

# Brammer Standard Company, Inc.

## Certificate of Analysis

### BS 17-4PHD

Certified Reference Material for Stainless Steel Grade 17-4 - UNS Number S17400

	Certified Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>	<b>Certified Values<sup>3</sup></b>	Certified Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>	
<b>C</b>	<b>0.028</b>	0.003		<b>Nb</b>	<b>0.33</b>	0.02
<b>Co</b>	<b>0.035</b>	0.003		<b>Ni</b>	<b>4.21</b>	0.07
<b>Cr</b>	<b>15.14</b>	0.09		<b>O</b>	<b>0.005</b>	0.001
<b>Cu</b>	<b>3.06</b>	0.06		<b>P</b>	<b>0.0181</b>	0.0009
<b>Fe</b>	<b>75.4</b>	0.3		<b>S</b>	<b>0.016</b>	0.002
<b>H</b>	<b>0.0002</b>	0.0001		<b>Si</b>	<b>0.68</b>	0.02
<b>Mn</b>	<b>0.772</b>	0.008		<b>Sn</b>	<b>0.004</b>	0.001
<b>Mo</b>	<b>0.034</b>	0.006		<b>Ti</b>	<b>0.002</b>	0.001
<b>N</b>	<b>0.024</b>	0.001		<b>V</b>	<b>0.162</b>	0.009

	Reference Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>	<b>Reference Values<sup>3,4</sup></b>	Reference Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>
<b>Al</b>	<b>0.003</b>	0.002		<b>Sb</b>	<b>&lt;0.05</b>
<b>As</b>	<b>&lt;0.05</b>			<b>Ta</b>	<b>&lt;0.05</b>
<b>B</b>	<b>&lt;0.005</b>			<b>W</b>	<b>&lt;0.05</b>
<b>Ca</b>	<b>&lt;0.05</b>			<b>Zn</b>	<b>&lt;0.005</b>
<b>Mg</b>	<b>&lt;0.005</b>			<b>Zr</b>	<b>&lt;0.005</b>
<b>Pb</b>	<b>&lt;0.005</b>				

<sup>1</sup> For each element, the certified value listed is the present best estimate of the true value based on the mean of the weighted results of an interlaboratory testing program. See page 3 for more information on its calculation.

<sup>2</sup> For each element, the uncertainty listed is based on a statistical evaluation of the contributions of homogeneity and the interlaboratory testing program. See page 3 for more information on its calculation.

<sup>3</sup> Values are given in weight percent. Values in brackets are reported by difference.

<sup>4</sup> Reference values are not certified and are provided for information only.

Trace element information values for Ag, Ba, Ce, Ga, Ge, Ir, La, Nd, Os, Re, and Ru are shown on page 4.

The requirements of ISO Guides 30, and Standards 33401 and 33405 were followed for the preparation of this Certified Reference Material and certificate of analysis.

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\* Code for method

Certified values listed as weight percent

Analysis	*	C	*	Co	*	Cr	*	Cu	*	Fe	*	H	*	Mn	*	Mo	*	N	*	Nb	
1	1	0.0247	5	0.0322	10	15.03	3	2.93	16	[75.062667]	2	0.0001	4	0.767	5	0.0252	2	0.02266667	5	0.300	
2	1	0.02691	5	0.0325667	13	15.056667	3	2.9466667	16	[75.062667]	2	0.00013	14	0.767333	5	0.0263667	2	0.02266667	5	0.308	
3	1	0.0273	12	0.0326667	13	15.07	3	2.98	16	[75.0946]	2	0.00013	3	0.769	5	0.0263667	2	0.023	5	0.308	
4	1	0.0273667	5	0.0330333	10	15.07	4	3.0191	16	[75.399]	2	0.00015	11	0.769	4	0.0296667	4	0.0230	10	0.320	
5	1	0.0274	5	0.0330333	4	15.079333	3	3.023	4	75.41666667	2	0.0002	4	0.7691	10	0.03	2	0.0230	4	0.322	
6	1	0.0274	8	0.034	3	15.09	3	3.0233333	16	[75.436334]	2	0.000203	4	0.7698	10	0.0305667	2	0.02306667	3	0.327	
7	1	0.0275	4	0.0341667	11	15.09	4	3.0266667	4	75.4528	2	0.00023	3	0.77	4	0.0306333	4	0.0237	4	0.327	
8	1	0.0276	4	0.0345333	3	15.09	4	3.031	16	[75.46]	2	0.000267	10	0.77	4	0.0308667	2	0.02405	14	0.328	
9	3	0.0278	4	0.0346	4	15.0952	4	3.0391	16	[75.508334]	2	0.00027	3	0.77	4	0.0313	2	0.0241	3	0.328	
10	1	0.0278	14	0.0349667	14	15.1	4	3.0391333	16	[75.52]	2	0.00045	7	0.771333	12	0.0313333	2	0.02433333	4	0.329	
11	1	0.028	3	0.035	4	15.108	14	3.04	14	75.52666667	4	0.7715	4	0.0313667	2	0.0244	4	0.330			
12	1	0.0284667	3	0.035	4	15.109167	10	3.04	16	[75.56437667]	4	0.772	5	0.0323667	2	0.02457	3	0.330			
13	1	0.0288333	4	0.0352	13	15.111667	4	3.041	10	75.67333333	4	0.772	14	0.0333333	2	0.02466667	3	0.330			
14	3	0.029	4	0.0352333	3	15.12	10	3.0433333	3	75.72333333	3	0.772	3	0.0356	2	0.02466667	4	0.332			
15	3	0.029	4	0.0353	13	15.121	3	3.05	4	75.73766667	4	0.772333	11	0.0356	2	0.02493333	4	0.332			
16	11	0.0291	3	0.0353333	3	15.13	4	3.069			4	0.772333	3	0.038	2	0.02593333	4	0.332			
17	1	0.0296	3	0.0355	10	15.15	4	3.077			4	0.772933	4	0.0392					10	0.334	
18	1	0.0298	4	0.0355667	3	15.153333	11	3.08			4	0.775333	4	0.0397					3	0.334	
19	1	0.030	3	0.0369667	4	15.153333	10	3.08			10	0.776	4	0.0413333					11	0.337	
20	1	0.0328	4	0.037	4	15.163333	4	3.0933333			4	0.777	3	0.0423333					4	0.342	
21			11	0.0381	4	15.16333	4	3.11			4	0.778667	3	0.043					10	0.346	
22			10	0.041	4	15.17467	4	3.160333			4	0.779							4	0.350	
23			3	0.042	4	15.205	4	3.206333			3	0.78							3	0.356	
24					3	15.222	4	3.206333			10	0.780							4	0.362	
25					4	15.32167					8	0.78									
26					4	15.32167															
27					4	15.3688															
Average		0.02836		0.0354		15.143		3.0556		75.44		0.000191		0.7721		0.0344		0.02435		0.3304	
Std Dev		0.00088		0.0011		0.083		0.0055		0.22		0.000015		0.0037		0.0010		0.00080		0.0034	
H		0.0017		0.0019		0.055		0.021		0.16		0.00024		0.009		0.0019		0.0016		0.0059	
U <sub>1</sub>		0.0019		0.0022		0.055		0.021		0.16		0.00024		0.010		0.0022		0.0018		0.0068	
t-statistic		2.09		2.07		2.06		2.07		2.14		2.26		2.06		2.09		2.13		2.07	
U <sub>2</sub>		0.0041		0.0046		0.11		0.044		0.34		0.00054		0.021		0.0045		0.0038		0.014	
U <sub>3</sub>		0.00091		0.0010		0.022		0.0090		0.088		0.00017		0.0042		0.0010		0.0010		0.0029	
Certified		<b>0.028</b>		<b>0.035</b>		<b>15.14</b>		<b>3.06</b>		<b>75.4</b>		<b>0.0002</b>		<b>0.772</b>		<b>0.034</b>		<b>0.024</b>		<b>0.33</b>	
Uncertainty		0.003		0.003		0.09		0.06		0.3		0.0001		0.008		0.006		0.001		0.02	
Tolerance		0.009		0.009		0.27		0.27		0.9		0.0001		0.024		0.018		0.004		0.06	

Analysis	*	Ni	*	O	*	P	*	S	*	Si	*	Sn	*	Ti	*	V				
1	4	4.0841	2	0.0040667	4	0.0158667	1	0.0132333	4	0.630	12	0.0023	12	0.000773	3	0.136				
2	3	4.11	2	0.00425	5	0.0163333	3	0.0146	4	0.637333333	5	0.0025	5	0.000867	4	0.1431667				
3	10	4.1566667	2	0.0047767	5	0.0173333	1	0.0146667	4	0.637333333	5	0.002667	5	0.000873	4	0.1526667				
4	7	4.18	2	0.0052	5	0.0173333	1	0.0148	10	0.649333333	5	0.002667	5	0.0010	10	0.156				
5	10	4.18	2	0.0055	4	0.0177	4	0.015	3	0.664	5	0.003097	5	0.00105	5	0.157				
6	4	4.19	2	0.0056	4	0.0177333	1	0.0154333	14	0.665333333	5	0.003367	4	0.0019	4	0.1573333				
7	6	4.1996667	2	0.0056333	10	0.0179333	1	0.0154433	3	0.67	3	0.003467	11	0.0021	3	0.1573333				
8	10	4.20	2	0.0059667	4	0.018	4	0.0158	10	0.67	4	0.003667	4	0.002333	5	0.159				
9	4	4.202	2	0.0060	3	0.018	11	0.0159	3	0.67	5	0.003667	4	0.0026	5	0.159				
10	4	4.202	2	0.0060333	14	0.0180333	1	0.0161	4	0.671	4	0.0039	4	0.0027	4	0.1590667				
11	3	4.2033333	2	0.0066667	4	0.0181333	3	0.0166	4	0.671	4	0.0040	4	0.0027	3	0.16				
12	4	4.2061667	2	0.0066667	4	0.0182	1	0.01695	6	0.675333333	3	0.0041	14	0.002833	3	0.16				
13	4	4.2068	3	0.0182667	1	0.0169667	4	0.0169667	4	0.676966667	4	0.0043	3	0.002933	4	0.160				
14	3	4.21	3	0.0183333	1	0.0169667	4	0.0169667	4	0.681666667	3	0.005	3	0.003	3	0.1633333				
15	4	4.2116667	4	0.0184	1	0.01725	4	0.01725	4	0.6957	3	0.005			4	0.1646667				
16	4	4.212	3	0.0185	1	0.0173	4	0.0173	4	0.696666667	4	0.0052			4	0.165				
17	14	4.2133333		0.0188	1	0.0174	4	0.0174	4	0.6986					4	0.1666667				
18	11	4.22	4	0.0189667	1	0.0175	3	0.0175	3	0.70					4	0.1683333				
19	3	4.24	3	0.019	1	0.0179	6	0.0179	6	0.70					14	0.169				
20	3	4.279		0.019	10	0.019	3	0.018	10	0.70					4	0.1693				
21	4	4.280		0.0199	11	0.0199	1	0.019067	4	0.7					11	0.17				
22	4	4.347367					1	0.019067	4	0.705667					10	0.17				
23	4	4.400							3	0.706					3	0.174				
24	4	4.400							11	0.717					10	0.18				
25															8	0.18				
Average		4.2071		0.00553		0.01808		0.0165		0.679		0.00352		0.00198		0.1619				
Std Dev		0.0061		0.00084		0.00090		0.0015		0.024		0.00012		0.00088		0.0025				
H		0.025		0.00084		0.0014		0.0013		0.0087		0.00070		0.00055		0.0041				
U <sub>1</sub>		0.026		0.00084		0.0014		0.0014		0.0087		0.00071		0.00056		0.0048				
t-statistic		2.07		2.20		2.09		2.08		2.07		2.13		2.16		2.06				
U <sub>2</sub>		0.053		0.0019		0.0029		0.0028		0.018		0.0015		0.0012		0.010				
U <sub>3</sub>		0.011		0.00054		0.00064		0.00060		0.0037		0.00038		0.00032		0.0020				
Certified		<b>4.21</b>		<b>0.005</b>		<b>0.0181</b>		<b>0.016</b>		<b>0.68</b>		<b>0.004</b>		<b>0.002</b>		<b>0.162</b>				
Uncertainty		0.07		0.001		0.0009		0.002		0.02		0.001		0.001		0.009				
Tolerance		0.21		0.003		0.0027		0.006		0.06		0.003		0.001		0.027				

Analysis	*	Al	* As	* B	* Ca	* Mg	* Pb	* Sb	* Ta	* W	* Zn							
1	12	0.0010633	12	0.0022667	4	0.0002	4	0.0014	12	0.000217	12	0.00011						
2	5	0.0012	4	0.0043	12	0.0003633	12	0.0014										
3	5	0.0012							4	0.00047	5	0.00243333						
4	5	0.0013							5	0.0005133	5	0.00243333						
5	5	0.0018							4	0.0032	4	0.00264						
6	5	0.0020867							5	0.0047	4	0.00266667						
7	14	0.0029							4	0.0048	5	0.00306667						
8	4	0.0029667							4	0.0048667	3	0.007						
9	4	0.0033							14	0.0051	3	0.00716667						
10	11	0.0035									4	0.0072						
11	4	0.0037									4	0.0166						
12	3	0.0038									14	0.0168						
13	4	0.0041									4	0.0171						
14	3	0.0044667									3	0.0172						
15	3	0.005																
Average		0.0028		0.00227		0.000363		0.00140		0.000217		0.00043		0.00595		0.000110		
Std Dev		0.0013		0.00023		0.000040		0.00017		0.000020		0.000021		0.00029		0.000070		
H		0.00064		0.00058		0.00030		0.00048		0.00019		0.00025		0.00032		0.00031		0.00087
U <sub>1</sub>		0.00064		0.00063		0.00030		0.00051		0.00019		0.00025		0.00032		0.00036		0.00091
t-statistic		2.14		12.71		12.71		12.71		12.71		12.71		2.31		2.16		12.71
U <sub>2</sub>		0.0014		0.0080		0.0038		0.0065		0.0024		0.0032		0.0041		0.00082		0.0020
U <sub>3</sub>		0.00035		0.0056		0.0027		0.0046		0.0024		0.0032		0.0041		0.00027		0.00053
Reference		<b>0.003</b>		<b>&lt;0.05</b>		<b>&lt;0.005</b>		<b>&lt;0.05</b>		<b>&lt;0.005</b>		<b>&lt;0.005</b>		<b>&lt;0.05</b>		<b>&lt;0.05</b>		<b>&lt;0.005</b>
Uncertainty		0.002																
Tolerance		0.002																

Analysis	*	Zr
1	12	0.0002133
Average		0.0002133
Std Dev		0.0000061
H		0.00087
U <sub>1</sub>		0.00087
t-statistic		12.71
U <sub>2</sub>		0.011
U <sub>3</sub>		0.011
Reference		<b>&lt;0.005</b>
Uncertainty		
Tolerance		

For each element, in accordance with the requirements of ISO 17034 and 33405, an effort must be made to account for the effects on the certified value of the uncertainty estimate from homogeneity testing (H) and the uncertainties of the contributing laboratories. The average (A) is calculated using a weighted mean where the reciprocal of the square of each laboratory's combined uncertainty (C<sub>L</sub>), calculated from its standard deviation (S<sub>L</sub>) and its uncertainty estimate (U<sub>L</sub>), is used as the weight (W<sub>L</sub>) for its mean (M<sub>L</sub>). The standard deviation (S) is calculated as the square root of the reciprocal of the sum of the weights. U<sub>1</sub> is the combined uncertainty from homogeneity and labs. U<sub>2</sub> is U<sub>1</sub> multiplied by the coverage factor (95 % t-statistic). U<sub>3</sub> is U<sub>2</sub> divided by the square root of the number of determinations (n). Thus:

$$C_L = \sqrt{S_L^2 + U_L^2} \quad W_L = \frac{1}{C_L^2} \quad A = \frac{\sum_{i=1}^n W_L M_L}{\sum_{i=1}^n W_L} \quad S = \frac{1}{\sqrt{\sum_{i=1}^n W_L}} \quad U_1 = \sqrt{H^2 + S^2} \quad U_2 = t \times U_1 \quad U_3 = \frac{U_2}{\sqrt{n}}$$

All but the final reported values are taken to two significant figures as determined by each quantity's uncertainty estimate. The final reported Uncertainty is U<sub>3</sub> rounded to one significant figure and represents the half width of the 95 % confidence interval for the Certified value. The final reported Certified value is A rounded to the same decimal place as the Uncertainty. The Uncertainty is a measure of the quality of the Certified value.

The Tolerance is a measure of the expected performance of an analysis. This involves further expanding the sample uncertainty to include instrument and operator uncertainty, for those without access to such calculations.

For further information regarding the confidence interval for the certified value see ISO Standard 33405:2024 section 10.

Analysis	*	Ag	*	Ba	*	Ce	*	Ga	*	Ge	*	Ir	*	La	*	Nd	*	Os	*	Re
1	12	0.73	12	0.13	12	0.07	12	25	12	6.4	12	0.02	12	0.03	12	0.02	12	0.03	12	0.07
2	12	0.8	12	0.17	12	0.09	12	27	12	6.7	12	0.02	12	0.04	12	0.02	12	0.03	12	0.07
3	12	0.85	12	0.17	12	0.09	12	27	12	6.7	12	0.03	12	0.04	12	0.02	12	0.03	12	0.07
Analysis	*	Ru																		
1	12	0.13																		
2	12	0.14																		
3	12	0.14																		

**Analytical Method Codes:**

1	Combustion (ASTM E1019)	7	Photometric	13	Titrimetric
2	Fusion (ASTM E1019)	8	Flame Atomic Absorption	14	DCP Atomic Emission
3	Spark Atomic Emission	9	GF Atomic Absorption	15	HG Atomic Fluorescence
4	ICP Atomic Emission	10	X-Ray Fluorescence	16	Difference
5	ICP Mass Spectrometry	11	GD Atomic Emission		
6	Gravimetric	12	GD Mass Spectrometry		

ICP = Inductively Coupled Plasma      GF = Graphite Furnace      GD = Glow Discharge  
 DCP = Direct Current Plasma      HG = Hydride Generation

Lab Name	Location	Registrar	Accreditation
Brammer Standard Company, Inc.	Houston, TX	A2LA	17025, 17034
NSL Analytical	Cleveland, OH	ANAB	17025
Element Materials Technology	Glendale Heights, IL	A2LA	17025
Elemental Analysis, Inc.	Lexington, KY	A2LA	17025
TUV Rheinland Pvt Ltd	Bangalore, India	NABL	17025
Anderson Laboratories, Inc.	Greendale, WI	A2LA	17025
APL, Inc	Milwaukee, WI	A2LA	17025
Luvak Inc.	Boylston, MA	PRI	17025
Eurofins EAG Materials Science, LLC	Liverpool, NY	A2LA	17025
Instytut Metalurgii Zelaza	Gliwice, Poland	PCA	17025
Dirats Laboratories	Westfield, MA	ANAB	17025
Laboratory Testing, Inc.	Hatfield, PA	A2LA	17025
Vitkovice Testing Center	Hulvaky, Ostrava	Czech Accreditation Institute	17025
Raghavendra Spectro Metallurgical Laboratory	Karnataka, India	NABL	17025
National Analysis Center For Iron And Steel	Beijing, China	CNAS	17025

A2LA = American Association for Laboratory Accreditation

ANAB = ANSI-ASQ National Accreditation Board

CNAS = China National Accreditation Service

NABL = National Accreditation Board for Testing and Calibration Laboratories

PCA = Polish Center For Accreditation

PRI = Performance Review Institute

**Analysis:** Chemical analyses were made on solid pieces and chips prepared by an end mill from representative samples for the certified portion of the lot in accordance with ASTM Standard Practice E1806. The laboratories participating in the testing followed the requirements of ISO Standard 17025.

**Traceability:** The following Certified Reference Materials were used to validate the analytical data: 12XLA2, 12X3500, 13X12855M; AR 44, 216A, 303, 555, 556, 614A, 645, 655, 662, 667, 670, 673, 675, 869, 870, 871, 881, 882, 920K, 946, 961, 1650, 1652, 1653; BAS 335, 336, 337, 408, 431, 464/1; BS XCCS-2, CSN-4, 17-4PHA, 17-4PHB, 17-4PHC, 88C, 88D, 88F, 89D, 89E, 94A, 94B, 179B, 185, 187C, 188B, 300A, 450, 1045, 2023, 9621, 9811, 9812; DSZU CA031; IARM 2F, 4F, 16C, 21D, 22B, 23A, 23B, 23C, 23D, 30C; IMZ 1.27/3; JSS GS-1d; LECO 501-503, 502-060, 502-413, 502-855, 502-863, 502-869, 502-903, 502-916, 502-918, 502-928, 502-935, 503-514, 503-543, 762-747; SRM C1154, C2400, 16F, 160B, 339, 345, 345A, 361, 363.

**Homogeneity:** This Certified Reference Material (CRM) was tested for homogeneity using ASTM Standard Method E826 and found acceptable. It was also examined by spark atomic emission spectrometry and found to be compatible with the following Reference Materials: BS 17-4PHB, 17-4PHC, 88C, 88F, 185, 9621, 9811; SRM C2400.

**Validity statement:** ISO Standard 33401 states that the certification should contain an expiration date for all materials where instability has been demonstrated or is considered possible, after which the certified value is no longer guaranteed by the certifying body. The certification of BS 17-4PHD is valid indefinitely. The certification is nullified if this CRM is damaged, contaminated, or otherwise modified.

**Storage:** This CRM must be stored in a cool, dry, non-corrosive environment.

**Source:** The bar stock for this CRM was produced by North American Stainless; Ghent, KY.

**Form:** This CRM is machined in the form of a disc, approximately 38mm in diameter and 19mm thick by Brammer Standard Company, Inc.

**Use:** This CRM is intended for use in spark atomic emission, glow discharge, and x-ray spectrometric methods of analysis. Refer to ISO Standard 33403 for information about the use of Certified Reference Materials.

**Certified Area:** The entire depth of the CRM may be used.

Caution: As with any bar material, avoid spark atomic emission spectrometric burns in the center of the CRM (5 mm radius), as some segregation may be present.

**Sample Preparation:** For best analytical results, use the same method for preparing the analytical surface on all reference materials as used for production specimens. Avoid overheating the sample during surface preparation.

Caution: CRM contains significant insoluble soft metal inclusions. Surface smearing may occur. Spark atomic emission spectrometers may require extended preburns to compensate.

**Certificate Number:** The unique identification number for this certificate of analysis is 17-4PHD-030226. You may obtain information on revisions of certificates from the internet at [www.brammerstandard.com](http://www.brammerstandard.com).

**Safety Notice:** A Safety Data Sheet (SDS) is not required for this material. This material will not release or otherwise result in exposure to a hazardous chemical, under normal conditions of use. Inquiries concerning this Reference Material should be directed to:

**Brammer Standard Co., Inc.**  
14603 Benfer Road  
Houston, Texas 77069-2895 USA

**Phone: (281) 440-9396**

**Web: [www.brammerstandard.com](http://www.brammerstandard.com)**

**Fax: (281) 440-4432**

**Email: [contact@brammerstandard.com](mailto:contact@brammerstandard.com)**

**Brammer Standard Company, Inc., is accredited by the American Association for Laboratory Accreditation (A2LA) to ISO Standard 17034:2016 as a Reference Material Producer for the production of Certified Reference Materials and Reference Materials (our current Certificate Number 656.02 expires 01/31/2027)**

**Brammer Standard Company's Chemical Laboratory is accredited by A2LA to ISO Standard 17025:2017. (Our current Certificate Number 656.01 expires 01/31/2027)**

**By current Certificate Number 10539 expiring 01/01/2027, the Quality System of Brammer Standard Company, Inc., is registered to ISO 9001:2015 by National Quality Assurance (NQA), U.S.A.**

**The scopes of accreditation are listed on the website: [www.brammerstandard.com](http://www.brammerstandard.com)**

## **References:**

Versions used were those available at the time of testing and characterization

E826 Standard Practice for Testing Homogeneity of a Metal Lot or Batch in Solid Form by Spark Atomic Emission Spectrometry

E1019 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques

E1806 Standard Practice for Sampling Steel and Iron for Determination of Chemical Composition

ISO Standard 17025:2017 General requirements for the competence of testing and calibration laboratories

ISO Standard 9001:2015 Quality Management Systems - Requirements

ISO Guide 30:2015 Terms and definitions used in connection with reference materials + 2008 amendment

ISO Standard 33401:2024 Reference materials - Contents of certificates, labels and accompanying documentation

ISO Standard 33403:2024 Reference materials – Requirements and recommendations for use

ISO Standard 17034:2016 General requirements for the competence of reference material producers

ISO Standard 33405:2024 Reference Materials – Approaches for characterization and assessment of homogeneity and stability

*ASTM documents available from ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428.*

*ISO Guides and Standards available from Global Engineering - [www.global.ihs.com](http://www.global.ihs.com)*

*Other useful documents available from NIST, U.S. Department of Commerce, Gaithersburg, MD 20899.*

NIST Special Publication 260-100, Handbook for SRM Users

NIST Special Publication 829, Use of NIST Standard Reference Materials for Decisions on Performance of Analytical Chemical Methods and Laboratories

Certified by: \_\_\_\_\_ on March 2, 2026.

Beau R. Brammer

President