

CERTIFICATE OF CHEMICAL ANALYSIS No 04 – 22

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

SPL CM-16B (PT 30/1A)

CERTIFIED VALUES – Mass content in %wt.

Element	Value [%wt.]	Uncertainty [%wt.]
C	0.421	0.002
Mn	0.762	0.003
Si	0.574	0.005
P	0.0508	0.0011
S	0.0376	0.0006
Cu	0.296	0.002
Cr	0.635	0.004
Ni	0.733	0.004
Al	0.128	0.003
Mo	0.424	0.003
W	0.141	0.002
V	0.272	0.002
Ti	0.121	0.002

Element	Value [%wt.]	Uncertainty [%wt.]
Co	0.058	0.001
As	0.065	0.001
Sn	0.0289	0.0003
B	0.0128	0.0004
Ca	0.00033	0.00004
Nb	0.094	0.002
Sb	0.0282	0.0008
Pb	0.0294	0.0015
Zr	0.102	0.005
Zn	0.0156	0.0009
N	0.0154	0.0002
Bi	<i>0.045</i>	

PARTICIPATING LABORATORIES:

AIMEN, Spain
ARCELORMITTAL Avilés (Asturias), Spain
ARCELORMITTAL Warszawa, Poland
BONATRANS, Czech Republic
BOSMAL, Poland
COGNOR S.A. - Ferrostal Łabędy, Poland
COGNOR S.A., Poland
ČEZ - JE Temelín, Czech Republic
DAIMLER TRUCK AG, Germany
DILLINGER, Germany
DUNAFERR Labor Nonprofit, Hungary
ENVIFORM, Czech Republic
INSTYTUT METALURGII ŻELAZA, Poland
JSC Moldova Steel Works, Moldova
LIBERTY Częstochowa, Poland
LIBERTY Ostrava, Czech Republic

MACHINEFISH MAT. & TECHNOL., Poland
MM VÝZKUM, Czech Republic
MTL Chomutov, Czech Republic
OCAS NV, Belgium
SIJ METAL RAVNE, Slovenia
SSAB EMEA, Sweden
SVÚM, Czech Republic
TATA STEEL IJMUIDEN, Netherlands
TATRA METALURGIE, Czech Republic
TÜV NORD Czech, Czech Republic
U. S. STEEL Košice - Labortest, Slovakia
ÚJV Řež, Czech Republic
VOESTALPINE, Austria
VÚHŽ, Czech Republic
ZPS - SLÉVÁRNA, Czech Republic

Method	C	Method	Mn	Method	Si	Method	P	Method	S	Method	Cu	Method	Cr	Method	Ni	Method	Al	Method	Mo	Method	W	Method	V	Method	Ti
IR AES Photom.	IR	0.396*				IR		IR	0.0329																
	IR	0.408				AES		AES	0.0332																
	AES	0.410				ICP		ICP	0.0334																
	IR	0.411				AES		AES	0.0344																
	AES	0.411				IR		IR	0.0350																
	IR	0.413				AES		AES	0.0350																
	AES	0.414				IR		IR	0.0351																
	IR	0.415				AES		AES	0.0352																
	IR	0.415				Photom.		Photom.	0.0358																
	AES	0.415		AES	0.527		AES	0.0361	ICP	0.0361	ICP	0.287	AES	0.594*	ICP	0.697	ICP	0.393*	ICP	0.240*			XRF	0.107	
AES	0.416	AES	0.747	ICP	0.0372*	XRF	0.0365	ICP	0.0365	XRF	0.288	AES	0.609	ICP	0.687	Photom.	0.402	Photom.	0.251						
IR	0.417	AES	0.747	AES	0.544	ICP	0.0435	AES	0.0365	XRF	0.288	AES	0.609	ICP	0.687	Photom.	0.402	Photom.	0.251						
IR	0.417	AES	0.749	AES	0.548	ICP	0.0435	AES	0.0366	AES	0.288	ICP	0.611	AES	0.706	XRF	0.099*	AES	0.410	AES	0.262	ICP	0.112		
IR	0.417	AES-m.	0.751	XRF	0.551	AES	0.0460	AES	0.0366	AES	0.288	ICP	0.617	AES	0.713	AES-m.	0.111	AES	0.412	XRF	0.263	AES	0.114		
AES	0.417	AES	0.751	AES	0.554	Photom.	0.0467	AES	0.0367	AES	0.292	AES-m.	0.619	AES	0.715	AES	0.115	AES	0.414	XRF	0.264	AES	0.114		
IR	0.418	AES-m.	0.753	ICP	0.559	ICP	0.0468	IR	0.0368	ICP	0.290	XRF	0.621	ICP	0.716	ICP	0.117	AES	0.414	Photom.	0.264	Photom.	0.116		
IR	0.418	AES	0.755	ICP	0.559	AES	0.0473	AES	0.0368	AES	0.290	AES	0.624	AES	0.716	ICP	0.117	AES	0.415	XRF	0.265	ICP	0.116		
IR	0.418	AES	0.757	AES	0.567	AES	0.0474	AES	0.0368	AES	0.290	Photom.	0.626	AES	0.717	ICP	0.117	ICP	0.417	AES	0.266	AES	0.116		
IR	0.418	ICP	0.758	AES	0.568	Photom.	0.0481	XRF	0.0369	AES	0.291	AES	0.628	AES	0.722	AES-m.	0.117	AES	0.418	AES	0.266	AES	0.116		
AES	0.419	XRF	0.759	AES	0.570	AES	0.0481	XRF	0.0370	AES	0.294	AES	0.634	XRF	0.727	AES	0.122	AES	0.419	ICP	0.269	XRF	0.117		
IR	0.419	ICP	0.758	AES	0.571	AES	0.0484	Photom.	0.0370	Photom.	0.293	AES	0.630	ICP	0.725	AES	0.121	AES	0.419	AES	0.267	AES	0.118		
AES	0.419	AES	0.758	Photom.	0.571	AES	0.0485	AES	0.0370	AES	0.293	AES	0.630	XRF	0.726	AES	0.121	AES	0.419	ICP	0.267	AES	0.119		
AES	0.420	AES	0.759	ICP	0.572	AES	0.0485	AES	0.0372	AES-m.	0.293	AES	0.633	AES	0.727	ICP	0.122	AES	0.420	Photom.	0.268	AES			

Method	Co	Method	As	Method	Sn	Method	B	Method	Ca	Method	Nb	Method	Sb	Method	Pb	Method	Zr	Method	Zn	Method	N	Method	Bi
Photom.	0.052																						
AES	0.053																						
AES	0.054																						
AES-m.	0.054																						
AES-m.	0.054																						
AES	0.056																						
AES	0.056		AES	0.0268																			
AES	0.056		AES	0.0271																			
Photom.	0.056		AES	0.0274																			
AES	0.056		ICP	0.0274																			
AES	0.057		AES	0.0275																			
AES	0.057	XRF	0.042*	XRF	0.0276																		
ICP	0.057	AES	0.0578			ICP	0.0104								Photom.	0.0190							
AES	0.057	XRF	0.061	ICP	0.0283		AES	0.0110							ICP	0.0233							
ICP	0.057	AES	0.061	ICP	0.0284	Photom.	0.0110								AES	0.0242							
AES	0.058	AES	0.062	AES	0.0284	AES	0.0113								AES	0.0249							
ICP	0.058	AES	0.063	ICP	0.0115		AES	0.0096							AES	0.0255							
AES	0.058	AES-m.	0.062	AES	0.0286	AES	0.0116				AES-m.	0.092	AES	0.0244	AES	0.0258							
AES	0.058	AES	0.062	AES	0.0287	ICP	0.0120				Photom.	0.092	AES	0.0246	AES	0.0261	Photom.	0.076					
AES	0.058	AES	0.063	AES	0.0287	AES	0.0120				ICP	0.092	ICP	0.0255	AES	0.0265	Photom.	0.082					
ICP	0.058	AES	0.063	AES	0.0288	AES	0.0122	AES	0.0092		AES	0.092	AES	0.0258	AES	0.0268	ICP	0.083					
ICP	0.059	ICP	0.063	XRF	0.0288	AES	0.0121				XRF	0.093	AES	0.0265	Photom.	0.0270	AES	0.090					
AES	0.059	AES	0.063	AES	0.0288	AES	0.0126				AES	0.093	XRF	0.0266	AES	0.0272	ICP	0.091					
AES	0.059	AES	0.063	AES	0.0289	AES	0.0126				AES	0.093	AES	0.0271	AES	0.0276	ICP	0.094					
AES	0.059	AES	0.063	AES	0.0289	AES	0.0127	AES	0.00022		AES	0.094	AES	0.0272	AES	0.0284	AES	0.096					
AES	0.059	ICP	0.064	ICP	0.0289	Photom.	0.0127	AES	0.00022	XRF	0.094	ICP	0.0276	AES	0.0295	AES	0.097						
AES	0.059	AES	0.064	AES	0.0290	AES	0.0127	AES	0.00024	ICP	0.094	AES	0.0279	AES	0.0295	AES	0.099						
AES	0.059	AES	0.064	AES	0.0290	AES	0.0129	AES	0.00024	AES	0.094	AES	0.0280	XRF	0.0296	AES	0.099						
XRF	0.059	AES	0.064	AES-m.	0.0290	AES	0.0129	AES	0.00027	AES	0.094	ICP	0.0280	ICP	0.0299	ICP	0.101						
AES	0.060	AES	0.065	AES	0.0290	AES	0.0129	AES	0.00030	AES	0.094	AES-m.	0.0280	AES	0.0304	AES	0.104						
AES	0.060	AES	0.066	ICP	0.0291	AES	0.0130	AES	0.00031	AES	0.094	AES	0.0281	AES	0.0306	AES	0.104						
AES	0.060	AES	0.067	AES	0.0293	AES	0.0131	AES	0.00033	AES	0.095	AES	0.0287	AES	0.0306	AES	0.105						
AES	0.060	ICP	0.067	AES	0.0294	AES	0.0132	AES	0.00034	AES	0.095	AES	0.0290	ICP	0.0308	AES	0.105						
AES	0.060	AES	0.067	AES	0.0294	AES	0.0133	AES	0.00035	AES-m.	0.097	XRF	0.0296	AES	0.0310	AES-m.	0.106	AES	0.0091*				
AES	0.060	AES	0.067	AES	0.0295	AES	0.0133	AES	0.00035	AES	0.097	AES	0.0297	AES	0.0314	AES	0.106	AES	0.0137				
XRF	0.060	ICP	0.067	AES	0.0296	AES-m.	0.0133	AES	0.00037	AES	0.097	AES	0.0299	AES	0.0317	AES-m.	0.109	AES	0.0146				
AES	0.060	AES	0.068	AES-m.	0.0297	AES	0.0134	AES-m.	0.00038	AES	0.098	AES	0.0301	AES	0.0317	AES	0.109	AES	0.0148				
AES	0.060	AES-m.	0.068	AES	0.0301	AES	0.0136	AES	0.00041	AES	0.099	AES	0.0306	ICP	0.0336	AES	0.110	AES	0.0149				
AES	0.061	XRF	0.069	AES	0.0306	AES	0.0136	AES	0.00042	AES	0.099	AES	0.0306	AES	0.0350	AES	0.110	AES	0.0157				
ICP	0.061	AES-m.	0.069	Photom.	0.0310	AES	0.0141	AES	0.00043	AES	0.100	AES	0.0308	AES	0.0351	ICP	0.110	AES	0.0159				
XRF	0.063	AES	0.070	AES	0.0312	AES	0.0142	AES	0.00044	ICP	0.102	ICP	0.0324	AES	0.0352	AES	0.111	ICP	0.0169				
ICP	0.064	AES	0.071	AES	0.0333*	AES	0.0154	AES	0.00069*	AES-m.	0.107	XRF	0.0377*	AES-m.	0.0359	ICP	0.115	AES	0.0169				
ICP	0.065	AES	0.071	XRF	0.0344*	ICP	0.0158	AES	0.00069*	ICP	0.108	AES	0.0397*	AES	0.0378	AES	0.125	AES	0.0170				

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 30/1A** - 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.

Responsible person: Martin Bogumský

Issued in Bohumín in May 2022

SPL-LABMAT s.r.o.
1. máje 432
735 31 Bohumín, CZ
IČO: 06480870, DIČ: CZ06480870
www.spl-labmat.cz
e-mail: info@spl-labmat.cz