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ISO 6508-1

ROCKWELL HARDNESS TEST - HRC

Program: SQO-M8 (Round 19)

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1. FOREWORD

This report summarizes the results of the **SQO-M8 (Round 19)** proficiency testing program on the determination of Rockwell C hardness number on metallic materials. This program is carried out under a simultaneous participation format, as described in clause A.2.2 of ISO/IEC 17043: 2023 (Types of PT schemes).

South Quality conducted the testing program in July/August 2026 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
Statistics:	Lic. Manuel Tozaki
Supervision:	Eng. Emiliano Medina

3. OBJECTIVE

The objective of this proficiency testing program is to determine the Rockwell C hardness number (HRC) on metallic materials in accordance with the following standard:

Standard
ISO 6508-1: 2023

To verify this, batches of metallic samples were selected.

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

4. PARTICIPANTS

In the present round, 22 laboratories have participated with the following details:

CODE	Country	ISO 17025 accredited	Results delivered
01	Chile	Yes	Yes
02	Spain	Yes	No
03	Mexico	Yes	Yes
04	Pakistan	No	Yes
05	Germany	Yes	Yes
06	Portugal	Yes	Yes
07	Malaysia	Yes	No
08	France	Yes	Yes
09	Mexico	No	No
10	Australia	Yes	Yes
11	England	Yes	Yes
12	South Africa	Yes	Yes
13	China	Yes	Yes
14	Brazil	No	Yes
15	Portugal	Yes	No
16	Italy	Yes	Yes
17	France	Yes	No
18	Hong Kong	Yes	Yes
19	Argentina	No	Yes
20	Brazil	Yes	Yes
21	Peru	No	Yes
22	China	Yes	No

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 the samples were selected using random-number-generation software.

The results of this test are presented below:

Size of each batch: **50 samples**

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

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES (MEDIUM CARBON STEEL)		
	BATCH: LM3183	BATCH: LM3184	BATCH: LM3185
HRC	NO	YES	YES

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES (STAINLESS STEEL)		
	BATCH: LM3345	BATCH: LM3346	BATCH: LM3347
HRC	YES	NO	YES

Samples for this program are taken from the selected batches identified as **LM3185** and **LM3345**.

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 (Participant **Code 16**):

Batch:	LM3185
Sample ID:	16
Characteristics:	Ø20 x 20 mm - Medium carbon steel (SAE 1045)

Batch:	LM3345
Sample ID:	16
Characteristics:	50 x 50 x 2.8 mm - Stainless steel (AISI 304)

7. IMAGES



8. ASSIGNED VALUES

The assigned values are obtained from the results reported by all participants (**Consensus values**).

9. PARTICIPANTS' RESULTS

LABORATORY CODE	LM3185	LM3345
	HRC - AVG	HRC - AVG
01	19.5	11.4
03	18.2	11.7
04	23.2	10.1
05	18.9	11.4
06	18.0	11.8
08	18.6	11.2
10	18.9	11.3
11	18.6	11.5
12	17.7	10.7
13	18.5	11.7
14	22.6	9.7
16	19.0	11.4
18	19.6	11.7
19	19.2	11.7
20	18.4	11.1
21	22.3	12.4

PARAMETER	ASSIGNED VALUES			
	LM3185		LM3345	
	MEDIAN	SD	MEDIAN	SD
HRC	18.9	1.3	11.4	0.5

10. STATISTICS

The results must be treated as quantitative.

According to B.3.1.3 of ISO 17043 the appropriate technique is to compare participant's 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

LABORATORY CODE	LM3185	LM3345
	z score	z score
01	0.5	0.0
03	0.6	0.6
04	3.6 ✖	2.6
05	0.0	0.0
06	0.8	0.8
08	0.3	0.4
10	0.0	0.2
11	0.3	0.2
12	1.0	1.4
13	0.3	0.6
14	3.1	3.4 ✖
16	0.1	0.0
18	0.6	0.6
19	0.3	0.6
20	0.4	0.6
21	2.9	2.0

Laboratory Code 01: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 02: The laboratory has not sent the results before the deadline.

Laboratory Code 03: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 04: The laboratory has obtained a **UNSATISFACTORY** result in the determination of HRC in batch **LM3185** and a **QUESTIONABLE** result in the determination of HRC in batch **LM3345**.

Laboratory Code 05: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 06: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 07: The laboratory has not sent the results before the deadline.

Laboratory Code 08: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 09: The laboratory has not sent the results before the deadline.

Laboratory Code 10: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 11: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 12: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 13: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 14: The laboratory has obtained **UNSATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 15: The laboratory has not sent the results before the deadline.

Laboratory Code 16: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 17: The laboratory has not sent the results before the deadline.

Laboratory Code 18: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 19: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 20: The laboratory has obtained **SATISFACTORY** results in the determination of HRC in both batches.

Laboratory Code 21: The laboratory has obtained a **QUESTIONABLE** result in the determination of HRC in batch **LM3185**. However, a **SATISFACTORY** result was obtained in batch **LM3345**.

Laboratory Code 22: The laboratory has not sent the results before the deadline.

GLOBAL PERFORMANCE - SUM OF ABSOLUTE Z SCORE

POSITION	LABORATORY CODE	Z SCORE
1 st	05	0.0
2 nd	16	0.1
3 rd	10	0.2
4 th	01	0.5
4 th	11	0.5
5 th	08	0.7
6 th	13	0.9
6 th	19	0.9
7 th	20	1.0
8 th	03	1.2
8 th	18	1.2
9 th	06	1.6
10 th	12	2.4
11 th	21	4.9
12 th	04	6.2
13 th	14	6.5

12. CONCLUSIONS

The overall performance in the **SQO-M8 (Round 19)** program, based on expected results from the participating laboratories, was as follows:

- Participant Codes **01, 03, 05, 06, 08, 10, 11, 12, 13, 16, 18, 19** and **20** have obtained **SUFFICIENT** performance according to the expected results, and no action is required;
- Participant Code **21** has obtained an **ALMOST SUFFICIENT** performance according to the expected results and must evaluate if it is necessary to take corrective action;
- Participant Code **04**, and **14** have obtained an **INSUFFICIENT** performance according to the expected results and must take corrective action (See Appendix B).

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

- **SUFFICIENT** performance: No unsatisfactory/questionable results obtained.
- **ALMOST SUFFICIENT** performance: No unsatisfactory results were obtained, but one questionable result was found.
- **INSUFFICIENT** performance: An unsatisfactory result or two questionable results were obtained.

APPENDIX A

A1 - PARTICIPANT DATA

Company: **CERTOTTICA S.c.r.l**
Laboratory: CERTOTTICA S.c.r.l
Country: Italy
Client ID: E497
Contact person: Alex Cordella (Technical Department)
alex.cordella@dolomiticert.it

A2 - PARTICIPANT RESULTS (RESULTS FORM)



INSTRUCTIONS & RESULTS FORM

PROGRAM:	Rockwell hardness test
CODE:	SQO-M8
ROUND:	19
STANDARD:	ISO 6508-1
COORDINATOR:	Eng. Alfredo Schmidt (aschmidt@ptsouthquality.com)

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1 - General

This document is intended to be completed with the results of the **SQO-M8 (Round 19)** program.

Results must be typed, not handwritten.

2 - Standard

ISO 6508-1: 2023

3 - Participant

CERTOTTICA S.c.r.l	CODE 16
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4 - Tests involved

TEST
Determination of Rockwell hardness number (HRC)

5 - Samples

CODE	SAMPLE	QUANTITY
LM3185-16	Medium carbon steel - Ø20 x 20 mm	1
LM3345-16	Stainless steel - 50 x 50 x 2.8 mm	1

6 - Notes

- The deadline for the delivery of results is **August 10, 2026**.
- The tables in this document may be modified by the participant, if desired, to include data or observations.
- Samples must be retained until the end of the program, which concludes with the submission of the final report.
- The samples are to be handled as routine lab samples, with all testing, documentation, and reporting adhering to **ISO 6508-1**.
- Participants may improve the sample surface for better testing; if modifications are made, please provide details in the observations box.
- For sample code **LM3185-XX**, indentations may be made on either side.
- For sample code **LM3345-XX**, indentations must be made on the same side as the marked identification.
- To review the results, the submission of images of the tests is appreciated. These images can be attached at the end of this document or sent via email.
- Upon completion of this document, please convert it to a PDF file and send it to the program coordinator.

7 - Test results

Test date:	30/07/2026	Temperature:	22.7 °C
Equipment:	Wolpert D62 DIA TESTOR 2RC n9883	Date calibration:	16/07/2025
Resolution:	1HRC	Resolution uncertainty:	/

SAMPLE	MEASUREMENT No	RESULT HRC
LM3185-16	1	19
	2	19
	3	18
	4	19
	5	20
	AVG	19
	Expanded uncertainty (U), K=2	N/A

SAMPLE	MEASUREMENT No	RESULT HRC
LM3345-16	1	11
	2	12
	3	12
	4	11
	5	11
	AVG	11,4
	Expanded uncertainty (U), K=2	N/A

OBSERVATIONS

PHOTOGRAPHS

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APPENDIX B

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