

CERTIFICATE OF REFERENCE MATERIAL

WN
Free cutting brass MO 59, MO60

The assigned certified values¹ and uncertainties²

	WN1	WN2	WN3	WN4	WN5
	%				
Pb	0.526	1.58	2.61	0.865	3.776
	±0.065	±0.19	±0.043	±0.034	±0.055
Sn	1.001	0.672	0.390	0.1335	0.0181
	±0.026	±0.044	±0.013	±0.0093	±0.0014
Mn	0.569	0.734	0.391	0.1280	0.0021
	±0.018	±0.0089	±0.0096	±0.0033	±0.00043
Al	0.331	0.244	0.1389	0.0477	-
	±0.011	±0.011	±0.0043	±0.0020	-
Fe	0.239	0.293	0.0623	0.1153	0.0084
	±0.014	±0.029	±0.0037	±0.0059	±0.0012
Si	0.157	0.219	0.1171	0.0358	-
	±0.011	±0.013	±0.0075	±0.0019	-
P	0.0306	0.0514	0.0340	0.0136	0.0050
	±0.0011	±0.0088	±0.0013	±0.00077	±0.00031
Sb	0.0975	0.1001	0.0203	0.0606	0.0035
	±0.0050	±0.0061	±0.00080	±0.0013	±0.00034
Bi	0.0239	0.0352	0.0203	0.0094	0.0027
	±0.0016	±0.0037	±0.00068	±0.00036	±0.00019
As	0.0353	0.0110	0.0317	0.0211	0.0296
	±0.0011	±0.00059	±0.0012	±0.0013	±0.00078
Ni	0.294	0.1935	0.0985	0.0496	0.0049
	±0.013	±0.0071	±0.0020	±0.0015	±0.00026
Cu	58.44	60.38	62.32	57.97	64.36
	±0.77	±0.67	±0.44	±0.91	±0.71

¹ Unweighted mean value of the means of accepted sets of data, each set being obtained in a different laboratory and/or with a different method of determination.

² The certified uncertainty is the expanded uncertainty with a coverage factor $k=2$, corresponding to a level of confidence of about 95 %.

Not certified values

	Si	Al	Zn
WN1 – WN5	-	-	The rest
WN5	mg/kg	mg/kg	-
	13 – 65	4 – 10	-

The certified reference material was developed within the project in co-operation with the National Institute of Standards and Technology NIST, USA

Signature

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INSTYTUT METALI NIEŻELAZNYCH
D Y R E K T O R

dr inż. Barbara Juszczyk

Description of the material:

The certified reference materials are available in the form of 40 mm diameter and 19 mm height discs.

Traceability:

The certified values are traceable to the SI via calibration using pure metals, certified monoelement standard solutions and certified reference materials i.e. BAM-M394 (CuZn40Pb2), produced by BAM Federal Institute for Materials Research and Testing, 31X 7835.6 (D) and 31X 7835.1 (T), produced by MBH Analytical LTD. All values were confirmed in an inter-laboratory comparison using independent analytical methods.

Analytical methods applied for characterization:

Cu - electrolytic, titration;

Pb - AAS, OES;

Sn - AAS, spectrophotometric with phenylfluoron, OES;

Mn - AAS, OES;

Al - AAS, spectrophotometric with ER, OES;

Fe - AAS directly and after co-precipitation on La(OH)₃, OES;

Si - gravimetric, spectrophotometric, OES;

P - titrimetric; spectrophotometric, OES;

Sb - AAS directly and after co-precipitation on Fe(OH)₃ at pH=4, OES;

Bi - AAS after co-precipitation with Fe(OH)₃, OES;

As - AAS after co-precipitation with Fe(OH)₃, OES;

Ni - AAS, spectrophotometric, OES.

Participating laboratories:

1. Łukasiewicz Research Network - Institute of Non-Ferrous Metals, Analytical Chemistry Department, Emission Spectrometry Laboratory, Gliwice, Poland
2. Łukasiewicz Research Network - Institute of Non-Ferrous Metals, Analytical Chemistry Department, Atomic Spectrometry Laboratory, Gliwice, Poland
3. Walcownia Metali Nieżelaznych "Łabędy" S.A., Gliwice, Poland
4. Zakłady Hutniczo-Przetwórcze Metali Nieżelaznych "HUTMEN", Wrocław, Poland
5. Walcownia Metali Dziedzice S.A., Czechowice-Dziedzice, Poland
6. Huta Metali Nieżelaznych Szopienice S.A., Katowice, Poland

Intended use:

The CRM is intended for establishing or checking the calibration of spark-OES and XRF for analysis of samples of similar matrix composition.

Minimum sample size:

Materials designed for spark-OES spectrometry, XRF spectrometry (>1 mm spot size). For other analytical techniques minimum 0.5 g of the CRM is required.

Instructions for storage and use:

Storage the material in a dry and clean environment at room temperature.

Transport under normal conditions.

The surface of CRM must be prepared by milling or turning on a lathe before every use. Samples should be prepared in the same way as the CRM.

Brief description of the production and certification process:

For the certification process random specimens were selected.

CRMs were made by melting of all components in the melting furnace and by continuous horizontal casting of rods 40 mm in diameter. Homogeneity investigations were made taking into account over 50 % of the material produced. Investigations were carried out using atomic emission spectrometry method with low voltage spark. Homogeneity was estimated statistically with application of the test F.

The certification of WN is valid 50 years, within the measurement uncertainties specified, provided the CRM is handled in accordance with the instructions given in this certificate.

Expired date:

50 years

Certificate Revision History: 31st of December 1993 (original certificate date); 30th of November 2023 (additional information about: expanded uncertainties, traceability, participating laboratories, methods used for certification, minimum sample size, instruction for storage and use and expire date was added change of graphic design)

Since 2018 our production of the certified reference materials is carried out in accordance with requirements of the ISO 17034 standard.

The Łukasiewicz Research Network —Institute of Non-Ferrous Metals holds an accreditation of the Polish Centre for Accreditation as a reference material producer according to ISO/IEC 17034 with certificate number RM 006.

Contact:

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