Tension Meter

Model T300

Instruction Manual

This manual covers programs up to version V1.1*.

Table of contents

EIKO SOKKI Co., Ltd.

SM-T300-C1E

Precautions for Use

Thank you very much for purchasing our product.
Please be sure to observe the following precautions when installing and operating this unit.

(1) Do not use with power voltage ratings other than the specified voltage.
Connecting to voltage sources that are higher than the specified voltage is very dangerous and could cause a fire.
Always check the power-supply voltage when wiring.

(2) Be sure to connect a power supply to the designated terminal.
The wrong connection could cause this unit to malfunction.

(3) For models fitted with an earth terminal, be sure to use D-class grounding with ground resistance of 100 Ý or less (former Type 3 grounding).
Failure to do so could result in electrical shock when touching the housing for this unit.

(4) Only qualified electricians are allowed to perform the wiring work.

(5) Only explosion-proof models can be used in explosion-proof areas.

(6) The power connection for this unit has a "  " symbol on it.
Be careful when applying current because touching this connection could result in electrical shock.

(7) Do not disassemble this unit; doing so could result in electrical shock.

(8) Exposure to combustible materials, liquids, and metals could result in the malfunction of this unit.

(9) Always install a safety device for a machine that may cause a serious loss of human life or equipment due to the malfunction of this unit.

(10) In the event of an abnormality, such as an unusual odor or smoke from this unit, turn off the unit immediately and contact our Service Department.

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1. Introduction

1-1. Overview

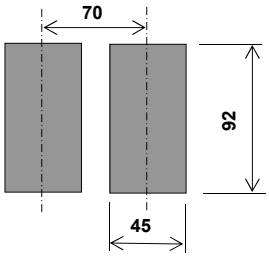
The T300 tension meter displays the tension of a running sheet-shaped material, such as paper, cloth, fiber, film, rubber, and metal, and outputs it to a recorder, an external

<Features>
● The panel-mounted unit is significantly downsized compared to conventional models.
● Both LS- and LA-series tension detectors can be connected.
● The auto zero and auto scale functions enable adjustments with a single touch of a button.
● Left and right tension signals can be output respectively as well as the total (2 types).
● Either the voltage output or the current output can be selected for output. The response frequency is also user-selectable.

1-2. Installation

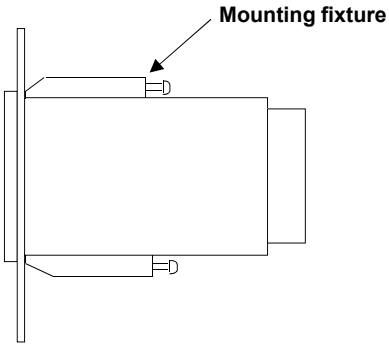
(1) Panel cutout size

When placing the units in a horizontal row, the minimum pitch required is 70 mm.



(2) Mounting

Use the provided mounting fixture when mounting the unit onto a panel. This unit can be mounted onto a panel up to 8 mm thick.

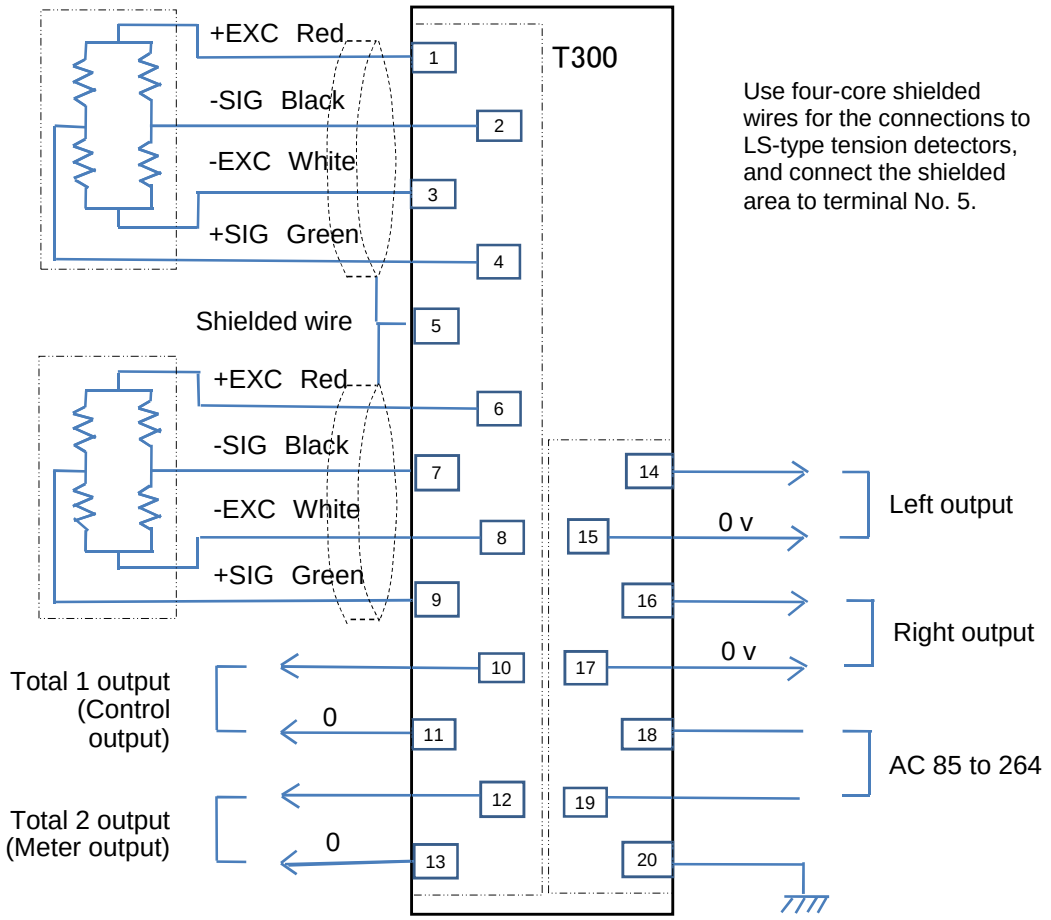


2. Wiring

Refer to the external wiring diagram shown below when performing the wiring.

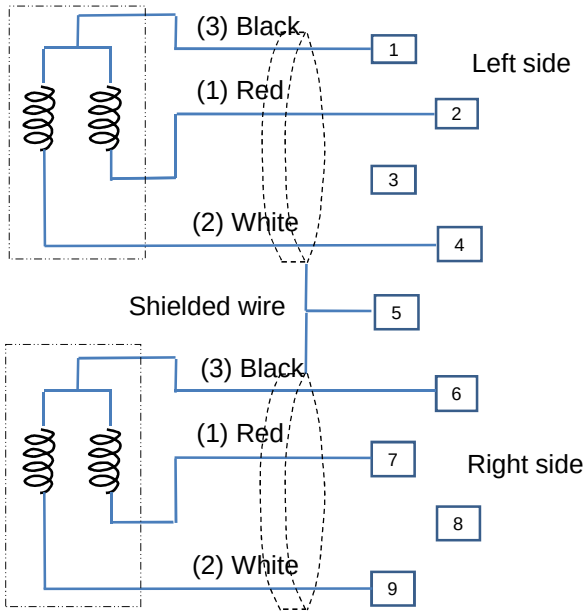
2-1. Wiring

(1) For LS-type detectors



Use four-core shielded wires for the connections to LS-type tension detectors, and connect the shielded area to terminal No. 5.

(2) For LA-type



Use three-core shielded wires for the connections to LA-type tension detectors, and connect the shielded area to the terminal No. 5.

Consult with us if the interconnection length exceeds 50 m.

Use M3 solderless terminals for the wiring and apply a tightening torque of 0.5ï 0.8 N·m to ensure secure tightening of terminals.

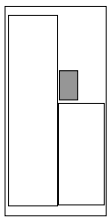
Be sure to connect the earth wire of the power supply to ground.

Caution!
Note that the arrangement sequence of the wires on LA-type detectors is different from the conventional sequence (i.e., Red -> White -> Black).

2-2. Switch settings

Refer to the diagram below to configure the switch settings.

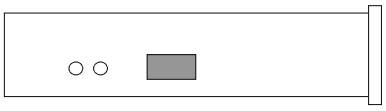
(1) Selecting the voltage and current output (SW1)



Turn the switch ON to use the output as the voltage output and turn it OFF to use the output as the current output.

BIT	OUTPUT	ON	OFF	
4	RIGHT	Voltage	Current	
3	LEFT	Voltage	Current	
2	TOTAL 2	Voltage	Current	[2]
1	TOTAL 1	Voltage	Current	[2]

(2) Selecting a tension detector (SW2)

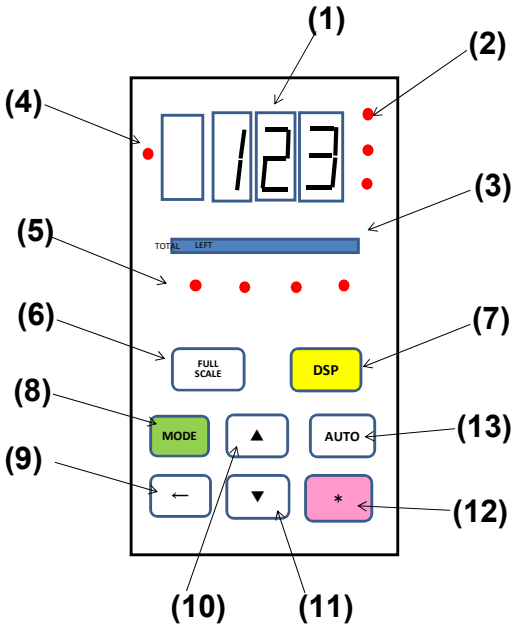


Configure the switch settings according to the type of tension detector. For an LS-type detector, set the switch to the OFF side. For an LA-type detector, set it to the ON side. Always use the same setting for LEFT and RIGHT.

	LEFT		RIGHT	
BIT	1	2	3	4
OFF	LS		LS	
ON	LA		LA	

3. Operating instructions

3-1. Panel description



(1) Numeric display
Displays the tension and setting values.
The version number is displayed immediately after power activation [2].

(2) Tension unit indicator lamp
Either one of the "N", "x10N" or "KN" lamps lights to display the set unit.

(3) Bar indicator light
Displays the tension with this bar.

(4) Setting operation indicator lamp
Lights when the unit is operating in any mode other than the tension display mode.

(5) Display item identification lamp
Either one lights depending on the item displayed in the tension display mode.

(6) [FULL SCALE] key
Temporarily displays the full scale of a tension detector.

(7) [DSP] key
Switches between the display items.

(8) [MODE] key
Switches between the operation modes.

(9) [Ŷ] key
Changes the number of digits of the numerical value.

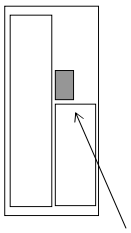
(10) [▲] key
Increases the setting value.

(11) [▼] key
Decreases the setting value.

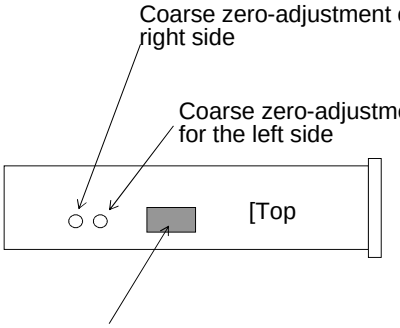
(12) [*] key
Registers the setting value.

(13) [AUTO] key
Executes the auto zero and auto scale adjustments.

[Backside]



SW1: Voltage/current outputs selection switch



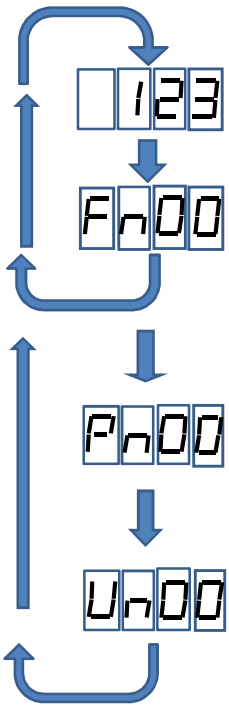
SW2: Tension detector selection switch

3-2. Switching between the operation

(1) Mode types

(1) Tension display mode
(2) Calibration mode
(3) Setting mode
(4) Detail display mode

(2) Switching between the operation modes



(1) Tension display

Press the MODE key.

(2) Calibration mode

Press the MODE key.

Press the ▲ and ▼ keys at the same time.

(3) Setting mode

Press the MODE key.

(4) Detail display mode

Press the MODE key.

Pressing the [MODE] key Switches between the tension display mode and the calibration mode alternatively.

[Protection operations]

Setting values are protected against accidental operations.

Pressing the [▲] and [▼] keys at the same time in the calibration [Fn] mode cancels the protection and moves to the setting mode.

Pressing the [▲] and [▼] keys at the same time in the setting [Pn] and detail display [Un] modes protects the setting value again.

The protection is applied to the setting value when the power is restored.

(3) Operating in the tension display mode

FULL SCALE key: Displays the full scale of a tension detector temporarily.

DSP key: Switches between the items shown on the numeric display.
- Total: Left value + right value
- Left: Tension value of the left side
- Right: Tension value of the right side
- Output value: Output value

The following indicator lamps check what is currently displayed.

TOTAL LEFT OUTPUT RIGHT OUTPUT

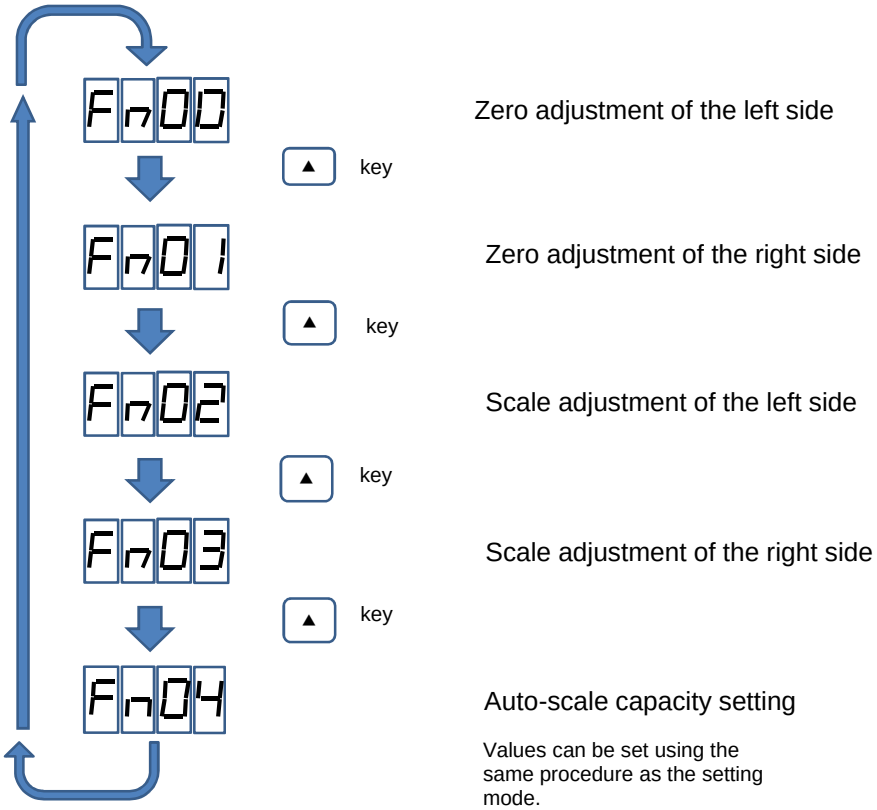
3-3. Explanation of the calibration mode

(1) Operation items in calibration mode

Device calibration involves the use of a tension detector in combination with an amplifier and then actiual application of the tension.

Perform the zero and scale adjustments on the right and

No.	Operation item
Fn00	Zero adjustment of the left side
Fn01	Zero adjustment of the right side
Fn02	Scale adjustment of the left side
Fn03	Scale adjustment of the right side
Fn04	Auto-scale capacity setting



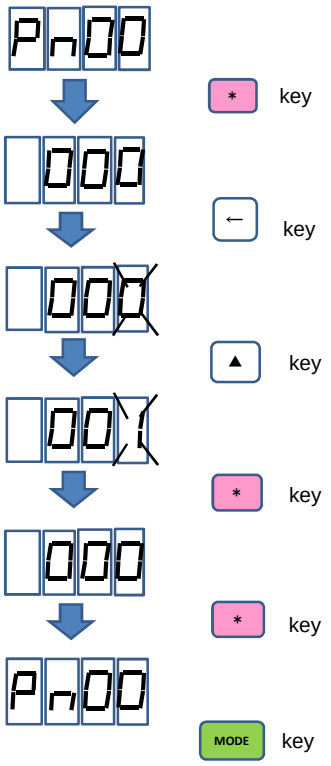
The ▼ key switches between items in descending order.

(2) Coarse zero adjustment

Perform a coarse zero adjustment only when an LA-type tension detector is used. It is not required for LS-type tension detectors.

LA-type tension detectors have coarse zero adjustment control knobs that move the zero point significantly. Be sure to perform a coarse zero adjustment in advance before performing a zero adjustment to bring the tension value close to zero.

First of all, manipulate the setting item "Pn00" to initialize the electronic volume control.



Select "Pn00" to start initialization of the electronic volume control.

"0" is displayed.

The ones place digit flashes.

The value of the ones place digit increases to "1".

"1" stops flashing and then returns to "0" after a few seconds. The electronic volume control position has returned to the default value.

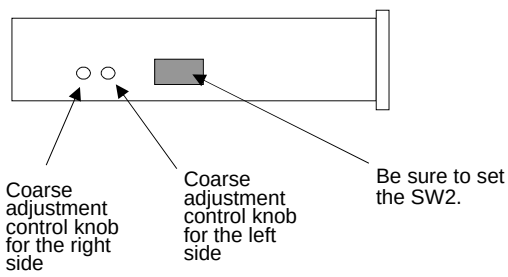
The display returns to the setting item number.

The unit moves to the tension display mode.

Be sure to perform a zero adjustment with no tension on the detector.

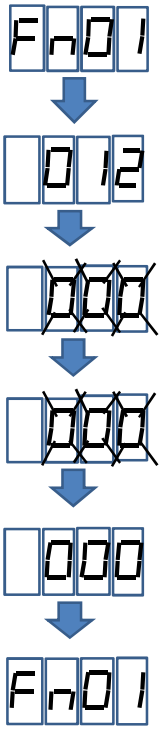
Turn the coarse adjustment control knobs for the left and right sides, respectively, to bring the displayed tension close to zero.

Press the DSP key to switch between the left side and the right side.



(3) Zero adjustment

No tension is on the detector during the zero adjustment.



Select "Fn01" to start the zero adjustment for the right side.

The tension of the right side is displayed.

The displayed tension rapidly moves closer to zero.

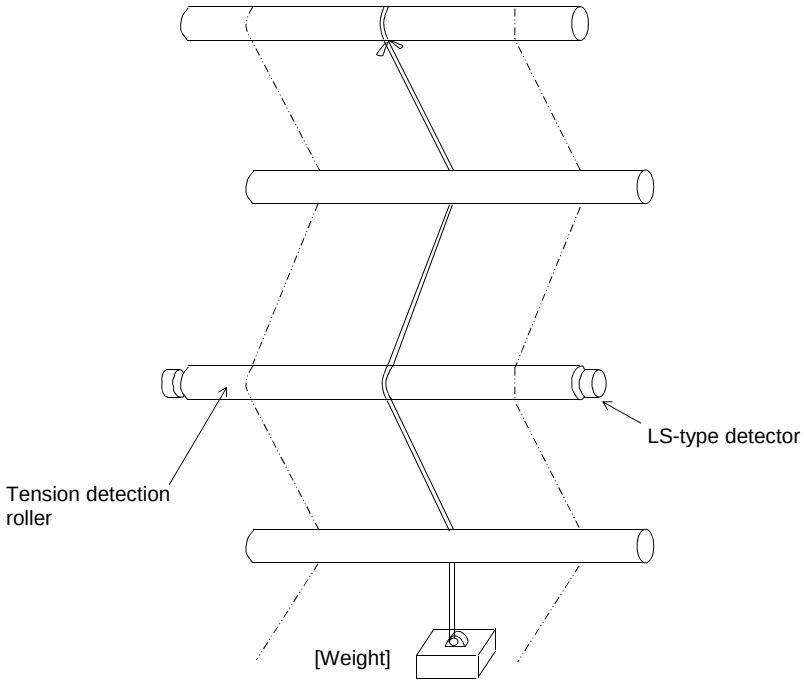
The displayed tension gradually moves closer to zero.

When the displayed tension becomes zero, press the [AUTO] key to complete the adjustment.

The display returns to the setting item number.

(3) Scale adjustment

Hang a weight on the tension detection roller using a heavy-duty tape or rope. Make sure that the weight hanging on the tension detection roller and the rollers located above and below it are on the same path as the sheet. The weight that is used should preferably be equivalent to the normal tension. If a weight cannot be hung, use a spring balance instead.



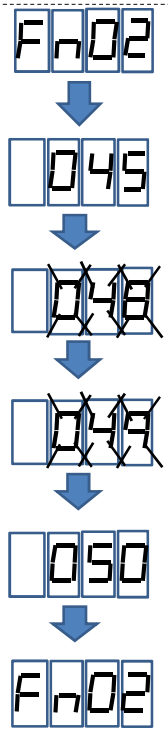
A scale adjustment shall be performed after completion of a zero adjustment.

No.	Description	Default value	Minimum value	Maximum value	Remark
Fn04	Auto-scale capacity setting	999	0	999	

Fn04 [Auto-scale capacity setting]: Set this item during calibration.
During a scale adjustment, set the value of the tension that is hung.

[Scale adjustment target values]

The target values for the left and right sides vary depending on the value of the [Fn04] auto-scale capacity setting and the style of use of the detector. For example, if a weight of 100 N is hung, set Fn04 to "100".
Both-end both-side detection: Half the value of [Fn04] ・・・・ Target value is 50 N
Both-end one-side detection: Half the value of [Fn04] ・・・・ Target value is 50 N
Single detection: The value of [Fn04] ・・・・ Target value is 100 N



Select Fn02 to start the scale adjustment for the left side.

The tension is displayed.

The displayed tension rapidly moves close to the target value.

The displayed tension gradually moves close to the target value.

For version 1.11 or later, it flashes slowly.[2]

When the displayed tension reaches the target value, press the [AUTO] key to complete the adjustment.

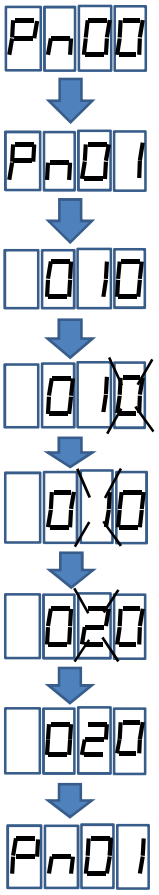
The display returns to the setting item number.

[If the displayed tension does not reach the target value]

If the displayed tension moves close to but does not reach the target value during the scale adjustment, then the amplifier gain is insufficient. Increase the [Pn01] gain changeover switch setting by one. Also note that changing the [Pn01] setting moves the zero point. In such a case, perform a zero adjustment again.

3-4. Setting and detail display modes

(1) Operating in setting mode



Setting item number is 00.

▲ key

The item number increases by one.

* key

The set value is displayed.

← key

The ones place digit flashes.

← key

Select the tenths place

▲ key

The value of the tenths place digit is increased by one.

* key

The setting value is fixed.

And then...

The display returns to the item number.

Pressing the [▲] key displays the item numbers in ascending order. Pressing the [▼] key displays them in descending order.

Pressing the [*] key displays the set value.

Pressing the [←] key flashes the ones place digit and enters the change state.

Use the [▲] and [▼] keys to change the values. Pressing the [←] key switches between the digits.

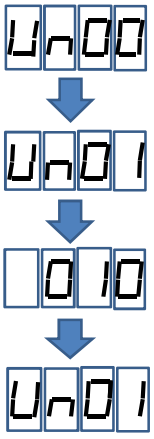
Pressing the [*] key again registers the set value and exits the change state.

Pressing the [MODE] key before pressing the [*] key exits the change state without registering the value.

MODE key

The value does not change.

(2) Operating in the detail display mode



The setting item

▲ key

The item number increases by one.

* key

The value is displayed.

* key

The display returns to the item number.

Pressing the [▲] key displays the item numbers in ascending order. Pressing the [▼] key displays them in descending order.

Pressing the [*] key displays the value.

Pressing the [*] key again returns to the item number again.

4. Setting examples

4-1. Explanation of the settings

No.	Description	Default value	Minimum value	Maximum value	Remarks
Pn00	Initialization of the electronic volume control	0	0	1	Changing the setting from 0 to 1 executes the initialization.
Pn01	Tenths place: Gain changeover switch for the left side	0	0	3	0:x1, 1:x3.4, 2:x5.6, 3:x7.9
	Ones place: Gain changeover switch for the right side	0	0	3	0:x1, 1:x3.4, 2:x5.6, 3:x7.9
Pn02	Usage style	0	0	4	0: Both ends, 1: Both ends and both sides of the right side, 2: Both ends and one side of the left side, 3: One side of the right side, 4: One side of the left side
Pn03	Detector type	1	0	1	0: LA type, 1: LS type
Pn04	Tenth place: Unit	0	0	2	0: N, 1:x10 N, 2: kN
	Ones place: Decimal point	0	0	2	0:xxx, 1:xx.x, 2:x.xx
Pn05	Full scale	999	1	999	N, x10 N, kN
Pn06	Display filter	0.16	0.01	9.99	Hz
Pn07	Total 1 output scale	100	0	200	% (10 V at 100%)・・・Ver. 1.01
		99.9	0	99.9	% (10 V at 99.9%)・・・Ver. 1.11 and later [2]
Pn08	Total 2 output scale	100	0	200	% (10 V at 100%)・・・Ver. 1.01
		99.9	0	99.9	% (10 V at 99.9%) ・・・Ver. 1.11 and later [2]
Pn09	Left/right output scale	100	0	200	% (10 V at 100%) ・・・Ver. 1.01
		99.9	0	99.9	% (10 V at 99.9%) ・・・Ver. 1.11 and later [2]
Pn10	Total 1 output filter	7.20	0.01	9.99	Hz
Pn11	Total 2 output filter	0.16	0.01	9.99	Hz
Pn12	Left/right output filter	7.20	0.01	9.99	Hz
Pn13	Initialization of all setting values	0	0	999	Changing the setting from 0 to 123 executes the initialization.
Pn14	Output voltage specification [2]	0	0	111	Hundredths place: Total 1, Tenths place: Total 2, Ones place: Left + right

Pn00 [Initialization of the electronic volume control]: Initializes the electronic volume control.
Changing the setting value from 0 to 1 performs the initialization.
Be sure to execute the initialization before conducting an adjustment for the first time.
Pn01 [Gain changeover switch]: Switches the amplifier sensitivity.
The tenths place digit sets the sensitivity of the left side, and the ones place digit sets the sensitivity of the right side.
The normal sensitivity of an LA-type detector is 1:x3.4 times, and that of an LS-type detector is 0:x1 time.
Pn02 [Usage style]: Sets the usage style of the tension detector [1].
0: Both ends, both sides detection, 1: Both ends, one-side (right) detection,
2: Both ends, one side (left) detection, 3: One end (right), 4: One end (left)
Both ends, both sides detection ・・・ A both-ends roll has detectors on both sides
Both ends, one side detection ・・・ A both-ends roll has one detector only on one side
One end detection ・・・ An one-end roll
Pn03 [Detector type]: Set it to "0" for an LA-type detector, and set it to "1" for an LS-type detector.
Pn04 [Display of a unit and decimal point]:
The tenths place digit sets the displayed unit. 0:N, 1:x10N, 2: KN
The ones place digit sets the decimal point position. 0:xxx, 1:xx.x, 2:xx.x
Pn05 [Full scale]: Sets the detector capacity.
Pn06 [Display filter]: Sets the response of the displayed tension.
Pn07 [Total 1 output scale]: For the level adjustment of output 1.
Pn08 [Total 2 output scale]: For the level adjustment of output 2.
Pn09 [Left/right output scale]: For the level adjustments of the left and right outputs.
If the voltage output is selected with switch SW1, voltage of 10 V is output at 100%.
If the current output is selected with switch SW1, current of 1 mA is output at 100%.
For Ver. 1.11 or later, voltage of 10 v and current of 1 mA are output at 99.9% [2].
Pn10 [Total 1 output filter]: The response adjustment for output 1
To reflect an analog meter, set the response to a slower rate.
Pn 11 [Total 2 output filter]: The response adjustment for output 2
Pn12 [Left/right output filter]: The response adjustment for left and right outputs
Pn13 [Initialization of all setting values]: Returns all settings to the default values.
Changing the setting value from 0 to 123 executes the initialization.
Pn14 [Output voltage specification]: Selects the analog output style [2].

4-2. Explanation of the display items

No.	Description	Default value	Minimum value	Maximum value	Remarks
Un00	Zero offset of the left side	0	0	±999	(Internal unit)
Un01	Zero offset of the right side	0	0	±999	(Internal unit)
Un02	Scale offset of the left side	0	0	±999	(Internal unit)
Un03	Scale offset of the right side	0	0	±999	(Internal unit)
Un04	Zero DP value of the left side	128	0	256	(Internal unit)
Un05	Zero DP value of the right side	128	0	256	(Internal unit)
Un06	Scale DP value of the left side	220	0	256	(Internal unit)
Un07	Scale DP value of the right side	220	0	256	(Internal unit)
Un08	Live tension of the left side	0	0	1999	(Internal unit)
Un09	Live tension of the right side	0	0	1999	(Internal unit)
Un10	Average tension of the left side	0	0	1999	(Internal unit)
Un11	Average tension of the right side	0	0	1999	(Internal unit)
Un12	Version number display	*.**	0.00	9.99	(Internal unit)
Un13	Not used				
Un14	Not used				
Un15	Not used				

The above items display the condition inside the unit. They do not need to be checked normally but shall be checked only when the calibration has not been completed properly.

Un00 [Zero offset of the left side]: Displays the offset value.
Un01 [Zero offset of the right side]:
Un02 [Scale offset of the left side]:
Un03 [Scale offset of the right side]:
These offsets are provided for fine adjustment and corrected by calculation because the electronic volume control changes step by step.
The scale offset function is not available for Ver. 1.01 and older.
It is available for Ver. 1.02 and later.
Un04 [Zero DP value of the left side]: Displays the electronic volume control position.
Un05 [Zero DP value of the right side]:
Un06 [Scale DP value of the left side]:
Un07 [Scale DP value of the right side]:
An electronic position-changing volume is used in the tension detection circuit.
These items display the wiper position. For a zero adjustment, the higher the value, the farther the wiper shifts in the plus direction. For a scale adjustment, the higher the value, the greater the reduction in sensitivity.

Un08 [Live tension of the left side]:
Un09 [Live tension of the right side]:
Un10 [Average tension of the left side]:
Un11 [Average tension of the right side]:
These items display the tensions before and after averaging.

Un12 [Version number display]: Displays the program version number.

4-3. Setting example 1 ・・・ A both ends detection using an LA-1F detector

Tension detector: LA-1F type
Full scale: 300 N
Usage style: Both ends, both sides detection
Total output 1: Used for control, Output voltage: 5 V/fs
Total output 2: An external analog meter is connected, 500 εA meter
Auto-scale load: 200 N ・・・ The load applied during a scale adjustment.

[SW1] Turns off Bit 2 only (current output) and turns on others (voltage output).
[SW2] Turns on all bits (LA type)

[Pn01] Gain changeover = 11 (Standard value of the LA type)
[Pn02] Usage style = 0 (Both ends, both sides detection)
[Pn03] Detector type = 0 (LA type)
[Pn04] Tenths place = 0 (N), Ones place = 1 (***)
[Pn05] Full scale = 300 (N)
[Pn07] Total 1 output scale = 50.0 (%) ・・・ 5 V/fs
[Pn10] Total output 1 filter = 7.20 (Hz) ・・・ Used for control
[Pn08] Total output 2 scale = 50.0 (%) 500 εA
[Pn11] Total output 2 filter = 0.16 (Hz) ・・・ An external analog meter is connected.

[Fn04] Auto-scale capacity = 200

4-4. Setting example 2 ・・・ A one end detection using an LS-0 detector

Tension detector: LS-0 type
Full scale: 50 N
Usage style: One end (left side) detection
Total output 1: Used for control, output voltage is 5 V/fs
Total output 2: For a recorder, output voltage is 5 V/fs
Auto-scale load: 50 N ・・・ The load applied during a scale adjustment.

[SW1] Turns on all bits (voltage output)
[SW2] Turns off all bits (LS type)

[Pn01] Gain changeover = 00 (Standard value of the LS type)
[Pn02] Usage style = 4 (One end, left side detection) [1]
[Pn03] Detector type = 1 (LS type)
[Pn04] Tenths place = 0 (N), Ones place = 1 (**. *)
[Pn05] Full scale = 50.0 (N)
[Pn07] Total 1 output scale = 50.0 (%) ・・・ 5 V/fs
[Pn10] Total output 1 filter = 7.20 (Hz) ・・・ Used for control
[Pn08] Total output 2 = 50.0 (%) 5 V
[Pn11] Total output 2 = 7.20 (Hz) ・・・ For a recorder

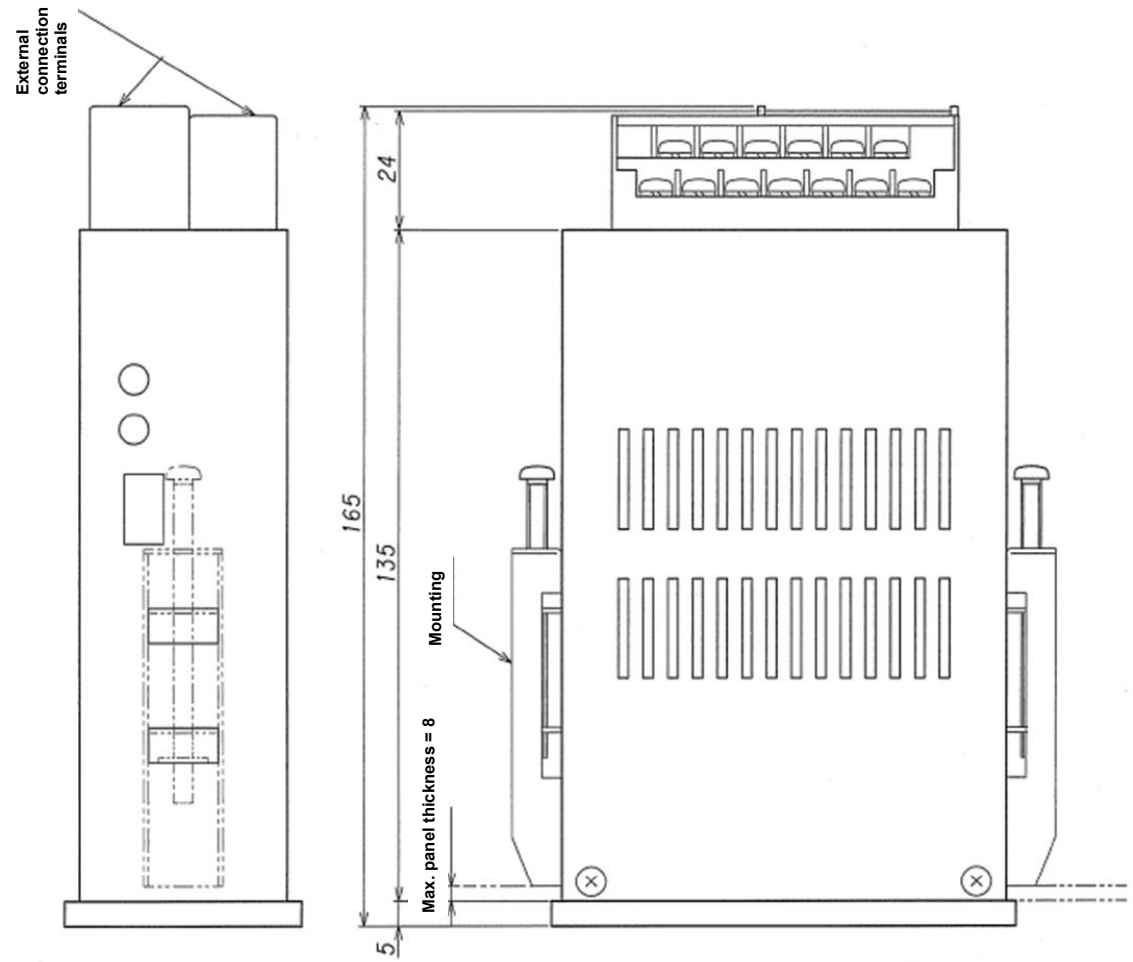
[Fn04] Auto-scale capacity = 50.0

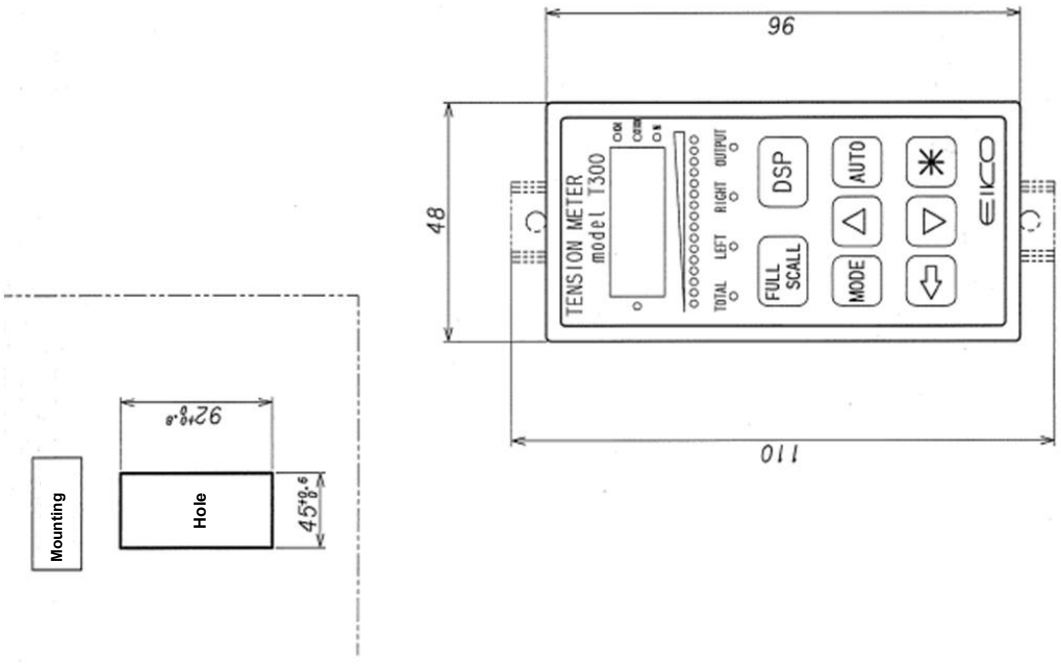
5. Specifications

5-1. Specifications

Item	Specification
Tension detection	Supports LA-type and LS-type tension detectors
	Supports the both ends, both sides; both ends, one side; and single detection methods
	Equipped with the auto-zero and auto-scale functions
Tension output	Total (two types), left and right outputs
	Voltage output of 0 to 10 V (variable), Current output of 0 to 1 mA (variable)
	Voltage output is selectable from 1 to 5 V
	Response frequency: 0.01 to 9.99 Hz (changeable)
Power supply	Voltage: AC 85 to 264 V, 50/60 Hz, Power consumption: 30 VA
Mass	Approximately 1 kg
Dimensions (W x H x D)	48 x 96 x 140 mm (165 mm including the terminal block)
Mounting hole dimension (W x H)	45 x 92 mm
Noise tolerance	Power-supply noise: 1200 Vp-p, pulse width: 1 µsec, 1 nsec
	Cable noise: 500 Vp-p, pulse width: 1 µsec, 1 nsec
	Electrostatic noise: 8000 v or more, 10 times
Use environment	No corrosive gas
Mounting	Panel-mounted type
Vibration resistance	Vibration frequency: 10 to 55 Hz, Vibration greatness: amplitude of 0.075 mm
	10 cycles per respective X-, Y-, and Z-directions
Shock resistance	Peak acceleration: 15 G, Duration of action: 11 msec, once per respective X-, Y-, and Z-directions
Ambient operating temperature	0°C to 50°C
Ambient operating humidity	30% to 90% (No condensation)

5-2. External dimensions





6. Revision history

(1) SM-T300-B

The ″[1]″ mark in the text
(1) Correction of errors in writing
- 3-3 (3) Scale adjustment: Changed the explanation that when pressing the AUTO key twice from "Slow flashing" to "Keep flashing fast"
- 4-1 Setting item: In "Pn02 [Usage style]", "left" and "right" were switched because of the wrong position.

(2) SM-T300-C

The "[2]" mark in the text
(1) The method of writing was changed from horizontal to vertical.
(2) Program Ver. 1.01 => Ver. 1.11 Changes due to revisions
- 3-3 (3) Scale adjustment: Added the scale fine-adjustment function that can be used when pressing the AUTO key twice
  Changed the explanation that when pressing the AUTO key twice from "Fast flashing" to "Slow flashing" (Ver. 1.02)
- The program version is displayed for a while after power activation (Ver. 1.02) .
- Changed the setting unit to 0.1% to enable the fine adjustment of the output voltage (Ver. 1.07)
- Corrected the mistake of the disturbance in the display of a setting, including decimal places (Ver. 1.07)
- Added "1ï 5 V/fs" to the analog output style in Pn14 [Output voltage specification] (Ver. 1.11)

Correction of errors: The product model displayed in the Instruction Manual was changed to "SM-T300-C1".
(3) 2-2. Switch setting (1) Selection of voltage and current outputs
In the table for the SW1:
"Bit2: TOTAL1" and "Bit1: TOTAL2" were corrected to "Bit2: TOTAL2" and "Bit1: TOTAL1" because they were incorrect.