

# Refine<sup>TM</sup> ±

## Reference Electrodes



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# Refine™

## Reference Electrodes



### Contents

AG1 AND AG2.....	PAGE 4 - 5
AG3.....	PAGE 6 - 7
AG4.....	PAGE 8 - 9
AG5.....	PAGE 10 - 11
CM1.....	PAGE 12 - 13
CU1.....	PAGE 14 - 15
CU2 AND AG6.....	PAGE 16 - 17
CU3 AND AG7.....	PAGE 18 - 19
CU4 AND AG8.....	PAGE 20 - 21
JR1 AND JR2.....	PAGE 22 - 23
JR3.....	PAGE 24 - 25
REFINE SPARE PARTS.....	PAGE 26 - 27

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Since 1950 CPCL have been designing, manufacturing, supplying and installing reference electrodes worldwide in all areas of Cathodic protection including :

- CIPS & DCVG Surveys
- Steel In Concrete
- Harbours, Jetties & Offshore
- Pipelines
- Ships & FPSO's
- Storage Tanks & Vessels
- Industrial Plant
- Power Stations

Over 60 years, our understanding of the technology and application of these products has developed, along with our desire to use ever more accurate, stable and innovative products to meet the needs of our clients.

The Refine™ range of Reference Electrodes has been developed with one clear purpose , to excel. Where we provide products that will be familiar in application, we have looked to refine and develop ideas, improve material quality and listen to customer requirements. Where we have innovated we do so with the knowledge and desire to provide useful, practical solutions to corrosion engineers in all fields.

The Refine™ range addresses many areas of difficulty felt by clients when purchasing reference cells such as

- Custom cable availability
- Self assembly cell / cable kits
- Easy to understand product coding
- Price competitive
- No minimum / maximum pack sizes
- Test and Calibration certification for every cell
- Bespoke options available
- Continuous product development
- Individual cell identification
- Fast and efficient delivery
- Innovative material selection
- Comprehensive range

The quality of our products is paramount, we have a dedicated UK manufacturing facility with stringent Q/A and test procedures applied. Every Refine cell you buy is given a unique ID number and provided with an individual test and calibration certificate. Our commitment to ongoing research and development of products is at the heart of the company's philosophy.



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## Reference Electrodes



### PORTABLE Ag/AgCl REFERENCE ELECTRODES AG1 AND AG2

The Refine<sup>TM</sup> AG1 Portable Reference Electrode is a perfect companion for offshore, jetty and harbour inspection work where you need a reliable, cost effective reference cell in your tool kit. Provided with UV protection sheath whilst cell is not in use.

The Refine<sup>TM</sup> AG2 Portable/Permanent Reference Electrode is a long life reference cell designed for offshore, jetty and harbour inspection work. Permanent version can be provided with various fittings to suit specific mounting hardware. Our sintered element design ensures long life, stability and accuracy.

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AG1 AND AG2

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### PORTABLE Ag/AgCl REFERENCE ELECTRODE AG1

#### Materials Specification :

Electrode Element	99.9% pure silver
Electrode Media	Specially formulated Ag/AgCl matrix
Body	End cap: acetal homopolymer Tubular element container: thermoplastic polycarbonate resin

#### Performance Details :

Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 – 75 °C (32 – 167 °F)

#### Dimensional Data :

Electrode Body Diameter	36 mm (1.4")
Electrode Body Length	180 mm (7")
Nominal Weight	300 grammes (10.5 oz) without cable tail

#### Cable Tails :

Standard Specification	1 x 2.5 mm <sup>2</sup> (14 AWG) EPR/CSP, stranded Cu conductor
You Specify	Cable tail fitted to your requirements

### PORTABLE / PERMANENT Ag/AgCl REFERENCE ELECTRODE AG2

#### Materials Specification :

Electrode Element	99.9 % pure silver
Electrode Media	Specially formulated Ag/AgCl matrix
Body	Acetal homopolymer

#### Performance Details :

Operating Life	25 years minimum, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 – 75 °C (32 – 167 °F)

#### Dimensional Data :

Electrode Body Diameter	27 mm (1.1")
Electrode Body Length	200 mm (7.9")
Nominal Weight	165 grammes (5.9 oz) without cable tail

#### Cable Tails :

Standard Specification	1 x 4 mm <sup>2</sup> (12 AWG) XLPE/PVC, stranded Cu conductor 15 m long
You Specify	Cable tail fitted to your requirements

#### Additional Information :

Both AG1 & AG2 electrodes should be immersed in seawater for a minimum period of 2 hours prior to recording any measurements.  
AG1 standard cable tail length c/w submersible connector is 10 metres, this length can be amended to suit your specific requirements.

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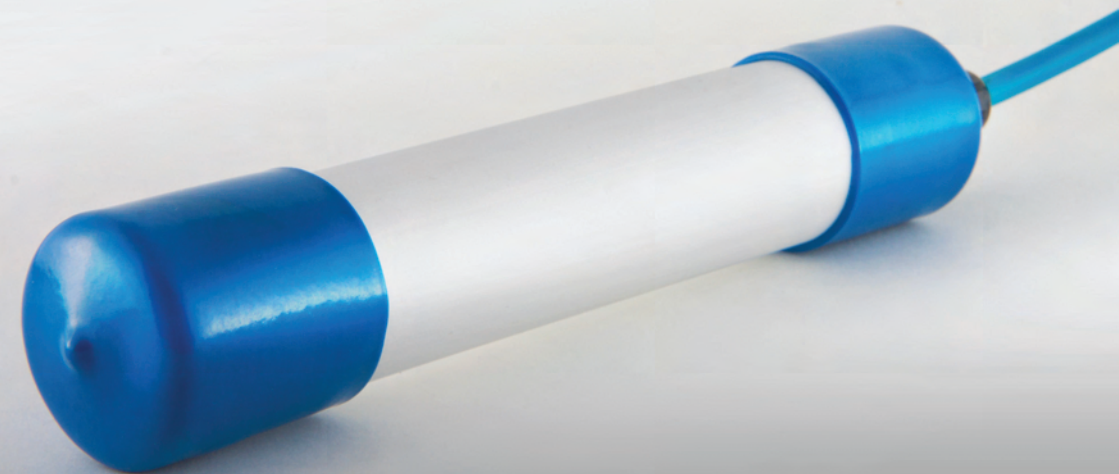
## Reference Electrodes



### PERMANENT Ag/AgCl REFERENCE ELECTRODE AG3

The Refine<sup>TM</sup> AG3 Reference Electrode is a long life permanent reference cell designed for onshore applications, particularly where high chloride content soils are encountered. Our sintered element design ensures long life, stability and accuracy over decades in service..

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## Reference Electrodes

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### PERMANENT Ag/AgCl REFERENCE ELECTRODE AG3

#### Materials Specification :

Electrode Element	99.9 % pure silver
Electrode Media	Specially formulated Ag/AgCl matrix
Body	Sintered Porous uHMWPE bonded to a formulated membrane liner

#### Performance Details :

Operating Life	25 years minimum, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 – 75 °C (32 – 167 °F)

#### Dimensional Data :

Electrode Body Diameter	36 mm (1.4")
Electrode Body Length	200 mm (7.9")
Nominal Weight	180 grammes (6.35 oz)

#### Cable Tails :

Standard Specification	1 x 4 mm <sup>2</sup> (12 AWG) XLPE/PVC, stranded Cu conductor 25 m long
You Specify	Cable tail fitted to your requirements
You Fit	Separate work instruction provided with encapsulation kit

#### QA/QC Details :

Traceability	Fully traceable calibration certificate provided with each electrode
Test Acceptance (vs. SCE)	-15 mV (± 10 mV) at 25 °C (77 °F)

#### Additional Information :

AG3 concentration is 0.5 molar.

Electrode interactive surface area with electrolyte is 158 cm<sup>2</sup> (24.5 in<sup>2</sup>) minimum.

No need for pre-packaging in a wetting backfill.

Prior to installation the AG3 reference electrode should be immersed in potable water for a minimum period of 2 hours. Water container shall be made from a non-metallic material.

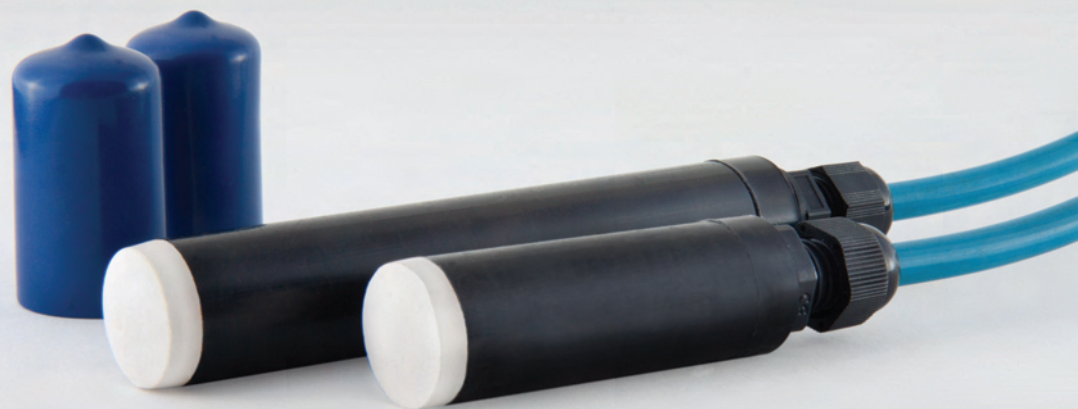
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## Reference Electrodes



### PERMANENT Ag/AgCl REFERENCE ELECTRODE AG4

The Refine<sup>TM</sup> AG4 Reference Electrode is a long life permanent reference cell designed for concrete applications. Our sintered element design ensures long life, stability and accuracy over decades in service. Applications include steel re-bar in concrete, steel framed buildings and buried steel structures in a concrete environment.



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### DATASHEET AG4

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## Reference Electrodes

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### PERMANENT Ag/AgCl REFERENCE ELECTRODES AG4 FOR CONCRETE

#### Materials Specification :

Electrode Element	99.9 % pure silver
Electrode Media	Specifically formulated Ag/AgCl matrix
Body	Acetal homopolymer tube and end cap
Conductive Tip	Chemically modified cementitious based end plug

#### Performance Details :

Operating Life (theoretical)	AG4-50: 20 Years. AG4-100: 25 Years (theoretical life)
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 – 75 °C (32 – 167 °F)

#### Dimensional Data :

Electrode Body Diameter	AG4-50 and AG4-100: 20 mm (0.79")
Electrode Body Length	AG4-50: 50 mm (2"). AG4-100: 100 mm (4")
Nominal Weight	AG4-50: 20 grammes (0.7 oz). AG4-100: 30 grammes (1.06 oz)

#### Cable Tails :

Standard Specification	1 x 4 mm <sup>2</sup> (12 AWG) XLPE/PVC, stranded Cu conductor 15 m long
You Specify	Cable tail fitted to your requirements
You Fit	Separate work instruction provided with encapsulation kit

#### QA/QC Details :

Traceability	Fully traceable calibration certificate provided with each cell
Test Acceptance (vs. SCE)	-15 mV (± 10 mV) at 25 °C (77 °F)

#### Additional Information:

AG4 concentration is 0.5 molar.

Encapsulation kit includes:

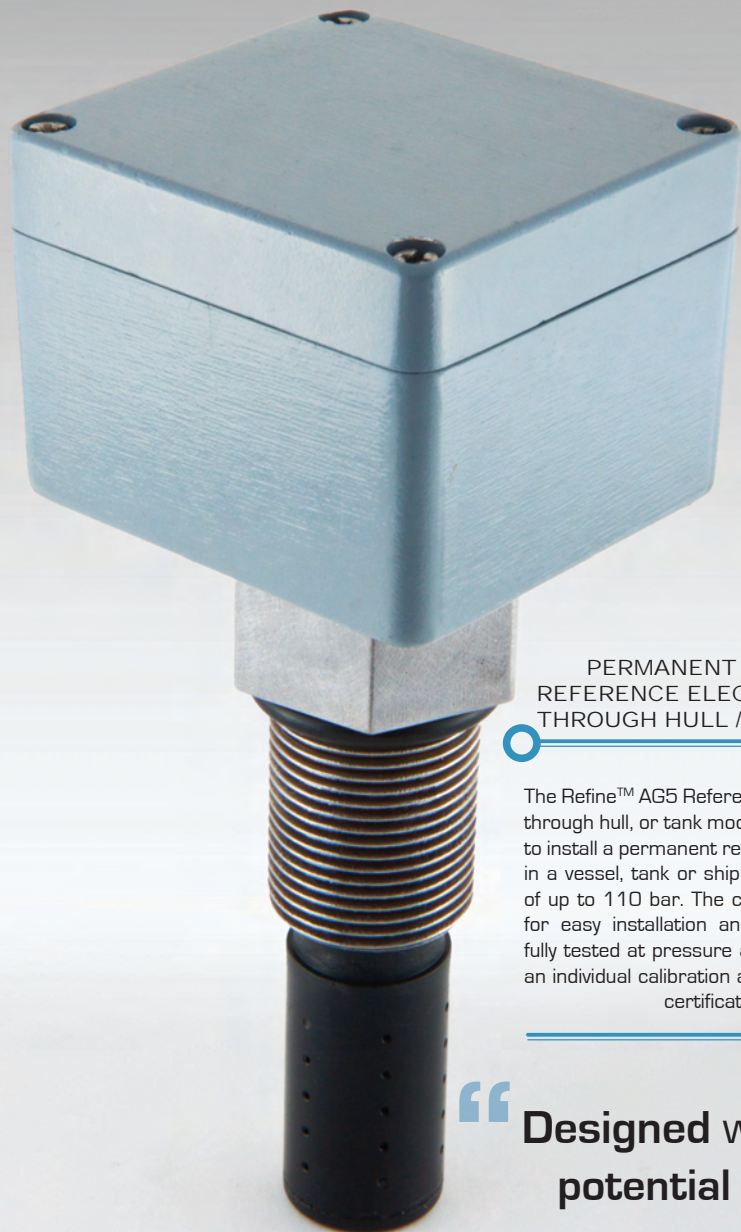
- Proprietary push on crimp lug to suit cable CSA (maximum 4 mm<sup>2</sup>).
- Two part epoxy resin kit to insulate cable tail connection.
- Cable sealing gland to suit cable tail OD (maximum 7 mm (0.28").

The method of self connection is simple yet offers maximum integrity, the activities required can be completed in remote areas without difficulty.

Prior to installation the AG4 reference electrode should be immersed in potable water for a period of 1 hour. Ensure storage protection cap is removed before immersion. Water container shall be made from a non-metallic material.

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## Reference Electrodes



PERMANENT Ag/AgCl  
REFERENCE ELECTRODE AG5  
THROUGH HULL / TANK TYPE

The Refine<sup>TM</sup> AG5 Reference Electrode is a through hull, or tank model that allows you to install a permanent reference electrode in a vessel, tank or ship under pressures of up to 110 bar. The cell is constructed for easy installation and each model is fully tested at pressure and provided with an individual calibration and pressure test certificate.

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### DATASHEET AG5

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## Reference Electrodes

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### PERMANENT Ag/AgCl REFERENCE ELECTRODE AG5

#### Materials Specification :

Electrode Element	99.9 % pure silver
Electrode Media	Specially treated and formulated Ag/AgCl matrix
Body	Acetal homopolymer tube and end cap

#### Performance Details :

Operating Life	Minimum 25 years, if handled correctly prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 – 75 °C (32 – 167 °F)

#### Dimensional Data :

Electrode Body Diameter	27 mm (1.06")
Active Body Length	45 mm (1.74")
Nominal Weight	780 grammes (27.5 oz) without cable tail

#### Cable Tails :

Standard Specification	1 x 4 mm <sup>2</sup> (12 AWG) XLPE/PVC, stranded Cu conductor 15 m long
You Specify	Cable tail fitted to your requirements
You Fit	Your cable tail crimp connector must have 6 mm (0.25") palm hole

#### QA/QC Details :

Traceability	Fully traceable calibration certificate provided with each cell
Test Acceptance (vs. SHE)	0.25 V (± 10 mV) at 25 °C ( 77 °F)

#### Additional Information :

The Ag/AgCl electrode is pressure fitted and encapsulated to a 1" BSP steel mount and can be provided with a hull penetration fitting for welding on site. The steel mount is totally isolated from the cathodically protected structure through the use of high impact and chemically impervious resin compounds, specifically formulated to expected working conditions. Maximum performance criteria stated in the table above.

The Ag/AgCl electrode connection enclosure is manufactured from coated die-cast aluminium and is fixed to the steel mount using a 1" BSP galvanised lock nut c/w with two di-electric sealing washers, to stop any bimetallic corrosion of the fittings.

Electrode steel mount can be provided with NPT threads if required.

Type tested to 110 bar without material or electrode potential degradation.

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## Reference Electrodes



### CONCRETE MAPPING REFERENCE ELECTRODE CM1

The Refine<sup>TM</sup> CM1 Concrete mapping reference electrode kit is a simple yet effective product used for potential measurements on concrete surfaces. It can be used on structures and surfaces such as bridge decks, buildings and caissons at initial site survey and design stages as well ongoing spot point monitoring. A portable Silver / Silver Chloride reference cell sits into a sponge filled well chamber that provides a large, moist surface contact area ideal for such applications. The cell can be used, recalibrated and re-used many times and replacement electrodes and components are always available from us.



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### DATASHEET CM1

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## Reference Electrodes

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### PORTABLE Ag/AgCl REFERENCE ELECTRODE FOR CONCRETE MAPPING

#### Materials Specification :

Electrode Element	99.9 % pure silver
Electrode Media	KCl solution, 0.5 molar as standard
Body	Acetal homopolymer
Conductive Medium	Specifically formulated ceramics

#### Performance Details :

Operating Life	Indefinite, if maintained and stored correctly between use
Shelf Life	Indefinite, if stored in correct conditions
Temperature Range	0 – 75 °C (32 – 167 °F)

#### Dimensional Data :

Electrode Body Diameter	32 mm (1.25")
Electrode Body Length	200 mm (7.9")
Nominal Weight	120 grammes (4.23 oz) without cable or sponge crucible

#### Cable Tails :

Standard Specification	1 x 2.5 mm <sup>2</sup> (14 AWG) EPR/CSP stranded Cu conductor 15 m
You Specify	Cable tail fitted to your requirements
You Fit	Cable tail crimp connector must have 6 mm (0.25") palm hole

#### QA/QC Details :

Traceability	Fully traceable calibration certificate provided with each electrode
Test Acceptance (vs. SCE)	-15 mV (± 10 mV)

#### Additional Information :

The CM1 Ag/Ag Cl reference cell can be sold individually, however it is best suited for use with its purpose designed and built acetal homopolymer sponge crucible.

A complete concrete potential mapping survey kit is available, contents of which are highlighted below:

- CM1 Ag/AgCl reference electrode
- 15 m cable tail
- Surface contact sponge crucible c/w 5 spare sponges
- 2 x 90 ml 0.5 molar KCl cell charges
- Transportation case

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## Reference Electrodes



### PERMANENT CuCuSO4 REFERENCE ELECTRODE CU1

The Refine<sup>TM</sup> CU1 Reference Electrode is a permanent installation reference cell used for underground buried structures, typically pipes, vessels and tanks. Our unique porous end plug / ion barrier design ensure long life, accuracy and stability over decades of service life without leaching of sulphates into the environment or cross contamination from exterior sources. Cell can be provided pre-packaged and fitted with your choice of cable tail, or self attachment cable kit if required.



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### DATASHEET CU1

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## Reference Electrodes

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### PERMANENT Cu/CuSO<sub>4</sub> REFERENCE ELECTRODE CU1

#### Materials Specification :

Electrode Element	High conductivity copper to HD HC C101 to BS EN 133/62
Electrode Media	Standard CU1.1 and CU1.2 specially formulated CuSO <sub>4</sub> matrix
	Gel Type CU 1.3 and CU 1.4 CuSO <sub>4</sub> Gel
Body	uPVC
Conductive Tip	CU1.1 and CU1.3 specially formulated high temperature fired ceramic
	CU1.2 and CU1.4 specially formulated porous plug with membrane trap

#### Performance Details :

Operating Life	25 years, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 – 60 °C (32 – 140 °F)
Environment	CU1.1 and CU1.3 have been designed for use in moist soils
	CU1.2 and CU1.4 have been designed for use in dry soils

#### Dimensional Data :

Electrode Body Diameter	80 mm (3.2")
Electrode Body Length	CU1.1 and CU1.2 150 mm (5.9")
	CU1.3 and CU1.4 300 mm (11.8")
Nominal Weight	450 grammes (15.87 oz) without electrode media

#### Cable Tails :

Standard Specification	1 x 4 mm <sup>2</sup> (12 AWG) XLPE/PVC, stranded Cu conductor 5m long
You Specify	Cable tail fitted to your requirements
You Fit	Separate work instruction provided with encapsulation kit

#### Additional Information :

All CU1 electrodes can be supplied pre-packaged with wetting backfill.

Encapsulation kit includes:

- Proprietary right angled crimp lug to suit specified cable CSA.
- Two part epoxy resin kit to insulate cable tail connection.
- Nut and washer set for terminating cable tail to electrode element.
- Protective cap c/w integral non-metallic sealing gland to suit cable tail OD.

The method of self connection is simple yet offer maximum integrity, the activities required can be completed in remote areas without difficulty.

Prior to installation CU1 reference electrodes should be immersed in potable water for a minimum period of 2 hours. Water container shall be made from a non-metallic material.

With or without wetting backfill CU1 reference electrodes should be installed vertically to achieve full life expectancy.

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## Reference Electrodes



PERMANENT Cu/CuSO<sub>4</sub> REFERENCE ELECTRODE CU2 "SIDE-SENSOR"<sup>TM</sup>

PERMANENT Ag/AgCl REFERENCE ELECTRODE AG6 "SIDE-SENSOR"<sup>TM</sup>

The Refine<sup>TM</sup> CU2 or AG6 "Side-Sensor"<sup>TM</sup> is the most advanced under tank cell available on the market today and the result of 60 years of experience and many thousand of hours of testing, research and development. Our unique side reading body, ion trap and element design combine to give market leading accuracy, stability and performance levels. These cells are ideal for direct installation into soil, sand or cement and will provide superb performance without the need for pre-packaging backfill materials.

Can be purchased with either standard cable tails, your choice of cable or a self assembly version for your convenience.

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CU2 AND AG6

# Refine<sup>±</sup>

## Reference Electrodes

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PERMANENT Cu/CuSO<sub>4</sub> REFERENCE ELECTRODE CU2 "SIDE-SENSOR"<sup>TM</sup>

### Materials Specification :

Electrode Element	High conductivity copper to HD HC C101 to BS EN 133/62
Electrode Media	Specifically formulated CuSO <sub>4</sub> matrix
Body	Sintered porous uHMWPE bonded to a formulated membrane liner

### Performance Details :

Operating Life	25 years minimum, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 - 75 °C (32 - 167 °F)

PERMANENT Ag/AgCl REFERENCE ELECTRODE AG6 "SIDE-SENSOR"<sup>TM</sup>

### Materials Specification :

Electrode Element	99.9 % pure silver
Electrode Media	Specifically formulated Ag/AgCl matrix
Body	Sintered porous uHMWPE bonded to a formulated membrane liner

### Performance Details :

Operating Life	25 years minimum, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 - 75 °C (32 - 167 °F)

### Dimensional Data :

Electrode Body Diameter	36 mm (1.4")
Electrode Body Length	200 mm (7.9")
Nominal Weight	180 to 200 grammes (6.35 to 7.1 oz)

### Cable Tails :

Standard Specification	1 x 4 mm <sup>2</sup> (12 AWG) XLPE/PVC, stranded Cu conductor 25 m long
You Specify	Cable tail fitted to your requirements
You Fit	Separate work instruction provided with encapsulation kit

### Additional Information :

Electrode interactive surface area with electrolyte is 158 cm<sup>2</sup> (24.5 in<sup>2</sup>) minimum.

No need for pre-packaging in a wetting backfill when installed in soils.

Prior to installation the CU2 and AG6 reference electrode should be immersed in potable water for a minimum period of 2 hours. Water container shall be made from a non-metallic material.

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## Reference Electrodes



PERMANENT Cu/CuSO<sub>4</sub> REFERENCE ELECTRODE CU3 "SIDESENSOR IR™"

PERMANENT Ag/AgCl REFERENCE ELECTRODE AG7 "SIDESENSOR IR™"

The Refine™ CU3 or AG7 "Side-Sensor IR™" is the most advanced under tank cell available on the market today and the result of 60 years of experience and many thousands of hours of testing, research and development. Our unique side reading body, ion trap and element design combined with in built polarisation coupon to give market leading accuracy, stability and performance levels. Coupon can be used to take IR free potentials without interrupter to the CP system. These cells are ideal for direct installation into soil, sand or cement and will provide superb performance without the need for pre-packaging backfill materials.

Can be purchased with either standard multi-core cable tails or your choice of cable specification (minimum 3 cores required)

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CU3 AND AG7

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## Reference Electrodes

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PERMANENT Cu/CuSO<sub>4</sub> REFERENCE ELECTRODE CU3 "SIDESENSOR IR™"

### Materials Specification :

Electrode Element	High conductivity copper to HD HC C101 to BS EN 133/62
Electrode Media	Specially formulated CuSO <sub>4</sub> matrix
Body	Sintered porous uHMWPE bonded to a formulated membrane liner

### Performance Details :

Operating Life	25 years minimum, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 - 75 °C (32 - 167 °F)

PERMANENT Ag/AgCl REFERENCE ELECTRODE AG7 "SIDESENSOR IR™"

### Materials Specification :

Electrode Element	99.9 % pure silver
Electrode Media	Specially formulated Ag/AgCl matrix
Body	Sintered porous uHMWPE bonded to a formulated membrane liner

### Performance Details :

Operating Life	25 years minimum, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 - 75 °C (32 - 167 °F)

### Dimensional Data :

Electrode Body Diameter	36 mm (1.4")
Electrode Body Length	200 mm (7.9")
Nominal Weight	180 to 200 grammes (6.35 to 7.1 oz)

### Cable Tails :

Standard Specification	3 x 2.5 mm <sup>2</sup> (14 AWG) PVC/PVC, stranded Cu conductor 25 m long
You Specify	Cable tail fitted to your requirements
You Fit	Separate work instruction provided with encapsulation kit

### Additional Information :

Our standard coupon is manufactured from ENS 275JR grade steel, we can also provide to your specification. Surface area of our standard coupon is 25 cm<sup>2</sup> and can be modified to your requirements.

Electrode interactive surface area with electrolyte is 158 cm<sup>2</sup> (24.5 inches squared) minimum.

No need for pre-packaging in a wetting backfill when installed in soils.

When wetting these cells prior to installation they should be immersed in potable water for a minimum period of 2 hours. Ensure coupon is above water level of water container. Water container shall be made from a non-metallic material.

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## Reference Electrodes



PERMANENT Cu/CuSO<sub>4</sub> REFERENCE ELECTRODE CU4 "SIDE-SENSOR Plus<sup>TM</sup>"

PERMANENT Ag/AgCl REFERENCE ELECTRODE AG8 "SIDE-SENSOR Plus<sup>TM</sup>"

The Refine<sup>TM</sup> CU4 or AG8 "Side-Sensor Plus<sup>TM</sup>" is the most advanced under tank cell available on the market today and the result of 60 years of experience and many thousands of hours of testing, research and development. Our unique side reading body, ion trap and element design combined with in built polarisation strip gives market leading accuracy, stability and performance levels. The unique polarisation strip gives you an inert reference point built into your cell against which to measure polarisation shift regardless of your reference cell performance.

These cells are ideal for direct installation into soil, sand and cement and will provide superb performance without the need for backfill pre-packaging materials. Can be purchased with either standard multi-core cable tails or your choice of cable specification (minimum 3 cores required).



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CU4 AND AG8

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PERMANENT Cu/CuSO<sub>4</sub> REFERENCE ELECTRODE CU4 "SIDE-SENSOR Plus<sup>TM</sup>"

### Materials Specification :

Electrode Element	High conductivity copper to HD HC C101 to BS EN 133/62
Electrode Media	Specifically formulated CuSO <sub>4</sub> matrix
Body	Sintered porous uHMWPE tube bonded to a membrane liner

### Performance Details :

Operating Life	25 years minimum, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 - 75 °C (32 – 167 °F)

PERMANENT Ag/AgCl REFERENCE ELECTRODE AG8 "SIDE-SENSOR Plus<sup>TM</sup>"

### Materials Specification :

Electrode Element	99.9 % pure silver
Electrode Media	Specifically formulated Ag/AgCl matrix
Body	Sintered Porous uHMWPE bonded to a formulated membrane liner

### Performance Details :

Operating Life	25 years minimum, with correct handling prior to installation
Shelf Life	Indefinite, under correct storage conditions
Stability	± 5 mV at 5 microamps
Temperature Range	0 - 75 °C (32 – 167 °F)

### Dimensional Data :

Electrode Body Diameter	36 mm (1.4")
Electrode Body Length	320 mm (12.6")
Nominal Weight	210 to 240 grammes (7.4 to 8.5 oz)

### Cable Tails :

Standard Specification	2 x 2.5 mm <sup>2</sup> (14 AWG) PVC/PVC, stranded Cu conductor 25 m long
You Specify	Cable tail fitted to your requirements
You Fit	Separate work instruction provided with encapsulation kit

### Additional Information :

The polarisation strip employs an inert material surrounded by a formulated porous media c/w protection membrane, allows for measurement of soil gradient voltages, potential swing and potential decay interpretation.

Electrode interactive surface area with electrolyte is 158 cm<sup>2</sup> (24.5 inches squared) minimum.

No need for pre-packaging in a wetting backfill when installed in soils.  
When wetting these cells prior to installation they should be immersed in potable water for a minimum period of 2 hours. Water container shall be made from a non-metallic material.

Email: [cpc@cathodic.co.uk](mailto:cpc@cathodic.co.uk) Website: [www.cathodic.co.uk](http://www.cathodic.co.uk), [www.refcells.com](http://www.refcells.com)  
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The information provided was accurate at time of going to print, we reserve the right to amend without prior warning.

# Refine<sup>TM</sup> ±

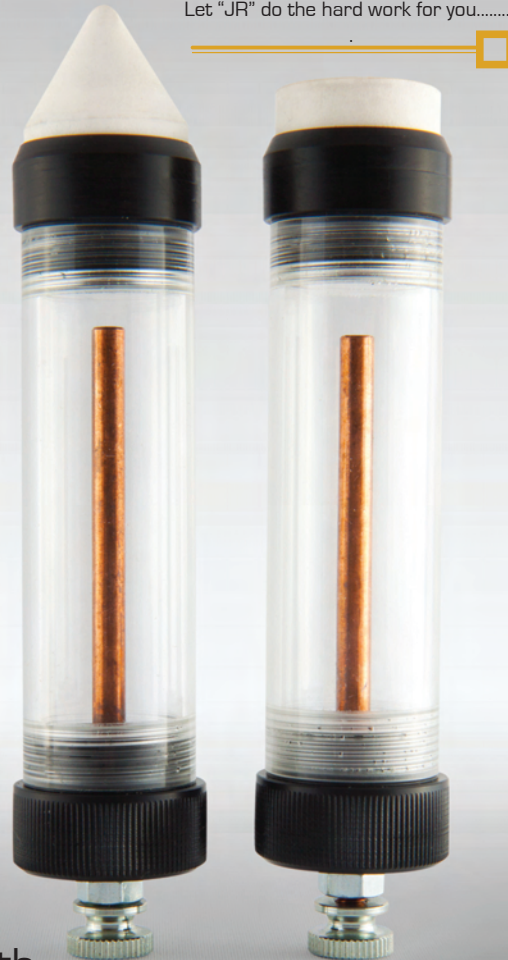
## Reference Electrodes



### PORTABLE CuCuSO<sub>4</sub> REFERENCE ELECTRODES JR1 AND JR2

Whether you're surveying in the desert, monitoring in the field or testing in the laboratory, the Refine<sup>TM</sup> "JR" series of portable reference cells offer a reliable, rugged and accurate product that never lets you down. Precision engineered to work with all existing field equipment on the market today and with a range of tips and choice of gel or solution fill.

Let "JR" do the hard work for you.....



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potential in mind”

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JR1 AND JR2

# Refine<sup>±</sup>

## Reference Electrodes

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### PORTABLE Cu/CuSO<sub>4</sub> REFERENCE ELECTRODE JR1 AND JR2

#### Materials Specification :

Electrode Element	High conductivity copper to HD HC C101 to BS EN 133/62
Electrode Media	CuSO <sub>4</sub> crystals mixed with distilled water or gelatine charge
Body	End caps: acetal homopolymer Tubular cell container: thermoplastic polycarbonate resin
Conductive Tip	Specially formulated ceramic

#### Performance Details :

Operating Life	Indefinite, with correct handling
Shelf Life	Indefinite, under correct storage conditions
Temperature Range	0 – 60 °C (32 – 140 °F)

#### Dimensional Data :

Electrode Body Diameter	36 mm (1.4") over end caps
Electrode Body Length	180 mm (7") without cable tail
Nominal Weight	160 grammes (5.6 oz) without electrode media or cable

#### Cable Tails :

As Standard	1 x 2.5 mm <sup>2</sup> (14 AWG) EPR/CSP, stranded Cu conductor 5 m long
You Specify	Cable tail fitted to your requirements
You Fit	Your cable tail crimp connector must have 6 mm (0.25") palm hole

#### Additional Information:

Select JR1 cell (conical ceramic tip) when taking measurements on general soils and sands.

Select JR2 cell (flat ceramic tip) when taking measurements on hard surfaces such as tarmac and concrete. Best results obtained where surface is wetted and a temporary wetted sponge is placed and fitted over the ceramic tip of the cell.

The JR1 and JR2 electrodes should be calibrated on a regular basis to ensure accuracy and the media should be replenished when spent.

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## Reference Electrodes



### PORTABLE $CuCuSO_4$ REFERENCE ELECTRODES JR3

The Refine<sup>TM</sup> "JR" series of portable reference cells offer a reliable, rugged and accurate product that never lets you down.. Precision engineered to work particularly well on pavements, dry sand, frozen soil etc The "JR3" is for that job where you need a little more surface contact .A choice of gel or solution fill is available .

Let "JR" do the hard work for you.....



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Materials Specification :	
Electrode Element	High conductivity copper to BS EN 12101 to BS EN 13293
Electrode Media	$CuSO_4$ crystals mixed with distilled water or gelatine charge
Body	End cap: acetal homopolymer Tubular cell container: thermoplastic polycarbonate resin
Conductive Tip	Specialty formulated ceramic
Performance Details :	
Operating Life	Indefinite, with correct handling
Shelf Life	Indefinite, under correct storage conditions
Temperature Range	0 – 80 °C (32 – 140 °F)
Dimensional Data :	
Electrode Body Diameter	70 mm (2.75")
Electrode Body Length	150 mm (5.9") without cable tail
Nominal Weight	450 grammes (15.9 oz) without electrode media
Cable Tails :	
Standard Specification	1 x 2.5 mm <sup>2</sup> (14 AWG) EPDM/PP, stranded Cu conductor 5 m long
You Specify	Cable tail fitted to your requirements
You Fit	Your cable tail clamp connector must have 4 mm (0.39") pin hole

Additional Information:	
Select JR3 cell when taking measurements on hard surfaces such as tar and concrete. Best results obtained where surface is wetted and a temporary wetted sponge is placed and fitted over the ceramic tip of the cell.	
The JR3 electrode should be calibrated on a regular basis to ensure accuracy and the media should be replenished when spent.	

# Refine<sup>TM</sup> ±

## Reference Electrodes



### REFINE SPARE PARTS

The Refine<sup>TM</sup> range of reference electrodes are designed for long life and tough service action, however we also provide a full list of replacement tips, bodies and electrolytes to keep your existing cells in tip top condition. If something doesn't appear on the list please call us and we'll be happy to help.

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### REFINE SPARE PARTS

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## Reference Electrodes

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### REFINE SPARE PARTS

#### COPPER/COPPER SULPHATE

Conductive Tips	JR1-CT: 30 mm (1.18") diameter conical ceramic tip JR2-FT: 30 mm (1.18") diameter flat ceramic tip JR3-FT: 75 mm (2.95") diameter flat ceramic tip
Electrode Body	JR1-EB: 32 mm (1.26") diameter x 180 mm (7.1") long. JR3-EB: 75 mm (2.95") diameter x 150 mm (5.9") long.
Top End Cap c/w Element	JR1-EC: 36 mm (1.40") diameter x 215 mm (8.5") long. JR3-EC: 75 mm (2.95") diameter x 100 mm (3.9") long.
Electrode Media	CEM-01: Copper Sulphate Gel – 200 millilitres CEM-02: Copper Sulphate Crystals – 16 grammes (0.56 ozs). CEM-03: Copper Sulphate Crystals – 500 grammes (17.64 ozs).

#### SILVER/SILVER CHLORIDE

AG1 Electrode Body	AG1-EB: 27 mm (1.1") diameter x 200 mm (7.9") long.
AG1 Submersible Connector	AG1-SC: 38 mm (1.49") diameter x 50 mm (1.9") long.
AG1 End Weight	AG1-EW: 38 mm (1.49") diameter x 60 mm (2.4") long.
AG1 Electrode Element	AG1-EE: 36 mm (1.42") diameter x 100 mm (3.9") long.
CM1 0.5 Molar KCl Solution	CM1-KC: 90 millilitre
CM1 Sponge Crucible	CM1-SC: 120 mm (4.72) diameter x 25 mm (1.0") deep.
CM1 Surface Contact Sponges	CM1-SS: 220 mm (8.66") diameter x 40 mm (1.57") deep.
CM1 Electrode Body	CM1-EB: 32 mm (1.25") diameter x 200 mm (7.9") long.
CM1 Electrode Element*	CM1-EE: 36 mm (1.42") diameter x 150 mm (5.9") long.

\* AG1-EE & CM1-EE Electrode Element provided with integral end cap

For further information on the Refine range of Reference Electrodes refer to our Website on [www.refcells.com](http://www.refcells.com)

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