



## Liquid Scintillation Counting Standards

Eckert & Ziegler Analytics manufactures a complete range of NIST traceable Standards for the calibration of Liquid Scintillation Counters (LSC). Our LSC Standards are calibrated in an ISO9001 certified and ISO17025 accredited laboratory using state of the art equipment, operated by experienced professional staff.

We offer unquenched Tritium and Carbon-14 Standards and a wide range of

quenched Standards for the verification and calibration of LSC instruments from all major manufacturers.

Providing the LSC community with customized, NIST traceable, quenched LSC Standards is one of our core strengths. For counting efficiency calibration by internal standardization we provide all common nuclides in the form of NIST traceable standardized solutions.

# Unquenched LSC Standard Sets

This unquenched Liquid Scintillation Counting Set of 3 Standards contains 1 Carbon-14, 1 Tritium (H-3) and 1 Background Standard. The set is designed for establishing optimum LSC operating settings and verifying long term stability. It can be used with all common LSC instruments. Each source is calibrated with measurement uncertainty <4% (k=2). The standards are available in 20 ml and 7 ml Argon purged, flame sealed borosilicate glass LSC vials.



## Chemical Form

C-14 or H-3 labeled toluene in toluene-based scintillator, PPO/bis-MSB in scintillation grade toluene.

## Technical Data

Product Code	SET-H3C14-LSC-20FST 20 ml unquenched LSC Standard Set	SET-H3C14-LSC-7FST 7 ml unquenched LSC Standard Set
Nuclides	Carbon-14 and Tritium (H-3)	Carbon-14 and Tritium (H-3)
C-14 Activity	1667 Bq (100 000 dpm) ± 10% Calibrated, NIST traceable	1667 Bq (100 000 dpm) ± 10% Calibrated, NIST traceable
Active Volume	15 ml C-14 labeled toluene in toluene-based scintillator	5 ml C-14 labeled toluene in toluene-based scintillator
H-3 Activity	4167 Bq (250 000 dpm) ± 10% Calibrated, NIST traceable	4167 Bq (250 000 dpm) ± 10% Calibrated, NIST traceable
Active Volume	15 ml H-3 labeled toluene in toluene-based scintillator	5 ml H-3 labeled toluene in toluene-based scintillator
BKG-Standard	Background Standard, 15ml toluene-based scintillator	Background Standard, 5ml toluene-based scintillator

## Technical Data / Unquenched C-14/H-3 Standards for Beckman Coulter LSC

Product Code	LSCBC566321 20 ml unquenched LSC Standard Set Recommended for Beckman Coulter LSC Instruments	LSCBC594946 7 ml unquenched LSC Standard Set Recommended for Beckman Coulter LSC Instruments
Nuclides	Carbon-14 and Tritium (H-3)	Carbon-14 and Tritium (H-3)
C-14 Activity	1667 Bq (100 000 dpm) ± 10% Calibrated, NIST traceable	750 Bq (45 000 dpm) ± 10% Calibrated, NIST traceable
Active Volume	15 ml C-14 labeled toluene in toluene-based scintillator	5 ml C-14 labeled toluene in toluene-based scintillator
H-3 Activity	1667 Bq (100 000 dpm) ± 10% Calibrated, NIST traceable	1667 Bq (100 000 dpm) ± 10% Calibrated, NIST traceable
Active Volume	15ml H-3 labeled toluene in toluene-based scintillator	5ml H-3 labeled toluene in toluene-based scintillator
BKG-Standard	Background Standard, 15ml toluene-based scintillator	Background Standard, 5ml toluene-based scintillator

# Quenched LSC Standards - Toluene

Quenched Liquid Scintillation Counting Sets contain 10 Standards. Each standard contains the same amount of radioactivity but with progressively higher levels of quenching agent nitromethane. Toluene based LSC Standards are designed to establish counting efficiency correlation curves which are applicable to a wide range of scintillations cocktails and quenching agents. The standards are available in 20 ml and 7 ml flame sealed borosilicate glass LSC vials. Each source is calibrated with measurement uncertainty <4% (k=2). The Transformed Spectral Index of the External Standard (tSIE) value is approx. 150 to 1000.



## Chemical Form

C-14 or H-3 labeled toluene in toluene-based scintillator, PPO/bis-MSB in scintillation grade toluene, quenching agent nitromethane.

Technical Data	C-14 Standards	H-3 Standards
<b>Product Code</b>	<b>SET-C14-LSC-20FST</b>	<b>SET-H3-LSC-20FST</b>
<b>Product</b>	<b>Set of 10 quenched C-14 Standards - 20 ml vials</b>	<b>Set of 10 quenched H-3 Standards - 20 ml vials</b>
<b>Nuclide</b>	Carbon-14	H-3 (Tritium)
<b>Activity</b>	1667 Bq (100 000 dpm) ± 10% per vial Calibrated, NIST traceable	4167 Bq (250 000 dpm) ± 10% per vial Calibrated, NIST traceable
<b>Active Volume</b>	15 ml C-14 labeled toluene in toluene-based scintillator	15 ml H-3 labeled toluene in toluene-based scintillator
<b>Product Code</b>	<b>SET-C14-LSC-7FST</b>	<b>SET-H3-LSC-7FST</b>
<b>Product</b>	<b>Set of 10 quenched C-14 Standards - 7 ml vials</b>	<b>Set of 10 quenched H-3 Standards - 7 ml vials</b>
<b>Nuclide</b>	Carbon-14	H-3 (Tritium)
<b>Activity</b>	1667 Bq (100 000 dpm) ± 10% per vial Calibrated, NIST traceable	4167 Bq (250 000 dpm) ± 10% per vial Calibrated, NIST traceable
<b>Active Volume</b>	5 ml C-14 labeled toluene in toluene-based scintillator	5 ml H-3 labeled toluene in toluene-based scintillator

Technical Data	C-14 Standards for Low Level Counting	H-3 Standards Low Level Counting
<b>Product Code</b>	<b>SET-C14-LSC-20FST-LOW</b>	<b>SET-H3-LSC-20FST-LOW</b>
<b>Product</b>	<b>Set of 10 quenched C-14 Standards - 20 ml vials</b>	<b>Set of 10 quenched H-3 Standards - 20 ml vials</b>
<b>Nuclide</b>	Carbon-14	H-3 (Tritium)
<b>Activity</b>	333 Bq (20 000 dpm) ± 10% per vial Calibrated, NIST traceable	500 Bq (30 000 dpm) ± 10% per vial Calibrated, NIST traceable
<b>Active Volume</b>	15 ml C-14 labeled toluene in toluene-based scintillator	15 ml H-3 labeled toluene in toluene-based scintillator

Technical Data	C-14 Standards for Beckman Coulter LSC	H-3 Standards for Beckman Coulter LSC
<b>Product Code</b>	<b>LSCBC566681</b>	<b>LSCBC566680</b>
<b>Product</b>	<b>Set of 10 quenched C-14 Standards - 20 ml vials</b>	<b>Set of 10 quenched H-3 Standards - 20 ml vials</b>
<b>Nuclide</b>	Carbon-14	H-3 (Tritium)
<b>Activity</b>	2500 Bq (150 000 dpm) ± 10% per vial Calibrated, NIST traceable	8333 Bq (500 000 dpm) ± 10% per vial Calibrated, NIST traceable
<b>Active Volume</b>	15 ml C-14 labeled toluene in toluene-based scintillator	15 ml H-3 labeled toluene in toluene-based scintillator
<b>Product Code</b>	<b>LSCBC566682</b>	<b>LSCBC566683</b>
<b>Product</b>	<b>Set of 10 quenched C-14 Standards - 7 ml vials</b>	<b>Set of 10 quenched H-3 Standards - 7 ml vials</b>
<b>Nuclide</b>	Carbon-14	H-3 (Tritium)
<b>Activity</b>	2250 Bq (135 000 dpm) ± 10% per vial Calibrated, NIST traceable	8333 Bq (500 000 dpm) ± 10% per vial Calibrated, NIST traceable
<b>Active Volume</b>	5 ml C-14 labeled toluene in toluene-based scintillator	5 ml H-3 labeled toluene in toluene-based scintillator

# Quenched Standards - Ultima Gold

Quenched Liquid Scintillation Counting Sets contain 10 Standards. Each standard contains the same amount of radioactivity but with progressively higher levels of quenching agent nitromethane. These LSC Standards are designed to establish counting efficiency correlation curves which are applicable to Ultima Gold LSC cocktails. The Transformed Spectral Index of the External Standard (tSIE) value is approx. 150-650. The standards are available in 20ml and 7 ml flame sealed borosilicate glass LSC vials.

Each source is calibrated with measurement uncertainty <4% (k=2).

## Chemical Form

C-14 labeled glucose or Tritium labeled water in Ultima Gold scintillation cocktail. Quenching agent nitromethane.

Technical Data	C-14 Standards	H-3 Standards
<b>Product Code</b>	<b>SET-C14-LSC-20FSUG</b>	<b>SET-H3-LSC-20FSUG</b>
<b>Product</b>	<b>Set of 10 quenched C-14 Standards - 20 ml vials</b>	<b>Set of 10 quenched H-3 Standards - 20 ml vials</b>
<b>Nuclide</b>	Carbon-14	H-3 (Tritium)
<b>Activity</b>	1667 Bq (100 000 dpm) ± 10% per vial Calibrated, NIST traceable	4167 Bq (250 000 dpm) ± 10% per vial Calibrated, NIST traceable
<b>Active Volume</b>	15 ml C-14 labeled glucose in Ultima Gold scintillation cocktail	15 ml Tritiated water (H-3) in Ultima Gold scintillation cocktail.
<b>Product Code</b>	<b>SET-C14-LSC-7FSUG</b>	<b>SET-H3-LSC-7FSUG</b>
<b>Product</b>	<b>Set of 10 quenched C-14 Standards - 7 ml vials</b>	<b>Set of 10 quenched H-3 Standards - 7 ml vials</b>
<b>Nuclide</b>	Carbon-14	H-3 (Tritium)
<b>Activity</b>	1667 Bq (100 000 dpm) ± 10% per vial Calibrated, NIST traceable	4167 Bq (250 000 dpm) ± 10% per vial Calibrated, NIST traceable
<b>Active Volume</b>	5 ml C-14 labeled glucose in Ultima Gold scintillation cocktail	5 ml Tritium labeled water in Ultima Gold scintillation cocktail.

## Standards For Low Level Counting - Ultima Gold

Technical Data	C-14 Standards for Low Level Counting	H-3 Standards Low Level Counting
<b>Product Code</b>	<b>SET-C14-LSC-20FSUG-LOW</b>	<b>SET-H3-LSC-20FSUG-LOW</b>
<b>Product</b>	<b>Set of 10 quenched C-14 Standards - 20 ml vials</b>	<b>Set of 10 quenched H-3 Standards - 20 ml vials</b>
<b>Nuclide</b>	Carbon-14	H-3 (Tritium)
<b>Activity</b>	333 Bq (20 000 dpm) ± 10% per vial Calibrated, NIST traceable	500 Bq (30 000 dpm) ± 10% per vial Calibrated, NIST traceable
<b>Active Volume</b>	15 ml C-14 labeled glucose in Ultima Gold scintillation cocktail	15 ml Tritium labeled water in Ultima Gold based scintillator

## LSC Alpha/Beta Standards - Ultima Gold AB

This quenched Liquid Scintillation Counting Set of 3 Standards contains 1 Americium-241, 1 Chlorine-36 and 1 Background Standard. The set is used to optimize the pulse discrimination parameter for alpha/beta separation. The standards are available in 20 ml flame sealed borosilicate glass LSC vials.

Technical Data	Alpha/Beta LSC Standard Set
Product Code	SET-AM1CL6-LSC-20FSUGAB
Am-241/Cl-36/BKG	Alpha/Beta Standard Set - 20 ml vials
Nuclide	<b>Am-241</b>
Am-241 Activity	1667 Bq (100 000 dpm) ± 10% Calibrated, NIST traceable
Active Volume	15 ml
Vial Type	20 ml flame sealed borosilicate glass ampoule
Chemical Form	Americium Chloride in Ultima Gold AB scintillation cocktail.
Nuclide	<b>Cl-36</b>
Cl-36 Activity	1667 Bq (100 000 dpm) ± 10% Calibrated, NIST traceable
Active Volume	15 ml
Vial Type	20 ml flame sealed borosilicate glass ampoule
Chemical Form	Sodium Chloride in Ultima Gold AB scintillation cocktail
BKG-Standard	<b>Background Standard</b>
Volume	15 ml
Vial Type	20 ml flame sealed borosilicate glass ampoule
Chemical Form	Ultima Gold AB scintillation cocktail

# Single LSC Standards

Unquenched LSC Standards in flame sealed borosilicate glass ampoules.

All standards are calibrated, NIST traceable, measurement uncertainty <4% (k=2). Customized standards are available on request.

Nuclide	Product Code	Activity	DPM	Vial	Active Volume	Chemical Form
C-14	C14-LSC-20FST-666BQ	666 Bq ± 10%	40 000	20 ml	15 ml	C-14 labeled toluene
C-14	C14-LSC-20FST-1666BQ	1667 Bq ± 10%	100 000	20 ml	15 ml	C-14 labeled toluene
C-14	C14-LSC-7FST-666BQ	666 Bq ± 10%	40 000	7 ml	5 ml	C-14 labeled toluene
C-14	C14-LSC-7FST-1666BQ	1667 Bq ± 10%	100 000	7 ml	5 ml	C-14 labeled toluene

Nuclide	Product Code	Activity	DPM	Vial	Active Volume	Chemical Form
H-3	H3-LSC-20FST-1333BQ	1333 Bq ± 10%	80 000	20 ml	15 ml	Tritium labeled toluene
H-3	H3-LSC-20FST-1666BQ	1667 Bq ± 10%	100 000	20 ml	15 ml	Tritium labeled toluene
H-3	H3-LSC-7FST-1666BQ	1667 Bq ± 10%	100 000	7 ml	5 ml	Tritium labeled toluene
H-3	H3-LSC-20FST-4167BQ	4167 Bq ± 10%	250 000	20 ml	15 ml	Tritium labeled toluene
H-3	H3-LSC-7FST-4167BQ	4167 Bq ± 10%	250 000	7 ml	5 ml	Tritium labeled toluene



The vial caps are color-coded and laser engraved. The engraving includes:

- Nuclide
- Measured activity in DPM
- Reference date
- Serial number
- Radioactive labeling

## Single LSC Standards - Ultima Gold cocktail in flame sealed borosilicate glass ampoules, Argon purged.

All standards are calibrated, NIST traceable, measurement uncertainty <4% (k=2). The tSIE quench value is approx.750.

Nuclide	Product Code	Activity	DPM	Vial	Active Volume	Chemical Form
Am-241	AM1-LSC-20FSUG-1666BQ	1667 Bq ± 10%	100 000	20 ml	15 ml	Americium Chloride
Am-241	AM1-LSC-7FSUG-1666BQ	1667 Bq ± 10%	100 000	7 ml	5 ml	Americium Chloride

Nuclide	Product Code	Activity	DPM	Vial	Active Volume	Chemical Form
C-14	C14-LSC-20FSUG-333BQ	333 Bq ± 10%	20 000	20 ml	15 ml	C-14 labeled glucose
C-14	C14-LSC-20FSUG-1666BQ	1667 Bq ± 10%	100 000	20 ml	15 ml	C-14 labeled glucose
C-14	C14-LSC-7FSUG-1666BQ	1667 Bq ± 10%	100 000	7 ml	5 ml	C-14 labeled glucose

Nuclide	Product Code	Activity	DPM	Vial	Active Volume	Chemical Form
Cl-36	CL6-LSC-20FSUG-1666BQ	1667 Bq ± 10%	100 000	20 ml	15 ml	Sodium Chloride
Cl-36	CL6-LSC-7FSUG-1666BQ	1667 Bq ± 10%	100 000	7 ml	5 ml	Sodium Chloride

Nuclide	Product Code	Activity	DPM	Vial	Active Volume	Chemical Form
H-3	H3-LSC-20FSUG-500BQ	500 Bq ± 10%	30 000	20 ml	15 ml	Tritium labeled water
H-3	H3-LSC-20FSUG-1666BQ	1667 Bq ± 10%	100 000	20 ml	15 ml	Tritium labeled water
H-3	H3-LSC-7FSUG-1666BQ	1667 Bq ± 10%	100 000	7 ml	5 ml	Tritium labeled water

Nuclide	Product Code	Activity	DPM	Vial	Active Volume	Chemical Form
Ni-63	NI3-LSC-20FSUG-1666BQ	1667 Bq ± 10%	100 000	20 ml	15 ml	Nickel Chloride
Ni-63	NI3-LSC-7FSUG-1666BQ	1667 Bq ± 10%	100 000	7 ml	5 ml	Nickel Chloride

Nuclide	Product Code	Activity	DPM	Vial	Active Volume	Chemical Form
Sr-90	SR0-LSC-20FSUG-1666BQ	1667 Bq ± 10%	100 000	20 ml	15 ml	Strontium Chloride
Sr-90	SR0-LSC-7FSUG-1666BQ	1667 Bq ± 10%	100 000	7 ml	5 ml	Strontium Chloride

# Internal standards for LSC counting efficiency calibration

Eckert & Ziegler Analytics offers a wide range of NIST traceable, calibrated solutions for the determination of counting efficiency by internal standardization. They are provided in a 10 ml flame sealed glass ampoule with an active volume of 10 ml. Customized solutions are available on request.

Nuclide	Product Code	Activity Conc. [kBq/g]	Total Activity [kBq]	Activity Conc. [DPM/g]	Measurement Uncertainty (k=2)	Chemical Form
H-3 (Tritium)	8003	40	400	$2.4 \times 10^6$	<3.5%	Tritium labeled water
H-3 (Tritium)	8003T	40	400	$2.4 \times 10^6$	<3.5%	Tritium labeled Toluene
C-14	8014T	10	100	$6 \times 10^5$	<4%	C-14 labeled Toluene
C-14	8014	10	100	$6 \times 10^5$	<4%	C-14 labeled glucose (50µg/g) + formaldehyde (1µg/g) in H <sub>2</sub> O
C-14	8014C	10	100	$6 \times 10^5$	<4%	Na <sub>2</sub> CO <sub>3</sub> in 0.001M NaOH, 30µg/g C
Am-241	8241	10	100	$6 \times 10^5$	<2%	Americium Chloride in 1M HCl, no carrier added
Ca-45	8045	10	100	$6 \times 10^5$	<6%	Calcium Chloride in 0.1 M HCl, 30 µg/g Ca
Cd-109	8109	10	100	$6 \times 10^5$	<2%	Cadmium Chloride in 0.1 M HCl, 30 µg/g Cd
Cl-36	8036	10	100	$6 \times 10^5$	<4%	Sodium Chloride in 0.0005M NaOH, 30 µg/g Cl
Co-60	8060	10	100	$6 \times 10^5$	<1.5%	Cobalt Chloride in 0.1 M HCl, 30 µg/g Co
Cr-51	8051	10	100	$6 \times 10^5$	<2%	Chromium Chloride in 0.1 M HCl, 30 µg/g Cr
Cs-137	8137	10	100	$6 \times 10^5$	<2%	Cesium Chloride in 0.1 M HCl, 30 µg/g Cs
Fe-55	8055	10	100	$6 \times 10^5$	<4%	Ferric Chloride in 0.1 M HCl, 30 µg/g Fe
I-125	8125	10	100	$6 \times 10^5$	<3.5%	Sodium Iodide in 0.1 M NaOH + 0.006M Na <sub>2</sub> SO <sub>3</sub> , 30 µg/g I
I-129	8129	10	100	$6 \times 10^5$	<3.5%	Sodium Iodide in 0.1 M NaOH + 0.006M Na <sub>2</sub> SO <sub>3</sub> , 30 µg/g I
Ni-63	8063	10	100	$6 \times 10^5$	<3%	Nickel Chloride in 0.1 M HCl, 30 µg/g Ni
S-35	8035	10	100	$6 \times 10^5$	<3.5%	Sodium Sulfate in H <sub>2</sub> O, 30 µg/g S
Sr-90	8090	10	100	$6 \times 10^5$	<2%	Strontium Chloride in 0.1 M HCl, 30 µg/g Sr + 30 µg/g Y
Tc-99	8099	10	100	$6 \times 10^5$	<3%	Sodium pertechnetate in 0.001M NaOH, no carrier added

# Low-Background (dead) Water

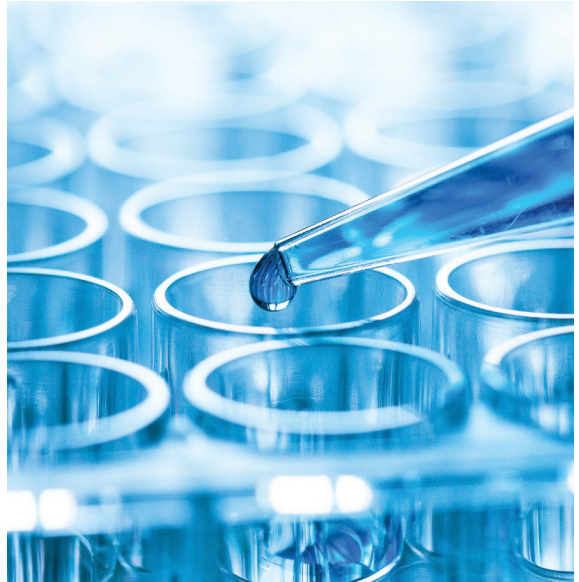
This freshwater is collected from an artesian well that is screened at a depth of >100 m below the water table. Based upon hydraulic Conductivity, this water has not been in contact with the atmosphere for several thousand years and should therefore contain undetectable amounts of tritium. Analysis of this water by the University of Miami Tritium Laboratory indicates that the tritium levels are below their detection limit (< 0.1 TU). This water is suitable for use as analytical field and equipment blanks. The water will be delivered in 1 liter polyethene bottles.

**Product Code: BGW-1LB**

1 Liter Low-Background Water

Tritium (H-3) activity less than 0.012 Bq/kg (12 pBq/g)

Analysis Certificate provided

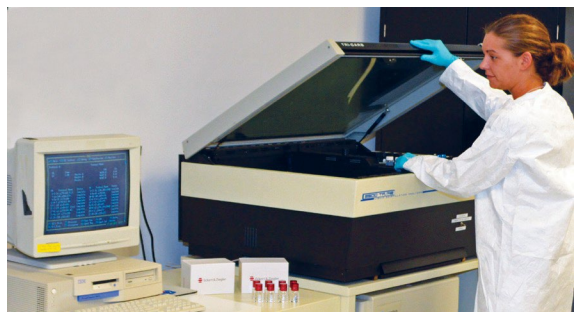


## Customized LSC standards and calibrated solutions

Eckert & Ziegler Analytics provides customized, NIST traceable LSC Standards for most applications. Please contact us with your requirements.

**We will need the following information for a quotation:**

- Set of sources or single standard
- Nuclide(s)
- Activity per nuclide
- Scintillation cocktail
- Active volume
- Vial type (volume)
- Quench tSIE value/range



**Eckert & Ziegler  
Analytics, Inc.**

1380 Seaboard Industrial Blvd.  
Atlanta, Georgia 30318  
USA

Tel: +1 404 352 8677  
Email: [isotrakusa@ezag.com](mailto:isotrakusa@ezag.com)  
Web: [www.ezag.com](http://www.ezag.com)

**Eckert & Ziegler  
Nuclitec GmbH**

Gieselweg 1  
38110 Braunschweig  
Germany

Tel: +49 5307 932 555  
Email: [infoisotrak@ezag.com](mailto:infoisotrak@ezag.com)  
Web: [www.ezag.com](http://www.ezag.com)

**Eckert & Ziegler  
Isotope Products France**

91940 Les Ulis  
France

Tel: +33 1 64 86 22 22  
Email: [contact-fr@ezag.com](mailto:contact-fr@ezag.com)  
Web: [www.ezag.com](http://www.ezag.com)

**Eckert & Ziegler  
Brazil Isotope Solutions**

Rua Miguel Nelson Bechara, 480  
Limão, São Paulo, SP, 02712-130  
Brasil

Tel: +55 11 3526-5757  
Email: [contato@ezag.com](mailto:contato@ezag.com)  
Web: [www.ezagbrasil.com.br](http://www.ezagbrasil.com.br)

**isotrak**<sup>™</sup>