



SPL-LABMAT s.r.o.

1.máje 432, CZ-735 31 Bohumín, Czech Republic  
e-mail: [info@spl-labmat.cz](mailto:info@spl-labmat.cz), [www.spl-labmat.cz](http://www.spl-labmat.cz), phone: +420 596 014 627

## 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	0.045	

#### 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

# CM-16B - ANALYTICAL DATA:

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	0.396*							IR	0.0329																
IR	0.408							IR	0.0332																
AES	0.410							AES	0.0334																
Photom.	0.411							ICP	0.0336																
IR	0.413							AES	0.0344																
AES	0.414							IR	0.0350																
IR	0.415							IR	0.0351																
AES	0.415							AES	0.0352																
AES	0.416							Photom.	0.0358																
AES	0.416							Photom.	0.0360																
AES	0.416							AES	0.0361																
AES	0.416	AES	0.747	ICP	0.527	XRF	0.0372*	IR	0.0365	ICP	0.287	AES	0.594*	ICP	0.697			ICP	0.393*			ICP	0.240*		
IR	0.417	AES	0.747	ICP	0.544	ICP	0.0435	ICP	0.0365	XRF	0.288	AES	0.609	ICP	0.687			Photom.	0.402			Photom.	0.251	XRF	0.107
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
AES	0.417	AES	0.751	XRF	0.551	AES	0.0460	AES	0.0366	AES	0.288	ICP	0.617	AES	0.713	AES-m.	0.112	AES	0.412			XRF	0.263	AES	0.114
AES	0.417	AES	0.751	AES-m.	0.554	Photom.	0.0467	AES	0.0367	AES	0.289	AES-m.	0.619	AES	0.715	AES	0.115	AES	0.414			AES	0.264	AES	0.116
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	ICP	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	0.721	ICP	0.117	ICP	0.417			AES	0.266	AES	0.116
IR	0.418	ICP	0.758	AES	0.568	Photom.	0.0480	IR	0.0369	AES	0.291	AES	0.628	AES	0.722	AES-m.	0.117	AES	0.418			AES	0.266	AES	0.117
AES	0.419	XRF	0.758	AES	0.570	AES	0.0481	XRF	0.0370	AES	0.292	AES	0.630	AES	0.724	AES	0.120	AES	0.419	ICP		ICP	0.121	AES	0.118
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		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		AES	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.		AES	0.268	AES	0.119
IR	0.420	AES	0.759	AES	0.573	AES	0.0488	IR	0.0373	AES-m.	0.294	AES	0.634	XRF	0.727	AES	0.122	AES	0.420	Photom.		ICP	0.269	XRF	0.119
AES	0.420	AES	0.759	AES	0.573	ICP	0.0489	AES	0.0375	AES	0.294	AES	0.634	AES	0.729	AES	0.123	AES-m.	0.420	AES		AES-m.	0.269	ICP	0.120
AES	0.421	AES	0.760	AES	0.573	AES	0.0491	AES	0.0376	XRF	0.294	AES	0.634	ICP	0.730	AES	0.124	AES	0.422	AES		AES	0.269	ICP	0.120
IR	0.421	AES	0.761	AES	0.574	AES	0.0491	AES-m.	0.0376	AES-m.	0.295	AES	0.635	Photom.	0.730	AES	0.125	ICP	0.422	XRF		AES	0.269	ICP	0.120
IR	0.421	AES	0.762	AES	0.574	AES	0.0497	IR	0.0381	ICP	0.295	AES	0.635	Photom.	0.731	AES	0.125	AES	0.424	ICP		AES	0.270	AES	0.120
IR	0.422	XRF	0.762	AES	0.575	XRF	0.0504	ICP	0.0383	AES	0.295	AES	0.636	AES-m.	0.732	AES	0.126	AES	0.425	XRF		AES-m.	0.270	AES	0.121
IR	0.422	AES	0.763	AES	0.575	AES	0.0505	IR	0.0383	Photom.	0.295	Photom.	0.636	AES	0.733	AES	0.126	ICP	0.425	AES-m.		AES	0.271	AES	0.121
IR	0.422	AES	0.763	AES	0.576	XRF	0.0505	AES	0.0383	AES	0.295	AES-m.	0.636	AES-m.	0.734	AES	0.127	ICP	0.426	AES		AES	0.271	Photom.	0.121
AES	0.423	XRF	0.764	AES	0.577	AES	0.0506	IR	0.0385	AES	0.296	AES	0.636	AES	0.734	AES	0.128	ICP	0.426	AES		AES	0.272	AES	0.121
IR	0.423	AES	0.764	AES	0.577	AES	0.0508	IR	0.0386	AES	0.296	AES	0.637	AES	0.735	AES	0.129	ICP	0.426	AES		AES	0.273	AES-m.	0.122
IR	0.423	AES-m.	0.765	Gravim.	0.577	AES-m.	0.0512	AES	0.0387	AES	0.297	ICP	0.637	AES	0.739	Photom.	0.129	ICP	0.427	AES		ICP	0.273	ICP	0.123
AES	0.423	AES	0.772	Gravim.	0.578	AES	0.0514	AES	0.0388	XRF	0.297	AES	0.637	AES	0.740	AES-m.	0.129	XRF	0.427	AES		AES	0.273	AES	0.124
AES	0.424	ICP	0.767	AES	0.578	AES	0.0515	IR	0.0389	AES	0.298	ICP	0.638	AES	0.740	AES	0.130	XRF	0.427	AES		AES	0.273	AES	0.124
IR	0.424	AES	0.768	AES	0.578	AES	0.0516	IR	0.0391	ICP	0.299	AES	0.638	AES	0.740	XRF	0.130	AES	0.427	AES		AES	0.274	AES	0.124
ICP	0.424	ICP	0.770	AES-m.	0.578	AES	0.0518	IR	0.0391	ICP	0.299	XRF	0.638	AES	0.740	AES	0.131	AES	0.427	XRF		AES-m.	0.274	AES	0.125
IR	0.424	AES	0.772	AES	0.579	ICP	0.0519	ICP	0.0391	Photom.	0.300	AES-m.	0.640	AES	0.740	AES	0.131	AES	0.428	AES		AES	0.274	AES	0.125
Photom.	0.425	AES	0.773	AES	0.580	AES	0.0522	IR	0.0395	AES	0.300	XRF	0.643	XRF	0.742	AES	0.134	AES	0.428	AES		ICP	0.275	AES	0.126
AES-m.	0.426	Photom.	0.774	AES	0.581	AES	0.0524	IR	0.0395	AES	0.300	AES	0.643	AES	0.742	AES	0.135	AES	0.430	AES		XRF	0.276	AES	0.126
AES-m.	0.427	AES	0.779	Gravim.	0.581	AES	0.0525	AES	0.0396	AES	0.300	AES	0.644	AES	0.743	AES	0.135	AES	0.431	AES		AES	0.277	AES-m.	0.128
AES	0.428	ICP	0.779	AES-m.	0.583	AES-m.	0.0526	AES-m.	0.0397	AES	0.301	AES	0.645	ICP	0.743	AES	0.135	AES-m.	0.432	AES		AES	0.277	AES	0.129
IR	0.428	ICP	0.780	AES-m.	0.586	ICP	0.0545	IR	0.0398	AES	0.301	ICP	0.646	AES	0.744	AES	0.136	Photom.	0.433	AES		AES	0.278	AES	0.129
AES	0.429	AES	0.785*	ICP	0.586	AES	0.0547	AES	0.0405	AES	0.302	AES	0.648	ICP	0.745	AES	0.137	AES	0.433	ICP		AES	0.281	AES	0.129
AES	0.429	Photom.	0.796*	XRF	0.588	AES-m.	0.0548	IR	0.0405	AES-m.	0.303	AES	0.649	AES	0.750	AES	0.138	XRF	0.434	AES		AES	0.282	AES	0.129
AES	0.430	AES	0.800*	AES	0.591	AES	0.0550	AES	0.0405	AES	0.309	AES	0.650	AES	0.753	ICP	0.139	AES	0.436	AES		ICP	0.284	AES-m.	0.131
AES	0.430	AES	0.807*	Photom.	0.591	AES	0.0551	IR	0.0406	AES	0.309	AES	0.654	AES	0.758	Photom.	0.140	AES	0.437	ICP		AES	0.284	AES	0.132
IR	0.430	AES	0.812*	AES-m.	0.600	AES	0.0578	AES	0.0408	AES	0.310	AES	0.658	AES	0.760	ICP	0.141	AES	0.437	ICP		AES	0.284	AES	0.142*
AES	0.433	AES	0.816*	AES	0.602	AES	0.0585	AES	0.0410	ICP	0.322*	AES	0.68*	AES	0.796*	AES	0.141	AES	0.440	AES		AES	0.285	ICP	0.149*
AES	0.436	ICP	0.852*	AES	0.613	AES	0.0585	IR	0.0418	ICP	0.326*	ICP	0.697*	ICP	0.821*	ICP	0.159*	ICP	0.475*	AES		AES	0.288	XRF	0.152*
<b>Value</b>	<b>0.421</b>		<b>0.762</b>		<b>0.574</b>		<b>0.0508</b>		<b>0.0376</b>		<b>0.296</b>		<b>0.635</b>		<b>0.733</b>		<b>0.128</b>		<b>0.424</b>		<b>0.141</b>		<b>0.272</b>		<b>0.121</b>
<b>s<sub>M</sub></b>	<b>0.006</b>		<b>0.009</b>		<b>0.016</b>		<b>0.0035</b>		<b>0.0021</b>		<b>0.006</b>		<b>0.011</b>		<b>0.013</b>		<b>0.008</b>		<b>0.008</b>		<b>0.007</b>		<b>0.008</b>		<b>0.006</b>
<b>U</b>	<b>0.002</b>																								

**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