

# Bolt Tension Calibrator MODEL AFC-20G2

## Operating Instruction



To use this product properly and safely, please read this operating instruction carefully before use. If you have any question about the product and its operations, please contact your nearest distributor or Tohnichi Mfg. Co., Ltd.

## ■ - AFC-20G2 Body -

# Contents

<b>Safety precautions</b> .....	<b>1</b>
<b>Precautions for use</b> .....	<b>1</b>
<b>1. Features</b> .....	<b>2</b>
<b>2. Components</b> .....	<b>2</b>
<b>3. Specifications</b> .....	<b>3</b>
<b>4. Name of each part</b> .....	<b>5</b>
4-1. Piston part and Operation part of the body side .....	5
4-2. Display and operation .....	6
4-3. Power supply and input / output .....	6
<b>5. Axial Tension Measurement</b> .....	<b>7</b>
5-1. How to install the measuring bolt .....	7
5-2. Axial tension measurement method .....	9
5-3. Precautions during axial tension measurement .....	9
<b>6. Daily Check</b> .....	<b>10</b>
<b>7. Standard Accessories</b> .....	<b>11</b>

## ■ - AFC-20G2 Display -

# Contents

<b>Safety precautions</b> .....	<b>16</b>
<b>Precautions for use</b> .....	<b>17</b>
<b>1. Features</b> .....	<b>18</b>
<b>2. Name of each part</b> .....	<b>19</b>
2-1. Display and operation .....	19
2-2. Power supply and Input / Output .....	20
2-3. Screen details .....	21
<b>3. Functions and operation methods</b> .....	<b>22</b>
3-1. Auto zero function .....	22
3-2. Over axial force alarm function .....	22
3-3. Setting switching function .....	22
<b>4. Connection</b> .....	<b>23</b>
4-1. Terminal block connection .....	23
4-2. RS232C connection .....	25
<b>5. Calibration</b> .....	<b>26</b>
5-1. About calibration .....	26
5-2. Calibration flow .....	27
5-3. Equivalent input calibration procedure .....	28
5-4. Actual load calibration procedure .....	31
<b>6. Various settings and operation methods</b> .....	<b>35</b>
6-1. Setting items .....	35
6-2. Calling the setting screen .....	35
<b>7. External communication function</b> .....	<b>40</b>
<b>8. Options</b> .....	<b>42</b>
<b>9. Error message display</b> .....	<b>43</b>
<b>10. Specifications</b> .....	<b>44</b>

# - AFC-20G2 Body -

## Safety precautions

To customers

Before using this display, please read this instruction manual carefully and use it correctly.

If you have any questions,

Please contact your dealer or Tohnichi. Please keep this instruction manual in a safe place.




### Safety caution symbol!



This symbol means the "safety precautions". Please be careful when you see this symbol in this instruction manual. Take preventive measures according to the description and perform "safe operation and correct management".

### [The signal word]

The signal word is a heading that indicates items that you should know when ensuring human safety and handling the device. Safety signal words are divided into "danger", "warning", and "caution" according to the degree of danger to humans. Used with the safety caution symbol to indicate the following situations:

- "  **Danger**" : Imminent danger that becomes a serious obstacle.
- "  **Warning**" : Potential danger that poses a serious obstacle.
- "  **Caution**" : A potential danger that is not serious but an obstacle.

## Precautions for use

■ If hydraulic oil gets into your eyes, wash your eyes with clean water for at least 15 minutes and then seek medical attention. If it gets on your skin, wash it with water and soap.

■ Please use AFC-20G2 between 0 °C and + 40 °C outside air temperature.

It may break down due to freezing of oil and hardening of packing in a frigid environment, and expansion of oil and packing in a high temperature environment.

■ When not using the operating lever, remove it from the AFC-20G2 main unit.

■ When refueling the oil tank, follow the upper limit of the oil amount range.

■ Change the hydraulic oil at least once a year.

■ For the hydraulic oil, use a general hydraulic oil equivalent to "General hydraulic oil ISO VG (viscosity grade # 32 or # 46)".

# 1 Features

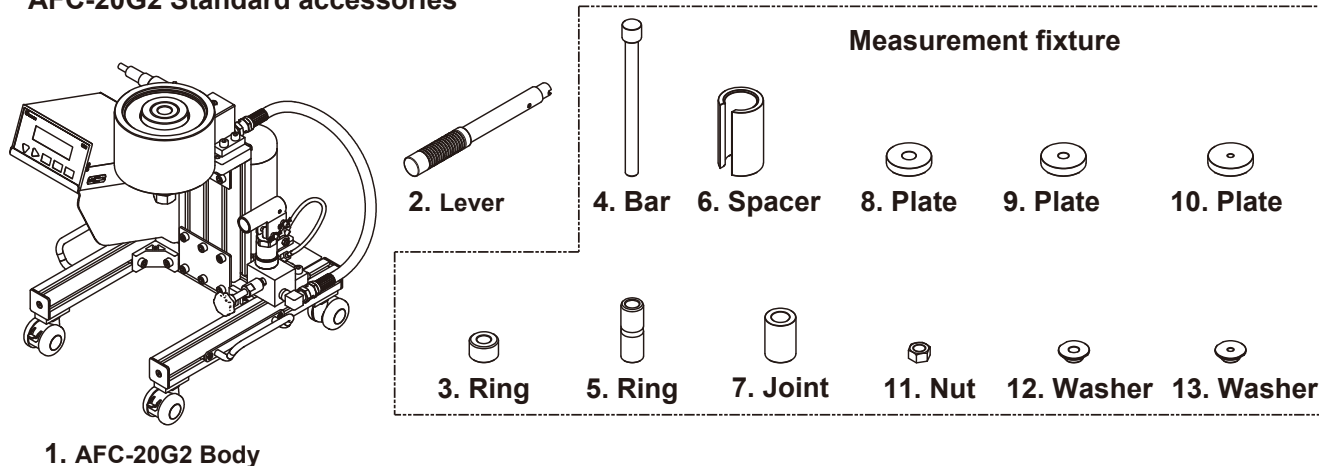
The axial tension calibrator "AFC-20G2" is a precision instrument that measures the K value of the material constants handled by the ultrasonic axial tension meter "TT" series, and has the following features.

- Measuring axial tension can be applied to bolts without tightening the bolts.
- The measured axial tension can be easily and repeatedly applied by operating the hydraulic pump.
- Axial tension of various screw sizes and lengths can be measured by using the attached bolt measuring jig.
- The power supply voltage is compatible with AC100V to AC240V  $\pm$  10% for global market.
- CE marking for European region.

# 2 Components

1. AFC-20G2 body	.....1 units
2. Lever	.....1 pc
3. Ring ( $\Phi$ 45- $\Phi$ 25-t30)	.....1 pc
4. Bar (M30-M20-L280)	.....1 pc
5. Ring ( $\Phi$ 35- $\Phi$ 22-t100)	.....1 pc
6. Spacer ( $\Phi$ 70- $\Phi$ 50-t120)	.....1 pc
7. Joint ( $\Phi$ 48-M30-t70)	.....1 pc
8. Plate ( $\Phi$ 70- $\Phi$ 22-t17)	.....1 pc
9. Plate ( $\Phi$ 70- $\Phi$ 16.5-t17)	.....1 pc
10. Plate ( $\Phi$ 70- $\Phi$ 10-t17)	.....1 pc
11. Nut (M20-Flat across width 30mm)	.....1 pc
12. Washer ( $\Phi$ 48-M30- $\Phi$ 16.5-t15)	.....1 pc
13. Washer ( $\Phi$ 48-M30- $\Phi$ 10-t15)	.....1 pc
14. AC Adapter (Model: BA-6)	.....1 pc
15. Conversion power plug (C type)	.....1 pc
16. Operating instruction	.....1 pc

### AFC-20G2 Standard accessories



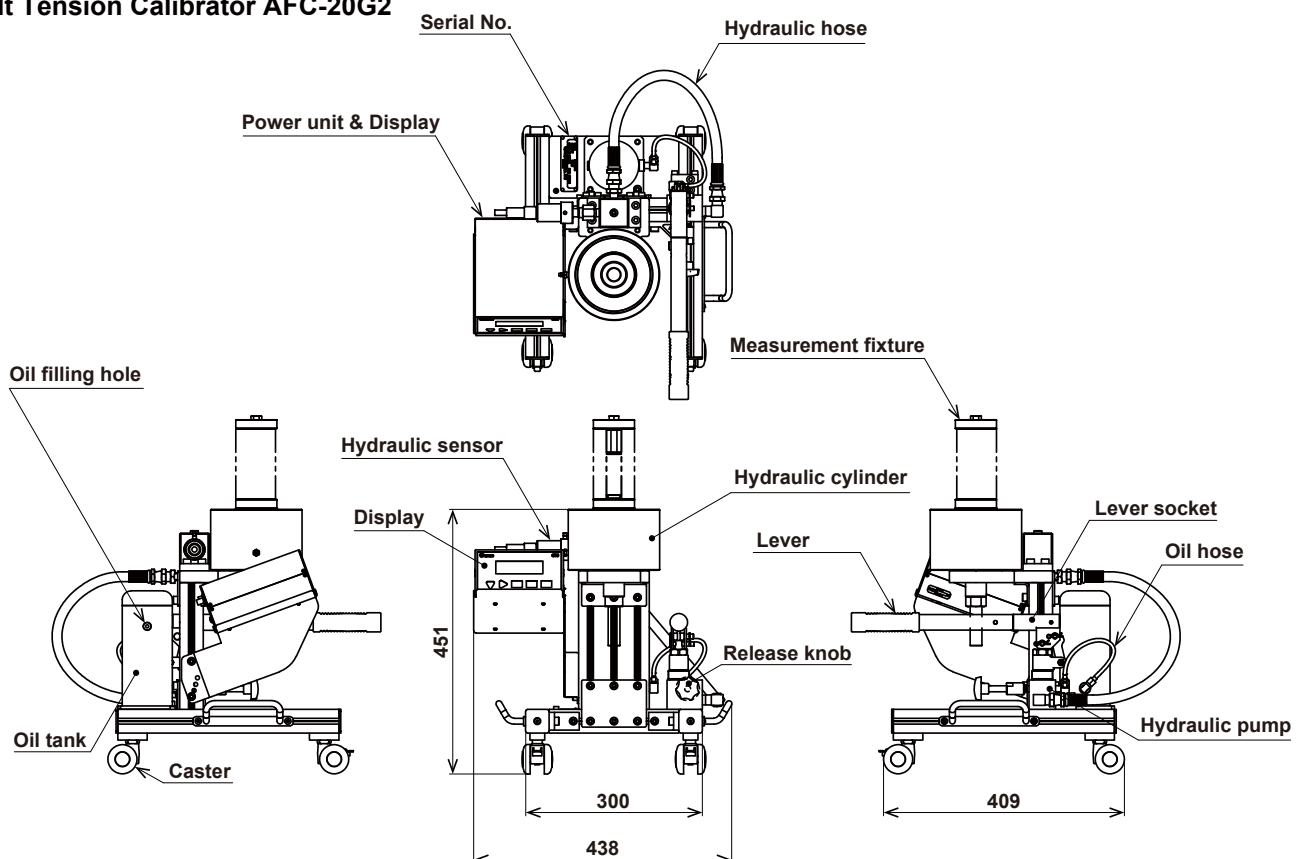
1. AFC-20G2 Body

# 3 Specifications

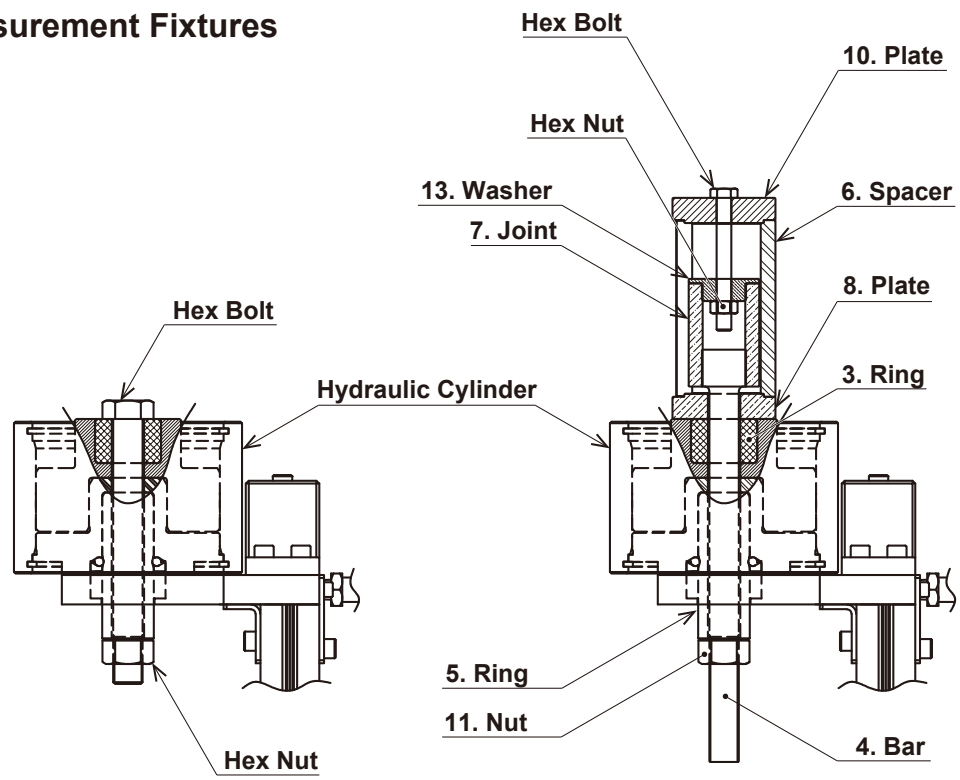
Model		AFC-20G2
Axial Tension Measurement Range [ kN ]	Min. - Max.	20 to 200
	1 digit	0.01
Available Bolt Size (Reference) [mm]	Less than $\phi 20\text{mm}$ , Bolt nominal length 45 to 300	
	M10 Standard accessory	45 to 80 (A nut with the same strength as the measurement bolt is required)
	M16 Standard accessory	50 to 85 (A nut with the same strength as the measurement bolt is required)
	M20 Standard accessory	70, 87, 170, 187, Max.300 (A nut with the same strength as the measurement bolt is required)
Dimensions [mm]	Overall Length	451
	Width	438 (Body300)
	Depth	409
Weight Approx. [kg]		36
Power		AC100 to 240V $\pm 10\%$ 50 / 60Hz
Temperature in Use		0 to 40 °C Less than 85%RH (No condensation)

Accuracy  $\pm 2\% + 1\text{digit}$

**Bolt Tension Calibrator AFC-20G2**



### Bolt Tension Calibrator AFC-20G2 Measurement Fixtures

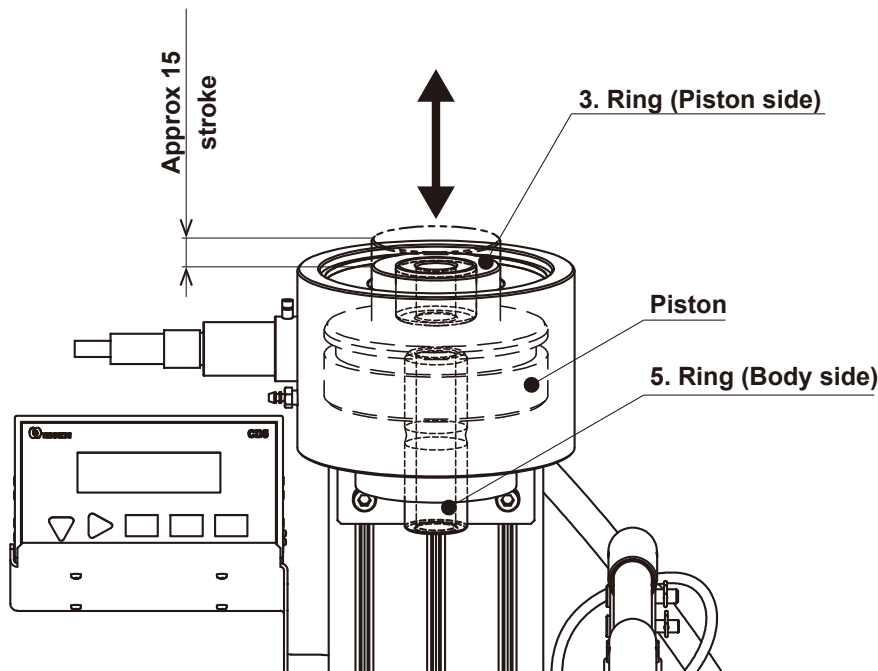


Note: Do not come with hex bolt and hex nut.

## 4 Name of each part

### 4-1. Piston part and Operation part of the body side

#### Bolt Tension Calibrator AFC-20G2 Hydraulic Piston Part Name



- **3. Ring (Piston side)**

For measuring bolt M20 size, use the upper surface of the ring as the seating surface.

- **Piston**

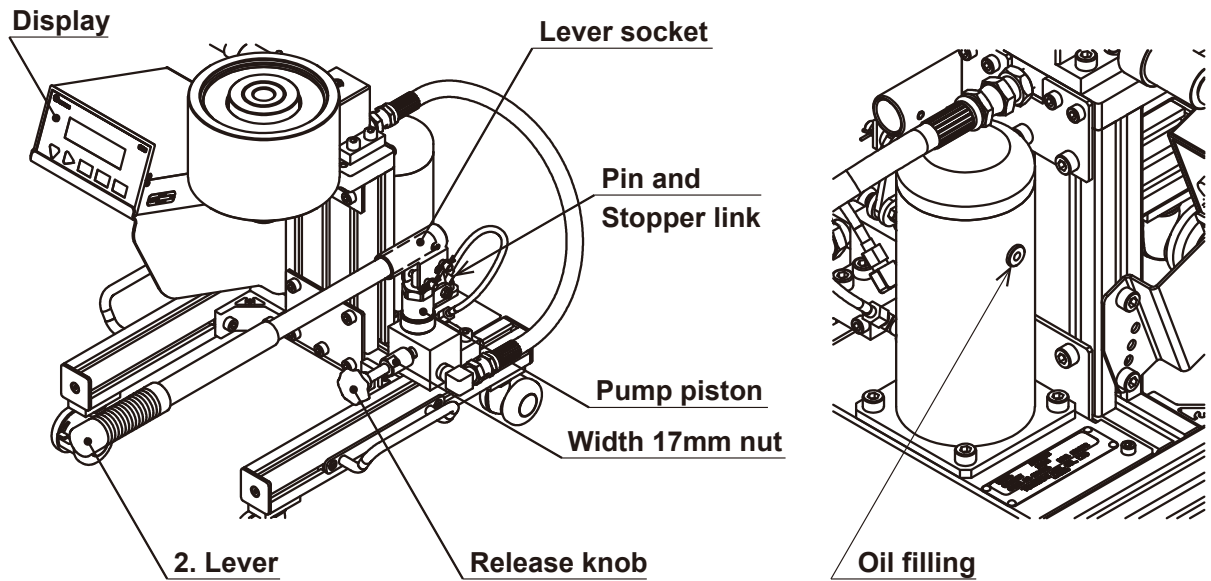
When the pump operation is performed and the flood pressure rises, the piston rises, and when the flood pressure drops, the piston falls.

⚠ Operating stroke: Be careful not to raise it by more than 15 mm.

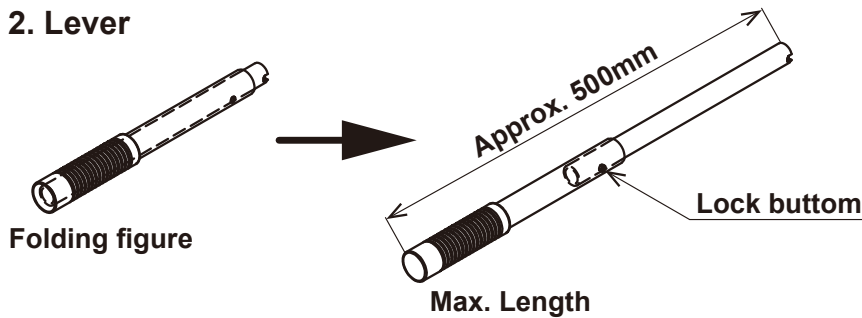
- **5 Ring (Bbody side)**

The nut (M20) comes into contact with the underside of the ring.

## Axial Tension Calibrator AFC-20G2 Body Part Names



### 2. Lever



#### • 2 Lever

The lever expands and contracts, so when using it, extend it until the locked position.

#### • Lever socket

Insert the operating lever into the lever socket firmly, move it up and down to pumping.

#### • Release knob

To generate axial force on the bolt, rotate the knob clockwise and tighten the knob firmly.

If the knob is loosely tightened, the axial force may not increase or the axial force may decrease immediately.

To release the axial force, slowly rotate the knob counterclockwise to loosen it.

If the knob is too stiff to loosen, loose the 17mm width of the nut by spanner.

**⚠** Be careful not to loosen the release knob more than 2 turns.

#### • Oil filling (fuel filler port)

Used for replacing or replenishing hydraulic oil.

Replenish hydraulic oil to the level of the filler port.

The hydraulic oil is equivalent to general hydraulic oil ISO VG, viscosity grade # 32, or # 46.

### 4-2. Display and operation

AFC-20G2 Instruction Manual Display section Please refer to "2-1. Display section and operation section".

### 4-3. Power supply and input / output

Please refer to "2-2. Power supply section and input / output section" in the display section of the AFC-20G2 instruction manual.



# 5 Axial Tension Measurement

## 5-1. How to install the measuring bolt

### Example 1: In the case of a small diameter hexagon bolt

(1) Pass the hexagon bolt to be measured through the holes of the # 10 plate and # 13 washer.

Match the distance between the hex bolt and hex nut to the actual length of the fastener. Adjust this length to the same dimension as the bolt dimension L2 of the ultrasonic bolt tension meter TT series. (Figure 1)

(2) Assemble the # 13 washer, # 7 joint, and # 4 bar as shown in (Fig. 2).

(3) Place the # 8 plate and # 6 spacer on the # 3 ring of the AFC-20G2 main unit, and insert the # 4 bar into the bolt hole of the # 8 plate from above. (Fig. 3)

(4) Place the # 10 plate on the # 6 spacer. (Fig. 3)

(5) After assembling, check that there is no gap or play between the plate and the spacer. If there are gaps or backlash, measurement may not be possible or the equipment may be damaged.

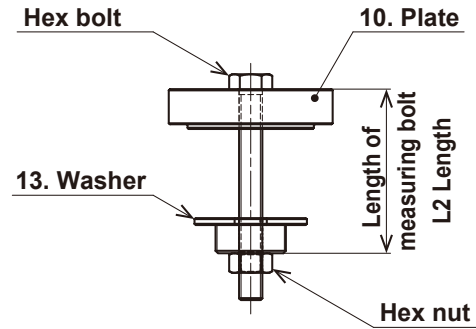


Figure 1

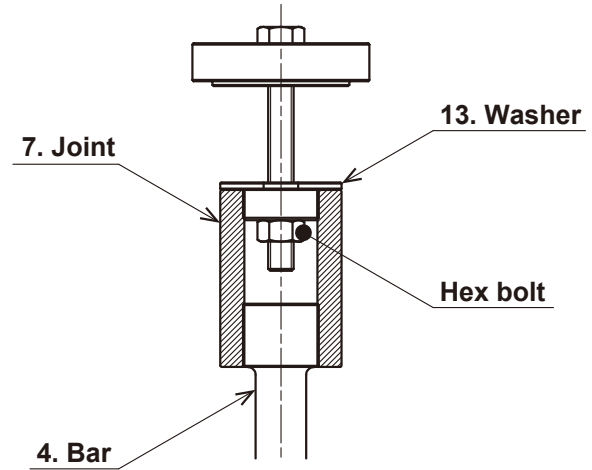


Figure 2

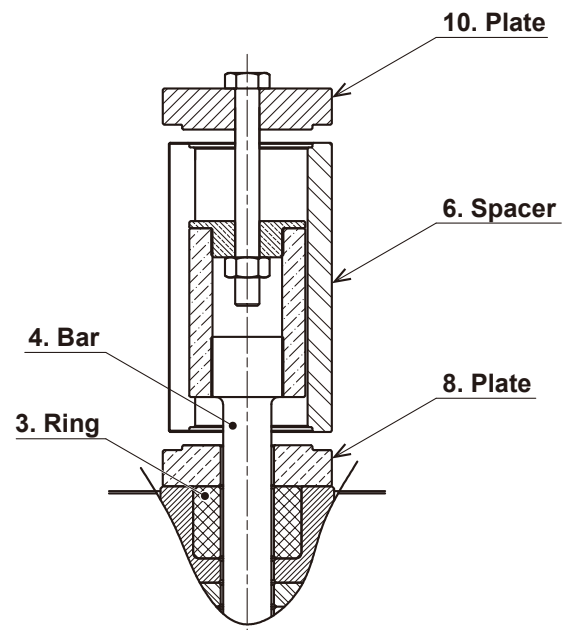


Figure 3

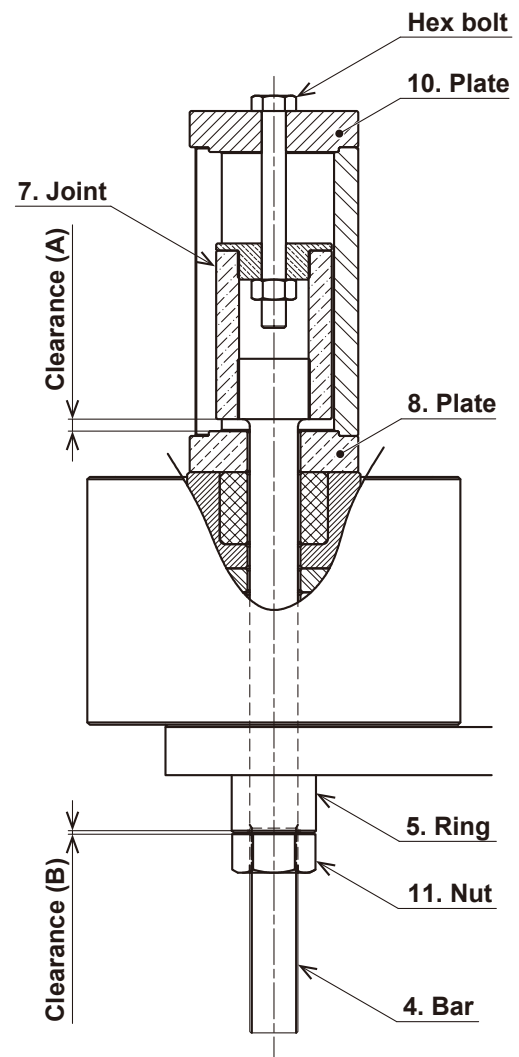
(6) Insert the # 11 nut from the bottom of the # 4 bar.

(7) Determine the position of the # 11 nut by providing a gap (A) so that the # 8 plate and the # 7 joint do not come into contact with each other.

Also, install a gap (B) so that the # 11 nut and # 5 ring do not come into contact with each other.

(8) If there is no gap between the # 7 joint and the # 8 plate, no axial tension will be generated on the measuring bolt.

(9) Prepare a separate washer or plate between the hexagon bolt and the # 10 plate so that a gap A is created, and install it. (Fig. 4)



### Example 2: In the case of a larg diameter hexagon bolt

(1) Insert the measuring hexagon bolt through the hole in the # 3 ring of the AFC-20G2 main unit.

(2) Attach the hex nut to the hex bolt coming out of the # 5 ring.

(3) The distance between the hexagon bolt and the hexagon nut matches the actual length of the fastener. This length should be adjusted to the same dimension as the bolt dimension L2 of the ultrasonic axial tension checker TT series. (Fig. 5)

(4) Install with a gap (B) so that the hexagon nut and # 5 ring do not come into contact with each other.

(5) If there is no gap (B) between the # 5 ring and the hexagon nut, the correct measurement axial force will not be generated.

(6) If the fastening body length is longer than the distance between the # 5 ring and the # 3 ring, prepare a washer or plate separately between the # 3 ring or the # 5 ring and install it.

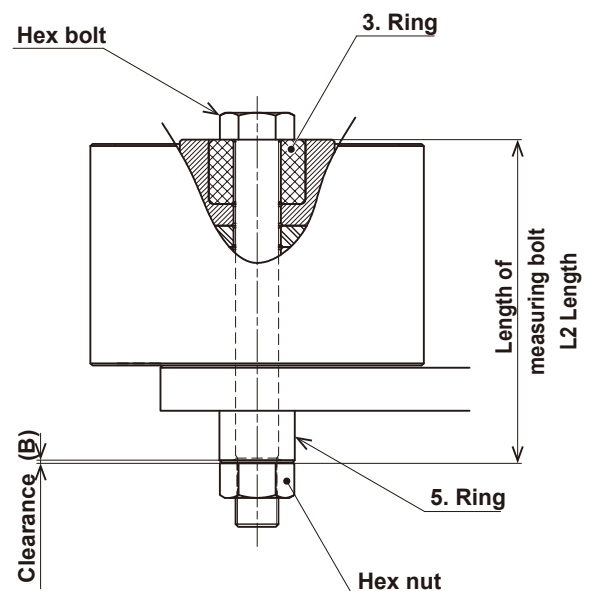


Figure 5

## 5-2. Axial tension measurement method

- (1) Install the measuring bolt on the AFC-20G2 using the attached measuring jig.
- (2) Press the C key on the display and check that the axial tension value is 0 kN.
- (3) Turn the release knob clockwise to tighten it firmly.
- (4) Insert the lever into the lever socket and slowly move it up and down to operate the pump.
- (5) Slowly raise the axial tension to be applied to the measurement bolt while observing the value on the display.
- (6) To finish the measurement, turn the release knob counterclockwise to release the axial tension load.
- (7) The work is completed when the value on the display returns to around 0 kN after the axial tension load is released.
- (8) If necessary, repeat the pump operation to measure the axial tension.

## 5-3. Precautions during axial tension measurement

- (1) Install the measuring bolt on the AFC-20G2 using the attached measuring jig.
- (2) Aline the measuring bolt and jigs to the center of the AFC-20G2 hydraulic cylinder when installing.
  
- (3) If an axial tension is loaded to the measuring bolt at a position deviated from the central axis, a parasitic component force other than the original axial tension is applied to the measuring bolt, and correct measurement cannot be performed.
  
- (3) If there is deviation to the central axis for the measuring bolt, jig and the cylinder of AFC-20G2, a parasitic component force other than the original axial tension will be applied to the bolt so it may not be performed the measurement exactly.
  
- (4) If there is no gap between the plate and joint of the attached jig, axial tension may not be generated on the measuring bolt. In addition, the measuring bolt and the AFC-20G2 main unit may be damaged.
  
- (5) If the measured axial tension is not stable or drops the value immediately, air may be contained in the hydraulic circuit, so please have the air bleeding work or inspection by the manufacturer.
  
- (6) If the release knob is loosely tightened, the axial tension may decrease, and if it is overtightened, the axial tension may not be released.
  
- (7) If the AFC-20G2 main unit is used in a tilted state or tilted, it may cause oil leakage.
  
- (8) When pumping, make sure that the lever does not protrude from the casters of the main body, otherwise the AFC-20G2 main unit may tip over.

## 6 Daily Check

### ● Before use

Check the following items before use, and if applicable, do not use AFC-20G2 and take measures such as sending it for repair.

1. When oil leakage is confirmed by looking at the entire device
2. When the piston does not operate smoothly when it is raised or lowered to the stroke end with no load. Normally, the piston part rises about 15 mm to the stroke end.
3. When an defect is confirmed in the lever socket or pin
  - Check if the pin holes are enlarged and loose.
  - Check for pin stopper rings.
4. When an defect is confirmed around the pump piston
  - Check for enlarged (play) and bending of the pin hole of the pump piston.

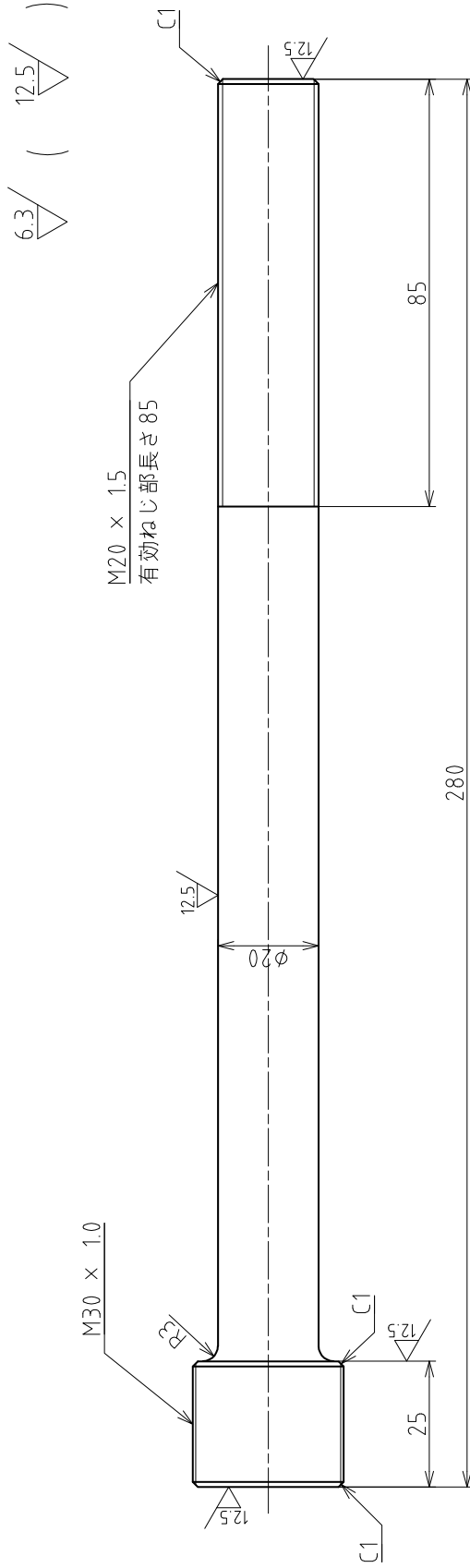
### ● After use

After use, please observe the following items and store in a room at room temperature.

1. If there is iron powder, dust, or other deposits on each part of the pump piston, remove them cleanly.
2. Lubricating the moving part (pump piston part) and wiping the entire device with a waste cloth soaked in oil to store it will have a rust prevention effect.
3. Lower the piston to the bottom and store it with the release knob lightly closed.
4. Do not store near fire or in a place where it may be exposed to water or seawater.
5. If you find any deformation, damage, oil leakage, or other defects during or after use, do not store the product as it is and send it for repair.
6. For daily use, it is recommended to overhaul at a designated store or service center once every two years. Even if it is not used on a daily basis, if oil seeps out from the pump piston or hydraulic cylinder, or if any parts are missing, damaged or otherwise abnormal, overhaul it immediately.
7. Hydraulic oil is gradually contaminated with oxidation, water, particles due to wear of equipment, dust entering from the fuel filler port, etc. Contaminated particles mixed in the hydraulic oil can cause malfunction even if they are very small, so replace the hydraulic oil regularly.



軸力校正器 AFC-20G2 治具 (品名: バー)



注記

- 1材質はSCM435とする
- 2硬度はHRC40~45 (要熱処理) とする
- 3許容軸力 F < 200kNf とする
- 4表面処理は四三酸化鉄皮膜とする

情報は2020年9月24日時点のものです。仕様等は改善・改良のため予告なく変更する場合があります。

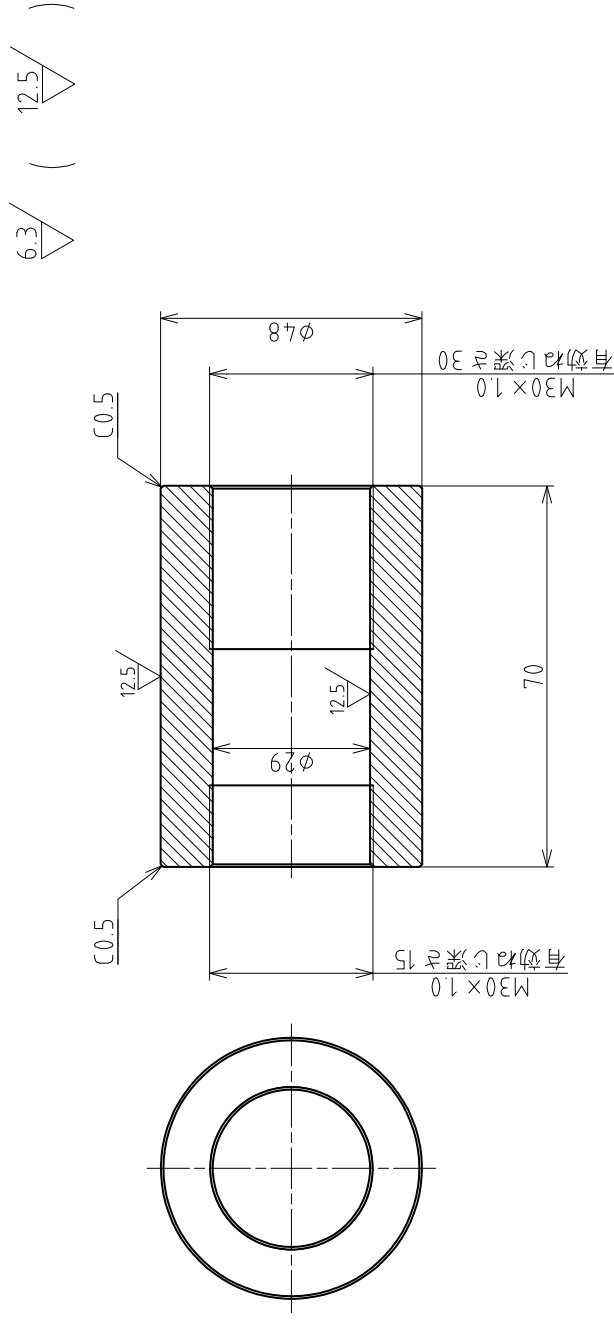
This drawing is the latest available as of 24.09.2020 Specification and other description may be changed for improvement or refinement without prior notice.

Drawing No. T.34046

株式会社 東日製作所  
TOHNICHI MFG. CO., LTD.



軸力校正器 AFC-20G2 治具 (品名: ジョイント)



注記

1材質はS45Cとする

2表面処理は四三酸化鉄皮膜とする

情報は2020年9月24日時点のものです。仕様等は改善・改良のため予告なく変更する場合があります。

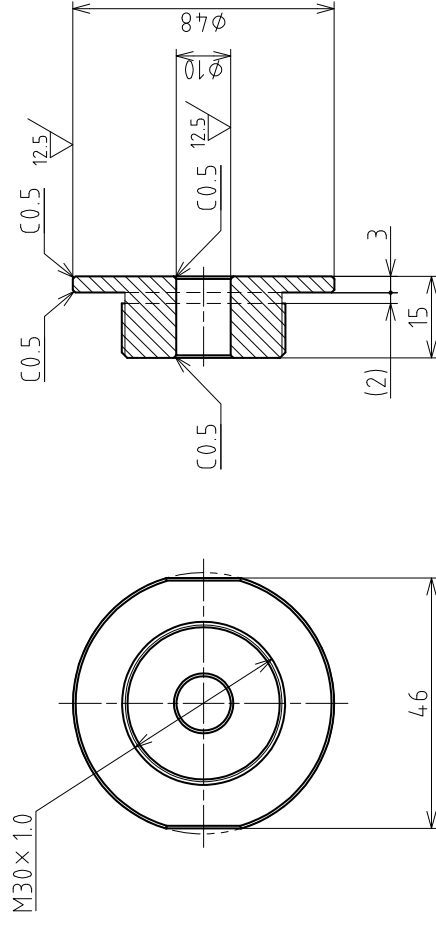
This drawing is the latest available as of 24.09.2020 Specification and other description may be changed for improvement or refinement without prior notice.

Drawing

T.34047

株式会社 東日製作所  
TOHNICHI MFG. CO., LTD.

軸力校正器 AFC-20G2 治具 (品名: ワッシャ)



6.3 ( 12.5 )

注記

- 1材質はS45Cとする
- 2表面処理は四三酸化鉄皮膜とする

情報は2020年9月24日時点のものです。仕様等は改善・改良のため予告なく変更する場合があります。

This drawing is the latest available as of 24.09.2020. Specification and other description may be changed for improvement or refinement without prior notice.

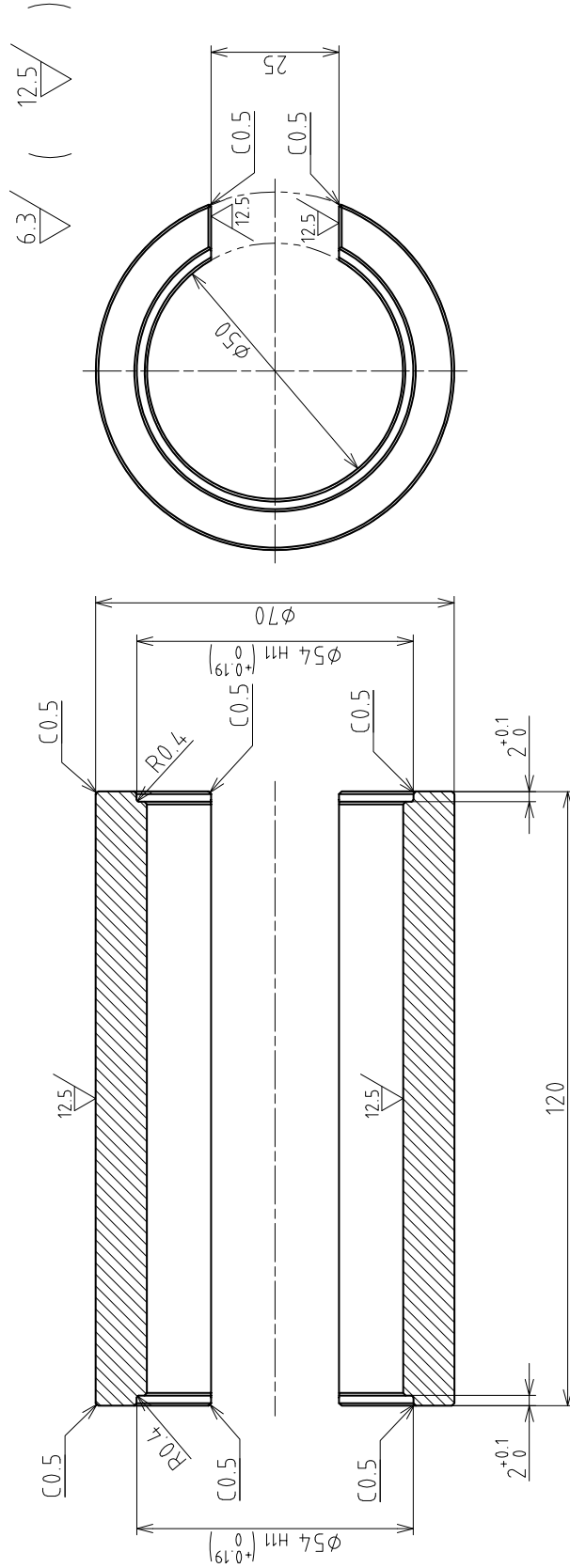
Drawing Number

T.34048

株式会社 東日製作所  
 TOHNICHI MFG. CO., LTD.



軸力校正器 AFC-20G2 治具 (品名: スペーサ)



注記

1材質はSITKM13Aとする。

2素材はTP70×10

3表面処理は四三酸化する。

情報は2020年9月24日時点のものです。仕様等は改善・改良のため予告なく変更する場合があります。

This drawing is the latest available as of 24.09.2020 Specification and other description may be changed for improvement or refinement without prior notice.

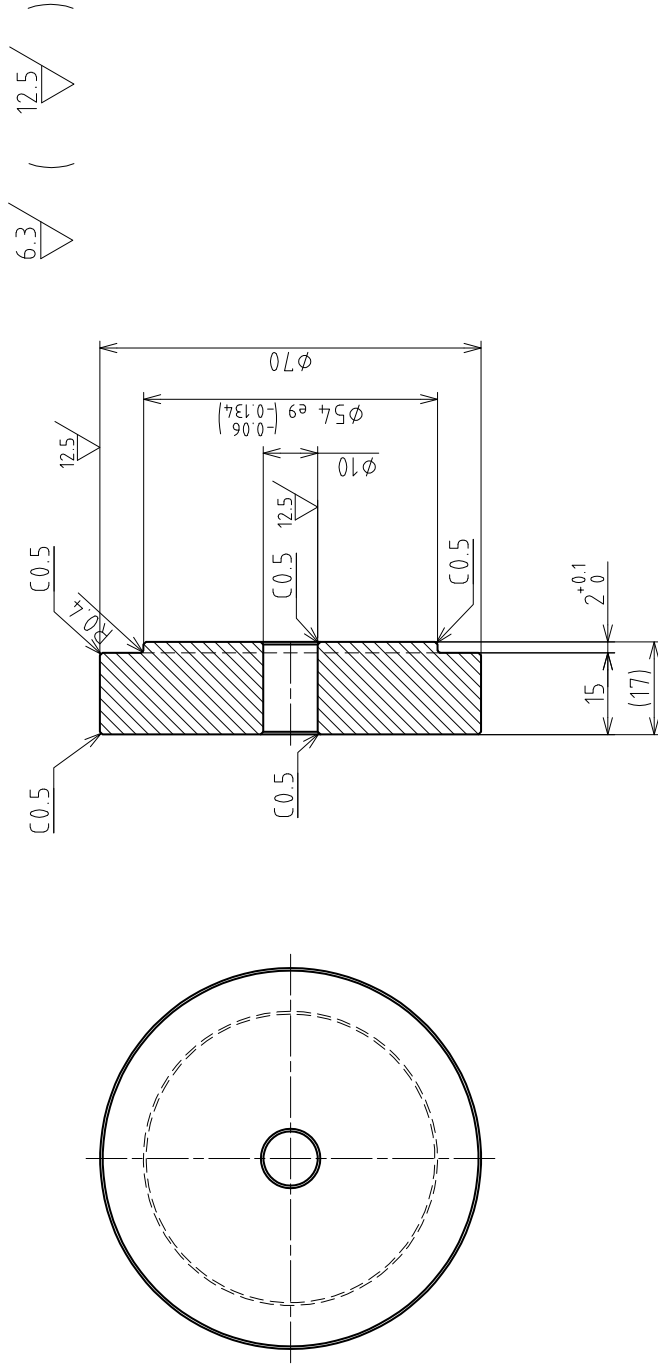
Drawing

T.34049

株式会社 東日製作所  
TOHNICHI MFG. CO., LTD.



軸力校正器 AFC-20G2 治具 (品名: プレート)



注記

- 1材質はS45Cとする
- 2表面処理は四三酸化鉄皮膜とする

情報は2020年9月24日時点のものです。仕様等は改善・改良のため予告なく変更する場合があります。

This drawing is the latest available as of 24.09.2020 Specification and other description may be changed for improvement or refinement without prior notice.

Drawing Number T.34050

株式会社 東日製作所  
TOHNICHI MFG. CO., LTD.

# - AFC-20G2 Display -

## Safety precautions

To customers

Before using this display, please read this instruction manual carefully and use it correctly.

If you have any questions,

Please contact your dealer or Tohnichi. Please keep this instruction manual in a safe place.






### Safety caution symbol!

This symbol means the "safety precautions". Please be careful when you see this symbol in this instruction manual. Take preventive measures according to the description and perform "safe operation and correct management".

### [The signal word]

The signal word is a heading that indicates items that you should know when ensuring human safety and handling the device. Safety signal words are divided into "danger", "warning", and "caution" according to the degree of danger to humans. Used with the safety caution symbol to indicate the following situations:

- "  **Danger**" : Imminent danger that becomes a serious obstacle.
- "  **Warning**" : Potential danger that poses a serious obstacle.
- "  **Caution**" : A potential danger that is not serious but an obstacle.

### **Warning**

1 Do not use the product in an abnormal condition such as smoke, strange odor or noise.

It may cause electric shock or fire. Immediately turn off the power, unplug the AC adapter from the outlet, and contact the shop or Tohnichi.

2 Do not disassemble or modify the equipment.

It may impair safety, shorten the function or life, or cause a malfunction.

3 If liquid such as foreign matter or water gets inside, do not use it as it is.

It may cause electric shock or fire.

4 Do not connect or disconnect the AC adapter with dirty hands.

It may cause electric shock.

5 Do not use other than the indicated power supply (AC100V ~ 240V ± 10%).

Using a power source other than the specified one may cause electric shock or fire.

6 Do not use the power cord of a damaged AC adapter.

It may cause electric shock or fire.

Observe the following points when handling the power cord.

- Do not damage, extend, or heat.
- Do not pull, place heavy objects on it, or pinch it.
- Do not bend, twist or bundle forcibly
- Do not use other power cords
- Do not use for other equipment

7 Be careful when handling the AC adapter.

Mishandling may cause a fire.

- Do not insert the power supply with foreign substances such as dust attached.
- Insert the power plug securely to the base of the blade.

8 When disconnecting the AC adapter from the outlet, be sure to hold the AC adapter body when disconnecting.

Pulling on the power cord may damage the cord and cause a fire or electric shock.

9 Do not place the product on an unstable place or a place with vibration such as a wobbling table or an inclined place.

This display may fall and cause injury.

10 Do not install in a place with flammable liquid or flammable gas.

It may cause electric shock or fire.

11 Be sure to use the specified accessories and options.

Do not use any accessories or options other than those specified in this instruction manual.

It may cause an accident or injury.



1 Do not install in a place with a lot of humidity or dust, a place that is easily wet with water, a place exposed to direct sunlight, or a place where the temperature or humidity changes drastically.

It may cause electric shock, fire, malfunction, functional deterioration, or malfunction.

2 Remove the AC adapter from the outlet regularly and clean the base of the blade and the space between the blades.

Dust may adhere to the base of the power plug blade, causing a short circuit and causing a fire.

3 For safety, be sure to unplug the AC adapter from the outlet when it will not be used for a long period of time.

4 Before moving this display, turn off the power for safety, unplug the AC adapter from the outlet, and make sure that all connection cords are disconnected. Also, do not give any shock or vibration.

The AC adapter, power cord or connection cord may be damaged, resulting in fire, electric shock, or malfunction.

5 Inspect for damaged parts.

Before use, thoroughly inspect the main unit, accessories and other parts for damage, and confirm that they operate normally and that they perform their intended functions. Check for any damage to parts, mounting conditions, or any other parts that affect work. For replacement or repair of damaged parts, contact the store where you purchased the product or Tohnichi.

## Precautions for use

1 The power supply voltage can only be used from AC100V to 240V.

Please use the accessories for the AC adapter.

2 Do not use this display except in the usage environment described in the instruction manual.

3 Do not disassemble or modify this display.

4 Before using the product, perform a start-up inspection and check the settings.

5 Please note that this indicator may be damaged or burned if it gets wet with water or oil.

6 Please note that dropping or hitting this display may cause damage or malfunction.

7 Correctly connect this display to the oil pressure sensor and external devices.

8 Be sure to perform regular inspections on this display.

9 Be sure to check for zero before making a measurement.

**If you notice any strange odor or fire during use, stop using it immediately, move this display to a safe place, and contact us.**

# 1

## Features

### 1 Data transfer to an external device

It has an RS232C (compliant) communication terminal as standard and can be easily connected to a personal computer.

### 2 Wide operating voltage

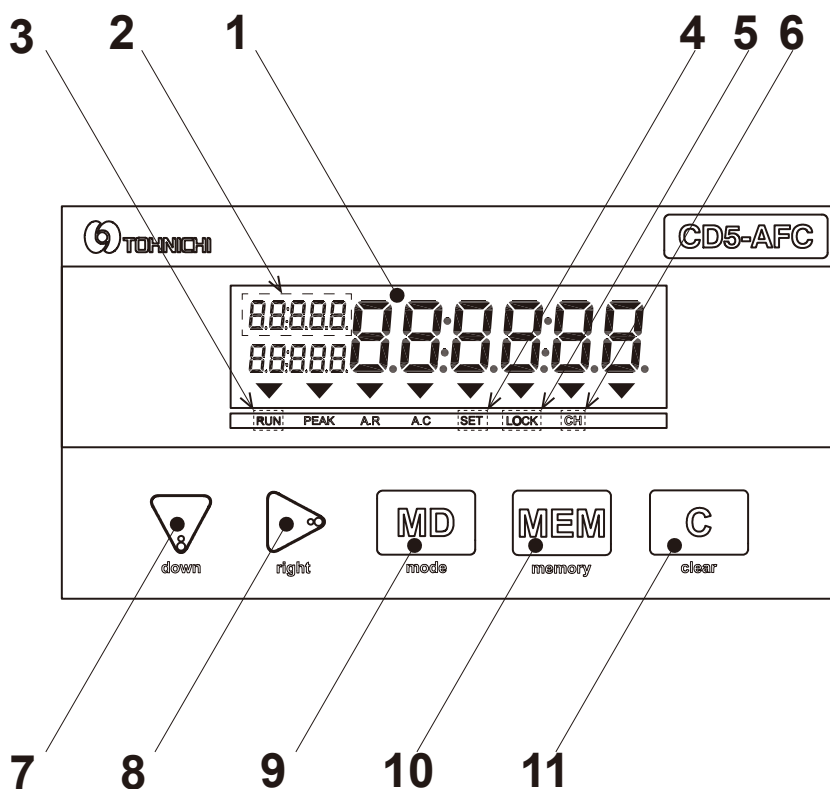
Since the power supply voltage corresponds to AC100V ~ AC240V  $\pm$  10%, most regions overseas It can be used in.

### 3 with CE marking

You can use it with confidence especially in the EU.

## 2 Name of each part

### 2-1. Display and operation



1 Axial force display: Displays the axial force value.

2 Counter display: Displays the memory counter (fixed to “0000”).

3 RUN mode display (RUN): The ▼ mark is always displayed.

4 Display during setting (SET): A ▼ mark is displayed during calibration and various settings.

5 Setting LOCK display (LOCK): A ▼ mark is displayed when the LOCK switch on the back side is ON.

6 Setting switching display (CH): ▼ mark is displayed when the terminal block CH.SW signal is input (CH2 is selected).

To do.

7 Back key (down key)

Change the set value during calibration and various settings.

\* Even if you press it while the axial force run is displayed, it does not respond.

8 Feed key (right key)

Change the set value during calibration and various settings.

\* Even if you press it while the axial force run is displayed, it does not respond.

9 Mode key (MD key)

Press and hold for 2 seconds to enter setting mode.

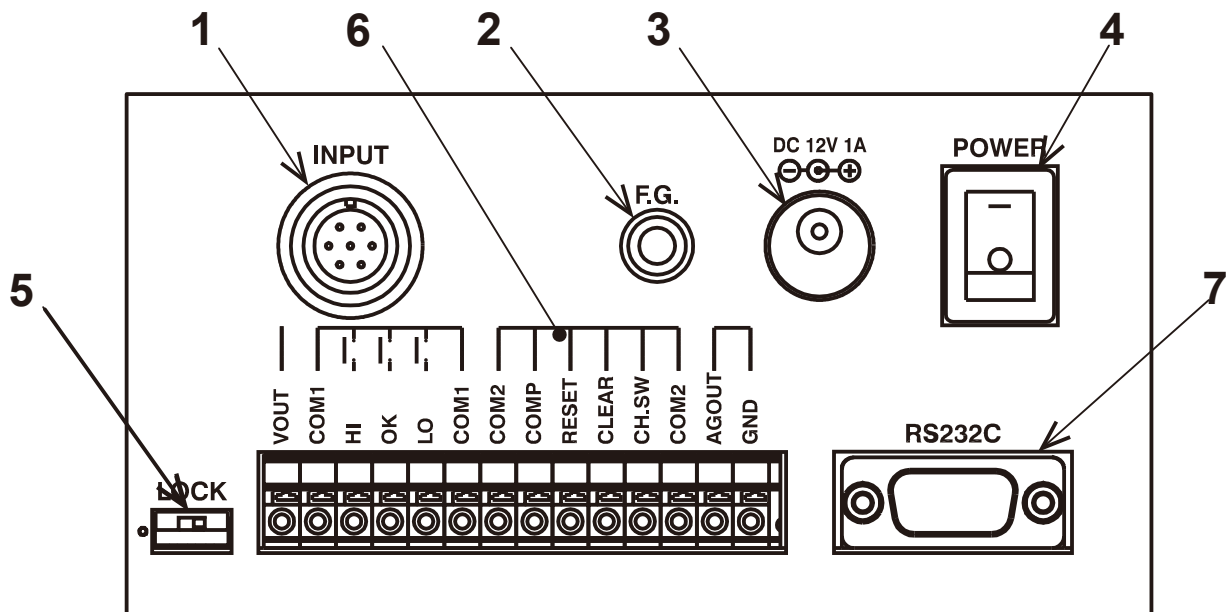
10 Memory key (MEM key)

The set value is memorized during calibration and various settings.

11 Clear key (C key)

Performs Auto zero.

## 2-2. Power supply and Input / Output



1 INPUT: Sensor cable connector.

2 Earth terminal: It becomes the frame ground.

3 Power jack (12V, 1A, Center Plus): Connect the included AC adapter (BA-6).

4 Power switch: Turns the power on and off.

5 LOCK switch

The LOCK switch locks the settings so that the settings will not be rewritten due to an erroneous operation. When turned on, the LOCK ▼ display on the display lights up.

6. External connecting terminal: It is used for communicating signals with other devices.

- **Voltage output terminal**

- VOUT: + 5V is Output.

- \* Allowable current 200mA

- **Signal output terminals: COM 1, HI, OK, LO terminals cannot be used.**

- **Signal input terminals: Short-circuit each terminal and COM2.**

- \* Do not apply voltage.

Input a signal for 0.1 seconds or longer.

- COM2: Common terminal for input signals. (Common terminals for RESET, CLEAR, COMP, CH.SW)

- RESET: When connected to a personal computer, etc., the measurement data is output to an external device.

- CLEAR: Performs Auto zero.

- COMP: Cannot be used.

- CH.SW: Switches the channel. When CH.SW and COM2 are short-circuited, the CH ▼ display on the display lights up.

- \* 2CH calibration value is not entered at the time of shipment. When using 2CH, calibrate it before use.

- **Analog output terminal**

- AGOUT: Amplifies the sensor input and outputs it as a voltage output.

(Approximately -7V at maximum  $\pm 11V$  0mV / V)

- GND: This is the GND terminal for analog output.

\* Analog output voltage is not calibrated. Check the output voltage by applying a static axial force load with a calibration device or the like.

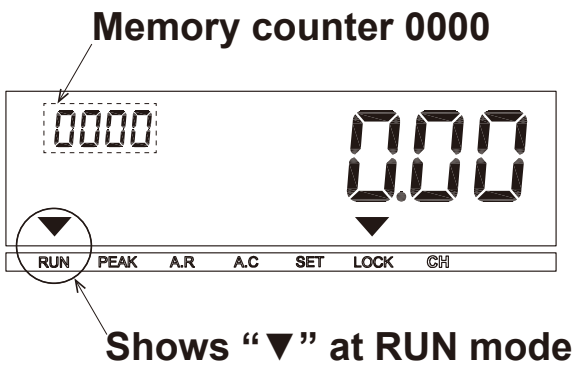
7 RS232C: A terminal for connecting to a printer, PC, etc. (D-SUB9 pin male)

## 2-3. Screen details

- **Continuous display mode (Run mode)**

Memory counter is fixed at 0000

When the axial load is applied, the display rises, and when the load is released, the display returns to 0.



## 3 Functions and operation methods

### 3-1. Auto zero function

The auto-zero function is activated by pressing the C key, inputting a CLEAR signal, or inputting CLEAR command from RS232C. The auto zero function also works when the power is turned on.

#### • Auto zero range

If Auto zero is taken with the condition of the Auto zero range is exceeded, "Er r 9" will be displayed.

- Run mode: Sensor input is less than  $\pm 0.2\text{m V/V}$
- When the power is started: The sensor input is less than  $\pm 0.2\text{ m V/V}$
- Er r 9 display: Sensor input is less than  $\pm 0.2\text{m V/V}$

#### • How to unlock Er r 9

Put the connected sensor in the no-load state and press the C key.

\* If the Er r 9 display disappears by the above operation, it can be used normally.

If the Er r 9 display remains, repair is required, please contact the store where you purchased the product or Tohnichi.

### 3-2. Over axial force alarm function

When 110% of the maximum measured value is exceeded, the axial force display flashes and the buzzer sounds intermittently.

### 3-3. Setting switching function

You can register two types of calibration values and other setting values, and switch between those settings for use. Replace and use the two oil pressure sensors.

You can also register two settings with one oil sensor. When CH.SW of the terminal block and COM2 are short-circuited, it switches to 2CH and the ▼ display of CH on the display lights up.

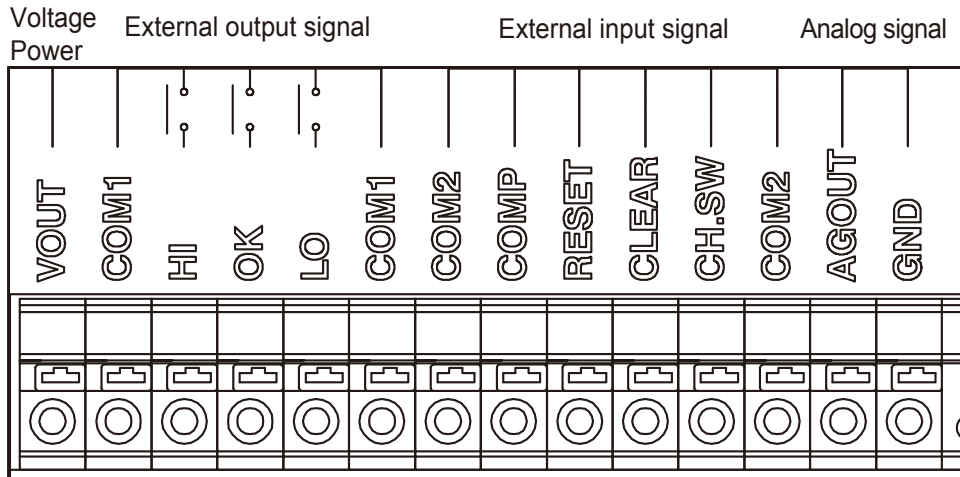
\* Switch channels with no load on the oil sensor. Auto zero is activated when switching channels.



### 4-1. Terminal block connection

The terminal block on the back of the CD5-AFC has a voltage output, an external output signal, an external input signal, and an analog output, which are arranged as shown below.

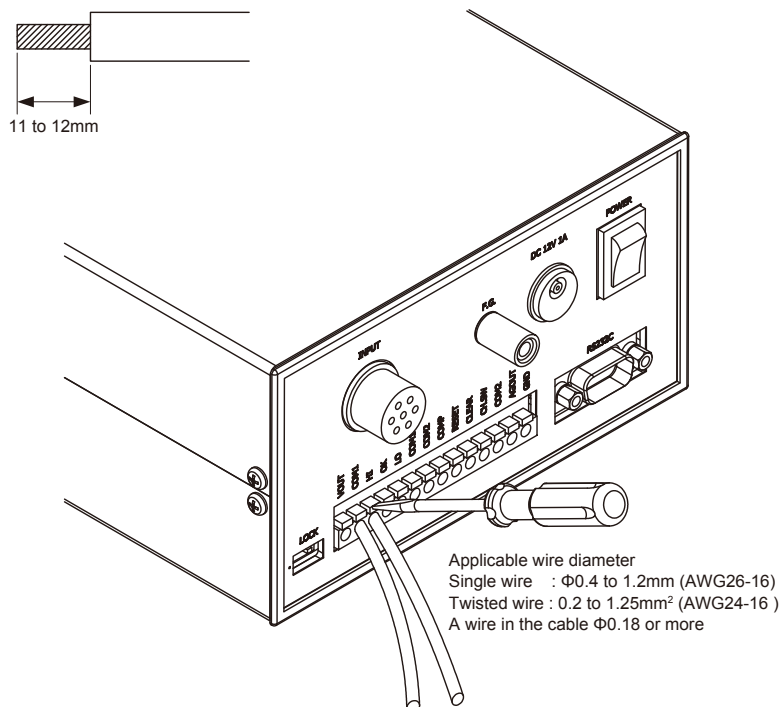
\* Do not connect to the HI, OK, LO terminals of the external output signal and the COMP terminal of the external input signal.



#### • How to connect the terminal block

The CD5-AFC uses a gauge clamp system for easy connection.

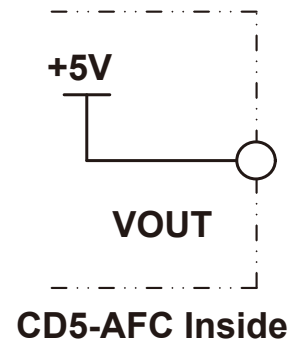
- 1 Strip the wire to be connected by 11 to 12 mm and twist it so that the tip does not come apart.
- 2 While pushing the convex part with a screwdriver, insert the electric wire into the hole below.
- 3 Release the screwdriver, etc. from the convex part.
- 4 Gently pull the wire to make sure it is securely clamped.



● **Voltage output connection**

This is a terminal that outputs + 5V.

\* The allowable current of VOUT is 200mA.  
Please be careful when using it.



● **External output signal connection**

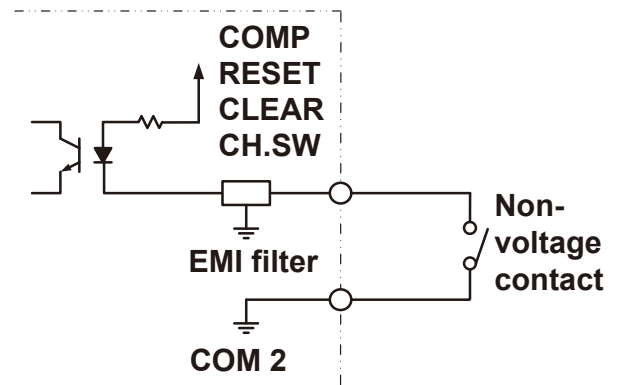
COM 1, HI, OK, LO terminals cannot be used.  
Please do not make a connection.

● **External input signal connection**

The external input circuit inputs a signal by short-circuiting each input terminal and the COM2 terminal.

A short circuit is performed by a non-voltage contact such as a relay or switch.

\* Do not connect to the COMP terminal.  
\* Never apply voltage to the input circuit. The internal circuit will be damaged.



CD5-AFC Input signal Equivalent circuit

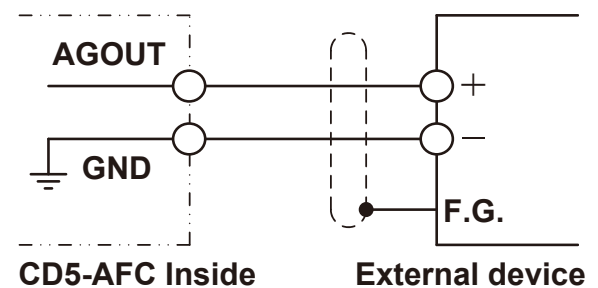
● **Analog output connection**

This is an output terminal for extracting an analog voltage proportional to the sensor signal.

Use a shielded cable for wiring.

\* Do not short-circuit AGOUT and GND. It may cause a malfunction.

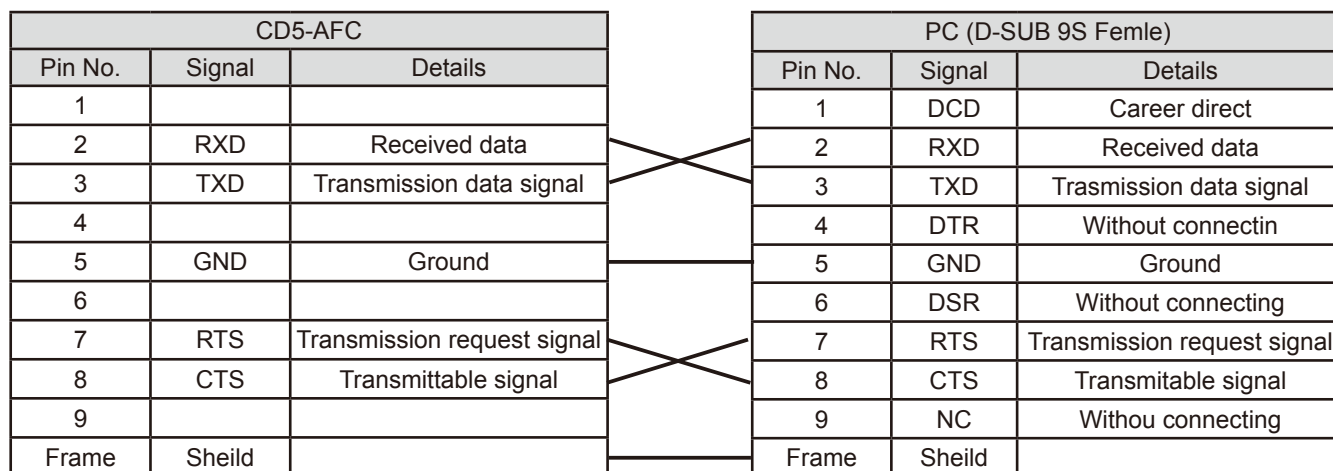
\* Do not apply voltage from the outside. It will be damaged.



## 4-2. RS232C connection

Use the dedicated cable (No.383) to connect the CD5-AFC to your PC.

An example of RS232C communication connection is shown below.



\* Commercially available serial cross cable for interlink can also be used  
(Reference: KR-ECLK2 manufactured by Sanwa Supply).

# 5 Calibration

## 5-1. About calibration

The operation of matching the CD5-AFC with the oil pressure sensor is called "calibration".

There are two types of calibration methods for CD5-AFC:

- **Equivalent input calibration**

This is a calibration method that does not depend on the actual load, just inputting the rated output value (mV / V) of the oil pressure sensor and the maximum measured value.

The sensor rated value setting range is + 0.5 mV / V to + 2.5 mV / V.

- **Actual load calibration**

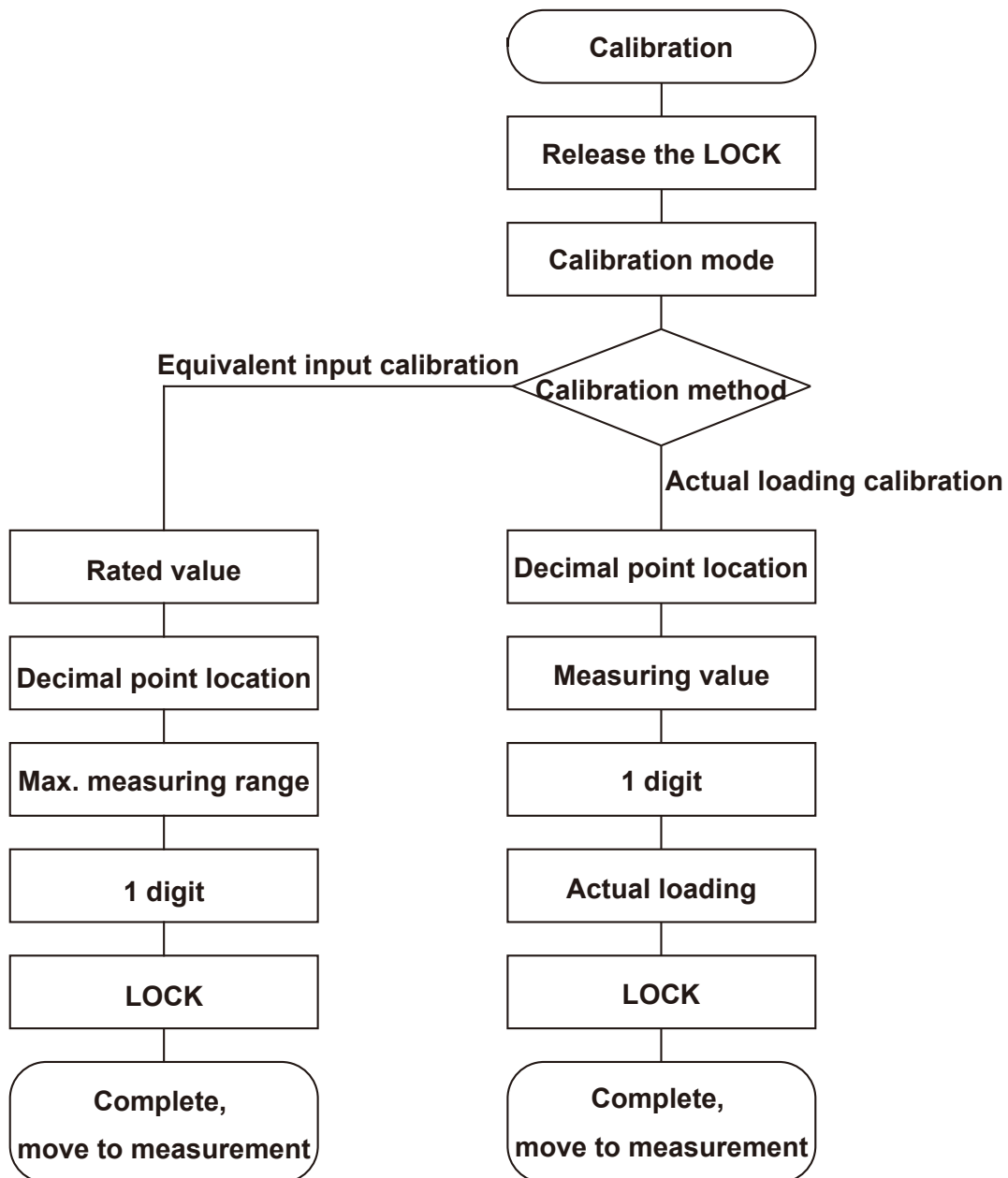
This is a calibration method in which a stable actual load is applied to the oil pressure sensor and the value of the actual load is keyed in.

Accurate calibration with less error is possible.

Calibration method	Equivalent input calibration		Calibration with actual load
Sensor rated value range	+0.5 to +1.75mV/V	+1.75 to +2.5mV/V	+1.75 to +2.5mV/V
Max measuring value	10000	25000	25000
Max resolution	1/5000	1/20000	1/20000
Measuring direction	Clockwise		Counterclockwise

\* If you purchase an axial force calibrator, it will be shipped with the calibration values entered in advance on the CD5-AFC, so there is no need to calibrate when accepting.


## 5-2. Calibration flow



### 5-3. Equivalent input calibration procedure

Equivalent input calibration is a calibration method that does not depend on the actual load, just inputting the rated output value (mV/V) of the hydraulic sensor and the maximum measured value.

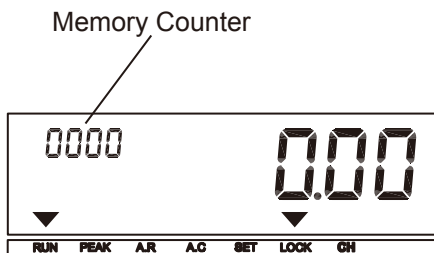
Equivalent input calibration is performed according to the following procedure.

-  If you purchased an axial force calibrator, it has already been calibrated. If calibration such as equivalent input calibration is performed at the time of acceptance, accuracy may be impaired, so do not perform calibration. If you have any questions, please contact your dealer or Tohnichi.

Example) In the case of a hydraulic sensor "rated output value 2 mV/V, rated capacity 20 MPa (axial force value 200 kN)"

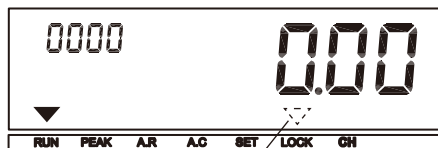
\* Please check the CD5-AFC, sensor and other wiring.

#### 1 Set the memory counter value to "0000" (fixed to "0000" for CD5-AFC).

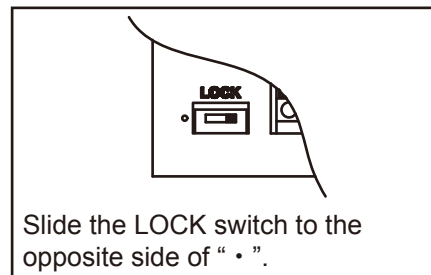


#### 2 Release the setting lock (setting cannot be done unless the lock is released)

When the LOCK switch on the back is turned off, the ▼ on the front LOCK display disappears and the setting lock is released.



LOCK will be disappeared



Slide the LOCK switch to the opposite side of "•".

#### 3 Calling the calibration screen

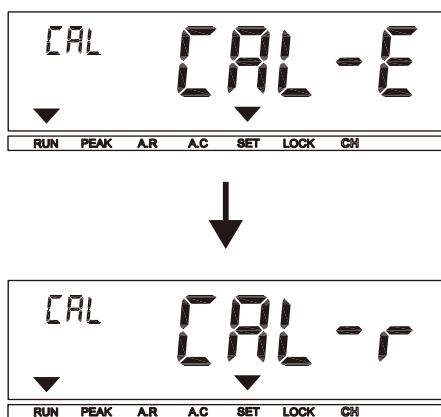
Operate the keys in the order of C → MEM → MD.

"CAL-E" is displayed and flushing is performed.

(If it has already been calibrated, either CAL-E or CAL-r will be displayed and flushed.)

#### 4 Selection of calibration method

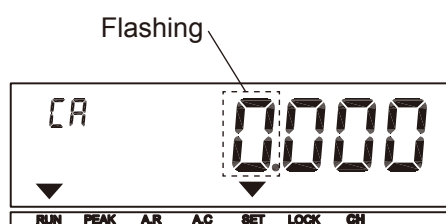
Use the down / right keys to select "CAL-E" (equivalent input calibration) and press the MEM key.



CAL-E: Equivalent input calibration

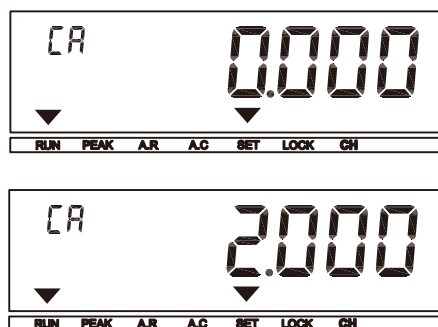
CAL-r: Actual load calibration

When the above operation is performed, "0." will be flushed on the screen below.



#### 5 Setting the sensor rating (Right)

Enter the sensor rating value.



Example) Set the rated output value to 2,000 V/V

1) Press the down key once

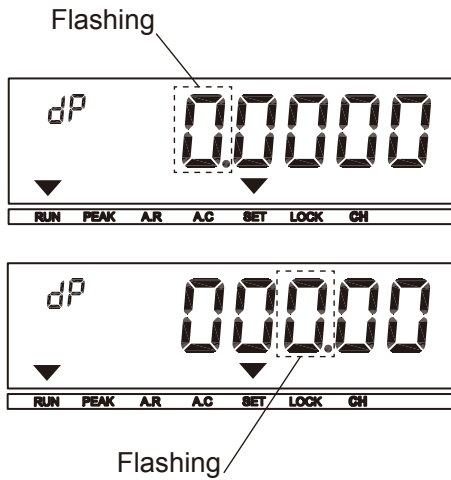
Use the down key to adjust the values  
(down count 3, 2, 1, 0)

2) Check the value and press the MEM key.

Pressing the MEM key, the decimal point position setting screen appears and "0" is flushed.

## 6. Setting the decimal point

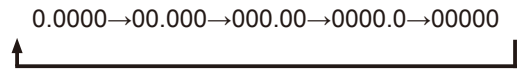
Align the decimal point position.



Set the decimal point position to "000.00".

1) Press the right key twice

Press the right key to move the decimal point position to the right by one digit.

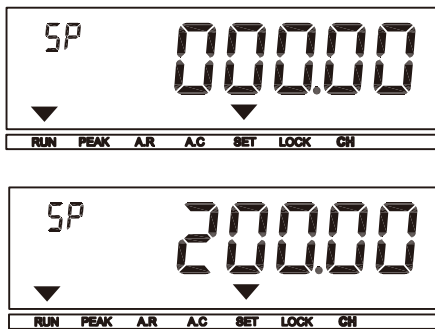


2) Check the position and press the MEM key.

When you press the MEM key, the maximum measured value setting screen appears, and the top "0" is flushed.

## 7. Setting the maximum measured value

Enter the maximum measurement value of the oil pressure sensor.



Example) Set the maximum measured value to "200.00".

1) Press the down key 8 times.

Use the down key to adjust the value (down count 9,8 → 0)

2) Check the value and press the MEM key.

When you press the MEM key, the minimum scale setting screen is displayed and the displayed value is flushed.

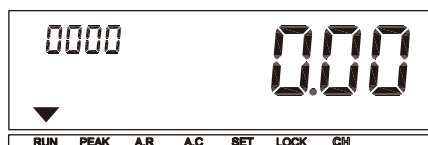
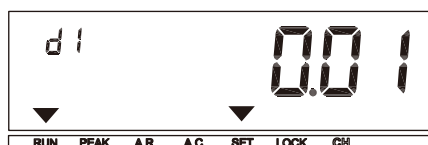
When the above operation is performed, the displayed value will be flushed on the screen below.





## 8 Minimum scale (1 digit) setting

Select the minimum scale value.



The value displayed is the minimum value.

If you want to make changes, press the down key.

\* The maximum display resolution of

CD5-AFC is 1/5000

when the sensor rated value is +0.5 to 1.75mV/V, and 1/20000 when the sensor rated value is +1.75 to +2.5mV/V.

Settings beyond that are not possible.

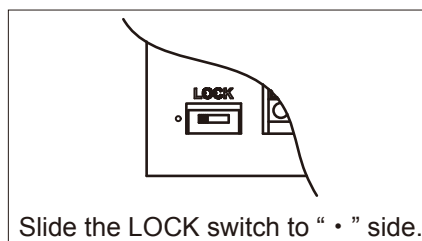
Check the displayed value and press the MEM key.

Press the MEM key to return to the run mode measurement screen.

Turn on the setting lock to prevent erroneous operation.



Lights on



## 5-4. Actual load calibration procedure

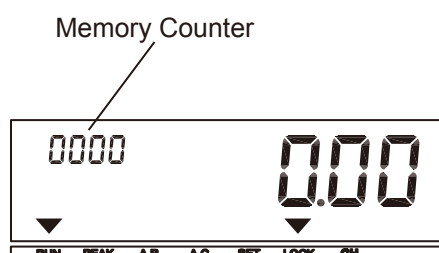
This is a calibration method in which a stable actual load is applied to the oil pressure sensor and the value of the actual load is keyed in. Accurate calibration with less error is possible.

Follow the procedure below for actual load calibration.

Example) In the case of the hydraulic sensor "rated capacity 20MPa (axial force value 200kN)"

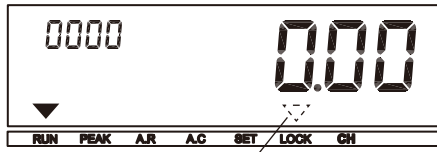
\* Please check the CD5-AFC, sensor and other wiring.

### 1 Set the memory counter value to "0000" (fixed to "0000" for CD5-AFC).

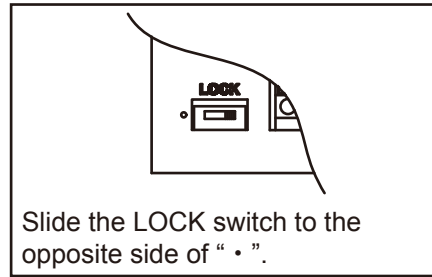


## 2 Release the setting lock (setting cannot be done unless the lock is released)

When the LOCK switch on the back is turned off, the ▼ on the front LOCK display disappears and the setting lock is released.



LOCK will be disappeared



Slide the LOCK switch to the opposite side of "•".

## 3 Calling the calibration screen

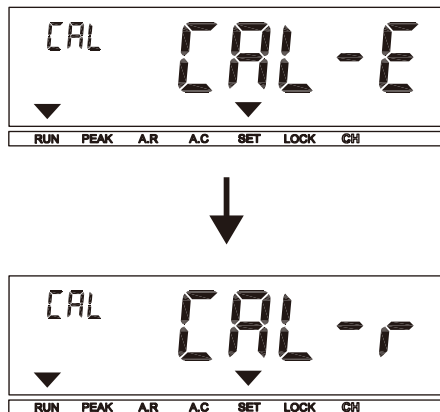
Operate the keys in the order of C → MEM → MD.

"CAL-E" is displayed and flushing is performed.

(If it has already been calibrated, either CAL-E or CAL-r will be displayed and flushed.)

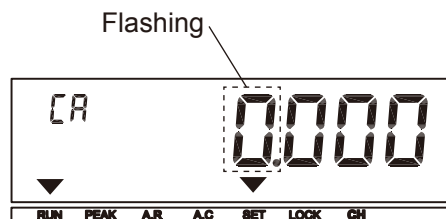
## 4 Selection of calibration method

Select "CAL-r" (actual load calibration) with the down / right keys and press the MEM key.



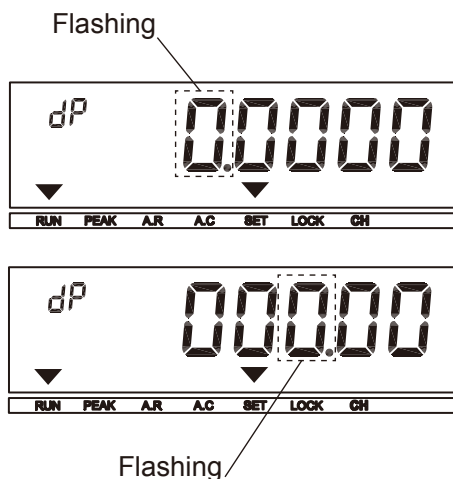
CAL-E: Equivalent input calibration  
 CAL-r: Actual load calibration

When the above operation is performed, "0." will be flushed on the screen below.



## 5 Setting the decimal point position

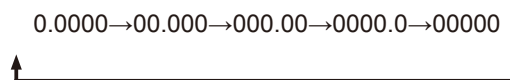
Align the decimal point position.



Set the decimal point position to "000.00".

1) Press the right key twice

Press the right key to move the decimal point position to the right by one digit.

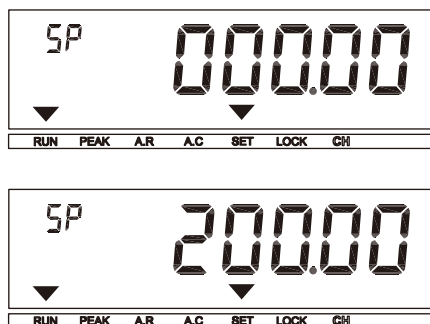


2) Check the position and press the MEM key.

When you press the MEM key, the maximum measured value setting screen appears, and the top "0" is flushed.

## 6 Setting the maximum measured value

Enter the maximum measurement value of the oil pressure sensor.



Example) Set the maximum measured value to "200.00".

1) Press the down key 8 times.

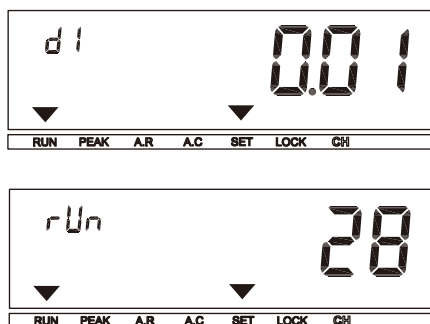
Use the down key to adjust the values (down count 9,8, → 0)

2) Check the value and press the MEM key.

When you press the MEM key, the minimum scale mark is displayed and flushed.

## 7 Minimum scale (1 digit) setting

Select the minimum scale value.



The value displayed is the minimum value.

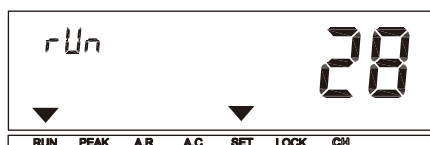
If you want to change it, press down n

\* The maximum display resolution of CD5-AFC is 1/5000 when the sensor rated value is + 0.5 to 1.75 mV/V, and 1/20000 when the sensor rated value is + 1.75 to + 2.5 mV/V.

Settings beyond that are not possible

Check the displayed value and press the MEM key.

When the above operation is performed, the display changes to the one below and an arbitrary value is displayed on the axial force display.



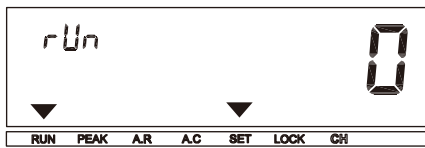
## 8 Zero adjustment and actual load calibration

8-1 Attach the calibration device to the axial force calibrator and apply a preliminary load.

Preload is max measure weight

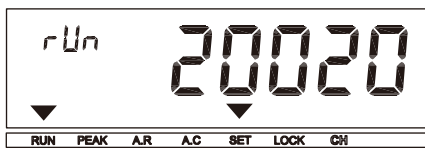
8-2 Release the preload and press the C key.

With the calibration device set, press the C key.



Confirm that the display is "0".

8-3 Apply the maximum measure weight again.



(The display at this time is not the axial force value)

8-4 Press the MEM key to register the actual load value.

Press the MEM key to return to the run mode measurement screen.



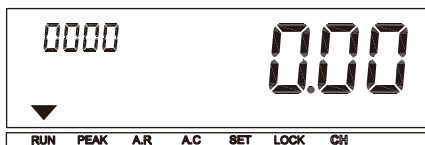
The display at this time is the axial force value.

Doing the above operation will return you to the run mode measurement screen.



8-5 Release the load and check "0".

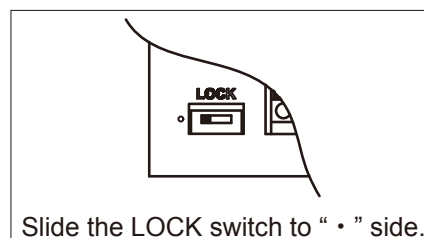
After confirming "0", remove the calibration device.



Turn on the setting lock to prevent erroneous operation.



Lights on



Slide the LOCK switch to "•" side.

# 6 Various settings and operation methods

This section describes the functions and setting methods of various settings.

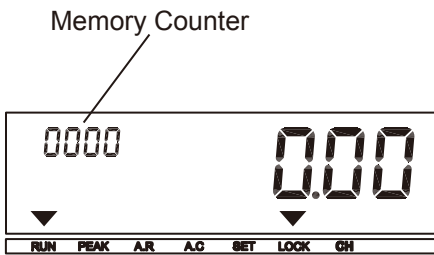
Follow the procedure below to set.

## 6-1. Setting items

	Setting item	Display	Default	Select
1	Detect external input signal	EdgE	rISE	FALL
2	Baud rate	bPS	2400	4800/9600/19200
3	Data length	LngtH	7bit	8bit
4	Parity	PArtY	nonE	odd/EvEn
5	Flow control(RTS/CTS)	Flo	on	oFF
6	Reset setting (Default setting)	dFLt	dFLt-n	dFLt-Y

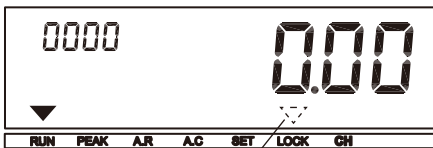
## 6-2. Calling the setting screen

1 Set the memory counter value to "0000" (fixed to "0000" for CD5-AFC).

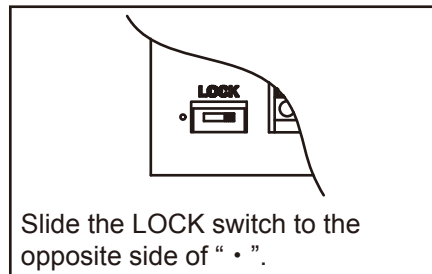


2 Release the setting lock (setting cannot be done unless the lock is released)

When the LOCK switch on the back is turned off, the ▼ on the front LOCK display disappears and the setting is unlocked.



LOCK will be disappeared

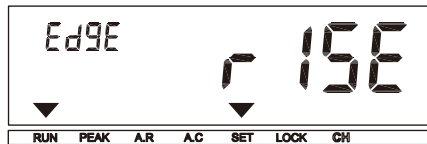


### 3 Calling the setting screen

On the above screen, press and hold the MD key for 2 seconds or longer.

If you press and hold it for 2 seconds or longer, you will hear a buzzer.

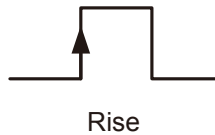
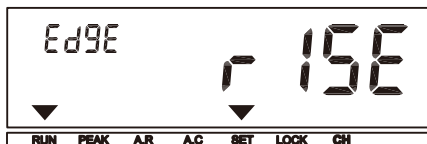
When you release your finger, the external input signal detection (EdgE) setting screen will be flushed.



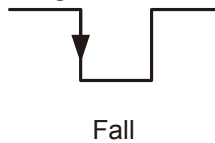
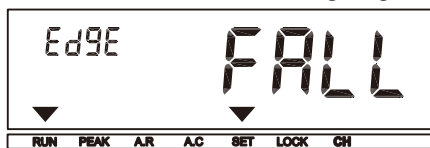
### 4 External input signal detection setting (factory: rISE)

Set the detection method of the input signal of the external terminal (RESET, CLEAR).

rISE: Detected at the rising edge of the input signal



FALL: Detected at the falling edge of the input signal



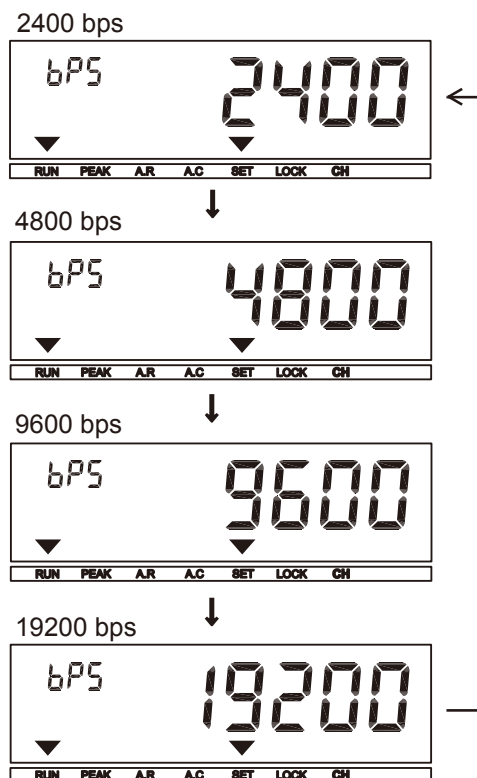
Press the MEM key to display the communication output format setting screen.

- \* Press the MD key to proceed to the next setting without memory, and press the C key to return to the run measurement display.

## 5 Communication baud rate setting (factory: 2400bps)

Sets the baud rate for RS232C communication.

\* When communicating with a PC, match the communication baud rate of the other party.



- 1) Select with the right / down keys
- 2) Check the display and register with the MEM key.

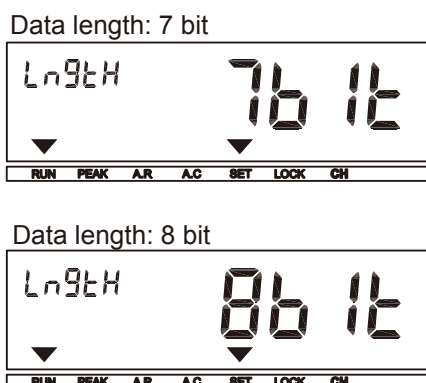
Press the MEM key to display the communication data length setting screen.

\* Press the MD key to proceed to the next setting without memory, and press the C key to return to the run measurement display.

## 6. Communication data length setting (Default: 7bit)

Sets the data length for RS232C communication.

\* When communicating with a PC, match the data length of the other party.



- 1) Select with the right / down keys
- 2) Check the display and register with the MEM key.

Press the MEM key to display the communication parity setting screen.

\* Press the MD key to proceed to the next setting without memory, and press the C key to return to the run measurement display.

## 7. Communication parity setting (Default: nonE: none)

Sets the parity for RS232C communication.



- 1) Select with the right / down keys
- 2) Check the display and register with the MEM key.

Press the MEM key to display the communication flow setting screen.

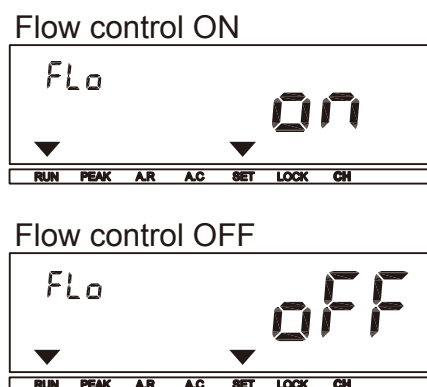
\* Press the MD key to proceed to the next setting without memory, and press the C key to return to the run measurement display.

## 8. Communication flow setting (factory: on)

Set whether to control the RTS / CTS flow for RS232C communication.

(on: with flow control / oFF: without flow control)

\* When sending a command to CD5-AFC from the outside, be sure to turn on the flow control.



- 1) Select with the right / down keys
- 2) Check the display and register with the MEM key.

Press the MEM key to display the memory mode setting screen.

\* Press the MD key to proceed to the next setting without memory, and press the C key to return to the Run measurement display.



## 9. Setting value default

Returns the set value to the factory default state.

The calibration value is not cleared.

Do not initialize the setting value



- 1) Select with the right / down keys
- 2) Check the display and register with the MEM key.

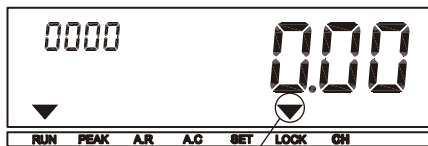
Initialize the setting value



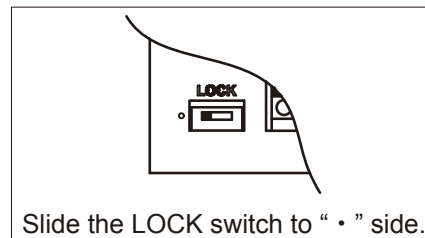
Press the MEM key to display the run mode measurement screen.

\* Press the MD key to proceed to the next setting without memory, and press the C key to return to the run measurement display.

Turn on the setting lock to prevent erroneous operation.



Lights on



## 7 External communication function

Connect the CD5-AFC to an external device with a communication cable (Catalog No.383). Match other communication settings with the external device. (For the setting method, please refer to "9 Various settings and operation methods")

### • Communication settings

Data format: RS232C compliant

Transmission method: Synchronous serial interface

Baud rate: 2400/4800/9600/19200bps

Data length: 7bit / 8bit

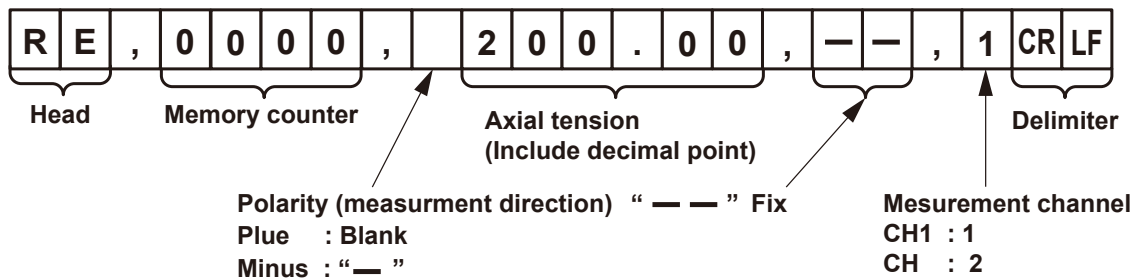
Stop bit: 1 bit

Parity: None / Even / Odd

### • 1 progressive output

Output when you enter a RESET signal or enter the "M3CRLF" command from your PC.

### • PC output format



## • PC input command

It can be operated by inputting the following command from an external device in the measurement state.

M	0	CR	LF	Display data is continuously output approximately every 100ms. (Dripping)
M	1	CR	LF	Outputs one measurement data. Releases the state of dripping. Releases the state of dripping.
M	2	CR	LF	Releases the state of dripping.
M	3	CR	LF	Operates the same as the RESET signal input. If it is connected to a personal computer, etc., the measurement data will be output to an external device. In addition, the state of dripping is released.
M	4	CR	LF	Operates the same as the CLEAR signal input. Performs auto zero.

## • Response command

When it receives an input command, it returns the following response code.

E	0	0	CR	LF	Message received completed
E	1	0	CR	LF	Receive error
E	0	9	CR	LF	When auto zero could not be obtained (Err9)

# 8

# Options

- Connection cable

Catalog No.383 (Applicable model: CD5-AFC → PC)



Error message	Content	Action
Err1-5	Key being kept pushed	Turn the power off and on again without touching any keys. If the error remains, switch error is suspected. Contact your nearest distributor or TOHNICHI for repair.
Err8	CPU/memory error	The repair is necessary. Contact your nearest distributor or TOHNICHI for repair.
Err9	Out of allowable zero range - error on torque sensor/ internal circuit	Check the torque sensor is securely connected. If it is not connected, connect it and press C key. If connected, press C key with no load condition. If the error message remains, the sensor error or internal circuit malfunction is suspected. Contact your nearest distributor or TOHNICHI for repair.

• Other abnormalities

Error Display	Content	Action
" " flashing	Sensor/circuit board error	Check the sensor is securely connected. If it is not connected, connect it and press C key. If connected, press C key with no load condition. When "0" shows on the display, capable of using.
Display unsteadily	Impact of external devices	If the value of axial tension fluctuates greatly, attach a clamp filter to the connection cord with the sensor.
	Calibration with incorrect way	The calibration is unlikely done correctly. 2CH is not calibrated with a purchase of axial tension calibrator.
	Sensor/circuit board error	Check the sensor is securely connected. If it is not connected, connect it and press C key. If connected, press C key with no load condition. When "0" shows on the display, capable of using.
Value of axial tension is not increased	Calibration with incorrect way	The calibration is unlikely done correctly. 2CH is not calibrated with a purchase of axial tension calibrator.
	Sensor/circuit board error	Check the sensor is securely connected. If it is not connected, connect it and press C key. If connected, press C key with no load condition. When "0" shows on the display, capable of using.

# 10 Specifications

## ●Specification table

Analog part	
Voltage	DC5V
Signal input range	-0.5mV/V ~ +2.5mV/V
Analog Filter	150Hz
AD converter	16 bit successive converting style
Sampling Speed	4000 times/sec
Accuracy	
Nonlinearity	±0.05% F.S
Zero point drift	±0.1μV/°C(TYP.)
Gain drift	±0.01%/°C(TYP.)
Display part	
Display	Negative type liquid crystal
Torque dies ply	13mm 6 digit
Counter display	5.2mm 4 digit
▼ display	RUN/PEAK/A.R/A.C/SET/LOCK/CH
Max torque display	25000
Gain calibration	
Calibration methods	Equivalent input calibration
	Actual loading calibration
External connection	
Voltage output	+5V allowable current 200mA
External input	RESET/COMP(Unavailable)/CLEAR/CHSW
External output	HI/OK/LO (Unavailable)
Analog output	Max ±11V (When 0mV/V input: -7V)
Communication	RS232C compliant



Designs and specifications are subject to change without notice.

---

■ **Tohnichi Mfg. Co., Ltd.**

Tel.+81-3-3762-2455 Fax.+81-3-3761-3852  
2-12, Omori-Kita, 2-Chome Ota-ku, Tokyo Japan  
E-mail: [overseas@tohnichi.co.jp](mailto:overseas@tohnichi.co.jp)  
Website: <http://www.global-tohnichi.com>

■ **N.V. Tohnichi Europe S.A.**

TEL.+32 16 60 66 61 FAX.+32 16 60 66 75  
Industrieweg 27 Boortmeerbeek, B-3190 Belgium  
E-mail: [europe@tohnichi.com](mailto:europe@tohnichi.com)

■ **Tohnichi America Corp.**

Tel.+1 847 947 8560  
1303 Barclay Blvd. Buffalo Grove, IL 60089 USA  
E-mail: [inquiry@tohnichi.com](mailto:inquiry@tohnichi.com)  
Website: <http://tohnichi.com>

■ **Tohnichi Shanghai Mfg. Co., Ltd.**

东仁扭矩仪器 ( 上海 ) 有限公司  
Tel.+86 21 3407 4008 Fax.+86 21 3407 4135  
RM.5 No.99 Nong1919, Du Hui Road, Minhang,  
Shanghai, P.R.China  
E-mail: [sales@tohnichi-sh.com](mailto:sales@tohnichi-sh.com)



● All rights reserved. No reproduction or republication without written permission.

● ©Tohnichi Mfg. Co., Ltd. All Rights Reserved.