



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 05 – 20

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

SPL LA-1C (PT 28/1A)

CERTIFIED VALUES – Mass content in %wt.

Element	Value [%wt.]	Uncertainty [%wt.]
C	0.0255	0.0006
Mn	0.173	0.002
Si	0.095	0.001
P	0.0087	0.0004
S	0.0070	0.0002
Cu	0.0286	0.0006
Cr	0.042	0.001

Element	Value [%wt.]	Uncertainty [%wt.]
Ni	0.037	0.001
Al	0.0095	0.0005
Mo	0.0109	0.0003
W	<i>0.003</i>	
V	0.0092	0.0004
Co	0.0095	0.0003
N	0.0069	0.0003

PARTICIPATING LABORATORIES:

ARCELORMITTAL Warszawa, Poland
BONATRANS GROUP, Czech Republic
BRITISH STEEL, United Kingdom
COGNOR S.A. - Ferrostal Łabędy, Poland
DUNAFERR Labor Nonprofit, Hungary
FERROMET, Czech Republic
GO STEEL Frýdek-Místek, Czech Republic
LIBERTY Ostrava, Czech Republic
MS UTILITIES & SERVICES, Czech Republic
OCAS NV, Belgium
PRECHEZA, Czech Republic

SES INSPEKT, Slovakia
SSAB EMEA, Sweden
SUNNINGWELL INTERNATIONAL, Poland
TATA STEEL, Netherlands
U. S. STEEL Košice – Labortest, Slovakia
ÚJV Řež, Czech Republic
UNIPETROL RPA, Czech Republic
VÁLCOVNY TRUB Chomutov, Czech Republic
VOESTALPINE STAHL, Austria
ZPS - SLÉVÁRNA, Czech Republic
ŽDAS, Czech Republic

LA-1C - ANALYTICAL DATA:

Method	C	Method	Mn	Method	Si	Method	P	Method	S	Method	Cu	Method	Cr
AES	0,0222												
IR	0,0223												
IR	0,0231							AES-m.	0,0056				
AES	0,0238	XRF	0,159	XRF-m.	0,087*			AES	0,0062				
IR	0,0239	AES	0,164	XRF	0,087*			AES	0,0062			XRF	0,038*
AES	0,0240	AES	0,167	AES	0,088			AES	0,0062	AES	0,0246	AES	0,040
AES	0,0240	AES	0,167	AES	0,091	ICP	0,0075	IR	0,0063	AES	0,0260	AES-m.	0,041
AES-m.	0,0242	AES-m.	0,168	AES	0,092	AES	0,0075	IR	0,0064	AES	0,0262	AES	0,041
AES-m.	0,0242	AES	0,168	AES	0,092	ICP	0,0075	AES	0,0064	ICP	0,0265	AES	0,041
IR	0,0244	AES-m.	0,168	AES	0,093	AES-m.	0,0076	AES	0,0066	ICP	0,0266	AES	0,041
IR	0,0247	AES	0,169	AES	0,093	AES-m.	0,0078	AES	0,0068	AES-m.	0,0268	AES-m.	0,041
IR	0,0250	AES	0,169	AES-m.	0,094	AES	0,0079	AES	0,0069	AES-m.	0,0272	AES	0,041
AES	0,0250	AES-m.	0,170	AES	0,094	AES-m.	0,0080	IR	0,0069	AES	0,0275	AES	0,042
AES	0,0252	AES	0,172	ICP	0,094	AES-m.	0,0080	AES	0,0069	XRF	0,0277	AES	0,042
AES	0,0254	AES	0,172	Photom.	0,095	AES	0,0081	AES	0,0069	AES	0,0277	AES	0,042
AES	0,0255	AES	0,172	AES	0,095	AES-m.	0,0082	IR	0,0069	AES	0,0281	XRF-m.	0,042
AES	0,0255	AES	0,172	AES	0,095	AES	0,0083	IR	0,0070	ICP	0,0282	AES	0,042
AES	0,0256	AES-m.	0,172	Gravim.	0,095	AES	0,0084	IR	0,0070	AES	0,0282	ICP	0,042
IR	0,0257	AES	0,172	AES	0,095	AES	0,0084	AES-m.	0,0070	AES	0,0283	AES	0,043
AES	0,0258	AES	0,172	AES	0,095	AES	0,0086	AES-m.	0,0070	AES	0,0285	AES-m.	0,043
AES	0,0258	ICP	0,173	AES	0,096	Photom.	0,0088	AES-m.	0,0070	AES	0,0286	AES	0,043
AES	0,0259	XRF-m.	0,174	AES	0,096	AES	0,0090	AES	0,0070	AES	0,0287	AES	0,043
IR	0,0259	AES-m.	0,174	AES	0,096	AES-m.	0,0090	AES	0,0070	AES	0,0288	AES	0,043
IR	0,0261	AES	0,175	AES-m.	0,096	AES	0,0092	IR	0,0071	AES	0,0289	AES	0,043
AES	0,0262	AES	0,176	ICP	0,096	AES	0,0092	IR	0,0071	AES	0,0292	ICP	0,043
IR	0,0266	AES	0,176	AES	0,097	AES	0,0092	IR	0,0072	AES	0,0292	AES	0,043
IR	0,0268	AES	0,176	AES-m.	0,097	AES	0,0094	IR	0,0073	AES	0,0294	AES-m.	0,043
IR	0,0268	AES	0,176	AES-m.	0,097	AES	0,0094	AES-m.	0,0073	AES	0,0296	AES	0,043
IR	0,0268	AES	0,177	AES	0,097	AES	0,0094	IR	0,0075	AES	0,0296	ICP	0,043
AES-m.	0,0268	AES	0,178	AES	0,098	AES	0,0095	IR	0,0075	AES	0,0296	AES	0,043
IR	0,0270	ICP	0,178	AES	0,098	AES	0,0095	AES	0,0075	AES-m.	0,0298	AES	0,043
AES	0,0271	AES	0,178	AES-m.	0,098	AES	0,0097	AES-m.	0,0078	AES-m.	0,0300	AES-m.	0,043
AES-m.	0,0273	AES-m.	0,181	AES-m.	0,098	AES	0,0103	AES	0,0080	AES	0,0308	AES-m.	0,044
AES	0,0284	ICP	0,182	AES	0,098	AES	0,0113	AES	0,0081	AES-m.	0,0308	AES	0,045
AES-m.	0,0288	XRF-m.	0,186	AES	0,100	AES	0,0127*	AES	0,0084	AES-m.	0,0320	AES	0,047*
AES	0,0356*	AES	0,201*	AES	0,106*	XRF-m.	0,0161*	AES	0,0086	AES	0,0321	AES	0,048*
C		Mn		Si		P		S		Cu		Cr	
Value	0,0255		0,173		0,095		0,0087		0,0070		0,0286		0,042
sM	0,0015		0,005		0,003		0,0009		0,0006		0,0017		0,001
U	0,0006		0,002		0,001		0,0004		0,0002		0,0006		0,001

Method	Ni	Method	Al	Method	Mo	Method	W	Method	V	Method	Co	Method	N
ICP	0,034												
AES	0,034			AES	0,0091			AES	0,0068*				
AES	0,034			AES	0,0094			AES	0,0070*			AES	0,0051
XRF	0,034			AES	0,0095			AES	0,0077			AES-m.	0,0059
AES	0,035	AES	0,0074	AES	0,0099			AES-m.	0,0080			AES	0,0059
ICP	0,035	AES	0,0078	AES	0,0102			AES-m.	0,0081	AES	0,0081	AES	0,0063
AES	0,036	AES	0,0079	AES	0,0104			ICP	0,0086	AES	0,0081	TCM	0,0063
AES	0,036	AES-m.	0,0086	AES	0,0104			AES	0,0086	AES	0,0081	TCM	0,0066
AES	0,036	AES	0,0087	AES	0,0104			ICP	0,0090	AES	0,0083	AES	0,0066
AES-m.	0,036	AES	0,0087	AES	0,0105			AES	0,0090	AES	0,0084	IR	0,0066
AES	0,037	AES-m.	0,0088	AES	0,0105			AES	0,0090	AES	0,0088	TCM	0,0066
AES	0,037	AES	0,0089	ICP	0,0106			ICP	0,0090	AES	0,0088	TCM	0,0066
AES	0,037	AES	0,0089	AES	0,0106			AES-m.	0,0090	ICP	0,0088	AES-m.	0,0067
AES-m.	0,037	AES-m.	0,0089	AES	0,0107			AES-m.	0,0090	AES	0,0095	TCM	0,0067
AES	0,037	AES	0,0092	AES-m.	0,0107			AES-m.	0,0090	AES-m.	0,0096	TCM	0,0067
AES-m.	0,037	AES	0,0093	XRF-m.	0,0107			AES	0,0090	ICP	0,0096	TCM	0,0068
AES	0,037	AES	0,0094	AES	0,0108			AES-m.	0,0090	AES	0,0096	TCM	0,0068
AES	0,037	ICP	0,0094	AES-m.	0,0108			AES	0,0091	AES	0,0096	AES	0,0068
AES	0,037	AES	0,0094	AES	0,0109	ICP	0,0006	AES	0,0091	AES	0,0096	TCM	0,0069
AES	0,038	ICP	0,0095	AES-m.	0,0110	AES	0,0010	AES	0,0091	AES	0,0097	AES	0,0070
AES	0,038	AES	0,0097	AES	0,0112	AES-m.	0,0012	AES	0,0092	AES	0,0097	AES	0,0070
AES	0,038	AES	0,0098	ICP	0,0113	AES	0,0013	AES	0,0094	AES	0,0099	AES	0,0072
AES-m.	0,038	AES	0,0099	AES	0,0113	AES	0,0018	AES	0,0094	AES	0,0100	AES-m.	0,0072
AES-m.	0,038	AES	0,0099	AES	0,0113	AES	0,0018	AES	0,0094	AES	0,0100	AES	0,0073
AES	0,038	AES	0,0100	ICP	0,0114	AES-m.	0,0022	AES	0,0095	AES-m.	0,0100	TCM	0,0074
ICP	0,038	AES-m.	0,0102	AES	0,0117	AES	0,0024	XRF-m.	0,0096	AES-m.	0,0100	AES-m.	0,0075
AES	0,039	AES-m.	0,0108	AES-m.	0,0120	AES	0,0027	AES	0,0098	AES	0,0101	AES-m.	0,0075
AES-m.	0,039	AES	0,0114	AES-m.	0,0120	AES	0,0056	AES	0,0099	AES	0,0103	AES	0,0076
AES	0,040	AES-m.	0,0116	AES	0,0121	AES-m.	0,0056	AES	0,0100	AES	0,0104	AES-m.	0,0076
AES	0,040	AES	0,0123	AES	0,0121	AES	0,0078	AES	0,0101	AES-m.	0,0104	AES	0,0079
AES	0,043*	AES	0,0142*	AES	0,0122	AES	0,0087	AES	0,0102	ICP	0,0107	AES	0,0080
XRF-m.	0,050*	AES	0,0206*	AES-m.	0,0122	AES	0,0117	AES	0,0110	AES-m.	0,0108	AES	0,0090
Ni		Al		Mo		W		V		Co		N	
Value	0,037		0,0095		0,0109		0,003		0,0092		0,0095		0,0069
sM	0,002		0,0011		0,0008				0,0007		0,0008		0,0007
U	0,001		0,0005		0,0003				0,0004		0,0003		0,0003

COMMENTS:

Value – reference value, s_M – 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 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 28/1A** - 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 2020

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