



SPL-LABMAT s.r.o.

CERTIFICATE OF CHEMICAL ANALYSIS No 08 – 19

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

SPL CM-1D

CERTIFIED VALUES – Mass content in %wt.

Element	<i>Value</i> [%wt.]	<i>Uncertainty</i> [%wt.]
C	0.735	0.005
Mn	1.800	0.015
Si	0.341	0.006
P	0.0218	0.0004
S	0.0268	0.0011
Cu	0.186	0.003
Cr	0.456	0.007
Ni	0.547	0.006
Al	0.0245	0.0011
Mo	0.100	0.002

Element	<i>Value</i> [%wt.]	<i>Uncertainty</i> [%wt.]
W	0.063	0.002
V	0.089	0.002
Ti	0.054	0.004
Co	0.029	0.001
Sn	0.0144	0.0009
B	0.0017	0.0002
Nb	0.050	0.004
Sb	0.0112	0.0008
N	0.0124	0.0005

PARTICIPATING LABORATORIES:

ARCELORMITTAL, Ostrava, Czech Republic
DUNAFERR LABOR NONPROFIT, Dunaújváros, Hungary
ENVIFORM, Třinec, Czech Republic
GO STEEL, Frýdek-Místek, Czech Republic
INSTITUTE FOR CRM (ICRM), Yekaterinburg, Russia
SES INSPEKT, Tlmače, Slovakia
ŠKODA AUTO, Mladá Boleslav, Czech Republic
U. S. STEEL KOŠICE – LABORTEST, Košice, Slovakia
VÍTKOVICE TESTING CENTER, Ostrava, Czech Republic
VOESTALPINE STAHL DONAWITZ, Leoben-Donawitz, Austria
ŽĐAS, Žďár nad Sázavou, Czech Republic

CM-1D - ANALYTICAL DATA:

Method	C	Method	Mn	Method	Si	Method	P	Method	S	Method	Cu	Method	Cr
IR+TCM	0,720							AES	0,0212				
AES	0,723							AES	0,0220				
AES	0,725							AES	0,0228				
IR+TCM	0,725							AES	0,0246				
AES	0,725							AES	0,0250				
AES	0,727							IR+TCM	0,0252				
AES	0,728							IR+TCM	0,0254				
IR	0,728	AES	1,765	ICP	0,307*	AES	0,0208	AES	0,0256	AES	0,180	ICP	0,437
AES	0,730	AES	1,765	AES	0,327	AES	0,0208	AES	0,0264	AES	0,181	AES	0,439
AES	0,731	ICP	1,765	AES	0,328	AES	0,0211	IR+TCM	0,0268	AES	0,182	AES	0,443
IR+TCM	0,732	AES	1,784	AES	0,332	AES	0,0217	AES	0,0268	AES	0,184	AES	0,452
AES	0,733	AES	1,807	AES	0,337	ICP	0,0217	AES	0,0269	AES	0,185	AES	0,455
IR+TCM	0,740	AES	1,811	AES	0,343	AES	0,0219	IR+TCM	0,0277	AES	0,186	AES	0,460
AES	0,741	AES	1,815	AES	0,345	AES	0,0220	IR+TCM	0,0280	ICP	0,186	AES	0,461
IR+TCM	0,741	AES	1,818	AES	0,346	AES	0,0220	IR+TCM	0,0281	AES	0,187	AES	0,461
IR+TCM	0,744	AES	1,818	AES	0,347	AES	0,0220	IR	0,0281	AES	0,188	AES	0,465
IR+TCM	0,750	AES	1,818	AES	0,348	AES	0,0222	IR+TCM	0,0286	AES	0,189	AES	0,467
IR+TCM	0,757	AES	1,819	AES	0,349	AES	0,0224	AES	0,0288	AES	0,191	AES	0,467
AES	0,758	AES	1,820	AES	0,350	AES	0,0233	IR+TCM	0,0294	AES	0,194	AES	0,470
C		Mn		Si		P		S		Cu		Cr	
Value	0,735		1,800		0,341		0,0218		0,0268		0,186		0,456
SM	0,011		0,023		0,009		0,0007		0,0023		0,004		0,011
U	0,005		0,015		0,006		0,0004		0,0011		0,003		0,007

Method	Ni	Method	Al	Method	Mo	Method	W	Method	V	Method	Ti	Method	Co
AES	0,535	ICP	0,0210	AES	0,094			AES	0,083	ICP	0,040		
AES	0,540	AES	0,0220	AES	0,096			AES	0,085	AES	0,051		
ICP	0,540	AES	0,0237	AES	0,097			AES	0,087	AES	0,051		
AES	0,541	AES	0,0237	ICP	0,097			AES	0,088	AES	0,052		
AES	0,543	AES	0,0238	AES	0,100	AES	0,045*	AES	0,088	AES	0,053	ICP	0,027
AES	0,544	AES	0,0244	AES	0,100	AES	0,060	ICP	0,088	AES	0,053	AES	0,028
AES	0,546	AES	0,0250	AES	0,100	AES	0,062	AES	0,088	AES	0,055	AES	0,029
AES	0,547	AES	0,0254	AES	0,101	AES	0,062	AES	0,089	AES	0,055	AES	0,029
AES	0,549	AES	0,0256	AES	0,101	AES	0,064	AES	0,090	AES	0,056	AES	0,029
AES	0,556	AES	0,0260	AES	0,102	AES	0,065	AES	0,090	AES	0,056	AES	0,030
AES	0,558	AES	0,0262	AES	0,103	AES	0,065	AES	0,093	AES	0,057	AES	0,030
AES	0,564	AES	0,0266	AES	0,106	AES	0,065	AES	0,093	AES	0,066	AES	0,031
Ni		Al		Mo		W		V		Ti		Co	
Value	0,547		0,0245		0,100		0,063		0,089		0,054		0,029
SM	0,009		0,0017		0,003		0,002		0,003		0,006		0,001
U	0,006		0,0011		0,002		0,002		0,002		0,004		0,001

Method	Sn	Method	B	Method	Nb	Method	Sb	Method	N
				ICP	0,039				
				AES	0,044				
AES	0,0130			AES	0,046				
AES	0,0132	AES	0,0013	AES	0,049			AES	0,0113
AES	0,0134	AES	0,0016	AES	0,050	AES	0,0066*	AES	0,0121
AES	0,0134	AES	0,0016	AES	0,050	AES	0,0072*	AES	0,0122
AES	0,0142	AES	0,0016	AES	0,050	AES	0,0106	IR+TCM	0,0125
AES	0,0150	AES	0,0017	AES	0,052	AES	0,0112	IR+TCM	0,0125
AES	0,0152	AES	0,0018	AES	0,052	ICP	0,0114	IR+TCM	0,0127
ICP	0,0156	AES	0,0019	AES	0,052	AES	0,0114	AES	0,0130
AES	0,0163	AES	0,0021	AES	0,061	AES	0,0116	IR+TCM	0,0132
Sn		B		Nb		Sb		N	
Value	0,0144		0,0017		0,050		0,0112		0,0124
SM	0,0012		0,0002		0,006		0,0004		0,0006
U	0,0009		0,0002		0,004		0,0008		0,0005

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

U – Uncertainty of the reference value $U = \pm \frac{t_{5,0,05}}{\sqrt{n}} \cdot s_M$ 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 Guide 35 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 inter-laboratory study of the expert laboratories listed below by spectrometric methods and alternative methods (combustion, thermoevolution, wet-way) standard methods, with measurements metrological **traceable** to adequate CRMs.

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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