



General Motors

GM Powertrain
Engine Engineering - Bldg. C
Mail Code 483-710-270
895 Joslyn Ave.
Pontiac Mi. 48340
USA

August 4, 2015

Dear Gary:

We propose to certify the 2016 G1UB based on SAE standard –J2723 witness testing completed on June 3, 2015 using a qualified ISO-Power analytical engine model. The process used, consistent with SAE J2723, was to certify a power response surface as a function of exhaust and induction restriction.

Data included:

1. Tabular data of witnessed test results with the G1UB exhaust restriction. Data was witnessed on 06/03/15.
2. A graphical representation of the 2016 LE2 peak power levels determined by an engine analytical model. This graphical representation is commonly referred to as an ISO-Power plot.
3. Tabular data showing proposed SAE- Certified power and torque values determined by the engine analytical model used to determine SAE-J1349 results on the following applications:

2016 Federal Emission Package

Please feel free to contact us if you have any questions.

Regards,

Jim Walker

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George Washburn

Development and Validation System Manager SGE

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Parameter	Units	1500	1800	2000	2100	2500	3000	3500	4000	4100	4500	5000	5500	5600	5700	6000	6250
Engine Speed	rpm	1500	1800	2000	2100	2500	3000	3500	4000	4100	4500	5000	5500	5600	5700	6000	6250
Observed Torque	lb-ft	149.6	177.3	178.6	179.6	181.1	182.3	183.6	183.3	182.3	176.4	162.4	146.3	143.1	138.0	125.1	
Observed Torque	N-m	201.404	242.379	244.111	244.111	243.551	247.111	248.057	248.944	247.209	239.177	220.223	199.381	193.989	187.088	169.617	
Corrected Torque	lb-ft	149.6	177.3	178.6	180.1	181.6	182.3	183.6	183.3	182.3	176.4	162.4	146.3	143.1	138.0	125.1	
Corrected Torque	N-m	201.404	242.379	244.111	244.111	243.551	247.111	248.057	248.944	247.209	239.177	220.223	199.381	193.989	187.088	169.617	
SAE Corrected Brake Power	hp	42.1	64.1	68.0	72.0	85.6	104.1	122.3	136.2	139.9	142.3	151.1	154.6	153.3	152.6	149.8	143.0
SAE Corrected Brake Power	kW	31.6	47.8	50.7	53.7	63.9	77.6	91.2	101.6	104.1	106.1	112.7	115.3	114.3	113.9	111.7	106.6
Corrected Brake Power SI - Losses	kW	31.40	47.60	50.46	53.45	63.50	77.25	90.80	101.10	103.60	105.60	112.10	114.05	113.60	113.10	111.00	105.80
Measuring Friction Torque	N-m																
Measuring Friction Power	kW																
Cooling Fan Loss (if applicable)	kW	0.20	0.20	0.2	0.25	0.30	0.35	0.40	0.50	0.50	0.50	0.60	0.65	0.70	0.70	0.70	0.80
Alternator Loss (if applicable)	kW																
PS Pump Loss (if applicable)	kW																
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PS Pump Loss (if applicable)	kW																
SAE J1349 Correction Factor	N-m	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Air/Fuel Ratio	kg/kg	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Mass Airflow	g/sec	307.563	377.147	414.6	446.8	584.4	861.5	1112.1	1405.1	1405.1	1405.1	1405.1	1405.1	1405.1	1405.1	1405.1	1405.1
Mass Fuel Flow	g/sec	19.2	23.9	25.7	27.1	35.8	53.8	69.7	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.9
Fuel Meter Temperature	°C	27.04	27.04	27.04	27.1	27.1	26.93	26.7	26.48	26.3	26.2	26.1	25.97	25.85	25.8	25.7	25.7
Fuel Rail Temperature	°C	26.8	27.02	27.28	27.46	27.43	27.4	27.2	27.0	26.86	26.8	26.7	26.6	26.5	26.4	26.4	26.4
Coolant Inlet Temperature	°C	90.3	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1
Coolant Outlet Temperature	°C	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9	71.9
Oil Sump Temperature	°C	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1
Exhaust Gas Temperature	°C	860.7	740.76	753.03	763.71	713.74	717.89	716.41	707.28	709.18	711.01	700.16	682.24	688.5	691.3	701.19	718.81
Ambient Temperature	°C	25.2	25.34	25.68	25.98	26.32	26.58	26.83	27.03	27.2	27.4	27.6	27.8	28.0	28.2	28.4	28.6
Inlet Air Temperature	°C	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45
Ambient Pressure	kPa	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45	98.45
Inlet Air Vapor Pressure	kPa	0.9713	0.9757	0.982	0.9892	0.9971	1.0057	1.0147	1.0237	1.0327	1.0417	1.0507	1.0597	1.0687	1.0777	1.0867	1.0957
Inlet Air Pressure	kPa	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15	99.15
Intake Manifold Pressure	kPa	171.3	214.5	200.3	200.3	200.3	200.3	200.3	200.3	200.3	200.3	200.3	200.3	200.3	200.3	200.3	200.3
Fuel Rail Pressure	kPa	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4	384.4
Oil Pressure	kPa	109.1	116.9	116.9	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2
Exhaust Backpressure (Converter Inlet)	kPa	1500.05	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07	1500.07
ecu: Mass Airflow	g/sec	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324	324
ecu: MAP	kPa	175.52	214.18	220.03	221.31	209.25	212.23	210.27	215.99	216.94	217.49	211.57	205.61	187.51	185.39	178.49	175.52
ecu: Spark Advance	deg	-7.14	-7.11	-7.22	-6.89	-4.62	-3.04	-0.09	2.1	2.3	2.56	5.37	6.37	10.46	10.54	10.07	9.15
ecu: Intake Cam Phase Position	deg	22.5	16.7	15	14.4	13	12.8	12.7	11.5	11	10.5	9.1	8.4	8.7	9	8.3	9.8
ecu: Exhaust Cam Phase Position	deg	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12	14.12
ecu: Throttle Position	deg	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
ecu: Battery Voltage	volt	89.01	87.48	87.29	87.25	86.95	87.04	87	87.08	87.08	86.84	86.37	86.5	86.76	86.84	86.75	86.75
ecu: Coolant Temperature	°C	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44
ecu: Charge Air Temperature	°C	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44
ecu: Barometric Pressure	kPa	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44	98.44
Compressor Inlet Temperature	°C	40.49	40.61	40.21	39.51	40.34	39.56	39.52	39.59	39.73	40.37	39.8	40.16	39.71	40.35	40.69	41.4
Compressor Inlet Pressure	kPa	179.7	217.4	223.4	228.3	215.8	214.5	223.5	222.2	222.9	216.7	206.9	196.2	194.7	182.7	167.3	167.3
Compressor Outlet Pressure	kPa	179.3	216.6	222.6	225.4	211.7	215.4	212.6	216.1	215.7	223.3	214	203.7	192.8	181.3	163.6	163.6
Charge Air Cooler Pressure Drop	kPa	0.4	0.8	0.8	0.9	0.9	1.4	1.9	2.6	2.6	3.2	3.4	3.4	3.4	3.4	3.4	3.4
Manifold Inlet Pressure	kPa	177.3	214.5	220.3	223	209.2	213	210.1	215.1	216.7	210.9	200.7	189.4	187.7	185.5	179.3	179.3
Manifold Inlet Temperature	°C	38.1	40.1	40.1	39.7	40.2	39.7	38.8	40	40	40.4	40	40.5	40.2	40.9	41.4	41.4



SAE Power Certification
Form J2723 B (ISO-Power / ISO- Torque Model Verification)

Manufacturer Name	General Motors Powertrain
Address:	777 Joslyn Rd
City:	Pontiac
State	MI
Country:	USA
Postal Code	48340
Engine:	LE2
Type of Certification:	Family Of Engines
Model Year & Vehicle Application(s).	2016 Engine Test Data with Buick Encore Exhaust Backpressure to Qualify ISO-Power Analytical Engine Model
Test Standard:	J1349: Sep2011
Test Location:	Pontiac Dyno Lab Test Cell D218
Engine Serial Number:	P5E2G801
Test/Run Number:	E_F5_ENG_J1349.57605
Test Date:	June03, 2015

RESULTS:

The engine described herein was tested on June03, 2015 according to the requirements prescribed in J1349: Sep2011, Engine Power Test Code in the presence of a qualified SAE Witness, and was determined to produce the following results:

Parameter	Rated Speed	Rated Output	Measured Speed	Measured Output	% Difference
Power (hp)	5600	153	5600	151.70	0.857
Torque (lb-ft)	2000- 4000	177	2000- 4000	177.7 -181.6	-0.508

APPROVALS:

The manufacture declares that the engine tested for this report is representative of engines in series production. The manufacturer further declares that the performance of engines in series production will characteristically be at least 98% of the rated torque and power values indicated on this report.

Name:	Kendell Fulton
Title:	Assistant Chief Engineer
Date:	AUG 4/15