SOUTH QUALITY

PROFICIENCY TESTING PROVIDER

REPORT No 11348

Date of issue: *September 12, 2025*

Status: FINAL REPORT

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ASTM E1085

ANALYSIS OF LOW-ALLOY STEELS BY WAVELENGTH DISPERSIVE X-RAY FLUORESCENCE SPECTROMETRY

Program: SQ-0029

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Prepared by:	Reviewed by:	Approved by:
cn=SERGIO E. ANDRADA, o=PT SOUTH QUALITY SAS, ou=PT SOUTH QUALITY SAS, email=tech@ptsouthquality.com, c=AR 2025.09.12 10:10:28 -03'00'	cn=ALFREDO M. SCHMIDT, o=PT SOUTH QUALITY SAS, ou=SOUTH QUALITY, email=aschmidt@ptsouthquality.com, c=AR 2025.09.12 16:28:11 -03'00'	cn=Emiliano Medina, o=SOUTH QUALITY, ou=PT SOUTH QUALITY SAS, email=quality@ptsouthquality.com, c=ES 2025.09.15 11:53:29 -03'00'
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1. FOREWORD

This report summarizes the results of the **SQ-0029** proficiency testing program on the determination of the composition of low-alloy steels by wavelength-dispersive x-ray fluorescence analysis. 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 August 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 composition of low-alloy steels, using the following standard:

Standard
ASTM E1085: 2022

To verify this, low-alloy steel samples 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**
Laboratory:	**Instrument Laboratory**
Country:	South Africa
Client ID:	F290
Contact person:	Kebuile Moseki Lab Specialist moseki.kebuile@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		
	BATCH: LM2465	BATCH: LM2466	BATCH: LM2467
MASS FRACTION	YES	NO	YES

Size of each batch: **50 units** Tested samples from each batch: **10 units**

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LM2773	BATCH: LM2774	BATCH: LM2775
MASS FRACTION	NO	YES	YES

Samples for this program are taken from the selected batches identified as LM2465 and LM2775.

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

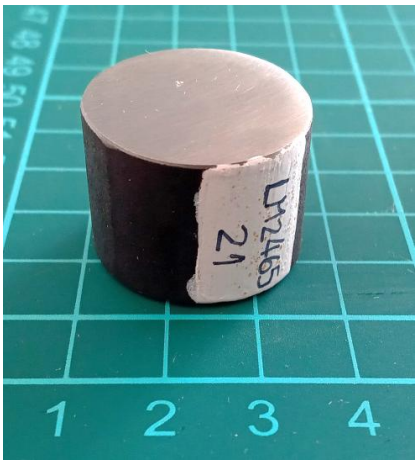
The following samples were sent to be tested:

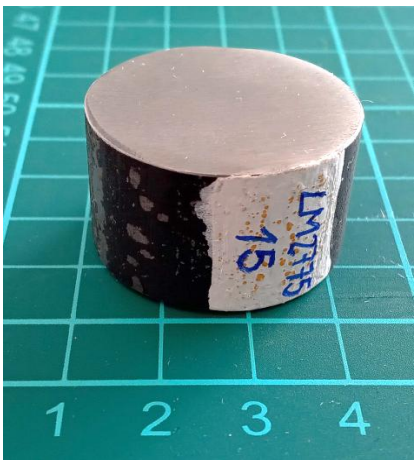
Batch:	LM2465
Sample ID:	21
Characteristics:	Low-alloy steel (SAE 4140) - Ø 25.4 x 20 mm

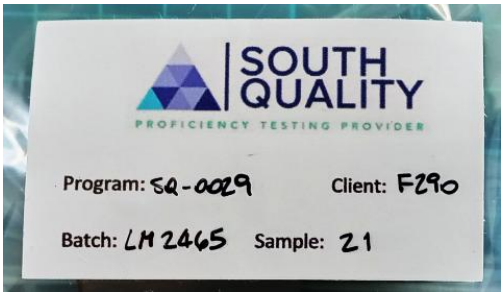
Batch:	LM2775
Sample ID:	15
Characteristics:	Low-alloy steel (SAE 4140) - Ø 32 x 20 mm

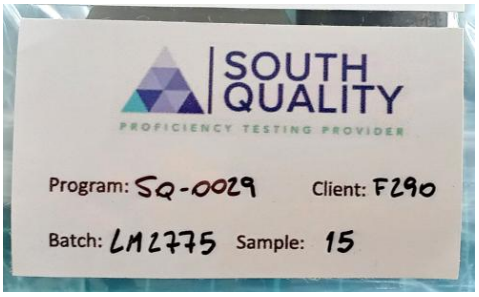
7. IMAGES

SAMPLES









8. ASSIGNED VALUES

BATCH	MASS FRACTION, % (Standard deviation)					
	CALCIUM	CHROMIUM	COBALT	COPPER	MANGANESE	MOLYBDENUM
LM2775	-	0.935 (0.067)	0.006 (0.001)	0.053 (0.004)	0.821 (0.072)	0.179 (0.016)

BATCH	MASS FRACTION, % (Standard deviation)					
	NIKEL	NIOBIUM	PHOSPHORUS	SILICON	SULFUR	VANADIUM
LM2775	0.0299 (0.0096)	0.003 (0.001)	0.0138 (0.0091)	0.243 (0.056)	0.0125 (0.0059)	0.023 (0.0009)

Note: The participant does not report results for the sample corresponding to batch LM2465 therefore, reference values are not published.

9. PARTICIPANT RESULTS (SEE APPENDIX)

CODE	MASS FRACTION, %					
	CALCIUM	CHROMIUM	COBALT	COPPER	MANGANESE	MOLYBDENUM
LM2775-15	-	0.966	0.006	0.06	0.849	0.161

CODE	MASS FRACTION, %					
	NIKEL	NIOBIUM	PHOSPHORUS	SILICON	SULFUR	VANADIUM
LM2775-15	0.0375	0.002	0.0122	0.279	0.0103	0.038

10. STATISTICS

The results must be treated as quantitative.

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 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

ELEMENT	MASS FRACTION, %		| z score |	PERFORMANCE RESULT
	PARTICIPANT RESULT	ASSIGNED VALUE		
CHROMIUM	0.966	0.935	**0.46**	**SATISFACTORY**
COBALT	0.006	0.006	**0.00**	**SATISFACTORY**
COPPER	0.06	0.053	**1.75**	**SATISFACTORY**
MANGANESE	0.849	0.821	**0.39**	**SATISFACTORY**
MOLYBDENUM	0.161	0.179	**1.13**	**SATISFACTORY**
NICKEL	0.0375	0.0299	**0.79**	**SATISFACTORY**
NIOBIUM	0.002	0.003	**1.00**	**SATISFACTORY**
PHOSPHOROUS	0.0122	0.0138	**0.18**	**SATISFACTORY**
SILICON	0.279	0.243	**0.64**	**SATISFACTORY**
SULFUR	0.0103	0.0125	**0.37**	**SATISFACTORY**
VANADIUM	0.0038	0.0023	**1.67**	**SATISFACTORY**

12. CONCLUSIONS

The overall performance on this **SQ-0029** program from the participant laboratory **COLUMBUS STAINLESS - Instrument Laboratory**, is **SUFFICIENT** based on expected results.

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

- **SUFFICIENT** performance: No unsatisfactory/questionable results were 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

PARTICIPANT RESULTS

(Results form)

INSTRUCTIVE
&
RESULTS FORM

PROGRAM:	Analysis of low-alloy steels by wavelength dispersive x-ray fluorescence spectrometry
CODE:	SQ-0029
VERSION:	-
STANDARD:	ASTM E1085
COORDINATOR:	Eng. Alfredo Schmidt (aschmidt@ptsouthquality.com)

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1 - General

This document is intended to be filled with the results of the **SQ-0029** program.

Results must be typed, not handwritten.

2 - Standard

ASTM E1085: 2022

3 - Tests involved

TEST
Determination of the composition of low-alloy steels by wavelength-dispersive X-ray fluorescence analysis

4 - Samples

CODE	SAMPLE	QUANTITY
LM2465-21	Low-alloy steel - Ø 25.4 x 20 mm	1
LM2775-15	Low-alloy steel - Ø 32 x 20 mm	1

5 - Notes

a) Being a bilateral program there is no deadline to accomplish sending results.
b) Tables in this document can be modified at will for the addition of data or observations.
c) The samples must be kept until the end of the program, which closes with the submission of the final report.
d) The surfaces where the tests must be carried out can be either of the two faces.
e) Participants may improve the surface to provide a better testing surface. If this is done, the procedure must be detailed in the 'observations' box.
f) Samples should be treated as a routine laboratory sample. All testing, recording and reporting is to be performed in accordance with ASTM E1085.
g) To review the results, sending images of the tests will be appreciated. Images can be attached at the end of this document or can be sent by email.
h) Once this document is completed, it is requested to transform it into a pdf file and send it to the program coordinator.

6 - **Test conditions**

Procedure:	According to standard
Final grinding:	P180 -grit

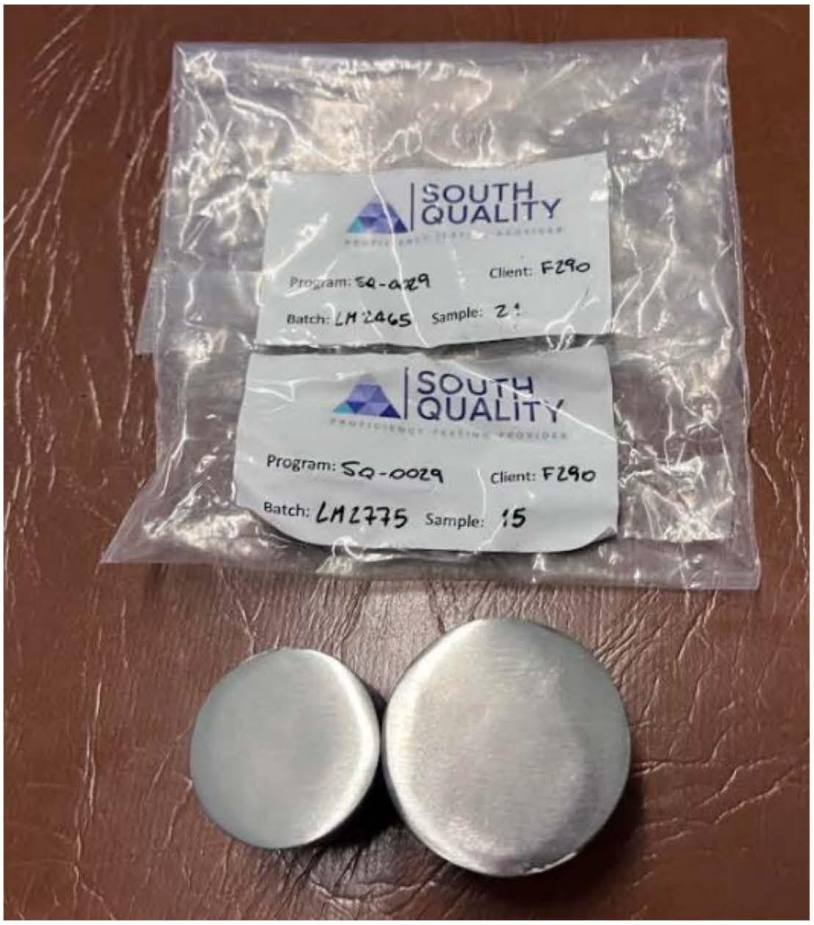
7 - **Test results**

ELEMENT	MASS FRACTION, %	
	LM2465-21	LM2775-15
CALCIUM		
CHROMIUM		0.966
COBALT		0.0060
COPPER		0.060
MANGANESE		0.849
MOLYBDENUM		0.161
NICKEL		0.0375
NIOBIUM		0.0020
PHOSPHORUS		0.0122
SILICON		0.279
SULFUR		0.0103
VANADIUM		0.0038

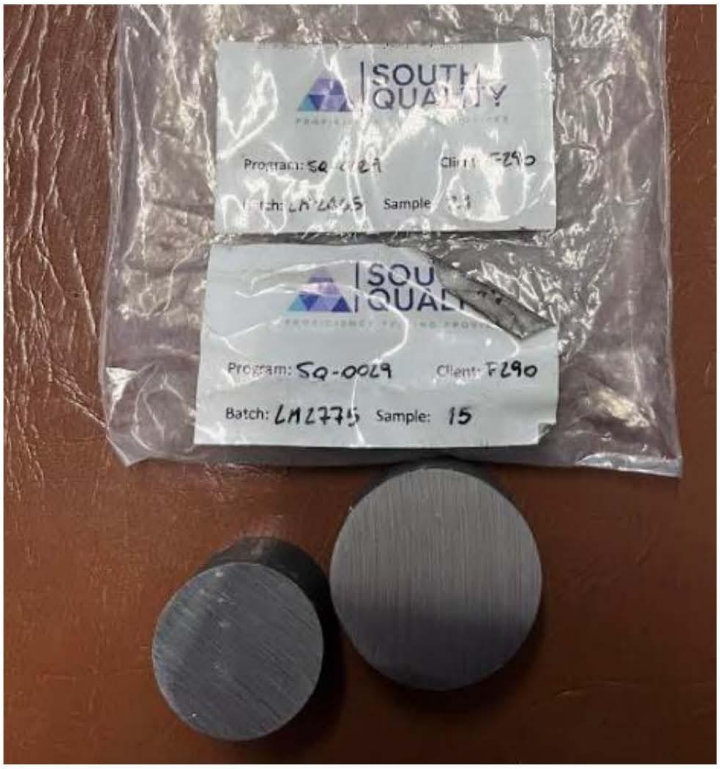
OBSERVATIONS
LM2465-21: Results not reported: Sample too small to fit into a normal cassette

PHOTOGRAPHS

Before analysis



After analysis



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