

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards
Certificate of Analyses
Standard Sample 30 E
Chromium-Vanadium Steel

ANALYST	C	Mn		P		S			Si	Cu	Ni	Cr	V	Mo	N
	Direct combustion	Bismuthate (FeSO ₄ -KMnO ₄)	Persulfate-Arsenite	Gravimetric (weighed as Mg ₂ P ₂ O ₇ after removal of arsenic)	Alkali-Molybdate ^a	Gravimetric (direct oxidation and precipitation after reduction of iron)	Combustion	Evolution with HCl (1-1) ZnS-Iodine (theoretical sulfur titer) ^b	Perchloric acid dehydration	H ₂ S-CuS-CuO	Weighed as nickel dimethylglyoxime	Persulfate oxidation (FeSO ₄ -KMnO ₄ titration)	HNO ₃ oxidation, potentiometric titration	Photometric	Distillation-titration
1.....	0.501		0.783	0.028	0.026	0.036	0.036	0.037	0.273	0.092	0.027	0.936	0.148	0.007	0.007
2.....	.508		.795	.027	.027	.034	.035	.034	.271	.091	.026	.932	.146	.009	
3.....	.506		.778	.028	.028	.037	.037	.037	.264	.094	.026	.939	.147	.008	
4.....	.506		.793	.024	.024	.036	.037	.035	.264	.096	.027	.935 .939	.152	.006	
5.....	.505		.790		{.026 .025}		.035		.274	.110	.026	.933	.148	.007	
	.506		.778		.028		.037		.269	{.092 .091}	.026	.933	.150	.007	
	.506		.780		.027		.037		.269	.099	.028	.933	.147	.007	
8.....	.503	.789	.787	.024	.024	.035	.036		.270	.092	.029	.932	.150	.007	
9.....	.502		.788	.026	.026	.033	.033		.269	.092	.028	.929	.152	.005	
10.....	.510		.791	.024	.024	.034	.035		.266	.091	.024	.937	.148	.008	
Average.....	0.505	0.789	0.786	0.028	0.026	0.035	0.036	0.036	0.269	0.094	0.027	0.934	0.149	0.007	
General average.....	0.505	0.786		0.026		0.036			0.269	0.094	0.027	0.934	0.149	0.007	

^a Precipitated at 40° C, washed with a 1-percent solution of KNO₃ and titrated with alkali standardized by the use of acid potassium phthalate and the ratio 23NaOH:1P.
^b Value obtained by standardizing the titrating solution by means of sodium oxalate through KMnO₄ and Na₂S₂O₄ and use of the ratio 21:15.
^c Molybdenum-blue photometric method. See J. Research NBS 26, 405 (1941) RP1386.
^d 1-g sample burned in oxygen at 1425° C and sulfur dioxide absorbed in starch-iodine solution. Iodine liberated from iodide by titration, during the combustion, with standard KIO₃ solution. Titer based on 93 percent of the theoretical factor.
^e Double dehydration with H₂SO₄ with intervening titration.

^f Diethyldithiocarbamate photometric method. See J. Research NBS 47, 380 (1951) RP2265.
^g Potentiometric titration with Fe(NH₄)₂(SO₄)₂.
^h Sulfuric acid digestion for 4 hours of 0.5g-sample. See J. Research NBS 43, 201 (1949) RP2021.
ⁱ Titrating solution standardized with a standard steel.
^j Sulfur gases absorbed in neutral H₂O₂, and titrated with NaOH.
^k Double dehydration.
^l Finished by electrolysis.
^m Vanadium separated from iron by precipitation as the phosphovanadate, and determined by the KMnO₄-(NH₄)₂S₂O₈ method.
ⁿ H₂S-MoS₂-MoO₃.
^o Chromium volatilized as CrO₂Cl₂.

^p Absorbed in ammoniacal cadmium chloride.
^q Dimethylglyoxime precipitate titrated with cyanide.
^r Vanadium titrated with KMnO₄ after addition of K₂HPO₄.
^s Chromium removed by precipitation with ZnO.
^t Copper-ammonia complex-photometric method.
^u Perchloric acid oxidation.
^v FeSO₄-(NH₄)₂S₂O₈-KMnO₄ method.
^w Dimethylglyoxime-photometric method.
^x H₂O₂-photometric method.
^y Titration with sodium arsenite.
^z Vanadium precipitated with cupferron, oxidized with perchloric acid and titrated with FeSO₄-KMnO₄.
^{aa} Alpha-benzoinoxime method.

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