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CERTIFICATE OF CHEMICAL ANALYSIS No 02 – 21

FREE CUTTING STEEL for solid sample spectrometry, combustion and wet-way methods

SPL CM-24A (PT 29/1B)
(grade 11SMn30/37)

CERTIFIED VALUES – Mass content in %wt.

Element	Value [%wt.]	Uncertainty [%wt.]
C	0.099	0.002
Mn	1.174	0.020
Si	0.0074	0.0009
P	0.0099	0.0007
S	0.317	0.009
Cu	0.168	0.003
Cr	0.111	0.003

Element	Value [%wt.]	Uncertainty [%wt.]
Ni	0.177	0.003
Al	0.0018	0.0004
Mo	0.050	0.002
Co	0.0087	0.0006
Sn	0.0094	0.0006
N	0.0110	0.0005

PARTICIPATING LABORATORIES:

ARCELORMITTAL Gijón (Asturias), Spain
OCAS NV, Belgium
ARCELORMITTAL Warszawa, Poland
BRITISH STEEL, United Kingdom
CMC Poland, Poland
COGNOR S.A. - Ferrostal Łabędy, Poland
COGNOR S.A.- HSJ, Poland
COMTES, Czech Republic
DUNAFERR Labor Nonprofit, Hungary
ENVIFORM, Czech Republic
COGNOR S.A. - Ferrostal Łabędy, Poland
COGNOR S.A.- HSJ, Poland

MM VÝZKUM, Czech Republic
MS UTILITIES & SERVICES, Czech Republic
MTL Chomutov, Czech Republic
SSAB EMEA, Sweden
TÜV NORD Czech, Czech Republic
VOESTALPINE STAHL, Germany
Z - GROUP - Ocelárna Hrádek, Czech Republic
ZPS - SLEVÁRNA, Czech Republic
ÚJV Řež, Czech Republic
ČZ, Czech Republic
ŠKODA AUTO, Czech Republic
ŽDAS, Czech Republic

CM-24A - ANALYTICAL DATA:

Method	C	Method	Mn	Method	Si	Method	P	Method	S	Method	Cu	Method	Cr	Method	Ni	Method	Al	Method	Mo	Method	Co	Method	Sn	Method	N	
IR	0,089																									
AES	0,092																									
AES	0,093																									
IR	0,096																									
AES	0,096								ICP	0,255*																
AES	0,097	ICP	1,051						IR	0,256*	AES	0,159	ICP	0,102	AES	0,166										
AES	0,097	ICP	1,090		AES	0,0081		IR	0,287	AES	0,161	AES	0,103	AES	0,169		AES	0,047								
AES	0,098	AES	1,115		ICP	0,0084		IR	0,294	ICP	0,161	AES	0,104	AES	0,170		AES	0,047								
IR	0,098	ICP	1,122		AES	0,0085		AES	0,298	XRF-m.	0,162	AES	0,106	ICP	0,170		AES	0,048						AES	0,0088	
IR	0,098	XRF	1,125		AES	0,0086		IR	0,299	ICP	0,162	AES	0,107	AES	0,171			AES	0,048						AES	0,0096
AES	0,098	AES	1,135		AES	0,0088		AES	0,305	AES	0,164	AES	0,108	ICP	0,171			ICP	0,049						AES	0,0087
AES	0,099	ICP	1,136		AES	0,0088		ICP	0,305	AES	0,164	AES	0,108	ICP	0,172			ICP	0,049						AES	0,0089
AES-m.	0,099	AES	1,137		AES	0,0089		AES	0,306	AES	0,164	AES	0,108	ICP	0,173			ICP	0,049						AES	0,0102
AES	0,099	AES	1,145		AES	0,0089		AES	0,306	ICP	0,165	AES	0,108	AES	0,173			XRF-m.	0,049						AES	0,0102
AES	0,099	AES	1,146		AES	0,0090		ICP	0,306	AES	0,165	AES	0,109	ICP	0,174			AES	0,049						AES	0,0103
IR	0,099	ICP	1,152		AES	0,0090		AES	0,307	AES	0,167	AES	0,109	XRF	0,176			AES	0,050						AES	0,0105
AES	0,099	AES	1,163		AES	0,0091		IR	0,308	AES	0,167	AES	0,109	AES	0,176	AES	0,0005	AES	0,050						AES	0,0106
AES	0,099	AES	1,170		AES	0,0092		AES	0,310	AES	0,168	AES-m.	0,110	AES	0,177	AES	0,0005	AES	0,050						AES	0,0108
IR	0,100	XRF-m.	1,174		AES	0,0093		IR	0,310	XRF	0,168	AES	0,110	AES	0,177	AES	0,0010	AES	0,050						AES	0,0108
AES	0,100	AES	1,176		AES	0,0095		AES	0,312	AES	0,168	AES	0,110	AES	0,178	AES	0,0010	AES	0,050						AES	0,0108
IR	0,100	AES	1,179		AES	0,0097		IR	0,312	AES	0,168	AES	0,110	AES	0,178	AES	0,0010	XRF	0,050						AES	0,0109
IR	0,100	AES	1,180		AES	0,0099		IR	0,312	ICP	0,169	AES	0,111	AES	0,180	AES-m.	0,0018	AES	0,050						AES	0,0110
IR	0,100	AES-m.	1,188		AES-m.	0,0078		IR	0,312	AES	0,169	AES	0,111	AES	0,180	ICP	0,0019	AES	0,050						AES	0,0111
IR	0,100	AES	1,191		AES	0,0080		AES	0,0101	IR	0,317	AES	0,170	AES	0,112	AES-m.	0,0019	AES	0,051						AES	0,0111
IR	0,100	AES	1,196		AES	0,0081		AES	0,0106	AES	0,320	AES	0,170	AES	0,112	AES	0,0019	AES	0,051						AES	0,0112
IR	0,100	AES	1,199		AES	0,0082		Photom.	0,0107	AES	0,325	ICP	0,170	XRF-m.	0,113	AES	0,0019	AES	0,051						AES-m.	0,0114
IR	0,101	AES	1,205		XRF	0,0084		AES	0,0110	AES	0,325	AES	0,172	ICP	0,113	XRF-m.	0,0020	AES	0,051						AES	0,0114
AES	0,103	AES	1,218		Gravim.	0,0086		AES	0,0112	AES	0,327	AES	0,172	XRF	0,114	AES	0,0020	AES	0,051						AES	0,0114
AES	0,103	AES	1,218		AES	0,0093		XRF	0,0113	IR	0,329	AES	0,172	ICP	0,115	AES	0,0020	AES	0,053						AES	0,0117
AES	0,103	AES	1,228		ICP	0,0094		ICP	0,0113	IR	0,340	AES	0,173	ICP	0,117	AES	0,0021	AES	0,053						AES	0,0119
AES	0,103	AES	1,236		AES	0,0095		AES	0,0116	AES	0,343	AES	0,173	AES	0,117	AES	0,0022	AES	0,053						AES	0,0120
IR	0,104	AES	1,253		AES	0,0096		AES	0,0123	AES	0,349	AES-m.	0,174	AES	0,118	AES	0,0024	AES	0,054						AES	0,0123
IR	0,105	AES	1,257		AES	0,0103		AES	0,0123	AES	0,353	AES	0,176	ICP	0,122	AES	0,0026	ICP	0,057*						AES-m.	0,0127
AES	0,107	AES	1,268		ICP	0,0183*		AES-m.	0,0124	AES	0,359	AES	0,183	AES	0,129*	AES	0,0030	AES-m.	0,058*						AES-m.	0,0132
		C	Mn	Si	P	S	Cu	Cr	Ni	Al	Mo	Co	Sn	N												
Value	0,099	1,174	0,0074	0,0099	0,317	0,168	0,111	0,177	0,0018	0,050	0,0087	0,0094	0,0110													
S _{rel}	0,004	0,051	0,0016	0,0013	0,018	0,005	0,005	0,006	0,0007	0,002	0,0012	0,0011	0,0010													
U	0,002	0,020	0,0009	0,0007	0,009	0,003	0,003	0,003	0,0004	0,002	0,0006	0,0006	0,0006	0,0005												

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 machining from bar.

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 29/1B** - 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.

Produced by: SPL-LABMAT s.r.o.

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