

# CERTIFICATE OF ANALYSIS

## IMZ 53/1

### REFERENCE MATERIAL OF STEEL

Analysis listed as percent by weight [% m/m]

|    |       |
|----|-------|
| C  | 0.41  |
| Mn | 0.60  |
| Si | 0.104 |
| P  | 0.018 |
| S  | 0.011 |
| Cr | 2.85  |
| Ni | 0.28  |
| Cu | 0.17  |
| Mo | 0.13  |
| V  | 0.28  |

Certificate Number: IMZ 53-1-200824

Certificate revision history on page 3

| Analysis | % C   | % Mn | % Si  | % P   | % S   | % Cr | % Ni | % Cu | % Mo | % V  |
|----------|-------|------|-------|-------|-------|------|------|------|------|------|
| 1        | 0.40  | 0.57 | 0.090 | 0.015 | 0.009 | 2.73 | 0.26 | 0.14 | 0.11 | 0.25 |
| 2        | 0.40  | 0.57 | 0.094 | 0.015 | 0.009 | 2.75 | 0.26 | 0.16 | 0.11 | 0.26 |
| 3        | 0.40  | 0.58 | 0.097 | 0.016 | 0.009 | 2.80 | 0.27 | 0.16 | 0.11 | 0.27 |
| 4        | 0.40  | 0.59 | 0.098 | 0.017 | 0.010 | 2.81 | 0.27 | 0.17 | 0.12 | 0.27 |
| 5        | 0.41  | 0.59 | 0.098 | 0.017 | 0.010 | 2.82 | 0.27 | 0.17 | 0.12 | 0.27 |
| 6        | 0.41  | 0.60 | 0.100 | 0.018 | 0.010 | 2.85 | 0.27 | 0.17 | 0.12 | 0.27 |
| 7        | 0.41  | 0.60 | 0.104 | 0.018 | 0.010 | 2.85 | 0.27 | 0.18 | 0.13 | 0.27 |
| 8        | 0.41  | 0.61 | 0.104 | 0.018 | 0.011 | 2.85 | 0.27 | 0.18 | 0.13 | 0.28 |
| 9        | 0.41  | 0.61 | 0.104 | 0.019 | 0.011 | 2.85 | 0.27 | 0.18 | 0.13 | 0.28 |
| 10       | 0.41  | 0.61 | 0.106 | 0.019 | 0.012 | 2.87 | 0.28 | 0.18 | 0.13 | 0.28 |
| 11       | 0.41  | 0.62 | 0.110 | 0.019 | 0.012 | 2.89 | 0.28 | 0.18 | 0.13 | 0.28 |
| 12       | 0.41  | 0.62 | 0.110 | 0.020 | 0.012 | 2.89 | 0.28 | 0.18 | 0.13 | 0.29 |
| 13       | 0.41  | 0.63 | 0.110 | 0.020 | 0.012 | 2.89 | 0.29 | 0.18 | 0.14 | 0.29 |
| 14       | 0.42  | 0.63 | 0.118 | 0.020 | 0.013 | 2.96 | 0.29 | 0.19 | 0.15 | 0.29 |
| 15       | 0.42  | 0.63 | 0.120 | 0.016 | 0.015 | 3.00 | 0.30 | 0.19 | 0.15 | 0.31 |
| Average  | 0.41  | 0.60 | 0.104 | 0.018 | 0.011 | 2.85 | 0.28 | 0.17 | 0.13 | 0.28 |
| C(95%)   | 0.003 | 0.01 | 0.005 | 0.001 | 0.001 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 |

$C(95\%) = (t \cdot SD) / \sqrt{n - 1}$  - The half-width confidence interval, calculated for the 95 % confidence level, where  $t$  is the appropriate Student's  $t$  value,  $SD$  is the interlaboratory standard deviation and  $n$  is the number of acceptable mean values.

**Chemical Analysis:** Chemical analyses were carried out on chips prepared by milling of the certified portion of the bars. Single values in the above table are the means obtained by individual laboratories. The following methods were used for analysis:

- C** - coulometric, infrared absorption, volumetric, spectroscopic,
- Mn** - atomic absorption spectroscopy, titrimetric with arsenite after oxidation with persulphate/silver nitrate, spectroscopic,
- Si** - photometric as molybdenum blue, gravimetric, spectroscopic,
- P** - photometric as phosphovanadomolybdate, titrimetric, photometric with extraction,
- S** - combustion, infrared absorption, iodometric, alkalimetric,
- Cr** - atomic absorption spectroscopy, photometric with diphenylcarbazide, polarographic after removal of iron by extraction,
- Ni** - atomic absorption spectroscopy, photometric with dimethylglyoxime, polarographic,
- Cu** - atomic absorption spectroscopy, photometric with diethyldithiocarbamate, spectroscopic, photometric with extraction, polarographic direct,
- Mo** - atomic absorption spectroscopy, photometric,
- V** - atomic absorption spectroscopy, photometric with N benzoyl -N phenylhydroxylamine, photometric with hydrogen peroxide.

**The laboratories participating in the testing of this Reference Material were:**

- Instytut Metalurgii Żelaza, Zakład Chemii Analitycznej, Gliwice, Poland
- Instytut Odlewnictwa, Zakład Laboratoriów, Kraków, Poland
- Huta Baildon, Zakład Badawczo - Technologiczno - Hutniczy, Katowice, Poland
- Huta Batory, Zakład Badawczo - Rozwojowy, Chorzów, Poland
- Huta Częstochowa, Centralne Laboratorium Chemiczne, Częstochowa, Poland
- Huta Katowice, Centralne Laboratorium Chemiczne, Dąbrowa Górnicza, Poland
- Huta Kościuszko, Zakład Badawczy, Chorzów, Poland
- Huta im Sendzimira, Zakład Badawczy, Kraków, Poland

- Huta Gliwice, Centralne Laboratorium Badawcze, Gliwice, Poland
- Huta Małapanew, Centralne Laboratorium Badawcze, Ozimek, Poland
- Huta Ostrowiec, Centralne Laboratorium Chemiczne, Ostrowiec Świętokrzyski, Poland
- Huta Pokój, Centralne Laboratorium Chemiczne, Ruda Śląska, Poland
- Huta Stalowa Wola, Centralne Laboratorium Chemiczne, Stalowa Wola, Poland
- Huta Warszawa, Centralne Laboratorium Chemiczne, Warszawa, Poland
- Huta Zawiercie, Centralne Laboratorium Chemiczne, Zawiercie, Poland

**Homogeneity:** The homogeneity of this Reference Material was evaluated with the use of statistic parameters obtained during interlaboratory tests and found acceptable.

**Production of melt:** This material was produced by Huta Baildon, Katowice.

**Available form:** Discs: 40 mm in diameter and 40 mm thick.

**Intended use:** This Reference Material is intended for use in optical emission and X-ray spectrometric methods

Caution: In optical emission spectrometry with spark excitation the central part of the surface of discs (approximately 5 mm) should be avoided because of possible segregation of the material.

**Validity of certification:** The certification of IMZ 53/1 is valid indefinitely provided this Reference Material is stored in dry place and in environment free from chemical or other aggressive vapours. Periodic recertification is not required. The certification is nullified if this Reference Material is damaged, contaminated or otherwise modified.

**Safety:** This Reference Material and packing does not contain substances which can directly influence health.

**Storage:** This Reference Material should be stored in dry place and in environment free from chemical or other aggressive vapours.

Inquiries regarding this Reference Material should be directed to:  
rm@git.lukasiewicz.gov.pl

Approved by  
Director of the Institute

Prof. Dr. Hab. Eng. Adam Zieliński

Certificate issue date: 20 August 2024

Certificate revision history:

20 August 2024 (editorial changes)

9 February 2021 (change of information regarding validity of certification, editorial changes);

May 2002 (editorial changes)

May 1980 (Original certificate date)