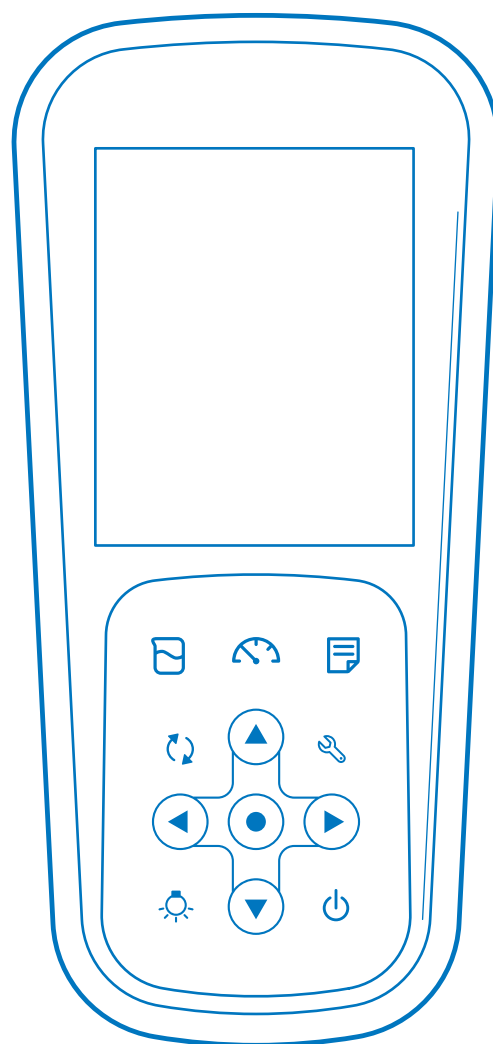


## Instruction Manual

Dissolved Oxygen Meter

LAQUAact-DO110

LAQUAact-DO120





## ■ Preface

This manual describes the operation of the following instrument.

Brand (pet name): LAQUAact

Series name: Portable pH · Water Quality Meter

Model: LAQUAact-DO110, LAQUAact-DO120

Model description: Dissolved Oxygen Meter

Be sure to read this manual before using the product to ensure proper and safe operation of the product. Also safely store the manual so it is readily available whenever necessary.

Product specifications and appearance, as well as the contents of this manual are subject to change without notice.

## ● Warranty and responsibility

HORIBA Advanced Techno Co., Ltd. warrants that the Product shall be free from defects in material and workmanship and agrees to repair or replace free of charge, at option of HORIBA Advanced Techno Co., Ltd., any malfunctioned or damaged Product attributable to responsibility of HORIBA Advanced Techno Co., Ltd. for a period of Two (2) years from the delivery unless otherwise agreed with a written agreement. In any one of the following cases, none of the warranties set forth herein shall be extended;

- Any malfunction or damage attributable to improper operation
- Any malfunction attributable to repair or modification by any person not authorized by HORIBA Advanced Techno Co., Ltd.
- Any malfunction or damage attributable to the use in an environment not specified in this manual
- Any malfunction or damage attributable to violation of the instructions in this manual or operations in the manner not specified in this manual
- Any malfunction or damage attributable to any cause or causes beyond the reasonable control of HORIBA Advanced Techno Co., Ltd. such as natural disasters
- Any deterioration in appearance attributable to corrosion, rust, and so on
- Replacement of consumables

HORIBA Advanced Techno Co., Ltd. SHALL NOT BE LIABLE FOR ANY DAMAGES RESULTING FROM ANY MALFUNCTIONS OF THE PRODUCT, ANY ERASURE OF DATA, OR ANY OTHER USES OF THE PRODUCT.

## ● Trademarks

- Microsoft, Windows are registered trademarks or trademarks of Microsoft Corporation in the United States and other countries.

Other company names and brand names are either registered trademarks or trademarks of the respective companies. (R), (TM) symbols may be omitted in this manual.

# Regulations

## ■ Regulations

### ● EU regulations

#### ● Conformable standards

This equipment conforms to the following standards:



|                |   |
|----------------|---|
| <b>EMC:</b>    | EN61326-1<br>Class B, Basic electromagnetic environment |
| <b>Safety:</b> | EN61010-1   |
| <b>RoHS:</b>   | EN50581<br>9. Monitoring and control instruments        |

**Warning:** This product is not intended for use in industrial environments. In an industrial environment, electromagnetic environmental effects may cause the incorrect performance of the product in which case the user may be required to take adequate measures.

#### ● Installation environment

This product is designed for the following environment.

- Overvoltage category II
- Pollution degree 2

#### ● Information on disposal of electrical and electronic equipment and disposal of batteries and accumulators

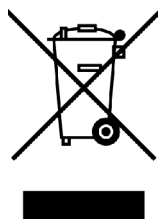
The crossed out wheeled bin symbol with underbar shown on the product or accompanying documents indicates the product requires appropriate treatment, collection and recycle for waste electrical and electronic equipment (WEEE) under the Directive 2012/19/EU, and/or waste batteries and accumulators under the Directive 2006/66/EC in the European Union.

The symbol might be put with one of the chemical symbols below. In this case, it satisfies the requirements of the Directive 2006/66/EC for the object chemical.

This product should not be disposed of as unsorted household waste.

Your correct disposal of WEEE, waste batteries and accumulators will contribute to reducing wasteful consumption of natural resources, and protecting human health and the environment from potential negative effects caused by hazardous substance in products.

Contact your supplier for information on applicable disposal methods.



#### ● Authorised representative in EU

HORIBA UK Limited  
2 Dalston Gardens, Stanmore, Middx HA7 1BQ, UK

# Regulations

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## ● FCC rules

Any changes or modifications not expressly approved by the party responsible for compliance shall void the user's authority to operate the equipment.

## ● Warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## ● Korea certification

### ● B급 기기 (가정용 방송통신기자재)

이 기기는 가정용(B 급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

## ● Taiwan battery recycling mark



廢電池請回收

## ● China regulation

标记的意义

Meaning of Marking

マークの意味

本标记适用在中华人民共和国销售电器电子产品，标记中央的数字表示环境保护使用期限的年数。(不是表示产品质量保证期间。)只要遵守这个产品有关的安全和使用注意事项，从制造日开始算起在这个年限内，不会给环境污染、人体和财产带来严重的影响。请不要随意废弃本电器电子产品。



This marking is applied to electric and electronic products sold in the People's Republic of China. The figure at the center of the marking indicates the environmental protection use period in years. (It does not indicate a product guarantee period.) It guarantees that the product will not cause environment pollution nor serious influence on human body and property within the period of the indicated years which is counted from the date of manufacture as far as the safety and usage precautions for the product are observed. Do not throw away this product without any good reason.

本マークは、中華人民共和国で販売される電気電子製品に適用され、マークの中央の数字は環境保護使用期限の年数を意味します（製品の品質保証期間を示すものではありません）。この製品に関する安全や使用上の注意をお守り頂く限り、製造日から起算するこの年限内では、環境汚染や人体や財産に深刻な影響を及ぼすことはありません。本製品をみだりに廃棄しないでください。

# Regulations

## 产品中有害物质的名称及含量

### Name and amount of hazardous substance used in a product

| 部件名称<br>Unit name                     | 有害物质<br>Hazardous substance |                           |                           |  |   |  |
|---------------------------------------|-----------------------------|---------------------------|---------------------------|--|---|--|
|                                       | 铅<br>Lead<br>(Pb)           | 汞<br>Mer-<br>cury<br>(Hg) | 镉<br>Cad-<br>mium<br>(Cd) | 六价铬<br>Hexa-<br>valent<br>chrom-<br>ium<br>(Cr (VI)) | 多溴联苯<br>Poly<br>bromo-<br>biphenyl<br>(PBB) | 多溴二苯醚<br>Poly<br>bromo-<br>diphenyl<br>ether<br>(PBDE) |
| 本体<br>Main unit                       | ×                           | ○                         | ○                         | ○  | ○   | ○  |
| 电池<br>Battery                         | ×                           | ○                         | ○                         | ○  | ○   | ○  |
| AC适配器<br>AC adapter <sup>*1, *2</sup> | ×                           | ○                         | ○                         | ○  | ○   | ○  |
| 电缆<br>Cable <sup>*2</sup>             | ×                           | ○                         | ○                         | ○  | ○   | ○  |
| 支架<br>Stand <sup>*2</sup>             | ○                           | ○                         | ○                         | ○  | ○   | ○  |
| 打印机<br>Printer <sup>*2</sup>          | ×                           | ○                         | ○                         | ○  | ○   | ○  |
| 电极<br>Electrode <sup>*2</sup>         | ×                           | ○                         | ×                         | ○  | ○   | ○  |

本表格依据 SJ/T 11364 的规定编制。

This form is prepared in accordance with SJ/T 11364.

○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

Denotes that the amount of the hazardous substance contained in all of the homogeneous materials used in the component is below the limit on the acceptable amount stipulated in the GB/T 26572.

×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

Denotes that the amount of the hazardous substance contained in any of the homogeneous materials used in the component is above the limit on the acceptable amount stipulated in the GB/T 26572.

\*1: 本部件的环保使用期限为10年。 The environmental protection use period of this product is 10 years.

\*2: 选配件 Optional products

## ■ For Your Safety

### ● Hazard classification and warning symbols

Warning messages are described in the following manner. Read the messages and follow the instructions carefully.

#### ● Hazard classification



This indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This is to be limited to the most extreme situations.



This indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



This indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

#### ● Warning symbols



Description of what should be done, or what should be followed



Description of what should never be done, or what is prohibited

### ● [DEU] Sicherheitsinformation

Lesen Sie vor der Verwendung des Produkts unbedingt diese Anleitung, um den ordnungsgemäßen und sicheren Betrieb des Produkts zu gewährleisten. Bewahren Sie die Anleitung sicher auf, damit sie bei Bedarf jederzeit zur Hand ist.

Die Inhalt dieser Anleitung können ohne Vorankündigung geändert werden.

#### ● Installationsumgebung

Dieses Produkt ist nicht zum Gebrauch in industriellen Umgebungen, wie in EN61326-1 definiert, vorgesehen.

In einer industriellen Umgebung können die elektromagnetischen Störungen eventuell zu Produktfehlfunktionen führen. Um dieses Produkt unter solchen Umständen verwenden zu können, muss der Benutzer ggf. angemessene Maßnahmen ergreifen.

Das Produkt ist gemäß EN61010-1 für die folgende Umgebung vorgesehen.

- Überspannungskategorie II
- Verschmutzungsgrad 2



## ● [FRA] Informations de sécurité

Veillez à lire le présent manuel avant d'utiliser le produit de manière à garantir son utilisation correcte et sûre. De même, rangez le manuel dans un lieu sûr de manière à pouvoir vous y reporter lorsque cela est nécessaire.

Le contenu du présent manuel peut être modifié sans notification préalable.

## ● Environnement d'installation

Ce produit n'est pas destinés à une utilisation dans des environnements industriels, tels que définis dans la norme EN61326-1.

Dans un environnement industriel, les interférences électromagnétiques peuvent entraîner un dysfonctionnement du produit. Pour utiliser le produit dans ce type d'environnements, l'utilisateur peut avoir à prendre des mesures appropriées.

Le produit est conçu pour l'environnement suivant, tel que défini dans la norme EN61010-1.

- Catégorie de surtension II
- Degré de pollution 2

## ● [ITA] Informazioni sulla sicurezza

Leggere attentamente questo manuale prima di utilizzare il prodotto al fine di utilizzarlo in modo sicuro e adeguato. Inoltre, conservare in un luogo sicuro il manuale per poterlo consultare se necessario.

Le contenuti di questo manuale sono soggetti a modifiche senza preavviso.

## ● Ambiente di installazione

Questo prodotto non è stato progettato per essere utilizzato in ambienti industriali, secondo la norma EN61326-1.

In un ambiente industriale, le interferenze elettromagnetiche potrebbero causare un malfunzionamento del prodotto. Per utilizzare il prodotto in tali ambienti, all'utente potrebbe essere richiesto di adottare le contromisure necessarie.

Il prodotto è designato per il seguente ambiente, definito nello standard EN61010-1.

- Categoria di sovratensione II
- Livello di inquinamento 2

## ● [SWE] Säkerhetsinformation

Se till att du läser denna handbok innan du börjar använda produkten för en korrekt och säker användning av den. Spara sedan handboken på en säker och lättåtkomlig plats så att du kan konsultera den när så behövs.

Innehållet i denna handbok kan komma att ändras utan föregående meddelande därom.

## ● Installationsmiljö

Detta produkten är ej avsedda för användning i industriella miljöer enligt riktlinjerna i EN61326-1.

Om den används i industrimiljöer kan de elektromagnetiska störningarna orsaka tekniska fel hos produkten. Om produkten ska användas i sådana miljöer kan användaren behöva vidta lämpliga åtgärder för att lösa dessa problem.

Produkten är utformad för användning i följande miljöer, i enlighet med SS-EN 61010-1.

- Överspänningskategori II
- Föroreningsgrad 2

## ● [SPA] Información de seguridad

Asegúrese de leer este manual antes de utilizar el producto para garantizar un uso correcto y seguro del mismo. Asimismo, guarde de forma segura el manual para que esté disponible siempre que sea necesario.

El contenido de este manual están sujetos a cambios sin previo aviso.

## ● Entorno de instalación

Este producto está diseñado para su uso en entornos industriales, tal y como se define en EN61326-1.

En un entorno industrial, las interferencias electromagnéticas pueden provocar un funcionamiento incorrecto del producto. Para usar el producto en tales entornos, el usuario debe tomar las medidas adecuadas.

El producto se ha diseñado para el siguiente entorno, definido en EN61010-1.

- Categoría de sobretensión II
- Nivel de contaminación 2

## ● [POL] Informacje dotyczące bezpieczeństwa

Przed przystąpieniem do użytkowania tego produktu należy dokładnie zapoznać się z niniejszą instrukcją, aby zapewniona była prawidłowa i bezpieczna eksploatacja produktu. Instrukcję przechowywać w bezpiecznym miejscu, aby w razie potrzeby była zawsze dostępna.

Treść niniejszej instrukcji może ulec zmianie bez wcześniejszego powiadomienia.

## ● Środowisko instalacji

Ten produkt nie są przeznaczone do użytkowania w środowisku przemysłowym, zgodnie z definicją określoną w normie EN61326-1.

W środowisku przemysłowym zakłócenia elektromagnetyczne mogą powodować nieprawidłowe działanie produktów. Możliwe, że aby użytkować produkt w takich środowiskach, użytkownik będzie musiał podjąć stosowne środki zaradcze.

Produkt jest przeznaczony do użycia w poniższym środowisku zdefiniowanym w normie EN61010-1.

- Kategoria przepięciowa II
- Stopień zanieczyszczenia 2

## ● [NLD] Veiligheidsinformatie

Lees deze handleiding voordat u dit product gebruikt zodat u het op de juiste manier en veilig kunt gebruiken. Bewaar de handleiding goed zodat u hem wanneer nodig kunt raadplegen.

De inhoud van deze handleiding kunnen zonder voorafgaande kennisgeving worden gewijzigd.

## ● Installatieomgeving

Dit product is niet bedoeld voor gebruik in een industriële omgeving zoals gedefinieerd in EN 61326-1.

In een industriële omgeving kan de elektromagnetische interferentie de werking van dit product storen. Voor gebruik van het product in een dergelijke omgeving moet de gebruiker mogelijk maatregelen treffen om de storing te verhelpen.

Het product is ontworpen voor de volgende omgeving, gedefinieerd in EN 61010-1.

- Overspanningscategorie II
- Vervuilingsgraad 2

## ● [JPN] 安全情報

ご使用になる前に、本書を必ずお読みください。お読みになった後は必要なときにすぐに取り出せるように大切に保管してください。

本書に記載されている内容は予告なく変更される場合があります。あらかじめご了承ください。

## ● 設置環境

本製品は、EN61326-1 で定義される工業環境で使用することを想定した製品ではありません。

工業環境においては、電磁妨害の影響を受ける可能性があり、その場合には使用者が適切な対策を講ずることが必要となることがあります。

本製品は、EN61010-1 で定義される以下の環境用に設計されています。




- 過電圧カテゴリー II
- 汚染度 2




# For Your Safety

## ● Safety precautions





This section provides precautions for using the product safely and correctly and to prevent injury and damage. The terms of DANGER, WARNING, and CAUTION indicate the degree of imminency and hazardous situation. Read the precautions carefully as it contains important safety messages.



## ● Instrument and electrode

|  <b>WARNING</b> |   |
|--|---|
|                 | Do not use an unspecified AC adapter.<br>Otherwise, it may heat up or be ignited resulting in a fire or an accident.        |
|                 | Do not disassemble or modify the instrument.<br>Otherwise, it may heat up or be ignited resulting in a fire or an accident. |

|  <b>CAUTION</b> |   |
|--|---|
|                 | <b>Harmful chemicals</b><br>The internal solution of DO electrodes is highly potassium hydroxide (KOH). If the internal solution comes in contact with the skin, wash it off immediately. If it gets into eyes, flush with plenty of water and then consult a doctor. |
|               | Do not use the RS-232C communication and the AC adapter under wet or humid conditions. Otherwise, it may cause a fire, electric shock, or breakage.   |

## ● Battery

|  <b>WARNING</b> |   |
|--|---|
|                 | Keep batteries out of reach of children. If someone accidentally swallows a battery, consult a doctor immediately.  |
|                 | If alkaline fluid from a battery gets into the eyes, do not rub the eyes, rinse with clean water immediately and then consult a doctor.<br>Contact with alkaline fluid could cause blindness. |
|                 | Do not put batteries in a fire, expose to heat, disassemble or remodel.<br>Doing so could cause fluid leakage, overheating or explosion.  |

|  <b>CAUTION</b> |  |
|--|--|
|                 | Do not remove or scratch the external label of the battery.<br>Doing so could cause injury to hands and fingers. |

## ■ Product Handling Information

### ● Operational precautions (instrument)

- Only use the product including accessories for their intended purpose.
- The function that measuring dissolved oxygen of the instrument is only usable for measuring under water. Do not use this function for the application except described above.
- Do not drop, crash, or give any physical impact on the instrument.
- The instrument is made of solvent-resistant materials but that does not mean it is resistant to all chemicals. Do not dip the instrument in strong acid or alkali solution, or wipe with such solution.
- If the instrument is dropped into water or gets wet, wipe it using soft cloth. Do not heat to dry it with a hair-dryer (or the like).
- 
- The instrument has a dust-proof and waterproof structure. Waterproof performance is following specification: the instrument does not malfunction even when immersed in water of 1 m depth for 30 minutes.  
This does not mean to guarantee non-destructive, trouble-free, dust-proof, and waterproof performance in all situations. If the instrument is correctly handled according to the descriptions in this manual, the instrument provides dust-proof and waterproof performance.
- When replacing the batteries with an AC adapter or a serial cable connected the instrument does not have the dust-proof and waterproof performance. The dust-proof and waterproof performance is maintained only when the covers are attached correctly.
- After replacing the batteries with an AC adapter or a serial cable connected make sure that the waterproof packing attached to each cover is not deformed or discolored, or has foreign matter adhering to it. If the waterproof packing is deformed, discolored or has foreign matter adhering to it, or dust could get inside, water leaks could occur that could lead to instrument malfunction.
- To disconnect an electrode, AC adapter cable or serial cable, hold the connector and pull it off. If you pull at the cable, it may cause a breakage.
- The RS-232C communication between the instrument and a personal computer (referred to as PC in the rest of this document) may fail because of environmental conditions, such as (radio/electromagnetic) noise.
- Do not replace the batteries in a dusty place or with wet hands while an AC adapter or a serial cable is connected. Dust or moisture could get inside the instrument, possibly causing instrument malfunction.
- Do not use the tip of a nail or an object with a sharp end to press the keys.

# Product Handling Information

---

- If the power supply is interrupted while measurement data is being saved in the instrument, the data could be corrupted.
- A Ni–MH rechargeable battery can be used in this instrument, but the battery used in the instrument cannot be charged using the AC adapter.

## ● Operational precautions (battery)

- Do not short-circuit a battery.
- Set the + and – side of the battery correctly.
- When the battery has run out or the instrument will not be used for a long time, remove the batteries.
- Of the specified battery types, make sure to use two batteries of the same type.
- Do not use a new battery together with a used battery.
- Do not use a fully charged nickel-metal hydride battery together with a partially charged battery.
- Do not attempt to charge a non-rechargeable battery.

## ● Environmental conditions for use and storage

- Temperature: 0°C to 45°C
- Humidity: under 80% in relative humidity and free from condensation

### **Avoid the following conditions.**

- Strong vibration
- Direct sunlight
- Corrosive gas environment
- Close to an air-conditioner
- Direct wind

## ● Transportation

When transporting the instrument, repackage it in the original package box. Otherwise, it may cause instrument breakage.

## ● Disposal

- Standard solution used for the calibration must be under neutralized before the disposal.
- When disposing of the product, follow the related laws and/or regulations of your country for disposal of the product.

## ■ Manual Information

### ● Description in this manual

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#### Note

This interprets the necessary points for correct operation and notifies the important points for handling the product.

---

---

#### Reference

This indicates the part where to refer for information.

---

---

#### Tip

This indicates reference information.

---

Description of this manual uses the screen display of LAQUAact-DO120.

# MEMO





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# MEMO



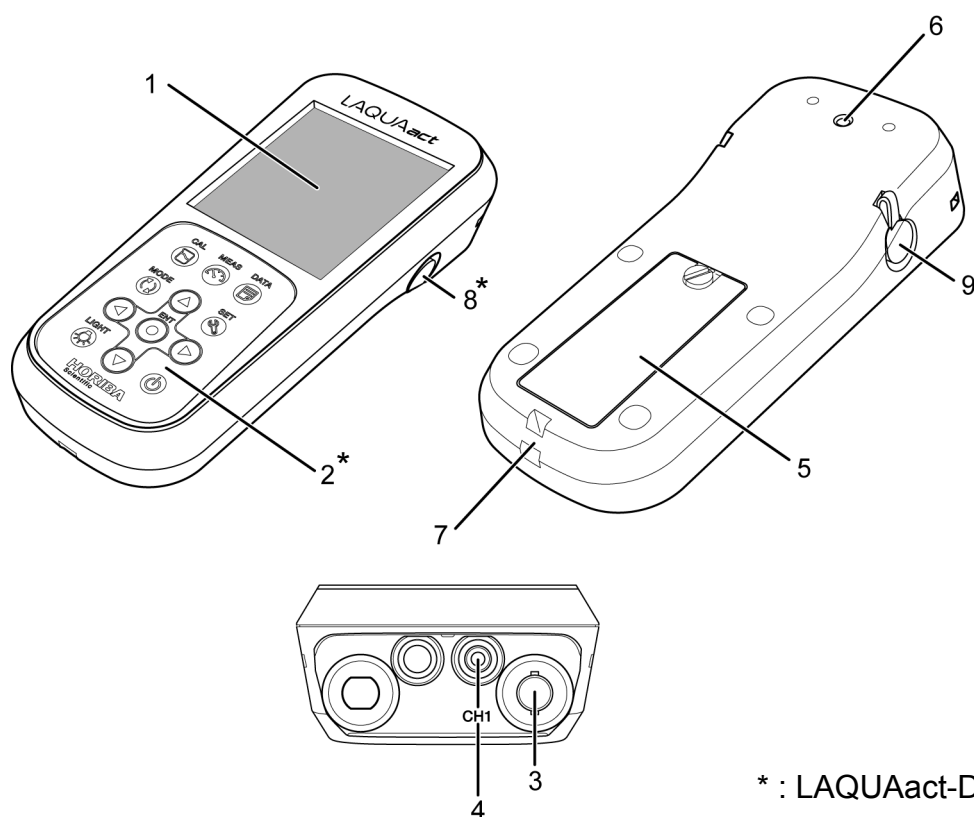
# Part Names and Basic Operation

This section describes the name of each part and the main role, function, and basic operation method of each part.

- **Names of each part..... 2**
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## ■ Names of each part

### ● Instrument



\* : LAQUAact-DO120 only

| No. | Name                              | Function  |
|-----|-----------------------------------|---|
| 1   | Display                           | Displays the measured value and set value and so on.                  |
| 2   | Operation keys                    | Used for instrument operation.<br>(LIGHT key: LAQUAact-DO120 only)    |
| 3   | Electrode connector               | Connects the BNC connector of the electrode.                          |
| 4   | Temperature connector (T)         | Connects the temperature connector (T) of the electrode.              |
| 5   | Battery cover                     | Set batteries inside.   |
| 6   | Electrode hook attachment section | Attach the electrode hook to carry with instrument.                   |
| 7   | Strap attachment section          | Attach a strap.   |
| 8   | Serial connector                  | Connects the serial cable and printer cable.<br>(LAQUAact-DO120 only) |
| 9   | AC adapter jack                   | Connects an optional AC adapter.                                      |

## ● Identification of manufacturing date

Manufacturing date can be identified from MFG No. described in the ID label on the backside of the instrument.

Third number from the left in the MFG No. indicates manufacturing year.

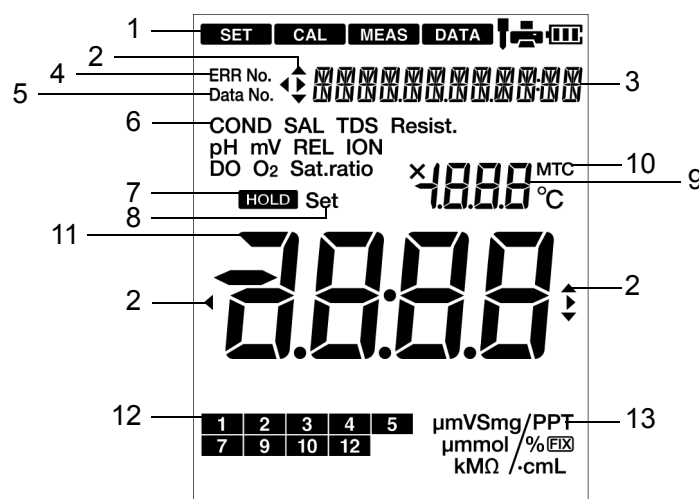
Fourth alphabet from the left in the MFG No. indicates manufacturing month.

The alphabet is assigned to month according to the table below.

Ex.: ID: AA6A0000 means the device manufactured in 2016 January.

| JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| A   | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   |

## ● Display



| No. | Name                                       | Function   |
|-----|--|--|
| 1   | Status icon                                | Displays the current operation mode, electrode status, printer or PC connection status, and remaining battery level. |
| 2   | Direction key icon                         | Displays the currently available direction key.  |
| 3   | Date and time, set item display area       | Displays the date and time and the set items.  |
| 4   | ERR No. icon                               | Displays an error No.  |
| 5   | Data No. icon                              | Displays the data No.  |
| 6   | Measurement parameter display area         | Displays the currently set measurement parameter.  |
| 7   | HOLD icon                                  | Lights when the measured value display is fixed.   |
| 8   | SET icon                                   | Lights when numerical values are entered.  |
| 9   | Temperature display area                   | Displays the measured and the set temperature.   |
| 10  | MTC icon                                   | Lights when the temperature setting is MTC (optional temperature setting).   |
| 11  | Measured value, set item display area      | Displays the measured value and the set value.   |
| 12  | Standard solution calibration history icon | When calibrating with air or standard solution, the corresponding icon lights.                                       |
| 13  | Unit display area                          | Displays the unit for the measurement parameter and the display item.  |



---

**•Battery level display**

Battery level is high.



Battery level is a little lower.



Battery level is low.

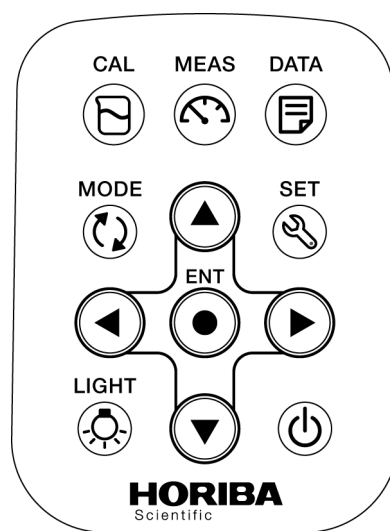
The backlight may become unavailable.



Battery has run out. Replace the batteries or use AC adapter (option).

"ERR No. 0002" is displayed and operation is disabled.

## ● Operation key



| Key | Name      | Function   |
|-----|-----------|--|
|     | MEAS key  | Changes the operation mode to the measurement mode during operation in a different mode.<br>Releases the fixed measurement value mode in the auto hold mode. |
|     | CAL key   | Changes from the measurement mode to the calibration mode.<br>Start calibration in the calibration mode.   |
|     | DATA key  | Changes from the measurement mode to the data mode.  |
|     | SET key   | Changes from the measurement mode to the setting mode.<br>Starts repeatability inspection after calibration is complete.                                     |
|     | POWER key | Turns ON/OFF the power of instrument.  |
|     | MODE key  | In the measurement mode, changes measurement parameters.   |
|     | LIGHT key | Turns on/off the back light.<br>(LAQUAact-DO120 only)  |
|     | ENTER key | Determines the selection or setting.<br>Save data in the measurement mode and calibration mode.  |
|     | UP key    | Changes the selected item.<br>Changes the number of the selected digit when entering numbers.  |
|     | DOWN key  |  |
|     | LEFT key  | Changes the selected item.   |
|     | RIGHT key | Changes the selected digit when entering numbers.  |


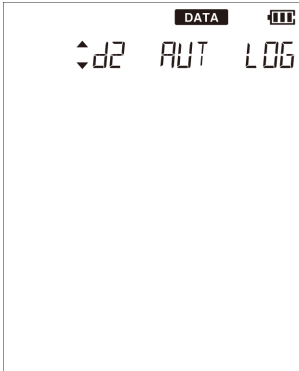

## ■ Basic operation

### ● Function layer

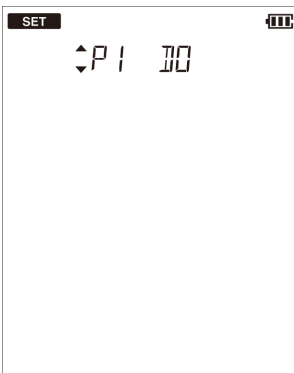


The function layer of the data mode and setting mode is shown as below.

"dX" and "PXX" indicates the program number which is shown in the screen of the instrument.

#### • Data mode

| Screen  | Layer        | Description   |
|---|--------------|---|
|    | d1: DATA OUT | Saved data display                                    |
|   | d2: AUT LOG  | Automatic data save setting<br>(LAQUAAact-DO120 only) |
|  | d3: DATA CLR | Deletion of saved data                                |

## • Setting mode

| Screen  | Layer         | Description   |
|---|---------------|---|
|  <p>SET P1 DO</p>    | P1: DO        | DO measurement settings                                   |
|   | P11: SAL      | Salinity correction setting                               |
|   | P12: PRES KPA | Air pressure correction setting                           |
|   | P13: CAL DATA | Calibration data display                                  |
|   | P14: CAL CLR  | Deletion of calibration data                              |
|  <p>SET P2 TEMP</p> | P2: TEMP      | Temperature setting                                       |
|   |               | Selection of temperature conversion or display : ATC, MTC |
|  <p>SET P3 GEN</p> | P3: GEN       | General settings  |
|   | P31: MEAS     | Selection of auto hold type: auto stability, auto hold    |
|   | P32: AUTO OFF | Automatic power off setting: 0 min to 30 min              |
|   | P33: RESET    | Initialization of settings                                |
|   | P34: DATE     | Date and time setting (LAQUAact-DO120 only)               |
|   | P35: PRINT    | Test print (LAQUAact-DO120 only)                          |

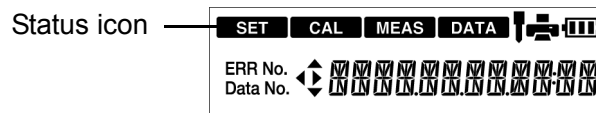
### Note

The indication of screen shown in this manual is based on LAQUAact-DO120. The program numbers of LAQUAact-DO110 is different from those of LAQUAact-DO120.

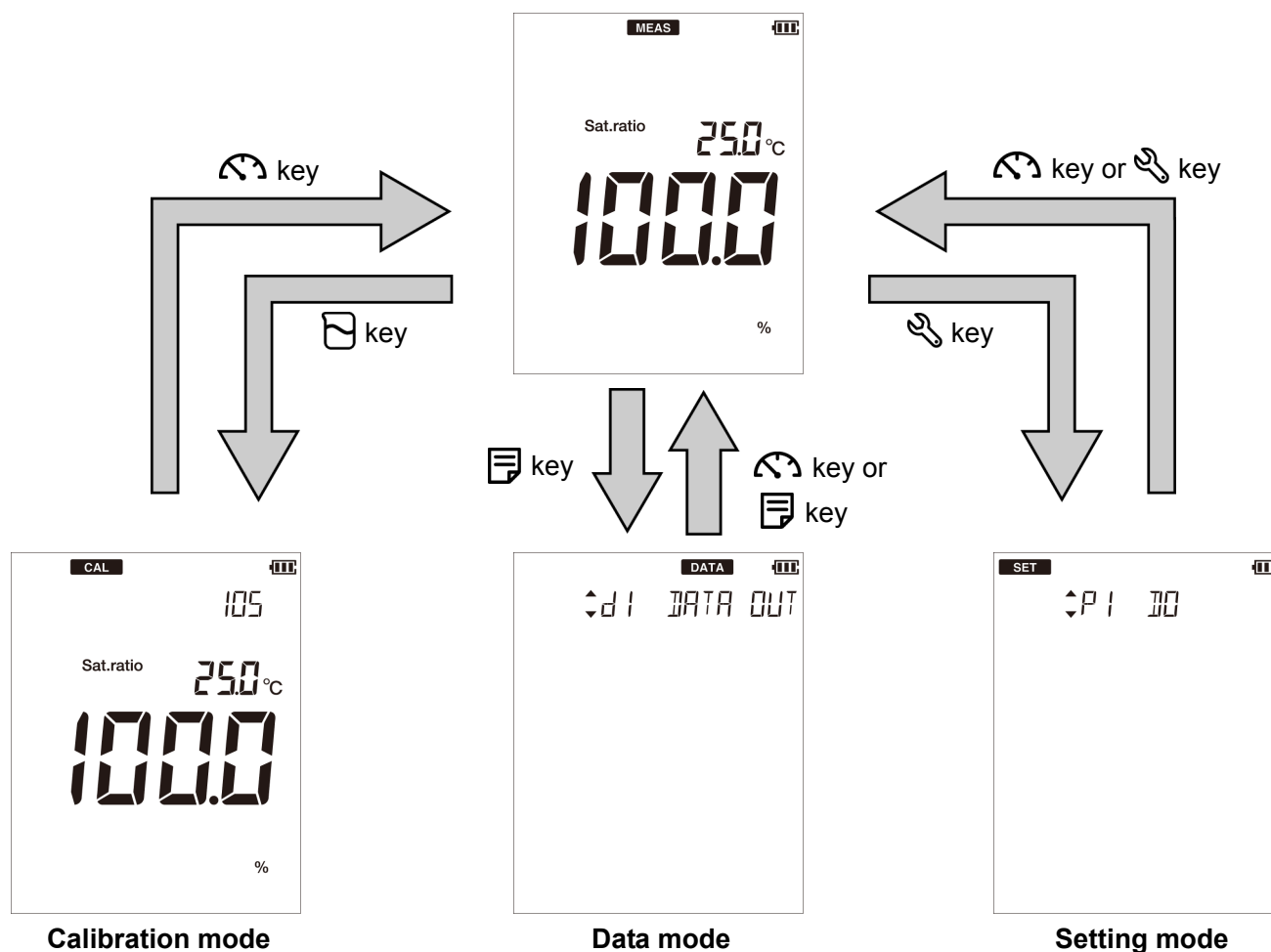
## ● Changing the operation mode

Change the operation mode from four available modes depending on the purpose of use. The status icon indicates the current mode.


You can change the operation mode using the corresponding key. However changing to the calibration mode, data mode, or setting mode is possible only from the measurement mode. When changing to a different mode, first change to the measurement mode and then change to the desired mode.



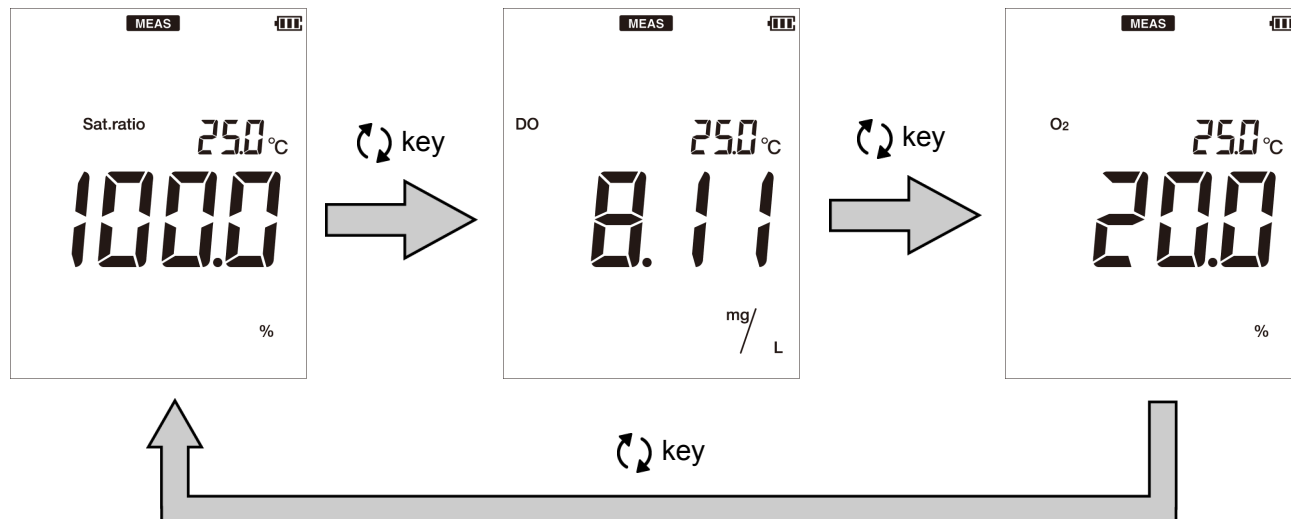
| Icon        | Name             | Function  |
|-------------|------------------|---|
| <b>MEAS</b> | Measurement mode | Performs measurement.                               |
| <b>CAL</b>  | Calibration mode | Performs calibration.                               |
| <b>DATA</b> | Data mode        | Performs data settings.<br>Displays the saved data. |
| <b>SET</b>  | Setting mode     | Performs various settings.                          |





### ● Changing the measurement parameter

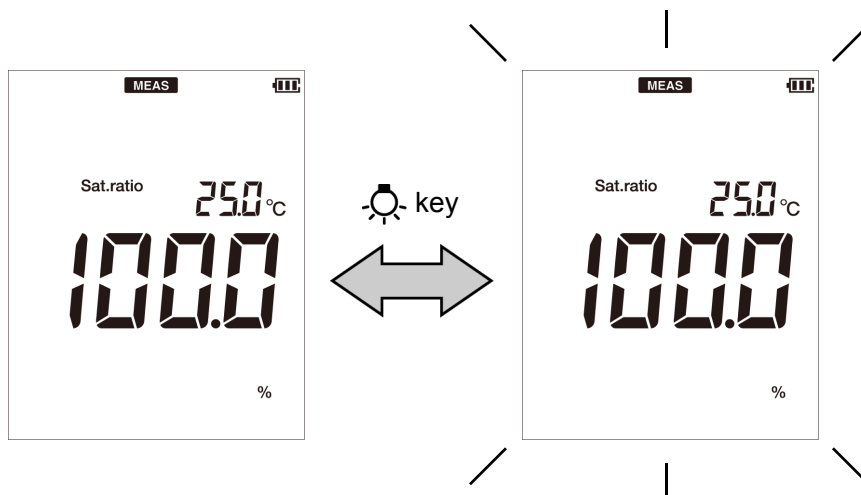
This instrument measures multiple parameters. For measurement, an electrode corresponding to the measurement parameter is required. In the measurement mode, the measurement parameter can be changed by pressing the  key.

This operation is available for the channel that is shown on the main screen.



## ● Using the backlight





When it is difficult to see the screen in a dark location, you can turn on the backlight by pressing the  key. If the backlight is not operated for 5 minutes, it automatically turns off. To turn it off manually, press the  key again while the backlight is on. This function is available for LAQUAact-DO120.

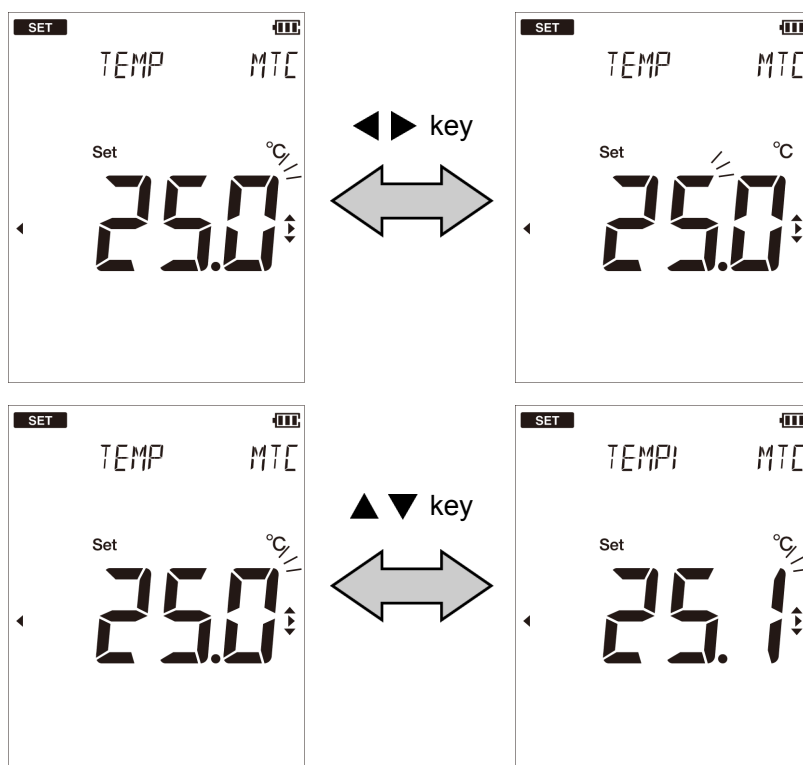


### Note

- Turning on the backlight consumes energy and shortens battery life.
- The backlight becomes unavailable when the battery level becomes low.

## ● Entering numeric values

When entering numeric values to make various settings and set a calibration value, change the selected digit using the   keys and increment or decrement the value (0 to 9) using the   keys.

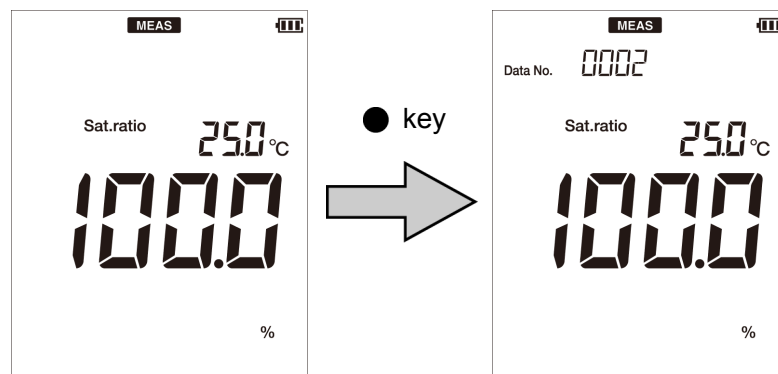


### ● Saving measurement data in the internal memory

Up to 100 (LAQUAact-DO110) or 1000 (LAQUAact-DO120) data items measured by the instrument can be stored in the internal memory. Saving the measurement data is possible only when the instrument is in the measurement mode.

#### 1. Press the ● key while the data to save is displayed.

The saved data is displayed for two seconds and then the display returns to the previous screen automatically.



#### Note

If the data saved reaches 100 (LAQUAact-DO110) or 1000 (LAQUAact-DO120) data items, an error occurs and "ERR No. 0010" is displayed. Copy or transfer necessary data to a PC and delete the data from the memory ("Deleting all saved data" (page 36)).

---



# Measurement

This section describes the basic measuring method of each measurement parameter.

|  |    |
|--|----|
| ■ Preparation .....                              | 14 |
| ● Confirmation before starting measurement ..... | 14 |
| ● Turning ON the instrument.....                 | 15 |
| ● Connecting an electrode .....                  | 18 |
| ■ Dissolved oxygen measurement.....              | 19 |
| ● Setting the instrument .....                   | 19 |
| ● Performing calibration .....                   | 24 |
| ● Performing measurement.....                    | 29 |
| ● Saving measured value .....                    | 30 |

## ■ Preparation

### ● Confirmation before starting measurement

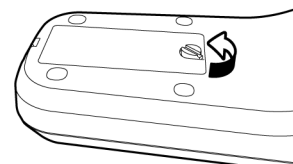
- Have you prepared the appropriate electrode for the measurement parameter?  
⇒ If not, purchase the appropriate electrode.
- Is the prepared electrode in good condition?  
⇒ If the responsive part is stained or damaged, it may not be possible to obtain accurate values.
- Have you prepared the appropriate standard solution for the measurement parameter?  
⇒ If not, prepare the standard solution according to your applications.
- Are there any items that should not be wet or stained around the instrument?  
⇒ Depending on the operation during measurement, items around the instrument could get wet or stained. Secure sufficient space around the instrument and perform measurement while always paying attention to safety.
- Are there any devices that can be a source of noise?  
⇒ Measured values could be affected. Do not use the instrument near such devices.  
Always ground devices operated by AC power.

## ● Turning ON the instrument

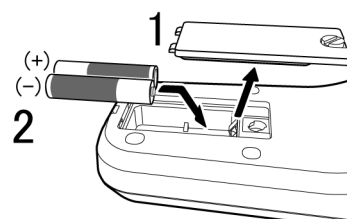
### • Inserting the batteries

This instrument is operated by batteries. You can use AAA alkaline batteries or AAA Ni-MH rechargeable batteries. Perform the following procedure to insert batteries in the instrument.

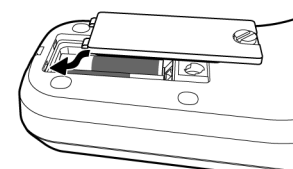
1. Turn the knob on the battery cover on the back of the instrument counterclockwise to unlock the battery cover.



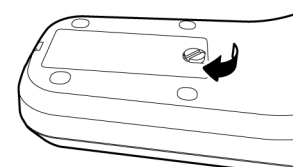
2. Remove the battery cover and set the batteries inside.



3. Put the battery cover back in.



4. Turn the knob on the battery cover on the back of the instrument clockwise to lock the battery cover.



#### Note

- Do not replace the batteries in a dusty place or with wet hands. Dust or moisture could get inside the instrument, possibly causing instrument malfunction.
- Do not short-circuit a battery.
- Set the + and – side of the battery correctly.
- When the battery has run out or the instrument will not be used for a long time, remove the batteries.
- Of the specified battery types, make sure to use two batteries of the same type.
- Do not use a new battery together with a used battery.
- When using the Ni-MH batteries, do not use a fully charged battery together with an insufficiently-charged battery.

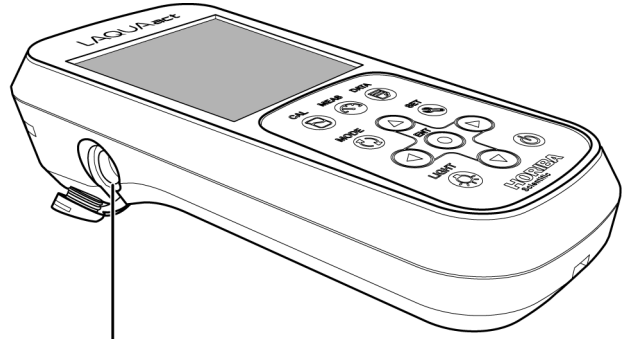
### • Using the AC adapter (option)

It is possible to use the AC adapter to operate the instrument.

Perform the following procedure to connect AC adapter to the instrument.

The AC adapter is an option. To purchase it, contact your dealer. (Refer to "Options" (page 70).)

1. Open the AC adapter cover of the instrument.
2. Insert the AC adapter cable by fitting with the AC adapter jack of in the instrument.
3. Insert AC adapter into the electrical socket.




AC adapter jack

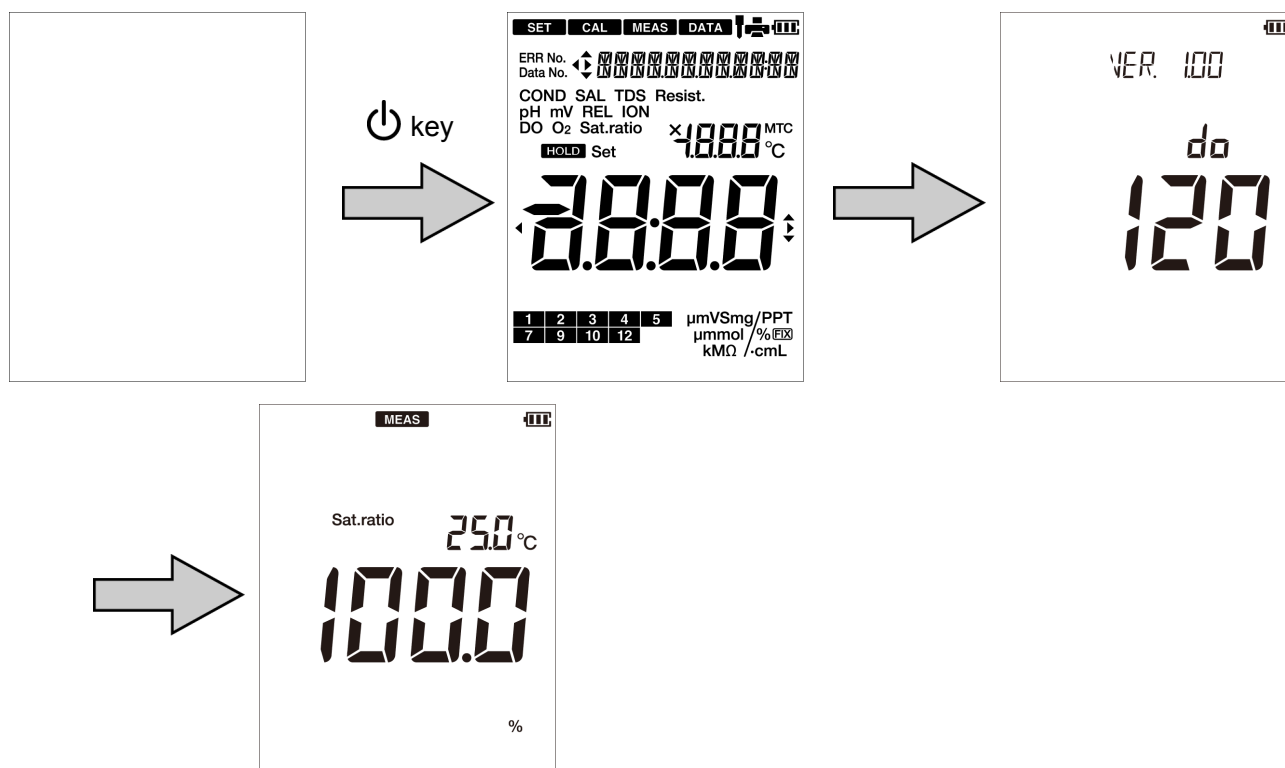
---

#### Note


- Do not insert the cable with force when the connector does not match the jack.
  - When not using the AC adapter, close the AC adapter connector cover.
  - While the AC adapter is connected, the instrument does not have the dust-proof and waterproof performance. Dust or moisture could get inside the instrument, possibly causing instrument malfunction.
-

## • Pressing the POWER key

After setting the batteries or connecting the AC adapter, press the  key over one second. The LCD is fully displayed for one second, and the screen displays the version number of software and the model, and then displays the measurement mode.



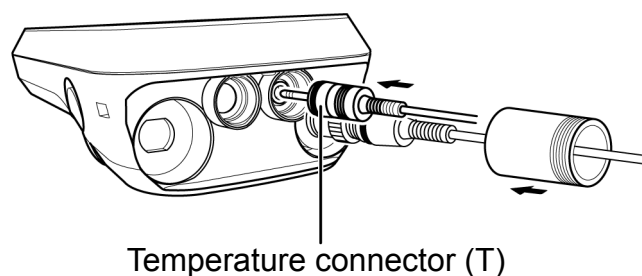
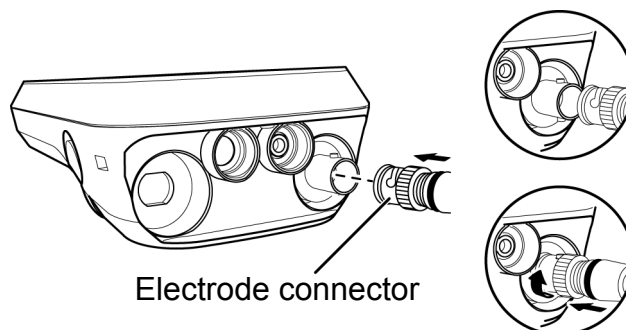
### Note

- Do not hold down the  key after the power of the instrument is turned ON.
- Do not use the tip of nail or an object with a sharp end to press keys.
- "VER" indicates the version of software. It may be revised when the software is updated.

### ● Connecting an electrode

To perform measurement, it is necessary use the appropriate electrode for measurement parameters. Recommended electrodes for each measured sample are listed in our product catalog and on our website. Refer to them when preparing electrodes. Use the following procedure to correctly connect the electrode to the instrument.

1. Insert the electrode connector by fitting its groove with the connector pin of the instrument.
2. Turn the electrode connector clockwise by following the groove.
3. Put the connector cover on the connector.
4. When using a combination electrode equipped with a temperature sensor, insert the temperature connector (T) into the jack of the temperature connector (T).



---

#### Tip

If the temperature connector (T) is unconnected or connection is wrong, temperature selected for MTC (manual temperature compensation) is displayed as the sample temperature.


---

Preparation for measurement is complete.

For details of the measurement operation, refer to the following pages.

## ■ Dissolved oxygen measurement

You can measure the dissolved oxygen, oxygen concentration, and saturated oxygen concentration of a sample with a DO electrode. Oxygen concentration and saturated oxygen concentration are calculated from the measured value of dissolved oxygen.

Press the  key to select the measurement parameter ("Changing the measurement parameter" (page 10)).





The operation is the same for all measurement parameters.

## ● Setting the instrument

### • Setting temperature compensation

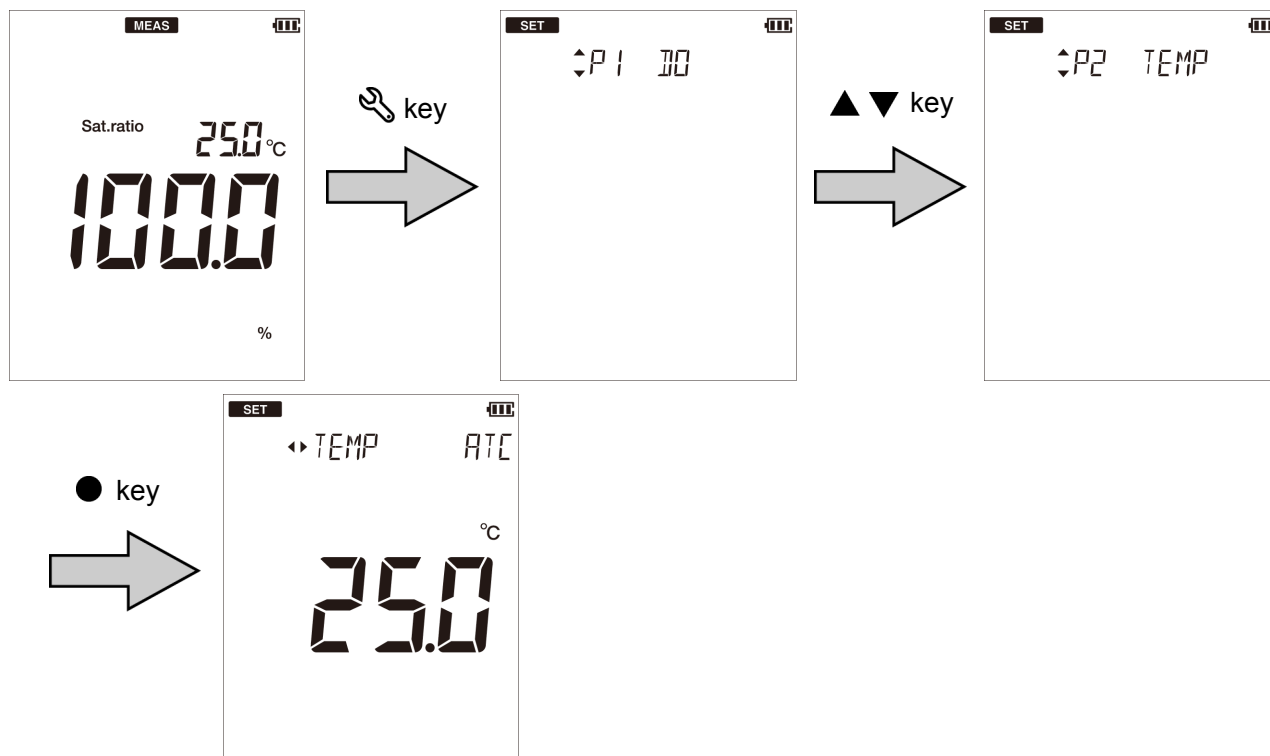
Automatic temperature compensation function can be used by using a DO electrode equipped with a temperature sensor. You can perform calibration with compensation by measuring the temperature of the standard solution (or the temperature of the air, when air calibration). You can correct the sensitivity of the calibration data according to the sample temperature with this function.

If you do not use the automatic temperature compensation function, match the temperature setting of the instrument to the temperature of the air (when air calibration is performed) or the standard solution (when standard solution calibration is performed) during calibration and match the sample temperature to the temperature setting of the instrument in measurement. By doing so, you can obtain the correct measurement value without being affected by sensitivity variation caused by temperature.

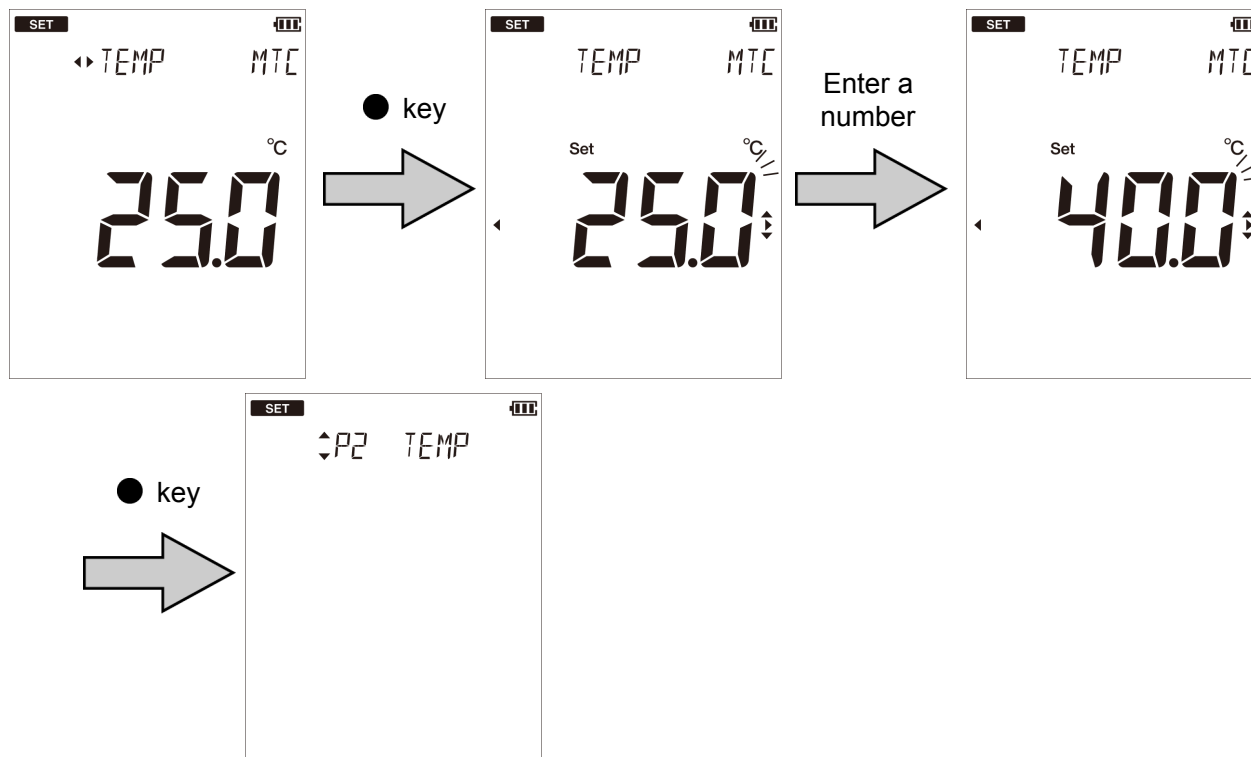
1. Press the  key to enter the setting mode.
2. Press the   keys to select "TEMP" (temperature setting) and then press the  key.


If the temperature connector (T) is connected, "ATC" (automatic temperature compensation) appears. If the temperature connector (T) is not connected, "MTC" (manual temperature compensation) appears.

In the case of "ATC", you can calibrate the temperature sensor (refer to "Calibrating temperature sensor" (page 41)).



3. In the case of "MTC", enter the temperature to be compensated for and press the ● key to confirm.











To return to the measurement mode, press the  key.

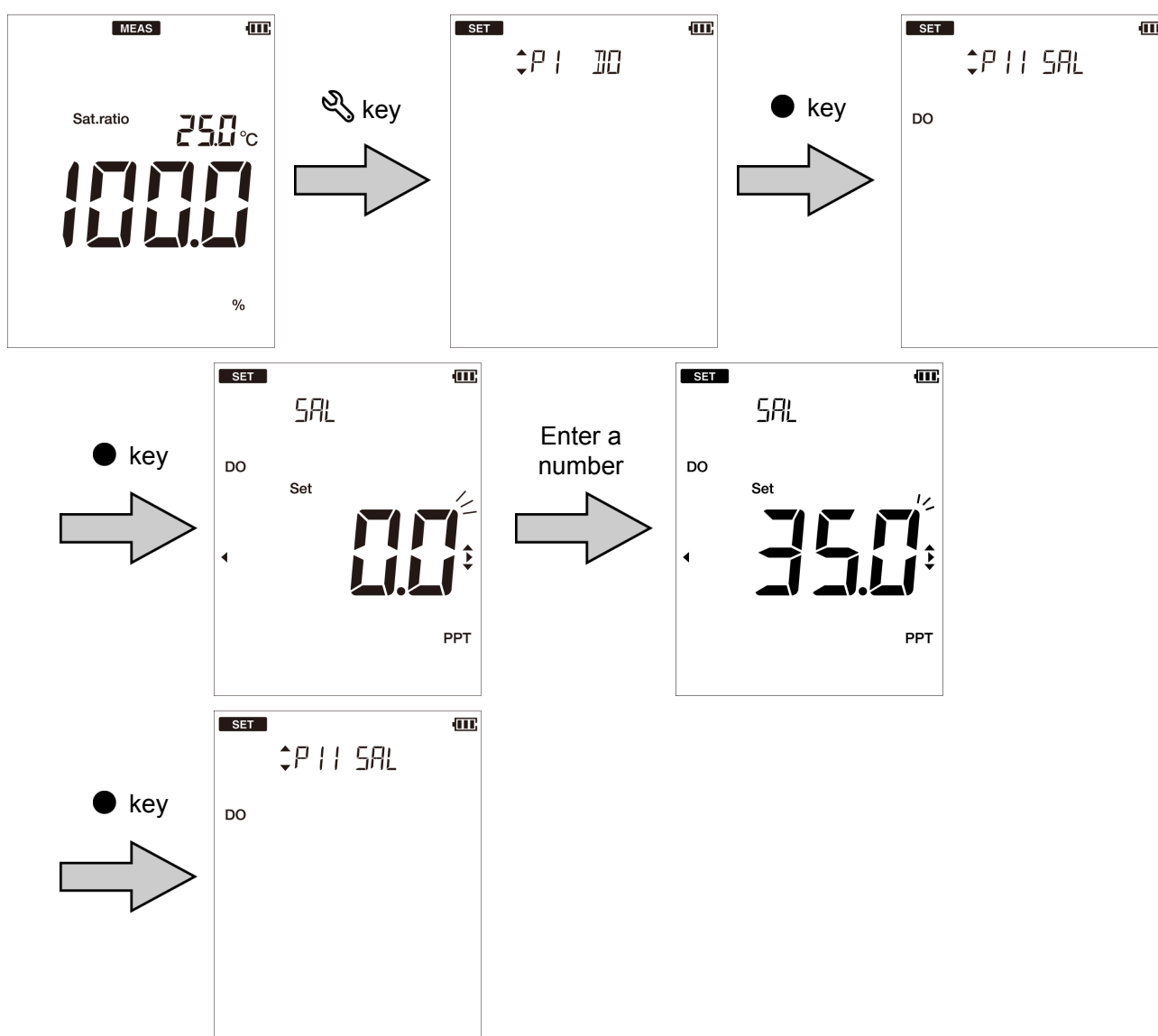


### • Setting salinity correction (default: 0.0 PPT)

Because dissolved oxygen is affected by the salinity concentration, you need to correct it at measurement. Set the salinity concentration of the sample beforehand.

You can select arbitrary numeric value or sea concentration (35.0 PPT). If the measured target does not contain saline matter, set to 0.0 PPT.








1. Press the  key to change the setting mode.
2. Press the   keys to select "DO" (DO correction setting) and then press the  key.
3. Press the   keys to select "SAL" (salinity coefficient setting) and then press the  key.
4. Enter the salinity coefficient and press the  key.  
The setting range is 0.0 PPT to 40.0 PPT.

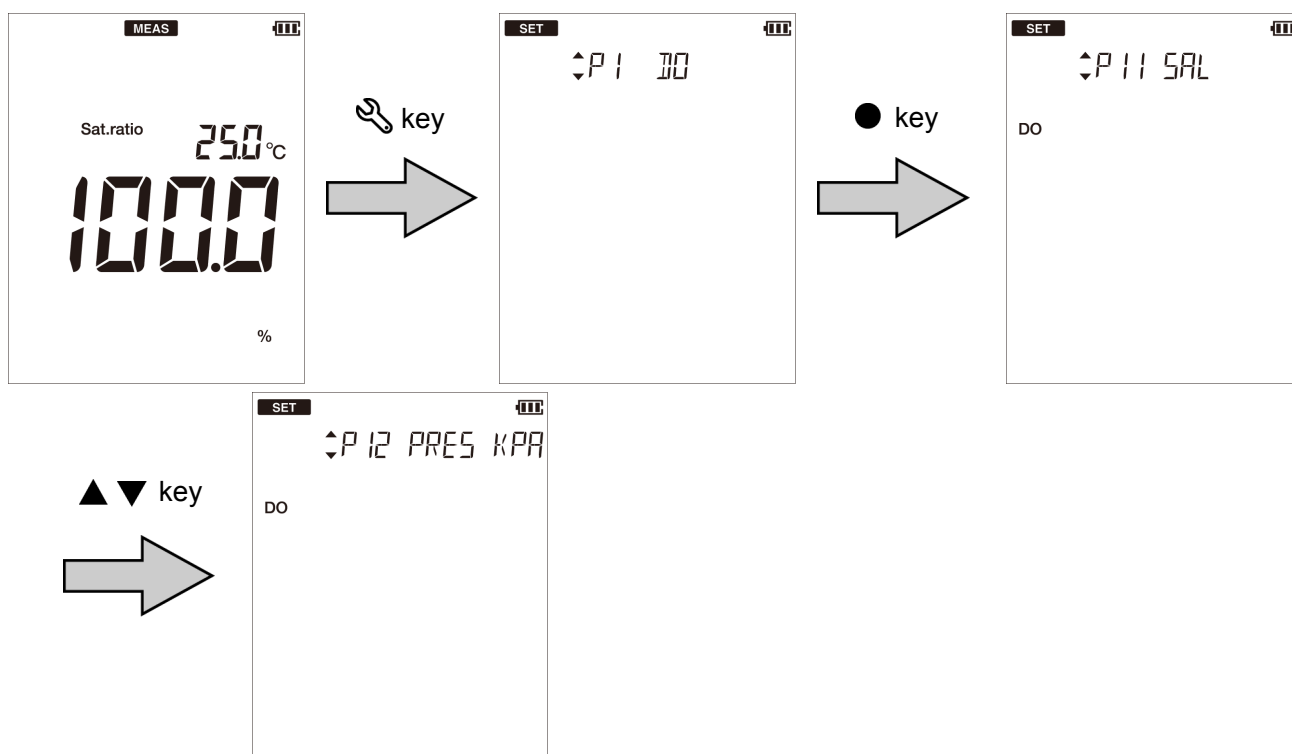


To return to the measurement mode, press the  key.

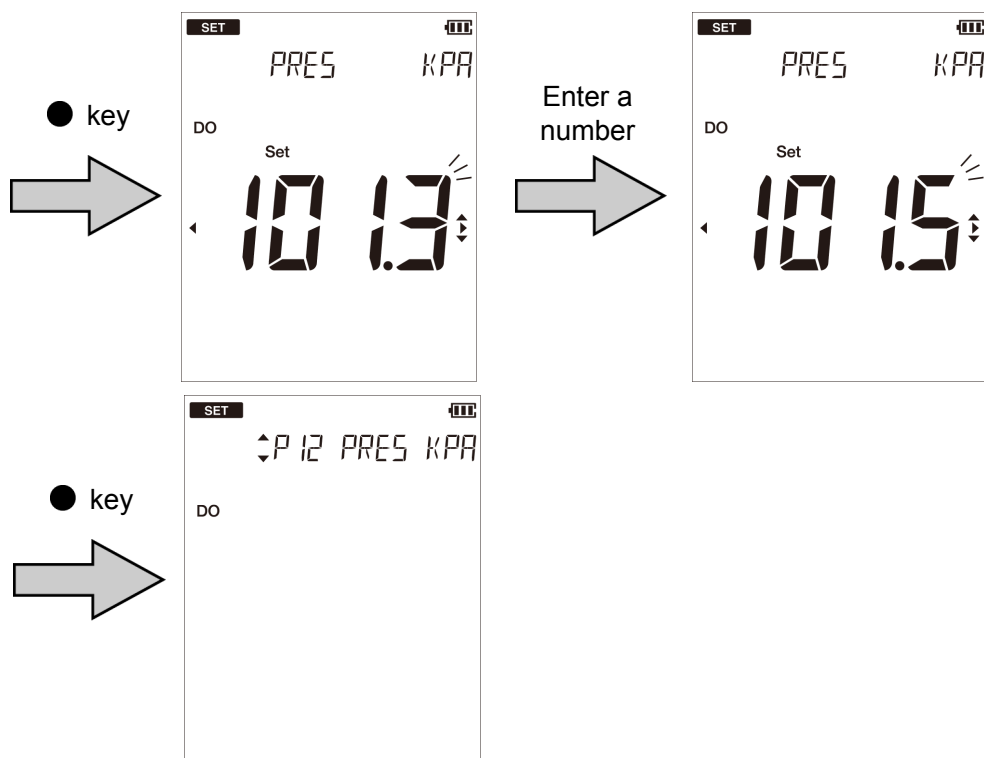
### • Setting air pressure correction (default: 101.3 kPa)

Amount of oxygen that can be dissolved in water is affected by air pressure in the location where measurement is taking place. You need to set the air pressure of the measurement location to the instrument before calibration to correct the pressure influence, and then perform measurement.

1. Press the  key to enter the setting mode.
2. Press the   keys to select "DO" (DO collection setting) and then press the  key.
3. Press the   keys to select "PRES KPA" (air pressure collection setting) and then press the  key.



4. Enter the air pressure value of the measurement location and then press the ● key.



To return to the measurement mode, press the ↶ key.

### ● Performing calibration

Calibration of the DO electrode is required to measure dissolved oxygen accurately.

We recommend performing calibration once a day, before the first measurement.

According to the following procedure, perform calibration accurately.

You can use the saturated oxygen concentration mode (%) or dissolved oxygen measurement mode (mg/L) for calibration.

---

#### Note

To perform accurate calibration, set the air pressure value before calibration ("Setting air pressure correction (default: 101.3 kPa)" (page 22)).

---

#### • Calibrating in the saturated oxygen concentration mode (%)

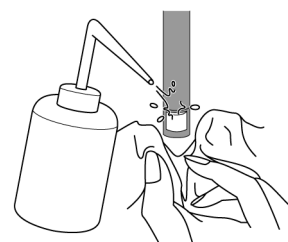
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#### Note

- Air calibration must be performed in clean air. If air calibration is performed in a location subject to dramatic temperature change, exposed to wind and rain, or near a heating appliance, an error may occur or the value may not be stabilized.
  - Do not hold the DO electrode with hand during calibration. DO electrode may be affected by temperature, causing an unstable value.
- 

1. **Clean the membrane at the tip of the DO electrode with pure water (or deionized water) and wipe it with a soft cloth at least 10 minutes before calibration.**

Be careful not to break the membrane at the tip of the electrode.





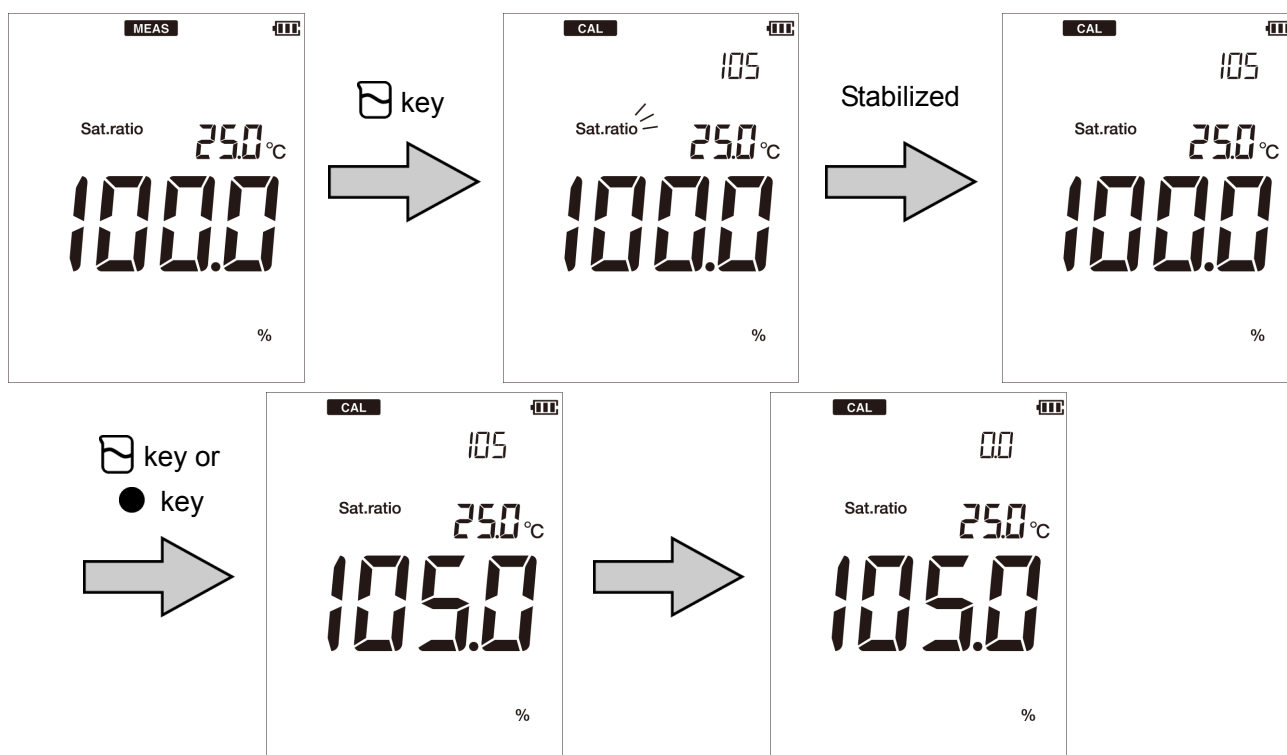
2. **Press the  key to enter the saturated oxygen concentration mode.**

3. **Hold the DO electrode still in clean air.**


4. **Press the  key to enter the calibration mode.**

Stability judgment starts and the Sat.ratio icon blinks. When the value is stabilized, the Sat.ratio icon changes from the blinking state to the lit state. When you press the



 key or the  key, the calibrated value is displayed (the calibrated value differs depending on the conditions because it is affected by temperature and air pressure).

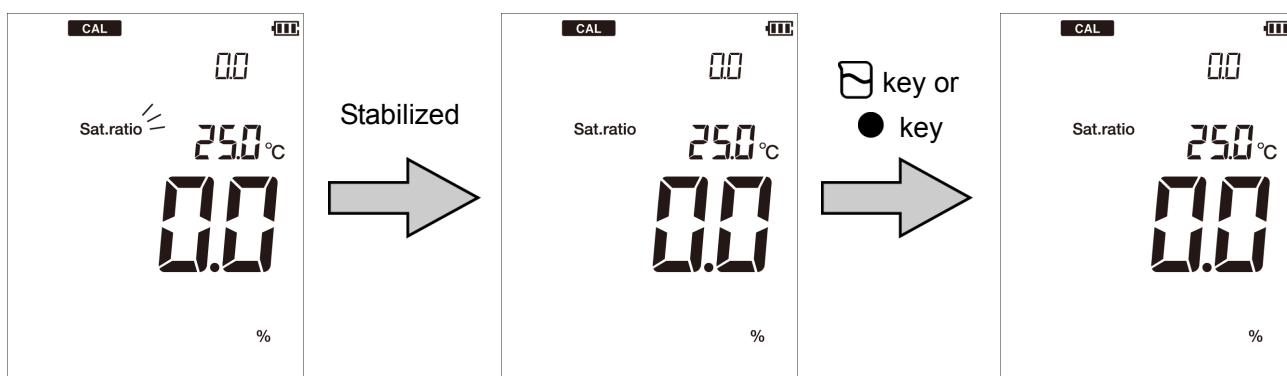


#### Tip

You can finish calibration by pressing the  key.

#### 5. To perform zero calibration, immerse the same electrode in the zero standard solution.

Stability judgment starts and the Sat.ratio icon blinks. When the value is stabilized, the Sat.ratio icon changes from the blinking state to the lit state. When you press the  key or the  key, the calibrated value is displayed. The calibrated value is displayed and then the display returns to the measurement screen.



#### •Preparing the zero standard solution

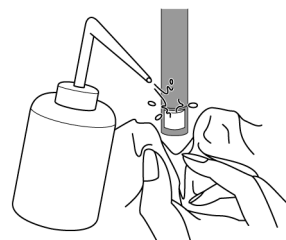
Add 50 g sodium sulfite ( $\text{Na}_2\text{SO}_3$ ) into 1000 mL pure water (or deionized water) and stir it until sodium sulfite completely dissolves.


### • Calibrating in the dissolved oxygen measurement mode

When you perform two-point calibration in the dissolved oxygen measurement mode, calibrate in the order from a high-concentration solution to a low-concentration solution.

1. **Clean the membrane at the tip of the DO electrode with pure water (or deionized water) and wipe it with a soft cloth at least 10 minutes before calibration.**

Be careful not to break the membrane at the tip of the electrode.



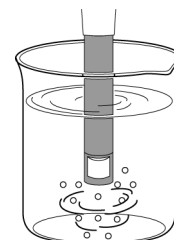
2. **Prepare the standard solution to be used for calibration.**
3. **Press the  key to change to dissolved oxygen measurement mode.**

4. **Immerse at least 6 cm of the tip of the DO electrode in the calibration solution.**

In two-point calibration, immerse it in the high-concentration solution first.

In order to immerse the temperature sensor in the standard solution, make sure to immerse the electrode surely.




During measurement, use a stirrer to stir the standard solution at 1000 rpm to 1500 rpm.

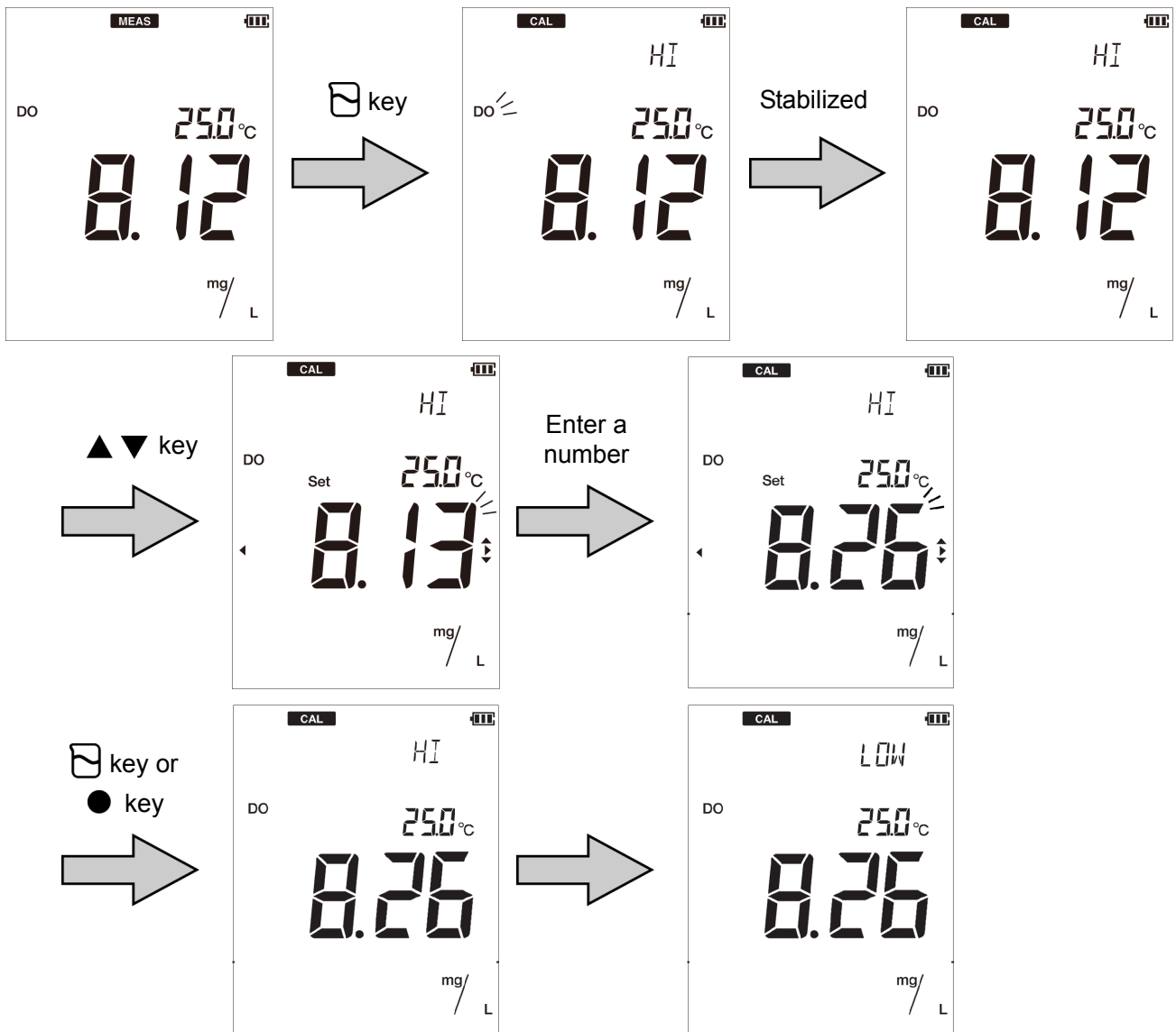


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#### Note

- If the temperature of the standard solution rises due to the use of a stirrer, use a temperature controlled bath.
  - When using an electrode "9551-20D" or "9551-100D", immerse at least 9 cm from the tip.
- 

5. **Press the  key to enter the calibration mode.**  
Stability judgment starts and the DO icon blinks. When the value is stabilized, the DO icon changes from the blinking state to the lit state.
6. **Enter the DO concentration value of the solution to be used for calibration.**
7. **Press the  key or the  key.**  
The value is set to the displayed value, and the mode is change to "LOW" concentration calibration.

**Tip**

You can finish calibration by pressing the key.

- To perform the 2nd point calibration, clean the DO electrode well in the same manner as the step 1. and immerse it in the second standard solution (low-concentration solution).

**Note**

When using an electrode "9551-20D" or "9551-100D", immerse at least 9 cm from the tip.

- Immerse the DO electrode in the standard solution.**

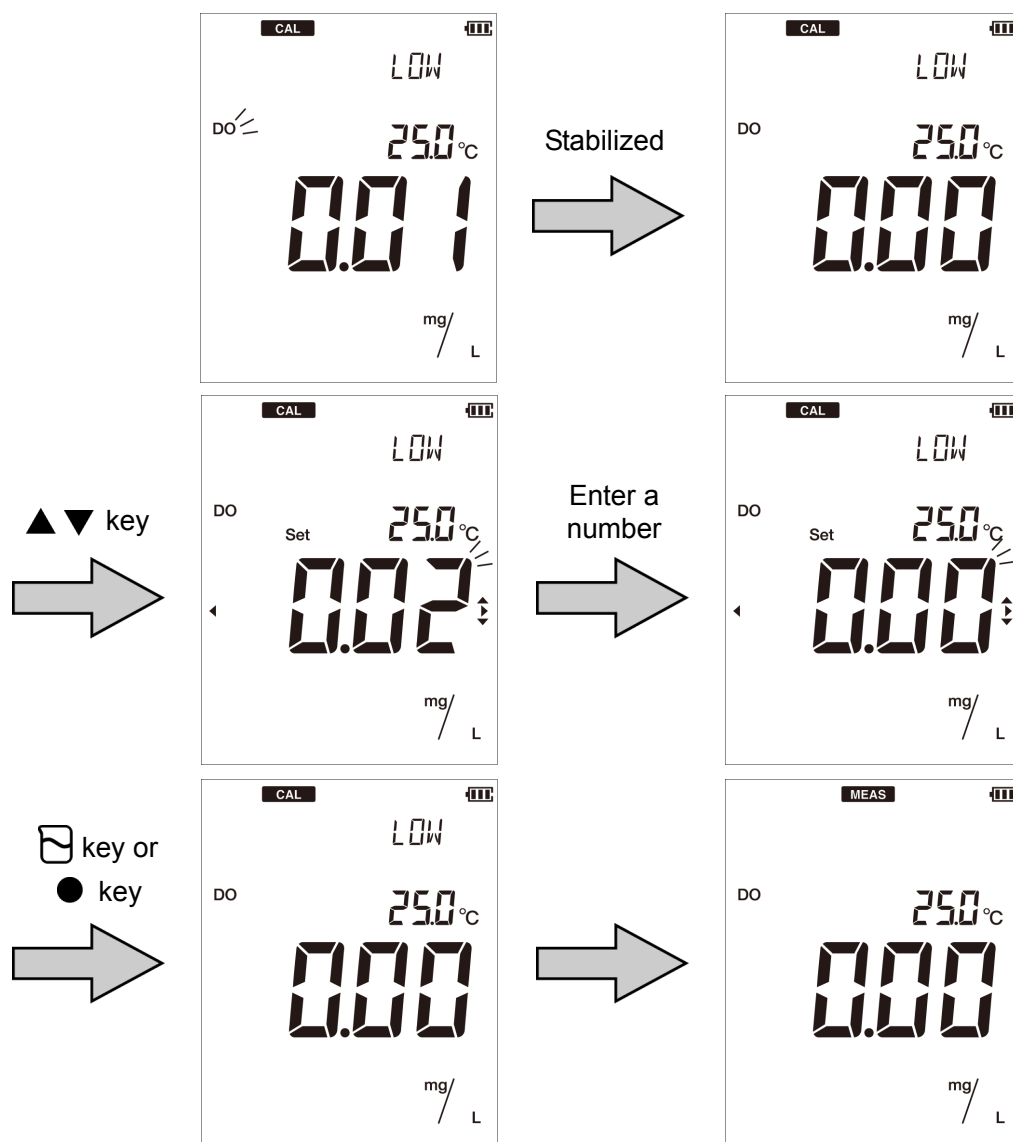
As with the step 4., immerse at least 6 cm of the tip of the DO electrode.

Stability judgment starts and the DO icon blinks. When the value is stabilized, the DO icon changes from the blinking state to the lit state.

- Press the **▲ ▼** keys to enter the DO concentration value of the solution to be used for calibration.

### 11. Press the key or the key.

The value is set to the displayed value, and the display returns to the measurement mode.



Calibration using the standard solution is complete.


#### Note

- The zero standard solution and the span standard solution are determined automatically by the instrument.
- If calibration of any standard solution is performed again, only the value of calibrated solution is updated.



## ● Performing measurement

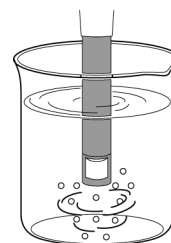
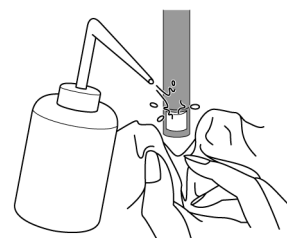
You can perform measurement in the measurement mode by immersing the DO electrode in the sample. Also, you can use the automatic hold function to judge the stability of the measured value. The automatic hold function has two modes, the auto stability mode and the auto hold mode. For the instruction to set the mode, refer to "Setting the auto stability and auto hold function" (page 43).

1. Press the  key to change the parameter to measure.
2. Clean the membrane at the tip of the DO electrode with pure water (or deionized water) and wipe it with a soft cloth at least 10 minutes before calibration.

Be careful not to break the membrane at the tip of the electrode.

3. Immerse at least 6 cm from the tip of the DO electrode in the sample solution.

In order to immerse the temperature sensor in the standard solution, make sure to immerse the electrode surely. During measurement, use a stirrer to stir the sample solution at 1000 rpm to 1500 rpm.




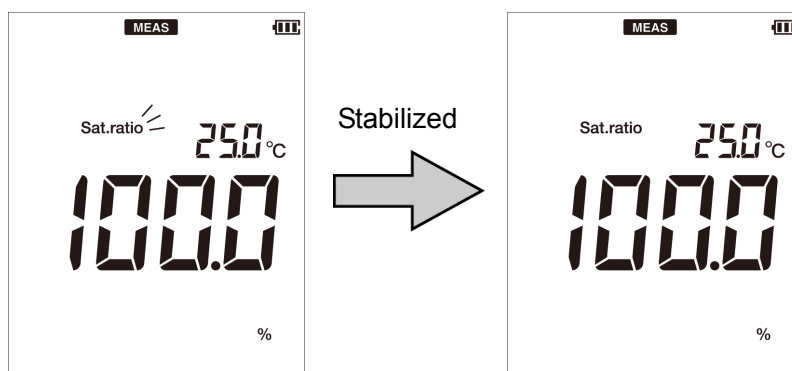
### Note

When using an electrode "9551-20D" or "9551-100D", immerse at least 9 cm from the tip.

4. Immerse the DO electrode in the sample solution.

Stabilization judgment starts and the DO icon blinks. When the value is stabilized, the DO icon changes from the blinking state to the lit state and the display is fixed to the measured value at the stable time.

For the auto stability mode, if the measurement DO value does not meet stability condition, the fixed value is released. When the measured value meets stability condition again, the measured value is fixed. For the auto hold mode, press the  key to release the fixed measurement value. When the measured value meets stability condition again, the measured value is fixed.



### Note

- The criteria of stability judgment in the automatic hold measurement are as follows.

|                                 |   |
|---------------------------------|---|
| Dissolved oxygen:               | Display value change for 10 seconds is less than 0.03 mg/L and temperature change is less than 2.0°C. |
| Oxygen concentration:           | Display value change for 10 seconds is less than 0.1% and temperature change is less than 2.0°C.      |
| Saturated oxygen concentration: | Display value change for 10 seconds is less than 0.3% and temperature change is less than 2.0°C.      |
  - "Ur" (Under) lights when the measured value is below the display range and "Or" (Over) when the measured value is above the display range. For details on how to correct them, refer to "The measured value is out of the measurement range" (page 64).
- 

## ● Saving measured value

To save the measurement data, press the ● key in the screen that you want to save. For details, refer to "Saving measurement data in the internal memory" (page 12).

# Using Various Functions





This section describes functions available in this instrument.





|   |    |
|---|----|
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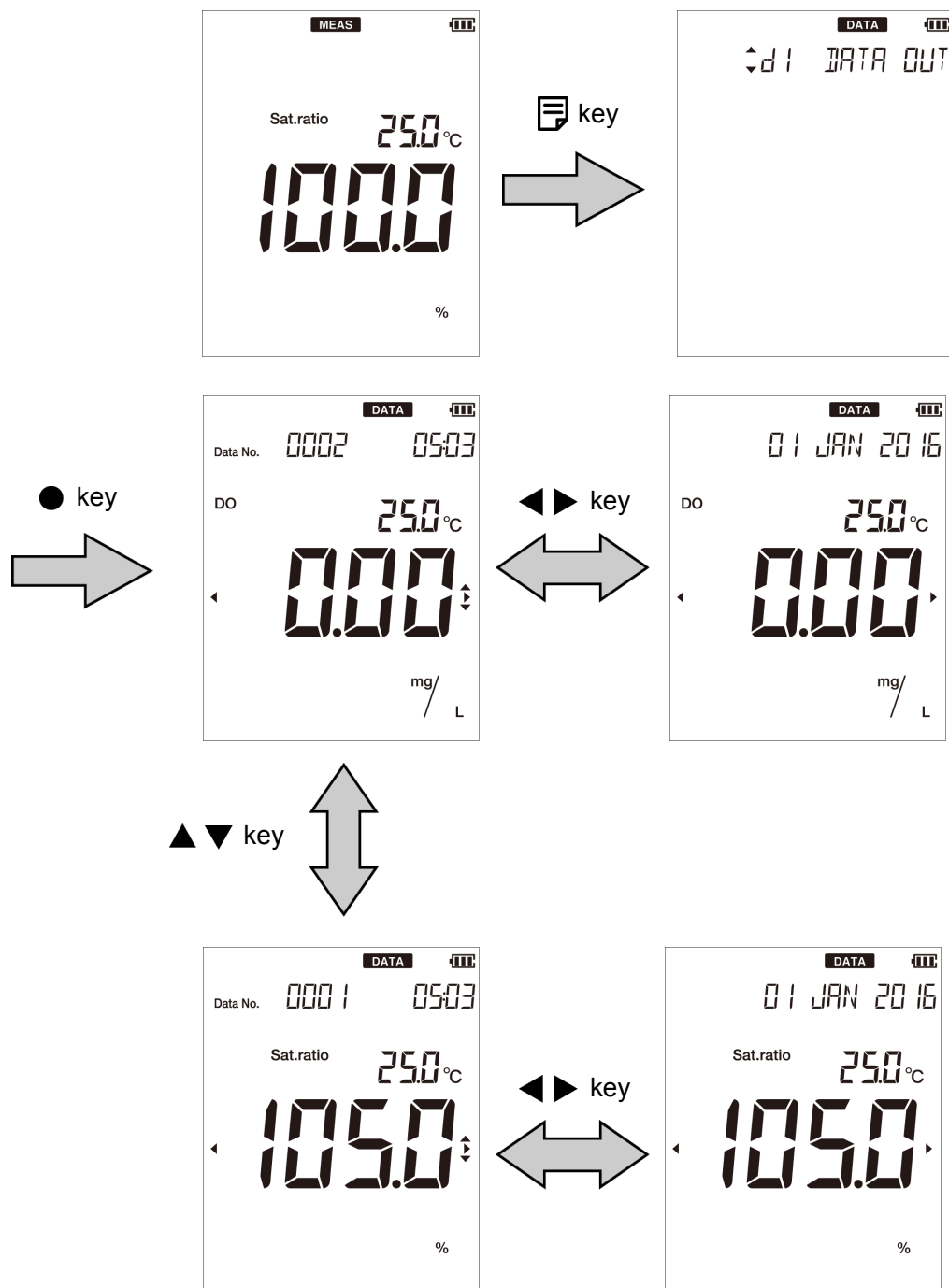
## ■ Data functions

### ● Displaying saved data

You can display the data saved in the internal memory.

1. Press the  key to enter the data mode.
2. Press the   keys to select "DATA OUT" (display saved data) and then press the  key.

Press the   keys to change the measurement data and press the   keys to change the display between date and data number.



To return to the measurement mode, press the  key and then press the  key.





## ● Using the automatic data save

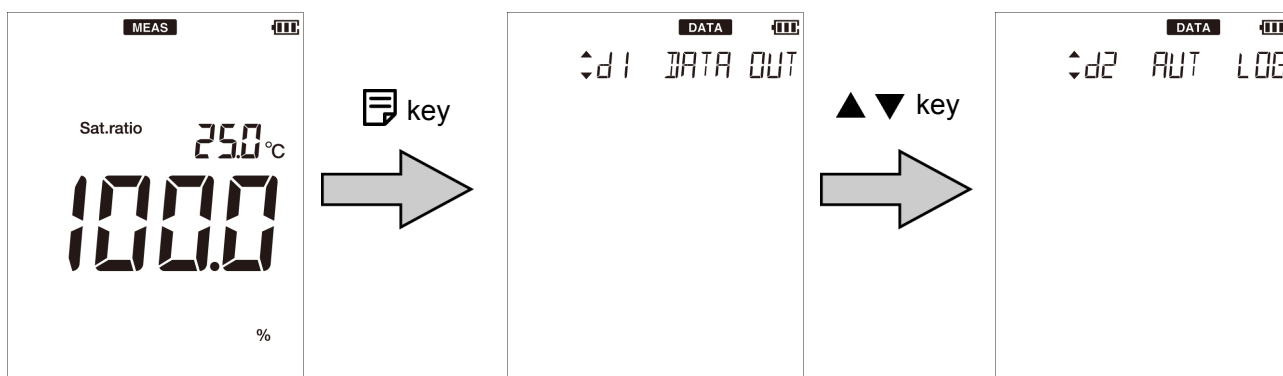
This function saves the data in the internal memory of the instrument at the specified interval automatically.


While using this function, auto stability and hold mode are not available and the automatic power off setting is disabled.

If the batteries run out while using the automatic data save function, the data saved until just before the batteries run out. Replace the batteries and check the data.

This function is available for LAQUAact-DO120.

1. Press the  key to enter the data mode.
2. Press the   keys to select "AUT LOG" (automatic data save) and then press the  key.

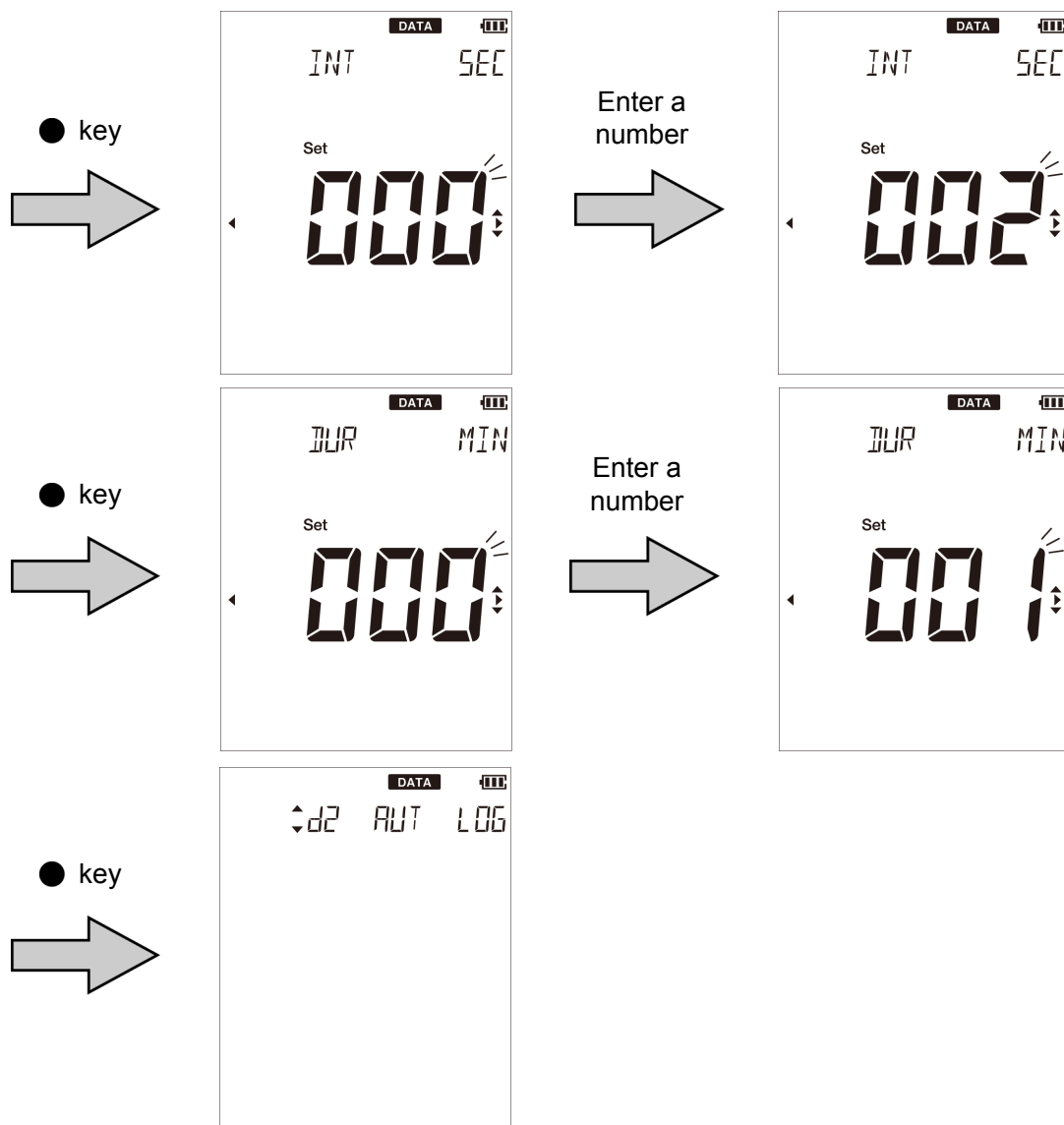


3. Enter the interval of saving in seconds and press the  key.  
An interval from 0, 2 s to 3600 s can be set.  
When "0" is entered, this function is set to OFF.

**4. Enter the period of saving in minutes and press the ● key.**

A period from 0 min to 3600 min can be set.

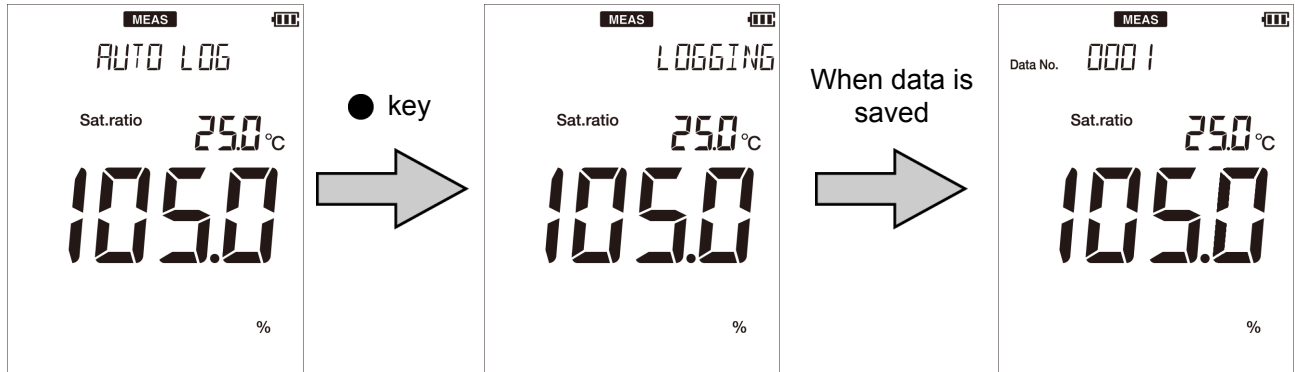
"0" indicates no period.



**5. Press the ⏮ key to enter the measurement mode.**

**6. Pressing the ● key starts saving the data (when the setting is "ON").**

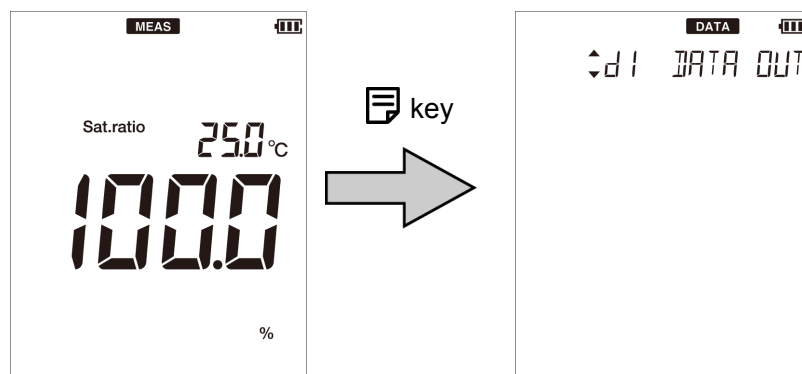
Pressing the ● key again stops the data saving process. During automatic data saving measurement, data is displayed for one second each time a measurement takes place. When more than 1000 data items are saved, "ERR No. 0010" is displayed and data saving is stopped. When you delete the data, the error is cleared (refer to "Deleting all saved data" (page 36)).



### ● Deleting all saved data

Delete all data saved in the internal memory. Data cannot be deleted selectively. Copy or transfer the data to a PC for storage if necessary.

1. Press the  key to enter the data mode.

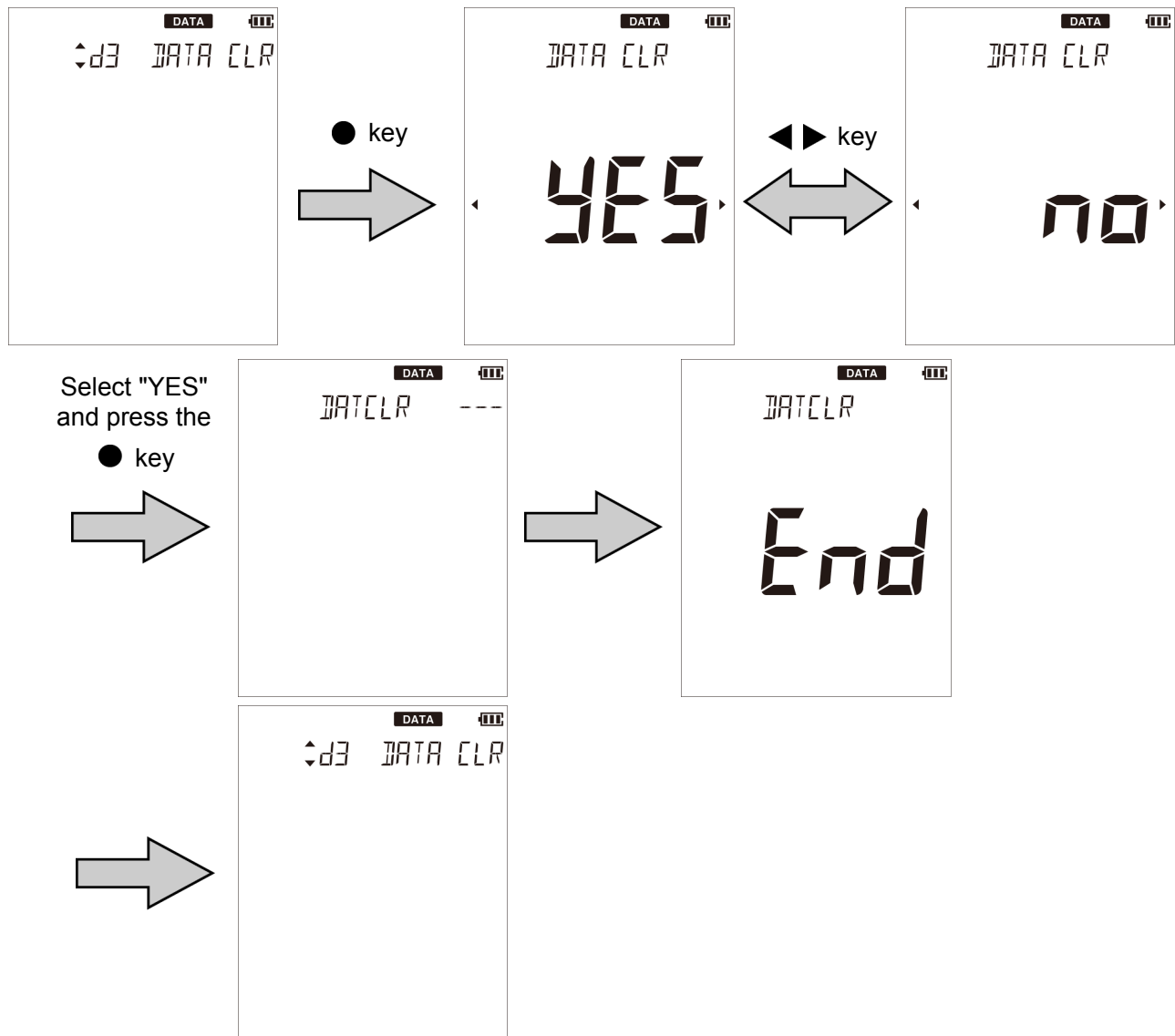


2. Press the ▲ ▼ keys to select "DATA CLR" (delete saved data) and then press the ● key.



3. Select "YES" to delete the saved data, or select "NO" to cancel deleting it. And then press the **●** key to confirm.

When "YES" is selected, "END" appears after deletion is complete.







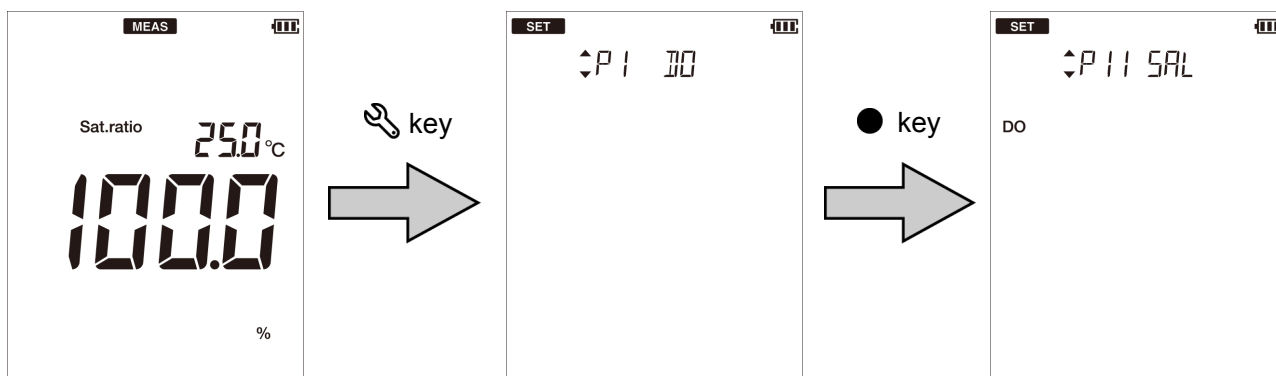
To return to the measurement mode, press the  key.

## ■ Measurement setting

### ● Displaying the latest calibration

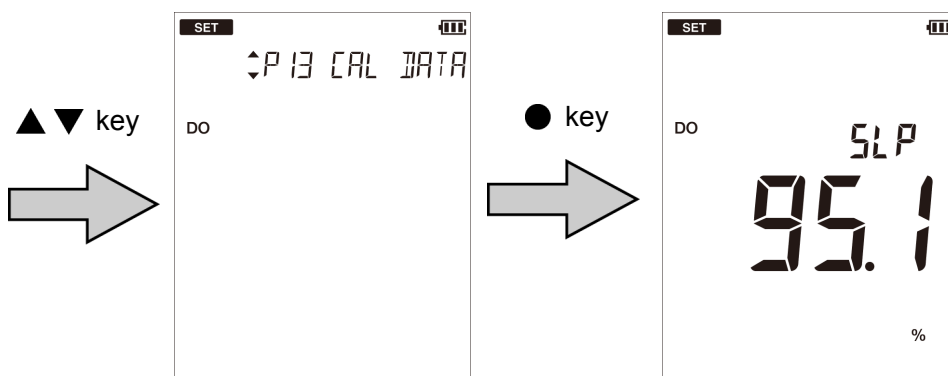
You can display the latest calibration data.

1. Press the  key to enter the setting mode.
2. Press the   keys to select "DO" (DO correcting setting) and then press the  key.



3. Press the   keys to select "CAL DATA" (display calibration data) and then press the  key.








The electrode status based on the calibration result (sensitivity) is displayed.

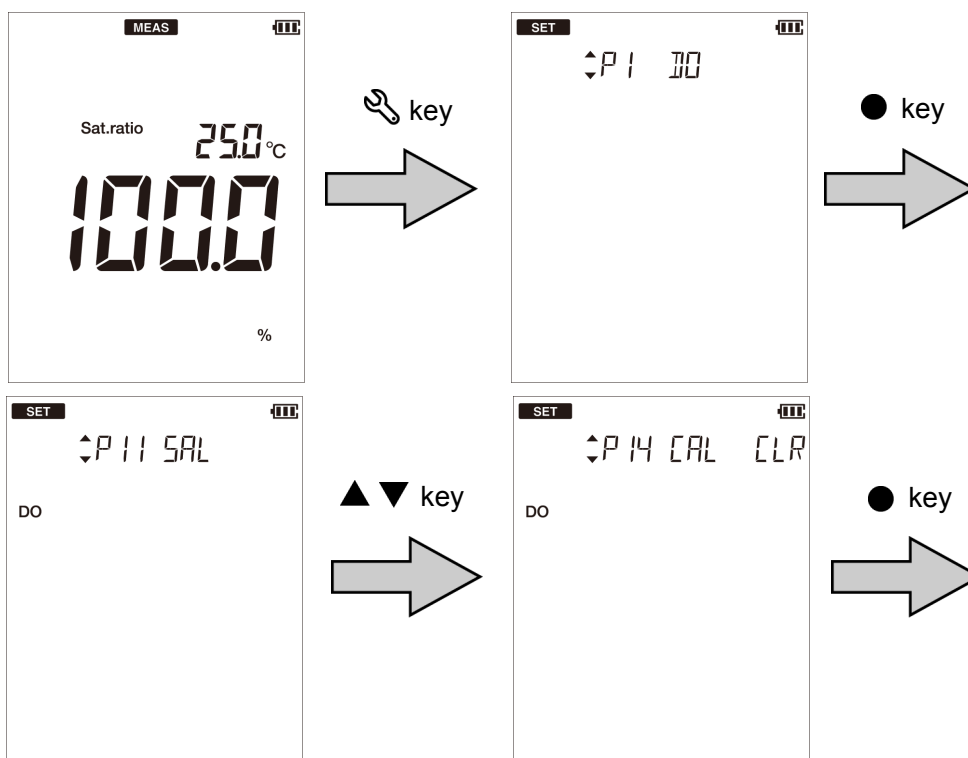


To return to the measurement mode, press the  key and then press the  key.

## ● Deleting calibration data

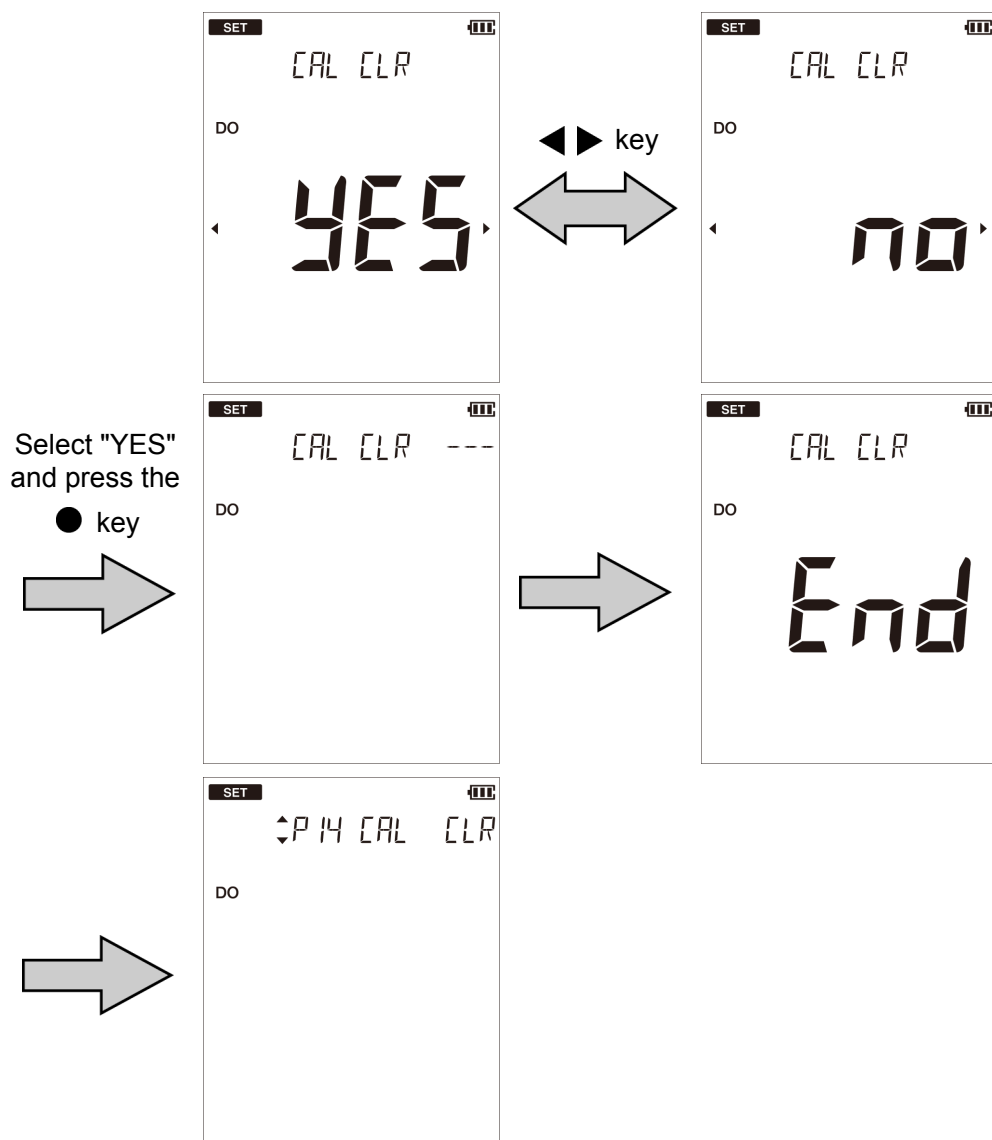
Delete the calibration data set in the instrument.

1. Press the  key to enter the setting mode.
2. Press the   keys to select "DO" (DO correcting setting) and then press the  key.
3. Press the   keys to select "CAL CLR" (delete calibration data) and then press the  key.



4. Select "YES" to delete the calibration data, or select "NO" to cancel deleting it. And then press the **●** key to confirm selection.


When "YES" is selected and **●** is pressed, "END" appears after deletion is complete.



To return to the measurement mode, press the  key.

---

### Tip





When the  key is pressed for more than three seconds in the measurement mode, "CALCLR" screen appears, and the calibration data can be deleted.

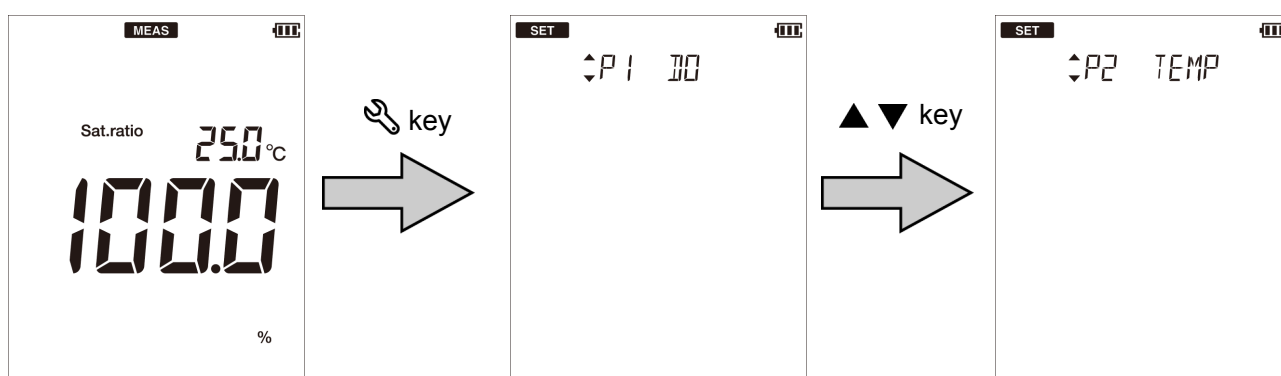
---



## ■ Temperature settings

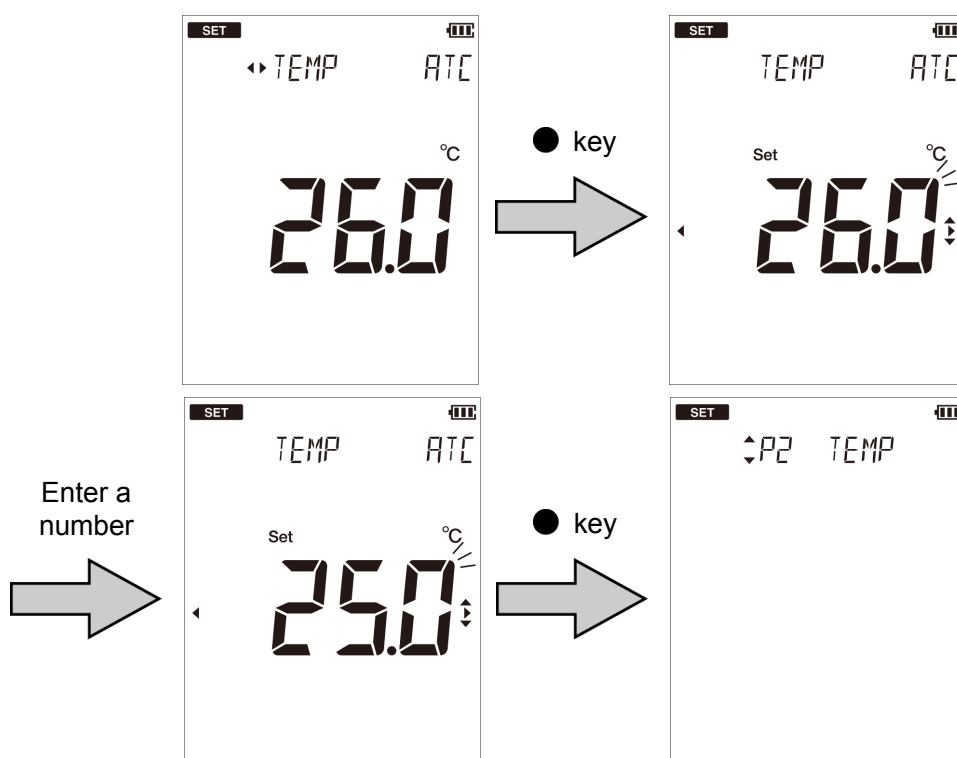
### ● Calibrating temperature sensor

The temperature sensor or temperature compensation electrode in the combination electrode has  $\pm 1^{\circ}\text{C}$  accuracy without calibration. You can use a known temperature solution to calibrate the temperature sensor.

1. Insert the temperature connector into the temperature connector (T) on the instrument.
2. Immerse the electrode into the solution until the temperature sensor is immersed.
3. Press the  key to enter the setting mode.
4. Press the   keys to select "TEMP" (temperature calibration setting) and then press the  key.



5. Make sure that "ATC" is displayed, and press the  key.  
The temperature setting screen is displayed.
6. Enter the set temperature and press the  key to confirm.  
The temperature sensor is calibrated.



To return to the measurement mode, press the  key.

---

**Note**

When initializing temperature calibration data, all settings need to be initialized. Perform initialization by referring to “ Resetting to factory default settings ” (page 47). When initialization is performed, all saved data is deleted. Copy or transfer necessary data to a PC for storage.

---

## ■ General settings


### ● Setting the auto stability and auto hold function

This instrument has the auto stability mode and the auto hold mode.








#### • Auto stability mode (displayed as AS)

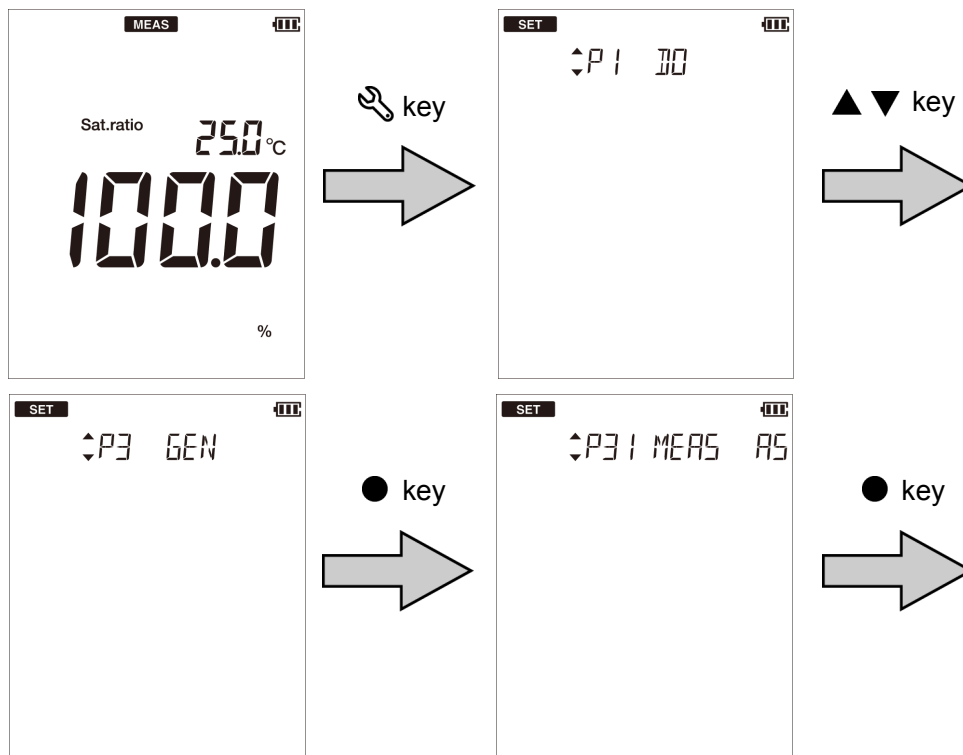
When the criterion for stability judgment is fulfilled during measurement, the component icon lights and the measured value is fixed. Once the value deviates from the stability judgment criterion, the measured value is released and displays instantaneous value.

#### • Auto hold mode (displayed as AH)

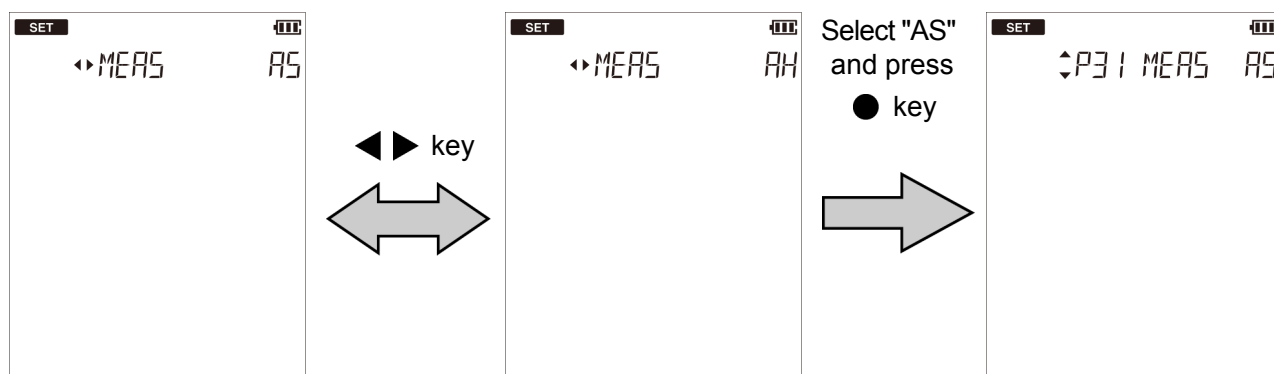
When the criterion for stability judgment is fulfilled during measurement, the component icon and the HOLD icon light and the measured value is fixed. To release the measured value, press the  key. Once a measured value is fixed, the measured value is not released automatically even when the state deviates from the stability judgment criterion.

#### • Setting procedure

1. Press the  key to enter the setting mode.
2. Press the   keys to select "GEN" (general setting) and then press the  key.
3. Press the   keys to select "MEAS" (measurement setting) and then press the  key.



4. Select "AS" to set the auto stability, or select "AH" to set the auto hold. And then press the **●** key to confirm selection.



To return to the measurement mode, press the  key.

---

### Note

In the calibration mode, the auto stability mode always works.

---

---

### Tip

The stability judgment criteria are the same for both the auto stability mode and the auto hold mode.





---

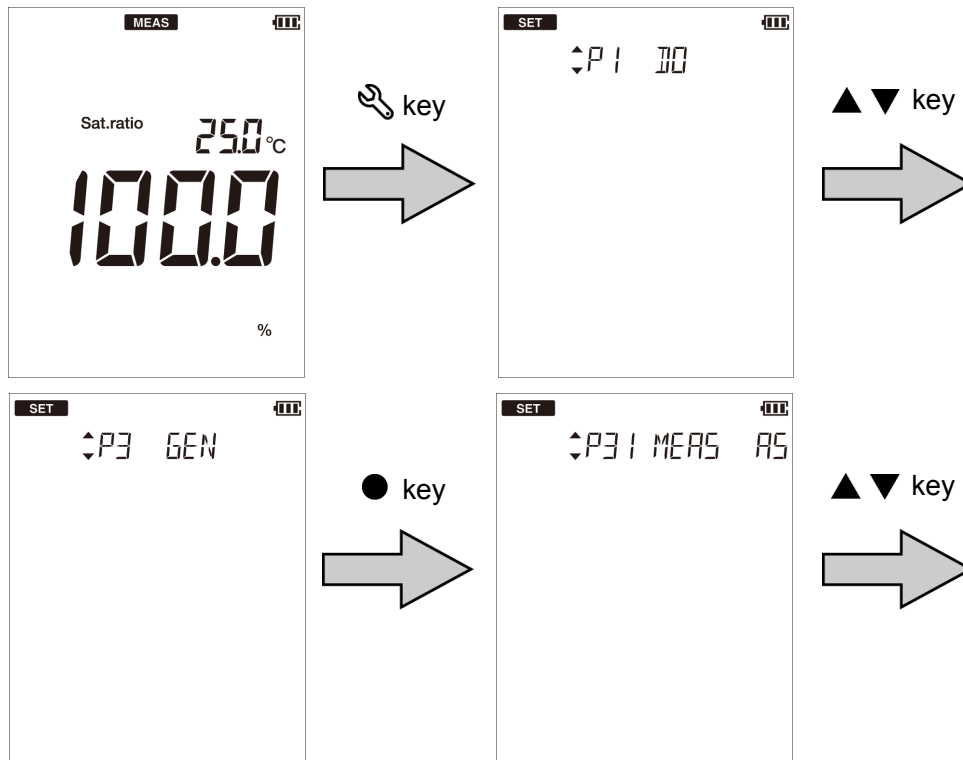


## ● Changing the automatic power off setting (default: 30 min)

You can set the instrument to automatically turn OFF when there is no key operation for a certain period of time.

This function is disabled during automatic data memory saving or remote operation using an external device.

1. Press the  key to enter the setting mode.
2. Press the   keys to select "GEN" (general setting) and then press the  key.

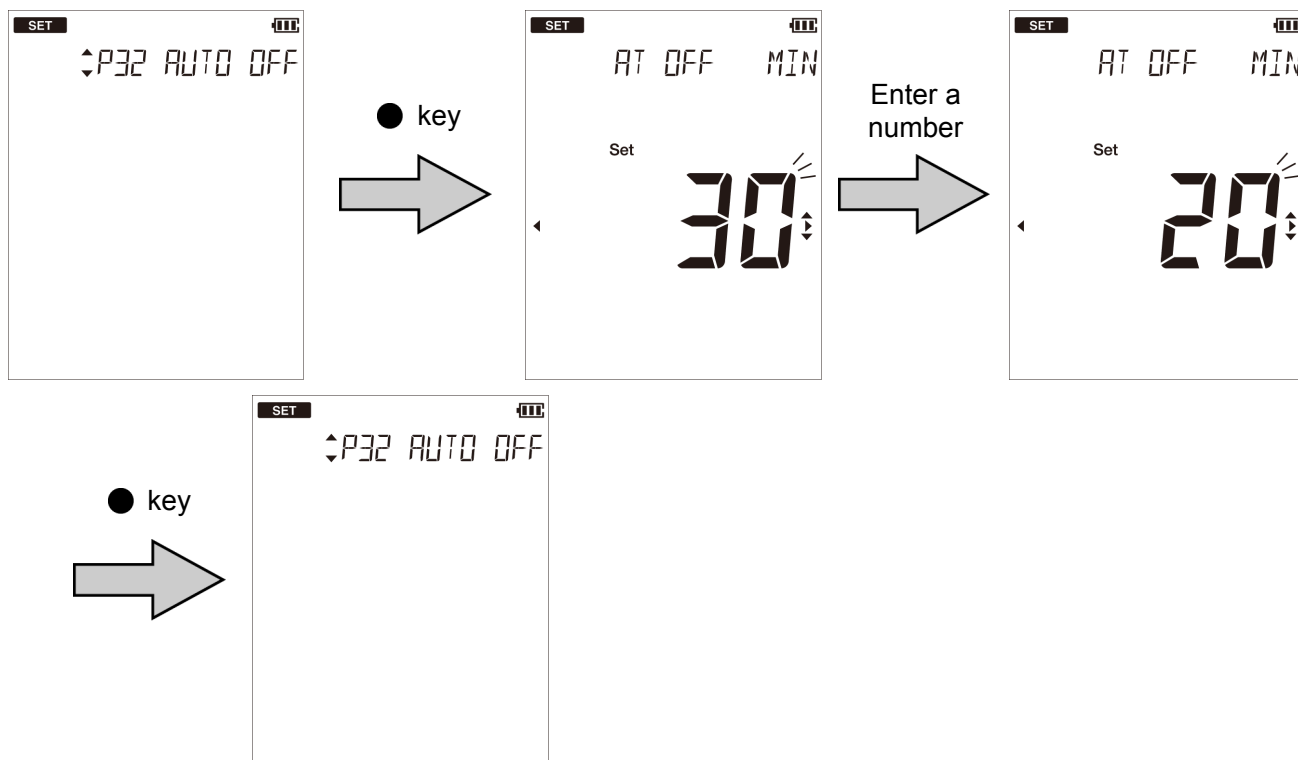


3. Press the   keys to select "AUTO OFF" (automatic power off setting) and then press the  key.

### 4. Enter the automatic power off time and press the **●** key.

The setting range is 0 min to 30 min.





"0" indicates the automatic power off is "OFF."

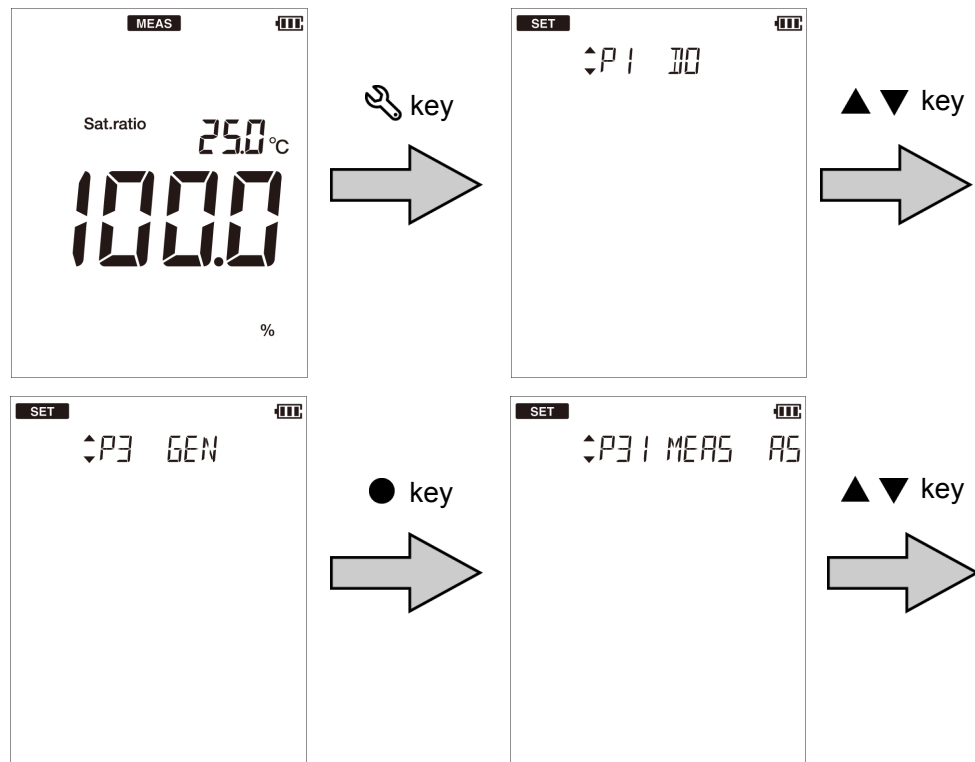


To return to the measurement mode, press the  key.

## ● Resetting to factory default settings

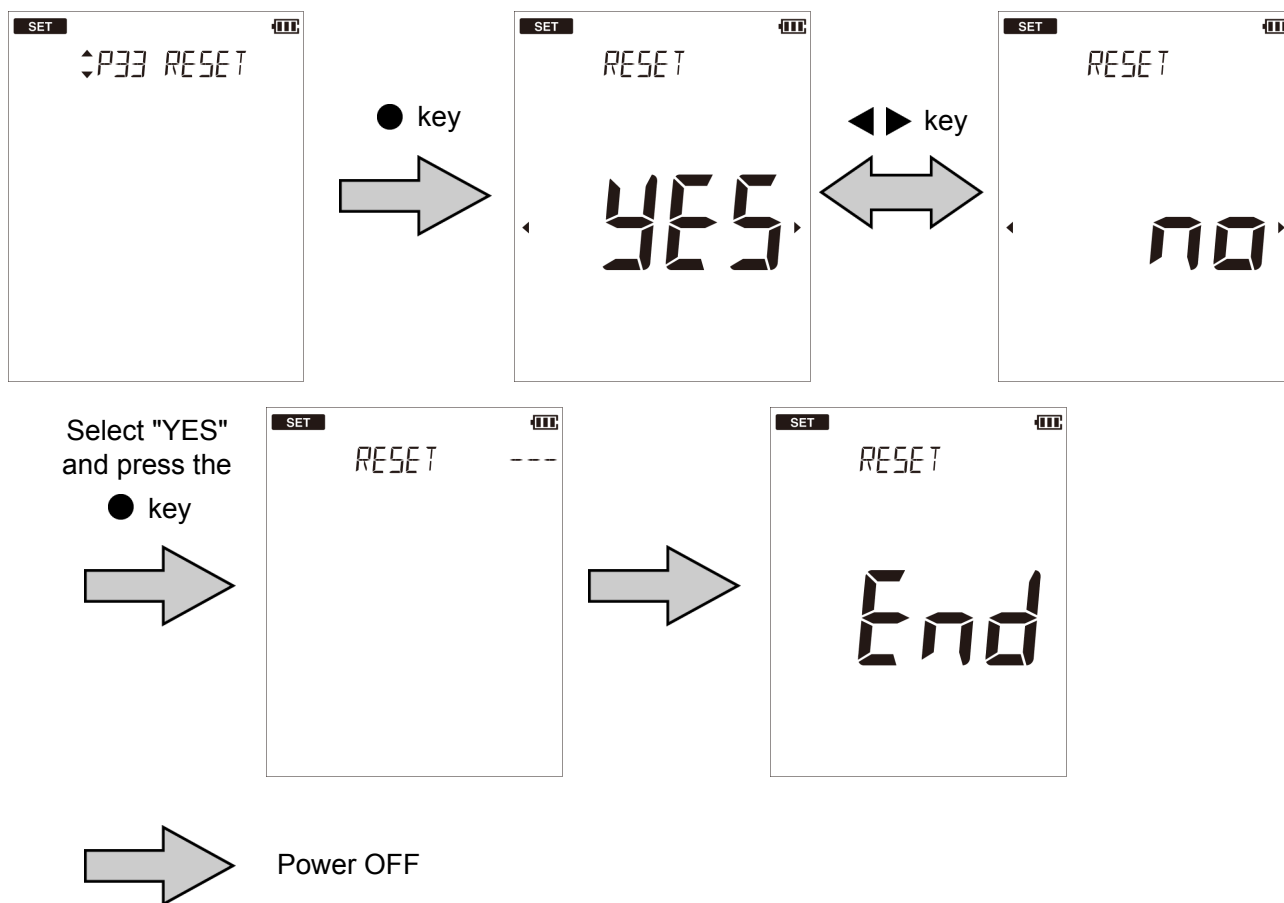
The instrument settings can be reset to the factory default settings. The calibration data is deleted but the data of date and time, and the saved data are not deleted. Make sure there will be no problems before using this function. When this function is used, the temperature calibration data is also initialized.

1. Press the  key to enter the setting mode.
2. Press the   keys to select "GEN" (general setting) and then press the  key.



3. Press the   keys to select "RESET" (initialize) and then press the  key.





4. Select "YES" to initialize the settings to the factory default settings, or select "NO" to cancel initialization. And then press the ● key to confirm selection. When "YES" is selected, "END" appears after the settings are initialized and then the instrument is automatically powered OFF.

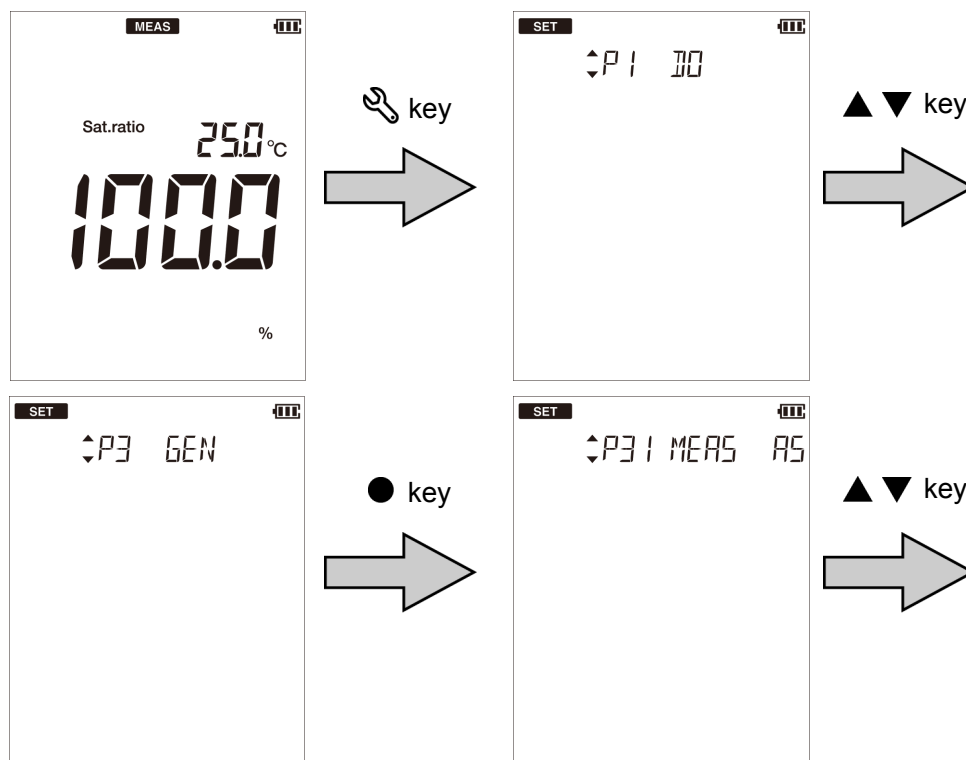






## ● Setting the date and time

When using the instrument for the first time or after replacing the batteries, set the date and time. After setting, the date and time data is displayed correctly when saving data in the internal memory. If the setting is incorrect, the date and time of saved data becomes incorrect.

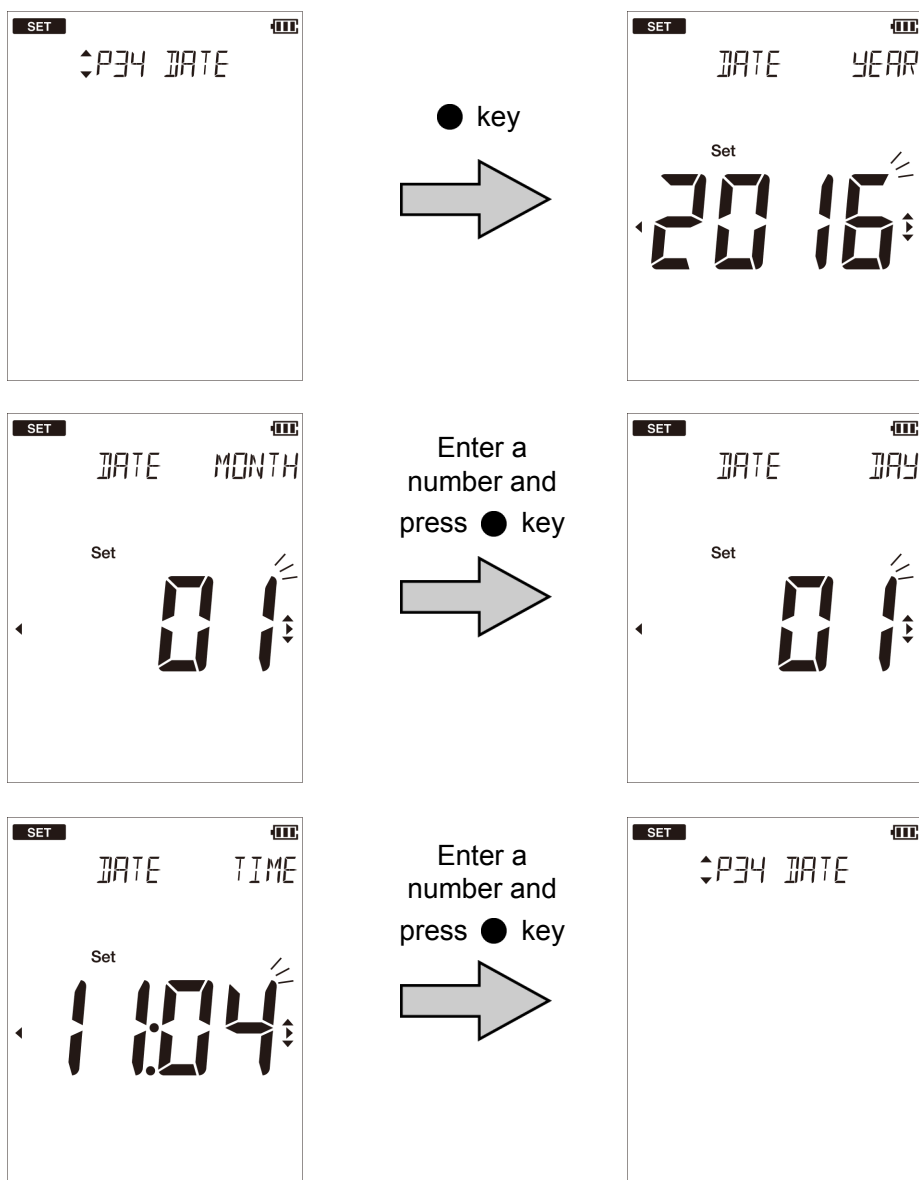
This function is available for LAQUAact-DO120.

1. Press the  key to enter the setting mode.
2. Press the   keys to select "GEN" (general setting) and then press the  key.



3. Press the   keys to select "DATE" (date and time setting) and then press the  key.
4. Set the "YEAR" (current year) and press the  key.
5. In the same way, set the "MONTH" (month), "DAY" (date) and "TIME" (hour and minute), in that order.

### 6. Press the ● key to confirm.







To return to the setting mode, press the ⏮ key.

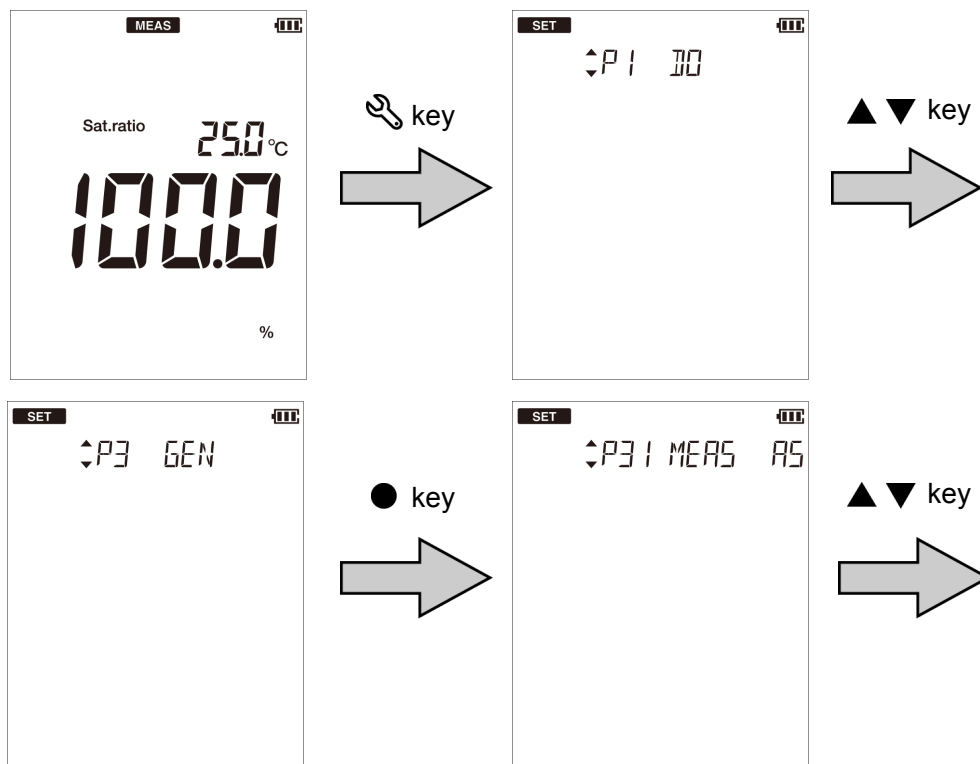
## ● Performing test printing of the printer unit

In order to check whether the printer unit is operating correctly or there is a printer communication problem, you can perform test printing.

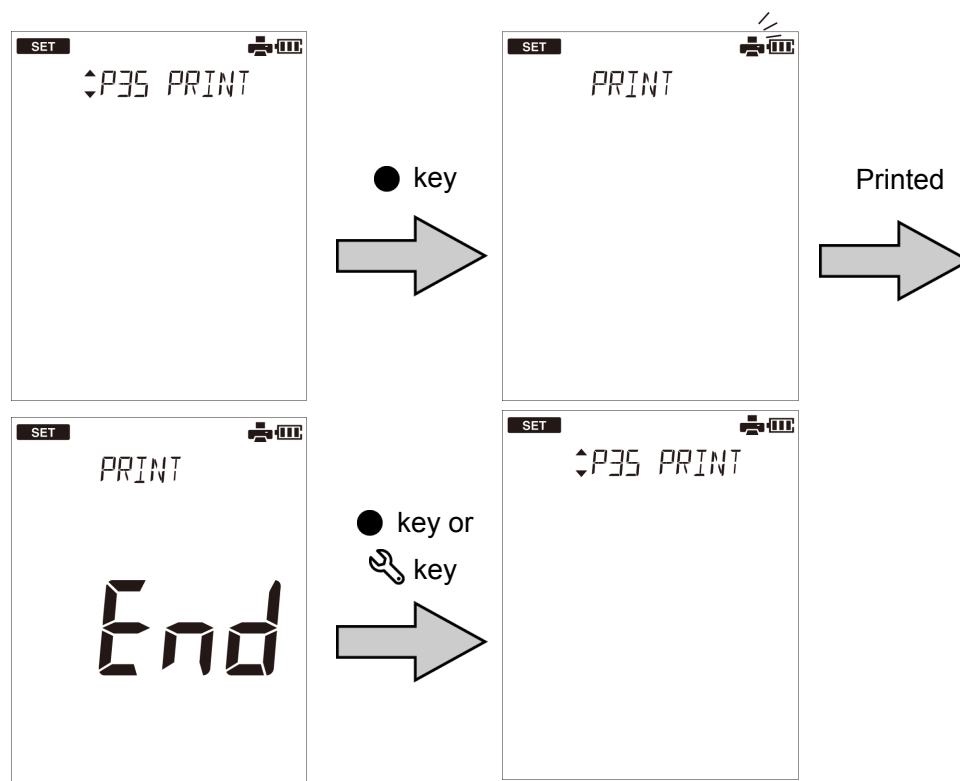
Connect the instrument and a printer correctly and perform the following procedure for test printing. As a result of test printing, if the printout is as shown below, the printer unit is operating correctly.

```
!"#$%&'()*+,-./0123
456789:;<=>?@ABCDEFGH
IJKLMNOPQRSTUVWXYZ[
\]~_`abcdefghijklmnopqrstuvwxyz
{|}
```

1. Press the  key to enter the setting mode.
2. Press the   keys to select "GEN" (general setting) and then press the  key.



3. Press the ▲ ▼ keys to select "PRINT" (test print) and then press the ● key. Printing starts automatically. When printing ends, the printer icon lights and "END" appears. Press the ● key or the 🔑 key.



To return to the measurement mode, press the ↶ key.



## ■ Other settings

### ● Printing measured values and calibration data

Print out the measured value or calibrated value displayed on the instrument, or the measurement data or the calibration data saved in the instrument. If the repeatability is inspected, the inspection data is printed out with the calibration data.

Pressing the ● key starts printing during displaying the data you want to print. Use the printer cable to connect the printer unit with the instrument beforehand. If the automatic data memory is set to "ON", you cannot print out in the measurement mode.

#### Reference

For details of how to display measurement data and calibration data, refer to the respective section.

"Displaying saved data" (page 32)

"Displaying the latest calibration" (page 38)

Refer to the following table in the case of LAQUAact-DO120.

< The data saved in internal memory > (LAQUAact-DO120)

| Printout format              | Description   |
|------------------------------|---|
| Memory Num : 0001            | Data number   |
| Date : 2016/01/01            | Measurement date  |
| Time : 09:00                 | Measurement time  |
| Channel : 1                  | Measurement channel   |
| DO : 1.03 mg/L               | Measured value and out of the measurement range or displaying range mark<br>Over: OR<br>Under: UR                         |
| Temperature : 25.0°C MTC     | Temperature value, temperature setting and out of the measurement range or displaying range mark<br>Over: OR<br>Under: UR |
| Inst. model : LAQUAact-DO120 | Instrument model  |
| Inst. SN : KL1TSE10          | Instrument serial number  |

< Calibration data (DO calibration (%)) >

| Printout format              | Description                               |
|------------------------------|---|
| Inst. model : LAQUAact-DO120 | Instrument model                          |
| Inst. SN : KL1TSE10          | Instrument serial number                  |
| Span. Coef : 1.23            | Span calibration coefficient              |
| Zero. Coef : 0.12            | Zero calibration coefficient              |
| Calibration data             |   |
| Date : 2016/01/01            | Calibration date                          |
| Time : 09:00                 | Calibration time                          |
| 105%                         | Standard value                            |
| : 25.0°C ATC                 | Temperature value and temperature setting |
| 0%                           | Standard value                            |
| : 25.1°C ATC                 | Temperature value and temperature setting |
| SAL. Coef : 5.0 PPT          | Salinity correction coefficient           |
| Pres. Coef : 101.3 kPa       | Air pressure correction coefficient       |

< Calibration data (DO calibration (mg/L)) >

| Printout format              | Description                               |
|------------------------------|---|
| Inst. model : LAQUAact-DO120 | Instrument model                          |
| Inst. SN : KL1TSE10          | Instrument serial number                  |
| Span. Coef : 1.23            | Span calibration coefficient              |
| Zero. Coef : 0.12            | Zero calibration coefficient              |
| Calibration data             |   |
| Date : 2016/01/01            | Calibration date                          |
| Time : 09:00                 | Calibration time                          |
| 8.11 mg/L                    | Standard value (Span)                     |
| : 25.0°C ATC                 | Temperature value and temperature setting |
| 0.00 mg/L                    | Standard value (Span)                     |
| : 25.1°C ATC                 | Temperature value and temperature setting |
| SAL. Coef : 5.0 PPT          | Salinity correction coefficient           |
| Pres. Coef : 101.3 kPa       | Air pressure correction coefficient       |

## ● Transferring saved data to a PC

By using a serial cable to connect the instrument to a PC, you can transfer the saved data to the PC and edit it (LAQUAAact-DO120 only). Connect the RS-232C connector at the instrument side to the serial port on the PC.

To save and edit data, please download the software "FD-70" from our website after the registration.

For details of how to use the "FD-70", refer to the "FD-70" instruction manual, which you can download from our website as well.

The required PC specifications and recommended PC specifications for using the "FD-70" are shown in the following table.

| Item           | Required PC specifications                   | Recommended PC specifications |
|----------------|--|-------------------------------|
| Memory         | 32 bit: 1 GB or more<br>64 bit: 2 GB or more |                               |
| CPU            | 1 GHz or more                                |                               |
| HDD free space | 5 GB or more                                 | 10 GB or more                 |
| OS             | Windows 7, Windows 8 (8.1), or Windows 10    |                               |
| Display        | Super VGA (800 × 600) or more                |                               |
| Connector      | Serial connector (D-Sub 9 pin)               |                               |

### Note

- If you are not using the RS-232C communication, close the connector cover tightly.
- While using the RS-232C communication, the instrument is not dust-proof or waterproof. Do not use the RS-232C communication in a dusty place or with wet hands.

### ● Operating the instrument from an external device

You can remotely operate the instrument from an external device (such as PC) via RS-232C communication. Use a serial cable to connect the serial connector on the instrument and the serial port on the PC.

This function is available for LAQUAact-DO120.

When using this function, pay attention to the following points.

- Use the optional serial cable to connect the unit to a PC.
- Make sure that the transfer formats used in the instrument and a PC are the same. When different transfer formats are used, a communication error occurs and the online mode does not start up, and as a result RS-232C communication cannot be performed. Also, when the transfer format is changed, turn OFF the power of the instrument and PC and then reboot them.

The transfer format of the instrument is as follows.

- Baud rate: 2400 bps
- Character length: 8 bits
- Parity: None
- Stop bit: 1 bit

You can download a list of communication commands from our website.

In order to download the list, you need to complete user registration.

---

#### Note

- If you are not using the RS-232C communication, close the connector cover tightly.
  - While using the RS-232C communication, the instrument is not dust-proof or waterproof. Do not use the RS-232C communication in a dusty place or with wet hands.
-

# Maintenance

This section describes maintenance of the instrument and the electrodes that are used with the instrument. To use them for a long period, perform the described maintenance procedures appropriately.

## ● Contact for maintenance

Please contact your dealer for the product maintenance.

## ● Maintenance and storage of the instrument

- If the instrument becomes dirty, wipe it gently with a soft dry cloth. If it is difficult to remove the dirt, wipe it gently with a cloth moistened with alcohol.
- The instrument is made of solvent resistant materials but that does not mean it is resistant to all chemicals. Do not dip the instrument in strong acid or alkali solution, or wipe it with such solution.
- Do not wipe the instrument with a polishing powder or other abrasive compound.

## ● Environmental conditions for storage

Temperature: 0°C to 45°C

Humidity: under 80% in relative humidity and free from condensation

Avoid the following conditions.

- Dusty place
- Strong vibration
- Direct sunlight
- Corrosive gas environment
- Close to an air-conditioner
- Direct wind

## ● Maintenance and storage of the DO electrode

For the detailed procedures for maintaining and storing electrodes, refer to the instruction manual for each electrode. This section describes an overview of the procedures for maintenance and storage to be performed as part of daily use.

### • How to clean the membrane of DO electrode

The membrane of DO electrode is extremely thin. Take care not to tear the membrane when cleaning. Clean the membrane with pure water (or deionized water) and wipe it with a soft cloth, taking care not to damage it.

#### Note

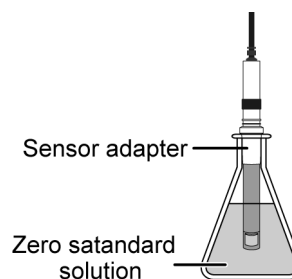
When using a neutral cleaning solution to clean the DO electrode, keep the neutral cleaning solution away from the membrane in order to prevent deterioration of the membrane.

### • Daily storage of the DO electrode

Follow the steps below to store the electrode correctly.

#### 9520-10D

1. Clean the DO electrode well with pure water (or deionized water).
2. Attach the adapter to the DO electrode.
3. Immerse the DO electrode in a conical flask containing zero standard solution (5% sodium sulfite solution).



#### 9551-20D, 9551-100D

1. Clean the DO electrode well with tap water.
2. Keep the DO electrode immersed in tap water.

#### Note

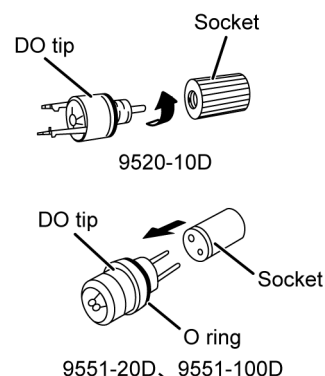
Leave the DO electrode connected to the instrument.

### • When the DO electrode will not be used for a long time

Follow the steps below to store the electrode correctly.

#### 9520-10D, 9551-20D, 9551-100D

1. Clean the DO electrode well with tap water, then dry it with cotton gauze.
2. Remove the DO tip from the DO electrode.
3. Attach the socket on the DO chip, then store it in a cool, dark location.



# How to Resolve Errors or Troubles

This section describes the causes of typical problems and the actions to be taken, including questions frequently asked by customers. Check these before contacting us.


## ■ When an error message appears

If "ERR No.00XX" is displayed while you are using the instrument, check the error in the error list below, and check the cause and action to be taken.

| ERR No. | Description                 | Definition of error   |
|---------|-----------------------------|---|
| 0001    | Memory error                | Data cannot be read from or written to the internal memory.                           |
| 0002    | Empty battery level         | The battery level is empty.   |
| 0005    | Electrode sensitivity error | The electrode sensitivity is out of the setting range that allows normal measurement. |
| 0009    | Printer error               | There is a problem with the printer.  |
| 0010    | Memory full                 | The number of the data saved has exceeded the limit of the internal memory.           |

### ● ERR No.0001 Memory error

Data cannot be read from or written to the internal memory.

| Cause   | How to solve problem   |
|---|--|
| The instrument does not start properly due to noise or other at power ON. | Remove the batteries, disconnect the AC adapter, and then press the  key. |
| The defect of the internal IC   | Contact your dealer for repair.  |

### ● ERR No.0002 Empty battery level

The instrument cannot operate properly because the battery level is empty.

| Cause                       | How to solve problem                                      |
|-----------------------------|---|
| The battery level is empty. | Replace the batteries or connect the AC adapter (option). |

## ● ERR No.0005 Electrode sensitivity error

Detected that the electrode sensitivity is out of the setting range that allows normal measurement.

| Cause  | How to solve problem   |
|--|--|
| The electrode is dirty.  | Clean the electrode.   |
| The electrode is cracked.  | Replace the electrode.   |
| The stirring is inappropriate.   | Stir at an appropriate stirring speed (1000 to 1500 rpm).  |
| The electrode is not connected correctly   | Connect the electrode correctly.   |
| The settings are wrong.  | Set the correct salinity correction, air pressure correction, and temperature.   |
| There is liquid on the DO tip membrane. (when performing air calibration)                            | Let the electrode sit until the liquid evaporates or remove the liquid using cotton gauze making sure not to scratch the membrane. |
| There is something wrong with the standard solution. (when conducting standard solution calibration) | Prepare new zero standard solutions.<br>Sufficiently bubble the span standard solution with a diffuser or other tools.             |

## ● ERR No.0009 Printer error

An error occurred during printer communication.

| Cause  | How to solve problem  |
|--|---|
| There is a problem with the printer unit connection. | Check the printer connection, and connect the instrument and printer again. |
| The defect of the printer                            | Consult your dealer.  |



**● ERR No.0010    Memory full**

Attempted to save more than the specified number of items.

| Cause  | How to solve problem   |
|--|--|
| Saving more than specified items of data is attempted. | The maximum number of savable items of data is 100 (LAQUAAct-DO110) or 1000 (LAQUAAct-DO120). Copy or transfer necessary data to a PC and delete the data from the memory ("Deleting all saved data" (page 36)). |

## ■ Troubleshooting

This section describes causes and actions to take for problems that customers frequently ask us.

### ● The indicated value fluctuates

#### < Problem with the electrode >

| Cause   | How to solve problem  |
|---|---|
| The electrode is dirty.                                       | Clean the electrode.  |
| The electrode is cracked.                                     | Replace the electrode.  |
| The wrong internal solution is being used.                    | Use the correct internal solution.  |
| There are air bubbles on the electrode.                       | Shake the electrode to remove the air bubbles.  |
| The level of internal solution in reference electrode is low. | Replenish the internal solution of the reference electrode until it is higher than the level of the sample. |

#### < Problem with the instrument >

| Cause   | How to solve problem  |
|---|---|
| There is a motor or other device causing electrical interference. | Measure at a place where no influence from induction is given. Ground all AC-powered equipment. |
| The electrode is not connected correctly.                         | Connect the electrode correctly.  |

#### < Problem with the sample >

| Cause  | How to solve problem  |
|--|---|
| Electrode is not immersed enough to cover liquid junction.     | The electrode must be immersed up to the liquid junction. As a guide, immerse to at least 3 cm from the tip of the electrode.   |
| The stability of electrode is affected by the sample solution. | It is important to select an electrode that is appropriate for the sample. Consult your dealer. To confirm an electrode that is appropriate for the sample, check the pH electrode selection guide in our catalogue, or refer to our website. |

## ● The response is slow

| Cause   | How to solve problem  |
|---|---|
| The electrode is dirty.                                       | Clean the electrode.  |
| The electrode is cracked.                                     | Replace the electrode.  |
| The wrong internal solution is being used.                    | Use the correct internal solution.  |
| The response of electrode is affected by the sample solution. | It is important to select an electrode that is appropriate for the sample. Consult your dealer. To confirm an electrode that is appropriate for the sample, check the pH electrode selection guide in our catalogue, or refer to our website. |

## ● The indicated value does not change/No response

| Cause                                     | How to solve problem  |
|---|---|
| The electrode is cracked.                 | Replace the electrode.  |
| The electrode is not connected correctly. | Connect the electrode correctly.  |
| Keys are locked.                          | Turn OFF the power, remove the batteries, and then turn ON the power again. |
| The instrument is in HOLD state.          | Cancel the HOLD state.  |
| Instrument defect                         | Consult your dealer.  |

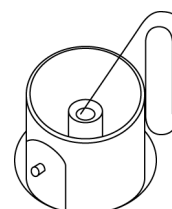
## ● The measured value is out of the measurement range

When the measured value is below the display range, "Ur" appears. When the measured value is over the display range, "Or" appears.

| Cause  | How to solve problem  |
|--|---|
| Sample is out of the measurement range.                    | Use a sample within the measurement range.  |
| Electrode is not immersed enough to cover liquid junction. | The electrode must be immersed up to the liquid junction. As a guide, immerse to at least 3 cm from the tip of the electrode. |
| The electrode cable is broken.                             | Replace the electrode.  |
| Calibration is not performed or performed incorrectly.     | Perform calibration correctly.  |
| Instrument defect  | Check as explained below.   |

### • How to check for instrument defect

Short the metal part of the outer tube to the center pin of the electrode connector of the corresponding channel of the instrument. If "Ur" or "Or" appears in this condition, consult your dealer.



## ● Repeatability of the measured value is poor

| Cause  | How to solve problem  |
|--|---|
| Effect of the sample solution                                    | Repeatability becomes poor when the pH of the sample changes over time.                                     |
| The electrode is dirty.  | Clean the electrode. (Electrode cleaning solution 220 or 250 is recommended.)                               |
| The electrode is cracked.  | Replace the electrode.  |
| The internal solution of the electrode runs out or contaminated. | Replace the internal solution with new one.   |
| The level of internal solution in reference electrode is low.    | Replenish the internal solution of the reference electrode until it is higher than the level of the sample. |

## ● Nothing appears when the power is turned ON

| Cause                                | How to solve problem  |
|--------------------------------------|---|
| Power is not supplied.               | Insert batteries or connect the AC adapter (option).              |
| Battery polarity (+, –) is reversed. | Insert the batteries with the polarity (+, –) correctly oriented. |
| Battery life is low.                 | Replace the batteries or connect the AC adapter (option).         |
| Instrument defect                    | Consult your dealer.  |

## ● Swelling of operation key sheet

| Cause  | How to solve problem   |
|--|--|
| Using the instrument at high elevation or other location where the air pressure is different from sea level. | To eliminate the pressure difference between the inside and outside of the instrument, briefly open and then close the AC adapter cover. After opening, correctly close the cover to maintain dust and water proofing. |
| Instrument defect  | Consult your dealer.   |

## ● Part of the display is missing

| Cause             | How to solve problem  |
|-------------------|---|
| Instrument defect | Check the display in full screen state when turning ON the power of the instrument. |

# MEMO

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# Appendix

This section describes the specifications of the instrument, default settings, measurement principles, and other technical information.

Options for the instrument are also described.

## ■ Main specifications

| Item                                    | Description   |
|---|---|
| Model                                   | LAQUAAct-DO110, LAQUAAct-DO120  |
| Brand (pet name)                        | LAQUAAct  |
| Series name                             | Portable pH · Water Quality Meter   |
| Model description                       | Dissolved Oxygen Meter  |
| Measurement parameters                  | Dissolved oxygen, oxygen concentration, saturated oxygen concentration, temperature   |
| Operating ambient temperature, humidity | 0°C to 45°C<br>80% or less in relative humidity (no condensation)   |
| Power                                   | AAA alkaline batteries (LR03) or AAA Ni-MH rechargeable batteries × 2<br>AC adapter 100 V to 240 V, 50/60 Hz, 0.37 A (option) |
| Dimensions                              | Approx. 67 [80] (W) × 170 (D) × 28 [42] (H) mm<br>(The figures in square bracket are maximum thicknesses.)                    |
| Mass                                    | Approx. 270 g (without batteries)   |

• Specification of each measurement parameter

| Measurement parameter          | Item                            | Description                            |
|--------------------------------|---------------------------------|--|
| Dissolved oxygen               | Measuring principle             | Membrane galvanic cell                 |
|                                | Measuring range (Display range) | 0.00 mg/L to 20.00 mg/L                |
|                                | Resolution                      | 0.01 mg/L                              |
|                                | Accuracy                        | ±0.1 mg/L                              |
| Saturated oxygen concentration | Measuring principle             | Conversion from dissolved oxygen value |
|                                | Measuring range (Display range) | 0.0% to 200.0%                         |
|                                | Resolution                      | 0.1%                                   |
| Oxygen concentration           | Measuring principle             | Conversion from dissolved oxygen value |
|                                | Measuring range (Display range) | 0.0% to 50.0%                          |
|                                | Resolution                      | 0.1%                                   |

## Instrument default settings

| Measurement parameter | Item                | Description        |
|-----------------------|---------------------|--------------------|
| Temperature           | Measuring principle | Thermistor method  |
|                       | Display range       | −30.0°C to 130.0°C |
|                       | Measuring range     | 0.0°C to 100.0°C   |
|                       | Resolution          | 0.1°C              |
|                       | Accuracy            | ±0.4°C             |

## ■ Instrument default settings

| Measurement parameter | Item  | Selection item/Setting range | Default values |
|-----------------------|---|------------------------------|----------------|
| Common                | Auto hold                                     | AS/AH                        | AS             |
|                       | Temperature input value                       | 0.0°C to 100.0°C             | 25.0°C         |
|                       | Auto power off time                           | 0 min to 30 min *1           | 30 min         |
|                       | Auto data memory time (LAQUAact-DO120 only)   | 0, 2 s to 3600 s *2          | 0 s            |
|                       | Auto data memory period (LAQUAact-DO120 only) | 0 min to 3600 min *3         | 0 min          |
| Dissolved oxygen      | Salinity correction coefficient               | 0.0 PPT to 40.0 PPT          | 0.0 PPT        |
|                       | Air pressure correction coefficient           | 10.0 kPa to 199.9 kPa        | 101.3 kPa      |

\*1: When 0 is inputted, auto power OFF is OFF.

\*2: When 0 is inputted, auto data memory is OFF.

\*3: When 0 is inputted, auto data memory period is OFF.



## ■ Technical note

### ● Saturated DO levels in water at various temperatures

•ISO17289 (JIS K0102)

| Temp.<br>(°C) | Saturated<br>DO<br>(mg/L) | Temp.<br>(°C) | Saturated<br>DO<br>(mg/L) | Temp.<br>(°C) | Saturated<br>DO<br>(mg/L) | Temp.<br>(°C) | Saturated<br>DO<br>(mg/L) |
|---------------|---------------------------|---------------|---------------------------|---------------|---------------------------|---------------|---------------------------|
| 1             | 14.22                     | 11            | 11.03                     | 21            | 8.92                      | 31            | 7.43                      |
| 2             | 13.83                     | 12            | 10.78                     | 22            | 8.74                      | 32            | 7.31                      |
| 3             | 13.46                     | 13            | 10.54                     | 23            | 8.58                      | 33            | 7.18                      |
| 4             | 13.11                     | 14            | 10.31                     | 24            | 8.42                      | 34            | 7.07                      |
| 5             | 12.77                     | 15            | 10.08                     | 25            | 8.26                      | 35            | 6.95                      |
| 6             | 12.45                     | 16            | 9.87                      | 26            | 8.11                      | 36            | 6.84                      |
| 7             | 12.14                     | 17            | 9.67                      | 27            | 7.97                      | 37            | 6.73                      |
| 8             | 11.84                     | 18            | 9.47                      | 28            | 7.83                      | 38            | 6.62                      |
| 9             | 11.56                     | 19            | 9.28                      | 29            | 7.69                      | 39            | 6.52                      |
| 10            | 11.29                     | 20            | 9.09                      | 30            | 7.56                      | 40            | 6.41                      |

## Options

A wide variety of electrodes and options are available for use with the instrument. You can select the optimum electrode and options for your application and objectives.

These options can be purchased from your nearest agency. Please provide the part name and part number to the representative.

With regard to electrodes, it is important to select the optimum electrode for the sample you want to measure. For details, refer to the catalogue or our website, or contact your dealer.

| Part name           |                      | Part number | Remarks                       |
|---------------------|----------------------|-------------|-------------------------------|
| Plain paper printer | Printer (USA, 120 V) | 3014030146  | Printer cable sold separately |
|                     | Printer (EU, 230 V)  | 3014030147  |                               |
|                     | Printer cable        | 3014030148  | 1.5 m                         |
|                     | Roll paper           | 3014030149  | 20 rolls/set                  |
|                     | Ink ribbon           | 3014030150  | 5 pcs/set                     |
| Serial cable        |                      | 3014030151  | 1.5 m                         |
| AC adapter*         |                      | 3200647413  | With 6 plug adapters          |

\*: The AC adapter includes 6 plug adapters.  
Referring to the following table, attach the appropriate plug adapter to the AC adapter depending on the country to be used.

| ① Australia | ② China | ③ Europe | ④ Korea | ⑤ U.K.,<br>Singapore | ⑥ USA,<br>Canada, Taiwan |
|-------------|---------|----------|---------|----------------------|--------------------------|
|             |         |          |         |                      |                          |

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For any questions regarding this product, please contact your local agency, or inquire from the following website.

[http://global.horiba.com/contact\\_e/index.htm](http://global.horiba.com/contact_e/index.htm)

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