

IN-LINE BRIX MONITOR

CM-800 α

Cat.No. 3564

Instruction Manual

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1. Precautions for Use

Introduction

Thank you for purchasing the In-line Brix-Monitor.

Before using the instrument, read this instruction manual carefully, and keep it on hand for future reference.



For safe use --- Be sure to observe the following.

To prevent injury and damage to property, safely operate the instrument by observing the precautions outlined in this manual.




The explanation of the indications and symbols of the precautions are as follows.

Read and understand them before continuing on to the following pages.

Explanation of indications

	WARNING	If this indication is neglected and the instrument is handled incorrectly, serious injury or death may result.
	CAUTION	If this indication is neglected and the instrument is handled incorrectly, injury and/or property damage may result.

Explanation of symbols

	This symbol denotes an item of which to be warned or cautioned. The contents of warning are described in detail in or near the Δ .
	This symbol denotes an action that must not be performed (a prohibited item). The contents of prohibition are described in detail in or near the \bigcirc .
	This symbol denotes an action that must be performed. The contents of instruction are described in detail in or near the \bullet .

Handling of this instrument



WARNING

◇ When measuring a substance harmful to the human body, be aware of its properties and wear protective gloves, mask, etc.



◇ Immediately turn off the power (DC24V) if the unit begins to overheat, smoke or emit an abnormal smell.

If the AC adapter AD-32, AD-33 or AD-34 (optional) is used, remove the power cable plug from the AC 100-240V outlet. Fire or malfunction may result if the instrument continues to be used. Contact your ATAGO Distributor for an inspection.



◇ Do not attempt to repair, modify, or disassemble the instrument yourself. Improper servicing may result in fire, electrical shock, or burns.



◇ If the instrument is dropped or is subjected to a strong shock, have it inspected by an Authorized ATAGO Service Center.

Fire or malfunction may result if the instrument is used.



CAUTION

◇ Do not apply water or sample to any part of the instrument other than the surface of the prism. Applying water to any other part of the instrument may result in a malfunction.



◇ Do not measure very hot or highly acidic samples.

This may damage the prism, which would result in inaccurate measurements.



Handling of this instrument (Continued)

CAUTION

- ◇ DO NOT measure any sample that can damage the prism or the sample inlet unit.
- ◇ Cleaning liquids up to 160°C can be used for CIP or SIP. The momentary difference between the sample liquid temperature and the cleaning liquid temperature must be no more than 80°C.
When using cleaning liquids at temperatures over 160°C, the power source (DC24V) must be turned off. If the AD-32 (AD-33 or AD-34) is used, unplug from the outlet before cleaning.



- ◇ If the sample could possibly stain the prism, immediately clean the prism according to the procedure described on page 36 "17.Cleaning the Prism".



- ◇ The In-line Monitor power (DC24V) should be turned off when it is not to be used for a long period of time. If the AD adapter AD-32, AD-33 or AD-34 (optional) is used, disconnect the power cable plug from the AC 100-240V outlet.



- ◇ When transporting the instrument, pack it in the original box.
- ◇ When transporting by aircraft, disconnect the power (DC24V) cable or the DC output cable of the AC adapter AD-32, AD-33 or AD-34 (optional) from the power input terminal of the In-line Monitor.



- ◇ Carefully read this instruction manual and fully understand the function and operation of each part of the instrument before use.
- ◇ Check that each part of the instrument operates normally before use.
- ◇ Perform the necessary inspections and reference adjustments according to the instruction manual.
- ◇ The manufacturer shall not be held responsible for any damage that results from using the instrument for other than its intended purposes (measurement of Brix(%), sugar content, liquid concentration).
- ◇ The manufacturer shall not be held responsible if the use of the instrument has an undesired effect on the measured materials.
- ◇ The prism in contact with the sample is a consumable item.

Handling of plug



WARNING

- | | |
|---|---|
| <ul style="list-style-type: none">◇ Supply the In-line Monitor with DC24V only (allowable fluctuation is $\pm 10\%$). Short-circuit, smoke, or fire may occur if other voltages are used.◇ The AC adapter AD-32 (AD-33 or AD-34) plug must be inserted into an AC 100-240V outlet. Other outlets may result in a short circuit, smoke, or fire. | <ul style="list-style-type: none">◇ Do not use a power cable and plug that is damaged, cut, broken, or altered. Use may result in fire, electrical shock, or burn. For repair service of the power cable and plug, contact an Authorized ATAGO Service Center.◇ Do not cut a plug to extend the power cable of the AD-32 (AD-33 or AD-34). |
|---|---|



CAUTION

- | | |
|--|---|
| <ul style="list-style-type: none">◇ Do not insert or pull out the connector and plug with wet hands. | <ul style="list-style-type: none">◇ When disconnecting the power cable of the AC adapter AD-32, AD-33 or AD-34 (optional) from the AC 100-240V outlet, remove by pulling on the plug only. Pulling the cable may damage it, and could result in fire or electrical shock. |
|--|---|



- ◇ Connect the grounding pin when connecting the plug of the power cable of the AC adapter AD-32, AD-33 or AD-34 (optional) to the AC 100-240V outlet.



Connection of optional component (printer, etc.)



WARNING

- ◇ Turn off the power (DC24V) prior to connecting cables to the individual units. If the AC adapter AD-32, AD-33 or AD-34 (optional) is used, pull out the power cable plug from the AC100-240V outlet before connecting.
Connecting the cables while the power is on may result in electrical shock.



Conditions to be observed when using

Environmental conditions

- ◇ Use the instrument at an altitude below 2,000m (above sea level).
- ◇ Use the instrument indoors.
- ◇ Use the instrument where the temperature is between 5 to 40°C.
- ◇ Do not leave the instrument in a location exposed to direct sunlight or near a heating unit where the temperature may rise.
- ◇ Do not change the environmental temperature of the instrument suddenly.
- ◇ Do not place the instrument in a place where it may be subject to strong vibrations.
- ◇ Do not use the instrument where there is much dust.
- ◇ Do not leave the instrument where the temperature is extremely low.
- ◇ Do not leave the instrument in a damp place.
- ◇ Do not place or drop heavy objects on the instrument.
- ◇ Use this instrument under the condition where humidity is 80% at 31°C or lower, falling linearly to 50% at 40°C.
- ◇ Main supply voltage fluctuation should not to exceed $\pm 10\%$ the nominal voltage.
- ◇ Installation categories (Overvoltage Categories): II
- ◇ The pollution degree is 2 (according to IEC60664).

Handling

- ◇ Do not drop the instrument or subject it to any strong shock.
- ◇ The power cable may be damaged by:
 - Bending the cable.
 - Pulling the cable.
 - Twisting the cable.
 - Placing the cable under heavy objects.
 - Catching the cable between objects.

Daily maintenance

- ◇ If the instrument becomes dirty, wipe it with a soft cloth.
- ◇ Do not use benzine, paint thinner, etc. to clean the instrument.

2. Refractive Index and Brix(%)

The In-line Brix-Monitor is a refractometer that detects the Refractive Index of a sample and outputs the Brix(%) value on the display.

The instrument can also transmit measured data to external devices via 4 to 20mA or RS-232C.

(1) What is refractometer?

When a straw is placed into a glass filled with water, the straw appears to bend. When a straw is placed into a glass filled with sugar water, the straw appears to bend much more sharply than in the case of water alone. This phenomenon is known as the refraction of light. The refractometer is an instrument that measures the Refractive Index by utilizing this principle (the Refractive Index increases in proportion to the concentration of the solution), and was developed by Dr. Ernst Abbe at the end of the 19th century.

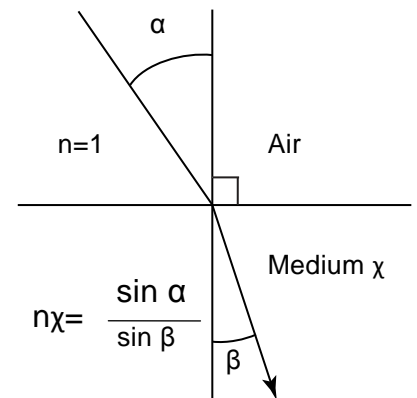
(2) What is the Refractive Index?

If the Refractive Index of air under atmospheric pressure is 1, then when light enters medium χ , the ratio of the sine of the incident angle measured against the phase boundary to the sine of the refracting angle β is called the Refractive Index of the medium χ .

The Refractive Index varies with the wavelength of light and temperature and is represented as follows:

$$n_D^t$$

n	: Represents the Refractive Index
t	: Temperature (°C)
D	: D-line of natrium (589nm)



For example, Refractive Index of water at 20°C under the D-line is:

$$n_D^{20} = 1.33299 \text{ (Generally expressed as } n_D = 1.33299.)$$


Note The Refractive Index is based upon the supposition that the Refractive Index in a vacuum is 1 and is called the absolute Refractive Index. Generally, however, this index is seldom used.

(3) Brix(%) scale

The instrument is programmed with the Brix(%) scale, based on the Refractive Index of water ($n_D = 1.33299$) as the reference (0%). The Brix(%) scale represents the weight of sucrose expressed by percentage (sucrose weight in grams contained in 100 grams of sucrose solution).

Therefore, this scale corresponds with the sucrose concentration. However, most samples are comprised of ingredients other than sugar. The total concentration of these ingredients is represented by the Brix(%), so this makes the Brix(%) scale a practical tool for measuring concentrations.

Note The Brix(%) scale is recommended by ICUMSA (International Committee of Uniform Method of Sugar Analysis) and is expressed in % mas (Sucrose) in international units (SI unit).

 The relationship between Brix(%) and the Refractive Index (nD) is outlined on page 40.

(4) Temperature correction

The Refractive Index of a substance varies with temperature. Thus, when using a refractometer to measure the Refractive Index of a liquid, the measurement value will vary with the sample temperature.

The instrument always detects the prism temperature. The value of the measurement is automatically corrected for temperature by a built-in processor, so that the displayed value is equal to the value measured at 20°C (provided that the sample temperature is within the range of 5 to 100°C).

3. Unpacking and Installation

(1) Configuration

The instrument is comprised of the items listed below.

① Main unit and standard accessories.
② through ⑥ are optional items and are included with the main unit if ordered. Additional items can be ordered at any time. For details, please contact an Authorized ATAGO Distributor.

① In-line Brix-Monitor CM-800α (Cat.No.3564)

- Main unit
- Power (DC24V) cable: approx. 1m
- O-ring (Silicon) 1
- O-ring (EPDM) 1
- Instruction manual (this book)
- Inspection certificate

② AC adapter AD-32 (Cat.No. 3527), AD-33 (Cat.No. 3528) or AD-34 (Cat.No. 3529)

The AD-32 is an adapter that converts AC 100V to DC24V for supplying power to the main unit.

The AD-33 is an adapter that converts AC 110V to DC24V for supplying power to the main unit.

The AD-34 is an adapter that converts AC 220-240V to DC24V for supplying power to the main unit.

③ Sample inlet unit

IDF/ISO clamp union (ferrule), IDF/ISO screw union (screw), JIS Flange, small diameter series compression fitting and hose connector are available. Refer to page 38 "19.Consumable Parts and Optional Items".

④ Recorder output cable

- 5m (Part No. RE-65374)
- 10m (Part No. RE-65375)
- 15m (Part No. RE-65376)
- 20m (Part No. RE-65377)
- Optional length (Part No. RE-65378)

⑤ RS-232C cable

- 15m
D-sub 9pin (Part No. RE-65330) D-sub 25pin (Part No. RE-5677)
- 1 to 15m
D-sub 9pin (Part No. RE-65331) D-sub 25pin (Part No. RE-5647)

⑥ Stand (Part No. RE-8607) for mounting the main unit and the AD-32 (AD-33 or AD-34)

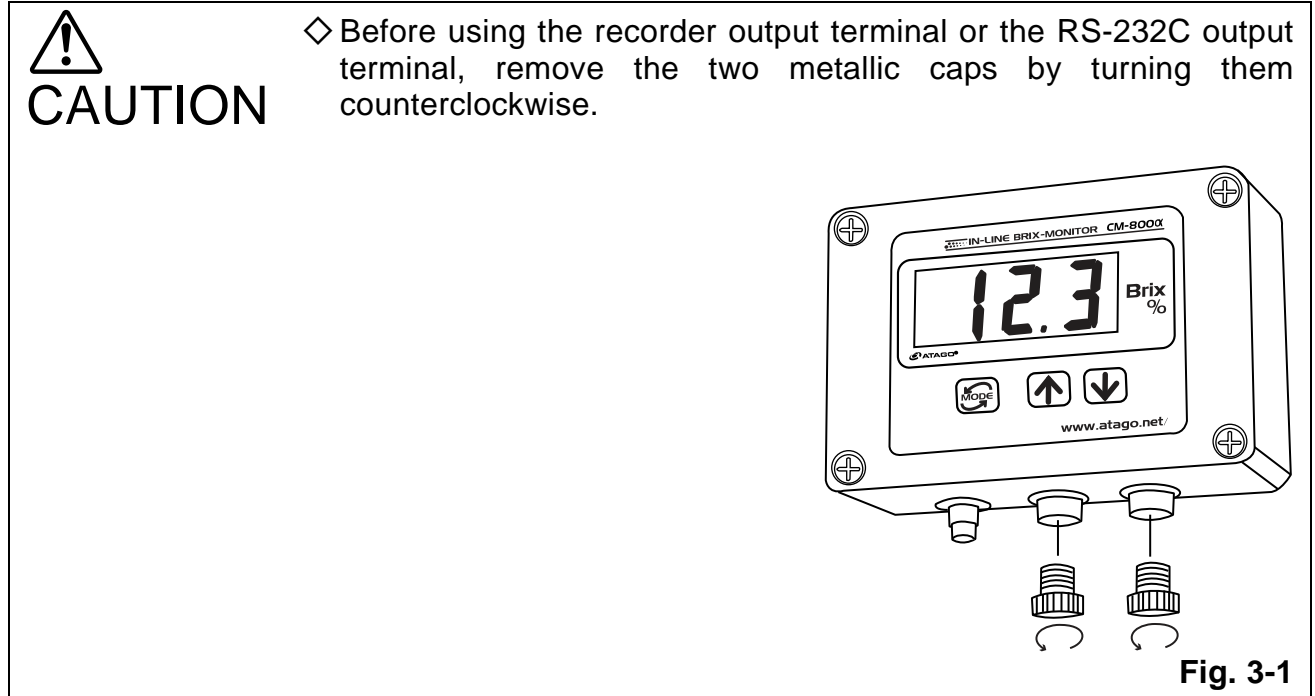
- Stand
- Hexagonal-head bolts (M6×10) 8
- Spring washers 8
- Washers 8

(2) Unpacking

① Unpack the main unit and confirm that there is no external damage.

② Confirm that all parts of the main unit, accessories, and any optional units as described in section "(1)Configuration" (👉 page 9) are included.


(3) Installation



- ① Connect the main unit to an AC100-240V main outlet (voltage fluctuations not to exceed 10%), 50/60Hz with the power cable.
- ② The main unit should be supplied with DC24V (allowable fluctuation is $\pm 10\%$). The AC adapter AD-32, AD-33 or AD-34 (optional) should be connected to a power supply of AC 100-240V, 50/60 Hz.
- ③ The instrument should be installed in a location with an ambient temperature of 5 to 40°C.
- ④ Because the instrument incorporates highly precise components, DO NOT install in locations exposed to direct sunlight or near a heating source, or in an environment that is dusty or exposed to corrosive gasses.
- ⑤ The instrument should be installed in a location that is free from vibration. When installing, take special care to avoid any strong shock to the instrument.
- ⑥ Do not touch the prism surface with your hand. Finger-prints left on the prism surface may cause sample to build up on the prism.
In the event of contact with the prism surface, clean carefully with a soft tissue soaked with ethyl alcohol.
In order to prevent scratches, never clean the prism surface using abrasive materials.

4. Names and Functions of Components

(1) Main unit of the In-line Monitor

- ① Prism
Sample material contacts the prism surface to allow for the measurement of its Brix(%).
- ② Prism stage
Connected to the sample inlet and fastened by a clamp band.
- ③ Radiator
Disperses heat when measuring high temperature samples to prevent the electric circuit from overheating.
- ④ Mounting screw locations
Used to mount the main unit to the stand.
- ⑤ Operation display
Comprised of the operation keys and display
 "(2)Operation Display" page 12.
- ⑥ Power (DC24V) input terminal
Terminal to connect the power cable (for DC24V input) or the DC output cable of the AC adapter AD-32, AD-33 or AD-34 (optional).
- ⑦ RS-232C output terminal
Terminal to connect to a computer.
- ⑧ Recorder output terminal
Terminal to connect to a recorder.

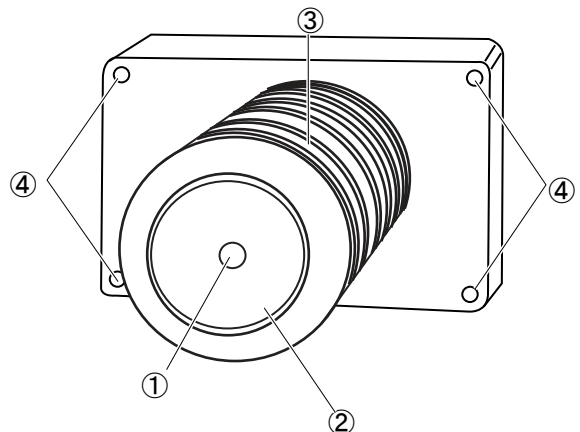


Fig. 4-1

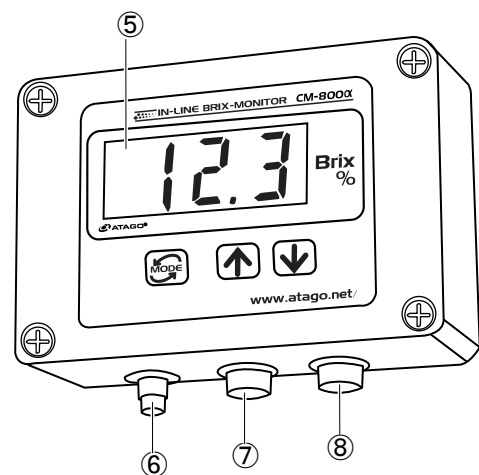







Fig. 4-2

(2) Operation Display

① Measurement value display
Digitally displays the measurement value [Brix(%)], setting mode, and other setting values.

②  key
Switches or sets the display mode of the measurement value and the setting mode.

Setting mode number	Setting description
[t]	Temperature scale
[0]	Measurement Interval and Mode-S Level
[1]	Adjustment to the reference
[2]	Temperature correction factor
[3]	Recorder output, lower limit value
[4]	Recorder output, upper limit value
[5]	Changing the Number of Decimal Places Displayed

③ Up  and down  keys
Increase or decrease the value in each setting mode.
The down  key also switches the display of each setting mode.
The temperature is displayed when press the down  key while measuring a sample.

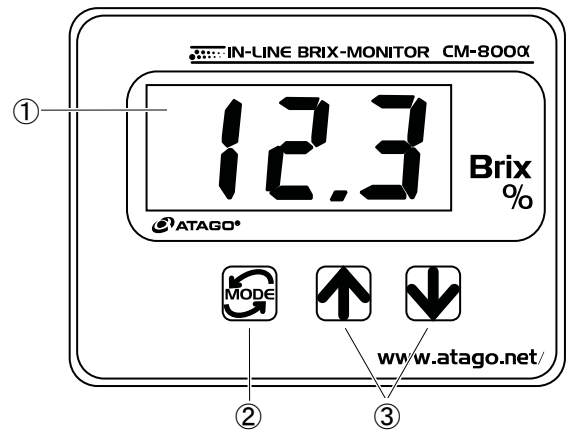


Fig. 4-3

(3) AC Adapter AD-32, AD-33 or AD-34 (Optional)

- ① Power cable
Connects to the AC 100-240V outlet.
- ② DC output cable
Connects to the output DC24V.
- ③ Pilot lamp
Functions when AC 100-240V is being input and DC24V is being output.
- ④ Mounting screw holes
These holes are used to mount the AD-32, AD-33 or AD-34 to the stand.

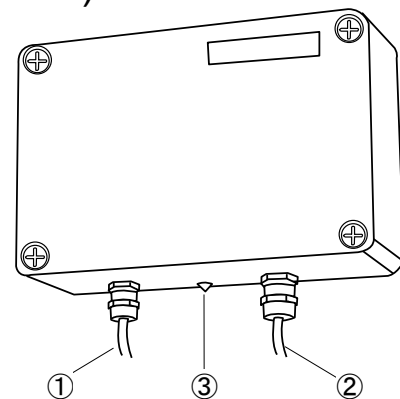


Fig. 4-4

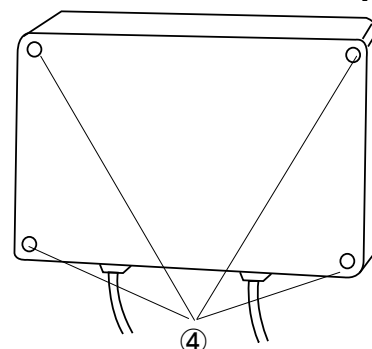


Fig. 4-5

5. Mounting the main unit and AC adapter AD-32 (AD-33 or AD-34) (Optional)



WARNING

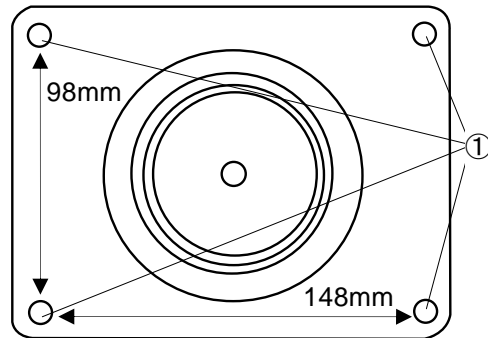
- ◇ Turn off the power (DC24V) before mounting. If AD-32 (AD-33 or AD-34) is used, disconnect the power cable's plug from the AC 100-240V outlet before beginning. Electrical shock may occur if the unit is mounted with the power connected.

① Mounting screws (Fig. 5-1, Fig. 5-2)

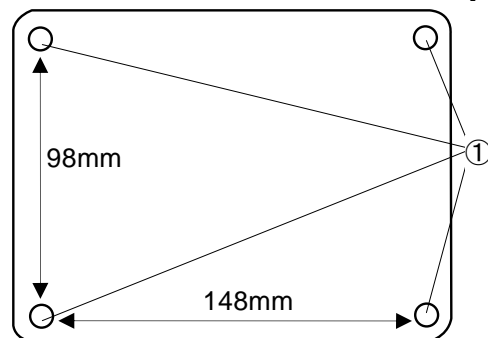
The main unit and the AD-32 (AD-33 or AD-34) each have four mounting screw locations.

Use the screws supplied with the stand to mount the main unit and AD-32 (AD-33 or AD-34) on the stand or panel plate.

The depth of the screw locations is 10mm, M6.



Main unit
Fig. 5-1



AD-32, AD-33 or AD-34
Fig. 5-2

Example of screw configuration (Fig. 5-3)

- ① Main unit or AD-32 (AD-33 or AD-34)
- ② Washer (M6)
- ③ Spring washer (M6)
- ④ Hexagonal-head bolt M6×10

Note Hexagonal-head bolts, spring washers and washers are included as standard accessories with the stand (optional).

memo Length of the hexagonal-head bolt = (Screw hole depth, 10mm) + (Panel plate length)

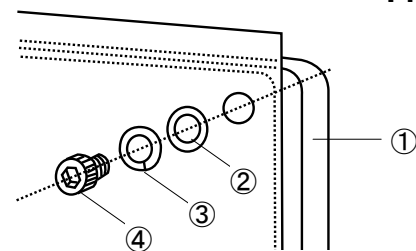


Fig. 5-3

Mounting on a stand (optional) (Fig. 5-4)



For information on ordering a stand, see page 38.

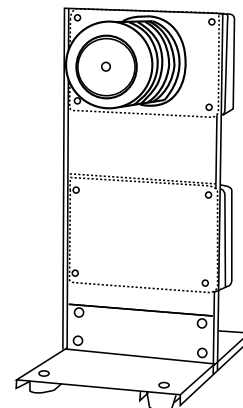


Fig. 5-4

6. Mounting the Sample Inlet Unit



WARNING

- ◇ Turn off the power (DC24V) before mounting. If AD-32 (AD-33 or AD-34) is used, disconnect the power cable's plug from the AC 100-240V outlet before beginning. Electrical shock may occur if the unit is mounted with the power connected.



CAUTION

- ◇ Ensure that the prism is clean and free of any damage and/or scratches. Completely remove any sample before installing the main unit to piping or equipment.

(1) Installation of the main unit with the sample inlet unit (optional):

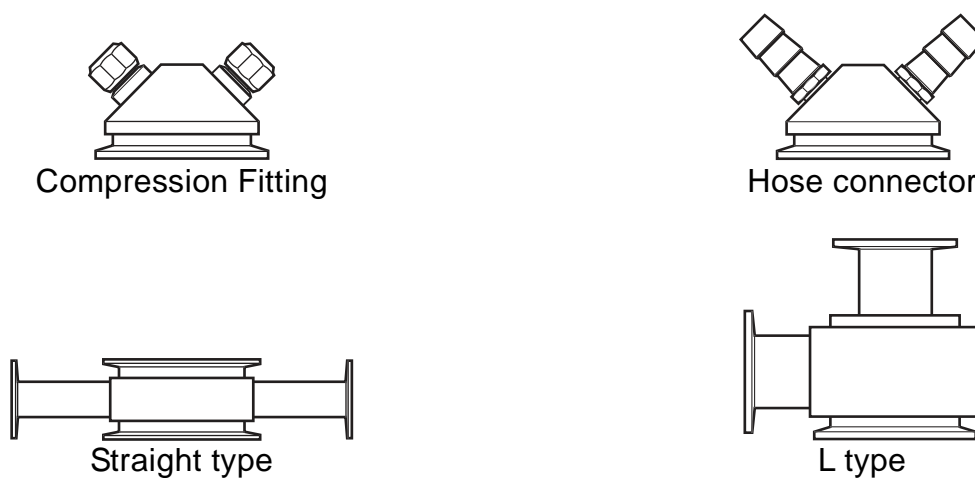






Fig. 6-1

Mounting procedure

- ① Install the main unit so that the prism surface is at a right angle to the ground.
- ② Attach the sample inlet unit to the main unit with O-ring (accessory) inserted between them, and fasten them together with the clamp band (accessory).
- ③ Install the inlet unit so that the sample solution runs from the lower nozzle to the upper nozzle to prevent air bubbles from forming.
- ④ When connecting the tubes to the hose connector, clamp them with a tie band.
 "Use of tie bands" page 16
- ⑤ The prism surface may become contaminated with solids, dirt and/or grease. If this happens, the prism surface must be cleaned by hand.
 "17.Cleaning the Prism" page 36
 The sample inlet unit should be installed in such a manner that it can be easily removed to allow access to the prism for cleaning.

- memo** Suspending the main unit (2.4kg) when using the sample inlet unit to connect to the piping is dangerous. Use of the optional stand is recommended.
-  "5.Mounting the main unit and AC adapter AD-32 (AD-33 or AD-34) (Optional)" page 13
-  "19.Consumable Parts and Optional Items" page 38

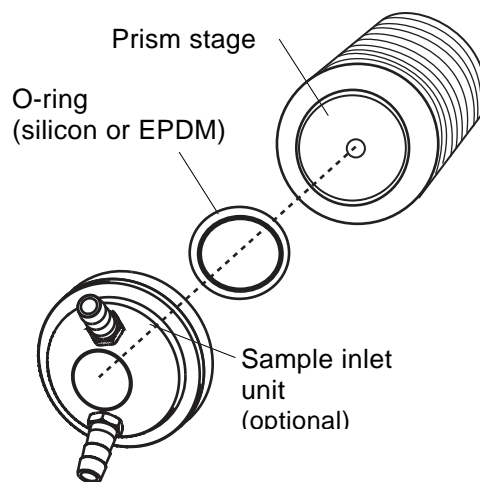


Fig. 6-2

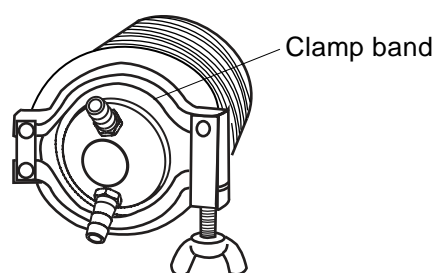


Fig. 6-3

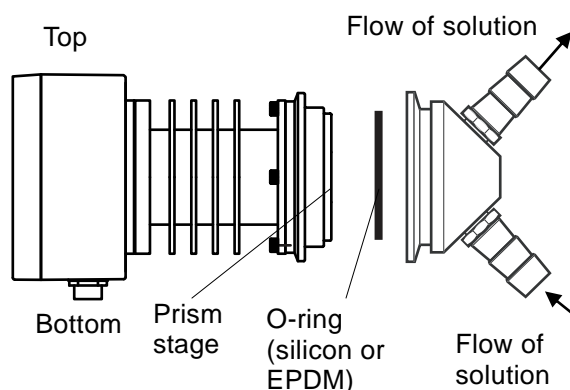


Fig. 6-4

● Use of tie bands

(Hose connector (Part No. RE-67501) only)

The hose connector (Part No. RE-67501) comes with tie bands as shown in Fig. 6-5.

- ① Insert an end of tube onto the nozzle so that the tube is tightly put on the nozzle.
- ② To fasten the tube with the tie band, insert the tip of the tie band into the slot (Fig. 6-6).
- ③ While holding the tie band by the part A, pull the tip (B) of the tie band to tighten it (Fig. 6-7).
- ④ After tightening the tie band, cut the tie band by the part C for cutting off the extra (Fig. 6-8).

Note The tie band that were tightened once cannot be reused.

For removing the tie band from the tube, cut it.

For fastening the tube with a tie band again, use a new tie band.

Note The tie bands are made of plastic. If measuring chemicals that are corrosive to plastic, use tie bands made of an alternative material.

memo Tie bands can be ordered through your ATAGO Distributor.


 "19.Consumable Parts and Optional Items" page 38



Fig. 6-5

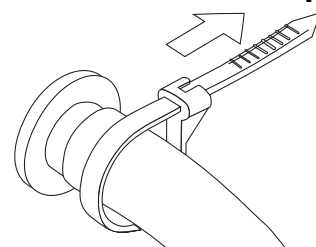


Fig. 6-6

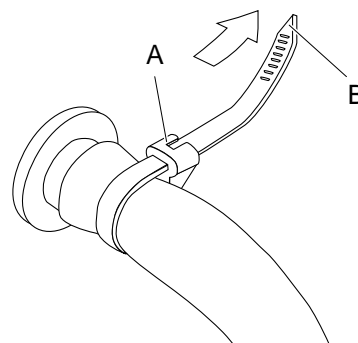


Fig. 6-7

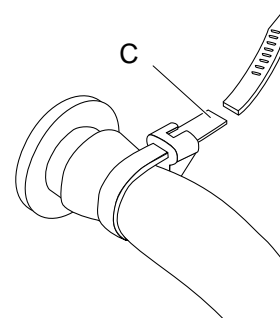



Fig. 6-8

(2) Installation of the main unit without the sample inlet unit (optional):

Please note the following when installing the main unit to piping or equipment without using a sample inlet unit (optional):

- The size of the prism stage of the main unit is a 3S ferrule.
The ferrule connection is recommended for installation.
- Install the main unit so that the prism surface is at a right angle to the ground.
- Connect the unit to the piping so that the sample flow directly contacts the prism surface.
The direct flow of samples (and self cleaning solutions) in contact with the prism will keep substances from adhering to the prism surface.
- When installation to a solution tank is preferred, allow the sample flow to directly contact the prism surface.
- The sample solution must remain in the temperature range of 5 to 100°C.
- During operation, build up of solids, dirt and/or grease may form on the prism surface. When this occurs, the prism surface must be manually cleaned ( "17.Cleaning the Prism" page 36).

For ease of cleaning, the main unit should be installed in such a manner so that the unit can be easily removed from the piping or solution tank.

7. Connecting the Power Cable or AC Adapter AD-32 (AD-33 or AD-34) (Optional)



WARNING

- ◇ Turn off the power (DC24V) when connecting or disconnecting the power cable (for DC24V) or the DC output cable of the AD-32 (AD-33 or AD-34) to or from the terminal. When AD-32 (AD-33 or AD-34) is used, remove the power cable plug from the AC 100-240V outlet.



CAUTION

- ◇ Disconnect the power cable or the DC output cable of the AD-32 (AD-33 or AD-34) from the power input terminal of the main unit when transporting the main unit by aircraft.

(1) When the main unit is used alone

- ① Connect the power (DC24V) input cable connector (provided) to the power (DC24V) input terminal located at the bottom of the main unit.

Connect the opening of the input terminal with the connector pin and insert the connector. Then fasten the connector by turning the connector ring clockwise. To disconnect the power cable, fully turn the connector ring counterclockwise and remove the connector.

- ② Connect the power (DC24V) input cable terminal to the power supply of DC24V as illustrated in Fig. 7-1.

Note At this stage, keep the DC24V power off.

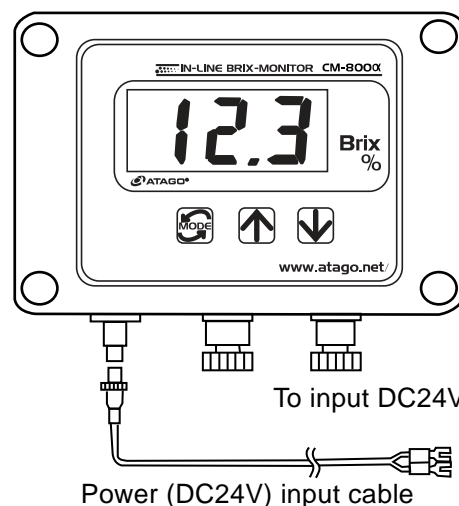


Fig. 7-1

Power (DC24V) input cable and code information table.

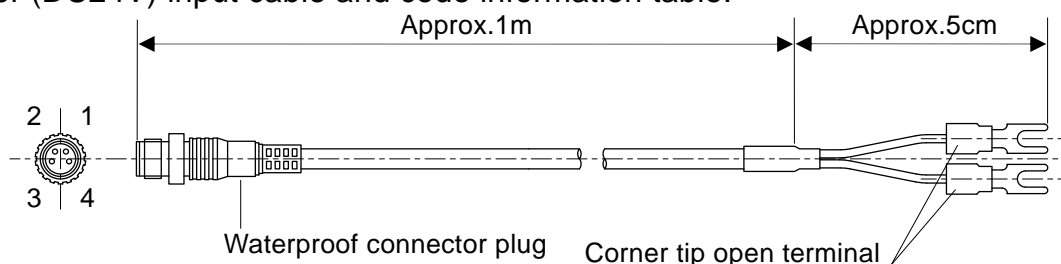


Fig. 7-2

Pin No.	Code color	
3	Brown	+24V
4	Blue	GND

(2) When the AC adapter AD-32, AD-33 or AD-34 (Optional) is used

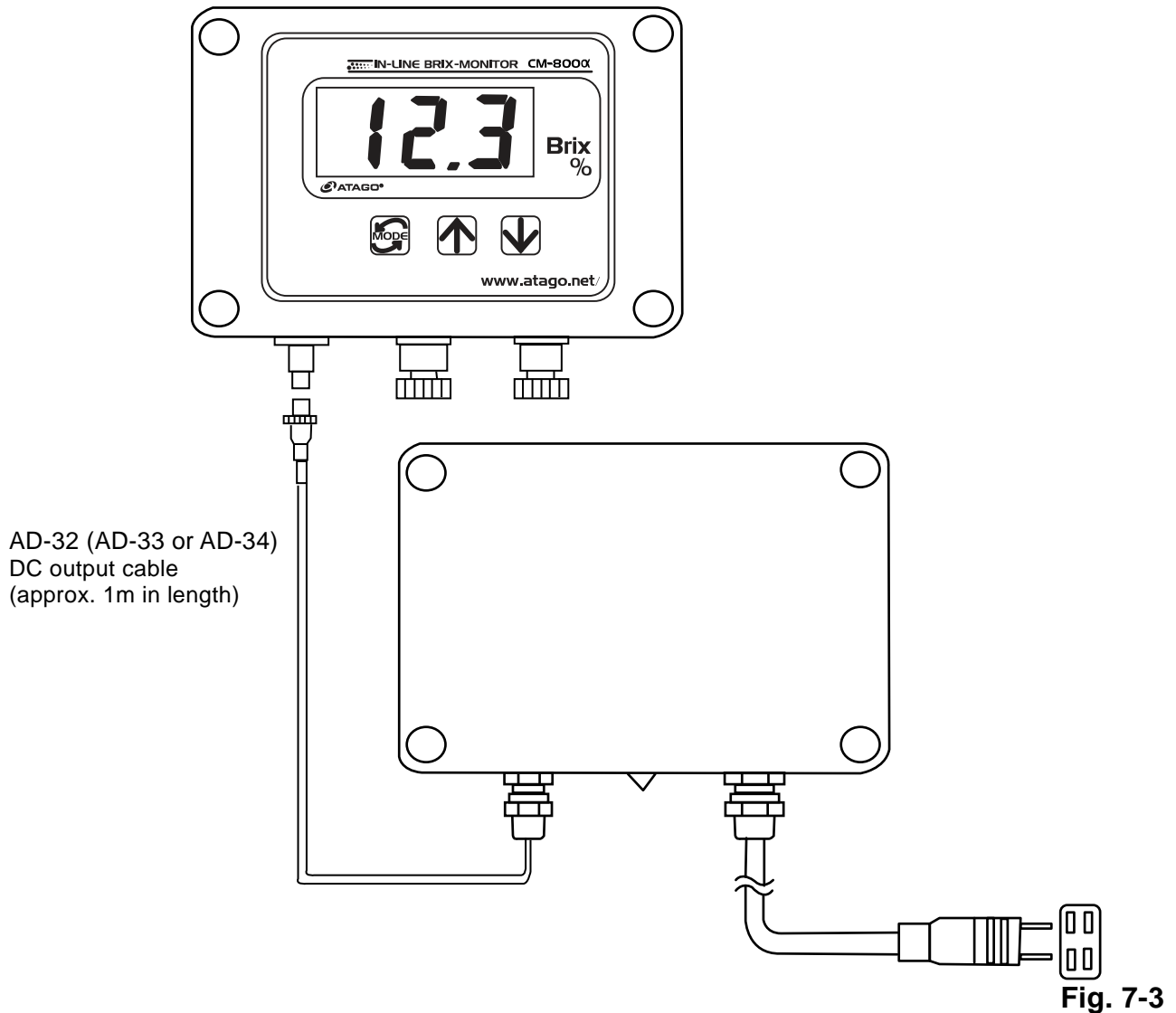
Attach the connector of the DC output cable of the AD-32 (AD-33 or AD-34) to the power (DC24V) input terminal at the bottom of the main unit.

Connect the opening of the input terminal with the connector pin and insert the connector. Then turn the connector ring clockwise to fasten the connector.

To disconnect the DC output cable, fully turn the connector ring counterclockwise and remove the connector.

Note At this stage, keep the plug disconnected from the AC 100-240V outlet.

Note When AD-32 (AD-33 or AD-34) is used, the power (DC24V) input cable provided with the main unit is not used.



8. External Output



WARNING

◇ When connecting or disconnecting the Recorder Output Cable or RS-232C Cable to the main unit, be sure to turn off the power (DC24V). If AD-32 (AD-33 or AD-34) is used, be sure to remove the plug from the outlet before connecting these cables.

The instrument comes equipped with external outputs for a 4 to 20mA recorder and a RS-232C.

(1) Recorder output

The Recorder Output provides a 4 to 20mA signal (open-circuit voltage is approx. 24V) of the Brix(%) and temperature (-15.5 to 160.5 °C).

The Brix(%) range to be output through the 4 to 20mA signal is set as described in Chapter 16 "Setting the Recorder Output." (See page 34.)

To utilize the 4 to 20mA signal, connect the Recorder Output Cable (optional) to the Recorder Output terminal on the main unit.

Recorder output cable and code table

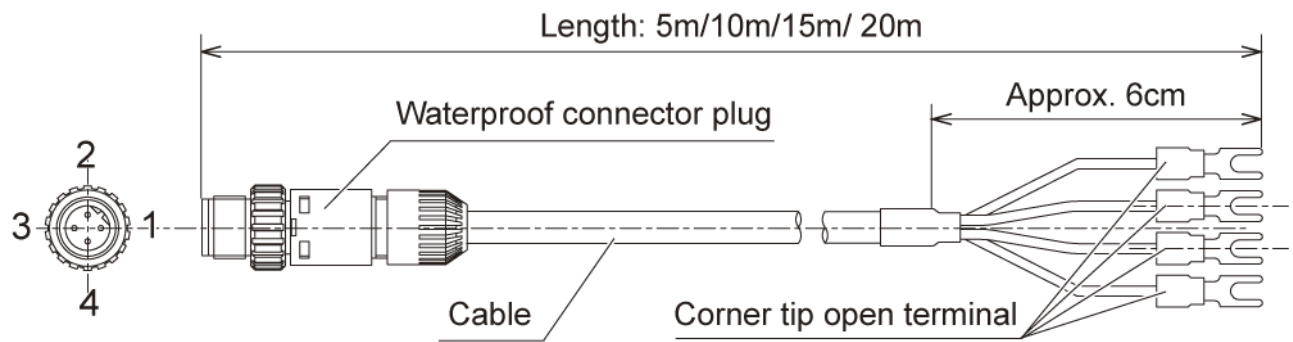


Fig. 8-1

Pin No.	Code color	Polarity
1	Red	Brix +
2	Red/White	Brix -
3	Black	Temperature +
4	Black/White	Temperature -

(2) RS-232C output

The instrument features a RS-232C output for computers. The RS-232C cable is an optional accessory.

When using the RS-232C cable, the main unit and the PC should be separated by no more than 15 meters.

① RS-232C output cable and code tables

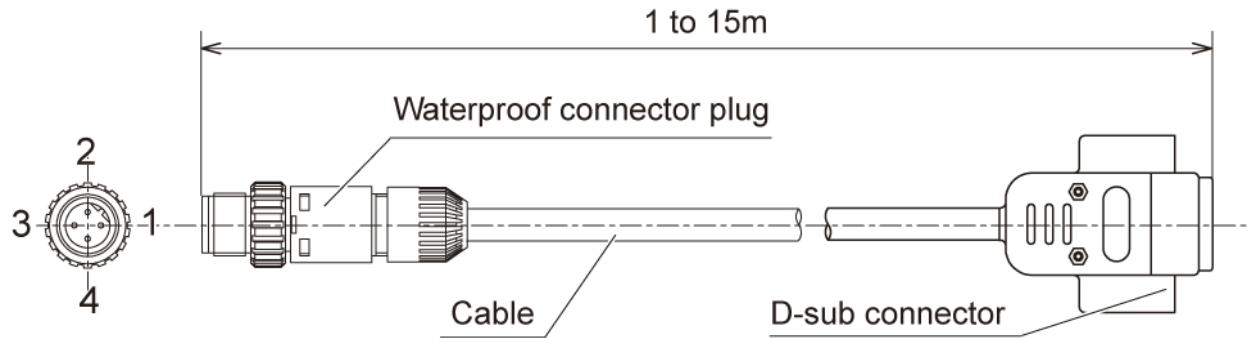


Fig. 8-2

Pin No.	Code color
1	Black
2	Black/White
3	Red
4	Shield

Pin No.	Code color	Signal name
2	Black	TXD
3	Black/White	RXD
5	Red	S.GND
7	Fold	
8		

② Preparing a PC for Data Transmission

Download a terminal emulator for PC serial communication.
Here, the open-source software "Tera Term" is used as an example.

Download Tera Term from a website, such as the one below:
<http://ttssh2.sourceforge.jp/index.html/en/>

(1) Start Tera Term.

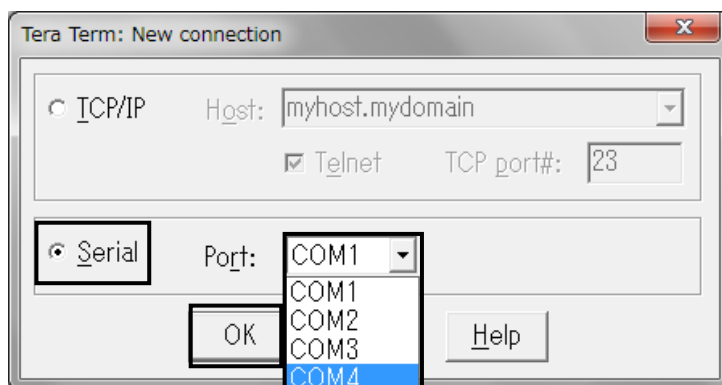
Select "serial" on the New connection dialogbox.

Select the port number.

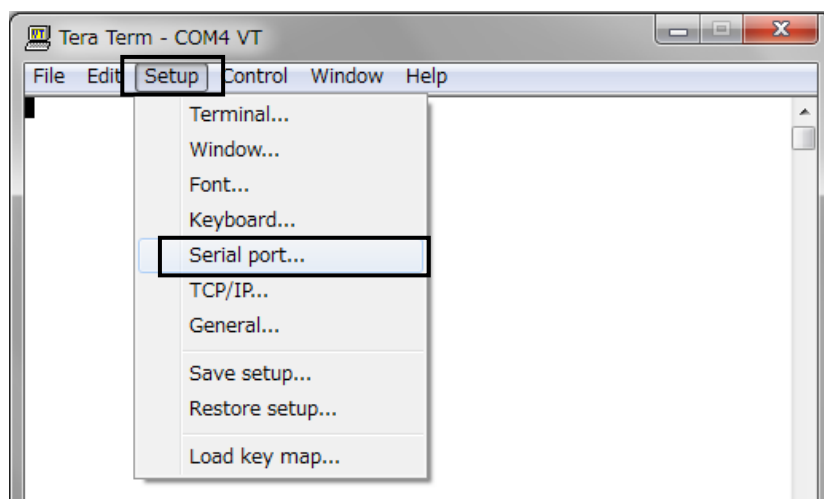
Click OK.

※ Check the port number.

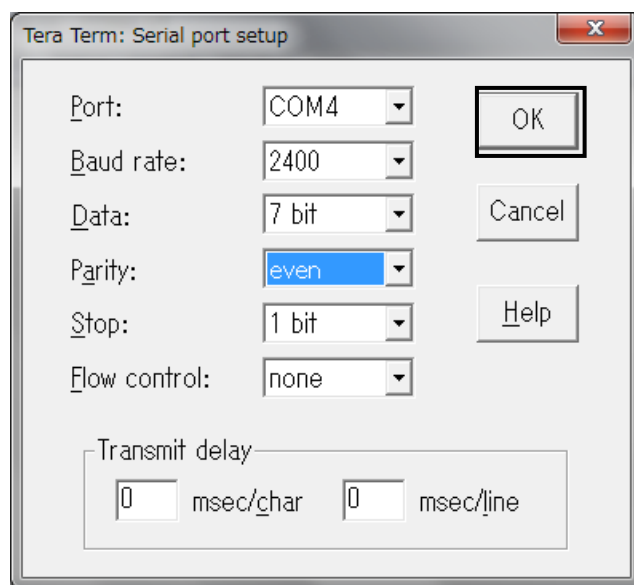
"Control Panel" → "System and Security" → "Device Manager" → "Port"



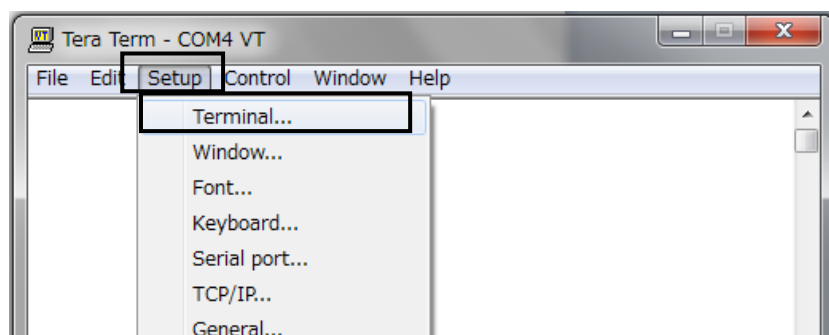
(2) Click Setup, and then Serial port.



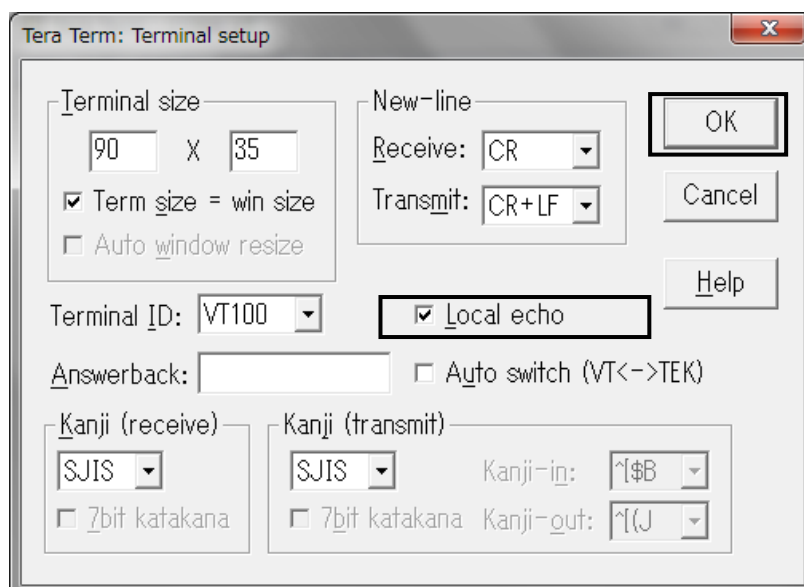
- (3) The serial settings are conformed to the instrument settings.
 Enter the port number selected in step (1).
 Click OK.



- (4) Click Setup, and then Terminal port.



- (5) Enter the settings as shown below and Click OK.
 ※ Make sure that the "Local echo" is checked.



③ Transmit data

Every time a measurement is taken, a new row of data appears in the Tera Term window.

Fixed range (No zero suppression) : 00.00,△△△.△,☆☆☆☆☆☆ CR / LF

00.00 : Brix(%)

The Brix(%) output range is "-2.00 to 80.50".

Example

Output Data	Brix(%)
06.30	6.30
25.00	25.0
LL.LL	-2.01 or less
HH.HH	80.51 or higher
EE.EE	Error

△△△.△ : Temperature

The temperature output range is "-15.5 to 160.5" in the case of °C, and is "004.1 to 320.9" in the case of °F.

Example

°C		°F	
Output Data	Temperature	Output Data	Temperature
LLL.L	-15.6°C or less	LLL.L	4°F or less
023.5	23.5°C	050.0	50°F
120.0	120.0°C	250.0	250°F
HHH.H	160.6°C or higher	HHH.H	321°F or higher

☆☆☆☆☆☆ : Refractive Index

Output Data	Refractive Index
L.LLLLL	Equivalent to Brix -2.01 or less
H.HHHHH	Equivalent to Brix 80.51 or higher
E.EEEEE	Error

9. Power Supply



WARNING

- ◇ NEVER connect the main unit to power other than DC24V (allowable fluctuation is $\pm 10\%$).
- ◇ NEVER insert the plug of the AD-32 (AD-33 or AD-34) AC Adapter to an outlet other than AC 100-240V.
- ◇ NEVER use a power cable that is damaged, cut, broken, or altered. Fire, electrical shock or burns may occur.
To purchase replacement power cables, contact an Authorized ATAGO Distributor.



CAUTION

- ◇ NEVER plug the AD-32 (AD-33 or AD-34) AC Adapter in with wet hands.
- ◇ When disconnecting the power cable from an AC 100-240V outlet, be sure to remove by pulling the plug.
Pulling by the cable may damage the cable and cause fire or electrical shock.
- ◇ When connecting the AC Adapter AD-32 (AD-33 or AD-34) to an outlet, be sure to connect the ground pin as well.

Note The main unit has no power switch. When power is supplied to the main unit, the measurement value display illuminates and the Brix(%) measurement commences.

(1) When the main unit is used alone

- ① Confirm that the power (DC24V) input cable is properly connected to the main unit and the DC24V power supply.
- ② When the DC24V power is supplied, the main unit turns on and the measurement value display will illuminate.

(2) When the AC adapter AD-32, AD-33 or AD-34 (optional) is used

- ① Confirm that the main unit and the AD-32 (AD-33 or AD-34) are properly connected.
- ② When the AD-32 (AD-33 or AD-34) power cable is plugged into an outlet, the main unit turns on and the measurement value display will illuminate.
When the AD-32 (AD-33 or AD-34) is connected to an outlet and the DC24V is output, a lamp will illuminate on the bottom of the AC Adapter.

10. Measuring Brix(%)



WARNING

- ◇ If the unit begins to overheat, smoke, or emit an abnormal smell, immediately turn off the power and unplug the unit from the power supply.
If this happens, please discontinue use of the instrument and contact an Authorized ATAGO Distributor to assist with inspection and/or repair. Continued use may cause fire or a malfunction of the unit.
- ◇ NEVER repair, modify, or disassemble the instrument. Fire, electrical shock or burns may occur.
- ◇ If the instrument is dropped or receives a severe impact, DO NOT use it and ask an Authorized Service Center to inspect it. Continued use may cause smoke or fire.



CAUTION

- ◇ DO NOT measure any sample that can damage the prism or the sample inlet unit.
- ◇ Cleaning liquids up to 160°C can be used for CIP or SIP. The momentary difference between the sample liquid temperature and the cleaning liquid temperature must be no more than 80°C. When using cleaning liquids at temperatures over 160°C, the power source (DC24V) must be turned off. If the AD-32 (AD-33 or AD-34) is used, unplug from the outlet before cleaning.
- ◇ If the sample solution could potentially stain the prism, immediately clean the prism after measurement (following the instructions on page 36 of this instruction manual).

① When power is supplied to the main unit, the Brix(%) measurement starts.

Note The main unit has no power switch.

② The Brix(%) value will be displayed when sample flows onto the prism surface.


③ If there is no sample on the prism surface (only air), the error message [LL.L] will be displayed.



④ The main unit constantly detects the temperature of the prism. When the sample temperature is within the range of 5 to 100°C, the Brix(%) values are automatically compensated for temperature.

memo When the sample temperature is below 5°C or above 100°C, the Brix(%) value blinks.

The displayed Brix(%) value is not properly corrected for temperature.

memo When the instrument was shipped from the factory, the temperature correction values for sucrose are set as default.

 To change temperature correction values, see page 29

⑤ While the Brix(%) is displayed, press and hold the down  key to display the prism temperature. For example, if the temperature of the prism is 20°C, the display will indicate "20c". When the down  key is released, the display will switch to the Brix(%).

memo When the temperature is in the range of 100 to 160°C, the temperature will be displayed as follows: "100" when it is 100°C; and "125" when it is 125°C.

When the temperature is in the range of -10 to -15°C, the temperature will be displayed as follows: "-15" when it is -15°C.






memo When the temperature scale is °F, the temperature will be displayed as follows: " 50" when it is 50°F; and "210" when it is 210°F.

⑥ For calibration (adjustment to a reference solution) see page 29.

For the setting the Recorder Output see page 34.

Note If an error message is displayed, refer to page 37 for the appropriate action.











11. Setting the temperature scale (°C/°F)

- ① Turn on the power (24V DC) according to the instructions on page 24, "9.Power Supply"
The unit will display the real-time measurements in Brix(%).
- ② Hold down the  key for one second.
Once [t] appears, press the  key.
"-c-" will appear.
"-c-" : °C
"-F-" : °F
- ③ Use the  key to select a scale.
Press the  key to confirm the selection, and [t] will appear.
- ④ Each time the  key is pressed, the menu item displayed switches in the order of: [0], [1], [2], [3], [4], [5], and Brix(%).
Select Brix(%).

 The factory default is "°C".

12. Setting the Measurement Interval and Mode-S Level

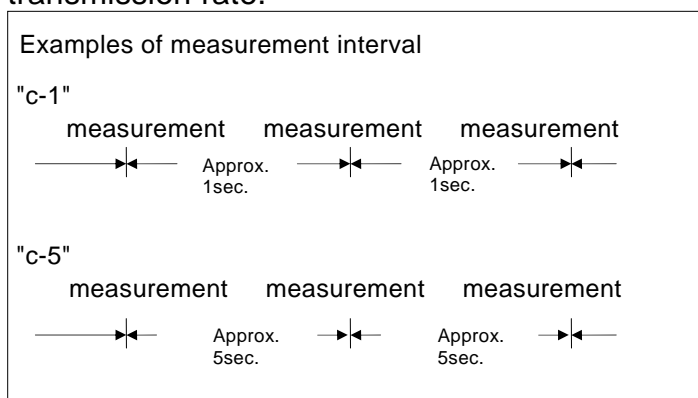
The Mode-S feature is designed to improve the measurement stability of samples that may have conventionally resulted in fluctuating readings.

- ① Turn on the power (24V DC) according to the instructions on page 24, "9.Power Supply"
The unit will display the real-time measurements in Brix(%).
- ② Hold down the  key for one second.
After [t] is displayed, press the  key once to display [0].
Then, press the  key.
"c - #" will appear, wherein "#" denotes a number from 1 to 5.
- ③ Use the  and  keys to select an interval.
Press the  key to confirm the selection. "d - #" will appear, wherein "#" denotes a number from 1 to 5.
- ④ Use the  and  keys to select a Mode-S level.
Press the  key to confirm the selection, and [0] will appear.
- ⑤ Each time the  key is pressed, the menu item displayed switches in the order of: [1], [2], [3], [4], [5], and Brix(%). Select Brix(%).

● Measurement interval: " c - # "

There are 5 options of intervals at which the unit takes measurements. The factory default is the shortest interval "c-1" wherein measurements are taken every approx. one second.

The other options indicate longer intervals; "c-2" is twice as slow as "c-1," "c-3" three times as slow, and so forth. The measurement interval setting is reflected on the data transmission rate.












● Mode-S level: " d - # "

The Mode-S feature is designed to improve the measurement stability of samples that may have conventionally resulted in fluctuating readings.

There are 5 levels, wherein the larger the number is, the better the stability. For samples that give stable readings, the factory default level 1 is sufficient. Emulsions or opaque samples and/or temperature fluctuations may cause measurements to become unstable. Try adjusting the Mode-S level when this occurs.

13. Changing the Number of Decimal Places Displayed








- ① Turn on the power (24V DC) according to the instructions on page 24, "9.Power Supply"
The unit will display the real-time measurements in Brix(%).
- ② Hold down the  key for one second, and [t] will appear.
Each time the  key is pressed, the menu item displayed switches in the order of: [0], [1], [2], [3], [4], and [5].
While [5] is displayed, press the  key.
"2" will appear. This means that readings will be displayed to the 2nd decimal place when Brix(%) values of less than 10% are measured.
Press the  key to change it to "1." This means that readings will be displayed to the 1st decimal place when Brix(%) values of less than 10% are measured.
- ③ Press the  and  key to switch back to "2." Press the  key, and [5] will appear.
- ④ Press the  key again to switch back to the real-time measurements in Brix(%)

 The factory default is "2," which displays measurements of less than 10% Brix(%) to the 2nd decimal place.

14. Adjusting to the Reference

Note Before adjusting to a reference solution, confirm that the prism surface is clean.

Note Before adjusting to the reference with distilled water, set the temperature correction factor to "1.00".

- ① Confirm that the sample inlet unit is properly connected to the piping.
- ② Let tap water or a reference sample flow through the piping.
- ③ Supply power to the main unit referring to the procedure described in Chapter 9 "Power Supply" on page 24. The current Brix(%) is displayed.
- ④ Press the  for one second. [t] is displayed. Press the  key again and the display will change to [1] (Fig. 14-1). Then, press the  key.
- ⑤ When the Brix(%) value blinks, adjust the value to 0.0% for tap water or to the true value for the reference sample by using the  and/or  keys (Fig. 14-2).
- ⑥ Pressing the  sets the adjustment and the display returns to [1] (Fig. 14-1).
- ⑦ Each time the  is pressed, the menu item displayed switches in the order of: [2], [3], [4], [5], and Brix(%). Select Brix(%)

memo If 30 seconds pass when in steps ④ through ⑥ above, the display returns to the continuous Brix(%) display.

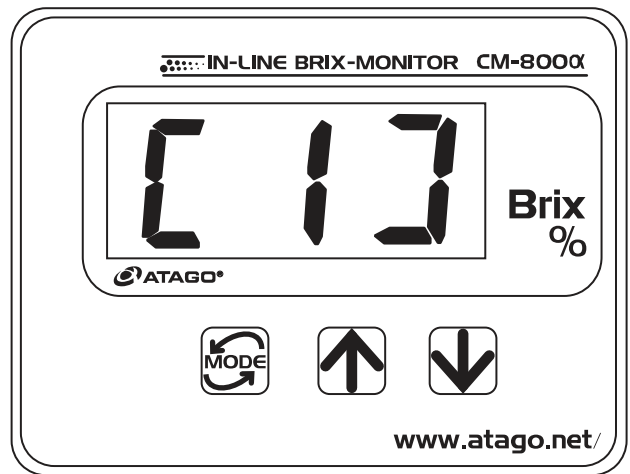
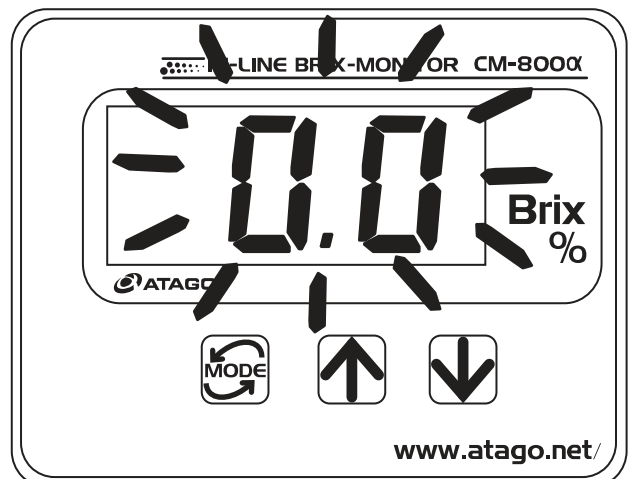




Fig. 14-1



Example of the adjustment to the 0.0%
Fig. 14-2

To reset the reference point to original factory settings

- ① While the Brix(%) is blinking in step ⑤ above, press and hold down both the  and  keys at the same time. After 5 seconds, the display will clear. Release the keys and the original standard Brix(%) will be displayed.
- ② The reference point is now reset to original factory settings.

15. Setting the Temperature Correction Values

● About temperature correction

The Refractive Index of every substance varies with the temperature. When measuring the Refractive Index of a liquid with a refractometer, the measurement value will also vary according to the sample temperature.

The instrument detects the temperature of the prism, and the Brix(%) indication values are automatically corrected based upon the preset temperature correction values. When the sample temperature is within the range of 5 to 100°C, the Brix(%) values are automatically compensated for temperature.

● Setting the temperature correction values for the instrument

When the instrument is shipped from the factory, the temperature correction values for sucrose have been set as the default. (👉 Table 15-1 page 31)

Table 15-1 lists the temperature correction values for temperatures between 15 to 40°C.

However, temperature correction values for 5 to 100°C have been set on the instrument.

If sugar is the main constituent of soluble solids in the sample, these values can be used as they are.

If the temperature correction factor is changed inadvertently, refer to page 32 "Inputting the temperature correction factor". By utilizing these instructions, it is possible to set the temperature correction factor back to "1.00".

● Setting procedure

If the main constituent of the sample is not sucrose, a different temperature correction value must be set. To set a new temperature correction value, you must determine the relationship between the temperature correction factor for sucrose and your desired sample. The temperature correction factor for sucrose is 1.00. When a new temperature correction factor is input, this factor is multiplied by the temperature correction factor for sucrose.

The temperature correction factor can be set in the range of 0.80 to 5.00.

EXAMPLE :








If the Refractive Index variation of a sample due to temperature is 3 times larger than that of sucrose, the temperature correction factor should be set to 3.00.

Table 15-1

Table of temperature correction values for sucrose (g/100g) for refractometer (reference at 20°C, 589nm)

Temperature (°C)	Sucrose (g/100g)																	
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
15	-0.29	-0.30	-0.32	-0.33	-0.34	-0.35	-0.36	-0.37	-0.37	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37
16	-0.24	-0.25	-0.26	-0.27	-0.28	-0.28	-0.29	-0.30	-0.30	-0.30	-0.31	-0.31	-0.31	-0.31	-0.31	-0.30	-0.30	-0.30
17	-0.18	-0.19	-0.20	-0.20	-0.21	-0.21	-0.22	-0.22	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.22
18	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
19	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	+0.06	+0.07	+0.07	+0.07	+0.07	+0.07	+0.08	+0.08	+0.08	+0.08	+0.08	+0.08	+0.08	+0.08	+0.08	+0.08	+0.08	+0.07
22	+0.13	+0.14	+0.14	+0.14	+0.15	+0.15	+0.15	+0.15	+0.16	+0.16	+0.16	+0.16	+0.16	+0.16	+0.15	+0.15	+0.15	+0.15
23	+0.20	+0.21	+0.21	+0.22	+0.22	+0.23	+0.23	+0.23	+0.23	+0.24	+0.24	+0.24	+0.24	+0.24	+0.23	+0.23	+0.23	+0.22
24	+0.27	+0.28	+0.29	+0.29	+0.30	+0.30	+0.31	+0.31	+0.31	+0.32	+0.32	+0.32	+0.32	+0.32	+0.31	+0.31	+0.31	+0.30
25	+0.34	+0.35	+0.36	+0.37	+0.38	+0.38	+0.39	+0.39	+0.40	+0.40	+0.40	+0.40	+0.40	+0.40	+0.39	+0.39	+0.38	+0.37
26	+0.42	+0.43	+0.44	+0.45	+0.46	+0.46	+0.47	+0.47	+0.48	+0.48	+0.48	+0.48	+0.48	+0.47	+0.47	+0.46	+0.46	+0.45
27	+0.50	+0.51	+0.52	+0.53	+0.54	+0.55	+0.55	+0.56	+0.56	+0.56	+0.56	+0.56	+0.56	+0.55	+0.55	+0.54	+0.53	+0.52
28	+0.58	+0.59	+0.60	+0.61	+0.62	+0.63	+0.64	+0.64	+0.64	+0.65	+0.65	+0.64	+0.64	+0.63	+0.63	+0.62	+0.61	+0.60
29	+0.66	+0.67	+0.68	+0.70	+0.71	+0.71	+0.72	+0.73	+0.73	+0.73	+0.73	+0.73	+0.72	+0.72	+0.71	+0.70	+0.69	+0.67
30	+0.74	+0.76	+0.77	+0.78	+0.79	+0.80	+0.81	+0.81	+0.82	+0.82	+0.81	+0.81	+0.80	+0.80	+0.79	+0.78	+0.76	+0.75
31	+0.83	+0.84	+0.85	+0.87	+0.88	+0.89	+0.89	+0.90	+0.90	+0.90	+0.90	+0.89	+0.89	+0.88	+0.87	+0.86	+0.84	+0.82
32	+0.92	+0.93	+0.94	+0.96	+0.97	+0.98	+0.98	+0.99	+0.99	+0.99	+0.99	+0.98	+0.97	+0.96	+0.95	+0.93	+0.92	+0.90
33	+1.01	+1.02	+1.03	+1.05	+1.06	+1.07	+1.07	+1.08	+1.08	+1.08	+1.07	+1.07	+1.06	+1.04	+1.03	+1.01	+1.00	+0.98
34	+1.10	+1.11	+1.13	+1.14	+1.15	+1.16	+1.16	+1.17	+1.17	+1.16	+1.16	+1.15	+1.14	+1.13	+1.11	+1.09	+1.07	+1.05
35	+1.19	+1.21	+1.22	+1.23	+1.24	+1.25	+1.25	+1.26	+1.26	+1.25	+1.25	+1.24	+1.23	+1.21	+1.19	+1.17	+1.15	+1.13
36	+1.29	+1.30	+1.31	+1.33	+1.34	+1.34	+1.35	+1.35	+1.35	+1.34	+1.34	+1.33	+1.31	+1.29	+1.28	+1.25	+1.23	+1.20
37	+1.39	+1.40	+1.41	+1.42	+1.43	+1.44	+1.44	+1.44	+1.44	+1.43	+1.43	+1.41	+1.40	+1.38	+1.36	+1.33	+1.31	+1.28
38	+1.49	+1.50	+1.51	+1.52	+1.53	+1.53	+1.54	+1.54	+1.53	+1.53	+1.52	+1.52	+1.48	+1.46	+1.44	+1.42	+1.39	+1.36
39	+1.59	+1.60	+1.61	+1.62	+1.63	+1.63	+1.63	+1.63	+1.63	+1.62	+1.61	+1.59	+1.57	+1.55	+1.52	+1.50	+1.47	+1.43
40	+1.69	+1.70	+1.71	+1.72	+1.73	+1.73	+1.73	+1.73	+1.72	+1.71	+1.70	+1.68	+1.66	+1.63	+1.61	+1.58	+1.54	+1.51

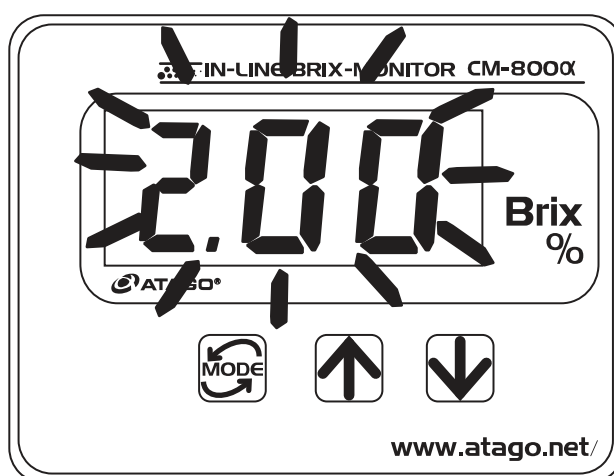
● Inputting the temperature correction factor

- ① Connect the power according to the procedure described on page 24, section "9.Power Supply".
- ② The current Brix(%) is displayed on the screen.
If there is no sample on the prism surface, [LL.L] will be displayed.
- ③ Press the  key for one second.
[t] is displayed.
Press the  key again and the display will change to [2] (Fig. 15-1).
- ④ Press the  key.
The temperature correction factor will blink on the display (Fig. 15-2).
- ⑤ If "1.00" is displayed, the temperature correction value is for sucrose.
To change this setting, press the  or  keys until the desired factor is displayed.
- ⑥ Pressing the  key sets the adjustment of the temperature correction factor and the display returns to [2] (Fig. 15-1).
- ⑦ Each time the  key is pressed, the menu item displayed switches in the order of: [3], [4], [5], and Brix(%).
Select Brix(%)

memo If 30 seconds or more has passed at any of the ③ through ⑥ stage, the display enters into the continuous display mode of the Brix(%) values.



Fig. 15-1



Example of the adjustment of the temperature correction factor to 2.00.

Fig. 15-2

● Obtaining the temperature correction factor for a sample whose main constituent is other than sugar

- ① Measure tap water and ensure that the Brix(%) value is 0.0%. If tap water does not read 0.0%, see page 29, section "14.Adjusting to the Reference".
- ② Let the sample to be measured continuously run across the prism surface. Be sure to keep the sample temperature CONSTANT at less than 15°C, or greater than 25°C.
- ③ While letting the sample run, follow the directions on page 32 to display the temperature correction factor. Make sure this reads 1.00.
- ④ After the temperature correction factor is verified, return to the Brix(%) display. Note the Brix(%) value (A value).
- ⑤ Return to the temperature correction factor screen and adjust the temperature correction factor to 4.00. Return to the Brix(%) display and note the Brix(%) Value (B value).
- ⑥ The temperature correction factor for the sample can be obtained using the following formula:
 C value = true value - A value
 D value = true value - B value

$$\text{Factor} = \frac{\text{D value} - (\text{C value} \times 4)}{\text{D value} - \text{C value}}$$

- ⑦ Set the obtained temperature correction factor according to the procedure described on page 29 (Any value in the range of 0.80 to 5.00 can be set as the factor).
- memo To obtain the true value [Brix(%)] of the sample, measure the sample with a benchtop refractometer that can control the temperature (through a waterbath or Internal Peltier Thermo-module). The temperature should be 20°C.

Example of procedure

- ① Let tap water run and adjust the Brix(%) value to 0.0%.
- ② Keep the sample less than 15°C or greater than 25°C.
- ③ Adjust the temperature correction factor to 1.00.
- ④ When returning to the Brix(%) value, 43.0% is displayed. This is the A value.
- ⑤ Adjust the temperature correction factor to 4.00.
- ⑥ Now, the Brix(%) value is 45.4%. This is the B value.
- ⑦ When measuring the sample with a benchtop refractometer at a constant temperature of 20□, the true value is 45.0%.
- ⑧ To obtain the temperature correction factor from the above example:
 C value = true value - A value = 2.0
 D value = true value - B value = -0.4

$$\text{Temperature correction factor} = \frac{-0.4 - (2.0 \times 4)}{-0.4 - 2.0} = 3.5$$

- ⑨ For this sample, the temperature correction factor should be set to 3.50.

16. Setting the Recorder Output

The instrument can output a DC 4 to 20mA signal across a specified range of Brix(%). The upper and lower limit values can be set.








The lower limit value of Brix(%) should be set in the range of -2.0 to 79.5%.

The upper limit value of Brix(%) should be set in the range of -1.0 to 80.5%.

The difference between the upper and lower limit values should be greater than 1.0%.

For example, to output the Brix(%) value of 0.0 to 60.0% at DC 4 to 20mA, set the lower limit value to 0.0 and the upper limit value to 60.0.

● Setting procedure

- ① Connect the power according to the procedure described on page 24, section "9.Power Supply".
- ② The current Brix(%) is displayed on the screen.
If there is no sample on the prism surface, [LL.L] will be displayed.
- ③ Press the  key for one second. [t] is displayed.
Press the  key again and the display will change to [0]. Press the  key again to display [3] (Fig. 16-1).
- ④ Press the  key.
The current lower limit value will blink on the display (Fig. 16-2).
- ⑤ Adjust the displayed value to the desired lower limit value by using the  and/or  keys (Fig. 16-2).
- ⑥ Press the  key.
The lower limit value is now set and the display returns to [3] (Fig. 16-1).

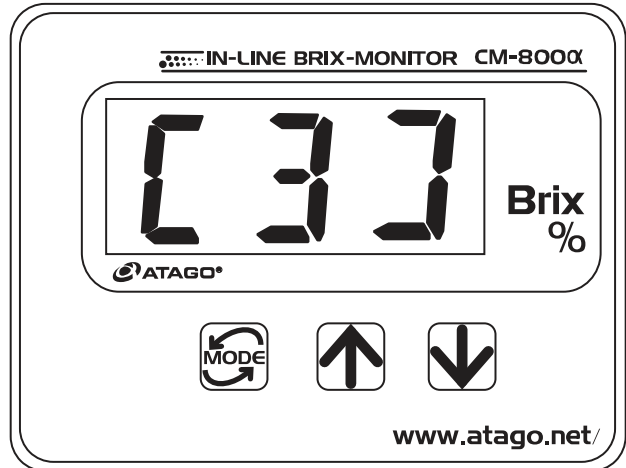
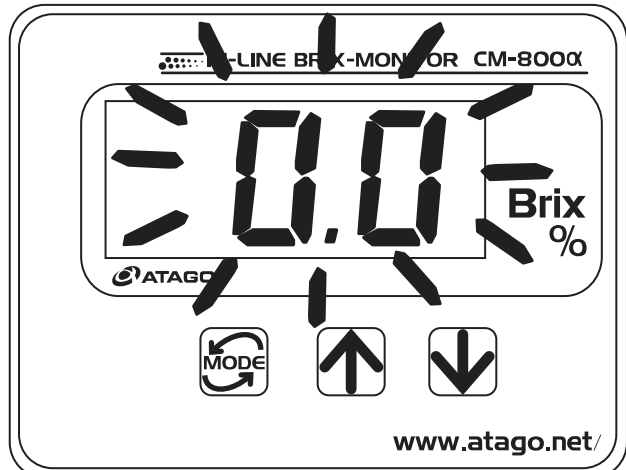








Fig. 16-1



Example: When the lower limit value of the recorder output range is set to Brix 0.0%.

Fig. 16-2

- ⑦ Press the  key again and the display turns to [4] (Fig. 16-3).
- ⑧ Press the  key.
The current upper limit value will blink on the display (Fig. 16-4).
- ⑨ Adjust the displayed value to the desired upper limit value by using the  and/or  keys.
- ⑩ Press the  key.
The upper limit value is now set and the display returns to [4] (Fig. 16-3).
- ⑪ Each time the  key is pressed, the menu item displayed switches in the order of: [5] and Brix(%).
Select Brix(%).

memo If 30 seconds pass when in steps ③ through ⑩ above, the display returns to the continuous display of the Brix(%).

Note Recorder Output when an error message is displayed
Please take note of the recorder output signal when an error message is displayed on the main unit.

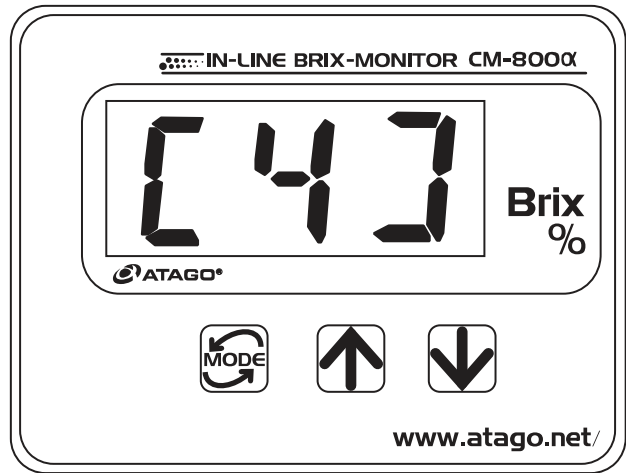
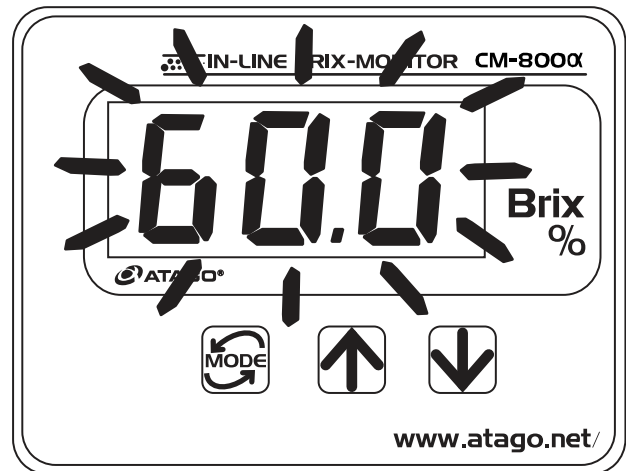


Fig. 16-3



Example: When the upper limit value of the recorder output range is set to Brix 60.0%.

Fig. 16-4

Error Message	Recorder Output
LL.L	4mA
HH.H	20mA
EE.E	20mA
...	Corresponds displayed Brix(%) value.

17. Cleaning the Prism



WARNING

- ◇ Before running hazardous substance(s) through any system, necessary precautions should be taken to ensure the safe handling of the hazardous substance(s). If using a sample inlet unit, use caution when disconnecting the main unit.



CAUTION

- ◇ Cleaning liquids up to 160°C can be used for CIP or SIP. The momentary difference between the sample liquid temperature and the cleaning liquid temperature must be no more than 80°C. When using cleaning liquids at temperatures over 160°C, the power source (DC24V) must be turned off. If the AD-32 (AD-33 or AD-34) is used, unplug from the outlet before cleaning.

- ① Detach the clamp band that connects the main unit to the sample inlet unit, piping or tank.
- ② Clean the prism surface carefully with a soft tissue soaked with warm water or ethyl alcohol. If the sample solution contains oil or grease, use ethyl alcohol to ensure the prism surface does not develop a film.
Development of a film on the prism could cause erroneous measurements.
- ③ NEVER clean the prism with an abrasive material.
Cleaning the prism with an abrasive material could cause scratches on the prism which could lead to erroneous measurements.
- ④ After cleaning is complete, re-attach the main unit to the sample inlet unit, piping or tank.
The procedure is described on page 14 of this instruction manual.

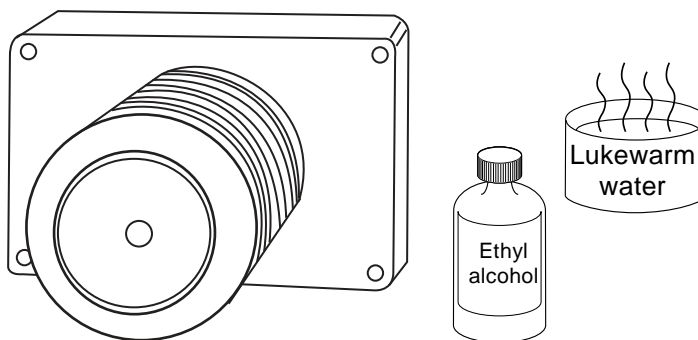


Fig. 17-1

18. Error Codes & Troubleshooting

Error code	Possible causes	Actions to be taken
LL.L	The sample is not covering the prism surface completely.	Run a sample with a Brix(%) that is known to be within the indication range (Brix 0.0 to 80.0%). Confirm that the error code [LL.L] is replaced by the known Brix(%).
	A sample with a Brix(%) lower than the lower limit value of the indication range (Brix -2.0 to 80.5%) is being measured.	Run a sample with a Brix(%) that is known to be within the indication range (Brix 0.0 to 80.0%). If [LL.L] is still displayed, please refer to page 29, section "14.Adjusting to the Reference". Follow the instructions on this page to set the reference value to the Brix(%) of the known sample.
HH.H	A sample with a Brix(%) that exceeds the upper limit value of the indication range (Brix -2.0 to 80.5%) is being measured. If the Brix(%) of the sample is extremely high, the error code [EE.E] will be displayed.	Run a sample with a Brix(%) that is known to be within the indication range (Brix 0.0 to 80.0%). Confirm that the error code [HH.H] is replaced by the known Brix(%).
	The prism surface is dirty.	Run a sample with a Brix(%) that is known to be within the indication range (Brix 0.0 to 80.0%). If [HH.H] continues to be displayed, the prism surface may need to be cleaned. Clean the prism carefully as described on page 36.
EE.E	A sample with a Brix(%) that significantly exceeds the upper limit value of the indication range (Brix -2.0 to 80.5%) is being measured.	Run a sample with a Brix(%) that is known to be within the indication range (Brix 0.0 to 80.0%).
	The prism surface is dirty.	If [EE.E] is displayed and the sample is known to have a Brix(%) within the indication range, the prism surface may need to be cleaned. Clean the prism carefully as described on page 36. If [EE.E] is continually displayed after the above procedures have been carried out, please contact an Authorized ATAGO Distributor.
Blinking Brix(%) value	The prism temperature is below 5°C or above 100°C. In this case, the displayed Brix(%) value is not properly corrected for temperature.	Run a sample at a temperature of 5 to 100°C.

* Please see Page 35 "Recorder Output when an error message is displayed."

19. Consumable Parts and Optional Items

(1) Consumable Parts

The following consumable parts are available for the instrument. These items should be monitored and replaced as necessary. To place an order, please contact an Authorized ATAGO Distributor.

Part name	Part number	Description
Tie band	RE-8507	Maximum temperature: Max. 150°C Quantity: 10 pieces For water bath connection
O-ring (Silicon)	RE-68100	O-ring used to connect the sample inlet unit to the prism stage unit of the instrument.
O-ring (EPDM)	RE-68115	
O-ring (Viton)	RE-68002	

(2) Optional Items

The following optional items are available for the instrument.

These items can be ordered through an Authorized ATAGO Distributor.

 "3.Unpacking and Installation" page 9

Product or part name		Catalog or part number	Description
AC adapter AD-32		Cat.No.3527	Converts the AC 100V to the DC24V and supplies the power to the main unit.
AC adapter AD-33		Cat.No.3528	Converts the AC 110V to the DC24V and supplies the power to the main unit.
AC adapter AD-34		Cat.No.3529	Converts the AC 220-240V to the DC24V and supplies the power to the main unit.
Sample inlet unit	Hose connector	RE-67501	Outside diameter of the Hose connector: 12mm φ
	Compression Fitting	RE-67503	Compression fitting 10mmφ
	Straight type IDF/ISO clamp union (ferrule)	RE-67511	1S
		RE-67512	1.5S
		RE-67521	2S
	Straight type IDF/ISO screw union (screw)	RE-67523	2S
	Straight type JIS Flange	RE-67515	25A
		RE-67525	40A
L type IDF/ISO clamp union (ferrule)	RE-67611	1S	
	RE-67621	2S	
Recorder output cable		RE-65374	4-pin connector, one-sided crimp contact (5m)
		RE-65375	4-pin connector, one-sided crimp contact (10m)
		RE-65376	4-pin connector, one-sided crimp contact (15m)
		RE-65377	4-pin connector, one-sided crimp contact (20m)
		RE-65378	4-pin connector, one-sided crimp contact (Optional length)
RS-232C cable D-SUB 25-pin		RE-5647	4-pin connector, one-sided D-SUB 25-pin connector * Please specify the length (1 to 15m) upon ordering.
		RE-5677	4-pin connector, one-sided D-SUB 25-pin connector (15m)
RS-232C cable D-SUB 9-pin		RE-65331	4-pin connector, one-sided D-SUB 9-pin connector * Please specify the length (1 to 15m) upon ordering.
		RE-65330	4-pin connector, one-sided D-SUB 9-pin connector (15m)
Stand		RE-8607	Stand for mounting the main unit and the AD-32 (AD-33 or AD-34).

20. Relationships between Brix(%) Values and Refractive Index (n_D²⁰) Values

The relationships between Brix(%) values and Refractive Index (n_D²⁰) values are listed in this table for your reference.

%	n _D ²⁰	%	n _D ²⁰	%	n _D ²⁰	%	n _D ²⁰	%	n _D ²⁰
0	1.33299	20	1.36384	40	1.39986	60	1.44193	80	1.49071
1	1.33442	21	1.36551	41	1.40181	61	1.44420	81	1.49333
2	1.33586	22	1.36720	42	1.40378	62	1.44650	82	1.49597
3	1.33732	23	1.36889	43	1.40576	63	1.44881	83	1.49862
4	1.33879	24	1.37060	44	1.40776	64	1.45113	84	1.50129
5	1.34026	25	1.37233	45	1.40978	65	1.45348	85	1.50398
6	1.34175	26	1.37406	46	1.41181	66	1.45584		
7	1.34325	27	1.37582	47	1.41385	67	1.45822		
8	1.34477	28	1.37758	48	1.41592	68	1.46061		
9	1.34629	29	1.37936	49	1.41799	69	1.46303		
10	1.34782	30	1.38115	50	1.42009	70	1.46546		
11	1.34937	31	1.38296	51	1.42220	71	1.46790		
12	1.35093	32	1.38478	52	1.42432	72	1.47037		
13	1.35250	33	1.38661	53	1.42647	73	1.47285		
14	1.35408	34	1.38846	54	1.42863	74	1.47535		
15	1.35568	35	1.39032	55	1.43080	75	1.47787		
16	1.35729	36	1.39220	56	1.43299	76	1.48040		
17	1.35891	37	1.39409	57	1.43520	77	1.48295		
18	1.36054	38	1.39600	58	1.43743	78	1.48552		
19	1.36218	39	1.39792	59	1.43967	79	1.48811		

Refractive Index values correlating to Brix 0 to 85% in the table above have been officially determined by ICUMSA (International Committee of Uniform Method of Sugar Analysis held in 1974).

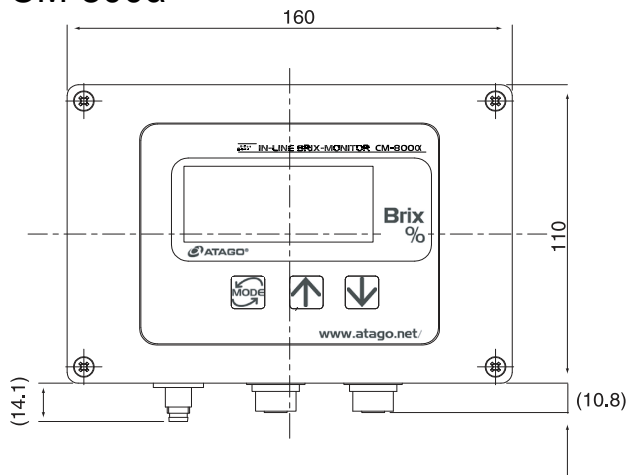
21. Specifications

Model	CM-800α
Cat.No.	3564
Measurement scale	Brix(%) (Automatic Temperature Compensation), Temperature
Measurement range	Brix 0.00 to 80.0% (indication: -2.0 to 80.5%), Temperature -15 to 160°C (indication: -15 to 160°C) / 5 to 320°F (indication: 5 to 320°F)
Resolution	Brix 0.01 or 0.1% (by selection; 0.00 to 9.99%) Brix 0.1% (10.0 to 80.0%) Temperature 1°C/1°F
Measurement accuracy	Brix ±0.1% (based on sucrose solution) Temperature ±1°C/±1°F
Measurement Interval (Same as output interval)	Approx. 1 second per measurement (factory default). There are 5 options of the interval.
Measurement temperature	5.0 to 100.0°C (Automatic Temperature Compensation range)
Temperature correction values	Based on the temperature correction table for sucrose. For 15 to 40°C, ICUMSA (International Committee of Unified Method of Sugar Analysis) values are used. For 5 to 15°C or 40 to 100°C, the values obtained at the ATAGO laboratories are used. The temperature correction values for sucrose can be multiplied by any factor in the range of 0.80 to 5.00.
Output (Optional Cables)	① Recorder output: DC 4 to 20mA Any value between Brix 1% through 80% can be set. Temperature -15.5 to 160.5°C = 4 to 20mA ② RS-232C output
Source	LED (D-line approximation)
Temperature sensor	Thin film platinum sensor
Materials in contact with the solution	Prism : Artificial sapphire Prism stage : SUS316L
Resistible pressure on the prism unit	0.98MPa(10kgf/cm ²)
International Protection Class	IP67
Power supply	100 to 240V (50/60Hz) (voltage fluctuation not to exceed ±10%) Main unit: DC24V (Allowable fluctuation is ±10%) AC adapter AD-32, AD-33 or AD-34 (optional): AC 100-240V 50/60Hz
Power consumption	3VA

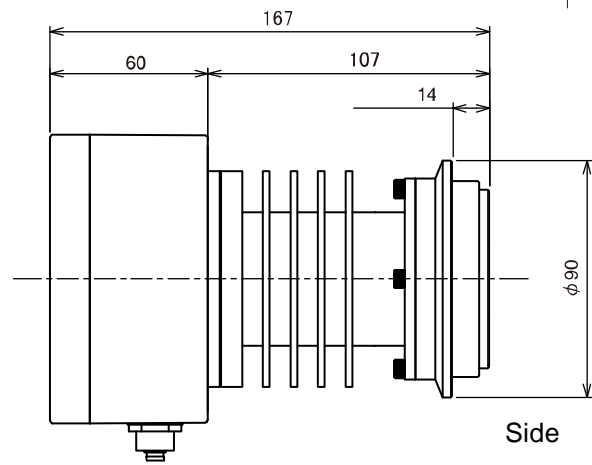
Environmental conditions	<p>Use the instrument at an altitude below 2,000m (above sea level).</p> <p>Use the instrument indoors.</p> <p>Use the instrument where the temperature is between 5 to 40°C.</p> <p>Use the instrument under the condition where humidity is 80% at 31°C or lower, falling linearly to 50% at 40°C.</p> <p>Main supply voltage fluctuation should not to exceed $\pm 10\%$ the nominal voltage.</p> <p>Installation categories (Overvoltage Categories) : II</p> <p>The pollution degree is 2 (according to IEC60664).</p>
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22. Dimensions

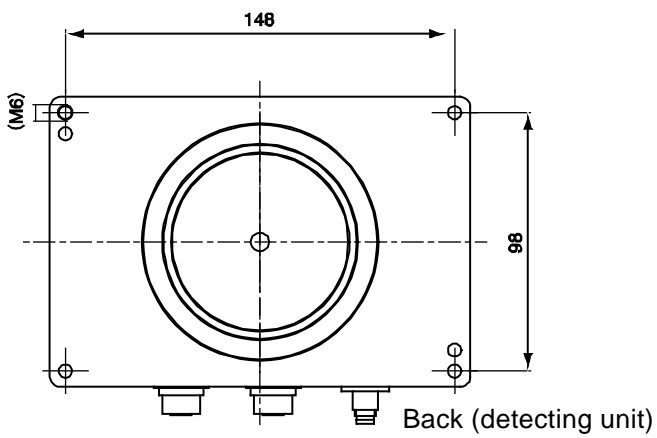
CM-800α



Front (display unit)

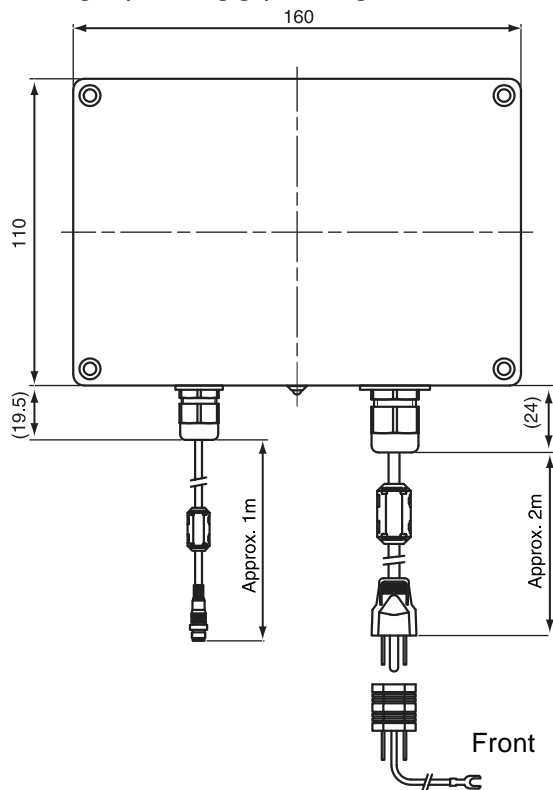


Side

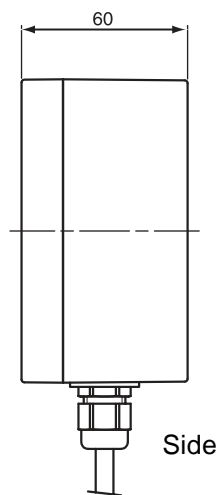


Back (detecting unit)

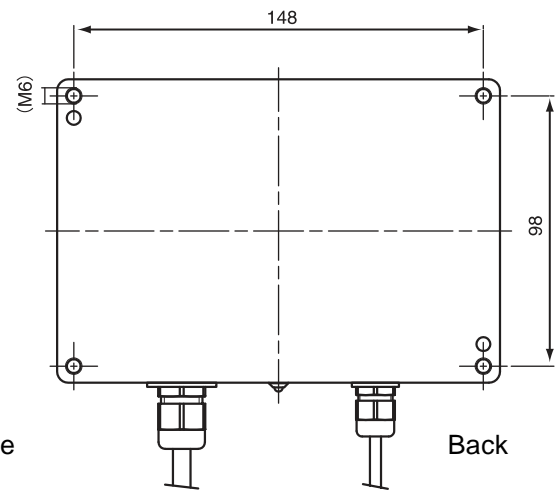
AD-32 / AD-33 / AD-34



Front



Side



Back

23. Repair Service and Warranty Period

The instrument is a precise electronic instrument which incorporates both optical and electrical components. Due to the complex interaction of these components, repairs and/or adjustments of the instrument must be performed by an ATAGO engineer or a properly trained service technician at an ATAGO Authorized Service Center. Authorized Service Center technicians have completed maintenance courses and have a vast knowledge of ATAGO instruments. Any simple inspection or replacement of parts described in this manual can be performed by the end-user. Only ATAGO engineers and properly trained service technicians are allowed to perform repairs or disassemble the instrument. Any attempt to make repairs or disassemble the unit will void the warranty. The warranty period of the instrument is one year from the date of purchase. This warranty covers manufacturer's defects. If any manufacturer's defect is found during the warranty period, the instrument will be repaired under warranty. The prism of the instrument is considered a consumable item and is not covered under the warranty. All instruments received for repair are subject to a possible inspection fee. If the unit is inspected and found to be either in good working order or is not covered by the warranty, the customer will be responsible for any inspection fees, repair costs including labor, parts and materials use, and shipping charges.

● Replacement Part Information

Please note that ATAGO cannot guarantee that replacement parts will be available after a unit has been discontinued. ATAGO will make every effort to secure replacement parts for a period of at least seven years after discontinuation of any product.

● Periodic inspection service (charged)

To ensure long-term, precise and stable operation of the instrument, we recommend for the unit to be inspected periodically (at least once every two years).

Periodic inspection service can be requested through an Authorized ATAGO Distributor or directly from an Authorized Service Center.

Periodic inspection service includes.

- Inspection, confirmation and replacement of functional parts (if necessary)
- Inspection and adjustment of the span
- Cleaning the prism
- Replacement of the dehumidifying agent

ATAGO CO., LTD.

When contacting your preferred distributor regarding repairs or troubleshooting, please inform them of the serial number of the unit.

24. ATAGO CO.,LTD. Service Centers

ATAGO has Authorized Service Centers around the world. Below is the list of countries where you can find an ATAGO Authorized Service Center. If your ATAGO instrument requires servicing please contact ATAGO at the following e-mail address.

overseas@atago.net

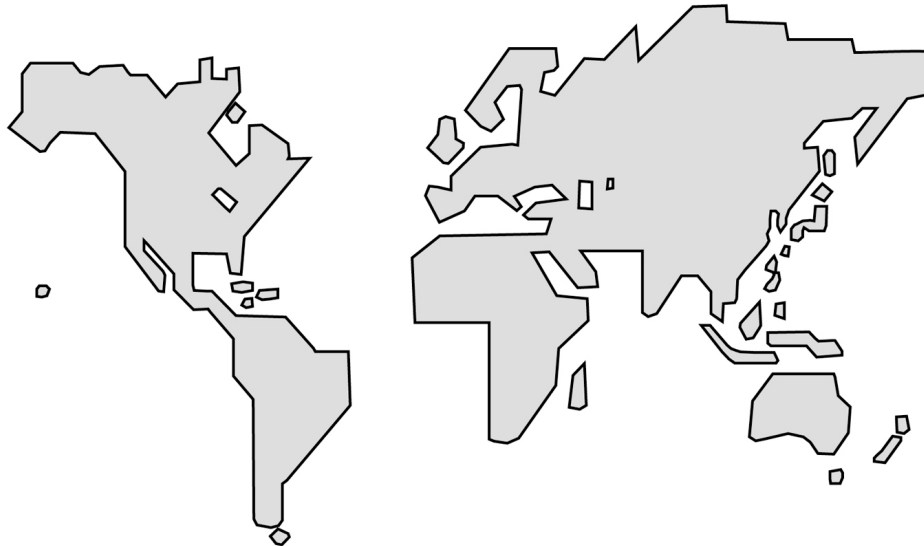
Please provide your company name, address and telephone number so that we can direct your inquiry to the Authorized Service Center nearest you. The Authorized Service Center in your area will contact you within 1 to 2 business days.

North America

Canada
U.S.A.
Mexico

Europe

Netherlands	U.K.	Belarus
Italy	Belgium	Ukraine
Germany	Poland	Serbia
France	Greece	Croatia
Spain	Russia	Romania



Central America

Costa Rica
El Salvador
Guatemala

South America

Argentina
Bolivia
Brazil
Colombia
Chile
Ecuador
Paraguay
Peru
Uruguay

Middle East / Africa

Iran
Turkey
Saudi Arabia
Israel
Lebanon
South Africa
Egypt

Asia / Oceania

Australia
China
India
Thailand
Korea
Taiwan
Indonesia
Malaysia
Singapore
Philippines
Bangladesh
Pakistan
Vietnam

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 **ATAGO INDIA Instruments Pvt. Ltd.**

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customerservice@atago-india.com

 **ATAGO THAILAND Co.,Ltd.**

TEL: 66-21948727-9 ,66-21171549
customerservice@atago-thailand.com

 **ATAGO BRASIL Ltda.**

TEL: 55 16 3913-8400 customerservice@atago-brasil.com

 **ATAGO ITALIA s.r.l.**

TEL: 39 02 36557267 customerservice@atago-italia.com

 **ATAGO CHINA Guangzhou Co.,Ltd.**

TEL: 86-20-38108256 info@atago-china.com

 **ATAGO RUSSIA Ltd.**

TEL: 7-812-777-96-96 info@atago-russia.com

 **ATAGO NIGERIA Scientific Co.,Ltd.**

TEL: 234-707-558-1552 atagonigeria@atago.net