U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 100A

MANGANESE STEEL

(SAE T1345)

ANALYST*	C	Mn		P		S			Si								
	Direct combustion	Bismuthate ($FeSO_4$-$KMnO_4$)	Persulfate-Arsenite	Gravimetric (weighed as MgP_2O_7 after removal of arsenic)	Alkali-Molybdate [a]	Gravimetric (direct oxidation and precipitation after reduction of iron)	Evolution with HCl (I-J) ZnS-Iodine (theoretical sulfur titre) [b]	Combustion	Sulfuric acid dehydration	COPPER H_2S-CuS-CuO	NICKEL Weighed as nickel dimethylglyoxime	CHROMIUM $FeSO_4$-$KMnO_4$ titration	VANADIUM	MOLYBDENUM Colorimetric	ALUMINUM (total)	
1	0. 445	1. 66	1. 67	0. 021	[c] 0. 020	0. 026	0. 025	[d] 0. 026	[e] 0. 243	0. 051	0. 032	[f] 0. 048	[g] 0. 003	0. 008	[h] 0. 039	
2	. 443	1. 66		[i] . 020	. 020	. 026	[i] . 026		[e] [k] . 242	[l] . 048	. 031	. 048			[m] . 040	
3	. 441		[n] 1. 66	. 020	[n] . 020	. 029	[j] [o] . 029	[n] [p] . 028	[e] . 241	. 052	. 030	. 052			[q] . 042	
4	. 451	1. 64	1. 64	. 019	. 020	. 026	[i] . 025		[e] . 243	[r] . 047	[s] . 032	. 053			[t] . 039	
5	. 451		[n] 1. 66		[n] . 020		[n] [u] . 028	[n] [p] . 028	[v] . 248	[w] . 050	. 031	[x] . 049				
6	. 449		1. 68	. 020	. 022	. 027	[i] . 028		[e] . 241	. 053	. 036	. 055			[h] . 041	
Averages	**0. 447**	**1. 65**	**1. 66**	**0. 020**	**0. 020**	**0. 027**	**0. 027**	**0. 027**	**0. 243**	**0. 050**	**0. 032**	**0. 051**	**0. 003**	**0. 008**	**0. 040**	
General average	**0. 447**	**1. 66**		**0. 020**		**0. 027**			**0. 243**	**0. 050**	**0. 032**	**0. 051**			**0. 040**	

[a] Titrated at 40° C, washed with a 1-percent solution of KNO_3 and titrated with alkali standardized by the use of acid potassium phthalate and the ratio 23 NaOH:1P.

[b] Value obtained by standardizing the titrating solution by means of sodium oxalate through $KMnO_4$ and $Na_2S_2O_3$ and use of the ratio 2I:1S.

[c] Molybdenum-blue photometric method. See J. Research NBS **26**, 405 (1941) RP1386.

[d] 1-g sample burned in oxygen at 1,400° C, and sulfur dioxide absorbed in starch-iodine solution. Iodine liberated from iodide by titration, during the combustion, with standard KIO_3 solution based on 93 percent of the theoretical factor.

[e] Double dehydration with intervening filtration.

[f] Persulfate oxidation and potentiometric titration with ferrous ammonium sulfate.

[g] Vanadium separated from the bulk of iron in a 10-g sample by selective precipitation with sodium bicarbonate, then oxidized with HNO_3 and titrated potentiometrically with ferrous ammonium sulfate.

[h] Bicarbonate-H_2S-NaOH-Al_2O_3 method.

[i] Weighed as ammonium phosphomolybdate.

[j] Absorbed in ammoniacal cadmium chloride.

[k] Nitric-sulfuric acid dehydration.

[l] Copper-ammonia complex photometric method.

[m] Bicarbonate-NaOH-8-hydroxyquinoline-bromate titration method.

[n] Titrating solution standardized by use of a standard steel.

[o] Evolution with concentrated HCl.

[p] As in (d), except sample burned at 1,320° C.

[q] Bicarbonate-NaOH-H_2S-$Al(OH)_3$-$AlPO_4$ method.

[r] Finished by electrolysis.

[s] Dimethylglyoxime precipitation, cyanide titration method.

[t] As in (h), except aluminum finally precipitated and weighed as $AlPO_4$.

[u] Solution with diluted HCl (2:1).

[v] Perchloric acid dehydration.

[w] Iodide-thiosulfate titration method.

[x] Perchloric acid photometric method.

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