

ZJ-12546-B

LD-FB TENTION CONTROL DEVICE

TECHNICAL MANUAL



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HIMEJI WORKS

## 1. Description of the Equipment

This equipment counts the number of revolution of the reel with the use of the proximity switch incorporated in the reel to thereby calculate the winding radius internally, and provides voltage output corresponding to the increase/decrease in the winding radius. The proximity switch of the reel is basically of one pulse/one revolution, and the head of the bolt buried in the winding shaft can be utilized for this purpose.

In operating this equipment, easy tension control can be provided by setting material thickness and initial radius.

## 2. Features

### 2-1 Non-contact winding radius detection system

The material will not be damaged since internal winding radius calculating system based on pulse detection is adopted.

### 2-2 Easy handling

Cumbersome adjustment is eliminated. The operator only has to set the winding radius and material thickness.

### 2-3 Built-in inertia compensating function

Inertia compensation can be made at start-up/ stopping by selecting proper external resistance.

### 2-4 Easy modification

Basically, one pulse is required per one revolution of the reel for the purpose of pulse detection. Since the head of the bolt mounted on the winding shaft can be used as a detection tip, the equipment can be applied to most machines already. Checking calculation of the number of pulses is not necessary.

### 2-5 Compact and lightweight

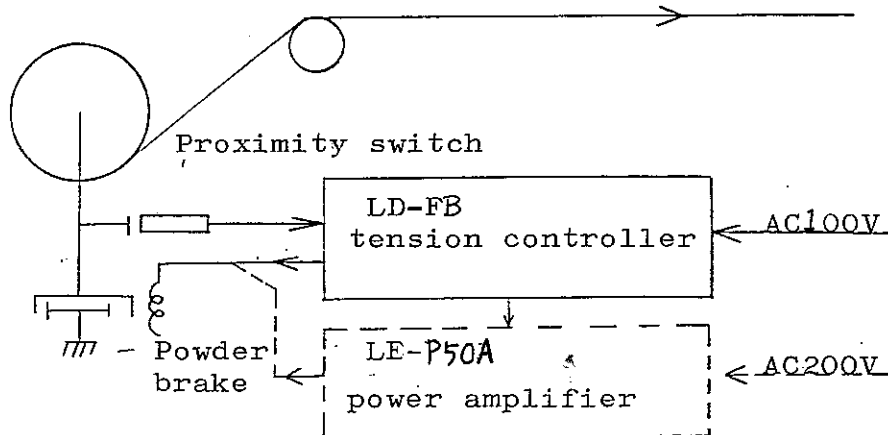
The controller has adopted transformer-free switching system, and therefore, lighter and more compact than conventional apparatuses.

### 3. Specifications

- o Detection system Non-contact winding radius detection
- o Detection pulse One pulse per one revolution of reel (basic control)
- o Supply voltage AC100/110V $\pm$ 10% 50/60Hz
- o Load used together Powder clutch/brake with coil rating of DC24V, 3.6A or less
- o Control resolution 1mm radius
- o Input pulse Voltage output proximity switch (Proximity switch) of DC12V, rectangular wave output, H level of 9V or more, and L level of 1V or less (Amperage dissipation: 50mA or less)
- o Input pulse response frequency 200Hz
- o Setting (Digital switch) Winding radius: 10 - 990mm (by 10mm step); provided that the applicable range is 30 - 990 mm. Material thickness: 1 - 99 $\mu$ m (1 $\mu$ m step)
- o Indication Output voltage (Meter indication)
- o Initial adjustment Adjustment with adjusting knob (ADJ)  
At the time of shipment; the equipment is adjusted to DC24V output for 500mm radius.
- o Inertia compensation External resistance switching system (External resistance shall be procured by the user.)
- o Terminal for connecting external amplifier External amplifier LE-P50A shall be used if a powder clutch/brake exceeding DC24V, 3.6A is to be used.
- o Paint color Munsel 5Y7/1 (Cream)

- o Mounting method                      Floor-mount or panel-mount
- o Weight                                 Approx. 6Kg
- o Applicable temperature             -5°C - +40°C
- o Accessories                            Adjusting driver and fuse (5A)

4. Construction (Example of unwinding)



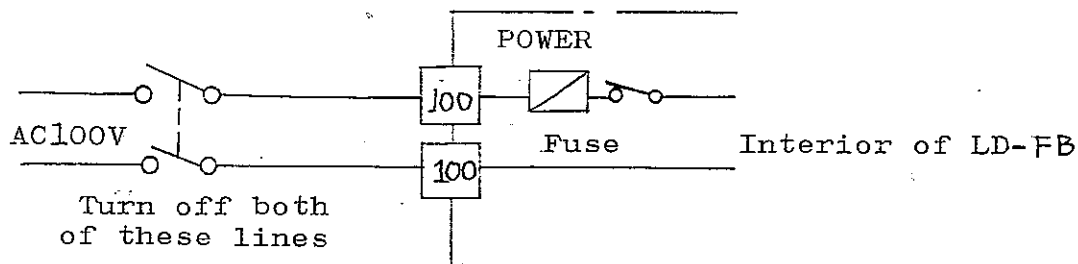
Note) Broken line indicates the construction when external amplifier is employed.

5. Initial Adjustment

After installation of this equipment, make the following initial adjustment prior to actual operation. If the equipment is to be used as manual power source only, refer to the following Section 6.

5-1 Selection of unwinding/winding

Turn the switch in the equipment appropriately, depending on whether the equipment is to be used for unwinding/winding. For position of the switch, refer to the label on the cover surface. When operating this switch, be sure to turn off voltages to terminals **100** and **100**.



## 5-2 Setting maximum winding radius

Adjustment shall be made so that the output voltage becomes 24V at the maximum winding radius applicable to this equipment when 'the tension set dial' is set at 10.

For shipment, this equipment is adjusted to the output voltage of DC24V for winding radius of 500mm with 'the tension set dial' set at 10.

If the maximum applicable radius is larger or smaller than 500mm, make the initial adjustment of output voltage in accordance with the following procedures.

- 1) Turn 'the ADJ knob' to make the output voltage as low as possible.
- 2) Set 'the digital switch' at the desired maximum radius. The tension set dial' shall be set at 10.
- 3) Turn 'the START/STOP switch' at START.  
(If the switch is already set at START, turn it to STOP once, and then turn it to START again.)
- 4) Using 'the ADJ knob' on 'the left side of the equipment, set the output voltage at 24V. Note that if the maximum radius is less than 100mm, output voltage may not adjusted to 24V.

## 6. Application as Manual Power Source Only

If this equipment is to be used as manual power source only, the proximity switch is not necessary. Short-circuit the terminals ST and G of the LD-FB controller, connect input power source and load, and make the following adjustment.

- 1) Turn the ADJ knob so that output is minimized.
- 2) Set 'the tension set dial' at 10.
- 3) Set 'the winding radius' at 990mm.
- 4) Turn the START/STOP switch at START.  
(If the switch is already set at START, turn it to STOP once, and then turn it to START again.)

5) Turn 'the ADJ knob' so that the output voltage becomes 24V.

The above-mentioned adjustment allows adjustment of output voltage within the range of 0 - 24V for the tension set dial' setting of 0 - 10.

In this case, the material thickness can be set at any value.

Upon completion of the said initial setting, the START/STOP switch may be set at either side for the purpose of operation.

## 7. Manual Operation

Adjustment for manual operation is virtually the same as that for using this equipment as manual power source only. However, 'the winding radius' must be set at the maximum value determined at the time of initial adjustment.

Then, turn 'the START/STOP switch' to START one, and then turn it to STOP again. (Note 1)

The output is variable within the range of 0 - 24V for the tension set dial of 0 - 10.

Note 1) If the switch is left as it is at START, automatic control will be effected.

Note 2) Turning 'the START/STOP switch' to STOP during automatic operation does not always permit 0 - 100% manual operation.

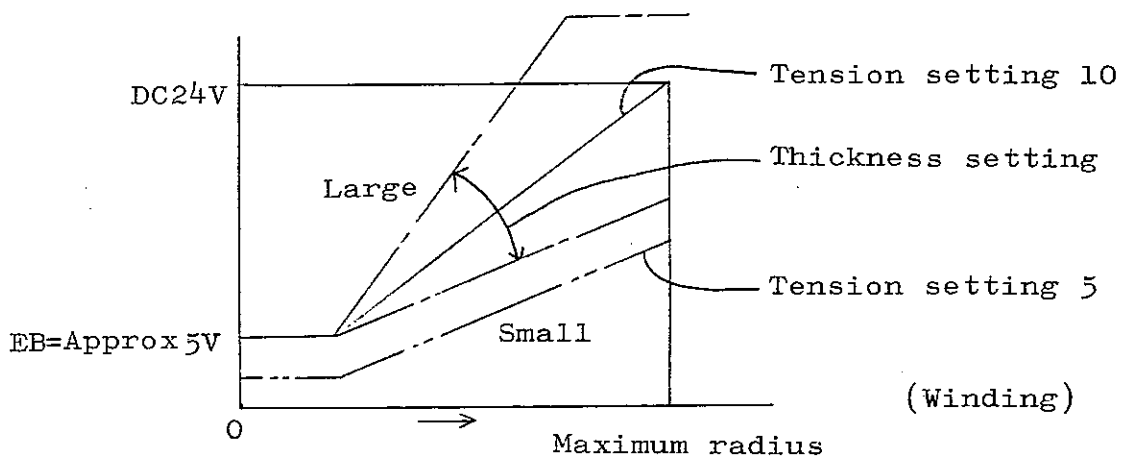
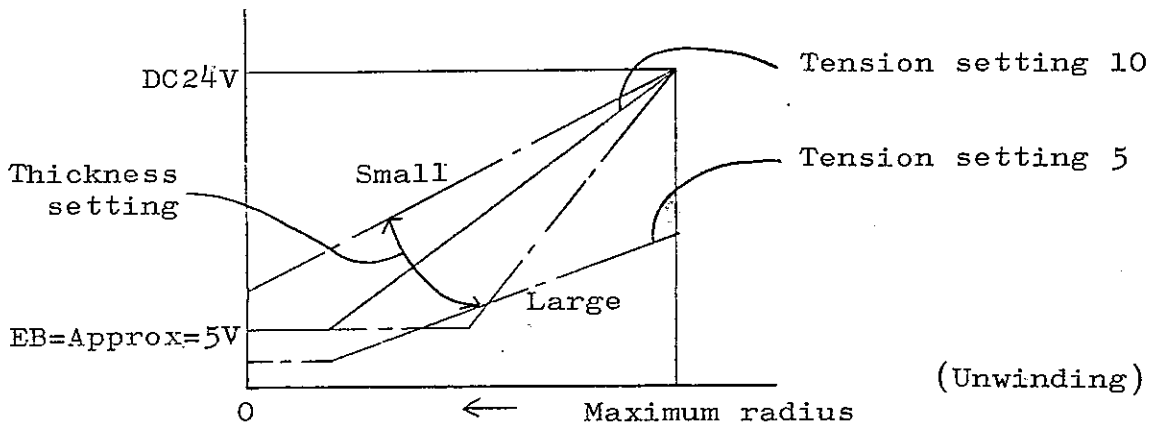
Even if "the tension set dial" is set at 10, only the output corresponding to the radius set at that time will be provided.

If the winding radius is set at the maximum value selected at the time of initial adjustment, output corresponding to the maximum radius shall be provided when the switch is turned to START again. If the winding radius is turned to START the maximum value selected at the time of initial adjustment, set the radius again at the maximum value selected at the time of initial adjustment.

## 8. Automatic operation

After the initial adjustment described in Section 5 above, set 'the winding radius' at the initial operating radius with the digital switch and set 'the material thickness' at the material thickness also with the digital switch.

Turn 'the START/STOP switch' to START, and begin operating the equipment. As the winding radius changes, output voltage changes to provide tension control.



Characteristics are as shown in the above figures. EB is a fixed value, and cannot be adjusted. Change in tension during operation can be made with 'the tension knob; while taper can be changed by shifting thickness setting.

Note that too large material thickness at the time of winding causes application of output voltage exceeding 24V.

If the material itself is changed, set the initial operating radius at the winding radius of that material, turn the START/STOP switch to STOP once, and then turn it again to START to have the equipment read the set value.

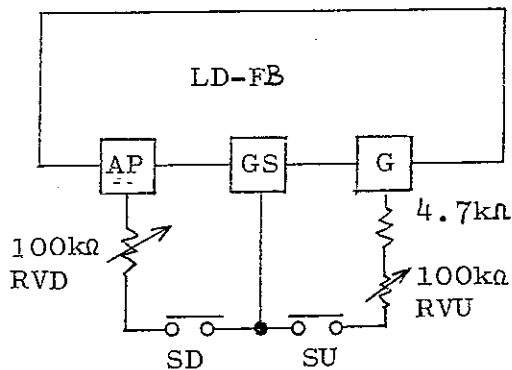
When power is turned off, winding radius calculation is reset. Therefore, in this case, the above-mentioned operation must be carried out again.

#### 9. Inertia Compensation at Start-up/Stopping

For inertia compensation at the time of start-up/stopping, connect external resistances to external terminals **AP**, **GS** and **G** to allow switching of start-up/operation/stop.

If inertia compensation is not required, this connection is not necessary.

#### Connecting External Resistance for Gain Selection



SD: When this contact turns ON, output decreases.

SU: When this contact turns ON, output increases.

Note) o Do not turn on SD and SU simultaneously.

o Turn OFF both contacts during operation.

#### Adjustment Range

RVD: 90% - 50% of steady state

RVU: 120% - 300% of steady state



## 10. Use of Large-Capacity Load

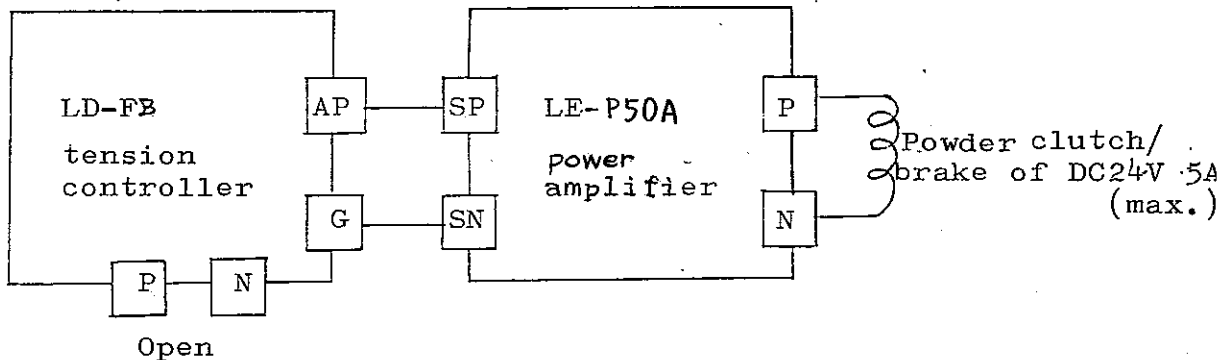
(Use of power clutch/brake with rating of DC24V, 3.6A or over)

Although the LD-FB controller has a built-in output power section, its control capacity is DC24V, 3.6A or less.

Controlling a powder clutch/brake of DC24V, 3.6A or over, external power supply is required in addition to the main body. The following describes the connection of the external power supply.

When load capacity exceeds DC24V 3.6A:

----- power amplifier LE-P50A shall be employed.---



For other connections, refer to the description of the outer connections of LD-FB and power amplifier LE-P50A.

10-1 Initial adjustment of LD-FB when external amplifier is employed.

Follow the procedure applicable when the external amplifier is not employed.

At the time of initial adjustment, the amplifier may or may not be connected. For initial adjustment, refer to Section 5 above.

10-2 Since the external amplifier is of constant-current type, let the manufacturer know the type of the powder clutch or brake used.

### 11. Material Thickness Exceeding 100 $\mu$ m

The maximum material thickness allowed for this controller is 99 $\mu$ m, assuming that one pulse is generated per revolution of the winding shaft.

The equipment can be applied to thicker materials, by increasing the number of pulses generated per revolution of the winding shaft. However, the set value of the material thickness switch shall be

$$\frac{\text{Actual material thickness}}{\text{Number of pulses generated per revolution}}$$

Material thickness	Number of pulses generated per revolution	Material thickness setting
200 $\mu$ m	10 pulses/ rev	20 Mm
1000 $\mu$ m	20 pulses/ rev	50 $\mu$ m

### 12. Unwinding/winding electric wire, etc.

This equipment can also be applied to electric wire, etc. in which a number of materials are used in one layer, permitting change in winding radius after several revolutions of the winding frame.

In this case, material thickness setting value shall be:

$$\text{Material thickness setting value} = \frac{\text{Thickness of one layer}}{\text{Number of winding turns per layer}} \times$$

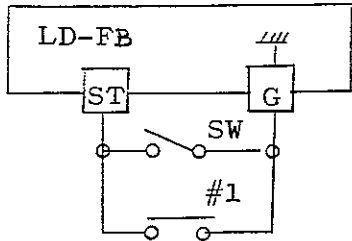
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Number of pulses generated per revolution

### 13. How to Use External Remote Terminals

Unless external remote control is employed, short-circuit external terminals **[ST]** and **[G]**. Note that if these terminals are not short-circuited, the START/STOP switch on the controller panel will not operate.

These external remote terminals shall be employed for starting up the controller through remote control by providing an external contact between them. Referring to the description of outer connection, connect the switch (SW) and remote control contact (#1) between the external terminals **[ST]** and **[G]**.



SW: External remote ON/OFF switch  
 #1: External START contact

When the switch (SW) is turned ON, the controller can be started with 'the START/STOP switch' on the controller panel.

When the switch (SW) is turned OFF, the controller can be started with the use of the external START contact (#1), provided that 'the START/STOP switch' on the controller panel must be turned to START.

Note) The term "start" used in this section means the operation to read the set winding radius on the panel. The set winding radius is read when the contact between ST and G changes from OFF to ON, thereby generating output voltage corresponding to the set winding radius value.

#### 14. Proximity Switch and Detection Tip

Any proximity switch manufactured by any firm can be used, so long as it is of DC12V voltage output type (H voltage: 9V or more and L voltage: 1V or less). The am-perage dissipation of such proximity switch need be 50mA or less.

For control with basic pulse (one pulse per revolution), it is recommended to detect the bolt head with a cylindrical proximity switch. On the other hand, several pulses per revolution are employed, the combination of groove-type proximity switch and slit disk is recommended.

### 15. Panel-Mount Type

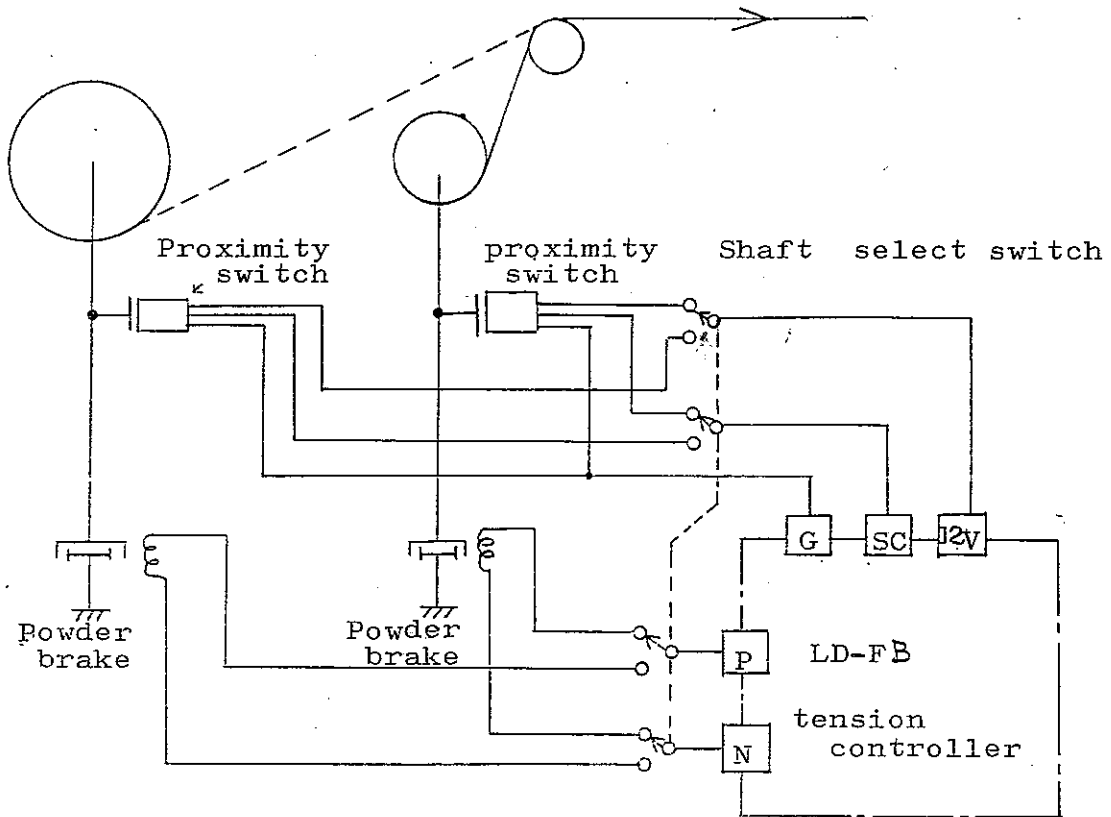
When the equipment is to be mounted on panel, remove the cover of the controller and four rubber legs at the bottom. (The rubber legs can be removed together by removing the rubber leg mounting screw from the bottom.)

On the left side of the controller, an adjustment window is provided. Mount the controller so that adjustment can be made after installation.

### 16. Calibration of Output Voltage

Since the output voltmeter of this equipment is actuated by control signal, a difference from the actual output voltage may be caused, depending on supply voltage fluctuations and load conditions. In this case, measure the output voltage between **P** and **N** with the use of a tester or similar instrument to adjust the reading of the output voltmeter. (Use the CALIB. volume.)

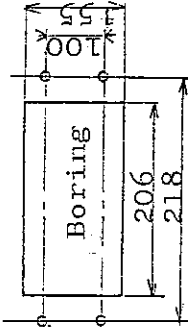
17. Two-Reel Chinging (Example Unwinding)



Simultaneously with the reel select signal, read the set initial operating radius, referring to 8. Automatic Operation and 13. How to Use External Remote Terminals.

18. Outward Figure

Panel cutting dimensions

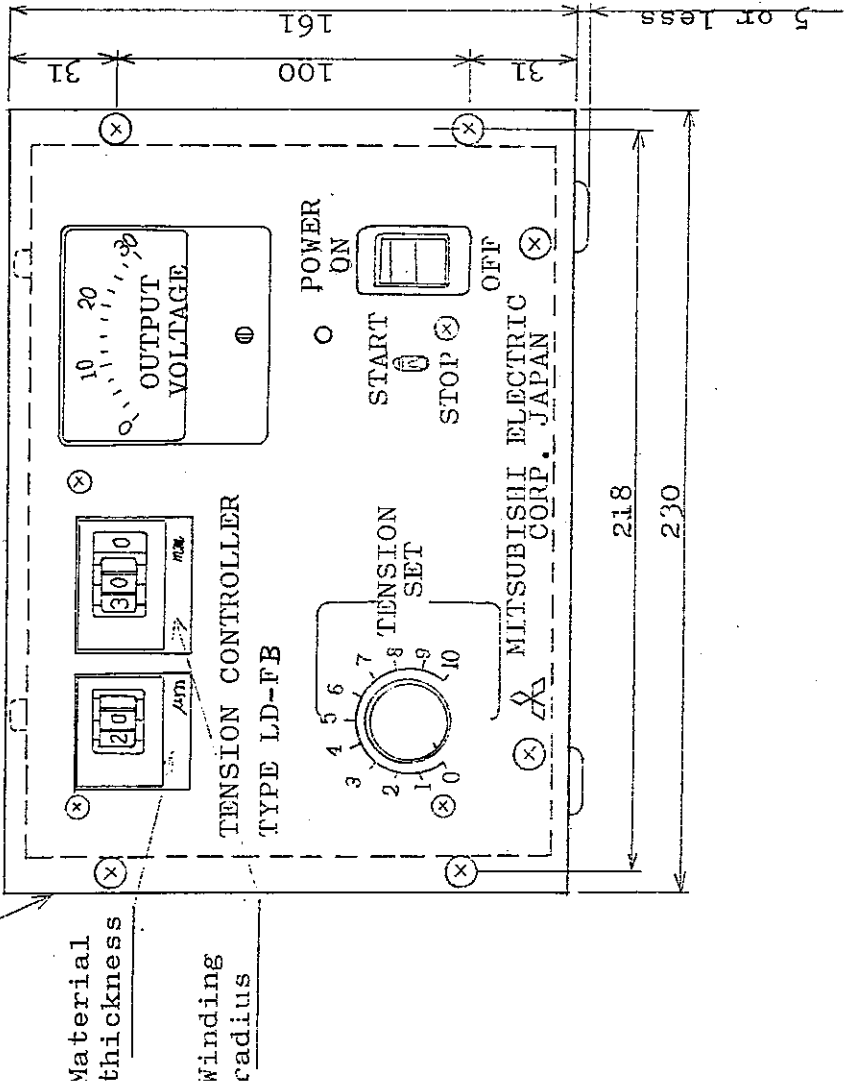
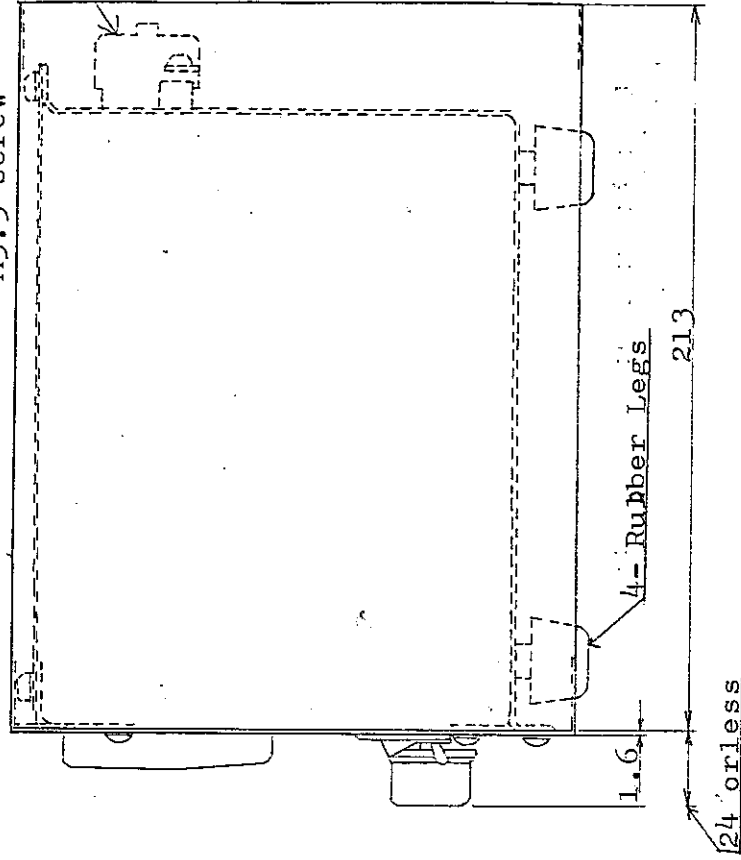


Panel mounting can be effected by removing cover and rubber legs.

Operation panel with adjusting knob and select switches

Paint color: Munsel 5Y7/1 (Cream)  
Weight: Approx. 6kg  
Terminal board for external wiring

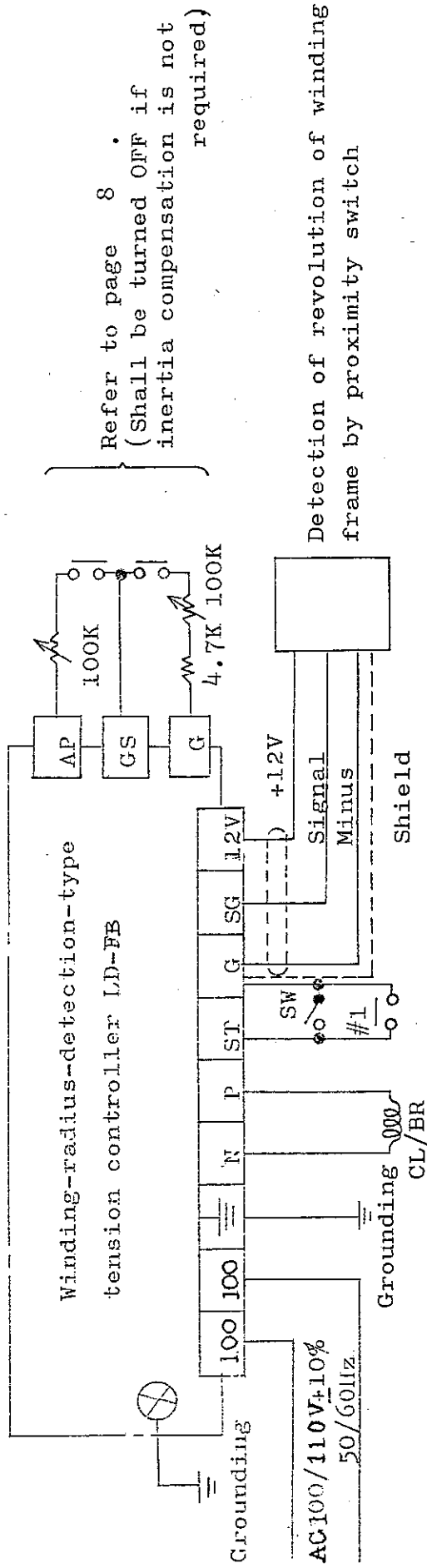
M3.5 screw



Material thickness

Winding radius

19. External Wiring Diagram



Grounding: Class 3 grounding

CL/BR: Powder clutch or powder brake DC24V, 3.6A (MAX)

#1: Contact to be turned ON during operation (for external remote control)

Wiring to #1 shall be made as short as possible, and small-current contact shall be employed

Proximity switch: 12V proximity switch with output signal of 9V or more for H level and 1V or less for L level, capable of generating rectangular wave form, shall be employed.

SW: External remote ON/OFF switch

External remote control is effected when the switch is turned OFF.

Note) Ground the case to prevent electric shocks.

(Use the screw marked  $\oplus$ .)

20. Considerations for Selection of Powder Clutch/Brake

Select proper powder clutch/brake in accordance with the following procedure, when the LD-FB tension controller is to be employed.

(1) Applicable powder clutch/brake

ZKB type: Models with rated torque of 10Kg.m or less

ZE type : All models

ZKA type: Models with rated torque of 45Kg.m or less

ZKG type: All models

(2) Since the powder clutch/brake of this controller undergoes somewhat larger temperature rise in character, the maximum applicable torque of the powder clutch/brake shall be limited as follows.

For models with rated torque of less than 1.0Kg.m: 80% or less of rated torque

For models with rated torque of 1.0Kg.m or more: 90% or less of rated torque

(3) Vibration may be caused, depending on the specifications of the equipment. Check the vibration of the actual equipment.