

Direct Measurement ISE Method

Method 10255

3.55 g/L to 35 g/L Cl⁻

Powder Pillow ISA

Scope and Application: For the determination of high concentrations (1 M) of chloride in brine solutions, produced waters and hydraulic fracturing waters.



Test preparation

Procedure notes:

The instructions in this procedure are specific to the HQd meters. The SensION+ meters can also be used but the navigation and menus will be different.
Refer to the meter user manual for meter operation. Refer to the probe user manual for probe maintenance.
Set the date and time in the meter before the probe is attached. The probe must have the correct service-life time stamp.
If complete traceability is necessary, enter a sample ID and operator ID. Refer to the HQd meter manual for more information.
Calibrate the probe regularly for the best measurement accuracy. Refer to Calibrate the probe .
Stir the standards at a slow and steady rate to prevent the formation of a vortex.
Air bubbles under the probe tip can cause slow response or measurement errors. Gently shake the probe to remove bubbles.
Keep the temperature of the calibration standards within ± 2 °C for best results.
Between measurements, rinse the probe with deionized water. Blot dry with a lint-free cloth.

Items to collect:

Description	Quantity
Beaker, 100-mL, polypropylene	4
Bottle, wash, 500-mL	1
Chloride ion-selective electrode	1
Chloride Ionic Strength Adjustor (ISA) Buffer Powder Pillows	4
Deionized water	varies
Meter, ion-selective electrode	1
Sodium chloride	11.55 g
Stir bars	4
Stirrer, electromagnetic	1
Volumetric flask, 200-mL	3

See [Consumables and replacement items](#) for reorder information.


Prepare the probe

1. Remove the sensor protection cap from the probe.

2. Rinse the probe with deionized water. Blot dry with a lint-free cloth.
3. Put the probe in a 3.55 g/L chloride standard solution for a minimum of 30 minutes. Refer to [Prepare the calibration standards](#).

Set up the meter

Change the default settings in the meter for high-range measurements. Save the new settings as a new method.

1. Connect the probe to the meter.
2. Push .
3. Go to ISECl181 Settings>Modify Current Settings>Measurement Options.
4. Set the measurement options for high-range measurements:
 - Units—g/L
 - Measurement limits—set the lower limit to 3 g/L.
5. Go to Calibration Options.
6. Set the calibration options for high-range measurements:
 - Std set—custom
 - Calibration units—g/L
 - Std set values—3.55, 12.5 and 35 g/L
7. Enter a name for the new settings, for example HR Cl.
8. Push **EXIT** until the display shows the measurement mode.

Calibrate the probe

Prepare the calibration standards

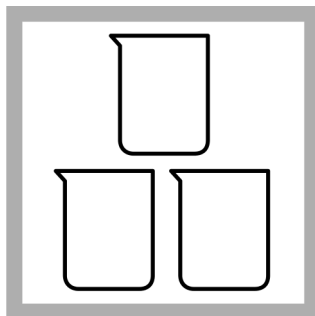
Prepare a 3.55 g/L, a 12.5 g/L and a 35 g/L chloride standard solution for calibration.

Items to collect:

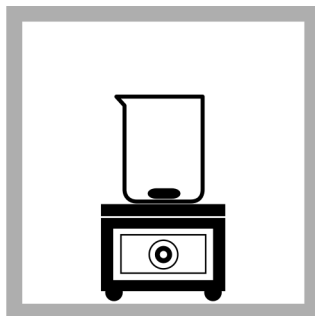
- Sodium chloride, NaCl
 - Volumetric flasks (3x), 200 mL, Class A
 - Laboratory balance
 - Deionized water
1. Prepare a 35 g/L chloride standard solution:
 - a. Weigh 11.55 g of sodium chloride.
 - b. Quantitatively transfer the NaCl into a volumetric flask.
 - c. Dilute to the mark with deionized water. Mix fully.
 2. Prepare a 12.5 g/L chloride standard solution:
 - a. Transfer 71.43 mL (or g) of the 35 g/L standard solution into a volumetric flask.
 - b. Dilute to the mark with deionized water. Mix fully.
 3. Prepare a 3.55 g/L chloride standard solution:
 - a. Transfer 56.8 mL (or g) of the 12.5 g/L standard solution into a volumetric flask.

- b. Dilute to the mark with deionized water. Mix fully.

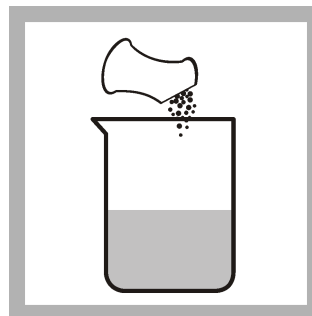
HR chloride calibration procedure



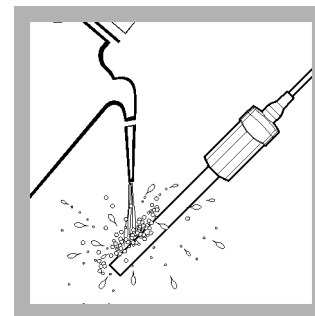
1. Add 25 mL of the 3.55 g/L, 12.5 g/L and 35 g/L chloride standard solution to three beakers.



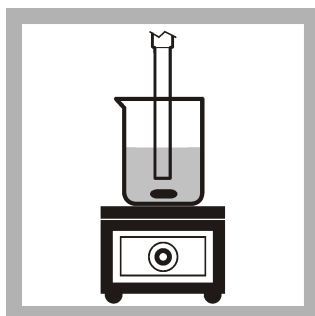
2. Add a stir bar and stir at a moderate rate.



3. Add the contents of one Chloride Ionic Strength Adjustment (ISA) Powder Pillow to each standard solution.



4. Rinse the probe with deionized water. Blot dry with a lint-free cloth.



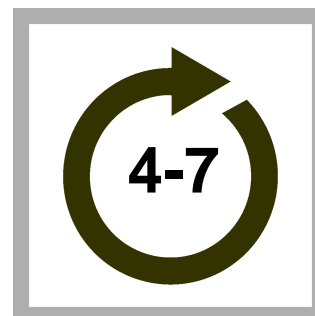
5. Put the probe into the 3.55 g/L chloride standard solution. Tap the probe to remove any air bubbles.



6. Push **Calibrate**. The display shows the standard solution value.



7. Push **Read**. The display shows "Stabilizing". When the reading is stable, the display shows the next standard solution value.



8. Repeat steps 4 to 7 for the 12.5 g/L and the 35 g/L chloride standard solutions.



9. Push **Done** to view the calibration summary.



10. Push **Store** to accept the calibration.

Rinse the probe with deionized water and blot dry.

Measure samples

Dilute samples that are greater than 35 g/L

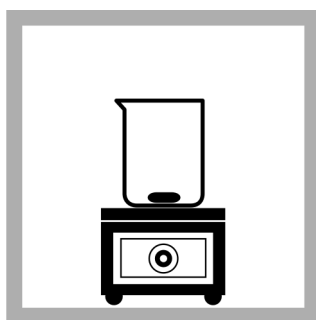
If the chloride concentration is greater than 35 g/L (1 M), dilute the sample to a lower concentration. Complete the steps that follow to make a 1:10 (10-fold) dilution.

1. Measure 2.5 mL of the sample in a 25-mL graduated cylinder.
2. Add deionized water to the 25-mL line.
3. Pour the diluted sample into a beaker.
4. Measure the concentration with the HR chloride measurement procedure.
5. Multiply the result by 10 to get the concentration of the sample before dilution.

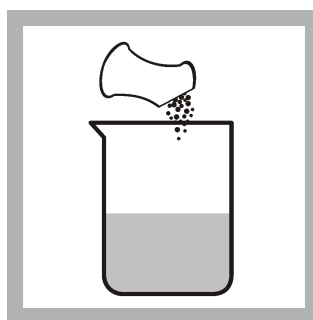
HR chloride measurement procedure



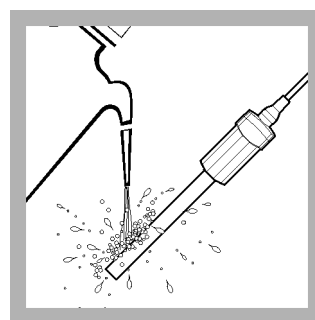
1. Add 25 mL of sample to a 50-mL beaker.



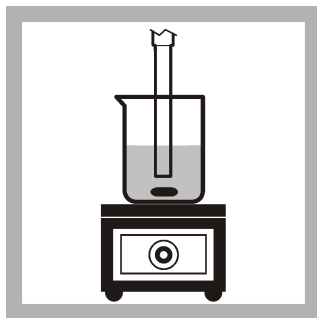
2. Add a stir bar and stir at a moderate rate.



3. Add the contents of one Chloride Ionic Strength Adjustment (ISA) Powder Pillow per 25 mL of sample.



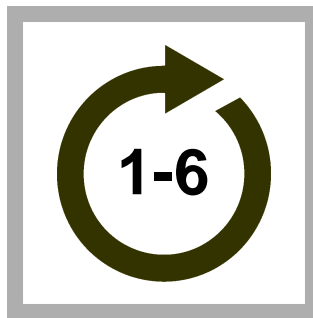
4. Rinse the probe with deionized water. Blot dry with a lint-free cloth.



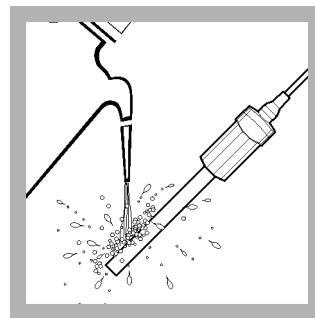
5. Put the probe into the sample. Tap the probe to remove any air bubbles.



6. Push **Read**. The display shows "Stabilizing" and then the chloride concentration of the sample.



7. Repeat steps 1 through 6 for each sample.



8. When done, rinse the probe.

Sample collection, preservation and storage

Collect samples in clean plastic or glass containers. Samples can be stored for a minimum of 28 days at room temperature.

Interferences

The sensing element can respond to other ions in addition to chloride and cause a positive error. If Chloride ISA is added to the standards and samples, the effect of interfering ions is minimized. Samples can contain oxidizing agents such as Copper (Cu^{2+}), Iron (ferrous) (Fe^{2+}) and Permanganate (MnO_4^-). Refer to [Table 1](#).

Table 1 Interfering substances

Substance	Interference
Mercury	Must be absent from samples.
Ions that form insoluble salts of silver	Can deposit a layer of salt on the sensing surface and cause probe errors.
Strong reducing solutions	Can form a surface layer of silver.

Consumables and replacement items

Required reagents and apparatus

Description	Quantity/Test	Unit	Item no.
Chloride Ionic Strength Adjustor (ISA) Buffer Powder Pillows	1	100/pkg	2318069
Beaker, 50-mL, polypropylene	1	1	108041
IntelliCAL Chloride Ion Selective Electrode (ISE), 1 m cable	1	1	ISECL18101

Recommended standards

Description	Unit	Item no.
Sodium chloride, ACS grade	454 g	18201H

Optional reagents and apparatus

Description	Unit	Item no.
Bottle, wash, 500 mL	1	62011
Cylinder, graduated, 25-mL, poly	1	108140
Deionized water	4 L	27256
IntelliCAL Chloride Ion Selective Electrode (ISE), 3 m cable	1	ISECL18103
sensION+ 9652C Chloride Combination Ion Selective Electrode (ISE), 1 m cable ¹	1	LZW9652C.97.002
Volumetric flask, 200 mL, Class A, glass	1	1457445

¹ Use with sensION+ meters or other meters that have a BNC connection.



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