

**FC Engine**  
**Working Specification Summary**  
 R. Wingrove  
 Updated:  
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| Parameter   | Units | Value | Reference | Notes | Date Updated |
|---|-------|-------|-----------|-------|--------------|
| <b>Physical</b>                                   |       |       |           |       |              |
| Length  | mm    |       |           |       |              |
| Width   | mm    |       |           |       |              |
| Height  | mm    |       |           |       |              |
| Volume  | L     |       |           |       |              |
| Mass  | kg    |       |           |       |              |
| CoM (x,y,z)                                       | mm    |       |           |       |              |
| <b>Major Components</b>                           |       |       |           |       |              |
| Air Compressor                                    | -     |       |           |       |              |
| Cathode Humidifier                                | -     |       |           |       |              |
| DC/DC Converter                                   | -     |       |           |       |              |
| Cells per stack                                   | #     |       |           |       |              |
| Stack Quantity                                    | #     |       |           |       |              |
| Air Filter  | PN    |       |           |       |              |
| Fuel Filter                                       | PN    |       |           |       |              |
| <b>Performance</b>                                |       |       |           |       |              |
| Voltage, Fuel Cell Out, min                       | VDC   |       |           |       |              |
| Voltage, Fuel Cell Out, max                       | VDC   |       |           |       |              |
| Current, Fuel Cell Out, maximum                   | A     |       |           |       |              |
| Connection, HV                                    | -     |       |           |       |              |
| Gross Power, Design Point A, BOL                  | kW    |       |           |       |              |
| Parasitic Loss, Design Point A, BOL               | kW    |       |           |       |              |
| Vout, Design Point A, BOL                         | VDC   |       |           |       |              |
| I, Design Point A, BOL                            | A     |       |           |       |              |
| Efficiency, Gross, Design Point A, BOL            | %     |       |           |       |              |
| Efficiency, Net, Design Point A, BOL              | %     |       |           |       |              |
| Blower outlet temperature, Design Point A, BOL    | °C    |       |           |       |              |
| Cathode flow, Design Point A, BOL                 | slpm  |       |           |       |              |
| Cathode stack inlet pressure, Design Point A, BOL | mbara |       |           |       |              |
| Gross Power, Design Point A, EOL                  | kW    |       |           |       |              |
| Parasitic Loss, Design Point A, EOL               | kW    |       |           |       |              |
| Vout, Design Point A, EOL                         | VDC   |       |           |       |              |
| I, Design Point A, EOL                            | A     |       |           |       |              |
| Efficiency, Gross, Design Point A, EOL            | %     |       |           |       |              |
| Efficiency, Net, Design Point A, EOL              | %     |       |           |       |              |
| Gross Power, Design Point B, BOL                  | kW    |       |           |       |              |
| Parasitic Loss, Design Point B, BOL               | kW    |       |           |       |              |
| Vout, Design Point B, BOL                         | VDC   |       |           |       |              |
| I, Design Point B, BOL                            | A     |       |           |       |              |
| Efficiency, Gross, Design Point B, BOL            | %     |       |           |       |              |
| Efficiency, Net, Design Point B, BOL              | %     |       |           |       |              |
| Blower outlet temperature, Design Point B, BOL    | °C    |       |           |       |              |
| Cathode flow, Design Point B, BOL                 | slpm  |       |           |       |              |
| Cathode stack inlet pressure, Design Point B, BOL | mbara |       |           |       |              |
| Gross Power, Design Point B, EOL                  | kW    |       |           |       |              |
| Parasitic Loss, Design Point B, EOL               | kW    |       |           |       |              |
| Vout, Design Point B, EOL                         | VDC   |       |           |       |              |
| I, Design Point B, EOL                            | A     |       |           |       |              |
| Efficiency, Gross, Design Point B, EOL            | %     |       |           |       |              |
| Efficiency, Net, Design Point B, EOL              | %     |       |           |       |              |
| Low Voltage Supply, nominal                       | VDC   |       |           |       |              |
| Low Voltage Draw, standby                         | A     |       |           |       |              |
| Low Voltage Draw, Point A                         | A     |       |           |       |              |
| Low Voltage Draw, Point B                         | A     |       |           |       |              |
| Low Voltage Draw, nominal                         | A     |       |           |       |              |
| Low Voltage Draw, maximum                         | A     |       |           |       |              |
| Connection, Low Voltage                           | -     |       |           |       |              |
| High Voltage Supply                               | VDC   |       |           |       |              |
| High Voltage Supply, Point A                      | A     |       |           |       |              |
| High Voltage Supply, Point B BOL                  | A     |       |           |       |              |
| High Voltage Supply, Point B EOL                  | A     |       |           |       |              |
| Connection, high voltage supply                   | -     |       |           |       |              |
| <b>Air Supply</b>                                 |       |       |           |       |              |
| Pressure drop, filter nominal                     | mbar  |       |           |       |              |
| Pressure drop, filter max                         | mbar  |       |           |       |              |
| Flow rate, air inlet maximum                      | slpm  |       |           |       |              |
| Pressure drop, outlet maximum                     | mbar  |       |           |       |              |
| Flow rate, air outlet maximum                     | slpm  |       |           |       |              |
| Temperature, max air outlet                       | °C    |       |           |       |              |
| Particulate matter                                | µm    |       |           |       |              |
| SO <sub>2</sub>                                   | ppb   |       |           |       |              |
| H <sub>2</sub> S                                  | ppb   |       |           |       |              |
| CO  | ppm   |       |           |       |              |
| NO <sub>2</sub>                                   | ppb   |       |           |       |              |
| NO  | ppb   |       |           |       |              |
| NH <sub>3</sub>                                   | ppb   |       |           |       |              |
| Total HC  | ppb   |       |           |       |              |
| <b>Hydrogen Supply</b>                            |       |       |           |       |              |
| Flow Rate, hydrogen maximum                       | slpm  |       |           |       |              |
| Inlet pressure                                    | barg  |       |           |       |              |
| Particulate matter                                | µm    |       |           |       |              |
| <b>Cooling</b>                                    |       |       |           |       |              |
| Heat load, design point 0                         | kW    |       |           |       |              |
| Delta T, design point 0                           | °C    |       |           |       |              |
| Flow rate, design point 0                         | slpm  |       |           |       |              |
| Pressure drop, design point 0                     | mbar  |       |           |       |              |
| Heat load, design Point A (BOL)                   | kW    |       |           |       |              |
| Delta T, design Point A (BOL)                     | °C    |       |           |       |              |
| Flow rate, design Point A (BOL)                   | slpm  |       |           |       |              |
| Pressure drop, design Point A (BOL)               | mbar  |       |           |       |              |
| Heat load, design Point A (EOL)                   | kW    |       |           |       |              |
| Delta T, design Point A (EOL)                     | °C    |       |           |       |              |
| Flow rate, design Point A (EOL)                   | slpm  |       |           |       |              |
| Pressure drop, design Point A (EOL)               | mbar  |       |           |       |              |
| Heat load, design Point B (BOL)                   | kW    |       |           |       |              |
| Delta T, design Point B (BOL)                     | °C    |       |           |       |              |
| Flow rate, design Point B (BOL)                   | slpm  |       |           |       |              |
| Pressure drop, design Point B (BOL)               | mbar  |       |           |       |              |
| Heat load, design Point B (EOL)                   | kW    |       |           |       |              |
| Delta T, design Point B (EOL)                     | °C    |       |           |       |              |
| Flow rate, design Point B (EOL)                   | slpm  |       |           |       |              |
| Pressure drop, design Point B (EOL)               | mbar  |       |           |       |              |
| Temperature, coolant inlet, design Point A        | °C    |       |           |       |              |
| Temperature, coolant outlet, design Point A       | °C    |       |           |       |              |
| Temperature, coolant inlet, design Point B        | °C    |       |           |       |              |
| Temperature, coolant inlet, design Point B        | °C    |       |           |       |              |
| Temperature, coolant maximum                      | °C    |       |           |       |              |
| Temperature, coolant minimum                      | °C    |       |           |       |              |
| Coolant type                                      | PN    |       |           |       |              |
| Coolant mixture                                   | ratio |       |           |       |              |



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|-----------------------------|--------------------|-------|-----------|-------|--------------|
| Particulate size            | µm                 |       |           |       |              |
| Conductivity, nominal       | µS/cm <sup>2</sup> |       |           |       |              |
| Conductivity, maximum       | µS/cm <sup>2</sup> |       |           |       |              |
| Acceptable Wetted Materials | -                  |       |           |       |              |



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