

# National Bureau of Standards

## Certificate of Analyses

### Standard Sample 100B Manganese Steel

ANALYST	C	Mn	P		S			Si	Cu	Ni	Cr	V	Mo	N
	Direct combustion	Persulfate-Arsenite	Gravimetric (weighed as $Mg_2P_2O_7$ after removal of arsenic)	Alkali-Molybdate <sup>a</sup>	Gravimetric (direct oxidation and precipitation after reduction of iron)	Combustion-Iodate titration	Evolution with HCl (1+1) ZnS-Iodine (theoretical sulfur titer) <sup>b</sup>	Perchloric acid dehydration		Weighted as nickel dimethylglyoxime	$FeSO_4$ - $KMnO_4$ titration		Colorimetric	Distillation-titration
1.....	0.395	1.89	0.021	0.025	0.030	0.028	0.030	0.213	0.064	0.029	0.063	0.003	0.238	0.004
2.....	.394	1.91	.021	.021	.028	.028		.209	.068	.028	.063	.003	.235	.004
3.....	.407	1.89		.024	.030	.029	.028	m, f, .21	n, .063	o, .030	p, .062	q, .003	.239	.005
4.....	.401	1.90		.023	.027	.027	.028	f, .207	r, .063	.029	p, .064	s, .003	.242	k, .005
5.....	.392	1.88	.023	1.023	.029		.027	m, .219	t, .060	u, .030	.061	v, .003	.233	
6.....	.392	1.88	.023	1.022	.030	1.030		m, .217	t, .058	u, .029	.058	v, .003	.229	
7.....	.397	1.87		w, .024			.026	.196	x, .076	o, .034	y, .068	k, .001	.243	
Averages.....	0.397	1.89	0.022	0.023	0.029	0.028	0.028	0.210	0.064	0.030	0.063	0.003	0.237	0.004
General Average.....	0.397	1.89	0.023		0.028		0.210	0.064	0.030	0.063	0.003	0.237	0.004	

<sup>a</sup> Precipitated 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 23NaOH:1P.

<sup>b</sup> Value obtained by standardizing the titrating solution by means of sodium oxalate through  $KMnO_4$  and  $Na_2S_2O_8$  and use of the ratio 21:1S.

<sup>c</sup> Potentiometric titration.

<sup>d</sup> Molybdenum-blue photometric method. See J. Research NBS 26, 405 (1941), RP1386.

<sup>e</sup> 1-g sample burned in oxygen at 1,425°C and sulfur dioxide absorbed in starch-iodide solution. Iodine liberated from iodide by titration, during the combustion, with standard  $KIO_3$  solution. Titer based on 93 percent of the theoretical factor.

<sup>f</sup> Double dehydration with intervening filtration.

<sup>g</sup> Diethyldithiocarbamate photometric method. See J. Research NBS 47, 380 (1951), RP2265.

<sup>h</sup> Chromium separated from the bulk of the iron in a 10-g sample by hydrolytic precipitation with  $NaHCO_3$ , oxidized with persulfate, and titrated potentiometrically with ferrous ammonium sulfate.

<sup>i</sup> Vanadium separated as in (h), oxidized with  $HNO_3$ , and titrated potentiometrically with ferrous ammonium sulfate.

<sup>j</sup> Sulfuric acid digestion for 4 hr of a 0.5-g sample. See J. Research NBS 43 201 (1949) RP2021.

<sup>k</sup> Photometric method.

<sup>l</sup> Titrating solution standardized with a standard steel.

<sup>m</sup> Sulfuric acid dehydration.

<sup>n</sup> Copper-ammonia-complex photometric method.

<sup>o</sup> Dimethylglyoxime photometric method.

<sup>p</sup> Diphenylcarbazide photometric method.

<sup>q</sup>  $NaHCO_3$ - $FeSO_4$ - $(NH_4)_2S_2O_8$ - $KMnO_4$  method.

<sup>r</sup>  $H_2S$ - $CuS$ - $CuO$ .

<sup>s</sup>  $H_2S$ - $MoS_2$ - $MoO_3$ .

<sup>t</sup>  $CuS$  precipitated with  $Na_2S_2O_8$ , and copper determined by electrolysis.

<sup>u</sup> Dimethylglyoxime precipitate ignited to  $NiO$ .

<sup>v</sup> Vanadium precipitated with cupferron and determined by the  $FeSO_4$ - $(NH_4)_2S_2O_8$ - $KMnO_4$  method.

<sup>w</sup> Molybdenum-blue photometric method.

<sup>x</sup> Neocuproine photometric method.

<sup>y</sup> Perchloric acid-photometric method.

### List of Analysts

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