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CERTIFICATE OF CHEMICAL ANALYSIS No 06 – 24

LOW ALLOY STEEL for solid sample spectrometry, combustion and wet-way methods

SPL CM-6B (PT 32/1D)

CERTIFIED VALUES – Mass content in %wt.

| Element | Value [%wt.] | Uncertainty [%wt.] |
|----------------|-------------------------|-------------------------------|
| C | 0.501 | 0.003 |
| Mn | 0.328 | 0.003 |
| Si | 0.241 | 0.002 |
| P | 0.0161 | 0.0003 |
| S | 0.072 | 0.002 |
| Cu | 0.080 | 0.002 |
| Cr | 0.363 | 0.003 |
| Ni | 0.145 | 0.002 |
| Al | 0.0297 | 0.0011 |
| Mo | 0.043 | 0.001 |
| W | 0.0299 | 0.0014 |
| V | 0.050 | 0.001 |

| Element | Value [%wt.] | Uncertainty [%wt.] |
|----------------|-------------------------|-------------------------------|
| Ti | 0.036 | 0.001 |
| Co | 0.040 | 0.001 |
| As | 0.0177 | 0.0007 |
| Sn | 0.0187 | 0.0006 |
| B | 0.0133 | 0.0005 |
| Ca | 0.0013 | 0.0001 |
| Nb | 0.041 | 0.001 |
| Sb | 0.0030 | 0.0014 |
| Pb | 0.0195 | 0.0006 |
| Zr | 0.0278 | 0.0015 |
| Ta | 0.0205 | 0.0015 |
| N | 0.0078 | 0.0002 |

PARTICIPATING LABORATORIES:

ARCELORMITTAL Avilés, Spain
ARCELORMITTAL Gijón, Spain
ARCELORMITTAL Warszawa, Poland
BWZ, Germany
COGNOR S.A. - Ferrostal Łabędy, Poland
ČEZ - JE Temelín, Czech Republic
DUNAFERR Labor Nonprofit, Hungary
ENVIFORM, Czech Republic
ESAB CZ, Czech Republic
JSC Moldova Steel Works, Moldova

MM VÝZKUM, Czech Republic
OCAS NV, Belgium
ORLEN UNIPETROL RPA, Czech Republic
SSAB, Sweden
STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, Czech Republic
ŠKODA AUTO, Czech Republic
TATA STEEL IJMUIDEN, Netherlands
TATRA METALURGIE, Czech Republic
VOESTALPINE STAHL, Germany
ZPS - SLÉVÁRNA, Czech Republic

COMMENTS:

Value – reference value, s_M – standard deviation of intralaboratory means (* - result excluded as outlier)

U – Uncertainty of the reference value $U \geq \pm \frac{t_{5;0,05}}{\sqrt{n}} \cdot s_M$ in the sense of the ISO Guide to the Expression of the Uncertainty of Measurement (1993), dependent on the standard deviation of the laboratory results.

Certified fully compliant with the ISO 17034 definition of Reference Material – with the characterization for determining the property values and their associated uncertainties.

Intended for calibration, matrix-match verification and statistical process control of low alloy steel spectrometric analysis from a plane of solid sample. They may not substitute CRM in a statement of metrological traceability, method validation. A single analysis area of at least 4 mm in diameter defines the minimum sample intake. They may be used for combustion and wet-way methods too.

Manufactured by casting to a special ingot with discarding of the parts, which have been suspected inhomogenous and the rest has been machined to the samples of the ultimate size.

Supplied as discs 37 mm in diameter and 25 mm of standard height.

Homogeneity (random and trend, within- and between- samples) was tested by various analytical techniques of adequate repeatability. Its uncertainty contribution, when statistically significant, was combined to the ultimate uncertainty statement. The RM are stable by a nature of material.

Characterised by results from SPL proficiency test **PT 32/1D** - laboratories by various spectrometric methods (AES spark, glow discharge, XRF) and alternative methods (combustion, thermoevolution, wet-way) standard methods, with measurements metrological traceable to adequate CRM (CZ 2001, 2003 - 2008, 2015-2024, BAS, Brammer Standard). Identity of PT participating laboratories is confidential.

Certified values in % m/m, tabulated below in bold, are robust means of a minimum five accepted laboratory means. They are rounded to the same digit as their uncertainty statement.

Uncertainty is expressed as a \pm half width interval combined from the standard uncertainty, expanded by the coverage factor $k = 2$ (corresponding to 95% level of confidence). It does not exceed 1,5 multiple of the typical uncertainty of the matching CRM.

Non-certified values in regular without the uncertainty statement do not meet the requirements for certification and are intended for the matrix information.

User instruction: the surface of the specimens and RM should be prepared in a similar manner in accordance with manufacturer's instructions of spectrometers. It is recommended to storage of RM in dry and non-corrosive conditions.

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