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CERTIFICATE OF CHEMICAL ANALYSIS No 11 – 22

SET OF LOW ALLOY STEELS for solid sample spectrometry, combustion and wet-way methods

SPL 300A, 301A, 302A, 303A, 304A, 305A, 306A, 307A

PARTICIPATING LABORATORIES:

ARCELORMITTAL Asturias, Spain
ARCELORMITTAL Warszawa, Poland
BRITISH STEEL, United Kingdom
DUNAFERR Labor Nonprofit, Hungary
ENVIFORM, Czech Republic
LIBERTY Ostrava, Czech Republic
LITHEA, Czech Republic
MS UTILITIES & SERVICES, Czech Republic
SES Inspekt, Slovakia
SPECTRO APS, Slovakia
SPECTRO Cleve, Germany
ŠKODA AUTO, Czech Republic
U. S. STEEL Košice - Labortest, Slovakia
VÍTKOVICE TESTING CENTER, Czech Republic
VOESTALPINE, Austria
ZPS - SLÉVÁRNA, Czech Republic
ŽĎAS, Czech Republic
ŽELEZIARNE PODBREZOVÁ, Slovakia

Certified mass-fraction values with uncertainty and non-certified values. in %

	C	Mn	Si	P	S	Cu	Cr	Ni	Al	Mo
300A	**0.0033** 0.0004	**0.0390** 0.0011	**0.0032** 0.0005	**0.0035** 0.0003	**0.0021** 0.0003	**0.0080** 0.0006	**0.0092** 0.0005	**0.0075** 0.0010	**0.0017** 0.0005	**0.0015** 0.0002
301A	**0.176** 0.004	**0.902** 0.012	**0.384** 0.008	**0.0322** 0.0012	**0.0260** 0.0012	**0.154** 0.003	**0.831** 0.009	**0.751** 0.009	**0.0136** 0.0008	**0.440** 0.006
302A	**0.118** 0.002	**0.471** 0.008	**0.691** 0.012	**0.051** 0.002	**0.0096** 0.0006	**0.790** 0.012	**3.04** 0.02	**0.126** 0.004	**0.175** 0.005	**0.758** 0.009
303A	**1.37** 0.02	**1.45** 0.02	**1.22** 0.02	**0.0122** 0.0009	**0.0069** 0.0004	**0.102** 0.003	**0.225** 0.006	**2.60** 0.03	**0.277** 0.007	**0.0455** 0.0020
304A	**0.369** 0.008	**0.121** 0.003	**0.854** 0.012	**0.0274** 0.0010	**0.062** 0.002	**0.066** 0.002	**0.434** 0.007	**5.04** 0.04	**0.0327** 0.0013	**0.131** 0.003
305A	**0.299** 0.006	**0.208** 0.004	**0.188** 0.008	**0.0073** 0.0008	**0.0468** 0.0014	**0.342** 0.005	**1.31** 0.02	**0.393** 0.008	**0.0046** 0.0004	**1.32** 0.02
306A	**0.759** 0.008	**2.29** 0.03	**1.63** 0.02	**0.0167** 0.0005	**0.0083** 0.0005	**0.551** 0.008	**0.107** 0.003	**1.355** 0.016	**0.0178** 0.0009	**0.283** 0.006
307A	**0.563** 0.003	**0.704** 0.009	**0.572** 0.009	**0.0219** 0.0009	**0.0055** 0.0005	**0.243** 0.005	**0.541** 0.008	**0.545** 0.007	**0.0906** 0.0022	**0.096** 0.002

	W	V	Ti	Co	As	Sn	B	Nb	Sb	Pb
300A	*0.0017*	*0.0011*	*0.0004*	**0.0022** 0.0003	**0.0027** 0.0003	*0.0008*	*0.0002*		*0.0015*	*0.0007*
301A	**0.275** 0.006	**0.262** 0.005	**0.107** 0.004	**0.0498** 0.0009	**0.0060** 0.0004	**0.0875** 0.0012	**0.0054** 0.0002	**0.0559** 0.0009	**0.0190** 0.0013	**0.0059** 0.0004
302A	**0.787** 0.017	**0.422** 0.005	**0.0111** 0.0007	**0.0966** 0.0020	**0.0064** 0.0009	**0.0180** 0.0004	**0.0074** 0.0005	**0.080** 0.003	**0.035** 0.005	**0.035** 0.003
303A	**0.442** 0.016	**0.090** 0.003	**0.0626** 0.0018	**0.0166** 0.0013	**0.0037** 0.0008	**0.0598** 0.0018	**0.0070** 0.0004	**0.0154** 0.0005	**0.0115** 0.0020	**0.0054** 0.0007
304A	**1.319** 0.023	**0.170** 0.003	**0.175** 0.005	**0.034** 0.002	**0.0194** 0.0013	**0.0302** 0.0007	**0.0041** 0.0002	**0.0176** 0.0011	**0.008** 0.002	**0.033** 0.003
305A	**0.132** 0.004	**0.795** 0.011	**0.0082** 0.0009	**0.159** 0.003	**0.031** 0.002	**0.0093** 0.0006	**0.0048** 0.0002	**0.222** 0.003	**0.015** 0.002	**0.0262** 0.0011
306A	**0.0266** 0.0018	**0.0559** 0.0018	**0.0508** 0.0015	**0.0259** 0.0008	**0.080** 0.003	**0.0074** 0.0005	**0.0079** 0.0003	**0.0118** 0.0010	**0.0073** 0.0009	**0.026** 0.003
307A	**0.0518** 0.0015	**0.0377** 0.0008	**0.0297** 0.0010	**0.0353** 0.0008	**0.0275** 0.0009	**0.0027** 0.0004	**0.0024** 0.0002	**0.0412** 0.0008	**0.0067** 0.0006	**0.0083** 0.0006

	Zr	Zn	N	Bi	Ce	Ca	Ta	**Other elements** (informative values)
300A		*0.0007*	**0.0028** 0.0006				*0.003*	
301A	*0.0013*	*0.0011*	**0.0098** 0.0004	*0.001*	**0.0134** 0.0021	*0.0003*	**0.036** 0.005	***Te*** *0.006* ***La*** *0.002* ***Se*** *0.007* ***Nd*** *0.002*
302A	**0.0157** 0.0011	**0.0264** 0.0025	**0.026** 0.002	*0.002*	**0.0202** 0.0033	**0.0012** 0.0002	**0.033** 0.003	***La*** *0.005* ***Nd*** *0.007*
303A	**0.171** 0.008	**0.0135** 0.0023	**0.0072** 0.0005	**0.0094** 0.0027	**0.0126** 0.0027	**0.0018** 0.0003	*0.005*	***Mg*** *0.0005* ***Te*** 0.002
304A	**0.057** 0.003		**0.0081** 0.0004	*0.002*	*0.004*			***Ge*** *0.014*
305A	**0.0059** 0.0006	**0.0031** 0.0007	**0.0104** 0.0003	*0.005*	*0.003*		*0.010*	***Ag*** *0.009*
306A	**0.0093** 0.0011	**0.0150** 0.0015	**0.0136** 0.0006	**0.0033** 0.0009	*0.004*	**0.0012** 0.0003	**0.029** 0.003	***Se*** *0.008* ***Nd*** *0.009* ***La*** *0.008* ***Ag*** *0.012*
307A	**0.0479** 0.0016	**0.0058** 0.0008	**0.0065** 0.0008	*0.002*	**0.0062** 0.0014	**0.0005** 0.0001	**0.007** 0.002	***Se*** *0.009* ***Mg*** *0.003* ***Ge*** *0.005* ***Ag*** *0.006*

COMMENTS:

ANALYTICAL DATA ARE AVAILABLE IN THE ANNEX 1 - COLLABORATIVE STUDY REPORT LINK:
https://www.spl-labmat.cz/obsah-mqtsepou/uploads/2022/09/Annex1-300A-307A.pdf

Value – reference value, **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 17034:2016 Expression of the Uncertainty of Measurement, dependent on the standard deviation of the laboratory results.

Certified fully compliant with the ISO 17034 definition of Reference Material – with the characterization for determination of 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 are not intended as substitutes of CRMs 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 can 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 inhomogeneous and the rest have been machined to the samples of the ultimate size.

Supplied as discs 37 mm in diameter and 25 mm of standard height, or alternatively as steel chips.

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 RMs are stable as result of the nature of the material.

Characterised by results from collaborative study – laboratories by various spectrometric (AES, combustion, thermoevolution, wet-way) standard methods, with measurements metrologically 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 usually five accepted laboratory means. They are rounded to the same digit as their uncertainty statement.

Uncertainty is expressed as a ± 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 font) 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 store the RM in dry and non-corrosive conditions.

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