

Metal and Quality LLC
CERTIFICATE OF ANALYSIS
DSZU LG53b
High Manganese Steel



INFORMATION Certified Reference Material LG53b is intended for calibration of measuring instruments at definition of chemical composition of high manganese steels by using of Optical Emission Spectrometry method

MANUFACTURER Metal and Quality, LLC

CERTIFIED	C	Si	Mn	P	S	Cr	Ni	Cu	Mo	V	Al	Nb	N
Mass fraction in % M(M)	1.15	0.375	12.68	0.0497	0.0073	0.417	0.201	0.137	0.023	0.022	0.017	<i>0.015</i>	<i>0.015</i>
Uncertainty C(95%)	0.02	0.010	0.03	0.0013	0.0007	0.010	0.006	0.004	0.002	0.002	0.002	-	-

Italics - approximate values

Uncertainty C(95%) estimated as the half-width confidence interval of Student's t-distribution, when n is the number of laboratory means (see next page)

$$C(95\%) = \frac{t \cdot s(M)}{\sqrt{n}}$$

SPECIFICATION Reference material is made of forged steel in the form of cylinders diameter of 40 mm, height 20 mm.

HOMOGENEITY The homogeneity was evaluated according ISO Guide 35:2017 - Reference materials - Guidance for characterization and assessment of homogeneity and stability. This reference material was tested for homogeneity using OES method and found acceptable

TRACEABILITY The traceability of LG53b established in accordance with ISO Guide 30-35. The metrological characteristics of LG53b were obtained on the basis of multiple comparative measurements with the CRM LG53 by optical emission method followed by an inter-laboratory experiment. At analyses applied standardized and certified methods of analysis, certified reference materials were used

RM VALIDITY Shelf life of CRM: unlimited. The working surface of the sample should be purified before use. Reference material will remain stable provided that it is not subjected to excessive heat (e.g. during preparation of the working surface)

DATE OF ISSUE August 2024

DELIVERY CRM, packed into a box and certificate

SAFETY A Safety Data Sheet (SDS) is not required for LG53b. Reference Material LG53b and packing does not contain hazardous chemical, explosives and radioactive substances and substances which might influence health and the environment

LABORATORY MEANS, mass fraction in %

n	C	Si	Mn	P	S	Cr	Ni	Cu	Mo	V	Al	Nb	N
1	1.107	0.353	12.61	0.0463	0.0059	0.380	0.190	0.129	0.0166	0.0188	0.0150	0.0105	0.0130
2	1.135	0.357	12.63	0.0480	0.0067	0.396	0.191	0.130	0.0175	0.0200	0.0159	0.0119	0.0164
3	1.136	0.360	12.63	0.0490	0.0070	0.408	0.193	0.133	0.0220	0.0200	0.0160	0.0134	
4	1.140	0.365	12.64	0.0490	0.0071	0.415	0.194	0.134	0.0227	0.0201	0.0162	0.0178	
5	1.140	0.366	12.66	0.0490	0.0071	0.418	0.195	0.135	0.0230	0.0207	0.0163	0.0200	
6	1.149	0.376	12.69	0.0492	0.0073	0.421	0.197	0.137	0.0240	0.0211	0.0186		
7	1.150	0.376	12.70	0.0494	0.0078	0.423	0.199	0.138	0.0243	0.0230	0.0190		
8	1.155	0.377	12.70	0.0500	0.0080	0.423	0.201	0.140	0.0250	0.0230	0.0222		
9	1.158	0.379	12.72	0.0515	0.0090	0.427	0.202	0.142	0.0250	0.0232			
10	1.165	0.388	12.72	0.0520		0.428	0.209	0.144	0.0260	0.0240			
11	1.168	0.396	12.75	0.0530		0.432	0.217	0.145		0.0275			
12	1.175	0.406				0.439	0.219						
M(M)	1.148	0.375	12.68	0.0497	0.0073	0.417	0.201	0.137	0.0226	0.0219	0.0174	<i>0.0147</i>	<i>0.0147</i>
s(M)	0.018	0.016	0.046	0.0019	0.0009	0.016	0.010	0.005	0.0032	0.0025	0.0024	<i>0.0040</i>	<i>0.0024</i>

M(M) - Mean of intralaboratory means

s(M) - Standard deviation of the mean values of laboratories

PARTICIPATING LABORATORIES

ArcelorMittal Krivy Rig PJSC

Dneprospetsstal (DSS) JSC

Dnepropress Steel LTD

Dnieper Railway Switch Plant JSC

Dniprovsky metallurgical plant (DMZ) JSC

Interpipe Steel (Dniprostal) LTD

Metal and Quality LLC

Motor Sich PJSC

Zaporozhye Steel Works LTD

Zaporizhstal PJSC

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