

# MITSUBISHI

*Changes for the Better*

ZJ-4003A

TENSION AMPLIFIER  
MODEL **LM-10TA**  
INSTRUCTION MANUAL



- Read through this manual, and use the unit correctly.  
Make sure to understand “Cautions on safety” completely.
- Store this manual carefully, and make sure to sent it to the end user.

# Caution on Safety



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



Please read through this instruction manual and the technical data, and handle the tension detector correctly while paying rigid attention to safety.



In this manual, the level of safety precautions are classified into "DANGER" and "CAUTION".


 <b>DANGER</b>	Erroneous handling may cause a dangerous situation in which the possibility of death or serious injury is expected.
 <b>CAUTION</b>	Erroneous handling may cause a dangerous situation in which the possibility of not so serious or slight injury is expected or occurrence of material damages exclusively is expected.

Store this manual carefully so that it can be referred to when required, and make sure to sent it to the end user.

 <b>DANGER</b>	Shut down all the phases of the external power supplies during installation and wiring.
	Otherwise, electrical shock or damages in unit may be caused. Make sure to shut down all the phases of the external power supplies before starting installation and wiring.

 <b>DANGER</b>	Make sure to perform class D grounding ( 100Ω or less ) to the ground terminal using a cable whose cross section is 2mm <sup>2</sup> or more.
	There is a dangerous possibility of electrical shock and failure in the unit. A qualified person (electrical engineer ) shall perform the grounding work, Never share the ground with a heavy electric system.

 <b>DANGER</b>	Never use the tension detector in an atmosphere in which inflammation or explosion is expected.
	Otherwise, inflammation or explosion may be caused.

 <b>CAUTION</b>	Check the environments.
Never install the tension detector in a location in which dust, soot, conductive dust and corrosive gas are present nor a location subject to high temperature, condensation, wind and rain. Never install the tension detector directly in a location on which vibrations or impacts are applied. Otherwise, damages, malfunction of deterioration in the tension detector may be caused.	

## CANTION

We shall not be responsible for the damages caused by repair, disassembly, modification or others performed by any third party other than the MITSUBISHI personnel or the personnel specified by MITSUBISHI.

The specifications mentioned in this "Cautions on Safety" and other sections in this instruction manual are subject to change without notice.

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# 1. Outline of The Product

The tension amplifier LM-10TA is used to measure the sheets, paper, wires, etc. under travelling for tension and to output the tension signal.

Since the tension detector used a deferential deviation converter of LX-TD series, it is possible to measure the material tension at high accuracy.

## 2. Installation and Wiring

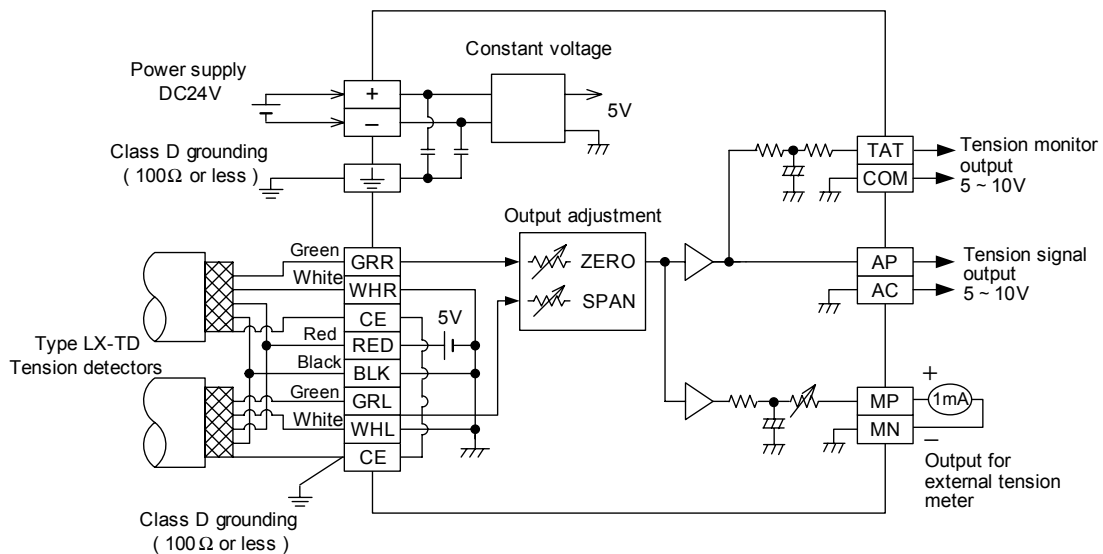
### 2.1 Caution regarding installation and wiring

⚠	<b>DANGER</b>	Do not drop any chips or cable chips into the tension amplifier.
🔥		Chips dropped into the tension amplifier may cause damage, fuming, fire, etc.
⚠	<b>DANGER</b>	Do not open the cover after power on or during operation.
⚡		After installation or wiring, be sure to attach the terminal cover. If you turn on the power or start operation without the terminal cover, you may get an electric shock.
⚠	<b>CAUTION</b>	Do not connect A.C. power to the tension amplifier.
🔥		If you connect A.C. power to the tension amplifier by mistake, the amplifier will be damaged. Connect 24VDC to the amplifier.

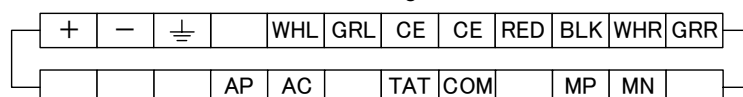
### 2.2 Installation

To install the tension amplifier, drive M4 screws into upper and lower holes of the amplifier.

### 2.3 Wiring diagram



Terminal arrangement



## 2.4 Wiring

### (1) Power connection

Connect 24VDC to the power supply terminals ( “+” and “-” terminals ) of the tension amplifier.

### (2) Grounding

Class D grounding ( 100Ω or less )

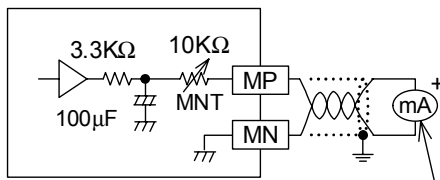
### (3) Tension detector

Connect the tension detector to the tension amplifier while referring to the wiring diagram shown on page 2.

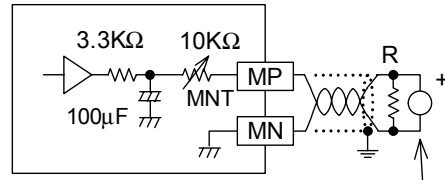
- To use one tension detector, connect the detector to the GRR and WHR terminals or to the GRL and WHL terminals. and open the terminals on the non-connected side.
- The tension detectors can be connected as shown in the wiring diagram on the page 2 only if a compressive load is applied. If a tensile load is applied, change the connection terminals between GRR and WHR and between GRL and WHL.

### (4) Connection of external tension meter

An external tension meter, such as the D.C. type 1mA ammeter and 4-digit digital panel meter, can be connected to the tension amplifier.



DC type 1mA ammeter of 300W or less



Digital panel meter with decimal point position setting terminal of 1.999V

Adjust the internal variable resistor so that the meter can display 1mA ( 100% output ) at full scale tension.

Fullscale tension	Resistance R	Resistance R
	When AP terminal is 5V	When AP terminal is 10V
1000, 100, 10	1.5kΩ 1/4W	1kΩ 1/4W
500, 50, 5	1kΩ 1/4W	470Ω 1/4W
300, 30, 3	470Ω 1/4W	330Ω 1/4W
200, 20, 2	330Ω 1/4W	220Ω 1/4W

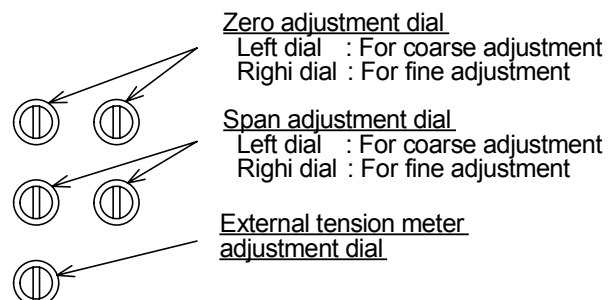
## 3. Adjustment

Before turning on the power, be sure to check that the power, grounding, input / output wires are connected correctly. In addition, be sure to adjust the zero point and span as described below. If the output signal is used for the external tension meter, adjust the output signal also.

### 3.1 Adjustment method

Open the small window cover on the panel surface, and then adjust the zero point, span, and external tension meter using the respective dials.

To ensure high accuracy in detecting tension, it is recommended that adjustment should be started 20 to 30 minutes after power on. This is because the amplifier internal temperature will be constant 20 to 30 minutes after power on.



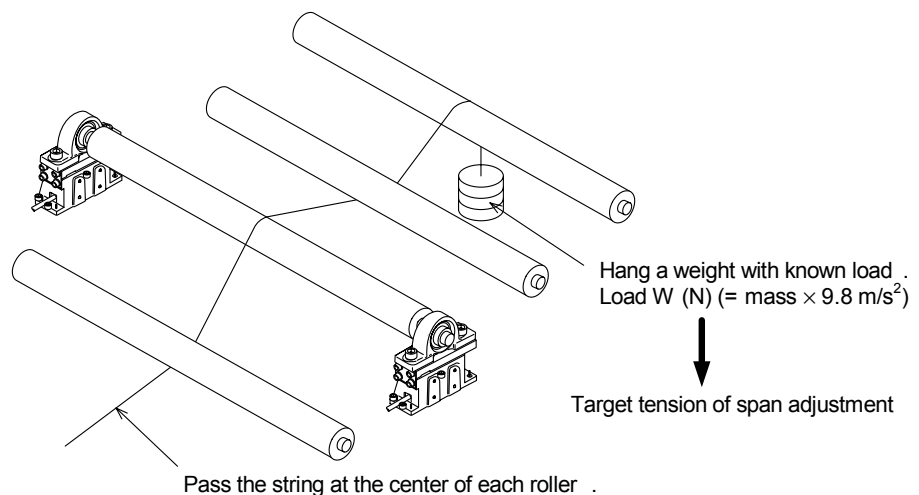
## 3.2 Adjustment order

### (1) Zero adjustment of tension detector - - - - - [ZERO] dial

- Even if the material tension is “0”, the roller and bearing loads ( compression or tension ) are always applied to the tension detector. To eliminate such positive or negative loads, adjust the zero point.
- There are two zero adjustment dials : coarse and fine adjustment dials. Both dials increase the tension output voltage when turned clockwise.
- Turn the span adjustment dials ( described below ) all the way clockwise, first, and then adjust the zero point using the zero adjustment dials.
- Turn the coarse zero adjustment dial first, and then turn the fine zero adjustment dial so that the voltage between the AP and AC terminals is set to zero.
- At the completion of span adjustment ( described below ), if the zero point is at a wrong position, adjust the zero point again without turning the span adjustment dials, and then adjust the span again.

### (2) Span adjustment of tension detector - - - - - [SPAN] dial

- The load ( material tension ) applied to the tension detector depends on the detector installation direction and sheet angle. To correct such difference in the load, adjust the span.
- Hang a weight ( whose weight should be previously known ) from the detection roller as shown in the figure below, and then adjust the span using the span adjustment dials. Note that if there is a change in the load during span adjustment, a difference will be caused. Also note that to minimize the tension detection error, use the weight having the same value as the maximum tension.
- There are two span adjustment dials : coarse and fine adjustment dials. Both dials increase the tension output voltage when turned clockwise. Apply the maximum tension, and turn the span adjustment dials so that the voltage between the AP and AC terminals is set to 5 to 10V.
- If the output tension is a negative value, change the connection terminals between the white and green wires of the tension detector, and then adjust the zero point and the span again.

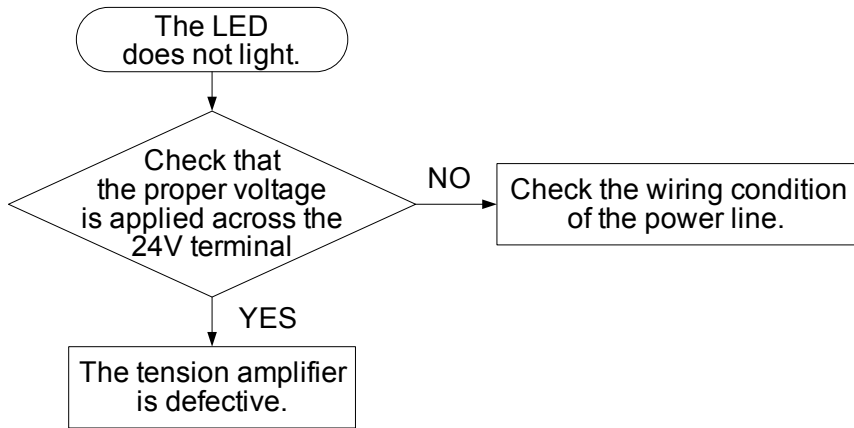


### (3) Adjustment of external tension meter - - - - - [MNT] dial

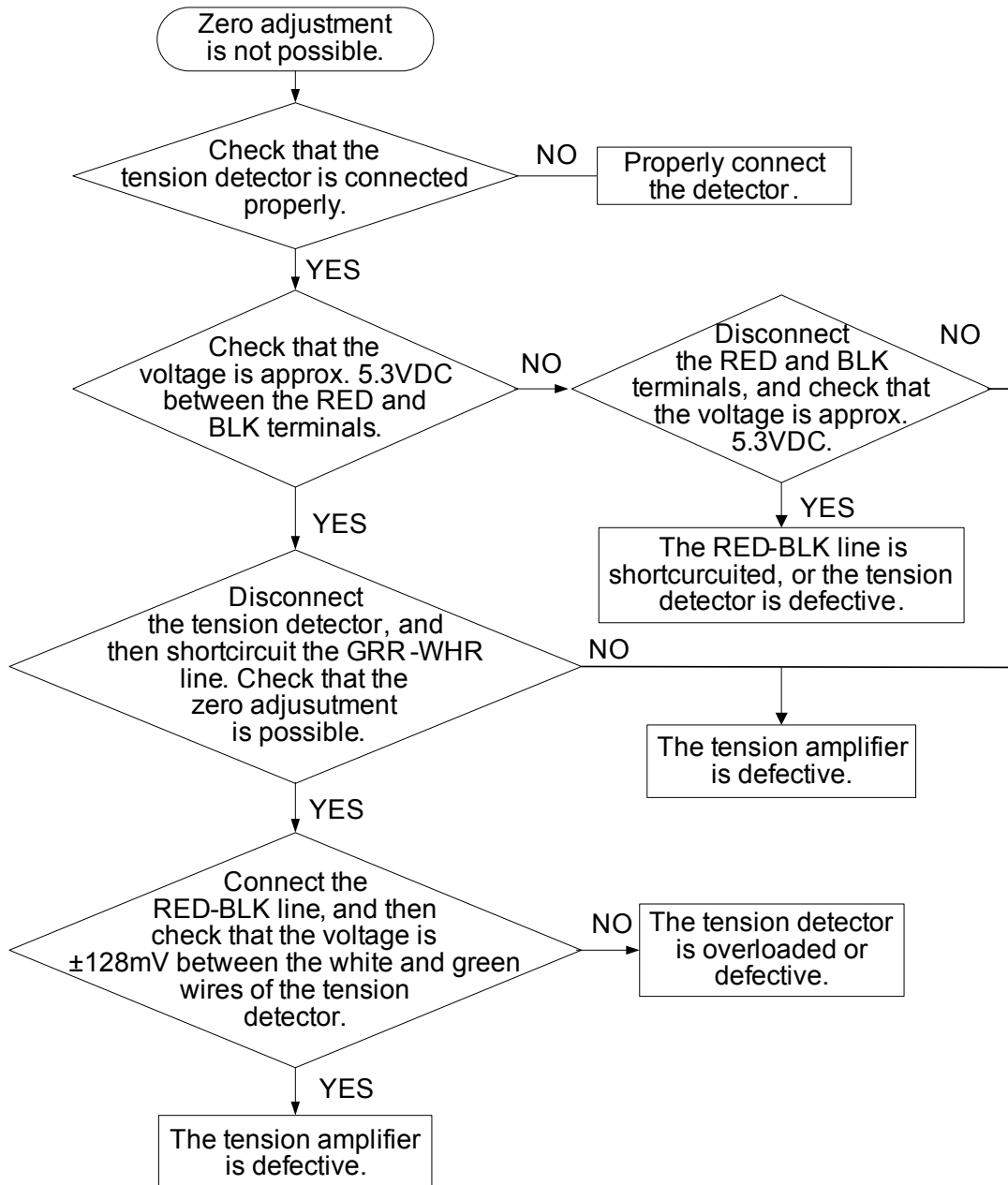
- This dial adjusts deflection of the external tension meter.
- Set the output of the AP/AC terminal to the rated value ( 5 to 10V ) using the zero adjustment dial.
- After that, adjust the current of the MP/MN terminal to 1mA using the MNT ( 1mA ) dial.

## 4. Troubleshooting

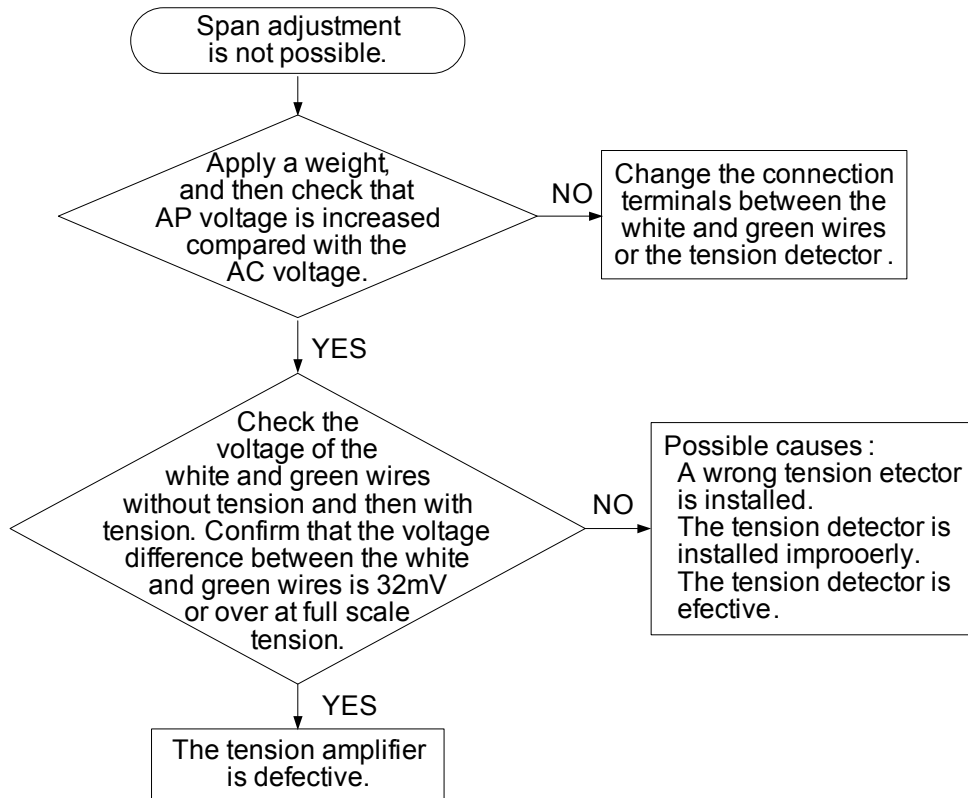
(1) The LED does not light



(2) Zero adjustment is not possible










(3) Span adjustment is not possible





## 5. Maintenance

 DANGER	To inspect the tension amplifier, be sure to cut off all the phases of the external power.
	Before starting installation or wiring work, be sure to cut off all the phases of the external power. This is because the external power cause electrical shock, or damage the tension amplifier.
 DANGER	Check the connection of the lead wire.
	The lead wire improperly connected may cause electrical shock, or damage the tension amplifier. Be sure to check the electrical and mechanical connection of the lead wire.
 CAUTION	Check the ambient conditions of the tension amplifier again.
	Keep the tension amplifier away from dust, dirt, oil mist, conductive dust, corrosive gas, high temperature, due condensation, wind, rain, etc. because they may damage the tension amplifier, or cause malfunction. In addition, keep the amplifier away from vibration and shock. Check that no particles or conductive dust is inside the amplifier. If there are particles or conductive dust, clean the inside of the amplifier.
 CAUTION	Do not check the insulation resistance using a megger.
	To check the insulation resistance of the wires or controller using a megger, be sure to disconnect the power cable and the tension amplifier. If they are not disconnected, the internal elements may be damaged during resistance check.
 CAUTION	Discard the tension amplifier as an industrial waste.

- Consumable units that can shorten the service life are not adopted for this tension amplifier and the tension detector.
- It is recommended that the tension detector should be subject to zero adjustment and span adjustment each time periodical inspection is performed. Particularly when the rated load of the tension detector is very large compared with the tension practically used, mechanical stress of the detector will cause great change as the time elapses.

## 6. Specifications

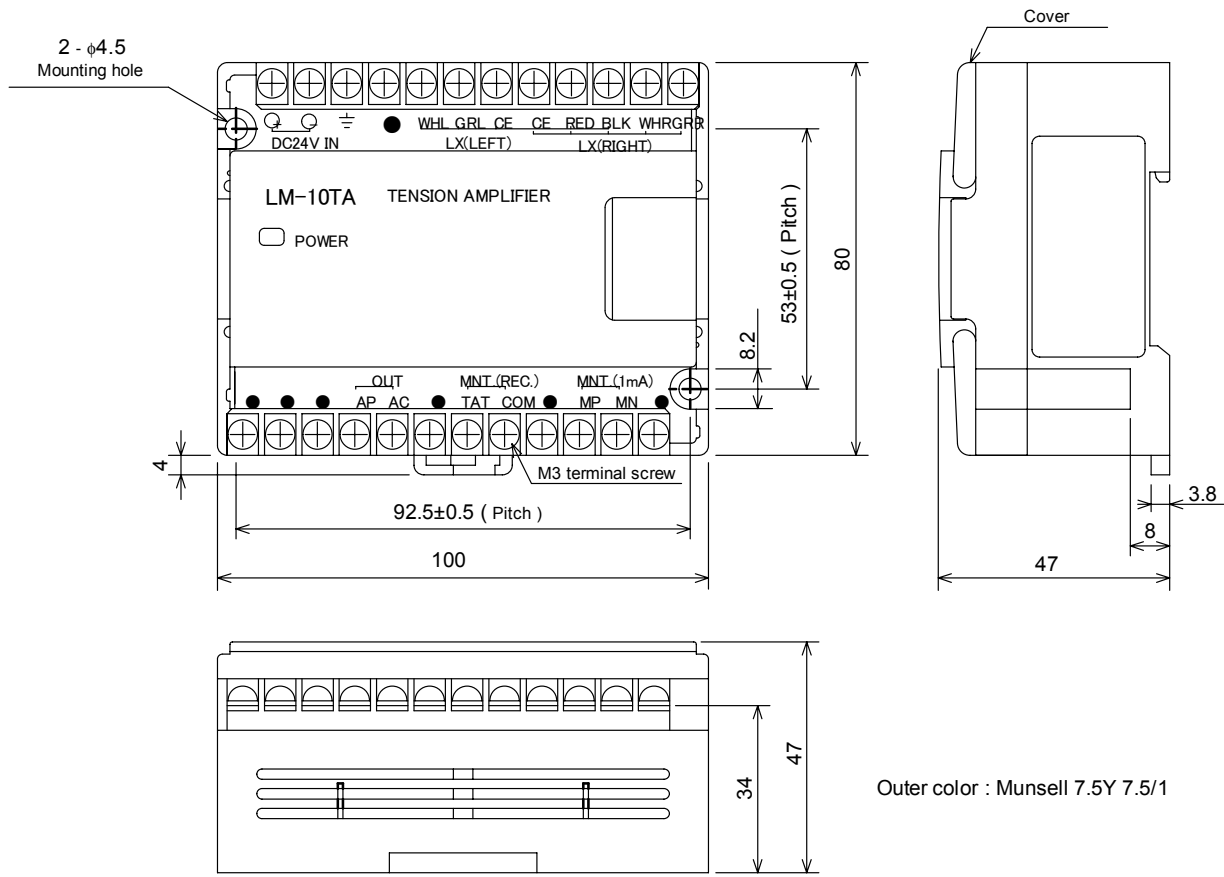
### 6.1 General specifications

Item	Terminal	Specifications
Power supply	Input	+ / - <ul style="list-style-type: none"> <li>• 24VDC <math>\pm</math>15%</li> <li>• Current consumption : approx.0.2A</li> </ul>
	Output	RED / BLK <ul style="list-style-type: none"> <li>• Power for tension detector</li> </ul>
Analog signal	Input	GLR / WHR Tension detector(right)
		GRL / WHL Tension detector(left)
	Output	AP / AC <ul style="list-style-type: none"> <li>• Outputs the tension signal to the external units, such as programmable controller.</li> <li>• At full scale tension, voltage can be adjusted to 5 to 10V.</li> <li>• Load resistance : 1k<math>\Omega</math> or more</li> </ul>
		MP / MN <ul style="list-style-type: none"> <li>• Connect the DC type 1mA ammeter to these terminals, and then adjust the current to 1mA (100%) at full scale tension using the internal dials.</li> <li>• Load resistance : 300<math>\Omega</math> or less</li> </ul>
		TAT / COM <ul style="list-style-type: none"> <li>• Output for recorder.</li> <li>• Load resistance : 100k<math>\Omega</math> or more</li> <li>• Used for monitoring AP/ AC signal. The difference between the output voltage of TAT / COM terminals and that of the AP / AC terminals should be 1% or less ( when the load resistance is 1M<math>\Omega</math> )</li> </ul>
	Indication	POWER
Dials	Inside the adjustment window	<ul style="list-style-type: none"> <li>• Zero and span adjustment dials : 4 dials ( total tension only )</li> <li>• External tension meter dial : 1 dial</li> </ul>

### 6.2 Environmental specifications

Ambient temperature	• 0 to 55°C during operation
Ambient humidity	• 35 to 80% RH (no condensation) during operation
Vibration resistance	• In accordance with JIS C0040, 10 to 55 Hz, 0.5mm ( 4. 9m / s <sup>2</sup> maximum), 2 hours in each of X,Y,Z axis directions .
Impact resistance	• In accordance with JIS C0041, 98m/s <sup>2</sup> 3 times in each of X,Y,Z axis direction.
Noise resistance	• By noise simulator with 1,000Vp-p noise voltage, 1 $\mu$ s noise width and 30 to 100Hz.
Dielectric withstand voltage	• 500V AC, 1 minute : Between all terminals as a whole and the case.
Insulation resistance	• 5 M $\Omega$ or more by 500V DC megger : Between all terminals as a whole and the case.
Operation atmosphere	• Free from corrosive gas and dust, no rain or drops of water.

# 7. Outside Dimensions



Outer color : Munsell 7.5Y 7.5/1

