QAR
QUALITY ASSURANCE RESOURCES, LLC
8455 River King Drive, Freeburg, IL 62243, USA

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO 17034
REFERENCE MATERIAL PRODUCER

Certificate # AR-2121

Certificate of Analysis

Primary HGI RM

Lot ID: 2026-49

METHODOLOGY

This is an empirical method, which produces an index relative to the ease of grinding a coal sample and has no absolute value.

These Hardgrove Grindability Index Primary Reference Materials are prepared in accordance with *ASTM D409/D409M-24*, *Standard Test Method for Grindability of Coal by the Hardgrove-Machine Method, Annexes A1-A5*. The sieves (W.S. Tyler ASTM E-11), utilized for standardizing this lot of HGI Primary RMs, have been specially matched, and including all the ancillary equipment necessary for HGI production, calibrated to the original sieves and equipment at Babcock and Wilcox used in the development of the Method. The ASTM HGI Task Group on Grindability, along with the ASTM Subcommittee on Statistics oversaw the calibration of sieves and equipment used in production of this Lot. All ancillary equipment meets the requirements listed in D409-24, Section 4, Apparatus. A coverage factor, k, is used to calculate the expanded uncertainty.

All Standards shall be air-dried per ASTM D409/D409M-24 section 6.2 "in conformance with Test Method D3302" prior to stage crushing.

Lot Number	Preparation Date	HGI Value	Standard Deviation Of Calculated -200	Expanded Uncertainty k=3.18	No. of Samples Tested	Repeatability	1.18 x 0.60 mm Moisture % Informational Only
2026-49-40	10/8/2026	38	0.05	3 Units	4	3	1.99
2026-49-60	10/8/2026	51	0.06	3 Units	4	3	0.84
2026-49-80	10/8/2026	78	0.05	1 Units	4	3	0.63
2026-49-100	10/8/2026	93	0.06	3 Units	4	3	0.66

Approved By: Tim Hutchison

Tim Hutchison
Manager-QAR, LLC

Certificate Date: 10/9/2026

ASTM D409/D409M-24 A5.4.1.1
Expiration Date for Use of Calibration: 8 April 2028

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MADE IN USA

QAR HGI RM property values are the best estimate of the true HGI value and are based on the unweighted mean of means.

Standard deviation is the standard deviation of the calculated -200 sample means tested under repeatability conditions.

Expanded uncertainty provides the user with information on the likely range of the true (but known) HGI value. A coverage factor, k=2, corresponds to a level of about 95% confidence.

Certified values are valid when tested in accordance with ASTM D409 and equivalent methods.

Homogeneity, value assignment and uncertainty (Std. Dev. to the nearest 0.1 unit) were assessed by analysis of 4 air-dried samples per ASTM D409/D409M-24 A3-A5 utilizing the Primary Reference Materials listed above by an ISO 17025 accredited laboratory using QAR, LLC dedicated equipment. The calculations were performed by QAR, LLC personnel. The stability has been addressed by ASTM. The material has an assigned usage period of 18 months per ASTM D409/D409M-24.

2026-49 Homogeneity and Certification Data								
	2026-49-40		**2026-49-60**		**2026-49-80**		**2026-49-100**	
	Calculated -200 mass (g)	**HGI**	**Calculated -200 mass (g)**	**HGI**	**Calculated -200 mass (g)**	**HGI**	**Calculated -200 mass (g)**	**HGI**
Average	3.68	38.3	5.57	51.3	9.42	77.6	11.68	93.1
Standard Deviation	0.046	0.642	0.062	0.71	0.049	0.352	0.059	0.642
No. Samples	4		4		4		4	
Relative Humidity during testing, %	Mean: 43 Range: 39-45		Mean: 45 Range: 40-48		Mean: 49 Range: 42-52		Mean: 44 Range 41-47	
Grind Moisture, %	Mean: 1.99 Range: 1.94-2.04		Mean: 0.84 Range: 0.82-0.86		Mean: 0.63 Range: 0.61-0.64		Mean: 0.66 Range: 0.65-0.68	

Instructions for Handing and Use

Sample containers should be kept tightly sealed and stored in a cool dark place, do not freeze. The grindability characteristics of samples may be altered by conditions during drying and preparation. This set of HGI Primary RM Coal Standard must be thoroughly mixed by end-over-end rotation before sub-sampling. Due to variation in the rank of these coal samples it is critical that these samples have ample exposure time to ensure equilibration of the material is stable before use. In some cases, may require additional equilibration time. QAR cannot be held responsible for any changes that occur after the sample bottle has been opened.

This product's intended usage is for calibration/verification of Hardgrove Grindability Equipment per ASTM D409 or equivalent. Per ASTM D409, minimum sample size is 1000 grams.

Approximately 150 kg of each of the following separate coal sources were prepared in accordance to ASTM D409/D409M-24 Annex A1-A5.: HGI ≈40 281-2026 KY, USA; HGI ≈60 281-2026 KY, USA; HGI ≈80 281-2026 VA, USA; HGI ≈100 281-2026 WV, USA.

HGI Primary RMs produced at QAR, LLC are ASTM-recognized Primary Reference Materials. ASTM Subcommittee D05.07 and the ASTM Task Group maintain oversight for production of these Primary Reference Materials.

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