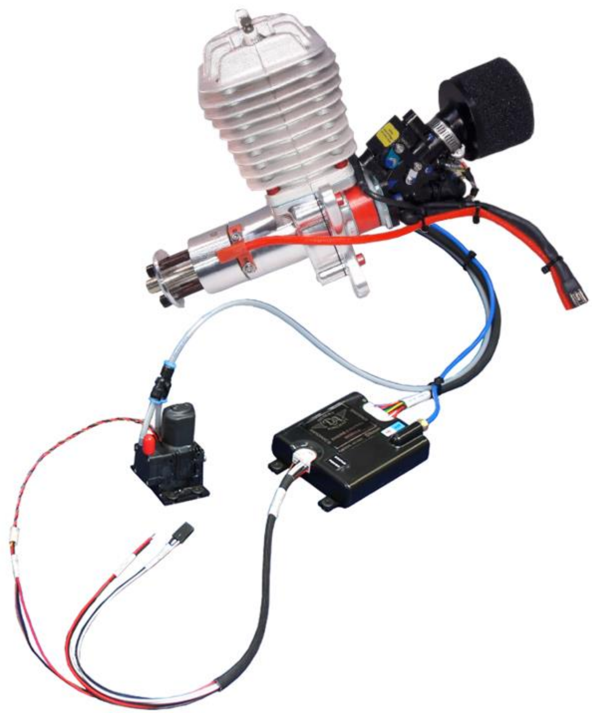


DA50 EFI Data Sheet

50cc Single Cylinder, Electronic Fuel Injected Two Stroke Engine

Featuring:

- 3.2 kW at 7500 RPM
- 3.9 Nm torque at 7000 RPM
- 1.8 kg full system weight
- 1-amp peak current draw
- RS-232 or CAN Telemetry

HFE INTERNATIONAL

8060 E. Research Ct.
Tucson, AZ 85710
520-578-0818

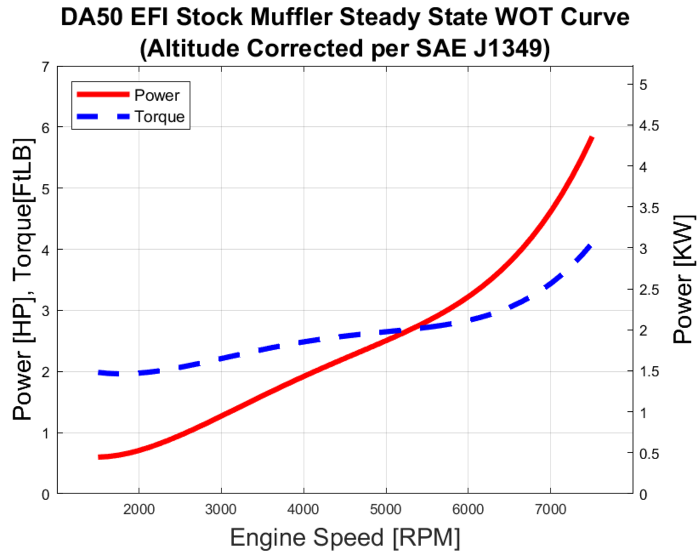


Figure 1: Power curve generated from steady state wide open throttle conditions from 2500 RPM to 7500 RPM in 500 RPM increments.

	METRIC	IMPERIAL
DISPLACEMENT	50 cc	3.05 ci
MAX POWER (7500 RPM)*	3.4 kW	4.2 HP
MAX TORQUE (7500 RPM)*	4.1 Nm	3.0 lbft
CONTINUOUS POWER (7000 RPM)*	3.0 kW	3.8 hp
CONTINUOUS TORQUE (7000 RPM)*	3.9 Nm	2.9 lbft
OPERATING RPM RANGE	2500 RPM to 7000 RPM	
AVERAGE BSFC	TBD	TBD
WEIGHT (ENGINE WITH THROTTLE BODY)	1.5 kg	3.3 lb
WEIGHT (ECM)	85 g	2.9 oz
WEIGHT (FUEL PUMP)	88 g	3.1 oz
WEIGHT (IGNITION)	150 g	5.3 oz
WEIGHT (WIRE HARNESS, FUEL LINES)	170 g	6.0 oz
FUEL**	Any Grade Pump Gasoline	
TWO STROKE OIL	Red Line, 40:1 mix ratio	
REQUIRED OPERATING VOLTAGE	10V to 15V	
CURRENT DRAW	1A Peak	
RECOMMENDED BATTERY	3s or greater LiPo, 1 hour / 1000 mAh	
AMBIENT TEMPERATURE RANGE	0 to 49° C	32 to 120° F

*Stock Muffler **No heavy fuel option at this time

Propeller Recommendations					
2-Blade	**Max RPM ±50**	**Estimated Max Thrust (lbs) ±5%**	**3-Blade**	**Max RPM ±50**	**Estimated Max Thrust (lbs) ±5%**
22 x 8	7100*	30.2**	20 x 8	6550**	29.8**
22 x 10	6300*	25.3**	20 x 10	5600**	23.1**
23 x 8	6750**	30.8**	22 x 8	5800**	30.3**

*Recorded from Test Stand **Simulation Estimation

Part Throttle Power and Torque

Part throttle curves were generated by operating the engine at steady state using a Magtrol eddy current dynamometer. Torque and speed data was captured for 30 seconds at each throttle position and speed point. Low throttle cut off points were determined by the engines ability to produce torque at a given speed; as speed increased higher starting throttle positions were required. Each trace represents constant throttle position, starting at 20% throttle (bottom trace) to 100% throttle (top trace). All data points are ±5% to account for measurement error and engine to engine variation.

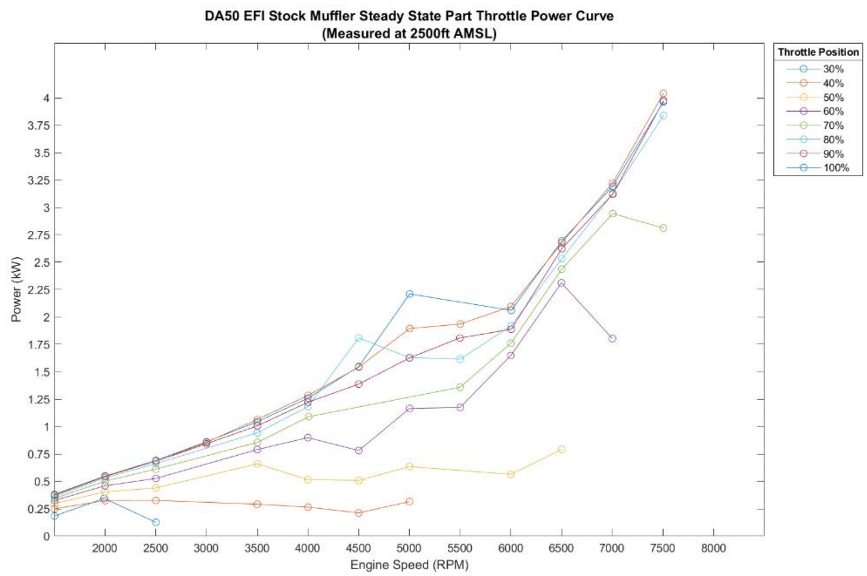


Figure 2. Part throttle power curves

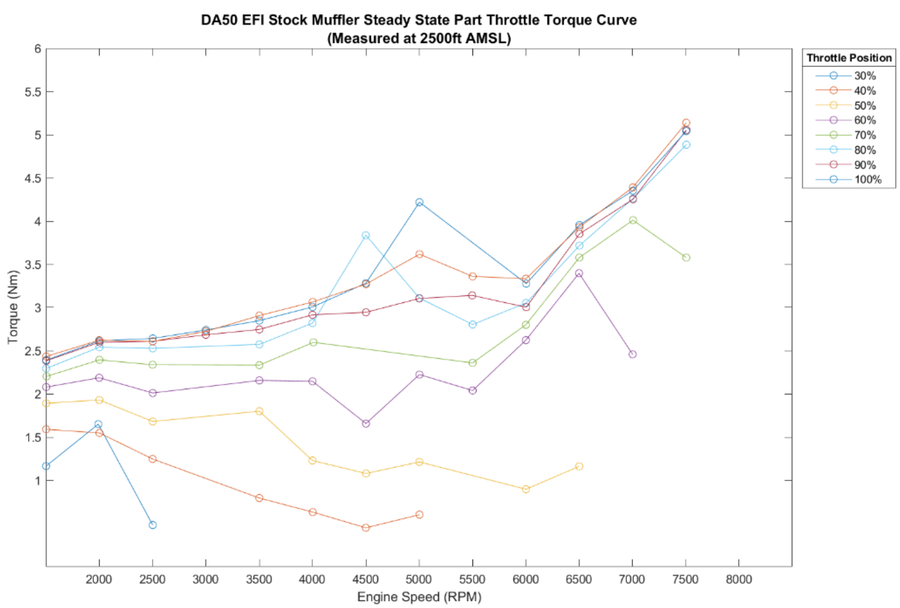


Figure 3. Part throttle torque curves

Power Degradation as a function of Cylinder Head Temperature (CHT)

It is common for an engine to experience reduced thermal efficiency with increased charge air temperature and/or increased cylinder wall temperature resulting in reduction of brake power. HFE EFI systems monitor these two temperate points using MAT and CHT thermistors. The EFI compensates for ΔT of either or both sensors by increasing or decreasing injector pulse width to maintain proper AFR, although power loss is still experienced. Power degradation was measured using a Magtrol eddy current dyno by maintaining constant CHT (235F), altering MAT or constant MAT (80F), altering CHT. MAT test was not performed for the DA50 as the location of throttle body is such that the cooling fan cannot be fixtured. Engine was held at steady state, 3500 RPM, 100% throttle for both tests. Optimal continuous operation temperature range 220-240F CHT, and 80-90F MAT.

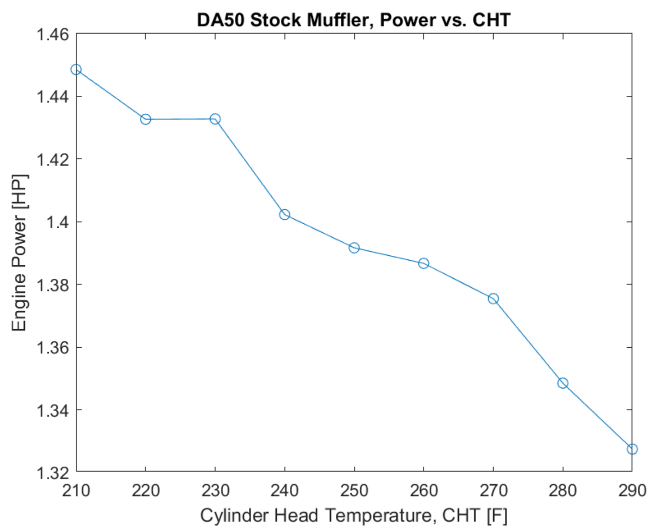


Figure 4. Power loss due to CHT is 0.04 HP / °F (30 W / °F); optimal CHT is 220-240F

Brake Specific Fuel Consumption (BSFC)

Fuel consumption was measured (10Hz sample rate) via gravimetric analysis at steady state for 30 seconds simultaneously with torque measurements. Relationship between BSFC and engine speed at wide open throttle (WOT) is shown (Figure 5); engine is most efficient around maximum brake torque, 6500 – 7500 RPM for the DA50 EFI. BSFC contours are shown (Figure 6) in relation to engine torque and speed; this is useful for estimating regions of torque and speed having a near constant BSFC. Additional BSFC vs. speed plots at a given throttle position are available upon request.

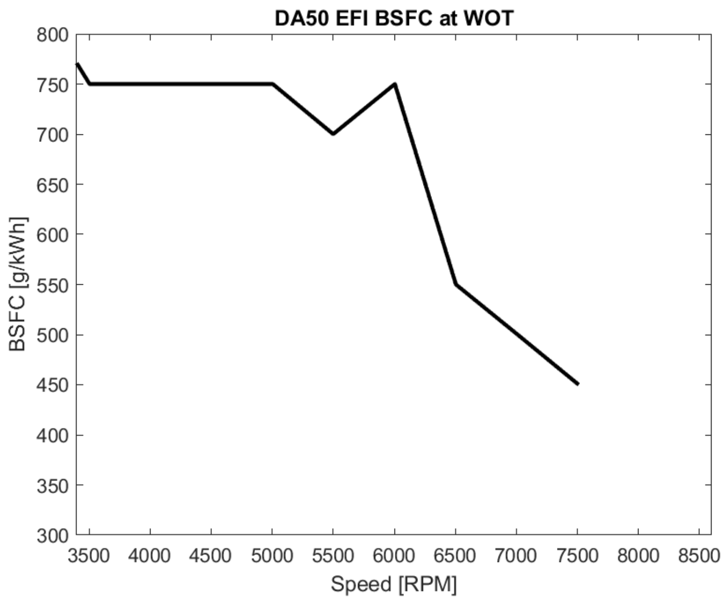


Figure 5. BSFC as a function of RPM

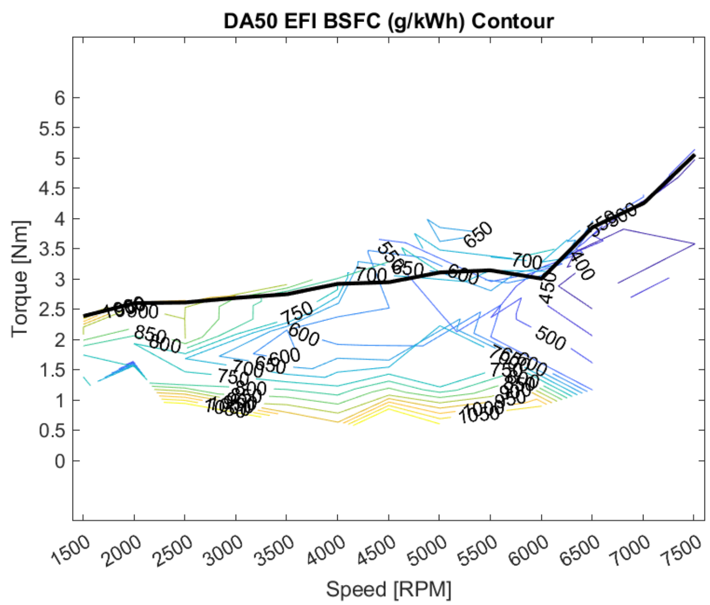


Figure 6. BSFC contours within regions of engine torque and speed

Stock muffler Acoustic Analysis

Acoustic data was measured using a thirty-two-microphone array, positioned 1.3 meters from the engine exhaust tip. A-weighted sound pressure from each microphone was averaged at a given frequency, then the equivalent sound pressure was calculated across a frequency range of 100Hz to 10kHz, to produce a single decibel level of the exhaust at a specific engine speed and throttle position. Figure 7 shows the results of this analysis at four throttle positions across the engine's speed range (1500 to 7000 RPM) where applicable.

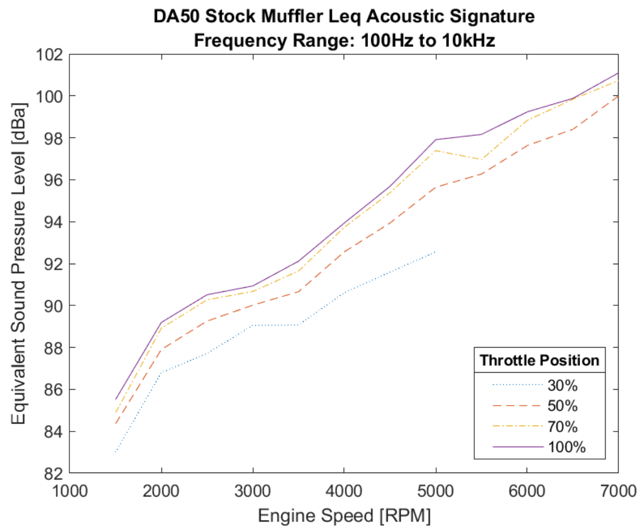


Figure 7. A-weighted equivalent sound level at four throttle positions, observer 1.3 meters from engine.

Altitude attenuation is used to approximate the engine exhaust dBa over an increasing altitude gradient assuming that the observer is directly underneath the aircraft. Sound pressure propagation is largely dependent on ambient relative humidity so isohumidic plots of sound level vs. altitude are shown for various engine speeds at respected throttle positions (Figure 8-10).

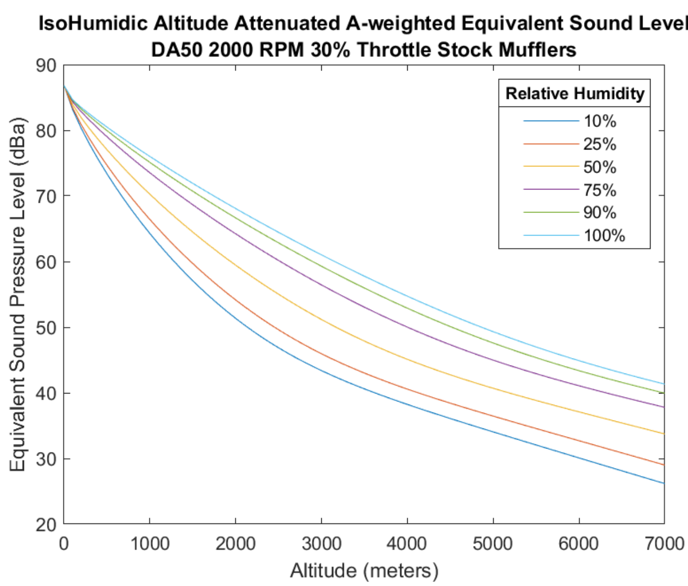


Figure 8. IsoHumidic plot for engine at idle speed and approximate throttle position (30%).

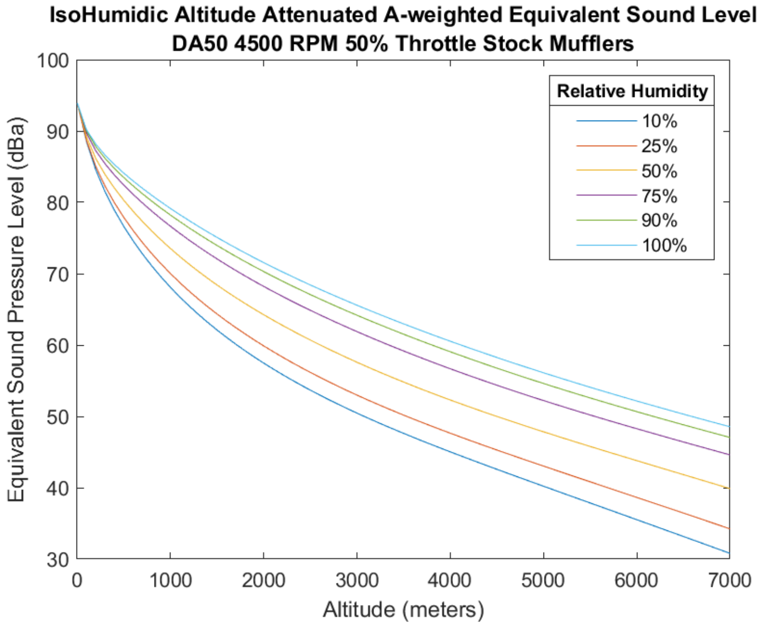


Figure 9. IsoHumidic plot for engine at cruise speed and approximate throttle position.

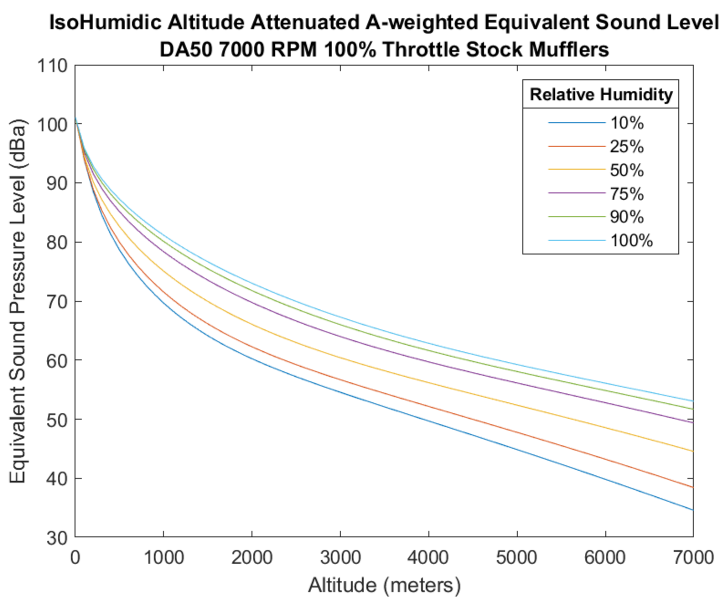
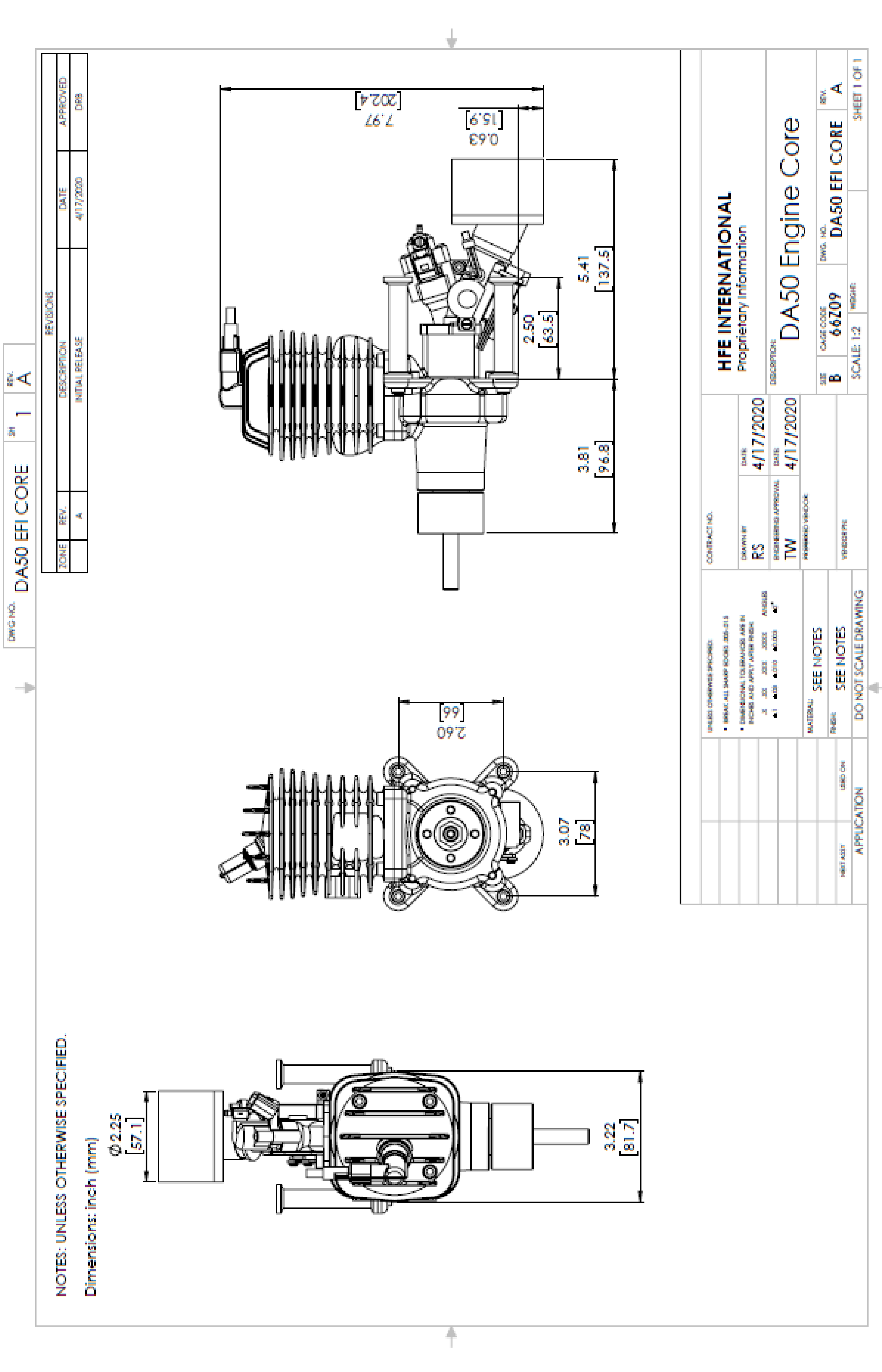


Figure 10. IsoHumidic plot for engine at takeoff speed and approximate throttle position.

Additional altitude attenuation plots and frequency plots are available upon request.


HFE INTERNATIONAL
Proprietary Information
DA50 Engine Core
DA50 EFI CORE
CAGE CODE 66Z09
SCALE: 1:2
SHEET 1 OF 1
REV. A
INITIAL RELEASE
4/17/2020
DRB
RS
TW
SEE NOTES
DO NOT SCALE DRAWING
APPLICATION
NOTES: UNLESS OTHERWISE SPECIFIED.
Dimensions: inch (mm)
7.97 [202.4]
0.63 [15.9]
5.41 [137.5]
2.50 [63.5]
3.81 [96.8]
2.60 [66]
3.07 [78]
3.22 [81.7]
Ø2.25 [57.1]