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 13 – 22

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

SPL CM-10B (PT 30/6A)

CERTIFIED VALUES – Mass content in %wt.

Element	*Value* [%wt.]	*Uncertainty* [%wt.]
C	**0.714**	0.006
Mn	**0.995**	0.010
Si	**0.855**	0.014
P	**0.0458**	0.0015
S	**0.0288**	0.0009
Cu	**0.323**	0.004
Cr	**5.774**	0.031
Ni	**2.471**	0.018
Al	**0.0461**	0.0024

Element	*Value* [%wt.]	*Uncertainty* [%wt.]
Mo	**1.294**	0.017
W	**1.015**	0.023
V	**0.923**	0.010
Ti	**0.0271**	0.0012
Co	**0.118**	0.002
B	**0.0461**	0.0029
Nb	**0.0149**	0.0021
N	**0.0267**	0.0009

PARTICIPATING LABORATORIES:

COGNOR S.A. - Ferrostal Łabędy, Poland
COMTES, Czech Republic
DAIMLER TRUCK AG, Germany
DUNAFERR Labor Nonprofit, Hungary
ESAB CZ, Czech Republic
GENERALZOLLDIREKTION, Germany
INSTITUT PRO TEST. A CERT., Czech Republic
MACHINEFISH, Poland
OCAS NV, Belgium
PCS, Czech Republic
SLOVENSKÉ ELEKTRÁRNE, Slovakia
SSAB EMEA, Sweden
STROJÍRENSKÝ ZKUŠ. ÚSTAV, Czech Republic
ŠKODA AUTO, Czech Republic
TATRA METALURGIE, Czech Republic
ÚJV Řež, Czech Republic
VÍTKOVICE TESTING CENTER, Czech Republic
VÚHŽ, Czech Republic
VÝZK. A ZKUŠ. ÚSTAV PLZEŇ, Czech Republic
ZÁPADOČESKÁ UNIV. V PLZNI, Czech Republic
ZPS - SLÉVÁRNA, Czech Republic
ŽĎAS, Czech Republic

CM-10B - ANALYTICAL DATA:

Method	C	Method	Mn	Method	Si	Method	P	Method	S	Method	Cu	Method	Cr	Method	Ni	Method	Al
												AES	5,604	AES	2,285*		
												AES	5,643	XRF	2,312*		
		AES-m.	0,934					AES	0,0238	AES-m.	0,300	AES	5,644	AAS	2,383		
AES-m.	0,603*	AES	0,949					AES	0,0253	AES-m.	0,310	AAS	5,684	AES-m.	2,384		
AES	0,664*	XRF	0,960					AES	0,0264	AES	0,313	AES	5,696	AES	2,426		
AES	0,686	AES	0,972					AES-m.	0,0272	AES	0,314	AES	5,706	AES	2,426		
IR	0,690	Photom.	0,973	AES	0,717*			IR	0,0273	AES	0,314	AES	5,707	AES	2,436		
IR	0,702	AES-m.	0,977	AES	0,797			IR	0,0274	XRF	0,317	AES	5,709	ICP	2,441		
AES	0,703	AES	0,978	AES	0,811	AES-m.	0,0408	AES	0,0276	Photom.	0,317	AES	5,734	XRF	2,442	AES-m.	0,0342
AES	0,703	AES	0,982	Gravim.	0,816	AES	0,0416	AES	0,0276	AES	0,317	AES-m.	5,735	Photom.	2,450	Photom.	0,0390
AES	0,704	AES	0,985	AES	0,818	XRF	0,0419	IR	0,0277	AAS	0,318	AES	5,755	AES	2,450	XRF	0,0414
IR	0,706	AES	0,988	XRF	0,835	AES-m.	0,0419	IR	0,0277	XRF	0,318	XRF	5,770	AAS	2,462	AES	0,0421
AES	0,706	XRF	0,990	AES	0,836	AES	0,0432	AES	0,0277	AES	0,319	AES	5,782	AES	2,463	AES	0,0438
IR	0,707	AES	0,993	XRF	0,837	AES	0,0433	AES	0,0282	AAS	0,320	AES	5,786	XRF	2,464	AES	0,0454
AES	0,708	AES	1,001	AES-m.	0,837	AES	0,0440	IR	0,0282	ICP	0,321	AES	5,792	XRF-m.	2,466	AES	0,0454
AES	0,709	AES	1,002	XRF	0,843	AES	0,0444	AES	0,0288	AES	0,321	XRF	5,800	Photom.	2,470	XRF	0,0456
IR	0,711	AES	1,003	AES-m.	0,848	AES	0,0449	AES	0,0288	ICP	0,323	AAS	5,803	AES	2,472	AES	0,0458
XRF	0,714	AES	1,003	AES	0,857	Photom.	0,0450	IR	0,0288	XRF	0,324	AES	5,806	XRF	2,476	AES	0,0462
IR	0,715	XRF	1,005	Photom.	0,861	AES	0,0450	AES	0,0291	AES	0,324	AES	5,808	AES	2,477	AES	0,0465
Photom.	0,720	AES	1,006	AES	0,862	AAS	0,0451	IR	0,0293	AES	0,325	Titrimetric	5,810	AES	2,491	AES	0,0466
IR	0,721	AAS	1,011	AES	0,864	AES	0,0456	AES	0,0294	AES	0,328	AES	5,813	AES	2,492	AES	0,0476
AES	0,722	XRF	1,013	AES	0,864	AES	0,0473	ICP	0,0297	AES	0,331	XRF-m.	5,815	XRF	2,498	AES	0,0481
AES	0,722	XRF-m.	1,015	AES	0,865	XRF	0,0480	Photom.	0,0300	XRF-m.	0,334	AES-m.	5,834	AES	2,501	AES	0,0481
IR	0,722	AES	1,016	AES	0,870	AES	0,0482	AES	0,0304	XRF	0,334	ICP	5,849	AES	2,508	AES	0,0485
AES	0,722	AAS	1,017	AES	0,871	ICP	0,0489	XRF	0,0312	AES	0,337	XRF	5,855	ICP	2,516	AES	0,0516
AES	0,723	ICP	1,020	AES	0,878	AES	0,0495	AES	0,0316	AES	0,340	XRF	5,902	AES	2,519	AAS	0,0552
AES	0,730	AES	1,023	ICP	0,909	AES	0,0504	IR	0,0324	AES	0,341	ICP	5,909	AES	2,534	AES-m.	0,0557
IR	0,732	ICP	1,044	AES	0,913	AES	0,0510	XRF	0,0326	AES	0,341	Photom.	5,928	AES-m.	2,592	AES	0,0676*
AES	0,750	ICP	1,318*	AAS	0,918	AES	0,0514	AES-m.	0,0331	ICP	0,389*	ICP	6,785*	ICP	3,031*	ICP	0,1131*
	C		**Mn**		**Si**		**P**		**S**		**Cu**		**Cr**		**Ni**		**Al**
Value	0,714		0,995		0,855		0,0458		0,0288		0,323		5,774		2,471		0,0461
s_M	0,014		0,025		0,032		0,0032		0,0022		0,010		0,081		0,045		0,0050
U	0,006		0,010		0,014		0,0015		0,0009		0,004		0,031		0,018		0,0024

Method	Mo	Method	W	Method	V	Method	Ti	Method	Co	Method	B	Method	Nb	Method	N
				AES	0,877										
ICP	1,216			AES	0,881										
ICP	1,232			AES	0,885										
AES	1,237			AES	0,888										
AES	1,246	AES	0,815*	XRF	0,888			XRF	0,108						
AES	1,252	AAS	0,899	AAS	0,899	AES-m.	0,0153*	AES	0,110						
AES-m.	1,252	AES	0,946	AES	0,900	ICP	0,0222	AES	0,110						
AES	1,268	AES	0,946	AES-m.	0,903	ICP	0,0228	AES	0,115						
AES	1,276	AES	0,959	AES	0,906	AES-m.	0,0244	AES	0,115						
AES	1,279	AES	0,973	AES	0,910	AES	0,0246	AES	0,116						
XRF	1,280	AES	0,976	AES	0,910	AES	0,0253	AES	0,116						
AES	1,280	Photom.	0,982	AES	0,914	AES	0,0258	AES-m.	0,116			AES	0,0078		
AAS	1,289	AES	0,990	AES	0,926	AES	0,0260	AES	0,117			XRF	0,0093	TCM	0,0244
AES	1,294	XRF	1,015	XRF	0,927	AES	0,0260	AES	0,117			AES-m.	0,0094	AES	0,0244
AES	1,294	AES	1,015	AES	0,932	AES	0,0265	ICP	0,118			AES	0,0110	TCM	0,0246
AES	1,304	AES-m.	1,017	XRF	0,933	AES	0,0266	AES	0,119			AES-m.	0,0117	TCM	0,0256
AES-m.	1,304	XRF-m.	1,018	AES	0,938	AES	0,0268	AES	0,120			AES	0,0146	IR	0,0257
AES	1,308	AES	1,020	ICP	0,939	AES	0,0269	AES	0,120			XRF	0,0149	TCM	0,0260
AES	1,308	XRF	1,029	AES-m.	0,939	AES	0,0275	ICP	0,120			AES	0,0149	AES	0,0262
AES	1,315	XRF	1,029	Titrimetric	0,940	AES	0,0276	AAS	0,121			AES	0,0150	TCM	0,0262
AES	1,317	XRF	1,030	XRF-m.	0,940	Photom.	0,0280	XRF	0,122	AES	0,0406	AES	0,0151	XRF	0,0264
AES	1,320	AES	1,045	Photom.	0,941	AAS	0,0280	AES	0,123	AES	0,0445	AES	0,0157	AES	0,0272
Photom.	1,330	ICP	1,047	AES	0,943	XRF	0,0282	AES	0,123	AES	0,0447	AES	0,0158	TCM	0,0274
XRF	1,346	AES	1,047	AES	0,948	AES	0,0286	AES	0,124	AES	0,0470	XRF	0,0178	AES	0,0277
XRF-m.	1,351	AES	1,050	ICP	0,949	AES	0,0288	AES-m.	0,125	AES	0,0472	AES	0,0192	AES	0,0277
XRF	1,372	AES	1,066	AES	0,953	AES	0,0310	AES	0,135*	AES	0,0480	AES	0,0194	AES	0,0283
XRF	1,375	AES	1,091	XRF	0,960	XRF	0,0311	ICP	0,137*	AES-m.	0,0504	AES	0,0194	AES	0,0287
ICP	1,677*	AES-m.	1,156	ICP	0,964	AES	0,0340	Photom.	0,145*	ICP	0,0853*	AES	0,0224	AES	0,0299
	Mo		**W**		**V**		**Ti**		**Co**		**B**		**Nb**		**N**
Value	1,294		1,015		0,923		0,0271		0,118		0,0461		0,0149		0,0267
s_M	0,041		0,054		0,025		0,0027		0,005		0,0031		0,0041		0,0016
U	0,017		0,023		0,010		0,0012		0,002		0,0029		0,0021		0,0009

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 30/6A** - laboratories by various spectrometric methods (AES spark, glow discharge, XRF) and alternative methods (combustion, thermoevolution, wet-way) standard methods, with measurements metrological traceabled 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 ± 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 December 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