



SPL-LABMAT s.r.o.

1.máje 432, CZ-735 31 Bohumín, Czech Republic
e-mail: info@spl-labmat.cz, www.spl-labmat.cz, phone: +420 596 014 627

CERTIFICATE OF CHEMICAL ANALYSIS No 03 – 23

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

SPL CM-7B (PT 31/1B)

CERTIFIED VALUES – Mass content in %wt.

Element	Value [%wt.]	Uncertainty [%wt.]
C	0.053	0.001
Mn	1.156	0.006
Si	0.314	0.003
P	0.0142	0.0005
S	0.0206	0.0004
Cu	0.092	0.001
Cr	0.208	0.002
Ni	0.057	0.001
Al	0.044	0.001
Mo	0.0263	0.0005
W	0.0037	0.0007

Element	Value [%wt.]	Uncertainty [%wt.]
V	0.0136	0.0004
Ti	0.131	0.002
Co	0.0081	0.0002
As	0.0059	0.0003
Sn	0.0073	0.0004
B	0.0010	0.0001
Nb	0.0065	0.0005
Sb	0.0035	0.0004
Zr	0.028	0.001
Zn	0.0019	0.0005
N	0.0100	0.0003

PARTICIPATING LABORATORIES:

ARCELORMITTAL Warszawa, Poland
COGNOR S.A. - Ferrostal Łabędy, Poland
COMTES, Czech Republic
ČEZ - JE Temelín, Czech Republic
ČZ, Czech Republic
DUNAFERR Labor Nonprofit, Hungary
ENVIFORM, Czech Republic
ENVIROLAB MIKE, Greece
ESAB CZ, Czech Republic
GO STEEL, Czech Republic
JSC Moldova Steel Works, Moldova
LIBERTY Częstochowa, Poland
LIBERTY Ostrava, Czech Republic
MS UTILITIES & SERVICES, Czech Republic

OBLF, Germany
OCAS NV, Belgium
ORLEN UNIPETROL RPA, Czech Republic
SSAB, Sweden
ŠKODA AUTO, Czech Republic
TATA STEEL IJMUIDEN, Netherlands
TAWESCO, Czech Republic
TÜV NORD Czech, Czech Republic
ÚJV Řež, Czech Republic
VOESTALPINE STAHL, Austria
ZÁPADOČ. UNIVERZITA V PLZNI, Czech Republic
ZPS - SLÉVÁRNA, Czech Republic
ŽDAS, Czech Republic

CM-7B - ANALYTICAL DATA:

Method	C	Method	Mn	Method	Si	Method	P	Method	S	Method	Cu	Method	Cr	Method	Ni	Method	Al	Method	Mo	Method	W	
IR	0,048								AES-m.	0,001*												
AES	0,049								ICP	0,0165												
IR	0,050								AES	0,0168												
AES	0,050								AES	0,0174												
AES	0,050								AES	0,0179												
IR	0,050								AES	0,0181												
AES	0,050	XRF	1,124						AES	0,0181	ICP	0,082	ICP	0,189	ICP	0,044*			ICP	0,0225		
IR	0,051	AES-m.	1,133						AES	0,0182	XRF	0,086	AES	0,195	ICP	0,050			AES	0,0226		
IR	0,051	ICP	1,134						AES	0,0194	ICP	0,086	ICP	0,201	AES-m.	0,051			AES	0,0242		
IR	0,052	AES	1,135	ICP	0,271*		ICP	0,0112	AES	0,0196	AES	0,088	ICP	0,201	AES	0,053	ICP	0,037	AES	0,0244		
IR	0,052	AES	1,135	ICP	0,295		AES	0,0126	AES	0,0196	AES	0,088	XRF	0,202	AES	0,054	AES	0,039	ICP	0,0246		
IR	0,052	AES	1,136	AES-m.	0,301		AES	0,0128	AES	0,0198	ICP	0,089	AES	0,202	AES	0,054	AES	0,040	XRF	0,0251		
IR	0,052	AES	1,139	AES	0,305		ICP	0,0131	AES	0,0198	AES	0,089	AES	0,202	ICP	0,054	AES	0,040	AES	0,0254		
IR	0,052	AES	1,140	AES	0,305		AES	0,0132	IR	0,0199	ICP	0,090	ICP	0,202	AES	0,055	AES	0,041	AES	0,0256		
AES	0,052	AES	1,143	AES	0,306		AES	0,0132	AES	0,0200	ICP	0,090	AES	0,202	AES	0,055	AES	0,043	AES	0,0258		
IR	0,052	AES	1,144	AES	0,307		AES	0,0132	AES	0,0200	AES	0,090	AES	0,203	ICP	0,055	ICP	0,043	AES	0,0259		
AES	0,052	ICP	1,145	AES	0,307		AES	0,0133	AES	0,0201	AES	0,090	AES	0,204	ICP	0,055	AES	0,043	AES	0,0260		
AES	0,052	AES	1,147	AES	0,309		ICP	0,0134	IR	0,0201	ICP	0,090	ICP	0,204	AES	0,055	AES	0,043	AES	0,0260		
IR	0,053	AES	1,147	AES	0,309		ICP	0,0134	IR	0,0204	AES	0,090	AES	0,205	AES	0,056	AES	0,043	AES	0,0260		
AES	0,053	AES	1,148	Gravim.	0,311		AES	0,0136	IR	0,0205	ICP	0,090	AES	0,205	XRF	0,056	AES	0,043	AES	0,0260		
AES	0,053	AES	1,150	AES	0,311		AES	0,0138	IR	0,0205	XRF-m.	0,090	AES	0,205	AES	0,056	AES	0,044	ICP	0,0260		
AES	0,053	ICP	1,151	XRF	0,312		AES	0,0138	AES	0,0205	AES	0,091	AES	0,207	AES	0,056	AES	0,044	AES	0,0262		
TCM	0,053	AES	1,152	AES	0,312		AES	0,0138	IR	0,0206	AES	0,091	AES	0,208	ICP	0,056	ICP	0,044	ICP	0,0262		
IR	0,053	AES	1,152	AES	0,312		AES	0,0140	IR	0,0206	AES	0,091	AES	0,208	AES	0,056	AES	0,044	AES	0,0262		
AES	0,053	Titrimetric	1,153	AES	0,313		AES	0,0140	IR	0,0206	AES	0,091	AES	0,208	AES	0,056	AES	0,045	ICP	0,0262		
IR	0,054	XRF-m.	1,154	AES	0,313		AES	0,0140	IR	0,0207	AES	0,091	AES	0,208	AES	0,056	XRF	0,045	AES	0,0263	AES-m.	0,0006
IR	0,054	AES	1,157	AES	0,314		AES	0,0141	AES	0,0208	AES	0,092	ICP	0,209	AES	0,056	AES	0,045	XRF-m.	0,0264	AES	0,0012
IR	0,054	AES	1,158	AES	0,314		AES	0,0142	AES	0,0208	AES	0,093	AES	0,209	AES	0,056	AES	0,045	AES	0,0265	ICP	0,0020
IR	0,054	AES	1,158	AES	0,314		AES	0,0142	AES	0,0209	AES	0,093	AES	0,209	AES	0,057	ICP	0,045	AES	0,0266	ICP	0,0020
AES	0,055	AES	1,160	ICP	0,316		AES	0,0143	AES	0,0209	AES	0,093	AES	0,210	AES	0,057	AES	0,045	AES	0,0268	XRF	0,0030
IR	0,055	AES	1,162	AES	0,316		Photom.	0,0144	IR	0,0211	AES	0,093	AES	0,211	AES	0,058	AES	0,045	AES	0,0268	AES	0,0032
AES	0,056	AES	1,163	AES	0,317		AES	0,0145	IR	0,0211	AES	0,093	AES	0,211	AES	0,058	ICP	0,045	ICP	0,0269	AES	0,0035
IR	0,056	AES	1,164	ICP	0,317		AES	0,0146	IR	0,0212	AES	0,093	AES	0,212	AES	0,058	AES	0,045	AES	0,0270	AES	0,0035
AES	0,056	AES	1,165	AES	0,318		AES	0,0146	AES	0,0212	AES	0,094	AES	0,212	AES	0,058	AES	0,046	AES	0,0272	ICP	0,0035
AES	0,056	AES	1,169	AES	0,318		AES	0,0147	AES	0,0213	AES	0,095	ICP	0,213	XRF-m.	0,058	ICP	0,046	AES	0,0273	AES	0,0036
AES	0,057	AES	1,169	AES	0,318		AES	0,0149	IR	0,0214	AES	0,096	AES-m.	0,214	AES	0,059	AES	0,046	AES	0,0273	AES	0,0043
AES	0,057	AES	1,171	AES	0,319		AES	0,0150	IR	0,0214	AES	0,096	AES	0,214	AES	0,059	AES	0,046	AES	0,0274	AES	0,0043
AES	0,057	AES	1,173	AES	0,320		AES	0,0152	IR	0,0215	AES	0,096	AES	0,214	AES	0,059	AES	0,047	AES	0,0274	AES	0,0046
AES	0,058	AES	1,176	AES	0,320		AES	0,0152	IR	0,0215	AES	0,096	AES	0,215	AES	0,059	AES	0,047	AES	0,0276	AES	0,0047
IR	0,058	AES	1,176	AES	0,324		AES	0,0152	IR	0,0217	AES	0,096	AES	0,215	AES	0,060	AES	0,048	AES	0,0276	AES	0,0052
IR	0,058	AES	1,181	AES	0,328		XRF	0,0155	IR	0,0217	AES	0,097	AES	0,216	AES	0,060	AES	0,048	ICP	0,0292	AES	0,0054
AES	0,058	ICP	1,186	AES	0,328		ICP	0,0173	IR	0,0219	AES	0,098	AES	0,219	ICP	0,061	AES	0,048	AES	0,0304	AES	0,0054
AES	0,060	ICP	1,190	ICP	0,329		AES	0,0176	XRF	0,0223	AES	0,101	AES	0,219	AES	0,062	AES	0,048	AES	0,0312*	AES	0,0055
AES-m.	0,065*	ICP	1,200	AES	0,342*		AES	0,0178	IR	0,0226	AES-m.	0,109*	AES	0,220	AES	0,063	AES-m.	0,048	AES-m.	0,0312*	AES	0,0057

	C	Mn	Si	P	S	Cu	Cr	Ni	Al	Mo	W
Value	0,053		0,14		0,0206		0,092		0,044		0,0037
S ₉₅	0,003	0,017	0,008	0,0014	0,0014	0,004	0,007	0,003	0,003	0,0015	0,0015
U	0,001	0,006	0,003	0,0005	0,0004	0,001	0,002	0,001	0,001	0,0005	0,0007

Method	V	Method	Ti	Method	Co	Method	As	Method	Sn	Method	B	Method	Nb	Method	Sb	Method	Zr	Method	Zn	Method	N	
AES-m.	0,0046*	ICP	0,105*																			
ICP	0,0108	AES	0,122																			
AES	0,0111	XRF	0,122																			
ICP	0,0115	ICP	0,124																			
ICP	0,0123	XRF-m.	0,124																			
AES	0,0123	AES	0,125									AES-m.	0,001*									AES
ICP	0,0124	ICP	0,125	ICP	0,0071							XRF-m.	0,0046									AES
XRF	0,0125	AES	0,125	AES	0,0073							AES	0,0050									AES
ICP	0,0126	AES	0,127	AES	0,0073							XRF	0,0050									AES
ICP	0,0127	AES	0,129	XRF	0,0074							ICP	0,0052									AES
AES	0,0130	AES	0,129	ICP	0,0074	XRF	0,0043	AES	0,0055	XRF	0,0007	AES	0,0057									TCM
AES	0,0130	AES	0,129	ICP	0,0075	ICP	0,0044	ICP	0,0055	AES	0,0008	AES	0,0058									TCM
AES	0,0131	AES	0,129	AES	0,0076	AES	0,0049	AES	0,0066	AES	0,0008	AES	0,0059									TCM
AES	0,0131	ICP	0,129	AES	0,0077	AES	0,0050	AES	0,0068	ICP	0,0008	AES	0,0059									TCM
AES	0,0132	AES	0,130	ICP	0,0077	AES	0,0051	AES	0,0069	AES	0,0009	AES	0,0060									TCM
AES	0,0133	AES	0,131	AES	0,0077	ICP	0,0051	AES	0,0069	AES	0,0009	AES	0,0061									AES

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 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 31/1B** - 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.

Responsible person: Martin Bogumský

Issued in Bohumín in May 2023

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