Miniature Solid State Reference Electrode: MSREF1 and MSREF2
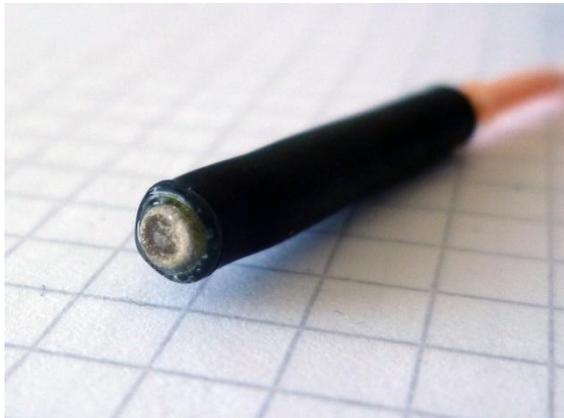
MSREF1:	**MSREF2:**
Ag/AgCl solid state reference electrode	**Ag/AgCl solid state reference electrode with PVA electrolyte layer**

Key Features

- Solid state Ag/AgCl reference electrode
- No storage in KCl required
- Very small size
- Long lifetime

Applications

- Laboratory
- Measurement in small volumes
- MSFET3330-2 Measurement kit
- Combined with MSFET sensor

Characteristics:

- Temperature range: 0°C … 70°C
- pH range: 2 … 10

The MSREF is an Ag/AgCl based miniature solid-state reference electrode to work with the sensors of the MSFET family. The MSREF can be used to replace glass-based Ag/AgCl liquid junction reference electrodes.

The MSREF miniature reference electrodes can be stored dry for several months before use and also between uses. A dry MSREF will require a hydration/conditioning time to activate the electrolyte.

Electrode Characteristics

MSREF1:

Dimensions:

	min	typical	max	
Length	15	20	25	mm
Diameter	2		4	mm

Characteristics:

- Short conditioning time (~1h)
- Good lifetime in stable salt conditions (>6-9 months)
- Can withstand temperatures up to 150°C (max. exposure < 15min)
- Can be stored dry (keep away from intense light)
- Sheath material: Polyolefin
- Sensitive to varying salt content (esp. Cl- content)
  - This reference electrode does not have an electrolyte layer and requires stable Cl- content of the solution. It can be used right away and does not need to be hydrated. However, it might need some conditioning to reach equilibrium in the measurement solution, since it needs to adapt to the Cl- content.
- The reference electrode potential is approximately 100mV higher than the traditional glass-based Ag/AgCl (3M KCl) macroelectrode.

MSREF2:

Dimensions:

|	min	typical	max	
Length		26		mm
Width (tip diameter)		6		mm
Thickness		1.5	2	mm

Characteristics:

- Good stability in buffers of varying salt content and ionic strength
- Good long-time stability
- Long lifetime (~6-9 months)
- Should not the subjected to temperatures above 100°C
- Can be stored dry (keep away from intense light)
- Long hydration time (6-24h)
  - This reference electrode is covered with a solid electrolyte that needs to be hydrated before use.
  - For hydration a solution of 1M-3M KCl is recommended.
  - The electrode can be stored dry, but every time it has dried, it needs to be hydrated again. We usually recommend keeping it in a 1M – 3M KCl storage solution if uses are only a few days apart.
  - Without sufficient hydration the MSREF2's impedance will be very high, leading to a noisy and/or unstable measurement signal.
  - Hydration time for a dry (or dried) MSREF2 is:

	min	typical	max	
Hydration time	0.5	6	24	h

Application

The reference electrodes MSREF1 and MSREF2 are used to obtain a stable reference potential in electrochemical measurements. It is submerged in the same volume as the Ion Sensitive Electrode (ISE) used to characterize the solution. The reference electrode is connected to the reference input of the sensor electronics.
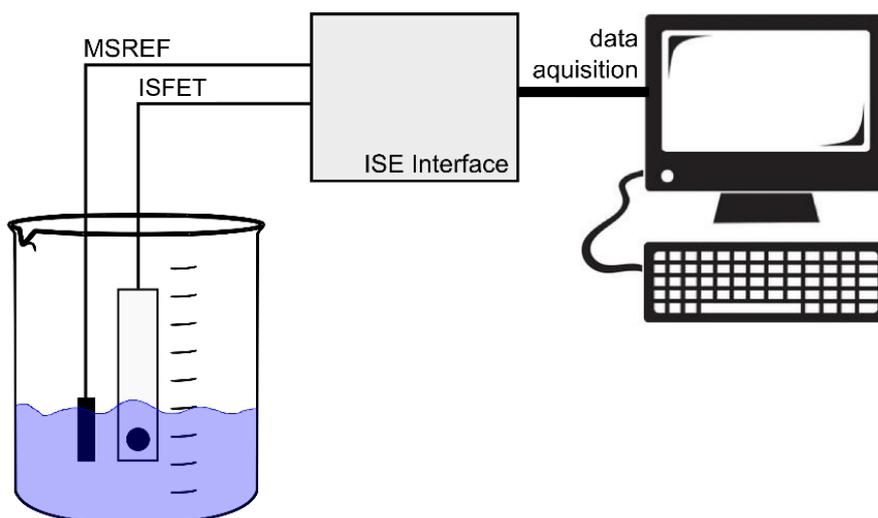
Handling recommendations:

1 – Store under dry conditions.

2 – Don't touch the tip of the electrode.

3 – Avoid contact with sharp objects (no scratching).

4 – Rinse the electrode shortly with DI water before and after use. Blow-dry very gently if needed.

5 – Avoid prolonged exposure to solutions of low ionic strength (e.g. DI water).

6 – For extended measurements only the round tip of the electrode should be submerged.

Selection Guide:

	MSREF1	MSREF2	Glass-based liquid-junction Ag/AgCl reference electrode
Longterm stability in solution of constant salt (Cl-) content	x	x	x**
Stable potential in varying salt (Cl-) content		x*	x
Short stabilization time	x		x
Lifetime (6-9 months)	x	x	x**
Solid-state	x	x	
Low-cost	x	x	
Mass-producible		x	
No electrolyte leakage	x		
store in dried state	x	x	
Glass-free	x	x	

*: until the depletion of the solid electrolyte. Once the electrolyte is depleted, the MSREF2 will have a behavior similar to MSREF1.

**: a regular exchange of the electrolyte solution will be required.