

REPORT No 11952

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ISO 2039-2 ROCKWELL HARDNESS TEST Program: SQ-0523.V4

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1. FOREWORD

This report summarizes the results of the **SQ-0523.V4** proficiency testing program on the determination of Rockwell hardness number on plastic materials. This program is conducted in a bilateral format, following the “split-sample” design described in clause A.4.2 of ISO/IEC 17043: 2023 (Alternative interlaboratory comparisons).

South Quality conducted the testing program in June 2026 with the aim of assessing the laboratory's ability to competently perform the designated tests.

2. ORGANIZATION

Program Coordinator:	Lic. Esther Casas
Assistant Technician:	Berenice Ferrel
Statistics:	Lic. Manuel Tozaki
Supervision:	Eng. Emiliano Medina

3. OBJECTIVE

The objective of this proficiency testing program is to determine the Rockwell hardness number on plastic materials using the following standard:

Standard
ISO 2039-2: 1987 (Scale L)

To verify this, batches of plastic samples have been selected.

Participants in this program have not been previously informed about the expected behavior of the samples they receive.

4. PARTICIPANT

Company:	LyondellBasell
Laboratory:	Technical Center - PT Lab
Country:	USA
Client ID:	C128
Contact person:	Cory Blue Laboratory manager cory.blue@lyondellbasell.com

5. HOMOGENEITY

Several batches were prepared identically by the staff at South Quality.

Subsequently, a homogeneity study was conducted with an ISO 17025 accredited laboratory.

The control process followed ISO 33405: 2024, clauses 7.4.1.1 / 7.4.1.2. Stratified random sampling was applied, and samples were selected using random number generation software.

The results of this test are presented below:

Size of each batch: **50 units**

Tested samples from each batch: **10 units**

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LP2997	BATCH: LP2998	BATCH: LP2999
HARDNESS	YES	YES	NO

Size of each batch: **50 units**

Tested samples from each batch: **10 units**

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LP3340	BATCH: LP3341	BATCH: LP3342
HARDNESS	YES	NO	YES

The samples for this program are taken from the selected batches identified as **LP2998**, and **LP3340**.

For the indicated batches, the values determined in the homogeneity study are utilized as the assigned values.

The analysis of the test data indicated that the selected samples exhibited sufficient homogeneity for the program. Therefore, the results of participants identified as outliers cannot be attributed to sample variability.

6. SAMPLE INFORMATION

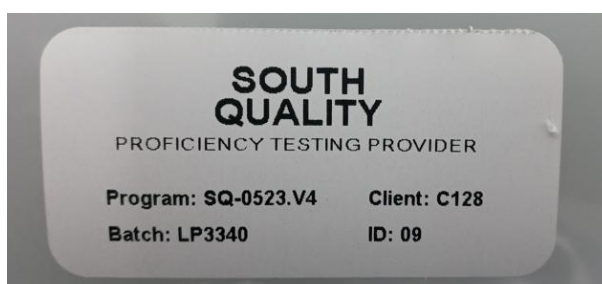
The following samples were sent for testing:

Batch:	LP2998
Sample ID:	16
Characteristics:	Plastic plate (Polyamide 6) - 100 x 100 x 10 mm

Batch:	LP3340
Sample ID:	09
Characteristics:	Plastic plate (Polypropylene) - 100 x 100 x 10 mm

7. IMAGES

SAMPLES



8. ASSIGNED VALUES

BATCH	HARDNESS	
	HRL	SD
LP2998	106.85	1.25
LP3340	113.86	1.74

9. PARTICIPANT RESULTS (SEE APPENDIX)

CODE	HARDNESS HRL
LP2998-16	105.98
LP3340-09	112.7

10. STATISTICS

The results must be treated as quantitative.

According to B.4.1.3 of ISO 17043 the appropriate technique is to compare participant results with the assigned values. The results can be compared using **z score**.

$$z = \frac{x - X}{\hat{\sigma}}$$

x is the participant's result

X is the assigned value

$\hat{\sigma}$ is the standard deviation

The performance evaluation of each sample is carried out with the following criteria:

$|z| \leq 2.0$ indicates “satisfactory” performance and generates no signal;

$2.0 < |z| < 3.0$ indicates “questionable” performance and generates a warning signal;

$|z| \geq 3.0$ indicates “unsatisfactory” performance and generates an action signal;

11. EVALUATION OF PERFORMANCE

BATCH	HARDNESS HRL		z score	PERFORMANCE RESULT
	PARTICIPANT RESULT	ASSIGNED VALUE		
LP2998	105.98	106.85	0.70	SATISFACTORY
LP3340	112.7	113.86	0.67	SATISFACTORY

12. CONCLUSIONS

The overall performance of this **SQ-0523.V4** program from the participant laboratory **LyondellBasell - Technical Center - PT Lab**, is **SUFFICIENT** based on expected results.

The criteria used for the evaluation of the overall performance are the following:

- **SUFFICIENT** performance: No unsatisfactory results were obtained.
- **INSUFFICIENT** performance: An unsatisfactory result was obtained.

APPENDIX

PARTICIPANT RESULTS

(Result form)



INSTRUCTIONS & RESULTS FORM

PROGRAM:	ROCKWELL HARDNESS TEST
CODE:	SQ-0523
VERSION:	4
STANDARD:	ISO 2039-2
COORDINATOR:	Lic. Esther Casas (ecasas@ptsouthquality.com)

1 - General

This document serves as a guide for managing the results of the **SQ-0523.V4** program.

Results must be typed, not handwritten.

2 - Standard

ISO 2039-2: 1987

3 - Tests involved

TEST
Determination of Rockwell hardness number

4 - Samples

CODE	SAMPLE	QUANTITY
LP2998-16	Plastic plate - 100 x 100 x 10 mm	1
LP3340-09	Plastic plate - 100 x 100 x 10 mm	1

5 - Notes

- Being a bilateral program, there is no deadline for submitting results.
- The tables in this document may be modified by the participant, if desired, to include data or observations.
- The samples are to be handled as routine lab samples, with all testing, documentation, and reporting adhering to **ISO 2039-2**.
- Indentations must be made on the side bearing the marked identification.
- Samples must be retained until the end of the program, which concludes with the submission of the final report.
- For result verification, test images would be appreciated. Images can be attached at the end of this document or sent by email.
- Once this document is completed, it must be converted into a PDF file and sent to the program coordinator.

6 - Test results

Test date:	6/19/26	Temperature:	22.3°C
Equipment:	Wilson Rockwell Hardness Series 500	Date calibration:	06/20/2025
Resolution:	0.1 HRR / 0.0002 mm depth	Resolution uncertainty:	+/- 0.029 HRR

SAMPLE	MEASUREMENT No	RESULT HRL
LP2998-16	1	108.4
	2	106.9
	3	106.1
	4	103.2
	5	105.3
	AVG	105.98
	Expanded uncertainty (U), K=2	+/- 1.73 (k=2)

SAMPLE	MEASUREMENT No	RESULT HRL
LP3340-09	1	113.7
	2	113.8
	3	113.6
	4	108.4
	5	114.0
	AVG	112.7
	Expanded uncertainty (U), K=2	+/-2.15 (k=2)

OBSERVATIONS
R-Scale Minor load (N) 98.07 or 10 (kg), Major load (N) 588.4 or 60(kg), Indenter diameter (mm) 12.7 +/-0.15 Sample LP3340-09 #4 was a bit lower than the rest. A repeat indentation was made near the same area and obtained the same result.

PHOTOGRAPHS

DSQ-012 - REV 06 -

SQ-0523.V4

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----- END OF REPORT -----