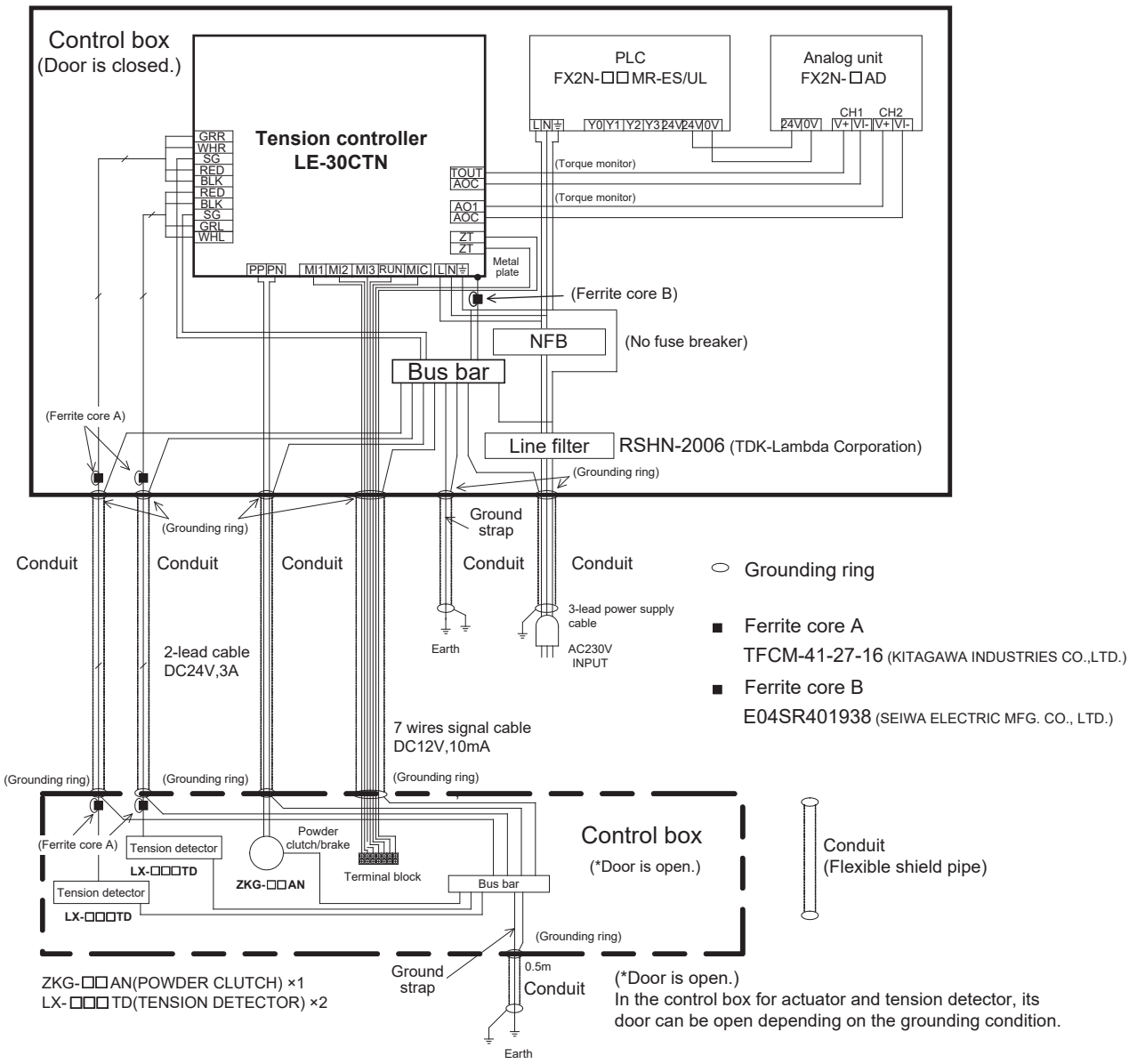
(1) Line filter: RSHN-2006 (TDK-Lambda Corporation)



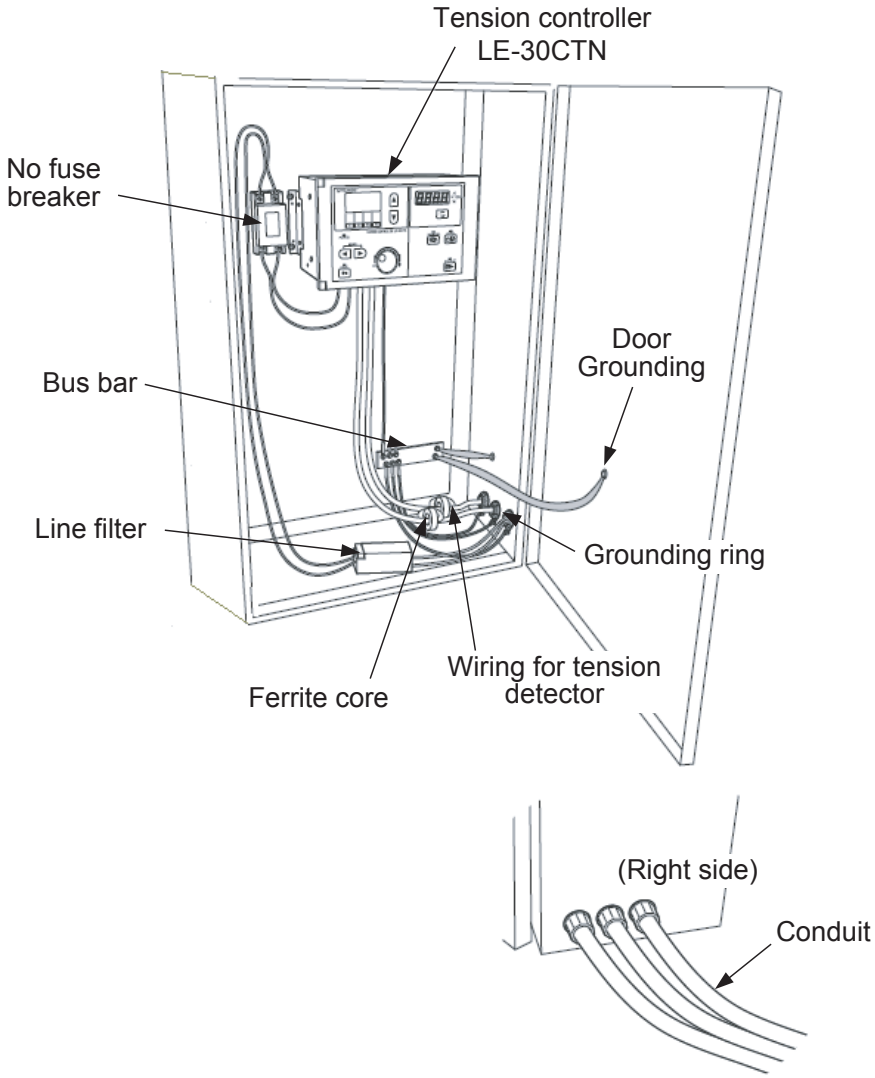
(2) Ferrite core: TFCM-41-27-16 (KITAGAWA INDUSTRIES CO.,LTD.)



16.4.5 Connection example for EMC



16.4.6 Control box configuration example



17. Compliance with UKCA marking

The requirements for compliance with UKCA marking are the same as that with EC directive (CE marking).

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18. Compliance with KC (Korea Certification) Mark

■ Compliance with KC (Korea Certification) Mark

The Radio Waves Act (South Korea) Article 58 (2) was revised in July, 2011 and the following tension controller is a subject.
Mitsubishi Electric performs the conformance test in the safety certification organization in South Korea, and some models require the EMC countermeasure to be compliant with the Radio Waves Act (South Korea).
To use the corresponding product in South Korea, see the following contents and perform the countermeasure.

(1) Radio Waves Act (South Korea) target model and EMC countermeasure

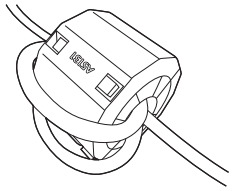
Radio Waves Act (South Korea) target model		Certification number	EMC countermeasure unnecessary	EMC countermeasure detail			
Evaluation model	Derived model			AC power line		Powder output	Installation in control panel
				LINE FILTER	CORE2	CORE1	
LE-30CTN	-	KCC-REM-MDH-094128	-	✓	-	-	-

(2) EMC countermeasure method

Table 1. EMC countermeasure recommended parts

	Insertion position	Model name	Manufacturer
AC power line filter	LINE FILTER	RSHN-2006	TDK LAMDA
Powder output core	CORE1	ESD-SR-160	NEC TOKIN
AC power line core	CORE2	28A5131-0A2	Laird Technologies

Figure 1. How to insert core



Wind the cable around the core twice.

Figure 2. EMC countermeasure parts inserting position

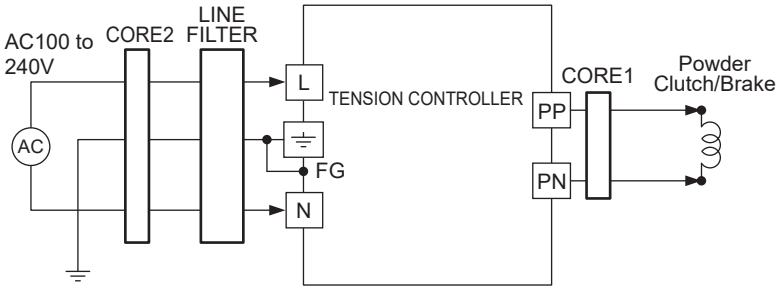
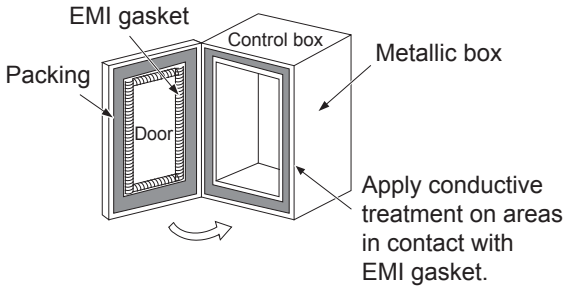


Figure 3. EMC control pane



The board thickness of the door and the main body is 2.0mm or more.

(3) Precautions for the Radio Waves Act (South Korea)

For the Radio Waves Act (South Korea)
This product complies with the Radio Waves Act (South Korea).
However, additional countermeasure parts are required.
Use this product in South Korea observing the two sections above.
The product is for business use (Class A) and meets the electromagnetic compatibility requirements.
The seller and the user must note the above point and use the product in a place except for home.

■ KC 마크 (한국 안전 인증 마크) 대응에 대해

*Note: This is the notification for the KC mark (Korea Certification)

한국 개정 전파법 (제 58조 2)가 2011년 7월에 개정되어, 텐션 컨트롤러 제품이 대상이 되었습니다.
당사는 대한민국의 안전 인증 기관에서 인증 시험을 실시하고 있으며, 한국의 전파법을 준수하기 위해 EMC의 조치가 필요합니다. 한국내에서 대상제품을 사용시는 하기의 내용을 이해하고 대책의 실시를 부탁드립니다.

(1) 한국전파법 대상기종 및EMC대책내용

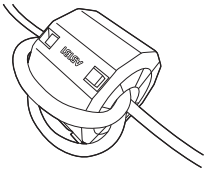
한국전파법대상기종		적합성평가번호	EMC대책 불필요	EMC대책방법			
				AC전원LINE		POWDER출력	제어반내 설치
평가기종	파생기종			LINE FILTER	CORE2	CORE1	
LE-30CTN	-	KCC-REM-MDH-094128	-	○	-	-	-

(2) EMC대책 실시방법

표1. EMC대책 추천부품

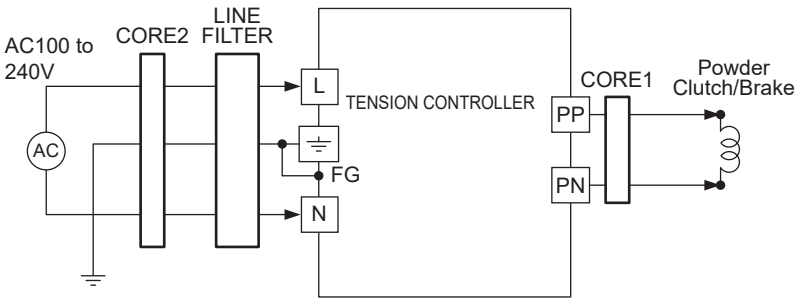
	삽입위치	형명	MAKER명
AC전원LINE FILTER	LINE FILTER	RSHN-2006	TDK LAMDA
POWDER출력CORE	CORE1	ESD-SR-160	NEC TOKIN
AC전원LINE CORE	CORE2	28A5131-0A2	Laird Technologies

도1. CORE의 투입방법

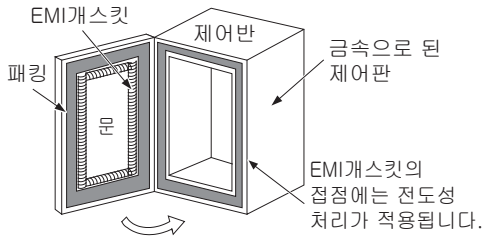


CORE에2회 감음

도2. EMC대책부품 삽입위치



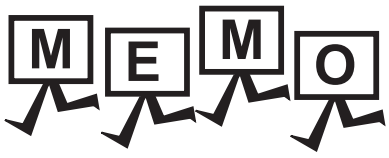
도3. EMC제어반



전면·본체의 판 두께2.0mm이상

(3) 한국전파법에의 대응 주의사항

한국전파법에의 대응
본 제품은 한국전파법에 적합함. 단, 추가적인 안전 장치가 필요하므로 한국에서 사용할 때는 위의 2절에 따라 사용하십시오.
이 기기는 업무용 (A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의 하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.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REVISIONS

Print Date	Sub No.	Revision
May 2003	A	First Printing
June 2003	A1	• The tension setting, manual setting, and taper rate setting screens are added. • AOC wiring between servo amplifier A and B is added. • "Mass unit of the winding reel inertia ×102 kg" is changed to "× 103 kg".
July 2003	A2	The panel diagram name is changed. (page 5)
November 2004	B	• The zero tension detection function is added. • AI3 input is erased. • The resistance position for upper limit setting is changed. • The section to be referred is changed from 11.3 to 12.3. • The symbol of the power supply switch is erased. • Paragraph format and other errors are corrected.
March 2006	B1	"u" is changed to ►, and "t" is changed to ◄.
October 2008	C	"In conformance with JIS ****" is erased.
August 2009	D	Conforming to CE Marking
February 2013	E	• Total revision • Description about Product Liability Act is revised. • Description about Radio Waves Act (South Korea) is added.
May 2014	F	Conforming to the LVD(EN61010-1: 2010 3rd edition) with the revision of EN61010-1: 2001 2nd edition
April 2015	G	The back cover was changed.
March 2020	H	• The troubleshooting is partially modified. • Revision due to production discontinuation of FX-EEPROM-□
December 2021	J	Partial corrections Subsection 9.1.2, Section 15.8 Partial additions Chapter 17 (Compliance with UKCA marking)
May 2022	K	Partial corrections • Standards, Section 3.2, Chapter 16, Chapter 18 • The grounding icons and protective ground terminals are changed to the functional ground terminals. Addition Subsection 5.1.3, Subsection 5.1.4

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(MEE)

Effective May 2022
Specifications are subject to change without notice.