

# UAV WHEEL

## RW1-79 APU

Rotary (Wankel type) Hybrid APU



### Key Features

#### Engine Design

Designed for use as a power source for UAVs. Easy to configure and manage. Flexibility of possible installation. Consistent performance over a wide range of altitudes and temperatures.

#### Air Intake

Ducted air intake and exhaust for cooling system and co-axial air flow of the exhaust system

#### Fuel System

Low fuel consumption. Operates on heavy fuel, including most common civil and military jet fuel grades such as Jet A, Jet A-1, JP-5, JP-8 and Sustainable Aviation Fuel (SAF).

#### Electronic Control

Multiple RW1-79 APU units can work in parallel or in hot-swap mode. A power balance controller can integrate batteries, supercapacitors and one or more generators into a common bus.

#### Cooling System

Forced cooling with pre-filtered air for all heat-emitting components. Ability to operate in any position and with accelerations up to +6G

#### Electrical Output

- Rated electrical power: 11 kW (48 VDC)
- Peak electrical output: 16 kW (5 min limit, DC bus)
- Internal bus: 48 VDC (configurable to 96/144/192 VDC by channel grouping)
- Auxiliary outputs: 5 V, 14.4 V, 28 V via internal DC-DC converters



## More details

### ⚙️ Engine Design

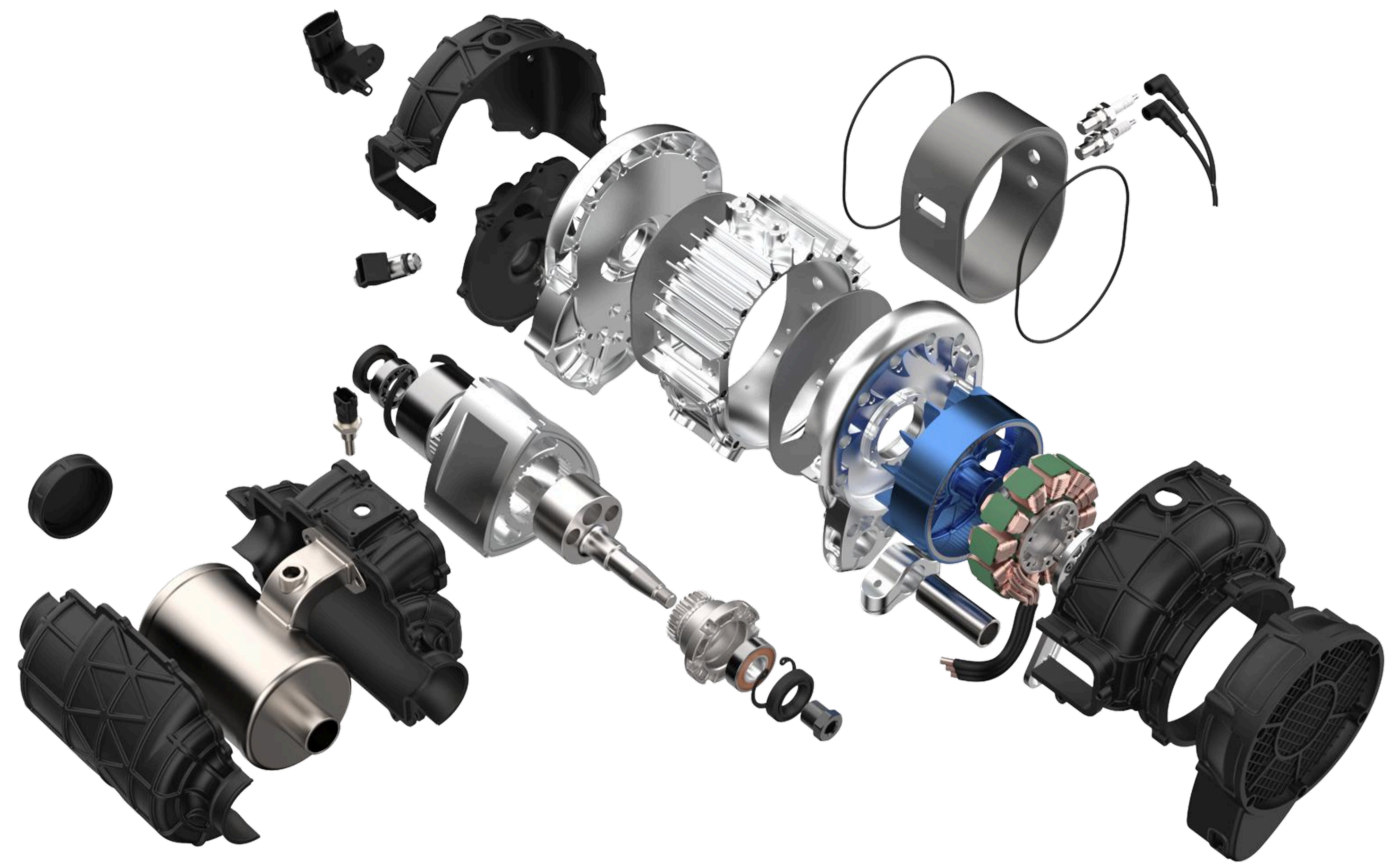
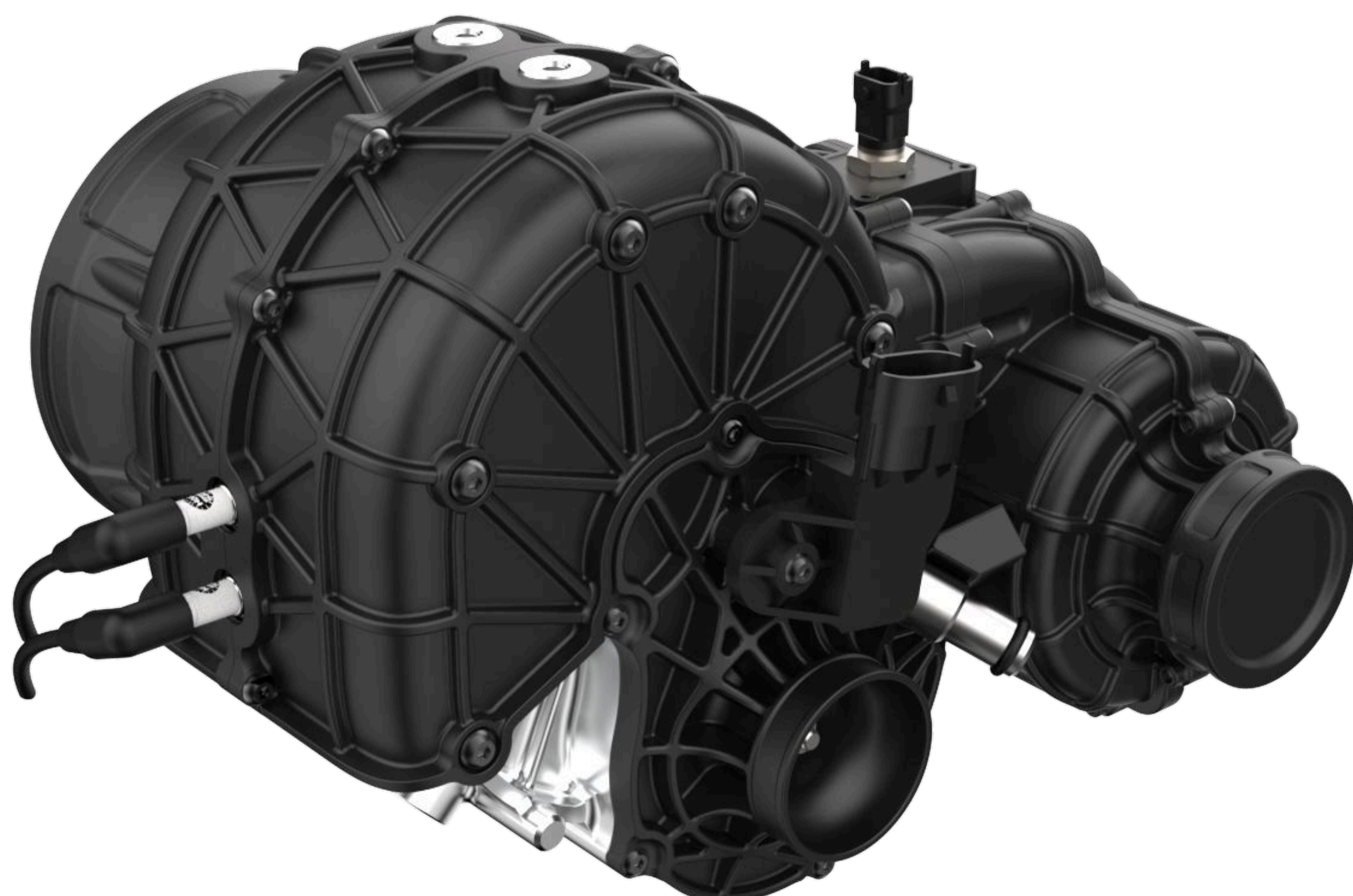
- Air-cooled rotary engine with direct drive generator on permanent magnets.
- Electronic fuel injection with forced electric supercharging.
- e-Supercharged fuel intake through the rotor with centrifugal acceleration of a pre-atomized fuel-air mixture.

### ⚙️ Materials

- The stator is aluminum, CNC-milled from a forging with a thin sleeve of hardened cast-iron liner.
- Rotor: Aluminum with DLC coatings in the seal channels.
- Apex seals: Polished tungsten-carbide apex seals.
- All external surfaces have hard anodizing and protective coatings to meet MIL-STD-810
- The laminated stator of the generator.
- Neodymium magnets in a Halbach array on an aluminum rotor.

### ⚙️ Fuel and Ignition System

- A BLDC electric motor for precise maintenance of selected pressure in the intake tract drives a supercharger impeller.
- Submersible high-pressure fuel pump and pressure regulator.
- Electronically controlled piezo injector with ultrasonic control of counter-focus of the spray flame. Sub-5  $\mu\text{m}$  droplet size.
- Dual ignition with two spark plugs.
- Complies with MIL-STD-461/464. Insulated wires, connectors and housings with EMI protection.



### ⚙️ Cooling System:

Forced air. Air intake through the generator stator for cooling. Air is discharged coaxially around the exhaust port.

### ⚙️ Electric output

- Continuous electrical output: 11 kW
- Peak electrical output (5 min limit): 16 kW

The system provides modular DC power through configurable low-voltage channels (48/96/144/192 VDC), allowing flexible distribution and parallel operation of multiple units.

### ⚙️ Flexibility

Multiple RW1-79 APU units can operate in parallel or hot-swap mode, seamlessly integrating with batteries, supercapacitors and additional generators through a power balance controller.

### ⚙️ Protection

- Peak electrical output: 16 kW (5 min limit)
- Short circuit current limit: 500 A for 2 s
- Recovery from 95% step load in 40 ms

Transient performance exceeds MIL-STD-704F:

- Over/under voltage
- Overload
- Short circuit
- High-temperature protection
- Internal system error

## Technical specifications

|   |   |
|---|---|
| Electric power output   | 11 kW maximum continuous;<br>16 kW (5 min limit, electrical power on DC bus)                                      |
| Weight (dry engine only)  | 5.17 kg   |
| Installed weight (with ECU/PDU, intake, exhaust, pumps, filters, wiring, starter battery and all components required for operation) | < 9 kg  |
| Overall dimensions (L × H × W)  | 175 × 202 × 162 mm  |
| Fuel type   | Aviation kerosene (Jet A-1, JP-8, SAF)  |
| Specific fuel consumption (electrical)  | 360 g/kWh(e) @ 11 kW continuous   |
| Fuel consumption @ 11 kW continuous   | 5.0 L/h   |
| Fuel consumption @ 16 kW (5 min limit)  | 7.7 L/h   |
| Cooling system  | Forced-air, direct flow   |
| Intake  | Electronic fuel injection with e-supercharger   |
| Ignition  | CDI, twin spark plugs   |
| Starter   | Integrated electric starter   |
| Lubrication   | Automix oil system / 1% premix (API TC oil)   |
| Control system  | FADEC with integrated support for UAVCAN/<br>Cyphal, SAE J1939, RS-485/Modbus, and<br>MAVLink telemetry protocols |
| Control interfaces  | CAN Bus (UAVCAN/J1939), RS-485, Ethernet<br>(RJ45), UART (MAVLink)  |
| Electric output voltage   | 48 VDC (modular, configurable to 96/144/192<br>VDC)   |
| Operational altitude  | Up to 4500 m: power loss ≤ 5%<br>Service ceiling: 7000 m  |
| Operational temperature range<br>(continuous operation)   | -30°C to +55°C  |
| Power deviation under adverse conditions  | ≤5%   |
| Time Between Overhaul (TBO)   | 1000 h (assigned overhaul interval -<br>overhaul at 1000 h)   |
| Recommended service interval  | 100 h   |

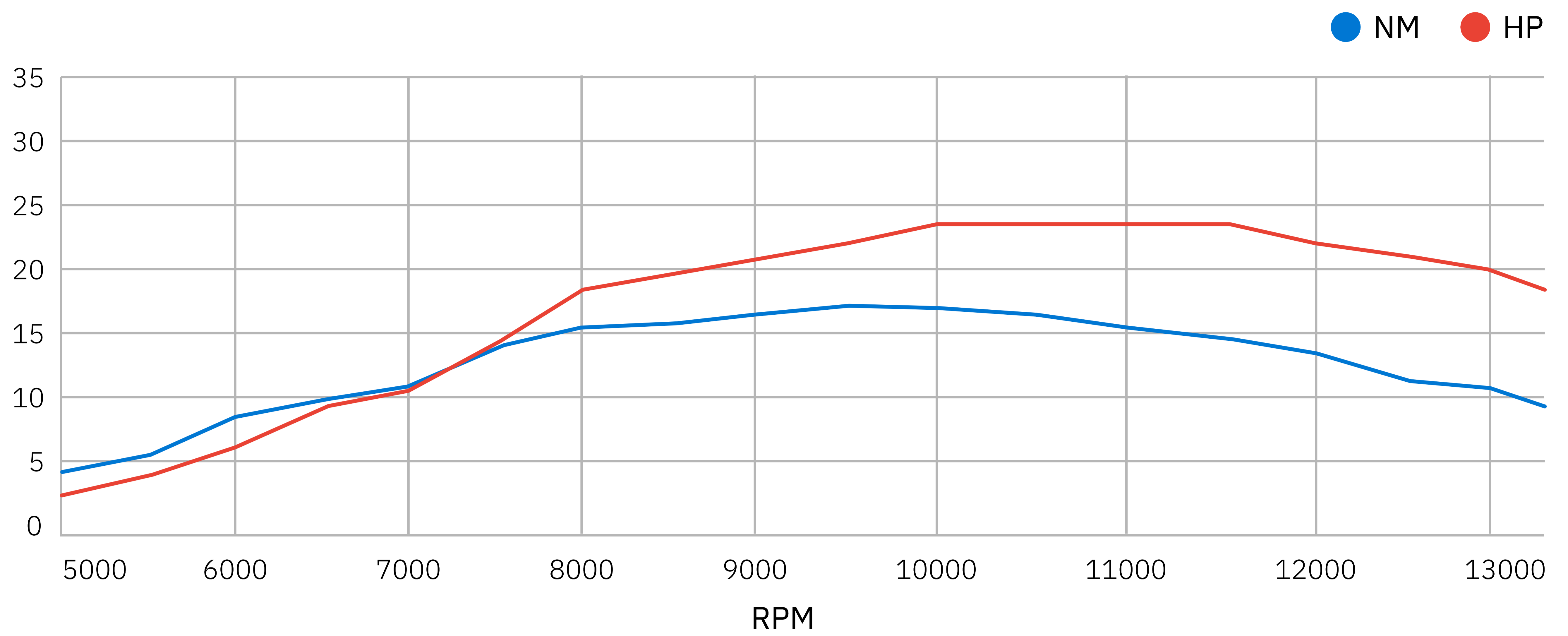
## Performance Data

| <i>RPM</i> | <i>HP</i> | <i>kW</i> | <i>Nm</i> | <i>SFC g/kWh</i> | <i>L/h (JET-A1,JP8)</i> |
|------------|-----------|-----------|-----------|------------------|-------------------------|
| 5000       | 3.0       | 2.2       | 4.3       | 690              | 1.9                     |
| 5500       | 4.0       | 3.3       | 5.7       | 643              | 2.6                     |
| 6000       | 7.0       | 4.9       | 7.8       | 598              | 3.7                     |
| 6500       | 9.0       | 6.7       | 9.9       | 553              | 4.6                     |
| 7000       | 11.0      | 8.4       | 11.4      | 505              | 5.3                     |
| 7500       | 14.0      | 10.4      | 13.3      | 455              | 5.9                     |
| 8000       | 17.0      | 12.7      | 15.1      | 398              | 6.3                     |
| 8500       | 19.0      | 14.2      | 15.9      | 347              | 6.1                     |
| 9000       | 21.0      | 15.7      | 16.7      | 310              | 6.1                     |
| 9500       | 23.0      | 17.1      | 17.2      | 285              | 6.1                     |
| 10000      | 24.0      | 17.9      | 17.1      | 265              | 5.9                     |
| 10500      | 24.0      | 18.2      | 16.5      | 270              | 6.1                     |
| 11000      | 24.0      | 17.9      | 15.6      | 278              | 6.2                     |
| 11500      | 24.0      | 17.8      | 14.8      | 290              | 6.4                     |
| 12000      | 23.0      | 17.2      | 13.7      | 308              | 6.6                     |
| 12500      | 21.0      | 16.0      | 12.2      | 314              | 6.3                     |
| 13000      | 20.0      | 14.9      | 11.0      | 329              | 6.1                     |
| 13500      | 18.0      | 13.4      | 9.5       | 335              | 5.6                     |

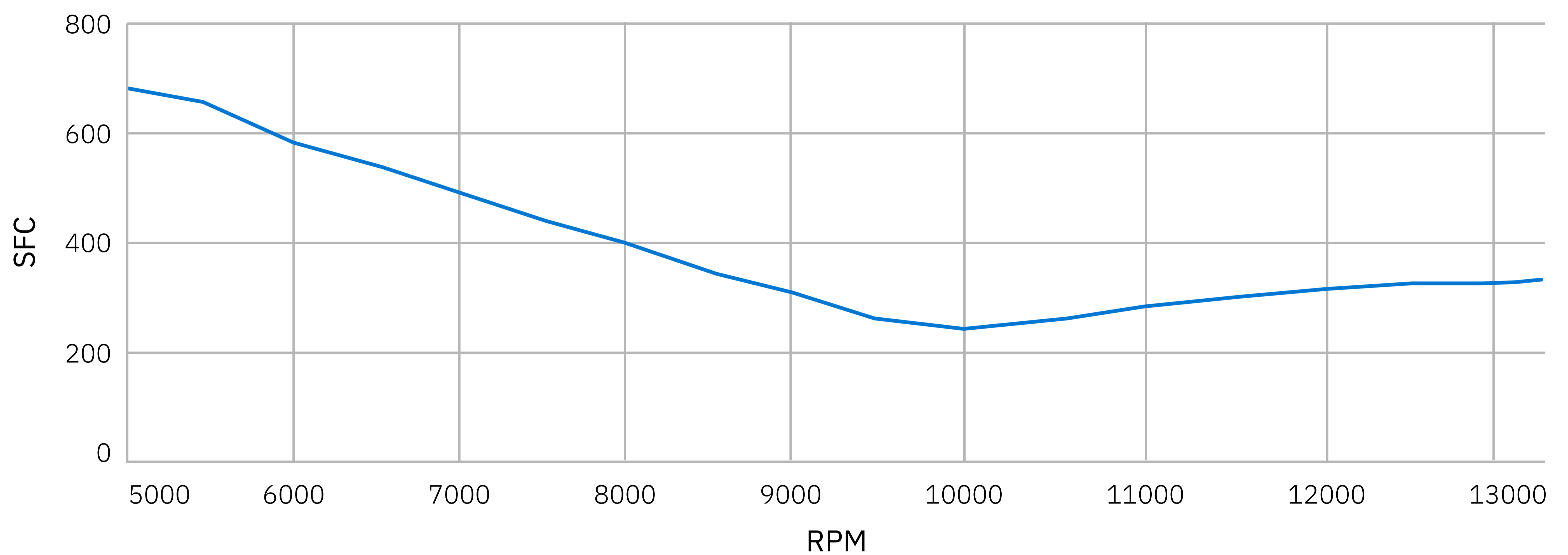
| <i>DC, kW</i> | <i>RPM</i> | <i>Engine load %</i> | <i>SFC (g/kWh el.)</i> | <i>Fuel L/h</i> |
|---------------|------------|----------------------|------------------------|-----------------|
| 1             | 7400       | 42.0                 | 870                    | 1.1             |
| 2             | 7800       | 45.0                 | 717                    | 1.8             |
| 3             | 8200       | 48.0                 | 589                    | 2.2             |
| 4             | 8500       | 52.0                 | 511                    | 2.6             |
| 5             | 8700       | 57.0                 | 467                    | 2.9             |
| 6             | 9000       | 60.0                 | 419                    | 3.1             |
| 7             | 9300       | 64.0                 | 398                    | 3.5             |
| 8             | 9500       | 68.0                 | 385                    | 3.9             |
| 9             | 10000      | 71.0                 | 370                    | 4.2             |
| 10            | 10000      | 77.0                 | 365                    | 4.6             |
| 11            | 10000      | 83.0                 | 360                    | 5.0             |
| 12            | 10000      | 89.0                 | 355                    | 5.3             |
| 13            | 10500      | 92.0                 | 350                    | 5.7             |
| 14            | 11000      | 101.0                | 361                    | 6.3             |
| 15            | 11600      | 108.0                | 389                    | 7.3             |
| 16            | 11600      | 114.0                | 411                    | 8.2             |

\* Fuel volume flow calculated using kerosene density 0.80 kg/L

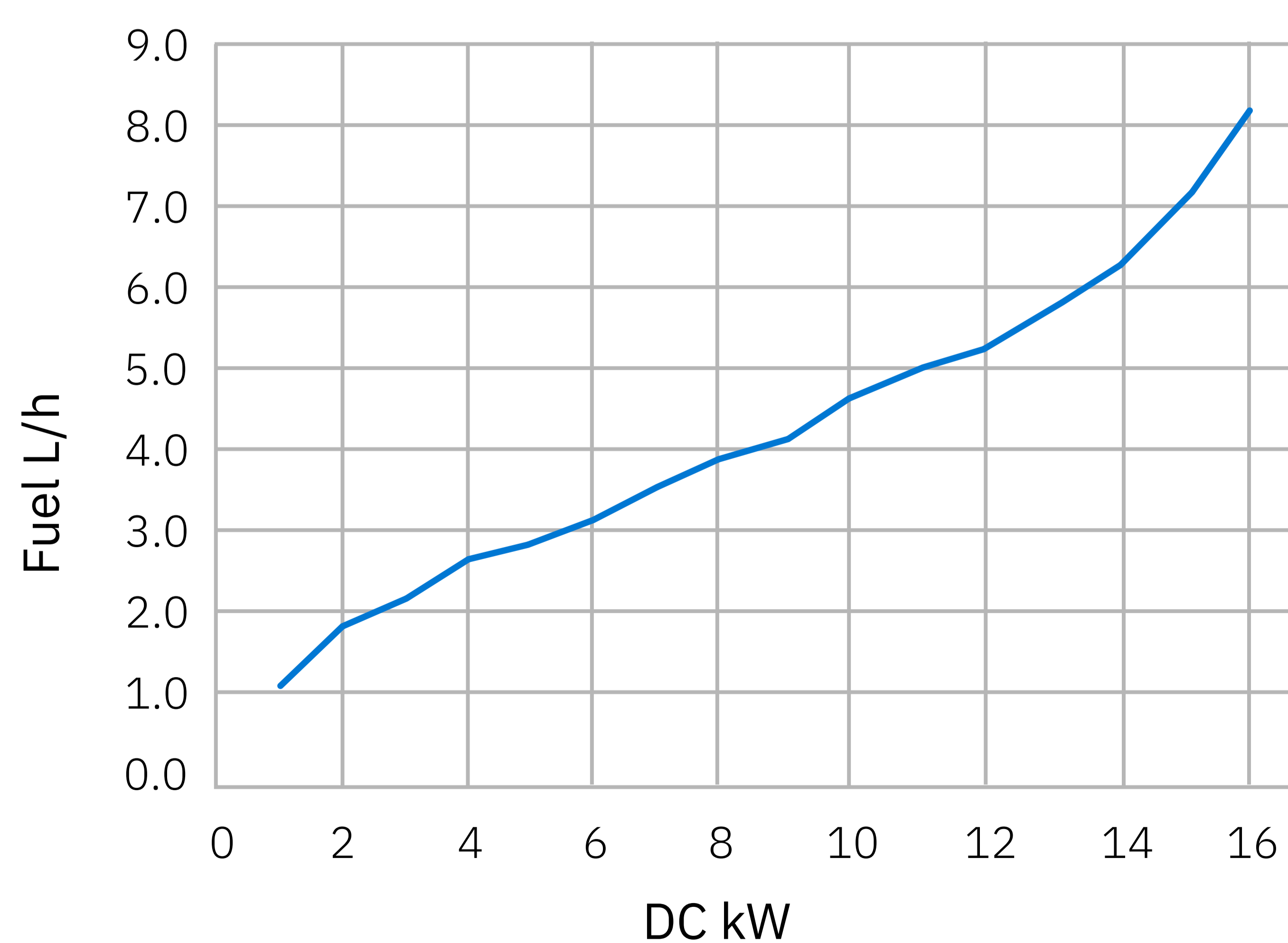
## NM and HP to RPM



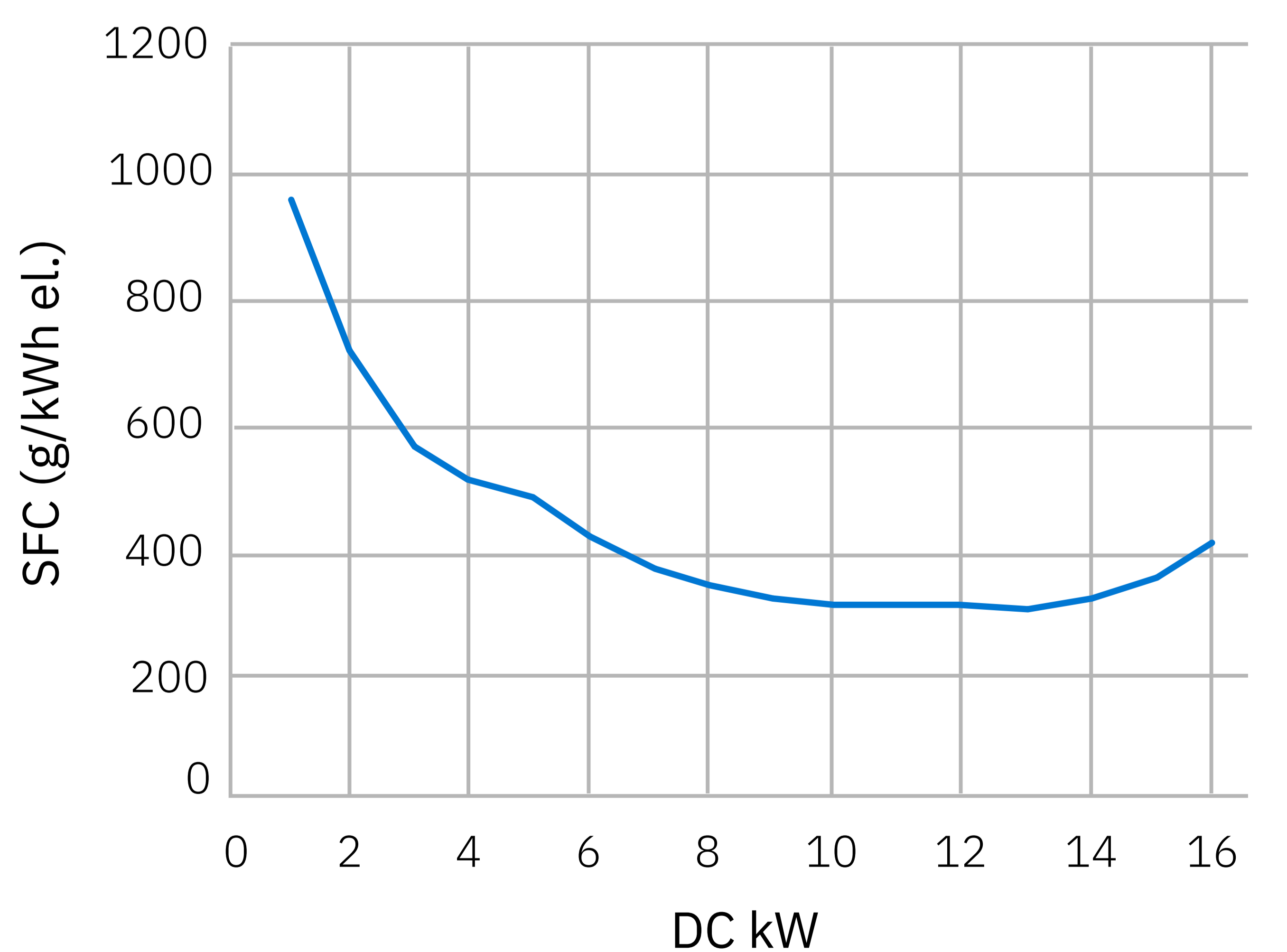
## SFC (g/kWh) vs RPM



## Fuel L/h vs DC kW

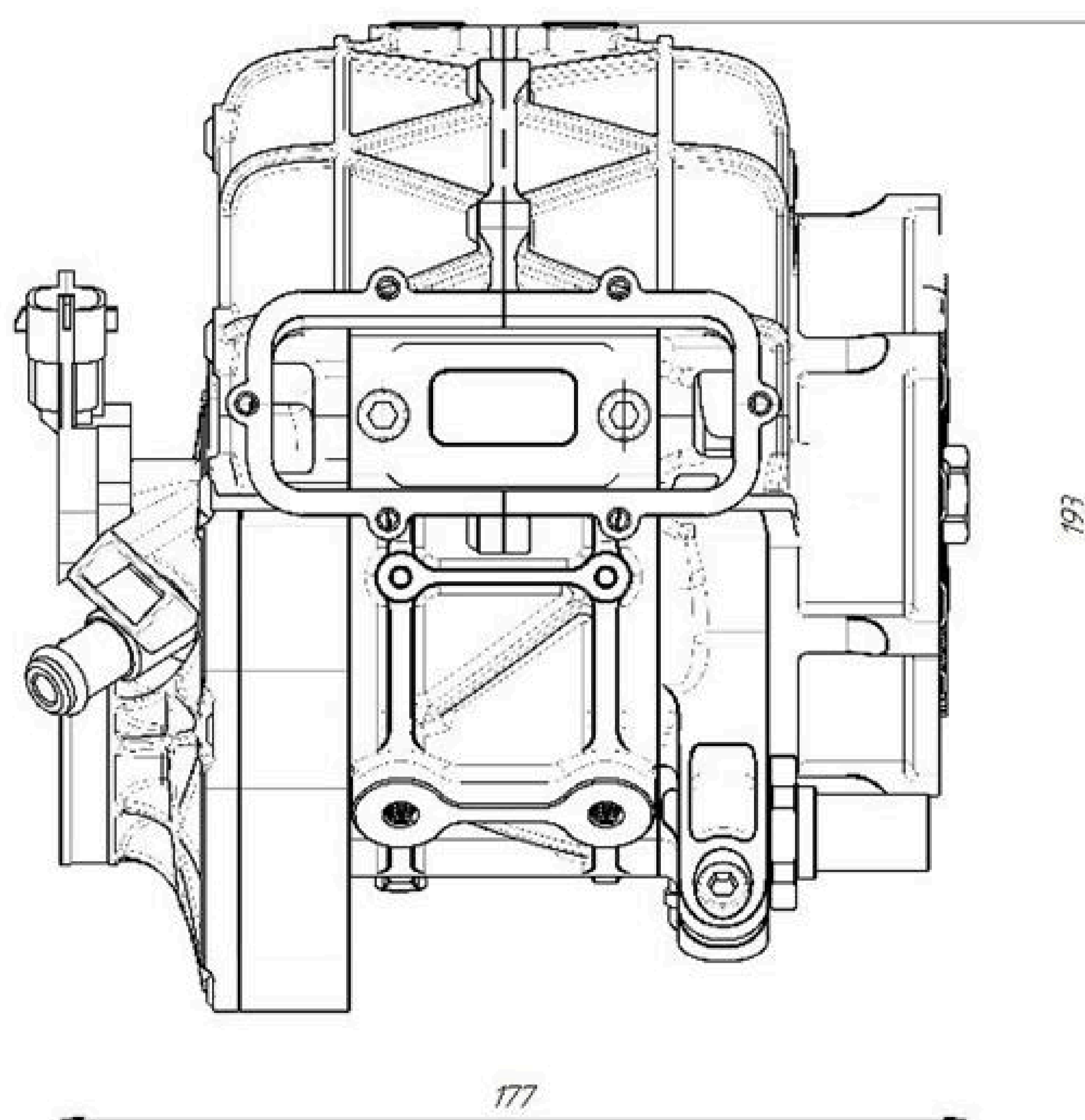
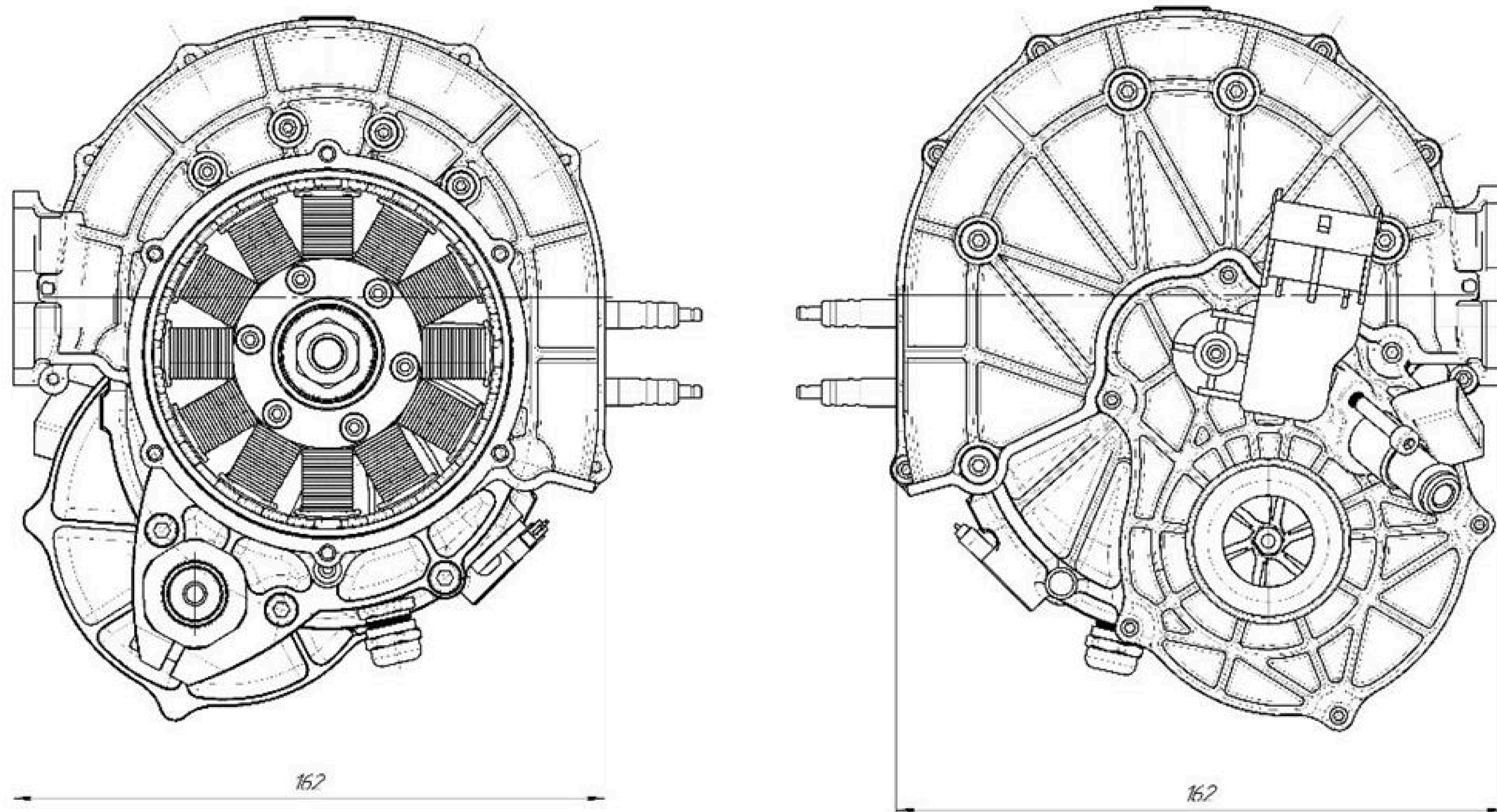


## SFC (g/kWh el.) vs DC kW



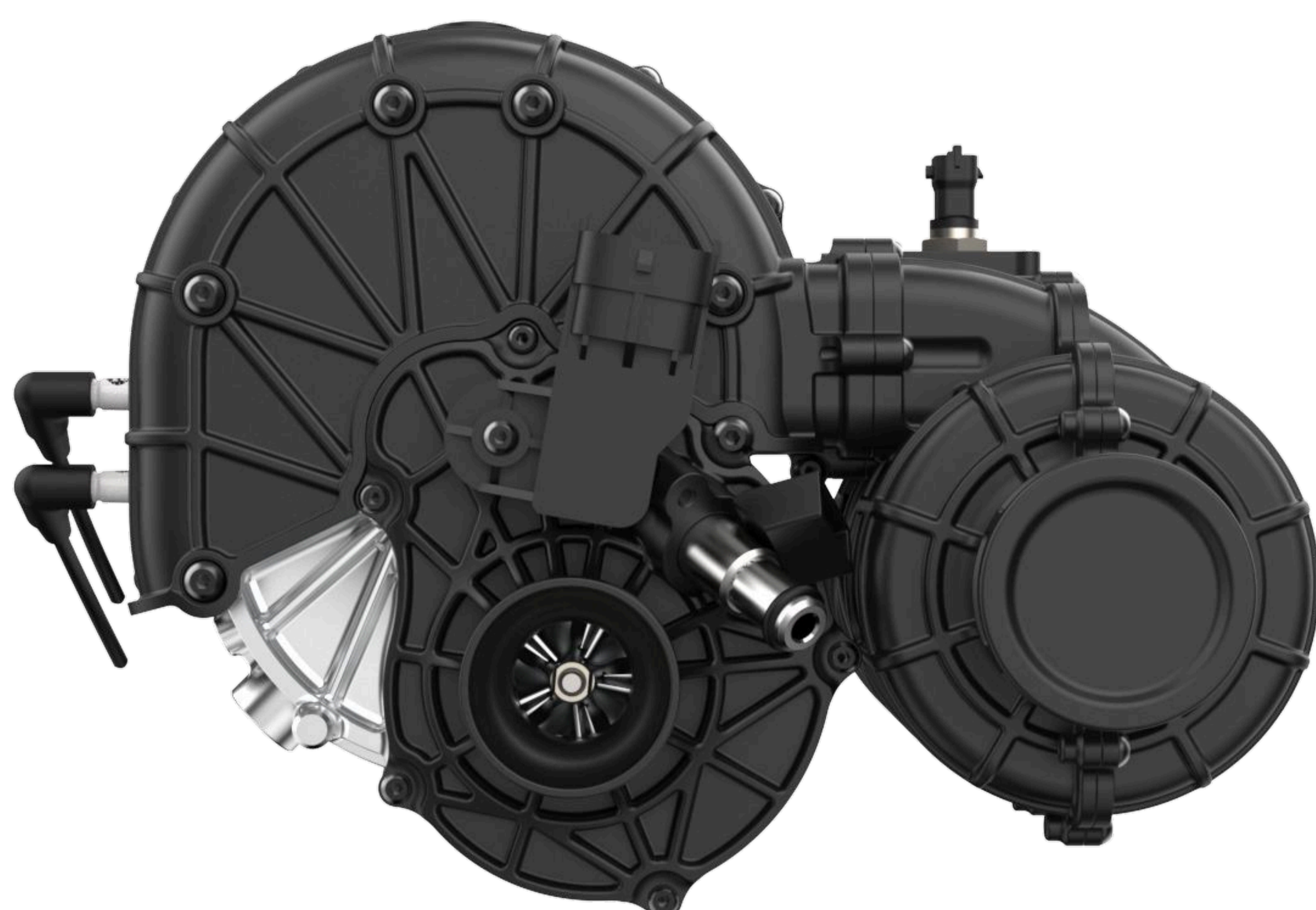
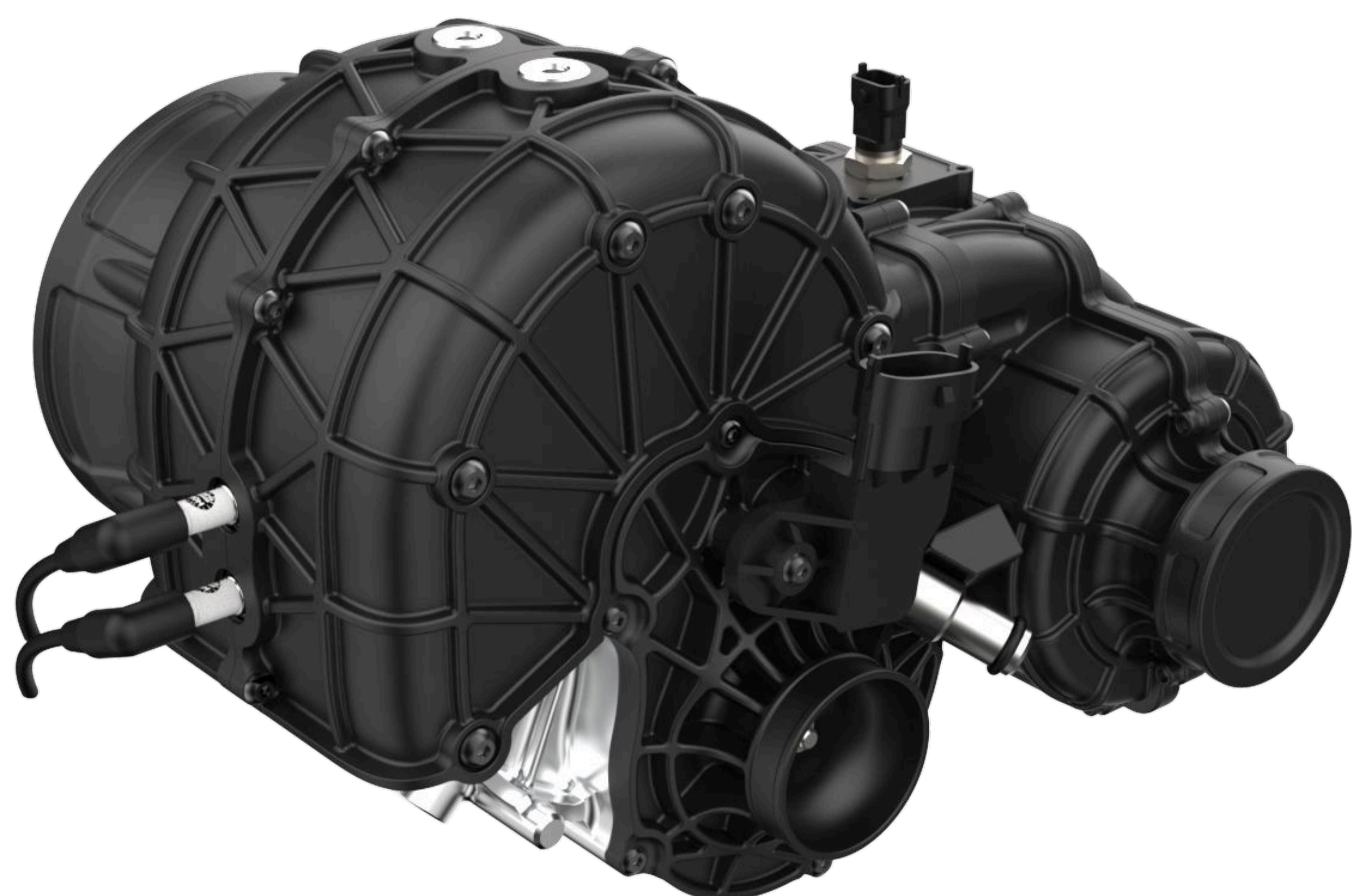
## Dimensions and Layout

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## Visual References

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# ECU / Generator Rectifier / Power Distribution Unit



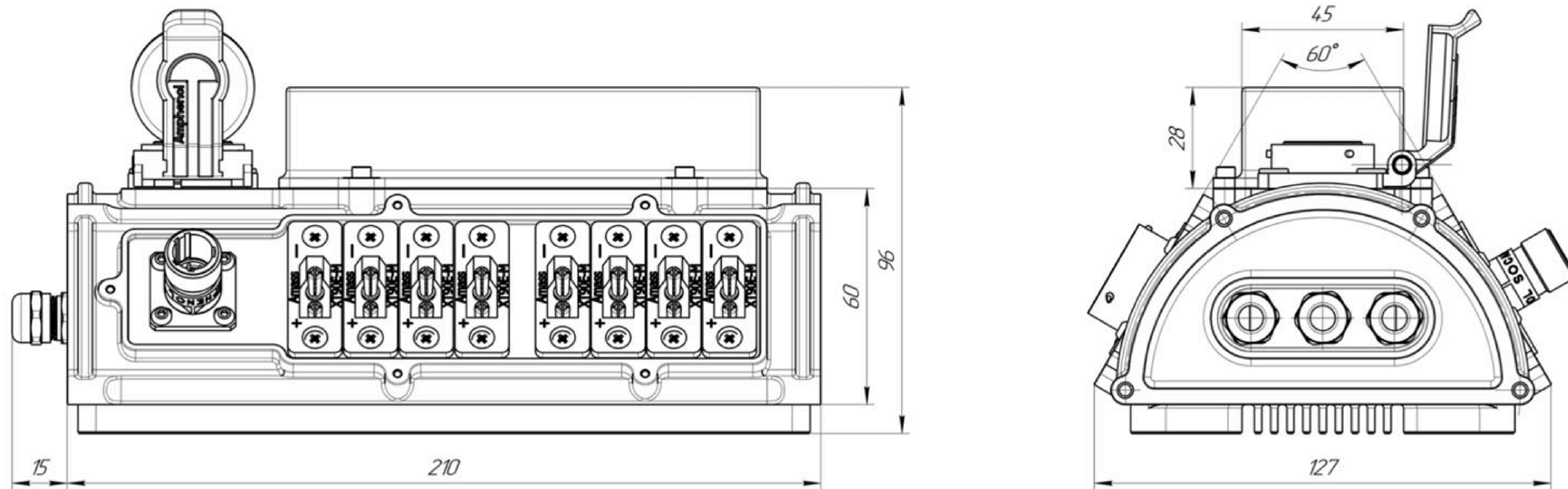
## Key Features

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- ✿ All engine electronic systems in one compact case
- ✿ Capability to configure hot-swap of multiple controllers and combine/balance multiple generators
- ✿ Ability to configure individual 48VDC channels into groups of 96VDC/144VDC/192VDC
- ✿ Integrated starter battery. Automatically recharges from the generator. Electrically isolated from other onboard systems
- ✿ Integrated supercapacitor-based energy buffer for torque fluctuation compensation
- ✿ Several independent channels for control and telemetry
- ✿ Priority system for responding to generator overload, separate profiles for each group of consumers
- ✿ Software configuration of protection/shutdown levels, resettable fuses
- ✿ 16 connectors for connecting the engine wiring, control interface and four groups (four channels each) of connectors for connecting electrical consumers and external batteries

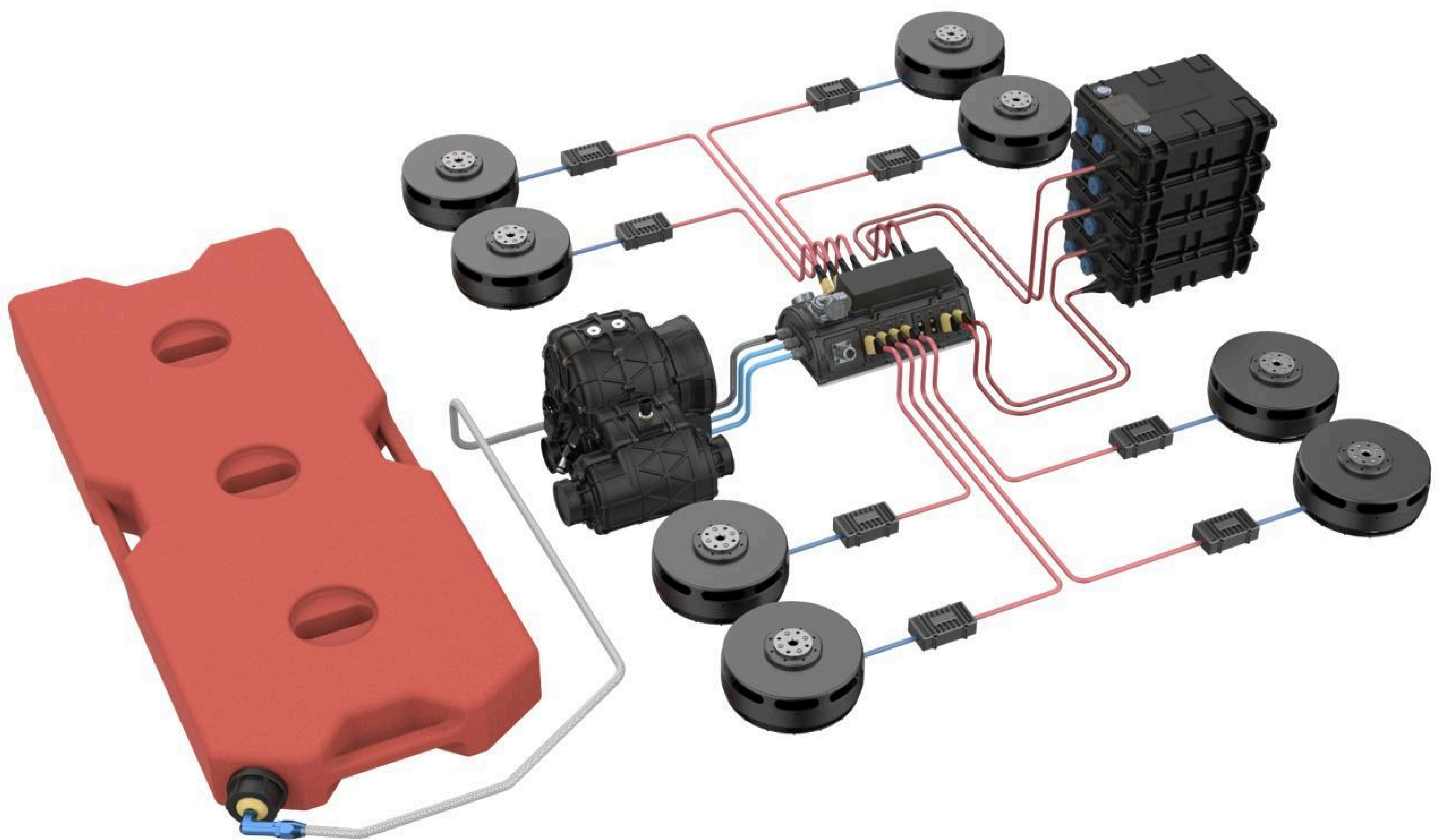
## Dimensions

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## Connection diagram

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## Price

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Price: 15,500 EUR (Ex-Works Barcelona)

We offer a 'Developers Kit' – an engine on a subframe suitable for mounting on a dyno, including a kit of radiators, pumps, a fuel system, an ECU and a wiring kit, with software control documentation (API, necessary source codes)

More info:

<https://uavhe.eu/products/rw1-79/>

CAD (STEP) files: [https://uavhe.eu/wp-content/uploads/2025/03/RW79APU.stp\\_.zip](https://uavhe.eu/wp-content/uploads/2025/03/RW79APU.stp_.zip)