

Ministry of Industrial Policy of Ukraine

**Ukrainian Special Steels Institute
JSC "Metal and Quality"**

**CERTIFICATE OF ANALYSIS
CRM C020 - CRM C024**

Set for Spectral Analysis of High Manganese Steel

INFORMATION

Certified Reference Materials of High Manganese Steel (Hadfield Steel) - set for spectral analysis (Ukrainian Branch Standard Sample GSZU No. 3.198-2010)

Produced in conformity to the Certificate No. 27.10-180, authorized by the Ministry of Industrial Policy of Ukraine

APPLICABILITY

The CRMs C020 - C024 is intended for calibration of measuring means, for the control of errors of measurements methods at definition of chemical compound of high manganese steels by Optical Emission and X-Ray Spectrometry

DEVELOPER AND MANUFACTURER

State enterprise "Ukrainian Special Steels Institute" in cooperation with Joint-Stock Company "Metal and Quality"

CERTIFIED VALUES (bold)

Mass fraction in % by weight	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	V
C020	0,97	0,091	8,85	0,024	0,015	0,96	0,13	1,36	0,53	0,152
C021	1,32	0,105	11,23	0,035	0,010	0,62	0,096	0,36	0,32	0,124
C022	1,15	0,34	12,89	0,087	0,0057	0,192	0,03	0,122	0,103	0,03
C023	0,79	0,291	13,09	0,052	0,0062	0,313	0,02	3,15	0,111	0,02
C024	0,88	0,531	16,95	0,068	0,0100	1,62	0,29	0,66	0,72	0,29

Italics - approximate value.

Estimate of uncertainty (confidence 0,95)	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	V
C020	0,01	0,007	0,09	0,001	-	0,01	0,02	0,03	0,02	0,003
C021	0,01	0,009	0,08	0,001	0,002	0,01	0,007	0,01	0,01	0,005
C022	0,01	0,01	0,07	0,002	0,0008	0,007	-	0,008	0,003	-
C023	0,01	0,008	0,08	0,002	0,0009	0,007	-	0,04	0,006	-
C024	0,01	0,015	0,08	0,002	0,0009	0,06	0,02	0,03	0,005	0,002

The certified values and uncertainty are calculated in accordance with the national standard DSTU GOST 8.532-2003

Indicative content

Mass fraction in % by weight	Al	Nb	N	B	Ti
C020	0,004	0,02	0,020	0,002	0,003
C021	0,003	0,03	0,013	0,002	0,005
C022	0,007	0,01	0,013	0,001	0,006
C023	0,006	0,02	0,018	0,001	0,004
C024	0,004	0,10	0,021	0,003	0,006

SPECIFICATION

CRMs are made from forged and heat-treated steels in cylinders form, 38-42 mm in diameter and 20-25 mm thick

HOMOGENEITY

The homogeneity was evaluated according to standard DSTU GOST 8.531:2002 "Reference materials of composition of solid and disperse materials. Ways of homogeneity assessment".

TRACEABILITY

The traceability of CRMs C020 - C024 established in accordance with ISO Guide 30-35. The characterisation of CRMs achieved by means inter-laboratory experiment. Average results of chemical methods have been obtained by two analysts, from 3 to 6 measurements by each. Average results of spectral methods have been obtained from 10 measurements. At analyses used standardized and certified methods of analysis: combustion coulometric and infrared, potentiometric, titrimetric, photometric, ICP-OES, F-AAS, Spark-OES, JDS-OES, XRF.

At analysis reference materials were used: ICRM CRM C51g, BAM ECRM 235-1, BAS SS-CRM 491/2, BAS SS-CRM 491/2, SS-CRM 493/2, BAS SS-CRM 494/2, BAS SS-CRM 495/3, BAS SS-CRM 495/4, MBH CRM 14XMN1 - 14XMN5, Brammer BS18A

CRM VALIDITY

Term of fitness CRM: unlimited, at the observance of terms of storage and application

DATE OF ISSUE

August, 2010

DELIVERY

CRM, packed into a box and the Certificate

SAFETY

The reference material and packing do not contain substances which can directly influence health

PARTICIPATING LABORATORIES

OJSC "Dnepropetsstal", Ukraine	http://www.dss.com.ua
OJSC "Ilyich Iron and Steel Works", Ukraine	http://www.ilyich.com.ua
"Kerch Switch Plant Ltd.", Ukraine	http://www.railwaybuild.org
OJSC "Dnepropetrovsk Pointer Factory", Ukraine	http://www.dsz.dp.ua/en-index.htm
State enterprise "Ukrainian Special Steels Institute"	http://ussi.nm.ru
OJSC "MECHEL", Russia	http://www.mechel.com
OJSC "UralSteel", Metalloinvest, Russia	http://www.metallinvest.ru/eng
OJSC "Alchevsk Iron & Steel Works", Ukraine	http://www.amk.lg.ua/eng
OJSC "REGOM", Ukraine	http://2592.ua.all-biz.info
"SPL-Bohumin", Czech Republic	http://www.spl-bohumin.cz/eng/index.htm
"Federal Institute for Materials Research and Testing (BAM)", Germany	http://www.bam.de
CJSC "KZGO" Mountain Equipment Works, Ukraine	http://www.kzgo.dp.ua

CONTACTS

Dr. Ustimenko V.N.
Patrioticheskaya street,
Zaporozhye, 69005,
Ukraine
Tel/fax: +38 061 2794977
rm@rm.co.ua
www.rm.co.ua



ANALYSES CRM C024

C024	No.	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	V	B	Ti	Nb
	1	0,854	0,495	16,59	0,0652	0,0083	1,505	0,267	0,587	0,650	0,256	0,0027	0,0042	0,092
	2	0,863	0,505	16,65	0,0663	0,0094	1,540	0,270	0,597	0,667	0,260	0,0032	0,0052	0,102
	3	0,870	0,513	16,77	0,0678	0,0095	1,587	0,279	0,635	0,670	0,277	0,0035	0,0070	0,106
	4	0,870	0,520	16,79	0,0680	0,0096	1,590	0,281	0,644	0,685	0,301	0,0048	0,0072	0,120
	5	0,873	0,533	16,87	0,0690	0,0097	1,603	0,282	0,658	0,689	0,309			
	6	0,873	0,535	16,90	0,0693	0,0106	1,624	0,293	0,660	0,776	0,311			
	7	0,875	0,539	16,91	0,0711	0,0110	1,663	0,314	0,680	0,793	0,317			
	8	0,888	0,552	16,92	0,0712	0,0120	1,748	0,330	0,690	0,810				
	9	0,896	0,553	16,92			1,755		0,699					
	10	0,897	0,561	16,95					0,720					
	11	0,898	0,566	17,01					0,734					
	12	0,922		17,05										
	13			17,06										
	14			17,08										
	15			17,19										
	16			17,20										
Mm		0,882	0,534	16,93	0,0685	0,0100	1,62	0,29	0,664	0,718	0,290	0,0036	0,0059	0,11
SD		0,019	0,023	0,17	0,0021	0,0011	0,09	0,02	0,047	0,064	0,025	0,0009	0,0014	0,01

Mm - Mean of the intralaboratory means

SD - Standard deviation of the intralaboratory means

