

## DeatschWerks DV2 Injector White Paper



### ***Purpose***

To investigate the defining technologies and features that comprise the DeatschWerks DV2 EFI fuel injectors.

### ***What is DV2?***

DV2 is an acronym for DeatschWerks Version 2. DV2 fuel injectors represent the highest level of quality, technology, and innovation in the DeatschWerks fuel injector line up. The purpose of DV2 technology is to provide the highest flow rate, fastest response time, and broadest fuel compatibility. Other lines of DW injectors may share some of the same features, but only DV2 injectors include the entire package of technologies outlined within this white paper.

### ***Technology***

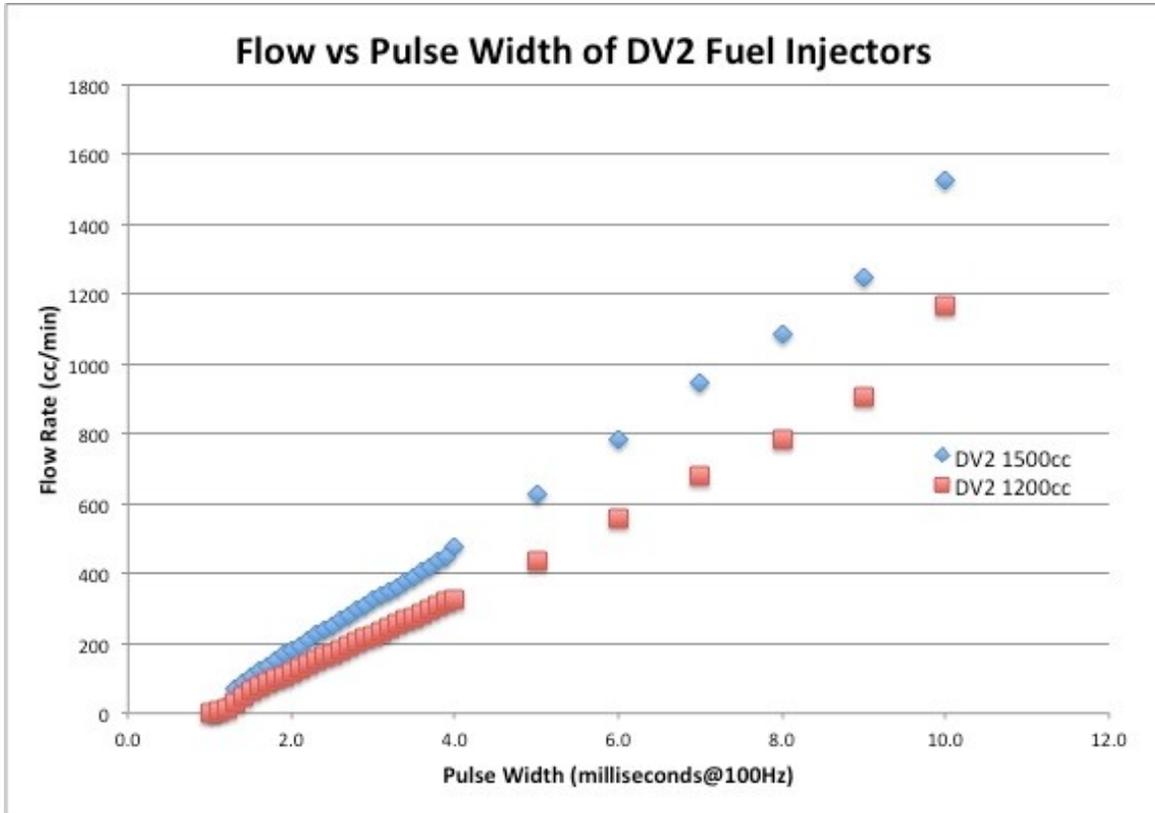
DV2 injectors incorporate Bosch EV14 fuel injector technology. EV14 is the most advanced EFI injector technology available from Bosch. EV14 features include low mass injection valves, high energy coils, precise ball and seat sealing surfaces, compact housings, and stainless steel internals.



*DV2 injectors are available in 3 different fitment standards: compact, standard, and long. Applications specific fitments are also available for a wide range of popular makes and models.*

### Flow Rates

The DV2 line is reserved for fuel injectors that flow in excess of 1,000cc/min (n-heptane, 43psi, SAE). >1000cc injectors require special treatment in terms of technology, tolerances, and data to provide OE quality drivability. DV2 technology is aimed at addressing these challenges. DV2 is currently available 1200cc and 1500cc flow rates.



Above graph displays actual data obtained during the in-house characterization process. Utilization of digital flow meters and programmable injector drivers are key to accurately obtaining the massive amounts of data needed for proper characterization. Antiquated graduated cylinder methods of data collection do not suffice.

### Fuel Compatibility

Special attention to both design and materials has resulted in a line of injectors that are compatible with many of the most popular fuels. All DV2 injectors are compatible with a broad range of fuel types including ethyl alcohol (ethanol), methyl alcohol (methanol), leaded fuels, and MTBE oxygenated fuels such as Q16.

- Stainless Steel Internals - All DV2 injectors are manufactured using stainless steel internals. Stainless steel is used in the valve needle, valve ball, and valve seat.

- Injection Valve Design – The ball-seat design of the DV2 injector valve reduces the risk of clogging from ethanol-induced precipitates. Other injection valve designs rely on angular sealing surfaces. The round shape of the ball-seat design is inherently more resistant to clogging.

- Internal Metering – Multi-orifice metering plates are more susceptible to ethanol-induced precipitates and have been eliminated in the DV2 injectors. All fuel-metering functions are contained within the design of the ball-seat injection valve itself.

### ***Fast Response Optimization***

The importance of injector response time increases rapidly when static flow rates exceed 1000cc/min. This is due to the extremely short opening times required for a very large injector to provide a very small amount of fuel. It is imperative that these opening times are fast, accurate, and precise. DV2 injectors employ 2 different strategies for fast response optimization.

- Low Mass Injection Valves – The injection valve needle is the internal moving part of the EFI injector. The valve needle has to lift off of the valve seat to deliver fuel. The smaller the mass of the needle assembly, the faster the injector can open and deliver fuel. Decreasing the mass of the valve needle assembly is a very effective method of increasing the response of the injector.
- High Energy Coils –The coil of the injector is what provides the energy to lift the valve needle off of the valve seat and deliver fuel. Higher energy coils can open the injector faster and more precisely. In general, lower impedance coils deliver more energy. While all DV2 injectors operate on high impedance (saturated) injector drivers, the impedance of the coils themselves is reduced to increase lifting energy.

Injector	Pintle Mass	Impedance	Response
Reference	2.3g	13.9 ohm	1.24 ms
DV2-1200cc	2.0g	12.2 ohm	1.05 ms
DV2-1500cc	1.5g	8.5 ohm	1.07 ms

*Late model high flow Denso chosen as high quality reference injector for above table. As illustrated above the lower pintle mass and higher energy coil (lower impedance) translates to a faster response.*

### **Data**

All DV2 injectors are fully characterized. A properly characterized injector is much easier to tune. Below is an outline of the DeatschWerks characterization data.

- Battery Offset/Latency – Measurements are expressed in milliseconds for voltages of 8v, 10v, 12v, 14v, and 16v and at pressures of 2bar, 3bar, 4bar, and 5bar.
- Pulsed Flow Data – Pulsed flow data is collected at 3bar delta fuel pressure. Measurements are expressed in both cc/shot and mg/shot for pulse widths ranging from 1.0ms to 8.0ms in 0.1ms increments. In addition, percent mass deviation is calculated (from ideal) to further characterize the non-linear ranges of the fuel injector.
- Static Flow Data – Measurements are expressed in both cc/min and lb/hr. Data is collected at 2bar, 3bar, 4bar, and 5bar of delta fuel pressure.
- Application Specific Data – When possible, application specific data is formatted and in-car validated for popular makes and models.



*Proper characterization data cannot be accurately obtained unless proper equipment is used and proper procedures are followed. DW's in-house process was developed using SAE J1832. Accuracy is obtained by using temperature controlled calibration fluid, NIST traceable pressure gauges, highly sensitive digital flow meters, and fully adjustable digital injector drivers with proper fly back loops.*

**Contact [sales@efisupply.com](mailto:sales@efisupply.com) to learn more about Deatschwerks Injectors.**