



# CERTIFIED FISCHER X-RAY CALIBRATION STANDARDS AND ACCESSORIES

DIN ISO/IEC 17025 accredited  
Edition February 2022

**fischer**®

# X-RAY Calibration Standards

## Quality assurance with energy-dispersive X-ray fluorescence analysis (EDXRF analysis)

Quality assurance and optimum processing procedures play an ever greater role in production. From this stems the necessity to perform reliable measurements, which also comply with the demanding requirements of an ISO certified quality management system.

Energy-dispersive X-ray fluorescence analysis (EDXRF analysis) is a particularly universal, fast and non-destructive measuring method. By using suitable reference materials, it enables coating thicknesses and material composition for a large number of applications to be determined with a high level of precision and in a traceable way. The wide range of industrial applications and the short cycle of product innovation place special challenges on measuring technology and on the availability of calibration standards that are suitable for EDXRF analysis.

## The Fischer Calibration Laboratory

Since July 2003 Fischer has been the first institution in Germany to be approved as a DKD/DAkkS calibration laboratory for the "Mass per unit area" measured variable and accredited in accordance with DIN EN ISO/IEC 17025. This accreditation entitles it to issue DAkkS calibration certificates for "Mass per unit area" calibration standards, which are used for calibrating X-ray fluorescence instruments for measuring coating thicknesses. The DAkkS certified calibration standards that are produced by Fischer meet the highest possible quality standard of national metrological institutes such as NIST, BAM etc.

## More than 300 Calibration Standards

The standard portfolio comprises more than 300 calibration standards for EDXRF analysis and covers a large number of applications for different industries, such as for example plug contacts, jewelry, PCBs, semi-conductors, RoHS/WEEE and high reliability.

## Customer-specific Calibration Standards

Thanks to the technical expertise and many years of experience of the Fischer Calibration Laboratory, we can also offer our customers the unique service of being able to have their own products certified as EDXRF calibration standards in accordance with the DAkkS accredited procedure - an invaluable benefit for you and your customers.

## Why DAkkS Accreditation?



**The Fischer Calibration Laboratory complies with DIN EN ISO/IEC 17025**

Calibration standards from Fischer with DAkkS accreditation give you the following benefits:

- The expertise of the Calibration Laboratory is checked and confirmed at regular intervals by an independent state authority.
- Traceability of the measured results: there is a seamless measuring chain up to internationally recognized base units, e.g. the SI-unit "meter". Only traceability proves, that the printed value is correct with a defined measurement uncertainty. The value is independent of time, person checking, test laboratory and measuring method, and it therefore creates the basis for process and quality control.

With DAkkS certified calibration standards from Fischer, you benefit not only from unique expertise in producing certified reference materials, but you also receive at the same time the warranty for their quality. Thanks to the internationally recognized DAkkS calibration certificate, you also gain security and strengthen customer trust in your products.

## Note on Terminology

Calibration standards are also often called reference standards or comparison standards. In the interests of uniform terminology, "calibration standard" is used throughout in this document.

## Traceability of Calibration Standards

The traceability of Fischer calibration standards is effected on the basis of the following procedures:

- In accordance with a procedure that is accredited by the German Accreditation Service, Deutscher Akkreditierungsservice (DKD/DAkkS), see the accreditation certificate at [www.helmut-fischer.de/akkreditierung](http://www.helmut-fischer.de/akkreditierung). This procedure can be applied for many pure-element coatings. The Fischer Calibration Laboratory ensures traceability to internationally recognized material measures. You can find the accreditation certificate on the Fischer website:



[www.helmut-fischer.com/service/certifications-and-accreditations](http://www.helmut-fischer.com/service/certifications-and-accreditations)

- Through comparison measurements with calibration standards, which have either been quantified by the accredited procedure and/or by other procedures. Reference to the calibration standards used and to their nominal values and measurement uncertainty is documented in the traceability reports, see [www.helmut-fischer.de/traceability](http://www.helmut-fischer.de/traceability). Specific reference is made to these in the test certificate for the calibration standard. This enables you to track, to which physical material measures your Fischer standards are traceable. You can find the traceability reports on the Fischer website:






[www.helmut-fischer.com/service/certified-calibration-standards](http://www.helmut-fischer.com/service/certified-calibration-standards)

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# The DAkkS Calibration Certificate

## The Front Page of the DAkkS Calibration Certificate

HELMUT FISCHER GMBH INSTITUT FÜR ELEKTRONIK UND MESSTECHNIK						
<b>Kalibrierschein / Calibration Certificate</b>						
Erstellt durch das Kalibrierlaboratorium der issued by the calibration laboratory						
HELMUT FISCHER GMBH Institut für Elektronik und Messtechnik Industriestraße 21 D-71069 Sindelfingen		 				
		<table border="1"> <tr><td>9999</td></tr> <tr><td>D-K</td></tr> <tr><td>15076-01-00</td></tr> <tr><td>JJJJ-MM</td></tr> </table>	9999	D-K	15076-01-00	JJJJ-MM
9999						
D-K						
15076-01-00						
JJJJ-MM						
		Kalibrierzeichen Calibration mark				
Gegenstand Object	<b>Flächenmassennormal Au/Ni</b> <i>Mass per unit area standard Au/Ni</i>	<p>Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).</p> <p>Die DAkkS ist Unterzeichner der Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.</p> <p>Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.</p> <p><i>This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).</i></p> <p><i>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.</i></p> <p><i>The user is obliged to have the object recalibrated at appropriate intervals.</i></p>				
Hersteller Manufacturer	<b>HELMUT FISCHER GMBH</b> Institut für Elektronik und Messtechnik Industriestraße 21 D-71069 Sindelfingen					
Typ Type	<b>601-708</b>					
Fabrikat/Serien-Nr. Serial number	<b>12345</b>					
Auftraggeber Customer	<b>Fa. Muster GmbH &amp; Co.KG</b> Musterstraße 21 99999 Musterstadt					
Auftragsnummer Order No.	<b>123456</b>					
Anzahl der Seiten des Kalibrierscheines Number of pages of the certificate	<b>2</b>					
Datum der Kalibrierung Date of calibration	<b>05.07.2021</b>					
<p>Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.</p> <p><i>This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature are not valid.</i></p>						
Datum Date	Leiter des Kalibrierlaboratoriums Head of the calibration laboratory		Bearbeiter Person in charge			
08.07.2021	Dr. David Balle	A. Dinkelacker				

The **insignia** designates the DAkkS calibration certificate as an official document. Strict requirements apply to calibration laboratories, and these requirements are regularly checked by the accreditation body of the German Calibration Service, Deutscher Kalibrierdienst (DKD).

The **calibration sign** shows the accreditation number of our laboratory, the number of the calibration certificate and the year and month it was issued. The sign is also on the wallet of your calibration standards.

The **type of calibration object**, here gold coating on nickel base material, in the case of alloys a consecutive sequence of elements, e.g.: NiZn/Fe: Nickel-zinc alloy coating on iron

The unique **identifier** of the calibration object.

The date and signatures confirm the validity of the measured values.

## The Back Page of the DAkkS Calibration Certificate

### Description of the calibration object

The **traceability** of the calibration standards is effected via a comparison measurement by means of X-ray fluorescence analysis against gravimetrically measured reference standards.

**Identification** of the calibration standard (as it is also printed on the standard), material and the mass per unit area that is determined. The mass per unit area is the size, which an X-ray fluorescence instrument determines. The coating thickness is derived from the mass per unit area via the material density.

In the case of coatings: **Derived sizes**, such as the thickness in micrometers and micro inches. The nominal value is the nominal value of the calibration object, for example a target coating thickness or catalogue value. This value must not be used for calibration.

### Thickness (actual value) and nominal value

The nominal value gives the range, in which the coating thickness or alloy composition should lie. It is also given on the following pages in the catalogue. The exact value (actual value) for the thickness or composition of the material is determined during the qualification of the material. The actual value deviates from the nominal value, because it is not technically possible to produce the exact value, e.g. applying a zinc coating with exactly 37.5 µm. Example:

KAL-N d Zn/Fe 25 µm, solid material standard for single coating, zinc coating on iron base material, nominal value for the zinc coating thickness = 25 µm, but printed on the standard and documented in the certificate is the actual value = 24.8 µm.

Always use the actual value for entering the calibration data in the X-RAY software.

9999  
 D-K-  
 15076-01-00  
 JJJJ-MM

Seite 2  
Page

**Kalibriergegenstand / Object of calibration:**  
 Das Flächenmassenormal besteht aus einer Goldschicht auf einem ebenen Nickelblech; gefasst in einem Kunststoffträger.  
*The mass per unit area standard consists of a gold coating on a flat nickel sheet, fasted in a plastic frame.*

**Kalibrierverfahren / Calibration method:**  
 Die Messungen erfolgten mit einem Röntgenfluoreszenz Messgerät unter Verwendung von Normalen und einem standardfreien Röntgenfluoreszenzverfahren. Die Normale sind über ein gravimetrisches Verfahren auf nationale Normale rückgeführt und entsprechen in Aufbau und Zusammensetzung dem Kalibriergegenstand.  
*The measurements were made with an X-ray fluorescence measuring instrument using master standards and a standard free XRF method. The master standards are traceable to national standards, by using mass and area measurements. The standards comply with the measurement sample, as far as the composition and consistence are concerned.*

**Messbedingungen / Measurement conditions:**  
 Die Röntgenfluoreszenzmessungen wurden in einer zentralen Fläche von 2x2 mm durchgeführt (wenn die Messfläche nicht anders gekennzeichnet ist). Die aufgeführten Werte repräsentieren die Mittelwerte über diese Fläche.  
*The x-ray fluorescence measurements were performed at a central area of 2x2 mm (unless specified otherwise). The reported values represent mean values for this area.*

**Umgebungsbedingungen / Environmental conditions:**  
 Die Kalibrierung (Röntgenmessung) wurde bei einer Temperatur von (23 ± 5)°C durchgeführt.  
*The calibration (x-ray measurement) was performed at a temperature of (23 ± 5)°C.*

**Messergebnisse / Measurement results:**

Bezeichnung Code	Material material	Flächenmasse mass per unit area [mg/cm <sup>2</sup> ]	U (k=2) [mg/cm <sup>2</sup> ]
ABCDE	Au/Ni	0.74	0.03

Die abgeleiteten Werte der folgenden Tabelle sind aus der Flächenmasse mit der angegebenen Dichte berechnet worden.  
*The values for the coating thickness of the following table have been converted from the mass per unit area using the specified density.*

Material material	Dichte density [g/cm <sup>3</sup> ]	Nennwert nominal value [µm]	Dicke thickness [µm]	U (k=2) [µm]	Dicke thickness [µm]	U (k=2) [µm]
Au	19.32	0.37	0.38	0.02	15.0	0.8

**Messunsicherheit / Measurement uncertainty:**  
 Angegeben ist die erweiterte Messunsicherheit, die sich aus der Standardmessunsicherheit durch Multiplikation mit dem Erweiterungsfaktor k=2 ergibt. Sie wurde gemäß EN ISO 9801 M ermittelt. Der Wert der Messgröße liegt mit einer Wahrscheinlichkeit von 95% im zugeordneten Wertintervall.  
*Stated is the expanded measurement uncertainty, which is a result of the multiplication of the standard measurement uncertainty with the expansion factor k=2. It was determined according to EN ISO 9801 M. With a probability of 95%; the value of the measured quantity is within the assigned value interval.*

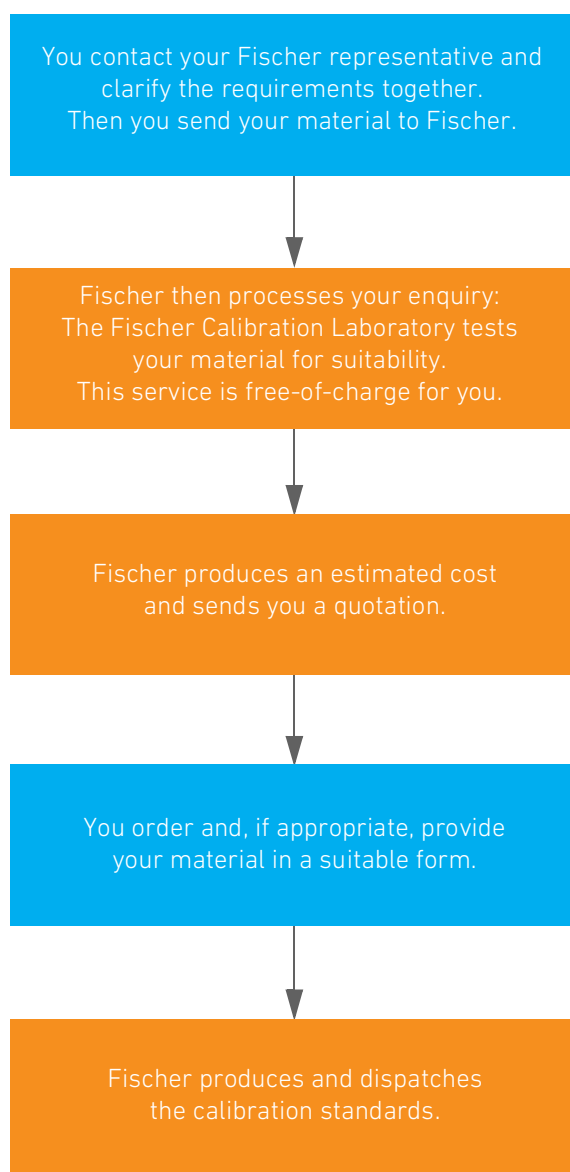
**Hinweis/Note:**  
 Die Deutsche Akkreditierungsstelle ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine. Die weiteren Unterzeichner innerhalb und außerhalb Europas sind den Internetseiten von EA ([www.european-accreditation.org](http://www.european-accreditation.org)) und ILAC ([www.ilac.org](http://www.ilac.org)) zu entnehmen.  
*The Deutsche Akkreditierungsstelle (German Accreditation Body) is a signer of the multilateral agreement of the European co-operation for Accreditation (EA) and the International Laboratory Accreditation Cooperation (ILAC) for mutual recognition of calibration certificates. Further signers within and outside of European are summarized on the web pages of EA ([www.european-accreditation.org](http://www.european-accreditation.org)) and ILAC ([www.ilac.org](http://www.ilac.org)).*

The **measurement uncertainty U** is determined for each calibration standard individually.

# Customer-specific Calibration Standards

Fischer offers you the unique service of being able to certify your own product as a calibration standard. In many cases it is even possible to issue an internationally recognized DAkkS calibration certificate. You can show this to your customers and populate it to an existing quality management system in accordance with ISO 9000/1. You also gain security with this in your production process, if a calibration standard corresponds to your products. The production of traceable calibration standards is very time-consuming and also dependent on the quality of the source material. Please therefore observe the following sequence when ordering.

## This is how you order a customer-specific calibration standard from Fischer



When you send your material to Fischer, please address the shipment directly to the application laboratory (address-addition application laboratory). This ensures that your material reaches the right contact person.

Colour key

Action taken by you

Action taken by Fischer

# Notes on the Catalogue

## Column DAkKS – Order with Manufacturer's Certificate or DAkKS Calibration Certificate

All calibration standards are supplied with a manufacturer's certificate. If there is a **D** in the *DAkKS* column in the table from page 8, then you can order a DAkKS calibration certificate as an option for this standard. Then add a D to the order number.

Example:

Order with manufacturer's certificate: 603-055

Order with DAkKS calibration certificate: 603-055D.

If there is no **D** in the *DAkKS* column, then the standard is available with manufacturer's certificate only.

## Differences between standards with a manufacturer's certificate and DAkKS certified standards

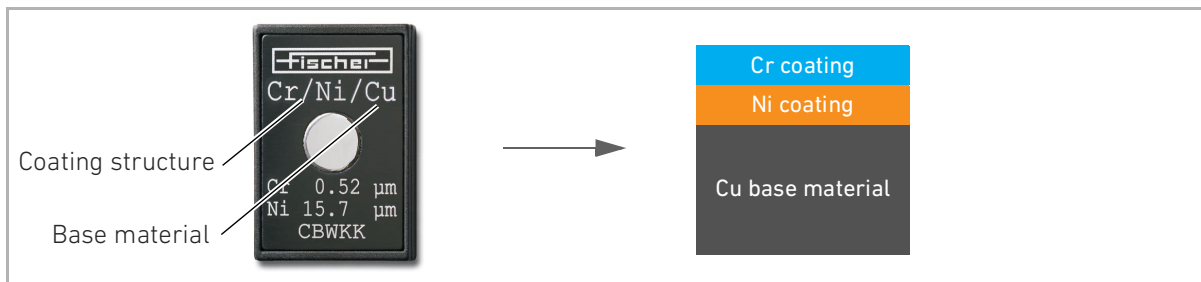
Property	Standard with manufacturer's certificate	DAkKS certified standard
Produced by a DAkKS certified calibration laboratory	✓	✓
Produced in accordance with DAkKS certified procedure		✓
Proof of traceability to internationally recognized base units		✓
Internationally recognized calibration certificate		✓
Worldwide comparability of the measured results		✓
Acceptance by ISO 9000/9001 certification bodies worldwide		✓

## Nominal value and actual value

In this document the values for coating thickness and alloy composition are always given as nominal values, see page 5.

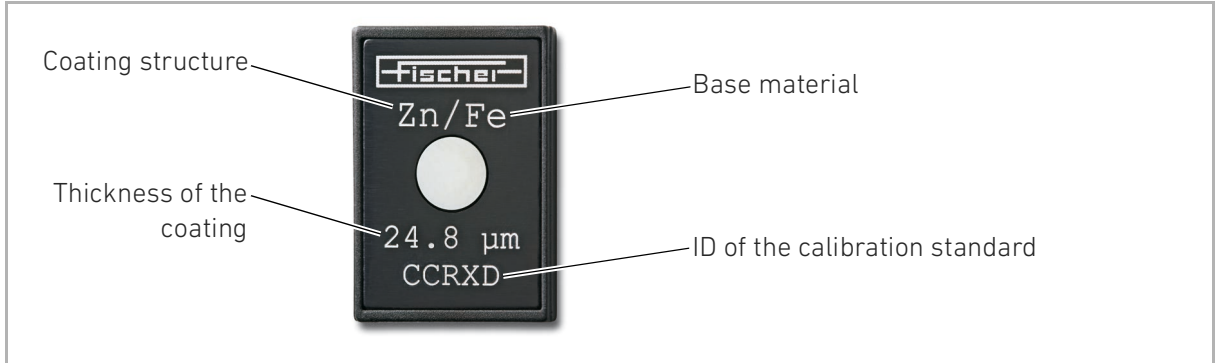
## Description of Coating Structure

The standards are identified in such a way, that the outer coating is always on the left and the base material always on the right, see the following figure.



# X-RAY Calibration Standards Catalogue

## CAL-X-S-1: Solid Standards Single Coatings



Designation	Ord. no.	DAkKS
CAL-X-S-1 Ag/Ni 2 µm	603-055	D
CAL-X-S-1 Au/Cu 0.4 µm	602-651	D
CAL-X-S-1 Au/Cu 0.85 µm	690-158	D
CAL-X-S-1 Au/Cu 1.3 µm	602-684	D
CAL-X-S-1 Au/Ni 0.2 µm	603-008	D
CAL-X-S-1 Au/Ni 0.5 µm	603-279	D
CAL-X-S-1 Au/Ni 0.35 µm	603-007	D
CAL-X-S-1 Au/Ni 0.85 µm	602-992	D
CAL-X-S-1 Au/Ni 1 µm	603-278	D
CAL-X-S-1 Au/Ni 1.5 µm	603-277	D
CAL-X-S-1 Au/Ni 2.5 µm	603-057	D
CAL-X-S-1 Cr/Cu 0.5 µm	690-169	D
CAL-X-S-1 Cr/Cu 2 µm	603-939	D

Designation	Ord. no.	DAkKS
CAL-X-S-1 Cr/Cu 6 µm	603-940	D
CAL-X-S-1 Cr/Cu 12 µm	603-941	D
CAL-X-S-1 Cr/Cu 16 µm	605-506	D
CAL-X-S-1 Cr/Fe 0.3 µm	603-157	D
CAL-X-S-1 Cr/Fe 0.5 µm	605-680	D
CAL-X-S-1 Cr/Fe 1 µm	605-500	D
CAL-X-S-1 Cr/Fe 2.5 µm	605-501	D
CAL-X-S-1 Cr/Fe 5 µm	604-583	D
CAL-X-S-1 Cr/Fe 10 µm	604-584	D
CAL-X-S-1 Cr/Fe 15 µm	605-502	D
CAL-X-S-1 Cr/Fe 20 µm	605-503	D
CAL-X-S-1 Cr/FeNi42 0.6 µm	604-566	D
CAL-X-S-1 Cr/Ni 0.5 µm	605-494	D

Continued on the next page



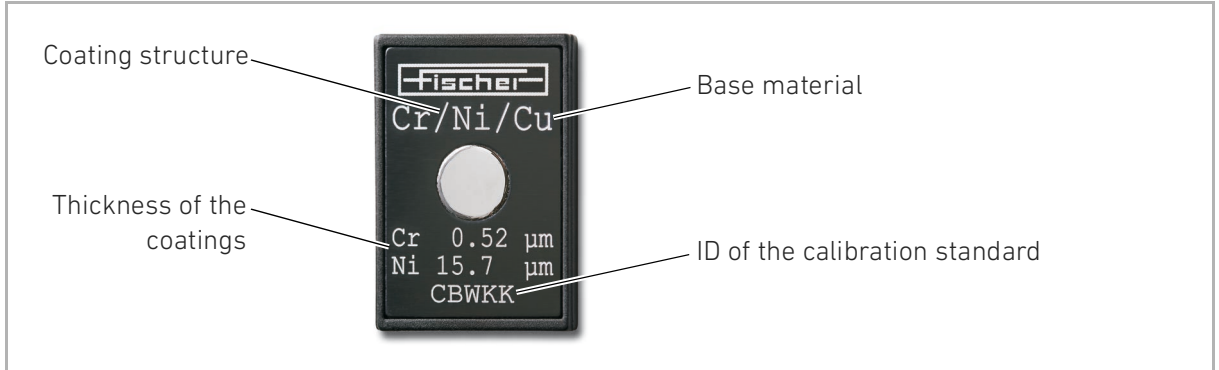
## CAL-X-S-1: Solid Standards Single Coatings – Continuation

Designation	Ord. no.	DAkkS
CAL-X-S-1 Cr/Ni 1.0 µm	605-495	D
CAL-X-S-1 Cr/Ni 2.5 µm	605-496	D
CAL-X-S-1 Cr/Ni 5 µm	605-497	D
CAL-X-S-1 Cr/Ni 10 µm	605-498	D
CAL-X-S-1 Cr/Ni 15 µm	605-499	D
CAL-X-S-1 Cr/Ni 20 µm	602-441	D
CAL-X-S-1 Cu/Fe 20 µm	604-092	D
CAL-X-S-1 Cu/PCB 5 µm	690-575	
CAL-X-S-1 Cu/PCB 9 µm	690-577	
CAL-X-S-1 Cu/PCB 35 µm	690-579	
CAL-X-S-1 Ni/Al 5 µm	690-521	D
CAL-X-S-1 Ni/Al 10 µm	690-523	D
CAL-X-S-1 Ni/Al 20 µm	690-525	D
CAL-X-S-1 Ni/Cu 1.0 µm	604-155	D
CAL-X-S-1 Ni/Cu 2.5 µm	604-156	D
CAL-X-S-1 Ni/Cu 5 µm	605-476	D
CAL-X-S-1 Ni/Cu 10 µm	605-477	D
CAL-X-S-1 Ni/Cu 16 µm	602-991	D

Designation	Ord. no.	DAkkS
CAL-X-S-1 Ni/Cu 20 µm	604-090	D
CAL-X-S-1 Ni/CuZn30 1.0 µm	604-643	D
CAL-X-S-1 Ni/CuZn30 3.0 µm	604-644	D
CAL-X-S-1 Ni/Fe 2 µm	603-564	D
CAL-X-S-1 Ni/Fe 5 µm	605-484	D
CAL-X-S-1 Ni/Fe 10 µm	605-485	D
CAL-X-S-1 Ni/Fe 20 µm	605-486	D
CAL-X-S-1 Pd/Ni 0.7 µm	602-993	D
CAL-X-S-1 Pd/Ni 1.25 µm	603-145	D
CAL-X-S-1 Rh/Ni 0.1 µm	603-056	D
CAL-X-S-1 Rh/Ni 2.0 µm	602-114	D
CAL-X-S-1 Sn/Ni 2.5 µm	604-132	D
CAL-X-S-1 Sn/Ni 4.0 µm	604-154	D
CAL-X-S-1 Sn/Ni 6 µm	604-502	D
CAL-X-S-1 Zn/Fe 5 µm	603-205	D
CAL-X-S-1 Zn/Fe 10 µm	603-638	D
CAL-X-S-1 Zn/Fe 38 µm	603-284	D

# X-RAY Calibration Standards Catalogue

## CAL-X-S-2: Solid Standards Double Coatings



Designation	Ord. no.	DAkKS
CAL-X-S-2 Ag/Ni/Alloy42 1.0/1.0 µm	604-635	D
CAL-X-S-2 Ag/Ni/Alloy42 1.0/3.0 µm	604-636	D
CAL-X-S-2 Ag/Ni/Alloy42 5.0/1.0 µm	604-637	D
CAL-X-S-2 Ag/Ni/Alloy42 5.0/3.0 µm	604-638	D
CAL-X-S-2 Ag/Ni/Cu 1.0/1.0 µm	604-619	D
CAL-X-S-2 Ag/Ni/Cu 1.0/3.0 µm	604-620	D
CAL-X-S-2 Ag/Ni/Cu 1.0/15 µm	604-116	D
CAL-X-S-2 Ag/Ni/Cu 5.0/1.0 µm	604-621	D
CAL-X-S-2 Ag/Ni/Cu 5.0/3.0 µm	604-622	D
CAL-X-S-2 Ag/Ni/CuZn30 1.0/1.0 µm	604-651	D
CAL-X-S-2 Ag/Ni/CuZn30 1.0/3.0 µm	604-652	D
CAL-X-S-2 Ag/Ni/CuZn30 5.0/1.0 µm	604-653	D
CAL-X-S-2 Ag/Ni/CuZn30 5.0/3.0 µm	604-654	D
CAL-X-S-2 Au/Ni/Alloy42 0.25/1.0 µm	604-629	D

Designation	Ord. no.	DAkKS
CAL-X-S-2 Au/Ni/Alloy42 0.25/3.0 µm	604-630	D
CAL-X-S-2 Au/Ni/Alloy42 1.0/1.0 µm	604-631	D
CAL-X-S-2 Au/Ni/Alloy42 1.0/3.0 µm	604-632	D
CAL-X-S-2 Au/Ni/Alloy42 2.5/1.0 µm	604-633	D
CAL-X-S-2 Au/Ni/Alloy42 2.5/3.0 µm	604-634	D
CAL-X-S-2 Au/Ni/Base* 0.03/3 µm	604-466	
CAL-X-S-2 Au/Ni/Base* 0.12/3 µm	604-457	
CAL-X-S-2 Au/Ni/Base* 0.12/7 µm	604-458	
CAL-X-S-2 Au/Ni/Base* 0.21/0.1 µm	604-455	
CAL-X-S-2 Au/Ni/Base* 0.5/0.3 µm	604-456	
CAL-X-S-2 Au/Ni/Cu 0.1µm/10 µm	604-158	D
CAL-X-S-2 Au/Ni/Cu 0.1µm/3.0 µm	604-157	D
CAL-X-S-2 Au/Ni/Cu 0.25/1.0 µm	604-613	D
CAL-X-S-2 Au/Ni/Cu 0.25/3.0 µm	604-614	D

\* The substrate material Base/PCB consists of copper-laminated PCB material.  
The Cu coating is approx. 35 µm thick and not certified.

**CAL-X-S-2: Solid Standards Double Coatings – Continuation**

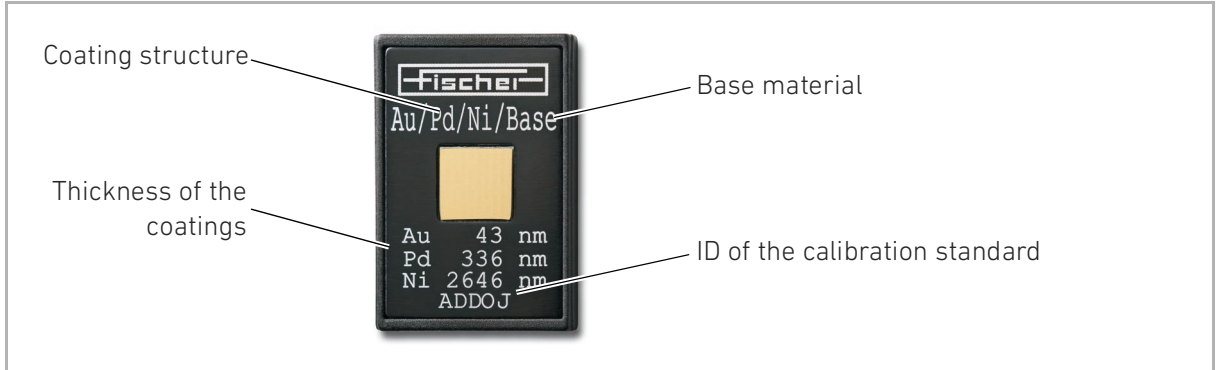
Designation	Ord. no.	DAkkS	Designation	Ord. no.	DAkkS
CAL-X-S-2 Au/Ni/Cu 0.3/7.5 µm	602-994	D	CAL-X-S-2 Ni/Cu/Zn 15/25µm	605-614	
CAL-X-S-2 Au/Ni/Cu 0.8/2.5 µm	601-895	D	CAL-X-S-2 Pd/Ni/Cu 1.0/1.0 µm	603-193	D
CAL-X-S-2 Au/Ni/Cu 1.0/1.0 µm	604-615	D	CAL-X-S-2 Pd/NiP10/Cu/ PCB* 0.05/4.5 µm	690-508	
CAL-X-S-2 Au/Ni/Cu 1.0/3.0 µm	604-616	D	CAL-X-S-2 Pd/NiP10/Cu/ PCB* 0.1/4.5 µm	690-510	
CAL-X-S-2 Au/Ni/Cu 1.5/10 µm	602-087	D	CAL-X-S-2 Pd/NiP10/Cu/ PCB* 0.25/4.5 µm	690-512	
CAL-X-S-2 Au/Ni/Cu 2.5/1.0 µm	604-617	D	CAL-X-S-2 Sn/Ni/Alloy42** 1.0/1.0 µm	604-639	D
CAL-X-S-2 Au/Ni/Cu 2.5/3.0 µm	604-618	D	CAL-X-S-2 Sn/Ni/Alloy42** 1.0/3.0 µm	604-640	D
CAL-X-S-2 Au/Ni/Cu 2.5/5.0 µm	602-086	D	CAL-X-S-2 Sn/Ni/Alloy42** 5.0/1.0 µm	604-641	D
CAL-X-S-2 Au/Ni/CuZn30 0.25/1.0 µm	604-645	D	CAL-X-S-2 Sn/Ni/Alloy42** 5.0/3.0 µm	604-642	D
CAL-X-S-2 Au/Ni/CuZn30 0.25/3.0 µm	604-646	D	CAL-X-S-2 Sn/Ni/Cu 1.0/1.0 µm	604-623	D
CAL-X-S-2 Au/Ni/CuZn30 1.0/1.0 µm	604-647	D	CAL-X-S-2 Sn/Ni/Cu 1.0/3.0 µm	604-624	D
CAL-X-S-2 Au/Ni/CuZn30 1.0/3.0 µm	604-648	D	CAL-X-S-2 Sn/Ni/Cu 4.5/5µm	601-898	D
CAL-X-S-2 Au/Ni/CuZn30 2.5/1.0 µm	604-649	D	CAL-X-S-2 Sn/Ni/Cu 5.0/1.0 µm	604-625	D
CAL-X-S-2 Au/Ni/CuZn30 2.5/3µm	604-650	D	CAL-X-S-2 Sn/Ni/Cu 5.0/3.0 µm	604-626	D
CAL-X-S-2 Au/NiP10/Cu/ PCB* 0.1/4.5 µm	690-506		CAL-X-S-2 Sn/Ni/CuZn30 1/1 µm	604-655	D
CAL-X-S-2 Cr/Ni/Cu 0.5/10 µm	603-156	D	CAL-X-S-2 Sn/Ni/CuZn30 1/3 µm	604-656	D
CAL-X-S-2 Cr/Ni/Fe 0.8/7 µm	603-155	D	CAL-X-S-2 Sn/Ni/CuZn30 5.0/1.0 µm	604-657	D
CAL-X-S-2 Ni/Cu/PCB* 3/15 µm	604-207		CAL-X-S-2 Sn/Ni/CuZn30 5/3 µm	604-658	D
CAL-X-S-2 Ni/Cu/Zn 8/15 µm	605-613	D			

\* Base/PCB consists of copper-laminated PCB material. The Cu coating is approx. 35 µm thick and not certified.

\*\* Composition Alloy42: 58% Fe, 42% Ni

# X-RAY Calibration Standards Catalogue

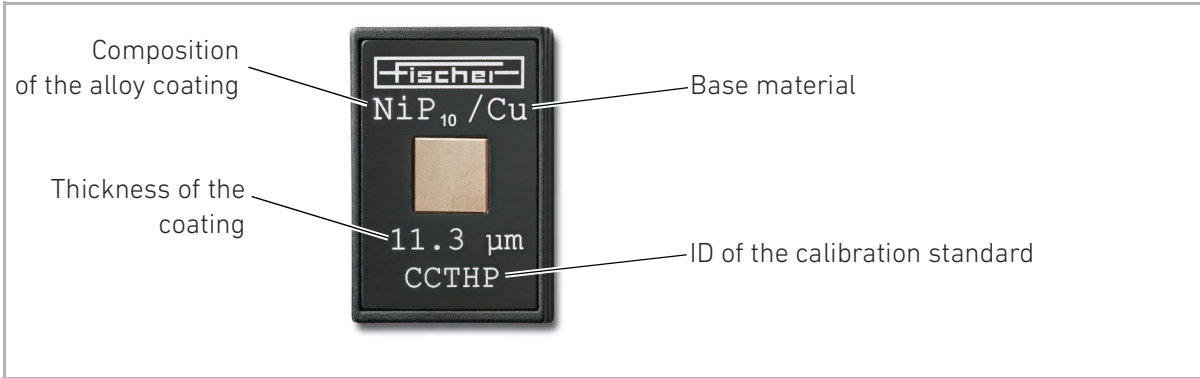
## CAL-X-S-3: Solid Standards Triple Coatings



Designation	Ord. no.	DAkKS
CAL-X-S-3 Au/Pd/NiP10/Cu/ PCB 0.05/0.03/4.5 µm	690-516	
CAL-X-S-3 Au/Pd/NiP10/Cu/ PCB 0.05/0.1/4.5 µm	690-517	

Designation	Ord. no.	DAkKS
CAL-X-S-3 Au/Pd/NiP10/Cu/ PCB 0.02/0.03/4.5 µm	690-514	
CAL-X-S-3 Au/Pd/NiP10/Cu/ PCB 0.1/0.2/4.5 µm	690-519	

### CAL-X-S-A: Solid Standards Alloy Coatings



	Ord. no.	DAkkS
CAL-X-S-A NiP10/Cu 5 μm	605-480	
CAL-X-S-A NiP10/Cu 15 μm	605-481	
CAL-X-S-A NiP12/Cu 1 μm	605-479	
CAL-X-S-A NiP10/CuZn 5 μm	605-482	
CAL-X-S-A NiP10/CuZn 15 μm	605-483	
CAL-X-S-A NiP2.5/Fe 3 μm	605-487	
CAL-X-S-A NiP2.5/Fe 5 μm	605-488	
CAL-X-S-A NiP5/Fe 17 μm	605-489	
CAL-X-S-A NiP10/Fe 3 μm	605-490	
CAL-X-S-A NiP10/Fe 15 μm	605-491	
CAL-X-S-A NiP10/Fe 20 μm	605-492	
CAL-X-S-A NiP10/Fe 30 μm	605-493	
CAL-X-S-A Ni13Zn/Fe 4.5 μm	603-071	D
CAL-X-S-A Ni13Zn/Fe 6 μm	605-513	D
CAL-X-S-A Ni13Zn/Fe 17 μm	605-514	D
CAL-X-S-A Ni13Zn/Fe 27 μm	603-072	D

	Ord. no.	DAkkS
CAL-X-S-A Ni15Zn/Fe 1 μm	603-928	D
CAL-X-S-A Ni6Zn/Fe 6 μm	606-069	D
CAL-X-S-A Sn60Pb40/Ni 2.5 μm	602-069	
CAL-X-S-A Sn60Pb40/Ni 10 μm	602-070	
CAL-X-S-A Sn60Pb40/Ni 40 μm	602-071	
CAL-X-S-A Sn90Pb10/Ni 2.0 μm	602-072	
CAL-X-S-A Sn90Pb10/Ni 10.5 μm	602-073	
CAL-X-S-A Pd70Ni/Cu 15 μm	603-198	
CAL-X-S-A Pd70Ni/Cu 3.5 μm	603-197	
CAL-X-S-A NiP10/Cu 4 μm	602-697	
CAL-X-S-A NiP10/Cu 10 μm	602-696	
CAL-X-S-A NiP8.5/Fe 25 μm	603-785	
CAL-X-S-A NiP8.5/Fe 8.5 μm	603-784	

# X-RAY Calibration Standards Catalogue

## CAL-X-solid: Solid Standards Pure Elements



Designation*	Ord. no.	WZ*
CAL-X-solid Ag	601-842	
CAL-X-solid Al	601-854	
CAL-X-solid Bi	603-257	
CAL-X-solid Cd	601-847	
CAL-X-solid Co	601-858	
CAL-X-solid Cr	601-850	
CAL-X-solid Cu	601-846	
CAL-X-solid Fe	601-848	
CAL-X-solid Ir	603-618	
CAL-X-solid Mn	602-074	
CAL-X-solid Mo	601-861	
CAL-X-solid Ni	601-845	
CAL-X-solid Pb	601-844	

Designation*	Ord. no.	WZ*
CAL-X-solid Pd	601-856	
CAL-X-solid Pt	601-862	
CAL-X-solid Rh	601-851	
CAL-X-solid Ru	604-034	
CAL-X-solid Re	605-671	
CAL-X-solid Sn	601-843	
CAL-X-solid Ti	601-859	
CAL-X-solid V	601-860	
CAL-X-solid W	601-853	
CAL-X-solid Zn	601-840	
CAL-X-solid Zr	602-719	
CAL-X-solid Ta	605-593	
CAL-X-solid Au	601-841	F

\* No Fischer manufacturer's certificates and no DAkkS calibration certificates are available for these standards. Exception: If there is an entry **F** in the **WZ** column, then you can order a Fischer manufacturer's certificate for this standard as an option.

Example:

Order without certificate: 601-841,

Order with Fischer manufacturer's certificate: 601-841F

## CAL-X-S-analysis: Solid Standards Alloys (Bulk)



Designation	Ord. no.	DAkKS
CAL-X-S-analysis Au10Ag35-Cu55 2 kt*	605-129	
CAL-X-S-analysis Au10Ag80-Cu10 2 kt*	605-121	
CAL-X-S-analysis Au30Ag10-Cu60 7 kt*	605-124	
CAL-X-S-analysis Au30Ag60-Cu10 7 kt*	605-122	
CAL-X-S-analysis Au33Ag12-Cu39Zn16 8 kt*	603-683	
CAL-X-S-analysis Au33Ag67 8 kt*	604-970	
CAL-X-S-analysis Au34Ag33-Cu33 8 kt*	605-123	
CAL-X-S-analysis Au37.5Ag20Cu42.5 9 kt*	605-020	
CAL-X-S-analysis Au50Ag25-Cu25 12 kt*	605-125	
CAL-X-S-analysis Au59Ag5-Cu37 14 kt*	603-682	
CAL-X-S-analysis Au59Ag27Pd14 14 kt*	603-748	
CAL-X-S-analysis Au59Ag30-Cu12 14 kt*	603-681	

Designation	Ord. no.	DAkKS
CAL-X-S-analysis Au64Ag10-Cu26 15 kt*	605-126	
CAL-X-S-analysis Au70Ag30 17 kt*	605-128	
CAL-X-S-analysis Au70Pt10Ag12Cu8 17 kt*	604-694	
CAL-X-S-analysis Au75Ag5-Cu8Cd12 18 kt*	603-745	
CAL-X-S-analysis Au75Ag5-Cu10Zn10 18 kt*	603-680	
CAL-X-S-analysis Au75Ag5-Cu20 18 kt*	603-679	
CAL-X-S-analysis Au75Ag10-Cu15 18 kt*	603-747	
CAL-X-S-analysis Au75Ag15-Cu10 18 kt*	603-746	
CAL-X-S-analysis Au75-Cu8Pd10Ni7 18 kt*	603-744	
CAL-X-S-analysis Au82Ag9Cu9 20 kt*	605-127	
CAL-X-S-analysis Au90Ag5Cu5 22 kt*	603-752	
CAL-X-S-analysis Au90Ag10 22 kt*	603-750	

Continued on the next page

\* The standard measurement uncertainty is determined for each calibration standard individually.

# X-RAY Calibration Standards Catalogue

## CAL-X-S-analysis: Solid Standards Alloys (Bulk) – Continuation

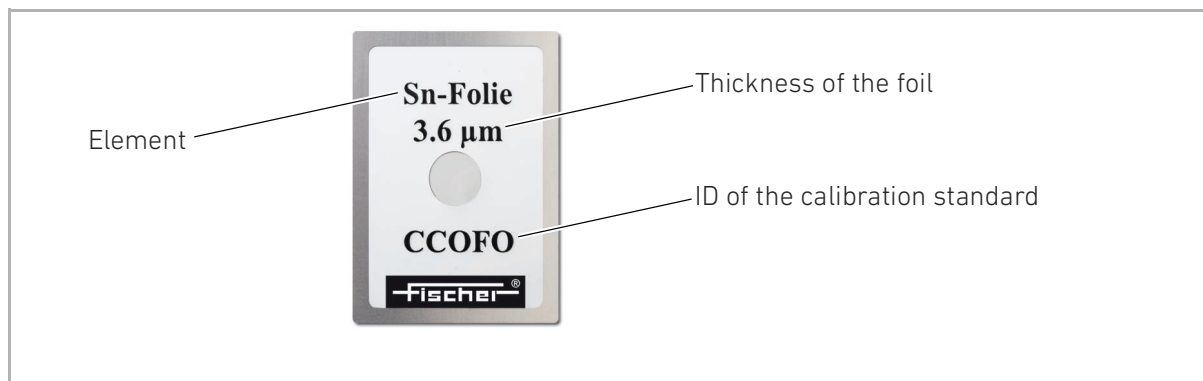
Designation	Ord. no.	DAkKS	Designation	Ord. no.	DAkKS
CAL-X-S-analysis Au95Ag3Cu2 23 kt*	603-751		CAL-X-S-analysis Ag75Cd20- Cu3Zn2*	605-562	
CAL-X-S-analysis Au95Ag5 23 kt*	603-749		CAL-X-S-analysis Ag80Cd2- Cu10Zn8*	605-563	
CAL-X-S-analysis Sterling Silver 935*	603-790		CAL-X-S-analysis Au75Ag25 18kt*	605-431	
CAL-X-S-analysis Ag83Cu17*	605-550		CAL-X-S-analysis Alloy42	601-865	
CAL-X-S-analysis Ag90Cu10*	605-551		CAL-X-S-analysis CuSn6	601-857	
CAL-X-S-analysis Ag92.5Cu 7.5* (Sterling Silver 925)	605-552		CAL-X-S-analysis CuZn37	601-855	
CAL-X-S-analysis Ag95.84Cu4.16*	605-553		CAL-X-S-analysis CuZn30	690-354	
CAL-X-S-analysis Ag99.5Cu0.5*	605-554		CAL-X-S-analysis CuZn15	690-687	
CAL-X-S-analysis Ag50Cd47- Cu3*	605-555		CAL-X-S-analysis Kovar**	601-849	
CAL-X-S-analysis Ag25Cd1.5Cu70Zn3.5*	605-556		CAL-X-S-analysis Pt950Cu50	604-036	
CAL-X-S-analysis Ag35Cd36- Cu25Zn4*	605-557		CAL-X-S-analysis Pt960Ru40	604-037	
CAL-X-S-analysis Ag59Cd37- Cu4Zn0.5*	605-558		CAL-X-S-analysis RoHS PE- Low	603-896	
CAL-X-S-analysis Ag60Cd26- Cu9Zn5*	605-559		CAL-X-S-analysis RoHS PE- High	603-895	
CAL-X-S-analysis Ag65Cd25- Cu8Zn2*	605-560		CAL-X-S-analysis RoHS PVC-BLANK	603-988	
CAL-X-S-analysis Ag69Cd21- Cu6Zn4*	605-561		CAL-X-S-analysis RoHS PVC-Low	603-987	
			CAL-X-S-analysis RoHS PVC-High	603-989	
			CAL-X-S-analysis Sn62Pb36Ag2	604-268	
			CAL-X-S-analysis Sn97Pb3	604-330	

\* The standard measurement uncertainty is determined for each calibration standard individually.

\*\* Kovar is a registered trade mark of CRS Holdings, Inc.



## CAL-X-F-1: Foil Standards Single Coatings



Designation	Ord. no.	DAkkS
CAL-X-F-1 Ag 0.1 µm	602-581	D
CAL-X-F-1 Ag 0.25 µm	602-580	D
CAL-X-F-1 Ag 0.5 µm	602-949	D
CAL-X-F-1 Ag 1 µm	601-817	D
CAL-X-F-1 Ag 2 µm	603-431	D
CAL-X-F-1 Ag 5 µm	601-818	D
CAL-X-F-1 Ag 9 µm	603-556	D
CAL-X-F-1 Ag 15 µm	601-819	D
CAL-X-F-1 Ag 20 µm	603-557	D
CAL-X-F-1 Ag 35 µm	601-820	D
CAL-X-F-1 Al 6 µm	603-335	
CAL-X-F-1 Al 10 µm	603-554	
CAL-X-F-1 Al 20 µm	603-336	
CAL-X-F-1 Al 100 µm	601-990	
CAL-X-F-1 Au 2 nm	605-991	
CAL-X-F-1 Au 5 nm	605-996	
CAL-X-F-1 Au 20 nm	605-998	
CAL-X-F-1 Au 0.05 µm	602-594	D
CAL-X-F-1 Au 0.1 µm	602-773	D
CAL-X-F-1 Au 0.25 µm	601-810	D
CAL-X-F-1 Au 0.5 µm	601-811	D
CAL-X-F-1 Au 1 µm	601-812	D
CAL-X-F-1 Au 3 µm	601-813	D
CAL-X-F-1 Au 6 µm	601-814	D

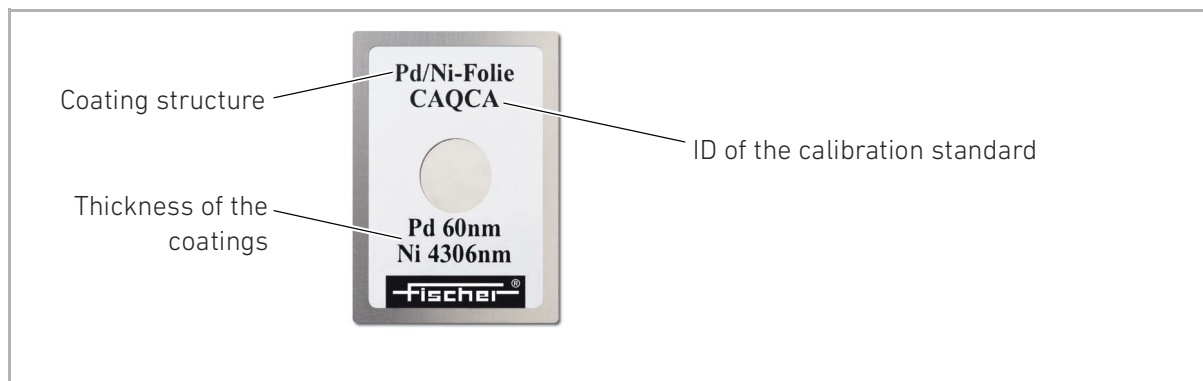
Designation	Ord. no.	DAkkS
CAL-X-F-1 Cd 5 µm	602-244	D
CAL-X-F-1 Cd 10 µm	602-245	D
CAL-X-F-1 Cd 20 µm	605-177	D
CAL-X-F-1 Co 3 µm	602-989	D
CAL-X-F-1 Co 5 µm	602-990	D
CAL-X-F-1 Cr 1 µm	603-239	D
CAL-X-F-1 Cu 0.02 µm	605-507	D
CAL-X-F-1 Cu 0.05 µm	605-508	D
CAL-X-F-1 Cu 0.1 µm	605-509	D
CAL-X-F-1 Cu 0.2 µm	605-510	D
CAL-X-F-1 Cu 0.5 µm	605-511	D
CAL-X-F-1 Cu 1 µm	605-512	D
CAL-X-F-1 Cu 2 µm	601-832	D
CAL-X-F-1 Cu 3 µm	601-833	D
CAL-X-F-1 Cu 5 µm	605-592	D
CAL-X-F-1 Cu 6 µm	601-834	D
CAL-X-F-1 Cu 10 µm	601-835	D
CAL-X-F-1 Cu 20 µm	601-836	D
CAL-X-F-1 Cu 25 µm	601-837	D
CAL-X-F-1 Cu 30 µm	603-555	
CAL-X-F-1 Fe 15 µm	603-883	D
CAL-X-F-1 Ir 11 nm	605-452	D
CAL-X-F-1 Ir 22 nm	605-453	D
CAL-X-F-1 Mo 4 µm	603-063	

# X-RAY Calibration Standards Catalogue

## CAL-X-F-1: Foil Standards Single Coatings – Continuation

Designation	Ord. no.	DAkKS	Designation	Ord. no.	DAkKS
CAL-X-F-1 Mo 10 µm	603-064		CAL-X-F-1 Sn 0.5 µm	602-897	D
CAL-X-F-1 Mo 15 µm	603-065		CAL-X-F-1 Sn 1 µm	602-888	D
CAL-X-F-1 Mo 25 µm	603-066		CAL-X-F-1 Sn 3 µm	601-821	D
CAL-X-F-1 Nb 1 µm	604-415		CAL-X-F-1 Sn 5 µm	603-919	D
CAL-X-F-1 Nb 3 µm	604-416		CAL-X-F-1 Sn 7 µm	603-211	D
CAL-X-F-1 Ni 0.1 µm	603-875	D	CAL-X-F-1 Sn 9 µm	601-822	D
CAL-X-F-1 Ni 0.5 µm	602-487	D	CAL-X-F-1 Sn 10 µm	603-920	D
CAL-X-F-1 Ni 1 µm	601-825	D	CAL-X-F-1 Sn 15 µm	604-095	D
CAL-X-F-1 Ni 2 µm	601-826	D	CAL-X-F-1 Sn 30 µm	601-823	D
CAL-X-F-1 Ni 3 µm	601-827	D	CAL-X-F-1 Sn 72 µm	601-824	
CAL-X-F-1 Ni 5 µm	602-593	D	CAL-X-F-1 Ta 0.5 µm	603-983	
CAL-X-F-1 Ni 6 µm	601-828	D	CAL-X-F-1 Ta 1.5 µm	603-470	
CAL-X-F-1 Ni 10 µm	601-829	D	CAL-X-F-1 Ti 0.05 µm	605-999	D
CAL-X-F-1 Ni 15 µm	601-830	D	CAL-X-F-1 Ti 0.1 µm	606-001	D
CAL-X-F-1 Ni 25 µm	601-831	D	CAL-X-F-1 Ti 0.2 µm	606-002	D
CAL-X-F-1 Pd 0.05 µm	603-579	D	CAL-X-F-1 Ti 0.5 µm	604-076	D
CAL-X-F-1 Pd 0.10 µm	603-306	D	CAL-X-F-1 Ti 1 µm	601-991	D
CAL-X-F-1 Pd 0.25 µm	602-477	D	CAL-X-F-1 Ti 2 µm	601-994	D
CAL-X-F-1 Pd 0.50 µm	604-133	D	CAL-X-F-1 Ti 6 µm	601-995	D
CAL-X-F-1 Pd 1.5 µm	601-815	D	CAL-X-F-1 Ti 15 µm	601-996	D
CAL-X-F-1 Pd 2.5 µm	601-795	D	CAL-X-F-1 Zn 2.5 µm	602-872	D
CAL-X-F-1 Pd 5 µm	601-816	D	CAL-X-F-1 Zn 5 µm	602-873	D
CAL-X-F-1 Pt 0.1 µm	604-282	D	CAL-X-F-1 Zn 10 µm	602-874	D
CAL-X-F-1 Pt 0.25 µm	602-421	D	CAL-X-F-1 Zn 15 µm	602-875	D
CAL-X-F-1 Pt 0.5 µm	602-422	D	CAL-X-F-1 Zn 20 µm	602-876	D
CAL-X-F-1 Pt 1 µm	602-423	D	CAL-X-F-1 Zn 25 µm	602-877	D
CAL-X-F-1 Pt 2.5 µm	602-424	D	CAL-X-F-1 Zr 0.5 µm	602-720	
CAL-X-F-1 Pt 5 µm	602-425	D	CAL-X-F-1 Zr 2 µm	602-712	
CAL-X-F-1 Rh 0.1 µm	601-998	D	CAL-X-F-1 Zr 4 µm	602-713	
CAL-X-F-1 Rh 0.25 µm	601-997	D	CAL-X-F-1 Zr 10 µm	602-714	
CAL-X-F-1 Ru 0.1 µm	603-314				

## CAL-X-F-2: Foil Standards Double Coatings

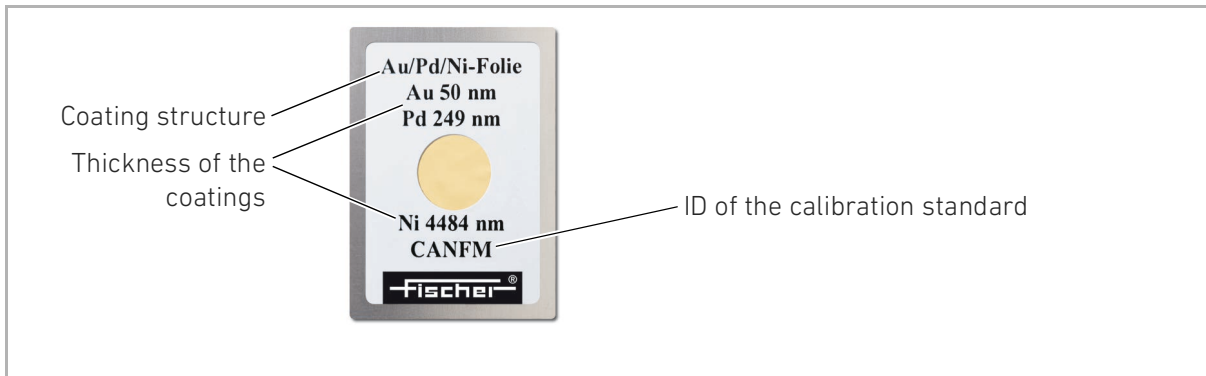


Designation	Ord. no.	DAkkS
CAL-X-F-2 Au/Ni 30 nm/4 µm	604-482	D
CAL-X-F-2 Au/Ni 100 nm/4 µm	604-483	D
CAL-X-F-2 Cr/Ni 0.5/10 µm	602-642	D
CAL-X-F-2 Pd/Ni 20 nm/4 µm	604-484	D

Designation	Ord. no.	DAkkS
CAL-X-F-2 Pd/Ni 60 nm/4 µm	604-485	D
CAL-X-F-2 Pd/Ni 100 nm/4 µm	604-486	D
CAL-X-F-2 Pd/Ni 250 nm/4 µm	604-487	D
CAL-X-F-2 In/Ni 0,6/2,0 µm	605-964	D

# X-RAY Calibration Standards Catalogue

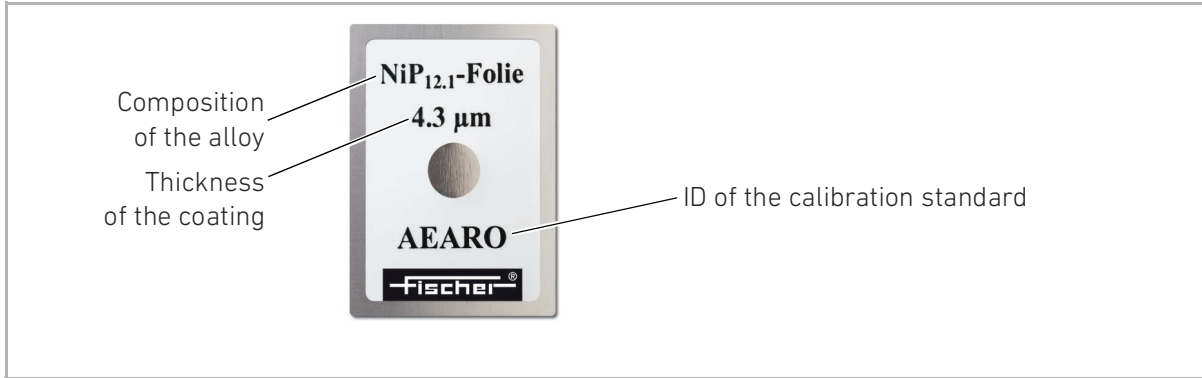
## CAL-X-F-3: Foil Standards Triple Coatings



Designation	Ord. no.	DAkKS
CAL-X-F-3 Au/Pd/Ni 50 nm/100 nm/4 µm	604-490	D
CAL-X-F-3 Au/Pd/Ni 50 nm/250 nm/4 µm	604-491	D

Designation	Ord. no.	DAkKS
CAL-X-F-3 Au/Pd/Ni 60 nm/20 nm/4 µm	604-488	D
CAL-X-F-3 Au/Pd/Ni 60 nm/60 nm/4 µm	604-489	D

## CAL-X-F-A: Foil Standards Alloy Coatings



Designation	Ord. no.	DAkKS
CAL-X-F-A Ag60Sn40 0.5 µm	605-681	D
CAL-X-F-A Ag80Sn20 0.5 µm	605-682	D
CAL-X-F-A Cu3Sn97 7 µm	603-776	
CAL-X-F-A Cu3Sn97 12 µm	603-777	
CAL-X-F-A Cu63Zn37 5 µm	603-151	
CAL-X-F-A NiP9 Foil 5 µm	605-228	
CAL-X-F-A NiP12 Foil 5 µm	605-229	
CAL-X-F-A NiP9 Foil 15 µm	605-230	
CAL-X-F-A NiP12 Foil 15 µm	605-231	
CAL-X-F-A Pd85Ni 1 µm	605-517	
CAL-X-F-A Sn88Bi12 5 µm	603-255	
CAL-X-F-A Sn88Bi12 10 µm	603-256	
CAL-X-F-A Sn94Ag6 7.5 µm	604-269	
CAL-X-F-A Sn94Ag6 20 µm	604-274	
CAL-X-F-A Sn95.5Ag3.8Cu0.7 5 µm	604-273	
CAL-X-F-A Sn95.5Ag3.8Cu0.7 10 µm	604-271	

Designation	Ord. no.	DAkKS
CAL-X-F-A Sn95Bi5 5 µm	604-239	
CAL-X-F-A Sn95Bi5 10 µm	604-243	
CAL-X-F-A Sn95Bi5 25 µm	604-232	
CAL-X-F-A Sn97Bi3 5 µm	604-474	
CAL-X-F-A Sn97Bi3 10 µm	604-475	
CAL-X-F-A Sn97Pb3 5 µm	604-292	
CAL-X-F-A Sn97Pb3 10 µm	604-294	
CAL-X-F-A Sn99.8Pb0.2 5 µm	603-915	
CAL-X-F-A Sn99.8Pb0.2 10 µm	603-914	
CAL-X-F-A Sn99.9Pb0.1 5 µm	603-917	
CAL-X-F-A Sn99.9Pb0.1 10 µm	603-916	
CAL-X-F-A Sn99Bi1 5 µm	604-238	
CAL-X-F-A Sn99Bi1 10 µm	604-242	
CAL-X-F-A Sn60Pb40 6 µm	601-838	
CAL-X-F-A Sn60Pb40 40 µm	601-839	

# X-RAY Calibration Standards Catalogue

## CAL-X-set-1: Standard Sets Single Coatings



Designation	Included Standards	Ord. no.	DAkKS
CAL-X-set-1 Ag/Ni 4 Standards	CAL-X-S-1 Ag/Ni 2 µm CAL-X-S-1 Ag/Ni 5 µm CAL-X-S-1 Ag/Ni 20 µm CAL-X-S-1 Ag/Ni 40 µm	601-350	D
CAL-X-set-1 Au/Ni 4 Standards	CAL-X-S-1 Au/Ni 0.35 µm CAL-X-S-1 Au/Ni 1 µm CAL-X-S-1 Au/Ni 2.5 µm CAL-X-S-1 Au/Ni 6 µm	601-708	D
CAL-X-set-1 Cr/Cu 4 Standards	CAL-X-S-1 Cr/Cu 0.5 µm CAL-X-S-1 Cr/Cu 2 µm CAL-X-S-1 Cr/Cu 6 µm CAL-X-S-1 Cr/Cu 20 µm	601-735	D
CAL-X-set-1 Cr/Fe 4 Standards	CAL-X-S-1 Cr/Fe 0.5 µm CAL-X-S-1 Cr/Fe 2.5 µm CAL-X-S-1 Cr/Fe 7 µm CAL-X-S-1 Cr/Fe 20 µm	601-737	D

Continued on the next page

### CAL-X-set-1: Standard Sets Single Coatings – Continuation

Designation	Included Standards	Ord. no.	DAkkS
CAL-X-set-1 Cr/Ni 4 Standards	CAL-X-S-1 Cr/Ni 0.5 µm CAL-X-S-1 Cr/Ni 2.5 µm CAL-X-S-1 Cr/Ni 5 µm CAL-X-S-1 Cr/Ni 20 µm	601-733	D
CAL-X-set-1 Cu/Fe 4 Standards	CAL-X-S-1 Cu/Fe 0.75 µm CAL-X-S-1 Cu/Fe 3 µm CAL-X-S-1 Cu/Fe 10 µm CAL-X-S-1 Cu/Fe 26 µm	601-750	D
CAL-X-set-1 Ni/Cu 4 Standards	CAL-X-S-1 Ni/Cu 1 µm CAL-X-S-1 Ni/Cu 5 µm CAL-X-S-1 Ni/Cu 10 µm CAL-X-S-1 Ni/Cu 25 µm	601-739	D
CAL-X-set-1 Ni/Fe 4 Standards	CAL-X-S-1 Ni/Fe 1 µm CAL-X-S-1 Ni/Fe 4 µm CAL-X-S-1 Ni/Fe 10 µm CAL-X-S-1 Ni/Fe 25 µm	601-743	D
CAL-X-set-1 Ni/CuZn 5 Standards	CAL-X-S-analysis CuZn30 CAL-X-S-1 Ni/CuZn30 1 µm CAL-X-S-1 Ni/CuZn30 6 µm CAL-X-S-1 Ni/CuZn30 10 µm CAL-X-S-1 Ni/CuZn30 25 µm	602-331	D
CAL-X-set-1 Rh/Sterling Silver 935 3 Standards	CAL-X-S-analysis Sterling Silver 935 CAL-X-S-1 Rh/Sterling Silver 40 nm CAL-X-S-1 Rh/Sterling Silver 200 nm	603-789	D
CAL-X-set-1 Sn/Ni 4 Standards	CAL-X-S-1 Sn/Ni 2.5 µm CAL-X-S-1 Sn/Ni 9 µm CAL-X-S-1 Sn/Ni 28 µm CAL-X-S-1 Sn/Ni 65 µm	601-728	D
CAL-X-set-1 Zn/Fe 4 Standards	CAL-X-S-1 Zn/Fe 1.5 µm CAL-X-S-1 Zn/Fe 5 µm CAL-X-S-1 Zn/Fe 15 µm CAL-X-S-1 Zn/Fe 38 µm	601-759	D

# X-RAY Calibration Standards Catalogue

## CAL-X-set-2: Standard Sets Double Coatings



Designation	Included Standards	Ord. no.	DAkkS
CAL-X-set-2 Ag/Ni/Cu 4 Standards	CAL-X-S-1 Ni/Cu 5 µm CAL-X-S-1 Ag/Ni 20 µm CAL-X-S-2 Ag/Ni/Cu 1.0/15 µm CAL-X-S-2 Ag/Ni/Cu 5.0/9.0 µm	604-780	D
CAL-X-set-2 Au/Ni/Cu 7 Standards	CAL-X-S-1 Au/Ni 0.5 µm CAL-X-S-1 Au/Ni 0.85 µm CAL-X-S-1 Au/Ni 1.5 µm CAL-X-S-1 Au/Ni 0.4 µm CAL-X-S-1 Au/Ni 1.3 µm CAL-X-S-1 Ni/Cu 2.5 µm CAL-X-S-2 Au/Ni/Cu 0.8/2.5 µm	601-869	D
CAL-X-set-2 Cr/Ni/Cu 6 Standards	CAL-X-S-1 Ni/Cu 2.5 µm CAL-X-S-1 Ni/Cu 10 µm CAL-X-S-1 Ni/Cu 20 µm CAL-X-S-2 Cr/Ni/Cu 0.5/10 µm CAL-X-S-2 Cr/Ni/Cu 1.5/15 µm CAL-X-S-2 Cr/Ni/Cu 0.5/20 µm	604-785	D
CAL-X-set-2 Cr/Ni/Fe 8 Standards	CAL-X-S-1 Cr/Fe 2.5 µm CAL-X-S-1 Cr/Fe 10 µm CAL-X-S-1 Cr/Ni 2.5 µm CAL-X-S-1 Cr/Ni 20 µm CAL-X-S-1 Ni/Fe 5 µm CAL-X-S-1 Ni/Fe 10 µm CAL-X-S-1 Ni/Fe 25 µm CAL-X-S-2 Cr/Ni/Fe 0.8/7 µm	604-786	D



### CAL-X-set-3: Standard Sets Triple Coatings



Designation	Included Standards	Ord. no.	DAkKS
CAL-X-set-3 Au/NiP/Cu/PCB 8 Standards	CAL-X-S-1 Cu/PCB 5 µm CAL-X-S-1 Cu/PCB 9 µm CAL-X-S-1 Cu/PCB 35 µm* NiP10/Cu/PCB 5/15 µm* NiP10/Cu/PCB 5/30 µm Au/NiP/Cu/PCB 0.03/5/30 µm* Au/NiP/Cu/PCB 0.05/3/12 µm* Au/NiP/Cu/PCB 0.1/7/30 µm*	605-101	
CAL-X-set-3 Au/NiP/Cu/PCB Prop. 6 Standards	CAL-X-F-1 Au 0.1 µm CAL-X-F-1 Au 0.5 µm CAL-X-F-1 Au 1 µm NiP10/Cu/PCB 5/15 µm* NiP10/Cu/PCB 5/30 µm* NiP10/Cu/PCB 6.5/18 µm*	605-427	
CAL-X-set-3 Au/Pd/Ni/Cu-Leg 9 Standards	CAL-X-S-1 Ni/CuFe 1µm CAL-X-S-1 Ni/CuFe 1.5µm CAL-X-S-1 Ni/CuFe 2.3µm CAL-X-S-2 Pd/Ni/CuFe 0.01/1.3µm CAL-X-S-2 Pd/Ni/CuFe 0.03/1.3µm CAL-X-S-2 Pd/Ni/CuFe 0.1/0.8µm CAL-X-S-3 Au/Pd/Ni/CuFe 4 nm/10 nm/1.5 µm CAL-X-S-3 Au/Pd/Ni/CuFe 6 nm/30 nm/0.9 µm CAL-X-S-3 Au/Pd/Ni/CuFe 10 nm/100 nm/0.8 µm	604-124	D
CAL-X-set-3 Cr/Ni/Cu/Base 10 Standards	CAL-X-F-1 Cu-F 6 µm CAL-X-F-1 Cu-F 20 µm CAL-X-F-1 Ni-F 5 µm CAL-X-F-1 Ni-F 25 µm CAL-X-F-2 Cr/Ni-F 0.5/10 µm CAL-X-S-2 Cr/Ni/Cu 1.5/15 µm CAL-X-solid Zn, CAL-X-solid Cu, CAL-X-solid Fe, CAL-X-solid Al	603-354	D

\* The substrate material PCB consists of copper-laminated PCB material.  
The Cu coating is approx. 35 µm thick and not certified.

Calibration  
Standard Sets

# X-RAY Calibration Standards Catalogue

## CAL-X-set-A: Standard Sets Alloy Coatings



Designation	Included Standards	Ord. no.	DAkkS
CAL-X-set-A NiZn/Fe 6 Standards	CAL-X-S-1 Zn/Fe 5 µm CAL-X-S-1 Zn/Fe 10 µm CAL-X-S-1 Zn/Fe 25 µm CAL-X-S-A Ni13Zn/Fe 6 µm CAL-X-S-A Ni13Zn/Fe 17 µm CAL-X-S-A Ni6Zn/Fe 6 µm	602-927	D
CAL-X-set-A SnBi/Ni 6 Standards	CAL-X-S-1 Sn/Ni 2.5 µm CAL-X-S-1 Sn/Ni 9 µm CAL-X-S-A SnBi5/Ni 4 µm CAL-X-S-A SnBi5/Ni10 µm CAL-X-S-A SnBi15/Ni 4 µm CAL-X-S-A SnBi15/Ni 10 µm	604-787	
CAL-X-set-A SnPb/Ni 8 Standards	CAL-X-S-1 Sn/Ni 2.5 µm CAL-X-S-1 Sn/Ni 9 µm CAL-X-S-1 Sn/Ni 50 µm CAL-X-S-A Sn60Pb40/Ni 2.5 µm CAL-X-S-A Sn60Pb40/Ni 10 µm CAL-X-S-A Sn60Pb40/Ni 40 µm CAL-X-S-A Sn90Pb10/Ni 2.0 µm CAL-X-S-A Sn90Pb10/Ni 10 µm	602-680	
CAL-X-set-A RoHS SnPb 6 Standards	CAL-X-F-1 Sn99.99 5 µm CAL-X-F-1 Sn99.99 10 µm CAL-X-F-A Sn99.9Pb0.1 5 µm CAL-X-F-A Sn99.9Pb0.1 10 µm CAL-X-F-A Sn99.8Pb0.2 5 µm CAL-X-F-A Sn99.8Pb0.2 10 µm	603-918	

### CAL-X-set-analysis: Standard Sets Alloys (Bulk)



Designation	Included Standards	Ord. no.	DAkKS
CAL-X-set-analysis GOLD ASSAY	CAL-X-S-analysis Au75Ag5Cu20 18 kt* CAL-X-S-analysis Au75Ag5Cu10Zn10 18 kt* CAL-X-S-analysis Au59Ag30Cu12 14 kt* CAL-X-S-analysis Au59Ag5Cu37 14 kt* CAL-X-S-analysis Au33Ag12Cu39Zn16 8 kt*	603-660	
CAL-X-set-analysis GOLD ASSAY 2	CAL-X-S-analysis Au33Ag12Cu39Zn16 8 kt* CAL-X-S-analysis Au59Ag30Cu12 14 kt* CAL-X-S-analysis Au59Ag5Cu37 14 kt* CAL-X-S-analysis Au59Ag27Pd14 14 kt* CAL-X-S-analysis Au75Ag5Cu10Zn10 18 kt* CAL-X-S-analysis Au75Ag5Cu20 18 kt* CAL-X-S-analysis Au75Ag15Cu10 18 kt* CAL-X-S-analysis Au75Cu8Pd10Ni7 18 kt* CAL-X-S-analysis Au75Ag10Cu15 18 kt* CAL-X-S-analysis Au75Ag5Cu8Cd12 18 kt* CAL-X-S-analysis Au90Ag5Cu5 22 kt* CAL-X-S-analysis Au95Ag3Cu2 23 kt* CAL-X-solid Ag CAL-X-solid Au CAL-X-solid Cu CAL-X-solid Pd CAL-X-solid Pt CAL-X-solid Ti	605-037	

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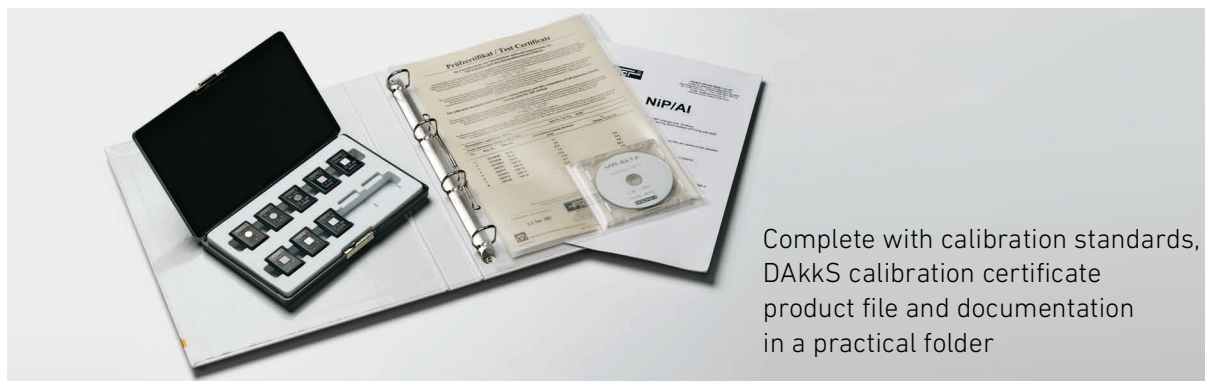
\* The standard measurement uncertainty is determined for each calibration standard individually.

# X-RAY Calibration Standards Catalogue

## CAL-X-S-analysis: Standards Sets Alloys (Bulk) – Continuation

Designation	Included Standards	Ord. no.	DAkkS
CAL-X-set-analysis RoHS SnCuAg (Pb)	CAL-X-S-analysis Sn99.99 CAL-X-S-analysis Sn99Cu1 CAL-X-S-analysis Sn97Ag3 CAL-X-S-analysis Sn96.5Cu0.5Ag3 CAL-X-S-analysis Sn95.5Cu0.5Ag4 CAL-X-S-analysis Sn98.99Cu1Pb0.01 CAL-X-S-analysis Sn96.99Ag3Pb0.01 CAL-X-S-analysis Sn96.49Cu0.5Ag3Pb0.01 CAL-X-S-analysis Sn98.9Cu1Pb0.1 CAL-X-S-analysis Sn96.4Cu0.5Ag3Pb0.1	604-084	
CAL-X-set-analysis RoHS PE	CAL-X-S-analysis RoHS PE-High CAL-X-S-analysis RoHS PE-Low CAL-X-S-analysis Scattering Sample Al CAL-X-S-analysis Scattering Sample ABS	603-897	
CAL-X-set-analysis RoHS PVC	CAL-X-S-analysis RoHS PVC-BLANK CAL-X-S-analysis RoHS PVC-Low CAL-X-S-analysis RoHS PVC-High	603-986	
CAL-X-set-analysis RoHS N6-Block for Functional Test	CAL-X-S-analysis Scattering ABS-Br CAL-X-S-analysis 31x B28 A6 Messing CAL-X-S-analysis 51X G00H5 B26 Al CAL-X-S-analysis Sn96.5Cu0.5Ag3 CAL-X-S-analysis RoHS PE-High CAL-X-S-analysis RoHS PVC-High	604-280	
CAL-X-set-analysis Stainless Steel Analysis	CAL-X-S-analysis X 12 CrNi 18 8 CAL-X-S-analysis X 8 CrNi 12 12 CAL-X-S-analysis X 5 CrNiMo 18 10 CAL-X-S-analysis X 10 CrNiTi 18 9 CAL-X-S-analysis X 10 CrNiNb 18 9 CAL-X-S-analysis CrNi-Stahl	603-677	

## CAL-X-app: Application Kits



Complete with calibration standards, DAkkS calibration certificate product file and documentation in a practical folder

Designation	Included Standards	Ord. no.	DAkkS
CAL-X-app NiP/Al 8 Standards**	CAL-X-S-1 Ni/Al 5 µm CAL-X-S-1 Ni/Al 10 µm CAL-X-S-1 Ni/Al 20 µm CAL-X-S-A NiP2.5/Al 3.5 µm CAL-X-S-A NiP2.5/Al 12 µm CAL-X-S-A NiP10/Al 3 µm CAL-X-S-A NiP10/Al 6 µm CAL-X-S-A NiP10/Al 12 µm	604-703	
CAL-X-app NiP/Cu;CuLEG 8 Standards**	CAL-X-S-1 Ni/Cu 5 µm CAL-X-S-1 Ni/Cu 10 µm CAL-X-S-1 Ni/Cu 20 µm CAL-X-S-A NiP12/Cu 1 µm CAL-X-S-A NiP10/Cu 5 µm CAL-X-S-A NiP10/Cu 15 µm CAL-X-S-A NiP10/CuZn 8 µm CAL-X-S-A NiP10/CuZn 15 µm	604-704	
CAL-X-app NiP/Cu/PCB** 10 Standards**	CAL-X-S-1 Ni/Cu/PCB* 3.0 µm CAL-X-S-1 Ni/Cu/PCB* 6.0 µm CAL-X-S-A NiP10/Cu/PCB* 0.5 µm CAL-X-S-A NiP8/Cu/PCB* 1.0 µm CAL-X-S-A NiP8/Cu/PCB* 3.0 µm CAL-X-S-A NiP9/Cu/PCB* 6.0 µm CAL-X-S-A NiP15/Cu/PCB* 0.5 µm CAL-X-S-A NiP15/Cu/PCB* 1.0 µm CAL-X-S-A NiP14/Cu/PCB* 3.0 µm CAL-X-S-A NiP12/Cu/PCB* 5.0 µm	604-705	

Continued on the next page

\*\* Measurement of phosphorus content requires instruments with SDD detector.

# X-RAY Calibration Standards Catalogue

## CAL-X-app: Application Kits – Continuation

Designation	Included Standards	Ord. no.	DAkKS
CAL-X-app NiP/Fe 9 Standards**	CAL-X-S-1 Ni/Fe 5 µm CAL-X-S-1 Ni/Fe 10 µm CAL-X-S-1 Ni/Fe 20 µm CAL-X-S-A NiP2.5/Fe 3 µm CAL-X-S-A NiP2.5/Fe 5 µm CAL-X-S-A NiP5/Fe 17 µm CAL-X-S-A NiP10/Fe 3 µm CAL-X-S-A NiP10/Fe 15 µm CAL-X-S-A NiP10/Fe 20 µm CAL-X-S-A NiP10/Fe 30 µm	604-753	
CAL-X-app Au/Pd/NiP/Cu/PCB 8 Standards**	CAL-X-S-2 Au/NiP10/Cu/PCB* 0.1/4.5 µm CAL-X-S-2 Pd/NiP10/Cu/PCB* 0.05/4.5 µm CAL-X-S-2 Pd/NiP10/Cu/PCB* 0.1/4.5 µm CAL-X-S-2 Pd/NiP10/Cu/PCB* 0.25/4.5 µm CAL-X-S-3 Au/Pd/NiP10/Cu/PCB* 0.02/0.03/4.5 µm CAL-X-S-3 Au/Pd/NiP10/Cu/PCB* 0.05/0.03/4.5 µm CAL-X-S-3 Au/Pd/NiP10/Cu/PCB* 0.05/0.1/4.5 µm CAL-X-S-3 Au/Pd/NiP10/Cu/PCB* 0.1/0.2/4.5 µm	605-224	

\* The substrate material PCB consists of copper-laminated PCB material.  
The Cu coating is approx. 35 µm thick and not certified.







\*\* Measurement of phosphorus content requires instruments with SDD detector.

## Kits for Monitoring the Measurement Devices



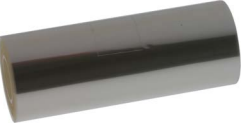

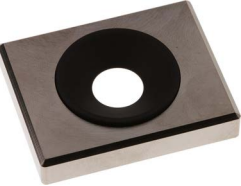



Designation	Ord. no.	DAkKS
MESSMITTELÜBERWACHUNGSKIT Ni/Cu	604-411	D
MESSMITTELÜBERWACHUNGSKIT Au/Ni/Cu	605-611	D
MESSMITTELÜBERWACHUNGSKIT NiZn/Fe	605-612	D
MESSMITTELÜBERWACHUNGSKIT Au/Ni/Cu (SP564)	605-071	D

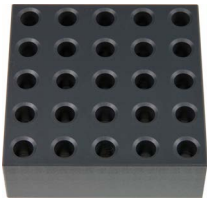

# X-RAY Accessories

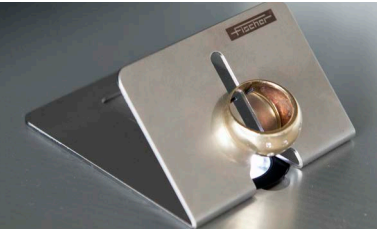
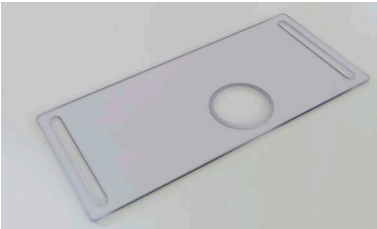




Products	Description	Ord. no.
	<p><b>New coating/alloy system</b></p> <p>New measuring application (product) for:</p> <ul style="list-style-type: none"> <li>• New coating system</li> <li>• Solution analysis</li> <li>• Alloy analysis</li> </ul>	
	<p><b>WinFTM extension PDM</b></p> <p>Extended functions for product administration and result documentation</p>	
	<p><b>WinFTM extension SUPER</b></p> <p>Extended functions for experts for the development of new measuring applications</p>	
	<p><b>Support</b></p> <p>Product training, staff training, setting up software and measuring applications, performing calibration and programming, connection to data systems, and much more</p>	
	<p><b>Measuring cell for solution analysis, red</b></p> <p>Measuring cell with Mo base            XAN, XDAL, XDV-SDD: All solutions            XUL(M), XDL(M): all except Rh, Ru, Pd</p>	603-215
	<p><b>Measuring cell for solution analysis, green</b></p> <p>Measuring cell with Ni base            All instruments: specially for Rh, Ru, Pd</p>	603-213



Products	Description	Ord. no.
	<p><b>Measuring cell for solution analysis, grey</b>  Measuring cell with Zr base  All instruments: PdNi and highly concentrated Rh, Ru and Pd solutions</p>	603-214
	<p><b>Solution analysis set</b>  Two measuring cells with Mo base, including 1 roll of cover foil 12 µm</p>	603-216
	<p><b>Solution analysis cover foil 12 µm</b>  Replacement cover foil for solution analysis measuring cells, L = 20 m, B = 70 mm</p>	601-564
	<p><b>Substrate for flexible PCBs</b>  Substrate for thin, flexible printed circuit boards, Fe base material, take into account for the measuring application</p>	603-466
	<p><b>Centering holder</b>  Holds the base material and several calibration foils over each other, for Fischer Domino or base material 24 mm x 32 mm</p>	603-439
	<p><b>Magnet frame</b>  Holds Fischer base material and calibration foil over each other, for Fischer Domino or base material 24 mm x 32 mm</p>	850-098

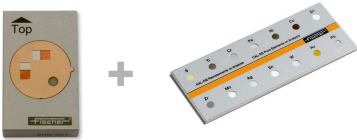





# X-RAY Accessories

Products	Description	Ord. no.
	<p><b>Positioning aid - support tables</b></p> <p>Combined beam trap and support table with different drill holes, for round parts and as support for flat samples.</p>	602-640
	<p><b>Cu beam trap</b></p> <p>As support table for thin and translucent parts (inhibiting the signals from the measuring stage), for RoHS "halogen-free" applications, where applicable, be aware of the Cu signal in the measuring spectrum</p>	604-543
	<p><b>PVC beam trap</b></p> <p>As support table for thin and translucent parts, as well as for small parts such as wires or particles on cover foil and filter paper, standard beam trap for all applications apart from "halogen-free"</p>	604-579
	<p><b>PVC beam trap and wire holder</b></p> <p>Combined beam trap and support table for positioning wires and cylindrical parts</p>	602-641
	<p><b>Positioning aid</b></p> <p>Measuring support table for ABS parts, the raised strip is made of tin</p>	603-020
	<p><b>Positioning aid tin plasticine mixture</b></p> <p>For Cr/Ni/Cu/ABS, for Ni and Cu coatings over 30 µm, Sn forms the base material and requires a special measuring application</p>	603-931




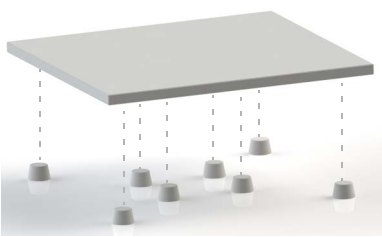
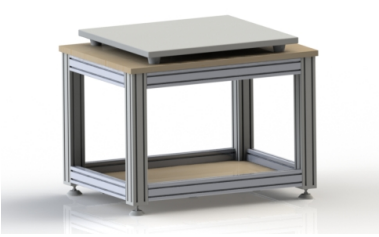
Products	Description	Ord. no.
	<p><b>Ring holder</b></p> <p>For the correct measuring of jewelry rings, it is necessary to adapt the software/measuring application, and exchanging the insert at the measuring stage may also be required</p>	605-104
	<p><b>XUL positioning aid</b></p> <p>For accurate placing of specimens on the XUL, without opening the lid of the measuring instrument</p>	605-571
	<p><b>Universal jaw vice</b></p> <p>For exact placing of specimens with difficult geometry, for example cylindrical specimens with a diameter of approx. 0.5 to 20 mm can be easily placed horizontally or vertically. Dimensions: 95 x 30 x 27.5 mm</p>	604-261
	<p><b>Material analysis measuring cell set</b></p> <p>Three 603-261 measuring cells and 1 roll of 601-564 cover foil for analyzing liquid, paste-like or powdery samples</p>	603-260
	<p><b>Material analysis measuring cell</b></p> <p>Measuring cells for analyzing liquid, paste-like or powdery samples, please order the 601-564 cover foil separately</p>	603-261
	<p><b>Pressing tool for chips</b></p> <p>For preparing samples, e.g. for precious metal chips, where the chips are pressed into a ring and can then be measured</p>	603-978

# X-RAY Accessories

Products	Description	Ord. no.
	<p><b>Pure element plate for instruments with proportional counter tube</b></p> <p>First element silver, for XUL, XULM, XDL, XDLM</p>	603-001
	<p><b>Pure element plate for instruments with PIN or SD detector</b></p> <p>First element sulfur, for XAN, XDAL, XDV-SDD, XDV-<math>\mu</math></p>	602-598
	<p><b>Pure element plate for instruments with helium purge</b></p> <p>First element Al, also suitable for XUV 773</p>	604-436
	<p><b>ABS scattering sample</b></p> <p>Scattering sample made of ABS plastics, For recording a scattering spectrum for all X-RAY instruments</p>	603-845
	<p><b>Al scattering sample</b></p> <p>Scattering sample made of ultra-high purity aluminum, Purity <math>\geq 999.99\%</math>, For recording a scattering spectrum for all X-RAY instruments</p>	603-846
	<p><b>Adjustment plate XDV-<math>\mu</math></b></p> <p>To adjust the optical axis of the instruments XDV-<math>\mu</math>, XDV-<math>\mu</math> WAFER, XDV-<math>\mu</math> PCB</p>	605-568

Products	Description	Ord. no.
	<p><b>Adjustment kit XDV-μ</b></p> <p>Contains adjustment plate for the adjustment of the optical axis and pure elements plate, for XDV-μ, XDV-μ WAFER, XDV-μ PCB</p>	605-542
	<p><b>Calibration holder</b></p> <p>For reel-to-reel strips as base material, holds base material and calibration foil over each other, the holder itself is magnetic, ideal for use with inline measurement systems</p>	850-229
	<p><b>Drift correction sample for XAN 500</b></p> <p>For correction of the spectra library (drift correction) on the mobile X-RAY XAN 500, saves new recording of the spectra library</p>	605-518
	<p><b>Option solution analysis for XAN 500</b></p> <p>For radiation-safe plugging in of measuring cells for solution analysis, contains accessory kit for solution analysis Molybdenum: 2 measuring cells (red) with Molybdenum reference plate, 1 roll of foil</p>	605-391
	<p><b>Measuring table inserts XAN</b></p> <p>Replacement measuring table inserts for XAN 120 to XAN 250, 5 pieces per pack, Foil 12 μm</p>	603-301
	<p><b>Measuring table inserts foil replacement kit XUL/XULM</b></p> <p>Contains two complete measuring table inserts: one with a large opening and one with a small opening, 1 Roll of foil 25 μm (603-304), 1 knife, 3 replacement fixing rings, manual For all instruments XUL and XULM</p>	600-026

# X-RAY Accessories

Products	Description	Ord. no.
	<p><b>Replacement foil for measuring table inserts foil replacement kit XUL/XULM</b></p> <p>Foil 25 µm, 150 mm x 10 m, for 600-026</p>	603-304
	<p><b>Measuring table insert for XAN 250 helium purge</b></p> <p>5 pieces, foil 4 µm Use together with helium purge only</p>	605-378
	<p><b>Measuring table insert for all GOLDSCOPE instruments</b></p> <p>5 pieces, foil 75 µm, self-adhesive</p>	524-169
	<p><b>Stone plate with damper feet XDV-µ</b></p> <p>For vibration damping, if table is present, consists of stone plate and eight damping feet, for the instruments XDV-µ, XDV-µ LD, XDV-µ WAFER, XDV-µ PCB</p>	1001671
	<p><b>Vibration damped table XDV-µ</b></p> <p>For vibration damping, consists of table, stone plate and eight damping feet, for the instruments XDV-µ, XDV-µ LD, XDV-µ WAFER, XDV-µ PCB</p>	604-698



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