Metal and Quality, LLC

CERTIFICATE OF ANALYSIS

DSZU C019

Stainless Steel

INFORMATION Certified Reference Material DSZU C019 is intended for calibration of measuring instruments at definition of chemical composition of stainless steels by using of Optical Emission and X-ray Spectrometry methods

MANUFACTURER Metal and Quality, LLC

CERTIFIED VALUES (bold)

	C	Si	Mn	S	P	Cr	Ni	Mo	Ti	Al	Cu	Co	V	Nb	W	Sn	N
Mass fraction in %, M(M)	**0.143**	**4.14**	**0.79**	**0.004**	**0.025**	**18.16**	**11.02**	**0.075**	**0.65**	**0.213**	**0.139**	**0.031**	**0.038**	*0.015*	*0.039*	*0.013*	*0.010*
Uncertainty C(95%)	**0.003**	**0.03**	**0.02**	**0.001**	**0.001**	**0.06**	**0.06**	**0.006**	**0.02**	**0.010**	**0.008**	**0.003**	**0.009**	*0.004*	*0.007*	*0.002*	*0.002*

Uncertainty C(95%) estimated as the half-width confidence interval of Student's t-distribution, when n is the number of laboratory means (see next page)

$$C(95\%) = \frac{t \cdot s(M)}{\sqrt{n}}$$

Italics - approximate values

SPECIFICATION The reference material is made of forged stainless steel in the form of a cylinder with a diameter of 40 mm and a height of 20 mm

HOMOGENEITY Homogeneity was evaluated according to ISO Guide 35:2017. To evaluate of homogeneity was used OES method

TRACEABILITY The traceability of DSZU C019 established in accordance with ISO Guide 30-35. The characterization of CRM was achieved by meansinter-laboratory experiment. At analyses applied standardized methods of analysis, certified reference materials were used.

RM VALIDITY The shelf life of DSZU C019 is 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 December 2023

DELIVERY DSZU C019, packed into a box and certificate

SAFETY A Safety Data Sheet (SDS) is not required for DSZU C019. Material DSZU C019 and packing does not contain hazardous chemical, explosives and radioactive substances and substances which might influence health and the environment

LABORATORY MEANS, mass fraction in % by weight

n	C	Si	Mn	S	P	Cr	Ni	Mo	Ti	Al	Cu	Co	V	Nb	W	Sn	N
1	0.1364	4.040	0.740	0.0024	0.0230	17.98	10.85	0.061	0.598	0.190	0.122	0.0260	0.0235	0.0090	0.0320	0.0113	0.0081
2	0.1370	4.080	0.752	0.0031	0.0230	18.01	10.86	0.065	0.600	0.190	0.127	0.0260	0.0280	0.0110	0.0350	0.0120	0.0092
3	0.1390	4.090	0.760	0.0033	0.0245	18.06	10.88	0.069	0.602	0.194	0.127	0.0270	0.0309	0.0140	0.0363	0.0135	0.0106
4	0.1400	4.110	0.765	0.0033	0.0246	18.08	10.90	0.070	0.611	0.207	0.130	0.0292	0.0315	0.0150	0.0380	0.0146	0.0110
5	0.1420	4.130	0.775	0.0040	0.0249	18.12	10.95	0.070	0.625	0.210	0.133	0.0310	0.0320	0.0175	0.0470		
6	0.1433	4.130	0.779	0.0044	0.0250	18.13	10.96	0.072	0.630	0.210	0.135	0.0323	0.0336	0.0185	0.0482		
7	0.1440	4.140	0.780	0.0050	0.0254	18.14	11.03	0.078	0.641	0.212	0.136	0.0330	0.0363	0.0220			
8	0.1450	4.155	0.787	0.0058	0.0258	18.16	11.03	0.080	0.655	0.220	0.140	0.0332	0.0465				
9	0.1470	4.170	0.790		0.0270	18.18	11.05	0.082	0.655	0.223	0.147	0.0350	0.0474				
10	0.1489	4.170	0.793			18.19	11.07	0.082	0.660	0.232	0.150	0.0355	0.0670				
11	0.1520	4.198	0.795			18.26	11.07	0.087	0.677	0.233	0.160						
12		4.220	0.815			18.29	11.10	0.090	0.680	0.237	0.160						
13			0.830			18.31	11.11		0.703								
14			0.830			18.33	11.12		0.709								
15							11.16										
16							11.23										
M(M)	**0.1431**	**4.136**	**0.785**	**0.0039**	**0.0248**	**18.16**	**11.02**	**0.075**	**0.646**	**0.213**	**0.139**	**0.0308**	**0.0377**	*0.0153*	*0.0394*	*0.0129*	*0.0097*
s(M)	0.0049	0.051	0.027	0.0011	0.0013	0.11	0.11	0.009	0.037	0.016	0.013	0.0036	0.0127	*0.0045*	*0.0066*	*0.0015*	*0.0013*

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

PARTICIPATING LABORATORIES

ArcelorMittal Krivy Rig PJSC Ukraine
Centravis Production Ukraine PJSC
Dneprospetsstal (DSS) PJSC Ukraine
Motor Sich JSC Ukraine
Nasosenergomash JSC Ukraine
Trubostal LLC Ukraine
Zaporizhzhya Foundry and Mechanical Plant Ltd. Ukraine
Zaporizhstal PJSC Ukraine
Zaporozhye Steel Works Ltd. Ukraine
Luvak Inc. USA

METHODS USED

C, S - Infrared absorption, Coulometric, OES
Si - Gravimetric, Photometric, ICP-OES, OES, XRF
Ni - Gravimetric, ICP-OES, OES, XRF
Cr - Titrimetric, ICP-OES, OES, XRF
Mn, Ti, P, Cu, Co, Mo, Nb, Al, V, W, Sn - ICP-OES, OES, XRF
N - Inert gas fusion with thermal conductivity

CONTACTS

37 Nezalezhnoi Ukrain Street, Zaporozhye City 69019, Ukraine
Tel/fax: +380 61 7171800
rm@rm.co.ua https://rm.co.ua

February 2023