

REPORT No 11252

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ISO 6507-1

VICKERS HARDNESS TEST

Program: SQ-0027

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1. FOREWORD

This report summarizes the results of the **SQ-0027** proficiency testing program on the determination of Vickers hardness number on metallic materials. This program is conducted in a bilateral format, following the A.3.3 classification of the ISO 17043 standard ("Split-sample testing schemes").

South Quality conducted the testing program in May 2025 with the aim of assessing the laboratory's ability to competently perform the designated tests.

2. ORGANIZATION

Program Coordinator: Eng. Alfredo Schmidt
 Assistant Technician: Sergio Andrada
 Statistic: Lic. Manuel Tozaki
 Supervision: Eng. Emiliano Medina

3. OBJECTIVE

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

Standard
ISO 6507-1: 2023

To verify this, samples of steel have been selected.

Participants in this program have not been previously informed about the expected values or value ranges of the samples they receive.

4. PARTICIPANT

Company: **COLUMBUS STAINLESS PTY (LTD)**
 Laboratory: **Columbus Laboratory**
 Country: South Africa
 Client ID: F290
 Contact person: Kobie Groenewald
 QA Manager
groenewald.kobie@columbus.co.za

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 Guide 35: 2017, clause 7.4.1.2. Stratified random sampling was employed, and samples were chosen 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 (LOW CARBON STEEL)		
	BATCH: LM2980	BATCH: LM2981	BATCH: LM2982
HV5	YES	YES	YES

Size of each batch: **50 units**

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

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES (STAINLESS STEEL)		
	BATCH: LM3005	BATCH: LM3006	BATCH: LM3007
HV10	YES	NO	YES

Samples for this program are taken from the selected batches identified as LM2981, and LM3005.

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:	LM2981
Sample ID:	09
Characteristics:	51 x 51 x 5 mm - Low carbon steel (SAE 1010)

Batch:	LM3005
Sample ID:	15
Characteristics:	53 x 40 x 3 mm - Stainless steel (AISI 304 430)

7. IMAGES



8. ASSIGNED VALUES

BATCH	HV	<i>U</i>
LM2981	161 HV 5	3.0
LM3005	155 HV 10	2.7

9. PARTICIPANT RESULTS (SEE APPENDIX)

CODE	HV
LM2981-09	158.0 HV 5
LM3005-15	153.8 HV 10

10. STATISTICS

The results must be treated as qualitative.

For quantitative results the comparison is made according B.3.1.3 of ISO 17043 and the appropriate technique is to compare participant results with the assigned values. The results can be compare using percent difference **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 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	HV		z score	PERFORMANCE RESULT
	PARTICIPANT RESULT	ASSIGNED VALUE		
LM2981	158.0 HV 5	161 HV 5	1.00	SATISFACTORY
LM3005	153.8 HV 10	155 HV 10	0.44	SATISFACTORY

12. CONCLUSIONS

The overall performance of this SQ-0027 program from the participant laboratory **COLUMBUS STAINLESS PTY (LTD) - COLUMBUS LABORATORY**, is **SUFFICIENT** based on expected results.

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

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

APPENDIX

PARTICIPANT RESULTS

(Results form)



INSTRUCTIONS & RESULTS FORM

PROGRAM:	Vickers hardness test
CODE:	SQ-0027
VERSION:	-
STANDARD:	ISO 6507-1
COORDINATOR:	Eng. Alfredo Schmidt (aschmidt@ptsouthquality.com)

1 - General

This document serves as a guide for managing the results of the **SQ-0027** program.

Results must be typed, not handwritten.

2 - Standard

ISO 6507-1: 2023

3 - Tests involved

TEST
Determination of Vickers hardness number

4 - Samples

CODE	SAMPLE	QUANTITY
LM2981-09	Low carbon steel - 51 x 51 x 5 mm	1
LM3005-15	Stainless steel - 53 x 40 x 3 mm	1

5 - Notes

- a) Being a bilateral program, there is no deadline for submitting results.
- b) The tables in this document may be modified by the participant, if desired, to include data or observations.
- c) Samples must be retained until the end of the program, which concludes with the submission of the final report.
- d) Participants may improve the surface to provide a better testing area. If so, the procedure must be described in the observations section.
- e) Indentations must be made on the side of the sample bearing the identification mark
- f) To review the results, test images would be appreciated. Images can be attached at the end of this document or sent by email.
- g) Once this document is completed, it must be converted into a PDF file and sent to the program coordinator.

6 - Test results

Test date:	15/05/2025	Temperature:	21
Equipment:	Indentec Vickers Hardness Tester	Date calibration:	20/06/2024
Resolution:	0.5HV	Resolution uncertainty:	0.1µm

SAMPLE	MEASUREMENT No	RESULT HV 5
LM2981-09	1	158
	2	159
	3	157
	4	159
	5	157
	AVG	158
	Expanded uncertainty (U), K=2	4.2

OBSERVATIONS
Sample LM2981-09 was polished with 1000 grit sand paper. The visibility of the Vickers indentations was found to be inadequate for reliable analysis, therefore the sample was then polished with 3 micron sand paper with diamond solution to improve the surface.

Test date:	16/05/2025	Temperature:	21
Equipment:	Indentec Vickers Hardness Tester	Date calibration:	20/06/2024
Resolution:	0.5HV	Resolution uncertainty:	0.1µm

SAMPLE	MEASUREMENT No	RESULT HV 10
LM3005-15	1	154
	2	153
	3	155
	4	154
	5	153
	AVG	153.8
	Expanded uncertainty (U), K=2	4.0

OBSERVATIONS
Sample LM3005-15 was polished with 1000 grit sand paper.

PHOTOGRAPHS

BEFORE TESTING



AFTER TESTING



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