ADA

GENERATOR SET ENVIRONMENTAL AND STABILITY TESTING

INTERIM REPORT
TFLRF No. 460

by
Gregory A. Hansen
Edwin A. Frame

U.S. Army TARDEC Fuels and Lubricants Research Facility
Southwest Research Institute® (SwRI®)
San Antonio, TX

for
Eric Sattler

U.S. Army TARDEC
Force Projection Technologies
Warren, Michigan

Contract No. W56HZV-09-C-0100 (WD21–Task V)

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14. ABSTRACT

Various tests according to MIL-STD-705c (608.1, 608.2, 630.1, 670.1, 701.1, 710.1, 720.1) were performed on a variety of tactical quiet generators ranging in capacity from 10kW to 100kW. The testing was performed to assess the performance impact of a new fuel. The fuel was a 50/50 volume % blend of JP-8 and HRJ-8. Although many mechanical problems occurred during testing, no direct fuel related failures were reported.

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EXECUTIVE SUMMARY

At the TARDEC Fuels and Lubricants Research Facility (San Antonio, Texas), candidate alternative fuel blend testing was performed on military Tactical Quiet Generators. These several tests are used to help qualify candidate alternative fuels for use in ARMY and DOD ground equipment. A test fuel blend consisting of 50% JP-8 and 50% synthetic fuel (HRJ-8) was used in five different generator types. The generators ranged in capacity from 10kW to 100kW. They featured various types of fuel injection systems and high pressure fuel pumps. The tests performed included hot and cold environmental chambers, altitude simulation, and transient response tests. All of these tests were performed as found in MIL-STD-705c [1]. Although some generators failed to finish the series of tests due to mechanical problems, there were no reported issues directly relating to the test fuel. For a list of the generators tested and their completed tests, please refer to Section 5, Tables 3 and 4.

FOREWORD/ACKNOWLEDGMENTS

The U.S. Army TARDEC Fuel and Lubricants Research Facility (TFLRF) located at Southwest Research Institute (SwRI), San Antonio, Texas, performed this work during the period January 2013 through December 2014 under Contract No. W56HZV-09-C-0100. The U.S. Army Tank-Automotive RD&E Center, Force Projection Technologies, Warren, Michigan administered the project. Mr. Eric Sattler (RDTA-DP M/S 110) served as the TARDEC contracting officer's technical representative. Ms. Patsy Muzzell of TARDEC served as project technical monitor.

Special thanks go to Thomas C. Dooley (RDECOM CERDEC PRD), and his assistant Tolulope O. Oyebode, for their continued support of this work. They provided the generators for this testing, and also invaluable troubleshooting aid.

The authors would like to acknowledge the contribution of the TFLRF technical support staff along with the administrative and report-processing support provided by the TFLRF Administrative Staff.

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ACRONYMS AND ABBREVIATIONS

BOCLE	Ball-On-Cylinder Lubricity Evaluator (ASTM D5001)
BSFC	Brake Specific Fuel Consumption
DCI-4A	Corrosion Inhibitor / Lubricity Improver Fuel Additive
EOT	End of Test
HFRR	High Frequency Reciprocating Rig
HRJ-8	Hydro-Renewable Jet Fuel
JFTOT	Jet Fuel Thermal Oxidation Test
kW	kilo Watts
MEP	Mobile Electric Power
MSEP	Water Separation Test (ASTM D3948)
MTBF	Mean Time Between Failure
ppm	parts per million
S/N	Serial Number
STADIS	Static Dissipative Fuel Additive
TFLRF	TARDEC Fuels and Lubricants Research Facility
CI/LI	Corrosion Inhibitor, Lubricity Improver

1.0 INTRODUCTION

The purpose of this testing was to evaluate the operation of tactical quiet generators on a candidate alternative fuel blend consisting of 50/50 by volume of JP-8 and HRJ-8. To do this they must complete the environmental, altitude, and transient response tests as outlined in MIL-STD-705c [1]. These tests are designed to measure the probability that a generator set will perform as intended. Since the generator sets used in this program were already qualified for use, we were only interested in results obtained as they pertained to the fuel system. All other data collected and provided is ancillary to the results of the fuel on the operation of the tactical quiet generators.

2.0 EQUIPMENT

A listing of the tactical quiet generators that were used for this program is presented in Table 1. Some of the generators set up for environmental testing can be seen in Figure 1.

Table 1. Generator Equipment Details

Model	Serial Numbers of Units Tested	Output [kW]	MFR	Engine Model	Weight [lbs]	Dimensions [L/W/H, in]	Est. Fuel Consumption [gal/hr]	Tank Capacity [gal]	Oil Sump [quart]	Coolant [gal]
MEP 803A	FZ35046 FZ35055	10	Onan	DN4M	1182	61.7 x 31.8 x 36.2	0.97	9	5.9	2.05
MEP 804A	FZ60344 FZ60357	15	Isuzu	C240	2124	69.3 x 35.3 x 54.1	1.5	14	6	3.4
MEP 804B	FZ61920 FZ61946	15	Yanmar	4TNV84T-BGGE	2040	69.3 x 35.3 x 54.1	1.2	14	6	2.8
MEP 805B	HX37756 HX37762	30	John Deere	4039T	3006	79.3 x 35.3 x 54.1	2.43	23	15	3.9
MEP 807A	100013	100	Caterpillar	3126B	6100	106 x 40 x 65	7.85	66	30	9.5

Figure 1. 15kW Generator Ready for Environmental Testing – Others on Standby

In order to most closely match the load requirements of the test, the load banks (in Table 2) were used at various voltage and power settings.

Table 2. Load Banks

Model	Rated Load	AC Voltage	Load Circuits (kW)
K490	10 kW	120/240 Single Phase	1, 2, 2, 2, 3
LPH100	100 kW	208-240/480 3 Phase	5, 10, 10, 25, 50

3.0 INSTRUMENTATION

Each generator set was instrumented with two automated data loggers: Campbell Scientific model CR3000. Thirty two thermocouples were used on each generator, along with five pressure transducers. Voltage, current, and frequency for each output line (single or 3-phase) were also measured. The temperature and pressure data were sampled at 1/10 Hz (every 6 seconds) and the load line electrical characteristics were sampled at 10 Hz for each test. The summary data gathered from the generators during testing can be found in Appendix A through E.

4.0 FUEL

The fuel used for this program consisted of a 50/50 volume percent blend of HRJ-8 and Jet-A. The blend was additized with 22.5 ppm DCI-4A and 1 ppm STADIS to bring the blend into conformance with the MIL-DTL-83133G specification. As per the SOW, the fuel used was already on hand; leftover from the previous durability testing. Complete fuel property information was presented in report ADA569977 [2]. Summarized fuel blend properties are presented in Table 3.

Table 3. Summarized Fuel Blend Properties

Physical Properties	Test Method	Specification		Result
		Minimum	Maximum	
Density @ 15°C	D 4052	775	840	775.2
Gravity, API @ 60°F		37.0	51.0	51.0
Kinematic Viscosity @ 40°C	D 445			1.27
Hydrocarbon Composition				
Aromatics (vol %)	D 1319	8.0	25.0	10.8
Hydrogen Content (mass%)	D 3701	13.4		14.61
Napthalene (vol%)	D 1840		3.0	0.10
Sulfur Content (mg/kg)	D 5453		3000	1.8
BOCLE (wear scar diameter)	D 5001			0.630
Volatility				
Flash Point (°C)	D 56	38		46.0
Distillation 10% Rec (°C)	D 86		205	171.1
Distillation 50% Rec (°C)		Report		197.2
Distillation 90% Rec (°C)		Report		266.2
Distillation Final BP (°C)			300	276.7
Distillation Residue (vol%)			1.5	1.5
Distillation Loss (vol%)			1.5	0.9
T50-T10 (°C)		15		26.1
T90-T10 (°C)		40		95.1

5.0 OPERATING SUMMARY

5.1 Completed Tests

To summarize the tests that each generator completed, the following charts (Tables 4 and 5) have been created. A discussion of the testing will follow starting in section 6 of this document.

Table 4. Generators and Completed Tests 1

MIL-STD-705c Method:		608.1	608.2	630.1	670.1
Serial Numbers of Units Tested	Output [kW]	Frequency and Voltage Regulation, Stability and Transient Response Test (Short Term) at Ambient Conditions	Frequency and Voltage Stability Test (Long Term) at Ambient Conditions	Parallel Operating Test at Ambient Conditions	Fuel Consumption Test
FZ35046	10	Completed	Completed	NA	Completed
FZ35055		Completed	Completed		Completed
FZ60344	15	Completed	Completed	Completed	Completed
FZ60357		Completed	Completed		Completed
FZ61920	15	Completed	Completed	Completed	Completed
FZ61946		Completed	Completed		Completed
HX37756	30	Completed	Completed	Completed	Completed
HX37762		Completed	Completed		Completed
100013	100	NA	NA	NA	NA

NA - Not Attempted

Table 5. Generators and Completed Tests 2

MIL-STD-705c Method:		701.1 & 608.1	710.1 & 608.1	720.1, 608.1, 640.1	720.1, 608.1, 640.1
Serial Numbers of Units Tested	Output [kW]	Starting and Operation Test (Extreme Cold Battery Start) at -50F	High Temperature Test at 125F	Altitude Operating and Max Power Tests at 4,000 ft	Altitude Operating and Max Power Tests at 10,000 ft
FZ35046	10	Completed	Completed	NA	NA
FZ35055		Completed	Completed	Completed	Completed
FZ60344	15	Completed	Completed	Completed	Completed
FZ60357		Completed	Completed	Completed	Completed
FZ61920	15	Completed	Completed	NA	NA
FZ61946		Completed	Completed	Completed	Completed
HX37756	30	Completed	Completed	Completed	Completed
HX37762		Completed	Completed	NA	NA
100013	100	Completed	Completed at 75% Load	NA	NA

NA - Not Attempted

Any test marked ‘Not Attempted’ was due to a mechanical failure that prevented the generator from participating in the remainder of the testing program.

5.2 Maintenance

It was recommended by Ft. Belvoir to limit regular maintenance to the recommended oil changes when operating the 705c test cycles on almost all of the generators. Depending on the generator set in question, the regular oil change interval ranged from 100 to 500 hours. TFLRF previously conducted the 1500 hour durability test on each of these units, and adhered to the recommended

service intervals. It may be noted that prior to receipt by TFLRF in 2010, some of the generators had been involved in previous testing programs and had already accumulated up to 500 hours.

Since each generator in this program had completed the durability test and finished with no noticeable maintenance problems, the decision was made to go ahead with the environmental testing. The fuel systems were flushed out, and the coolant and oil were changed. The oil used was MIL-PRF-46167D, commonly referred to as Arctic Oil. Each unit also needed a winterization kit installed in preparation for the environmental testing at -50 °F. No further fluid changes were performed for the duration of the testing.

As a result of some rough running problems experienced during the environmental testing at 125 °F, each generator, with the exception of the 100kW unit, had its fuel injectors pulled out and checked for wear. Each injector was tested for opening pressure (at ambient conditions), then disassembled and adjusted for the appropriated opening pressure as recommended by the manufacturer. Details regarding the condition were also recorded. Tables 6 through 9 summarize the work done on the injectors.

Table 6. 10kW Injector Reconditioning

Model:	MEP-803A (10kW)		Serial:	35055	
Cylinder #	Old Pressure	New Pressure	Chatter	Spray	Leakage
1	3300	3625	Good	Good	Okay
2	3225	3625	Good	Good	Okay
3	3150	3625	Good	Good	Okay
4	3000	3625	Good	Good	Okay
Comment:	Cleaned all tips. Pintles had bad scuffing on top end and required polishing.				
Model:	MEP-803A (10kW)		Serial:	35046	
Cylinder #	Old Pressure	New Pressure	Chatter	Spray	Leakage
1	3300	3600	Good	Good	High
2	3100	3600	Good	Good	High
3	2900	3625	Good	Good	High
4	3200	3650	Good	Good	High
Comment:	Cleaned all tips. Pintles still had light scuffing on top end after polishing. Return leakage high due to wear.				

Both 10kW units had their nozzles removed and pressure checked. The specification for opening pressure was for 3600 psi. Actual opening pressures were between 2900 and 3300 psi. All injectors were cleaned and adjusted to meet specification. Unit # 35046 still had high return fuel leakage after adjustment, likely due to the high amount of wear on the pintles. After reinstallation, both generators ran smooth at no load conditions.

Table 7. 15kW Injector Reconditioning (A units)

Model:	MEP-804A (15kW)		Serial:	FZ60344	
Cylinder #	Old Pressure	New Pressure	Chatter	Spray	Leakage
1	1500	1750	Good	Good	Okay
2	1575	1750	Good	Good	Okay
3	1525	1750	Good	Good	Okay
4	1550	1750	Good	Good	Okay

Comment: None

Model:	MEP-804A (15kW)		Serial:	FZ60357	
Cylinder #	Old Pressure	New Pressure	Chatter	Spray	Leakage
1	1450	1750	Good	Good	Okay
2	1500	1750	Good	Good	Okay
3	1500	1750	Good	Good	Okay
4	1450	1750	Good	Good	Okay

Comment: None

The two 15kW generators (FZ60344 and FZ60357) had their injectors removed. The two piece body on one injector was loose which caused a fuel leak into the injector bore and deposited large amounts of carbon. The internal components of this injector also had heavy carbon deposits. The injectors for both engines were pressure checked. The spec was 1750 psi, but the injectors measured between 1450 and 1575. All injectors were cleaned and adjusted to meet the spec. After reinstallation, both generators ran smooth at no load conditions.

Table 8. 15kW Injector Reconditioning (B units)

Model:	MEP-804B (15kW)		Serial:	FZ61920	
Cylinder #	Old Pressure	New Pressure	Chatter	Spray	Leakage
1	3000	3275	Good	Good	Okay
2	3025	3275	Good	Good	Okay
3	2950	3275	Good	Good	Okay
4	2875	3275	Good	Good	Okay

Comment: Pintle #4 was cleaned and polished.

Model:	MEP-804B (15kW)		Serial:	FZ61946	
Cylinder #	Old Pressure	New Pressure	Chatter	Spray	Leakage
1	3000	3275	Good	Good	Okay
2	2925	3275	Good	Good	Okay
3	3100	3275	Good	Good	Okay
4	3000	3275	Good	Good	Okay

Comment: None

The two 15kW generators (FZ61920 and FZ61946) had their injectors removed. While there were no indications of poor performance during the environmental testing, the injectors for both units were pressure checked. The spec was 3275 psi, but the injectors measured between 2875 and 3100. All injectors were cleaned and adjusted to meet the spec. After reinstallation, both generators ran smooth at no load conditions.

Table 9. 30kW Injector Reconditioning

Model:	MEP-805B (30kW)		Serial:	HX37762	
Cylinder #	Old Pressure	New Pressure	Chatter	Spray	Leakage
1	3150	3650	Good	Good	Okay
2	3175	3650	Good	Good	Okay
3	3250	3650	Good	Good	Okay
4	3200	3650	Good	Good	Okay

Comment: None

Model:	MEP-805B (30kW)		Serial:	HX37756	
Cylinder #	Old Pressure	New Pressure	Chatter	Spray	Leakage
1	3150	3650	Good	Good	Okay
2	3200	3650	Good	Good	Okay
3	3150	3650	Good	Good	High
4	3050	3650	Good	Good	High

Comment: Pintles are worn. Suggest injector replacement.

The 30kW generator (HX37756) that exhibited issues during the high temperature test ran smooth when it was test fired at TFLRF, but the injectors from both units were removed for inspection and reconditioning. The spec was 3650 psi, but the injectors measured between 3050 and 3175. All injectors were cleaned and adjusted to meet the spec. After reinstallation, both generators ran smooth at no load conditions.

While the exact cause of the broad scope injector deterioration is unknown, it is more likely to have occurred slowly over the course of the previous 1500 hour durability test program (report ADA 569977) than suddenly during the 4 to 8 hour environmental test. One possibility may be that the severe environmental conditions exacerbated existing normal wear on the hardware to a point that individual unit's performance suffered.

6.0 ENVIRONMENTAL TESTING (HOT AND COLD)

The hot and cold environmental testing of the generators was performed at Environmental Testing Laboratory in Dallas, Texas from March 4, 2013 to March 22, 2013. This was the only commercially available facility with the capability to run the generators at full load while remaining completely enclosed at -50 °F for the full duration of the 8 hour test.

6.1 Method 710.1: 125 Fahrenheit

For this test, Method 608.1 was also performed to determine the short term transient response at elevated temperatures. All of the data for these tests is located in Appendix A.

The hot testing was carried out at the prescribed temperature of 125 °F. As an item of interest, the oil used for the hot testing was the same as the cold testing, which is the current arctic oil MIL-PRF-46167D. There were no issues with oil pressure running the short duration test at this elevated ambient temperature.

There were some hot restart issues with the 15kW and 30kW generators. When attempting to restart after the three minute hot-stop shut down, the high coolant temperature indicator would prevent the generator from restarting. This was due to latent heat from the generator soaking back into the already stressed cooling system. The solution was to wait an additional 5-10 minutes (against the test protocol) to allow the generator to cool down before restarting.

An additional cooling problem occurred with the 100kW generator. Due to the high ambient temperature, the steady state full load was limited to 75% of the rated load. While operating at 100% load, after 12 minutes into the warm-up period the generator shut down due to high coolant temperature (235 °F). The maximum steady state load was reduced to 75kW and the coolant temperature stabilized at 221 °F. The root cause of the high coolant temperature is currently unknown, but the age of the generator may have been a factor.

No problems were noticed while the environmental chamber testing was on-going, but upon review of the data, a 400 °F discrepancy was found between the hottest and coolest exhaust gas temperature while the 100kW generator was at a no load condition. This was indicative of leaky injectors. The root cause was suspected to be normal wear from the 1500 hour endurance test performed at TFLRF and an unknown number of hours and test programs performed prior to delivery at TFLRF.

After the environmental testing, the 100kW, serial number 100013, was retired from this program due to bad injectors. The injectors themselves were not expensive ($300-$500 range) to replace, but the additional man hours to service them were not in the budget. Due to the excellent packaging of the generator in its case, it was estimated that an additional 100 man hours would be required to replace the injectors.

Also during the hot testing there were some fueling issues with 2 of the generators. The 15kW (SN# FZ60344) which produced some black smoke near the end of the 1500 hour durability test, again produced black smoke at high load conditions. The exhaust gas temperature data showed significantly elevated temperatures as compared to its 15kW twin (SN# FZ60357) which ran

acceptably. It was unknown whether the problem was related to the injectors or the injection pump. The data from the hot test looked bad enough that the decision was made not to run this generator during the cold test.

The other generator that exhibited fuel system issues during the hot testing was the 30kW (SN# HX37756). This was the first time this generator exhibited unusual symptoms. During start up and steady state no-load operation the generator behaved erratically. The RPM was surging as if there was a misfire. The data did not show one cylinder to be significantly hotter or cooler than the others, but the temperatures of all 4 cylinders were very erratic together. After full load operation and load cycling, the erratic behavior did not reappear for the remainder of the hot test.

6.2 Method 701.1: -50 Fahrenheit

For this test, Method 608.1 was also performed to determine the short term transient response at arctic temperatures. All of the data for these tests is located in Appendix B.

Overall, the cold testing was more problematic than the hot testing, but most of the issues were related to the coolant. The coolant used to fill the generators was a 50/50 ethylene glycol and water mix. For arctic conditions, a 60/40 glycol/water mix was supposed to be used. This was discovered after the generators were in the environmental chamber at -50 °F and the auxiliary heaters failed to start. Due to the time constraints of test facility, a decision was made to perform the cold soak at -20 °F, start the units, and then rapidly cool the chamber down to -50 °F during the 15 minute no load warm up period. This would allow the auxiliary heaters to operate prior to start, and the generator would then be operated on test at the prescribed temperature. The only portion of the test protocol not met was the engine cranking conditions, but owing to the high cetane value of the fuel, this was expected to perform better than the average JP-8 fuel.

Although each of the auxiliary heaters was tested at TFLRF ambient conditions prior to shipment, three of the nine failed to start or stay running (at -20 °F) for a variety of reasons listed here.

10kW #FZ35055

Code 11: Under-voltage shutdown. Extra batteries were brought in to fix this.

Code 17: Overheat with excessive temperature. Unit was allowed to cool down for 30 minutes and restarted normally.

15kW #FZ61920

Code 14: Potential overheat detected. All further attempts to use the heater failed.

15kW #FZ61946

Code 52: No start, Safety time exceeded.

Code 54: Flame cutout in high mode. All further attempts to use the heater failed.

100kW #100013

No indications of problem on the display, but the auxiliary pump turned on, the flame lit off, it ran for 30 seconds and shut down. All further attempts to use the heater failed.

For the three generators which did not have a functioning auxiliary heater to warm them up prior to starting, they were cold-started successfully at -20 °F without any starting aids (i.e., ether, intake pre heaters, etc.). The root cause of the heater failures is unknown, but with an observed 30% failure rate, further investigations may be needed to verify operability with the fuel used in this program.

The 30kW generator which experienced some initial problems during the hot test did not complete the cold test due to the #4 cylinder producing excessive temperature and large amounts of smoke. Just after the start of the short term transient portion of the cold test, the exhaust temperature of the #4 cylinder jumped by 200 °F at full power and did not dip below 800 °F once the load was removed. This was indicative of a stuck open or broken injector, so the test was aborted before more damage could be inflicted on the generator.

The 10kW generator (SN# FZ35055) showed signs of a sticky or stuck closed injector at no load conditions. At rated power the generator performed as expected, but at no load, the exhaust temperature of cylinder #4 cooled to just 80 °F, which was in line with the coolant temperature and indicative that no combustion was occurring.

7.0 FUEL CONSUMPTION TESTING

For this test, Method 670.1 was performed to evaluate the fuel consumption rates of the generators. While the fuel consumption results can be seen in Table 10 below, all of the data for these tests can be found in Appendix C.

There was some difficulty in keeping the 15kW generator, MEP804B #FZ61920, running and on load during the 4 hour fuel consumption test. The engine seemed to be surging irregularly as if one cylinder would misfire on occasion. A root cause is unknown, but during the reconditioning of the fuel system the injector pintle on cylinder #4 was cleaned and polished due to excess gum. All of the other generators completed the fuel consumption testing without further incident.

Table 10. Fuel Consumption Results

MIL-STD-705c Method:			670.1
Serial Numbers of Units Tested	Output [kW]	Est. Fuel Consumption [gal/hr]	Measured Fuel Consumption [gal/hr]
FZ35046	10	0.97	0.94
FZ35055		0.97	0.98
FZ60344	15	1.5	1.6
FZ60357		1.5	1.5
FZ61920	15	1.2	1.6
FZ61946		1.2	1.4
HX37756	30	2.43	2.76
HX37762		2.43	2.91

The estimated values of fuel consumption were pulled from each unit's operating manual. It was expected that the low fuel density would drive volumetric fuel consumption higher across the board. It was also expected that not all of the units would meet their target values simply due to the number of hours accumulated. Each unit tested had between 1500 and 2000 hours of runtime, largely as a result of the previous durability program [2]. This hour accumulation had the potential to affect fuel consumption due to wear in the fuel system, and wear elsewhere in the engine. The units (FZ35046, FZ61920, HX37762), with large fuel consumption discrepancies were also the ones exhibiting rough operation after reconditioning their injectors. And after

viewing the results of the ambient stability testing were removed from the program prior to the altitude simulation tests. Please refer back to Tables 4 and 5 for a listing of completed tests.

8.0 ELECRICAL CHARACTERISTICS TESTING AT AMBIENT CONDITIONS

All of the data from the following three test methods can be found in Appendix D.

8.1 Method 608.1: Frequency and Voltage Regulation, Stability and Transient Response Test (Short Term)

Each of the eight generator units (10kW through 30kW) completed this test. The following three charts (Figures 2 through 4) are electrical plots from one of the 10kW units. Each test generated similar data.

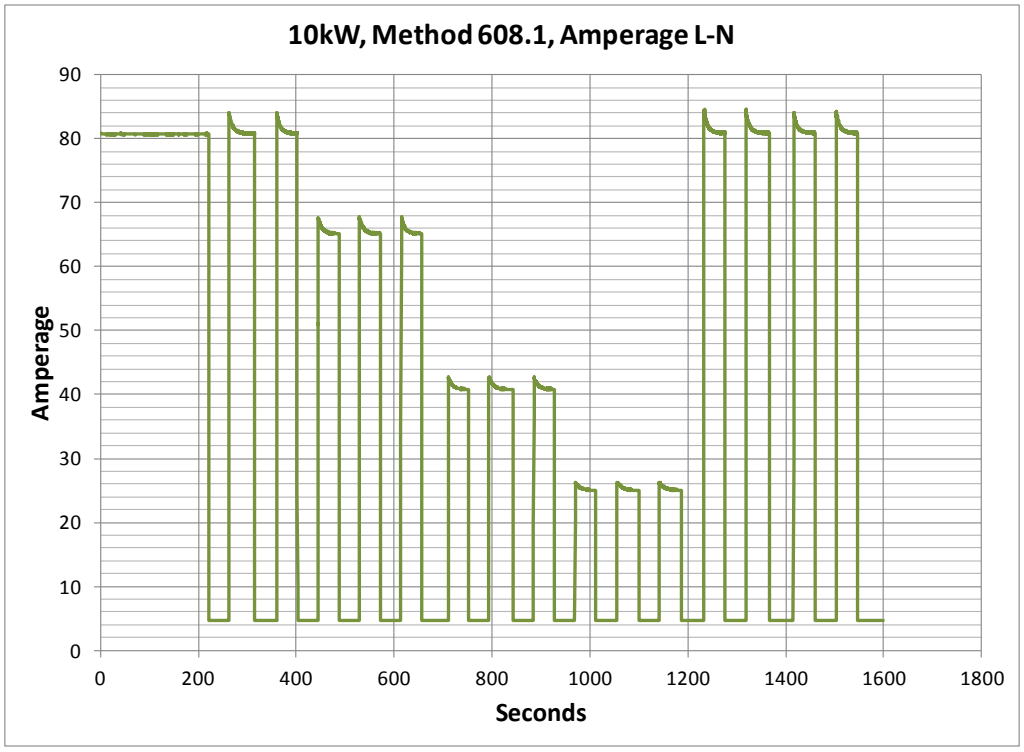

Figure 2. Example of Current Response for Method 608.1

For this method, load is the controlling factor. The load is cycled from maximum rated power to no load, three times each, and in changing increments of 25% rated load. The unit's electrical response is then plotted and analyzed.

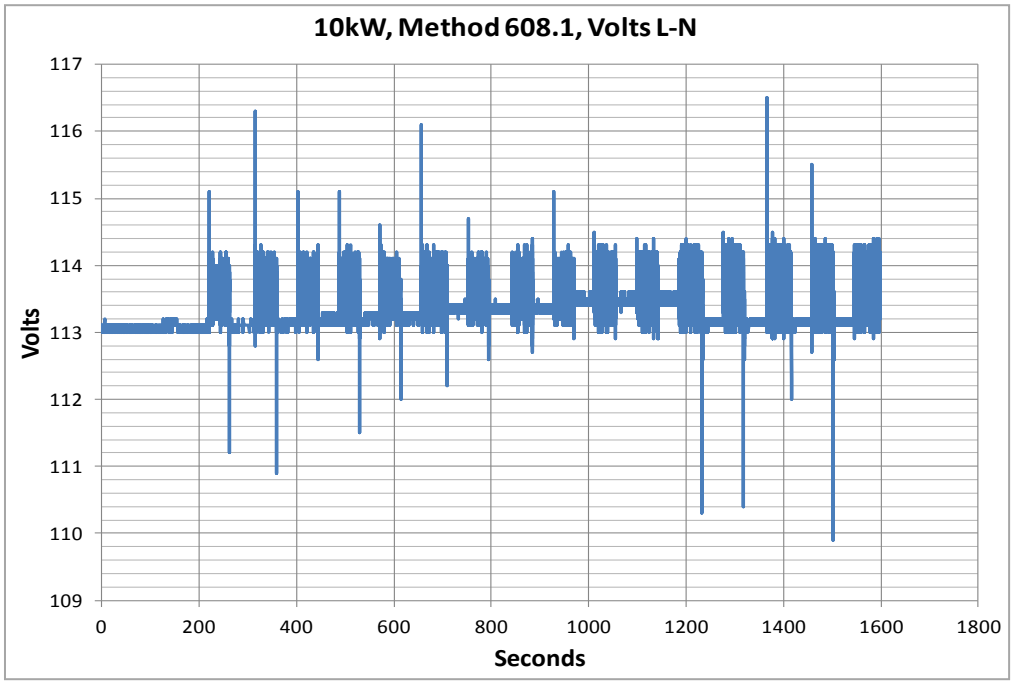

Figure 3: Example of Voltage Response for Method 608.1

At each load step, and each load change, the voltage response to a load input is analyzed. Some of the parameters measured are voltage excursion (addition or subtraction from the mean), excursion recovery time, steady state variation, and stepwise regulation.

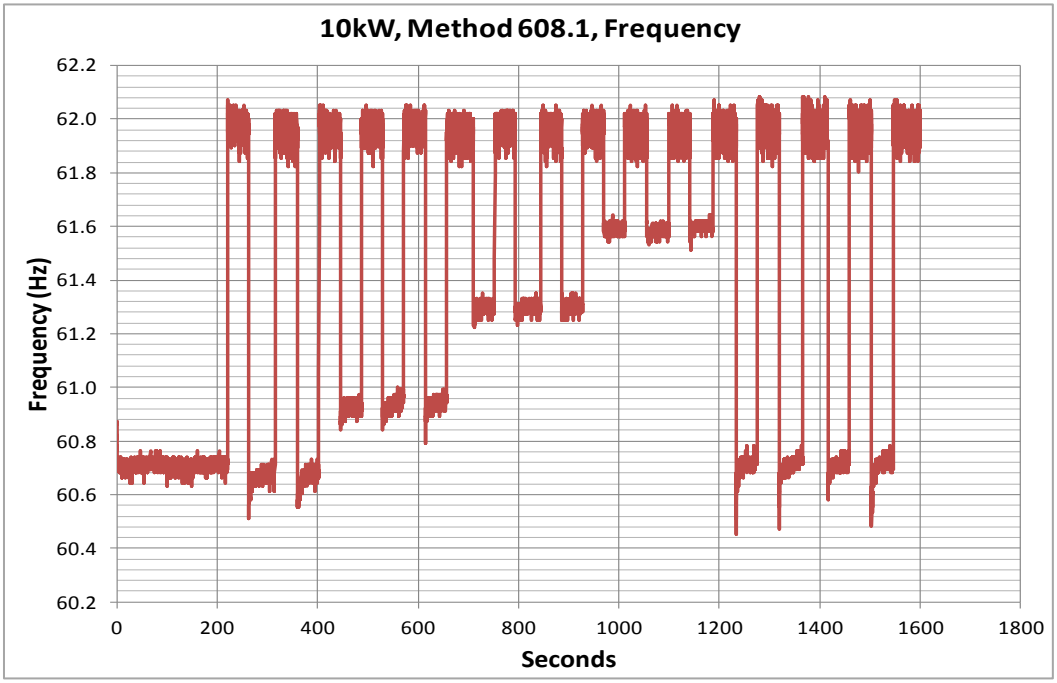

Figure 4: Example of Frequency Response for Method 608.1

At each load step, and each load change, the frequency response to a load input is analyzed. Some of the parameters measured are frequency excursion (addition or subtraction from the mean), excursion recovery time, steady state variation, and stepwise regulation.

8.2 Method 608.2: Frequency and Voltage Stability Test (Long Term)

Each of the eight generator units (10kW through 30kW) completed this test. This was a simple two step test (rated load, and no load), where electrical characteristics were statistically compiled for both the first minute of each load step, and the entire 4 hour duration of the load step. There were no issues running the generators during this testing.

8.3 Method 630.1: Parallel Operating Test

Each of the six generator units (15kW through 30kW) completed this test. The Parallel Operation Test utilized a shortened version of both the Short and Long Term Transient Tests.

Two units of equal generation capacity were linked together via a communication cable, and their load lines were connected to the same load source. The 15kW unit mentioned in section 7,

again exhibited rough operation and as a result, the data was largely unintelligible for both it and it's companion (15kW #FZ61946). The other 4 units ran the test without any issues. The actual process of splitting the load evenly proved troublesome, and lead to some large load imbalances, which is evident in the analyzed data.

This method asks for data to be analyzed similarly to Methods 608.1 and 608.2, in addition to calculations for active power division, active power exchange, and load current pulsation. It is unknown how much of the acceptance of this method is dependent on robust controls, and how much is dependent on highly skilled operators.

9.0 SIMULATED ALTITUDE TESTING

The data from the following test method can be found in Appendix E.

The altitude testing was performed as close to the instructions in Method 720.1 as possible. The generators were moved to a building on SwRI campus for altitude simulation in a test cell that normally does altitude work on very large engines. This test cell uses an extremely large positive displacement pump to draw a vacuum on a large manifold which is connected to the engine's intake and exhaust streams. The manifold is regulated for temperature and pressure to meet altitude requirements from sea-level to 12,000 feet.

Of the five remaining operable units, four completed the test successfully. One of the 15kW (#FZ61946) units suffered an instrumentation failure which caused a complete data loss. Due to the high cost of running in the altitude simulation test cell, it was decided not to re-run that unit.

In general, the generators which were naturally aspirated struggled to meet the 75% load points at 10,000 ft without overheating (or shutting down on high coolant temperature alarm). The generators that were turbocharged had no problems running at 100% or even 110% overload conditions at 10,000 ft simulated altitude.

Unfortunately, for all tests, the operator used the load selector switch on the generator to toggle load steps for Method 608.1 instead of the switch on the load bank. This resulted in null data present for half of the operating time. So no calculations for Method 608.1 were possible.

9.1 Method 720.1: 4,000 Feet

For this test, Methods 608.1 and 640.1 were also performed to determine the short term transient response and maximum power output at reduced atmospheric pressure equivalent to 4,000 feet. All of the data for these tests is located in Appendix E. Mechanically speaking, each of the generator units performed this test successfully. However, the instrumentation failure of the 15kW prevented data from being recorded.

9.2 Method 720.1: 10,000 Feet

For this test, Methods 608.1 and 640.1 were also performed to determine the short term transient response and maximum power output at reduced atmospheric pressure equivalent to 10,000 feet. All of the data for these tests is located in Appendix E.

There were some issues when operating the naturally aspirated 15kW units. For the #FZ60344 unit, the coolant temperature alarm sounded the entire time the unit was at 10,000 ft equivalent. In order to complete the test, the battle short switch was engaged to bypass the alarm. In addition, there was an overload cutout when rated load was applied. This limited the test to the 75% power level. Part way through the test, the auxiliary power outlet (115V) fuse blew, preventing that portion of the test from completing. According to the test method, the auxiliary power outlet should be loaded to 75% of rated current capacity. This was done with a small space heater that had a variable output dial.

For the 15kW unit, #FZ60357, the auxiliary power outlets ceased to function (unknown root cause) at the beginning of the test. This unit also struggled to make rated power.

10.0 SUMMARY

Out of the nine units that started this program, five of the units were operational at the end. As far as TFLRF staff can discern, there were no direct fuel related failures as a result of this testing. However, like the previous 1500 hour durability program that was run on these units [2], there continued to be numerous hardware and electrical related issues that plagued certain generators.

On an additional non-fuel related item, both of the 30kW units suffered failures of the user interface. It is suspected that during some portion of the environmental testing, the cursor buttons stopped working on one unit, and the upper half of the monitor screen stopped displaying on the other unit. It may be that the extreme temperatures, coupled with some rogue moisture condensation played a role in these failures.

While the four generator units that suffered failures did so on one of the tests in this program, it is not suspected that the failures were sudden onset. The most likely scenario is that during the course of the previous 1500 hour durability study, the units suffered from a normal amount of wear in the fuel injection systems. This normal wear was then exacerbated during the short environmental testing to the point that operability problems became evident.

The data presented in the appendices was processed according to the individual methods listed in MIL-STD 705c. In addition, generator temperature and pressure data has been tabulated for each unit and method run. According to each method, the results of the test should be compared with the requirements of the individual procurement documents.

Overall, the alternative fuel used here (a 50/50 volumetric blend of HRJ-8 and JP-8) performed adequately. There was no noticeable power loss at ambient conditions, there were no noticeable cold or hot start issues on the generators, and the de-rated power at 10,000 ft simulated altitude was in line with expected performance.

11.0 REFERENCES

1. Military Standard: Generator Sets, Engine Driven, Methods of Tests and Instructions, MIL-STD-705C, April 1989
2. Hansen, Gregory; Frame, Edwin; Sattler, Eric, “Generator Set Durability Testing”, Report# ADA569977, January, 2012

Appendix A

Summary Data from Method 710.1: Environmental Testing at 125 Fahrenheit

Model No. MEP 803A – 10kW

Serial No. FZ35046

Steady State Full Load Hot Test 10kW FZ35046								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	125.5	0.10		Baro psia	psia	14.16	1.152
Filter Housing	F	128.1	0.22		Air Filter psia	psia	14.58	0.003
Inlet Manifold	F	128.8	0.19		Int Man psia	psia	14.43	0.176
Exh Cyl 1	F	600.3	1.75		Exh Man psia	psia	14.92	1.293
Exh Cyl 2	F	677.8	1.27		Exh Muff psia	psia	14.61	0.001
Exh Cyl 3	F	845.7	1.98					
Exh Cyl 4	F	797.0	2.30		Power	kW	9.6	
Exh Manifold	F	777.7	1.02		Voltage	V	118.1	0.05
After Muffler	F	679.4	0.56		Current	A	81.2	0.06
Outlet Vent	F	169.7	0.17		Frequency	Hz	59.0	0.02
Fuel Inlet	F	137.9	0.18					
Fuel Return	F	193.4	0.34					
Oil Gallery	F	238.8	0.47					
Oil Sump	F	242.5	0.61					
Radiator 1	F	153.4	0.18					
Radiator 2	F	144.4	0.21					
Radiator 3	F	151.3	0.23					
Radiator 4	F	146.3	0.23					
Coolant Inlet	F	207.7	0.32					
Coolant Outlet	F	216.4	0.34					
Aux Heater In	F	206.7	0.25					
Aux Heater Out	F	121.6	0.39					
Instrument Panel	F	129.2	0.06					
Voltage Reg	F	99.6	0.07					
Stator Frame	F	131.1	0.16					
Stator Housing	F	168.6	0.40					
Battery 1	F	123.8	0.22					
Battery 2	F	123.6	0.14					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.15	0.25
1-2		0.80		0.67	0.30			2.42	3.00		0.30		0.50	0.50		
2						0.20	0.17								0.30	0.50
2-3	0.40		0.33		0.20			2.42	3.17	0.15		0.25		0.25		
3						0.10	0.08								0.10	0.17
3-4		0.80		0.67	0.30			2.42	3.00		0.15		0.25	0.50		
4						0.20	0.17								0.20	0.33
4-5	0.70		0.58		0.30			2.42	3.17	0.30		0.50		0.80		
5						0.10	0.08								0.15	0.25
5-6		0.80		0.67	0.30			2.33	3.00		0.15		0.25	0.60		
6						0.20	0.17								0.25	0.42
7-8	1.20		1.00		0.50			1.92	2.50	0.30		0.50		1.00		
8						0.20	0.17								0.15	0.25
8-9		0.70		0.58	0.60			1.92	2.50		0.20		0.33	0.40		
9						0.20	0.17								0.25	0.42
9-10	1.20		1.00		0.40			1.92	2.50	0.35		0.58		0.60		
10						0.20	0.17								0.20	0.33
10-11		0.80		0.67	0.30			1.92	2.50		0.10		0.17	0.30		
11						0.20	0.17								0.20	0.33
11-12	1.30		1.08		0.40			1.92	2.50	0.30		0.50		0.90		
12						0.20	0.17								0.25	0.42
12-13		0.30		0.25	0.30			1.92	2.33		0.10		0.17	0.40		
13						0.40	0.33								0.10	0.17
14-15	0.30		0.25		0.30			1.25	1.50	0.10		0.17		0.50		
15						0.20	0.17								0.20	0.33
15-16		1.10		0.92	0.50			1.17	1.50		0.10		0.17	0.40		
16						0.40	0.33								0.15	0.25
16-17	1.30		1.08		0.60			1.25	1.50	0.10		0.17		0.80		
17						0.20	0.17								0.15	0.25
17-18		0.90		0.75	0.50			1.17	1.50		0.05		0.08	0.50		
18						0.30	0.25								0.15	0.25
18-19	1.00		0.83		0.25			1.25	1.50	0.10		0.17		0.20		
19						0.20	0.17								0.20	0.33
19-20		1.30		1.08	0.70			1.17	1.42		0.10		0.17	0.50		
20						0.20	0.17								0.10	0.17
21-22	0.70		0.58		0.40			0.75	0.83	0.05		0.08		0.60		
22						0.20	0.17								0.10	0.17
22-23		0.80		0.67	0.20			0.79	0.83	0.10			0.00	0.40		
23						0.20	0.17								0.15	0.25
23-24	0.80		0.67		0.40			0.75	0.92	0.05		0.08		0.40		
24						0.20	0.17								0.20	0.33
24-25		0.40		0.33	0.40			0.75	0.75		0.00		0.00	0.20		
25						0.20	0.17								0.15	0.25
25-26	0.70		0.58		0.50			0.75	0.83	0.10		0.17		0.30		
26						0.20	0.17								0.15	0.25
26-27		0.40		0.33	0.40			0.75	0.83		0.05		0.08	0.40		
27						0.20	0.17								0.10	0.17
28-29	0.50		0.42		0.50			2.33	2.75	0.10		0.17		0.80		
29						0.20	0.17								0.20	0.33
29-30		0.70		0.58	0.40			2.33	2.83		0.15		0.25	0.60		
30						0.20	0.17								0.15	0.25
30-31	0.50		0.42		0.60			2.33	2.92	0.10		0.17		0.80		
31						0.20	0.17								0.20	0.33
31-32		0.40		0.33	0.50			2.33	2.83		0.10		0.17	1.00		
32						0.20	0.17								0.10	0.17
32-33	0.50		0.42		0.60			2.33	2.83	0.15		0.25		1.10		
33						0.20	0.17								0.25	0.42
33-34		0.50		0.42	0.60			2.33	2.83		0.10		0.17	0.80		
34						0.20	0.17								0.15	0.25

Model No. MEP 803A – 10kW

Serial No. FZ35055

Steady State Full Load Hot Test 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	121.3	0.19		Baro psia	psia	14.60	0.003
Filter Housing	F	121.7	0.52		Air Filter psia	psia	14.57	0.000
Inlet Manifold	F	127.2	0.22		Int Man psia	psia	14.44	0.004
Exh Cyl 1	F	756.3	1.22		Exh Man psia	psia	15.33	0.006
Exh Cyl 2	F	755.2	1.17		Exh Muff psia	psia	14.66	0.002
Exh Cyl 3	F	726.8	0.94					
Exh Cyl 4	F	722.4	0.83		Power	kW	9.6	
Exh Manifold	F	758.0	0.86		Voltage	V	118.0	0.03
After Muffler	F	667.7	0.46		Current	A	81.0	0.05
Outlet Vent	F	168.7	0.43		Frequency	Hz	58.7	0.02
Fuel Inlet	F	134.4	0.28					
Fuel Return	F	206.3	0.36					
Oil Gallery	F	238.9	0.56					
Oil Sump	F	241.5	0.56					
Radiator 1	F	145.2	0.27					
Radiator 2	F	149.3	0.25					
Radiator 3	F	149.1	0.23					
Radiator 4	F	147.3	0.36					
Coolant Inlet	F	204.1	0.38					
Coolant Outlet	F	210.9	0.34					
Aux Heater In	F	206.2	0.35					
Aux Heater Out	F	122.3	0.22					
Instrument Panel	F	127.5	0.09					
Voltage Reg	F	142.3	0.30					
Stator Frame	F	129.7	0.35					
Stator Housing	F	155.4	0.59					
Battery 1	F	110.6	0.27					
Battery 2	F	116.1	0.33					

Load Step	Voltage							Regulation		Frequency						
	Max Volt Excursion		Excursion %		Rec Time	Variation				Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.10	0.17
1-2		0.40		0.33	0.90			2.50	3.33		0.35		0.58	1.20		
2						0.20	0.17								0.12	0.20
2-3	0.60		0.50		1.20			2.50	3.50	0.62		1.03		1.80		
3						0.20	0.17								0.18	0.30
3-4		0.40		0.33	1.10			2.50	3.33		0.31		0.52	1.40		
4						0.20	0.17								0.09	0.15
4-5	1.70		1.42		1.90			2.50	3.33	0.95		1.58		1.80		
5						0.10	0.08								0.16	0.27
5-6		0.70		0.58	1.10			2.50	3.33		0.35		0.58	1.50		
6						0.10	0.08								0.12	0.20
7-8	0.40		0.33		0.80			2.08	2.83	0.25		0.42		1.40		
8						0.10	0.08								0.20	0.33
8-9		1.40		1.17	1.20			2.00	2.67		0.55		0.92	1.30		
9						0.10	0.08								0.12	0.20
9-10	0.80		0.67		0.80			2.08	2.67	0.65		1.08		1.60		
10						0.10	0.08								0.11	0.18
10-11		1.40		1.17	0.90			2.00	2.58		0.59		0.98	0.70		
11						0.10	0.08								0.14	0.23
11-12	0.80		0.67		1.00			2.08	2.75	0.60		1.00		1.60		
12						0.10	0.08								0.13	0.22
12-13		1.40		1.17	1.00			2.00	2.57		0.55		0.92	1.20		
13						0.10	0.08								0.12	0.20
14-15	1.00		0.83		0.40			2.17	1.70	0.40		0.67		1.50		
15						0.20	0.17								0.10	0.17
15-16		1.00		0.83	0.80			1.25	1.58		0.38		0.63	1.20		
16						0.10	0.08								0.14	0.23
16-17	1.00		0.83		0.60			1.33	1.85	0.33		0.55		1.20		
17						0.10	0.08								0.13	0.22
17-18		1.00		0.83	0.80			1.33	1.70		0.40		0.67	1.00		
18						0.10	0.08								0.11	0.18
18-19	1.10		0.92		0.50			1.33	1.83	0.38		0.63		1.30		
19						0.10	0.08								0.16	0.27
19-20		0.80		0.67	0.90			1.25	1.73		0.27		0.45	1.00		
20						0.20	0.17								0.10	0.17
21-22	0.60		0.50		0.40			0.83	1.00	0.15		0.25		0.70		
22						0.10	0.08								0.12	0.20
22-23		0.50		0.42	0.40			0.83	1.23		0.15		0.25	0.60		
23						0.20	0.17								0.12	0.20
23-24	0.80		0.67		0.50			0.83	1.12	0.10		0.17		0.70		
24						0.10	0.08								0.13	0.22
24-25		0.60		0.50	0.50			0.83	1.18		0.40		0.67	0.80		
25						0.20	0.17								0.08	0.13
25-26	0.70		0.58		0.50			0.83	1.12	0.13		0.22		0.80		
26						0.20	0.17								0.10	0.17
26-27		0.60		0.50	0.50			0.83	1.08		0.50		0.83	0.70		
27						0.20	0.17								0.12	0.20
28-29	0.80		0.67		1.10			1.67	3.10	0.55		0.92		1.40		
29						0.10	0.08								0.20	0.33
29-30		0.40		0.33	0.90			1.58	3.25		0.40		0.67	0.75		
30						0.20	0.17								0.11	0.18
30-31	0.90		0.75		0.60			1.67	3.17	0.69		1.15		1.30		
31						0.20	0.17								0.18	0.30
31-32		0.80		0.67	0.90			1.58	3.25		0.35		0.58	1.20		
32						0.20	0.17								0.11	0.18
32-33	0.80		0.67		1.00			0.83	3.27	0.65		1.08		1.30		
33						0.20	0.17								0.13	0.22
33-34		0.80		0.67	1.00			1.63	3.17		0.43		0.72	1.00		
34						0.20	0.17								0.12	0.20

Model No. MEP 804A – 15kW

Serial No. FZ60344

Steady State Full Load Hot Test 15kW FZ60344								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	120.8	0.78		Baro psia	psia	14.52	0.000
Filter Housing	F	125.4	0.51		Air Filter psia	psia	14.46	0.000
Inlet Manifold	F	131.4	0.24		Int Man psia	psia	14.28	0.005
Exh Cyl 1	F	798.1	1.69		Exh Man psia	psia	14.87	0.009
Exh Cyl 2	F	866.7	2.54		Exh Muff psia	psia	14.55	0.005
Exh Cyl 3	F	854.6	2.25					
Exh Cyl 4	F	700.7	1.28		Power	kW	15.4	
Exh Manifold	F	861.0	1.83		Voltage L1	V	118.0	0.15
After Muffler	F	605.1	0.48		Voltage L2	V	118.1	0.16
Outlet Vent	F	188.0	0.17		Voltage L3	V	118.2	0.16
Fuel Inlet	F	124.9	0.10		Current L1	A	43.5	0.06
Fuel Return	F	208.5	0.08		Current L2	A	44.0	0.06
Oil Gallery	F	216.1	0.45		Current L3	A	42.6	0.06
Oil Sump	F	220.3	0.51		Frequency L1	Hz	59.7	0.02
Radiator 1	F	150.7	0.27		Frequency L2	Hz	62.1	0.02
Radiator 2	F	156.3	0.29		Frequency L3	Hz	59.9	0.02
Radiator 3	F	148.7	0.35					
Radiator 4	F	149.5	0.41					
Coolant Inlet	F	197.8	0.20					
Coolant Outlet	F	210.5	0.11					
Aux Heater In	F	208.8	0.11					
Aux Heater Out	F	122.9	0.07					
Instrument Panel	F	132.3	0.18					
Voltage Reg	F	134.7	0.10					
Stator Frame	F	128.9	0.47					
Stator Housing	F	127.3	0.44					
Battery 1	F	129.1	0.15					
Battery 2	F	127.4	0.24					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.30	0.25								0.11	0.18
1-2		2.20		1.83	0.40			0.25	0.03		1.19		1.98	0.60		
2						0.00	0.00								0.05	0.08
2-3	2.10		1.75		0.50			0.25	0.17	1.10		1.83		0.90		
3						0.40	0.33								0.11	0.18
3-4		1.80		1.50	0.50			0.25	0.08		1.30		2.17	0.80		
4						0.10	0.08								0.13	0.22
4-5	1.80		1.50		0.40			0.33	0.05	1.17		1.95		0.70		
5						0.40	0.33								0.12	0.20
5-6		1.90		1.58	0.60			0.25	0.08		1.30		2.17	0.60		
6						0.10	0.08								0.05	0.08
7-8	1.10		0.92		0.50			0.17	0.00	0.87		1.45		0.50		
8						1.70	1.42								0.20	0.33
8-9		1.50		1.25	0.40			0.17	0.00		1.62		2.70	0.80		
9						0.20	0.17								0.08	0.13
9-10	1.60		1.33		0.50			0.17	0.00	0.80		1.33		0.50		
10						1.80	1.50								0.23	0.38
10-11		1.60		1.33	0.40			0.17	0.00		1.60		2.67	0.70		
11						0.20	0.17								0.09	0.15
11-12	1.60		1.33		0.40			0.25	0.00	0.82		1.37		1.30		
12						1.50	1.25								0.30	0.50
12-13		1.60		1.33	0.20			0.17	0.03		1.68		2.80	0.50		
13						0.10	0.08								0.10	0.17
14-15	0.90		0.75		0.40			0.25	0.00	5.10		8.50		1.70		
15						1.20	1.00								0.53	0.88
15-16		0.90		0.75	0.30			0.17	0.00		1.00		1.67	0.40		
16						0.10	0.08								0.11	0.18
16-17	1.10		0.92		0.50			0.17	0.00	1.08		1.80		1.70		
17						1.50	1.25								0.29	0.48
17-18		0.30		0.25	0.80			0.17	0.03		1.78		2.97	1.30		
18						0.10	0.08								0.10	0.17
18-19	0.80		0.67		0.60			0.17	0.00	1.18		1.97		2.00		
19						1.40	1.17								0.25	0.42
19-20		1.10		0.92	0.60			0.25	0.08		1.28		2.13	1.40		
20						0.10	0.08								0.12	0.20
21-22	0.20		0.17		0.10			0.17	0.00	0.44		0.73		0.70		
22						0.00	0.00								0.07	0.12
22-23		0.30		0.25	0.10			0.08	0.00		0.38		0.63	0.80		
23						0.00	0.00								0.07	0.12
23-24	0.70		0.58		0.10			0.08	0.00	0.50		0.83		0.70		
24						0.00	0.00								0.06	0.10
24-25		0.20		0.17	0.10			0.08	0.00		0.27		0.45	1.00		
25						0.00	0.00								0.07	0.12
25-26	0.20		0.17		0.10			0.08	0.00	0.49		0.82		1.10		
26						0.10	0.08								0.08	0.13
26-27		0.30		0.25	0.10			0.08	0.00		0.39		0.65	0.80		
27						0.00	0.00								0.10	0.17
28-29	2.30		1.92		1.20			0.25	0.00	1.19		1.98		1.50		
29						0.40	0.33								0.10	0.17
29-30		2.10		1.75	0.50			0.25	0.00		1.37		2.28	1.10		
30						0.10	0.08								0.10	0.17
30-31	2.20		1.83		0.60			0.33	0.07	1.13		1.88		1.20		
31						1.60	1.33								0.36	0.60
31-32		1.90		1.58	0.50			0.33	0.00		1.78		2.97	2.10		
32						0.20	0.17								0.07	0.12
32-33	2.10		1.75		0.90			0.33	0.00	5.48		9.13		1.80		
33						1.60	1.33								0.32	0.53
33-34		2.70		2.25	0.50			0.33	0.00		1.88		3.13	1.20		
34						0.10	0.08								0.06	0.10

Model No. MEP 804A – 15kW

Serial No. FZ60357

Steady State Full Load Hot Test 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	121.6	0.22		Baro psia	psia	14.50	0.162
Filter Housing	F	122.8	0.26		Air Filter psia	psia	14.49	0.007
Inlet Manifold	F	129.7	0.12		Int Man psia	psia	14.29	0.004
Exh Cyl 1	F	816.7	1.72		Exh Man psia	psia	14.83	0.017
Exh Cyl 2	F	908.1	2.66		Exh Muff psia	psia	14.59	0.001
Exh Cyl 3	F	879.0	2.59					
Exh Cyl 4	F	724.4	2.08		Power	kW	15.3	
Exh Manifold	F	871.1	2.25		Voltage L1	V	117.9	0.04
After Muffler	F	580.1	1.19		Voltage L2	V	117.9	0.03
Outlet Vent	F	187.3	0.14		Voltage L3	V	118.1	0.05
Fuel Inlet	F	125.1	0.25		Current L1	A	43.4	0.02
Fuel Return	F	208.5	0.11		Current L2	A	43.8	0.02
Oil Gallery	F	220.6	0.35		Current L3	A	42.5	0.02
Oil Sump	F	223.2	0.36		Frequency L1	Hz	59.8	0.02
Radiator 1	F	150.8	0.14		Frequency L2	Hz	62.1	0.02
Radiator 2	F	148.6	0.19		Frequency L3	Hz	59.9	0.02
Radiator 3	F	152.9	0.11					
Radiator 4	F	151.6	0.13					
Coolant Inlet	F	197.5	0.21					
Coolant Outlet	F	211.2	0.12					
Aux Heater In	F	208.3	0.12					
Aux Heater Out	F	123.4	0.28					
Instrument Panel	F	133.2	0.10					
Voltage Reg	F	139.9	0.15					
Stator Frame	F	128.8	0.13					
Stator Housing	F	129.8	0.17					
Battery 1	F	131.4	0.27					
Battery 2	F	130.4	0.16					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.15	0.25
1-2		2.40		2.00	0.50			0.25	0.00		0.32		0.53	0.90		
2						0.10	0.08								0.08	0.13
2-3	3.10		2.58		0.60			0.25	0.00	0.29		0.48		1.30		
3						0.20	0.17								0.17	0.28
3-4		1.30		1.08	0.60			0.33	0.03		1.34		2.23	1.00		
4						0.00	0.00								0.10	0.17
4-5	2.60		2.17		0.50			0.25	0.00	0.63		1.05		1.10		
5						0.10	0.08								0.12	0.20
5-6		1.70		1.42	0.60			0.25	0.03		1.31		2.18	1.10		
6						0.00	0.00								0.06	0.10
7-8	1.70		1.42		0.40			0.25	0.00	0.93		1.55		1.20		
8						0.10	0.08								0.09	0.15
8-9		1.30		1.08	0.60			0.25	0.00		0.97		1.62	1.20		
9						0.10	0.08								0.10	0.17
9-10	2.00		1.67		0.50			0.25	0.00	5.43		9.05		1.00		
10						0.10	0.08								0.11	0.18
10-11		0.90		0.75	0.50			0.25	0.00		1.00		1.67	1.10		
11						0.00	0.00								0.07	0.12
11-12	1.40		1.17		0.40			0.25	0.00	0.98		1.63		1.20		
12						0.10	0.08								0.11	0.18
12-13		0.80		0.67	0.50			0.25	0.00		0.98		1.63	1.00		
13						0.10	0.08								0.08	0.13
14-15	1.40		1.17		0.30			0.17	0.00	0.71		1.18		0.90		
15						0.10	0.08								0.09	0.15
15-16		0.50		0.42	0.60			0.17	0.00		0.57		0.95	1.00		
16						0.10	0.08								0.06	0.10
16-17	0.60		0.50		0.50			0.17	0.00	0.67		1.12		0.90		
17						0.10	0.08								0.08	0.13
17-18		0.50		0.42	0.50			0.17	0.00		0.83		1.38	1.00		
18						0.10	0.08								0.11	0.18
18-19	1.10		0.92		0.50			0.17	0.00	0.77		1.28		0.80		
19						0.10	0.08								0.14	0.23
19-20		0.50		0.42	0.60			0.17	0.00		0.72		1.20	0.90		
20						0.10	0.08								0.11	0.18
21-22	0.10		0.08		0.30			0.08	0.00	0.66		1.10		0.90		
22						0.10	0.08								0.09	0.15
22-23		0.20		0.17	0.40			0.08	0.00		0.61		1.02	0.90		
23						0.10	0.08								0.13	0.22
23-24	0.60		0.50		0.30			0.08	0.00	0.61		1.02		1.00		
24						0.10	0.08								0.15	0.25
24-25		0.20		0.17	0.60			0.08	0.00		0.57		0.95	0.80		
25						0.10	0.08								0.12	0.20
25-26	0.40		0.33		0.40			0.08	0.00	0.59		0.98		0.90		
26						0.10	0.08								0.13	0.22
26-27		0.10		0.08	0.30			0.08	0.00		0.62		1.03	0.80		
27						0.10	0.08								0.11	0.18
28-29	2.50		2.08		0.50			0.25	0.00	1.28		2.13		1.90		
29						0.10	0.08								0.13	0.22
29-30		2.30		1.92	0.60			0.25	0.00		1.35		2.25	1.10		
30						0.10	0.08								0.11	0.18
30-31	3.50		2.92		0.70			0.25	0.07	1.24		2.07		1.60		
31						0.20	0.17								0.14	0.23
31-32		2.40		2.00	0.50			0.25	0.00		1.31		2.18	0.90		
32						0.10	0.08								0.09	0.15
32-33	2.30		1.92		0.50			0.25	0.00	1.16		1.93		1.10		
33						0.10	0.08								0.14	0.23
33-34		1.60		1.33	0.60			0.25	0.00		1.34		2.23	0.90		
34						0.00	0.00								0.12	0.20

Model No. MEP 804B – 15kW

Serial No. FZ61920

Steady State Full Load Hot Test 15kW FZ61920								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	121.2	0.43		Baro psia	psia	13.56	1.735
Filter Housing	F	126.4	0.31		Air Filter psia	psia	14.46	0.273
Inlet Manifold	F	185.0	0.22		Int Man psia	psia	17.46	1.922
Exh Cyl 1	F	736.8	0.87		Exh Man psia	psia	17.32	2.108
Exh Cyl 2	F	743.7	0.58		Exh Muff psia	psia	13.96	1.468
Exh Cyl 3	F	751.9	1.00					
Exh Cyl 4	F	763.8	0.97		Power	kW	15.6	
Exh Manifold	F	797.6	0.63		Voltage L1	V	119.2	0.07
After Turbo	F	701.8	0.85		Voltage L2	V	119.2	0.08
After Muffler	F	536.7	0.87		Voltage L3	V	119.3	0.08
Outlet Vent	F	177.6	0.37		Current L1	A	43.8	0.04
Fuel Inlet	F	146.2	0.18		Current L2	A	44.3	0.04
Fuel Return	F	188.2	0.48		Current L3	A	43.0	0.05
Oil Gallery	F	182.5	0.58		Frequency L1	Hz	59.7	0.04
Oil Sump	F	230.9	0.70		Frequency L2	Hz	62.1	0.04
Radiator 1	F	152.7	0.23		Frequency L3	Hz	59.8	0.04
Radiator 2	F	151.3	0.28					
Radiator 3	F	94.7	0.20					
Radiator 4	F	102.3	0.21					
Coolant Inlet	F	185.0	0.40					
Coolant Outlet	F	193.0	0.44					
Aux Heater In	F	188.8	0.44					
Aux Heater Out	F	122.9	0.12					
Instrument Panel	F	110.7	0.15					
Voltage Reg	F	144.2	0.24					
Stator Frame	F	121.1	0.22					
Stator Housing	F	115.8	0.19					
Battery 1	F	124.4	0.09					
Battery 2	F	124.4	0.11					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.18	0.30
1-2		2.60		2.17	0.50			0.25	0.08		2.43		4.05	1.00		
2						0.10	0.08								0.11	0.18
2-3	2.00		1.67		0.70			0.25	0.05	2.87		4.78		1.80		
3						0.00	0.00								0.11	0.18
3-4		2.00		1.67	0.50			0.25	0.12		2.33		3.88	1.00		
4						0.10	0.08								0.16	0.27
4-5	3.70		3.08		0.90			0.25	0.05	2.72		4.53		1.60		
5						0.20	0.17								0.14	0.23
5-6		2.00		1.67	0.50			0.33	0.12		2.36		3.93	1.00		
6						0.20	0.17								0.34	0.57
7-8	1.80		1.50		0.50			0.25	0.03	2.56		4.27		1.70		
8						0.20	0.17								0.07	0.12
8-9		1.30		1.08	0.60			0.17	0.03		1.76		2.93	1.20		
9						0.30	0.25								0.21	0.35
9-10	1.40		1.17		0.80			0.17	0.08	2.55		4.25		1.60		
10						0.20	0.17								0.12	0.20
10-11		1.30		1.08	0.50			0.17	0.00		2.06		3.43	2.00		
11						0.20	0.17								0.17	0.28
11-12	1.40		1.17		0.50			0.17	0.00	2.70		4.50		2.20		
12						0.60	0.50								0.14	0.23
12-13		1.20		1.00	0.50			0.17	0.00		2.05		3.42	2.20		
13						0.60	0.50								0.20	0.33
14-15	1.00		0.83		0.30			0.08	0.00	1.63		2.72		2.20		
15						0.30	0.25								0.09	0.15
15-16		0.60		0.50	0.50			0.17	0.03		1.51		2.52	1.90		
16						0.10	0.08								0.22	0.37
16-17	1.80		1.50		0.60			0.17	0.00	1.91		3.18		1.70		
17						0.10	0.08								0.08	0.13
17-18		0.60		0.50	0.50			0.17	0.00		1.64		2.73	2.00		
18						0.10	0.08								0.15	0.25
18-19	1.40		1.17		0.60			0.17	0.00	1.75		2.92		1.70		
19						0.20	0.17								0.09	0.15
19-20		1.50		1.25	0.50			0.17	0.00		1.55		2.58	2.00		
20						0.20	0.17								0.18	0.30
21-22	0.30		0.25		0.40			0.00	0.00	1.03		1.72		1.60		
22						0.20	0.17								0.06	0.10
22-23		0.20		0.17	0.50			0.00	0.00		0.99		1.65	1.80		
23						0.20	0.17								0.23	0.38
23-24	0.20		0.17		0.40			0.08	0.00	0.98		1.63		1.60		
24						0.20	0.17								0.07	0.12
24-25		0.30		0.25	0.50			0.08	0.00		0.99		1.65	1.80		
25						0.10	0.08								0.20	0.33
25-26	0.10		0.08		0.30			0.08	0.00	1.12		1.87		1.50		
26						0.10	0.08								0.06	0.10
26-27		0.40		0.33	0.50			0.00	0.00		0.98		1.63	2.10		
27						0.20	0.17								0.40	0.67
28-29	2.40		2.00		1.10			0.25	0.05	3.16		5.27		2.30		
29						0.10	0.08								0.21	0.35
29-30		1.70		1.42	0.50			0.25	0.08		2.60		4.33	2.70		
30						0.20	0.17								0.21	0.35
30-31	3.30		2.75		0.50			0.25	0.07	3.00		5.00		2.10		
31						0.10	0.08								0.25	0.42
31-32		1.80		1.50	0.50			0.25	0.05		2.49		4.15	1.20		
32						0.10	0.08								0.22	0.37
32-33	3.90		3.25		0.90			0.25	0.00	3.13		5.22		2.00		
33						0.10	0.08								0.25	0.42
33-34		2.60		2.17	0.40			0.25	0.00		2.62		4.37	1.30		
34						0.10	0.08								0.18	0.30

Model No. MEP 804B – 15kW

Serial No. FZ61946

Steady State Full Load Hot Test 15kW FZ61946								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	124.4	0.37		Baro psia	psia	14.36	0.708
Filter Housing	F	124.5	0.39		Air Filter psia	psia	14.54	0.007
Inlet Manifold	F	179.7	0.25		Int Man psia	psia	17.86	0.512
Exh Cyl 1	F	730.8	2.48		Exh Man psia	psia	18.22	0.849
Exh Cyl 2	F	715.5	2.42		Exh Muff psia	psia	14.57	0.168
Exh Cyl 3	F	747.7	2.14					
Exh Cyl 4	F	703.3	3.66		Power	kW	15.2	
Exh Manifold	F	582.5	1.84		Voltage L1	V	117.6	0.24
After Turbo	F	673.7	1.57		Voltage L2	V	117.6	0.24
After Muffler	F	496.9	1.10		Voltage L3	V	117.6	0.24
Outlet Vent	F	172.9	0.13		Current L1	A	43.1	0.09
Fuel Inlet	F	147.4	0.18		Current L2	A	43.7	0.09
Fuel Return	F	185.8	0.19		Current L3	A	42.3	0.09
Oil Gallery	F	183.0	0.30		Frequency L1	Hz	59.7	0.03
Oil Sump	F	223.0	0.21		Frequency L2	Hz	62.0	0.03
Radiator 1	F	148.6	0.14		Frequency L3	Hz	59.8	0.03
Radiator 2	F	99.4	0.19					
Radiator 3	F	146.4	0.28					
Radiator 4	F	147.9	0.20					
Coolant Inlet	F	182.3	0.24					
Coolant Outlet	F	190.4	0.20					
Aux Heater In	F	185.4	0.20					
Aux Heater Out	F	125.5	0.15					
Instrument Panel	F	137.6	0.21					
Voltage Reg	F	140.0	0.20					
Stator Frame	F	132.2	0.13					
Stator Housing	F	129.6	0.12					
Battery 1	F	131.4	0.17					
Battery 2	F	135.7	0.09					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.80	0.67								0.31	0.52
1-2		1.90		1.58	0.60			0.33	0.05		2.05		3.42	1.70		
2						1.10	0.92								0.48	0.80
2-3	3.10		2.58		0.70			0.25	0.07	2.20		3.67		1.90		
3						0.30	0.25								0.33	0.55
3-4		2.40		2.00	0.60			0.25	0.08		2.11		3.52	1.50		
4						0.20	0.17								0.47	0.78
4-5	2.60		2.17		0.50			0.25	0.03	2.47		4.12		2.50		
5						0.20	0.17								0.41	0.68
5-6		1.90		1.58	0.70			0.25	0.12		2.20		3.67	2.30		
6						0.40	0.33								0.41	0.68
7-8	1.70		1.42		0.50			0.17	0.03	1.67		2.78		2.40		
8						0.80	0.67								0.12	0.20
8-9		1.40		1.17	0.90			0.17	0.03		1.45		2.42	1.70		
9						0.20	0.17								0.27	0.45
9-10	2.20		1.83		0.60			0.17	0.07	1.53		2.55		2.80		
10						0.20	0.17								0.12	0.20
10-11		1.50		1.25	0.60			0.17	0.05		1.42		2.37	1.70		
11						0.90	0.75								0.25	0.42
11-12	2.00		1.67		0.40			0.25	0.07	1.52		2.53		2.60		
12						0.80	0.67								0.10	0.17
12-13		1.30		1.08	1.10			0.33	0.03		1.45		2.42	1.70		
13						0.30	0.25								0.31	0.52
14-15	1.40		1.17		0.30			0.08	0.00	1.08		1.80		1.70		
15						0.40	0.33								0.12	0.20
15-16		0.50		0.42	0.60			0.08	0.00		1.13		1.88	1.40		
16						0.40	0.33								0.28	0.47
16-17	1.20		1.00		0.20			0.17	0.00	1.06		1.77		1.70		
17						0.10	0.08								0.10	0.17
17-18		0.60		0.50	0.60			0.08	0.00		1.22		2.03	1.60		
18						0.20	0.17								0.08	0.13
18-19	0.60		0.50		0.40			0.17	0.03	0.98		1.63		1.60		
19						0.10	0.08								0.08	0.13
19-20		0.70		0.58	0.60			0.17	0.00		1.13		1.88	1.70		
20						0.20	0.17								0.04	0.07
21-22	0.20		0.17		0.40			0.08	0.00	0.51		0.85		2.30		
22						0.30	0.25								0.08	0.13
22-23		0.40		0.33	0.70			0.00	0.00		0.51		0.85	1.50		
23						0.20	0.17								0.09	0.15
23-24	0.20		0.17		1.00			0.08	0.03	0.35		0.58		3.00		
24						0.30	0.25								0.06	0.10
24-25		0.20		0.17	0.40			0.08	0.00		0.61		1.02	1.10		
25						0.10	0.08								0.08	0.13
25-26	0.40		0.33		0.50			0.08	0.00	0.47		0.78		3.30		
26						0.20	0.17								0.10	0.17
26-27		0.30		0.25	0.60			0.08	0.00		0.49		0.82	1.70		
27						0.20	0.17								0.05	0.08
28-29	3.60		3.00		1.00			0.25	0.00	2.31		3.85		2.20		
29						0.20	0.17								0.28	0.47
29-30		2.30		1.92	0.70			0.25	0.03		2.09		3.48	1.90		
30						0.20	0.17								0.05	0.08
30-31	2.50		2.08		0.70			0.25	0.05	2.33		3.88		2.00		
31						0.30	0.25								0.35	0.58
31-32		2.40		2.00	0.70			0.25	0.00		2.16		3.60	2.10		
32						0.30	0.25								0.05	0.08
32-33	3.20		2.67		0.90			0.25	0.07	2.32		3.87		2.30		
33						0.20	0.17								0.35	0.58
33-34		2.60		2.17	0.50			0.25	0.00		2.18		3.63	2.10		
34						0.20	0.17								0.07	0.12

Model No. MEP 805B – 30kW

Serial No. HX37756

Steady State Full Load Hot Test 30W HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	121.3	0.69		Baro psia	psia	14.50	0.003
Filter Housing	F	121.3	0.25		Air Filter psia	psia	14.44	0.005
Inlet Manifold	F	187.2	0.45		Int Man psia	psia	18.83	0.109
Exh Cyl 1	F	737.8	1.15		Exh Man psia	psia	19.03	0.051
Exh Cyl 2	F	775.3	1.08		Exh Muff psia	psia	14.64	0.002
Exh Cyl 3	F	780.5	1.28					
Exh Cyl 4	F	756.7	1.32		Power	kW	29.8	
Exh Manifold	F	811.2	1.43		Voltage L1	V	117.4	0.05
After Turbo	F	740.7	1.20		Voltage L2	V	117.5	0.05
After Muffler	F	628.2	0.70		Voltage L3	V	117.5	0.00
Outlet Vent	F	190.6	0.26		Current L1	A	84.5	0.03
Fuel Inlet	F	148.4	0.27		Current L2	A	85.8	0.01
Fuel Return	F	206.8	0.24		Current L3	A	83.2	0.03
Oil Gallery	F	226.7	0.41		Frequency L1	Hz	59.5	0.01
Oil Sump	F	241.9	0.33		Frequency L2	Hz	61.9	0.01
Radiator 1	F	164.3	0.32		Frequency L3	Hz	59.7	0.01
Radiator 2	F	168.0	0.29					
Radiator 3	F	170.0	0.38					
Radiator 4	F	169.0	0.38					
Coolant Inlet	F	206.1	0.26					
Coolant Outlet	F	213.2	0.24					
Aux Heater In	F	207.6	0.25					
Aux Heater Out	F	125.6	0.22					
Instrument Panel	F	125.1	0.06					
Voltage Reg	F	130.3	0.06					
Stator Frame	F	134.0	0.13					
Stator Housing	F	144.0	0.22					
Battery 1	F	126.5	0.20					
Battery 2	F	125.3	0.18					

Load Step	Voltage								Frequency							
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation	Max Freq Excursion		Excursion %		Rec Time	Variation		
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						3.90	3.25								1.55	2.58
1-2		2.20		1.83	0.30			0.17	3.45		0.08		0.13	0.40		
2						3.80	3.17								1.75	2.92
2-3	1.60		1.33		0.30			0.17	2.93	0.54		0.90		0.60		
3						3.60	3.00								1.44	2.40
3-4		4.50		3.75	0.40			0.17	3.02		1.10		1.83	0.80		
4						4.10	3.42								1.78	2.97
4-5	2.60		2.17		0.30			0.17	2.67	0.12		0.20		0.50		
5						3.50	2.92								1.55	2.58
5-6		1.90		1.58	0.70			0.17	2.55		0.60		1.00	0.60		
6						3.70	3.08								1.67	2.78
7-8	1.40		1.17		0.60			0.17	1.33	0.30		0.50		0.90		
8						2.70	2.25								0.98	1.63
8-9		1.30		1.08	0.50			0.17	0.83		0.71		1.18	0.40		
9						4.00	3.33								1.74	2.90
9-10	3.30		2.75		0.50			0.17	0.97	0.59		0.98		1.20		
10						4.30	3.58								0.95	1.58
10-11		0.70		0.58	1.10			0.25	0.03		0.40		0.67	2.00		
11						0.10	0.08								0.06	0.10
11-12	0.70		0.58		1.00			0.25	0.00	0.53		0.88		1.70		
12						0.10	0.08								0.05	0.08
12-13		1.10		0.92	0.70			0.25	0.00		0.57		0.95	2.00		
13						0.10	0.08								0.09	0.15
14-15	0.50		0.42		0.70			0.17	0.00	4.99		8.32		1.60		
15						0.00	0.00								0.06	0.10
15-16		1.00		0.83	0.70			0.17	0.00		0.42		0.70	1.30		
16						0.10	0.08								0.05	0.08
16-17	0.40		0.33		0.50			0.17	0.00	0.41		0.68		1.50		
17						0.00	0.00								0.06	0.10
17-18		0.50		0.42	0.60			0.17	0.00		0.41		0.68	1.70		
18						0.10	0.08								0.05	0.08
18-19	1.00		0.83		0.50			0.17	0.00	0.39		0.65		1.50		
19						0.00	0.00								0.05	0.08
19-20		0.70		0.58	0.80			0.17	0.00		0.39		0.65	1.40		
20						0.10	0.08								0.06	0.10
21-22	0.50		0.42		0.70			0.08	0.00	0.22		0.37		1.00		
22						0.10	0.08								0.05	0.08
22-23		0.60		0.50	0.60			0.08	0.00		0.26		0.43	1.10		
23						0.10	0.08								0.06	0.10
23-24	0.50		0.42		0.50			0.08	0.00	0.25		0.42		1.60		
24						0.10	0.08								0.06	0.10
24-25		0.80		0.67	0.60			0.08	0.00		0.26		0.43	1.10		
25						0.10	0.08								0.60	1.00
25-26	0.10		0.08		0.40			0.08	0.00	0.26		0.43		1.50		
26						0.10	0.08								0.05	0.08
26-27		0.70		0.58	0.50			0.08	0.00		0.24		0.40	1.80		
27						0.10	0.08								0.05	0.08
28-29	1.70		1.42		0.50			0.33	0.03	0.74		1.23		1.90		
29						0.10	0.08								0.09	0.15
29-30		1.30		1.08	0.80			0.33	0.00		0.73		1.22	1.90		
30						0.10	0.08								0.05	0.08
30-31	1.20		1.00		1.00			0.33	0.00	10.44		17.40		2.60		
31						0.10	0.08								0.08	0.13
31-32		1.10		0.92	0.70			0.33	0.00		0.74		1.23	1.90		
32						0.10	0.08								0.05	0.08
32-33	1.90		1.58		0.60			0.33	0.00	0.69		1.15		2.20		
33						0.10	0.08								0.08	0.13
33-34		0.70		0.58	0.70			0.33	0.00		0.77		1.28	1.80		
34						0.10	0.08								0.05	0.08

Model No. MEP 805B – 30kW

Serial No. HX37762

Steady State Full Load Hot Test 30W HX37762								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	123.4	0.67		Baro psia	psia	14.55	0.002
Filter Housing	F	123.8	0.29		Air Filter psia	psia	14.48	0.001
Inlet Manifold	F	194.4	0.39		Int Man psia	psia	19.34	0.011
Exh Cyl 1	F	797.0	0.95		Exh Man psia	psia	19.36	0.009
Exh Cyl 2	F	813.7	0.81		Exh Muff psia	psia	14.71	0.001
Exh Cyl 3	F	837.8	0.99					
Exh Cyl 4	F	784.7	0.68		Power	kW	30.1	
Exh Manifold	F	859.2	0.62		Voltage L1	V	118.2	0.00
After Turbo	F	774.6	0.39		Voltage L2	V	118.2	0.04
After Muffler	F	655.9	0.16		Voltage L3	V	118.3	0.01
Outlet Vent	F	202.4	0.23		Current L1	A	84.8	0.02
Fuel Inlet	F	154.4	0.19		Current L2	A	86.1	0.04
Fuel Return	F	212.8	0.23		Current L3	A	83.6	0.05
Oil Gallery	F	241.4	0.49		Frequency L1	Hz	59.8	0.02
Oil Sump	F	247.9	0.57		Frequency L2	Hz	62.1	0.02
Radiator 1	F	177.4	0.37		Frequency L3	Hz	59.9	0.02
Radiator 2	F	174.1	0.30					
Radiator 3	F	170.3	0.30					
Radiator 4	F	170.5	0.32					
Coolant Inlet	F	212.4	0.25					
Coolant Outlet	F	219.6	0.25					
Aux Heater In	F	214.3	0.24					
Aux Heater Out	F	121.7	0.09					
Instrument Panel	F	127.2	0.12					
Voltage Reg	F	129.9	0.11					
Stator Frame	F	132.6	0.23					
Stator Housing	F	142.8	0.34					
Battery 1	F	129.0	0.16					
Battery 2	F	126.5	0.28					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.09	0.15
1-2		1.10		0.92	0.80			0.33	0.00		1.26		2.10	1.80		
2						0.10	0.08								0.23	0.38
2-3	2.20		1.83		0.60			0.25	0.00	1.15		1.92		1.50		
3						0.10	0.08								0.09	0.15
3-4		1.00		0.83	0.90			0.33	0.00		1.23		2.05	1.40		
4						0.10	0.08								0.13	0.22
4-5	1.90		1.58		0.60			0.33	0.00	1.13		1.88		1.60		
5						0.00	0.00								0.07	0.12
5-6		1.00		0.83	0.80			0.33	0.00		1.24		2.07	2.20		
6						0.10	0.08								0.12	0.20
7-8	0.10		0.08		1.00			0.25	0.00	0.87		1.45		1.60		
8						0.00	0.00								0.12	0.20
8-9		0.20		0.17	0.70			0.25	0.00		0.83		1.38	1.40		
9						0.10	0.08								0.12	0.20
9-10	1.50		1.25		1.10			0.25	0.00	0.95		1.58		1.90		
10						0.00	0.00								0.07	0.12
10-11		0.70		0.58	0.80			0.25	0.00		0.87		1.45	2.10		
11						0.10	0.08								0.12	0.20
11-12	1.60		1.33		1.00			0.25	0.00	0.88		1.47		1.90		
12						0.00	0.00								0.07	0.12
12-13		0.30		0.25	0.80			0.25	0.00		0.88		1.47	1.40		
13						0.10	0.08								0.12	0.20
14-15	1.00		0.83		0.90			0.17	0.00	0.71		1.18		1.60		
15						0.10	0.08								0.12	0.20
15-16		0.20		0.17	0.70			0.17	0.00		0.57		0.95	1.50		
16						0.10	0.08								0.10	0.17
16-17	0.70		0.58		1.10			0.17	0.00	0.69		1.15		1.50		
17						0.10	0.08								0.08	0.13
17-18		0.40		0.33	0.70			0.17	0.00		0.56		0.93	1.30		
18						0.10	0.08								0.12	0.20
18-19	0.50		0.42		0.50			0.17	0.00	0.64		1.07		1.40		
19						0.10	0.08								0.08	0.13
19-20		0.20		0.17	0.80			0.17	0.00		0.57		0.95	1.40		
20						0.10	0.08								0.11	0.18
21-22	0.20		0.17		0.80			0.08	0.00	0.51		0.85		1.30		
22						0.10	0.08								0.08	0.13
22-23		0.50		0.42	0.60			0.08	0.00		0.33		0.55	1.20		
23						0.10	0.08								0.09	0.15
23-24	0.40		0.33		0.80			0.08	0.00	0.56		0.93		1.70		
24						0.10	0.08								0.08	0.13
24-25		0.50		0.42	0.70			0.08	0.00		0.36		0.60	1.30		
25						0.10	0.08								0.12	0.20
25-26	0.70		0.58		0.60			0.08	0.00	0.51		0.85		1.30		
26						0.10	0.08								0.09	0.15
26-27		0.20		0.17	0.60			0.08	0.00		0.33		0.55	1.60		
27						0.10	0.08								0.11	0.18
28-29	1.40		1.17		0.60			0.33	0.00	1.15		1.92		1.70		
29						0.10	0.08								0.08	0.13
29-30		0.60		0.50	0.80			0.33	0.00		1.13		1.88	1.50		
30						0.10	0.08								0.11	0.18
30-31	0.80		0.67		0.50			0.33	0.00	1.07		1.78		1.40		
31						0.00	0.00								0.10	0.17
31-32		1.10		0.92	0.90			0.33	0.00		1.19		1.98	1.60		
32						0.10	0.08								0.09	0.15
32-33	1.20		1.00		0.70			0.33	0.00	1.18		1.97		1.50		
33						0.00	0.00								0.10	0.17
33-34		0.80		0.67	0.90			0.33	0.00		1.11		1.85	1.60		
34						0.10	0.08								0.09	0.15

Model No. MEP 807A – 100kW

Serial No. 100013

Steady State 75% Load Hot Test 100kW 100013								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	124.3	2.41		Baro psia	psia	14.48	0.000
Filter Housing	F	129.8	0.99		Air Filter psia	psia	14.45	0.005
Inlet Manifold	F	162.1	1.21		Int Man psia	psia	23.44	0.022
Exh Cyl 1	F	893.8	2.13		Exh Man psia	psia	22.86	0.018
Exh Cyl 2	F	880.4	1.98		Exh Muff psia	psia	14.74	0.005
Exh Cyl 3	F	884.5	1.89					
Exh Cyl 4	F	913.0	2.19		Power	kW	75.7	
Exh Cyl 5	F	905.0	1.69		Voltage L1	V	139.1	0.05
Exh Cyl 6	F	867.7	2.67		Voltage L2	V	139.3	0.05
Exh Manifold	F	976.5	2.18		Voltage L3	V	139.2	0.05
After Turbo	F	852.7	2.04		Current L1	A	180.9	0.07
After Muffler	F	798.6	0.82		Current L2	A	184.0	0.07
Outlet Vent	F	180.9	0.83		Current L3	A	178.7	0.07
Fuel Inlet	F	138.0	1.30		Frequency L1	Hz	59.3	0.01
Fuel Return	F	217.3	0.40		Frequency L2	Hz	61.6	0.01
Oil Gallery	F	239.3	0.14		Frequency L3	Hz	59.4	0.01
Oil Sump	F	244.9	0.13					
Radiator 1	F	154.4	1.06					
Radiator 2	F	156.2	1.04					
Radiator 3	F	153.0	1.31					
Radiator 4	F	150.9	1.07					
Coolant Inlet	F	216.9	0.56					
Coolant Outlet	F	222.0	0.44					
Aux Heater In	F	218.3	0.46					
Aux Heater Out	F	132.8	0.14					
Instrument Panel	F	127.9	0.20					
Voltage Reg	F	131.2	0.08					
Stator Frame	F	126.0	0.35					
Stator Housing	F	133.0	0.65					
Battery 1	F	127.8	0.29					
Battery 2	F	128.3	0.66					

Load Step	Voltage								Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation		
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1	Points not run due to high coolant temperature.																
1-2																	
2																	
2-3																	
3																	
3-4																	
4																	
4-5																	
5																	
5-6																	
6																	
7-8																	
8						0.30	0.25								0.07	0.12	
8-9		2.76		1.97	3.40			0.29	1.28		1.40		2.33	2.40			
9						0.20	0.17								0.06	0.10	
9-10	10.56		7.54		1.80			0.29	1.32	1.68		2.80		2.70			
10						0.20	0.17								0.07	0.12	
10-11		2.46		1.76	2.70			0.29	1.33		1.23		2.05	2.10			
11						0.20	0.17								0.05	0.08	
11-12	9.16		6.54		2.20			0.29	1.30	1.68		2.80		2.60			
12						0.20	0.17								0.07	0.12	
12-13		2.66		1.90	2.90			0.29	1.27		1.42		2.37	2.60			
13						0.20	0.17								0.07	0.12	
14-15	4.44		3.17		2.90			0.21	0.87	5.58		9.30		1.50			
15						0.20	0.17								0.06	0.10	
15-16		1.44		1.03	1.70			0.21	0.87		0.86		1.43	2.30			
16						0.20	0.17								0.05	0.08	
16-17	4.74		3.39		1.70			0.21	0.87	1.09		1.82		2.00			
17						0.20	0.17								0.04	0.07	
17-18		1.54		1.10	2.80			0.21	0.87		0.94		1.57	2.70			
18						0.20	0.17								0.05	0.08	
18-19	4.54		3.24		1.80			0.21	0.87	1.01		1.68		1.70			
19						0.20	0.17								0.04	0.07	
19-20		1.64		1.17	1.80			0.21	0.87		0.95		1.58	1.80			
20						0.20	0.17								0.06	0.10	
21-22	0.91		0.65		1.80			0.07	0.43	0.55		0.92		1.90			
22						0.20	0.17								0.05	0.08	
22-23		0.91		0.65	2.60			0.07	0.42		0.53		0.88	1.90			
23						0.20	0.17								0.05	0.08	
23-24	1.01		0.72		1.50			0.07	0.42	0.55		0.92		1.20			
24						0.30	0.25								0.05	0.08	
24-25		0.81		0.58	1.80			0.07	0.42		0.55		0.92	1.80			
25						0.30	0.25								0.07	0.12	
25-26	1.01		0.72		1.30			0.07	0.42	0.67		1.12		0.90			
26						0.30	0.25								0.05	0.08	
26-27		0.81		0.58	1.30			0.07	0.42		0.53		0.88	1.60			
27						0.20	0.17								0.07	0.12	
28-29	16.87		12.05		3.20			0.36	1.73	2.57		4.28		3.00			
29						0.20	0.17								0.07	0.12	
29-30		4.07		2.91	3.00			0.36	1.72		1.90		3.17	2.80			
30						0.20	0.17								0.05	0.08	
30-31	16.17		11.55		2.30			0.36	1.72	2.27		3.78		3.47			
31						0.20	0.17								0.08	0.13	
31-32		4.17		2.98	3.10			0.36	1.72		1.94		3.23	2.90			
32						0.20	0.17								0.05	0.08	
32-33	15.57		11.12		2.40			0.36	1.73	1.57		2.62		2.50			
33						0.20	0.17								0.07	0.12	
33-34		4.27		3.05	3.00			0.36	1.75		1.99		3.32	2.70			
34						0.20	0.17								0.05	0.08	

Appendix B

Summary Data from Method 701.1: Environmental Testing at -50 Fahrenheit

Model No. MEP 803A – 10kW

Serial No. FZ35046

Steady State Full Load Cold Test 10kW FZ35046								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-47.6	1.16		Baro psia	psia	14.24	0.001
Filter Housing	F	-35.7	0.21		Air Filter psia	psia	14.36	0.001
Inlet Manifold	F	-6.2	0.19		Int Man psia	psia	14.25	0.005
Exh Cyl 1	F	436.4	0.89		Exh Man psia	psia	14.79	0.008
Exh Cyl 2	F	479.6	0.72		Exh Muff psia	psia	14.40	0.000
Exh Cyl 3	F	605.5	0.93					
Exh Cyl 4	F	595.5	1.24		Power	kW	10.1	
Exh Manifold	F	552.1	0.43		Voltage	V	121.2	0.05
After Muffler	F	483.7	0.19		Current	A	83.2	0.06
Outlet Vent	F	-13.3	0.38		Frequency	Hz	59.6	0.03
Fuel Inlet	F	-15.9	0.13					
Fuel Return	F	133.5	0.44					
Oil Gallery	F	175.3	0.53					
Oil Sump	F	176.5	0.13					
Radiator 1	F	-18.1	0.39					
Radiator 2	F	-22.0	0.33					
Radiator 3	F	-22.1	0.34					
Radiator 4	F	-22.1	0.41					
Coolant Inlet	F	155.2	0.79					
Coolant Outlet	F	189.1	0.35					
Aux Heater In	F	175.8	0.30					
Aux Heater Out	F	-29.4	0.13					
Instrument Panel	F	-32.6	0.18					
Voltage Reg	F	-62.8	0.06					
Stator Frame	F	-39.8	0.11					
Stator Housing	F	-1.1	0.10					
Battery 1	F	-28.0	0.19					
Battery 2	F	-25.8	0.22					

Steady State Zero Load Cold Test 10kW FZ35046								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-48.4	0.37		Baro psia	psia	14.24	0.000
Filter Housing	F	-39.1	0.12		Air Filter psia	psia	14.35	0.000
Inlet Manifold	F	-18.5	0.07		Int Man psia	psia	14.22	0.005
Exh Cyl 1	F	230.5	4.11		Exh Man psia	psia	15.10	0.005
Exh Cyl 2	F	251.2	2.75		Exh Muff psia	psia	14.40	0.004
Exh Cyl 3	F	255.5	2.77					
Exh Cyl 4	F	256.8	5.40		Power	kW	NA	
Exh Manifold	F	255.6	1.66		Voltage	V	123.9	0.13
After Muffler	F	224.0	0.49		Current	A	NA	NA
Outlet Vent	F	-23.7	0.20		Frequency	Hz	60.5	0.08
Fuel Inlet	F	-25.6	0.08					
Fuel Return	F	87.6	0.22					
Oil Gallery	F	130.4	0.41					
Oil Sump	F	132.4	0.12					
Radiator 1	F	-29.2	0.15					
Radiator 2	F	-30.2	0.20					
Radiator 3	F	-31.7	0.29					
Radiator 4	F	-30.3	0.22					
Coolant Inlet	F	-32.2	0.21					
Coolant Outlet	F	18.0	0.26					
Aux Heater In	F	127.3	0.14					
Aux Heater Out	F	-34.6	0.07					
Instrument Panel	F	-39.2	0.15					
Voltage Reg	F	-60.4	0.06					
Stator Frame	F	-42.7	0.09					
Stator Housing	F	-21.8	0.11					
Battery 1	F	-31.6	0.06					
Battery 2	F	-28.6	0.16					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.20	0.17								0.51	0.85
1-2		0.80		0.67	2.70			2.00	2.47		0.08		0.13	2.40		
2						0.50	0.42								0.11	0.18
2-3	1.30		1.08		0.40			2.17	2.50	0.71		1.18		1.30		
3						0.20	0.17								0.44	0.73
3-4		2.00		1.67	3.20			2.08	2.58		0.10		0.17	3.70		
4						0.50	0.42								0.13	0.22
4-5	1.50		1.25		0.30			2.17	2.47	0.69		1.15		1.30		
5						0.30	0.25								0.31	0.52
5-6		1.40		1.17	3.50			2.08	2.58		0.01		0.02	2.70		
6						0.50	0.42								0.18	0.30
7-8	0.40		0.33		0.70			1.75	1.78	0.24		0.40		1.00		
8						0.30	0.25								0.13	0.22
8-9		0.50		0.42	1.50			1.75	1.90		0.07		0.12	1.30		
9						0.20	0.17								0.14	0.23
9-10	0.90		0.75		0.40			1.75	1.82	0.11		0.18		1.40		
10						0.30	0.25								0.15	0.25
10-11		0.50		0.42	0.90			1.67	1.90		0.07		0.12	1.50		
11						0.40	0.33								0.14	0.23
11-12	1.40		1.17		0.90			1.75	1.77	0.24		0.40		0.90		
12						0.30	0.25								0.18	0.30
12-13		0.60		0.50	3.30			1.67	1.77		0.00		0.00	0.40		
13						0.20	0.17								0.16	0.27
14-15	0.40		0.33		0.90			1.08	1.13	0.05		0.08		0.70		
15						0.40	0.33								0.13	0.22
15-16		0.60		0.50	0.80			1.08	1.25		0.03		0.05	0.90		
16						0.30	0.25								0.13	0.22
16-17	0.60		0.50		1.40			1.08	1.28	0.00		0.00		0.40		
17						0.30	0.25								0.16	0.27
17-18		0.10		0.08	0.50			1.08	1.37		0.00		0.00	0.50		
18						0.10	0.08								0.18	0.30
18-19	0.60		0.50		1.00			1.08	1.32	0.00		0.00		0.60		
19						0.50	0.42								0.18	0.30
19-20		0.20		0.17	0.90			1.08	1.20		0.00		0.00	0.50		
20						0.30	0.25								0.17	0.28
21-22	0.30		0.25		0.90			0.58	0.80	0.00		0.00		0.60		
22						0.30	0.25								0.20	0.33
22-23		0.30		0.25	1.20			0.58	0.73		0.05		0.08	0.80		
23						0.30	0.25								0.16	0.27
23-24	0.30		0.25		0.70			0.58	0.72	0.05		0.08		0.80		
24						0.30	0.25								0.16	0.27
24-25		0.20		0.17	0.50			0.58	0.75		0.04		0.07	0.60		
25						0.30	0.25								0.19	0.32
25-26	0.50		0.42		1.70			0.58	0.70	0.00		0.00		0.50		
26						0.40	0.33								0.15	0.25
26-27		0.40		0.33	0.70			0.58	0.75		0.05		0.08	0.80		
27						0.30	0.25								0.18	0.30
28-29	0.90		0.75		0.40			2.00	2.32	0.92		1.53		1.60		
29						0.20	0.17								0.42	0.70
29-30		0.60		0.50	1.80			2.00	2.33		0.00		0.00	2.60		
30						0.30	0.25								0.28	0.47
30-31	1.30		1.08		0.90			2.00	2.33	0.78		1.30		1.60		
31						0.40	0.33								0.24	0.40
31-32		0.50		0.42	0.60			2.00	2.43		0.00		0.00	0.70		
32						0.30	0.25								0.25	0.42
32-33	0.80		0.67		1.40			2.00	2.47	0.42		0.70		2.90		
33						0.20	0.17								0.21	0.35
33-34		0.20		0.17	0.90			2.00	2.33		0.00		0.00	0.60		
34						0.30	0.25								0.20	0.33

Model No. MEP 803A – 10kW

Serial No. FZ35055

Steady State Full Load Cold Test 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-50.0	0.26		Baro psia	psia	14.20	0.000
Filter Housing	F	-50.1	0.20		Air Filter psia	psia	14.29	0.003
Inlet Manifold	F	-38.6	0.10		Int Man psia	psia	14.19	0.000
Exh Cyl 1	F	565.6	0.55		Exh Man psia	psia	14.76	0.007
Exh Cyl 2	F	554.2	0.44		Exh Muff psia	psia	14.40	0.000
Exh Cyl 3	F	519.2	0.58					
Exh Cyl 4	F	504.2	0.70		Power	kW	10.2	
Exh Manifold	F	546.6	2.35		Voltage	V	121.8	0.01
After Muffler	F	482.7	1.49		Current	A	84.1	0.03
Outlet Vent	F	-24.0	0.24		Frequency	Hz	59.6	0.02
Fuel Inlet	F	-21.1	0.20					
Fuel Return	F	192.9	0.27					
Oil Gallery	F	174.4	1.50					
Oil Sump	F	181.5	0.18					
Radiator 1	F	-28.1	0.36					
Radiator 2	F	-22.7	0.26					
Radiator 3	F	-26.3	0.42					
Radiator 4	F	-24.1	0.48					
Coolant Inlet	F	165.3	0.46					
Coolant Outlet	F	191.3	4.09					
Aux Heater In	F	180.2	16.96					
Aux Heater Out	F	-10.2	8.87					
Instrument Panel	F	-39.6	0.06					
Voltage Reg	F	-5.9	0.05					
Stator Frame	F	-34.8	0.21					
Stator Housing	F	-7.2	0.13					
Battery 1	F	-27.9	0.13					
Battery 2	F	-28.0	0.24					

Steady State Zero Load Cold Test 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-50.6	0.30		Baro psia	psia	14.23	0.000
Filter Housing	F	-50.1	0.18		Air Filter psia	psia	14.33	0.003
Inlet Manifold	F	-42.9	0.10		Int Man psia	psia	14.21	0.001
Exh Cyl 1	F	345.8	1.66		Exh Man psia	psia	15.12	0.007
Exh Cyl 2	F	294.9	2.53		Exh Muff psia	psia	14.44	0.005
Exh Cyl 3	F	196.0	2.75					
Exh Cyl 4	F	80.1	1.04		Power	kW	NA	
Exh Manifold	F	246.7	1.07		Voltage	V	124.5	0.07
After Muffler	F	214.3	0.30		Current	A	NA	NA
Outlet Vent	F	-33.9	0.18		Frequency	Hz	60.4	0.06
Fuel Inlet	F	-28.9	0.11					
Fuel Return	F	137.2	0.15					
Oil Gallery	F	116.3	0.49					
Oil Sump	F	136.0	0.10					
Radiator 1	F	-34.4	0.25					
Radiator 2	F	-29.7	0.20					
Radiator 3	F	-29.7	13.20					
Radiator 4	F	-2.0	40.45					
Coolant Inlet	F	2.8	0.53					
Coolant Outlet	F	100.9	2.74					
Aux Heater In	F	126.9	12.03					
Aux Heater Out	F	-6.2	7.47					
Instrument Panel	F	-42.5	0.09					
Voltage Reg	F	-18.5	0.11					
Stator Frame	F	-44.0	0.12					
Stator Housing	F	-28.7	0.09					
Battery 1	F	-30.1	0.06					
Battery 2	F	-29.3	0.41					

Load Step	Voltage									Frequency						
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.20	0.17								0.17	0.28
1-2		0.10		0.08	0.70			2.08	2.60		0.08		0.13	0.70		
2						0.20	0.17								0.18	0.30
2-3	1.10		0.92		0.90			2.08	2.62	0.15		0.25		1.00		
3						0.20	0.17								0.17	0.28
3-4		0.30		0.25	0.70			2.08	2.72		0.06		0.10	1.50		
4						0.20	0.17								0.21	0.35
4-5	1.00		0.83		0.60			2.08	2.58	0.15		0.25		1.30		
5						0.20	0.17								0.15	0.25
5-6		0.20		0.17	1.20			2.08	2.63		0.13		0.22	1.50		
6						0.10	0.08								0.20	0.33
7-8	0.50		0.42		0.70			1.67	2.05	0.15		0.25		0.90		
8						0.20	0.17								0.21	0.35
8-9		1.10		0.92	1.10			1.67	2.15		0.12		0.20	1.00		
9						0.10	0.08								0.20	0.33
9-10	1.20		1.00		1.00			1.67	2.13	0.33		0.55		1.90		
10						0.20	0.17								0.18	0.30
10-11		0.40		0.33	0.80			1.67	2.13		0.21		0.35	0.70		
11						0.10	0.08								0.15	0.25
11-12	0.80		0.67		0.70			1.67	2.23	0.17		0.28		0.80		
12						0.20	0.17								0.20	0.33
12-13		0.90		0.75	0.70			1.67	2.17		0.16		0.27	0.70		
13						0.10	0.08								0.25	0.42
14-15	0.50		0.42		0.40			1.08	1.50	0.15		0.25		1.20		
15						0.20	0.17								0.19	0.32
15-16		0.30		0.25	0.50			1.08	1.50		0.22		0.37	1.40		
16						0.20	0.17								0.16	0.27
16-17	0.30		0.25		1.20			1.08	1.58	0.15		0.25		1.90		
17						0.20	0.17								0.18	0.30
17-18		0.40		0.33	0.70			1.08	1.33		0.25		0.42	1.00		
18						0.20	0.17								0.18	0.30
18-19	0.60		0.50		1.30			1.08	1.58	0.13		0.22		0.90		
19						0.20	0.17								0.23	0.38
19-20		0.50		0.42	0.70			1.08	1.30		0.23		0.38	0.80		
20						0.20	0.17								0.19	0.32
21-22	0.40		0.33		0.30			0.67	1.15	0.12		0.20		0.80		
22						0.30	0.25								0.26	0.43
22-23		0.20		0.17	0.30			0.67	1.00		0.24		0.40	1.10		
23						0.30	0.25								0.15	0.25
23-24	0.10		0.08		0.30			0.67	1.18	0.05		0.08		0.70		
24						0.30	0.25								0.30	0.50
24-25		0.30		0.25	0.30			0.67	1.08		0.12		0.20	0.70		
25						0.10	0.08								0.18	0.30
25-26	0.30		0.25		0.30			0.67	1.30	0.10		0.17		0.60		
26						0.30	0.25								0.23	0.38
26-27		0.50		0.42	0.50			0.67	1.62		0.18		0.30	0.90		
27						0.20	0.17								0.25	0.42
28-29	0.90		0.75		1.10			2.00	2.23	0.24		0.40		1.90		
29						0.90	0.75								0.43	0.72
29-30		0.20		0.17	0.90			2.00	2.50		0.16		0.27	0.90		
30						0.10	0.08								0.33	0.55
30-31	1.10		0.92		0.90			2.00	2.50	0.23		0.38		1.20		
31						0.60	0.50								0.38	0.63
31-32		0.40		0.33	1.20			2.00	2.47		0.18		0.30	1.20		
32						0.10	0.08								0.30	0.50
32-33	0.90		0.75		0.90			2.00	2.50	0.25		0.42		1.40		
33						0.50	0.42								0.39	0.65
33-34		0.30		0.25	0.70			2.00	2.50		0.18		0.30	0.12		
34						0.10	0.08								0.48	0.80

Model No. MEP 804A – 15kW

Serial No. FZ60344

There was a problem with the data processing. The data was downloaded from the acquisition units, but it became corrupted prior to analysis by TFLRF staff.

Model No. MEP 804A – 15kW

Serial No. FZ60357

Steady State Full Load Cold Test 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-51.2	0.46		Baro psia	psia	14.35	0.001
Filter Housing	F	-50.9	0.45		Air Filter psia	psia	14.40	0.005
Inlet Manifold	F	-45.0	0.26		Int Man psia	psia	14.21	0.005
Exh Cyl 1	F	533.9	1.37		Exh Man psia	psia	14.76	0.010
Exh Cyl 2	F	537.0	1.06		Exh Muff psia	psia	14.54	0.003
Exh Cyl 3	F	531.6	0.57					
Exh Cyl 4	F	486.7	1.06		Power	kW	15.2	
Exh Manifold	F	539.5	0.77		Voltage L1	V	117.6	0.01
After Muffler	F	343.4	0.85		Voltage L2	V	117.6	0.01
Outlet Vent	F	-15.4	0.23		Voltage L3	V	117.7	0.05
Fuel Inlet	F	-31.3	0.07		Current L1	A	43.1	0.10
Fuel Return	F	170.2	0.09		Current L2	A	43.7	0.10
Oil Gallery	F	160.6	0.06		Current L3	A	42.5	0.08
Oil Sump	F	166.9	0.08		Frequency L1	Hz	59.7	0.02
Radiator 1	F	-25.8	0.32		Frequency L2	Hz	62.0	0.02
Radiator 2	F	-28.7	0.30		Frequency L3	Hz	59.8	0.02
Radiator 3	F	-23.0	0.24					
Radiator 4	F	-21.7	0.14					
Coolant Inlet	F	151.2	1.30					
Coolant Outlet	F	172.2	0.09					
Aux Heater In	F	170.9	0.10					
Aux Heater Out	F	-30.8	0.05					
Instrument Panel	F	-40.2	0.05					
Voltage Reg	F	-30.0	0.20					
Stator Frame	F	-47.0	0.22					
Stator Housing	F	-46.1	0.26					
Battery 1	F	-29.3	0.60					
Battery 2	F	-32.6	0.10					

Steady State Zero Load Cold Test 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-52.0	0.14		Baro psia	psia	14.36	0.000
Filter Housing	F	-51.3	0.19		Air Filter psia	psia	14.41	0.006
Inlet Manifold	F	-46.6	0.12		Int Man psia	psia	14.21	0.004
Exh Cyl 1	F	197.2	0.45		Exh Man psia	psia	14.76	0.003
Exh Cyl 2	F	191.8	0.43		Exh Muff psia	psia	14.53	0.000
Exh Cyl 3	F	188.5	0.36					
Exh Cyl 4	F	189.8	0.53		Power	kW	NA	
Exh Manifold	F	189.6	0.27		Voltage L1	V	117.8	0.04
After Muffler	F	90.2	3.05		Voltage L2	V	117.8	0.05
Outlet Vent	F	-32.3	0.09		Voltage L3	V	117.9	0.04
Fuel Inlet	F	-31.7	0.08		Current L1	A	NA	NA
Fuel Return	F	169.1	0.05		Current L2	A	NA	NA
Oil Gallery	F	152.0	0.06		Current L3	A	NA	NA
Oil Sump	F	157.9	0.13		Frequency L1	Hz	59.7	0.02
Radiator 1	F	-36.3	0.10		Frequency L2	Hz	62.1	0.02
Radiator 2	F	-37.3	0.11		Frequency L3	Hz	59.8	0.02
Radiator 3	F	-31.1	0.14					
Radiator 4	F	-30.0	0.07					
Coolant Inlet	F	167.1	0.20					
Coolant Outlet	F	157.6	0.15					
Aux Heater In	F	169.7	0.05					
Aux Heater Out	F	-30.5	0.11					
Instrument Panel	F	-43.0	0.08					
Voltage Reg	F	-40.5	0.08					
Stator Frame	F	-48.3	0.24					
Stator Housing	F	-48.5	0.17					
Battery 1	F	-33.7	0.24					
Battery 2	F	-33.3	0.14					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.10	0.17
1-2		2.10		1.75	0.60			0.17	0.00		1.22		2.03	1.00		
2						0.10	0.08								0.11	0.18
2-3	2.10		1.75		1.10			0.17	0.00	1.22		2.03		0.90		
3						0.10	0.08								0.10	0.17
3-4		2.30		1.92	0.70			0.17	0.00		1.20		2.00	1.00		
4						0.10	0.08								0.10	0.17
4-5	1.60		1.33		1.50			0.17	0.00	1.29		2.15		1.00		
5						0.10	0.08								0.08	0.13
5-6		1.60		1.33	0.70			0.17	0.00		1.17		1.95	1.00		
6						0.10	0.08								0.10	0.17
7-8	1.00		0.83		0.50			0.17	0.00	0.94		1.57		1.00		
8						0.10	0.08								0.09	0.15
8-9		0.50		0.42	0.70			0.17	0.00		1.03		1.72	1.00		
9						0.10	0.08								0.11	0.18
9-10	0.70		0.58		0.60			0.17	0.00	0.91		1.52		1.00		
10						0.10	0.08								0.11	0.18
10-11		1.00		0.83	1.10			0.17	0.00		1.05		1.75	1.00		
11						0.10	0.08								0.13	0.22
11-12	1.10		0.92		0.50			0.17	0.00	1.18		1.97		1.00		
12						0.10	0.08								0.11	0.18
12-13		0.90		0.75	0.70			0.17	0.00		1.01		1.68	1.00		
13						0.10	0.08								0.12	0.20
14-15	0.60		0.50		0.50			0.17	0.00	0.68		1.13		0.90		
15						0.10	0.08								0.13	0.22
15-16		0.50		0.42	0.50			0.17	0.00		0.71		1.18	0.90		
16						0.10	0.08								0.12	0.20
16-17	0.60		0.50		0.50			0.17	0.00	0.72		1.20		1.00		
17						0.10	0.08								0.08	0.13
17-18		0.50		0.42	0.70			0.17	0.00		0.73		1.22	1.00		
18						0.10	0.08								0.13	0.22
18-19	0.30		0.25		0.40			0.17	0.00	0.77		1.28		0.80		
19						0.10	0.08								0.08	0.13
19-20		0.40		0.33	0.70			0.17	0.00		0.73		1.22	1.00		
20						0.10	0.08								0.13	0.22
21-22	0.20		0.17		0.50			0.08	0.00	0.38		0.63		1.00		
22						0.10	0.08								0.10	0.17
22-23		0.20		0.17	0.50			0.08	0.00		0.39		0.65	1.00		
23						0.10	0.08								0.13	0.22
23-24	0.30		0.25		0.70			0.08	0.00	0.36		0.60		1.00		
24						0.10	0.08								0.10	0.17
24-25		0.20		0.17	0.50			0.08	0.00		0.39		0.65	1.10		
25						0.10	0.08								0.13	0.22
25-26	0.30		0.25		0.40			0.08	0.00	0.42		0.70		1.00		
26						0.10	0.08								0.10	0.17
26-27		0.10		0.08	0.60			0.08	0.00		0.40		0.67	0.80		
27						0.10	0.08								0.12	0.20
28-29	1.50		1.25		0.60			0.17	0.00	1.29		2.15		1.10		
29						0.10	0.08								0.10	0.17
29-30		1.60		1.33	0.70			0.17	0.00		1.24		2.07	1.00		
30						0.10	0.08								0.12	0.20
30-31	1.90		1.58		0.80			0.17	0.00	1.25		2.08		1.10		
31						0.10	0.08								0.11	0.18
31-32		1.40		1.17	0.60			0.17	0.00		1.22		2.03	1.00		
32						0.10	0.08								0.13	0.22
32-33	1.10		0.92		0.50			0.17	0.00	1.17		1.95		1.10		
33						0.10	0.08								0.09	0.15
33-34		1.50		1.25	1.10			0.17	0.00		1.29		2.15	1.50		
34						0.10	0.08								0.13	0.22

Model No. MEP 804B – 15kW

Serial No. FZ61920

Steady State Full Load Cold Test 15kW FZ61920								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-45.7	0.24		Baro psia	psia	14.49	0.002
Filter Housing	F	-49.1	0.22		Air Filter psia	psia	14.61	0.005
Inlet Manifold	F	7.4	0.08		Int Man psia	psia	19.32	0.016
Exh Cyl 1	F	466.3	0.72		Exh Man psia	psia	19.47	0.005
Exh Cyl 2	F	474.7	0.63		Exh Muff psia	psia	14.67	0.000
Exh Cyl 3	F	484.9	0.41					
Exh Cyl 4	F	506.4	0.63		Power	kW	14.9	
Exh Manifold	F	511.8	0.30		Voltage L1	V	120.0	0.02
After Turbo	F	441.1	0.12		Voltage L2	V	119.9	0.05
After Muffler	F	292.5	0.30		Voltage L3	V	120.2	0.02
Outlet Vent	F	-18.1	0.17		Current L1	A	41.5	0.10
Fuel Inlet	F	-18.8	0.10		Current L2	A	41.8	0.10
Fuel Return	F	2.4	0.13		Current L3	A	40.6	0.09
Oil Gallery	F	63.1	0.27		Frequency L1	Hz	59.8	0.06
Oil Sump	F	174.9	0.54		Frequency L2	Hz	62.1	0.07
Radiator 1	F	-29.6	0.18		Frequency L3	Hz	59.9	0.06
Radiator 2	F	-25.9	0.15					
Radiator 3	F	-67.9	0.21					
Radiator 4	F	-78.9	0.08					
Coolant Inlet	F	118.0	1.50					
Coolant Outlet	F	136.3	0.72					
Aux Heater In	F	155.1	0.09					
Aux Heater Out	F	153.3	0.06					
Instrument Panel	F	-57.6	0.10					
Voltage Reg	F	-32.4	0.18					
Stator Frame	F	-41.6	0.10					
Stator Housing	F	-57.3	0.09					
Battery 1	F	-35.2	0.10					
Battery 2	F	-33.9	0.17					

Steady State Zero Load Cold Test 15kW FZ61920								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-50.1	0.26		Baro psia	psia	14.50	0.004
Filter Housing	F	-53.2	0.36		Air Filter psia	psia	14.62	0.003
Inlet Manifold	F	-28.3	0.31		Int Man psia	psia	16.01	0.057
Exh Cyl 1	F	194.4	0.82		Exh Man psia	psia	17.43	0.033
Exh Cyl 2	F	193.6	0.93		Exh Muff psia	psia	14.67	0.008
Exh Cyl 3	F	193.8	0.76					
Exh Cyl 4	F	217.0	0.98		Power	kW	NA	
Exh Manifold	F	200.8	1.40		Voltage L1	V	120.3	0.10
After Turbo	F	172.7	0.62		Voltage L2	V	120.3	0.10
After Muffler	F	75.8	0.62		Voltage L3	V	120.5	0.10
Outlet Vent	F	-39.7	0.23		Current L1	A	NA	NA
Fuel Inlet	F	-23.0	0.07		Current L2	A	NA	NA
Fuel Return	F	-6.4	0.07		Current L3	A	NA	NA
Oil Gallery	F	44.7	0.27		Frequency L1	Hz	59.8	0.93
Oil Sump	F	145.4	0.10		Frequency L2	Hz	62.1	0.96
Radiator 1	F	-40.5	0.29		Frequency L3	Hz	59.9	0.95
Radiator 2	F	-35.9	0.27					
Radiator 3	F	-66.1	0.28					
Radiator 4	F	-66.9	0.43					
Coolant Inlet	F	-37.4	0.18					
Coolant Outlet	F	105.9	1.22					
Aux Heater In	F	138.1	0.16					
Aux Heater Out	F	136.3	0.13					
Instrument Panel	F	-56.5	0.39					
Voltage Reg	F	-42.9	0.30					
Stator Frame	F	-46.7	0.17					
Stator Housing	F	-57.7	0.14					
Battery 1	F	-35.6	0.10					
Battery 2	F	-32.1	0.11					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.21	0.35
1-2		2.50		2.08	1.10			0.25	0.00		2.18		3.63	0.90		
2						0.30	0.25								1.71	2.85
2-3	1.80		1.50		1.40			0.25	0.00	2.55		4.25		3.70		
3						0.10	0.08								0.32	0.53
3-4		1.10		0.92	1.90			0.25	0.00		2.10		3.50	1.40		
4						0.40	0.33								1.79	2.98
4-5	2.50		2.08		1.50			0.25	0.00	3.07		5.12		3.80		
5						0.10	0.08								0.33	0.55
5-6		2.50		2.08	1.20			0.25	0.00		1.88		3.13	1.10		
6						0.40	0.33								1.74	2.90
7-8	1.60		1.33		0.80			0.17	0.00	1.94		3.23		1.50		
8						0.10	0.08								0.23	0.38
8-9		1.00		0.83	0.70			0.17	0.00		1.74		2.90	1.00		
9						0.40	0.33								1.58	2.63
9-10	1.10		0.92		0.90			0.17	0.00	1.47		2.45		1.40		
10						0.10	0.08								0.22	0.37
10-11		1.20		1.00	0.70			0.17	0.00		1.69		2.82	1.10		
11						0.30	0.25								1.53	2.55
11-12	0.70		0.58		1.10			0.17	0.00	2.32		3.87		2.40		
12						0.10	0.08								0.46	0.77
12-13		0.90		0.75	0.70			0.17	0.00		1.64		2.73	1.00		
13						0.40	0.33								1.74	2.90
14-15	1.00		0.83		0.50			0.08	0.00	2.09		3.48		4.40		
15						0.10	0.08								0.26	0.43
15-16		0.50		0.42	0.60			0.08	0.00		1.14		1.90	1.40		
16						0.30	0.25								1.62	2.70
16-17	0.40		0.33		0.40			0.08	0.00	2.06		3.43		4.30		
17						0.10	0.08								0.22	0.37
17-18		0.30		0.25	0.60			0.08	0.00		1.17		1.95	2.20		
18						0.40	0.33								1.71	2.85
18-19	0.60		0.50		0.60			0.08	0.00	1.50		2.50		3.30		
19						0.10	0.08								0.31	0.52
19-20		0.40		0.33	1.00			0.08	0.00		1.23		2.05	1.10		
20						0.40	0.33								1.92	3.20
21-22	0.20		0.17		0.50			0.00	0.00	0.80		1.33		3.30		
22						0.10	0.08								0.28	0.47
22-23		0.30		0.25	**DNR			0.00	0.00		0.99		1.65	**DNR		
23						0.40	0.33								1.97	3.28
23-24	0.30		0.25		0.60			0.00	0.00	0.96		1.60		2.10		
24						0.10	0.08								0.20	0.33
24-25		0.20		0.17	**DNR			0.00	0.00		0.95		1.58	**DNR		
25						0.40	0.33								2.10	3.50
25-26	0.30		0.25		0.50			0.00	0.00	0.68		1.13		6.10		
26						0.10	0.08								0.21	0.35
26-27		0.20		0.17	**DNR			0.00	0.00		1.10		1.83	**DNR		
27						0.40	0.33								2.16	3.60
28-29	1.80		1.50		0.70			0.17	0.00	2.96		4.93		2.60		
29						0.10	0.08								0.28	0.47
29-30		2.30		1.92	1.00			0.17	0.00		2.22		3.70	1.60		
30						0.30	0.25								1.64	2.73
30-31	1.60		1.33		1.50			0.17	0.00	1.68		2.80		3.90		
31						0.10	0.08								0.20	0.33
31-32		1.60		1.33	0.90			0.17	0.00		2.07		3.45	1.70		
32						0.30	0.25								1.64	2.73
32-33	2.00		1.67		0.60			0.17	0.00	1.83		3.05		2.60		
33						0.10	0.08								0.29	0.48
33-34		1.40		1.17	1.00			0.17	0.00		2.12		3.53	0.90		
34						0.30	0.25								2.01	3.35

**DNR: Did not recover. Unstable operation.

Model No. MEP 804B – 15kW

Serial No. FZ61946

Steady State Full Load Cold Test 15kW FZ61946								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-50.8	0.24		Baro psia	psia	14.40	0.000
Filter Housing	F	-50.4	0.21		Air Filter psia	psia	14.50	0.001
Inlet Manifold	F	8.3	0.12		Int Man psia	psia	19.24	0.013
Exh Cyl 1	F	497.1	0.73		Exh Man psia	psia	19.59	0.007
Exh Cyl 2	F	484.4	0.64		Exh Muff psia	psia	14.59	0.004
Exh Cyl 3	F	511.1	0.46					
Exh Cyl 4	F	491.1	0.85		Power	kW	15.4	
Exh Manifold	F	456.4	0.31		Voltage L1	V	118.8	0.0
After Turbo	F	363.1	0.57		Voltage L2	V	119.1	0.0
After Muffler	F	302.2	0.29		Voltage L3	V	119.2	0.0
Outlet Vent	F	-29.4	0.18		Current L1	A	43.1	0.1
Fuel Inlet	F	-18.2	0.08		Current L2	A	43.7	0.1
Fuel Return	F	9.5	0.09		Current L3	A	42.6	0.1
Oil Gallery	F	80.7	0.05		Frequency L1	Hz	59.5	0.0
Oil Sump	F	171.4	0.11		Frequency L2	Hz	61.8	0.0
Radiator 1	F	-35.4	0.15		Frequency L3	Hz	59.6	0.0
Radiator 2	F	-58.3	0.18					
Radiator 3	F	-21.3	0.16					
Radiator 4	F	-29.2	0.15					
Coolant Inlet	F	149.6	0.74					
Coolant Outlet	F	127.7	0.38					
Aux Heater In	F	149.8	0.07					
Aux Heater Out	F	152.6	0.07					
Instrument Panel	F	-28.4	0.10					
Voltage Reg	F	-16.9	0.31					
Stator Frame	F	-39.8	0.13					
Stator Housing	F	-41.0	0.22					
Battery 1	F	-40.4	0.10					
Battery 2	F	-49.2	0.12					

Steady State Zero Load Cold Test 15kW FZ61946								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-50.6	0.16		Baro psia	psia	14.40	0.000
Filter Housing	F	-49.7	0.21		Air Filter psia	psia	14.51	0.003
Inlet Manifold	F	-25.7	0.07		Int Man psia	psia	15.69	0.005
Exh Cyl 1	F	195.9	0.24		Exh Man psia	psia	17.28	0.005
Exh Cyl 2	F	190.1	0.28		Exh Muff psia	psia	14.58	0.000
Exh Cyl 3	F	194.0	0.19					
Exh Cyl 4	F	200.9	0.25		Power	kW	NA	
Exh Manifold	F	168.1	0.09		Voltage L1	V	119.2	0.02
After Turbo	F	131.8	0.39		Voltage L2	V	119.4	0.04
After Muffler	F	90.2	2.94		Voltage L3	V	119.4	0.01
Outlet Vent	F	-37.3	0.10		Current L1	A	NA	NA
Fuel Inlet	F	-19.1	0.06		Current L2	A	NA	NA
Fuel Return	F	1.8	0.06		Current L3	A	NA	NA
Oil Gallery	F	66.0	0.07		Frequency L1	Hz	59.5	0.03
Oil Sump	F	145.8	0.12		Frequency L2	Hz	61.8	0.03
Radiator 1	F	-39.7	0.11		Frequency L3	Hz	59.6	0.03
Radiator 2	F	-48.8	0.18					
Radiator 3	F	-39.7	0.08					
Radiator 4	F	-37.0	0.10					
Coolant Inlet	F	126.8	0.53					
Coolant Outlet	F	-43.2	0.24					
Aux Heater In	F	137.8	0.06					
Aux Heater Out	F	140.5	0.07					
Instrument Panel	F	-29.9	0.20					
Voltage Reg	F	-35.4	0.12					
Stator Frame	F	-42.0	0.17					
Stator Housing	F	-42.7	0.14					
Battery 1	F	-37.6	0.12					
Battery 2	F	-48.7	0.11					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.08	0.13
1-2		1.70		1.42	0.70			0.17	0.00		1.68		2.80	2.20		
2						0.10	0.08								0.07	0.12
2-3	2.70		2.25		0.60			0.17	0.00	1.67		2.78		1.90		
3						0.10	0.08								0.10	0.17
3-4		2.40		2.00	0.70			0.17	0.00		1.80		3.00	2.50		
4						0.10	0.08								0.08	0.13
4-5	2.10		1.75		0.60			0.17	0.00	1.65		2.75		1.60		
5						0.10	0.08								0.08	0.13
5-6		1.90		1.58	0.40			0.17	0.00		1.65		2.75	2.00		
6						0.10	0.08								0.09	0.15
7-8	1.00		0.83		0.50			0.17	0.00	1.38		2.30		1.90		
8						0.10	0.08								0.08	0.13
8-9		0.70		0.58	1.50			0.17	0.00		1.55		2.58	2.20		
9						0.10	0.08								0.06	0.10
9-10	0.70		0.58		0.50			0.17	0.00	1.37		2.28		2.00		
10						0.10	0.08								0.10	0.17
10-11		1.20		1.00	0.50			0.17	0.00		1.55		2.58	1.90		
11						0.10	0.08								0.10	0.17
11-12	1.30		1.08		0.40			0.17	0.00	1.33		2.22		2.00		
12						0.10	0.08								0.10	0.17
12-13		1.00		0.83	1.10			0.17	0.00		1.38		2.30	2.00		
13						0.00	0.00								0.09	0.15
14-15	0.70		0.58		0.60			0.08	0.00	0.90		1.50		1.80		
15						0.10	0.08								0.07	0.12
15-16		0.40		0.33	0.60			0.08	0.00		1.06		1.77	1.80		
16						0.00	0.00								0.09	0.15
16-17	0.80		0.67		0.40			0.08	0.00	0.93		1.55		1.60		
17						0.10	0.08								0.07	0.12
17-18		0.50		0.42	0.50			0.08	0.00		1.06		1.77	1.90		
18						0.00	0.00								0.07	0.12
18-19	0.50		0.42		0.50			0.08	0.00	0.97		1.62		1.60		
19						0.10	0.08								0.07	0.12
19-20		0.60		0.50	0.40			0.08	0.00		1.11		1.85	1.80		
20						0.00	0.00								0.07	0.12
21-22	0.40		0.33		0.30			0.00	0.00	0.56		0.93		**DNR		
22						0.10	0.08								0.53	0.88
22-23		0.40		0.33	0.70			0.00	0.00		0.65		1.08	0.90		
23						0.10	0.08								0.10	0.17
23-24	0.60		0.50		0.30			0.00	0.00	0.51		0.85		**DNR		
24						0.10	0.08								0.52	0.87
24-25		0.20		0.17	0.40			0.00	0.00		0.46		0.77	1.10		
25						0.00	0.00								0.09	0.15
25-26	0.40		0.33		0.40			0.00	0.00	0.57		0.95		**DNR		
26						0.10	0.08								0.53	0.88
26-27		0.20		0.17	0.40			0.00	0.00		0.44		0.73	1.20		
27						0.00	0.00								0.08	0.13
28-29	2.60		2.17		0.60			0.17	0.00	1.43		2.38		1.90		
29						0.10	0.08								0.08	0.13
29-30		1.60		1.33	1.80			0.17	0.00		1.80		3.00	2.10		
30						0.00	0.00								0.06	0.10
30-31	2.00		1.67		0.60			0.17	0.00	1.70		2.83		1.80		
31						0.10	0.08								0.08	0.13
31-32		2.20		1.83	0.60			0.17	0.00		1.73		2.88	2.00		
32						0.10	0.08								0.05	0.08
32-33	2.80		2.33		0.60			0.17	0.00	1.74		2.90		1.80		
33						0.10	0.08								0.08	0.13
33-34		2.30		1.92	0.60			0.17	0.00		1.77		2.95	2.20		
34						0.10	0.08								0.07	0.12

**DNR: Did not recover. Unstable operation.

Model No. MEP 805B – 30kW

Serial No. HX37756

Steady State Full Load Cold Test 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-53.0	0.00		Baro psia	psia	14.52	0.000
Filter Housing	F	-50.5	0.01		Air Filter psia	psia	14.55	0.000
Inlet Manifold	F	43.0	0.07		Int Man psia	psia	24.03	0.035
Exh Cyl 1	F	558.7	0.35		Exh Man psia	psia	22.99	0.014
Exh Cyl 2	F	612.4	0.28		Exh Muff psia	psia	14.87	0.007
Exh Cyl 3	F	628.0	0.21					
Exh Cyl 4	F	597.4	0.49		Power	kW	30.0	
Exh Manifold	F	649.1	1.34		Voltage L1	V	118.2	0.1
After Turbo	F	576.3	0.14		Voltage L2	V	118.2	0.4
After Muffler	F	476.6	0.57		Voltage L3	V	118.3	0.2
Outlet Vent	F	-19.7	0.30		Current L1	A	84.8	0.3
Fuel Inlet	F	-38.3	0.16		Current L2	A	85.9	0.3
Fuel Return	F	-17.4	0.00		Current L3	A	83.3	0.3
Oil Gallery	F	152.7	0.00		Frequency L1	Hz	60.0	0.7
Oil Sump	F	194.3	0.07		Frequency L2	Hz	62.3	0.7
Radiator 1	F	-23.1	0.07		Frequency L3	Hz	60.0	0.5
Radiator 2	F	-30.6	0.00					
Radiator 3	F	-37.4	0.16					
Radiator 4	F	-22.5	0.37					
Coolant Inlet	F	166.5	0.28					
Coolant Outlet	F	178.3	0.21					
Aux Heater In	F	170.9	0.14					
Aux Heater Out	F	167.9	0.00					
Instrument Panel	F	-44.7	0.00					
Voltage Reg	F	-37.2	0.08					
Stator Frame	F	-37.3	0.08					
Stator Housing	F	-21.9	0.08					
Battery 1	F	-41.7	0.08					
Battery 2	F	-41.3	0.08					

Steady State Zero Load Cold Test 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-55.7	0.24		Baro psia	psia	14.53	0.005
Filter Housing	F	-54.1	0.25		Air Filter psia	psia	14.61	0.004
Inlet Manifold	F	-21.8	0.27		Int Man psia	psia	16.43	0.006
Exh Cyl 1	F	232.5	0.49		Exh Man psia	psia	18.42	0.013
Exh Cyl 2	F	231.9	0.41		Exh Muff psia	psia	14.75	0.005
Exh Cyl 3	F	237.8	1.23					
Exh Cyl 4	F	250.0	1.05		Power	kW	NA	
Exh Manifold	F	239.9	0.82		Voltage L1	V	118.5	0.1
After Turbo	F	217.5	0.09		Voltage L2	V	118.5	0.3
After Muffler	F	170.6	0.07		Voltage L3	V	118.6	0.2
Outlet Vent	F	-35.7	0.34		Current L1	A	NA	NA
Fuel Inlet	F	-37.8	0.05		Current L2	A	NA	NA
Fuel Return	F	-21.8	0.19		Current L3	A	NA	NA
Oil Gallery	F	133.4	0.37		Frequency L1	Hz	59.8	0.7
Oil Sump	F	173.2	0.35		Frequency L2	Hz	62.1	0.7
Radiator 1	F	-32.3	0.31		Frequency L3	Hz	59.9	0.7
Radiator 2	F	-38.8	0.26					
Radiator 3	F	-44.1	0.41					
Radiator 4	F	-35.5	0.77					
Coolant Inlet	F	159.8	0.37					
Coolant Outlet	F	44.3	0.49					
Aux Heater In	F	159.8	0.33					
Aux Heater Out	F	156.9	0.35					
Instrument Panel	F	-46.2	0.31					
Voltage Reg	F	-39.0	0.39					
Stator Frame	F	-42.5	0.19					
Stator Housing	F	-31.8	0.24					
Battery 1	F	-40.6	0.32					
Battery 2	F	-40.8	0.32					

The Table for Method 608.1 is not present due to unstable operation at all steps.

Model No. MEP 805B – 30kW

Serial No. HX37762

Steady State Full Load Cold Test 30kW HX37762								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-48.9	0.86		Baro psia	psia	14.25	0.992
Filter Housing	F	-44.3	0.60		Air Filter psia	psia	14.48	0.256
Inlet Manifold	F	36.1	0.59		Int Man psia	psia	22.36	0.997
Exh Cyl 1	F	563.2	0.76		Exh Man psia	psia	22.39	0.847
Exh Cyl 2	F	571.9	0.96		Exh Muff psia	psia	14.76	0.880
Exh Cyl 3	F	584.1	0.92					
Exh Cyl 4	F	560.4	1.09		Power	kW	30.1	
Exh Manifold	F	612.9	0.97		Voltage L1	V	124.4	0.0
After Turbo	F	537.3	0.69		Voltage L2	V	124.4	0.3
After Muffler	F	446.7	0.65		Voltage L3	V	124.5	0.2
Outlet Vent	F	-11.7	7.68		Current L1	A	80.6	0.2
Fuel Inlet	F	-22.5	0.08		Current L2	A	81.7	0.3
Fuel Return	F	15.1	8.86		Current L3	A	79.3	0.2
Oil Gallery	F	147.5	15.75		Frequency L1	Hz	60.3	0.7
Oil Sump	F	180.2	16.90		Frequency L2	Hz	62.6	0.7
Radiator 1	F	-4.5	15.46		Frequency L3	Hz	60.3	0.6
Radiator 2	F	4.6	12.42					
Radiator 3	F	-12.5	19.48					
Radiator 4	F	-17.5	29.53					
Coolant Inlet	F	163.1	14.92					
Coolant Outlet	F	170.1	5.45					
Aux Heater In	F	170.0	8.39					
Aux Heater Out	F	149.9	15.75					
Instrument Panel	F	-15.0	15.31					
Voltage Reg	F	2.6	12.60					
Stator Frame	F	-25.9	0.50					
Stator Housing	F	-13.9	0.46					
Battery 1	F	-38.7	0.30					
Battery 2	F	-39.6	0.33					

Steady State Zero Load Cold Test 30kW HX37762								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-48.0	2.91		Baro psia	psia	13.92	1.506
Filter Housing	F	-43.7	1.42		Air Filter psia	psia	14.56	0.170
Inlet Manifold	F	-15.1	2.10		Int Man psia	psia	16.15	0.687
Exh Cyl 1	F	243.1	1.53		Exh Man psia	psia	18.06	1.300
Exh Cyl 2	F	226.1	1.01		Exh Muff psia	psia	14.80	0.244
Exh Cyl 3	F	240.6	1.83					
Exh Cyl 4	F	267.2	0.98		Power	kW	NA	
Exh Manifold	F	234.6	11.23		Voltage L1	V	124.8	0.0
After Turbo	F	218.2	1.16		Voltage L2	V	124.9	0.3
After Muffler	F	171.4	0.81		Voltage L3	V	124.9	0.2
Outlet Vent	F	-29.6	2.73		Current L1	A	NA	NA
Fuel Inlet	F	-22.0	0.20		Current L2	A	NA	NA
Fuel Return	F	14.3	10.00		Current L3	A	NA	NA
Oil Gallery	F	132.6	11.59		Frequency L1	Hz	60.2	0.6
Oil Sump	F	155.1	16.58		Frequency L2	Hz	62.5	0.6
Radiator 1	F	-2.7	10.55		Frequency L3	Hz	60.3	0.6
Radiator 2	F	-5.7	16.51					
Radiator 3	F	-19.3	22.78					
Radiator 4	F	-23.6	28.02					
Coolant Inlet	F	158.6	0.28					
Coolant Outlet	F	114.9	1.71					
Aux Heater In	F	160.9	0.32					
Aux Heater Out	F	137.4	12.24					
Instrument Panel	F	-11.9	13.94					
Voltage Reg	F	-1.9	10.77					
Stator Frame	F	-30.3	0.87					
Stator Housing	F	-22.6	0.61					
Battery 1	F	-35.9	0.80					
Battery 2	F	-37.0	1.05					

The Table for Method 608.1 is not present due to unstable operation at all steps.

Model No. MEP 807A – 100kW

Serial No. 100013

Steady State Full Load Cold Test 100kW 100013								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-48.0	0.98		Baro psia	psia	14.29	0.005
Filter Housing	F	-40.5	0.51		Air Filter psia	psia	14.32	0.005
Inlet Manifold	F	-0.9	0.62		Int Man psia	psia	29.77	0.032
Exh Cyl 1	F	631.2	1.98		Exh Man psia	psia	29.06	0.027
Exh Cyl 2	F	632.9	1.16		Exh Muff psia	psia	14.96	0.006
Exh Cyl 3	F	646.5	1.48					
Exh Cyl 4	F	639.4	1.42		Power	kW	100.0	
Exh Cyl 5	F	665.3	1.43		Voltage L1	V	138.7	0.1
Exh Cyl 6	F	623.5	0.98		Voltage L2	V	138.9	0.1
Exh Manifold	F	690.9	1.58		Voltage L3	V	138.9	0.1
After Turbo	F	538.2	1.14		Current L1	A	240	est.
After Muffler	F	522.8	0.95		Current L2	A	240	est.
Outlet Vent	F	6.8	0.87		Current L3	A	240	est.
Fuel Inlet	F	-36.3	0.37		Frequency L1	Hz	58.8	0.0
Fuel Return	F	185.4	0.07		Frequency L2	Hz	61.1	0.0
Oil Gallery	F	198.7	0.10		Frequency L3	Hz	58.9	0.0
Oil Sump	F	201.4	0.14					
Radiator 1	F	-14.6	0.64					
Radiator 2	F	-14.8	0.60					
Radiator 3	F	-12.1	0.71					
Radiator 4	F	-18.2	0.68					
Coolant Inlet	F	71.0	1.58					
Coolant Outlet	F	75.9	0.71					
Aux Heater In	F	187.9	0.14					
Aux Heater Out	F	-21.8	0.12					
Instrument Panel	F	-39.9	0.33					
Voltage Reg	F	-36.7	0.17					
Stator Frame	F	-42.7	0.46					
Stator Housing	F	-35.0	0.57					
Battery 1	F	-37.8	0.63					
Battery 2	F	-37.8	0.64					

Steady State Zero Load Cold Test 100kW 100013								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	-52.5	0.41		Baro psia	psia	14.29	0.001
Filter Housing	F	-45.2	0.24		Air Filter psia	psia	14.38	0.003
Inlet Manifold	F	-25.0	0.29		Int Man psia	psia	20.04	0.067
Exh Cyl 1	F	596.2	1.79		Exh Man psia	psia	21.43	0.047
Exh Cyl 2	F	212.1	3.34		Exh Muff psia	psia	14.65	0.025
Exh Cyl 3	F	269.9	4.42					
Exh Cyl 4	F	221.8	6.84		Power	kW	NA	
Exh Cyl 5	F	552.1	4.13		Voltage L1	V	139.4	0.2
Exh Cyl 6	F	459.9	10.12		Voltage L2	V	139.4	0.2
Exh Manifold	F	481.9	2.81		Voltage L3	V	139.5	0.2
After Turbo	F	322.4	0.62		Current L1	A	NA	NA
After Muffler	F	288.2	0.40		Current L2	A	NA	NA
Outlet Vent	F	-21.0	0.20		Current L3	A	NA	NA
Fuel Inlet	F	-37.9	0.15		Frequency L1	Hz	59.8	0.1
Fuel Return	F	171.6	0.11		Frequency L2	Hz	62.2	0.1
Oil Gallery	F	177.9	0.12		Frequency L3	Hz	59.9	0.1
Oil Sump	F	179.1	0.10					
Radiator 1	F	-25.1	0.33					
Radiator 2	F	-26.6	0.32					
Radiator 3	F	-24.4	0.37					
Radiator 4	F	-30.3	0.29					
Coolant Inlet	F	116.0	0.68					
Coolant Outlet	F	-24.6	0.27					
Aux Heater In	F	173.9	0.10					
Aux Heater Out	F	-15.6	0.35					
Instrument Panel	F	-41.8	0.19					
Voltage Reg	F	-37.3	0.27					
Stator Frame	F	-46.8	0.21					
Stator Housing	F	-40.6	0.21					
Battery 1	F	-39.5	0.38					
Battery 2	F	-39.4	0.34					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.20	0.14								0.13	0.22
1-2		3.50		2.50	2.80			0.43	1.75		1.40		2.33	2.30		
2						0.50	0.36								0.22	0.37
2-3	10.00		7.14		2.40			0.43	1.75	1.56		2.60		2.60		
3						0.20	0.14								0.10	0.17
3-4		4.10		2.93	2.90			0.43	1.75		1.44		2.40	1.80		
4						0.60	0.43								0.23	0.38
4-5	9.20		6.57		2.50			0.43	1.75	1.72		2.87		2.60		
5						0.20	0.14								0.05	0.08
5-6		4.10		2.93	3.30			0.43	1.75		1.41		2.35	2.00		
6						0.60	0.43								0.29	0.48
7-8	4.80		3.43		2.30			0.36	1.42	1.07		1.78		3.90		
8						0.20	0.14								0.08	0.13
8-9		2.10		1.50	2.70			0.36	1.42		1.05		1.75	1.70		
9						0.60	0.43								0.18	0.30
9-10	6.20		4.43		2.10			0.36	1.42	6.06		10.10		2.40		
10						0.30	0.21								0.10	0.17
10-11		2.30		1.64	2.90			0.36	1.42		1.17		1.95	2.00		
11						0.80	0.57								0.28	0.47
11-12	8.00		5.71		2.30			0.36	1.42	1.18		1.97		2.90		
12						0.20	0.14								0.08	0.13
12-13		2.70		1.93	3.00			0.36	1.42		1.17		1.95	2.90		
13						0.80	0.57								0.30	0.50
14-15	1.30		0.93		1.50			0.29	1.00	0.47		0.78		1.10		
15						0.40	0.29								0.14	0.23
15-16		1.40		1.00	1.40			0.29	1.00		0.74		1.23	1.80		
16						0.70	0.50								0.28	0.47
16-17	2.00		1.43		1.80			0.29	1.00	5.53		9.22		1.20		
17						0.20	0.14								0.12	0.20
17-18		1.30		0.93	1.30			0.29	1.00		0.76		1.27	1.80		
18						0.70	0.50								0.25	0.42
18-19	4.50		3.21		2.30			0.29	1.00	0.74		1.23		2.30		
19						0.30	0.21								0.14	0.23
19-20		1.40		1.00	1.50			0.29	1.00		0.69		1.15	1.90		
20						0.60	0.43								0.26	0.43
21-22	1.00		0.71		1.30			0.14	0.50	0.32		0.53		1.70		
22						1.00	0.71								0.33	0.55
22-23		0.60		0.43	1.60			0.14	0.50		0.48		0.80	2.20		
23						0.80	0.57								0.36	0.60
23-24	1.00		0.71		0.80			0.14	0.50	0.33		0.55		1.10		
24						1.00	0.71								0.25	0.42
24-25		0.60		0.43	1.30			0.14	0.50		0.43		0.72	1.20		
25						0.60	0.43								0.39	0.65
25-26	0.60		0.43		0.70			0.14	0.50	0.17		0.28		1.80		
26						1.30	0.93								0.31	0.52
26-27		0.50		0.36	1.10			0.14	0.50		0.38		0.63	1.10		
27						0.80	0.57								0.34	0.57
28-29	9.40		6.71		2.60			0.43	1.75	1.31		2.18		2.80		
29						0.30	0.21								0.12	0.20
29-30		3.30		2.36	3.00			0.43	1.75		1.37		2.28	1.90		
30						0.70	0.50								0.28	0.47
30-31	9.50		6.79		2.40			0.43	1.75	1.38		2.30		3.00		
31						0.20	0.14								0.12	0.20
31-32		3.80		2.71	1.50			0.43	1.75		1.45		2.42	1.60		
32						0.50	0.36								0.28	0.47
32-33	11.00		7.86		2.40			0.43	1.75	6.65		11.08		2.70		
33						0.20	0.14								0.12	0.20
33-34		3.70		2.64	3.30			0.43	1.75		1.43		2.38	1.50		
34						0.80	0.57								0.36	0.60

Appendix C

Summary Data from Method 670.1: Fuel Consumption Testing

Model No. MEP 803A – 10kW

Serial No. FZ35046

Steady State Full Load Ambient Fuel Consumption 10kW FZ35046								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	65.9	5.80		Baro psia	psia	na	na
Filter Housing	F	73.1	5.99		Air Filter psia	psia	14.36	0.007
Inlet Manifold	F	75.0	6.66		Int Man psia	psia	14.22	0.006
Exh Cyl 1	F	507.6	10.06		Exh Man psia	psia	15.17	0.016
Exh Cyl 2	F	547.5	12.97		Exh Muff psia	psia	14.44	0.008
Exh Cyl 3	F	683.7	17.15					
Exh Cyl 4	F	667.4	17.02		Power	kW	9.1	
Exh Manifold	F	623.5	16.17		Voltage	V	113.0	0.10
After Muffler	F	549.2	16.75		Current	A	80.2	1.60
Outlet Vent	F	102.4	10.20		Frequency	Hz	60.6	0.21
Fuel Inlet	F	76.1	5.66					
Fuel Return	F	87.4	6.77					
Oil Gallery	F	200.5	14.61					
Oil Sump	F	205.0	16.03					
Radiator 1	F	102.2	7.64					
Radiator 2	F	91.1	7.14					
Radiator 3	F	97.8	7.28					
Radiator 4	F	86.9	6.83					
Coolant Inlet	F	143.3	10.30					
Coolant Outlet	F	190.3	14.61					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	75.6	8.65					
Voltage Reg	F	50.3	6.40					
Stator Frame	F	70.8	5.84					
Stator Housing	F	102.4	9.72					
Battery 1	F	84.4	8.39					
Battery 2	F	77.2	6.45					

Fuel Consumption	6.08	Lbs/Hr
Pounds per kWH	0.671	Lbs/kW-Hr
Operating Hours	9.57	Hr

Model No. MEP 803A – 10kW

Serial No. FZ35055

Steady State Full Load Ambient Fuel Consumption 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	87.2	5.39		Baro psia	psia	na	na
Filter Housing	F	103.6	14.49		Air Filter psia	psia	14.19	0.073
Inlet Manifold	F	144.0	19.29		Int Man psia	psia	14.18	0.299
Exh Cyl 1	F	721.8	12.58		Exh Man psia	psia	15.10	0.331
Exh Cyl 2	F	680.8	8.87		Exh Muff psia	psia	14.31	0.110
Exh Cyl 3	F	627.9	12.10					
Exh Cyl 4	F	616.5	15.37		Power	kW	9.9	
Exh Manifold	F	671.6	13.17		Voltage	V	118.6	0.53
After Muffler	F	592.5	22.71		Current	A	83.3	0.80
Outlet Vent	F	190.4	17.62		Frequency	Hz	59.5	0.42
Fuel Inlet	F	98.0	5.74					
Fuel Return	F	118.0	13.88					
Oil Gallery	F	215.2	13.62					
Oil Sump	F	209.2	14.25					
Radiator 1	F	112.3	6.49					
Radiator 2	F	118.1	6.70					
Radiator 3	F	118.5	5.95					
Radiator 4	F	110.8	5.74					
Coolant Inlet	F	174.1	9.36					
Coolant Outlet	F	193.7	9.06					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	96.9	7.15					
Voltage Reg	F	119.6	10.21					
Stator Frame	F	151.0	18.73					
Stator Housing	F	178.1	18.23					
Battery 1	F	148.5	19.69					
Battery 2	F	149.6	18.83					

Fuel Consumption	6.32	Lbs/Hr
Pounds per kWH	0.640	Lbs/kW-Hr
Operating Hours	9.21	Hr

Model No. MEP 804A – 15kW

Serial No. FZ60344

Steady State Full Load Ambient Fuel Consumption 15kW FZ60344								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	78.6	2.64		Baro psia	psia	13.99	0.011
Filter Housing	F	87.2	1.61		Air Filter psia	psia	14.12	0.012
Inlet Manifold	F	91.6	1.52		Int Man psia	psia	13.68	0.012
Exh Cyl 1	F	710.5	5.63		Exh Man psia	psia	14.49	0.014
Exh Cyl 2	F	795.4	4.86		Exh Muff psia	psia	14.25	0.012
Exh Cyl 3	F	773.1	4.34					
Exh Cyl 4	F	634.0	5.48		Power	kW	16.3	
Exh Manifold	F	778.0	4.59		Voltage L1	V	119.7	0.19
After Muffler	F	560.8	3.51		Voltage L2	V	119.8	0.18
Outlet Vent	F	153.6	4.66		Voltage L3	V	119.9	0.19
Fuel Inlet	F	94.2	5.56		Current L1	A	45.6	0.08
Fuel Return	F	95.3	4.90		Current L2	A	45.7	0.09
Oil Gallery	F	199.9	3.12		Current L3	A	45.0	0.09
Oil Sump	F	201.8	3.10		Frequency L1	Hz	59.0	0.02
Radiator 1	F	113.7	1.84		Frequency L2	Hz	60.0	0.02
Radiator 2	F	117.6	1.85		Frequency L3	Hz	60.1	0.02
Radiator 3	F	111.5	1.80					
Radiator 4	F	112.6	1.90					
Coolant Inlet	F	170.9	3.12					
Coolant Outlet	F	188.7	3.09					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	91.9	1.33					
Voltage Reg	F	94.6	1.27					
Stator Frame	F	94.9	2.15					
Stator Housing	F	88.8	1.92					
Battery 1	F	86.1	2.56					
Battery 2	F	95.5	1.70					

Fuel Consumption	10.35	Lbs/Hr
Pounds per kWH	0.634	Lbs/kW-Hr
Operating Hours	8.75	Hr

Model No. MEP 804A – 15kW

Serial No. FZ60357

Steady State Full Load Ambient Fuel Consumption 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	74.1	4.81		Baro psia	psia	14.30	0.004
Filter Housing	F	77.4	4.50		Air Filter psia	psia	14.35	0.007
Inlet Manifold	F	83.4	4.44		Int Man psia	psia	14.14	0.007
Exh Cyl 1	F	747.5	11.18		Exh Man psia	psia	14.67	0.010
Exh Cyl 2	F	788.8	15.21		Exh Muff psia	psia	14.42	0.007
Exh Cyl 3	F	785.4	9.96					
Exh Cyl 4	F	659.5	8.23		Power	kW	16.1	
Exh Manifold	F	784.2	10.93		Voltage L1	V	120.5	0.04
After Muffler	F	481.5	5.27		Voltage L2	V	120.5	0.02
Outlet Vent	F	139.2	7.33		Voltage L3	V	120.5	0.04
Fuel Inlet	F	83.4	7.39		Current L1	A	44.5	0.03
Fuel Return	F	83.2	7.65		Current L2	A	45.1	0.03
Oil Gallery	F	192.0	2.56		Current L3	A	43.9	0.04
Oil Sump	F	194.7	2.46		Frequency L1	Hz	59.1	0.02
Radiator 1	F	104.4	5.31		Frequency L2	Hz	46.7	0.02
Radiator 2	F	101.9	5.24		Frequency L3	Hz	60.0	0.02
Radiator 3	F	107.0	5.58					
Radiator 4	F	105.5	5.47					
Coolant Inlet	F	152.4	5.74					
Coolant Outlet	F	174.4	1.14					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	84.8	6.40					
Voltage Reg	F	92.1	6.28					
Stator Frame	F	82.4	4.90					
Stator Housing	F	83.5	4.87					
Battery 1	F	96.8	5.91					
Battery 2	F	91.1	6.43					

Fuel Consumption	9.92	Lbs/Hr
Pounds per kWH	0.617	Lbs/kW-Hr
Operating Hours	9.13	Hr

Model No. MEP 804B – 15kW

Serial No. FZ61920

Steady State Full Load Ambient Fuel Consumption 15kW FZ61920								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	73.6	4.68		Baro psia	psia	14.18	0.003
Filter Housing	F	74.6	4.77		Air Filter psia	psia	14.26	0.005
Inlet Manifold	F	134.0	5.46		Int Man psia	psia	18.32	0.111
Exh Cyl 1	F	668.7	12.10		Exh Man psia	psia	18.30	0.094
Exh Cyl 2	F	689.7	12.77		Exh Muff psia	psia	14.30	0.006
Exh Cyl 3	F	686.4	12.05					
Exh Cyl 4	F	677.5	9.58		Power	kW	16.0	
Exh Manifold	F	725.4	15.17		Voltage L1	V	120.1	0.35
After Turbo	F	633.9	12.92		Voltage L2	V	120.1	0.35
After Muffler	F	422.7	13.70		Voltage L3	V	120.1	0.35
Outlet Vent	F	123.9	6.93		Current L1	A	44.5	0.47
Fuel Inlet	F	85.3	11.03		Current L2	A	45.0	0.48
Fuel Return	F	106.1	9.56		Current L3	A	43.8	0.47
Oil Gallery	F	139.3	5.79		Frequency L1	Hz	59.9	0.88
Oil Sump	F	199.0	3.92		Frequency L2	Hz	62.3	0.91
Radiator 1	F	na	na		Frequency L3	Hz	60.0	0.88
Radiator 2	F	na	na					
Radiator 3	F	99.3	5.73					
Radiator 4	F	99.5	5.61					
Coolant Inlet	F	121.1	7.39					
Coolant Outlet	F	158.9	1.07					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	82.4	5.04					
Voltage Reg	F	93.8	5.98					
Stator Frame	F	79.1	6.13					
Stator Housing	F	86.9	5.97					
Battery 1	F	90.7	6.12					
Battery 2	F	90.3	6.23					

Fuel Consumption	10.25	Lbs/Hr
Pounds per kWH	0.641	Lbs/kW-Hr
Operating Hours	8.84	Hr

Model No. MEP 804B – 15kW

Serial No. FZ61946

Steady State Full Load Ambient Fuel Consumption 15kW FZ61946								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	62.3	3.56		Baro psia	psia	14.25	0.010
Filter Housing	F	66.7	4.14		Air Filter psia	psia	14.41	0.014
Inlet Manifold	F	124.9	4.94		Int Man psia	psia	18.16	0.063
Exh Cyl 1	F	632.2	10.47		Exh Man psia	psia	18.76	0.105
Exh Cyl 2	F	606.2	9.41		Exh Muff psia	psia	14.48	0.007
Exh Cyl 3	F	660.2	8.12					
Exh Cyl 4	F	636.2	6.81		Power	kW	16.3	
Exh Manifold	F	609.4	9.42		Voltage L1	V	120.1	0.06
After Turbo	F	560.6	10.23		Voltage L2	V	120.1	0.06
After Muffler	F	433.5	14.92		Voltage L3	V	120.2	0.06
Outlet Vent	F	86.0	4.68		Current L1	A	45.3	0.14
Fuel Inlet	F	85.4	10.68		Current L2	A	45.6	0.15
Fuel Return	F	104.8	9.54		Current L3	A	44.7	0.16
Oil Gallery	F	140.6	10.93		Frequency L1	Hz	59.9	0.02
Oil Sump	F	192.3	9.86		Frequency L2	Hz	60.0	0.02
Radiator 1	F	89.0	5.16		Frequency L3	Hz	60.2	0.02
Radiator 2	F	114.0	8.92					
Radiator 3	F	109.0	7.41					
Radiator 4	F	87.7	4.72					
Coolant Inlet	F	52.1	3.10					
Coolant Outlet	F	157.1	3.49					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	78.0	6.57					
Voltage Reg	F	77.7	5.19					
Stator Frame	F	77.7	4.98					
Stator Housing	F	70.6	4.32					
Battery 1	F	75.6	4.67					
Battery 2	F	74.6	4.49					

Fuel Consumption	8.80	Lbs/Hr
Pounds per kWH	0.540	Lbs/kW-Hr
Operating Hours	10.29	Hr

Model No. MEP 805B – 30kW

Serial No. HX37756

Steady State Full Load Ambient Fuel Consumption 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	50.1	1.80		Baro psia	psia	14.33	0.006
Filter Housing	F	53.9	1.44		Air Filter psia	psia	14.37	0.006
Inlet Manifold	F	117.1	2.15		Int Man psia	psia	19.31	0.162
Exh Cyl 1	F	632.4	9.73		Exh Man psia	psia	19.51	0.074
Exh Cyl 2	F	675.7	9.37		Exh Muff psia	psia	14.51	0.007
Exh Cyl 3	F	683.2	11.94					
Exh Cyl 4	F	653.6	8.22		Power	kW	31.6	
Exh Manifold	F	708.1	10.68		Voltage L1	V	120.3	0.05
After Turbo	F	638.8	11.56		Voltage L2	V	120.3	0.03
After Muffler	F	533.7	14.18		Voltage L3	V	120.5	0.05
Outlet Vent	F	97.2	3.15		Current L1	A	87.4	0.05
Fuel Inlet	F	72.7	7.94		Current L2	A	88.8	0.05
Fuel Return	F	86.3	2.45		Current L3	A	86.2	0.06
Oil Gallery	F	190.9	9.26		Frequency L1	Hz	60.1	0.02
Oil Sump	F	211.1	7.12		Frequency L2	Hz	62.5	0.02
Radiator 1	F	61.4	0.95		Frequency L3	Hz	60.2	0.02
Radiator 2	F	95.5	3.15					
Radiator 3	F	98.1	3.25					
Radiator 4	F	97.1	2.99					
Coolant Inlet	F	158.9	2.15					
Coolant Outlet	F	179.7	3.17					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	66.8	1.29					
Voltage Reg	F	55.4	0.76					
Stator Frame	F	108.6	4.39					
Stator Housing	F	77.1	2.29					
Battery 1	F	52.2	0.76					
Battery 2	F	53.1	0.69					

Fuel Consumption	17.83	Lbs/Hr
Pounds per kWH	0.565	Lbs/kW-Hr
Operating Hours	8.34	Hr

Model No. MEP 805B – 30kW

Serial No. HX37762

Steady State Full Load Ambient Fuel Consumption 30kW HX37762								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	48.9	4.51		Baro psia	psia	14.39	0.013
Filter Housing	F	52.8	4.73		Air Filter psia	psia	14.44	0.015
Inlet Manifold	F	120.9	5.83		Int Man psia	psia	19.86	0.120
Exh Cyl 1	F	673.5	11.32		Exh Man psia	psia	19.80	0.059
Exh Cyl 2	F	688.7	8.70		Exh Muff psia	psia	14.62	0.016
Exh Cyl 3	F	712.5	9.46					
Exh Cyl 4	F	660.2	5.69		Power	kW	30.3	
Exh Manifold	F	730.4	9.01		Voltage L1	V	118.7	0.21
After Turbo	F	647.9	10.13		Voltage L2	V	118.6	0.21
After Muffler	F	544.0	13.23		Voltage L3	V	118.7	0.20
Outlet Vent	F	94.6	8.37		Current L1	A	85.1	0.13
Fuel Inlet	F	64.7	13.92		Current L2	A	86.4	0.13
Fuel Return	F	96.5	10.54		Current L3	A	84.0	0.12
Oil Gallery	F	200.6	19.23		Frequency L1	Hz	59.9	0.05
Oil Sump	F	210.3	13.93		Frequency L2	Hz	62.3	0.05
Radiator 1	F	59.9	7.25		Frequency L3	Hz	60.1	0.05
Radiator 2	F	96.1	8.11					
Radiator 3	F	98.2	8.37					
Radiator 4	F	100.9	7.53					
Coolant Inlet	F	159.9	5.87					
Coolant Outlet	F	181.3	10.25					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	62.2	5.98					
Voltage Reg	F	59.2	7.27					
Stator Frame	F	114.2	10.77					
Stator Housing	F	70.5	7.77					
Battery 1	F	59.5	5.47					
Battery 2	F	58.3	5.43					

Fuel Consumption	18.80	Lbs/Hr
Pounds per kWH	0.620	Lbs/kW-Hr
Operating Hours	7.92	Hr

Appendix D

Summary Data from Methods 608.1, 608.2, 630.1: Electrical Characteristics Testing At Ambient Conditions

Model No. MEP 803A – 10kW

Serial No. FZ35046

Method 608.1

Steady State Full Load Ambient Short Term Transient 10kW FZ35046								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	63.2	0.18		Baro psia	psia	14.23	0.003
Filter Housing	F	68.3	0.25		Air Filter psia	psia	14.29	0.005
Inlet Manifold	F	72.2	1.11		Int Man psia	psia	14.15	0.000
Exh Cyl 1	F	503.0	1.25		Exh Man psia	psia	15.11	0.008
Exh Cyl 2	F	547.4	1.36		Exh Muff psia	psia	14.37	0.005
Exh Cyl 3	F	691.4	2.07					
Exh Cyl 4	F	665.7	2.12		Power	kW	9.1	
Exh Manifold	F	629.8	1.48		Voltage	V	113.1	0.03
After Muffler	F	553.2	1.76		Current	A	80.7	0.06
Outlet Vent	F	101.6	0.55		Frequency	Hz	60.7	0.05
Fuel Inlet	F	72.7	0.17					
Fuel Return	F	83.9	0.26					
Oil Gallery	F	200.7	0.16					
Oil Sump	F	204.5	0.23					
Radiator 1	F	98.8	0.29					
Radiator 2	F	87.6	0.19					
Radiator 3	F	94.0	0.36					
Radiator 4	F	83.1	0.23					
Coolant Inlet	F	139.5	0.58					
Coolant Outlet	F	189.4	0.06					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	73.6	0.22					
Voltage Reg	F	46.8	0.05					
Stator Frame	F	67.6	0.22					
Stator Housing	F	100.3	0.24					
Battery 1	F	98.9	0.38					
Battery 2	F	74.6	0.20					

Load Step	Voltage								Frequency							
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation	Max Freq Excursion			Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.12	0.20
1-2		1.50		1.25	0.50			0.50	2.23		0.02		0.03	1.90		
2						1.20	1.00								0.21	0.35
2-3	1.90		1.58		0.70			0.42	2.23	0.13		0.22		4.30		
3						0.20	0.17								0.10	0.17
3-4		2.70		2.25	0.70			0.42	2.15		0.04		0.07	1.80		
4						1.30	1.08								0.21	0.35
4-5	2.20		1.83		0.50			0.50	2.23	0.08		0.13		4.70		
5						0.20	0.17								0.15	0.25
5-6		1.50		1.25	0.50			0.50	2.20		0.05		0.08	2.70		
6						1.20	1.00								0.21	0.35
7-8	0.60		0.50		0.80			0.42	1.85	0.03		0.05		1.50		
8						0.20	0.17								0.11	0.18
8-9		1.40		1.17	0.80			0.42	1.78		0.02		0.03	2.00		
9						1.30	1.08								0.23	0.38
9-10	1.70		1.42		0.70			0.42	1.73	0.07		0.12		2.70		
10						0.20	0.17								0.13	0.22
10-11		1.10		0.92	0.80			0.33	1.60		0.11		0.18	2.50		
11						1.30	1.08								0.20	0.33
11-12	1.20		1.00		1.10			0.33	1.88	0.10		0.17		3.60		
12						0.20	0.17								0.12	0.20
12-13		2.50		2.08	0.40			0.33	1.55		0.06		0.10	1.90		
13						1.30	1.08								0.21	0.35
14-15	1.10		0.92		0.40			0.25	1.17	0.04		0.07		1.90		
15						0.20	0.17								0.13	0.22
15-16		1.00		0.83	0.80			0.25	1.17		0.00		0.00	1.30		
16						1.20	1.00								0.18	0.30
16-17	0.80		0.67		0.60			0.21	1.18	0.02		0.03		0.90		
17						0.20	0.17								0.12	0.20
17-18		0.60		0.50	1.20			0.21	1.17		0.04		0.07	1.30		
18						1.40	1.17								0.23	0.38
18-19	0.65		0.54		0.60			0.21	1.00	0.01		0.02		1.20		
19						0.20	0.17								0.10	0.17
19-20		1.40		1.17	0.50			0.25	1.13		0.01		0.02	0.90		
20						1.20	1.00								0.21	0.35
21-22	0.55		0.46		0.70			0.21	0.72	0.01		0.02		1.00		
22						0.20	0.17								0.10	0.17
22-23		0.90		0.75	0.50			0.13	0.62		0.01		0.02	1.00		
23						1.30	1.08								0.23	0.38
23-24	0.60		0.50		0.80			0.08	0.58	0.03		0.05		1.30		
24						0.20	0.17								0.08	0.13
24-25		0.75		0.63	0.70			0.13	0.70		0.04		0.07	0.14		
25						1.50	1.25								0.21	0.35
25-26	0.60		0.50		1.30			0.17	0.57	0.05		0.08		1.20		
26						0.20	0.17								0.10	0.17
26-27		0.40		0.33	0.50			0.17	0.62		0.07		0.12	1.30		
27						1.40	1.17								0.23	0.38
28-29	2.80		2.33		1.40			0.42	2.20	0.18		0.30		1.80		
29						0.20	0.17								0.17	0.28
29-30		0.80		0.67	1.00			0.38	2.13		0.05		0.08	1.30		
30						1.40	1.17								0.26	0.43
30-31	2.70		2.25		1.40			0.42	2.30	0.17		0.28		1.40		
31						0.20	0.17								0.14	0.23
31-32		2.70		2.25	0.70			0.38	2.15		0.08		0.13	1.10		
32						1.60	1.33								0.24	0.40
32-33	1.10		0.92		0.70			0.42	2.23	0.06		0.10		1.60		
33						0.20	0.17								0.12	0.20
33-34		1.80		1.50	1.10			0.46	2.10		0.03		0.05	1.50		
34						1.40	1.17								0.27	0.45

Method 608.2

Steady State Full Load Ambient Long Term Transient 10kW FZ35046								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	66.6	5.37		Baro psia	psia	14.26	0.005
Filter Housing	F	72.7	5.67		Air Filter psia	psia	14.33	0.005
Inlet Manifold	F	76.7	5.35		Int Man psia	psia	14.18	0.001
Exh Cyl 1	F	505.6	3.66		Exh Man psia	psia	15.14	0.011
Exh Cyl 2	F	549.8	5.79		Exh Muff psia	psia	14.40	0.005
Exh Cyl 3	F	692.2	7.58					
Exh Cyl 4	F	671.9	5.07		Power	kW	9.0	
Exh Manifold	F	628.5	7.03		Voltage	V	112.2	0.07
After Muffler	F	554.5	5.92		Current	A	80.2	0.08
Outlet Vent	F	105.4	5.92		Frequency	Hz	60.8	0.04
Fuel Inlet	F	76.9	4.67					
Fuel Return	F	88.6	5.15					
Oil Gallery	F	203.1	1.78					
Oil Sump	F	207.4	1.22					
Radiator 1	F	103.5	5.12					
Radiator 2	F	92.5	5.27					
Radiator 3	F	98.6	5.27					
Radiator 4	F	87.9	5.40					
Coolant Inlet	F	146.4	5.22					
Coolant Outlet	F	190.8	0.48					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	79.2	5.58					
Voltage Reg	F	51.7	5.22					
Stator Frame	F	71.6	5.57					
Stator Housing	F	105.0	5.54					
Battery 1	F	98.4	9.63					
Battery 2	F	78.5	5.36					

Steady State No Load Ambient Long Term Transient 10kW FZ35046								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	81.7	3.09		Baro psia	psia	14.24	0.014
Filter Housing	F	85.1	2.95		Air Filter psia	psia	14.30	0.014
Inlet Manifold	F	86.3	3.10		Int Man psia	psia	14.15	0.015
Exh Cyl 1	F	267.2	2.96		Exh Man psia	psia	14.96	0.090
Exh Cyl 2	F	282.1	1.84		Exh Muff psia	psia	14.38	0.019
Exh Cyl 3	F	357.6	2.04					
Exh Cyl 4	F	354.1	2.65		Power	kW	na	
Exh Manifold	F	319.8	1.58		Voltage	V	112.7	0.47
After Muffler	F	290.2	6.07		Current	A	na	na
Outlet Vent	F	108.1	4.28		Frequency	Hz	62.0	0.05
Fuel Inlet	F	90.1	4.76					
Fuel Return	F	99.0	3.87					
Oil Gallery	F	193.7	1.71					
Oil Sump	F	196.0	1.63					
Radiator 1	F	108.0	3.59					
Radiator 2	F	101.2	3.31					
Radiator 3	F	103.4	3.62					
Radiator 4	F	96.8	3.28					
Coolant Inlet	F	134.8	3.52					
Coolant Outlet	F	186.1	0.84					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	96.9	7.65					
Voltage Reg	F	77.0	8.93					
Stator Frame	F	83.8	3.11					
Stator Housing	F	101.3	3.33					
Battery 1	F	124.8	7.83					
Battery 2	F	88.7	3.34					

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	112.2	112.3	112.2
	Long Term	112.2	112.4	112.0
Frequency [Hz]	Short Term	60.91	60.96	60.86
	Long Term	60.85	60.97	60.61
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	112.8	113.3	112.2
	Long Term	112.7	113.9	111.4
Frequency [Hz]	Short Term	62.08	62.16	61.92
	Long Term	62.02	62.18	61.82

Model No. MEP 803A – 10kW

Serial No. FZ35055

Method 608.1

Steady State Full Load Ambient Short Term Transient 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	82.0	5.75		Baro psia	psia	na	na
Filter Housing	F	119.1	20.75		Air Filter psia	psia	14.22	0.078
Inlet Manifold	F	156.3	12.70		Int Man psia	psia	14.25	0.370
Exh Cyl 1	F	712.2	9.04		Exh Man psia	psia	15.20	0.420
Exh Cyl 2	F	684.9	4.99		Exh Muff psia	psia	14.35	0.120
Exh Cyl 3	F	630.9	4.34					
Exh Cyl 4	F	628.0	11.63		Power	kW	10.2	
Exh Manifold	F	680.9	9.20		Voltage	V	120.0	0.03
After Muffler	F	603.2	8.38		Current	A	84.6	0.04
Outlet Vent	F	200.6	15.15		Frequency	Hz	59.8	0.02
Fuel Inlet	F	90.1	0.85					
Fuel Return	F	120.9	11.29					
Oil Gallery	F	220.8	6.15					
Oil Sump	F	215.4	6.45					
Radiator 1	F	106.0	1.59					
Radiator 2	F	111.1	1.77					
Radiator 3	F	110.3	3.90					
Radiator 4	F	104.0	3.70					
Coolant Inlet	F	184.0	9.82					
Coolant Outlet	F	206.4	10.71					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	87.9	1.61					
Voltage Reg	F	120.6	8.78					
Stator Frame	F	165.0	11.74					
Stator Housing	F	195.2	14.15					
Battery 1	F	164.1	14.58					
Battery 2	F	162.7	12.52					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.10	0.17
1-2		1.90		1.58	1.30			0.50	2.92		0.09		0.15	2.30		
2						0.20	0.17								0.12	0.20
2-3	0.50		0.42		1.00			0.50	2.95	0.23		0.38		3.90		
3						0.20	0.17								0.10	0.17
3-4		1.40		1.17	0.60			0.50	2.98		0.05		0.08	1.80		
4						0.20	0.17								0.13	0.22
4-5	0.70		0.58		1.50			0.50	2.98	0.16		0.27		2.50		
5						0.10	0.08								0.10	0.17
5-6		1.70		1.42	0.70			0.50	2.93		0.04		0.07	1.80		
6						0.30	0.25								0.09	0.15
7-8	0.95		0.79		0.40			0.50	2.43	0.09		0.15		3.00		
8						0.10	0.08								0.10	0.17
8-9		1.60		1.33	0.50			0.42	2.33		0.03		0.05	1.10		
9						0.30	0.25								0.13	0.22
9-10	2.45		2.04		0.50			0.42	2.37	0.10		0.17		3.20		
10						0.20	0.17								0.13	0.22
10-11		0.85		0.71	1.00			0.42	2.23		0.03		0.05	0.90		
11						0.20	0.17								0.10	0.17
11-12	1.45		1.21		0.40			0.42	2.40	0.10		0.17		2.70		
12						0.10	0.08								0.14	0.23
12-13		1.70		1.42	0.50			0.42	2.27		0.02		0.03	0.80		
13						0.30	0.25								0.11	0.18
14-15	0.75		0.63		0.60			0.29	1.57	0.10		0.17		1.70		
15						0.10	0.08								0.12	0.20
15-16		1.10		0.92	0.30			0.29	1.60		0.05		0.08	0.90		
16						0.20	0.17								0.08	0.13
16-17	0.50		0.42		0.50			0.29	1.63	0.03		0.05		1.40		
17						0.10	0.08								0.17	0.28
17-18		1.20		1.00	0.40			0.25	1.55		0.05		0.08	1.10		
18						0.30	0.25								0.09	0.15
18-19																
19																
19-20	Missed Load Step When Operating															
20																
21-22	1.00		0.83		0.30			0.21	1.03	0.00		0.00		0.70		
22						0.10	0.08								0.13	0.22
22-23		0.50		0.42	0.40			0.21	0.95		0.03		0.05	0.70		
23						0.30	0.25								0.08	0.13
23-24	0.55		0.46		0.30			0.21	1.00	0.02		0.03		1.70		
24						0.10	0.08								0.12	0.20
24-25		0.50		0.42	0.60			0.17	0.92		0.00		0.00	0.80		
25						0.20	0.17								0.16	0.27
25-26	0.80		0.67		0.30			0.17	1.00	0.05		0.08		1.70		
26						0.20	0.17								0.12	0.20
26-27		0.80		0.67	0.30			0.17	0.93		0.05		0.08	1.90		
27						0.20	0.17								0.10	0.17
28-29	1.10		0.92		0.70			0.42	3.07	0.41		0.68		1.30		
29						0.00	0.00								0.21	0.35
29-30		1.90		1.58	1.30			0.42	2.75		0.04		0.07	1.50		
30						0.20	0.17								0.10	0.17
30-31	1.40		1.17		0.80			0.50	2.70	0.41		0.68		1.30		
31						0.20	0.17								0.18	0.30
31-32		1.20		1.00	1.00			0.50	2.88		0.02		0.03	0.90		
32						0.20	0.17								0.09	0.15
32-33	1.80		1.50		0.70			0.50	3.10	0.30		0.50		1.20		
33						0.10	0.08								0.18	0.30
33-34		1.40		1.17	1.30			0.50	2.83		0.00		0.00	2.00		
34						0.20	0.17								0.07	0.12

Method 608.2

Steady State Full Load Ambient Long Term Transient 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	80.6	8.21		Baro psia	psia	na	na
Filter Housing	F	109.0	20.72		Air Filter psia	psia	14.20	0.081
Inlet Manifold	F	153.4	17.19		Int Man psia	psia	14.23	0.350
Exh Cyl 1	F	717.2	7.31		Exh Man psia	psia	15.17	0.373
Exh Cyl 2	F	685.5	3.46		Exh Muff psia	psia	14.34	0.120
Exh Cyl 3	F	629.4	4.88					
Exh Cyl 4	F	622.3	11.73		Power	kW	10.3	
Exh Manifold	F	678.1	12.17		Voltage	V	120.8	0.06
After Muffler	F	602.8	9.01		Current	A	85.2	0.06
Outlet Vent	F	196.0	16.52		Frequency	Hz	60.0	0.02
Fuel Inlet	F	88.9	1.91					
Fuel Return	F	119.4	12.51					
Oil Gallery	F	218.8	6.66					
Oil Sump	F	215.1	7.24					
Radiator 1	F	103.6	2.14					
Radiator 2	F	109.2	2.09					
Radiator 3	F	108.0	4.36					
Radiator 4	F	101.2	3.65					
Coolant Inlet	F	178.3	10.90					
Coolant Outlet	F	207.7	11.46					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	84.7	2.55					
Voltage Reg	F	119.9	9.80					
Stator Frame	F	161.6	16.94					
Stator Housing	F	190.0	16.87					
Battery 1	F	159.7	17.07					
Battery 2	F	160.8	16.77					

Steady State No Load Ambient Long Term Transient 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	85.6	6.00		Baro psia	psia	na	na
Filter Housing	F	114.2	20.68		Air Filter psia	psia	14.19	0.081
Inlet Manifold	F	162.8	12.96		Int Man psia	psia	14.20	0.342
Exh Cyl 1	F	332.5	12.73		Exh Man psia	psia	14.94	0.380
Exh Cyl 2	F	308.4	9.52		Exh Muff psia	psia	14.32	0.126
Exh Cyl 3	F	283.1	11.63					
Exh Cyl 4	F	275.6	15.06		Power	kW	na	
Exh Manifold	F	315.2	17.00		Voltage	V	121.3	0.08
After Muffler	F	285.8	18.09		Current	A	na	na
Outlet Vent	F	185.9	12.91		Frequency	Hz	61.7	0.03
Fuel Inlet	F	93.7	6.31					
Fuel Return	F	125.8	12.97					
Oil Gallery	F	203.8	8.35					
Oil Sump	F	201.9	9.55					
Radiator 1	F	101.8	4.91					
Radiator 2	F	105.8	5.11					
Radiator 3	F	104.2	6.72					
Radiator 4	F	100.4	5.77					
Coolant Inlet	F	154.3	12.83					
Coolant Outlet	F	205.3	13.38					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	93.1	6.34					
Voltage Reg	F	127.4	13.09					
Stator Frame	F	165.6	12.80					
Stator Housing	F	180.6	13.41					
Battery 1	F	166.6	13.31					
Battery 2	F	166.5	12.76					

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	120.6	120.7	120.6
	Long Term	120.8	120.9	120.6
Frequency [Hz]	Short Term	59.97	60.01	59.92
	Long Term	59.96	60.04	59.89
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	121.2	121.4	120.6
	Long Term	121.3	121.5	121.0
Frequency [Hz]	Short Term	61.49	61.77	59.92
	Long Term	61.73	61.83	61.60

Model No. MEP 804A – 15kW

Serial No. FZ60344

Method 608.1

Steady State Full Load Ambient Short Term Transient 15kW FZ60344								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	82.1	1.01		Baro psia	psia	14.02	0.000
Filter Housing	F	91.9	0.64		Air Filter psia	psia	14.14	0.000
Inlet Manifold	F	96.6	0.09		Int Man psia	psia	13.71	0.004
Exh Cyl 1	F	720.7	0.43		Exh Man psia	psia	14.52	0.005
Exh Cyl 2	F	803.6	0.52		Exh Muff psia	psia	14.28	0.000
Exh Cyl 3	F	781.6	0.33					
Exh Cyl 4	F	643.8	0.31		Power	kW	16.4	
Exh Manifold	F	787.3	0.22		Voltage L1	V	120.0	0.04
After Muffler	F	569.0	0.07		Voltage L2	V	120.2	0.05
Outlet Vent	F	158.7	0.21		Voltage L3	V	120.2	0.03
Fuel Inlet	F	89.3	0.07		Current L1	A	45.6	0.02
Fuel Return	F	91.5	0.11		Current L2	A	45.7	0.02
Oil Gallery	F	203.0	0.08		Current L3	A	45.0	0.04
Oil Sump	F	205.0	0.14		Frequency L1	Hz	59.8	0.02
Radiator 1	F	117.6	0.18		Frequency L2	Hz	60.0	0.02
Radiator 2	F	122.2	0.33		Frequency L3	Hz	60.1	0.01
Radiator 3	F	115.7	0.38					
Radiator 4	F	117.4	0.58					
Coolant Inlet	F	177.7	0.45					
Coolant Outlet	F	195.4	0.05					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	92.9	0.07					
Voltage Reg	F	97.5	0.22					
Stator Frame	F	95.2	0.68					
Stator Housing	F	91.4	0.61					
Battery 1	F	88.7	0.13					
Battery 2	F	98.2	0.20					

Load Step	Voltage							Regulation	Frequency							
	Max Volt Excursion		Excursion %		Rec Time	Variation			Max Freq Excursion		Excursion %		Rec Time	Variation		
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.10	0.17
1-2		1.90		1.58	1.30			0.50	2.92		0.09		0.15	2.30		
2						0.20	0.17								0.12	0.20
2-3	0.50		0.42		1.00			0.50	2.95	0.23		0.38		3.90		
3						0.20	0.17								0.10	0.17
3-4		1.40		1.17	0.60			0.50	2.98		0.05		0.08	1.80		
4						0.20	0.17								0.13	0.22
4-5	0.70		0.58		1.50			0.50	2.98	0.16		0.27		2.50		
5						0.10	0.08								0.10	0.17
5-6		1.70		1.42	0.70			0.50	2.93		0.04		0.07	1.80		
6						0.30	0.25								0.09	0.15
7-8	0.95		0.79		0.40			0.50	2.43	0.09		0.15		3.00		
8						0.10	0.08								0.10	0.17
8-9		1.60		1.33	0.50			0.42	2.33		0.03		0.05	1.10		
9						0.30	0.25								0.13	0.22
9-10	2.45		2.04		0.50			0.42	2.37	0.10		0.17		3.20		
10						0.20	0.17								0.13	0.22
10-11		0.85		0.71	1.00			0.42	2.23		0.03		0.05	0.90		
11						0.20	0.17								0.10	0.17
11-12	1.45		1.21		0.40			0.42	2.40	0.10		0.17		2.70		
12						0.10	0.08								0.14	0.23
12-13		1.70		1.42	0.50			0.42	2.27		0.02		0.03	0.80		
13						0.30	0.25								0.11	0.18
14-15	0.75		0.63		0.60			0.29	1.57	0.10		0.17		1.70		
15						0.10	0.08								0.12	0.20
15-16		1.10		0.92	0.30			0.29	1.60		0.05		0.08	0.90		
16						0.20	0.17								0.08	0.13
16-17	0.50		0.42		0.50			0.29	1.63	0.03		0.05		1.40		
17						0.10	0.08								0.17	0.28
17-18		1.20		1.00	0.40			0.25	1.55		0.05		0.08	1.10		
18						0.30	0.25								0.09	0.15
18-19																
19																
19-20	Missed Load Step When Operating															
20																
21-22	1.00		0.83		0.30			0.21	1.03	0.00		0.00		0.70		
22						0.10	0.08								0.13	0.22
22-23		0.50		0.42	0.40			0.21	0.95		0.03		0.05	0.70		
23						0.30	0.25								0.08	0.13
23-24	0.55		0.46		0.30			0.21	1.00	0.02		0.03		1.70		
24						0.10	0.08								0.12	0.20
24-25		0.50		0.42	0.60			0.17	0.92		0.00		0.00	0.80		
25						0.20	0.17								0.16	0.27
25-26	0.80		0.67		0.30			0.17	1.00	0.05		0.08		1.70		
26						0.20	0.17								0.12	0.20
26-27		0.80		0.67	0.30			0.17	0.93		0.05		0.08	1.90		
27						0.20	0.17								0.10	0.17
28-29	1.10		0.92		0.70			0.42	3.07	0.41		0.68		1.30		
29						0.00	0.00								0.21	0.35
29-30		1.90		1.58	1.30			0.42	2.75		0.04		0.07	1.50		
30						0.20	0.17								0.10	0.17
30-31	1.40		1.17		0.80			0.50	2.70	0.41		0.68		1.30		
31						0.20	0.17								0.18	0.30
31-32		1.20		1.00	1.00			0.50	2.88		0.02		0.03	0.90		
32						0.20	0.17								0.09	0.15
32-33	1.80		1.50		0.70			0.50	3.10	0.30		0.50		1.20		
33						0.10	0.08								0.18	0.30
33-34		1.40		1.17	1.30			0.50	2.83		0.00		0.00	2.00		
34						0.20	0.17								0.07	0.12

Method 608.2

Steady State Full Load Ambient Long Term Transient 15kW FZ60344								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	79.8	1.71		Baro psia	psia	14.05	0.007
Filter Housing	F	88.7	1.46		Air Filter psia	psia	14.18	0.008
Inlet Manifold	F	93.0	1.42		Int Man psia	psia	13.74	0.008
Exh Cyl 1	F	712.0	4.06		Exh Man psia	psia	14.55	0.010
Exh Cyl 2	F	798.3	4.67		Exh Muff psia	psia	14.31	0.007
Exh Cyl 3	F	775.6	3.99					
Exh Cyl 4	F	633.3	3.93		Power	kW	16.3	
Exh Manifold	F	779.9	4.12		Voltage L1	V	119.7	0.06
After Muffler	F	561.9	4.89		Voltage L2	V	119.8	0.07
Outlet Vent	F	156.6	5.53		Voltage L3	V	119.9	0.05
Fuel Inlet	F	98.1	4.58		Current L1	A	45.6	0.03
Fuel Return	F	98.9	4.27		Current L2	A	45.7	0.02
Oil Gallery	F	201.4	4.36		Current L3	A	45.1	0.04
Oil Sump	F	203.4	4.39		Frequency L1	Hz	59.8	0.02
Radiator 1	F	116.0	2.79		Frequency L2	Hz	60.0	0.02
Radiator 2	F	119.7	2.62		Frequency L3	Hz	60.1	0.02
Radiator 3	F	113.7	2.73					
Radiator 4	F	114.5	2.66					
Coolant Inlet	F	172.7	5.96					
Coolant Outlet	F	190.9	5.70					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	95.1	1.99					
Voltage Reg	F	97.3	1.98					
Stator Frame	F	95.8	2.76					
Stator Housing	F	89.5	2.00					
Battery 1	F	91.2	2.31					
Battery 2	F	98.3	2.67					

Steady State No Load Ambient Long Term Transient 15kW FZ60344								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	81.9	1.31		Baro psia	psia	14.05	0.016
Filter Housing	F	87.7	1.47		Air Filter psia	psia	14.18	0.017
Inlet Manifold	F	89.4	1.47		Int Man psia	psia	13.72	0.017
Exh Cyl 1	F	243.8	2.55		Exh Man psia	psia	14.42	0.016
Exh Cyl 2	F	273.1	2.55		Exh Muff psia	psia	14.29	0.015
Exh Cyl 3	F	268.1	2.38					
Exh Cyl 4	F	263.5	2.83		Power	kW	na	
Exh Manifold	F	260.3	2.60		Voltage L1	V	119.8	0.05
After Muffler	F	217.7	1.61		Voltage L2	V	120.0	0.03
Outlet Vent	F	119.8	1.77		Voltage L3	V	120.1	0.02
Fuel Inlet	F	93.8	3.38		Current L1	A	na	na
Fuel Return	F	94.4	3.05		Current L2	A	na	na
Oil Gallery	F	184.9	0.51		Current L3	A	na	na
Oil Sump	F	187.0	0.48		Frequency L1	Hz	59.8	0.02
Radiator 1	F	104.4	1.53		Frequency L2	Hz	60.0	0.02
Radiator 2	F	106.1	1.48		Frequency L3	Hz	60.1	0.02
Radiator 3	F	101.9	1.51					
Radiator 4	F	100.1	1.51					
Coolant Inlet	F	169.1	0.20					
Coolant Outlet	F	170.3	0.28					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	96.7	2.19					
Voltage Reg	F	93.3	2.02					
Stator Frame	F	89.9	1.06					
Stator Housing	F	86.5	1.18					
Battery 1	F	93.0	1.07					
Battery 2	F	93.7	1.36					

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	119.9	119.9	119.8
	Long Term	119.7	120.0	119.6
Frequency [Hz]	Short Term	59.8	59.8	59.7
	Long Term	59.8	59.9	59.7
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	119.9	119.9	119.9
	Long Term	119.8	119.9	119.8
Frequency [Hz]	Short Term	59.8	59.8	59.8
	Long Term	59.8	59.9	59.7

Model No. MEP 804A – 15kW

Serial No. FZ60357

Method 608.1

Steady State Full Load Ambient Short Term Transient 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	85.4	0.41		Baro psia	psia	14.27	0.000
Filter Housing	F	86.7	0.34		Air Filter psia	psia	14.32	0.007
Inlet Manifold	F	92.0	0.10		Int Man psia	psia	14.11	0.005
Exh Cyl 1	F	744.5	28.81		Exh Man psia	psia	14.62	0.007
Exh Cyl 2	F	791.3	33.42		Exh Muff psia	psia	14.38	0.000
Exh Cyl 3	F	784.4	34.31					
Exh Cyl 4	F	672.1	18.20		Power	kW	16.1	
Exh Manifold	F	774.0	43.55		Voltage L1	V	120.5	0.01
After Muffler	F	408.4	9.11		Voltage L2	V	120.5	0.04
Outlet Vent	F	139.8	1.35		Voltage L3	V	120.4	0.05
Fuel Inlet	F	88.3	0.07		Current L1	A	44.4	0.02
Fuel Return	F	90.0	0.07		Current L2	A	45.1	0.02
Oil Gallery	F	173.0	0.71		Current L3	A	43.9	0.03
Oil Sump	F	174.9	0.87		Frequency L1	Hz	59.9	0.02
Radiator 1	F	109.7	0.64		Frequency L2	Hz	62.3	0.02
Radiator 2	F	107.5	0.67		Frequency L3	Hz	60.1	0.02
Radiator 3	F	112.3	0.57					
Radiator 4	F	110.9	0.57					
Coolant Inlet	F	152.1	1.19					
Coolant Outlet	F	173.6	0.24					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	111.5	0.22					
Voltage Reg	F	110.5	0.05					
Stator Frame	F	92.2	0.25					
Stator Housing	F	94.0	0.15					
Battery 1	F	104.1	0.19					
Battery 2	F	97.4	0.18					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.20	0.17								0.49	0.82
1-2		1.95		1.63	0.50			0.21	0.03		1.31		2.18	1.10		
2						0.10	0.08								0.05	0.08
2-3	2.10		1.75		0.50			0.21	0.07	1.24		2.07		1.70		
3						0.10	0.08								0.14	0.23
3-4		2.35		1.96	0.50			0.21	0.08		1.36		2.27	2.10		
4						0.10	0.08								0.05	0.08
4-5	2.20		1.83		0.50			0.21	0.07	1.02		1.70		2.30		
5						0.10	0.08								0.07	0.12
5-6		1.75		1.46	0.50			0.21	0.03		1.32		2.20	2.00		
6						0.10	0.08								0.05	0.08
7-8	1.90		1.58		0.50			0.21	0.00	1.19		1.98		1.90		
8						0.10	0.08								0.10	0.17
8-9		1.80		1.50	0.50			0.17	0.05		1.34		2.23	1.60		
9						0.10	0.08								0.12	0.20
9-10	1.40		1.17		0.60			0.17	0.05	0.90		1.50		1.90		
10						0.10	0.08								0.07	0.12
10-11		1.10		0.92	0.40			0.17	0.03		0.94		1.57	1.70		
11						0.10	0.08								0.06	0.10
11-12	1.10		0.92		0.40			0.17	0.00	0.92		1.53		2.10		
12						0.10	0.08								0.08	0.13
12-13		1.20		1.00	0.60			0.17	0.03		0.98		1.63	1.20		
13						0.00	0.00								0.06	0.10
14-15	1.20		1.00		0.40			0.17	0.00	0.90		1.50		1.80		
15						0.00	0.00								0.06	0.10
15-16		1.00		0.83	0.40			0.17	0.03		0.98		1.63	1.80		
16						0.00	0.00								0.06	0.10
16-17	0.95		0.79		0.50			0.13	0.03	0.74		1.23		1.00		
17						0.10	0.08								0.06	0.10
17-18		0.50		0.42	0.60			0.13	0.03		0.74		1.23	1.20		
18						0.00	0.00								0.05	0.08
18-19	0.55		0.46		0.50			0.13	0.07	0.76		1.27		1.50		
19						0.10	0.08								0.06	0.10
19-20		0.60		0.50	0.50			0.13	0.07		0.75		1.25	1.10		
20						0.00	0.00								0.06	0.10
21-22	0.75		0.63		0.50			0.13	0.07	0.77		1.28		1.90		
22						0.10	0.08								0.06	0.10
22-23		0.50		0.42	0.50			0.08	0.07		0.71		1.18	1.00		
23						0.00	0.00								0.06	0.10
23-24	0.40		0.33		0.40			0.08	0.07	0.58		0.97		0.90		
24						0.00	0.00								0.06	0.10
24-25		0.10		0.08	0.40			0.08	0.07		0.58		0.97	1.00		
25						0.00	0.00								0.06	0.10
25-26	0.20		0.17		0.40			0.08	0.03	0.52		0.87		1.00		
26						0.00	0.00								0.05	0.08
26-27		0.20		0.17	0.30			0.08	0.03		0.56		0.93	0.80		
27						0.00	0.00								0.05	0.08
28-29	0.50		0.42		0.30			0.08	0.03	0.57		0.95		1.70		
29						0.00	0.00								0.05	0.08
29-30		0.20		0.17	0.30			0.08	0.00		0.52		0.87	1.00		
30						0.00	0.00								0.06	0.10
30-31	2.05		1.71		0.40			0.21	0.05	1.22		2.03		1.70		
31						0.10	0.08								0.08	0.13
31-32		2.40		2.00	0.50			0.21	0.10		1.39		2.32	1.70		
32						0.00	0.00								0.05	0.08
32-33	2.75		2.29		0.40			0.21	0.05	1.13		1.88		2.00		
33						0.10	0.08								0.06	0.10
33-34		1.30		1.08	0.50			0.21	0.00		1.32		2.20	2.00		
34						0.00	0.00								0.06	0.10

Method 608.2

Steady State Full Load Ambient Long Term Transient 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	67.4	5.03		Baro psia	psia	14.35	0.009
Filter Housing	F	70.5	5.00		Air Filter psia	psia	14.39	0.010
Inlet Manifold	F	76.3	4.98		Int Man psia	psia	14.19	0.010
Exh Cyl 1	F	730.6	10.89		Exh Man psia	psia	14.72	0.011
Exh Cyl 2	F	768.9	11.14		Exh Muff psia	psia	14.46	0.009
Exh Cyl 3	F	764.3	10.84					
Exh Cyl 4	F	648.5	10.95		Power	kW	16.0	
Exh Manifold	F	761.8	11.34		Voltage L1	V	120.2	0.12
After Muffler	F	468.3	5.75		Voltage L2	V	120.2	0.11
Outlet Vent	F	134.1	6.17		Voltage L3	V	120.1	0.11
Fuel Inlet	F	81.5	5.08		Current L1	A	44.4	0.04
Fuel Return	F	81.5	5.02		Current L2	A	45.0	0.04
Oil Gallery	F	190.4	1.45		Current L3	A	43.9	0.04
Oil Sump	F	193.0	1.16		Frequency L1	Hz	59.9	0.03
Radiator 1	F	98.6	4.97		Frequency L2	Hz	62.3	0.03
Radiator 2	F	95.9	5.06		Frequency L3	Hz	60.1	0.03
Radiator 3	F	101.0	4.91					
Radiator 4	F	99.9	4.91					
Coolant Inlet	F	148.1	4.60					
Coolant Outlet	F	173.0	0.77					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	77.9	5.73					
Voltage Reg	F	85.5	5.36					
Stator Frame	F	76.1	4.76					
Stator Housing	F	76.7	4.92					
Battery 1	F	91.2	4.26					
Battery 2	F	84.5	4.73					

Steady State No Load Ambient Long Term Transient 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	80.8	2.41		Baro psia	psia	14.33	0.014
Filter Housing	F	81.3	1.55		Air Filter psia	psia	14.37	0.015
Inlet Manifold	F	84.4	1.47		Int Man psia	psia	14.16	0.016
Exh Cyl 1	F	271.7	8.64		Exh Man psia	psia	14.61	0.016
Exh Cyl 2	F	268.6	9.51		Exh Muff psia	psia	14.44	0.015
Exh Cyl 3	F	269.5	9.59					
Exh Cyl 4	F	258.3	9.14		Power	kW	na	
Exh Manifold	F	268.5	8.97		Voltage L1	V	120.4	0.00
After Muffler	F	199.3	7.01		Voltage L2	V	120.3	0.01
Outlet Vent	F	115.6	2.50		Voltage L3	V	120.4	0.00
Fuel Inlet	F	91.6	0.75		Current L1	A	na	na
Fuel Return	F	91.2	0.70		Current L2	A	na	na
Oil Gallery	F	184.2	0.73		Current L3	A	na	na
Oil Sump	F	186.5	0.69		Frequency L1	Hz	59.9	0.02
Radiator 1	F	98.5	1.28		Frequency L2	Hz	62.3	0.02
Radiator 2	F	95.5	1.33		Frequency L3	Hz	60.1	0.02
Radiator 3	F	101.9	2.08					
Radiator 4	F	101.0	1.39					
Coolant Inlet	F	157.5	2.82					
Coolant Outlet	F	169.0	0.52					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	93.0	2.30					
Voltage Reg	F	93.9	1.25					
Stator Frame	F	84.8	1.20					
Stator Housing	F	85.3	1.33					
Battery 1	F	97.9	0.92					
Battery 2	F	92.2	1.20					

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	120.2	120.3	118.8
	Long Term	120.2	120.6	120.1
Frequency [Hz]	Short Term	59.9	60.0	58.8
	Long Term	59.9	60.1	59.6
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	120.4	120.5	120.4
	Long Term	120.4	120.5	120.4
Frequency [Hz]	Short Term	59.9	59.9	59.6
	Long Term	59.9	60.0	59.7

Method 630.1 for FZ60344 and FZ60357

Steady State Full Load Ambient Parallel 15kW FZ60344								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	84.1	1.91		Baro psia	psia	14.09	0.004
Filter Housing	F	94.9	1.97		Air Filter psia	psia	14.21	0.007
Inlet Manifold	F	101.0	2.13		Int Man psia	psia	13.77	0.006
Exh Cyl 1	F	903.1	15.67		Exh Man psia	psia	14.64	0.009
Exh Cyl 2	F	1018.8	18.08		Exh Muff psia	psia	14.37	0.005
Exh Cyl 3	F	992.6	17.30					
Exh Cyl 4	F	794.2	10.34		Power	kW	23.1	
Exh Manifold	F	1002.8	17.12		Voltage L1	V	118.9	0.06
After Muffler	F	672.5	16.72		Voltage L2	V	119.1	0.06
Outlet Vent	F	161.7	4.19		Voltage L3	V	119.0	0.06
Fuel Inlet	F	96.2	2.07		Current L1	A	64.6	0.76
Fuel Return	F	97.5	2.10		Current L2	A	65.2	0.76
Oil Gallery	F	199.4	4.03		Current L3	A	63.9	0.75
Oil Sump	F	201.4	4.15		Frequency L1	Hz	59.2	0.01
Radiator 1	F	120.1	2.68		Frequency L2	Hz	60.2	0.01
Radiator 2	F	125.8	2.86		Frequency L3	Hz	60.3	0.01
Radiator 3	F	118.0	2.61					
Radiator 4	F	120.2	2.67					
Coolant Inlet	F	173.2	3.79					
Coolant Outlet	F	190.1	3.89					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	102.7	2.05					
Voltage Reg	F	105.2	2.56					
Stator Frame	F	99.4	2.19					
Stator Housing	F	97.6	2.22					
Battery 1	F	97.1	1.46					
Battery 2	F	100.5	2.42					

Steady State Full Load Ambient Parallel 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	82.0	1.02		Baro psia	psia	14.25	0.007
Filter Housing	F	83.1	1.17		Air Filter psia	psia	14.27	0.007
Inlet Manifold	F	88.1	0.90		Int Man psia	psia	14.07	0.006
Exh Cyl 1	F	674.3	5.04		Exh Man psia	psia	14.57	0.008
Exh Cyl 2	F	711.1	6.26		Exh Muff psia	psia	14.34	0.008
Exh Cyl 3	F	706.8	3.86					
Exh Cyl 4	F	598.3	8.43		Power	kW	10.3	
Exh Manifold	F	na	na		Voltage L1	V	119.1	0.16
After Muffler	F	436.0	6.35		Voltage L2	V	119.0	0.15
Outlet Vent	F	113.8	1.19		Voltage L3	V	119.1	0.18
Fuel Inlet	F	91.4	0.80		Current L1	A	29.1	5.20
Fuel Return	F	91.2	0.79		Current L2	A	28.9	5.38
Oil Gallery	F	188.5	0.61		Current L3	A	28.6	5.16
Oil Sump	F	189.9	0.70		Frequency L1	Hz	59.2	0.13
Radiator 1	F	97.7	1.09		Frequency L2	Hz	46.8	0.13
Radiator 2	F	107.0	1.06		Frequency L3	Hz	60.2	0.13
Radiator 3	F	104.5	1.10					
Radiator 4	F	110.1	1.14					
Coolant Inlet	F	153.1	1.36					
Coolant Outlet	F	170.4	0.26					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	86.8	0.94					
Voltage Reg	F	91.5	0.91					
Stator Frame	F	145.8	1.80					
Stator Housing	F	91.1	1.20					
Battery 1	F	103.1	1.18					
Battery 2	F	98.5	1.42					

15kW FZ60344																	
Load Step	Voltage									Frequency							
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation		
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.04	0.07
1-2	1.80		1.50		0.90			0.08	0.00	0.63		1.05		1.70		
2						0.30	0.25								0.10	0.17
2-3		1.70		1.42	0.50			0.08	0.00		1.50		2.50	1.80		
3						0.10	0.08								0.03	0.05
3-4	1.80		1.50		1.90			0.08	0.00	1.20		2.00		2.40		
4						0.30	0.25								0.08	0.13
4-5		1.70		1.42	0.80			0.08	0.00		1.50		2.50	1.80		
5						0.10	0.08								0.04	0.07
5-6	2.40		2.00		1.80			0.08	0.00	1.30		2.17		3.80		
6						0.30	0.25								0.09	0.15
6-7		1.70		1.42	0.70			0.08	0.00		1.40		2.33	2.40		
7						0.10	0.08								0.03	0.05
7-8	1.60		1.33		1.60			0.08	0.00	1.30		2.17		2.20		
8						0.30	0.25								0.10	0.17

15kW FZ60357																	
Load Step	Voltage									Frequency							
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation		
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.05	0.08
1-2	1.70		1.42		0.30			0.17	0.00	0.60		1.00		1.50		
2						0.30	0.25								0.06	0.10
2-3		1.60		1.33	0.30			0.25	0.00		1.50		2.50	1.70		
3						0.00	0.00								0.03	0.05
3-4	1.90		1.58		2.00			0.25	0.00	1.20		2.00		2.50		
4						0.30	0.25								0.06	0.10
4-5		1.60		1.33	0.20			0.25	0.00		1.50		2.50	1.90		
5						0.10	0.08								0.03	0.05
5-6	2.40		2.00		1.90			0.25	0.00	1.20		2.00		3.50		
6						0.30	0.25								0.06	0.10
6-7		1.60		1.33	1.00			0.25	0.00		1.40		2.33	2.20		
7						0.00	0.00								0.03	0.05
7-8	1.70		1.42		2.10			0.25	0.00	1.30		2.17		3.00		
8						0.30	0.25								0.08	0.13

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	120.4	120.5	119.8
	Long Term	120.4	120.5	120.3
Frequency [Hz]	Short Term	59.9	59.9	59.4
	Long Term	59.9	59.9	59.8
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	120.7	121.0	120.7
	Long Term	120.7	120.8	120.7
Frequency [Hz]	Short Term	60.1	60.3	60.0
	Long Term	60.1	60.2	60.1

Active Power Division	Nominal System Load		FZ60344		FZ60357		Difference
	kW	%	kW	%	kW	%	%
	10.1	33.6	2.2	14.5	7.9	52.7	72.5
	10.2	34.0	1.7	11.3	8.5	56.7	80.1
	15.8	52.7	1.7	11.4	14.1	93.9	87.9
	22.5	74.9	11.3	75.3	11.2	74.5	1.2
	34.6	115.3	20.5	136.7	14.1	94.0	31.3
Active Power Exchange			**Max kW**	**Min kW**	**Max kW**	**Min kW**	**Diff % (Max)**
	10.1	33.6	2.29	2.09	8.20	7.65	3.70
	10.2	34.0	1.71	1.67	8.53	8.46	0.48
	15.8	52.7	1.74	1.68	14.43	14.09	2.25
	22.5	74.9	11.87	10.73	11.58	10.46	7.61
	34.6	115.3	20.98	19.82	14.60	13.55	7.71
Reactive Power Division				**KVAR**		**KVAR**	**% Unbalance**
		0					
note: there is no		0					
reactive load on the		0					
genset, only resistive		0					
		0					
Load Current Pulsation			**Max A**	**Min A**	**Max A**	**Min A**	**% Pulsation**
	10.1	33.6	7.00	5.02	22.75	21.04	3.80
	10.2	34.0	5.49	3.94	23.81	23.14	2.97
	15.8	52.7	5.55	3.95	40.42	38.51	3.67
	22.5	74.9	33.39	29.44	32.11	28.90	7.60
	34.6	115.3	58.91	54.34	40.58	37.47	8.79
Reverse Power			**Max kW**	**Min kW**	**Max kW**	**Min kW**	

Note: unable to determine reverse power limit at minimum load

Model No. MEP 804B – 15kW

Serial No. FZ61920

Method 608.1

Steady State Full Load Ambient Short Term Transient 15kW FZ61920								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	90.5	0.43		Baro psia	psia	14.15	0.005
Filter Housing	F	91.1	1.52		Air Filter psia	psia	14.22	0.005
Inlet Manifold	F	154.6	0.46		Int Man psia	psia	18.38	0.234
Exh Cyl 1	F	724.2	11.97		Exh Man psia	psia	18.06	0.420
Exh Cyl 2	F	730.5	14.28		Exh Muff psia	psia	14.25	0.007
Exh Cyl 3	F	745.9	14.85					
Exh Cyl 4	F	717.6	12.91		Power	kW	15.8	
Exh Manifold	F	803.6	24.18		Voltage L1	V	120.4	0.33
After Turbo	F	695.5	11.09		Voltage L2	V	120.4	0.36
After Muffler	F	464.4	1.98		Voltage L3	V	120.4	0.34
Outlet Vent	F	112.3	1.60		Current L1	A	43.7	1.75
Fuel Inlet	F	94.8	0.08		Current L2	A	44.2	1.79
Fuel Return	F	115.1	0.31		Current L3	A	43.1	1.73
Oil Gallery	F	143.1	0.21		Frequency L1	Hz	58.0	3.46
Oil Sump	F	200.8	0.32		Frequency L2	Hz	60.3	3.60
Radiator 1	F	na	na		Frequency L3	Hz	58.2	3.48
Radiator 2	F	114.0	0.33					
Radiator 3	F	115.7	0.48					
Radiator 4	F	110.6	0.43					
Coolant Inlet	F	143.2	0.83					
Coolant Outlet	F	161.0	0.28					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	96.7	0.17					
Voltage Reg	F	85.8	0.23					
Stator Frame	F	142.2	0.50					
Stator Housing	F	87.7	0.60					
Battery 1		104.7	0.06					
Battery 2	F	104.8	0.08					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						3.00	2.50								19.01	31.68
1-2		1.80		1.50	3.30			0.17	0.83		4.73		7.88	3.50		
2						0.80	0.67								5.05	8.42
2-3	2.80		2.33		0.50			0.17	0.02	1.69		2.82		1.70		
3						1.80	1.50								9.25	15.42
3-4		2.50		2.08	0.70			0.17	0.02		1.37		2.28	1.70		
4						0.70	0.58								0.71	1.18
4-5	2.90		2.42		1.00			0.17	0.02	1.68		2.80		5.20		
5						1.00	0.83								3.31	5.52
5-6		1.50		1.25	1.70			0.13	0.07		3.20		5.33	3.60		
6						0.10	0.08								0.08	0.13
7-8	1.70		1.42		0.50			0.13	0.07	0.32		0.53		1.90		
8						0.50	0.42								1.15	1.92
8-9		1.20		1.00	0.50			0.08	0.02		0.32		0.53	1.90		
9						0.60	0.50								1.90	3.17
9-10	1.50		1.25		0.50			0.08	0.00	1.39		2.32		2.00		
10						1.10	0.92								3.31	5.52
10-11		1.50		1.25	0.80			0.08	0.05		5.24		8.73	2.70		
11						0.20	0.17								0.08	0.13
11-12	1.30		1.08		0.40			0.17	0.07	1.32		2.20		3.10		
12						0.40	0.33								0.47	0.78
12-13		0.90		0.75	0.50			0.17	0.07		1.29		2.15	2.30		
13						0.00	0.00								0.08	0.13
14-15	1.00		0.83		0.50			0.08	0.02	0.95		1.58		2.10		
15						0.80	0.67								0.44	0.73
15-16		0.60		0.50	0.60			0.08	0.05		0.98		1.63	2.40		
16						0.50	0.42								0.87	1.45
16-17	0.90		0.75		0.70			0.08	0.08	0.98		1.63		2.10		
17						0.80	0.67								1.68	2.80
17-18		0.50		0.42	0.90			0.13	0.03		0.88		1.47	1.60		
18						0.60	0.50								0.72	1.20
18-19	1.00		0.83		0.80			0.13	0.03	0.92		1.53		2.20		
19						0.10	0.08								0.06	0.10
19-20		0.60		0.50	0.50			0.13	0.05		0.98		1.63	2.40		
20						0.10	0.08								0.08	0.13
21-22	0.10		0.08		0.30			0.04	0.03	0.41		0.68		1.60		
22						0.50	0.42								0.43	0.72
22-23		0.20		0.17	0.50			0.04	0.05		0.40		0.67	2.20		
23						0.50	0.42								1.08	1.80
23-24	0.30		0.25		1.00			0.04	0.02	0.37		0.62		1.90		
24						0.50	0.42								0.28	0.47
24-25		0.10		0.08	0.40			0.04	0.02		0.37		0.62	1.50		
25						0.10	0.08								0.90	1.50
25-26	0.30		0.25		0.70			0.04	0.05	0.39		0.65		2.20		
26						0.10	0.08								0.05	0.08
26-27		0.30		0.25	0.80			0.08	0.08		0.46		0.77	1.50		
27						0.30	0.25								0.59	0.98
28-29	2.30		1.92		0.80			0.21	0.03	1.56		2.60		2.50		
29						0.80	0.67								1.05	1.75
29-30		1.90		1.58	0.50			0.21	0.02		1.48		2.47	2.30		
30						0.80	0.67								0.41	0.68
30-31	3.10		2.58		0.60			0.17	0.05	1.59		2.65		2.00		
31						0.10	0.08								0.14	0.23
31-32		2.40		2.00	0.90			0.17	0.00		4.95		8.25	1.80		
32						0.20	0.17								0.07	0.12
32-33	3.20		2.67		0.70			0.17	0.00	1.67		2.78		1.90		
33						0.20	0.17								0.12	0.20
33-34		1.60		1.33	0.90			0.17	0.03		5.53		9.22	1.00		
34						0.10	0.08								0.07	0.12

Method 608.2

Steady State Full Load Ambient Long Term Transient 15kW FZ61920								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	60.6	10.92		Baro psia	psia	14.23	0.008
Filter Housing	F	72.2	3.64		Air Filter psia	psia	14.31	0.008
Inlet Manifold	F	132.5	3.16		Int Man psia	psia	18.45	0.204
Exh Cyl 1	F	680.5	12.70		Exh Man psia	psia	18.39	0.174
Exh Cyl 2	F	700.6	14.42		Exh Muff psia	psia	14.34	0.010
Exh Cyl 3	F	692.5	14.67					
Exh Cyl 4	F	667.2	11.15		Power	kW	16.2	
Exh Manifold	F	730.3	15.11		Voltage L1	V	120.7	0.78
After Turbo	F	637.7	13.01		Voltage L2	V	120.7	0.79
After Muffler	F	438.6	13.87		Voltage L3	V	120.7	0.78
Outlet Vent	F	91.6	6.13		Current L1	A	44.7	0.63
Fuel Inlet	F	94.1	10.48		Current L2	A	45.2	0.65
Fuel Return	F	111.4	7.63		Current L3	A	44.1	0.62
Oil Gallery	F	135.8	8.37		Frequency L1	Hz	59.9	1.10
Oil Sump	F	198.3	9.44		Frequency L2	Hz	62.3	1.15
Radiator 1	F	na	na		Frequency L3	Hz	60.0	1.11
Radiator 2	F	92.2	2.91					
Radiator 3	F	96.9	3.13					
Radiator 4	F	97.8	3.16					
Coolant Inlet	F	118.0	5.83					
Coolant Outlet	F	156.3	2.48					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	87.2	5.46					
Voltage Reg	F	75.4	6.02					
Stator Frame	F	122.0	4.97					
Stator Housing	F	77.2	7.88					
Battery 1	F	88.2	3.09					
Battery 2	F	87.6	3.14					

Steady State No Load Ambient Long Term Transient 15kW FZ61920								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	50.9	0.70		Baro psia	psia	14.23	0.005
Filter Housing	F	66.5	0.73		Air Filter psia	psia	14.32	0.005
Inlet Manifold	F	87.8	1.53		Int Man psia	psia	15.12	0.045
Exh Cyl 1	F	274.0	7.21		Exh Man psia	psia	16.43	0.048
Exh Cyl 2	F	279.3	4.87		Exh Muff psia	psia	14.34	0.006
Exh Cyl 3	F	266.8	5.67					
Exh Cyl 4	F	248.4	4.86		Power	kW	na	
Exh Manifold	F	266.2	4.38		Voltage L1	V	121.3	0.86
After Turbo	F	236.2	9.38		Voltage L2	V	121.4	0.86
After Muffler	F	174.1	15.46		Voltage L3	V	121.4	0.86
Outlet Vent	F	68.2	1.74		Current L1	A	na	na
Fuel Inlet	F	97.2	2.86		Current L2	A	na	na
Fuel Return	F	107.3	2.48		Current L3	A	na	na
Oil Gallery	F	125.7	2.24		Frequency L1	Hz	60.0	0.16
Oil Sump	F	178.0	2.05		Frequency L2	Hz	62.4	0.16
Radiator 1	F	na	na		Frequency L3	Hz	60.2	0.16
Radiator 2	F	79.3	1.39					
Radiator 3	F	80.3	1.64					
Radiator 4	F	79.3	1.65					
Coolant Inlet	F	97.0	1.68					
Coolant Outlet	F	148.6	0.61					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	66.8	1.78					
Voltage Reg	F	62.5	0.98					
Stator Frame	F	93.9	2.31					
Stator Housing	F	61.2	1.23					
Battery 1	F	74.8	1.72					
Battery 2	F	74.6	1.66					

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	118.0	118.1	117.8
	Long Term	120.7	122.4	117.2
Frequency [Hz]	Short Term	60.1	60.1	59.7
	Long Term	59.9	63.7	44.3
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	121.4	121.5	121.4
	Long Term	121.3	122.6	116.9
Frequency [Hz]	Short Term	60.0	60.1	60.0
	Long Term	60.0	65.2	59.7

Model No. MEP 804B – 15kW

Serial No. FZ61946

Method 608.1

Steady State Full Load Ambient Short Term Transient 15kW FZ61946								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	82.1	1.01		Baro psia	psia	14.02	0.000
Filter Housing	F	91.9	0.64		Air Filter psia	psia	14.14	0.000
Inlet Manifold	F	96.6	0.09		Int Man psia	psia	13.71	0.004
Exh Cyl 1	F	720.7	0.43		Exh Man psia	psia	14.52	0.005
Exh Cyl 2	F	803.6	0.52		Exh Muff psia	psia	14.28	0.000
Exh Cyl 3	F	781.6	0.33					
Exh Cyl 4	F	643.8	0.31		Power	kW	16.5	
Exh Manifold	F	787.3	0.22		Voltage L1	V	120.2	0.04
After Muffler	F	569.0	0.07		Voltage L2	V	120.3	0.05
Outlet Vent	F	158.7	0.21		Voltage L3	V	120.3	0.04
Fuel Inlet	F	89.3	0.07		Current L1	A	45.7	0.03
Fuel Return	F	91.5	0.11		Current L2	A	46.0	0.02
Oil Gallery	F	203.0	0.08		Current L3	A	45.1	0.05
Oil Sump	F	205.0	0.14		Frequency L1	Hz	59.1	0.01
Radiator 1	F	117.6	0.18		Frequency L2	Hz	60.1	0.01
Radiator 2	F	122.2	0.33		Frequency L3	Hz	60.1	0.01
Radiator 3	F	115.7	0.38					
Radiator 4	F	117.4	0.58					
Coolant Inlet	F	177.7	0.45					
Coolant Outlet	F	195.4	0.05					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	92.9	0.07					
Voltage Reg	F	97.5	0.22					
Stator Frame	F	95.2	0.68					
Stator Housing	F	91.4	0.61					
Battery 1	F	88.7	0.13					
Battery 2	F	98.2	0.20					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation	Max Freq Excursion			Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.10	0.17
1-2		1.90		1.58	1.30			0.50	2.92		0.09		0.15	2.30		
2						0.20	0.17								0.12	0.20
2-3	0.50		0.42		1.00			0.50	2.95	0.23		0.38		3.90		
3						0.20	0.17								0.10	0.17
3-4		1.40		1.17	0.60			0.50	2.98		0.05		0.08	1.80		
4						0.20	0.17								0.13	0.22
4-5	0.70		0.58		1.50			0.50	2.98	0.16		0.27		2.50		
5						0.10	0.08								0.10	0.17
5-6		1.70		1.42	0.70			0.50	2.93		0.04		0.07	1.80		
6						0.30	0.25								0.09	0.15
7-8	0.95		0.79		0.40			0.50	2.43	0.09		0.15		3.00		
8						0.10	0.08								0.10	0.17
8-9		1.60		1.33	0.50			0.42	2.33		0.03		0.05	1.10		
9						0.30	0.25								0.13	0.22
9-10	2.45		2.04		0.50			0.42	2.37	0.10		0.17		3.20		
10						0.20	0.17								0.13	0.22
10-11		0.85		0.71	1.00			0.42	2.23		0.03		0.05	0.90		
11						0.20	0.17								0.10	0.17
11-12	1.45		1.21		0.40			0.42	2.40	0.10		0.17		2.70		
12						0.10	0.08								0.14	0.23
12-13		1.70		1.42	0.50			0.42	2.27		0.02		0.03	0.80		
13						0.30	0.25								0.11	0.18
14-15	0.75		0.63		0.60			0.29	1.57	0.10		0.17		1.70		
15						0.10	0.08								0.12	0.20
15-16		1.10		0.92	0.30			0.29	1.60		0.05		0.08	0.90		
16						0.20	0.17								0.08	0.13
16-17	0.50		0.42		0.50			0.29	1.63	0.03		0.05		1.40		
17						0.10	0.08								0.17	0.28
17-18		1.20		1.00	0.40			0.25	1.55		0.05		0.08	1.10		
18						0.30	0.25								0.09	0.15
18-19																
19																
19-20	Missed Load Step When Operating															
20																
21-22	1.00		0.83		0.30			0.21	1.03	0.00		0.00		0.70		
22						0.10	0.08								0.13	0.22
22-23		0.50		0.42	0.40			0.21	0.95		0.03		0.05	0.70		
23						0.30	0.25								0.08	0.13
23-24	0.55		0.46		0.30			0.21	1.00	0.02		0.03		1.70		
24						0.10	0.08								0.12	0.20
24-25		0.50		0.42	0.60			0.17	0.92		0.00		0.00	0.80		
25						0.20	0.17								0.16	0.27
25-26	0.80		0.67		0.30			0.17	1.00	0.05		0.08		1.70		
26						0.20	0.17								0.12	0.20
26-27		0.80		0.67	0.30			0.17	0.93		0.05		0.08	1.90		
27						0.20	0.17								0.10	0.17
28-29	1.10		0.92		0.70			0.42	3.07	0.41		0.68		1.30		
29						0.00	0.00								0.21	0.35
29-30		1.90		1.58	1.30			0.42	2.75		0.04		0.07	1.50		
30						0.20	0.17								0.10	0.17
30-31	1.40		1.17		0.80			0.50	2.70	0.41		0.68		1.30		
31						0.20	0.17								0.18	0.30
31-32		1.20		1.00	1.00			0.50	2.88		0.02		0.03	0.90		
32						0.20	0.17								0.09	0.15
32-33	1.80		1.50		0.70			0.50	3.10	0.30		0.50		1.20		
33						0.10	0.08								0.18	0.30
33-34		1.40		1.17	1.30			0.50	2.83		0.00		0.00	2.00		
34						0.20	0.17								0.07	0.12

Method 608.2

Steady State Full Load Ambient Long Term Transient 15kW FZ61946								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	70.5	0.77		Baro psia	psia	14.14	0.006
Filter Housing	F	74.0	0.83		Air Filter psia	psia	14.30	0.007
Inlet Manifold	F	132.9	2.76		Int Man psia	psia	17.99	0.075
Exh Cyl 1	F	655.1	13.33		Exh Man psia	psia	18.70	0.108
Exh Cyl 2	F	619.2	6.36		Exh Muff psia	psia	14.37	0.005
Exh Cyl 3	F	676.8	4.56					
Exh Cyl 4	F	648.0	8.61		Power	kW	16.5	
Exh Manifold	F	558.8	7.69		Voltage L1	V	120.4	0.08
After Turbo	F	625.1	10.56		Voltage L2	V	120.4	0.09
After Muffler	F	448.5	18.44		Voltage L3	V	120.5	0.09
Outlet Vent	F	94.9	2.61		Current L1	A	45.7	0.04
Fuel Inlet	F	91.3	11.20		Current L2	A	46.0	0.04
Fuel Return	F	110.8	9.61		Current L3	A	45.1	0.06
Oil Gallery	F	145.1	12.04		Frequency L1	Hz	59.9	0.02
Oil Sump	F	193.8	12.21		Frequency L2	Hz	60.1	0.02
Radiator 1	F	97.1	3.07		Frequency L3	Hz	60.2	0.02
Radiator 2	F	na	na					
Radiator 3	F	117.5	5.82					
Radiator 4	F	95.9	2.49					
Coolant Inlet	F	127.7	8.39					
Coolant Outlet	F	159.1	5.55					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	87.5	2.16					
Voltage Reg	F	88.2	1.59					
Stator Frame	F	85.9	2.83					
Stator Housing	F	78.3	1.94					
Battery 1	F	84.4	2.53					
Battery 2	F	83.6	2.57					

Steady State No Load Ambient Long Term Transient 15kW FZ61946								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	67.9	0.80		Baro psia	psia	14.17	0.006
Filter Housing	F	67.5	0.53		Air Filter psia	psia	14.33	0.006
Inlet Manifold	F	87.2	1.81		Int Man psia	psia	14.86	0.044
Exh Cyl 1	F	265.3	3.22		Exh Man psia	psia	16.63	0.036
Exh Cyl 2	F	226.9	6.78		Exh Muff psia	psia	14.39	0.005
Exh Cyl 3	F	244.6	5.53					
Exh Cyl 4	F	260.2	5.21		Power	kW	na	
Exh Manifold	F	213.9	10.49		Voltage L1	V	120.6	0.03
After Turbo	F	231.5	10.74		Voltage L2	V	120.7	0.04
After Muffler	F	180.7	16.96		Voltage L3	V	120.8	0.04
Outlet Vent	F	79.7	1.81		Current L1	A	na	na
Fuel Inlet	F	97.9	3.37		Current L2	A	na	na
Fuel Return	F	108.9	3.05		Current L3	A	na	na
Oil Gallery	F	135.0	2.84		Frequency L1	Hz	59.9	0.02
Oil Sump	F	175.6	2.12		Frequency L2	Hz	60.0	0.02
Radiator 1	F	81.7	1.72		Frequency L3	Hz	60.2	0.02
Radiator 2	F	na	na					
Radiator 3	F	91.0	2.56					
Radiator 4	F	79.9	1.62					
Coolant Inlet	F	98.0	2.26					
Coolant Outlet	F	152.0	0.57					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	78.1	1.87					
Voltage Reg	F	75.8	1.69					
Stator Frame	F	74.1	2.36					
Stator Housing	F	71.2	2.04					
Battery 1	F	75.2	1.79					
Battery 2	F	76.1	1.72					

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	120.8	121.4	120.5
	Long Term	120.4	120.7	120.0
Frequency [Hz]	Short Term	59.9	60.0	59.8
	Long Term	59.9	60.0	59.8
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	120.6	120.6	120.5
	Long Term	120.6	120.7	120.5
Frequency [Hz]	Short Term	59.9	61.1	59.8
	Long Term	59.9	60.0	59.8

Model No. MEP 805B – 30kW

Serial No. HX37756

Method 608.1

Steady State Full Load Ambient Short Term Transient 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	90.5	0.43		Baro psia	psia	14.15	0.005
Filter Housing	F	91.1	1.52		Air Filter psia	psia	14.22	0.005
Inlet Manifold	F	154.6	0.46		Int Man psia	psia	18.38	0.234
Exh Cyl 1	F	724.2	11.97		Exh Man psia	psia	18.06	0.420
Exh Cyl 2	F	730.5	14.28		Exh Muff psia	psia	14.25	0.007
Exh Cyl 3	F	745.9	14.85					
Exh Cyl 4	F	717.6	12.91		Power	kW	na	
Exh Manifold	F	803.6	24.18		Voltage L1	V	na	na
After Turbo	F	695.5	11.09		Voltage L2	V	na	na
After Muffler	F	464.4	1.98		Voltage L3	V	na	na
Outlet Vent	F	112.3	1.60		Current L1	A	na	na
Fuel Inlet	F	94.8	0.08		Current L2	A	na	na
Fuel Return	F	115.1	0.31		Current L3	A	na	na
Oil Gallery	F	143.1	0.21		Frequency L1	Hz	na	na
Oil Sump	F	200.8	0.32		Frequency L2	Hz	na	na
Radiator 1	F	na	na		Frequency L3	Hz	na	na
Radiator 2	F	114.0	0.33					
Radiator 3	F	115.7	0.48					
Radiator 4	F	110.6	0.43					
Coolant Inlet	F	143.2	0.83					
Coolant Outlet	F	161.0	0.28					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	96.7	0.17					
Voltage Reg	F	85.8	0.23					
Stator Frame	F	142.2	0.50					
Stator Housing	F	87.7	0.60					
Battery 1		104.7	0.06					
Battery 2	F	104.8	0.08					

Data loss on the electrical characteristics for Method 608.1

Method 608.2

Steady State Full Load Ambient Long Term Transient 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	47.9	1.63		Baro psia	psia	14.38	0.007
Filter Housing	F	51.0	1.38		Air Filter psia	psia	14.42	0.008
Inlet Manifold	F	114.3	1.77		Int Man psia	psia	19.29	0.074
Exh Cyl 1	F	632.4	2.74		Exh Man psia	psia	19.41	0.055
Exh Cyl 2	F	675.5	2.11		Exh Muff psia	psia	14.57	0.007
Exh Cyl 3	F	681.9	2.99					
Exh Cyl 4	F	655.1	2.07		Power	kW	31.6	
Exh Manifold	F	704.9	2.88		Voltage L1	V	120.3	0.05
After Turbo	F	634.7	3.79		Voltage L2	V	120.3	0.03
After Muffler	F	530.1	5.02		Voltage L3	V	120.5	0.05
Outlet Vent	F	95.1	4.53		Current L1	A	87.4	0.05
Fuel Inlet	F	58.8	8.72		Current L2	A	88.8	0.05
Fuel Return	F	80.7	5.05		Current L3	A	86.2	0.06
Oil Gallery	F	187.6	16.08		Frequency L1	Hz	60.1	0.02
Oil Sump	F	209.8	10.63		Frequency L2	Hz	62.5	0.02
Radiator 1	F	59.8	2.06		Frequency L3	Hz	60.2	0.02
Radiator 2	F	94.3	4.49					
Radiator 3	F	96.6	4.81					
Radiator 4	F	95.9	4.17					
Coolant Inlet	F	160.3	3.05					
Coolant Outlet	F	179.8	4.80					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	63.5	3.15					
Voltage Reg	F	54.2	1.05					
Stator Frame	F	106.5	6.30					
Stator Housing	F	72.7	5.48					
Battery 1	F	51.0	0.97					
Battery 2	F	51.6	0.99					

Steady State No Load Ambient Long Term Transient 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	43.3	1.48		Baro psia	psia	14.39	0.011
Filter Housing	F	45.8	0.65		Air Filter psia	psia	14.46	0.010
Inlet Manifold	F	70.2	0.54		Int Man psia	psia	15.38	0.017
Exh Cyl 1	F	280.4	0.69		Exh Man psia	psia	17.49	0.015
Exh Cyl 2	F	309.5	1.30		Exh Muff psia	psia	14.55	0.011
Exh Cyl 3	F	305.9	0.99					
Exh Cyl 4	F	289.7	0.86		Power	kW	na	
Exh Manifold	F	315.5	1.02		Voltage L1*	V	120.4	0.06
After Turbo	F	288.7	0.51		Voltage L2*	V	120.4	0.06
After Muffler	F	236.3	0.78		Voltage L3*	V	120.5	0.05
Outlet Vent	F	69.7	1.67		Current L1	A	na	na
Fuel Inlet	F	66.7	1.69		Current L2	A	na	na
Fuel Return	F	74.6	1.15		Current L3	A	na	na
Oil Gallery	F	179.9	0.61		Frequency L1*	Hz	59.8	0.12
Oil Sump	F	199.8	0.42		Frequency L2*	Hz	62.3	0.13
Radiator 1	F	53.3	1.45		Frequency L3*	Hz	60.0	0.12
Radiator 2	F	72.4	1.02					
Radiator 3	F	71.6	0.91					
Radiator 4	F	70.9	0.92					
Coolant Inlet	F	171.3	0.67					
Coolant Outlet	F	178.6	0.49					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	55.1	1.61					
Voltage Reg	F	47.9	1.03					
Stator Frame	F	73.5	1.68					
Stator Housing	F	59.8	2.98					
Battery 1	F	47.1	1.23					
Battery 2	F	47.8	1.30		*missing data on high speed			

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	119.9	120.0	119.4
	Long Term	120.3	120.5	119.8
Frequency [Hz]	Short Term	59.9	60.1	59.7
	Long Term	60.1	60.2	60.0
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	120.4	120.5	120.3
	Long Term*	120.3	120.4	120.3
Frequency [Hz]	Short Term	59.7	60.3	59.5
	Long Term*	59.9	60.0	59.8

Model No. MEP 805B – 30kW

Serial No. HX37762

Method 608.1

Steady State Full Load Ambient Short Term Transient 30kW HX37762								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	90.5	0.43		Baro psia	psia	14.15	0.005
Filter Housing	F	91.1	1.52		Air Filter psia	psia	14.22	0.005
Inlet Manifold	F	154.6	0.46		Int Man psia	psia	18.38	0.234
Exh Cyl 1	F	724.2	11.97		Exh Man psia	psia	18.06	0.420
Exh Cyl 2	F	730.5	14.28		Exh Muff psia	psia	14.25	0.007
Exh Cyl 3	F	745.9	14.85					
Exh Cyl 4	F	717.6	12.91		Power	kW	30.3	
Exh Manifold	F	803.6	24.18		Voltage L1	V	118.5	0.04
After Turbo	F	695.5	11.09		Voltage L2	V	118.6	0.03
After Muffler	F	464.4	1.98		Voltage L3	V	118.5	0.00
Outlet Vent	F	112.3	1.60		Current L1	A	85.1	0.02
Fuel Inlet	F	94.8	0.08		Current L2	A	86.3	0.02
Fuel Return	F	115.1	0.31		Current L3	A	84.0	0.02
Oil Gallery	F	143.1	0.21		Frequency L1	Hz	59.9	0.02
Oil Sump	F	200.8	0.32		Frequency L2	Hz	62.3	0.02
Radiator 1	F	na	na		Frequency L3	Hz	60.0	0.02
Radiator 2	F	114.0	0.33					
Radiator 3	F	115.7	0.48					
Radiator 4	F	110.6	0.43					
Coolant Inlet	F	143.2	0.83					
Coolant Outlet	F	161.0	0.28					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	96.7	0.17					
Voltage Reg	F	85.8	0.23					
Stator Frame	F	142.2	0.50					
Stator Housing	F	87.7	0.60					
Battery 1	F	104.7	0.06					
Battery 2	F	104.8	0.08					

Load Step	Voltage							Frequency								
	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation	
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%
1						0.10	0.08								0.10	0.17
1-2		1.80		1.50	2.10			0.25	0.83		1.69		2.82	2.80		
2						0.10	0.08								0.10	0.17
2-3	2.80		2.33		2.00			0.25	0.02	1.72		2.87		1.70		
3						0.00	0.00								0.10	0.17
3-4		2.50		2.08	1.50			0.25	0.02		1.23		2.05	1.70		
4						0.00	0.00								0.10	0.17
4-5	2.90		2.42		2.00			0.25	0.02	1.68		2.80		1.50		
5						0.00	0.00								0.10	0.17
5-6		1.50		1.25	1.70			0.17	0.07		1.18		1.97	2.10		
6						0.00	0.00								0.10	0.17
7-8	1.70		1.42		0.50			0.17	0.07	0.91		1.52		1.90		
8						0.00	0.00								0.08	0.13
8-9		1.20		1.00	0.50			0.17	0.02		0.87		1.45	1.90		
9						0.00	0.00								0.08	0.13
9-10	1.50		1.25		0.50			0.17	0.00	0.98		1.63		2.00		
10						0.00	0.00								0.08	0.13
10-11		1.50		1.25	0.80			0.17	0.05		0.85		1.42	2.70		
11						0.00	0.00								0.08	0.13
11-12	1.30		1.08		0.40			0.17	0.07	0.87		1.45		3.10		
12						0.00	0.00								0.08	0.13
12-13		0.90		0.75	0.50			0.17	0.07		0.81		1.35	2.30		
13						0.00	0.00								0.08	0.13
14-15	1.00		0.83		0.50			0.17	0.02	0.95		1.58		2.10		
15						0.10	0.08								0.08	0.13
15-16		0.60		0.50	0.60			0.17	0.05		0.98		1.63	2.40		
16						0.00	0.00								0.08	0.13
16-17	0.90		0.75		0.70			0.17	0.08	0.98		1.63		2.10		
17						0.10	0.08								0.08	0.13
17-18		0.50		0.42	0.90			0.17	0.03		0.88		1.47	1.60		
18						0.00	0.00								0.08	0.13
18-19	1.00		0.83		0.80			0.17	0.03	0.92		1.53		2.20		
19						0.10	0.08								0.08	0.13
19-20		0.60		0.50	0.50			0.08	0.05		0.98		1.63	2.40		
20						0.00	0.00								0.08	0.13
21-22	0.10		0.08		0.30			0.08	0.03	0.41		0.68		1.60		
22						0.10	0.08								0.08	0.13
22-23		0.20		0.17	0.50			0.08	0.05		0.40		0.67	2.20		
23						0.00	0.00								0.08	0.13
23-24	0.30		0.25		1.00			0.08	0.02	0.37		0.62		1.90		
24						0.10	0.08								0.08	0.13
24-25		0.10		0.08	0.40			0.08	0.02		0.37		0.62	1.50		
25						0.00	0.00								0.08	0.13
25-26	0.30		0.25		0.70			0.08	0.05	0.39		0.65		2.20		
26						0.10	0.08								0.08	0.13
26-27		0.30		0.25	0.80			0.25	0.08		0.46		0.77	1.50		
27						0.00	0.00								0.08	0.13
28-29	2.30		1.92		0.80			0.33	0.03	1.56		2.60		2.50		
29						0.10	0.08								0.10	0.17
29-30		1.90		1.58	0.50			0.33	0.02		1.22		2.03	2.30		
30						0.00	0.00								0.10	0.17
30-31	2.80		2.33		0.60			0.33	0.05	1.67		2.78		2.00		
31						0.10	0.08								0.10	0.17
31-32		2.40		2.00	0.90			0.33	0.00		1.28		2.13	1.80		
32						0.00	0.00								0.10	0.17
32-33	2.70		2.25		0.70			0.33	0.00	1.59		2.65		1.90		
33						0.10	0.08								0.10	0.17
33-34		1.60		1.33	0.90			0.33	0.03		1.25		2.08	1.00		
34						0.00	0.00								0.10	0.17

Method 608.2

Steady State Full Load Ambient Long Term Transient 30kW HX37762								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	56.0	5.62		Baro psia	psia	14.42	0.012
Filter Housing	F	59.7	5.68		Air Filter psia	psia	14.46	0.016
Inlet Manifold	F	128.5	6.13		Int Man psia	psia	19.88	0.067
Exh Cyl 1	F	683.9	10.27		Exh Man psia	psia	19.81	0.072
Exh Cyl 2	F	699.6	9.02		Exh Muff psia	psia	14.63	0.018
Exh Cyl 3	F	723.6	9.38					
Exh Cyl 4	F	669.3	6.60		Power	kW	30.3	
Exh Manifold	F	740.4	10.18		Voltage L1	V	118.6	0.19
After Turbo	F	659.5	9.86		Voltage L2	V	118.6	0.19
After Muffler	F	554.3	9.32		Voltage L3	V	118.6	0.19
Outlet Vent	F	103.1	8.29		Current L1	A	85.1	0.16
Fuel Inlet	F	69.9	11.30		Current L2	A	86.4	0.17
Fuel Return	F	102.1	8.68		Current L3	A	84.0	0.16
Oil Gallery	F	202.8	13.20		Frequency L1	Hz	59.8	0.05
Oil Sump	F	211.6	8.61		Frequency L2	Hz	62.2	0.05
Radiator 1	F	67.4	8.35		Frequency L3	Hz	60.0	0.05
Radiator 2	F	103.7	8.06					
Radiator 3	F	105.9	8.37					
Radiator 4	F	108.7	7.66					
Coolant Inlet	F	160.1	1.79					
Coolant Outlet	F	182.0	2.57					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	69.4	6.59					
Voltage Reg	F	66.8	8.41					
Stator Frame	F	123.7	10.55					
Stator Housing	F	78.4	8.23					
Battery 1	F	66.7	6.30					
Battery 2	F	64.4	6.73					

Steady State No Load Ambient Long Term Transient 30kW HX37762								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	62.9	0.69		Baro psia	psia	14.38	0.007
Filter Housing	F	63.8	1.04		Air Filter psia	psia	14.42	0.007
Inlet Manifold	F	87.8	1.28		Int Man psia	psia	15.25	0.037
Exh Cyl 1	F	309.3	2.19		Exh Man psia	psia	17.42	0.020
Exh Cyl 2	F	322.1	3.84		Exh Muff psia	psia	14.53	0.008
Exh Cyl 3	F	333.6	3.64					
Exh Cyl 4	F	313.7	2.51		Power	kW	na	
Exh Manifold	F	333.7	4.05		Voltage L1	V	119.1	0.09
After Turbo	F	305.0	6.50		Voltage L2	V	119.2	0.09
After Muffler	F	255.9	11.16		Voltage L3	V	119.2	0.08
Outlet Vent	F	89.0	2.09		Current L1	A	na	na
Fuel Inlet	F	81.8	1.38		Current L2	A	na	na
Fuel Return	F	104.5	0.85		Current L3	A	na	na
Oil Gallery	F	192.8	1.79		Frequency L1	Hz	59.8	0.02
Oil Sump	F	200.6	1.44		Frequency L2	Hz	62.2	0.02
Radiator 1	F	71.6	2.94		Frequency L3	Hz	60.0	0.02
Radiator 2	F	91.3	2.14					
Radiator 3	F	91.1	2.22					
Radiator 4	F	91.9	2.22					
Coolant Inlet	F	168.0	0.61					
Coolant Outlet	F	178.0	0.24					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	70.4	1.88					
Voltage Reg	F	70.5	3.04					
Stator Frame	F	98.3	3.06					
Stator Housing	F	77.1	2.78					
Battery 1	F	72.0	1.21					
Battery 2	F	71.0	1.03					

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	119.1	119.1	119.0
	Long Term	118.6	119.1	118.2
Frequency [Hz]	Short Term	59.9	59.9	59.9
	Long Term	59.8	60.0	59.7
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	118.9	119.0	118.9
	Long Term	119.1	119.3	118.9
Frequency [Hz]	Short Term	59.8	59.8	59.7
	Long Term	59.8	59.9	59.7

Method 630.1 for HX37756 and HX37762

Steady State Full Load Ambient Parallel 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	67.5	4.94		Baro psia	psia	14.28	0.004
Filter Housing	F	69.4	3.33		Air Filter psia	psia	14.28	0.006
Inlet Manifold	F	133.6	2.91		Int Man psia	psia	19.37	0.060
Exh Cyl 1	F	688.3	5.87		Exh Man psia	psia	19.24	0.056
Exh Cyl 2	F	732.9	6.06		Exh Muff psia	psia	14.42	0.005
Exh Cyl 3	F	737.0	6.61					
Exh Cyl 4	F	709.8	5.59		Power	kW	39.1	
Exh Manifold	F	763.7	6.42		Voltage L1	V	118.6	0.00
After Turbo	F	691.3	6.21		Voltage L2	V	118.7	0.03
After Muffler	F	572.0	6.40		Voltage L3	V	118.8	0.01
Outlet Vent	F	123.2	38.29		Current L1	A	109.9	0.31
Fuel Inlet	F	75.2	2.04		Current L2	A	111.4	0.32
Fuel Return	F	93.8	1.71		Current L3	A	108.3	0.31
Oil Gallery	F	192.5	1.18		Frequency L1	Hz	59.8	0.01
Oil Sump	F	210.1	0.86		Frequency L2	Hz	62.1	0.01
Radiator 1	F	78.5	1.67		Frequency L3	Hz	59.9	0.01
Radiator 2	F	106.9	2.22					
Radiator 3	F	111.2	2.10					
Radiator 4	F	110.3	2.40					
Coolant Inlet	F	176.4	0.63					
Coolant Outlet	F	154.5	0.98					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	83.9	2.53					
Voltage Reg	F	74.7	1.47					
Stator Frame	F	133.2	4.00					
Stator Housing	F	100.2	4.71					
Battery 1	F	62.4	1.47					
Battery 2	F	59.1	1.44					

Steady State Full Load Ambient Parallel 30kW HX37762								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	70.5	3.43		Baro psia	psia	14.12	0.005
Filter Housing	F	76.4	1.46		Air Filter psia	psia	14.21	0.007
Inlet Manifold	F	138.1	1.54		Int Man psia	psia	18.53	0.031
Exh Cyl 1	F	663.5	2.88		Exh Man psia	psia	18.69	0.118
Exh Cyl 2	F	680.7	2.50		Exh Muff psia	psia	14.45	0.005
Exh Cyl 3	F	700.0	2.62					
Exh Cyl 4	F	649.7	2.24		Power	kW	28.2	
Exh Manifold	F	719.7	2.69		Voltage L1	V	118.6	0.01
After Turbo	F	642.1	3.13		Voltage L2	V	118.8	0.00
After Muffler	F	537.0	4.48		Voltage L3	V	118.7	0.00
Outlet Vent	F	131.6	3.22		Current L1	A	79.2	0.23
Fuel Inlet	F	83.5	1.60		Current L2	A	79.7	0.22
Fuel Return	F	109.9	1.31		Current L3	A	78.8	0.23
Oil Gallery	F	204.4	0.86		Frequency L1	Hz	59.7	0.01
Oil Sump	F	211.5	0.72		Frequency L2	Hz	59.9	0.01
Radiator 1	F	110.0	1.20		Frequency L3	Hz	60.0	0.01
Radiator 2	F	110.7	1.31					
Radiator 3	F	115.8	3.00					
Radiator 4	F	111.6	2.97					
Coolant Inlet	F	160.4	0.75					
Coolant Outlet	F	181.2	0.45					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	72.5	0.82					
Voltage Reg	F	69.4	0.82					
Stator Frame	F	89.4	2.79					
Stator Housing	F	75.6	0.44					
Battery 1	F	79.8	2.20					
Battery 2	F	77.1	0.57					

30kW HX37756																	
	Voltage									Frequency							
Load Step	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation		
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%	
1						0.00	0.00								0.03	0.05	
1-2		0.60		0.50	0.70			0.33	0.07		0.85		1.42	1.10			
2						0.10	0.08								0.03	0.05	
2-3	1.40		1.17		0.70			0.33	0.07	0.90		1.50		1.70			
3						0.00	0.00								0.03	0.05	
3-4		0.70		0.58	0.60			0.33	0.07		0.85		1.42	1.20			
4						0.10	0.08								0.03	0.05	
4-5	0.80		0.67		0.50			0.33	0.07	0.70		1.17		2.00			
5						0.00	0.00								0.03	0.05	
5-6		1.30		1.08	0.50			0.33	0.07		0.80		1.33	1.20			
6						0.10	0.08								0.03	0.05	
6-7	0.70		0.58		0.50			0.33	0.07	0.85		1.42		2.00			
7						0.00	0.00								0.03	0.05	
7-8		1.00		0.83	0.70			0.33	0.07		0.80		1.33	1.50			
8						0.10	0.08								0.03	0.05	

30kW HX37762																	
	Voltage									Frequency							
Load Step	Max Volt Excursion		Excursion %		Rec Time	Variation		Regulation		Max Freq Excursion		Excursion %		Rec Time	Variation		
	Volt Drop	Volt Add	% Drop	% Add	Seconds	Volt	%	Volt %	Freq %	Freq Drop	Freq Add	% Drop	% Add	Seconds	Freq	%	
1						0.10	0.08								0.05	0.08	
1-2		0.60		0.50	0.70			0.25	0.03		0.85		1.42	1.10			
2						0.10	0.08								0.05	0.08	
2-3	1.30		1.08		0.70			0.25	0.03	0.90		1.50		1.70			
3						0.10	0.08								0.05	0.08	
3-4		0.60		0.50	0.60			0.25	0.03		0.85		1.42	1.20			
4						0.10	0.08								0.05	0.08	
4-5	0.80		0.67		0.50			0.25	0.03	0.70		1.17		2.00			
5						0.10	0.08								0.05	0.08	
5-6		1.40		1.17	0.50			0.25	0.03		0.80		1.33	1.20			
6						0.10	0.08								0.05	0.08	
6-7	0.70		0.58		0.50			0.25	0.03	0.85		1.42		2.00			
7						0.10	0.08								0.05	0.08	
7-8		0.90		0.75	0.70			0.25	0.03		0.80		1.33	1.50			
8						0.00	0.00								0.05	0.08	

Full Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	117.9	117.9	118.0
	Long Term	118.1	117.8	118.8
Frequency [Hz]	Short Term	60.0	60.0	60.1
	Long Term	60.0	60.0	60.1
No Load		**Average**	**Max**	**Min**
Voltage [V]	Short Term	119.0	118.9	119.0
	Long Term	118.8	118.6	119.0
Frequency [Hz]	Short Term	60.1	60.1	60.2
	Long Term	60.1	60.0	60.2

Active Power Division	Nominal System Load		HX37756		HX37762		Difference
	kW	%	kW	%	kW	%	%
	14.3	23.8	7.5	24.9	6.8	22.6	9.2
	18.2	30.3	11.0	36.6	7.2	24.0	34.4
	32.5	54.1	18.6	61.9	13.9	46.3	25.1
	48.2	80.3	27.6	92.1	20.6	68.5	25.6
	66.7	111.1	38.5	128.2	28.2	94.0	26.6
Active Power Exchange			**Max kW**	**Min kW**	**Max kW**	**Min kW**	**Diff % (Max)**
	14.3	23.8	9.56	7.20	9.01	6.64	7.88
	18.2	30.3	11.88	10.58	8.84	7.00	6.14
	32.5	54.1	19.12	17.95	15.27	13.50	5.88
	48.2	80.3	28.13	26.16	22.84	20.09	9.16
	66.7	111.1	39.43	33.91	28.54	26.28	18.41
Reactive Power Division				**KVAR**		**KVAR**	**% Unbalance**
		0					
note: there is no		0					
reactive load on the		0					
genset, only resistive		0					
		0					
Load Current Pulsation			**Max A**	**Min A**	**Max A**	**Min A**	**% Pulsation**
	14.3	23.8	23.97	20.00	25.68	18.35	7.05
	18.2	30.3	33.67	29.35	25.31	19.29	5.79
	32.5	54.1	54.61	49.78	43.33	37.80	5.32
	48.2	80.3	80.70	72.74	64.71	56.30	8.09
	66.7	111.1	112.30	94.40	80.60	73.77	17.21
Reverse Power			**Max kW**	**Min kW**	**Max kW**	**Min kW**	

Note: unable to determine reverse power limit at minimum load

Appendix E

Summary Data from Method 720.1: Simulated Altitude Testing at 4,000 and 10,000 Feet

Model No. MEP 803A – 10kW

Serial No. FZ35055

Steady State Full Load 4,000 Ft 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	na	na		Baro psia	psia	14.35	0.257
Filter Housing	F	100.7	7.02		Air Filter psia	psia	14.29	0.039
Inlet Manifold	F	na	na		Int Man psia	psia	12.79	0.396
Exh Cyl 1	F	796.8	2.37		Exh Man psia	psia	13.69	0.595
Exh Cyl 2	F	780.3	3.03		Exh Muff psia	psia	12.75	0.247
Exh Cyl 3	F	728.1	6.51					
Exh Cyl 4	F	700.8	6.67		Power	kW	10.2	
Exh Manifold	F	779.4	3.46		Voltage	V	119.3	0.04
After Muffler	F	703.9	6.12		Current	A	85.3	0.33
Outlet Vent	F	na	na		Frequency	Hz	62.1	0.35
Fuel Inlet	F	100.2	1.18					
Fuel Return	F	na	na					
Oil Gallery	F	221.5	1.40					
Oil Sump	F	242.7	8.36					
Radiator 1	F	99.3	3.04					
Radiator 2	F	na	na					
Radiator 3	F	107.3	9.65					
Radiator 4	F	110.3	4.57					
Coolant Inlet	F	202.8	11.44		There was a gound-loop feedback issue with some of the thermocouples.			
Coolant Outlet	F	217.7	15.51					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	na	na					
Voltage Reg	F	na	na					
Stator Frame	F	na	na					
Stator Housing	F	na	na					
Battery 1	F	na	na					
Battery 2	F	na	na					

4,000 Ft: FZ35055		
Maximum Power	10.35	kW

Steady State Full Load 10,000 Ft 10kW FZ35055								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	82.0	5.75		Baro psia	psia	na	na
Filter Housing	F	119.1	20.75		Air Filter psia	psia	14.22	0.078
Inlet Manifold	F	156.3	12.70		Int Man psia	psia	14.25	0.370
Exh Cyl 1	F	712.2	9.04		Exh Man psia	psia	15.20	0.420
Exh Cyl 2	F	684.9	4.99		Exh Muff psia	psia	14.35	0.120
Exh Cyl 3	F	630.9	4.34					
Exh Cyl 4	F	628.0	11.63		Power	kW	7.7	
Exh Manifold	F	680.9	9.20		Voltage	V	119.2	0.02
After Muffler	F	603.2	8.38		Current	A	64.5	0.07
Outlet Vent	F	200.6	15.15		Frequency	Hz	62.6	0.09
Fuel Inlet	F	90.1	0.85					
Fuel Return	F	120.9	11.29					
Oil Gallery	F	220.8	6.15					
Oil Sump	F	215.4	6.45					
Radiator 1	F	106.0	1.59					
Radiator 2	F	111.1	1.77					
Radiator 3	F	110.3	3.90					
Radiator 4	F	104.0	3.70					
Coolant Inlet	F	184.0	9.82		There was a gound-loop feedback issue with some of the thermocouples.			
Coolant Outlet	F	206.4	10.71					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	87.9	1.61					
Voltage Reg	F	na	na					
Stator Frame	F	na	na					
Stator Housing	F	na	na					
Battery 1	F	na	na					
Battery 2	F	na	na					

10,000 Ft: FZ35055		
Maximum Power	7.54	kW

Model No. MEP 804A – 15kW

Serial No. FZ60344

Steady State Full Load 4,000 Ft 15kW FZ60344								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	93.1	5.97		Baro psia	psia	na	na
Filter Housing	F	94.8	4.59		Air Filter psia	psia	14.20	0.087
Inlet Manifold	F	109.0	5.46		Int Man psia	psia	12.64	0.445
Exh Cyl 1	F	725.0	5.50		Exh Man psia	psia	13.20	0.523
Exh Cyl 2	F	824.4	1.37		Exh Muff psia	psia	12.74	0.150
Exh Cyl 3	F	803.3	2.71					
Exh Cyl 4	F	634.2	7.72		Power	kW	15.2	
Exh Manifold	F	785.3	4.88		Voltage L1	V	119.7	0.05
After Muffler	F	257.3	2.87		Voltage L2	V	119.9	0.04
Outlet Vent	F	175.5	9.40		Voltage L3	V	119.9	0.05
Fuel Inlet	F	115.0	1.33		Current L1	A	42.3	0.02
Fuel Return	F	na	na		Current L2	A	42.7	0.02
Oil Gallery	F	199.7	2.00		Current L3	A	41.5	0.03
Oil Sump	F	197.6	2.27		Frequency L1	Hz	59.9	0.02
Radiator 1	F	109.9	3.61		Frequency L2	Hz	62.2	0.02
Radiator 2	F	108.3	4.99		Frequency L3	Hz	60.0	0.02
Radiator 3	F	113.7	4.97					
Radiator 4	F	103.7	5.20					
Coolant Inlet	F	187.1	11.45					
Coolant Outlet	F	203.6	4.79					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na		There was a gound-loop feedback issue with some of the thermocouples.			
Instrument Panel	F	101.1	7.65					
Voltage Reg	F	107.5	4.73					
Stator Frame	F	na	na					
Stator Housing	F	na	na					
Battery 1	F	na	na					
Battery 2	F	na	na					

4,000 Ft: FZ60344		
Maximum Power	19.12	kW

Steady State Full Load 10,000 Ft 15kW FZ60344								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	82.1	1.01		Baro psia	psia	14.02	0.000
Filter Housing	F	91.9	0.64		Air Filter psia	psia	14.14	0.000
Inlet Manifold	F	96.6	0.09		Int Man psia	psia	13.71	0.004
Exh Cyl 1	F	720.7	0.43		Exh Man psia	psia	14.52	0.005
Exh Cyl 2	F	803.6	0.52		Exh Muff psia	psia	14.28	0.000
Exh Cyl 3	F	781.6	0.33					
Exh Cyl 4	F	643.8	0.31		Power	kW	16.4	
Exh Manifold	F	787.3	0.22		Voltage L1	V	120.0	0.04
After Muffler	F	569.0	0.07		Voltage L2	V	120.2	0.05
Outlet Vent	F	158.7	0.21		Voltage L3	V	120.2	0.03
Fuel Inlet	F	89.3	0.07		Current L1	A	45.6	0.02
Fuel Return	F	91.5	0.11		Current L2	A	45.7	0.02
Oil Gallery	F	203.0	0.08		Current L3	A	45.0	0.04
Oil Sump	F	205.0	0.14		Frequency L1	Hz	59.8	0.02
Radiator 1	F	117.6	0.18		Frequency L2	Hz	60.0	0.02
Radiator 2	F	122.2	0.33		Frequency L3	Hz	60.1	0.01
Radiator 3	F	115.7	0.38					
Radiator 4	F	117.4	0.58					
Coolant Inlet	F	177.7	0.45					
Coolant Outlet	F	195.4	0.05					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	92.9	0.07					
Voltage Reg	F	97.5	0.22					
Stator Frame	F	95.2	0.68					
Stator Housing	F	91.4	0.61					
Battery 1	F	88.7	0.13					
Battery 2	F	98.2	0.20					

10,000 Ft: FZ60357		
Maximum Power	16.35	kW

Model No. MEP 804A – 15kW

Serial No. FZ60357

Steady State Full Load 4,000 Ft 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	76.9	0.66		Baro psia	psia	na	na
Filter Housing	F	89.2	6.95		Air Filter psia	psia	14.25	0.069
Inlet Manifold	F	154.7	5.35		Int Man psia	psia	12.67	0.431
Exh Cyl 1	F	922.6	3.30		Exh Man psia	psia	13.16	0.469
Exh Cyl 2	F	981.3	5.35		Exh Muff psia	psia	12.73	0.200
Exh Cyl 3	F	974.2	5.29					
Exh Cyl 4	F	796.2	8.10		Power	kW	17.0	
Exh Manifold	F	976.4	4.13		Voltage L1	V	119.4	0.05
After Muffler	F	198.1	1.12		Voltage L2	V	119.4	0.04
Outlet Vent	F	197.2	3.58		Voltage L3	V	119.4	0.04
Fuel Inlet	F	93.9	7.10		Current L1	A	47.5	0.02
Fuel Return	F	92.0	4.08		Current L2	A	48.2	0.02
Oil Gallery	F	186.3	2.82		Current L3	A	46.9	0.02
Oil Sump	F	186.0	1.74		Frequency L1	Hz	60.0	0.03
Radiator 1	F	106.7	4.20		Frequency L2	Hz	62.3	0.03
Radiator 2	F	94.0	3.13		Frequency L3	Hz	60.1	0.03
Radiator 3	F	91.1	2.64					
Radiator 4	F	97.1	3.37					
Coolant Inlet	F	168.5	12.24					
Coolant Outlet	F	181.1	3.97					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	83.0	5.91					
Voltage Reg	F	97.7	6.71					
Stator Frame	F	169.1	3.06					
Stator Housing	F	166.5	5.77					
Battery 1	F	169.1	5.09					
Battery 2	F	166.8	5.56					

4,000 Ft: FZ60357		
Maximum Power	18.47	kW

Steady State Full Load 10,000 Ft 15kW FZ60357								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	95.2	8.15		Baro psia	psia	na	na
Filter Housing	F	114.1	6.06		Air Filter psia	psia	14.14	0.137
Inlet Manifold	F	171.3	7.09		Int Man psia	psia	10.19	0.537
Exh Cyl 1	F	1092.4	3.82		Exh Man psia	psia	10.58	0.474
Exh Cyl 2	F	1180.6	4.98		Exh Muff psia	psia	10.19	0.189
Exh Cyl 3	F	1186.0	7.17					
Exh Cyl 4	F	935.5	5.46		Power	kW	14.8	
Exh Manifold	F	1185.8	7.61		Voltage L1	V	118.6	0.04
After Muffler	F	419.5	14.75		Voltage L2	V	118.5	0.05
Outlet Vent	F	221.7	5.94		Voltage L3	V	118.7	0.05
Fuel Inlet	F	104.4	7.87		Current L1	A	41.7	0.06
Fuel Return	F	104.2	5.58		Current L2	A	42.3	0.06
Oil Gallery	F	192.0	3.27		Current L3	A	41.2	0.05
Oil Sump	F	193.2	2.69		Frequency L1	Hz	60.0	0.10
Radiator 1	F	121.5	3.44		Frequency L2	Hz	62.3	0.11
Radiator 2	F	109.3	5.88		Frequency L3	Hz	60.1	0.11
Radiator 3	F	107.1	4.52					
Radiator 4	F	111.0	4.03					
Coolant Inlet	F	169.2	12.44					
Coolant Outlet	F	180.6	4.75					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	104.7	7.86					
Voltage Reg	F	117.0	5.13					
Stator Frame	F	187.0	2.98					
Stator Housing	F	182.5	7.40					
Battery 1	F	181.8	9.71					
Battery 2	F	186.9	6.92					

10,000 Ft: FZ60357		
Maximum Power	15.13	kW

Model No. MEP 805B – 30kW

Serial No. HX37756

Steady State Full Load 4,000 Ft 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	80.0	0.74		Baro psia	psia	na	na
Filter Housing	F	151.0	0.24		Air Filter psia	psia	12.06	0.044
Inlet Manifold	F	152.3	4.32		Int Man psia	psia	16.49	0.257
Exh Cyl 1	F	763.1	0.97		Exh Man psia	psia	17.05	0.287
Exh Cyl 2	F	815.0	0.59		Exh Muff psia	psia	12.68	0.012
Exh Cyl 3	F	821.7	5.76					
Exh Cyl 4	F	788.9	3.04		Power	kW	30.6	
Exh Manifold	F	841.4	13.83		Voltage L1	V	118.1	0.00
After Turbo	F	750.1	4.81		Voltage L2	V	118.1	0.02
After Muffler	F	604.8	2.55		Voltage L3	V	118.2	0.00
Outlet Vent	F	209.1	6.56		Current L1	A	86.3	0.04
Fuel Inlet	F	89.2	5.32		Current L2	A	87.9	0.00
Fuel Return	F	107.5	6.81		Current L3	A	85.2	0.03
Oil Gallery	F	194.8	0.45		Frequency L1	Hz	59.8	0.01
Oil Sump	F	217.0	3.61		Frequency L2	Hz	62.2	0.01
Radiator 1	F	127.6	2.34		Frequency L3	Hz	60.0	0.01
Radiator 2	F	133.6	7.04					
Radiator 3	F	130.6	4.03					
Radiator 4	F	124.6	1.75					
Coolant Inlet	F	177.7	2.22					
Coolant Outlet	F	185.8	4.17					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	88.1	5.12					
Voltage Reg	F	94.6	3.79					
Stator Frame	F	163.6	4.66					
Stator Housing	F	172.9	6.63					
Battery 1		165.1	3.96					
Battery 2	F	158.8	5.19					

4,000 Ft: HX37756		
Maximum Power	34.16	kW

Steady State Full Load 10,000 Ft 30kW HX37756								
Measurement	Unit	Average	Std. Dev.		Measurement	Unit	Average	Std. Dev.
Inlet Vent	F	85.1	0.70		Baro psia	psia	na	na
Filter Housing	F	130.2	1.85		Air Filter psia	psia	10.15	0.034
Inlet Manifold	F	171.5	0.69		Int Man psia	psia	14.82	0.041
Exh Cyl 1	F	818.9	1.11		Exh Man psia	psia	14.23	0.035
Exh Cyl 2	F	891.0	1.36		Exh Muff psia	psia	10.12	0.016
Exh Cyl 3	F	894.0	1.43					
Exh Cyl 4	F	856.2	1.60		Power	kW	30.9	
Exh Manifold	F	932.5	3.93		Voltage L1	V	118.4	0.03
After Turbo	F	796.2	0.75		Voltage L2	V	118.4	0.00
After Muffler	F	641.2	1.84		Voltage L3	V	118.5	0.02
Outlet Vent	F	198.9	2.04		Current L1	A	86.8	0.05
Fuel Inlet	F	102.1	3.52		Current L2	A	88.4	0.00
Fuel Return	F	119.0	3.90		Current L3	A	85.7	0.04
Oil Gallery	F	198.4	0.34		Frequency L1	Hz	59.8	0.01
Oil Sump	F	218.0	1.62		Frequency L2	Hz	62.2	0.02
Radiator 1	F	126.7	0.79		Frequency L3	Hz	59.9	0.01
Radiator 2	F	130.1	1.17					
Radiator 3	F	130.8	3.67					
Radiator 4	F	129.1	1.46					
Coolant Inlet	F	170.1	0.37					
Coolant Outlet	F	187.2	4.84					
Aux Heater In	F	na	na					
Aux Heater Out	F	na	na					
Instrument Panel	F	93.9	1.33					
Voltage Reg	F	99.9	1.69					
Stator Frame	F	146.5	3.09					
Stator Housing	F	156.8	2.56					
Battery 1		149.4	2.03					
Battery 2	F	140.0	1.20					

10,000 Ft: HX37756		
Maximum Power	34.30	kW