SenseLine
Conductivity meter F430

Contents

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!
- Dry off any liquids sprayed immediately! The instrument is not watertight.
- 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!
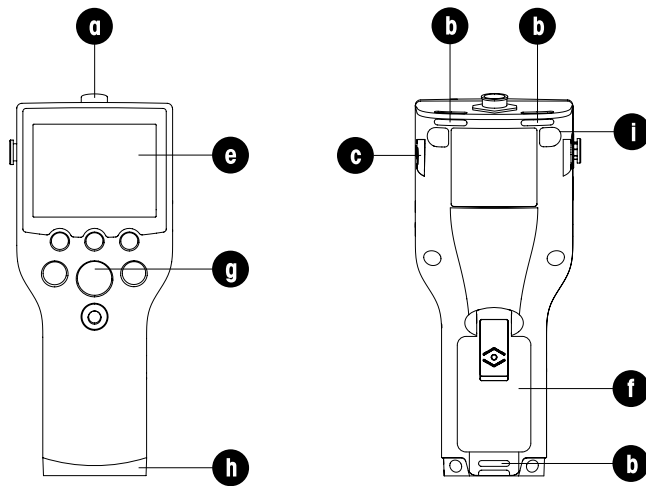
a	**7-pin LTW socket** for conductivity and temperature signal input
b	**Slots** for attaching the wrist strap
c	**Fixing points**
e	**Display**
f	**Battery cover**
g	**Rubber key pad**
h	**Bottom cap**
i	**Rubber feet** fixing points

3.   Installation

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

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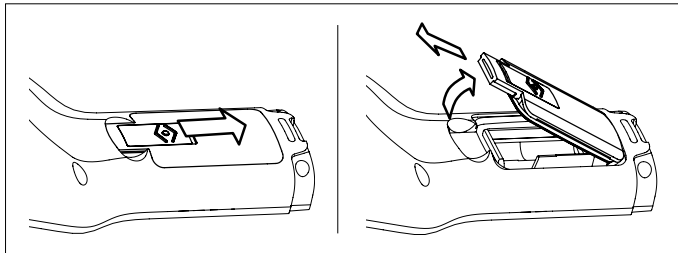
1. Push the button on the Battery cover in the direction of the arrow, hold the lid with two fingers and remove it, as shown;
2. Insert the batteries in the battery compartment;
3. Replace the Battery cover, and push back the button to fix the lid in place.

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
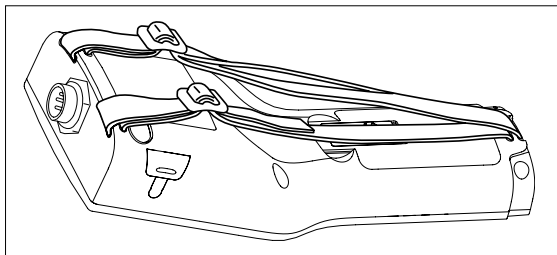
Fit the wrist strap as shown in the diagram.

4. Operating the F430 conductivity meter

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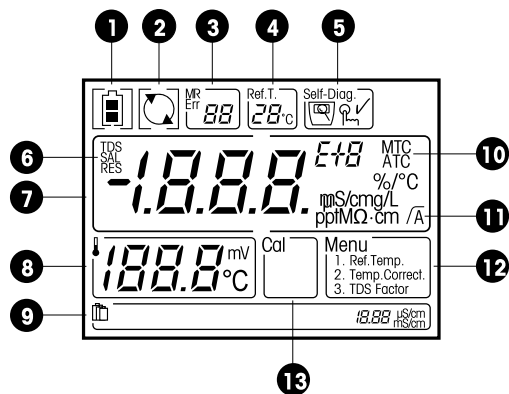
1 Battery status shows the condition of the batteries – fully charged, half-charged or fully discharged. (To replace batteries, see Section 3.1)

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	M 88	R 88
Error index	Number of data sets stored in memory	Recall memory

4 Reference temperature

Ref.T. 28°C

5 Meter self-diagnosis (see Section 4.6)

Self-Diag.	⌂ₘ	✓
Self-diagnosis indicator	Indication to press key	Self-diagnosis passed

6 Measurement mode

7 Conductivity/TDS/Salinity/Resistivity reading

8 Temperature

9 Standards (see Section 4.2)

10 Automatic temperature compensation

11 Endpoint stability/auto endpoint
⌐ Endpoint stability   **A** Auto endpoint

12 Menu

13 Calibration indicator
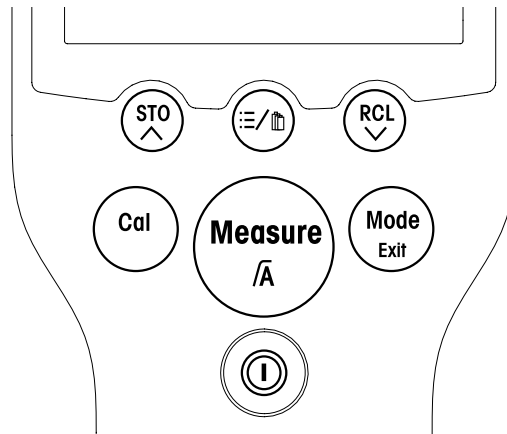
	Press and release 👆	**Press and hold for 2 seconds** 👆
⏻	- Meter on/off	- Switch on/off auto-off override (switches off the meter after 15 minutes)
Measure /Ā	- Start or endpoint measurement - Return to measurement mode - Confirm setting; store entered value	- Switch auto endpoint on/off Γ / Γ̄
Cal	- Start calibration	
Mode Exit	- Switch between conductivity, TDS, salinity and resistivity measurement mode - Back to measurement (ignore the input)	
☰/🗑	- Enter Menu	- Select calibration standard
STO ∧	- Store current reading to memory - Increase value during setting - Scroll up through the memory	
RCL ∨	- Recall stored data - Decrease value during setting - Scroll down through the memory	- Review the latest calibration data
Cal + Measure /Ā	- Start meter self-diagnosis Self-Diag.	

4.2 Calibration

4.2.1 Selecting a standard

When using the SenseLine F430 conductivity meter, you have to select a standard for calibration.
Press and hold ☰/🔒 until the current standard blinks.
Use the ∧ or ∨ key to select another standard. When the desired standard blinks, press **Measure** to confirm your selection.
The following three predefined standards are available:

- 84 µS/cm
- 1413 µS/cm
- 12.88 mS/cm

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

4.2.2 Performing a calibration

Place the conductivity sensor in the defined calibration standard and press **Cal**.
With the default setting, the SenseLine conductivity meter automatically endpoints when the signal is stable. To manually endpoint, press **Measure**. The meter displays the value of the standard followed by the cell constant after a few seconds.
To accept the calibration and return to sample measurement, press **Measure**. To reject the calibration, press **Exit**.

Note

To ensure the most accurate conductivity readings, you should verify your cell constant with a standard solution regularly and recalibrate if necessary. Use always fresh standards.

4.3 Sample measurement

4.3.1 Conductivity measurement

Place the conductivity sensor in the sample and press **Measure** to start the measurement: the decimal point blinks.
The display shows the conductivity of the sample. The automatic endpoint **A** is the default setting of the meter. When the signal has stabilized, the display automatically freezes, and /A̅ appears.
By pressing and holding down **Measure** key, you can switch between auto and manual endpoint mode. To manually endpoint a measurement, press **Measure**, the display freezes and ⌐ appears.

Stability criterion for conductivity measurement
The sensor input signal of the must not deviate by more than 0.4% from the measured average conductivity of the probe in 6 seconds.

4.3.2 TDS/salinity/resistivity measurement

To perform a TDS/salinity/resistivity measurement, follow the same procedure as for a conductivity measurement. Press **Mode** to switch between conductivity, TDS, salinity and resistivity measurement modes.

Note

For accurate measurement with the SenseLine F430 conductivity meter it is important to use an electrode with a built-in temperature sensor. The use of the special IP67 conductivity and temperature sensor QC4460T guarantees optimum performance even in very humid environments.

4.4 Menu settings

Press ☰/🗑, the menu's content appears on the screen and first item blinks:

```
Menu                          Set reference temperature
  1. Ref.Temp.                Set temperature correction coefficient
  2. Temp.Correct.
  3. TDS Factor               Set TDS factor
```
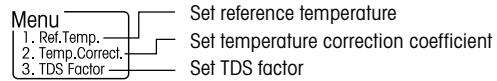
Use ∧ or ∨ to select a menu item. When the desired item blinks, press the **Measure** key to start the setting or press the **Exit** key to return to measurement.

4.4.1 Set reference temperature

When "Ref.Temp. 25 °C" appears and the frame of current reference temperature blinks, use ∧ or ∨ to toggle between 25 °C and 20 °C. Press **Measure** to confirm your selection or press **Exit** to return to the menu settings.

4.4.2 Set temperature correction coefficient

When the current temperature coefficient appears, use ∧ or ∨ to increase or decrease the value. Press **Measure** to confirm your setting or press **Exit** to back to menu settings.

4.4.3 Set TDS factor

When the current TDS factor appears, use ∧ or ∨ to increase or decrease the value. Press **Measure** to confirm your setting or press **Exit** to back to menu settings.

4.5   Using the memory

4.5.1 Storing a reading

The SenseLine F430 can store up to 30 end-pointed results. Press **STO** when the measurement has end-pointed. **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 ∨ 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 ∨ 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 ℞ 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.

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	Check if the electrode is properly connected and placed in a sample solution.
Err 3	The measured standard temperature is out of the range (0…35 °C)	Keep the standard temperature within the range for calibration.
Err 4	Measuring temperature out of range (0…105 °C)	Check if the electrode is properly connected and keep the sample temperature within the range.
Err 5	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.

Note

To prevent static damage to the instrument, always disconnect the conductivity sensor from the meter before cleaning the sensor.

5.2   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

	Order no.
SenseLine pH meter F410	
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
Conductivity standard 1413 µS/cm, 500ml	QS950X
Conductivity standard 12.88 mS/cm, 500ml	QS951X
Conductivity standard 111.8 mS/cm, 500ml	QS1012
Conductivity electrode 4-pole, temperature sensor, epoxy, IP67	QC4460T

SenseLine conductivity

7. Specifications

	SenseLine conductivity meter F430
Measurement range	
Conductivity	0.10 µS/cm…500 mS/cm
TDS	0.10 mg/L…300 g/L
Salinity	0.00…80.0 ppt
Resistivity	0.00…100.0 MΩ·cm
Temperature	-5…105 °C
Resolution	
Conductivity	Auto range
	0.10 µS/cm…19.99 µs/cm
	20.0 µS/cm…199.9 µS/cm
	200 µS/cm…1999 µS/cm
	2.00 mS/cm…19.99 mS/cm
	20.0 mS/cm…199.9 mS/cm
	200 mS/cm…500 mS/cm
TDS	Auto range, same as conductivity
Salinity	0.00 ppt…19.99 ppt
	20.0 ppt…80.0 ppt
Resistivity	Ω·cm (Scientific)
	0.00 Ω·cm…9.99 E +5 Ω·cm
	MΩ·cm
	1.000 MΩ·cm…19.99 MΩ·cm
	20.0 MΩ·cm…100.0 MΩ·cm
Temperature	0.1 °C
Limits of error	
Conductivity	±0.5 % of measured value
TDS	±0.5 % of measured value
Salinity	±0.5 % of measured value
Resistivity	±0.5 % of measured value
Temperature	±0.2 °C
Power requirements	Ratings: 6 V DC, 5 mA Batteries: 4 x AA/LR6 1.5 V or NiMH 1.2 V rechargeable
Size/Weight	220 x 90 x 45 mm / 0.33 kg
Display	Liquid crystal
Signal input	7-Pin LTW plug
IP rating	IP67 with and without electrode
Battery life	> 500 working hours
Ambient conditions	Temperature: 5…40 °C Relative humidity: 5%...80% (non-condensing) Installation category: II Pollution degree: 2
Materials	Housing: ABS/PC reenforced Window: polymethylmethacrylate (PMMA) Keypad: silicone rubber

8. Appendix

8.1 Temperature correction factors f$_{25}$

°C	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	1.918	1.912	1.906	1.899	1.893	1.887	1.881	1.875	1.869	1.863
1	1.857	1.851	1.845	1.840	1.834	1.829	1.822	1.817	1.811	1.805
2	1.800	1.794	1.788	1.783	1.777	1.772	1.766	1.761	1.756	1.750
3	1.745	1.740	1.734	1.729	1.724	1.719	1.713	1.708	1.703	1.698
4	1.693	1.688	1.683	1.678	1.673	1.668	1.663	1.658	1.653	1.648
5	1.643	1.638	1.634	1.629	1.624	1.619	1.615	1.610	1.605	1.601
6	1.596	1.591	1.587	1.582	1.578	1.573	1.569	1.564	1.560	1.555
7	1.551	1.547	1.542	1.538	1.534	1.529	1.525	1.521	1.516	1.512
8	1.508	1.504	1.500	1.496	1.491	1.487	1.483	1.479	1.475	1.471
9	1.467	1.463	1.459	1.455	1.451	1.447	1.443	1.439	1.436	1.432
10	1.428	1.424	1.420	1.416	1.413	1.409	1.405	1.401	1.398	1.384
11	1.390	1.387	1.383	1.379	1.376	1.372	1.369	1.365	1.362	1.358
12	1.354	1.351	1.347	1.344	1.341	1.337	1.334	1.330	1.327	1.323
13	1.320	1.317	1.313	1.310	1.307	1.303	1.300	1.297	1.294	1.290
14	1.287	1.284	1.281	1.278	1.274	1.271	1.268	1.265	1.262	1.259
15	1.256	1.253	1.249	1.246	1.243	1.240	1.237	1.234	1.231	1.228
16	1.225	1.222	1.219	1.216	1.214	1.211	1.208	1.205	1.202	1.199
17	1.196	1.193	1.191	1.188	1.185	1.182	1.179	1.177	1.174	1.171
18	1.168	1.166	1.163	1.160	1.157	1.155	1.152	1.149	1.147	1.144
19	1.141	1.139	1.136	1.134	1.131	1.128	1.126	1.123	1.121	1.118
20	1.116	1.113	1.111	1.108	1.105	1.103	1.101	1.098	1.096	1.093
21	1.091	1.088	1.086	1.083	1.081	1.079	1.076	1.074	1.071	1.069
22	1.067	1.064	1.062	1.060	1.057	1.055	1.053	1.051	1.048	1.046
23	1.044	1.041	1.039	1.037	1.035	1.032	1.030	1.028	1.026	1.024
24	1.021	1.019	1.017	1.015	1.013	1.011	1.008	1.006	1.004	1.002
25	1.000	0.998	0.996	0.994	0.992	0.990	0.987	0.985	0.983	0.981
26	0.979	0.977	0.975	0.973	0.971	0.969	0.967	0.965	0.963	0.961
27	0.959	0.957	0.955	0.953	0.952	0.950	0.948	0.946	0.944	0.942
28	0.940	0.938	0.936	0.934	0.933	0.931	0.929	0.927	0.925	0.923
29	0.921	0.920	0.918	0.916	0.914	0.912	0.911	0.909	0.907	0.905
30	0.903	0.902	0.900	0.898	0.896	0.895	0.893	0.891	0.889	0.888
31	0.886	0.884	0.883	0.881	0.879	0.877	0.876	0.874	0.872	0.871
32	0.869	0.867	0.866	0.864	0.863	0.861	0.859	0.858	0.856	0.854
33	0.853	0.851	0.850	0.848	0.846	0.845	0.843	0.842	0.840	0.839
34	0.837	0.835	0.834	0.832	0.831	0.829	0.828	0.826	0.825	0.823
35	0.822	0.820	0.819	0.817	0.816	0.814	0.813	0.811	0.810	0.808

SenseLine conductivity

8.2 Conductivity standards

t(°C)	84 µS/cm	1413 µS/cm	12.88 mS/cm
0	46 µS/cm	776 µS/cm	7.15 mS/cm
10	60 µS/cm	1020 µS/cm	9.33 mS/cm
15	68 µS/cm	1147 µS/cm	10.48 mS/cm
20	76 µS/cm	1278 µS/cm	11.67 mS/cm
25	84 µS/cm	1413 µS/cm	12.88 mS/cm
30	93 µS/cm	1552 µS/cm	14.12 mS/cm
35	102 µS/cm	1696 µS/cm	15.39 mS/cm

8.3 Examples of temperature coefficients (α-values)

Substance at 25°C	Concentration [%]	Temperature coefficient α [%/°C]
HCl	10	1.56
KCl	10	1.88
CH_3COOH	10	1.69
NaCl	10	2.14
H_2SO_4	10	1.28
HF	1.5	7.20

8.4 Practical salinity scale (UNESCO 1978)

In the F430 conductivity meter the salinity is calculated according to the official definition of UNESCO 1978, Therefore the salinity Spsu of a sample in psu (practical salinity unit) at standard atmospheric pressure is calculated as follows:

$$S = \sum_{j=0}^{5} a_j R_T^{j/2} - \frac{(T-15)}{1+k(T-15)} \sum_{j=0}^{5} b_j R_T^{j/2}$$

$a_0 = 0.0080$ $b_0 = 0.0005$ $k = 0.00162$
$a_1 = -0.1692$ $b_1 = -0.0056$
$a_2 = 25.3851$ $b_2 = -0.0066$
$a_3 = 14.0941$ $b_3 = -0.0375$
$a_4 = -7.0261$ $b_4 = 0.0636$
$a_5 = 2.7081$ $b_5 = -0.0144$

$$R_T = \frac{R_{Sample}(T)}{R_{KCl}(T)}$$

(32.4356 g KCl per 1000 g of solution)

8.5   Conductivity to TDS conversion factors

Conductivity at 25 °C	TDS KCl		TDS NaCl	
	ppm value	Factor	ppm value	Factor
84 µS	40.38	0.5048	38.04	0.4755
447 µS	225.6	0.5047	215.5	0.4822
1413 µS	744.7	0.527	702.1	0.4969
1500 µS	757.1	0.5047	737.1	0.4914
8974 µS	5101	0.5685	4487	0.5000
12.880 µS	7447	0.5782	7230	0.5613
15.000 µS	8759	0.5839	8532	0.5688
80 mS	52.168	0.6521	48.384	0.6048

8.6   Error Limits

Message	Description	Range not accepted	
Err 2	Measured value out of range	C:	< 0.1 µS/cm or > 500 mS/cm
		TDS:	< 0.1 mg/L or > 300 g/L
		SAL:	< 0.01 ppt or > 80 ppt
		Res:	< 0.01 MΩ·cm or > 100 MΩ·cm
Err 3	Calibration standard temperature out of range	T:	< 0 °C or > 35 °C
Err 4	Temp. out of range	T:	< -5 °C or > 105 °C

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

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