



Tension Controller

**MODEL**  
**LX7-F FLANGE-TYPE TENSION DETECTOR**

**INSTRUCTION MANUAL**

Manual Number	IB(NA)-0800580ENG
Revision	B
Date	April 2018

This manual describes the part names, dimensions, mounting, and specifications of the product. Before use, read this manual and the manuals of all relevant products fully to acquire proficiency in handling and operating the product. Make sure to learn all the product information, safety information, and precautions. 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.

Effective April 2018  
specifications are subject to change without notice.  
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**How to obtain manuals**

**How to obtain manuals**  
For product manuals or documents, consult with your local Mitsubishi Electric representative.

**Registration**  
• The company names and product names in this document are trademarks or registered trademarks of their respective companies.

**Safety Precaution** (Read these precautions before use.)

This manual classifies the safety precautions into two categories:

**WARNING** and **CAUTION**.

<b>WARNING</b>	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
<b>CAUTION</b>	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.  
It is important to follow all precautions for personal safety.

**DESIGN PRECAUTIONS** **CAUTION**

- Do not bundle the signal line together with or lay it near the main circuit or power line. Normally, keep a distance of 100 mm or more between them. Noise may cause malfunction.
- While using, avoid applying force to the connector and terminal block. Failure to do so may cause disconnection or trouble.
- Ground the shield of the shielded wire or cable to be connected to the product at a single point on the product side. However, do not ground it at a point common to any high-power system. Noise may cause malfunction.

**INSTALLATION PRECAUTIONS** **WARNING**

- Never use this product in an atmosphere containing grease or flammable gases that could ignite or explode.
- Turn OFF the power, and confirm that the rotator is stopped. Performing work while the rotator is rotating could lead to electric shock or injury. Before starting any installation, removal, adjustment, or maintenance work, always turn OFF the device power, and confirm that the rotator is stationary. Pay special attention to prevent hands and fingers, etc., from getting caught.
- Completely tighten the bolts and take measures to prevent loosening. Depending on the condition of the tightened bolt, the bolt could be sheared or damaged, leading to injury. Always take measures to prevent the bolt from loosening by using adhesive or spring washer, etc.
- Do not allow cutting chips or wire scraps to fall into the product. There is a risk of product damage, smoke generation, or combustion, etc.

**INSTALLATION PRECAUTIONS** **CAUTION**

- Do not suspend the product by cables. If the cable breaks, the product could drop and cause injury. Always hold the product body when installing and removing.
- Confirm the length of the installation bolts.

**WIRING PRECAUTION** **WARNING**

- Make sure that cutting chips and wiring debris do not enter the ventilation slits of the product. There is a risk of product damage, smoke generation, or combustion, etc.

**PRECAUTIONS FOR OPERATION** **WARNING**

- Do not touch the product while it is operating. There is a risk of electric shock or injury if body parts such as hands or fingers come in contact with the tension detector while the detection roller, etc., is rotating. Attach a protective cover if hands or fingers will come in contact with the product while it is operating.

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Exclusion of loss in opportunity and secondary loss from warranty liability  
Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:  
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(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.  
(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

**For safe use**

- 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.

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**1. Product outline**

**1.1 Outline**  
The LX7-F flange-type tension detector is a tension detector mounted on a flange. This tension detector functions together with the tension controller and tension meter to output the voltage in proportion to the load applied on the detection roller.

**1.2 Product model name**

Rated load	Model name
50N	LX7-50FN17
150N	LX7-150FN17
300N	LX7-300FN17
500N	LX7-500FN17

**1.3 Confirmation of package contents**  
Confirm that the package contains the following products and accessories.

Product unit	LX7-□□FN17
Accessories	<ul style="list-style-type: none"> <li>Snap ring (for hole) Nominal 40: 2 pcs.</li> <li>Shielded cable with connector 7 m (φ6): 1 cable.</li> <li>Seal (for preventing entry of dust, etc.): 2 pcs.</li> </ul>

**1.4 Bearings**  
Bearings are not enclosed with this product. Customers are asked to prepare the bearings.

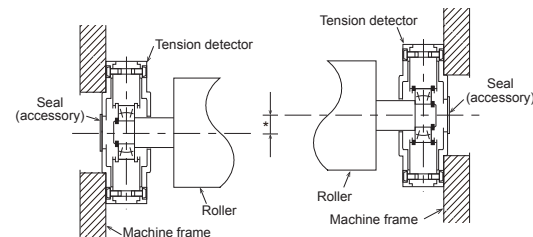
Tension detector rated load (N)	Compatible shaft diameter (mm)
50/150/300/500	17

**2. Installing the tension detector**

This product is a highly sensitive detector produced with precision machining and assembly technology. Caution is required during assembly and operation.

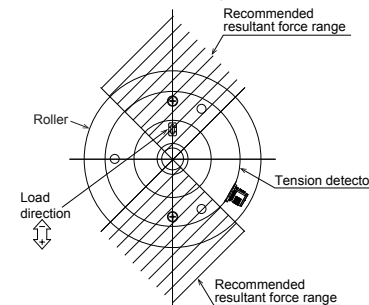
**2.1 Precautions for installation**

- Always use Self-aligning ball bearings so that unbalance of the tension detection rollers, mechanical machining errors such as uneven sensor mounting face, and changes in the roller length caused by temperature changes are not detected as tension. Keep mechanical machining errors mentioned above as small as possible in order to minimize tension detection errors. ISO 1940-1: 2003(E) G1-G6.3 is recommended for the tension detection roller unbalance. (Follows machine specifications)
- When supporting the tension detector roller on both ends, align the height of the tension detector installation face.

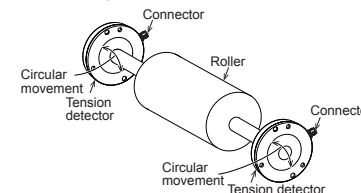


- Keep the \* section as low as possible to minimize tension detection error.
- If the \* section dimensions are large, there is a risk of the material snaking, the life of the bearings dropping, and the zero point output fluctuating, etc.

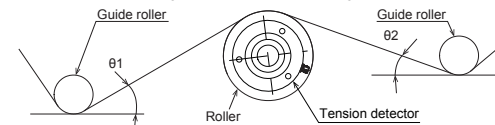
- The tension resultant force according to the material angle must be within the recommended resultant force range indicated in the drawing to maintain the tension detection accuracy.



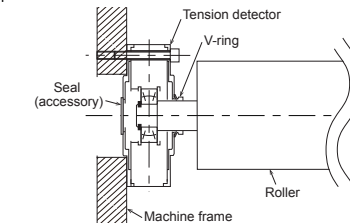
- When a load is applied on the flange-type tension detector, the roller moves slightly with a circular motion. Adjust the direction of the connectors so that the left and right tension detectors bend in the same direction.



- When installing the tension detector, take care not to apply strong impact loads or excessive loads and prevent the entry of foreign matter such as cutting chips and wire scraps. Pay attention to the following types of impact and excessive loads when installing the product.
  - When fixing without using self-aligning bearing type bearings, and when there is eccentricity or a non-parallel state.
  - When directly tapping the roller with a hammer to achieve parallelism between the rollers.
  - When people get on or objects are placed on the detection rollers.
  - When vibration or impact are applied while transporting the machine after installing the detection roller.
  - When the tension detector has been dropped, or when transporting without cushioning materials.
- When using in an environment with large temperature changes, provide a mechanism to absorb the changes in tension detection rollers from the changes in temperature so that the accuracy of tension detection is not affected.
- When operating with a low tension, keep the mechanical loss as low as possible in order to minimize the tension control error.
- The detection roller cannot be installed on only one side.
- Provide guide rollers on the front and rear of the tension detector so that the material angles θ1 and θ2 do not change.



- When using in places with high levels of dust, etc., insert a V-ring etc., where the shaft enters the product to prevent the entry of dust, etc., into the product.



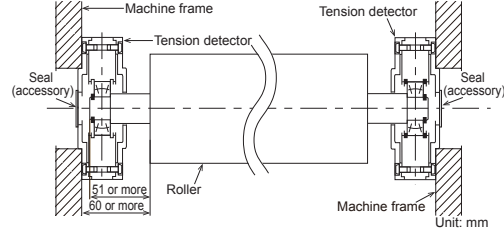
\* V-ring: Size must match user's roller size)

## 2.2 Installation methods

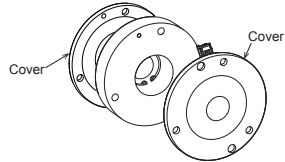
Install the product with the following procedure.

- 1) This product has internal self-aligning ball bearings that support the roller shaft.
- 2) Provide a spigot (φ60) on the main unit and socket on the machine frame to position, and then install the product onto the inner side or outer side of the machine frame.
- 3) Use three M6 bolts (strength class 10.9 or more) to install the product onto the machine frame. (Tightening torque: 9 N·m to 12 N·m)
- 4) The tightening torque for the cross-recessed screw on the product cover is 1.1 N·m to 1.8 N·m.

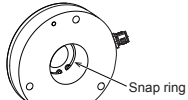
### 2.2.1 Details of tension detector (when installing on wall face)



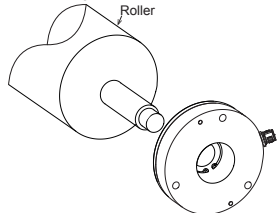
- a) Loosen the cross-recessed screw on the product and open the cover.



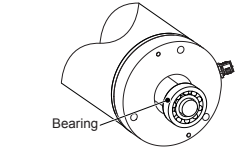
- b) Attach a snap ring on the side opposite the machine frame, and tighten the cross-recessed screws to close the cover.



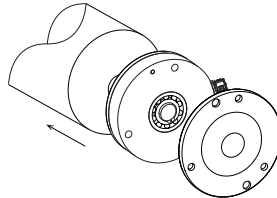
- c) Pass the roller through the product.



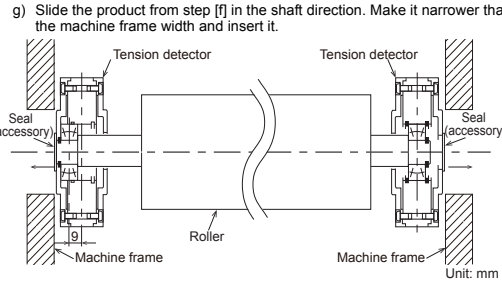
- d) Mount the bearings into the roller. (Fix the shaft direction with the snap ring.)



- e) Slide the bearings into the product in the direction of the arrow, and attach a snap ring on the opposite side of [b]. Then, tighten the cross-recessed screws to close the cover.



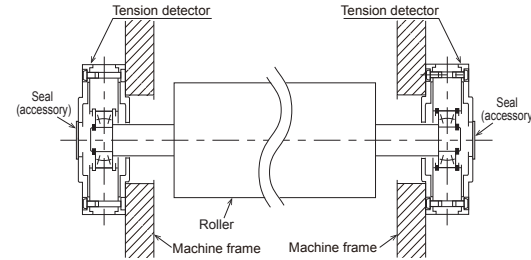
- f) On the other piece of the product, slide the bearings into the product in the same way. Note that on this side, a snap ring is not attached. Tighten the cross-recessed screw and close the cover.



- h) When installing, attach the product's spigot (φ60) into the socket provided on the machine frame, and install with three M6 bolts.
  - Take care to prevent the entry of dust, etc., when the product cover is opened. After installing, plug the cover hole with the enclosed seal.

### 2.2.2 Details of tension detector (when installing on outer side of wall)

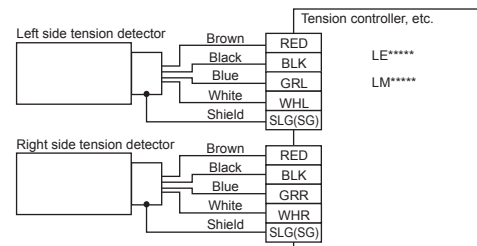
- a) Loosen the cross-recessed screw on the product and open the cover (both sides).
- b) Attach the machine frame side snap ring, and tighten the cross-recessed screws to close the cover.
- c) Pass the roller through the product.
- d) Mount the bearings into the roller. (Fix the shaft direction with the snap ring, etc.)
- e) Slide the bearings into the product, and attach a snap ring on the opposite side of [b]. Then, tighten the cross-recessed screws to close the cover.
- f) Set the product spigot (φ60) into the socket provided on the machine frame, and tighten with three M6 bolts.
- g) Install the other piece of the product with the same procedure.
  - Pass the cover on the machine frame side through the roller.
  - Mount the bearings into the roller.
  - Insert the product body into the outer ring of the bearings.
  - Align the cover with the screw holes on the product unit, set the product spigot (φ60) into the socket provided on the machine hole, and install with the three M6 bolts.
  - Take care to prevent the entry of dust, etc., when the product cover is opened. After installing, plug the cover hole with the enclosed seal.



## 3. Wiring work

### 3.1 Connecting the tension detector and tension controller

- 1) An example of how to connect to the tension controller, etc., is shown below. Refer to the instruction manual of each tension controller for details on connections.



- 2) Always use a shielded wire when joining cables.

## 4. Operation

### 4.1 Precautions for operation

Take care not to apply a large impact load or excessive load when operating the tension detector. Pay attention to the following types of impact and excessive loads when installing the product.

- 1) When the roller's dynamic balance is poor, and abnormal vibration results from resonance, etc.
- 2) When the machine has large reel inertia, and sudden acceleration or sudden deceleration is performed.
- 3) When a reel torque for a large reel diameter is issued while using a small reel diameter.
- 4) When there is abnormal tension on one side of the material

## 5. Specifications

### 5.1 Environmental specifications

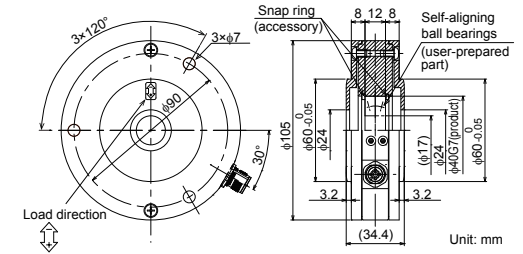
Item	Specifications
Operating temperature	-5 to 60°C (with no freezing)
Operating humidity	85% RH or less (with no dew condensation)
Storage temperature	-5 to 60°C (with no freezing)
Storage humidity	85% RH or less (with no dew condensation)
Vibration resistance	2 m/s <sup>2</sup> or less
Impact resistance	98 m/s <sup>2</sup> or less: 3 times each in 3 axis directions
Power noise withstand level	Noise voltage 1000 Vp-p, using noise simulator with noise width 1 μsec. and frequency of 30 to 100 Hz
Withstand voltage	1000 V AC for 1 min: Measure across batch of all terminals and housing
Insulation resistance	100 MΩ or more when measured with 500 V DC insulation resistance tester: Measure across batch of all terminals and housing
Operating environment	Environment must be free of corrosive or flammable gases, conductive dust, and must have low levels of dust

### 5.2 Performance specifications

Item	Specifications	
Rated load (N)	50    150    300    500	
Load direction	Compression (+), tension(-)	
Maximum load withstand level	200% of rated load	
Outline dimensions	Outer diameter φ105 × width 34.4 mm	
Input power	5 V DC, 20 mA or less (Brown: 5 V DC, black: GND)	
Output voltage	150±30 mV DC (when 10 kΩ load resistance is connected)	
Output voltage polarity	During compression load	Blue +, white -
	During tension load	Blue -, white +
Detection accuracy <sup>*1</sup>	Temperature drift	1%/FS or less/20°C
	Linearity	±1% or less
	Hysteresis	0.5% or less
Installation method	Wall-mounted	
Weight	1.2 kg	
Recommended bearings	Self-aligning ball bearings	
Compatible shaft diameter	17 mm (when inserting bearings)	
Surface treatment (exterior part)	Electroless nickel plating	

<sup>\*1</sup> The detection accuracy is the accuracy for the isolated tension detector. The detection accuracy for the system will vary according to the machine specifications and installation accuracy, etc.

## 6. Outline dimensions



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张力检测器	×	○	○	○	○	○
外壳	×	○	○	○	○	○
差动变压器	×	○	○	○	○	○

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