INSTRUCTION MANUAL

SOUNDING LEVEL METER

MODEL: TLX-120AP1/200AP

Meanings of indications for safety used in this Instruction Manual are as follows.

WARNING: Indicates that improper handling assumes the risk of a fatal or serious injury.

CAUTION: Indicates that improper handling assumes the risk of injury or damage to property only.

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No.ETL1000-1

09.02.04

Thank you for purchasing this product.
Please check the model number and accessories, and follow the instructions in the instruction manual for proper use of this product.

Request of the customer

Please be sure that the persons using this product have access to the instruction manual. Be sure to keep this manual for future reference.

Safety precautions

In this instruction manual, the following symbols are used to ensure safe use of the product.

Warning: Improper use of the product may result in death or serious injury.

Caution: Improper use of the product may result in minor injury or physical damage only.

Warning: Be sure to strictly observe the following safety precautions in order to use the sounding level meter properly and safely. We shall not be liable and make no warranty for any accident or failure resulting from failure to observe these precautions.

Caution: The sounding level meter may fail to provide accurate measurements depending on conditions of use (such as temperature and humidity). Check the specifications of the product for proper use of the product.
Never rework or modify the detector or controller unit. Doing so may cause the measurement to fail and may damage the product.

Warning: Turn off the power supply to the product before connecting the wires. Failure to do so may result in electric shock depending on the circuit.

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1. Principle of Operation

The sounding level meter accurately measures the level of powder and grain inside a silo or tank by electrically measuring the length of a wire rope mounted with a weight that is let down until it reaches the measurement target.

2. Features

- The controller is built into the detector unit, allowing the use of the sounding level meter with the input switch and output indicator (output of 4–20 mA DC or pulse signals used for a counter). This configuration eliminates the requirement for large controller space.
- Anyone can use the product without difficulty. For the rated settings, simply input the distance you want to apply. No need for complicated calculations or conversion tables. Easily modify the ratings corresponding to the current output of 4–20 mA.
- The meter provides output while it performs the measurement. The output can be used as a signal to set the timing for throwing in the measurement target.
- The self-diagnosis function outputs an alarm indicating an abnormality (such as wire rope breakage and buried weight). With the LED indicator of the controller built into the detector unit, the operator can check the abnormality.
- The meter is equipped with a simplified automatic measuring timer.
- Contact type operation of the level meter allows use in hazardous environments, such as in dust, which causes problems when measuring the levels of powder and grain.

3. Description of Operation

When a start signal is input to the TLX sounding level meter, the meter outputs one pulse as the measurement starts. Then, the motor starts rotating downward, letting down the wire rope mounted with a weight. The distance the wire rope is lowered is measured with a sensor. When the weight reaches the measurement target, another sensor detects the status, and the meter completes measurement. After that, the weight is quickly wound up, and the meter waits for the next measurement, retaining the measured data. The meter outputs a pulse every 10 cm during the measurement, which is used to display the measured amount with a commercial non-voltage input type indicator.

4. Specifications

Type		TLX-120AP1	TLX-200AP
Measurement range		0–12 m	0–20 m
Measurement method		Pulse method	
Measurement scale		Wire rope Φ2mm, SUS304	
Motor		Single-phase 20 W reversible (50/60Hz), Electromagnetic brake type	
Output	Current output	4–20 mA DC, resistance load 350 Ω or less	
	Pulse output Start output	NPN open-collector output Maximum 40 mA (30 A) or less, residual voltage 1 V or less	
	Output during measurement	Contact a, AC250V/5A, DC30V/5A (resistance load)	
	Abnormality output	Contact a, AC250V/5A, DC30V/5A (resistance load)	
Input		Non-voltage contact signal (start input)	
Measurement resolution		10 cm	
Accuracy		10 cm	1% of F.S.
Indicator lamp		Power supply (yellow), operation (with a two-color LED, measuring: green, abnormality: red)	
Weight elevating speed		About 13 m/min	
Timer function		3 min, 5 min, 10 min, 15 min, 20 min, 30 min, 60 min, 2 h, and 3 h (3 min cannot be selected with TLX-200AP)）	
Power supply voltage		AC100V or AC200V, 50/60Hz	
Power consumption		70 VA	
Flange size		5K100A (SS400)	
Ambient temperature during use		-10ºC to +50°C (no freezing allowed)	
Materials used (main)		Body, flange Cover Wire Drum Weight (standard)	SS400 SS400 SUS304 Cast aluminum SS41
Painting color		Munsell 10YR7.5/14	
Weight		31 kg	

Caution: Specify AC100V or AC200V for the power supply voltage.

*Special specifications conform to documents accompanying the product.

5. Installation

5-1. Short tube nozzle for mounting

The length of the short tube nozzle to be mounted must be 150 mm or less (for the case of the standard standby position of 500 mm). (Refer to Figure 5-1.)

Cut off the inside edges of the short tube to prevent wire damage and product malfunction.

5-2. Mounting position

Avoid mounting the product in a position directly below or close to the carry-in or carryout port of the measurement target. Failure to do so may cause a buried weight. Select a position where the weight does not touch the surrounding structures when swinging. Be sure to secure the necessary space for an inspection of the product around the top cover and the section storing the controller. For the details of the mounting position and mounting method of the product, refer to Figure 5-2.

In the event exposure to direct sunlight may cause the temperature to rise in the product, implement the appropriate measure, such as attaching a sunshade.

5-3. Mounting method

This product is mounted with a flange (JIS 5K100A). Be sure to mount the product in the horizontal position. If the product is mounted at a slant, the wire rope may deviate from the drum, wind around the main shaft, or prevent the upper limit detection lever from lowering. Be sure to check the mounting condition with a level gauge or other devices. When mounting the product, be sure to insert rubber packing (thickness of about 3 mm) and secure the product with M16 x L60 bolts, nuts, and washers in eight positions.

Pay close attention to avoid damaging the wire rope when mounting the sensor. In addition, be sure to secure the space necessary for inspection. It is recommended that an opening for inspection be provided in near the product.

Caution: The rubber packing, bolts, nuts, and washers are not attached to the product. They must be prepared separately.

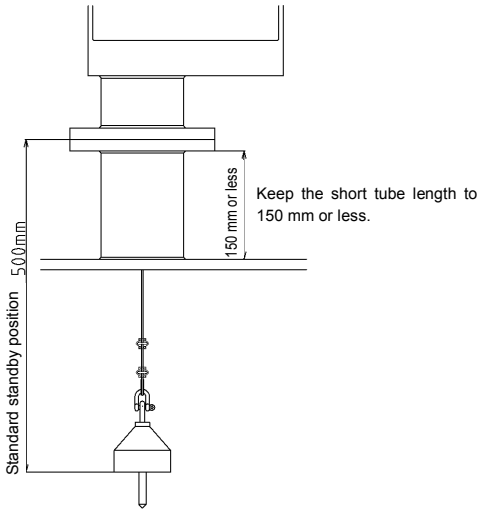


Figure 5-1

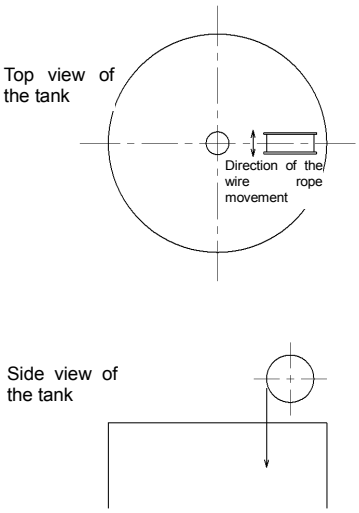
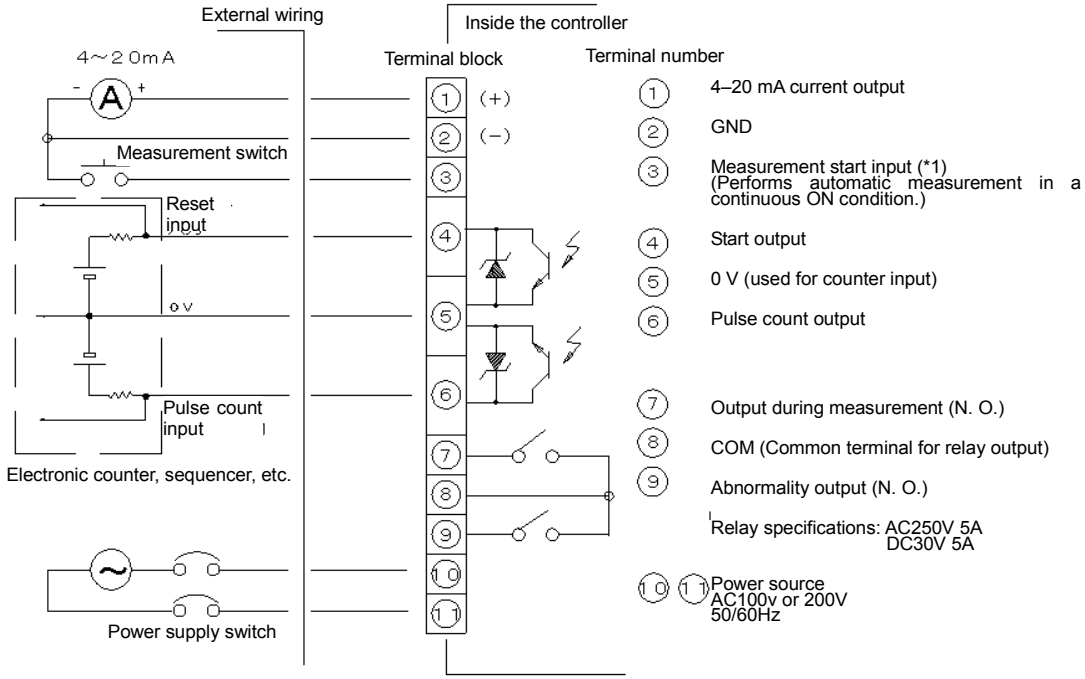


Figure 5-2

6. Terminal description



- 4–20 mA (Terminal No. 1)

  The terminal for current output used together with Terminal No. 2. The current output of 4–20 mA has been adjusted by default before shipment, requiring no further adjustment.

- GND (Terminal No. 2)

Used as a ground for the 4–20 mA terminal and the start terminal. Pay attention to avoid mistaking this for the 0 V terminal of Terminal No. 5, which has no relationship to the ground.

- Start input

  A signal to start measurement with this product. Measurement starts by short-circuiting this terminal to GND. When the terminal short-circuits continuously, a timer function activates during that period. When the circuit opens, the timer stops functioning, resetting the elapsed time. When the abnormality output is being activated, short-circuiting the start input to GND continuously for 5 seconds generates a reset condition to initialize the product. If the timer function is being used, the terminal must be opened once.

- Start input (Terminal No.4)

  The terminal outputs one pulse before measurement starts. This is used to reset the previous value of the devices such as the counter. The terminal provides output by means of a transistor (open collector) that holds Lo potential at signal output. The terminal is used together with 0 V (Terminal No. 5).

- 0V (Terminal No. 5)

  This terminal is used together with Terminals No. 4 and No. 6, by connecting to 0 V of the input of the devices such as the counter or to GND. Pay attention to avoid mistaking this for Terminal No. 2 that has no relationship to this terminal.

- Pulse output (Terminal No.6)

  This terminal outputs a pulse for every 10 cm during measurement. The terminal provides output by means of a transistor (open collector) that holds Lo potential at signal output. The terminal is used together with 0 V (Terminal No. 5).

- Output during operation (Terminal Nos. 7 and 8)

  When the start input initiates the measurement, the relay contact closes as a signal to show that measurement is underway until measurement is completed. During standby, the relay contact is open. This terminal is used together with Terminal No. 8.

- Abnormality output (Terminal Nos. 9 and 8)

  In the event of an abnormal condition in the product, the relay contact closes as an output signal to show the abnormality. In the normal condition, the relay contact is open. Abnormal conditions refer to wire breakage and buried weight. This terminal is used together with Terminal No. 8.

- Power terminal (Terminal Nos. 10 and 11)

  Be sure to supply the specified power source voltage (AC100V or AC200V, 50/60Hz).

7. Wiring

7-1. Precautions on wiring

⚠ Caution: Do not use a power supply that exceeds the rated power supply of the product. Doing so may cause damage.

Short-circuit the start input to GND for operation. Do not apply voltage. Implement wiring and piping separate from high voltage and power lines. Failure to do so may result in the influence of inductive noise on the product, causing malfunction or damage to the product.

⚠ Warning: When implementing the wiring, check that the power switch of this product is turned off and no voltage is supplied to the cables wired from outside the product. Ground the product chassis during operation.

7-2. Electric wires

For wiring, polyvinyl-coated wires (PVC cable) with a cross-section of 1.25–2 mm^2 are recommended. The product provides two wiring inlet ports. Use a cable for measurement (captire cable) for wiring to current output, start input, and counter output (Terminal Nos. 1, 2, 3, 4, 5, and 6) different from the cable for the power supply (Terminal Nos. 10 and11).

For output during operation and the abnormality function (Terminal Nos. 7, 8, and 9), use different types of cable as required by the application. If there is a possibility of influence from noise, wire the output circuit with shielded wires and connect to GND or 0 V on the receiving side.

7-3. Wiring

Before wiring, check that the type number and rated power supply of the instrument are correct. In addition, check the terminals inside the instrument as required for wiring. Keep the wiring length 500 m or less at the longest. There is no need for a circuit protector.

Use crimp terminals with M3.5 screws when connecting the wires to the terminal block.

The cable that has been pulled into the portion where the controller is stored should not be loosened inside this section. In addition, the excessive length of the cable inside should not be bound into a loop. Connect the cable with the appropriate length paying close attention that the cable does not touch the internal motor or the detection mechanism.

8. Settings

8-1. How to configure rated setting

The use of 4–20 mA output is described here. Apply the same procedure when the output pulses are used to activate an electronic counter. As shown in Figure 8-1, the rated setting is configured by inputting the following distances from the standby position (standard: 500 mm) with the rotary switches on the panel denoted as 20 mA and 4 mA:

Distance from the standby position to the upper limit position L1

Distance from the standby position to the lower limit position L2

The rotary switches can be rotated in either direction, left or right, with a precision Phillips screwdriver. Determine the input distance in units of 0.1 m.

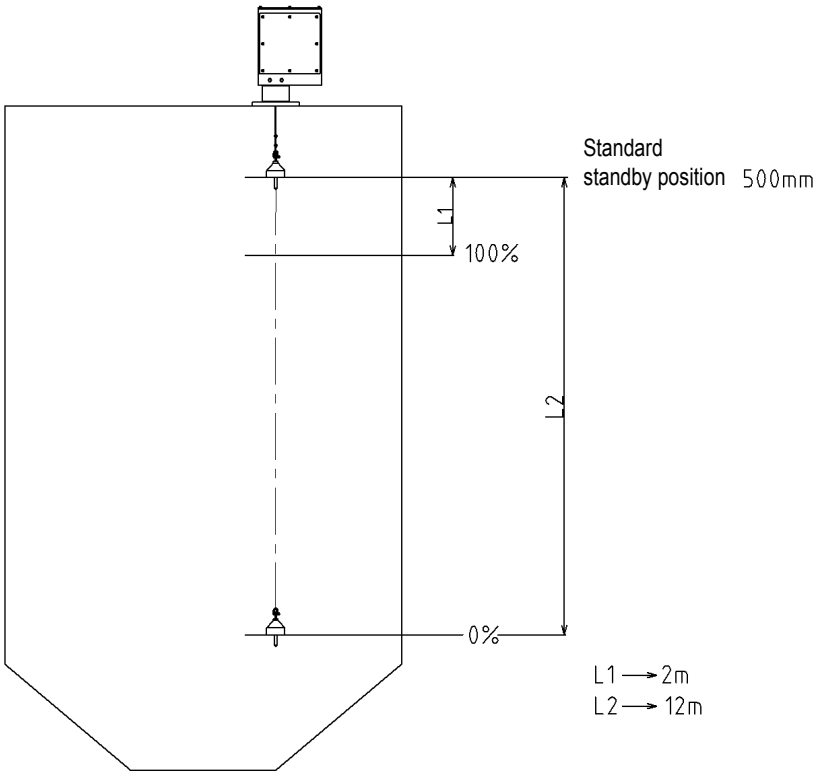


Figure 8-1 Configuring Rated setting

For example, suppose we set the current output to 20 mA at a position 2 m from the standby position (standard: 500 mm) and to 4 mA at a position 12 m from the standby position as shown in Figure 8-1. This results in a measurement distance of 10 m. In the case of pulse output, pulses are not output until the position L1, but are output between position L1 and position L2 until the detection operation is activated. Pulse

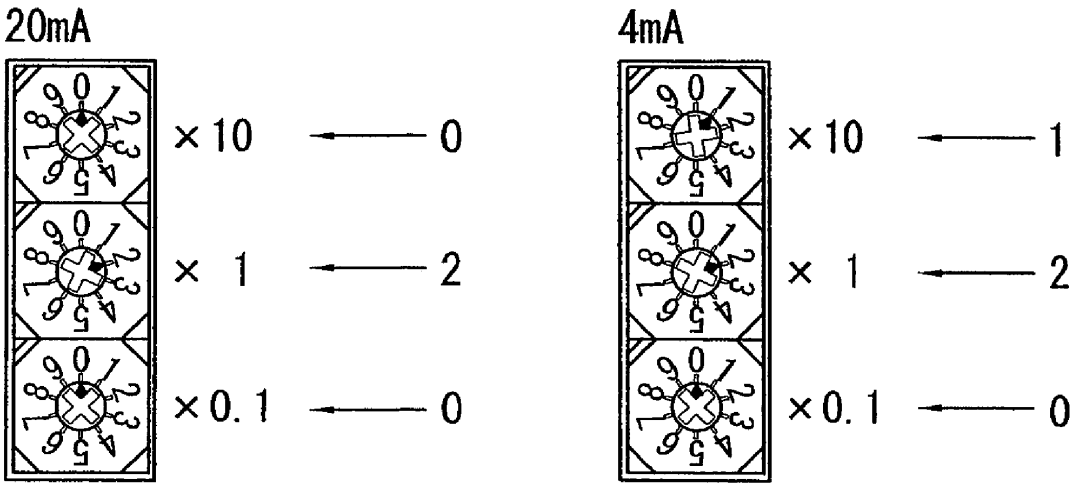
output is 1 pulse for every 0.1m.

Procedure1.

Set the current output to 20 mA at a position 2 m from the standby position. Set the rotary switches for 20 mA on the panel (three switches) to 0, 2, 0 from the top to bottom.

Procedure2.

Set the current output to 4 mA at a position 12 m from the standby position. Set the rotary switches for 4 mA on the panel (three switches) to 1, 2, 0 from the top to bottom.



Conversely, in order to set the current output to 4 mA at a position 2 m from the standby position and to 20 mA at a position 12 m from the standby position, adjust the input to 1, 2, 0 at procedure1 and to 0, 2, 0 at procedure 2, respectively. In this way, you can exchange the current outputs of 4 mA and 20 mA.

You cannot set both distances to the upper limit and to the lower limit to 0 m. You cannot input a value exceeding the rated value, 12.0 m for the TLX-120AP1 and 20.0 m for the TLX-200AP, respectively. If the setting is not configured correctly, the operation indicator LED blinks green. In this case, the abnormality indication does not function. You can implement rotary switch settings regardless of the on or off status of the power supply, but pay close attention because the settings cannot be implemented during a measurement.

8-2. Simplified way to obtain the current output (4 mA and 20 mA)

This section describes the method for obtaining the current output of 4 mA and 20 mA without making a measurement. The initial value of 20 mA is output when turning on the power supply. If the power supply is turned off and then turned on again, the output value is 20 mA.

Implement one detection operation to output 4 mA. For example, set the rotary switches for 20 mA to 0, 0, 0, and the rotary switches for 4 mA to 0, 0, 1, respectively, following the rated setting procedures described in 8-1. This is the setting for the measurement of just 0.1 m, but if the measurement target is detected, the position becomes the upper limit, outputting 4 mA. Pay attention, however, that if no detection is made, the output is 20 mA.

8-3. How to set simplified automatic operation

The TLX sounding level meter has a built-in timer function for continuous operation. Set the time interval of the timer with the rotary switch on the panel. The number set on the rotary switch determines the timer time. The relationships between the number and the time interval are as shown below:

TLX-120AP1

Number	0	1	2	3	4	5	6	7	8
Timer time	3 min	5 min	10 min	15 min	20 min	30 min	60 min	2 h	3 h

TLX-200AP

Number	0	1	2	3	4	5	6	7	8
Timer time	-	5 min	10 min	15 min	20 min	30 min	60 min	2 h	3 h

9. Operation Procedures and Description of Input/Output Operation

9-1. Manual operation

After completing the mounting and adjusting the settings, you can start measurement. Once again check that the settings have been properly configured. After turning on the power supply switch, the power supply indicator LED turns on. At this time, the current output is 20 mA as the initial value.

Start the measurement by short-circuiting the start input to GND. If the short-circuit condition is maintained, operation becomes continuous. To start manual operation, open the input before implementing the next measurement operation. Once the operation starts, the operation LED turns on in green, and the output during operation closes. A pulse is output from the counter reset terminal, and the weight goes down. During measurement, a pulse is output for every 10 cm after the weight passes the set upper limit position.

After measurement is finished, pulse output stops. The measurement value is output by a current value (4–20 mA DC). Then, the weight goes up to the standby position, the operation indicator LED turns off, and the output opens.

⚠ Caution: Check that the weight has been completely wound up before turning off the power supply. If the weight stops in the lowered condition, the weight may become buried. Pay close attention so that the current output returns to the initial value from the previous value when the power supply is turned off.

9-2. Continuous operation

Once again, check the setting of the timer. For continuous operation, maintain the condition where the start input is short-circuited to GND. If the circuit is opened while the operation is underway, the first measurement starts at the next point of the start input. The time of the timer is from the end of the measurement operation to the next measurement operation. The operation is the same as the manual operation. By connecting a commercial timer to the start input and GND instead of using the timer function of the product, it is possible to set any time.

⚠ Caution: To prevent the motor from overheating, do not operate the product at a timer setting of less than 3 minutes for the TLX-120AP1 and 5 minutes for the TLX-200AP, respectively. For continuous operation, employ interlocks or other means to avoid throwing in the measurement target during operation of

this product. Failure to do so may result in a buried weight and wire deviation.

10. Abnormality

In the event of an abnormality, the operation indicator LED turns red, and the abnormality output relay closes. The operation indicator LED turns on in different ways depending on the different types of abnormality as described below. Determine the cause of the abnormality from the way the LED turns on, and eliminate the cause.

10-1. Wire rope breakage

If the start input is implemented when the wire rope is broken, judgment of abnormality takes place. In this case, the indicator LED blinks red at a low rate, and at the same time, the abnormality output relay closes. (Blinking at a low rate means a turn-on time of about 1 second.)

10-2. Buried weight

When the weight has not been elevated for about 10 seconds in a situation where the wire rope is in wind-up status with the weight buried, the wind-up operation stops. Then, after the weight is lowered about 10 cm, the wind-up operation starts again. If situation does not change for about 10 seconds, the wind-up operation stops. Then, the indicator LED blinks red at a high rate, and at the same time, the abnormality output relay closes.

11. Reset Function

If the TLX operation needs to be initialized due to abnormal operation, implement either one of the following operations: (TLX-120AP1 and TLX-200AP)

1. Turn off the power supply to the product or turn off the power with the power source switch of the product, and turn on the power again after waiting about 5 seconds.
2. When the indicator LED turns red and the abnormality output is closed due to an abnormality, short-circuit the start input terminal and the GND terminal for about 5 seconds continuously.

In the case of 2, the product can be initialized without turning off the power supply. However, if the product is in continuous operation using the timer function of the TLX, it is necessary to release the start input once.

12. Maintenance

⚠Caution: In implementing maintenance and inspections, be sure to turn off the power supply except when checking operation. Check that the weight has been completely wound up before turning off the power supply. If the weight stops and is left in the lowered condition, the weight may become buried.

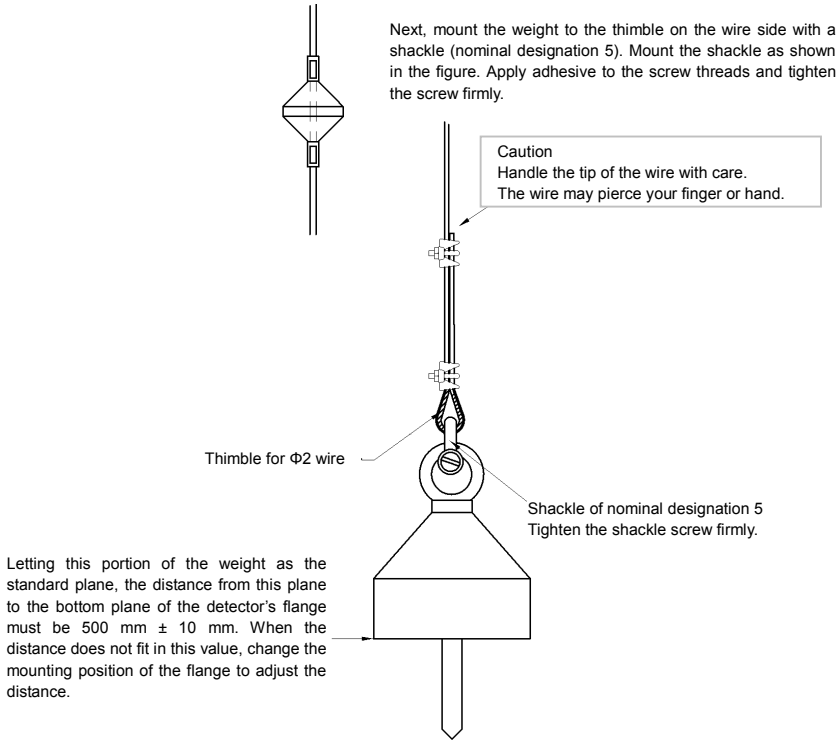
Place to check	Description	Action
Drum	1. Whether the measurement target has accumulated or adhered to the drum	1. Clean the drum.
Wire rope	1. Whether the measurement target has accumulated or adhered to the wire rope 2. Whether the wire rope has bent marks or hangnails 3. Whether the wire rope has deviated from the drum.	1. Clean the wire rope. 2. Replace the wire rope. 3. Bring back the wire rope on the drum
Weight	1. Whether the measurement target has accumulated or adhered to the weight	1. Clean the weight.

13. Parts Replacement

If a bent mark or hangnail is found on the wire rope during maintenance and inspection or if the wire rope is broken, replace the wire rope by following the procedures described below:

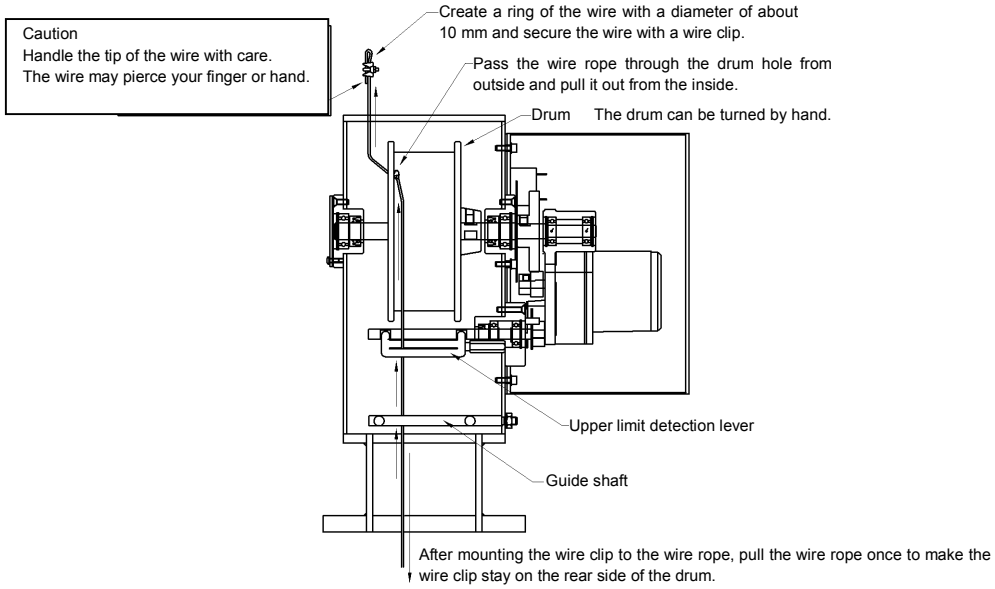
13-1. Mounting the weight

Mount the weight by loosening the shackle of nominal designation 5. After mounting the weight, apply threadlocker on the shackle screw and tighten the screw firmly. In mounting the weight, handle the tip of the wire with care. The wire may pierce your finger or hand.



13-2. Mounting the wire rope.

Insert the end of the wire rope, which has the weight mounted on the other end, from the flange on the chassis of the product body. Then, pass the end through the square portion of the guide shaft. Next, pass the end through the square portion of the upper limit detection lever. Pass the wire rope end through the hole of the drum from outside to inside and pull it out as shown in the figure. Pass the pulled-out wire through a wire clip. Create a ring of the wire rope with a diameter of about Φ10 mm and fix the wire rope to the wire clip. Tighten the nut thoroughly with a nut driver fitting with the M3 screw to secure the wire clip. At that time, apply threadlocker adhesive to the thread portion of the screw to prevent loosening. Last, pull the wire rope coming out of the flange so that the tip of the drum-side wire rope stays on the rear side of the drum.



13-3. How to wind up the wire rope

When mounting of the weight and the wire rope has been completed, follow the procedures described below to wind up the wire rope on the drum.

1. Supply the power source for the TLX-120AP1/200AP so that the product is ready to operate. At this point, keep the power supply turned off.
2. When tension is applied to the wire rope, turn on the power supply switch for the TLX-120AP1/200AP. Then, the drum starts rotating, winding up the wire rope. To apply tension to the wire rope, put the weight inside the tank and set the product in the non-detection status. Without tension, the wire may be loose when winding up, causing the wire to deviate from the drum.
3. The wire should be wound in such a way that the wire moves away successively from the hole on the drum. When winding is out of order, turn the power supply off and adjust the wire. When the power supply is on, pay special attention to handling the wire.
4. When winding of the wire is completed, turn the power supply off.
5. After finishing all the work, implement the measurement operation with the TLX-120AP1/200AP to check for normal operation.

14. Troubleshooting

Failure status	Cause	Action
The weight does not go down.	Controller indicates an error.	Remove the cause of the error.
The weight stops in the middle of going down.	The weight has touched a stay or something else before it touches the measurement target.	Change the mounting position of the product.
The weight is buried.	The measurement target and the shape of the weight do not match well.	Select a weight that is suitable for the measurement target.
The weight is not wound up after measurement.	The photo sensor has something adhered to it, or it has failed.	Clean or replace the photo sensor.
The weight falls down.	The measurement target and the shape of the weight do not match well.	Select a weight that is suitable for the measurement target.
The wire deviates from the drum.	The product has been mounted in a slanted position.	Mount the product in a horizontal position.
The wire is wound in a reverse direction.	Failure of the photo sensor.	Replace the photo sensor.
The wire breaks.	A load is being applied to the wire.	Remove the load on the wire.
The measurement value with the product is different from the actually measured value	The measurement target and the shape of the weight do not match well.	Select a weight that is suitable for the measurement target.
The detection lever does not go down or return.	The product has been mounted in a slanted position.	Mount the product in a horizontal position.