

MBH

ANALYTICAL LTD

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CERTIFICATE OF ANALYSIS

Reference Material Type NICKEL/COPPER - MONEL TYPE (CAST)

Catalogue Section: 212 X Sample No: NA 2 Batch No: G

Certified Values

ELEMENT	C	Si	S	P	Mn	Cu	Fe	Mg	Pb	Ni
%	0.07	2.50	0.023	0.019	1.06	29.6	1.53	0.008	0.02	(REM)

Form and Size: Disc 40mm diameter x 15mm thickness

Supplied by: MBH Analytical Limited

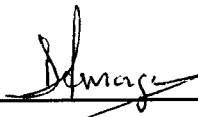
Produced by: Willan Metals Limited

Date of Certification: 21 June 1995

Intended Use: With Optical Emission and X-Ray Fluorescence Spectrometers.

Recommended Method of Use: Nickel Base Alloys are generally prepared by finishing (avoiding contamination with abrasives), milling or turning on a lathe (avoiding the use of lubricants) or lapping (using a suitable polishing media). However, users are recommended to follow the calibration and sample preparation procedures specified by the relevant instrument manufacturer. Preparation should be the same for reference materials and the samples for test. When using O.E. a minimum of three consistent replicate analyses is recommended to optimise precision and accuracy. Users are advised to check against possible bias between reference materials and production samples due to difference in metallurgical history and be aware of possible inter-element effect.

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Method of Preparation: This Reference Material was produced from pure metals and master alloys. The discs are the product of one melt poured into a single mould with a feeding system designed to ensure sound discs. Metal was removed from the cast surface of the discs to minimise surface effect.

Sampling: Samples were taken relative to the top and the bottom of the mould. Two discs were used for chemical analysis and were checked for homogeneity

Chemical Analysis Data:

Sample	C	Si	S	P	Mn	Cu	Fe	Mg	Pb
1	0.075	2.52	0.024	0.019	1.04	29.6	1.54	0.010	0.024
2	0.071	-	0.021	-	-	-	-	-	-
3	0.070	2.56	0.023	0.018	1.05	29.8	1.54	0.008	0.018
4	0.073	2.42	0.025	-	1.08	29.4	1.50	0.007	0.022
Mean:	0.072	2.50	0.023	0.019	1.057	29.6	1.527	0.008	0.021
Standard Dev.	0.002	0.072	0.001	-	0.020	0.200	0.023	0.001	0.003

Homogeneity: Two discs were taken relative to the top and bottom of the composite mould and each disc was checked on the face and back using an Optical Emission Spectrometer

Multiple sparkings were made on each surface, averaged and reported.

The mean value for the material was then calculated from these averages.

The difference between the reported average for each face and the overall mean value is tabulated below in % concentration for each element.

Disc from Top of Mould

Step	C	Si	S	P	Mn	Cu	Fe	Mg	Pb
Face	0.000	-0.03	+0.002	-0.001	-0.01	-0.125	+0.04	-0.002	-0.002
Back	-0.002	+0.02	-0.002	-0.001	+0.01	+0.075	-0.02	0.000	+0.002
Avge	-0.001	-0.01	0.000	-0.001	0.00	-0.025	+0.01	-0.001	0.000

Disc from Bottom of Mould

Step	C	Si	S	P	Mn	Cu	Fe	Mg	Pb
Face	+0.001	0.00	0.000	+0.001	0.00	-0.025	-0.01	+0.001	+0.001
Back	+0.001	+0.02	-0.001	+0.001	0.00	+0.075	-0.01	+0.001	-0.001
Avge	+0.001	+0.01	0.000	+0.001	0.00	+0.025	-0.01	+0.001	0.000

Participating Laboratories:

Rotech Lab. Services	Wednesbury, England	
Metals Tech. (Testing) Ltd	Sheffield, England	NAMAS Approval 0963
Willan Metals Limited	Rotherham, England	NAMAS Approval 0014
J B Elds Limited	Stoke-on-Trent, England	NAMAS Approval 1173

Analytical Methods Used:

Carbon		Combustion (IRD)
Silicon	(a)	Atomic Absorption
Sulphur		Combustion (IRD)
Phosphorus	(a)	Colorimetric
Manganese	(a)	Atomic Absorption
Copper	(a)	Atomic Absorption
Iron	(a)	Atomic Absorption
Magnesium		Atomic Absorption
Lead	(a)	Atomic Absorption

NOTE:

1. Some cast materials may exhibit shrinkage cavities on the back engraved surface of the disc. This does not effect the certified portion.
2. (a) overchecked by XRF
3. Confidence Limits

These are the upper and lower values between which the actual measurements will fall with a certain probability to a gaussian distribution

68.3% of the results will fall within ± 1 x Standard Deviation of the mean

95.4% of the results with fall within ± 2 x Standard Deviation of the mean

99.7% of the results will fall within ± 3 x Standard Deviation of the mean

The material to which the Certificate of Analysis refers is supplied subject to our general conditions of sale