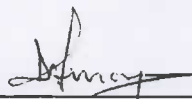


CERTIFICATE OF ANALYSIS**Reference Material Type** CORROSION RESISTANT CAST IRON (CAST)**Catalogue Section:** 11 X **Sample No:** 20003 **Batch No:** K**Certified Values**

ELEMENT	C	Si	S	P	Mn	Ni	Cr	Cu
%	2.91	3.03	0.007	0.17(4)	1.53	17.8	2.53	0.52

Form and Size: Disc 40mm diameter x 15mm thickness**Supplied by:** MBH Analytical Limited**Produced by:** Willan Metals Limited**Date of Certification:** 21 December 1994**Intended Use:** With Optical Emission and X-Ray Fluorescence Spectrometers.

Recommended Method of Use: Cast Irons are generally prepared by grinding. 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.

MBH ANALYTICAL LIMITEDV.A.T. REGISTERED No. GB 421 3295 82
Registered in England. Registered No. 1875653

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Registered Office: Regency House, 33 Wood Street, Barnet, Herts. EN5 4BE

CERT. No.
0524

Method of Preparation:

This Reference Material was produced from pure metals, ferro alloys 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	Ni	Cr	Cu
1	2.93	3.02	0.005	0.18	1.54	17.83	2.55	0.53
2	2.94	3.06	-	0.176	1.51	18.00	2.50	0.50
3	2.89	3.02	0.008	0.166	1.53	17.66	2.53	0.53
4	2.884	-	0.007	-	-	-	-	-
Mean:	2.911	3.033	0.007	0.174	1.527	17.83	2.527	0.52
Stand. Deviation:	0.028	0.023	0.001	0.007	0.015	0.170	0.025	0.017

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	Ni	Cr	Cu
Face	-0.01	+0.02	0.000	+0.005	0.00	+0.02	+0.02	0.00
Back	-0.01	-0.02	0.000	-0.002	-0.01	-0.06	0.00	0.00
Avg	-0.01	0.00	0.000	+0.001	0.00	-0.02	+0.01	0.00

Disc from Bottom of Mould

Step	C	Si	S	P	Mn	Ni	Cr	Cu
Face	+0.01	0.00	0.000	0.000	0.00	-0.01	-0.01	-0.01
Back	+0.01	0.00	0.000	-0.002	0.00	+0.04	-0.01	0.00
Avg.	+0.01	0.00	0.000	-0.001	0.00	+0.02	-0.01	0.00

Participating Laboratories:

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
Ross & Catherall Ltd	Killamarsh, England	NAMAS Approval 0178

Analytical Methods Used:

Carbon		Combustion	(IRD)
Silicon	(a)	Gravimetric	Atomic Absorption
Sulphur		Combustion	(IRD)
Phosphorus	(a)	Volumetric	Colorimetric
Manganese	(a)	Atomic Absorption	
Nickel	(a)	Atomic Absorption	Volumetric
Chromium	(a)	Volumetric	Atomic Absorption
Copper	(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 Certificates of Analysis refers is supplied subject to our general conditions of sale.