

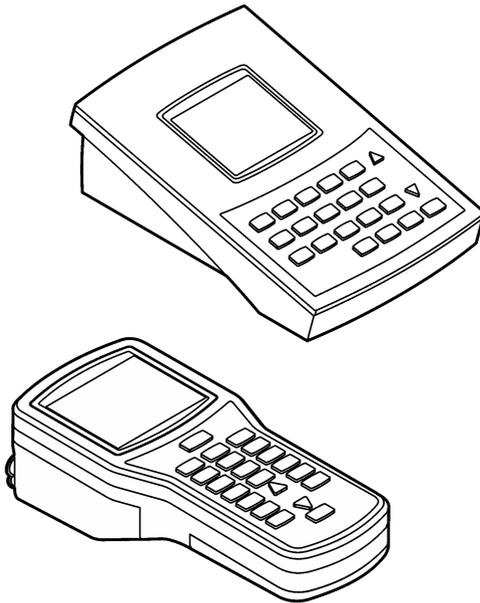


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H-Series Meters

10/2013, Edition 2

User Manual



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Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions (W x D x H)	Handheld meters: 9 x 20 x 5 cm (3.5 x 8 x 2 in.) Benchtop meters: 20 x 13 x 8 cm (5 x 8 x 3 in.)
Weight	Handheld meters: 1300 g (3.0 lb.) Benchtop meters: 900 g (2.0 lb.)
Battery enclosure	Water resistant
Battery requirements	4-ANSI 15 A or IEC-LR6 (AA Alkaline)
Power consumption	Backlight on and Bluetooth™ active: 1 W Backlight on and Bluetooth™ inactive: 50 mW
Power source	Internal power source: 4 AA alkaline or rechargeable nickel metal hydride (NiMH) batteries; battery life: > 200 hours External power source: 100 to 240 VAC, 50/60 Hz input; 4.5 to 7.0 VDC; 100 mA (benchtop meters only)
Storage temperature	-20 to +40 °C (4 to 140 °F)
Operating temperature	5 to 40 °C (41 to 104 °F)
Operating humidity	Relative humidity: 50% maximum at 25 °C (77 °F), non-condensing
Input connectors	Handheld meters: 8-pin ISFET, BNC with phono jack temperature, 12-pin conductivity (H170G only) Benchtop meters: 8-pin ISFET BNC with phono jack temperature, 12-pin conductivity (H270G only), 2 mm reference, USB and external AC
USB adapter	Peripheral
Data memory (internal)	Up to 999 measurement results at user selectable intervals from 1 to 1999 seconds
Data storage	Automatic in store mode; user enables data logging mode; data is user stored, recalled and deleted
Data export	USB connection to PC; transfer the data log or as data is read
Languages	English
Temperature correction	Off, automatic and manual (parameter dependent)
Measurement	Continuous measurement
Protection rating	Handheld meters: IP67 Benchtop meters: IP42
Certifications	CE
pH	
Calibration	Up to five points: 1.68, 4.01, 6.86, 7.00, 9.18, 10.01, 12.45
Accuracy	±0.01 pH
Resolution	0.01 pH
Range	-2.00 to 19.99
mV	
Calibration	None
Accuracy	±1 mV

Specification	Details
Resolution	Autoranging, 0.1 and 1
Range	Autoranging, ± 199.9 mV to ± 1999 mV
Temperature	
Calibration	None
Accuracy	± 0.5 °C
Resolution	0.1 °C (0.1 °F)
Range	-5 to 105 °C (23 to 221 °F)
ISE	
Calibration	Up to five points
Accuracy	Probe dependent
Resolution	0.1 ppm–0.1 ppt
Range	Autoranging, -0.0 ppm to 1999 ppt
Conductivity	
Calibration	Up to five points
Accuracy	$\pm 1\%$ full scale or ± 1 digit
Resolution	0.01 μ S, 0.1 μ S, 1 μ S, 0.01 mS, 0.1 mS
Range	Autoranging: 0.00 to 19.99 μ S, 20.0 to 199.9 μ S, 200 to 1999 μ S, 2.00 to 19.99 mS, 20.0 to 199.9 mS
TDS	
Calibration	Up to five points
Accuracy	$\pm 1\%$ full scale or ± 1 digit
Resolution	0.01 ppm, 0.1 ppm, 1 ppm, 0.01 ppt, 0.1 ppt, 1 ppt, 0.1 mg/L, 1 mg/L, 0.01 gal/L, 0.1 gal/L
Range	Autoranging, ppm: 0.00 to 9.99 ppm, 10.0 to 99.9 pm, 100 to 999 ppm, 1.00 to 9.99 ppt, 10.0 to 99.9 ppt, 100 to 200 ppt mg/L: 0.00 to 199.9 mg/L, 200 to 1999 mg/L, 2.00 to 19.99 gal/L, 20 to 50 gal/L
Salinity	
Calibration	None (derived from conductivity)
Accuracy	± 0.1 ppt (–2 to +35 °C or 28.4 to 95 °F)
Resolution	0.1 ppt, 1%
Range	0 to 42, ppt 0 to 4.2%
Dissolved oxygen	
Calibration	One or two points, user-selectable to any value
Accuracy	$\pm 1.5\%$ full scale
Resolution	0.1%, 0.01 ppm or mg/L
Range	0.0% to 199.9% saturation, 0 to 19.99 ppm or mg/L Salinity correction: automatic with conductivity probe Barometric pressure compensation: automatic

Specification	Details
Barometric pressure	
Calibration	Factory calibration
Accuracy	±1.5 hPa (10 to 40 °C or 50 to 104 °F)
Resolution	1 mm Hg or 1 hPa 0.01 in Hg±
Range	225 to 900 mm Hg or 300 to 1200 hPa (8.86 to 35.43 in. Hg)

General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Safety information

NOTICE

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

Use of hazard information

▲ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

▲ WARNING

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

▲ CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. If on the instrument, refer to the instruction manual for operation or safety information.
	This symbol indicates that a risk of electrical shock and/or electrocution exists.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user. Note: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.

Certification

Canadian Radio Interference-Causing Equipment Regulation, IECS-003, Class A:

Supporting test records reside with the manufacturer.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe A répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "A" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. 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 their expense. The following techniques can be used to reduce interference problems:

1. Disconnect the equipment from its power source to verify that it is or is not the source of the interference.
2. If the equipment is connected to the same outlet as the device experiencing interference, connect the equipment to a different outlet.
3. Move the equipment away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

Product overview

NOTICE

Always disconnect power to the meter when electrodes are changed. Only use the meter as instructed in this manual or the meter performance can decrease.

The H-series handheld and benchtop meters operate with glass sensor electrodes with BNC connectors or non-glass probes with ISFET (ion sensitive field effect transistor) silicon chip sensors.

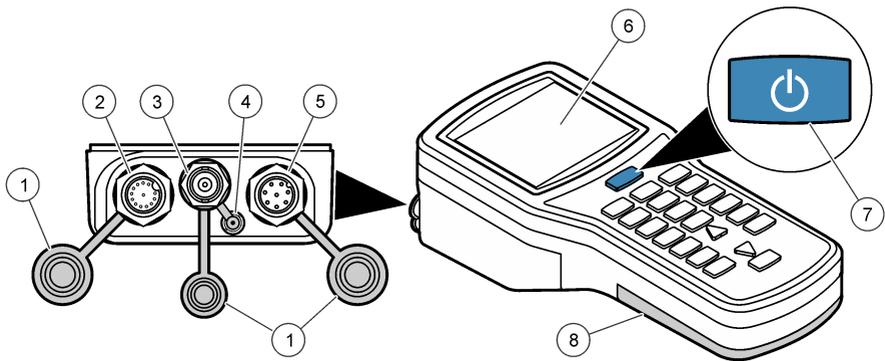
The meters use one pH electrode (a BNC pH electrode or an ISFET pH probe) at a time. When the meter power is set to on, the meter automatically identifies the type of electrode that is attached.

The H-Series meters are available in eight models:

- Waterproof handheld meters with Bluetooth™ technology. Refer to [Figure 1](#):
 - H160G—pH and ORP
 - H170G—pH, ORP, conductivity, TDS and salinity
- Benchtop meters with a USB output. Refer to [Figure 2](#):
 - H260G—pH and ORP
 - H270G—pH, ORP, conductivity, TDS and salinity
 - H280G—pH, ORP, conductivity, TDS, salinity and dissolved oxygen (DO)
- Benchtop meters with Bluetooth™ technology and a USB output. Refer to [Figure 2](#):
 - H260GB—pH and ORP
 - H270GB—pH, ORP, conductivity, TDS and salinity
 - H280GB—pH, ORP, conductivity, TDS, salinity and DO

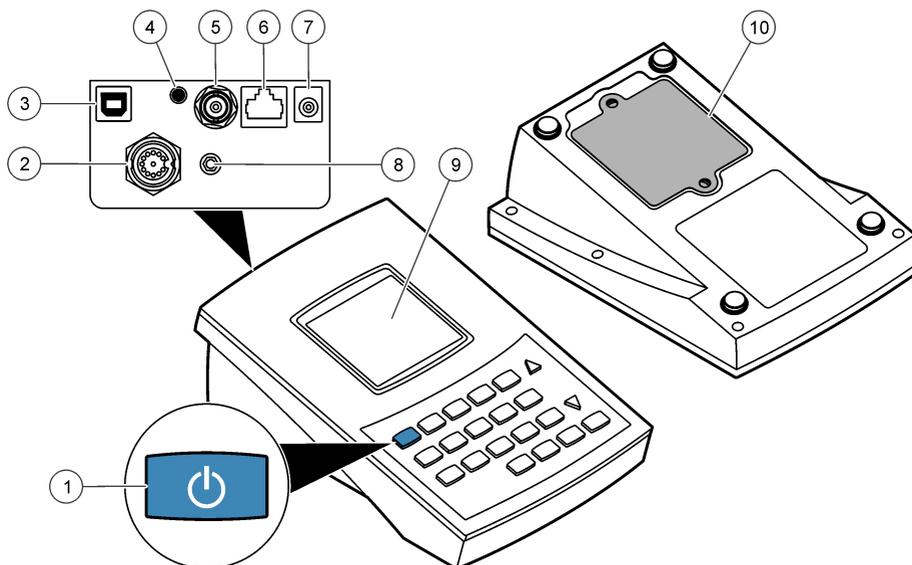
Note: The difference between the benchtop meters is that the GB benchtop meters have Bluetooth™ technology and a USB output, and the G benchtop meters only have a USB output. Unless noted, when the benchtop series is documented in this manual, the benchtop meter includes all of the H-series benchtop meters (both the G and the GB benchtop meters).

Figure 1 Handheld meter



1 Rubber dust caps	5 ISFET pH probe connector (8-pin)
2 Conductivity probe connection (12-pin, H170G only)	6 LCD display
3 BNC probe connector	7 Power button
4 3.5 mm phono jack for glass pH electrode, ISE, ORP or DO temperature sensors	8 Battery cover

Figure 2 Benchtop meter

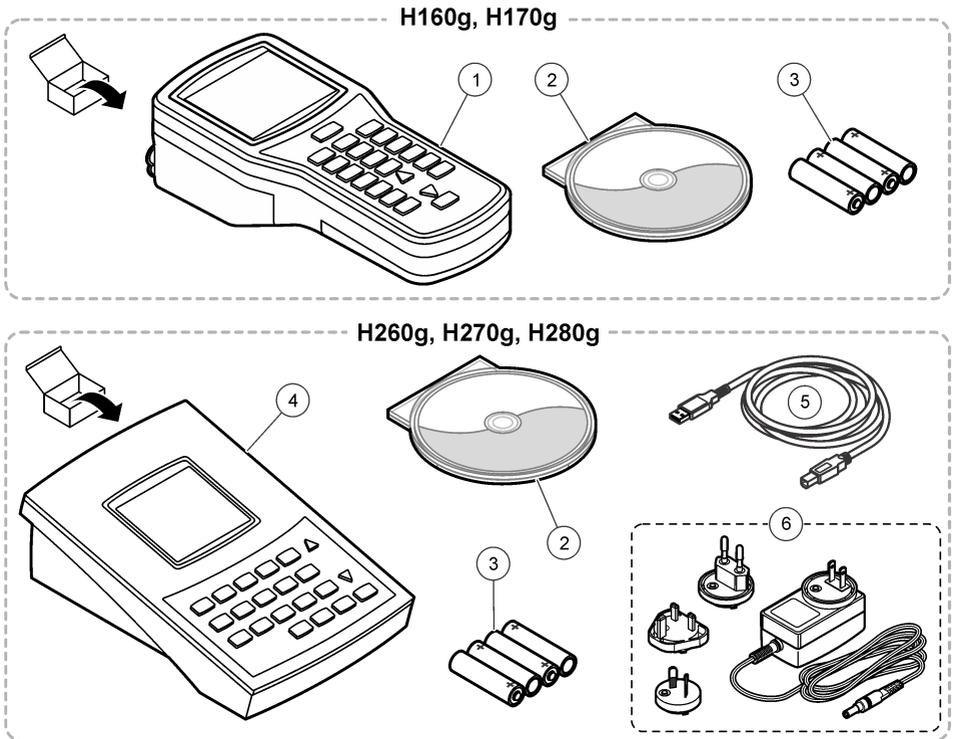


1 Power button	6 ISFET pH probe connector
2 Conductivity probe connector (12-pin, H270G and H280G only)	7 AC power connector
3 USB connector	8 External reference connector
4 3.5 phono jack for glass pH electrode, ORP, ISE or DO temperature sensors	9 LCD display
5 BNC connector for glass pH electrode, ISE, ORP or DO (H280G only) probes	10 Battery cover

Product components

Make sure that all components have been received. Refer to [Figure 3](#). If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Figure 3 Handheld and benchtop meter components



1 Waterproof handheld meter	4 Benchtop meter
2 SmartLogger II software	5 USB cable
3 AA Alkaline batteries (4x)	6 AC-DC power supply kit (power supply and three plugs: US, EU, UK)

Installation

▲ CAUTION



Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

Electrical installation

Connect to AC power

▲ DANGER



Electrocution hazard. If this equipment is used outdoors or in potentially wet locations, a Ground Fault Circuit Interrupt (GFCI/GFI) device must be used for connecting the equipment to its main power source.

▲ WARNING

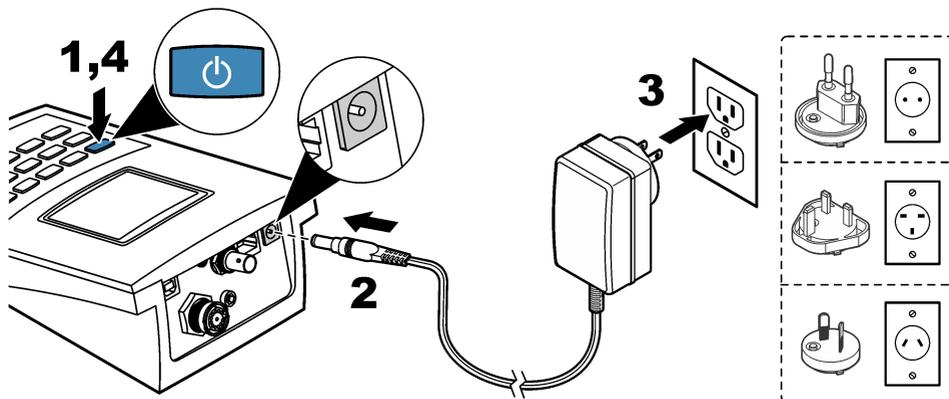


Fire hazard. Use only the power supply that is specified for this instrument.

The benchtop meters use AC power with an AC power adapter kit. Refer to [Product components](#) on page 8. The kit includes an AC-DC power supply, USB/DC adapter and AC power cord. Refer to [Figure 4](#) for AC power connections.

Note: Always set power to off before any power connections are made.

Figure 4 AC power connection



Install the batteries

▲ WARNING



Explosion hazard. Incorrect battery installation can cause the release of explosive gases. Be sure that the batteries are of the same approved chemical type and are inserted in the correct orientation. Do not mix new and used batteries.

NOTICE

Do not tighten the screws too much or instrument damage can occur.

NOTICE

Only do this procedure if the power to the meter is set to off or disconnected. Do not complete this operation with probes attached to the meter. Remove all probes from the meter or instrument damage can occur.

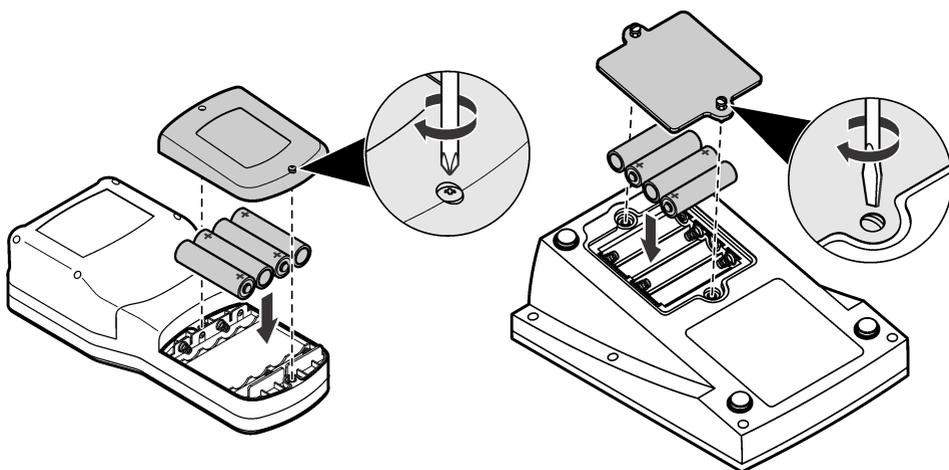
The meter uses AA alkaline or rechargeable NiMH batteries. To conserve the battery life, refer to [Configure the meter](#) on page 14 to configure automatic shutdown of the meter.

Refer to [Figure 5](#) to install the batteries.

Items to collect:

- Phillips screwdriver (for handheld meters)
- Flathead screwdriver (for benchtop meters)
- AA Alkaline batteries (4x)

Figure 5 Battery installation



Probe and connection types

NOTICE

Make sure that all the rubber plugs are fully installed before the handheld meter is put in water or the interior of the 3.5 mm phono jack will fill with water. The interior of the handheld meter will stay sealed. If water gets into the 3.5 mm phono jack, immediately invert the meter to let water come out of the phono jack. Let the connector dry.

NOTICE

Always set the power to off before a probe connection is changed or damage to the instrument can occur.

The meters can connect to two pH-sensing technologies: ISFET pH probes and glass electrodes. When the meter is set to on, it automatically identifies the type of probe attached. The meter only uses one type of pH probe at a time. Refer to [Product overview](#) on page 6.

Note: When a probe is not attached to the meter, the selected mode is inactive.

User interface and navigation

Keypad description

[Figure 6](#) shows the handheld and benchtop meter keypads. [Table 1](#) gives the function of the keys on the keypad and the meters that use that function.

Figure 6 Keypad description

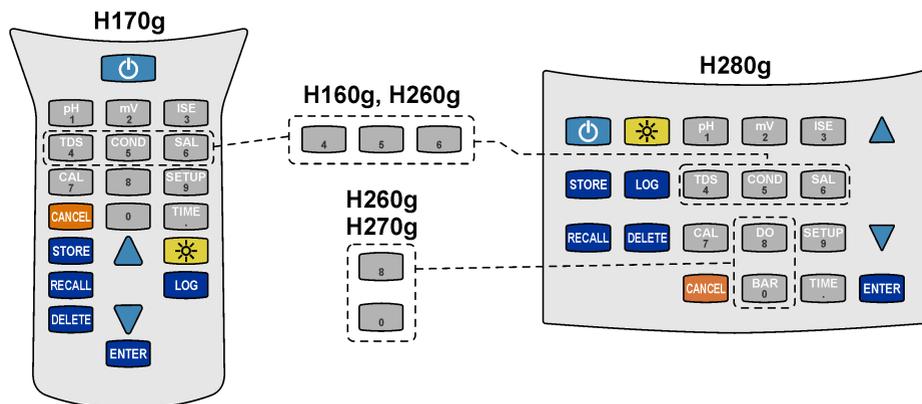


Table 1 Keypad functions

Key	Action	H160G H260G H260GB	H170G H270G H270GB	H280G H280GB
	ON/OFF: Set the meter power to on or to off.	x	x	x
	pH mode	x	x	x
	mV mode	x	x	x
	ISE mode	x	x	x
	TDS mode		x	x
	Conductivity mode		x	x
	Salinity mode		x	x
	Calibration mode	x	x	x
	DO mode			x
	Setup mode	x	x	x
	Barometric pressure mode			x

Table 1 Keypad functions (continued)

Key	Action	H160G H260G H260GB	H170G H270G H270GB	H280G H280GB
	Time and date display	x	x	x
	Store a reading	x	x	x
	Recall a stored reading.	x	x	x
	Delete a stored reading.	x	x	x
	Scroll through values, setup screens and options.	x	x	x
	Set the backlight to on. After 2 minutes without a keystroke, the backlight is set to off.	x	x	x
	Start/stop the data log	x	x	x
	Select an option, setting or value.	x	x	x
	Cancel an option, setting or value.	x	x	x

Display description

Figure 7 shows the measurement modes and values, data connection and storage options, battery status, temperature values, stabilization lock and connection statuses shown on the display.

Figure 7 Display



1 Data log indicator	10 Data storage memory location
2 Temperature and data values	11 Automatic temperature compensation (ATC) value (pH, conductivity, TDS or salinity)
3 Measured value	12 Calibration mode indicator
4 Stabilization lock	13 Temperature unit
5 Hold indicator	14 Low battery indicator
6 ISFET probe indicator	15 Bluetooth™ connection indicator
7 Measurement mode	16 PC data transfer icon
8 Measurement units	17 Setup mode
9 Storage options	

Startup

Set the power to on

Push the power button to set the power to on or off. Make sure that the power supply (AC power or battery power) is correctly installed.

Configure the meter

Do the operations in order:

1. Set the power to on.
2. Push **SETUP** to put the meter in setup mode.
3. Use the arrow keys to select an option, then push **ENTER**:

Option	Function	Description
CLr ALL CAL	Clear calibration points	Erases all the calibration points. Make sure to calibrate the meter. ¹
int	Data log interval	Keeps up to 999 data points in intervals from 1 to 1999 seconds (default = 10) in the data log.
year	Year	Use the number keys to enter the correct year.

Option	Function	Description
date	Date format	Sets the date to mm/dd/yy or dd/mm/yy format.
m/d date	Month and day	Use the number keys to set the correct month and day.
time	Time	Sets the correct time in a 24-hour format. Use the number keys to set the correct time.
OFF	Automatic shutdown	Sets the shutdown parameters from 1 minute to 000 minutes (continuous power). The meter beeps 1 minute before shutdown. Make sure to power cycle for the automatic shutdown to occur. Automatic shutdown is disabled during: data logging, Bluetooth™ transfers and when connected to the USB port.
Snd	Sound options	Sets sound alerts to on or off. Three sounds tell the user about different functions: <ul style="list-style-type: none"> • One beep: Stabilization occurred with the stabilization lock on. • Two beeps: An error occurred. The error code shows on the display. Refer to Troubleshooting on page 28. • Three beeps: Measurement stability in calibration mode, regardless of the stabilization lock setting.
°C °F	Temperature display	Sets the temperature unit from °C to °F.
READY	Stabilization lock	Sets the stabilization lock to on or off: <ul style="list-style-type: none"> • The "READY" icon shows when an endpoint occurs and the stabilization lock is set to on. • After stabilization, the display locks the value and the meter ignores slight measurement changes in pH, conductivity or TDS. • Sets the stabilization lock to off during titrations or slight change detection. The display automatically unlocks after a significant measurement change is found.

¹ This does not erase calibration data for an ISFET probe.

4. Push **ENTER** to keep the changes and go back to setup mode.

Note: To exit and not keep the changes, push **CANCEL**.

Operation

Configure the Bluetooth™ wireless connection

Transfer data and control several instrument functions from a remote location to a PC with the Bluetooth™ wireless connection.

Note: The arrow icon shows on the display when the meter is in communication with the SmartLogger II software on a PC. The arrow icon flashes when data is transferred. Refer to the SmartLogger II documentation to setup the wireless connection to a PC.

1. Set the power to on. The meter looks for the Bluetooth™ connection with a PC.
2. On the PC, select the option to find or add a Bluetooth™ device. Next, the PC prompts if the user wants to pair with a found device.
3. When the PC prompts for a pass key or PIN, enter the PIN (default = **1234**). The PC shows if the pair is successful and the meter shows the Bluetooth™ icon.
4. If the pair is not successful, do steps 1 through 4 again.

Note: If there is more than one meter in range, each meter is identified with the model number and the serial number (e.g., H170G LP SN1 2755).

Send data to a PC

Transmit data in storage to a PC and see real-time measurement values from a remote location on a PC. Refer to the SmartLogger II PC software guide for operation instructions for the PC to USB connection.

1. Set the power to off.
2. Connect the USB cable to the USB port of the PC.
3. Use the USB drivers to make a USB connection to the PC.
4. Set the power to on. Refer to the SmartLogger II documentation for data transfer information.

Keep measurement data

Keep up to 999 measurement readings to review, download or print later.

1. Push **STORE** during a data measurement. The meter shows the next available sample number, then the "?" icon flashes.
2. Push **STORE** again. The data is kept in that memory location and the meter goes back to the measurement mode.
3. To keep data in a different sample number, use the number keys to select a different sample number. Push **ENTER** to keep the measurement in this memory location.

***Note:** The meter beeps two times if a sample number already contains data or if all memory locations are full. The meter will prompt: "DELETE SAMPLE?". Push **ENTER** to overwrite the data in that location with the current data. Push **CANCEL** to exit to keep the current data.*

Examples of measurement data

pH and ISE measurements

- Sample number
- pH or ISE value
- mV value (pH)
- Sample temperature
- Temperature compensation (automatic or manual values)
- Date and time
- Meter serial number
- Probe serial number (ISFET)
- Software version
- Calibration date and time

Conductivity, TDS, salinity and DO measurements

- Sample number
- Conductivity, TDS, salinity or DO values
- Sample temperature
- mV value (pH)
- Temperature normalization (20 to 25 °C or 68 to 77 °F)
- Temperature compensation coefficient (conductivity/TDS)
- Salinity adjustment (DO)
- Barometric pressure (DO)
- Calibration date and time
- Meter serial number
- Software version

Set the data log

Note: The data log procedure stops during calibration and setup. Calibration alarms are not active during the data log procedure.

1. When the meter is in read mode, push **LOG** to record data. The "LOGGING" icon flashes and the digits in the lower right corner shows the number of collected data points.
2. To stop a data log procedure, push **LOG**.
3. To continue a data log procedure, push **LOG** again.
Note: Monitor data log memory to prevent data loss. If the memory is full, the meter deletes every even-numbered data point and continues to record data.

Recall the data

To recall data in storage or logged data:

1. In the measurement mode, push **RECALL**.
2. Push **STORE** to recall data in storage or push **LOG** to recall logged data.
3. To see the last data storage location, push **RECALL**.
4. To select a different location, use the numeric keypad to enter the location number, then push **ENTER**.
Note: If the user tries to recall data from a location with no data in storage, the display shows "NO." If "NO" shows, use the arrow keys to scroll to another data storage location.
5. To show the time a sample in storage was recorded, push **TIME**.
6. To show the date a sample in storage was recorded, push **TIME** again.
7. Push **pH, ISE, COND, TDS, SAL or DO** or **CANCEL** to go back to measurement mode.

Erase a single data measurement

Erase a data measurement or specific data measurements. Refer to [Erase all measurement data](#) on page 17 to erase all data measurements.

1. Push **RECALL** in the measurement mode.
2. Push **STORE CAL** or **LOG** to recall calibration or logged data records. The number of the last data measurement location shows.
3. Push **RECALL** to see the data.
4. To select a different memory location, use the numeric keypad to enter the location number, then push **ENTER**.
5. When the data to delete shows on the display, push **DELETE**. The meter will show "DELETE?".
6. Push **ENTER** to erase a data measurement.
Note: To exit and not keep the changes, push **CANCEL**.
7. Push **pH, ISE, COND, TDS, SAL or DO** to go back to the measurement mode.

Erase all measurement data

Refer to [Erase a single data measurement](#) on page 17 to erase specific data measurements. To erase all data in storage or all logged data measurements:

1. With a sample shown, push **DELETE**. The meter shows "DELETE SAMPLE?".
2. Push **STORE** or **LOG** to recall data. The number of the last data measurement location shows.
3. Push **RECALL** to show the data.
4. Push **0**, then **ENTER** and the meter shows "ALL."
5. Push **ENTER** to erase all data in storage or logged data.
Note: To exit and not keep the changes, push **CANCEL**.

Keep calibration data

The meter keeps the last 10 calibrations. [Table 2](#) shows the date for each calibration.

Table 2 Calibration and instrument data

Calibration data	
Calibration number	Cal 1 value
Cal 1 mV value	Cal 1 temperature
Cal 2 value	Cal 2 mV value
Cal 2 temperature	Cal 3 value
Cal 4 value	Cal 4 mV value
Cal 5 mV value	Cal 5 temperature
Slope cal 1 to cal 2	Slope cal 2 to cal 3
Slope cal 3 to cal 4	Slope cal 4 to cal 5
Cal date	Cal time
Instrument data	
Meter serial number	Probe serial number (ISFET only)

Recall a calibration

1. In the measurement mode, push **RECALL**.
2. Push **CAL** to read calibration data. The last calibration data location shows.
3. Push **RECALL** to read the data.
4. To select a different data location, use the numeric keypad to enter the location number, then push **ENTER**.
5. The first calibration point for the calibration in storage shows. Use the arrow keys to read other calibration points in storage.
6. Push **ENTER** to see the **mV** value of the calibration point in storage.
7. Push **ENTER** to see the slope of the calibration in storage.
8. Push **RECALL** or **CANCEL** to go back to the pH calibration values in storage.
9. Push **TIME** to see the time of a calibration in storage.
10. Push **TIME** again to see the date of a calibration in storage.
11. Push **pH, ISE, COND, TDS, SAL or DO** or **CANCEL** to go back to measurement mode.

Set a passcode

Set a passcode for authorized personnel to access calibration methods or other functions.

Note: To use setup functions without a passcode, set the passcode to **0000**.

1. Push **SETUP** to put the meter in setup mode.
2. Use the arrow keys until the **PASSCODE** and **SETUP** shows on the display.
3. Push **ENTER**. The display prompts to change the passcode. The default is "NO."
4. Use the arrow keys to select "YES." Push **ENTER**.
5. Use the number keys to enter a passcode. Push **ENTER** to keep the changes and go back to setup mode.

Note: To exit and not keep the changes, push **CANCEL**.

Note: Wait 5 minutes for the meter to set the new passcode, or set the meter power to off, then back on. The meter will prompt for the new passcode.

Change a passcode

To change a set passcode, first make sure that the passcode is set. Refer to [Set a passcode](#) on page 18.

1. Push **SETUP** to put the meter in setup mode.
2. Use the arrow keys to enter the four-digit passcode.
3. Push **ENTER**.
4. If the passcode is not correct, the display shows "Err."
5. Push **CANCEL** to enter the correct passcode, or push **pH, mV, ISE, TDS, COND, SAL** or **DO** to go back to measurement mode.

Note: Contact technical support if the user or the system administrator cannot enter the correct passcode.

Override an error

The user can override some errors (e.g., poor electrode condition) until a replacement electrode is ordered and received.

Note: It is not possible to override all errors. The manufacturer does not recommend that the user override error codes. Contact technical support to override error codes.

To cancel or override an error:

1. Find the cause of the error. Refer to [Error codes](#) on page 29. If possible, push **CANCEL** or **pH, COND, TDS** or **DO** to cancel the calibration or other error.
2. To override the error, do not complete step 1. Instead, push **ENTER**.
3. Use the arrow keys until "YES" shows.
4. Push **ENTER**.

Advanced operation

Set the pH operations

Set the calibration alarm, the pH resolution, the calibration points and the calibration methods. Do the operations in order.

1. Set the power to on.
2. Push **SETUP**, then **pH**.
3. Use the arrow keys to select an option, then push **ENTER**:

Operation	Function
pH calibration alarm	Sets the alarm from 1 to 999 hours. The recalibration alarm is set to "OFF" at 000 hours.
pH resolution	Sets the pH resolution to 0.1 or 0.01 pH. The stabilization lock (the "READY" icon) is faster at a 0.1 pH resolution.
Set the 2, 3, 4 or 5-point pH calibration	Shows the current number of calibration points. Use the arrow keys to set the calibration points.
pH calibration method	<ul style="list-style-type: none">• Selects the pH buffer to use and in what order. The default is a 2-point calibration (pH 7.00, then 4.00).• Shows the pH buffer for the first calibration point.• Changes other buffer values to set the pH calibration method until all buffers are set. <p>Note: Previously-set buffers will not be shown.</p>

4. Push **ENTER** to keep the changes and go back to setup mode.
- Note:** To exit and not keep the changes, push **CANCEL**.

Set the manual temperature compensation

Glass pH electrodes are automatically temperature compensated if a temperature probe is sensed in the 3.5 mm phono jack. If no probe is sensed, the meter defaults to the manual temperature compensation at 25.0 °C. Manual temperature compensation is always in °C. Refer to [Set the manual temperature compensation for glass electrodes](#).

pH buffer values at various temperatures							
25 °C	0 °C	5 °C	10 °C	20 °C	30 °C	40 °C	50 °C
1.68	1.67	1.67	1.67	1.67	1.68	1.69	1.71
4.01	4.00	4.00	4.00	4.00	4.01	4.03	4.06
6.86	6.98	6.95	6.92	6.87	6.85	6.84	6.83
7.00	7.12	7.09	7.06	7.01	6.99	6.97	6.97
9.18	9.46	9.40	9.33	9.23	9.14	9.07	9.02
10.01	10.32	10.25	10.18	10.06	9.97	9.98	9.83
12.45	13.42	13.21	13.00	12.63	12.29	12.04	11.70

1. Push **SETUP**, then **pH** to put into pH setup mode.
2. Use the arrow keys until the manual temperature shows "- - - °C" on the display.
3. Push **ENTER** to see the manual temperature value.
4. Use the arrow keys to set the manual temperature compensation.
5. Push **ENTER** to keep the changes and go back to setup mode.
*Note: To exit and not keep the changes, push **SETUP**.*

Calibrate for pH measurement

The meter accepts 1, 2, 3, 4 and 5-point calibrations. The default is a 2-point calibration. If necessary, a system administrator or a user can set the sequence of buffers and numbers of calibration points.

1. Push **pH** to put the meter in pH mode.*
2. Put the probe in the buffer solution.
*Note: To erase all previous calibration points, slopes and offset, push **CAL**, then **DELETE**. To update a previous calibration with a single-point calibration, ignore this step.*
3. Push **CAL**, then the "CAL" icon flashes on the display.
*Note: The user can stop a calibration when the pH value is in flash mode. Push **pH** or **CANCEL** to go back to the measurement mode.*
4. If the buffer is not correct, push **ENTER**, then the pH buffer flashes on the main display until the calibration is complete.
5. If the pH buffer is incorrect, use the arrow keys to select another buffer.
6. Use the arrow keys to see the buffers: 1.68, 4.01, 6.86, 7.00, 9.18, 10.01 and 12.45. During "CAL 2" or "CAL 3", the meter ignores the values used in previous calibrations.
7. The meter beeps three times when a calibration is complete. **CAL 3** and the next pH buffer value (the default is 4.01) flashes on the display.
8. Rinse the probe in deionized water and put in the second buffer solution.

* The slope is the change in potential when the pH reading changes by one decade, (e.g., from pH 7.00 to pH 8.00). The % slope is the ratio of the measured slope and the theoretical Nernst slope of 59.16 mV per decade of pH change at 25 °C. If the slope on a BNC electrode is not between 85 to 102%, the meter shows the error code: E04. If the calibration is more than two points, the slope that shows is the average slope for all points. The meter will show E03, if the offset from 0.0 mV in pH 7.00 is larger than ±30 mV. Refer to [Error codes](#) on page 29.

9. Push **ENTER**, if OK or use the arrow keys to change the value. Push the **pH** to accept a 1-point calibration and to go back to the pH measurement mode.
If **ENTER** is selected, then the buffer value flashes until calibration is complete.
10. If the meter is set for a 2-point calibration, the meter beeps three times when the calibration is complete. The display shows the slope, the mV offset at pH 7.00 and the number of calibration points. Review the calibration data, then push **pH** or **STORE** to start reading the pH value of any solution.
11. If the meter is setup for three or more calibration points, then do steps 1 through 9 again until the final calibration points are complete.

Set the ISE operations

Set the calibration alarm, the 2, 3, 4 or 5-point calibration and the calibration method. Do the operations in order.

1. Set the power to on.
2. Push **SETUP**, then **ISE** to put the meter in ISE setup mode.
3. Use the arrow keys to select an option, then push **ENTER**:

Operation	Function
ISE calibration alarm	Sets the alarm from 1 to 999 hours. The recalibration alarm is set to "OFF" at 000 hours.
2, 3, 4 or 5-point ISE calibration	Shows the current number of calibration points. Use the arrow keys to set the calibration points.
ISE calibration method	<ul style="list-style-type: none"> • Selects the ISE standard to use and specifies the order. • Shows the numeric entry screen. Push TIME two times to toggle between ppm or ppt resolution. • Use the arrows or the numeric keypad to enter the first ISE calibration standard. • Do these steps again for each calibration point. <p><i>Note: Exit the setup mode and go to ISE calibration mode to view calibration values in storage. Use the arrow keys to view all calibration values in the current setup method.</i></p>

4. Push **ENTER** to keep the changes and go back to setup mode.
*Note: To not save the changes and exit, push **CANCEL**.*

Calibrate for ISE measurement

The meter accepts up to five ISE calibration standards. The values of the concentration standards are first entered in the setup mode.

1. Set the power to on.
2. Push **ISE** to put the meter in the ISE mode.
*Note: Push **CANCEL** at any time to stop calibration.*
3. Put the probe in the first calibration solution.
4. To erase all previous calibration points, slopes and offset values, push **CAL**, then **DELETE**.
5. To update a previous calibration with a single point calibration, do not erase all previous calibration points, slopes and offset values.
6. Push **CAL**. The "CAL 1" icon flashes.
7. Use the arrow keys to select the concentration of the ISE standard.
8. Push **ENTER** to start the calibration.
9. The meter beeps three times when the first calibration is complete. "CAL 2" and the next ISE concentration value flashes on the display.
10. Rinse the probe in deionized water. If necessary, put the probe in the next calibration solution. Repeat steps 2 to 10 until calibrations are complete.

Set the conductivity options

Set the calibration alarm, the conductivity temperature compensation, the 2, 3, 4 or 5-point conductivity calibration, the conductivity temperature and the cell constant.

1. Set the power to on.
2. Push **SETUP**, then **COND** to put the meter in conductivity setup mode.
3. Use the arrow keys to select an option, then push **ENTER**:

Operation	Function
ISE calibration alarm	Sets the alarm from 1 to 999 hours. The recalibration alarm is set to "OFF" at 000 hours.
Conductivity temperature compensation	<ul style="list-style-type: none"> • Use the arrow keys to set the compensation coefficient between 0 to 10 (the default is set to 2% per °C). • Conductivity is automatically temperature compensated.
2, 3, 4 or 5-point conductivity calibration	<ul style="list-style-type: none"> • Use the arrow keys to select each option, then push ENTER: • Shows the first active calibration point. Use the arrow keys to see other in-use values. Note: "- - - -" shows on the display if there are no conductivity calibration points in storage.
Conductivity temperature ¹	<ul style="list-style-type: none"> • Shows the conductivity normalization value. • Use the display settings between 20 to 25 °C (default = 25 °C).
Conductivity probe cell constant	<p>The cell constant is automatically found and shows on the display. Sets the cell constants to:</p> <ul style="list-style-type: none"> • K = 0.5 for general procedures • K = 1 for low conductivity procedures (e.g., drinking water) • K = 10 for salinity or brackish water • If no conductivity probe is attached, the display shows "000."

¹ Conductivity varies a lot with temperature. The Automatic temperature compensation (ATC) adjusts conductivity measurements to calculate the conductivity changes in the reading that are caused by temperature. The readings are referenced to or "normalized" at a standard temperature. The ATC gives the equivalent conductivity or TDS of a solution normalized at 20 or 25 °C.

4. Push **ENTER** to keep the changes and go back to setup mode.
Note: To exit and not keep the changes, push **CANCEL**.

Set the TDS options

Set the TDS conversion factor, the TDS units and the salinity units. Complete the operations in order.

1. Set the power to on.
2. Push **SETUP**, then **ISE** to put the meter in ISE setup mode.
3. Use the arrow keys to select an option, then push **ENTER**:

Operation	Function
TDS conversion factor	<ul style="list-style-type: none"> • TDS values are related to conductivity. Calibrate with a TDS standard or with conductivity standards, then program the meter with a conversion factor. • Sets the conversion factor to 0.40 to 1.00 (default is set to 0.50).
TDS units	Use the arrow keys to set the TDS units in mg/L (g/L) or ppm (ppt).
Salinity units in ppm (ppt) or %	Use the arrow keys to set the salinity units in ppm (ppt) or as a percentage.

4. Push **ENTER** to keep the changes and go back to setup mode.

*Note: To exit and not keep the changes, push **CANCEL**.*

Calibrate for conductivity and TDS measurement

Calibrate the meter with up to five calibration points with conductivity or TDS standards. If the calibration point is 20% larger than a calibration point in storage, both conductivity points are kept. If the calibration point is 20% smaller than a calibration point in storage, only the new calibration point is kept. If there are five calibration points in storage, the new calibration data replaces values near the same range.

By default, the meter uses the temperature coefficient of 2% per °C. The user can set the coefficient in setup mode. Review calibration points in setup mode.

Note: Salinity measurements are identified from conductivity.

1. Set the power to on.
2. Push **COND** or **TDS**.
3. Put the probe in the first standard solution. The meter measures the standard.
4. Use the arrow keys to select the value of the conductivity or TDS standard.
5. Push **ENTER**. The main display shows, then the "Wai" icon flashes.
*Note: Push **TDS** or **COND** to stop calibration. The meter stops the current calibration and keeps the previous calibration data.*
6. Push **CAL**. The main value flashes.
7. To erase all previous calibration points, slopes and offset values, push **CAL**, then **DELETE**. Ignore this step to update a previous calibration with a single point calibration.
8. Push **COND** or **TDS** to read the conductivity or TDS value of any solution.
9. Do steps 2 through 9 again to complete multiple calibration points (maximum of 5).
10. When the calibration is complete, the meter shows the slope as compared to the nominal sensitivity for a probe of that cell constant and the total number of conductivity and TDS calibration points in the meter.
Note: The number at the bottom right corner of the display is the calibration points that are in the meter. The value above the slope is the slope relative to the nominal sensitivity.

Set the DO operations

Use the steps that follow to set: the calibration alarm, the measurement units, the calibration units, 1 or 2-point calibration points and the calibration methods. Make sure that the operations are completed in order.

Note: If the DO calibration units are changed in setup, (e.g., from % to ppm), the meter automatically changes the values entered when the calibration method is setup to the selected units. Since the conversions are approximate, for maximum accuracy, enter the necessary values in this procedure in the correct calibration units.

1. Set the power to on.
2. Push **SETUP**, then **DO** to put the meter in DO mode.
3. Use the arrow keys to select an option, then push **ENTER**:

Operation	Function
DO calibration alarm	<ul style="list-style-type: none"> • Sets the alarm from 1 to 999 hours. The recalibration alarm is set to OFF at 000 hours. • Push ENTER to go back to setup mode. • Push ENTER, then DO. • Use the arrow keys until "Unit" shows.
Measurement units	Use the arrow keys to set the DO measurement units (mg/L, %, salinity or ppm).
Calibration units	Use the arrow keys to set the DO calibration units (mg/L, % or ppm).

Operation	Function
1 or 2-point calibrations	<ul style="list-style-type: none"> The default calibration point is set to one at 100% saturation.¹ Use the arrow keys to set the calibration point to 1 or 2. After this data is kept or cancelled, the display shows the current number of calibration points.
Calibration method	<ul style="list-style-type: none"> Use the arrow keys to set the first calibration standard. If the meter is setup for two DO points, do these steps again for the second calibration point. <p><i>Note: If the DO calibration units are changed in setup, (e.g., from % to ppm), the meter automatically changes the values entered in this step to the selected units. Since the conversions are approximate, enter the necessary values in this procedure (for maximum accuracy) in the correct calibration units.</i></p> <p><i>Note: DO calibrations are not salinity compensated. The salinity value from an attached salinity probe or the salinity value entered in setup will be ignored.</i></p>

¹ This assumes a nominal slope of 47 mV from 0% to 100% at 25 °C at 1013 hPa barometric pressure with 0 ppm salinity.

- Push **ENTER** to keep the changes and go back to setup mode.
*Note: To exit and not keep the changes, push **CANCEL**.*

Set the Barometric pressure compensation units

DO measurements are sensitive to barometric pressure. The meter has a built-in barometer to give automatic compensation of barometric pressure.

The meter shows barometric pressure in Hg (inches of mercury), mmHg (millimeters of mercury), or hPa (hectopascals or millibars). The default unit is set to hPa.

- Set the power to on.
- Push **SETUP**, then **DO** to put the meter in the DO setup mode.
- Use the arrow keys until "bAr Unit" shows on the display.
- Push **ENTER**, then use the arrow keys to set the barometric pressure units (hPa, mmHg and inHg).
- Push **ENTER** to keep the changes and go back to setup mode.
*Note: To exit and not keep the changes, push **CANCEL**.*
- Next, use the numeric keypad or the arrow keys to set the salinity compensation value.
- Push **ENTER** to keep the changes and go back to setup mode.
*Note: To exit and not keep the changes, push **CANCEL**.*

Calibrate for DO measurement

Calibrate the H280G and H280GB benchtop meters to measure DO with two methods: the water-saturated air method or the water sample with a known DO concentration method.

Up to two calibration points can be done at any concentration. If a 1-point calibration is done, the meter replaces the calibration point in storage that is most near the new calibration point (e.g., a new 100% DO single-point calibration replaces the calibration point in storage that is closest to a 100% DO value). Both methods can do 1-or-2-point calibrations. During setup, calibration and measurement units can be set to % or mg/L.

NOTICE

DO is related to barometric pressure. The meter has a built-in barometer that will do automatic compensation for barometric pressure.

Note: Do not set the power to off and remove the probes during conductivity or DO modes because the meter will show an error the next time the meter is set to power on. Exit conductivity or DO modes before shutdown.

Calibrate with a known concentration method

To measure DO, make sure that the concentration is already known.

Note: Put the probe into an oxygen-scavenging solution (e.g., a 2% sodium sulfite for 5 minutes) to get a near-zero DO solution.

1. Set the meter power to on.
2. Use the arrow keys to select the DO standard concentration.
3. Push ENTER to start the calibration. Push **CANCEL** at any time during calibration to exit. The meter stops the current calibration and keeps the old calibration data.
4. The DO value and "WaiT" flashes until the calibration is complete.
5. The meter beeps three times when the first point of the calibration is complete.
6. If setup for a 1-point calibration, the meter shows the slope. Push **DO** or **STORE** to go to the measurement mode.
7. If setup for a 2-point calibration, the next DO concentration value (specified in setup) and "CAL 2" flashes.
8. Push **ENTER** to start the calibration. The DO value and "WaiT" flashes until calibration is complete. When the calibration is complete, the slope shows on the display.
9. To do only a 1-point calibration, push **DO** or **STORE**. The meter will accept just a 1-point calibration and show the slope. If not, continue to the next step.
10. Push **BAR** to see barometric pressure. Push **SAL** to see the measured salinity adjustment, if a conductivity (salinity) probe is attached. If no conductivity probe is attached, the manual salinity compensation factor shows on the display.

Calibrate with an air-saturated method

Refer to [Configure the meter](#) on page 14 to set the calibration and measurement units to % or mg/L. Do the operations in order:

1. Prepare the first standard. Put 1 cc of water in a narrow-necked bottle and shake vigorously.
2. Clean the probe tip dry, then put the probe in the bottle.
3. For a quick method: Wet the probe membrane with water, then hold the probe in the air with the sensor pointed to the ground.
Note: Slope is the ratio of the actual mV output of the sensor as compared to the nominal sensitivity of 0.0 mV at 0% saturation and 45.0 mV at 100% (i.e., 100% = 8.2 mg/L saturation at 25 °C at 1013.25 hPa barometric pressure at 0 ppm salinity). 1 mg/L = 1 ppm. The nominal slope is 8.2 ppm/45mV or 0.1822 ppm per mV.
4. Set the meter power to on.
5. Push **DO** to put the meter in DO mode. The meter reads the DO value. Push **CANCEL** during calibration to exit. The meter stops the current calibration and keeps the old calibration data.
6. Put the probe in the first calibration solution or the saturated air bottle. To erase all previous calibration points, slopes and offsets, push **CAL**, then **DELETE**. To update a previous calibration with a 1-point calibration, ignore this step.
7. Push **CAL**, then the "CAL" icon flashes.

Maintenance

Replace the batteries

The display shows "bAt" when the batteries are too low to give a reliable measurement. The low battery icon (refer to [Display description](#) on page 13) shows when there is approximately 25 hours of battery power. Measurement errors are possible when the batteries are low. Refer to [Install the batteries](#) on page 10 to replace the batteries.

Note: The date and time must be set again when the batteries are removed or are fully discharged.

Clean the instrument

Clean the exterior of the instrument with a moist cloth and a mild soap solution and then wipe the instrument dry.

ISFET pH probe maintenance

▲ CAUTION



Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

▲ CAUTION



Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

The expected life of an ISFET probe is approximately 18 months. The reference electrode has a KCl gel that is diluted over time. The reference is sealed and is non-refillable. Replace the probe when it becomes difficult to calibrate.

- Keep the probe dry with the protective shroud on when not in use.
- Clean oil, fat, food particles, starch, protein or other materials from the probe tip after use.
- Never use sharp metal objects (e.g., a needle, a pin, etc.) to clean the sensor surface.
- Remove the probe from environments with static electricity. Electrostatic discharge (ESD) can permanently damage the probe.
- Remove the probe from environments that will damage the sensor, such as hydrofluoric acid or abrasive samples.
- Remove the probe from environments that will damage the epoxy materials used in the probe tip (e.g., keep the probe away from acetone, toluene, methylene chloride, xylene and other strong organic solvents).
- Do not use the probe in temperatures more than 60 °C (140 °F). Thermal cycling can decrease the life of the probe.
- For semi-solids use, carefully twist the probe to make sufficient contact with the sample to the sensor.
- When semi-solids are tested, make sure that solid objects (i.e., bone or gristle) do not scratch the sensor.
- Cool samples to room temperature to maximize probe life.
- Always use new buffers and new rinse solutions.

Prepare the probe for storage

NOTICE

Do not use the probe for long-term pH measurement applications.

Note: No electrode storage solution is necessary.

A new probe usually has visible reference gel at the tip of the probe, as well as in the interior of the rubber dust cap. To remove the gel, carefully clean with a soft-bristled toothbrush and mild soapy water (a few drops of dish soap in a warm cup of water). The gel can continue to show for two to five days. Do not put the rubber dust cap on the probe until all of the reference gel is removed. Do not complete the steps that follow until all reference gel is removed from the probe and the interior and exterior of the rubber dust cap.

Prepare the probe for storage

1. Put the new probe (or the probe that was in extended storage) in pH 7 buffer for at least 5 minutes.
2. Stir the probe in pH 7 buffer solution to dislodge air bubbles.
3. Use fresh deionized water to rinse the probe.
4. Dry the probe with a lint-free cloth.

5. Put the rubber dust cap back on.
6. Keep the probe in dry storage when not in use.

Calibrate the ISFET probe

Refer to [Prepare the probe for storage](#) on page 26 before calibration.

NOTICE

Do not use the probe for applications that cycle between hot and room temperature samples.

Note: Remove other active or non-active measurement devices during pH or conductivity measurement. Other devices, even AC power, can cause interference.

Note: Only do calibrations away from the sun. Direct sunlight can cause unstable readings or difficulty in calibration.

1. Connect the probe to the meter.
2. Set the meter power to on.
3. Clean the probe with new deionized water and dry with a lint-free cloth.
4. Put the probe in the pH 7 buffer.
5. Clean the probe with deionized water and dry with a lint-free cloth.
6. Put the probe in the second buffer (pH 4 or pH 10).
7. Read the results.
8. If the result is not correct, the probe is not correctly hydrated.
Soak the probe for another 5 minutes in pH 7 buffer, then do the calibration again.

Clean the ISFET probe

NOTICE

Do not use sharp metal objects (a needle, a pin, etc.) to clean the sensor. This can scratch the sensor and cause permanent damage to the probe.

For use in dairy, cheese or meat applications, soak the probe in Pepsin Cleaning Solution for 15 minutes before the probe is cleaned.

Regularly clean a non-glass probe:

1. Remove the rubber dust cap from the probe, then rinse with new deionized water.
2. Use a soft-bristle toothbrush and a mild detergent (a few drops of dish soap in a warm cup of water) to carefully clean the probe.
3. Rinse with new deionized water to remove all debris from the sensor surface.
4. Dry the probe with a lint-free cloth.
5. Calibrate the probe again. Refer to [Calibrate the ISFET probe](#) on page 27, then [Prepare the probe for storage](#) on page 26.

Repair the ISFET probes

NOTICE

Do not use the probe to find out if the buffer is above 60 °C (140 °F). If the probe is suddenly put into very hot liquid, the probe can be permanently damaged.

Monitor how long the probes are in dry storage. If the probes are in storage for an extended period of time, the KCl gel at the reference junction can crystallize.

1. Heat pH 7 buffer to approximately 45 to 60 °C (115 to 140 °F).
2. Soak the probe for 2 minutes.
3. Put the probe in room temperature pH 7.00 buffer and let cool.

BNC electrode maintenance

Prevent unstable readings:

- Keep the probe in an electrode storage solution.
- Start measurements with at least a 2-point calibration. Update often with 1, 2 or 3-point calibrations.
- Use new buffers and new deionized rinse solution.
- Use buffer solutions with pH values no larger than 3 pH units apart. Ideally, the buffers bracket the anticipated pH values of the unmeasured samples.
- Use deionized water to rinse residual buffer and sample solutions from the probe after calibration and measurement.
- Calibrate at the same temperature as the sample solution. Although the meter has an ATC, get the best results when the calibration buffers and the sample are the same temperature.
- Keep the connectors clean and dry. Dirty or damp connectors can cause unstable readings.

Clean the electrode

NOTICE

Never use sharp metal objects (e.g., a needle, a pin, etc.) to clean the sensor surface. The sensor can be permanently damaged with abrasion of the sensor surface.

Clean the electrode with a soft-bristled toothbrush and mild soapy water (a few drops of soap in warm water).

Troubleshooting

Problem	Possible cause	Solution
No display	Automatic shutdown set the power to off.	Set the power to on again.
	There is no power.	Replace the batteries.
Unstable reading	The probe is dirty.	Clean the probe.
	The probe or the meter connectors are dirty.	Clean the probe contacts on the cable connector. Clean the meter with methanol on a cotton swab. Let dry completely. Connect the probe to the meter again.
	No flow in the reference junction	Clean the warm buffer.
	ISFET probe is not correctly hydrated.	Soak the probe for at least 5 minutes in a pH 7.00 buffer.
	Interference from other devices	Remove other devices from the solution.
	Interference from direct sunlight	Use protection for the probe from direct sunlight.
	The probe is in a very low ionic strength solution.	A stable reading is not possible.
	The pH or temperature of the solution changes.	A stable reading is not possible until pH and temperature are constant.

Problem	Possible cause	Solution
The meter continually shows -2.00 or 19.99 with an electrode attached. The "ISFET" icon does not show when ISFET probe is attached.	The ISFET probe is not sensed by the meter or the probe.	Set the meter power to off. If the "ISFET" icon does not show, replace the ISFET probe.
	Out of calibration	Calibrate the ISFET probe on page 27.
	The probe is not in the solution.	Put the probe in liquid. Carefully shake the probe to make sure that air bubbles are not caught on the sensor surface.
	No probe is connected to the meter.	Set the meter power to off. Connect the pH probe. Set the meter power to on.
	The probe is dirty.	Clean the probe.
	The probe is damaged.	Replace the probe. Contact technical support.
Screen flashes during calibration.	The probe sensor surfaces are dirty or it is necessary for the probe to be conditioned again.	Clean and condition the probe again.
	No flow in the reference junction	Clean the warm buffer.
	The buffers are contaminated or expired.	Calibrate with new buffers again.
	Interference from other devices in the solution	Remove all devices from the solution.
	The battery is low.	Replace the batteries if the battery icon shows low battery power.
	Interference from direct sunlight	Use protection for the probe from direct sunlight.
	The probe is too old.	Replace the probe.

Error codes

Table 3 shows the codes that can occur for various reasons. Error codes show instrument malfunction or user error.

Table 3 Error code descriptions

Error Code	Description	Solution
E02	The ISFET pH probe is damaged.	Replace the probe. Contact technical support for probe replacement information.
E03	Clean the probe.	Clean the probe. If the error continues, replace the probe.
E04	Glass pH probe slope error. The slope is smaller than 85% or larger than 102% of 59.16 mV per pH unit.	Clean the probe. If the error continues, replace the probe.
E06	ISFET pH probe slope error.	Clean the probe. Soak in 40 °C (113 °F) pH 7.00 buffer for 2 minutes. Calibrate again. If the error continues, replace the probe.
E07	Clean the probe.	Clean the probe. Make sure that no air bubbles on the sensor surface or foreign objects or materials on the sensor.

Table 3 Error code descriptions (continued)

Error Code	Description	Solution
E08	Too long to calibrate. Signal is not stable during calibration.	Clean the probe. Disconnect stirrers and other AC power sources. Make sure that the calibration solution temperature is constant. Replace the probe if the error continues.
E13	The ISFET pH probe temperature sensor is damaged.	Replace the probe. Contact technical support for probe replacement information.
E14	The battery is extremely low.	Replace the batteries immediately. Damage to the accuracy and function of the meter could have occurred.
E15	Replace the battery immediately. The accuracy and function of the meter could be compromised.	Contact technical support for service information.
E20	The conductivity temperature sensor is damaged.	Replace the probe. Contact technical support for probe replacement information.
E25	The slope is smaller than 60% or larger than 140% of the nominal.	Replace DO probe membrane and fill solution. Replace the probe if the error continues. Nominal = 0.1822 ppm/mV.
E26	The mV reading is more than ± 10 mV from nominal.	Replace DO probe membrane and fill solution. Replace the probe if the error continues. Nominal = 0.0 mV at 0% saturation; 45mV at 100%.
E27	DO probe temperature error	Attach the temperature sensor to the 3.5 mm phono jack. DO readings are highly temperature dependent and a temperature sensor must be attached.
E28	Barometric pressure sensor error	Contact technical support for repair information.
E30	ISE electrode calibration error	The slopes are not the same sign or are not within 25% of each other. Calibrate again in the correct solutions.
E40	Unrecognized host command	Command from a host PC is not found. Use only valid commands.
E42	Invalid input	The value entered during the setup is invalid. Enter a different value.
E44	No probe is installed	No probe is installed for the applicable parameter. Set the meter power to off. Install the correct probe. Set the meter power to on.

Replacement parts and accessories

⚠ WARNING



Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.

Replacement parts

Description	Quantity	Item no.
AA Alkaline batteries	4	1938004
USB cable assemblies, A-B, 28/26, black	1	10013Q
Power supply, 100–240 VAC	1	8522400

Accessories

Description	Quantity	Item no.
ISFET pH probes for the handheld meters ¹		
General purpose round tip pH probe	1	PHW77-SS
Micro pH probe	1	PHW17-SS
Piercing tip micro pH probe	1	PHW37-SS
pH probe for NMR tubes	1	PHW47-SS
Heavy duty piercing tip micro pH probe	1	PHW57-SS
ISFET pH probes for the benchtop meters		
General purpose round tip pH probe	1	PH77-SS
Micro pH probe	1	PH17-SS
Piercing tip micro pH probe	1	PH37-SS
pH probe for NMR Tubes	1	PH47-SS
Heavy duty piercing tip micro pH probe	1	PH57-SS
Conductivity and dissolved oxygen probes		
General purpose conductivity probe, epoxy, K = 0.5	4 graphite contacts	CDW97-KP5
LIS conductivity probe, glass, K = 1	4 platinum contacts	CDW97-K1
Conductivity probe for salinity and brackish water, epoxy, K = 10	4 contacts	CDW97-K10
Glass pH probes		
Gel-filled combination pH, BNC and 3.5 mm phone	1	5193511
Pt Series combination pH, BNC and 3.5 mm phone	1	5191011
Refillable combination pH, BNC and 3.5 mm phone	1	5194011

¹ These ISFET pH probes are for both handheld and benchtop meters and are stainless steel.

Consumables

Description	Quantity	Item no.
Probe cleaning solution for removal of protein deposits on pH probes	500 mL	2964349
Rinse solution, non-ionic surfactant	500 mL	2964449
Buffer solution, red, pH 4.01	500 mL	2283449
Buffer solution, yellow, pH 7.00	500 mL	2283549
Buffer solution, blue, pH 10.01	500 mL	2283649
Conductivity standard solution, 100 µS/cm	500 mL	2971849
Conductivity standard solution, 1000 µS/cm	500 mL	1440049
Conductivity standard solution, 10,000 µS/cm	500 mL	2972249
Conductivity standard solution of 35 ppt salinity, 53 mS/cm	500 mL	2714349
Conductivity standard solution, 100 µS/cm	100 mL	2971842
Conductivity standard solution, 1000 µS/cm	100 mL	1440042

Consumables (continued)

Description	Quantity	Item no.
Conductivity standard solution, 10,000 $\mu\text{S}/\text{cm}$	100 mL	2972242
Easy-to-thread-on cap with a pre-installed membrane	1	DO50-CAP
DO50-KIT, includes: DO50-CAP, electrolyte and syringe	1	DO50-KIT



HACH COMPANY World Headquarters

P.O. Box 389, Loveland, CO 80539-0389 U.S.A.
Tel. (970) 669-3050
(800) 227-4224 (U.S.A. only)
Fax (970) 669-2932
orders@hach.com
www.hach.com

HACH LANGE GMBH

Willstätterstraße 11
D-40549 Düsseldorf, Germany
Tel. +49 (0) 2 11 52 88-320
Fax +49 (0) 2 11 52 88-210
info@hach-lange.de
www.hach-lange.de

HACH LANGE Sàrl

6, route de Compois
1222 Vézenaz
SWITZERLAND
Tel. +41 22 594 6400
Fax +41 22 594 6499