

MBA 30-30SB COMBINATION UNIT

SAE PERFORMANCE TEST RESULTS

ISSUED: DEC-2-2005

TESTED: MAY-20-2005~DEC-2-2005

PER SAE J1469-AUG 95 RECOMMENDED PRACTICES
EVALUATION CRITERIA PER SAE J2318-JUNE 2001



SAE AIR BRAKE ACTUATOR TEST INDEX

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EXECUTIVE SUMMARY

Purpose

The purpose of this report is to document the performance, durability, and function of our spring brake actuators when tested under the guidelines of SAE J1469. This is the recognized industry standard of “uniform procedures and methods for laboratory testing of brake actuators used in air brake systems”.

Conclusions

The test observations and results provided in this report conclude that our Spring Brake Type 3030 Tandem successfully satisfies all tests required by SAE J1469. The test results show that the brakes tested meet or exceed the standard set forth by SAE J2318.

Some of the tests contained within this report may have been conducted by an independent laboratory certified to meet the standards established by the National Institute of Standards and Technology-for example :CHINA CHONGQING AUTOMOBILE RESEARCH INSTITUTE.



AIR BRAKE ACTUATOR TEST - SAE J1469 AUG. 95

PROCEDURE TRUCK-TRACTOR, BUS AND TRAILERS

At MBA. Our brakes are constantly being tested to ensure the highest possible quality and safety. The following Society of Automotive Engineers (SAE) test results demonstrate our brakes comply with all industry standards applicable to Spring Brake Actuators.

All tests were performed in accordance with the recommended SAE test procedure. The SAE recommended practices provide uniform procedures and methods for laboratory testing of brake actuators with respect to durability, function, and environmental performance. A minimum of five test units designated A,B,C,D and E are used to perform the following tests.

SAE ENGINEERING SPECIFICATIONS AIR BRAKE ACTUATOR TEST		TEST PROCEDURE SECTION NO.	TEST FOR SERVICE CHAMBER ONLY TEST UNIT DESIGNATION					TEST FOR PARK CHAMBER ONLY TEST UNIT DESIGNATION					TEST FOR COMBINATION TEST UNIT DESIGNATION					
			A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	
	DATE																	
LEAKAGE RATE		4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CHAMBER VOLUME		5	X											X				
MAX. RELEASE AND HOLD OFF		6						X						X				
FORCE OUTPUT AND STROKE: PARK		7						X	X	X	X	X	X	X	X	X	X	X
FORCE OUTPUT AND STROKE: SERVICE		8	X	X	X	X	X							X	X	X	X	X
LOW TEMP. LEAKAGE		9	X					X						X				
LOW TEMP. MAX. RELEASE AND HOLD OFF		10						X						X				
LOW TEMP. FORCE OUTPUT		11						X						X				
LOW TEMP. OPERATIONAL		12	X											X				
CORROSION		13		X					X						X			
MECH. BACK-OFF RELEASE		14						X	X					X	X			
PROOF PRESSURE		15	X					X						X				
CYCLE TEST: PARK		16							X	X					X	X		X
CYCLE TEST: SERVICE		17		X	X		X								X	X		X
ELEVATED TEMP CYCLE TEST		18				X					X						X	
VIBRATION		19				X											X	



APPARATUS AND SUPPLIES:

The following equipment was used to perform testing in accordance with SAE J1469 recommended practices.

Air tank	For supply air
Leakage test platform	For test chamber leakage
Chamber volume equipment	requirements and procedures specified in section 5.0
Spring force test machine	For test the service and parking chamber force output
Salty spray test container	For salt test per ASTM B117
Hydraulic pressure equipment	For test the unit proof pressure.
Cycling test equipment	For cycle test in section 16.0
Vibrating equipment	For vibration test in section 19.0
Temperature control test equipment	For low-high temperature cycle test
Torque spanner	For test the torque of the parking chamber mechanical back-off mechanism



PRESSURE DECAY LEAK TEST - SECTION 4.0

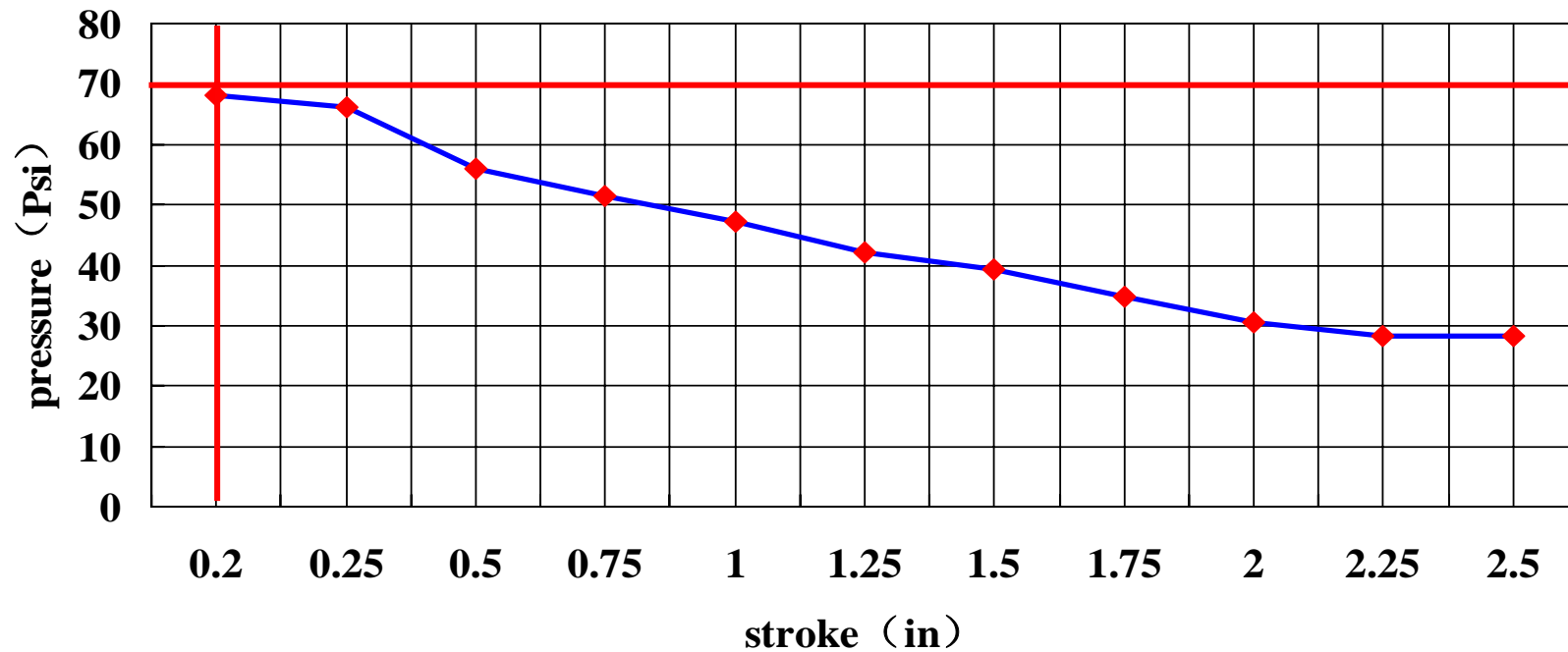
	LEAKAGE RATE
SAMPLE A: PARK CHAMBER:	1kpa/10min
SERVICE CHAMBER:	2kpa/10min
SAMPLE B: PARK CHAMBER:	2kpa/10min
SERVICE CHAMBER:	2kpa/10min
SAMPLE C: PARK CHAMBER:	1kpa/10min
SERVICE CHAMBER:	1kpa/10min
SAMPLE D: PARK CHAMBER:	3kpa/10min
SERVICE CHAMBER:	2kpa/10min
SAMPLE E: PARK CHAMBER:	3kpa/10min
SERVICE CHAMBER:	1kpa/10min
MAXIMUM ACCEPTABLE LEAK RATE:	10.34kpa/10min

CHAMBER VOLUME (TYPE 30) - SECTION 5.0

	VOLUME
SAMPLE A: : SERVICE CHAMBER:	1410 ml



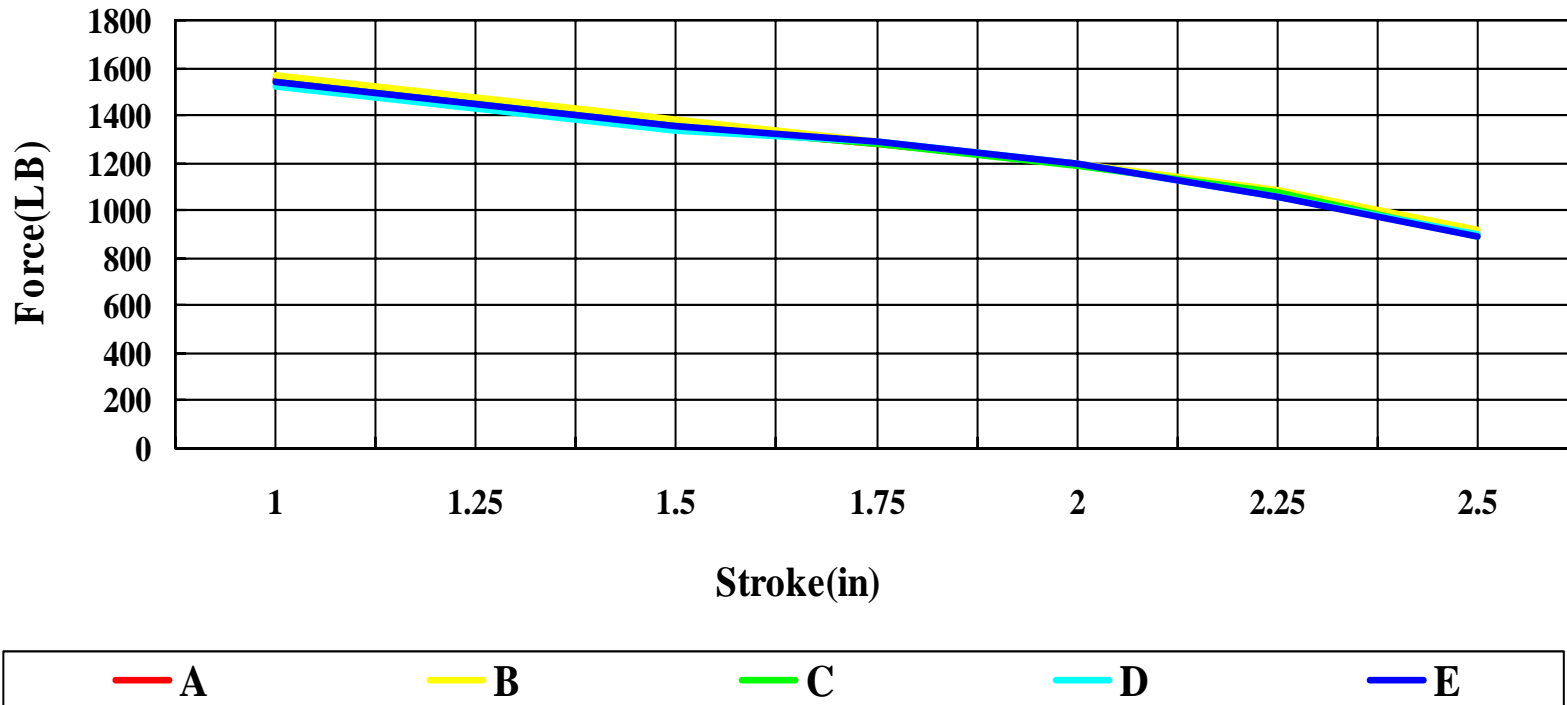
MAXIMUM HOLD-OFF AND RELEASE (TYPE 30) - SECTION 6.0



stroke (in)	0	0.2	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5
pressure(Psi)	92.88	68.21	66.03	55.88	51.52	47.17	44.99	42.09	39.18	34.83	30.48	28.30



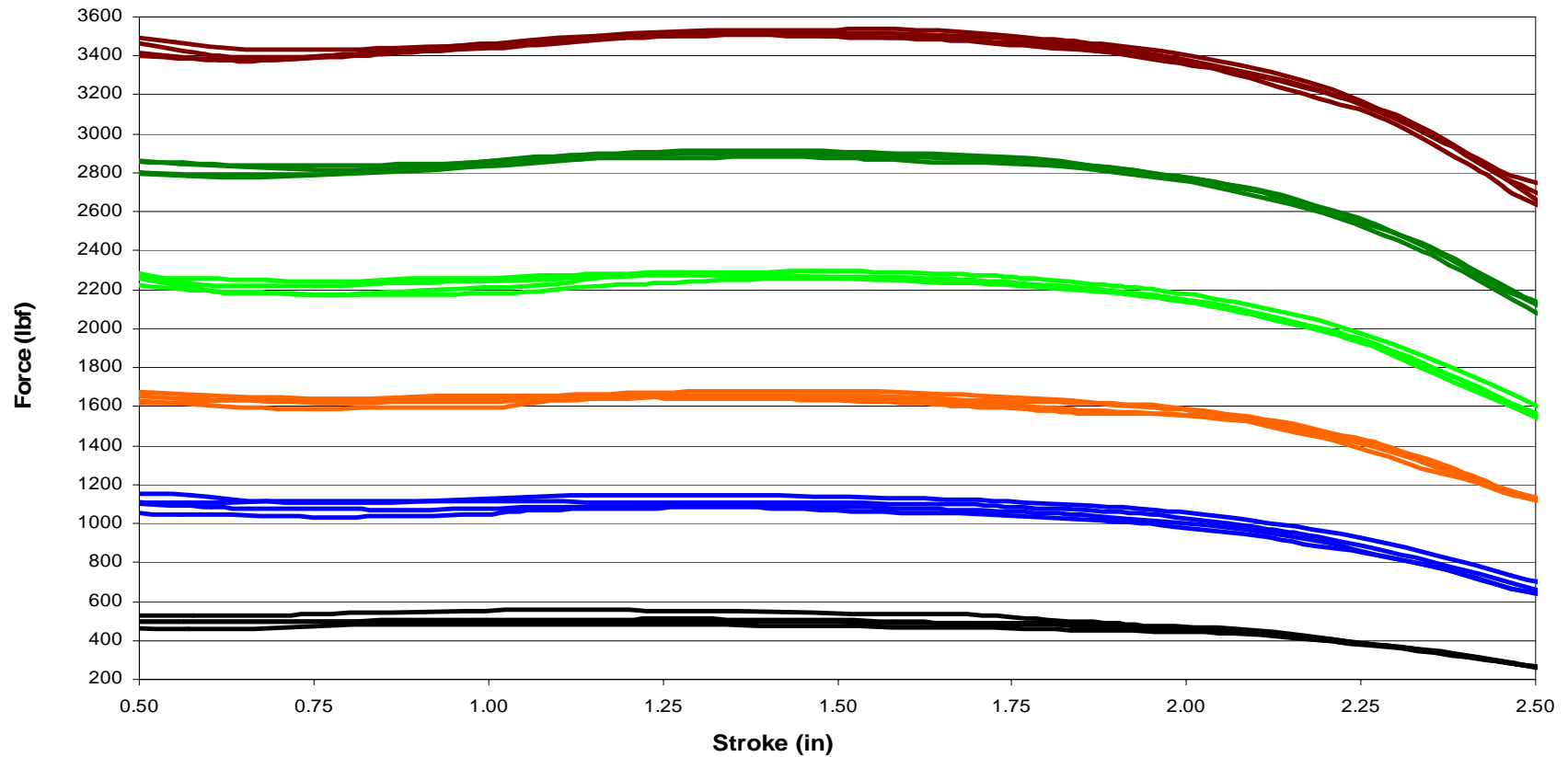
FORCE OUTPUT VERSUS STROKE (PARK CHAMBER) TYPE 30 - SECTION 7.0



Required parking force outputs are dependent on the requirements of the individual manufacturer. It is the duty of the manufacturer to test the vehicle in accordance with FMVSS121. The force values shown are after 24 hours set. Force output tolerances are +/-10%.



FORCE OUTPUT AND STROKE – TYPE 30 SERVICE CHAMBER - SECTION 8.0



Please refer to the following slide for this data shown in exact test values.



FORCE OUTPUT AND STROKE – TYPE 30 SERVICE CHAMBER - SECTION 8.0

Sample A

in\psi	20	40	60	80	100
1.00	494	1092	1695	2295	2824
1.25	506	1117	1709	2318	2846
1.50	502	1107	1690	2266	2816
1.75	483	1070	1648	2269	2836
2.00	461	992	1548	2145	2682
2.25	402	870	1382	1908	2454
2.50	258	642	1085	1558	1999

Sample B

in\psi	20	40	60	80	100
1.00	505	1104	1707	2309	2835
1.25	518	1122	1711	2329	2860
1.50	514	1118	1701	2277	2827
1.75	494	1081	1659	2280	2847
2.00	473	1004	1514	2157	2692
2.25	413	879	1386	1913	2465
2.50	270	653	1091	1569	2010

FORCE GIVEN IN POUNDS

Sample C

in\psi	20	40	60	80	100
1.00	516	1115	1713	2321	2845
1.25	529	1126	1727	2332	2861
1.50	519	1116	1712	2311	2837
1.75	506	1091	1671	2291	2859
2.00	484	1016	1571	2167	2703
2.25	424	892	1397	1924	2476
2.50	282	664	1103	1581	2022

Sample D

in\psi	20	40	60	80	100
1.00	507	1104	1709	2309	2838
1.25	520	1117	1720	2330	2861
1.50	515	1106	1703	2279	2829
1.75	496	1081	1662	2283	2850
2.00	475	1006	1562	2159	2692
2.25	415	870	1388	1915	2467
2.50	272	654	1096	1572	2013

Sample E

in\psi	20	40	60	80	100
1.00	510	1106	1710	2310	2842
1.25	522	1119	1724	2331	2863
1.50	514	1107	1709	2282	2829
1.75	498	1083	1685	2285	2852
2.00	477	1008	1563	2161	2694
2.25	416	872	1391	1917	2471
2.50	276	656	1098	1571	2015

SUGGESTED MIN. AND MAX.

C	20	40	60	80	100					
1.00	490	539	1025	1128	1560	1716	2120	2332	2650	2915
1.25	490	539	1025	1128	1580	1738	2125	2338	2680	2948
1.50	490	539	1030	1133	1590	1749	2140	2354	2710	2981
1.75	480	528	1025	1128	1580	1738	2120	2332	2700	2970
2.00	460	506	990	1089	1500	1650	2050	2255	2605	2866
2.25	395	435	865	952	1375	1513	1900	2090	2445	2690
2.50	255	281	640	704	1080	1188	1555	1711	1995	2195



LOW TEMPERATURE LEAKAGE RATE - SECTION 9.0

TEST TEMPERATURE

-42 F

SOAK TIME

18 HRS

SAMPLE A:

PARK CHAMBER:

SERVICE CHAMBER:

LEAKAGE RATE

5kpa/10min

8kpa/10min

MAXIMUM ACCEPTABLE LEAK RATE:

13.79kpa/10/min

LOW TEMPERATURE OPERATIONAL - SECTION 12.0

TEST TEMPERATURE

-42 F

SOAK TIME

24 HRS

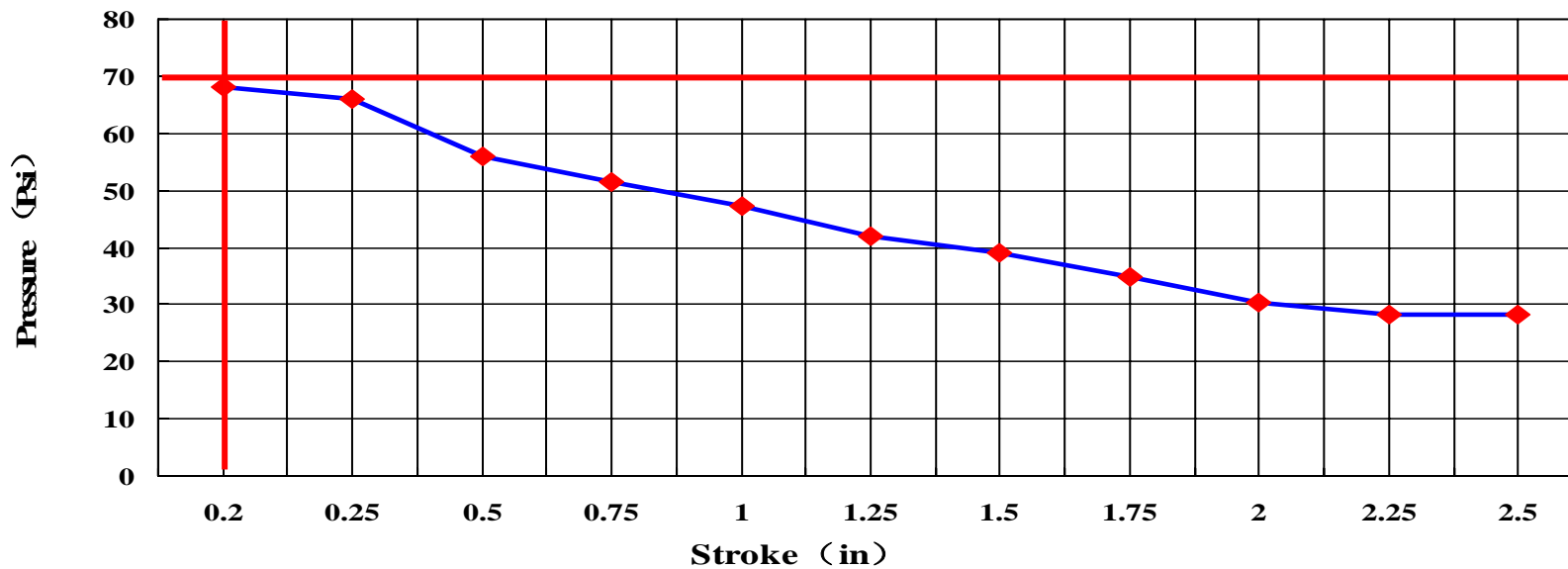
TIME REQUIRED TO RETRACT WITHIN .25 INCH OF ORIGINAL POSITION: 2 SECONDS



LOW TEMPERATURE MAXIMUM HOLD-OFF AND RELEASE PRESSURE (TYPE 30) - SECTION 10.0

TEST TEMPERATURE: -42 F

SOAK TIME: 19 HRS



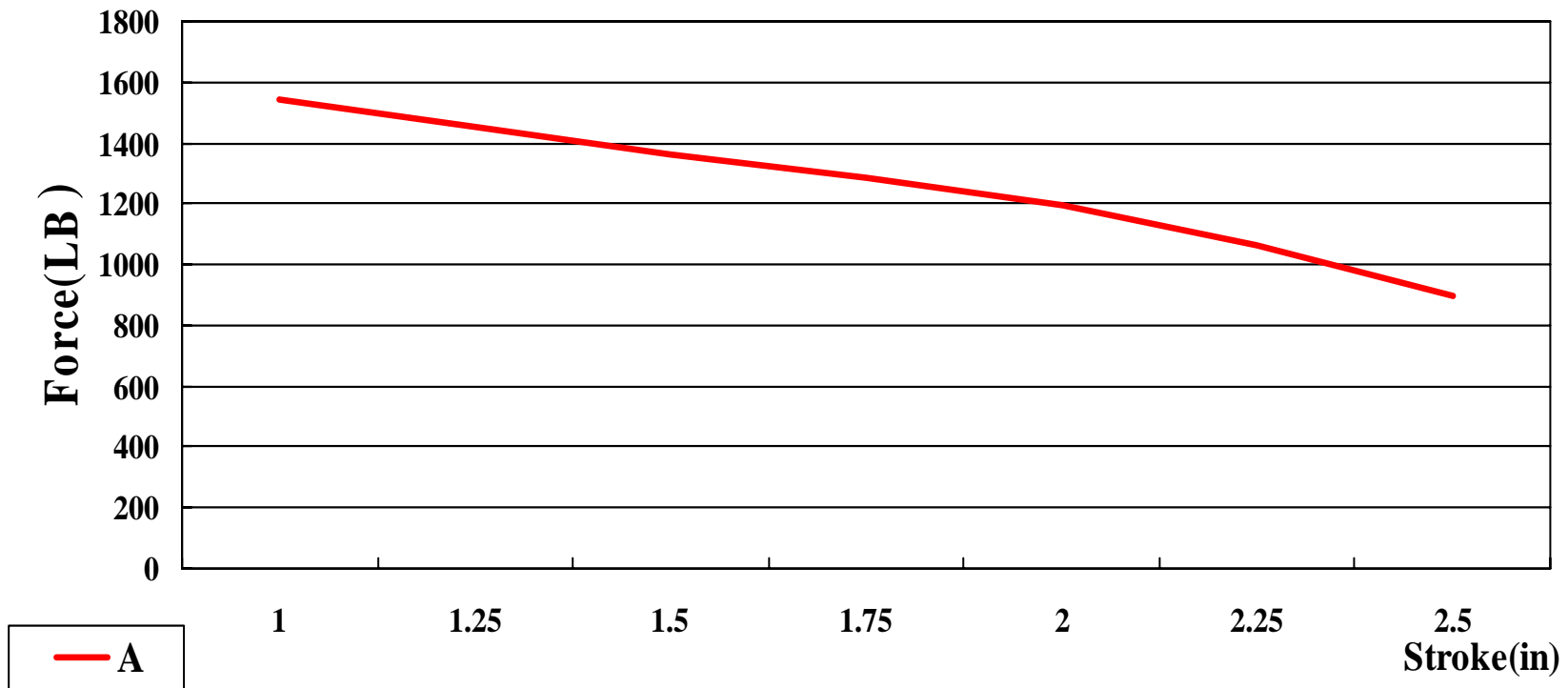
Stroke (in)	0	0.2	0.25	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5
Pressure(Psi)	92.88	68.21	65.31	57.32	52.97	47.89	46.44	43.54	40.64	36.28	30.49	29.02



LOW TEMPERATURE FORCE OUTPUT VERSUS STROKE (TYPE 30) - PARK CHAMBER SECTION 11.0

TEST TEMPERATURE: -43°F

SOAK TIME: 24 Hours



Required parking force outputs are dependent on the requirements of the individual manufacturer. It is the duty of the manufacturer to test the vehicle in accordance with FMVSS121. Force output tolerances are +/-10%.



CORROSION RESISTANCE - SECTION 13.0

LEAKAGE TEST - SECTION 13.1.a

SAMPLE A:

PARK CHAMBER:

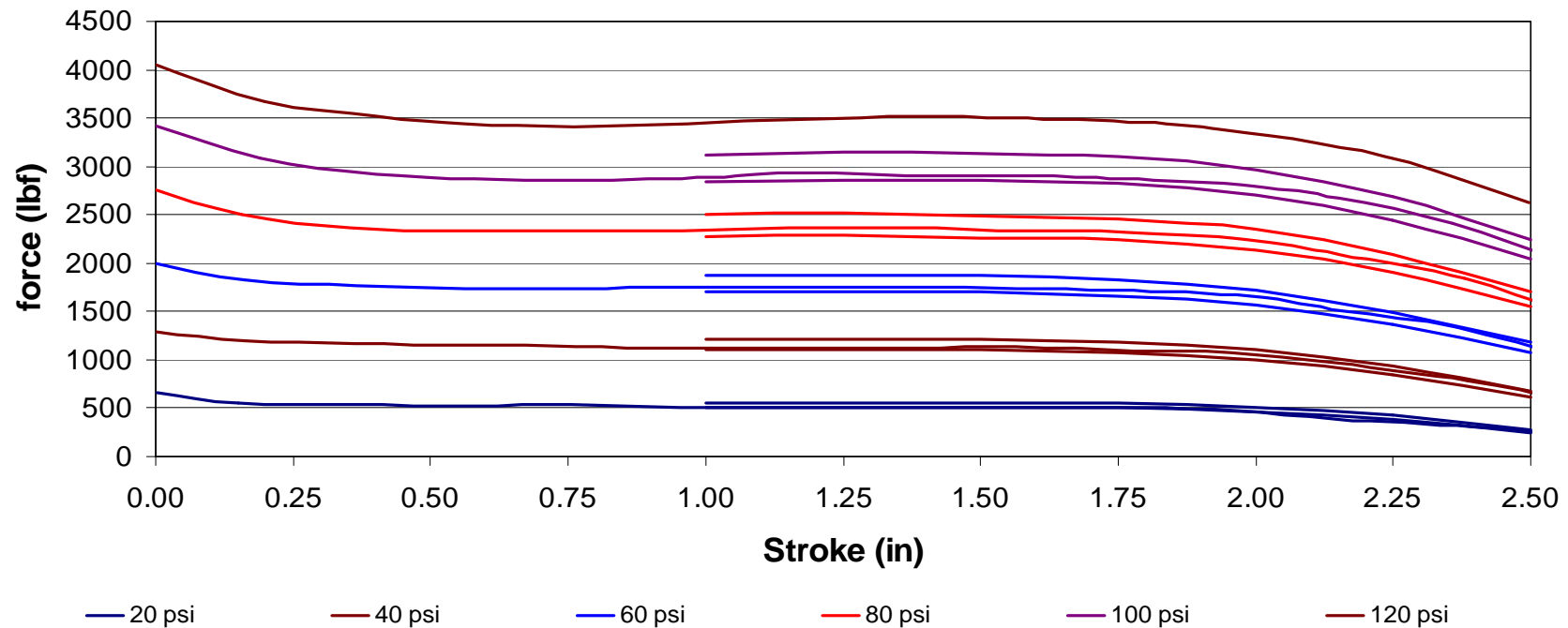
SERVICE CHAMBER:

LEAKAGE RATE

2kpa/10min

3kpa/10min

FORCE OUTPUT AND STROKE - SERVICE CHAMBER - SECTION 13.1.b

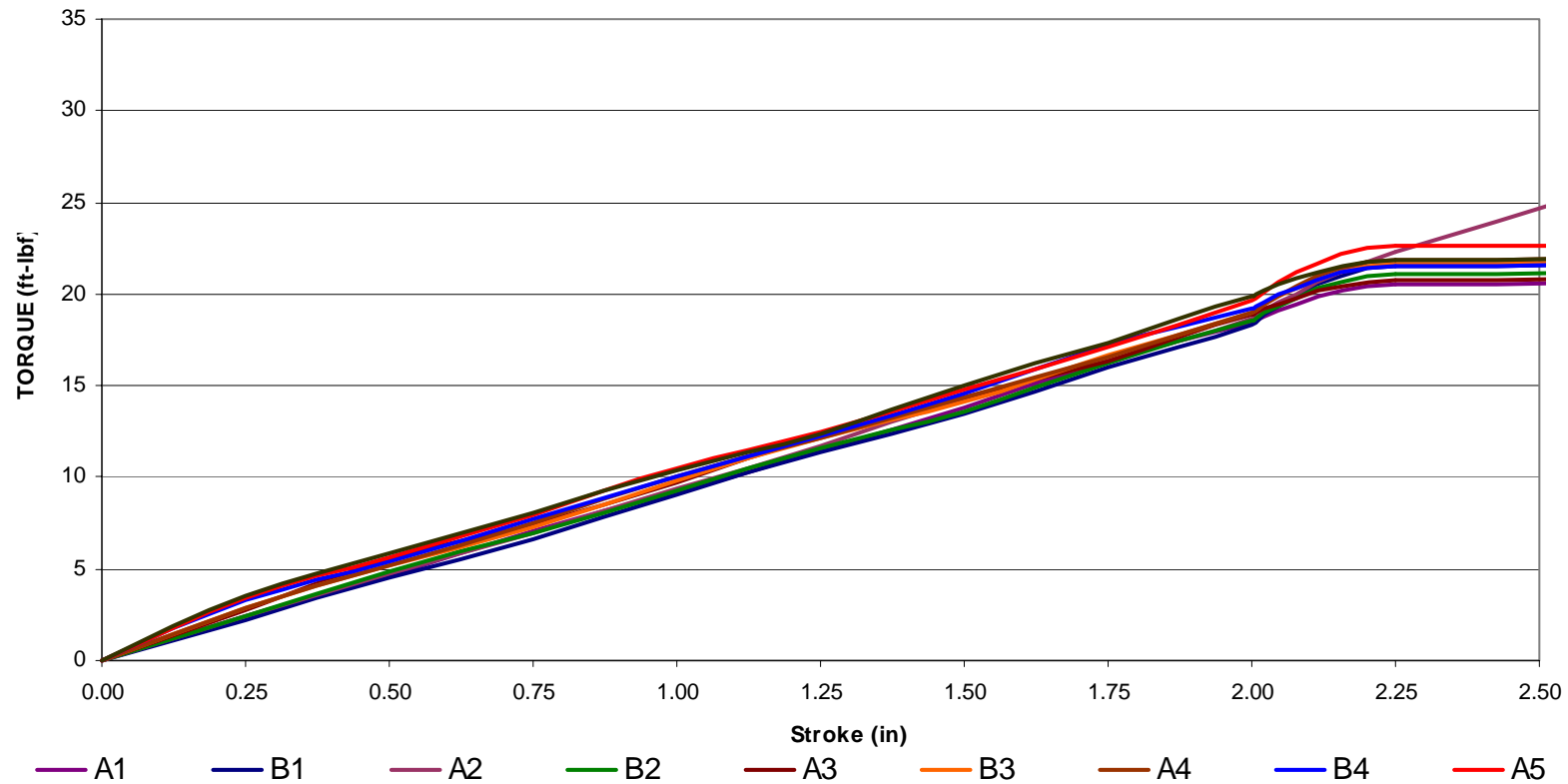


CORROSION RESISTANCE - SECTION
13.1.c VISUAL INSPECTION





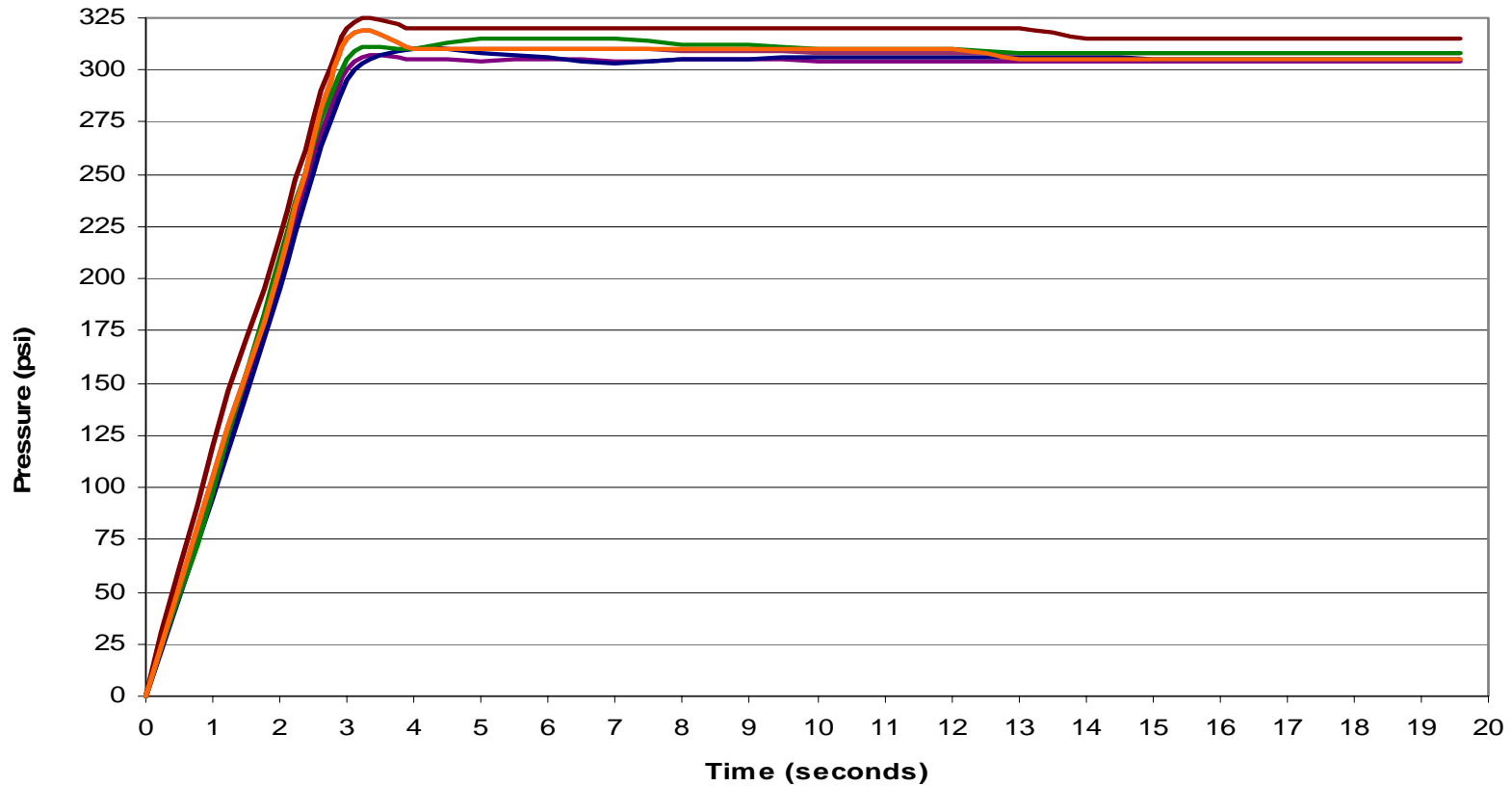
MECHANICAL BACK-OFF AND RELEASE (TYPE 30) - SECTION 14.0



Torque required for mechanical back-off to release power spring to zero stroke is less than 25 ft-lbs.



PROOF PRESSURE - SECTION 15.0



Units held above 300 PSI for 15 seconds and exhibited pressure loss during decay leak. Components display no structural damage.



DURABILITY CYCLE TEST - SECTION 16.0

Parking Chamber

<u>Unit Designation</u>	<u>Result</u>	<u>Required Cycles</u>	<u>Actual Cycles</u>
B	Pass	200,000	225,000
C	Pass	200,000	252,000
E	Pass	200,000	205,500

Post cycle examination of components revealed no fatigue failures or unusual wear patterns stemming from durability cycle test.

DURABILITY CYCLE TEST - SECTION 17.0

Service Chamber

<u>Unit Designation</u>	<u>Result</u>	<u>Required Cycles</u>	<u>Actual Cycles</u>
B	Pass	1,000,000	1,110,000
C	Pass	1,000,000	1,020,000
E	Pass	1,000,000	1,207,500

Post cycle examination of components revealed no fatigue failures or unusual wear patterns stemming from durability cycle test.



ELEVATED TEMPERATURE CYCLE TEST - SECTION 18.0 (TEMPERATURE:158°F)

Parking Chamber - Section 18.1

<u>Unit Designation</u>	<u>Result</u>	<u>Required Cycles</u>	<u>Actual Cycles</u>
D	Pass	30,000	31,680

After cycling, leakage test the parking chamber: leakage rate is 6kpa/10min,(Max. acceptable leak tate:13.79kpa/10min)

Throughout and upon completion of testing, the test unit operated properly and showed no visible signs of deterioration or damage.

Service Chamber - Section 18.2

<u>Unit Designation</u>	<u>Result</u>	<u>Required Cycles</u>	<u>Actual Cycles</u>
D	Pass	30,000	31,050

After cycling, leakage test the service chamber: leakage rate is 8kpa/10min,(Max. acceptable leak tate:13.79kpa/10min)

Throughout and upon completion of testing, the test unit operated properly and showed no visible signs of deterioration or damage.



SINUSOIDAL VIBRATION TEST - SECTION 19.0

Resonance Frequency scan:

Amplitude 8.5 g peak input acceleration

Sweep Rate 20 - 150 Hz in 12.5 minutes

Result; 138Hz

Frequency; 33.3Hz

Duration One resonance search was performed in the vertical axis followed by an 8.5-g dwell at the fundamental resonance for 10,000,000 cycles.

Result During and upon completion of the test the unit remained intact, functional, and incurred no apparent damage or degradation as a result of the test. The test unit remained pressured throughout the duration of the vibration test.