

**Metal and Quality, LLC**  
**CERTIFICATE OF ANALYSIS**  
**Certified Reference Materials LG51 – LG55**  
**Set for Spectral Analysis of High Manganese Steels**



#### INFORMATION

**Certified Reference Materials of High Manganese steels LG51 – LG55 - Set for Spectral Analysis**, produced in conformity to the Approval Certificate, authorized by State Committee of Ukraine for Technical Regulation and Consumer Policy.

#### APPLICABILITY

The CRMs LG51 – LG55 are intended for verification, calibration of measuring instruments, for metrological certification and control of measurements methods at definition of chemical composition of High Manganese steels by using of Optical Emission and X-ray Spectrometry methods

#### DEVELOPER AND MANUFACTURER

Metal and Quality JSC (Ukraine)

#### CERTIFIED VALUES

Mass fraction in % by weight (**bold**)

| No.  | C           | Si           | Mn          | P            | S             | Cr           | Ni           | Mo           | V             | Cu           | Nb           | B             | N            | Al           |
|------|-------------|--------------|-------------|--------------|---------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------|--------------|--------------|
| LG51 | <b>0,98</b> | <b>0,09</b>  | <b>8,9</b>  | <b>0,024</b> | <b>0,016</b>  | <b>0,97</b>  | <b>1,37</b>  | <b>0,157</b> | <b>0,151</b>  | <b>0,53</b>  | <b>0,011</b> | <b>0,0010</b> | <b>0,023</b> | <i>0,004</i> |
| LG52 | <b>1,33</b> | <b>0,11</b>  | <b>11,2</b> | <b>0,034</b> | <b>0,012</b>  | <b>0,62</b>  | <b>0,36</b>  | <b>0,096</b> | <b>0,121</b>  | <b>0,31</b>  | <b>0,023</b> | <b>0,0016</b> | <b>0,013</b> | <i>0,003</i> |
| LG53 | <b>1,15</b> | <b>0,35</b>  | <b>12,9</b> | <b>0,087</b> | <b>0,0056</b> | <b>0,197</b> | <b>0,121</b> | <b>0,010</b> | <b>0,0104</b> | <b>0,100</b> | <i>0,01</i>  | <i>0,0010</i> | <b>0,013</b> | <i>0,007</i> |
| LG54 | <b>0,78</b> | <b>0,292</b> | <b>13,1</b> | <b>0,051</b> | <b>0,0061</b> | <b>0,32</b>  | <b>3,15</b>  | <b>0,018</b> | <b>0,0211</b> | <b>0,109</b> | <i>0,02</i>  | <i>0,0013</i> | <b>0,020</b> | <i>0,006</i> |
| LG55 | <b>0,88</b> | <b>0,54</b>  | <b>16,9</b> | <b>0,069</b> | <b>0,010</b>  | <b>1,65</b>  | <b>0,66</b>  | <b>0,30</b>  | <b>0,326</b>  | <b>0,69</b>  | <b>0,10</b>  | <b>0,0037</b> | <i>0,021</i> | <i>0,004</i> |

*Italics - approximate value*

#### Uncertainty (confidence 0.95)

| No.  | C    | Si    | Mn  | P     | S      | Cr    | Ni    | Mo    | V      | Cu    | Nb    | B      | N     |
|------|------|-------|-----|-------|--------|-------|-------|-------|--------|-------|-------|--------|-------|
| LG51 | 0.03 | 0.02  | 0.2 | 0.001 | 0.001  | 0.01  | 0.02  | 0.002 | 0.005  | 0.01  | 0.002 | 0.0004 | 0.002 |
| LG52 | 0.03 | 0.02  | 0.2 | 0.002 | 0.002  | 0.01  | 0.01  | 0.004 | 0.004  | 0.01  | 0.005 | 0.0006 | 0.002 |
| LG53 | 0.01 | 0.01  | 0.1 | 0.003 | 0.0007 | 0.005 | 0.006 | 0.001 | 0.0006 | 0.004 | -     | -      | 0.002 |
| LG54 | 0.01 | 0.006 | 0.1 | 0.002 | 0.0006 | 0.01  | 0.03  | 0.001 | 0.0006 | 0.004 | -     | -      | 0.002 |
| LG55 | 0.02 | 0.01  | 0.1 | 0.003 | 0.001  | 0.03  | 0.02  | 0.01  | 0.005  | 0.01  | 0.01  | 0.0006 | -     |

#### SPECIFICATION

CRMs are made from forged and heat-treated steels in cylinders form, 38-42 mm diameter and 19 - 25 mm thick

#### HOMOGENEITY

The homogeneity was evaluated according to ISO Guide 35:2006 (7.7. Evaluating a homogeneity study) and DSTU GOST 8.531:2002 "Reference materials of composition of solid and disperse materials. Ways of homogeneity assessment"

#### TRACEABILITY

The traceability of CRMs LG51 - LG54 established in accordance with ISO Guide 30-35. The characterization of CRMs achieved by means inter-laboratory experiment. At analyses applied standardized and certified methods of analysis: combustion coulometric and infrared, potentiometric, titrimetric, photometric, ICP-OES, F-AAS, Spark-OES, JDS-OES, XRF. In analysis reference materials were used: ECRM BAM 235-1, ICRM CRM C51g, BAS SS-CRM 491/2, BAS SS-CRM 491/2, BAS 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**

February 2013

## **DELIVERY**

CRM, packed into a box and Certificate

## **SAFETY**

The reference material and packing does not contain explosives and radioactive substances and substances which might influence health and the environment

## **PARTICIPATING LABORATORIES**

**Ukraine:** JSC "Dneprospetsstal", JSC "Ilyich Iron and Steel Works", "Kerch Switch Plant Ltd.", JSC "Dnepropetrovsk Pointer Factory", State enterprise "Ukrainian Special Steels Institute", JSC "Alchevsk Iron and Steel Works", JSC "REGOM", JSC Mountain Equipment Works ("KZGO")

**Russia:** JSC "MECHEL", JSC "UralSteel", Zlatoust Metallurgical Works, Uralmash Machine-Building Corporation, JSC "Ural Institute of Metals", Institute of Metallurgy Ural Branch of the Russian Academy of Sciences, Gorky Automobile Plant, Institute for Certified Reference Materials

**Germany:** Federal Institute for Materials Research and Testing (BAM)

**Poland:** Institute for Ferrous Metallurgy

**Czech Republic:** Třinecké železářny a.s, Vítkovice testing center Ltd., ZPS Zlin Malenovice Metso Minerals (Wears) a.s.

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