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Operating Instructions

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**SenseLine**  
**pH meter F410**



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**Contents**

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<b>1.</b>	<b>Introduction</b>	<b>3</b>
<b>2.</b>	<b>Safety measures</b>	<b>3</b>
<b>3.</b>	<b>Installation</b>	<b>5</b>
	3.1 Installing the batteries	5
	3.2 Fitting the wrist strap	5
<b>4.</b>	<b>Operating the F410 pH meter</b>	<b>6</b>
	4.1 Display and key controls	6
	4.2 Calibration	8
	4.2.1 Buffer groups	8
	4.2.2 Selecting a predefined buffer group	8
	4.2.3 Setting up a user-defined buffer group	8
	4.2.4 Performing a 1-point calibration	9
	4.2.5 Performing a 2-point calibration	9
	4.2.6 Performing a 3-point calibration	9
	4.3 Sample measurement	10
	4.3.1 Performing a pH measurement	10
	4.3.2 Performing a mV measurement	10
	4.4 Temperature measurement	10
	4.4.1 Automatic temperature compensation	10
	4.4.2 Manual temperature compensation	10
	4.5 Using the memory	11
	4.5.1 Storing a reading	11
	4.5.2 Recalling from memory	11
	4.5.3 Clearing the memory	11
	4.6 Self-diagnosis	12
	4.7 Error messages	12
<b>5.</b>	<b>Maintenance</b>	<b>13</b>
	5.1 Meter maintenance	13
	5.2 Electrode maintenance	13
	5.3 Disposal	13
<b>6.</b>	<b>Accessories</b>	<b>14</b>
<b>7.</b>	<b>Specifications</b>	<b>15</b>
<b>8.</b>	<b>Appendix</b>	<b>16</b>
	8.1 Buffer tables	16
	8.2 Error Limits	17

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## 1. Introduction

Thank you for purchasing this high quality QiS portable meter. SenseLine is much more than just a series of portable meters with an excellent price/performance ratio. It is an ingenious concept that includes many exciting new features:

- IP67 rating: this applies to the instrument itself as well as to the sensors and the connections;
- optimum ease of use, making the operating instructions primarily a source of reference;
- excellent ergonomics – as if the instrument were part of you;
- option for regular equipment qualification, giving you full confidence that your measurement results are always accurate;

## 2. Safety measures

### Measures for your protection



- Never work in an environment subject to explosion hazards! The housing of the instrument is not gas tight (explosion hazard due to spark formation, corrosion caused by the ingress of gases).



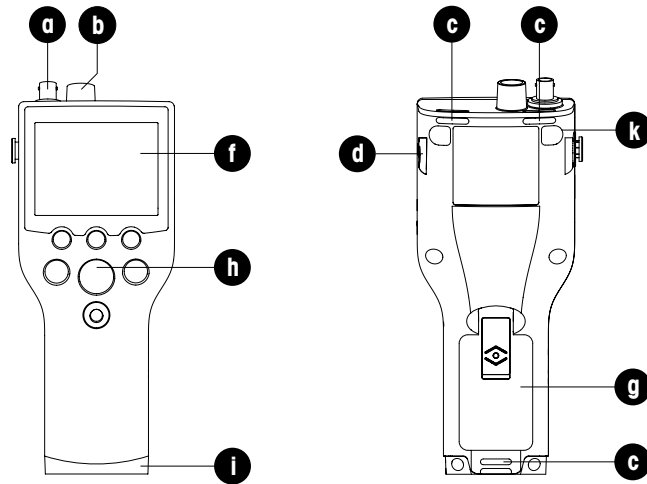
- When using chemicals and solvents, comply with the instructions of the producer and the general lab safety rules!

### Measures for your operational safety



- Do not unscrew the two halves of the housing.
- Have the instrument serviced only by QiS Service!
- Exclude the following environmental influences:
  - powerful vibrations,
  - direct sunlight,
  - atmospheric humidity greater than 80%,
  - corrosive gas atmosphere,
  - temperatures below 5 °C and above 40 °C,
  - powerful electric or magnetic fields!

Installation



**a** BNC socket for mV/pH signal input

**b** Cinch socket for temperature signal input

**c** Slots for attaching the wrist strap

**d** Fixing points

**f** Display

**g** Battery cover

**h** Rubber key pad

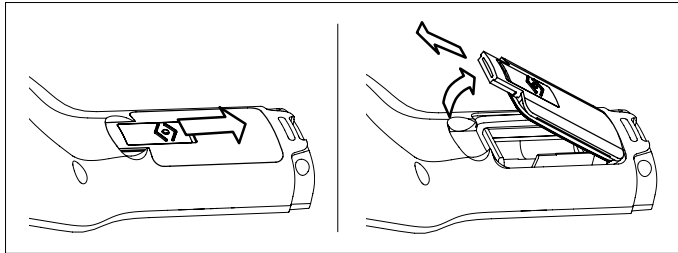
**i** Bottom cap

**k** Rubber feet fixing points

### 3. Installation

Carefully unpack the meter. Keep the calibration certificate in a safe place.

#### 3.1 Installing the batteries

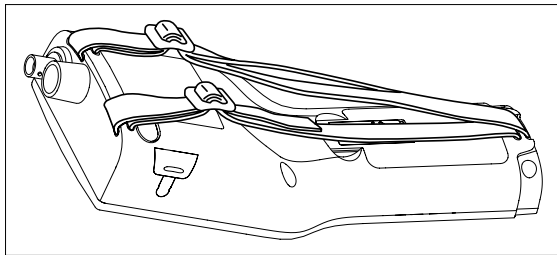


1. Push the button on the Battery cover in the direction of the arrow, hold the lid with two fingers and remove it;
2. Insert the batteries in the battery compartment, as shown;
3. Replace the Battery cover, and push back the button to fix the lid in place.

#### Note

The IP67 rating requires the battery compartment to be perfectly sealed. The sealing ring around the Battery cover must be replaced if it is damaged in any way (SenseLine Sealing Kit, QA8110X).

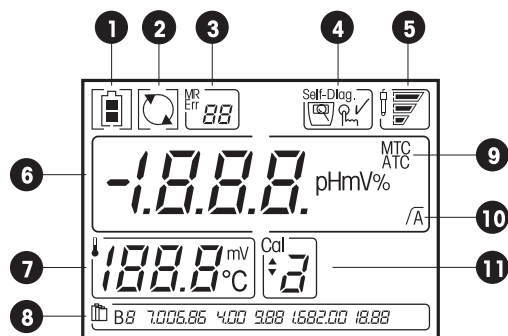
#### 3.2 Fitting the wrist strap



Fit the wrist strap as shown in the diagram.

## 4. Operating the F410 pH meter

### 4.1 Display and key controls



1 Battery status shows the condition of the batteries – fully charged, half-charged or fully discharged. (To replace batteries, see Section 3.1)

2 Auto-off override, in default operation, the meter switches itself off after 15 minutes to prolong battery life. After switching off/on, the auto-off is active again

3 Memory number / Error index (for use of memory see Section 4.5 / Error messages are described in Section 4.7)

Err **88**

Error index

M **88**

Number of data sets stored in memory

R **88**

Recall memory

4 Meter self-diagnosis (see Section 4.6)



Self-diagnosis indicator



Indication to press key



Self-diagnosis passed

5 Electrode condition (for electrode maintenance see Section 5.2)



Slope: 95-105%  
Offset:  $\pm(0-15)$  mV  
Electrode is in good condition



Slope: 90-94%  
Offset:  $\pm(15-35)$  mV  
Electrode needs cleaning



Slope: 85-89%  
Offset:  $\pm(>35)$  mV  
Electrode is faulty

6 pH/mV reading

7 Temperature during measurement or offset value in calibration process

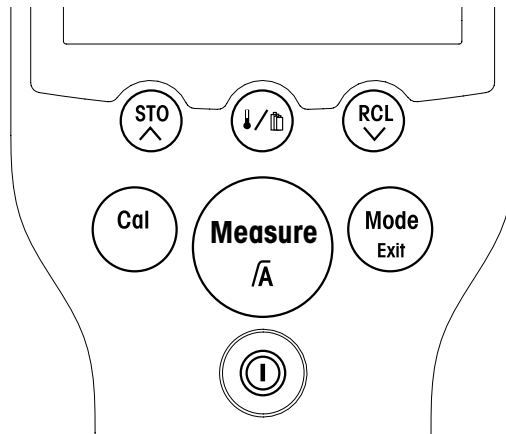
8 Buffer groups (see Section 4.2)












9 Auto/Manual temperature compensation (see Section 4.4)

10 Endpoint stability/auto endpoint

$\swarrow$  Endpoint stability    A Auto endpoint

11 Calibration point



	Press and release 	Press and hold for 2 seconds 
	- Meter on/off	- Switch on/off auto-off override (switches off the meter after 15 minutes)
	- Start or endpoint measurement - Return to measurement mode - Confirm setting; store entered value	- Turn auto endpoint on/off ↵ / $\bar{A}$
	- Start calibration	
	- Switch between pH and mV measuring modes - Back to measurement (ignore the input)	
	- Set MTC	- Select or edit buffer group
	- Store current reading to memory - Increase value during setting - Scroll up through the memory	
	- Recall stored data - Decrease value during setting - Scroll down through the memory	- Review the latest calibration data
	- Start meter self-diagnosis	



## 4.2 Calibration

### 4.2.1 Buffer groups

The SenseLine F410 pH meter allows you to perform 1-, 2- and 3-point calibrations. If you select your calibration buffer group from one of the four predefined groups defined in the meter, the buffers are automatically recognized and displayed during calibration (auto buffer recognition).

The four predefined buffer groups are:

B1	7.00	4.00	10.01	1.68		(at 25 °C)
B2	7.00	4.01	9.21	2.00	11.00	(at 25 °C)
B3	7.00	4.00	9.00	2.00	12.00	(at 20 °C)
B4	6.86	4.01	9.18	1.68		(at 25 °C)

Tables (B1...B4) for automatic temperature compensation are programmed in the meter (see also Appendix).

You can also follow the buffer setting procedure described below to define your own buffer group, but in this case auto buffer recognition does not work during calibration.

### 4.2.2 Selecting a predefined buffer group

Press and hold  $\downarrow/\uparrow$  until the current buffer group blinks. Use  $\wedge$  or  $\vee$  to select another buffer group. When the desired buffer group blinks, press **Measure** to confirm your selection.

### 4.2.3 Setting up a user-defined buffer group

Press and hold  $\downarrow/\uparrow$  until the current buffer group blinks. Use  $\wedge$  or  $\vee$  until **B5** appears to start setting the values. Press **Measure** to confirm the selection. The meter displays your current temperature setting and the unit and frame blink (default temperature is 25 °C). Use  $\wedge$  or  $\vee$  to change the value. Press **Measure** to store the value and continue.

After setting the temperature value, the meter displays the current setting of the first calibration buffer (default value 4.00). Use  $\wedge$  or  $\vee$  to change the buffer value. Press **Measure** to store the value and continue.

After setting the first calibration buffer, press **Cal** to set the next calibration buffer.

The procedure is the same as for the first point. You can set up to three user-defined calibration buffers.

When you have completed your settings, press **Measure** to exit.

#### Note

When using a user-defined buffer group in the calibration, the screen will display the buffer value you set. Make sure that you use the correct buffer.

For user-defined buffers, there is no buffer table programmed in the meter. Therefore you should always keep the buffer temperature at the set value. When using a temperature probe, if the temperature measured differs by more than 1 °C from the set value, Err 5 appears.

#### 4.2.4 Performing a 1-point calibration

Place the electrode in a calibration buffer and press **Cal**. The F410 endpoints according to the preselected endpoint mode after the signal has stabilized or after pressing **Measure** the meter displays and freezes the relevant buffer value. The offset value and the slope are then shown on the display.

To accept the calibration and return to sample measurement, press **Measure**. To reject the calibration, press **Exit**.

##### Note

With the 1-point calibration only the offset is adjusted. If the sensor was previously calibrated with multi-point calibration the previously stored slope will remain. Otherwise the theoretical slope (59.16 mV / pH) will be used.

#### 4.2.5 Performing a 2-point calibration

- Step 1 Perform the first point calibration as described above in "Performing a 1-point calibration".
- Step 2 Rinse the electrode with deionized water.
- Step 3 Place the electrode in the next calibration buffer and press **Cal**.

The F410 endpoints according to the preselected endpoint mode after the signal has stabilized or after pressing **Measure**. The meter displays and freezes the relevant buffer value, updates the electrode offset and shows the new slope calculated from the two calibration points.

To accept the calibration and return to sample measurement, press **Measure**. To reject the calibration, press **Exit**.

#### 4.2.6 Performing a 3-point calibration

Perform the same steps as described above in "Performing a 2-point calibration", and then repeat steps 2 and 3 for the third calibration point.

##### Note

The use of a temperature sensor or electrode with a built-in temperature sensor is recommended. If you use the MTC mode, you should enter the correct temperature value and keep all buffer and sample solutions at the set temperature.

To ensure the most accurate pH readings, you should perform a calibration regularly.

### 4.3 Sample measurement

#### 4.3.1 Performing a pH measurement

Place the electrode in the sample and press **Measure** to start the measurement: the decimal point blinks. The display shows the pH of the sample. The automatic endpoint **A** is the default setting of the meter. When the signal has stabilized, the display freezes automatically, and  $\bar{A}$  appears.

By pressing and holding down **Measure**, you can switch between the auto and manual endpoint modes. To manually endpoint a measurement, press **Measure**: the display freezes and  $\bar{A}$  appears.

**Stability criterion for pH and mV measurement** – The signal of the sensor input must not change by more than 0.1 mV in 5 seconds.

#### 4.3.2 Performing a mV measurement

To switch to mV mode, press **Mode**.

To perform a mV measurement, follow the same procedure as for pH measurement.

### 4.4 Temperature measurement

#### 4.4.1 Automatic temperature compensation

For better accuracy, we recommend the use of either a built-in or a separate temperature probe. If a temperature probe is used, **ATC** and the sample temperature are displayed.

#### Note

The meter accepts NTC 30 k $\Omega$  temperature sensors.

#### 4.4.2 Manual temperature compensation

If the meter does not detect a temperature probe, it automatically switches to the manual temperature compensation mode and **MTC** appears.

To set the MTC temperature, press  $\downarrow/\square$  and use  $\wedge$  and  $\vee$  to increase or decrease the value to the temperature of your sample. Press **Measure** to confirm your setting. The default setting is 25 °C.

## 4.5 Using the memory

### 4.5.1 Storing a reading

The SenseLine F410 pH meter can store up to 30 end-pointed results. Press **STO** when the measurement has endpointed. **M01** indicates that one result has been stored, and **M30** that the maximum of 30 results have been stored.

If you press **STO** when **M30** is displayed, **FUL** indicates that the memory is full. To store further data you will have to clear the memory (see below).

### 4.5.2 Recalling from memory

Press **RCL** to recall the stored values from memory when the current measurement has end-pointed.

Press **^** or **v** to scroll through the stored results. **R01** to **R30** indicate which result is being displayed. Press **Measure** to exit.

### 4.5.3 Clearing the memory

Continue pressing **^** or **v** to scroll through stored results until **MRCL** appears. Then press **Measure, CLR** blinks; Press **Measure** again to confirm the deletion or press **Exit** to return to measurement mode without deletion of the data.

## 4.6 Self-diagnosis

Press and hold **Measure** and **Cal** simultaneously until the meter **Self-Diag** icon appears.

The meter displays the full screen first, then each icon blinks one after the other. This way you may check whether all icons are correctly shown. The final step is to check that the keys are functioning correctly. This requires user interaction.

When **ℹ** blinks, seven icons are displayed. You are requested to press the seven function keys on the keypad one by one in any order. Each time you press a key, an icon disappears from the display; continue to press the other keys until all the icons have disappeared.

When self-diagnosis has been completed, **✓** appears. If self-diagnosis fails, "Err 1" appears (see Section 4.7).

### Note

You have to finish pressing all the seven keys within two minutes, otherwise "Err 1" appears, and you will have to repeat the procedure.

## Error messages

### 4.7 Error messages

Err 1	Self-diagnosis failed	Repeat the self-diagnosis procedure and make sure that you finish pressing all seven keys within two minutes. If "Err 1" still appears, call QiS Service.
Err 2	Measured value out of range	Make sure that the electrode wetting cap has been removed and that the electrode is properly connected and placed in the sample solution. If no electrode is connected, put the shorting plug in the socket.
Err 3	Measured buffer temperature out of range (5...50 °C)	Keep the buffer temperature within the range for calibration.
Err 4	Offset out of range	Make sure you have the correct buffer and that it is fresh. Clean or replace the electrode.
Err 5	Slope out of range	Make sure you have the correct buffer and that it is fresh. Clean or replace the electrode.
Err 6	Meter cannot recognize the buffer	Make sure you have the correct buffer and that it is fresh. Check that the buffer has not been used more than once during the calibration.
Err 7	Data entry error in setting the user-defined buffer	When entering the user-defined buffer value, the meter does not accept a value whose pH differs by less than 1 pH unit from other preset values. Reenter a value.
Err 8	ATC measured temperature is different to the user-defined value	Keep the buffer or sample at the set temperature or change the temperature setting.
Err 9	The current data set has already been stored once	A measurement can only be stored once. Perform a new measurement to store a new data set.

## 5. Maintenance

### 5.1 Meter maintenance

Never unscrew the two halves of the housing.

The SenseLine series instruments do not require any maintenance other than an occasional wipe with a damp cloth and the replacement of dead batteries.

The housing is made of acrylonitrile butadiene styrene/polycarbonate (ABS/PC). This material is attacked by some organic solvents, such as toluene, xylene and methyl ethyl ketone (MEK). Any spillage should be immediately wiped off.

### 5.2 Electrode maintenance

Make sure the electrode is always stored in an appropriate storage solution.

For maximum accuracy, any filling solution that may have "crept" and encrusted the outside of the electrode should be removed with deionized water.

Always store the electrode according to the manufacturer's instructions and do not allow it to dry out.

If the electrode slope falls rapidly, or if the response becomes sluggish, the following procedures may help.

Try one of the following, depending on your sample.

1. For fat or oil build-up, degrease the membrane with cotton wool soaked in either acetone or a soap solution.
2. If the sensor membrane has dried out, soak the tip of the electrode in 0.1 M HCl overnight.
3. If protein build-up has occurred in the diaphragm, remove deposits by soaking the electrode in an HCl/pepsin solution (QS941X).
4. If silver sulfide contamination has occurred, remove the deposits by soaking the electrode in a solution of thiourea (QS901X).

After treatment a new calibration should be performed.

#### Note

Cleaning and filling solutions should be handled with the same care as that given to toxic or corrosive substances.

### 5.3 Disposal



In conformance with the European Directive 2002/96/ EC on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.

If you have any questions, please contact the responsible authority or the distributor from which you purchased this device.

Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

**6. Accessories**

	<b>Order no.</b>
SenseLine Conductivity meter F430	
SenseLine Plus Dissolved Oxygen meter F450	
SenseLine Plus Ion/pH meter F470	
Swing arm electrode holder	QA854X
Sealing kit	QA8110X
AA batteries, pk/4	QA8120X
Carrying case	QA8130X
Printer	QA8140X
Printer paper, pk/5	QA8150X
pH buffer 4 (red), 500ml	QS910X
pH buffer 7 (yellow), 500ml	QS912X
pH buffer 9 (green), 500ml	QS914X
pH buffer 10 (blue), 500ml	QS916X
pH storage solution 3M KCl, 500ml	QS942X
pH Filling solution 3M KCl, 500ml	QS937X
pH Filling solution 3M KCl/ AgCl, 100ml	QS938X
Storage bottle, pk/4	QA839X
pH electrode; temperature sensor; gel-filled, epoxy, 1m cable, IP67	QP4111T
pH electrode; temperature sensor; gel-filled, epoxy, 10m cable, IP67	QP4111T10

## 7. Specifications

<b>SenseLine pH meter F410</b>	
<b>Measurement range</b>	pH 0.00...14.00
	-1999...1999 mV
	-5 °C to 105 °C
<b>Resolution</b>	0.01 pH
	1 mV
	0.1 °C
<b>Limits of error</b>	± 0.01 pH
	± 1 mV
	± 0.5 °C
<b>pH calibration</b>	up to 3 points
<b>Isopotential point</b>	pH 7.00
<b>Calibration buffer</b>	4 predefined groups
	1 user-defined group of 3 buffers
<b>Power requirements</b>	Ratings: 6 V DC, 5 mA
	Batteries: 4 x AA/LR6 1.5 V or NiMH 1.2 V rechargeable
<b>Size/Weight</b>	220 x 90 x 45 mm / 0.33 kg
<b>Display</b>	Liquid crystal
<b>pH input</b>	BNC (IP67), impedance > 10 <sup>12</sup> Ω
<b>T input</b>	Cinch (IP67), NTC 30 kΩ
<b>IP rating</b>	IP67 with and without electrode
<b>Battery life</b>	> 500 working hours
<b>Ambient conditions</b>	Temperature: 5...40 °C
	Relative humidity: 5%...80% (non-condensing)
	Installation category: II
	Pollution degree: 2
<b>Materials</b>	Housing: ABS/PC reinforced
	Window: polymethylmethacrylate (PMMA)
	Keypad: silicone rubber



## 8. Appendix

### 8.1 Buffer tables

SenseLine pH Meters automatically correct for the temperature dependence of the buffer pH using the values given in the tables:

#### Buffer Set 1 (ref. 25 °C)

---

5	7.09	4.00	10.25	1.67
10	7.06	4.00	10.18	1.67
15	7.04	4.00	10.12	1.67
20	7.02	4.00	10.06	1.68
25	7.00	4.00	10.01	1.68
30	6.99	4.01	9.97	1.68
35	6.98	4.02	9.93	1.69
40	6.97	4.03	9.89	1.69
45	6.97	4.04	9.86	1.70
50	6.97	4.06	9.83	1.71

#### Buffer Set 2 (ref. 25 °C)

---

5	7.09	4.01	9.45	2.02	11.72
10	7.06	4.00	9.38	2.01	11.54
15	7.04	4.00	9.32	2.00	11.36
20	7.02	4.00	9.26	2.00	11.18
25	7.00	4.01	9.21	2.00	11.00
30	6.99	4.01	9.16	1.99	10.82
35	6.98	4.02	9.11	1.99	10.64
40	6.97	4.03	9.06	1.98	10.46
45	6.97	4.04	9.03	1.98	10.28
50	6.97	4.06	8.99	1.98	10.10

#### Buffer Set 3 (ref. 20 °C)

---

5	7.07	4.04	9.16	2.01	12.41
10	7.05	4.02	9.11	2.01	12.26
15	7.02	4.01	9.05	2.00	12.10
20	7.00	4.00	9.00	2.00	12.00
25	6.98	4.01	8.95	2.00	11.88
30	6.98	4.01	8.91	2.00	11.72
35	6.96	4.01	8.88	2.00	11.67
40	6.95	4.01	8.85	2.00	11.54
45	6.95	4.01	8.82	2.00	11.44
50	6.95	4.00	8.79	2.00	11.33

**Buffer Set 4 (ref. 25 °C)**

5	6.95	4.00	9.40	1.67
10	6.92	4.00	9.33	1.67
15	6.90	4.00	9.28	1.67
20	6.88	4.00	9.22	1.68
25	6.86	4.01	9.18	1.68
30	6.85	4.02	9.14	1.68
35	6.84	4.02	9.10	1.69
40	6.84	4.04	9.07	1.69
45	6.83	4.05	9.04	1.70
50	6.83	4.06	9.01	1.71

**8.2 Error Limits**

Message	Description	Range not accepted
Err 2	Value out of range	pH: < 0.00 or > 14.00 mV: < -1999 or > 1999
Err 3	Buffer temperature out of range	T [°C]: < 5 or > 50
Err 4	Offset out of range (first cal. point)	Eref1 - Eb   > 60 mV
Err 5	Slope out of range (following cal. points)	Eref1 - Eb   > 60 mV
Err 6	Wrong buffer	ΔEref1   < 10 mV
Err 7	Invalid pH for user-defined buffer	ΔpH   < 1 pH
Err 8	ATC temperature different from set value	t <sub>ATC</sub> - t <sub>buffer</sub>   > 1 °C



**Quality certificate.** Development, production and testing according to ISO9001.  
Environmental management system according to ISO14001.



SERVICE

**Worldwide service.** Our extensive service network is among the best in the world and ensures maximum availability and service life of your product.



**European conformity.** The CE conformity mark provides you with the assurance that our products comply with the most recent EU directives.



INTERNET

**On the Internet.** You will quickly find lots of essential information about our products, our services, and our company at <http://www.q-i-s.net>



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Subject to technical changes and to the availability  
of the accessories supplied with the instruments.  
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