



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 06 – 19

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

SPL CM-22A

CERTIFIED VALUES – Mass content in %wt.

Element	<i>Value</i> [%wt.]	<i>Uncertainty</i> [%wt.]
C	0.154	0.002
Mn	1.443	0.009
Si	0.248	0.008
P	0.086	0.004
S	0.084	0.003
Cu	0.419	0.006
Cr	0.167	0.004
Ni	3.106	0.041
Al	0.0049	0.0017

Element	<i>Value</i> [%wt.]	<i>Uncertainty</i> [%wt.]
Mo	0.132	0.006
W	0.599	0.010
V	0.653	0.008
Ti	0.0038	0.0004
Co	0.130	0.002
As	0.057	0.006
Sn	0.069	0.002
Nb	0.0195	0.0022
N	0.0065	0.0002

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

ŽDAS, Žďár nad Sázavou, Czech Republic

CM-22A - ANALYTICAL DATA:

Method	C	Method	Mn	Method	Si	Method	P	Method	S	Method	Cu	Method	Cr	Method	Ni	Method	Al
IR+TCM	0,147																
AES	0,148																
AES	0,149																
AES	0,150								AES	0,066							
AES	0,150								AES	0,068							
IR	0,150								AES	0,069							
IR+TCM	0,151								AES	0,069							
IR+TCM	0,152	AES	1,413	AES	0,224				IR+TCM	0,077							
AES	0,153	AES	1,432	ICP	0,236				IR+TCM	0,080	AES	0,402	ICP	0,158	AES	2,927*	
AES	0,153	AES	1,433	AES	0,238	ICP	0,079		AES	0,082	AES	0,410	AES	0,158	AES	2,978*	ICP
IR+TCM	0,154	AES	1,435	AES	0,243	AES	0,080		IR+TCM	0,082	AES	0,416	AES	0,162	AES	3,034	AES
IR+TCM	0,154	AES	1,436	AES	0,246	AES	0,082		IR+TCM	0,084	ICP	0,417	AES	0,164	AES	3,066	AES
AES	0,155	AES	1,441	AES	0,249	AES	0,083		IR+TCM	0,084	AES	0,417	AES	0,167	AES	3,071	AES
AES	0,155	AES	1,442	AES	0,254	AES	0,084		IR+TCM	0,085	AES	0,417	AES	0,168	AES	3,104	AES
IR+TCM	0,156	AES	1,446	AES	0,255	AES	0,086		AES	0,086	AES	0,418	AES	0,169	AES	3,108	AES
AES	0,157	AES	1,455	AES	0,255	AES	0,086		IR+TCM	0,086	AES	0,420	AES	0,170	AES	3,118	AES
IR+TCM	0,158	AES	1,456	AES	0,257	AES	0,091		IR+TCM	0,087	AES	0,426	AES	0,170	AES	3,164	AES
AES	0,160	AES	1,461	AES	0,257	AES	0,091		AES	0,087	AES	0,432	AES	0,172	AES	3,180	AES
IR+TCM	0,165	ICP	1,463	AES	0,266	AES	0,093		IR	0,091	AES	0,433	AES	0,179	ICP	3,197*	AES
	C		Mn		Si		P		S		Cu		Cr		Ni		Al
Value	0,154		1,443		0,248		0,086		0,084		0,419		0,167		3,106		0,0049
S _M	0,004		0,014		0,012		0,005		0,004		0,009		0,006		0,049		0,0022
U	0,002		0,009		0,008		0,004		0,003		0,006		0,004		0,041		0,0017

Method	Mo	Method	W	Method	V	Method	Ti	Method	Co	Method	As	Method	Sn	Method	Nb	Method	N
AES	0,113																
AES	0,122				AES	0,629	ICP	0,0025									
AES	0,126				AES	0,637	AES	0,0035									
AES	0,130				AES	0,647	AES	0,0036									
AES	0,131	AES	0,584	AES	0,648	AES	0,0036	AES	0,126	AES	0,048	AES	0,065	AES	0,0164	IR+TCM	0,0063
AES	0,134	AES	0,588	AES	0,650	AES	0,0040	AES	0,129	AES	0,051	AES	0,067	AES	0,0170	IR+TCM	0,0063
AES	0,135	AES	0,593	AES	0,656	AES	0,0040	ICP	0,130	AES	0,051	AES	0,068	AES	0,0178	IR+TCM	0,0064
AES	0,136	AES	0,600	AES	0,656	AES	0,0040	AES	0,130	AES	0,058	AES	0,069	AES	0,0184	IR+TCM	0,0064
ICP	0,136	AES	0,604	AES	0,656	AES	0,0040	AES	0,131	AES	0,059	AES	0,070	AES	0,0195	AES	0,0066
AES	0,137	AES	0,608	AES	0,663	AES	0,0042	AES	0,131	AES	0,060	ICP	0,070	AES	0,0216	IR+TCM	0,0067
AES	0,140	AES	0,616	AES	0,669	AES	0,0050	AES	0,132	AES	0,062	AES	0,072	AES	0,0220	AES	0,0076*
AES	0,145	AES	0,665*	ICP	0,669	AES	0,0072*	AES	0,132	ICP	0,068	AES	0,078*	AES	0,0250	AES	0,0082*
	Mo		W		V		Ti		Co		As		Sn		Nb		N
Value	0,132		0,599		0,653		0,0038		0,130		0,057		0,069		0,0195		0,0065
S _M	0,009		0,011		0,012		0,0006		0,002		0,007		0,002		0,0028		0,0002
U	0,006		0,010		0,008		0,0004		0,002		0,006		0,002		0,0022		0,0002

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 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 inhomogeneous 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 metrologically **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.

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

Responsible person: Martin Bogumský

Issued in Bohumín in August 2019

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