

The Fredericks Company | Televac®

Vacuum Calibration Test Points with Tolerances

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1. Section 1 - Description

General: This document gives a description of the calibration options available from Televac® as well as the vacuum calibration test points and tolerances for various vacuum sensors, vacuum controllers, and active vacuum gauges offered by Televac®. All values are in Torr and calibrations are done in nitrogen gas unless otherwise stated. Televac® reserves the right to change vacuum test points and tolerances for any product. Any modification to any unit without approval from Televac® voids the unit's calibration certificate or certificate of compliance. Additional custom test points are available upon request.

Description of ISO/IEC 17025 accredited calibration: The Fredericks Company is ISO/IEC 17025 accredited for vacuum and pressure calibration in the range of 1E-6 Torr to 1000 Torr. Units are vacuum calibrated (on a vacuum stand) in nitrogen gas at various points (gauge dependent) against reference standards traceable to NIST, using systems that are accredited to ISO/IEC 17025. This includes incoming (as found) data, outgoing (as left) data after calibration adjustments, and the reference standard uncertainty at each point. A statement of conformity using a simple decision rule is included. The conformity decision is made by comparing the measurement results to the calibration limits, defined by form televac_tolerances, without including measurement uncertainty.

Description of NIST traceable calibration: The Fredericks Company offers NIST traceable calibration, where units are vacuum calibrated (on a vacuum stand) in nitrogen gas at various points (gauge dependent) against reference standards traceable to NIST. This includes incoming (as found) data, outgoing (as left) data after calibration adjustments, but does not include the reference uncertainty at each point (ISO 17025 accredited calibration does include uncertainties).

Description of factory calibration (previously called "standard calibration"): The Fredericks Company offers factory calibration, where units are electrically verified using electrical equipment only. The verification includes checking that the units provide vacuum readings within a specified tolerance when a specific electrical signal is applied. This is not a vacuum calibration, and does not guarantee that a sensor will read accurately when connected to a controller or active gauge. This is because sensor contamination and sensor to sensor mechanical variability cannot be accounted for with an electrical verification.

2. Section 2 - Comparison Table of Calibration Options

Description	Factory	NIST Traceable	ISO 17025 Accredited
Electrical verification	Yes	No	No
Vacuum comparison calibration to NIST traceable references	No	Yes	Yes
Reference standard uncertainties included	No	No	Yes
ISO 17025 accredited calibration	No	No	Yes

3. Section 3 - 2A, 2A VacuMini, 2A NASA Mini Part 1

Applicable Controllers and Active Gauges

MX200, MM200, MC300, MV2A, Compact 2A, Vacuguard, B2A Portable, MP2AR

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	-1.0E-3	1.0E-3
1.0E-1	9.0E-2	1.1E-1
1.0E+0	8.0E-1	1.2E+0

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	-1.0E-3	1.0E-3
1.0E-2	9.0E-3	1.1E-2
2.0E-2	1.8E-2	2.2E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
2.0E-1	1.6E-1	2.4E-1
5.0E-1	4.0E-1	6.0E-1
1.0E+0	8.0E-1	1.2E+0

NIST Traceable GE Aviation Specification P10TF3 Compatible Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	-1.0E-3	1.0E-3
1.0E-2	9.0E-3	1.1E-2
2.0E-2	1.8E-2	2.2E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
2.0E-1	1.7E-1	2.3E-1
5.0E-1	4.3E-1	5.8E-1
1.0E+0	8.5E-1	1.2E+0

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-3	0.0E-3	2.0E-3
1.0E-2	9.0E-3	1.1E-2
2.0E-2	1.8E-2	2.2E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
2.0E-1	1.6E-1	2.4E-1
5.0E-1	4.0E-1	6.0E-1
1.0E+0	8.0E-1	1.2E+0

ISO 17025 Accredited GE Aviation Specification P10TF3 Compatible Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-3	0.0E-3	1.0E-3
1.0E-2	9.0E-3	1.1E-2
2.0E-2	1.8E-2	2.2E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
2.0E-1	1.7E-1	2.3E-1
5.0E-1	4.3E-1	5.8E-1
1.0E+0	8.5E-1	1.2E+0

4. Section 4 - 2A, 2A VacuMini, 2A NASA Mini Part 2

Applicable Controllers and Active Gauges

MX2A

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	0.0E-3	1.0E-3
1.0E+0	9.0E-1	1.1E+0
7.6E+2	6.8E+2	8.4E+2

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	0.0E-3	1.0E-3
1.0E-2	9.0E-3	1.1E-2
2.0E-2	1.8E-2	2.2E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
2.0E-1	1.8E-1	2.2E-1
5.0E-1	4.5E-1	5.5E-1
1.0E+0	9.0E-1	1.1E+0

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-3	0.0E-3	2.0E-3
1.0E-2	9.0E-3	1.1E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
5.0E-1	4.5E-1	5.5E-1
1.0E+0	9.0E-1	1.1E+0
1.0E+1	9.0E+0	1.1E+1
1.0E+2	9.0E+1	1.1E+2
7.6E+2	6.8E+2	8.4E+2

5. Section 5 - 4A Part 1

Applicable Controllers and Active Gauges

MX200, MX4A

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	0.0E-3	1.0E-3
1.0E+0	9.0E-1	1.1E+0
7.6E+2	6.8E+2	8.4E+2

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	0.0E-3	1.0E-3
1.0E-2	9.0E-3	1.1E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
5.0E-1	4.5E-1	5.5E-1
1.0E+0	9.0E-1	1.1E+0
1.0E+1	9.0E+0	1.1E+1
1.0E+2	9.0E+1	1.1E+2
7.6E+2	6.8E+2	8.4E+2

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-3	0.0E-3	2.0E-3
1.0E-2	9.0E-3	1.1E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
5.0E-1	4.5E-1	5.5E-1
1.0E+0	9.0E-1	1.1E+0
1.0E+1	9.0E+0	1.1E+1
1.0E+2	9.0E+1	1.1E+2
7.6E+2	6.8E+2	8.4E+2

6. Section 6 - 4A Part 2

Applicable Controllers and Active Gauges

MM200, MC300, MP4AR

Standard Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	-1.0E-3	1.0E-3
1.0E+0	9.0E-1	1.1E-0
7.6E+2	6.8E+2	8.4E+2

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.0E+0	-1.0E-3	1.0E-3
1.0E-2	9.0E-3	1.1E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
5.0E-1	4.5E-1	5.5E-1
1.0E+0	9.0E-1	1.1E+0
1.0E+1	9.0E+0	1.1E+1
1.0E+2	8.0E+1	1.2E+2
7.6E+2	6.8E+2	8.4E+2

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-3	0.0E-3	2.0E-3
1.0E-2	9.0E-3	1.1E-2
5.0E-2	4.5E-2	5.5E-2
1.0E-1	9.0E-2	1.1E-1
5.0E-1	4.5E-1	5.5E-1
1.0E+0	9.0E-1	1.1E+0
1.0E+1	9.0E+0	1.1E+1
1.0E+2	8.0E+1	1.2E+2
7.6E+2	6.8E+2	8.4E+2

7. Section 7 - 7B, 7E, 7M, 7F, 7FC, 7FCS Part 1

Applicable Controllers and Active Gauges

MX200, MM200, MC300, MP7ER, MP7FR

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-5	6.0E-6	1.6E-5
1.0E-4	6.0E-5	1.6E-4

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-6	6.0E-7	1.6E-6
5.0E-6	3.2E-6	8.0E-6
1.0E-5	6.3E-6	1.6E-5
5.0E-5	3.2E-5	8.0E-5
1.0E-4	6.3E-5	1.6E-4

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-6	6.0E-7	1.6E-6
5.0E-6	3.2E-6	8.0E-6
1.0E-5	6.3E-6	1.6E-5
5.0E-5	3.2E-5	8.0E-5
1.0E-4	6.3E-5	1.6E-4

8. Section 8 - 7B, 7E, 7M, 7F, 7FC, 7FCS Part 2

Applicable Gauges

MX7B, MX7M

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-5	7.0E-6	1.3E-5
1.0E-4	7.0E-5	1.3E-4

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-6	7.0E-7	1.3E-6
5.0E-6	3.5E-6	6.5E-6
1.0E-5	7.0E-6	1.3E-5
5.0E-5	3.5E-5	6.5E-5
1.0E-4	7.0E-5	1.3E-4

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-6	7.0E-07	1.3E-6
5.0E-6	3.5E-06	6.5E-6
1.0E-5	7.0E-06	1.3E-5
5.0E-5	3.5E-05	6.5E-5
1.0E-4	7.0E-05	1.3E-4

9. Section 9 - CC-10

Applicable Controllers and Active Gauges CC-10

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-5	6.0E-6	1.6E-5
1.0E+0	8.5E-1	1.2E+0
7.6E+2	7.2E+2	8.0E+2

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-6	6.3E-7	1.6E-6
5.0E-6	3.2E-6	8.0E-6
1.0E-5	6.3E-6	1.6E-5
5.0E-5	3.2E-5	8.0E-5
1.0E-4	6.3E-5	1.6E-4
1.0E-3	6.3E-4	1.6E-3
1.0E-2	6.3E-3	1.6E-2
1.0E-1	8.5E-2	1.2E-1
1.0E+0	8.5E-1	1.2E+0
1.0E+1	8.5E+0	1.2E+1
1.0E+2	8.5E+1	1.2E+2
7.6E+2	7.2E+2	8.0E+2

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E-6	6.3E-7	1.6E-6
5.0E-6	3.2E-6	8.0E-6
1.0E-5	6.3E-6	1.6E-5
5.0E-5	3.2E-5	8.0E-5
1.0E-4	6.3E-5	1.6E-4
1.0E-3	6.3E-4	1.6E-3
1.0E-2	6.3E-3	1.6E-2
1.0E-1	8.5E-2	1.2E-1
1.0E+0	8.5E-1	1.2E+0
1.0E+1	8.5E+0	1.2E+1
1.0E+2	8.5E+1	1.2E+2
7.6E+2	7.2E+2	8.0E+2

10.Section 10 - 1E

Applicable Controllers and Active Gauges

MX200, MM200

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
5.0E+0	4.0E+0	6.0E+0
1.0E+2	9.0E+1	1.1E+2
7.6E+2	7.2E+2	8.0E+2

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
5.0E+0	4.5E+0	5.5E+0
1.0E+2	9.0E+1	1.1E+2
4.0E+2	3.8E+2	4.2E+2
7.6E+2	7.2E+2	8.0E+2

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E+0	0.0E+0	2.0E+0
1.0E+1	9.0E+0	1.1E+1
1.0E+2	9.0E+1	1.1E+2
4.0E+2	3.8E+2	4.2E+2
7.6E+2	7.2E+2	8.0E+2

11.Section 11 - 1F

Applicable Controllers and Active Gauges

MX200, MM200

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E+1	0.0E+0	2.0E+1
1.0E+2	9.0E+1	1.1E+2
7.6E+2	7.2E+2	8.0E+2

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
1.0E+1	0.0E+0	2.0E+1
1.0E+2	9.0E+1	1.1E+2
4.0E+2	3.6E+2	4.4E+2
7.6E+2	6.8E+2	8.4E+2

12.Section 12 - CDG (Capacitance Diaphragm Gauge, Capacitance Manometer)

Applicable Controllers and Active Gauges

MX200, MM200

Notes

FS indicates the full-scale range of the CDG (typically 0.1, 1, 10, 100, or 1000 Torr).

Factory Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.1*FS	(0.1*FS) - 2%	(0.1*FS) + 2%
0.5*FS	(0.5*FS) - 2%	(0.5*FS) + 2%
FS	FS - 2%	FS + 2%

NIST Traceable Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.01*FS	0.01*FS - 0.001*FS	0.01*FS + 0.001*FS
0.1*FS	(0.1*FS) - 2%	(0.1*FS) + 2%
0.2*FS	(0.2*FS) - 2%	(0.2*FS) + 2%
0.3*FS	(0.3*FS) - 2%	(0.3*FS) + 2%
0.4*FS	(0.4*FS) - 2%	(0.4*FS) + 2%
0.5*FS	(0.5*FS) - 2%	(0.5*FS) + 2%
0.6*FS	(0.6*FS) - 2%	(0.6*FS) + 2%
0.7*FS	(0.7*FS) - 2%	(0.7*FS) + 2%
0.8*FS	(0.8*FS) - 2%	(0.8*FS) + 2%
0.9*FS	(0.9*FS) - 2%	(0.9*FS) + 2%
FS	FS - 2%	FS + 2%

ISO 17025 Accredited Calibration

Test Point	Lower Tolerance	Upper Tolerance
0.01*FS	0.01*FS - 0.001*FS	0.01*FS + 0.001*FS
0.1*FS	(0.1*FS) - 2%	(0.1*FS) + 2%
0.2*FS	(0.2*FS) - 2%	(0.2*FS) + 2%
0.3*FS	(0.3*FS) - 2%	(0.3*FS) + 2%
0.4*FS	(0.4*FS) - 2%	(0.4*FS) + 2%
0.5*FS	(0.5*FS) - 2%	(0.5*FS) + 2%
0.6*FS	(0.6*FS) - 2%	(0.6*FS) + 2%
0.7*FS	(0.7*FS) - 2%	(0.7*FS) + 2%
0.8*FS	(0.8*FS) - 2%	(0.8*FS) + 2%
0.9*FS	(0.9*FS) - 2%	(0.9*FS) + 2%
FS	FS - 2%	FS + 2%

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