VONNEN™

Hybrid Supercar Technology

Summary

- Enthusiasts love their cars
  - Style, sounds, sensations, nostalgia
  - Engaging driving experience
  - But – desire benefits of New Technology
    - Faster, Cleaner, Efficient, Better
- Solution
  - Performance Hybrid Technology Retrofit
  - Vonnen Technology ports to most any car
  - Delivers power, efficiency, smog legal

VONNEN
ELECTRIFYING PERFORMANCE

- Porsche 918
- McClaren P1
- LaFerrari
- Koenigsegg Regara
- F1 KERS

- All use Performance Hybrid Technology

- Legacy performance technologies

Turbocharging	NOS	Camshafts	ECU tuning
Supercharging	Intake	Compression	Exhaust

- Legacy problems

Smog non-compliance	modest gains	driveability	hurts fuel economy
shortened engine life	complex tuning	ECU fault codes	flat spots
rough idle	peaky delivery	poor low end	throttle / turbo lag

No real control over power delivery

- Vonnen Performance Hybrid technology

Zero smog impact	Big performance gain	full torque from idle	"off" switch
instant throttle response	enhanced fuel economy	improve engine life	

Complete control over power delivery torque fill, drivetrain protection, traction control, RPM matching

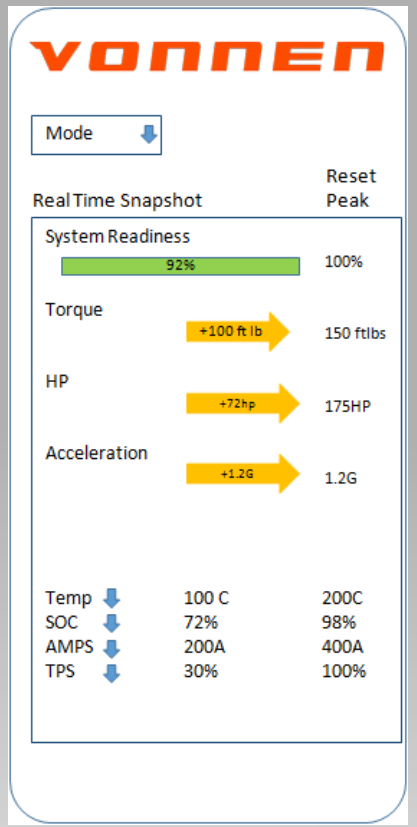
Performance Hybrid

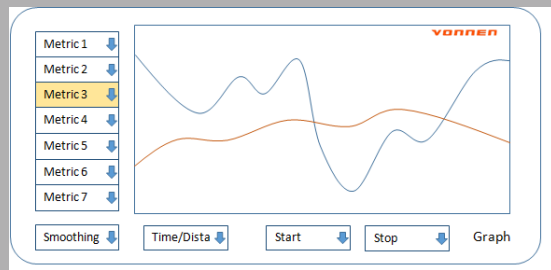
VONNEN
ELECTRIFYING PERFORMANCE

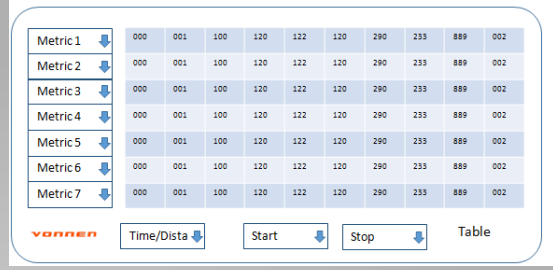
- Not an electric car
  - Normal driving is under gas power
- Electric motor added to existing gasoline drivetrain
- Hybrid system engaged when power boost desired
  - Otherwise system is recharging, cooling
- Battery charging methods
  - From engine while running
  - Through brake regeneration
  - From AC outlet
- Bursty output matches real-world driving requirements
  - Short bursts of high output
  - Followed by long periods of low output

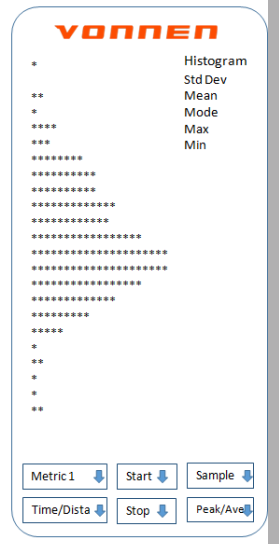
Performance Hybrid

- Drives as normal
  - Gas peddle and brake
  - No special buttons
- Smart phone is UI
  - Blue tooth connection
  - Choose modes
  - Real Time system status
  - Wireless software updates
  - Remote support









User interface

VONNEN
ELECTRIFYING PERFORMANCE

Inverter

Commications: CAN bus
Weight: 7.5 kg (16.5 lbs)
Cooling: Liquid

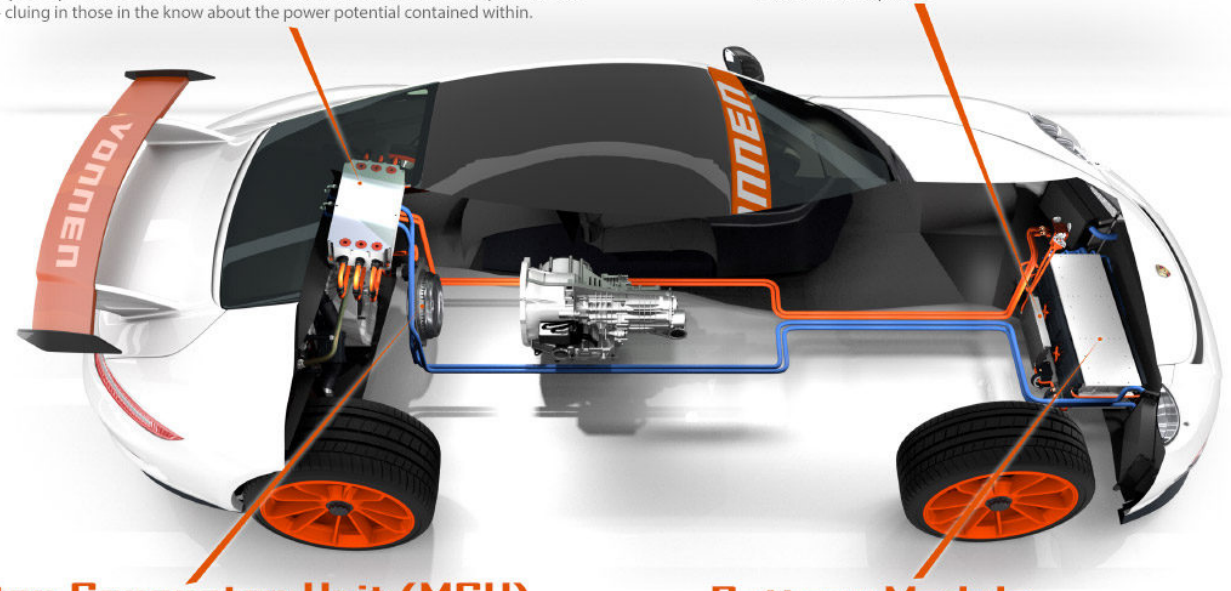
The Inverter converts DC and AC requirements of the battery and MGU. It contains the power electronics to manage current flow and select between torque mode and generator mode.

Mounted proudly on the car's rear shelf, the inverter is the most visible component in the system – cluing in those in the know about the power potential contained within.

Vonnen Control Unit (VCU)

Speed: 65Mhz
Input/Output: 2xCAN bus, bluetooth, USB, 16 digital, 8 analog
Memory: 256k flash, 32k SRAM, 16k ROM, 32G SD card

The brains of the system, the VCU executes all the control logic and algorithms. Monitors the system readiness and manages the mode of operation. The VCU also performs data logging and interacts with the UI. The VCU software is wirelessly upgradable using your iPhone or Android smartphone.



Motor Generator Unit (MGU)

Stage 1 Peak Power : 175hp (130 kW)
Type: Permanent magnet AC
Maximum Torque: 200 NM (150 ft/lbs)
Current: 400 A RMS peak
Weight: 17 kg (38 lbs)
Cooling: Liquid

The MGU acts as both motor and generator. It is fit in place of the stock flywheel. The rotor is mounted rigidly to the crankshaft, and the stator fits between the engine case and transaxle. The MGU is under 70mm (2.75 inches) long and occupies the space formerly occupied by the flywheel. The engine and transaxle are separated just 25mm (under 1 inch) to accommodate the MGU.. In torque mode it provides propulsion, in regeneration mode it acts as a generator to charge the battery module.

The MGU is used the start the engine. The stock starter motor is removed, along with the stock flywheel. Relieved of the starting requirements, the 12V battery is replaced with a lightweight unit.

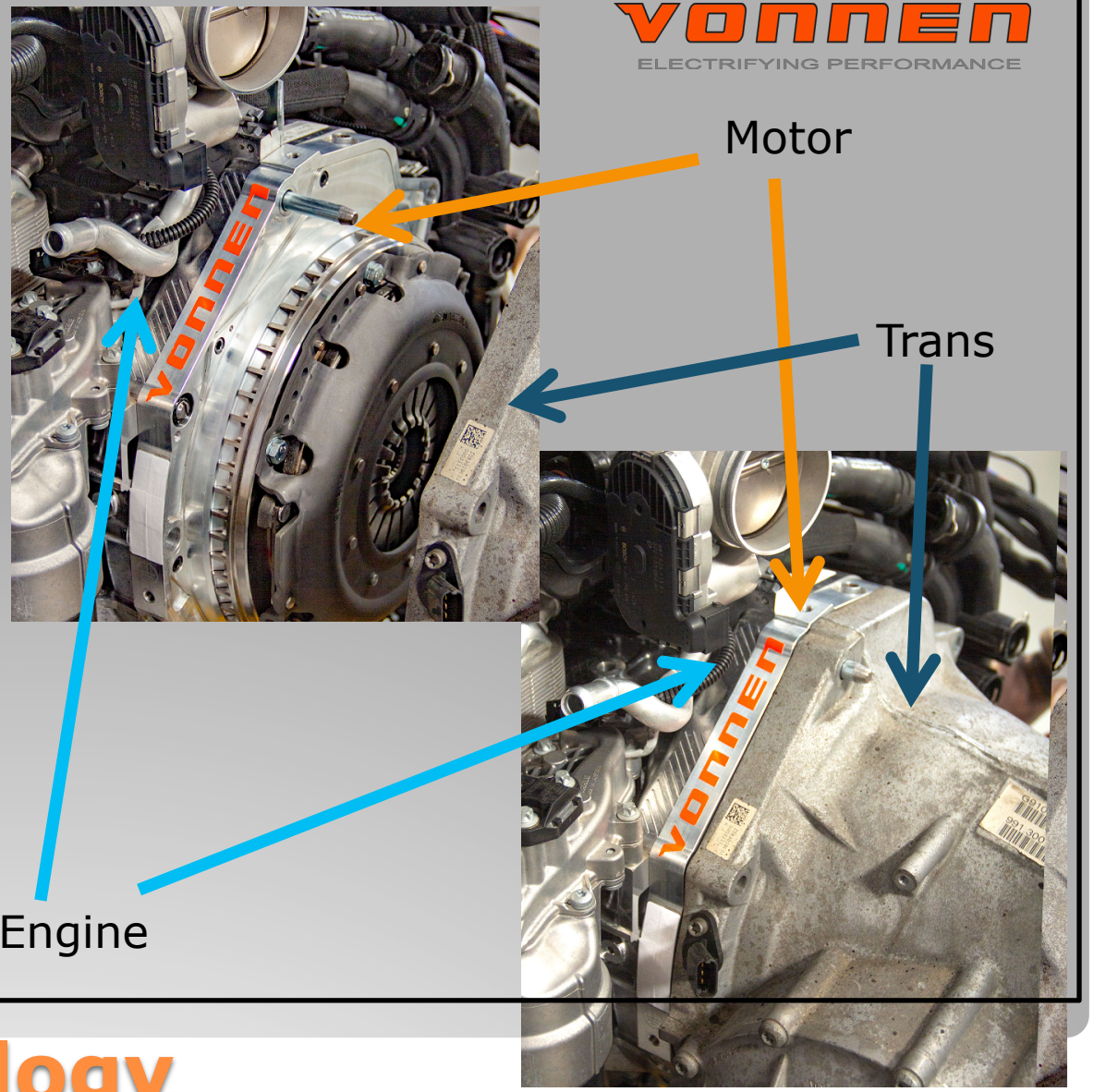
Battery Module

Stage 1 Power: 145 kW
Voltage: 400 VDC peak
Current: 400 Amps peak
Energy Storage: 1000 Wh
Cells: 144
Cooling: Liquid
Weight: 29.5 kg (80 lbs including cooling system)

The Battery Module is fit to the front trunk area and only uses 7" of depth. It has extremely high power density and is designed to charge / discharge symmetrically at up to 400 amps. Peak 400V provides high power output and low I^2R losses.

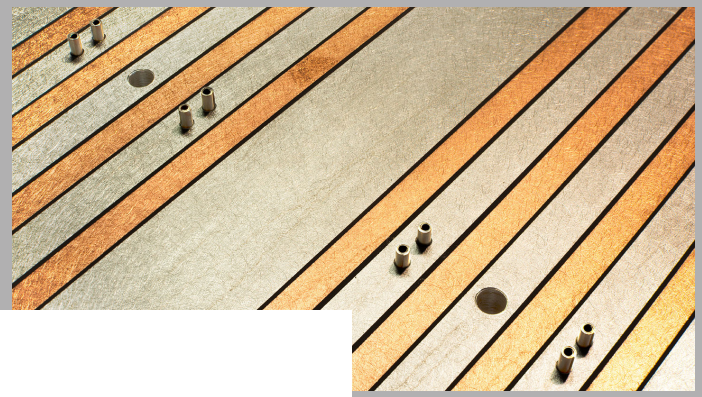
System Overview

- Deployable on most any car/truck
  - Integrates inside drivetrain
  - Replaces flywheel with motor
  - Powers through existing drivetrain
- Fit between engine and trans
  - Inside bellhousing
  - Motor only 2.75 inches long
  - Connected directly to crankshaft
  - Solves space claim problem
  - Solves drive coupling problem
- Readily ported to other models
  - 2wd, 4wd, fwd, rwd, automatic, manual
  - Motor engineered to fitment
  - Balance of system ports over
- Solves retrofit integration issues

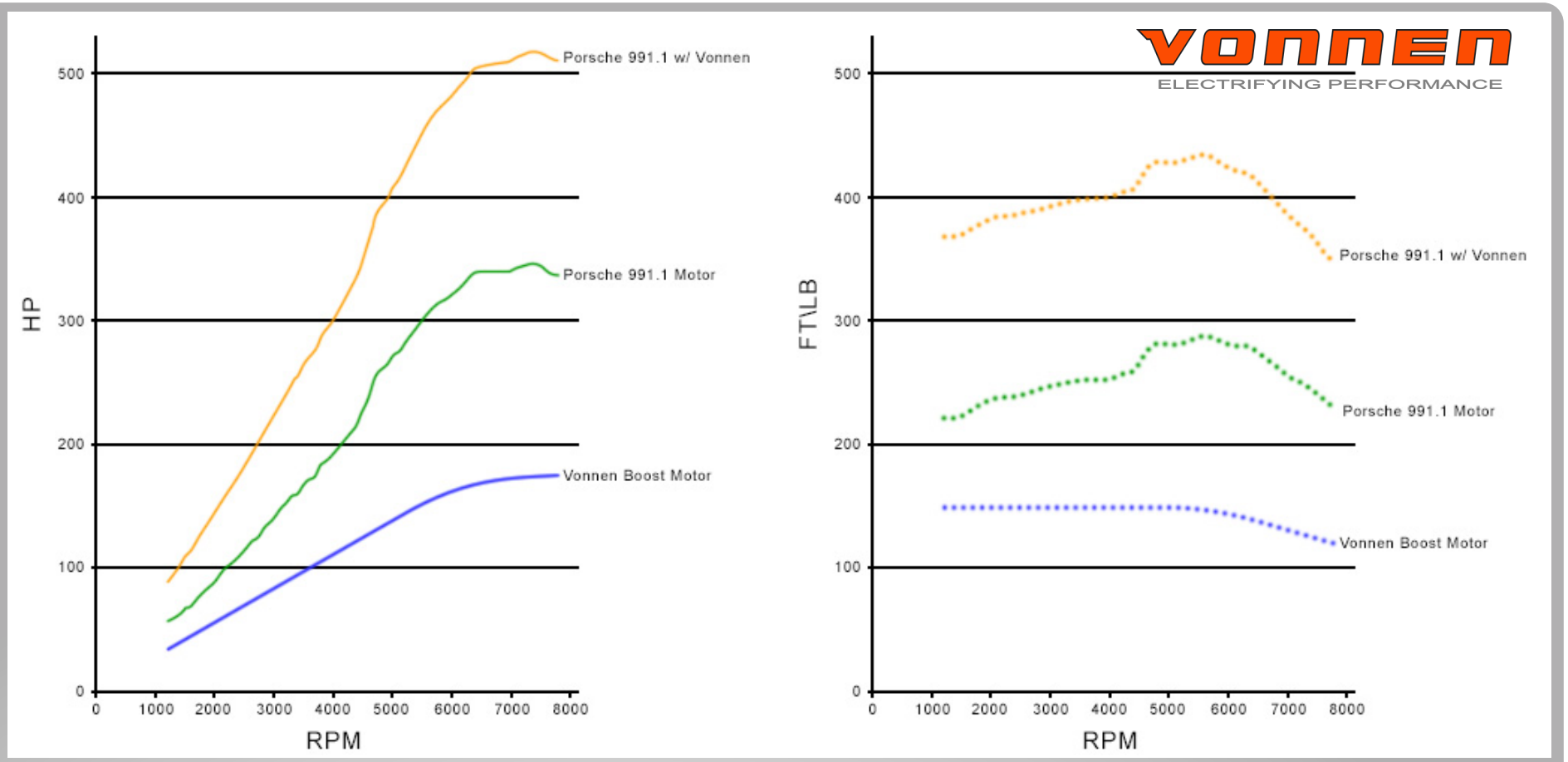


Flywheel Motor Technology

- High power density
  - vs high energy density
- Ultra lightweight and compact battery
- Liquid cooling



Battery Module



- Very High Power increase
- E-Motor gives full torque from idle

Performance

- Availability
  - 991 series – 2019 Q1
  - 911 air cooled – 2019 Q3

Rollout