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CERTIFICATE No 06 – 23

REFERENCE MATERIALS OF LOW ALLOY STEEL
for solid sample spectrometry

SPL CM - 1C, 3A, 4B, 6A, 7A, 8A, 9B, 14A, 14B

Recertified to make the former QCM fully compliant with the ISO Guide 35 definition of Reference Material – with the values confirmed and their uncertainties assessed.

Compliant with the ISO Guide 35 definition of Reference Material.

Intended for calibration and the control of matrix-match and of the state of statistic regulation in the automated spectrometry of low alloy steel from a plane of solid sample. They may not substitute CRM in establishing traceability of the results. A single analysis area of at least 4 mm in diameter defines the minimum sample intake.

Manufactured by casting to a special ingot with the parts suspected inhomogenous discarded and rest machined to the samples of the ultimate size. Their structure thus remains as-cast, matching with that of the foundry samples

Supplied as discs of 37 mm in diameter and in 10 or 25 mm standard heights, with size on option of height up to 50 mm on request.

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 an interlaboratory experiment of the expert laboratories listed below by various spectrometric (AES spark, glow discharge, XRF) and alternative (combustion, thermoevolution, wet-way) standard methods, with values **traceable** to values of the adequate CRM (CZ 2001, 2003 - 2008, BAS, Brammer Standard).

ARCELORMITTAL a.s., Ostrava, Czechia
ENVIFORM a.s., Třinec, Czechia
LECO INSTRUMENTE PLZEŇ s.r.o., Plzeň, Czechia
ZPS-SLÉVÁRNA, a.s., Zlín, Czechia
VÍTKOVICE TESTING CENTER s.r.o., Ostrava, Czechia
ŽĎAS a.s., Žďár nad Sázavou, Czechia

RM	C	Mn	Si	P	S	Cu	Cr	Ni
CM-1C	**0,72**	**1,73**	**0,31**	**0,023**	**0,025**	**0,18**	**0,47**	**0,52**
	0,01	0,01	0,01	0,001	0,002	0,01	0,015	0,015
CM-3A	**0,295**	**0,37**	**0,27**	**0,016**	**0,0013**	**0,16**	**1,87**	**1,82**
	0,013	0,01	0,02	0,002	0,0003	0,005	0,04	0,04
CM-4B	**0,72**	**0,50**	**0,80**	**0,023**	**0,012**	**0,40**	**2,23**	**1,40**
	0,02	0,01	0,02	0,003	0,002	0,01	0,03	0,03
CM-6A	**0,52**	**0,37**	**0,27**	**0,016**	**0,058**	**0,05**	**0,37**	**0,19**
	0,015	0,013	0,014	0,002	0,003	0,003	0,01	0,006
CM-7A	**0,05**	**1,17**	**0,56**	**0,011**	**0,016**	**0,09**	**0,10**	**0,05**
	0,005	0,02	0,016	0,002	0,002	0,003	0,006	0,003
CM-8A	**0,16**	**2,13**	**0,18**	**0,007**	**0,011**	**0,03**	**1,38**	**0,03**
	0,006	0,03	0,006	0,001	0,002	0,003	0,01	0,003
CM-9B	**0,17**	**2,27**	**0,89**	**0,008**	**0,010**	**0,040**	**1,36**	**0,023**
	0,01	0,03	0,02	0,002	0,002	0,003	0,01	0,003
CM-14A	**0,523**	**1,58**	**1,15**	**0,051**	**0,028**	**0,30**	**1,13**	**1,14**
	0,012	0,03	0,02	0,003	0,002	0,01	0,02	0,02
CM-14B	**0,55**	**1,63**	**1,18**	**0,017**	**0,023**	**0,36**	**1,38**	**1,10**
	0,012	0,03	0,02	0,002	0,002	0,01	0,02	0,02
RM	**Al**	**Mo**	**W**	**V**	**Ti**	**Co**	**As**	**Sn**
CM-1C	**0,034**	**0,084**	**0,064**	**0,073**	**0,066**	**0,026**	**0,036**	**0,012**
	0,001	0,004	0,002	0,002	0,002	0,001	0,002	0,001
CM-3A	**0,05**	**0,33**	**0,015**	**0,007**	**0,006**	**0,012**	**0,005**	**0,007**
	0,002	0,01	0,003	0,002	0,0003	0,002	0,002	0,002
CM-4B	**0,025**	**0,33**	**0,116**	**0,18**	**0,12**	**0,115**	**0,015**	**0,028**
	0,002	0,01	0,005	0,01	0,01	0,004	0,001	0,002
CM-6A	**0,02**	**0,04**	**0,04**	**0,05**	**0,03**	**0,03**	**0,025**	**0,017**
	0,002	0,003	0,003	0,003	0,003	0,005	0,002	0,002
CM-7A	**0,13**	**0,015**	**0,01**	**0,012**	**0,14**	**0,007**	**0,005**	**0,008**
	0,01	0,002	0,002	0,001	0,005	0,001	0,001	0,002
CM-8A	**0,02**	0,001	**0,01**	**0,008**	0,001	**0,004**	0,002	0,003
	0,003		0,002	0,002		0,001		
CM-9B	**0,049**	0,002		**0,006**	**0,002**	**0,004**	0,002	**0,003**
	0,003			0,001	0,001	0,001		0,001
CM-14A	*0,063*	**0,395**	**0,021**	**0,345**	*0,40*	**0,015**	**0,016**	**0,027**
		0,01	0,002	0,01		0,002	0,001	0,002
CM-14B	**0,26**	**0,400**	**0,03**	**0,36**	**0,36**	**0,026**	**0,015**	**0,040**
	0,01	0,01	0,002	0,01	0,01	0,002	0,001	0,003
RM	**B**	**Nb**	**Pb**	**Sb**	**Zr**	**Ca**	**Ta**	**N**
CM-1C	**0,0020**	**0,054**	**0,005**	**0,01**	**0,051**	**0,0007**		**0,009**
	0,0002	0,002	0,002	0,002	0,002	0,0002		0,001
CM-3A	**0,0002**	**0,006**						**0,007**
	0,0001	0,001						0,001
CM-4B	**0,017**	**0,071**	**0,022**	**0,052**		**Zn 0,007**		**0,013**
	0,001	0,002	0,003	0,002		0,001		0,001
CM-6A	**0,015**	**0,028**	**0,017**	**0,03**	**0,04**			**0,009**
	0,001	0,002	0,001	0,003	0,003			0,001
CM-7A	**0,0003**	**0,004**	0,0014	0,0003	**0,042**			**0,01**
	0,0001	0,001			0,003			0,002
CM-8A	**0,004**	**0,034**						
	0,001	0,003						
CM-9B	**0,004**	**0,06**	**0,002**	**0,003**	**0,003**			
	0,001	0,01	0,001	0,001	0,001			
CM-14A	**0,0062**	**0,115**	**0,013**	**0,006**	*0,044*	0,004	**0,015**	*0,0095*
	0,0005	0,005	0,001	0,001			0,002	
CM-14B	**0,0205**	**0,165**	**0,007**	**0,010**	**0,040**			**0,0072**
	0,0010	0,006	0,001	0,001	0,003			0,0010

Certified values in % m/m, tabulated over page in bold, are robust means of a minimum five laboratory means accepted by a technical scrutiny, each of them based on at least five independent results. They are rounded to the same digit as their respective:

Uncertainty (tabulated in regular below the respective value), expressed as a ± half width interval of combined uncertainty, expanded by a coverage factor k = 2 (corresponding to 95% probability level). 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 working surface of the RM must be prepared before the analysis in the same way as the analysed sample in acordance with the particular analyser manual. Storage in dry and non-corrosive environment is recommended.

Produced by: SPL, the authorised producer of CRM for the Czech Metrology Institute and the provider of the interlaboratory Proficiency Testing accredited by the Czech Accreditation Institute, in a strict compliance with ISO/IEC 17025, 17043 and in particular with ISO Guide 34.

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