TEST REPORT FOR:

Zap Jonway

2008 Zap Xebra

TESTED TO:

FMVSS 122

Motorcycle Brake Systems

PREPARED FOR:

Zap Jonway

501 Fourth Street

Santa Rosa, CA 95401

TEST REPORT NUMBER:

TR-P32023-01-NC

REPORT DATE:

November 27, 2011

TEST DATE:

May 16, 2012 – June 27, 2012

KARCO Engineering, LLC.
Automotive Research Center
9270 Holly Road
Adelanto, CA 92301
Tel: (760) 246-1672
Fax: (760) 246-8112

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Tested By:	Matthew S. Hubbard Mr. Matthew S. Hubbard Test Engineer
Report By:	Matthew S. Hubbard Mr. Matthew S. Hubbard Test Engineer
Reviewed By:	Mr. Kelsey A. Chiu Engineering Department Supervisor
Approved By:	Mr. Michael L. Dunlap Director of Operations
Approval Date:	July 27, 2012

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TR-P32023-01

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SECTION 1
PURPOSE AND PROCEDURE

1.1 PURPOSE

Tests were performed on a 2008 Zap Xebra, manufactured by Qingqi Group Motorcycle Co. LTD to determine compliance with Federal Motor Vehicle Safety Standard (FMVSS) 122, “Motorcycle Brake Systems”. The purpose of this test is to ensure safe braking performance under normal and emergency conditions.

1.2 TEST PROCEDURE

All tests were conducted in accordance with the current National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure TP-122-02, dated August 1, 2006. Procedures for receiving, inspecting, testing and reporting of the test results are described in the test procedures and are not repeated in this report.

The Zap Xebra was subjected to FMVSS 122 testing from May 16 through June 27, 2012. Photographs of the vehicle and the test setup are shown in Appendix A.

SECTION 2
TEST VEHICLE

2.1 TEST VEHICLE DESCRIPTION

The test vehicle is a 2008 Zap Xebra three-wheeled motorcycle, VIN LAEMA24608G200303. This vehicle was provided for testing by Zap Jonway.

The Zap Xebra is powered by an electric motor and is rear wheel driven. The wheel base is 83.5 in.

The braking system on the Zap Jonway Xebra consists of hydraulic split system operated by a foot pedal. Both front and rear wheels employ a hydraulic disc and caliper system. All wheels are fitted with Maxmiler-X GT Radial tires.

2.2 INSPECTION OF THE TEST MOTORCYCLE

An inspection of the vehicle's mechanical condition and brake system was conducted prior to the initiation of the FMVSS 122 brake test series. The speedometer is displayed in mph and km/h. The odometer is displayed in miles. The vehicle appeared to be in used condition, with 478 miles registered on the odometer. The vehicle required no mechanical repairs or adjustments during the course of the FMVSS 122 brake test series. Data Sheet No. 1 summarizes the vehicle performance compared to the requirements of FMVSS 122.

SECTION 3
RESULTS AND DATA SHEETS

3.1 SUMMARY

All data resulting from FMVSS 122 testing on the Zap Xebra is presented in this section. The test vehicle was inspected, paying special attention to the brake system, brake cables, rotors, and brake pads for possible areas of concern and non-compliance due to design or manufacturing defects. All performance tests up to the Second Effectiveness test were completed. The vehicle did not meet the minimum requirements of the Second Effectiveness test and the remainder of the testing was stopped.

3.2 INSPECTION

The brake failure indicator lamp does not meet the minimum height requirement of three thirty-seconds of an inch.

3.3 TEST RESULTS

The Zap Xebra failed to meet the minimum stopping distance requirement on Second Effectiveness. Thermocouple installation and positioning shown in Figures 15 and 20. The instrumentation and data recording system was installed as shown in Figures 9 and 10. The equipment used to conduct this test is listed in Appendix B. Test vehicle identification data is presented in Data Sheet No. 2, brake system inspection results are presented in Data Sheet No. 2, and the test data is summarized in Data Sheet No. 3. The remaining data sheets present test data for each test segment.

DATA SHEETS

Test Vehicle:	2008 Zap Xebra	Project No.:	P32023
Test Program:	FMVSS 122	Test Date:	06/27/12

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in^2	kPa	6.895
Temperature	General Use	°F	°C	=(Tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET 1

SUMMARY OF TESTS

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

TEST SUMMARY	SPEED (mph)	STOP. DIST. (ft.)	CORRECTED STOPPING DISTANCE (ft.)	PEDAL FORCE (lb)		DECEL. (ft/s^2)		PASSED
				Max	Avg	Max	Avg.	
Maximum Speed	37							
1st Effectiveness Test, 30 mph (Service Brake System)	30.23	51.71	50.92	81.10	58.95	-42.38	-12.49	Yes
1st Effectiveness Test, 60 mph (Service Brake System)	30.09	51.68	51.37	89.71	59.60	-49.94	-13.35	Yes
2nd Effectiveness Test, 30 mph	30.20	56.36	55.60	95.06	73.24	-29.62	-13.86	No
2nd Effectiveness Test, 60 mph								
2nd Effectiveness Test, 80 mph								
2nd Effectiveness Test, 120 mph								
1st Fade and Recovery (Baseline/Recovery)								
Final Effectiveness Test, 30 mph								
Final Effectiveness Test, 60 mph								
Final Effectiveness Test, 80 mph								
Final Effectiveness Test, 120 mph								
Final Effectiveness Test, 30 mph								
Final Effectiveness Test, 60 mph								
Final Effectiveness Test 30 mph (Partial Failure, Rear Wheel								
Final Effectiveness Test, 60 mph								
Parking Brake								
Water Recovery (Baseline/Recovery)								

DATA SHEET 2

VEHICLE INFORMATION

Test Vehicle:	2008 Zap Xebra	Project No.:	P32023
Test Program:	FMVSS 122	Test Date:	06/27/12

Supplier	**Zap Jonway**
Manufacturer	**Qingqi Group Motorcycle Co. LTD**

Year	**2008**	**Odometer (Mi.)**	**478**
Make	**Zap**	**No. Cylinders**	
Model	**Xebra**	**Displacement**	
MFG Date	**10/2008**	**Transmission**	
VIN	**LAEMA24608G[redacted]**	**Final Drive**	**Rear**
Color	**Copper**	**Drive Type**	**Electric**
Received Date	**05/15/12**	**Drive Side**	
Wheel Base	**83.5 inches**		

TIRE SPECIFICATION

Front		**Rear**	
Tire Placard Size	**145R12C**	**Tire Placard Size**	**145R12C**
Tire Placard psi	**51**	**Tire Placard psi**	**51**
On Vehicle Make	**Maxmiler-X**	**On Vehicle Make**	**Maxmiler-X**
On Vehicle Model	**GT Radial**	**On Vehicle Model**	**GT Radial**
On Vehicle Size	**145R12C**	**On Vehicle Size**	**145R12C**
On Vehicle psi	**51 max**	**On Vehicle psi**	**51 max**

WEIGHT SPECIFICATION

GAWR (Front)	**400kg (879 lb)**	**Ballast Added to Driver**	**10lbs**
GAWR (Rear)	**799kg (1759 lb)**		
GVWR	**1275kg (2805lb)**		
Delivered Weight (F)	**663 lbs**	**Test Weight (F)**	**754 lbs**
Delivered Weight (R)	**1225 lbs**	**Test Weight (R)**	**1335 lbs**
Delivered Weight (T)	**1888 lbs**	**Test Weight (T)**	**2089 lbs**

DATA SHEET 2 … (CONTINUED)

VEHICLE INFORMATION

Test Vehicle:	2008 Zap Xebra	Project No.:	P32023
Test Program:	FMVSS 122	Test Date:	06/27/12

BRAKE SPECIFICATION

Front	
Disc, Drum	Disc
Hydraulic, Mech.	Hydraulic
Lever, Pedal	Pedal
Twin Disc	No

Rear	
Disc, Drum	Disc
Hydraulic, Mech.	Hydraulic
Lever, Pedal	Pedal

BRAKE COMPONENT DIMENSION

	Front			
Pads	Inboard	Outboard		
Length (in.)	4.020	4.020		
Width (in.)	1.280	1.280		
Thickness (in.)	0.335	0.335		
Temp. Code	None			
Piston Dia. (in.)	1.950 x 1 Piston			
Disc/Drum	Disc			
Diameter (in.)	8.325			
Thickness (in.)	0.385			

	Left Rear		Right Rear	
Pads	Inboard	Outboard	Inboard	Outboard
Length (in.)	4.020	4.020	4.020	4.020
Width (in.)	1.280	1.280	1.280	1.280
Thickness (in.)	0.335	0.335	0.335	0.335
Temp. Code	None		None	
Piston Dia. (in.)	1.950 x 1 Piston		1.950 x 1 Piston	
Disc/Drum	Disc		Disc	
Diameter (in.)	8.325		8.325	
Thickness (in.)	0.385		0.385	

	Parking Brake Left Rear		Parking Brake Right Rear	
Pads	Inboard	Outboard	Inboard	Outboard
Length (in.)	3.995	3.995	3.995	3.995
Width (in.)	1.242	1.242	1.242	1.242
Thickness (in.)	0.350	0.350	0.350	0.350
Temp. Code	None		None	
Disc/Drum	Disc		Disc	
Diameter (in.)	8.325		8.325	
Thickness (in.)	0.385		0.385	

DATA SHEET 2 … (CONTINUED)

VEHICLE INFORMATION

Test Vehicle:	2008 Zap Xebra	Project No.:	P32023
Test Program:	FMVSS 122	Test Date:	06/27/12

MASTER CYLINDER RESERVOIR VOLUME

Front	**100ml**	**Rear**	**100ml**

BRAKE FLUID TYPE

Front	**Dot 4**	**Rear**	**Dot 4**

VEHICLE INSTRUMENTATION

SPEEDOMETER

Digital, Analog	**Analog**
km/h, mph	**Both**
Lighted	**Yes**

ODOMETER

Digital, Analog	**Digital**
Km., mi.	**Mi.**
Lighted	**Yes**

TACHOMETER

Digital, Analog	**None**
Lighted	

DATA SHEET 3

VEHICLE BRAKE SYSTEM INSPECTION

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

VEHICLE BRAKE SYSTEM INSPECTION REQUIREMENTS	TEST VEHICLE COMPLIANCE	DATA	
		YES	NO
S5.1 - Motor driven cycle shall have either a split service brake system or two independently actuated service brake systems.	Motor driven cycle has split service brake system?	X	
	Motor driven cycle has two independently actuated service brake systems?		X
S5.1.1 - Failure of any component in a mechanical service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle.	If vehicle has a mechanical service brake system, would component failure result in loss of braking in other service brake system?	N/A	
S5.1.2 - Leakage failure in hydraulic service brake system shall not result in a loss of braking ability in other service brake system on the vehicle.	If vehicle has hydraulic service brake system, would leakage failure in one service brake system result in a loss of braking ability in other service brake system?		X
S5.1.2.1 - Each master cylinder shall have a separate reservoir for each brake circuit, with each reservoir filler opening having its own cover, seal, and cover retention device. Each reservoir shall have a minimum capacity equivalent to one and one-half times the total fluid displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoir move from a new lining, fully retracted position to a fully worn, fully applied position. Where adjustment is a factor, the worst condition of adjustment shall be used for this measurement. (See Appendix 2 for information on reservoir capacity measurement)	Vehicle meets master cylinder reservoir requirements?	X	
S5.1.2.2 - Each motor driven cycle shall have a brake fluid warning statement that reads as follows, in letters at least three thirty-seconds of an inch high: **Warning: clean filler cap before removing. Use only ---fluid from a sealed container.** (Inserting the recommended type of brake fluid as specified in 49 CFR 571.116, e.g., DOT 3.) The lettering shall be: (A) Permanently affixed, engraved, or embossed (B) Located so as to be visible by direct view, either on or within 4 inches of the brake-fluid reservoir filler plug or cap (C) Of a color that contrasts with its background, if it is not engraved or embossed	Vehicle meets all master cylinder warning statement requirements?	X	
	Type of brake fluid required?	Dot 4	

DATA SHEET 3 … (CONTINUED)

VEHICLE BRAKE SYSTEM INSPECTION

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

VEHICLE BRAKE SYSTEM INSPECTION REQUIREMENTS	TEST VEHICLE COMPLIANCE	DATA	
		YES	NO
S5.1.3 - (A) Each motor driven cycle equipped with a split service brake system shall have one or more electrically operated service brake system failure indicator lamps that is mounted in front of and in clear view of the driver, and that is activated — (1) In the event of pressure failure in any part of the service brake system, other than a structural failure of either a brake master cylinder body in a split integral body type master cylinder system or a service brake system failure indicator body, before or upon application of not more than 20 lb of pedal force upon the service brake. (2) Without the application of pedal force, when the level of brake fluid in a master cylinder reservoir drops to less than the recommended safe level specified by the manufacturer or to less than one-half the fluid reservoir capacity, whichever is the greater. (B) All failure indicator lamps shall be activated when the ignition switch is turned from the "off" to the "on" or to the "start" position. (C) Except for the momentary activation required by S5.1.3.1(b), each indicator lamp once activated, shall remain activated as long as the condition exists, whenever the ignition switch is in the "on" position. An indicator lamp activated when the ignition is turned to the "start" position will be deactivated upon return of the switch to the "on" position unless a failure exists in the service brake system. (D) Each indicator lamp shall have a red lens with the legend "Brake Failure" on or adjacent to it in letters not less than three thirty-seconds of an inch high that shall be legible to the driver in daylight when lighted.	Does vehicle have a brake system failure indicator lamp?		X
	Does failure indicator lamp conform to operational and physical requirements?	X	
S5.1.4 - Each three-wheeled motor driven cycle shall be equipped with a parking brake of a friction type with a solely mechanical means to retain engagement.	If vehicle is a three-wheeled motor driven cycle, is vehicle equipped with a parking brake?	X	
S5.1.5 - The brake system shall be installed so that the lining thickness of the drum brake shoes may be visually inspected, either directly or by use of a mirror without removing the drums, and so that disc brake friction lining may be visually inspected without removing the pads.	Can the drum brake lining thickness or disc brake friction lining thickness be determined without removal of drum or disc brake pads?	X	

DATA SHEET 4

INSTRUMENTATION CHECKS

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 83 °F Wind Velocity / Direction: 2mph / South

Odometer Reading - Start: 478 Mi. Finish: 484 Mi.

REQUIREMENTS: Check instrumentation by making not more than 10 stops from 30 mph at a deceleration of not more than 10 fpsps, record results, repeat if necessary.

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)	
				MAX.	AVG.	MAX.	AVG.	FRONT	REAR
1	30.73	117.61	112.10	25.70	14.80	43.65	9.62	-	116
2	31.21	127.61	117.90	24.15	13.51	30.53	9.16	-	122
3	31.22	137.82	117.30	16.39	9.91	57.52	8.03	-	130
4	30.63	133.99	128.50	17.94	8.35	30.25	7.94	-	135
5	31.06	119.41	111.40	21.43	12.83	33.44	9.34	-	146
6	31.49	154.24	140.00	15.23	8.21	33.99	7.36	-	153
7	30.66	156.19	149.60	15.23	8.12	25.97	7.04	-	162
8	33.42	151.82	122.40	16.39	8.50	25.51	8.30	-	-
9	32.12	132.26	115.40	18.33	6.76	25.15	8.61	-	-
10	30.50	131.49	127.20	36.55	11.52	35.81	8.36	-	-

MOTORCYCLE MAXIMUM SPEED DETERMINATION —

REQUIREMENTS: Measure the speed that the motorcycle will attain in a distance of one mile from a standing start

M/C SPEED ATTAINABLE IN 1 MILE 37 mph

DATA SHEET 5

FIRST EFFECTIVENESS

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 80-97 °F Wind Velocity / Direction: 2-10mph / S.

Odometer Reading - Start: 478 Mi. Finish: 526 Mi.

REQUIREMENTS:

A. Utilize both brakes, no wheel lockup, initial brake temperature between 130°F and 150°F.
Make the following stops: (1) 6 stops from 30 mph (2) 6 stops from 60mph

B. Compliance to S122 requires 1 stop at each of the following:
(1) 30 mph within 54 feet (2) 60mph within 216 feet

30mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1	30.46	52.03	50.46	95.33	53.89	-48.48	-16.97	134	140	FAIL
2	30.66	57.18	54.76	91.96	73.13	-42.01	-16.85	144	144	FAIL
3	30.74	51.57	49.12	100.91	69.43	-48.57	-13.46	127	143	FAIL
4	30.33	56.35	55.13	92.99	67.23	-50.31	-13.47	136	120	FAIL
5	29.94	53.96	54.19	85.64	54.70	-42.29	-11.67	142	121	FAIL
6	30.23	51.71	50.92	81.10	58.95	-42.38	-12.49	145	118	PASS

60mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1	29.96	48.27	48.40	93.47	38.93	-61.06	-10.28	141	142	FAIL
2	30.53	55.23	53.25	85.53	43.33	-52.68	-15.39	140	136	PASS
3	30.09	51.68	51.37	89.71	59.60	-49.94	-13.35	142	138	PASS
4	30.04	51.59	51.44	79.45	37.16	-43.93	-14.58	137	132	PASS
5	30.12	53.42	52.99	86.47	65.01	-50.31	-13.56	141	136	PASS
6	30.16	53.19	52.63	95.96	61.12	-45.38	-12.71	143	132	FAIL

DATA SHEET 6

BURNISH

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 64-87 °F Wind Velocity / Direction: 2-10mph / S.

Odometer Reading - Start: 526 Mi. Finish: 750 Mi.

REQUIREMENTS

A. Burnish the brakes by making 200 stops from 30 mph at 12 fpsps deceleration

B. The braking interval shall be either the distance necessary to reduce the brake temperature to between 130°F and 150°F or 1 mile whichever comes first

C. Accelerate at maximum rate to 30 mph immediately and maintain that speed until making the next stop

D. Hand lever and foot pedal force limits do not apply during this procedure

30mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)	
				MAX.	AVG.	MAX.	AVG.	FRONT	REAR
1	30.62	103.83	99.66	24.23	9.37	-33.26	-9.67	120	153
25	30.70	90.12	86.04	24.32	16.38	-21.23	-8.81	112	144
50	30.53	86.30	83.30	29.21	14.36	-23.97	-7.65	120	177
75	30.28	89.29	87.64	31.39	18.20	-20.60	-9.42	138	245
100	30.77	87.82	83.49	26.63	17.27	-18.04	-10.38	143	254
125	30.25	88.94	87.48	25.09	14.91	-21.69	-9.49	268	319
150	30.23	85.20	83.92	20.23	11.13	-26.79	-8.84	239	269
175	30.81	94.04	89.18	24.90	15.31	-21.96	-8.89	159	146
200	30.76	85.27	81.10	34.28	16.26	-21.96	-9.84	123	140

DATA SHEET 7

SECOND EFFECTIVENESS

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 87-96 °F Wind Velocity / Direction: 4mph / South

Odometer Reading - Start: 750 Mi. Finish: 775 Mi.

REQUIREMENTS

A. Make stops as follows:

(1) 6 stops from 30 mph
(2) 6 stops from 60 mph
(3) 4 stops from 80 mph
(4) 4 stops from vehicle maximum speed not to exceed 120 mph

Utilize both brakes, no wheel lockup, initial brake temperature between 130□F and 150□F.

B. Compliance to S122 requires 1 stop at each of the following:

(1) 30 mph within 43 feet
(2) 60 mph within 185 feet
(3) 80 mph within 345 feet
(4) 120 mph within 861 feet

Maximum vehicle speed 37.0 mph within 5280 feet

30mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1	30.57	59.74	57.54	92.78	66.66	-27.98	-12.87	123	142	FAIL
2	30.20	56.36	55.60	95.06	73.24	-29.62	-13.86	124	136	FAIL
3	30.49	61.44	59.48	89.72	64.79	-28.43	-11.15	131	135	FAIL
4	30.45	61.51	59.71	92.33	55.51	-27.07	-11.30	132	132	FAIL
5	30.61	59.00	56.66	79.85	51.77	-28.80	-11.62	134	134	FAIL
6	30.55	58.04	55.97	88.95	30.95	-28.16	-11.60	136	130	FAIL

DATA SHEET 7 ... (CONTINUED)

SECOND EFFECTIVENESS

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 87-96 °F Wind Velocity / Direction: 4mph / South

Odometer Reading - Start: 750 Mi. Finish: 775 Mi.

60mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1										
2										
3										
4										
5										
6										

80mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1										
2										
3										
4										

DATA SHEET 7 ... (CONTINUED)

SECOND EFFECTIVENESS

Test Vehicle: 2008 Zap Xebra Project No.: P32023

Test Program: FMVSS 122 Test Date: 06/27/12

Ambient Temperature: 87-96 °F Wind Velocity / Direction: 4mph / South

Odometer Reading - Start: 750 Mi. Finish: 775 Mi.

120mph Data

RUN NO.	SPEED (mph)	STOPPING DISTANCE (ft)	CORRECTED STOPPING DISTANCE (ft)	PEDAL FORCE (LB)		DECELERATION (fpsps)		TEMPERATURE (°F)		RESULT
				MAX	AVG	MAX	AVG	FRONT	REAR	
1										
2										
3										
4										

DATA SHEET 8

FINAL INSPECTION

Test Vehicle:	2008 Zap Xebra	Project No.:	P32023
Test Program:	FMVSS 122	Test Date:	06/27/12

REQUIREMENTS

Disassemble all brakes and inspect the following:

A. The entire brake system for detachment or fracture of any component.

B. Brake linings for detachment from the shoe or pad.

C. Wheel cylinder, master cylinder, and axle seals for fluid or lubricant leakage.

OBSERVATIONS:

A. No fractures or separation of any brake system components.

B. No fractures or separation of any brake system components.

C. No fluid leakage of brake system seals or cylinders.

BRAKE COMPONENT DIMENSION

	Front			
Pads	**Inboard**	**Outboard**		
Length (in.)	**4.020**	**4.020**		
Width (in.)	**1.280**	**1.280**		
Thickness (in.)	**0.317**	**0.316**		
Temp. Code	**None**			
Piston Dia. (in.)	**1.950 x 1 Piston**			
Disc/Drum	**Disc**			
Diameter (in.)	**8.325**			
Thickness (in.)	**0.385**			

	Left Rear		Right Rear	
Pads	**Inboard**	**Outboard**	**Inboard**	**Outboard**
Length (in.)	**4.020**	**4.020**	**4.020**	**4.020**
Width (in.)	**1.280**	**1.280**	**1.280**	**1.280**
Thickness (in.)	**0.332**	**0.319**	**0.318**	**0.323**
Temp. Code	**None**		**None**	
Piston Dia. (in.)	**1.950 x 1 Piston**		**1.950 x 1 Piston**	
Disc/Drum	**Disc**		**Disc**	
Diameter (in.)	**8.325**		**8.325**	
Thickness (in.)	**0.385**		**0.385**	

DATA SHEET 9

MASTER CYLINDER VOLUME CALCULATION

Test Vehicle:	2008 Zap Xebra	Project No.:	P32023
Test Program:	FMVSS 122	Test Date:	06/27/12

VOLUME REQUIRED: $V_r = (\Delta t_i + \Delta t_o) \times \frac{\pi D^2}{4}$

WHERE	
V_r =	Volume Required Per Wheel
Δt =	Total Change In Pad Thickness
D =	Caliper Cylinder Diameter

FRONT WHEEL VOLUME						
Δt x 0.670	π x $\frac{(1.950^2)}{4}$	=	CUBIC IN. 2.0	X	NUMBER OF PISTONS 1	2.0
Total Cubic Inch Displacement	2.0	X	16.39=	Total Master Cylinder Required Volume (ml)	32.78	
Master Cylinder Required Volume	32.78	X	1.5=	49.17	Total Wheel System Requirement	

REAR WHEEL VOLUME						
Δt x 0.670	π x $\frac{(0.994^2)}{4}$	=	CUBIC IN. 2.0	X	NUMBER OF PISTONS 2	4.0
Total Cubic Inch Displacement	4.0	X	16.39=	Total Master Cylinder Required Volume (ml)	65.56	
Master Cylinder Required Volume	65.56	X	1.5=	98.34	Total Wheel System Requirement	

Master Cylinder Required Volume	Front Wheel	Pass	Fail	Rear Wheel	Pass	Fail
	49.17ml	X		98.34ml	X	
Master Cylinder Measured Volume	100ml			100ml		

APPENDIX A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

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26	Right Rear Parking Brake Pads	A-13

FIGURE 1. LEFT FRONT ¾ AS RECEIVED

FIGURE 2. LEFT FRONT ¾ AS TESTED

FIGURE 3. RIGHT REAR ¾ AS RECEIVED

FIGURE 4. RIGHT REAR ¾ AS TESTED

FIGURE 5. MANUFACTURER'S LABEL

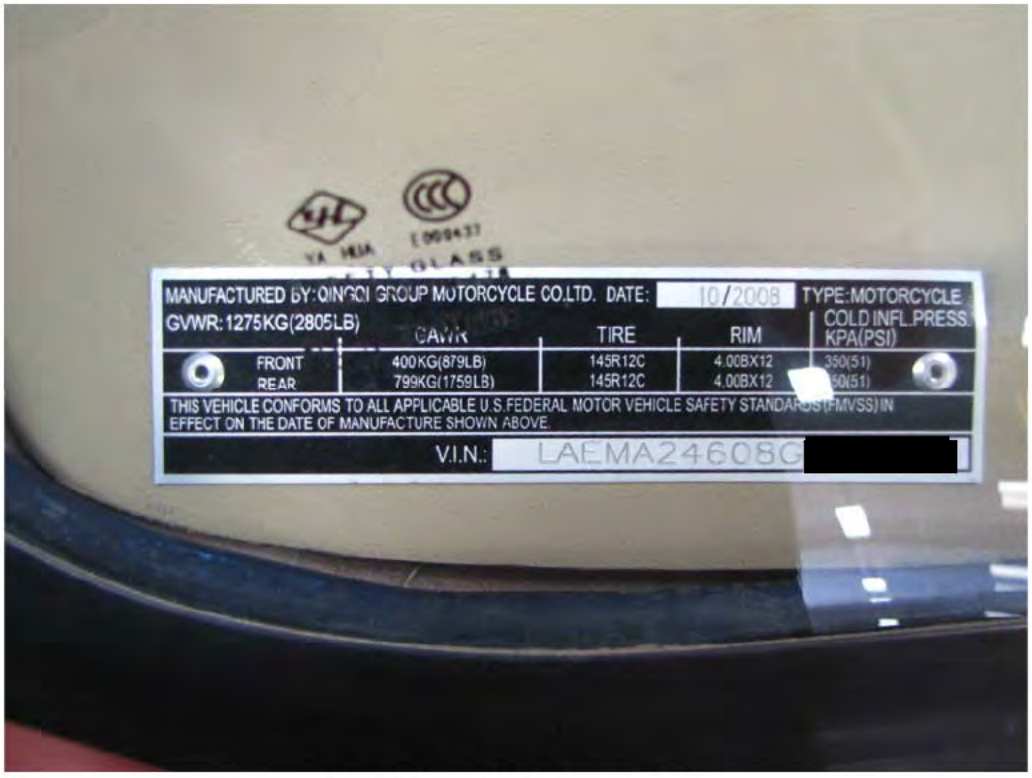

FIGURE 6. TIRE PLACARD

FIGURE 7. LIGHTS AND GAUGES

FIGURE 8. VEHICLE BEING WEIGHED

FIGURE 9. INSTRUMENTATION INSTALLED ON VEHICLE

FIGURE 10. INSTRUMENTATION INSTALLED ON VEHICLE

FIGURE 11. LOCATION OF BRAKE MASTER CYLINDER

FIGURE 12. BRAKE MASTER CYLINDER LABEL

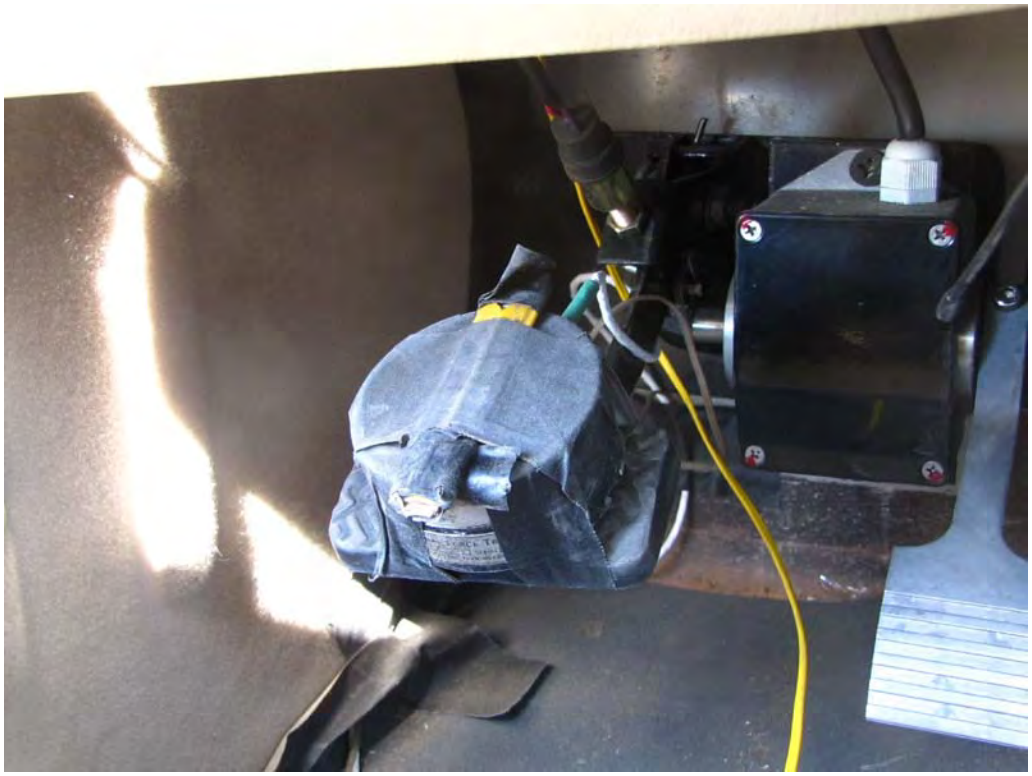

FIGURE 13. BRAKE PEDAL WITH LOAD CELL

FIGURE 14. FRONT BRAKE DISC

FIGURE 15. FRONT BRAKE WITH THERMOCOUPLE INSTALLED

FIGURE 16. FRONT BRAKE CALIPERS AND PISTON

FIGURE 17. FRONT BRAKE PADS

FIGURE 18. FRONT BRAKE PADS

FIGURE 19. RIGHT REAR BRAKE DISC

FIGURE 20. RIGHT REAR BRAKE WITH THERMOCOUPLE INSTALLED

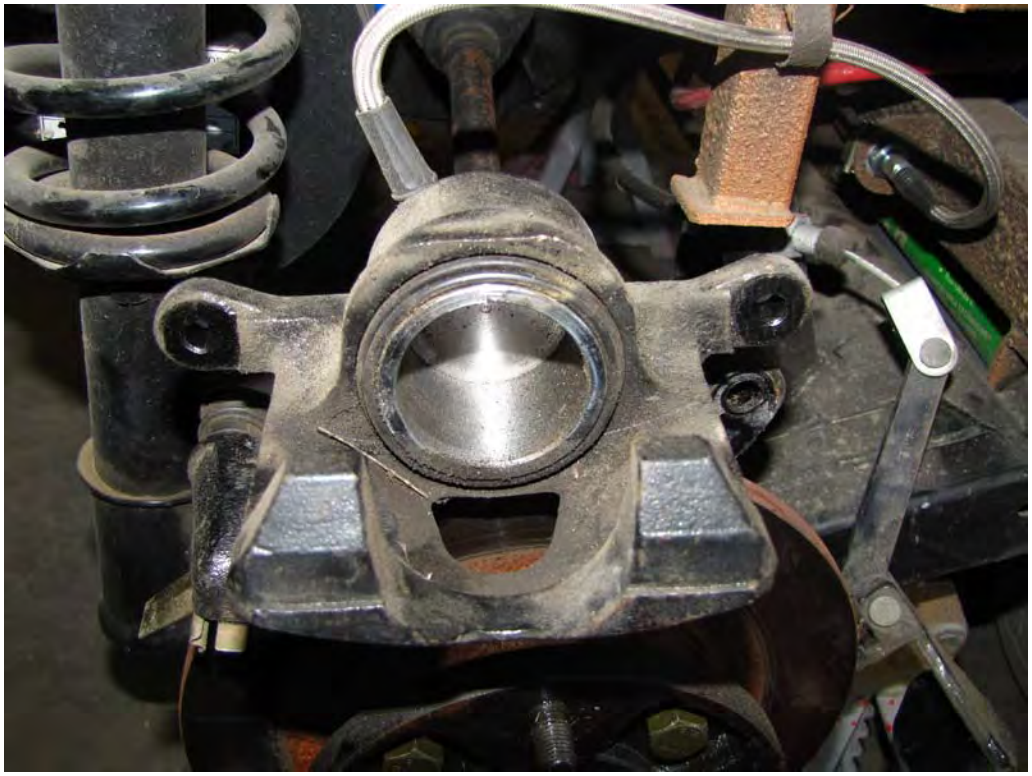

FIGURE 21. RIGHT REAR BRAKE CALIPERS AND PISTON

FIGURE 22. RIGHT REAR BRAKE PADS

FIGURE 23. RIGHT REAR BRAKE PADS

FIGURE 24. RIGHT REAR PARKING BRAKE ASSEMBLY

FIGURE 25. RIGHT REAR PARKING BRAKE PADS

FIGURE 26. RIGHT REAR PARKING BRAKE PADS

APPENDIX B

TEST EQUIPMENT AND CALIBRATION LIST

TEST EQUIPMENT AND CALIBRATION LIST

ITEM	MFR./MODEL	S/N	CALIB. DATE	CALIB. DUE
Data Acquisition System:	Racelogic / VBOX III	030309	05/14/12	05/14/13
Pedal Force Transducer	GSE	183	05/14/12	05/14/13
Two (2) Thermocouples:	Duro-Sense Corporation Type 'K'	N/A	05/14/12	05/14/13
Scale:	Indiana Scale Co. Model 22-10	7098	11/26/11	5/26/12
Scale:	Indiana Scale Co. Model 22-10	7099	11/26/11	5/26/12