

MBA 24-24SB COMBINATION UNIT

SAE PERFORMANCE TEST RESULTS

ISSUED: MAY-15-2005

TESTED: MAY-03-2004~MAY-15-2005

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

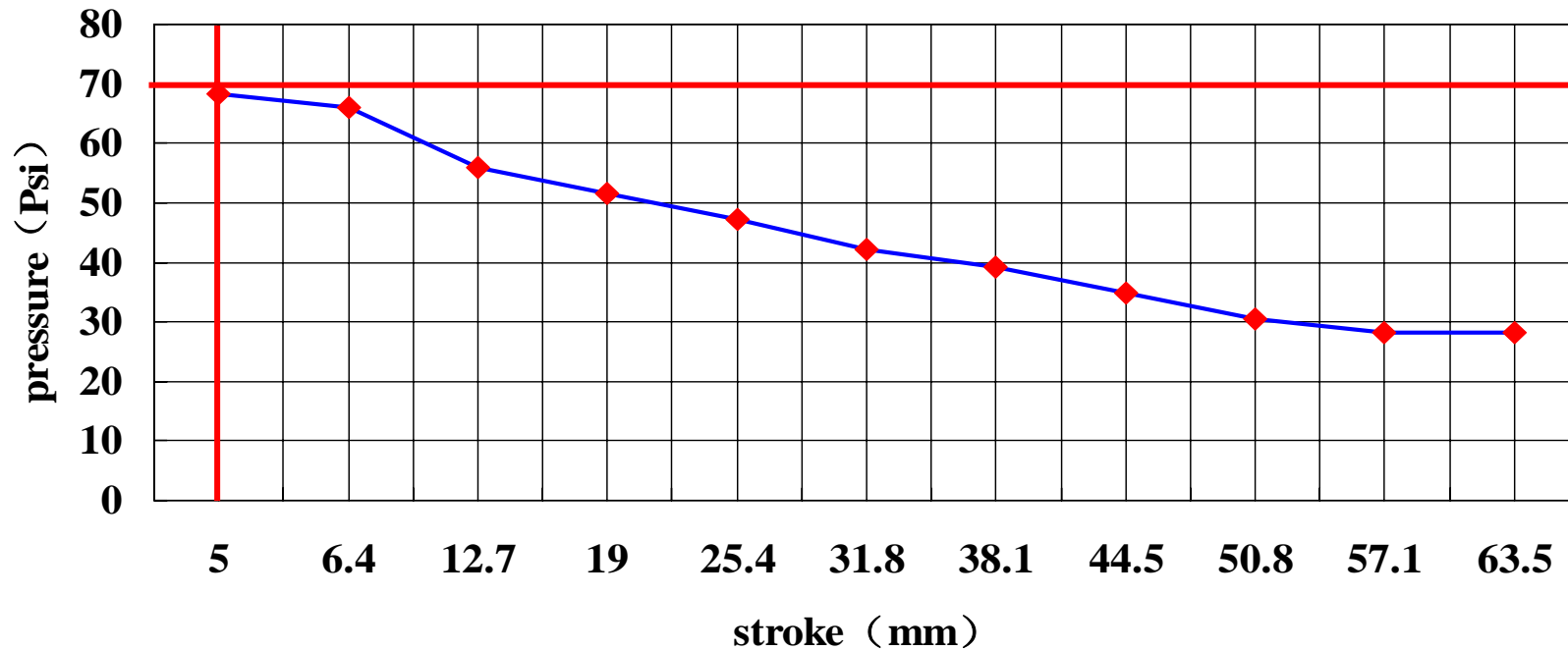
	LEAKAGE RATE
SAMPLE A: PARK CHAMBER:	0.9 cc/min
SERVICE CHAMBER:	0.8 cc/min
SAMPLE B: PARK CHAMBER:	0.8 cc/min
SERVICE CHAMBER:	0.7 cc/min
SAMPLE C: PARK CHAMBER:	0.7cc/min
SERVICE CHAMBER:	0.8 cc/min
SAMPLE D: PARK CHAMBER:	0.9 cc/min
SERVICE CHAMBER:	0.9 cc/min
SAMPLE E: PARK CHAMBER:	0.9 cc/min
SERVICE CHAMBER:	0.9cc/min
MAXIMUM ACCEPTABLE LEAK RATE:	23 cc/min

CHAMBER VOLUME (TYPE 24) - SECTION 5.0

	VOLUME
SAMPLE A: : SERVICE CHAMBER:	1089 ml



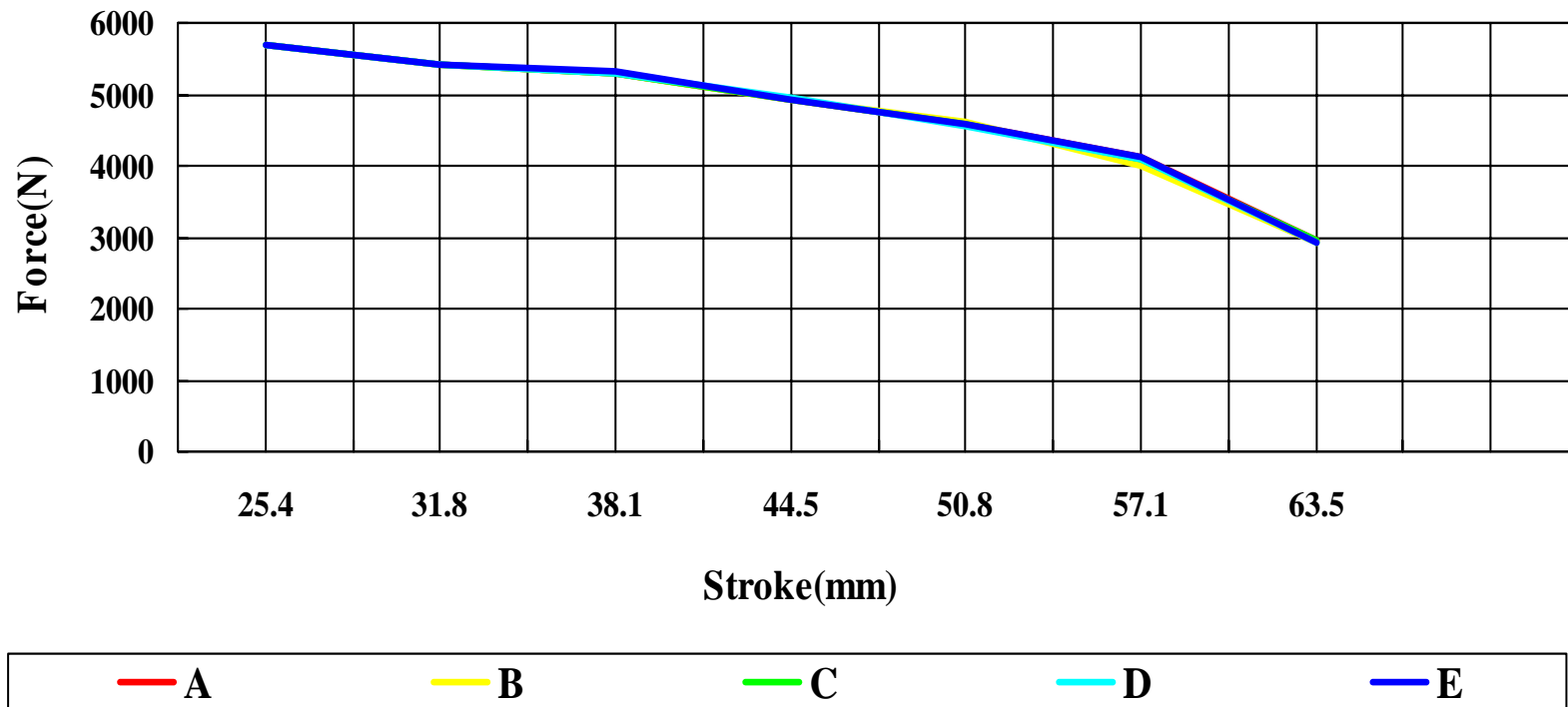
MAXIMUM HOLD-OFF AND RELEASE (TYPE 24) - SECTION 6.0



stroke (mm)	0	5	6.4	12.7	19	25.4	31.8	38.1	44.5	50.8	57.1	63.5
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



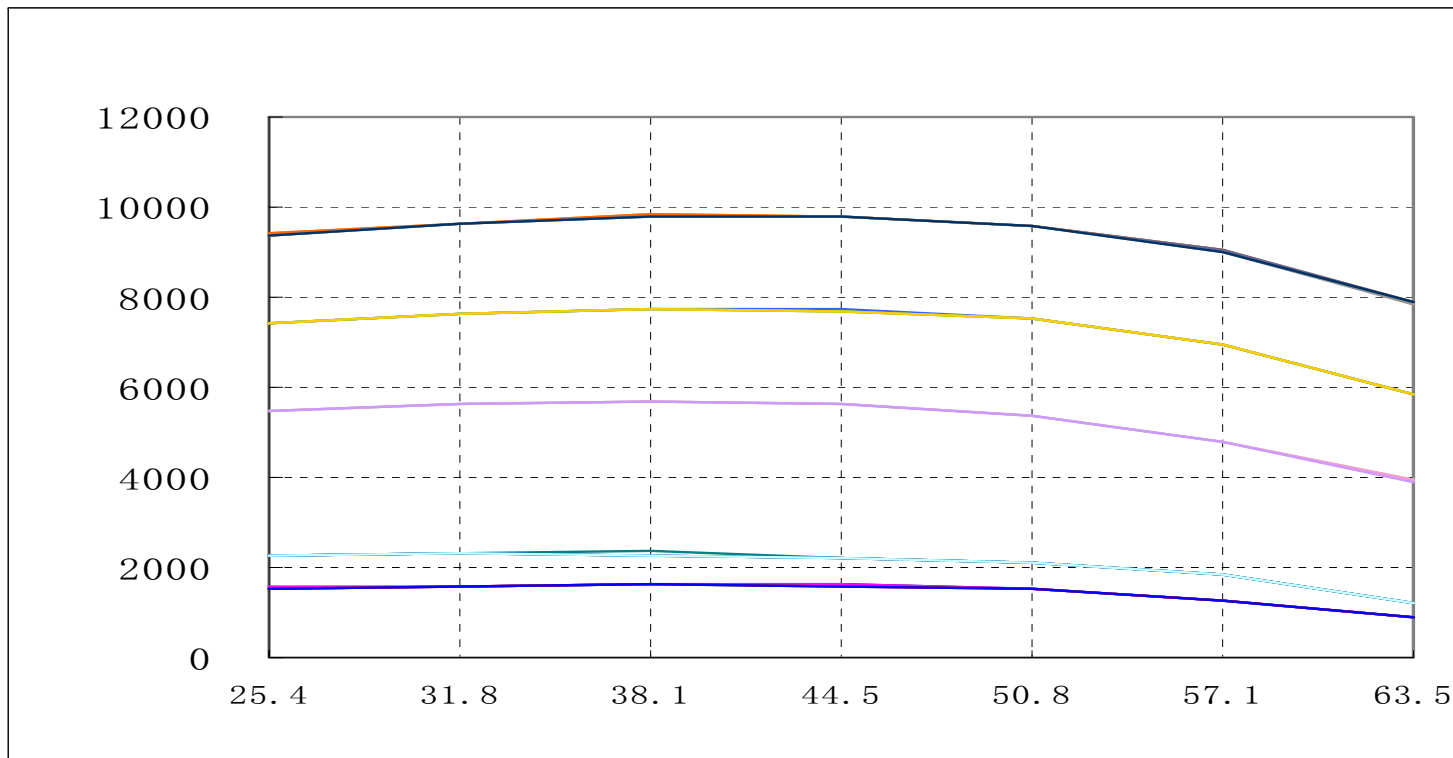
FORCE OUTPUT VERSUS STROKE (PARK CHAMBER) TYPE 24 - SECTION 7.0



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 24 SERVICE CHAMBER - SECTION 8.0



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



FORCE OUTPUT AND STROKE – TYPE 24 SERVICE CHAMBER - SECTION 8.0

Sample A

mm\psi	20	40	60	80	100
25.40	1550	2262	5466	7418	9395
31.80	1585	2310	5615	7623	9641
38.10	1650	2281	5699	7749	9817
44.50	1610	2214	5630	7709	9797
50.80	1529	2118	5359	7543	9591
57.10	1263	1847	4772	6936	9034
63.50	897	1221	3924	5836	7889

Sample B

mm\psi	20	40	60	80	100
25.40	1556	2269	5452	7421	9399
31.80	1594	2323	5619	7625	9647
38.10	1652	2386	5710	7753	9821
44.50	1617	2217	5634	7714	9800
50.80	1531	2121	5364	7548	9597
57.10	1265	1856	4779	6939	9048
63.50	901	1227	3926	5837	7867

FORCE GIVEN IN N

Sample C

mm\psi	20	40	60	80	100
25.40	1544	2265	5480	7419	9390
31.80	1581	2320	5621	7622	9635
38.10	1641	2285	5699	7743	9812
44.50	1601	2215	5642	7702	9791
50.80	1528	2120	5365	7536	9587
57.10	1261	1850	4781	6931	9031
63.50	894	1225	3926	5831	7881

Sample D

mm\psi	20	40	60	80	100
25.40	1548	2264	5460	7411	9387
31.80	1583	2321	5610	7610	9611
38.10	1630	2283	5689	7732	9801
44.50	1600	2213	5631	7701	9785
50.80	1527	2121	5369	7537	9583
57.10	1261	1851	4780	6928	9024
63.50	896	1224	3925	5826	7864

Sample E

mm\psi	20	40	60	80	100
25.40	1546	2268	5456	7414	9388
31.80	1580	2325	5614	7612	9625
38.10	1630	2289	5701	7736	9801
44.50	1601	2219	5631	7700	9776
50.80	1524	2125	5362	7532	9575
57.10	1259	1859	4781	6932	9014
63.50	899	1227	3921	5824	7876

SUGGESTED MIN. AND MAX.

mm\psi	20		40		60		80		100	
25.40	1501	1835	3303	4037	5101	6233	6860	8382	8587	10495
31.80	1501	1835	3303	4037	5145	6287	6906	8440	8708	10642
38.10	1501	1835	3303	4037	5145	6287	6966	8514	8772	10720
44.50	1458	1781	3163	3865	5104	6238	6786	8294	8548	10446
50.80	1261	1541	2803	3425	4905	5993	6366	7780	8051	9839
57.10	901	1101	2203	2691	3624	4428	5000	6605	7207	8807
63.50	401	490	1241	1517	2723	3328	4003	4893	5365	6557



LOW TEMPERATURE LEAKAGE RATE - SECTION 9.0

TEST TEMPERATURE

-42 F

SOAK TIME

23HRS

SAMPLE A:

PARK CHAMBER:

SERVICE CHAMBER:

LEAKAGE RATE

1.2 cc/min

1.1 cc/min

MAXIMUM ACCEPTABLE LEAK RATE:

23 cc/min

LOW TEMPERATURE OPERATIONAL - SECTION 12.0

TEST TEMPERATURE

-42 F

SOAK TIME

24 HRS

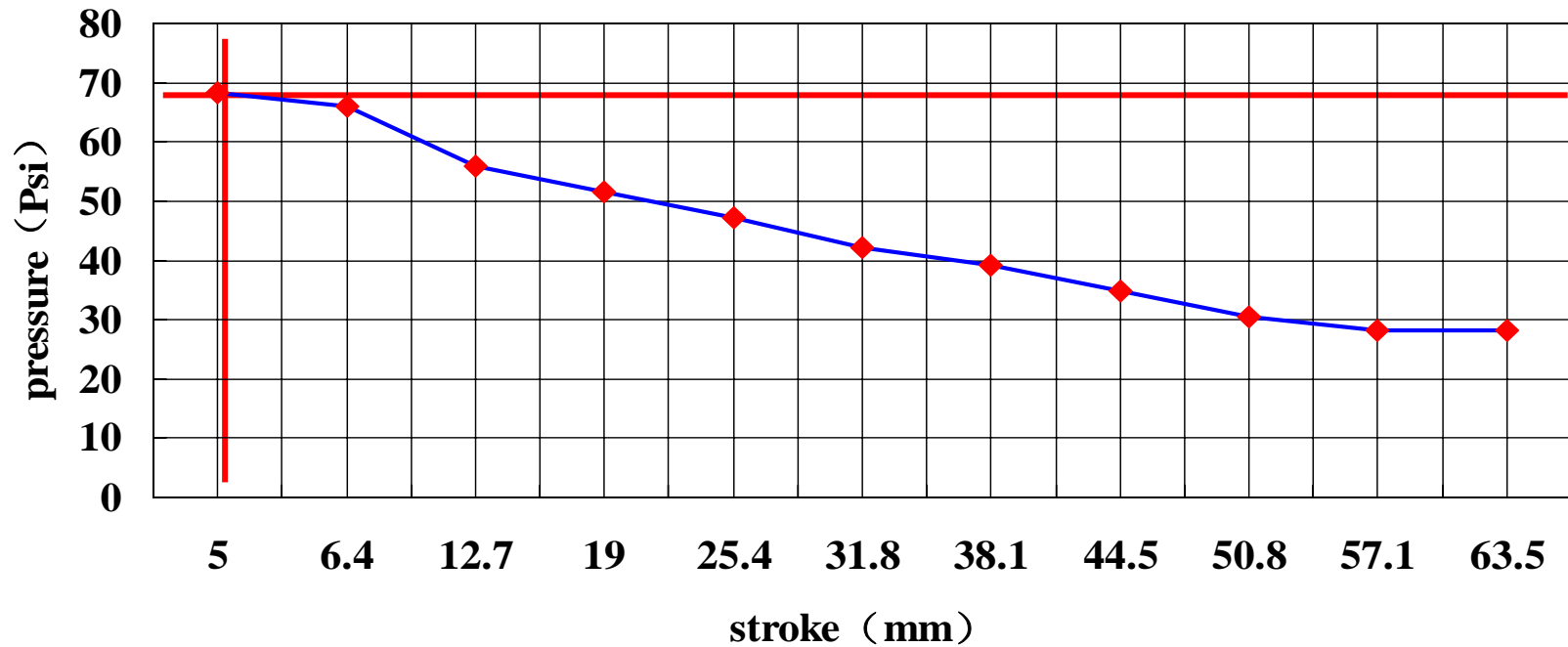
TIME REQUIRED TO RETRACT WITHIN 5mm OF ORIGINAL POSITION: 2 SECONDS



LOW TEMPERATURE MAXIMUM HOLD-OFF AND RELEASE PRESSURE (TYPE 24) - SECTION 10.0

TEST TEMPERATURE: -42 F

SOAK TIME: 19 HRS



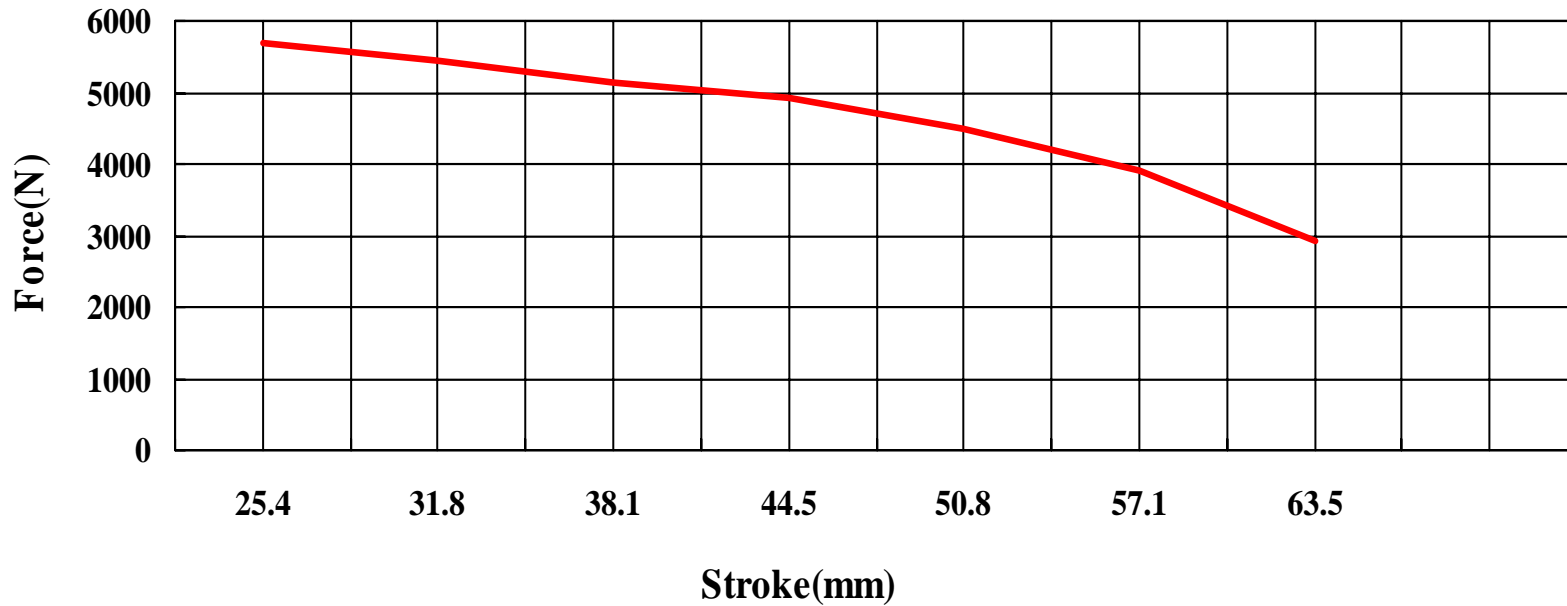
stroke (mm)	0	5	6.4	12.7	19	25.4	31.8	38.1	44.5	50.8	57.1	63.5
pressure(Psi)	92.88	68.21	66.03	55.88	51.52	47.17	44.99	42.09	39.18	34.83	30.48	28.30



LOW TEMPERATURE FORCE OUTPUT VERSUS STROKE (TYPE 24) - 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%.

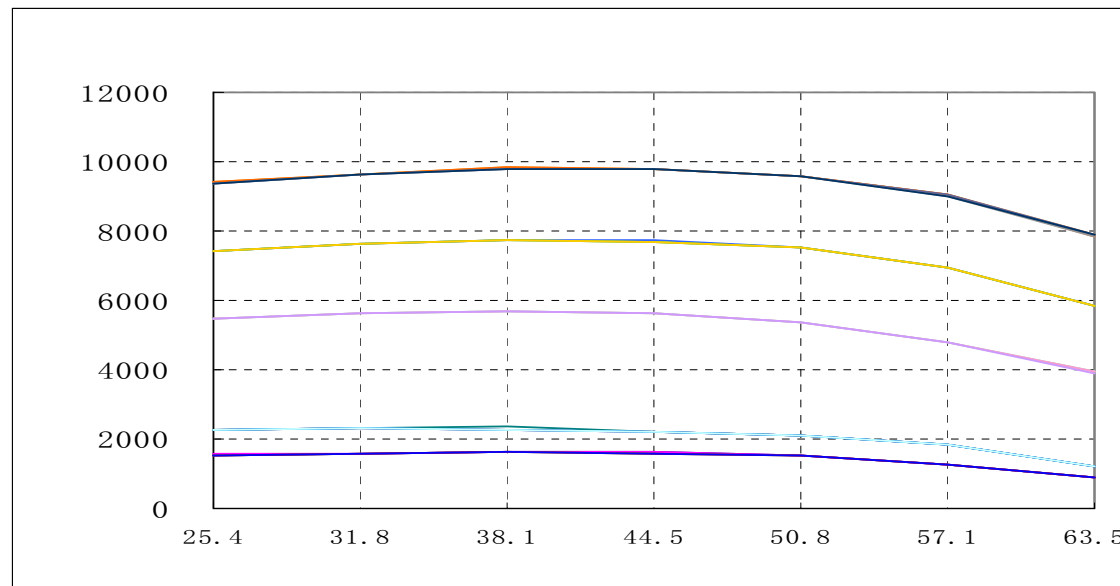


CORROSION RESISTANCE - SECTION 13.0

LEAKAGE TEST - SECTION 13.1.a

SAMPLE A:	LEAKAGE RATE
PARK CHAMBER:	1.1 cc/min
SERVICE CHAMBER:	1.2 cc/min

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

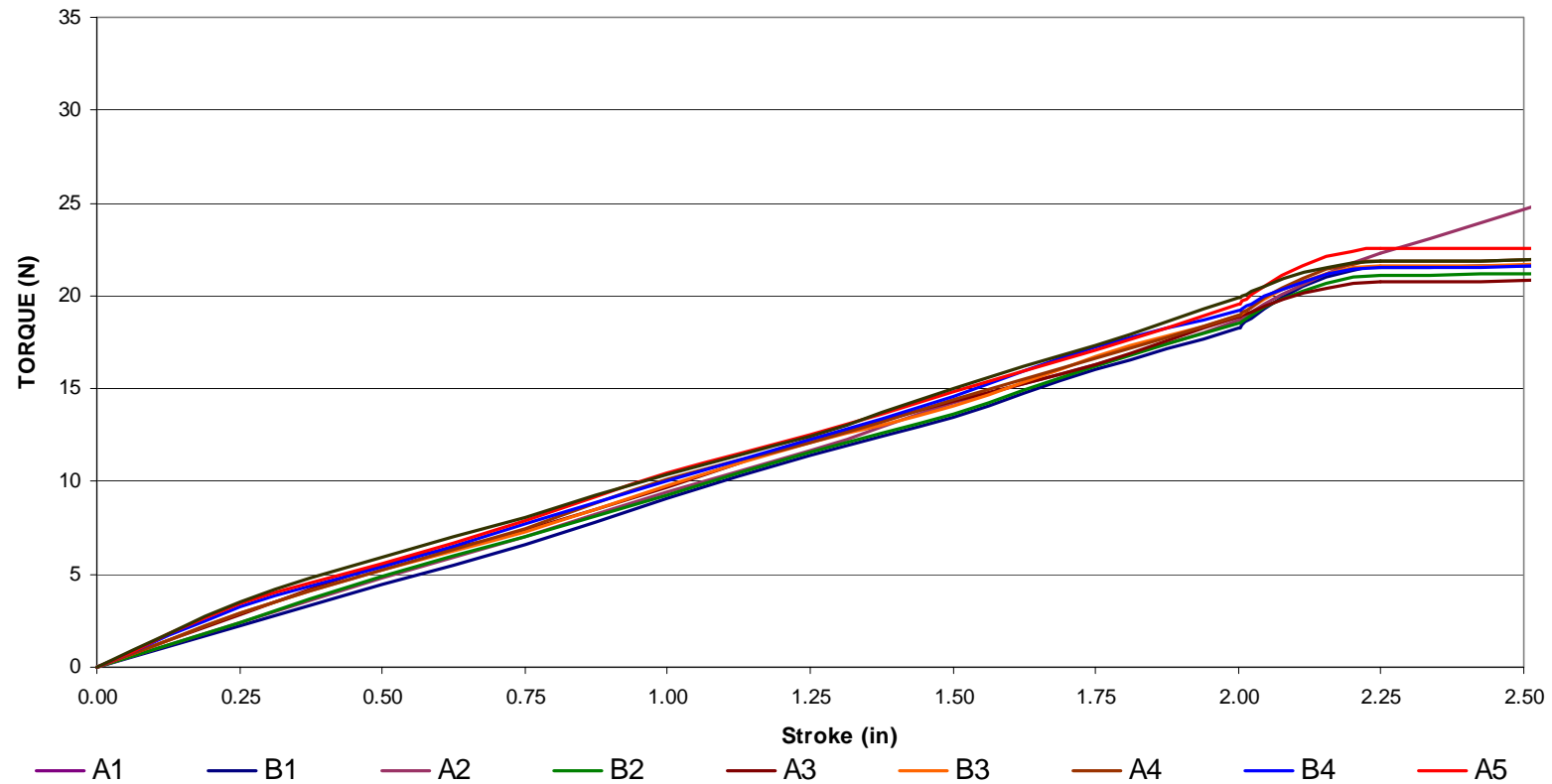


CORROSION RESISTANCE - SECTION 13.1.c VISUAL INSPECTION





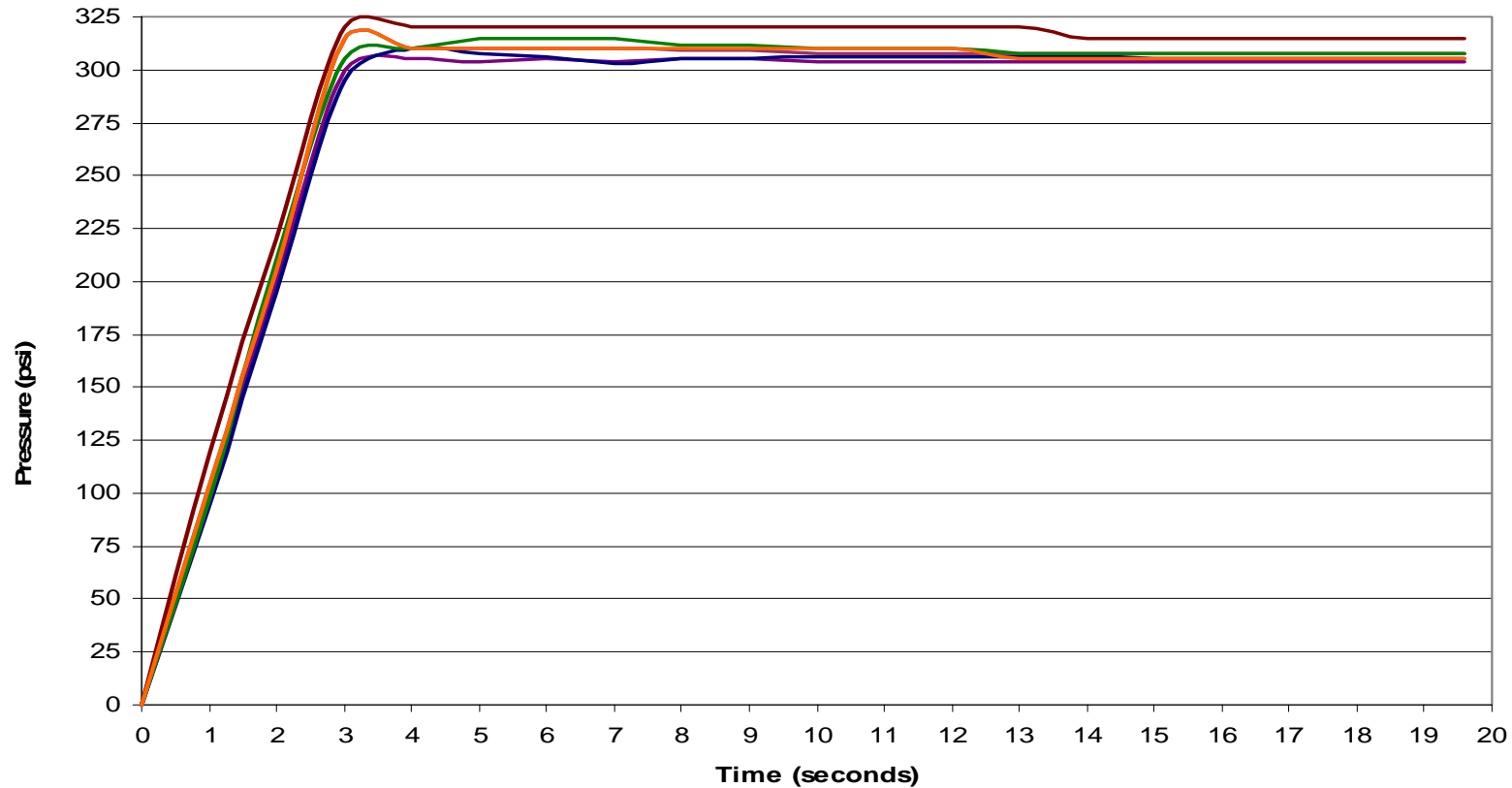
MECHANICAL BACK-OFF AND RELEASE (TYPE 2424) - SECTION 14.0



Torque required for mechanical back-off to release power spring to zero stroke is less than 35N.M



PROOF PRESSURE - SECTION 15.0



Units held above 300 PSI for 15 seconds and exhibited zero 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	228,000
C	Pass	200,000	253,000
E	Pass	200,000	215,500

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	1,113,000
C	Pass	1,000,000	1,120,000
E	Pass	1,000,000	1,247,500

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	31,687

After cycling, leakage test the parking chamber: leakage rate is 0.0cc/min,(Max. acceptable leak rate:23cc/min)

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	31,550

After cycling, leakage test the service chamber: leakage rate is 0.0cc/min,(Max. acceptable leak rate:23cc/min)

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; 135Hz

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.