Eckert & Ziegler Nuclitec GmbH
Gieselweg 1
38110 Braunschweig
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Fax +49 5307 932-293

Eckert & Ziegler

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

DAkkS Deutsche Akkreditierungsstelle D-K-15203-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

Kalibrierzeichen *Calibration mark*
032058
D-K-15203-01-00
2018-03

Kalibrierschein
Calibration certificate

Seriennr. / *Serial No.* AL-5357

Gegenstand *Object*	**Gamma Reference Source**
Hersteller *Manufacturer*	**Eckert & Ziegler Nuclitec GmbH**
Typ *Type*	**QCRB9481AM**
Seriennr. *Serial No.*	**AL-5357**
Auftraggeber *Customer*	**Eckert & Ziegler Analytics** **1380 Seaboard Industrial Blvd.** **Atlanta, GA 30318** **United States of America**
Auftragsnummer *Order No.*	**CO00171829**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**1 April 2018**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
21 March 2018	Dr. Heid	Schohl

032058
D-K-15203-01-00
2018-03

Gamma Reference Source

Serial No.	AL-5357
Drawing	VZ-478-001
Form	sealed
Nuclide	Americium-241
Activity	38.8 kBq
Relative uncertainty*	3 %
Reference date	1 April 2018 at 12:00 UTC
Radioactive impurities	Am-243 < 0.06 %
ISO classification*	ISO/12/C34313
Measuring method	The activity of the source was determined by comparison with a reference source of the same construction using a sodium iodine detector with multi-channel analyser.

* please see HI001

End of Certificate

Additional Information

Leakage and contamination test*	Wipe test according to ISO 9978.
Wipe test passed on	19 March 2018
Your reference	KIJESKI25JAN18/VS 8152/41060
Remark	---

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DAkkS Deutsche Akkreditierungsstelle D-K-15203-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

Kalibrierzeichen *Calibration mark*	032059
	D-K-15203-01-00
	2018-03

Kalibrierschein
Calibration certificate

Seriennr. / *Serial No.* AL-5358

Gegenstand *Object*	**Gamma Reference Source**
Hersteller *Manufacturer*	**Eckert & Ziegler Nuclitec GmbH**
Typ *Type*	**QCRB9481BA**
Seriennr. *Serial No.*	**AL-5358**
Auftraggeber *Customer*	**Eckert & Ziegler Analytics** **1380 Seaboard Industrial Blvd.** **Atlanta, GA 30318** **United States of America**
Auftragsnummer *Order No.*	**CO00171829**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**1 April 2018**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
21 March 2018	Dr. Heid	Schohl

032059
D-K-15203-01-00
2018-03

Gamma Reference Source

Serial No.	AL-5358
Drawing	VZ-477-001
Form	sealed
Nuclide	Barium-133
Activity	39.3 kBq
Relative uncertainty*	3 %
Reference date	1 April 2018 at 12:00 UTC
Radioactive impurities	Co-60 < 0.01 %
ISO classification*	ISO/12/C34313
Measuring method	The activity of the source was determined by comparison with a reference source of the same construction using a sodium iodine detector with multi-channel analyser.

* please see HI001

End of Certificate

Additional Information

Leakage and contamination test*	Wipe test according to ISO 9978.
Wipe test passed on	19 March 2018
Your reference	KIJESKI25JAN18/VS 8152/41060
Remark	---

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DAkkS Deutsche Akkreditierungsstelle D-K-15203-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

Kalibrierzeichen *Calibration mark*	032060
	D-K-15203-01-00
	2018-03

Kalibrierschein
Calibration certificate

Seriennr. / *Serial No.* AL-5359

Gegenstand *Object*	**Gamma Reference Source**
Hersteller *Manufacturer*	**Eckert & Ziegler Nuclitec GmbH**
Typ *Type*	**QCRB9481CS**
Seriennr. *Serial No.*	**AL-5359**
Auftraggeber *Customer*	**Eckert & Ziegler Analytics** **1380 Seaboard Industrial Blvd.** **Atlanta, GA 30318** **United States of America**
Auftragsnummer *Order No.*	**CO00171829**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**1 April 2018**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
21 March 2018	Dr. Heid	Schohl

032060
D-K-15203-01-00
2018-03

Gamma Reference Source

Serial No.	AL-5359
Drawing	VZ-477-001
Form	sealed
Nuclide	Caesium-137
Activity	44.9 kBq
Relative uncertainty*	3 %
Reference date	1 April 2018 at 12:00 UTC
Radioactive impurities	Cs-134 < 0.03 %
ISO classification*	ISO/12/C34313
Measuring method	The activity of the source was determined by comparison with a reference source of the same construction using a sodium iodine detector with multi-channel analyser.

* please see HI001

End of Certificate

Additional Information

Leakage and contamination test*	Wipe test according to ISO 9978.
Wipe test passed on	19 March 2018
Your reference	KIJESKI25JAN18/VS 8152/41060
Remark	---

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DAkkS Deutsche Akkreditierungsstelle D-K-15203-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

032061
D-K-15203-01-00
2018-03

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

Seriennr. / *Serial No.* AL-5360

Gegenstand *Object*	**Gamma Reference Source**
Hersteller *Manufacturer*	**Eckert & Ziegler Nuclitec GmbH**
Typ *Type*	**QCRB9481CO**
Seriennr. *Serial No.*	**AL-5360**
Auftraggeber *Customer*	**Eckert & Ziegler Analytics** **1380 Seaboard Industrial Blvd.** **Atlanta, GA 30318** **United States of America**
Auftragsnummer *Order No.*	**CO00171829**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**1 April 2018**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
21 March 2018	Dr. Heid	Schohl

032061
D-K-15203-01-00
2018-03

Gamma Reference Source

Serial No.	AL-5360
Drawing	VZ-477-001
Form	sealed
Nuclide	Cobalt-60
Activity	38.3 kBq
Relative uncertainty*	3 %
Reference date	1 April 2018 at 12:00 UTC
Radioactive impurities	none
ISO classification*	ISO/12/C34313
Measuring method	The activity of the source was determined by comparison with a reference source of the same construction using a sodium iodine detector with multi-channel analyser.

* please see HI001

End of Certificate

Additional Information

Leakage and contamination test*	Wipe test according to ISO 9978.
Wipe test passed on	19 March 2018
Your reference	KIJESKI25JAN18/VS 8152/41060
Remark	---

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Deutsche Akkreditierungsstelle GmbH

DAkkS Deutsche Akkreditierungsstelle D-K-15203-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

032062
D-K-15203-01-00
2018-03

Kalibrierzeichen
Calibration mark

Kalibrierschein
Calibration certificate

Seriennr. / *Serial No.* AL-5361

Gegenstand *Object*	**Gamma Reference Source**
Hersteller *Manufacturer*	**Eckert & Ziegler Nuclitec GmbH**
Typ *Type*	**QCRB9481EU**
Seriennr. *Serial No.*	**AL-5361**
Auftraggeber *Customer*	**Eckert & Ziegler Analytics** **1380 Seaboard Industrial Blvd.** **Atlanta, GA 30318** **United States of America**
Auftragsnummer *Order No.*	**CO00171829**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**1 April 2018**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
21 March 2018	Dr. Heid	Schohl

032062
D-K-15203-01-00
2018-03

Gamma Reference Source

Serial No.	AL-5361
Drawing	VZ-477-001
Form	sealed
Nuclide	Europium-152
Activity	36.9 kBq
Relative uncertainty*	3 %
Reference date	1 April 2018 at 12:00 UTC
Radioactive impurities	Eu-154 < 0.3 %
ISO classification*	ISO/12/C34313
Measuring method	The activity of the source was determined by comparison with a reference source of the same construction using a sodium iodine detector with multi-channel analyser.

* please see HI001

End of Certificate

Additional Information

Leakage and contamination test*	Wipe test according to ISO 9978.
Wipe test passed on	19 March 2018
Your reference	KIJESKI25JAN18/VS 8152/41060
Remark	---

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Deutsche Akkreditierungsstelle GmbH

DAkkS Deutsche Akkreditierungsstelle D-K-15203-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst DKD

032063
D-K-15203-01-00
2018-03

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

Seriennr. / *Serial No.* AL-5362

Gegenstand *Object*	**Gamma Reference Source**
Hersteller *Manufacturer*	**Eckert & Ziegler Nuclitec GmbH**
Typ *Type*	**QCRB9481NA**
Seriennr. *Serial No.*	**AL-5362**
Auftraggeber *Customer*	**Eckert & Ziegler Analytics** **1380 Seaboard Industrial Blvd.** **Atlanta, GA 30318** **United States of America**
Auftragsnummer *Order No.*	**CO00171829**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**1 April 2018**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
21 March 2018	Dr. Heid	Schohl

032063
D-K-15203-01-00
2018-03

Gamma Reference Source

Serial No.	AL-5362
Drawing	VZ-477-001
Form	sealed
Nuclide	Sodium-22
Activity	43.4 kBq
Relative uncertainty*	3 %
Reference date	1 April 2018 at 12:00 UTC
Radioactive impurities	none
ISO classification*	ISO/12/C34313
Measuring method	The activity of the source was determined by comparison with a reference source of the same construction using a sodium iodine detector with multi-channel analyser.

* please see HI001

End of Certificate

Additional Information

Leakage and contamination test*	Wipe test according to ISO 9978.
Wipe test passed on	19 March 2018
Your reference	KIJESKI25JAN18/VS 8152/41060
Remark	---

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DAkkS Deutsche Akkreditierungsstelle D-K-15203-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

Kalibrierzeichen *Calibration mark*	032064
	D-K-15203-01-00
	2018-03

Kalibrierschein
Calibration certificate

Seriennr. / *Serial No.* AL-5363

Gegenstand *Object*	**Gamma Reference Source**
Hersteller *Manufacturer*	**Eckert & Ziegler Nuclitec GmbH**
Typ *Type*	**QCRB9481PB**
Seriennr. *Serial No.*	**AL-5363**
Auftraggeber *Customer*	**Eckert & Ziegler Analytics** **1380 Seaboard Industrial Blvd.** **Atlanta, GA 30318** **United States of America**
Auftragsnummer *Order No.*	**CO00171829**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**1 April 2018**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
21 March 2018	Dr. Heid	Schohl

032064
D-K-15203-01-00
2018-03

Gamma Reference Source

Serial No.	AL-5363
Drawing	VZ-478-001
Form	sealed
Nuclide	Lead-210
Activity	218 kBq
Relative uncertainty*	4 %
Reference date	1 April 2018 at 12:00 UTC
Radioactive impurities	Ra-226 < 0.01 %
ISO classification*	ISO/12/C34313
Measuring method	The activity of the source was determined by comparison with a reference source of the same construction using a sodium iodine detector with multi-channel analyser.

* please see HI001

End of Certificate

Additional Information

Leakage and contamination test*	Wipe test according to ISO 9978.
Wipe test passed on	19 March 2018
Your reference	KIJESKI25JAN18/VS 8152/41060
Remark	---

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DAkkS Deutsche Akkreditierungsstelle D-K-15203-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

032065	
D-K-15203-01-00	
2018-03	

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

Seriennr. / *Serial No.* AL-5364

Gegenstand *Object*	**Gamma Reference Source**
Hersteller *Manufacturer*	**Eckert & Ziegler Nuclitec GmbH**
Typ *Type*	**QCRB9481RA**
Seriennr. *Serial No.*	**AL-5364**
Auftraggeber *Customer*	**Eckert & Ziegler Analytics** **1380 Seaboard Industrial Blvd.** **Atlanta, GA 30318** **United States of America**
Auftragsnummer *Order No.*	**CO00171829**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**2**
Datum der Kalibrierung *Date of calibration*	**1 April 2018**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
21 March 2018	Dr. Heid	Schohl

032065
D-K-15203-01-00
2018-03

Gamma Reference Source

Serial No.	AL-5364
Drawing	VZ-3293-001
Form	sealed
Nuclide	Radium-226
Activity	29.7 kBq
Relative uncertainty*	3 %
Reference date	1 April 2018 at 12:00 UTC
Radioactive impurities	none
ISO classification*	ISO/12/C34313
Measuring method	The activity of the source was determined by comparison with a reference source of the same construction using a sodium iodine detector with multi-channel analyser.

* please see HI001

End of Certificate

Additional Information

Leakage and contamination test*	Wipe test according to ISO 9978.
Wipe test passed on	19 March 2018
Your reference	KIJESKI25JAN18/VS 8152/41060
Remark	---

HI001

English

from page 3

Definitions, Safety and Handling Instructions for Radioactive Sources and Radioactive Solutions

Warnings
For reasons of safety and to ensure correct usage, read these instructions carefully before un-packing, using, storing, transporting or disposing of the radiation sources/solutions.

These instructions must always accompany the radiation sources and be readily available to all persons using them.

You should be aware of the following:
- Radiation sources must only be used by qualified persons or by trained assistants working under their direct supervision.
- Radiation sources emit harmful radiation.
- Potentially dangerous radioactive material may be released if the radiation sources are damaged by misuse.
- The sources must not be used under operating conditions or for purposes outside those agreed in writing by Eckert & Ziegler Nuclitec.
- The sources must never be modified unless the modifications have been agreed in writing by Eckert & Ziegler Nuclitec.

If in doubt obtain advice from a competent person.

Deutsch

ab Seite 13

Definitionen, Sicherheitsbestimmungen und Handhabungsanweisungen für radioaktive Strahlenquellen und Lösungen

Warnhinweise
Aus Sicherheitsgründen und um die ordnungsgemäße Benutzung zu gewährleisten, lesen Sie bitte diese Anweisung sorgfältig vor dem Auspacken, der Benutzung, der Lagerung, dem Transport oder der Entsorgung der radioaktiven Strahlenquellen/Lösungen.

Diese Anweisungen müssen allen Benutzern der Strahlenquellen jederzeit zur Verfügung stehen.

Folgendes ist unbedingt zu beachten:
- Radioaktive Strahlenquellen dürfen nur von fachlich qualifizierten Personen und unter Aufsicht einer hierfür autorisierten Fachkraft (z. B. Strahlenschutzbeauftragter) gehandhabt und verwendet werden.
- Radioaktive Strahlenquellen emittieren potentiell gesundheitsgefährdende Strahlung.
- Bei Beschädigung oder unsachgemäßer Handhabung kann radioaktives Material freigesetzt werden. Radioaktive Strahlenquellen dürfen nicht außerhalb der festgelegten Einsatzbedingungen benutzt werden (außer wenn schriftliche Zustimmung von Eckert & Ziegler Nuclitec vorliegt).
- Radioaktive Strahlenquellen dürfen nicht verändert werden (außer wenn schriftliche Zustimmung von Eckert & Ziegler Nuclitec vorliegt).

Bei Unklarheiten wenden Sie sich bitte an eine sachkundige Person.

Eckert & Ziegler

1 Uncertainty

The reported uncertainty is based on standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %. (ISO Guide, 1995)

2 Traceability

This certificate documents the traceability of measurement results to national standards, standard measuring equipment and methods for the realisation of physical units of measurement according to the International System of Units (SI).

Traceability is defined as 'the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.

The calibration laboratory of Eckert & Ziegler Nuclitec GmbH has been accredited by the Deutsche Akkreditierungsstelle GmbH (DAkkS) and is authorized to issue reference sources which are traceable to national standards held at the PTB in Germany.

Because of the European co-operation for Accreditation (EA) mutual recognition agreement the certificates are also accepted by all EA-members (e. g. UKAS).

This product complies with the requirements for traceability to NIST specified in the American National Standard "Traceability of Radioactive Sources to the NIST and Associated Instrument Quality Control (ANSI N42.22-1995)".

As a requirement for the ANSI N42.22-1995 Eckert & Ziegler Nuclitec GmbH participates in the NRMAP-NIST radioactivity measurements assurance program.

3 Air Kerma Rate

The air kerma rate of a source with an activity A is the sum of the initial kinetic energies of all charged particles created by phontons, released per volume element of air and per unit of time.

4 Leakage and Contamination Tests

Stringent tests for leakage are an essential feature of radioactive sources production. They are based on ISO 9978. Some standard methods used for testing radiation sources are listed below.

4.1 Wipe Test I

The source is wiped with a swab or tissue, moistened with ethanol or water, the activity removed is measured.
Limit: 200 Bq, USA: 5 nCi

4.2 Immersion Test II

The source is immersed in a suitable liquid at 50 °C for at least 4 hours and the activity removed is measured.
Limit: 200 Bq, USA: 5 nCi

4.3 Bubble Test III

The source is immersed in water or a suitable liquid and the pressure in the vessel reduced to 13 kPa (100 mm Hg). No bubbles must be observed.

4.4 Krypton Emanation Test VI

The source is held under reduced pressure for 24 hours. The content of the chamber is analysed for ^{85}Kr by scintillation counting. The test is repeated after at least 7 days.
Limit: 1.85 kBq

5 ISO Classification

The International Organization for Standardization (ISO) has proposed a system of classification of sealed radioactive sources based on safety requirements for typical uses (see ISO 2919 and ANSI N43.6-1997). This system provides a manufacturer of sealed radioactive sources with a set of tests to evaluate the safety of his products. It also assists a user of such sealed sources to select types which suit the application he has in mind. The tests to which specimen sources are subjected are listed in the following table.

Classification of sealed source performance standard according to ISO 2919 and ANSI N43.6-1997 (extract)

Test	Class					
	1	2	3	4	5	6
Temperature	No test	- 40 °C (20 min) + 80 °C (1 h)	- 40 °C (20 min) + 180 °C (1 h)	- 40 °C (20 min) + 400 °C (1 h) and thermal shock to 20 °C	- 40 °C (20 min) + 600 °C (1 h) and thermal shock to 20 °C	- 40 °C (20 min) + 800 °C (1 h) and thermal shock to 20 °C
External Pressure	No test	25 kPa absolute to atmospheric	25 kPa absolute to 2 MPa absolute	25 kPa absolute to 7 MPa absolute	25 kPa absolute to 70 MPa absolute	25 kPa absolute to 170 MPa absolute
Impact	No test	50 g from 1 m or equivalent imparted energy	200 g from 1 m or equivalent imparted energy	2 kg from 1 m or equivalent imparted energy	5 kg from 1 m or equivalent imparted energy	20 kg from 1 m or equivalent imparted energy
Vibration	No test	3 times 10 min 25 Hz to 500 Hz at 49 m/s² (5 g) [a]	3 times 10 min 25 Hz to 50 Hz at 49 m/s² (5 g) [a] and 50 Hz to 90 Hz at 0,635 mm peak to peak and 90 Hz to 500 Hz at 98 m/s² (10 g) [a]	3 times 30 min 25 Hz to 80 Hz at 1,5 mm peak to peak and 80 Hz to 2000 Hz at 196 m/s² (20 g) [a]	Not used	Not used
Puncture	No test	1 g from 1 m or equivalent imparted energy	10 g from 1 m or equivalent imparted energy	50 g from 1 m or equivalent imparted energy	300 g from 1 m or equivalent imparted energy	1 kg from 1 m or equivalent imparted energy

[a] 1 g = 9.8 m/s²

6 Recommended Working Life

The Recommended Working Life (RWL) is the maximum period within which Eckert & Ziegler Nuclitec expects the source to meet its design requirements under proper conditions of environment and usage. A source should be replaced within the Recommended Working Life or a proper assessment should be made to verify its suitability for continued use.

Eckert & Ziegler Nuclitec makes no warranties, expressed or implied, or guarantees as to how long any source can actually be safely used. Adverse environments, conditions, improper usage or materials combination in usage could affect the appearance and integrity of the source and it is the user's responsibility to carry out routine inspection and testing to determine when it should be replaced.

According to the requirements of the authorities the expiry of the RWL (details see approval) may result in the loss of the approval as special form source.

7 Special Applications

No test programme can cover all possible combinations of environments to which a source may be exposed. Users should therefore consult our experts before using sources in potentially adverse environments.

8 IAEA Special Form

'Special Form' is a test specification for sealed sou
given in the IAEA transport regulations. It is used i
determining the maximum acceptable activities for
ous types of transport containers.

If nothing else is stated, the reference date is iden
with the date of manufacture.

9 Quality Assurance System

The quality assurance system of Eckert & Ziegler
Nuclitec GmbH was certified by Lloyd's Register Q
Assurance (LRQA) according to ISO 9001:2008 a
according to ISO 13485:2003 for medical devices.
Isotrak products meet the requirements of 10CFR
Appendix B.

10 NRC Advice

Radioactive material - not for human use - introdu
into foods, beverages, cosmetics, drugs, or medi
or into products manufactured for commercial dis
tion is prohibited - exempt quantities should not b
bined.

Uncertainty

reported uncertainty is based on standard uncertain-
ultiplied by a coverage factor k = 2, providing a level
nfidence of approximately 95 %. (ISO Guide, 1995)

Traceability

certificate documents the traceability of measure-
results to national standards, standard measuring
oment and methods for the realisation of physical
of measurement according to the International
em of Units (SI).

eability is defined as 'the property of a result of a
surement whereby it can be related to appropriate
dards, generally international or national standards,
gh an unbroken chain of comparisons.

calibration laboratory of Eckert & Ziegler Nuclitec
H has been accredited by the Deutsche Akkredi-
ngsstelle GmbH (DAkkS) and is authorized to issue
ence sources which are traceable to national stand-
held at the PTB in Germany.

use of the European co-operation for Accreditation
mutual recognition agreement the certificates are
accepted by all EA-members (e. g. UKAS).

product complies with the requirements for tracea-
to NIST specified in the American National Stand-
Traceability of Radioactive Sources to the NIST and
ciated Instrument Quality Control (ANSI N42.22-
)".

requirement for the ANSI N42.22-1995 Eckert &
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Limit: 1.85 kBq

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Classification of sealed source performance standard according to ISO 2919 and ANSI N43.6-1997 (extract)

Test	Class						
	1	2	3	4	5	6	X
Temperature	No test	- 40 °C (20 min) + 80 °C (1 h)	- 40 °C (20 min) + 180 °C (1 h)	- 40 °C (20 min) + 400 °C (1 h) and thermal shock to 20 °C	- 40 °C (20 min) + 600 °C (1 h) and thermal shock to 20 °C	- 40 °C (20 min) + 800 °C (1 h) and thermal shock to 20 °C	Special test
External Pressure	No test	25 kPa absolute to atmospheric	25 kPa absolute to 2 MPa absolute	25 kPa absolute to 7 MPa absolute	25 kPa absolute to 70 MPa absolute	25 kPa absolute to 170 MPa absolute	
Impact	No test	50 g from 1 m or equivalent imparted energy	200 g from 1 m or equivalent imparted energy	2 kg from 1 m or equivalent imparted energy	5 kg from 1 m or equivalent imparted energy	20 kg from 1 m or equivalent imparted energy	
Vibration	No test	3 times 10 min 25 Hz to 500 Hz at 49 m/s² (5 g) [a]	3 times 10 min 25 Hz to 50 Hz at 49 m/s² (5 g) [a] and 50 Hz to 90 Hz at 0.635 mm peak to peak and 90 Hz to 500 Hz at 98 m/s² (10 g) [a]	3 times 30 min 25 Hz to 80 Hz at 1.5 mm peak to peak and 80 Hz to 2000 Hz at 196 m/s² (20 g) [a]	Not used	Not used	
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Eckert & Ziegler Nuclitec makes no warranties, expressed or implied, or guarantees as to how long any source can actually be safely used. Adverse environments, conditions, improper usage or materials combination in usage could affect the appearance and integrity of the source and it is the user's responsibility to carry out routine inspection and testing to determine when it should be replaced.

According to the requirements of the authorities the expiry of the RWL (details see approval) may result in the loss of the approval as special form source.

7 Special Applications

No test programme can cover all possible combinations of environments to which a source may be exposed. Users should therefore consult our experts before using sources in potentially adverse environments.

8 IAEA Special Form

'Special Form' is a test specification for sealed sources given in the IAEA transport regulations. It is used in determining the maximum acceptable activities for various types of transport containers.

If nothing else is stated, the reference date is identical with the date of manufacture.

9 Quality Assurance System

The quality assurance system of Eckert & Ziegler Nuclitec GmbH was certified by Lloyd's Register Quality Assurance (LRQA) according to ISO 9001:2008 and according to ISO 13485:2003 for medical devices. Isotrak products meet the requirements of 10CFR50 Appendix B.

10 NRC Advice

Radioactive material - not for human use - introduction into foods, beverages, cosmetics, drugs, or medicinals, or into products manufactured for commercial distribution is prohibited - exempt quantities should not be combined.