REPORT No 11426

Date of issue: *October 17, 2025*

Status: FINAL REPORT

****

ASTM E8

TENSION TESTING OF METALLIC MATERIALS

Program: SQO-M14 (Round 23)

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1. FOREWORD

This report summarizes the results of the **SQO-M14 (Round 23)** proficiency testing program on the determination of tensile properties of 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 between August and October 2025 to assess the participating laboratories' 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 following parameters of metallic materials:

- Yield Strength 0.2 Offset
- Tensile Strength
- Elongation at fracture
- Reduction of area

These parameters are verified in accordance with the following standard:

Standard
ASTM E8 - 24

To perform this verification, batches of bar samples were selected.

Participants were not informed in advance of the expected values or value ranges for the samples they received.

4. PARTICIPANTS

In the present round, 23 laboratories have participated with the following details:

CODE	Country	ISO 17025 accredited	Results delivered
01	Brazil	Yes	Yes
02	Germany	Yes	Yes
03	France	Yes	Yes
04	Spain	Yes	No
05	France	Yes	Yes
06	Mexico	Yes	Yes
07	Italy	No	Yes
08	Spain	No	Yes
09	Portugal	Yes	No
10	Germany	Yes	Yes
11	Pakistan	Yes	Yes
12	Spain	Yes	Yes
13	Türkiye	Yes	Yes
14	Australia	Yes	Yes
15	United Kingdom	Yes	Yes
16	Argentina	Yes	Yes
17	Bangladesh	Yes	Yes
18	Italy	No	Yes
19	Chile	Yes	Yes
20	Peru	Yes	No
21	Italy	Yes	Yes
22	Hong Kong	No	Yes
23	New Zealand	Yes	Yes

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: **162 units** Tested samples from each batch: **18 units**

DETERMINATION	STEEL - HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LM2485	BATCH: LM2486	BATCH: LM2487
Yield Strength 0.2 Offset	YES	YES	YES
Tensile Strength	NO	YES	YES
Elongation at fracture	NO	YES	YES
Reduction of area	YES	YES	YES

Size of each batch: **162 units** Tested samples from each batch: **18 units**

DETERMINATION	ALUMINIUM - HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LM2530	BATCH: LM2531	BATCH: LM2532
Yield Strength 0.2 Offset	NO	YES	YES
Tensile Strength	NO	YES	YES
Elongation at fracture	NO	YES	YES
Reduction of area	NO	YES	YES

Samples for this program were taken from the selected batches identified as **LM2487,** and **LM2531**.

The analysis of the test data indicated that the selected samples were sufficiently homogeneous for use in the program. Therefore, outlying participant results cannot be attributed to sample variability.

6. SAMPLE INFORMATION

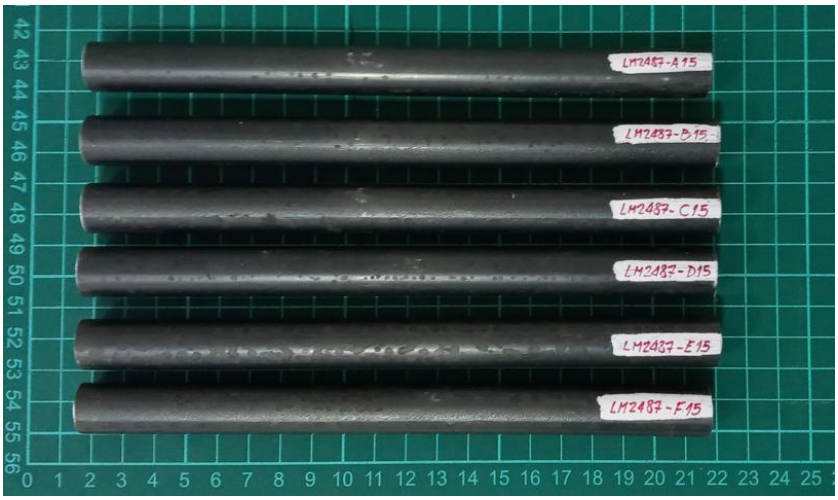
The following samples were sent for testing (Participant **Code 15**):

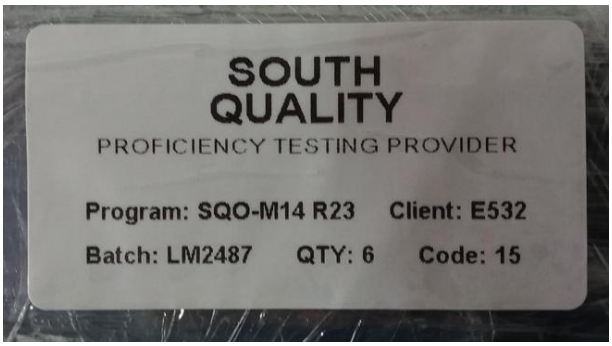
Batch:	LM2487
Sample ID:	A15 / B15 / C15 / D15 / E15 / F15
Characteristics:	Steel (SAE 1010) - Ø15.9 x 200mm

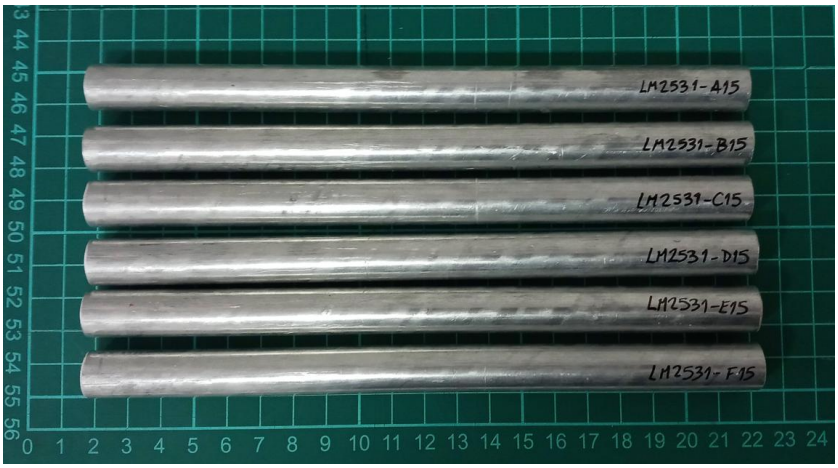
Batch:	LM2531
Sample ID:	A15 / B15 / C15 / D15 / E15 / F15
Characteristics:	Aluminum (2005) - Ø14.3 x 200mm

7. IMAGES

SAMPLES





SAMPLES
 

8. ASSIGNED VALUES

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

Results submitted after the deadline, missing results, and results excluded under the statistical procedure are not included in the consensus.

9. PARTICIPANTS' RESULTS

LABORATORY CODE	BATCH: LM2487 (AVG)			
	Yield strength 0.2 offset (MPa)	Tensile strength (MPa)	Elongation at fracture (%)	Reduction of area (%)
01	349.12	455.82	36.93	78.76
02	332.33	433.43	39.12	77.11
03	344.60	440.30	36.66	72.49
05	329.03	419.03	35.46	78.04
06	321.27	423.07	35.78	75.61
07	338.82	431.22	38.88	77.70
08	325.77	421.57	38.73	76.93
10	339.51	449.31	40.38	77.49
11	369.36	474.66	32.58	70.05
12	328.37	421.47	40.80	76.39
13	345.38	438.68	40.25	73.36
14	321.20	427.90	35.93	77.37
15	334.17	439.16	38.39	75.30
16	321.92	426.62	37.89	72.76
17	320.47	420.07	38.46	71.18
18	333.42	433.42	34.09	74.99
19	343.51	458.25	35.45	78.39
21	322.86	432.56	38.29	71.63
22	326.06	431.16	39.89	74.47
23	335.38	438.88	41.53	78.98

SUMMARY STATISTICS - STEEL SAMPLES

STATISTICS	Yield strength 0.2 offset	Tensile strength	Elongation at fracture	Reduction of area
Number of results	20	20	20	20
Median	333	433	38	76
IQR	15.4675	13.7125	3.42	4.3325
Normalized IQR	11.47	10.17	2.54	3.21
Uncertainty (Median)	3.2	2.8	0.7	0.9
Robust CV	3.4	2.3	6.6	4.2

LABORATORY CODE	BATCH: LM2531 (AVG)			
	Yield strength 0.2 offset (MPa)	Tensile strength (MPa)	Elongation at fracture (%)	Reduction of area (%)
01	339.25	405.06	9.41	21.70
02	303.22	373.22	9.56	22.27
03	317.18	384.58	10.11	25.31
05	290.01	351.51	10.15	23.55
06	313.84	376.94	7.72	23.94
07	284.33	349.93	7.88	21.16
08	313.16	367.76	7.20	22.08
10	315.19	366.89	6.97	23.29
11	337.25	399.89	6.76	26.09
12	302.00	365.50	9.15	25.70
13	316.38	384.78	7.29	22.60
14	300.37	357.57	10.66	24.06
15	303.52	362.83	8.78	23.25
16	314.80	381.60	9.82	22.24
17	289.24	354.84	11.26	20.72
18	293.68	350.88	11.16	21.40
19	303.12	362.62	8.03	26.08
21	284.10	349.00	8.83	26.20
22	282.87	335.57	10.75	21.98
23	313.32	374.52	10.38	21.17

SUMMARY STATISTICS - ALUMINIUM SAMPLES

STATISTICS	Yield strength 0.2 offset	Tensile strength	Elongation at fracture	Reduction of area
Number of results	20	20	20	20
Median	303	366	9	23
IQR	22.135	24.0975	2.3675	2.4625
Normalized IQR	16.41	17.86	1.76	1.83
Uncertainty (Median)	4.6	5	0.5	0.5
Robust CV	5.4	4.9	18.9	8

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´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

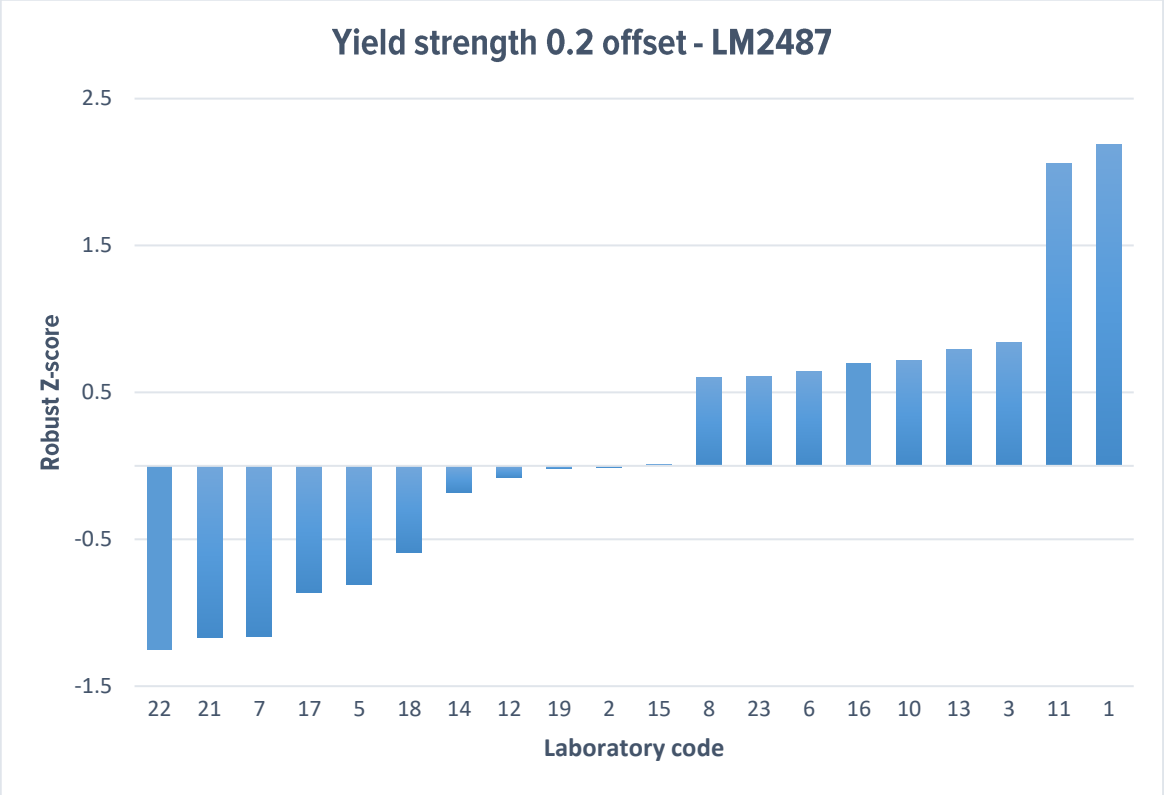
$\hat{\sigma}$ is the standard deviation

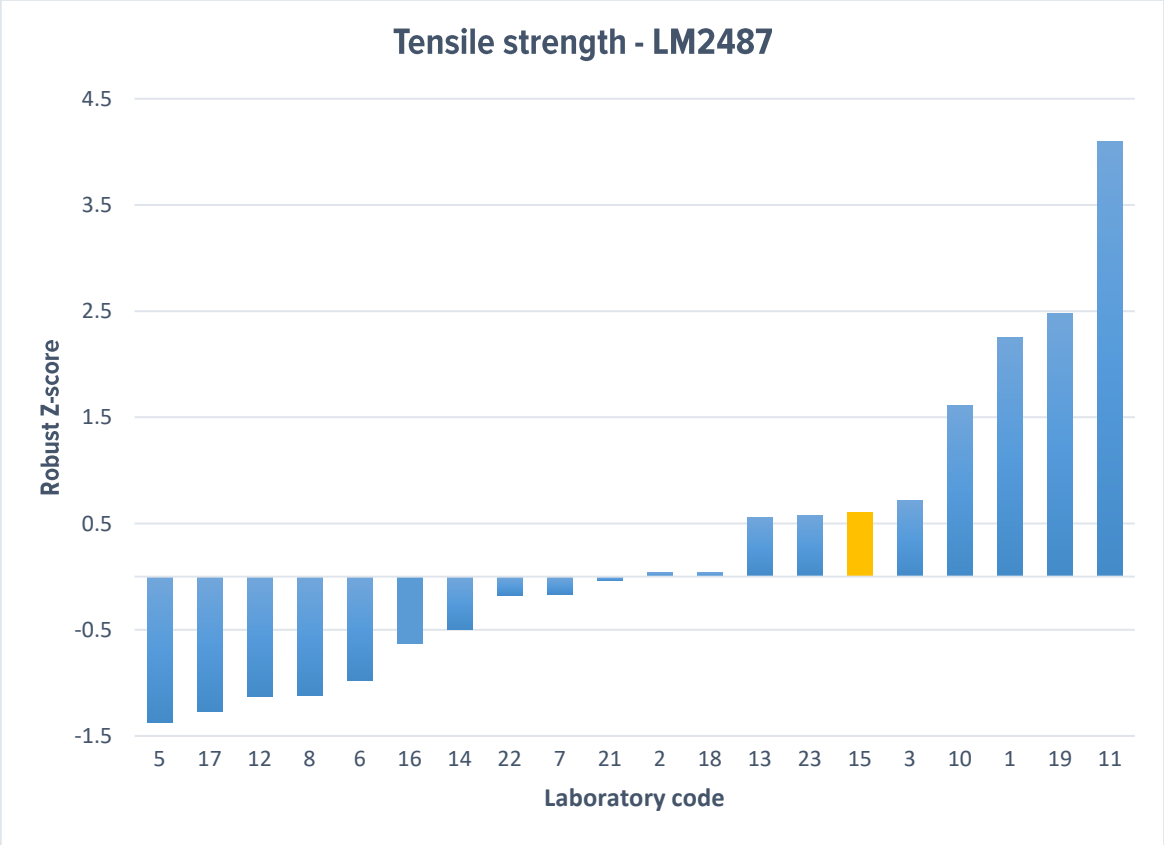
The performance evaluation of each sample is carried out with the following criteria:

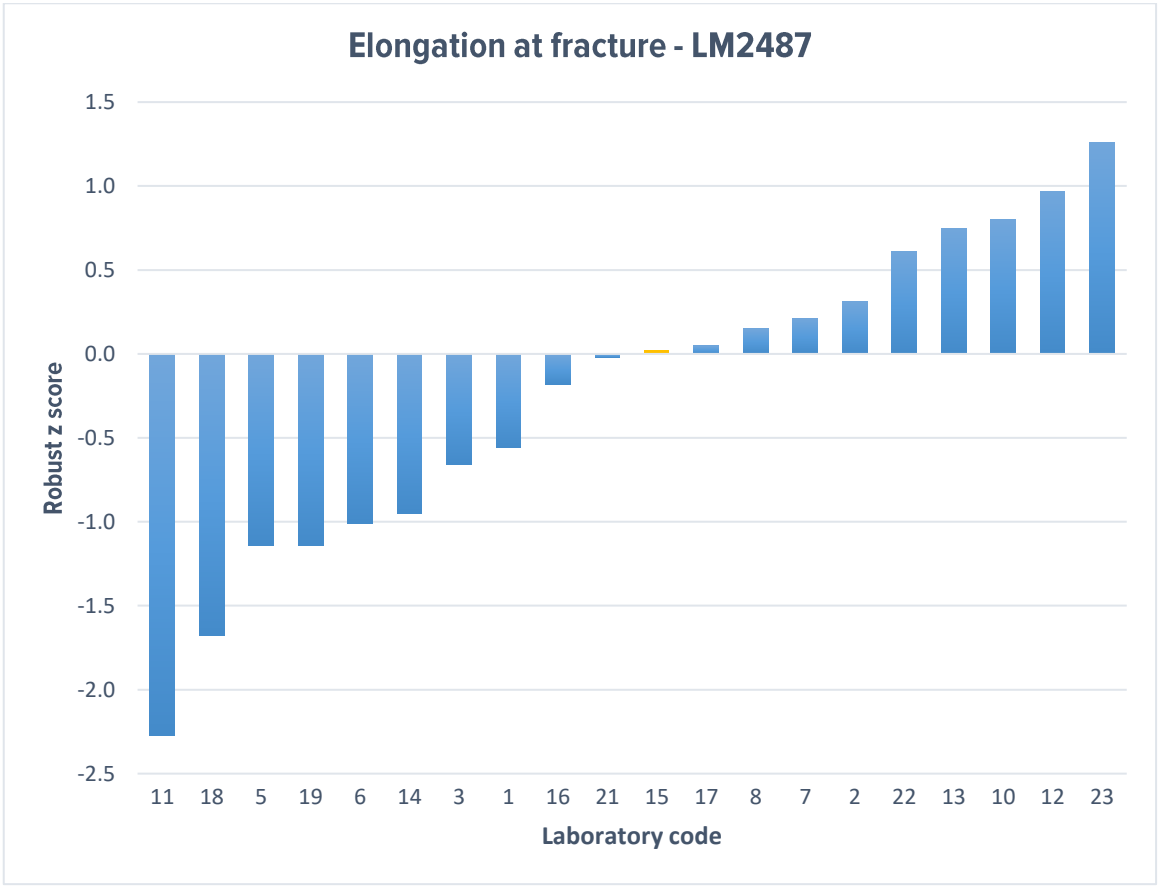
$\|z\| \leq 2.0$	**indicates "satisfactory" performance and generates no signal;**
$2.0 < \|z\| < 3.0$	**indicates "questionable" performance and generates a warning signal;**
$\|z\| \geq 3.0$	**indicates "unsatisfactory" performance and generates an action signal;**

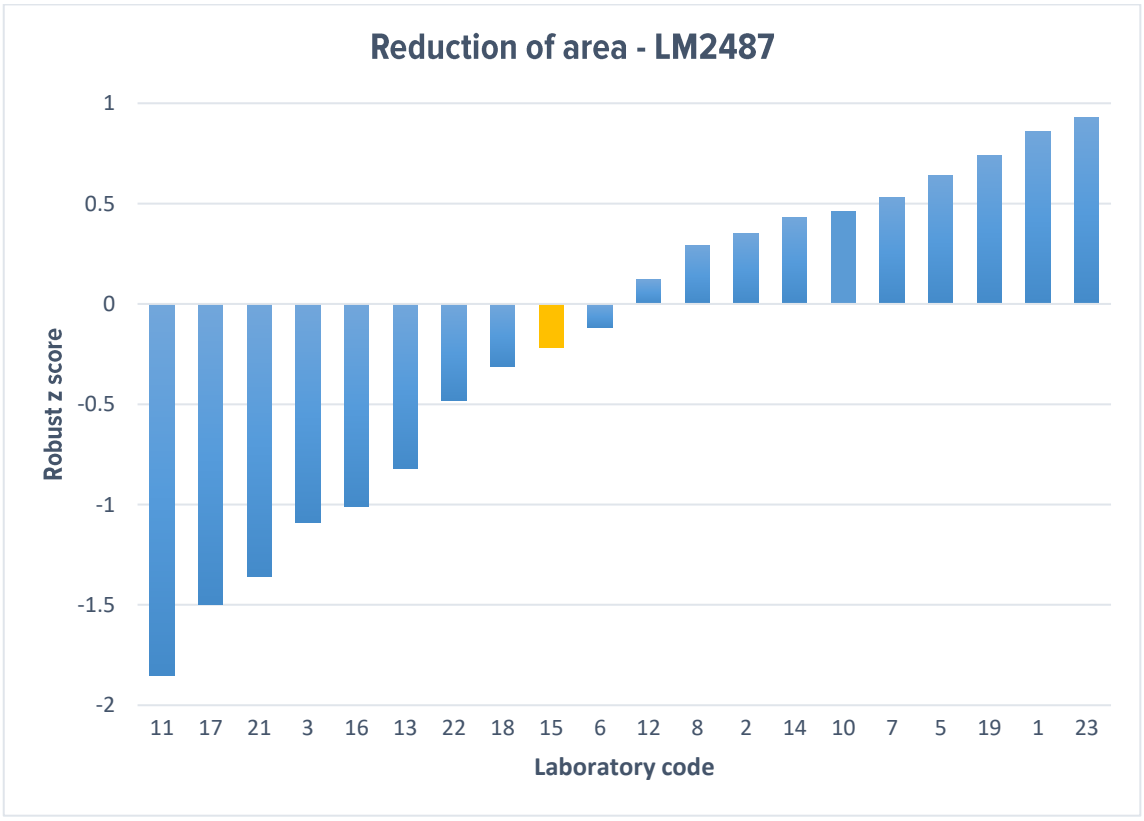
11. EVALUATION OF PERFORMANCE

LABORATORY CODE	BATCH: LM2487 - *z score*			
	Yield strength 0.2 offset (MPa)	Tensile strength (MPa)	Elongation at fracture (%)	Reduction of area (%)
01	1.42	2.25	-0.56	0.86
02	-0.05	0.04	0.31	0.35
03	1.02	0.72	-0.66	-1.09
05	-0.34	-1.37	-1.14	0.64
06	-1.01	-0.98	-1.01	-0.12
07	0.52	-0.17	0.21	0.53
08	-0.62	-1.12	0.15	0.29
10	0.58	1.61	0.80	0.46
11	3.18	4.10	-2.27	-1.85
12	-0.39	-1.13	0.97	0.12
13	1.09	0.56	0.75	-0.82
14	-1.02	-0.50	-0.95	0.43
15	0.11	0.61	0.02	-0.22
16	-0.96	-0.63	-0.18	-1.01
17	-1.08	-1.27	0.05	-1.50
18	0.05	0.04	-1.68	-0.31
19	0.93	2.48	-1.14	0.74
21	-0.87	-0.04	-0.02	-1.36
22	-0.59	-0.18	0.61	-0.48
23	0.22	0.58	1.26	0.93

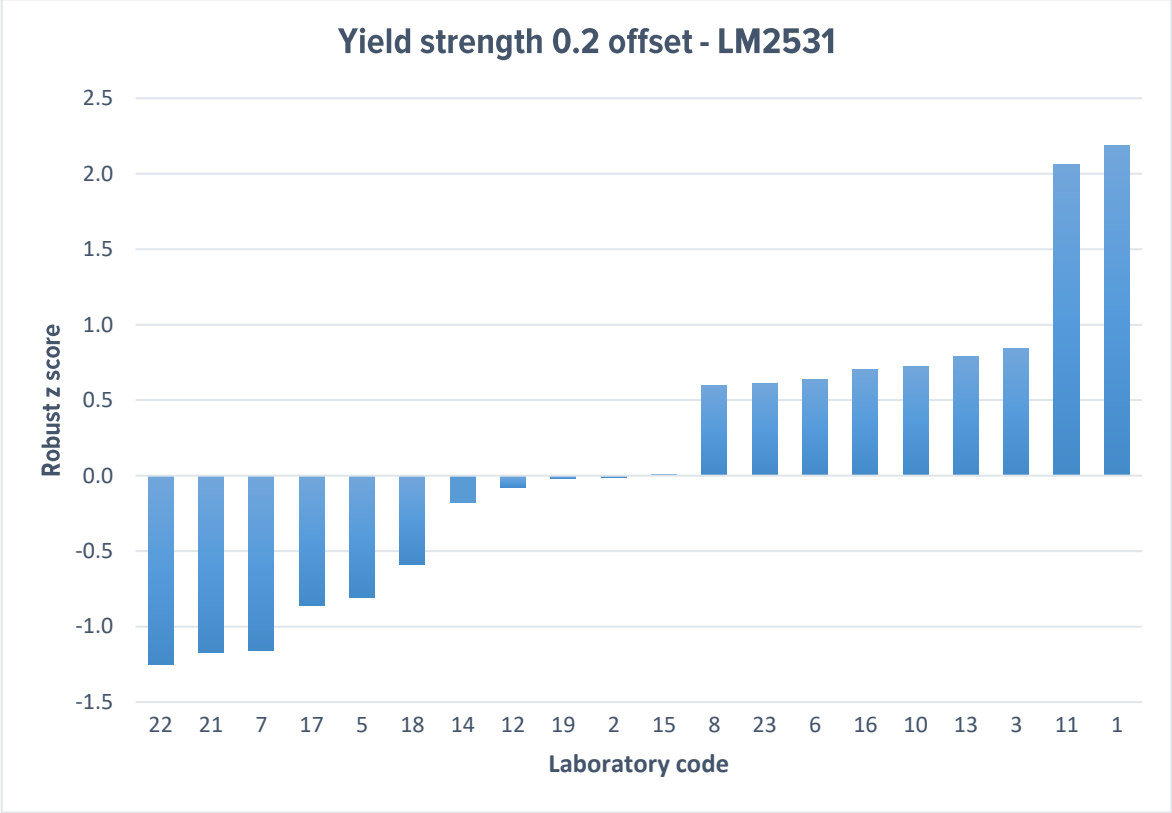

Yield strength 0.2 offset - LM2487
Robust Z-score
2.5
1.5
0.5
-0.5
-1.5
22 21 7 17 5 18 14 12 19 2 15 8 23 6 16 10 13 3 11 1
Laboratory code

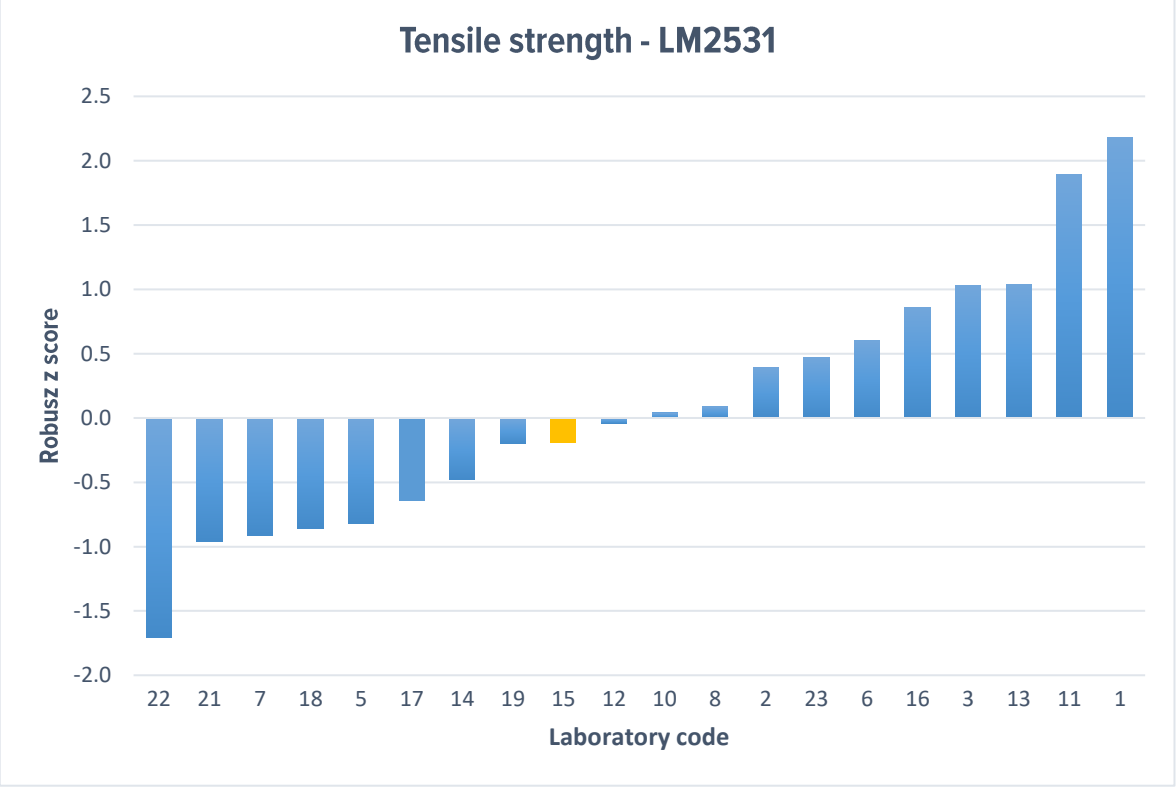

Tensile strength - LM2487
Robust Z-score
4.5
3.5
2.5
1.5
0.5
-0.5
-1.5
5 17 12 8 6 16 14 22 7 21 2 18 13 23 15 3 10 1 19 11
Laboratory code

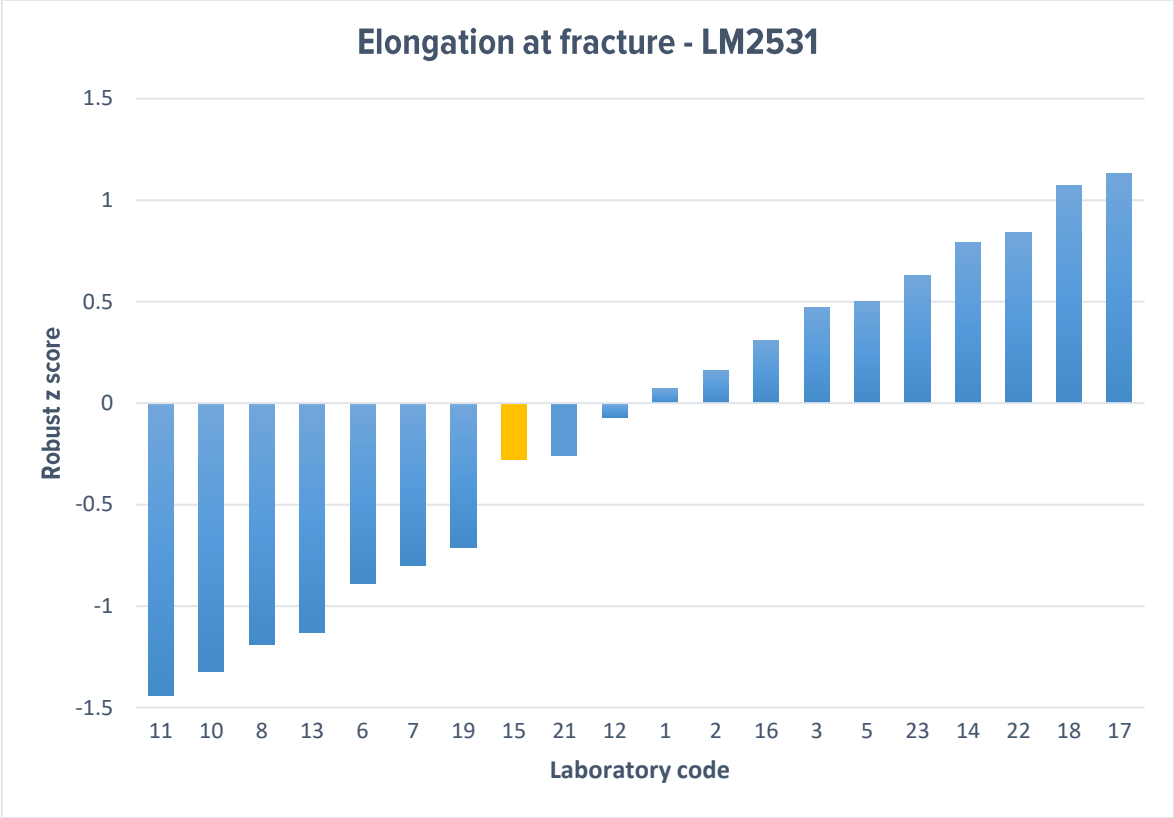

Elongation at fracture - LM2487
Robust z score
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
11 18 5 19 6 14 3 1 16 21 15 17 8 7 2 22 13 10 12 23
Laboratory code


Reduction of area - LM2487
Robust z score
1
0.5
0
-0.5
-1
-1.5
-2
11 17 21 3 16 13 22 18 15 6 12 8 2 14 10 7 5 19 1 23
Laboratory code

LABORATORY CODE	BATCH: LM2531 - *z score*			
	Yield strength 0.2 offset (MPa)	Tensile strength (MPa)	Elongation at fracture (%)	Reduction of area (%)
01	2.19	2.18	0.07	-0.67
02	-0.01	0.39	0.16	-0.36
03	0.84	1.03	0.47	1.31
05	-0.81	-0.82	0.50	0.34
06	0.64	0.60	-0.89	0.56
07	-1.16	-0.91	-0.80	-0.97
08	0.60	0.09	-1.19	-0.46
10	0.72	0.04	-1.32	0.20
11	2.06	1.89	-1.44	1.73
12	-0.08	-0.04	-0.07	1.52
13	0.79	1.04	-1.13	-0.18
14	-0.18	-0.48	0.79	0.62
15	0.01	-0.19	-0.28	0.18
16	0.70	0.86	0.31	-0.38
17	-0.86	-0.64	1.13	-1.21
18	-0.59	-0.86	1.07	-0.84
19	-0.02	-0.20	-0.71	1.73
21	-1.17	-0.96	-0.26	1.79
22	-1.25	-1.71	0.84	-0.52
23	0.61	0.47	0.63	-0.96


Yield strength 0.2 offset - LM2531
Robust z score
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
22 21 7 17 5 18 14 12 19 2 15 8 23 6 16 10 13 3 11 1
Laboratory code


Tensile strength - LM2531
Robusz z score
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
22 21 7 18 5 17 14 19 15 12 10 8 2 23 6 16 3 13 11 1
Laboratory code


Elongation at fracture - LM2531
Robust z score
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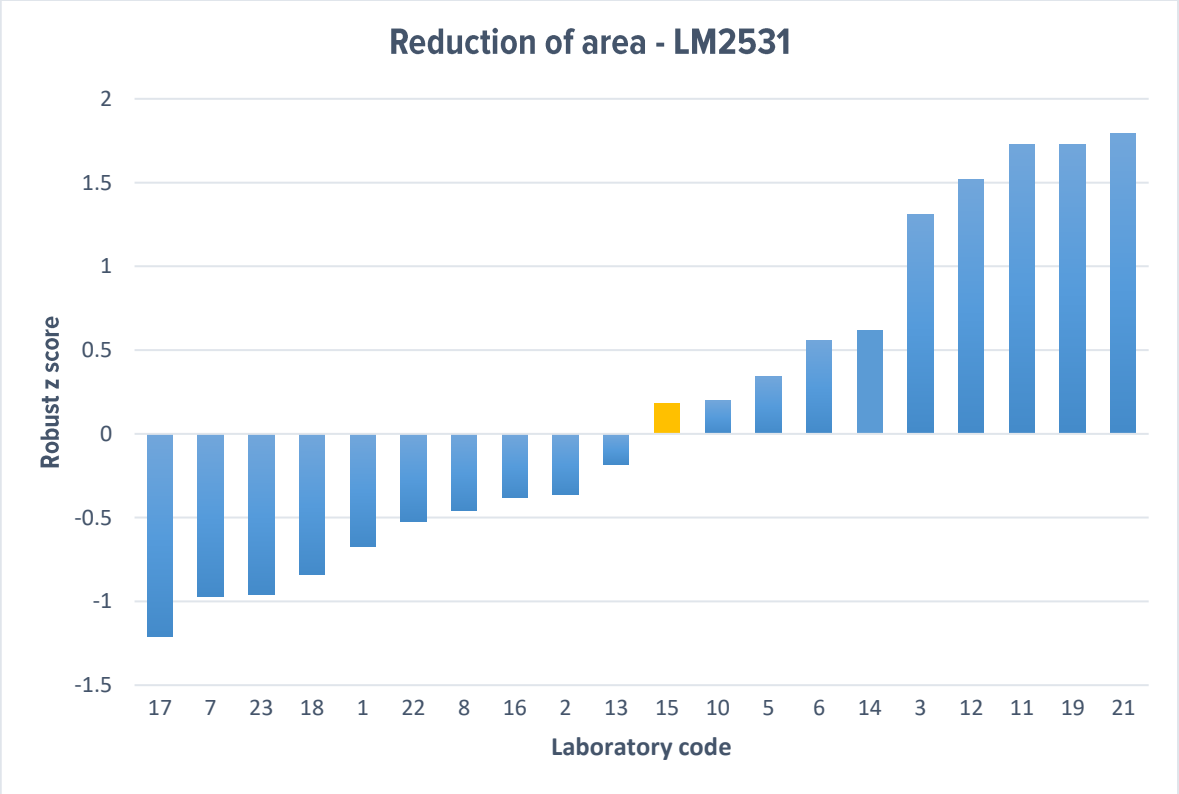
0.5
0
-0.5
-1
-1.5
11 10 8 13 6 7 19 15 21 12 1 2 16 3 5 23 14 22 18 17
Laboratory code


Reduction of area - LM2531
Robust z score
2
1.5
1
0.5
0
-0.5
-1
-1.5
17 7 23 18 1 22 8 16 2 13 15 10 5 6 14 3 12 11 19 21
Laboratory code

Laboratory **Code 01**: The laboratory obtained a **QUESTIONABLE** result for the determination of tensile strength in the **LM2487** batch and **QUESTIONABLE** results for the determination of yield strength and tensile strength in the **LM2531** batch. Furthermore, **SATISFACTORY** results were obtained for the remaining parameters.

Laboratory **Code 02**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 03**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 04**: The laboratory has not sent the results before the deadline.

Laboratory **Code 05**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 06**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 07**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 08**: The laboratory has obtained **SATISFACTORY** results for all parameters.

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

Laboratory **Code 10**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 11**: The laboratory obtained **UNSATISFACTORY** results for the determination of yield strength and tensile strength and a **QUESTIONABLE** result for the determination of elongation at fracture in the **LM2487** batch. Furthermore, the laboratory obtained a **QUESTIONABLE** result for the determination of yield strength in the **LM2531** batch. **SATISFACTORY** results were obtained for the remaining parameters.

Laboratory **Code 12**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 13**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 14**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 15**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 16**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 17**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 18**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 19**: The laboratory obtained a **QUESTIONABLE** result for the determination of tensile strength in the **LM2487** batch. Furthermore, **SATISFACTORY** results were obtained for the remaining parameters.

Laboratory **Code 20**: The laboratory has not sent the results before the deadline.

Laboratory **Code 21**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 22**: The laboratory has obtained **SATISFACTORY** results for all parameters.

Laboratory **Code 23**: The laboratory has obtained **SATISFACTORY** results for all parameters.

GLOBAL PERFORMANCE - SUM OF ABSOLUTE Z SCORE

POSITION	LABORATORY CODE	z SCORE
1st	15	1.62
2nd	02	1.67
3rd	12	4.32
4th	08	4.52
5th	14	4.97
6th	16	5.03
7th	07	5.27
8th	18	5.44
9th	23	5.66
10th	10	5.73
11th	06	5.81
12th	05	5.96
13th	22	6.18
14th	13	6.36
15th	21	6.47
16th	03	7.14
17th	17	7.74
18th	19	7.95
19th	01	10.20
20th	11	18.52

12. CONCLUSIONS

The overall performance in the **SQO-M14 (Round 23)** program, based on expected results from the participating laboratories, was as follows:

- Participant Codes **02, 03, 05, 06, 07, 08, 10, 12, 13, 14, 15, 16, 17, 18, 21, 22** and **23** have obtained **SUFFICIENT** performance according to the expected results, and no action is required;

- Participant Code **19** has obtained an **ALMOST SUFFICIENT** performance according to the expected results and must evaluate if it is necessary to take corrective action;

- Participant Code **01** and **11** 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:

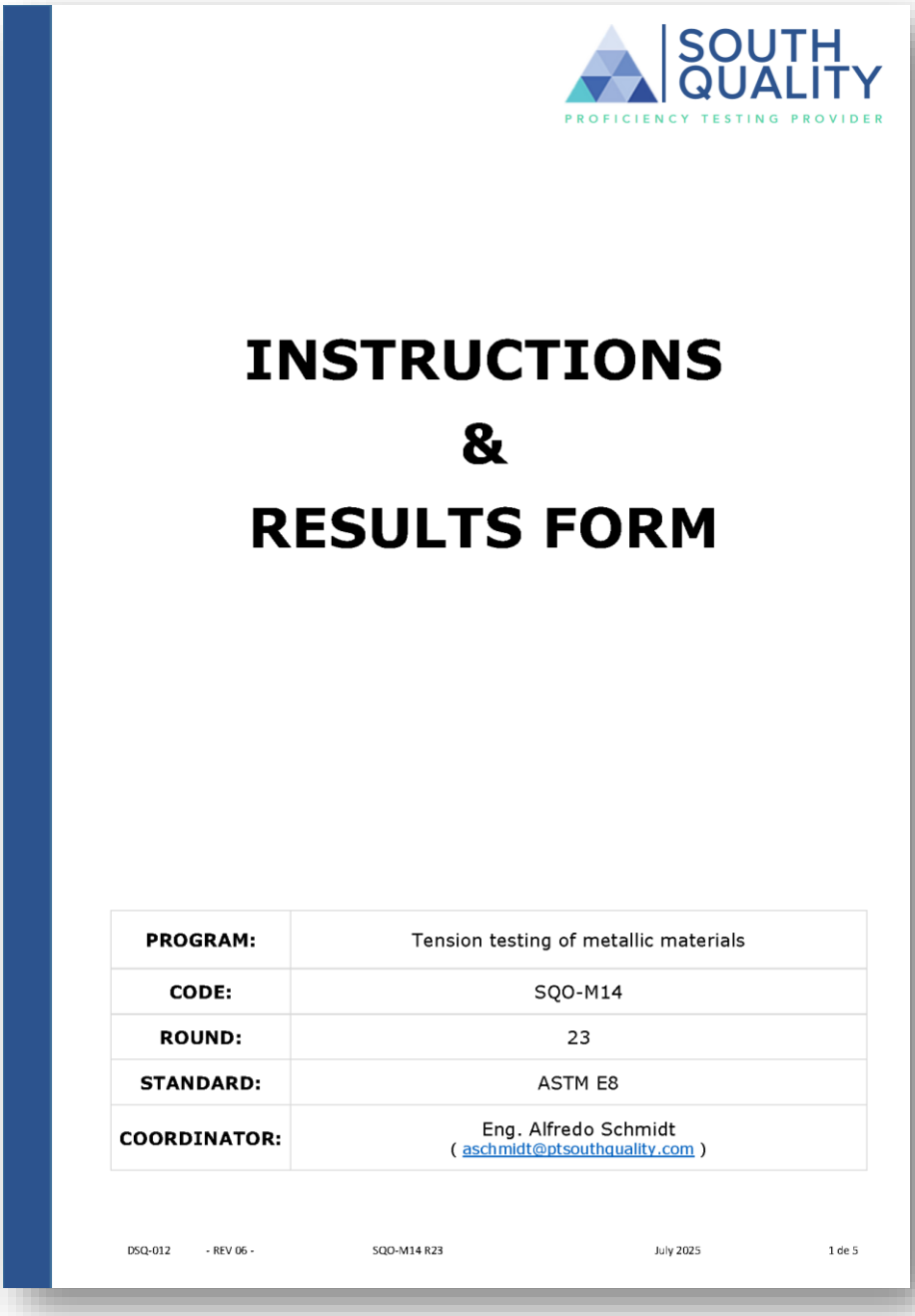
- **SUFFICIENT** performance: No unsatisfactory/questionable results obtained.
- **ALMOST SUFFICIENT** performance: No unsatisfactory results were obtained, but one questionable result was found.
- **INSUFFICIENT** performance: An unsatisfactory result or two questionable results were obtained.

APPENDIX A

A1 - PARTICIPANT DATA

Company:	**Cronite Castings Ltd**
Country:	United Kingdom
Client ID:	E532
Contact person:	Mark Moody - Metallurgical Technician
	mark.moody@cronite-group.com

A2 - PARTICIPANT RESULTS



SOUTH QUALITY
PROFICIENCY TESTING PROVIDER

INSTRUCTIONS
&
RESULTS FORM

PROGRAM:	Tension testing of metallic materials
CODE:	SQO-M14
ROUND:	23
STANDARD:	ASTM E8
COORDINATOR:	Eng. Alfredo Schmidt (aschmidt@ptsouthquality.com)

DSQ-012 - REV 06 - SQO-M14 R23 July 2025 1 de 5

1 - **General**

This document is intended to be filled with the results of the **SQO-M14 (Round 23)** program.

Results must be typed, not handwritten.

2 - **Standard**

ASTM E8 - 24

3 - **Participant**

CRONITE CASTINGS LTD	CODE 15

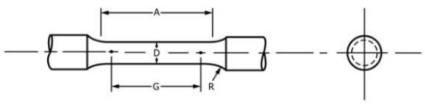
4 - **Tests involved**

TEST	SUBTEST
Tension testing of metallic material	- Yield Strength 0.2 Offset - Tensile Strength - Elongation at fracture - Reduction of area

5 - **Samples**

CODE	SAMPLE	QUANTITY
LM2487-A15 LM2487-B15 LM2487-C15 LM2487-D15 LM2487-E15 LM2487-F15	Steel sample - Ø15.9 x 200mm	6
LM2531-A15 LM2531-B15 LM2531-C15 LM2531-D15 LM2531-E15 LM2531-F15	Aluminum sample - Ø14.3 x 200mm	6

6 - **Sample preparation**

SAMPLE	DIMENSIONS (mm)
 According FIG. 9 Standard Specimen (Specimen 1)	G - Gauge length: 50.0 ± 0.1 D - Diameter: 12.5 ± 0.2 R - Radius of fillet, min: 10 A - Length of reduced parallel section, min: 56

7 - **Notes**

a) The deadline for the delivery of results is **September 19, 2025**.

b) The tables in this document may be modified by the participant, if desired, to include data or observations.

c) The samples must be kept until the end of the program, which concludes with the submission of the final report.

d) The samples are to be handled as routine lab samples, with all testing, documentation, and reporting adhering to ASTM E8.

e) 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.

f) Upon completion of this document, please convert it to a PDF file and send it to the program coordinator.

8 - **Test results**

Method:	According to standard
Testing rate:	Method C

Test date:	7/10/25	Temperature:	22
Equipment:	X500-100	Date calibration:	12/05/25
Resolution:		Resolution uncertainty:	
Gripped ends - Type:	Threaded	Speed:	

SAMPLE	Yield strength 0.2 Offset (MPa)	Tensile strength (MPa)	Elongation at fracture (%)	Reduction of area (%)
LM2487-A15				
LM2487-B15	331.874	439.667	37.811	74.867
LM2487-C15	342.505	440.583	38.029	75.908
LM2487-D15	331.618	438.146	40.652	75.133
LM2487-E15	343.054	438.759	39.217	75.724
LM2487-F15	321.814	438.628	36.217	74.867
AVG	334.173	439.157	38.385	75.300
U (±)				

Test date:	8/10/25	Temperature:	22
Equipment:	X500-100	Date calibration:	12/05/25
Resolution:		Resolution uncertainty:	
Types of ends:	Threaded	Speed:	

SAMPLE	Yield strength 0.2 Offset (MPa)	Tensile strength (MPa)	Elongation at fracture (%)	Reduction of area (%)
LM2531-A15	307.187	367.384	9.748	21.093
LM2531-B15	302.670	360.31	7.181	18.089
LM2531-C15	301.283	362.185	8.614	26.389
LM2531-D15	300.623	359.376	9.769	27.524
LM2531-E15	305.636	364.129	7.369	21.788
LM2531-F15	303.737	363.615	10.023	24.628
AVG	303.523	362.833	8.784	23.252
U (±)				

OBSERVATIONS

PHOTOGRAPHS

APPENDIX B

VOID

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