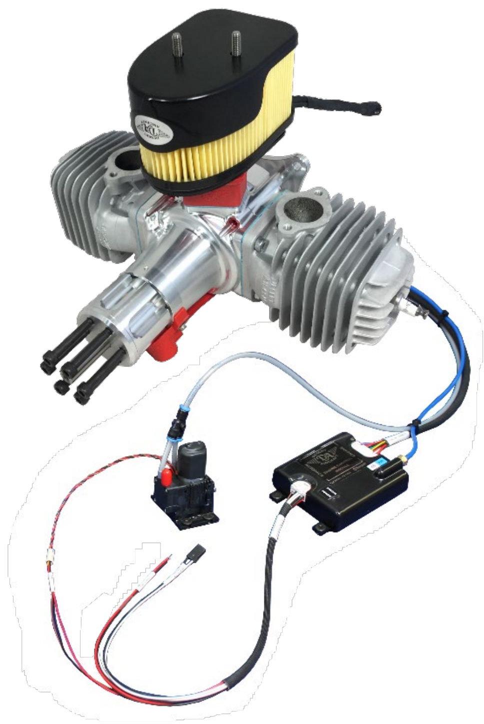


# DA120 EFI Data Sheet

**120cc Boxer Twin, Electronic Fuel Injected Two Stroke Engine**

## Featuring:

- 7.7 kW at 8500 RPM
- 10.1 Nm torque from 5500 RPM to 6500 RPM
- 590 g/kWh average BSFC
- 2.5 kg full system weight
- 1-amp peak current draw
- RS-232 and CAN Telemetry

HFE INTERNATIONAL

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

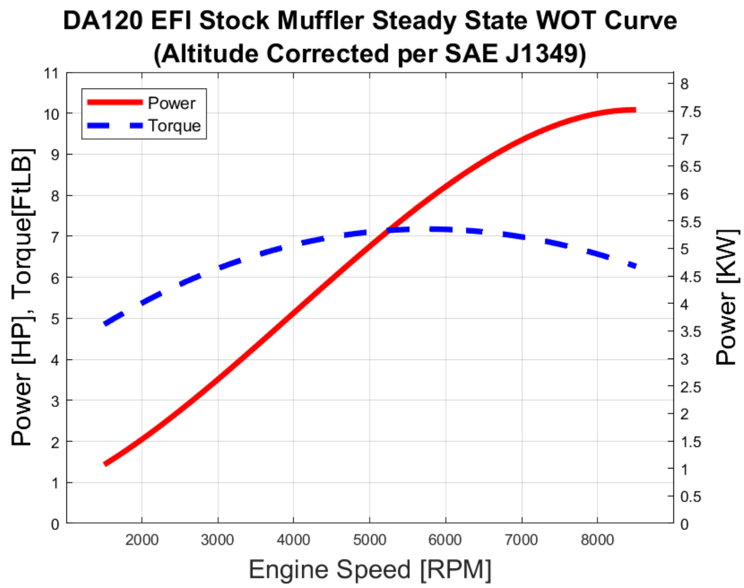



*Figure 1:* Power curve generated from steady state wide open throttle conditions from 1500 RPM to 8500 RPM in 500 RPM increments. Measured torque was averaged over 30 seconds at each RPM, accounting for all high/low torque spikes that are present in normal operating conditions.

| | METRIC | IMPERIAL |
|---|---|---|
| **DISPLACEMENT** | 120 cc | 7.4 ci |
| **MAX POWER (8500 RPM)*** | 7.7 kW | 10.3 HP |
| **MAX TORQUE (5500 RPM)*** | 10.1 Nm | 7.4 lbft |
| **CONTINUOUS POWER (7000 RPM)*** | 7.0 kW | 9.3 hp |
| **CONTINUOUS TORQUE (7000 RPM)*** | 9.5 Nm | 7.0 lbft |
| **OPERATING RPM RANGE** | 2000 RPM to 8000 RPM | |
| **AVERAGE BSFC** | 590 g/kWh | 0.98 lb/HPh |
| **WEIGHT (ENGINE WITH THROTTLE BODY)** | 2.25 kg | 4.95 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 Mixture | |
| **REQUIRED OPERATING VOLTAGE** | 10V to 15V | |
| **CURRENT DRAW** | 1A Peak | |
| **RECOMMENDED BATTERY** | 3s or greater LiPo, 1 hour / 1000 mAh | |
| **AMBIENT TEMPERATURE RANGE** | -12° to 49° C | 10° 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%** |
|---|---|---|---|---|---|
| 28 x 10 | 6600* | 53 | 26 x 12 | 5000** | 39 |
| 28 x 12 | 5750* | 42 | 27 x 10 | 5600** | 52 |
| 29 x 10 | 6200** | 51 | | | |

*Recorded from static test stand **Estimated via simulation

## 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.

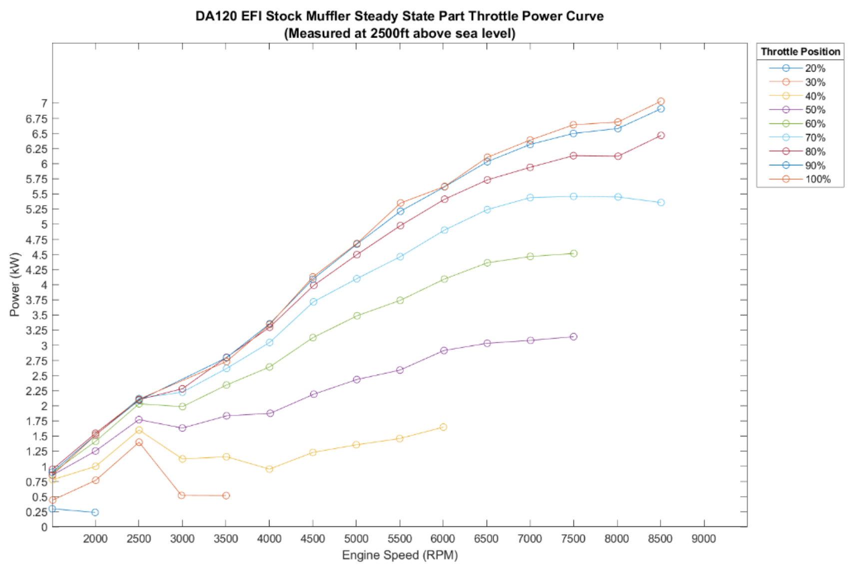



Figure 2. Part throttle power curves

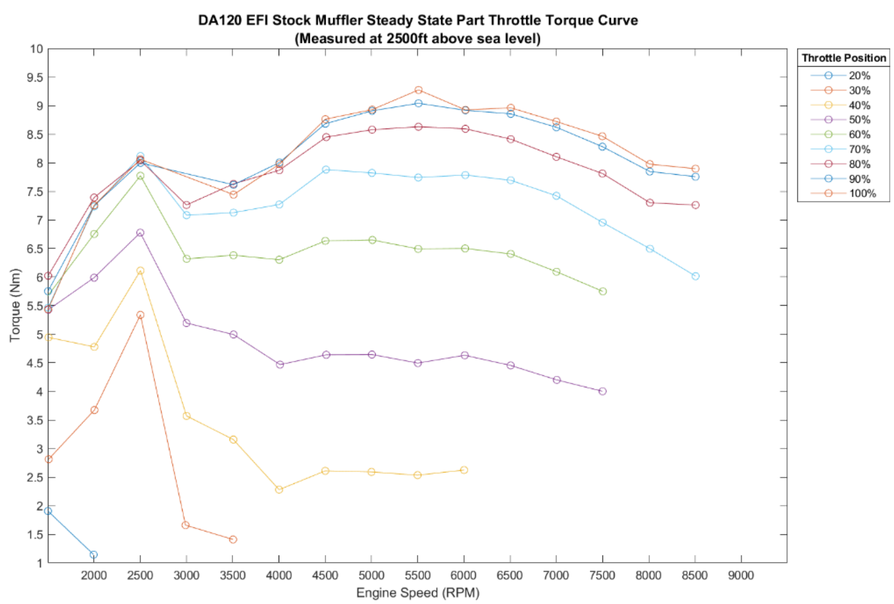



Figure 3. Part throttle torque curves

## Power Degradation as a function of Manifold Air Temperature (MAT) or 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 (90F), altering CHT. 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.

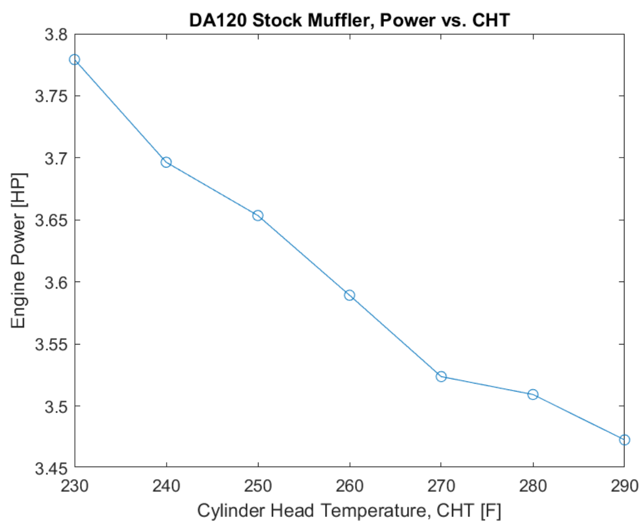



Figure 4. Power loss due to CHT is 0.11 HP / °F (82 W / °F); optimal CHT is 220-240F

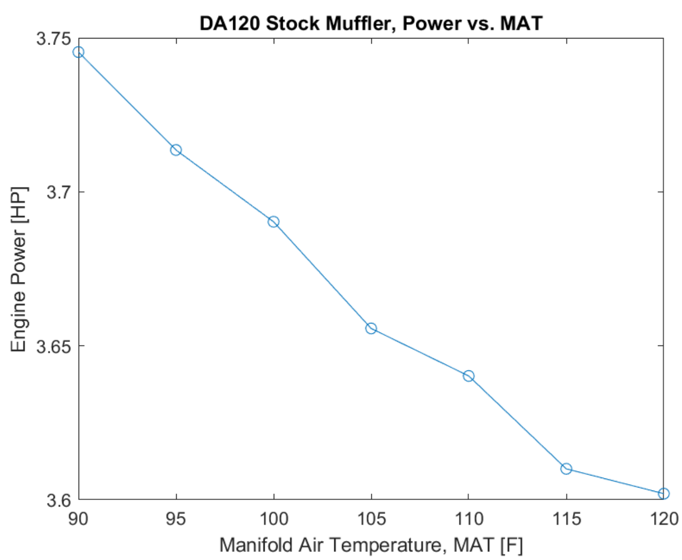



Figure 5. Power loss due to MAT is 0.05 HP / °F (37 W / °F); optimal MAT is 80-90F

## 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 6); engine is most efficient around maximum brake torque, 5500 – 6000 RPM for the DA120 EFI. BSFC contours are shown (Figure 7) 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.

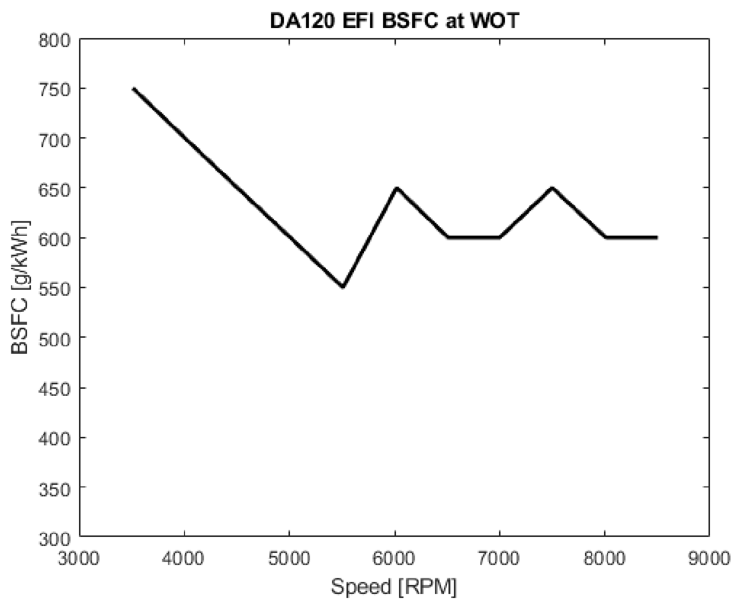



Figure 6. BSFC as a function of RPM

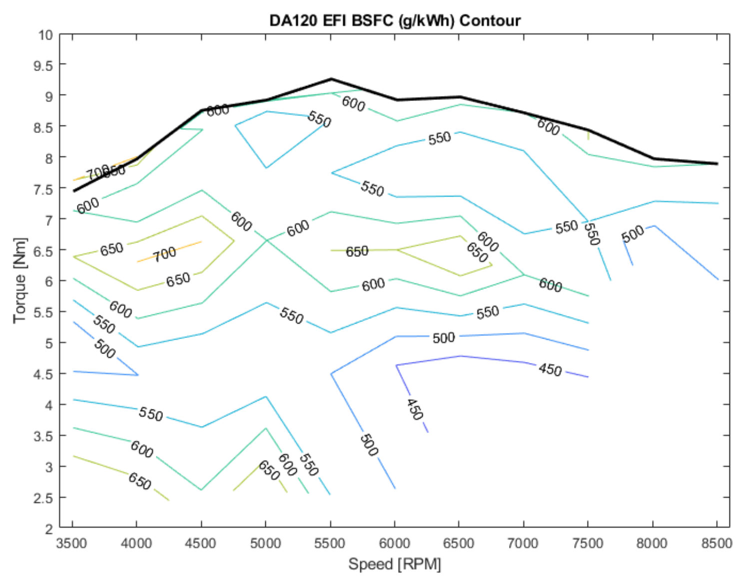



Figure 7. BSFC contours within regions of engine torque and speed

## 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 8 shows the results of this analysis at four throttle positions across the engine's speed range (1500 to 8500 RPM) where applicable.

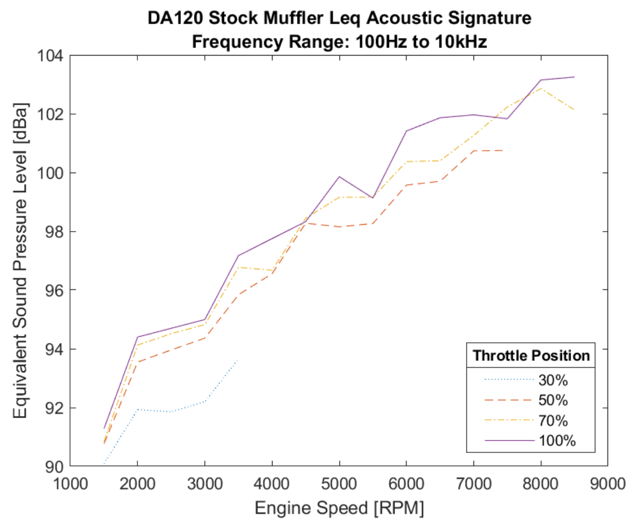



Figure 8. A-weighted equivalent sound level at four throttle positions, observer 1.3 meters from engine.

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 9-11).

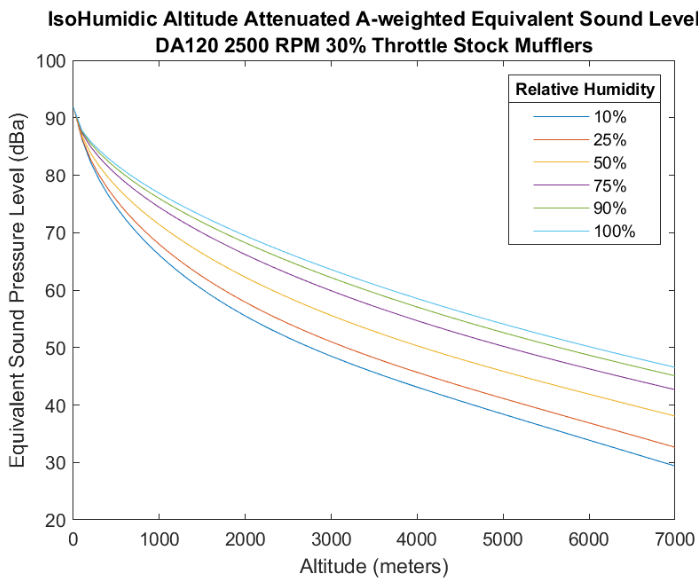



Figure 9. IsoHumidic plot for engine at idle speed and approximate throttle position (30%).

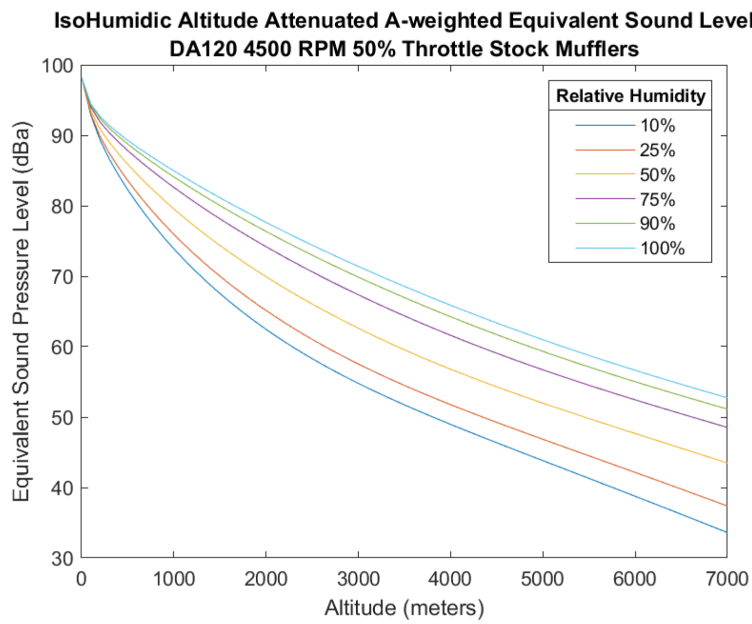



Figure 10. IsoHumidic plot for engine at cruise speed and approximate throttle position.

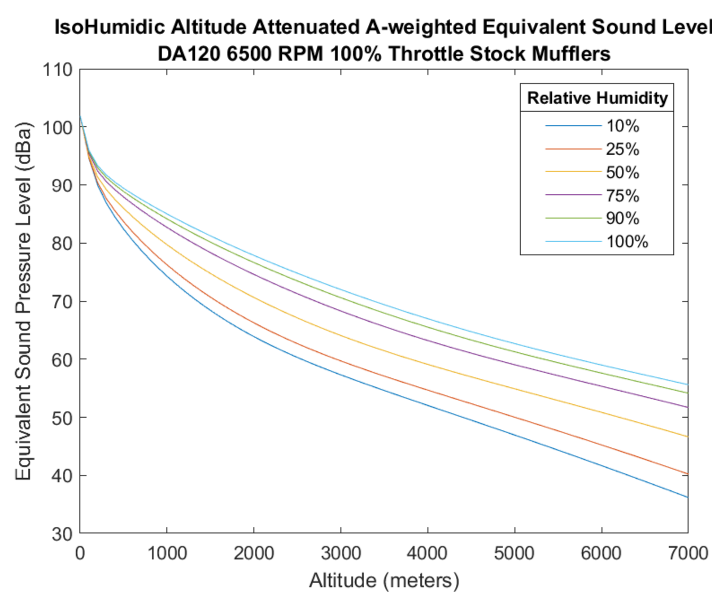
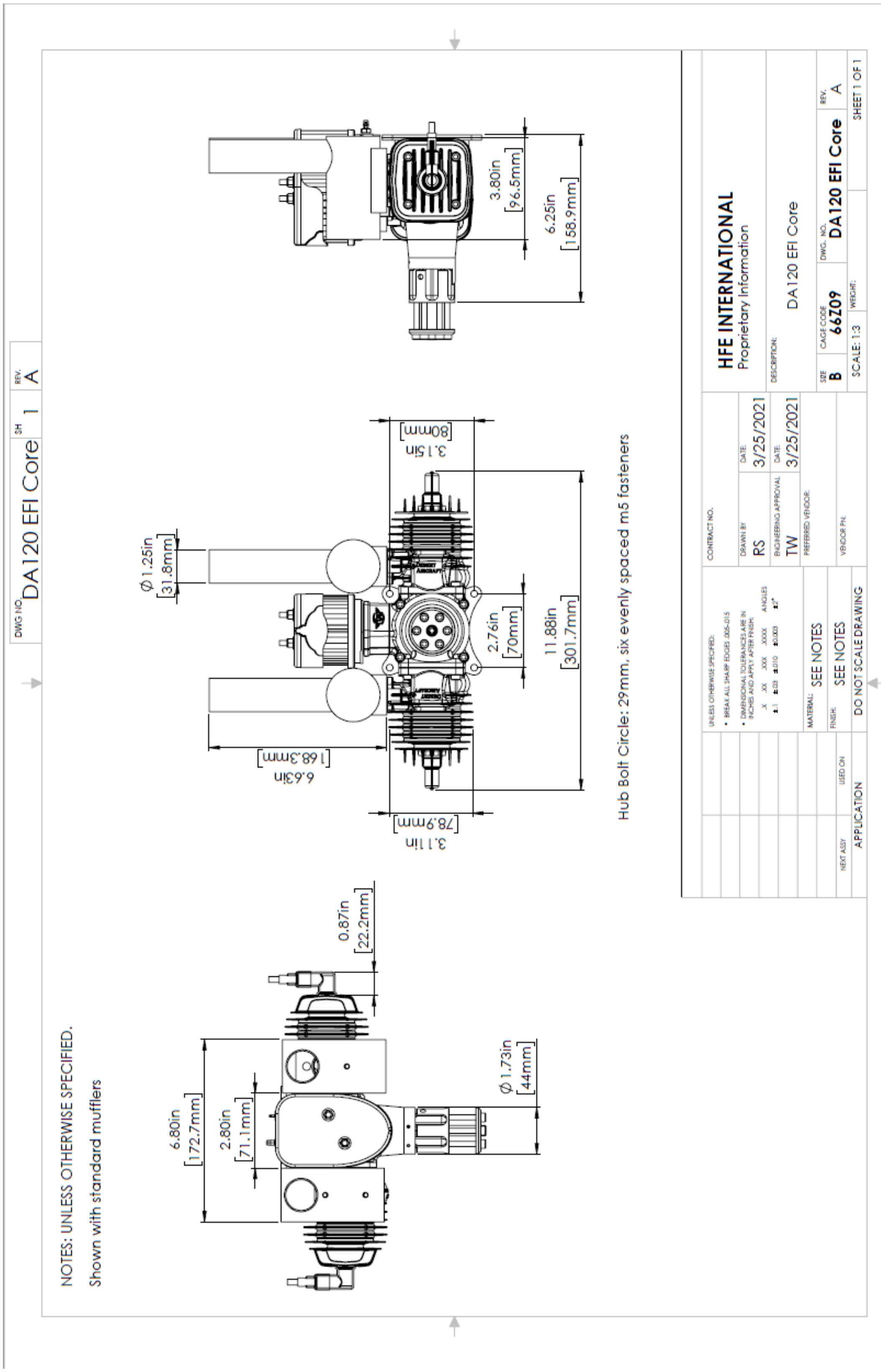



Figure 11. IsoHumidic plot for engine at takeoff speed and approximate throttle position.

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


DWG NO. DA120 EFI Core
SH 1
REV. A
NOTES: UNLESS OTHERWISE SPECIFIED.
Shown with standard mufflers
3.80in [96.5mm]
6.25in [158.9mm]
Ø1.25in [31.8mm]
3.15in [80mm]
2.76in [70mm]
11.88in [301.7mm]
6.63in [168.3mm]
3.11in [78.9mm]
Hub Bolt Circle: 29mm, six evenly spaced m5 fasteners
0.87in [22.2mm]
6.80in [172.7mm]
2.80in [71.1mm]
Ø1.73in [44mm]
HFE INTERNATIONAL
Proprietary Information
DESCRIPTION:
DA120 EFI Core
DRAWN BY RS
DATE: 3/25/2021
ENGINEERING APPROVAL TW
DATE: 3/25/2021
MATERIAL: SEE NOTES
FINISH: SEE NOTES
DO NOT SCALE DRAWING
APPLICATION
SIZE B
CAGE CODE 66709
DWG. NO. DA120 EFI Core
REV. A
SCALE: 1:3
SHEET 1 OF 1