Certified FISCHER X-RAY Calibration Standards and Accessories

DIN ISO/IEC 17025 accredited
March 2018/2

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, jewellery, 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?

DAkkS
Deutsche
Akkreditierungsstelle
D-K-15076-01-00

FISCHER Calibration Lab 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 procedure, 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:

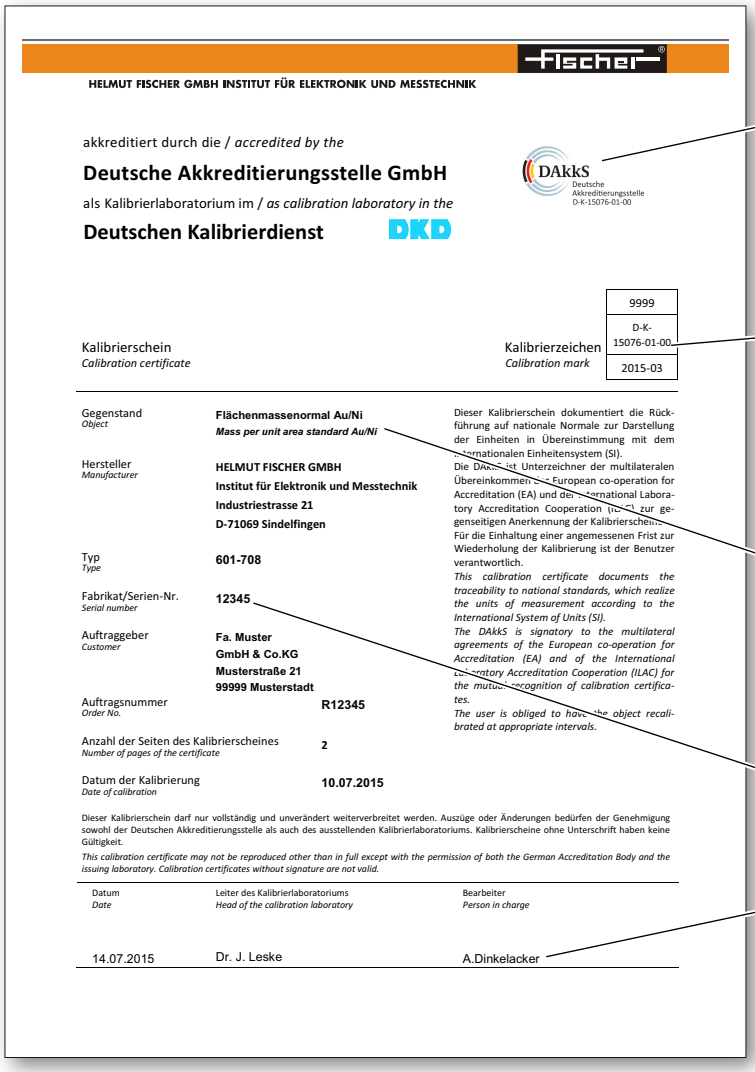
- In accordance with a procedure that is accredited by the German Accreditation Service, Deutscher Akkreditierungsservice (DKD/DAkkS), see the accreditation certificate. This procedure can be applied for many pure-element coatings. The FISCHER Calibration Laboratory ensures traceability to internationally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

- 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. 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 will find the traceability reports on the FISCHER web site:
  www.helmut-fischer.de/trace

Content

The DAkkS Calibration Certificate

The Front Page of the DAkkS Calibration Certificate



HELMUT FISCHER GMBH INSTITUT FÜR ELEKTRONIK UND MESSTECHNIK

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DAkkS Deutsche Akkreditierungsstelle D-K-15076-01-00

DKD

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

9999
D-K-15076-01-00
2015-03

Gegenstand
Object
Flächenmassenormal Au/Ni
Mass per unit area standard Au/Ni

Hersteller
Manufacturer
HELMUT FISCHER GMBH
Institut für Elektronik und Messtechnik
Industriestrasse 21
D-71069 Sindelfingen

Typ
Type
601-708

Fabrikat/Serien-Nr.
Serial number
12345

Auftraggeber
Customer
Fa. Muster
GmbH & Co.KG
Musterstraße 21
99999 Musterstadt

Auftragsnummer
Order No.
R12345

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate
2

Datum der Kalibrierung
Date of calibration
10.07.2015

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.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Deutschen Akkreditierungsstelle als auch des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.
This calibration certificate may not be reproduced other than in full except with the permission of both the German Accreditation Body and the issuing laboratory. Calibration certificates without signature are not valid.

Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
14.07.2015	Dr. J. Leske	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 mark** 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 unequivocal **identifier** of the calibration object.

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

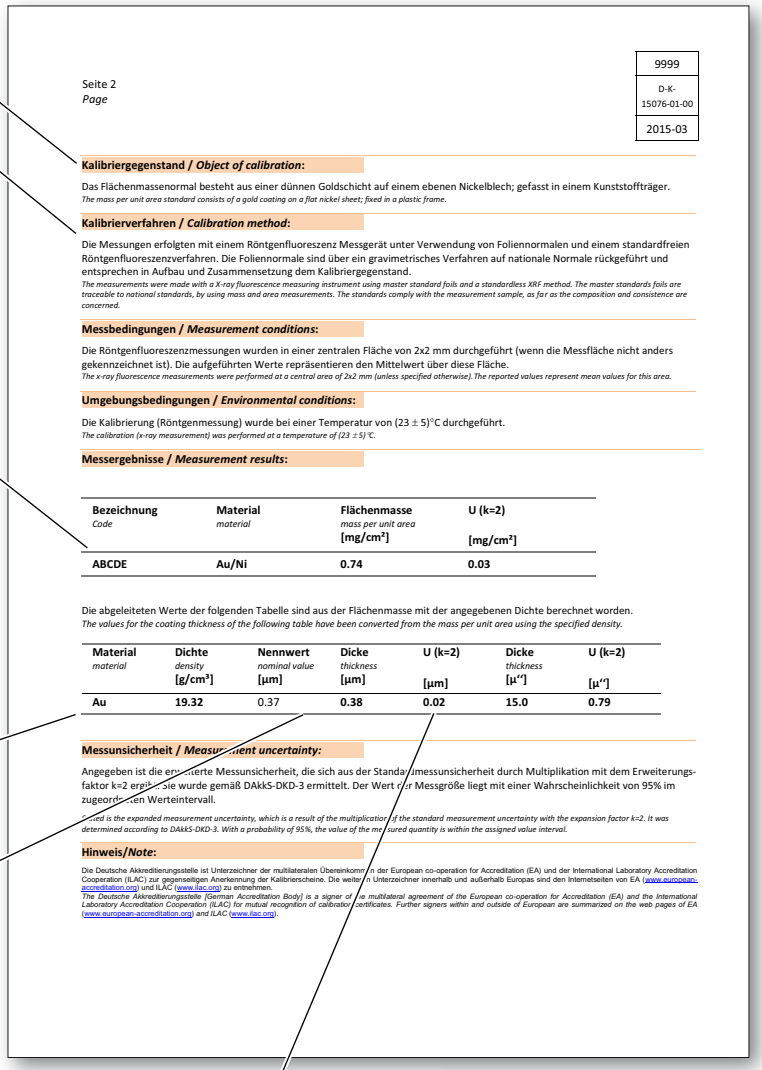
The Back Page of the DAkkS Calibration Certificate

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 microinches. The nominal value of the calibration object, for example a target coating thickness or catalog value. This value must not be used for calibration.



Seite 2
Page

9999
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2015-03

Kalibriergegenstand / *Object of calibration*:

Das Flächenmassenormal besteht aus einer dünnen 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; fixed in a plastic frame.

Kalibrierverfahren / *Calibration method*:

Die Messungen erfolgten mit einem Röntgenfluoreszenz Messgerät unter Verwendung von Foliennormalen und einem standardfreien Röntgenfluoreszenzverfahren. Die Foliennormale sind über ein gravimetrisches Verfahren auf nationale Normale rückgeführt und entsprechen in Aufbau und Zusammensetzung dem Kalibriergegenstand.
The measurements were made with a X-ray fluorescence measuring instrument using master standard foils and a standardless XRF method. The master standards foils 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 den Mittelwert 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/cm²]	U (k=2) [mg/cm²]
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/cm³]	Nennwert *nominal value* [µm]	Dicke *thickness* [µm]	U (k=2) [µm]	Dicke *thickness* [µ'']	U (k=2) [µ'']
Au	19.32	0.37	0.38	0.02	15.0	0.79

Messunsicherheit / *Measurement uncertainty*:

Angegeben ist die erweiterte Messunsicherheit, die sich aus der Standardmessunsicherheit durch Multiplikation mit dem Erweiterungsfaktor k=2 ergibt. Sie wurde gemäß DAkkS-DKD-3 ermittelt. Der Wert der Messgröße liegt mit einer Wahrscheinlichkeit von 95% im zugeordneten Werteintervall.
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 DAkkS-DKD-3. 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) und ILAC (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) and ILAC (www.ilac.org).

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 catalog. 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.

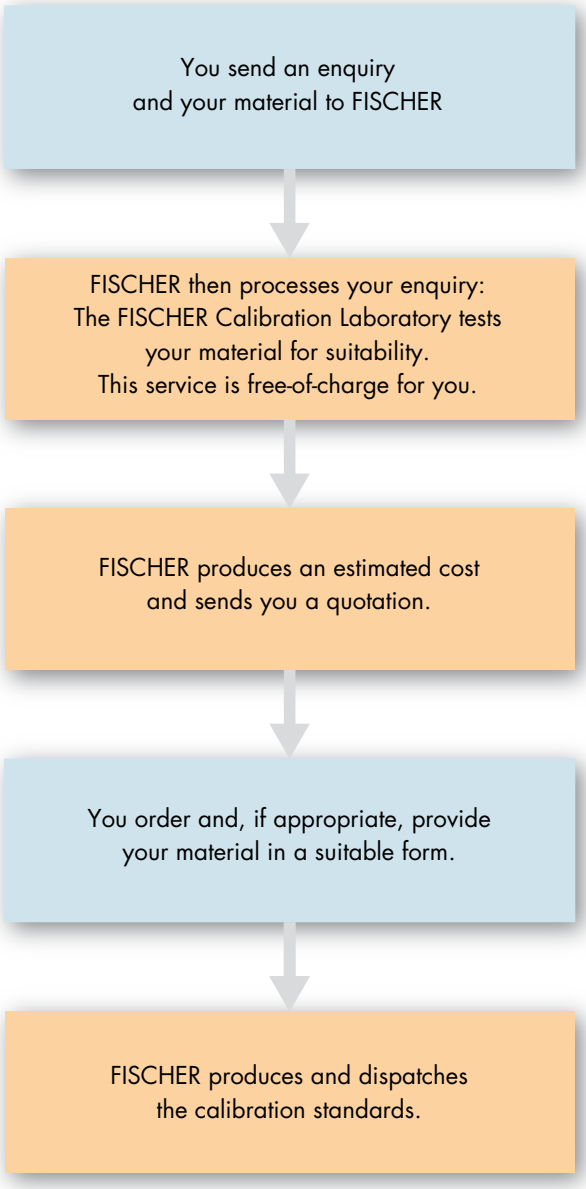
Always use the actual value for entering the calibration data in the X-RAY software.

The **measurement uncertainty U** is determined for each calibration standard individually.
In the case of gold and silver standards (see page 14 f.), the standard measurement uncertainty is always below 0.25 %.

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



Please address your material directly to the Application Lab (Use an extra line *Application Lab* in the address). You thus ensure that your material reaches the right contact.

Color key:

Action taken by you

Action taken by FISCHER

DAkkS Column

All calibration standards will be delivered with a manufacturer's certificate. If the table starting on Page 8 displays a green check mark ✔ , then you do have the option to order a DAkkS calibration certificate for this standard. If the table row doesn't show ✔ , then the standard is available with manufacturer's certificate only.

Differences between Standards with a Manufacturer's Certificate and DAkkS Certified Standards

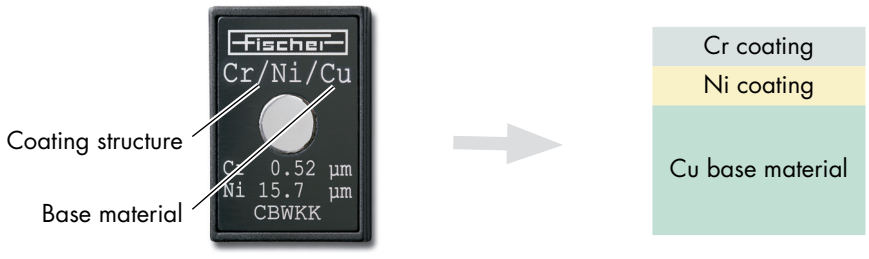
Property	Standard with manufacturer's certificate	DAkkS certified standard
Produced by a DAkkS certified calibration laboratory	✔	✔
Produced in accordance with DAkkS certified procedure		✔
Proof of traceability to internationally recognized base units		✔
Internationally recognized calibration certificate		✔
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.

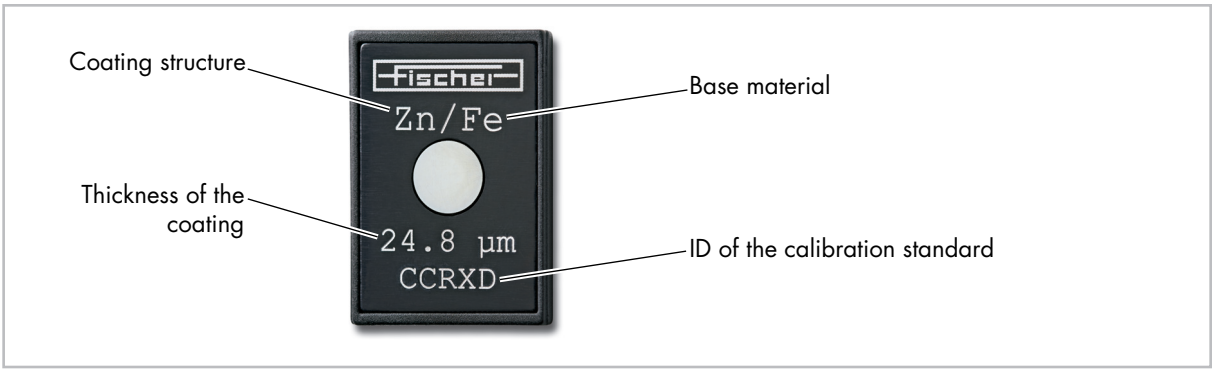


The identification of the calibration standards contains the information, whether a coating thickness and/or a concentration can be calibrated: **d** = coating thickness, **c** = concentration, examples:

KAL-N **d** Cr/Cu 8 µm
A Cr coating with a coating thickness of 8 µm can be used for calibrating the coating thickness (**d**).

KAL-N **dc** NiP10/Cu 5 µm
A NiP10 coating with a coating thickness of 5 µm can be used for calibrating the coating thickness (**d**) and calibrating the concentration (**c**).

KAL-N 1: Solid Standards Single Coatings



Part No.	Designation	DAkkS
603-055	KAL-N d Ag/Ni 1.75 µm	✔
602-651	KAL-N d Au/Cu 0.35 µm	✔
602-684	KAL-N d Au/Cu 1.3 µm	✔
603-008	KAL-N d Au/Ni 0.2 µm	✔
603-007	KAL-N d Au/Ni 0.35 µm	✔
603-279	KAL-N d Au/Ni 0.45 µm	✔
602-992	KAL-N d Au/Ni 0.85 µm	✔
603-278	KAL-N d Au/Ni 1 µm	✔
603-277	KAL-N d Au/Ni 1.5 µm	✔
603-057	KAL-N d Au/Ni 2.8 µm	✔
604-566	KAL-N d Cr/Alloy42 0.6 µm	✔
603-939	KAL-N d Cr/Cu 2 µm	✔
605-504	KAL-N d Cr/Cu 4 µm	✔
603-940	KAL-N d Cr/Cu 6 µm	✔

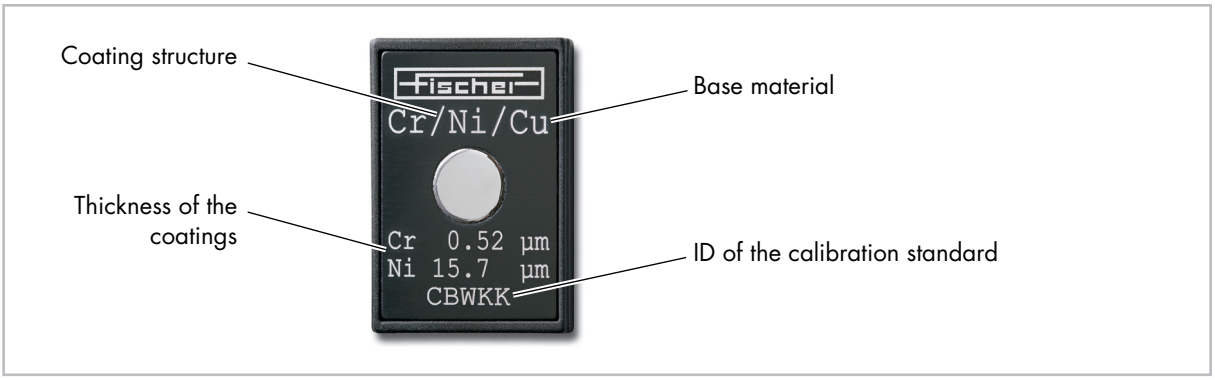
Part No.	Designation	DAkkS
605-505	KAL-N d Cr/Cu 8 µm	✔
603-941	KAL-N d Cr/Cu 12 µm	✔
605-506	KAL-N d Cr/Cu 16 µm	✔
605-680	KAL-N d Cr/Fe 0.6 µm	✔
605-500	KAL-N d Cr/Fe 1 µm	✔
605-501	KAL-N d Cr/Fe 2.5 µm	✔
604-583	KAL-N d Cr/Fe 5 µm	✔
604-584	KAL-N d Cr/Fe 10 µm	✔
605-502	KAL-N d Cr/Fe 15 µm	✔
605-503	KAL-N d Cr/Fe 20 µm	✔
605-494	KAL-N d Cr/Ni 0.5 µm	✔
605-495	KAL-N d Cr/Ni 1.0 µm	✔
605-496	KAL-N d Cr/Ni 2.5 µm	✔
605-497	KAL-N d Cr/Ni 5 µm	✔

KAL-N 1: Solid Standards Single Coatings – Continuation

Part No.	Designation	DAkkS
605-498	KAL-N d Cr/Ni 10 µm	✔
605-499	KAL-N d Cr/Ni 15 µm	✔
602-441	KAL-N d Cr/Ni 19 µm	✔
604-092	KAL-N d Cu/Fe 20 µm	✔
604-155	KAL-N d Ni/Cu 1.0 µm	✔
604-156	KAL-N d Ni/Cu 2.5 µm	✔
605-476	KAL-N d Ni/Cu 5 µm	✔
605-477	KAL-N d Ni/Cu 10 µm	✔
602-991	KAL-N d Ni/Cu 16 µm	✔
604-090	KAL-N d Ni/Cu 20 µm	✔
604-643	KAL-N d Ni/CuZn30 1.0 µm	✔
604-644	KAL-N d Ni/CuZn30 3.0 µm	✔
603-564	KAL-N d Ni/Fe 2 µm	✔
605-484	KAL-N d Ni/Fe 5 µm	✔
605-485	KAL-N d Ni/Fe 10 µm	✔

Part No.	Designation	DAkkS
605-486	KAL-N d Ni/Fe 20 µm	✔
603-280	KAL-N d Pb/Ni 0.7 µm	
603-219	KAL-N d Pb/Ni 2.7 µm	
603-218	KAL-N d Pb/Ni 6 µm	
602-993	KAL-N d Pd/Ni 0.7 µm	✔
603-145	KAL-N d Pd/Ni 1.25 µm	✔
603-056	KAL-N d Rh/Ni 0.1 µm	✔
602-114	KAL-N d Rh/Ni 2.0 µm	✔
604-132	KAL-N d Sn/Ni 2-3 µm	✔
604-154	KAL-N d Sn/Ni 4.0 µm	✔
604-502	KAL-N d Sn/Ni 6 µm	✔
603-205	KAL-N d Zn/Fe 6 µm	✔
603-638	KAL-N d Zn/Fe 9.5 µm	✔
603-284	KAL-N d Zn/Fe 37.5 µm	✔

KAL-N 2: Solid Standards Double Coatings



Part No.	Designation	DAkkS
604-635	KAL-N dd Ag/Ni/Alloy42 1.0/1.0 µm	
604-636	KAL-N dd Ag/Ni/Alloy42 1.0/3.0 µm	
604-637	KAL-N dd Ag/Ni/Alloy42 5.0/1.0 µm	
604-638	KAL-N dd Ag/Ni/Alloy42 5.0/3.0 µm	
604-619	KAL-N dd Ag/Ni/Cu 1.0/1.0 µm	
604-620	KAL-N dd Ag/Ni/Cu 1.0/3.0 µm	
604-116	KAL-N dd Ag/Ni/Cu 1.0/15 µm	
604-621	KAL-N dd Ag/Ni/Cu 5.0/1.0 µm	
604-622	KAL-N dd Ag/Ni/Cu 5.0/3.0 µm	
604-651	KAL-N dd Ag/Ni/CuZn30 1.0/1.0 µm	
604-652	KAL-N dd Ag/Ni/CuZn30 1.0/3.0 µm	
604-653	KAL-N dd Ag/Ni/CuZn30 5.0/1.0 µm	
604-654	KAL-N dd Ag/Ni/CuZn30 5.0/3.0 µm	
604-629	KAL-N dd Au/Ni/Alloy42 0.25/1.0 µm	

Part No.	Designation	DAkkS
604-630	KAL-N dd Au/Ni/Alloy42 0.25/3.0 µm	
604-631	KAL-N dd Au/Ni/Alloy42 1.0/1.0 µm	
604-632	KAL-N dd Au/Ni/Alloy42 1.0/3.0 µm	
604-633	KAL-N dd Au/Ni/Alloy42 2.5/1.0 µm	
604-634	KAL-N dd Au/Ni/Alloy42 2.5/3.0 µm	
604-466	KAL-N dd Au/Ni/Base* 0.03/3 µm	
604-457	KAL-N dd Au/Ni/Base* 0.12/3 µm	
604-458	KAL-N dd Au/Ni/Base* 0.12/7 µm	
604-455	KAL-N dd Au/Ni/Base* 0.21/0.1 µm	
604-456	KAL-N dd Au/Ni/Base* 0.5/0.3 µm	
604-158	KAL-N dd Au/Ni/Cu 0.1µm/10.0 µm	
604-157	KAL-N dd Au/Ni/Cu 0.1µm/3.0 µm	
604-613	KAL-N dd Au/Ni/Cu 0.25/1.0 µm	
604-614	KAL-N dd Au/Ni/Cu 0.25/3.0 µm	

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

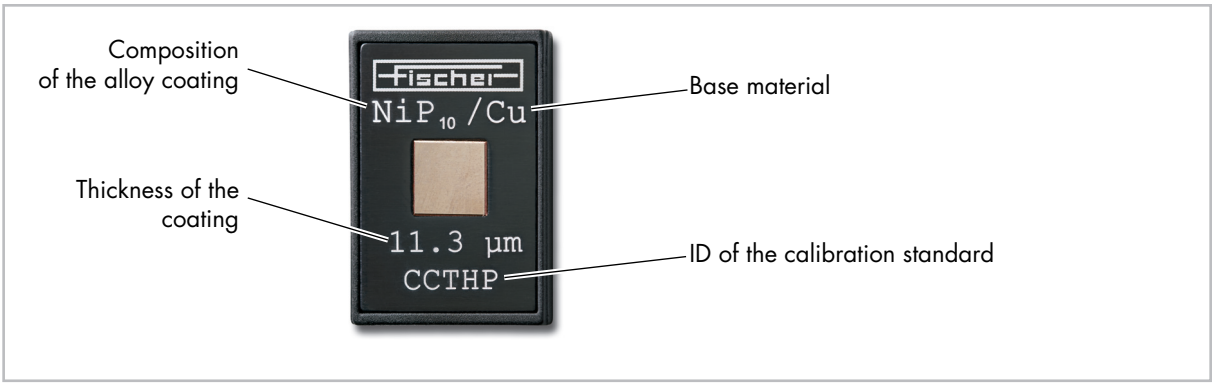
KAL-N 2: Solid Standards Double Coatings – Continuation

Part No.	Designation	DAkkS
602-994	KAL-N dd Au/Ni/Cu 0.3/7.5 µm	
601-895	KAL-N dd Au/Ni/Cu 0.8/2.5 µm	
604-615	KAL-N dd Au/Ni/Cu 1.0/1.0 µm	
604-616	KAL-N dd Au/Ni/Cu 1.0/3.0 µm	
602-087	KAL-N dd Au/Ni/Cu 1.5/10 µm	
604-617	KAL-N dd Au/Ni/Cu 2.5/1.0 µm	
604-618	KAL-N dd Au/Ni/Cu 2.5/3.0 µm	
602-086	KAL-N dd Au/Ni/Cu 2.5/5.0 µm	
604-645	KAL-N dd Au/Ni/CuZn30 0.25/1.0 µm	
604-646	KAL-N dd Au/Ni/CuZn30 0.25/3.0 µm	
604-647	KAL-N dd Au/Ni/CuZn30 1.0/1.0 µm	
604-648	KAL-N dd Au/Ni/CuZn30 1.0/3.0 µm	
604-649	KAL-N dd Au/Ni/CuZn30 2.5/1.0 µm	
604-650	KAL-N dd Au/Ni/CuZn30 2.5/3.0 µm	
602-996	KAL-N dd Au/Pd/Ni 0.5/0.8 µm	
603-156	KAL-N dd Cr/Ni/Cu 0.5/10 µm	
603-155	KAL-N dd Cr/Ni/Fe 0.8/7 µm	
604-207	KAL-N dd Ni/Cu/PCB 3/15 µm	

Part No.	Designation	DAkkS
605-613	KAL-N dd Ni/Cu/Zn 8/15µm	
605-614	KAL-N dd Ni/Cu/Zn 15/25µm	
604-461	KAL-N dd Pd/Ni/Base* 0.3/3 µm	
603-193	KAL-N dd Pd/Ni/Cu 1.0/1.0 µm	
604-639	KAL-N dd Sn/Ni/Alloy42 1.0/1.0 µm	
604-640	KAL-N dd Sn/Ni/Alloy42 1.0/3.0 µm	
604-641	KAL-N dd Sn/Ni/Alloy42 5.0/1.0 µm	
604-642	KAL-N dd Sn/Ni/Alloy42 5.0/3.0 µm	
604-623	KAL-N dd Sn/Ni/Cu 1.0/1.0 µm	
604-624	KAL-N dd Sn/Ni/Cu 1.0/3.0 µm	
601-898	KAL-N dd Sn/Ni/Cu 4.5/5µm	
604-625	KAL-N dd Sn/Ni/Cu 5.0/1.0 µm	
604-626	KAL-N dd Sn/Ni/Cu 5.0/3.0 µm	
604-655	KAL-N dd Sn/Ni/CuZn30 1.0/1.0 µm	
604-656	KAL-N dd Sn/Ni/CuZn30 1.0/3.0 µm	
604-657	KAL-N dd Sn/Ni/CuZn30 5.0/1.0 µm	
604-658	KAL-N dd Sn/Ni/CuZn30 5.0/3.0 µm	

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

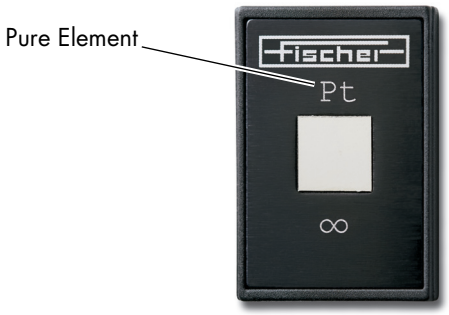
KAL-N: Solid Standards Alloy Coatings



Part No.	Designation	DAkkS
602-697	KAL-N dc NiP10/Cu 4 µm	
605-480	KAL-N dc NiP10/Cu 5 µm	
605-481	KAL-N dc NiP10/Cu 15 µm	
605-479	KAL-N dc NiP12/Cu 1 µm	
605-482	KAL-N dc NiP10/CuZn 5 µm	
605-483	KAL-N dc NiP10/CuZn 15 µm	
605-487	KAL-N dc NiP2.5/Fe 3 µm	
605-488	KAL-N dc NiP2.5/Fe 5 µm	
605-489	KAL-N dc NiP5/Fe 17 µm	
605-490	KAL-N dc NiP10/Fe 3 µm	
605-491	KAL-N dc NiP10/Fe 14 µm	
605-492	KAL-N dc NiP10/Fe 20 µm	
605-493	KAL-N dc NiP10/Fe 30 µm	
603-071	KAL-N dc Ni13Zn/Fe 4.5 µm	
605-513	KAL-N dc Ni13Zn/Fe 6 µm	

Part No.	Designation	DAkkS
603-073	KAL-N dc Ni13Zn/Fe 14 µm	
605-514	KAL-N dc Ni13Zn/Fe 17 µm	
603-072	KAL-N dc Ni13Zn/Fe 27 µm	
603-928	KAL-N dc Ni15Zn/Fe 1 µm	
605-515	KAL-N dc Pd85Ni/Cu 1 µm	
605-411	KAL-N dc SnAg1.7/Cu 10 µm	
602-069	KAL-N dc Sn60Pb40/Ni 2.5 µm	
602-070	KAL-N dc Sn60Pb40/Ni 11 µm	
602-071	KAL-N dc Sn60Pb40/Ni 40 µm	
602-072	KAL-N dc Sn90Pb10/Ni 2.0 µm	
602-073	KAL-N dc Sn90Pb10/Ni 10.5 µm	

KAL-N: Solid Standards Pure Elements



Part No.	Designation	DAkkS
601-842	KAL-N Ag ∞	
601-854	KAL-N Al ∞	
603-257	KAL-N Bi ∞	
601-847	KAL-N Cd ∞	
601-858	KAL-N Co ∞	
601-850	KAL-N Cr ∞	
601-846	KAL-N Cu ∞	
601-848	KAL-N Fe ∞	
603-618	KAL-N Ir ∞	
602-074	KAL-N Mn ∞	
601-861	KAL-N Mo ∞	
601-845	KAL-N Ni ∞	
601-844	KAL-N Pb ∞	

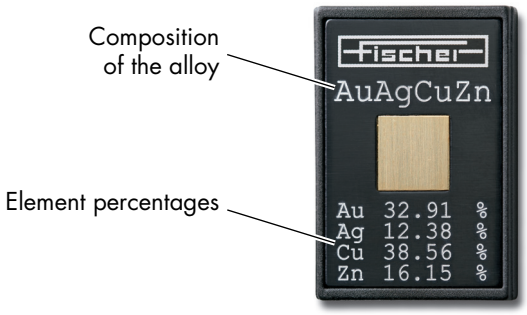
Part No.	Designation	DAkkS
601-856	KAL-N Pd ∞	
601-862	KAL-N Pt ∞	
605-671	KAL-N Re ∞	
601-851	KAL-N Rh ∞	
604-034	KAL-N Ru ∞	
601-843	KAL-N Sn ∞	
605-593	KAL-N Ta ∞	
601-859	KAL-N Ti ∞	
601-860	KAL-N V ∞	
601-853	KAL-N W ∞	
601-840	KAL-N Zn ∞	
602-719	KAL-N Zr ∞	

KAL-N: Solid Standards Ultra-High Purity Elements*

Part No.	Designation	Purity
601-841	KAL-N Au 5N ∞	≥ 999,99 ‰

* Delivery with certificate of analysis

KAL-N: Solid Standards Alloys (Bulk)



Part No.	Designation	DAkkS
605-129	KAL-N c Au10Ag35Cu55 2 kt*	
605-121	KAL-N c Au10Ag80Cu10 2 kt*	
605-124	KAL-N c Au30Ag10Cu60 7 kt*	
605-122	KAL-N c Au30Ag60Cu10 7 kt*	
603-683	KAL-N c Au33Ag12Cu39Zn16 8 kt*	
604-970	KAL-N c Au33Ag67 8 kt*	
605-123	KAL-N c Au34Ag33Cu33 8 kt*	
605-020	KAL-N c Au37.5Ag20Cu42.5 9 kt*	
605-125	KAL-N c Au50Ag25Cu25 12 kt*	
603-682	KAL-N c Au59Ag5Cu37 14 kt*	
603-748	KAL-N c Au59Ag27Pd14 14 kt*	
603-681	KAL-N c Au59Ag30Cu12 14 kt*	

Part No.	Designation	DAkkS
605-126	KAL-N c Au64Ag10Cu26 15 kt*	
605-128	KAL-N c Au70Ag30 17 kt*	
604-694	KAL-N c Au70Pt10Ag12Cu8 17 kt*	
603-745	KAL-N c Au75Ag5Cu8Cd12 18 kt*	
603-680	KAL-N c Au75Ag5Cu10Zn10 18 kt*	
603-679	KAL-N c Au75Ag5Cu20 18 kt*	
603-747	KAL-N c Au75Ag10Cu15 18 kt*	
603-746	KAL-N c Au75Ag15Cu10 18 kt*	
603-744	KAL-N c Au75Cu8Pd10Ni7 18 kt*	
605-127	KAL-N c Au82Ag9Cu9 20 kt*	
603-752	KAL-N c Au90Ag5Cu5 22 kt*	
603-750	KAL-N c Au90Ag10 22 kt*	
603-751	KAL-N c Au95Ag3Cu2 23 kt*	
603-749	KAL-N c Au95Ag5 23 kt*	
603-790	KAL-N c Sterling Silver 935*	

Continued on the next page

* The standard measurement uncertainty is determined for each calibration standard individually. For gold and silver standards the standard measurement uncertainty of the calibration standards is always below 0.25 %.

KAL-N: Solid Standards Alloys (Bulk) – Continuation

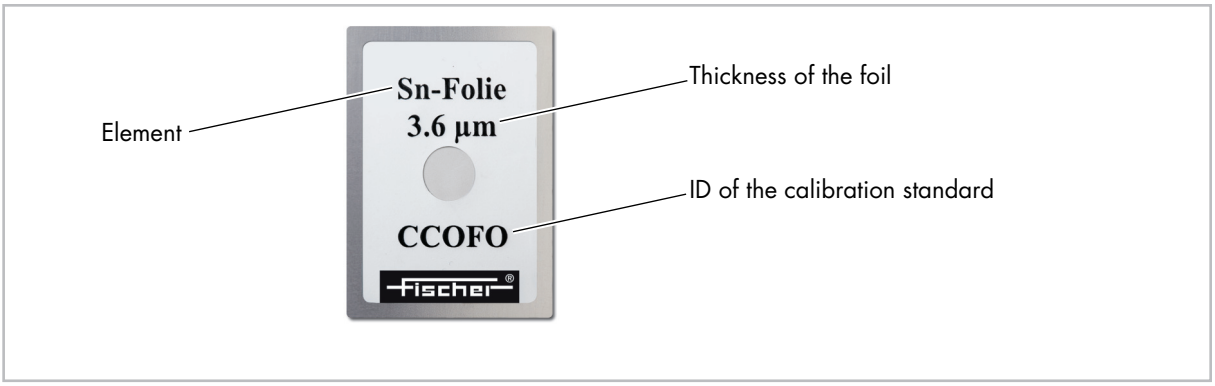
Part No.	Designation	DAkkS
605-550	KAL-N c Ag83Cu17*	
605-551	KAL-N c Ag90Cu10*	
605-552	KAL-N c Ag92.5Cu7.5* (Sterling Silver 925)	
605-553	KAL-N c Ag95.84Cu4.16*	
605-554	KAL-N c Ag99.5Cu0.5*	
605-555	KAL-N c Ag50Cd47Cu3*	
605-556	KAL-N c Ag25Cd1.5Cu70Zn3.5*	
605-557	KAL-N c Ag35Cd36-Cu25Zn4*	
605-558	KAL-N c Ag59Cd37-Cu4Zn0.5*	
605-559	KAL-N c Ag60Cd26Cu9Zn5*	
605-560	KAL-N c Ag65Cd25Cu8Zn2*	
605-561	KAL-N c Ag69Cd21Cu6Zn4*	
605-562	KAL-N c Ag75Cd20Cu3Zn2*	
605-563	KAL-N c Ag80Cd2Cu10Zn8*	
601-865	KAL-N c Alloy42	
601-857	KAL-N c CuSn6	

Part No.	Designation	DAkkS
601-855	KAL-N c CuZn37	
601-849	KAL-N c Kovar**	
604-036	KAL-N c Pt950Cu50	
604-037	KAL-N c Pt960Ru40	
603-896	KAL-N c RoHS PE Low: Br 500 ppm, Hg 200 ppm, Cr 398 ppm, Pb 400 ppm, Cd 100 ppm	
603-895	KAL-N c RoHS PE High: Br 1099 ppm, Hg 1100 ppm, Cr 1000 ppm, Pb 1201 ppm, Cd 300 ppm	
603-988	KAL-N c RoHS PVC Blank	
603-987	KAL-N c RoHS PVC-Low: Br 499 ppm, Hg 200 ppm, Cr 400 ppm, Pb 399 ppm, Cd 100 ppm	
603-989	KAL-N c RoHS PVC High: Br 1099 ppm, Hg 1100 ppm, Cr 1000 ppm, Pb 1199 ppm, Cd 301 ppm	
604-268	KAL-N c Sn62Pb36Ag2	
604-330	KAL-N c Sn97Pb3	

* The standard measurement uncertainty is determined for each calibration standard individually. For gold and silver standards the standard measurement uncertainty of the calibration standards is always below 0.25 %.

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

KAL-F 1: Foil Standards Single Coatings



Part No.	Designation	DAkkS
602-581	KAL-F d Ag 0.1 µm	✔
602-580	KAL-F d Ag 0.25 µm	✔
602-949	KAL-F d Ag 0.5 µm	✔
601-817	KAL-F d Ag 1 µm	✔
603-431	KAL-F d Ag 2 µm	✔
601-818	KAL-F d Ag 5 µm	✔
603-556	KAL-F d Ag 9 µm	✔
601-819	KAL-F d Ag 15 µm	✔
603-557	KAL-F d Ag 20 µm	✔
601-820	KAL-F d Ag 35 µm	✔
603-335	KAL-F d Al 6 µm	
603-554	KAL-F d Al 10 µm	
603-336	KAL-F d Al 20 µm	
601-990	KAL-F d Al 100 µm	
602-594	KAL-F d Au 0.05 µm	✔
602-773	KAL-F d Au 0.1 µm	✔
601-810	KAL-F d Au 0.25 µm	✔
601-811	KAL-F d Au 0.5 µm	✔
601-812	KAL-F d Au 1 µm	✔
601-813	KAL-F d Au 3 µm	✔
601-814	KAL-F d Au 6 µm	✔
602-244	KAL-F d Cd 5 µm	✔
602-245	KAL-F d Cd 10 µm	✔
605-177	KAL-F d Cd 20 µm	✔

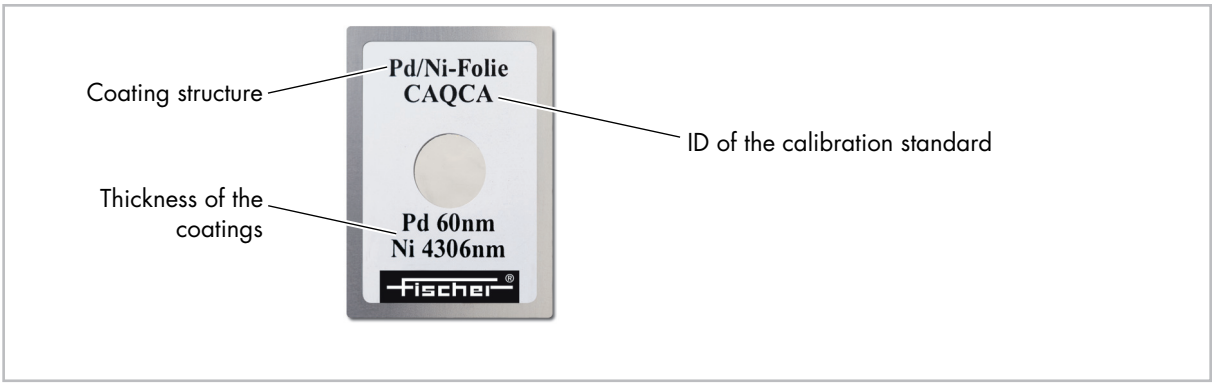
Part No.	Designation	DAkkS
602-989	KAL-F d Co 3 µm	✔
602-990	KAL-F d Co 5 µm	✔
603-239	KAL-F d Cr 1 µm	✔
605-507	KAL-F d Cu 0.02 µm	✔
605-508	KAL-F d Cu 0.05 µm	✔
605-509	KAL-F d Cu 0.1 µm	✔
605-510	KAL-F d Cu 0.2 µm	✔
605-511	KAL-F d Cu 0.5 µm	✔
605-512	KAL-F d Cu 1 µm	✔
601-832	KAL-F d Cu 2 µm	✔
601-833	KAL-F d Cu 3 µm	✔
605-592	KAL-F d Cu 5 µm	✔
601-835	KAL-F d Cu 10 µm	✔
601-836	KAL-F d Cu 20 µm	✔
601-837	KAL-F d Cu 25 µm	✔
603-555	KAL-F d Cu 30 µm	✔
603-883	KAL-F d Fe 15 µm	
605-452	KAL-F d Ir 11 nm	✔
605-453	KAL-F d Ir 22 nm	✔
603-063	KAL-F d Mo 4 µm	
603-064	KAL-F d Mo 10 µm	
603-065	KAL-F d Mo 15 µm	
603-066	KAL-F d Mo 25 µm	
604-415	KAL-F d Nb 1 µm	

KAL-F 1: Foil Standards Single Coatings – Continuation

Part No.	Designation	DAkkS
604-416	KAL-F d Nb 3 µm	
603-875	KAL-F d Ni 0.1 µm	✔
602-487	KAL-F d Ni 0.5 µm	✔
601-825	KAL-F d Ni 1 µm	✔
601-826	KAL-F d Ni 2 µm	✔
601-827	KAL-F d Ni 3 µm	✔
602-593	KAL-F d Ni 5 µm	✔
601-828	KAL-F d Ni 6 µm	✔
601-829	KAL-F d Ni 10 µm	✔
601-830	KAL-F d Ni 15 µm	✔
601-831	KAL-F d Ni 25 µm	✔
603-579	KAL-F d Pd 0.05 µm	✔
603-306	KAL-F d Pd 0.10 µm	✔
602-477	KAL-F d Pd 0.25 µm	✔
604-133	KAL-F d Pd 0.50 µm	✔
601-815	KAL-F d Pd 1.5 µm	✔
601-795	KAL-F d Pd 2.5 µm	✔
601-816	KAL-F d Pd 5 µm	✔
604-282	KAL-F d Pt 0.1 µm	✔
602-421	KAL-F d Pt 0.25 µm	✔
602-422	KAL-F d Pt 0.5 µm	✔
602-423	KAL-F d Pt 1 µm	✔
602-424	KAL-F d Pt 2.5 µm	✔
602-425	KAL-F d Pt 5 µm	✔
601-998	KAL-F d Rh 0.1 µm	✔
601-997	KAL-F d Rh 0.25 µm	✔

Part No.	Designation	DAkkS
603-314	KAL-F d Ru 0.1 µm	
602-897	KAL-F d Sn 0.5 µm	✔
602-888	KAL-F d Sn 1 µm	✔
601-821	KAL-F d Sn 3 µm	✔
603-211	KAL-F d Sn 7 µm	✔
601-822	KAL-F d Sn 9 µm	✔
604-095	KAL-F d Sn 15 µm	✔
601-823	KAL-F d Sn 30 µm	✔
601-824	KAL-F d Sn 72 µm	✔
603-983	KAL-F d Ta 0.5 µm	
603-470	KAL-F d Ta 1.5 µm	
604-076	KAL-F d Ti 0.5 µm	✔
601-991	KAL-F d Ti 1 µm	✔
601-994	KAL-F d Ti 2 µm	✔
601-995	KAL-F d Ti 6 µm	✔
601-996	KAL-F d Ti 15 µm	✔
602-872	KAL-F d Zn 2.5 µm	✔
602-873	KAL-F d Zn 5 µm	✔
602-874	KAL-F d Zn 10 µm	✔
602-875	KAL-F d Zn 15 µm	✔
602-876	KAL-F d Zn 20 µm	✔
602-877	KAL-F d Zn 25 µm	✔
602-720	KAL-F d Zr 0.5 µm	
602-712	KAL-F d Zr 2 µm	
602-713	KAL-F d Zr 4 µm	
602-714	KAL-F d Zr 10 µm	

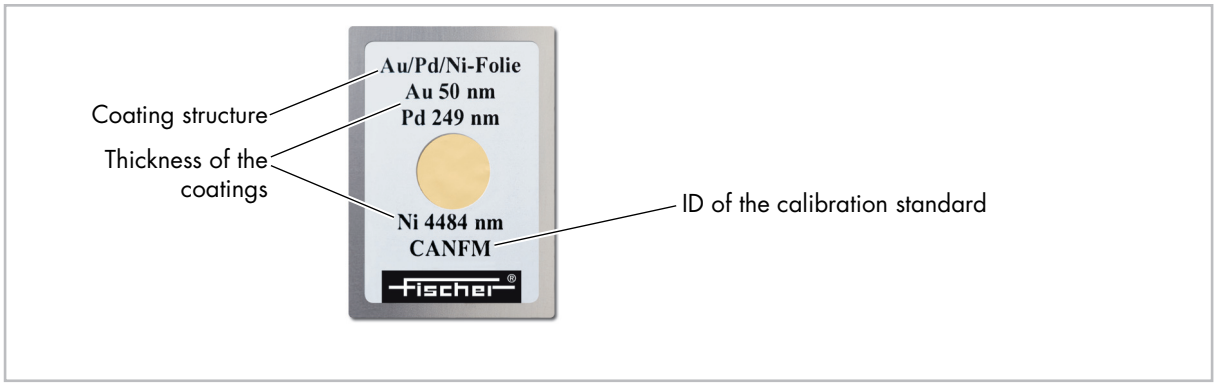
KAL-F 2: Foil Standards Double Coatings



Part No.	Designation	DAkkS
604-482	KAL-F dd Au/Ni 30 nm/4 µm	✔
604-483	KAL-F dd Au/Ni 100 nm/4 µm	✔
602-642	KAL-F dd Cr/Ni 0.5/10 µm	✔
604-484	KAL-F dd Pd/Ni 20 nm/4 µm	✔

Part No.	Designation	DAkkS
604-485	KAL-F dd Pd/Ni 60 nm/4 µm	✔
604-486	KAL-F dd Pd/Ni 100 nm/4 µm	✔
604-487	KAL-F dd Pd/Ni 250 nm/4 µm	✔

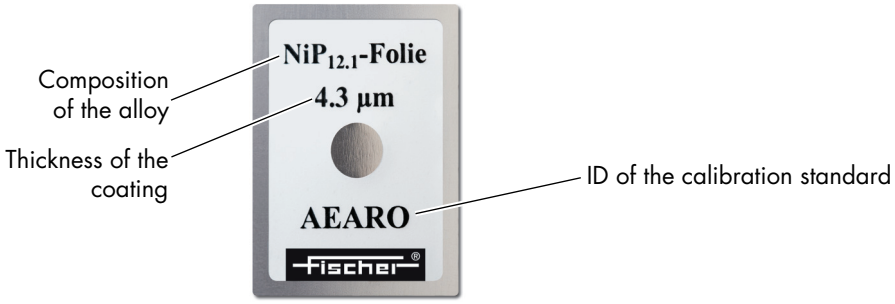
KAL-F 3: Foil Standards Triple Coatings



Part No.	Designation	DAkkS
604-490	KAL-F ddd Au/Pd/Ni 50 nm/ 100 nm/4 µm	✔
604-491	KAL-F ddd Au/Pd/Ni 50 nm/ 250 nm/4 µm	✔

Part No.	Designation	DAkkS
604-488	KAL-F ddd Au/Pd/Ni 60 nm/ 20 nm/4 µm	✔
604-489	KAL-F ddd Au/Pd/Ni 60 nm/ 60 nm/4 µm	✔

KAL-F: Foil Standards Alloy Coatings



Part No.	Designation	DAkkS
605-681	KAL-F dc Ag60Sn40 0.5 µm	
605-682	KAL-F dc Ag80Sn20 0.5 µm	
603-776	KAL-F dc Cu3Sn97 7 µm	
603-777	KAL-F dc Cu3Sn97 12 µm	
603-151	KAL-F dc Cu63Zn37 5 µm	
605-228	KAL-F dc NiP9 Foil 5 µm	
605-230	KAL-F dc NiP9 Foil 15 µm	
605-229	KAL-F dc NiP12 Foil 5 µm	
605-231	KAL-F dc NiP12 Foil 15 µm	
605-517	KAL-F dc Pd85Ni 1 µm	
604-270	KAL-F dc Sn62Pb36Ag2 20 µm	
604-272	KAL-F dc Sn62Pb36Ag2 7.5 µm	
603-255	KAL-F dc Sn88Bi12 5 µm	
603-256	KAL-F dc Sn88Bi12 10 µm	
604-235	KAL-F dc Sn88Bi12 30 µm	
604-269	KAL-F dc Sn94Ag6 7.5 µm	
604-274	KAL-F dc Sn94Ag6 20 µm	
604-273	KAL-F dc Sn95.5Ag3.8Cu0.7 5 µm	

Part No.	Designation	DAkkS
604-271	KAL-F dc Sn95.5Ag3.8Cu0.7 10 µm	
604-239	KAL-F dc Sn95Bi5 5 µm	
604-243	KAL-F dc Sn95Bi5 10 µm	
604-232	KAL-F dc Sn95Bi5 25 µm	
604-474	KAL-F dc Sn97Bi3 5 µm	
604-475	KAL-F dc Sn97Bi3 10 µm	
604-292	KAL-F dc Sn97Pb3 5 µm	
604-294	KAL-F dc Sn97Pb3 10 µm	
603-915	KAL-F dc Sn99.8Pb0.2 5 µm	
603-914	KAL-F dc Sn99.8Pb0.2 10 µm	
603-917	KAL-F dc Sn99.9Pb0.1 5 µm	
603-916	KAL-F dc Sn99.9Pb0.1 10 µm	
603-919	KAL-F dc Sn99.99 5 µm	
603-920	KAL-F dc Sn99.99 10 µm	
604-238	KAL-F dc Sn99Bi1 5 µm	
604-242	KAL-F dc Sn99Bi1 10 µm	
604-231	KAL-F dc Sn99Bi1 30 µm	
601-838	KAL-F dc Sn60Pb40 6 µm	
601-839	KAL-F dc Sn60Pb40 40 µm	

KAL-NS 1: Standard Sets Single Coatings

Part No.	Designation	Included Standards	DAkkS
601-350	KAL-NS Ag/Ni 4 Standards	Ag/Ni 1.5 µm Ag/Ni 5 µm Ag/Ni 20 µm Ag/Ni 40 µm	✔
601-708	KAL-NS Au/Ni 4 Standards	Au/Ni 0.4 µm Au/Ni 1 µm Au/Ni 2.5 µm Au/Ni 6 µm	✔
601-735	KAL-NS Cr/Cu 4 Standards	Cr/Cu 0.6 µm Cr/Cu 2 µm Cr/Cu 6.5 µm Cr/Cu 20 µm	✔
601-737	KAL-NS Cr/Fe 4 Standards	Cr/Fe 0.6 µm Cr/Fe 2 µm Cr/Fe 7 µm Cr/Fe 20 µm	✔
601-733	KAL-NS Cr/Ni 4 Standards	Cr/Ni 0.6 µm Cr/Ni 2 µm Cr/Ni 7 µm Cr/Ni 20 µm	✔

KAL-NS 1: Standard Sets Single Coatings – Continuation

Part No.	Designation	Included Standards	DAkkS
601-750	KAL-NS Cu/Fe 4 Standards	Cu/Fe 0.75 µm Cu/Fe 3 µm Cu/Fe 10 µm Cu/Fe 26 µm	✔
601-739	KAL-NS Ni/Cu 4 Standards	Ni/Cu 1 µm Ni/Cu 6 µm Ni/Cu 10 µm Ni/Cu 25 µm	✔
602-331	KAL-NS Ni/CuZn 4 Standards	Ni/CuZn 1 µm Ni/CuZn 6 µm Ni/CuZn 10 µm Ni/CuZn 25 µm	✔
601-743	KAL-NS Ni/Fe 4 Standards	Ni/Fe 1 µm Ni/Fe 3 µm Ni/Fe 10 µm Ni/Fe 25 µm	✔
603-789	KAL-NS Rh/Sterling Silver 935 3 Standards	Sterling Silver 935 Rh/Sterling Silver 40 nm Rh/Sterling Silver 200 nm	
601-728	KAL-NS Sn/Ni 4 Standards	Sn/Ni 2.5 µm Sn/Ni 9 µm Sn/Ni 28 µm Sn/Ni 65 µm	✔
601-759	KAL-NS Zn/Fe 4 Standards	Zn/Fe 1.5 µm Zn/Fe 4.5 µm Zn/Fe 14 µm Zn/Fe 38 µm	✔

KAL-NS 2: Standard Sets Double Coatings

Part No.	Designation	Included Standards	DAkkS
604-780	KAL-NS dd Ag/Ni/Cu 4 Standards	Ni/Cu 6 µm Ag/Ni 20 µm Ag/Ni/Cu 1.0/16 µm Ag/Ni/Cu 5.0/9.0 µm	
601-869	KAL-NS dd Au/Ni/Cu 7 Standards	Au/Ni 0.4 µm Au/Ni 1.0 µm Au/Ni 1.7 µm Au/Cu 0.6 µm Au/Cu 1.4 µm Ni/Cu 4 µm Au/Ni/Cu 0.8/2.5 µm	
604-785	KAL-NS dd Cr/Ni/Cu 6 Standards	Ni/Cu 3 µm Ni/Cu 10 µm Ni/Cu 20 µm Cr/Ni/Cu 0.5/10 µm Cr/Ni/Cu 0.5/20 µm Cr/Ni/Cu 1.5/15 µm	
604-786	KAL-NS dd Cr/Ni/Fe 8 Standards	Cr/Fe 2 µm Cr/Fe 10 µm Cr/Ni 2 µm Cr/Ni 20 µm Ni/Fe 4 µm Ni/Fe 12 µm Ni/Fe 25 µm Cr/Ni/Fe 0.7/7.0 µm	

KAL-NS 3: Standard Sets Triple Coatings

Part No.	Designation	Included Standards	DAkkS
605-101	KAL-NS ddd Au/NiP/Cu/PCB 8 Standards	Cu/PCB 5 µm Cu/PCB 9 µm Cu/PCB 35 µm* NiP9/Cu/PCB 3.5/15 µm NiP9/Cu/PCB 3.5/35 µm* Au/NiP/Cu/PCB 0.03/3/35 µm* Au/NiP/Cu/PCB 0.05/2.5/12 µm Au/NiP/Cu/PCB 0.1/7/35 µm*	
605-427	KAL-NS ddd Au/NiP/Cu/PCB PC 6 Standards	Au Foil 0.1 µm Au Foil 0.5 µm Au Foil 1.0 µm NiP10.5/Cu/PCB 3.5/15 µm NiP10.5/Cu/PCB 3.5/30 µm NiP10.5/Cu/PCB 6.5/18 µm	
604-124	KAL-NS ddd Au/Pd/Ni/Cu-Leg (Lead Frame) 9 Standards	Ni/Cu 0.6 µm Ni/Cu 1 µm Ni/Cu 2 µm Pd/Ni/Cu 0.01/1.3 µm Pd/Ni/Cu 0.03/1.3 µm Pd/Ni/Cu 0.1/0.8 µm Au/Pd/Ni/Cu 4 nm/10 nm/1.5 µm Au/Pd/Ni/Cu 6 nm/30 nm/0.9 µm Au/Pd/Ni/Cu 10 nm/100 nm/0.8 µm	

Continued on the next page

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

KAL-NS 3: Standard Sets Triple Coatings – Continuation

Part No.	Designation	Included Standards	DAkkS
604-782	KAL-NS Cr/Ni/Cu/Al 9 Standards	Cr/Ni 1 µm Ni/Cu 6 µm Ni/Cu 25 µm Cu/Al 6 µm Cu/Al 25 µm Ni/Cu/Al 6/25 µm Ni/Cu/Al 25/20 µm Cr/Ni/Cu 0.5/15 µm Cr/Ni/Cu 1.5/10 µm	
604-783	KAL-NS Cr/Ni/Cu/Fe 9 Standards	Cr/Ni 1 µm Ni/Cu 6 µm Ni/Cu 30 µm Cu/Fe 6 µm Cu/Fe 25 µm Ni/Cu/Fe 6/25 µm Ni/Cu/Fe 30/15 µm Cr/Ni/Cu 0.5/15 µm Cr/Ni/Cu 1.5/10 µm	
604-784	KAL-NS Cr/Ni/Cu/Zn 9 Standards	Cr/Ni 1 µm Ni/Cu 6 µm Ni/Cu 30 µm Cu/Zn 6 µm Cu/Zn 25 µm Ni/Cu/Zn 10/30 µm Ni/Cu/Zn 20/15 µm Cr/Ni/Cu 0.5/15 µm Cr/Ni/Cu 1.5/15 µm	

KAL-NS: Standard Sets Alloy Coatings

Part No.	Designation	Included Standards	DAkkS
602-927	KAL-NS dc NiZn/Fe 6 Standards	Zn/Fe 4 µm Zn/Fe10 µm Zn/Fe 25 µm Ni13Zn/Fe 6 µm Ni13Zn/Fe 17 µm Ni6Zn/Fe 6 µm	
603-918	KAL-NS RoHS SnPb 6 Standards, calibration foils	Sn 99.99% 5 µm Sn 99.99% 10 µm Sn99.9Pb0.1 5 µm Sn99.9Pb0.1 10 µm Sn99.8Pb0.2 5 µm Sn99.8Pb0.2 10 µm	
604-787	KAL-NS SnBi/Ni 6 Standards	Sn/Ni 2.5 µm Sn/Ni 13 µm SnBi5/Ni 4 µm SnBi5/Ni10 µm SnBi15/Ni 4 µm SnBi15/Ni 10 µm	
602-680	KAL-NS SnPb/Ni 8 Standards	Sn/Ni 2 µm Sn/Ni10 µm Sn/Ni 50 µm Sn60Pb/Ni 2.5 µm Sn60Pb/Ni 10 µm Sn60Pb/Ni 50 µm Sn90Pb/Ni 2 µm Sn90Pb/Ni 10 µm	

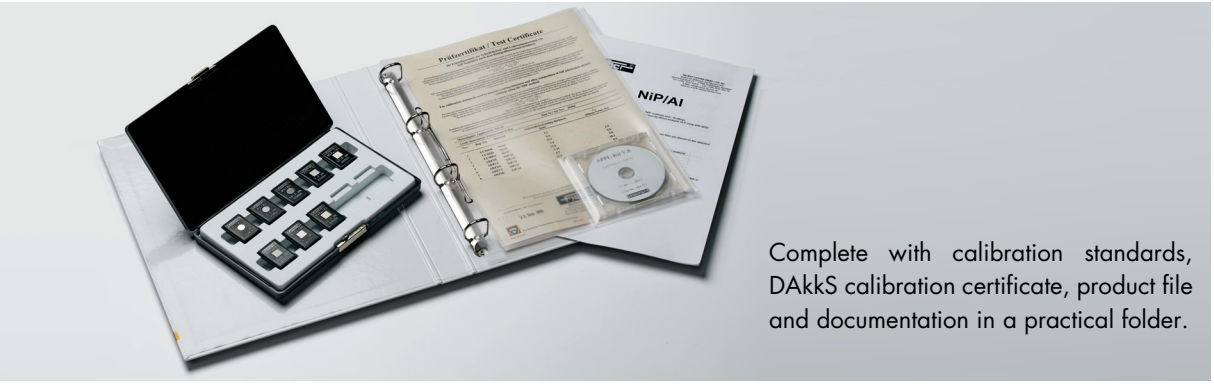
KAL-NS: Standard Sets Alloys (Bulk)

Part No.	Designation	Included Standards	DAkkS
603-660	KAL-NS GOLD ASSAY 5 Standards	Au75Ag5Cu20 (18 kt) Au75Ag5Cu10Zn10 (18 kt) Au58.5Ag29.5Cu12 (14 kt) Au58.5Ag4.5Cu37 (14 kt) Au33.3Ag12Cu38.7Zn16 (8 kt)	
605-037	KAL-NS GOLD ASSAY 2 12 Standards 6 Pure Elements	Au33Ag12Cu39Zn16 (8 kt) Au58Ag30Cu12 (14 kt) Au58Ag5Cu37 (14 kt) Au59Ag27Pd14 (14 kt) Au75Ag5Cu10Zn10 (18kt) Au75Ag5Cu20 (18 kt) Au75Ag15Cu10 (18 kt) Au75Cu8Pd10Ni7 (18 kt) Au75Ag10Cu15 (18 kt) Au75Ag5Cu8Cd12 (18 kt) Au90Ag5Cu5 (22 kt) Au95Ag3Cu2 (23 kt) Pure Elements Ag, Au, Cu, Pd, Pt, Ti	

KAL-NS: Alloys (Bulk) – Continuation

Part No.	Designation	Included Standards	DAkkS
603-897	KAL-NS RoHS PE 4 Standards	PE-High: Br 1099 ppm, Hg 1100 ppm, Cr 1000 ppm, Pb 1201 ppm, Cd 300 ppm PE-Low: Br 500 ppm, Hg 200 ppm, Cr 398 ppm, Pb 400 ppm, Cd 100 ppm KAL-N Scattering Sample Al KAL-N Scattering Sample ABS	
603-986	KAL-NS RoHS PVC 3 Standards	PVC-High: Br 1099 ppm, Hg 1100 ppm, Cr 1000 ppm, Pb 1199 ppm, Cd 301 ppm PVC-Low: Br 499 ppm, Hg 200 ppm, Cr 400 ppm, Pb 399 ppm, Cd 100 ppm PVC-Blank	
604-084	KAL-NS RoHS SnCuAg (Pb) 10 Standards	Sn99.99 Sn99Cu1 Sn97Ag3 Sn95.5Cu0.5Ag4 Sn96.5Cu0.5Ag3 Sn96.99Ag3Pb0.01 Sn98.9Cu1Pb0.1 Sn98.99Cu1Pb0.01 Sn96.49Cu0.5Ag3Pb0.01 Sn96.4Cu0.5Ag3Pb0.1	

APPL-Kit: Application Kits



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

Part No.	Designation	Included Standards	DAkkS
605-224	APPL-KIT Au/Pd/NiP/Base* 8 Standards	Pd/NiP10/Base* 0.05/4.7 µm Pd/NiP10/Base* 0.1/4.4 µm Pd/NiP10/Base* 0.25/4.4 µm Au/NiP10/Base* 0.1/4.4 µm Au/Pd/NiP10/Base* 0.02/0.03/4.6 µm Au/Pd/NiP10/Base* 0.05/0.03/4.7 µm Au/Pd/NiP10/Base* 0.05/0.1/4.7 µm Au/Pd/NiP10/Base* 0.1/0.2/4.5 µm	
604-703	APPL-KIT V.6 NiP/Al 8 Standards	Ni/Al 5 µm Ni/Al 10 µm Ni/Al 18 µm NiP2.5/Al 3 µm NiP2.5/Al 8 µm NiP10/Al 3 µm NiP10/Al 6 µm NiP10/Al 13 µm	
604-704	APPL-KIT V.6 NiP/Cu;CuLEG 8 Standards	Ni/Cu 5 µm Ni/Cu 10 µm Ni/Cu 20 µm NiP10/Cu 5 µm NiP10/Cu 15 µm NiP12/Cu 1 µm NiP10/CuZn 8 µm NiP10/CuZn 15 µm	

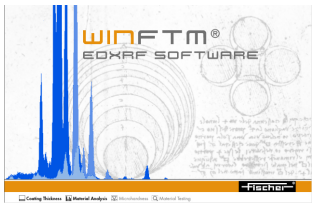
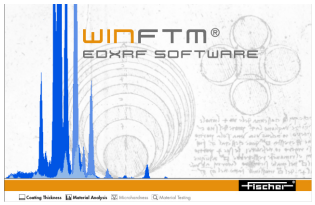
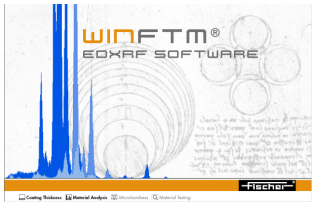
* The substrate material Base consists of copper-laminated PCB material.
The Cu coating is approx. 35 µm thick and not certified.

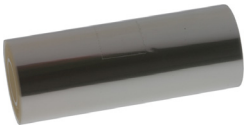
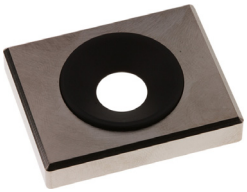
APPL-Kit: Application Kits – Continuation

Part No.	Designation	Included Standards	DAkkS
604-705	APPL-KIT V.6 NiP/Base* 10 Standards	Ni/Base* 3 µm Ni/Base* 6 µm NiP9/Base* 0.5 µm NiP9/Base* 1 µm NiP9/Base* 3 µm NiP9/Base* 6 µm NiP14/Base* 0.5 µm NiP14/Base* 1 µm NiP14/Base* 3 µm NiP14/Base* 6 µm	
604-753	APPL-KIT V.6 NiP/Fe 10 Standards	Ni/Fe 5 µm Ni/Fe 10 µm Ni/Fe 20 µm NiP2.5/Fe 2.5 µm NiP2.5/Fe 5 µm NiP5/Fe 17 µm NiP10/Fe 3 µm NiP10/Fe 14 µm NiP10/Fe 20 µm NiP10/Fe 30 µm	

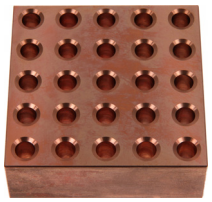
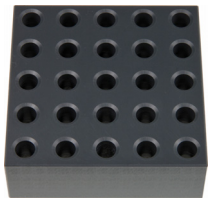
* The substrate material Base consists of copper-laminated PCB material.
The Cu coating is approx. 35 µm thick and not certified.

X-RAY Accessories

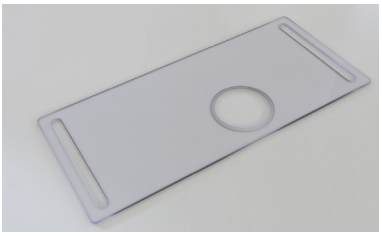
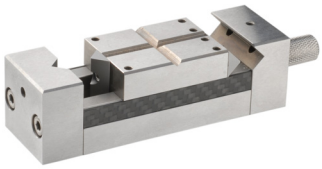
Product	Description	Part No.
	**New coating/alloy system** New measuring application (product) for: • New coating system • Solution analysis • Alloy analysis	
	**WinFTM extension PDM** Extended functions for product administration and result documentation	
	**WinFTM extension SUPER** Extended functions for experts for the development of new measuring applications	
	**Support** Product training, staff training, setting up software and measuring applications, performing calibration and programming, connection to data systems, and much more	
	**Measuring cell for solution analysis, red** Measuring cell with Mo base XAN, XDAL, XDV-SDD: All solutions XUL(M), XDL(M): all except Rh, Ru, Pd	603-215
	**Measuring cell for solution analysis, green** Measuring cell with Ni base All instruments: specially for Rh, Ru, Pd	603-213

Product	Description	Part No.
	**Measuring cell for solution analysis, grey** Measuring cell with Zr base All instruments: PdNi and highly concentrated Rh, Ru and Pd solutions	603-214
	**Solution analysis set** Two measuring cells with Mo basis, including 1 roll of cover foil	603-216
	**Solution analysis cover foil** Replacement cover foil for solution analysis measuring cells. L = 20 m, W= 70 mm	601-564
	**Substrate for flexible PCBs** Substrate for thin, flexible printed circuit boards, Fe base material, take into account during the measuring application	603-466
	**Centering holder** Holds the basic material and several calibration foils over each other. For Fischer domino or basic material 24 mm x 32 mm	603-439
	**Magnet frame** Holds Fischer basic material and calibration foil over each other. For Fischer Domino or basic material 24 mm x 32 mm	850-098

X-RAY Accessories

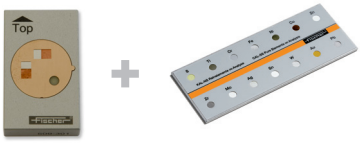
Product	Description	Part No.
	**Positioning aid - support tables** Combined beam trap and support table with different drill holes. For round parts and as support for flat samples.	602-640
	**Cu beam trap** As support table for thin and translucent parts (inhibiting the signals from the measuring stage). For RoHS "halogen-free" applications. Where applicable, be aware of the Cu signal in the measuring spectrum.	604-543
	**PVC beam trap** 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"	604-579
	**PVC beam trap and wire holder** Combined beam trap and support table for positioning wires and cylindrical parts.	602-641
	**Positioning aid** Measuring support table for ABS parts, the raised strip is made of tin	603-020
	**Tin plasticine mixture** For Cr/Ni/Cu/ABS, for Ni and Cu coatings over 30 µm, Sn forms the base material and requires a special measuring application	603-931

Accessories

Product	Description	Part No.
	**Ring holder** For the correct measuring of jewellery rings. It is necessary to adapt the software/measuring application, and exchanging the insert at the measuring stage may also be required.	605-104
	**XUL positioning aid** For accurate placing of specimens on the XUL, without opening the lid of the measuring instrument	605-571
	**Universal jaw vice** 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	604-261
	**Material analysis measuring cell set** Three 603-261 measuring cells and 1 roll of 601-564 cover foil for analysing liquid, paste-like or powdery samples	603-260
	**Material analysis measuring cell** Measuring cells for analysing liquid, paste-like or powdery samples. Please order the 601-564 cover foil separately.	603-261
	**Pressing tool for shavings** For preparing samples, e.g. for precious metal shavings, where the shavings are pressed into a ring and can then be measured	603-978

X-RAY Accessories

Product	Description	Part No.
	**Pure element plate for instruments with proportional counter tube** First element silver, for XUL, XULM, XDL, XDLM	603-001
	**Pure element plate for instruments with PIN or SD detector** First element sulphur, for XAN, XDAL, XDV-SDD, XDV-µ	602-598
	**Pure element plate for vacuum instrument** First element Al, for XUV 773	604-436
	**Set for monitoring the measurement devices, bar and task** Bar with samples Ni 5 µm/Cu and Ag, Cu for monitoring the instruments and for reference measurement. Installation within the travel range of the measuring stage. Delivery includes task. From WinFTM 6.31 onwards, it is possible to have automatic start of the instrument with monitoring of the measurement devices.	604-411
	**Set for monitoring the measurement devices, bar with Au coating and task** Bar with samples Au 0.8 µm/Ni 2.5 µm/Cu and Ag, Cu for monitoring the instruments and for reference measurement. Installation within the travel range of the measuring stage. Delivery includes task. From WinFTM 6.31 onwards, it is possible to have automatic start of the instrument with monitoring of the measurement devices.	605-071
	**Test samples for RoHS function check** 6 test samples for checking the function of X-RAY instruments for RoHS measurement. No certified standards, therefore not suitable for calibration.	604-280

Product	Description	Part No.
	**ABS scattering sample** Scattering sample made of ABS plastics, For recording a scattering spectrum for all X-RAY instruments	603-845
	**Al scattering sample** Scattering sample made of ultra-high purity aluminium, Purity ≥ 999,99 ‰, For recording a scattering spectrum for all X-RAY instruments	603-846
	**Ni/Cu reference sample** Reference sample for monitoring the measurement devices, approx. 5 µm Ni on Cu.	603-565
	**Adjustment Plate XDV-µ** For the adjustment of the optical axis, for XDV-µ, XDV-µ WAFER, XDV-µ PCB	605-568
	**Adjustment Kit XDV-µ** Contains adjustment plate for the adjustment of the optical axis and pure elements plate, for XDV-µ, XDV-µ WAFER, XDV-µ PCB	605-542
	**Calibration holder** 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	850-229

X-RAY Accessories

Product	Description	Part No.
	**Drift correction sample for XAN 500** For correction of the spectra library (drift correction) on the mobile X-RAY XAN 500, saves new recording of the spectra library	605-518
	**Option Solution Analysis for XAN 500** 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	605-391
	**Measuring table inserts XAN** Replacement measuring table inserts for XAN 120 to XAN 250, 5 pieces per pack	603-301
	**Measuring table inserts foil replacement kit XUL/XULM** Contains two complete measuring table inserts: one with a large opening and one with a small opening, 1 Roll of foil (603-304), 1 Knife, 3 Replacement fixing rings, Manual, For all instruments XUL and XULM	600-026
	**Replacement foil for Measuring table inserts foil replacement kit XUL/XULM** Foil 150 mm x 10 m, for 600-026	603-304

Fischer Worldwide

Helmut Fischer GmbH
Institut für Elektronik und Messtechnik
71069 Sindelfingen, **Germany**

Helmut Fischer AG und
Helmut Fischer Technologie AG
CH-6331 Hünenberg, **Switzerland**

IfG-Institute for Scientific Instruments GmbH
12489 Berlin, **Germany**

Fischer Instrumentation (GB) Ltd
Lymington, Hampshire SO41 8JD, **England**

Fischer Technology, Inc.
Windsor, CT 06095, **USA**

Helmut Fischer S. de R.L. de C.V.
76230 Querétaro, QRO, **Mexico**

Fischer Instrumentation Electronique
78180 Montigny le Bretonneux, **France**

Helmut Fischer S.R.L.
20099 Sesto San Giovanni (Milano), **Italy**

Fischer Instruments, S.A.
08018 Barcelona, **Spain**

Helmut Fischer Meettechniek B.V.
5627 GB Eindhoven, **The Netherlands**

Fischer do Brasil
04711-030 São Paulo, **Brazil**

Fischer Instrumentation (Taiwan) Co., Ltd
Taipei City 11493, **Taiwan**

Fischer Instruments K.K.
Saitama-ken 340-0012, **Japan**

Nantong Fischer Instrumentation Ltd
Shanghai 200333, P.R. **China**

Fischer Instrumentation (Far East) Ltd
Kwai Chung, N.T., **Hong Kong**

Fischer Measurement Technologies (India) Pvt. Ltd
Pune 411057, **India**

Fischer Instrumentation (S) Pte Ltd
Singapore 658065, **Singapore**

Helmut Fischer Korea Co., Ltd
Seoul-City, **Republic of Korea**

Fischer Technology (M) SDN Bhd
47301 Petaling Jaya, **Malaysia**

Helmut Fischer Thailand Co., Ltd
Bangkok 10250, **Thailand**

Fischer Instruments Middle East FZE
P.O.Box Dubai 371100, **United Arab Emirates**

www.helmut-fischer.com

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