

Metal and Quality, LLC
CERTIFICATE OF ANALYSIS
CRM C047a
Alloy Steel



INFORMATION

Certified Reference Material C047a is intended for calibration of measuring instruments at definition of chemical composition of low alloy steels by using of Optical Emission and X-ray Spectrometry methods

DEVELOPER AND MANUFACTURER

Metal and Quality, LLC

CERTIFIED VALUES (bold)

C047a	C	Mn	P	S	Si	Cr	Ni	Cu	Al	W	V	Mo	Ti	Co	Nb	Sn	B	As	Ca	N
Mass fraction in % by weight	0.789	0.411	0.022	0.0107	1.94	4.76	0.311	0.150	0.054	2.37	1.21	0.76	0.0096	0.105	0.020	0.0104	0.0006	<i>0.0095</i>	0.0022	0.022
Uncertainty	0.007	0.006	0.001	0.0007	0.03	0.04	0.009	0.002	0.004	0.05	0.02	0.01	0.0015	0.004	0.003	0.0014	0.0001	-	0.0006	0.001

Italic - approximate value

Uncertainty was estimated as the confidence interval of the half-width C (95%) of the Student's t-distribution

SPECIFICATION

Reference material is made of hot rolled steel in the form of cylinders diameter of 40 mm, height 25 mm.

HOMOGENEITY

The homogeneity was evaluated according ISO Guide 35:2017 - Reference materials - Guidance for characterization and assessment of homogeneity and stability. To evaluate of homogeneity was used OES method.

TRACEABILITY

The characterization of CRMs was achieved by means inter-laboratory experiment. Chemical analyses were carried out by the participants in the certification tests both on monolithic samples and on chips taken from monolithic samples. The participating laboratories followed the requirements of ISO 17025 and used standardized analytical methods - national standards DSTU GOST 18895-97, DSTU GOST 12345:2004, DSTU GOST 12344:2005, DSTU GOST 8920:2019 and the following certified reference materials for verification of analytical data: DSZU C047, DSZU C049, DSZU C08, ICRM UG4/5, ICRM UG0/8, ICRM UG1/8, ICRM UG133, ICRM LG21/3, ICRM RG21/1, ICRM C2/5, ICRM C25/4, ICRM C32/4, ICRM 1FM28, ICRM U6/7

RM VALIDITY

Shelf life of CRM: unlimited. The working surface of the sample should be purified before use. Reference material will remain stable provided that it is not subjected to excessive heat (e.g. during preparation of the working surface)

DATE OF ISSUE

January 2022

DELIVERY

CRM, packed into a box and Certificate

SAFETY

The reference material and packing does not contain explosives and radioactive substances and substances which might influence health and the environment

LABORATORY MEANS, mass fraction in %

C047a	C	Mn	P	S	Si	Cr	Ni	Cu	Al	W	V	Mo	Ti	Co	Nb	Sn	B	As	Ca	N
1	0.763	0.386	0.0176	0.0084	1.83	4.67	0.288	0.139	0.041	2.27	1.17	0.722	0.0071	0.095	0.012	0.0074	0.00040	0.0085	0.00120	0.0205
2	0.773	0.396	0.0200	0.0095	1.86	4.72	0.295	0.146	0.047	2.28	1.18	0.725	0.0078	0.103	0.017	0.0100	0.00050	0.0095	0.00180	0.0215
3	0.778	0.400	0.0206	0.0097	1.89	4.73	0.296	0.148	0.049	2.34	1.19	0.732	0.0083	0.103	0.018	0.0102	0.00055	0.0097	0.00198	0.0226
4	0.780	0.408	0.0217	0.0101	1.91	4.73	0.299	0.149	0.052	2.34	1.19	0.738	0.0085	0.104	0.018	0.0102	0.00060	0.0104	0.00200	0.0227
5	0.785	0.410	0.0218	0.0110	1.92	4.75	0.301	0.150	0.053	2.39	1.20	0.740	0.0091	0.104	0.019	0.0103	0.00066		0.00210	0.0229
6	0.790	0.410	0.0224	0.0110	1.94	4.76	0.301	0.150	0.054	2.39	1.20	0.750	0.0095	0.105	0.019	0.0104	0.00070		0.00306	0.0233
7	0.790	0.410	0.0224	0.0110	1.95	4.76	0.303	0.150	0.057	2.42	1.23	0.751	0.0117	0.106	0.019	0.0106			0.00310	
8	0.791	0.412	0.0228	0.0112	1.96	4.78	0.303	0.150	0.058	2.44	1.24	0.753	0.0122	0.108	0.020	0.0137				
9	0.792	0.413	0.0231	0.0113	1.96	4.80	0.316	0.151	0.059	2.44	1.24	0.762	0.0123	0.109	0.021					
10	0.793	0.413	0.0234	0.0113	1.97	4.86	0.319	0.151	0.060	2.45	1.25	0.763		0.118	0.023					
11	0.800	0.413	0.0238	0.0113	1.97		0.320	0.152	0.061		1.29	0.772			0.029					
12	0.800	0.413	0.0240	0.0130	2.00		0.322	0.152	0.064			0.774								
13	0.801	0.416			2.00		0.322	0.153				0.775								
14	0.803	0.422					0.339	0.154				0.782								
15		0.428					0.346					0.796								
16		0.432																		
M(M)	0.789	0.411	0.0220	0.0107	1.94	4.76	0.311	0.150	0.054	2.37	1.21	0.756	0.0096	0.105	0.020	0.0104	0.00057	0.0095	0.00218	0.0223
s(M)	0.012	0.011	0.0018	0.0012	0.05	0.05	0.017	0.004	0.007	0.06	0.04	0.022	0.0020	0.006	0.004	0.0017	0.00011	0.0008	0.00068	0.0010

M(M) - Mean of intralaboratory means

s(M) - Standard deviation of the mean values of laboratories

PARTICIPATING LABORATORIES (Ukraine)

ArcelorMittal Kriviy Rig PJSC
 Azovstal Iron & Steel Works PJSC
 Azov Steel-Casting Company LLC
 Dneprospetsstal (DSS) PJSC
 Dneprometiz PJSC
 Dnipropetrovsk Railway Switch Plant PJSC
 Energomashspetsstal PJSC
 Ilyich Iron and Steel Works of Mariupol PJSC
 Kryvyi Rih Mechanical Repair Plant LLC
 Zaporozhye Steel Works LLC.

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