Explanation of Dynamic Flow Graphs

The critical dynamic flow characteristics of an injector can be described with three basic graphs. These are **Uncorrected Flow vs. Actual Pulsewidth**, **Corrected Flow vs. Effective Pulsewidth**, and **Linearity Deviation vs. Actual Pulsewidth**.

Effective Pulsewidth is the final pulsewidth calculated by the ECU prior to the addition of the dead time compensation.

Actual Pulsewidth is the pulsewidth delivered to the injector and is the sum of the effective pulsewidth and the injector dead time compensation.

Uncorrected Flow vs. Actual Pulsewidth - This graph shows the dynamic flow vs. actual pulsewidth across the voltage range. The Y Axis is flow in units of cubic centimeters per minute. The X Axis is actual pulsewidth in units of milliseconds.

All dynamic flow characteristics are generated from this raw data which clearly illustrates the non linearities and voltage sensitivity of the injector.

Corrected Flow vs. Effective Pulsewidth - This graph shows the dynamic flow vs. effective pulsewidth across the voltage range. The Y Axis is flow in units of cubic centimeters per minute. The X Axis is effective pulsewidth in units of milliseconds.

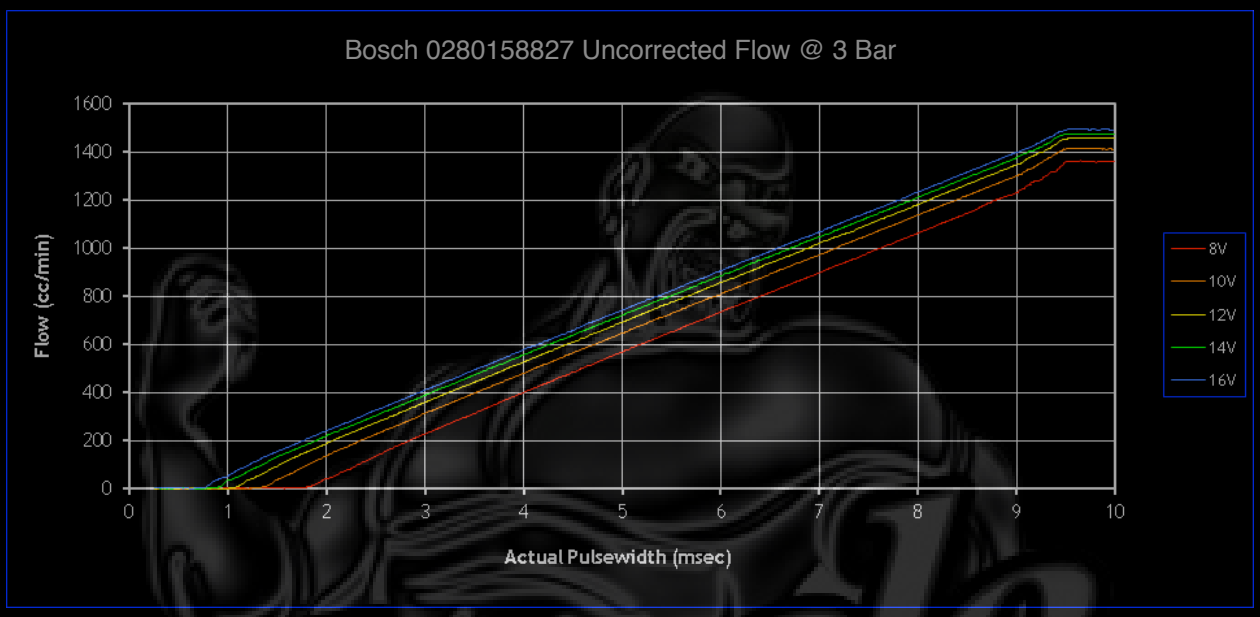
This curve represents the response of the injector with proper dead time compensation, and at the end of the day this is the one that really matters.

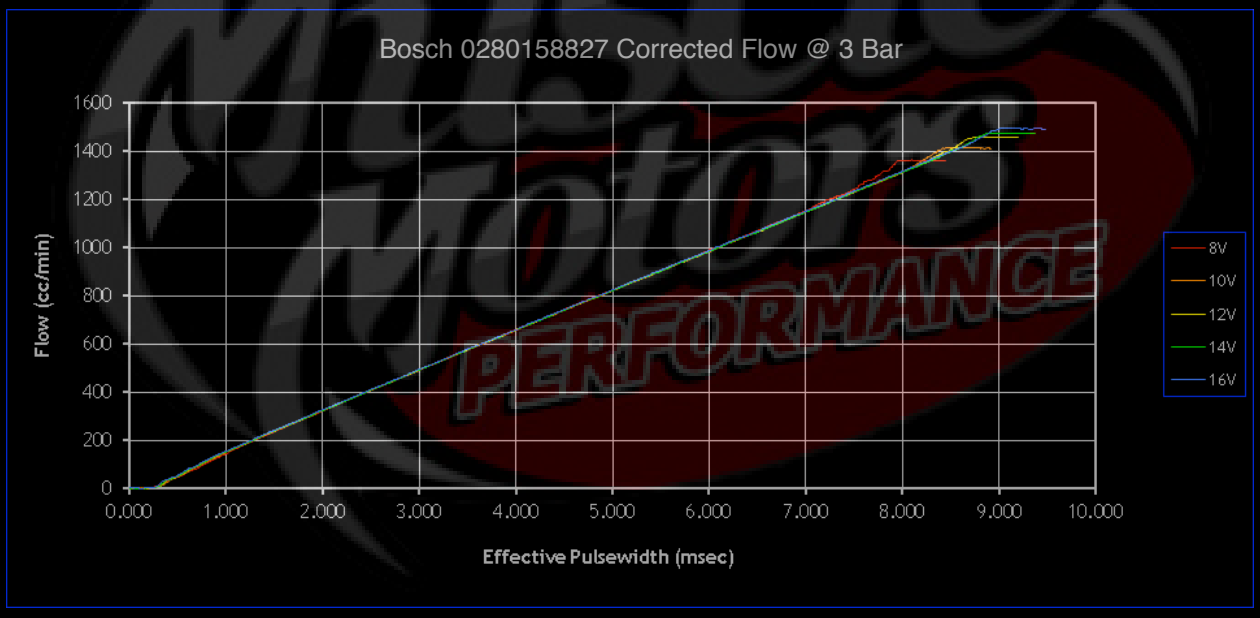
Linearity Deviation vs. Actual Pulsewidth - This graph shows the deviation from linearity (Straight Line Response) across the pulsewidth range. The Y Axis is flow deviation in percent. The X Axis is actual pulsewidth in units of milliseconds.

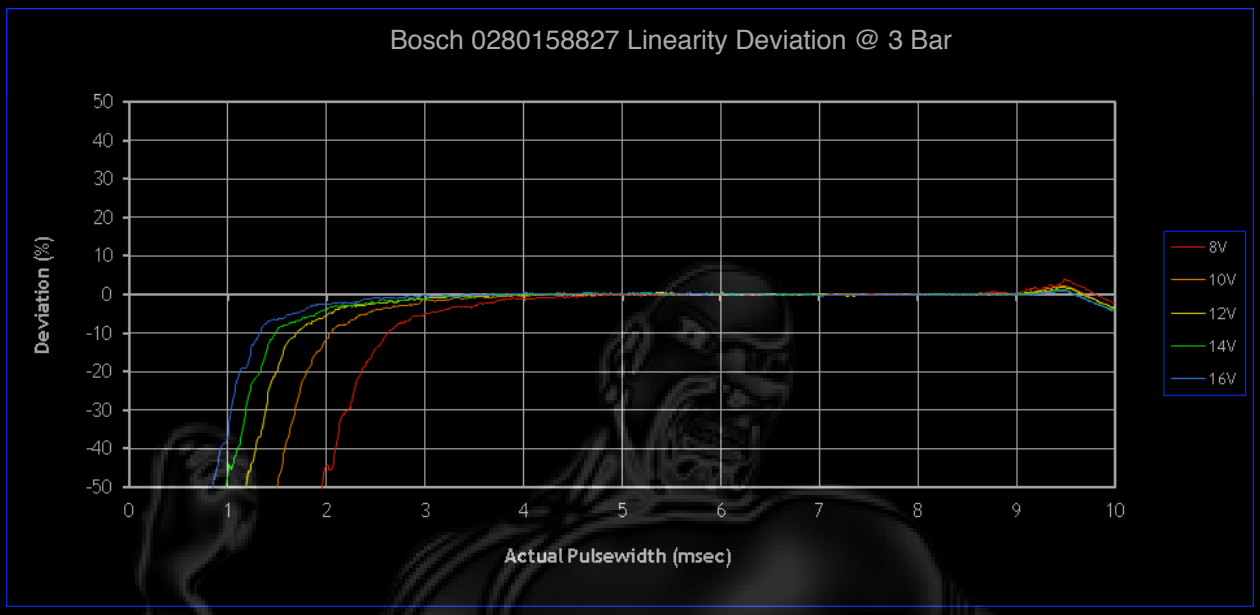
All tests are performed at 100hz using a Motec M800 ECU. It should be noted that even though 10 milliseconds represents static flow, the Motec drive circuit requires that the injector be turned off for at least .5msec per cycle which limits the actual duty cycle to 95% at 100Hz.

This is clearly illustrated by the flat response of the curve above 9.5 msec.

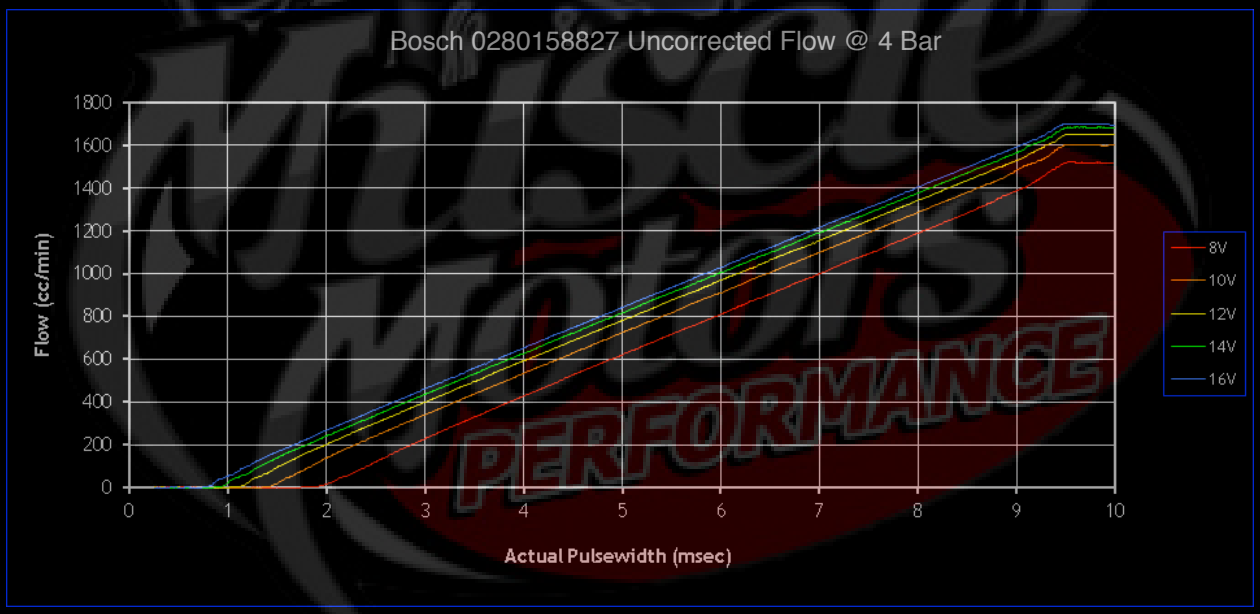
Dynamic Flow Characteristics - 3 Bar (43.5 psi)



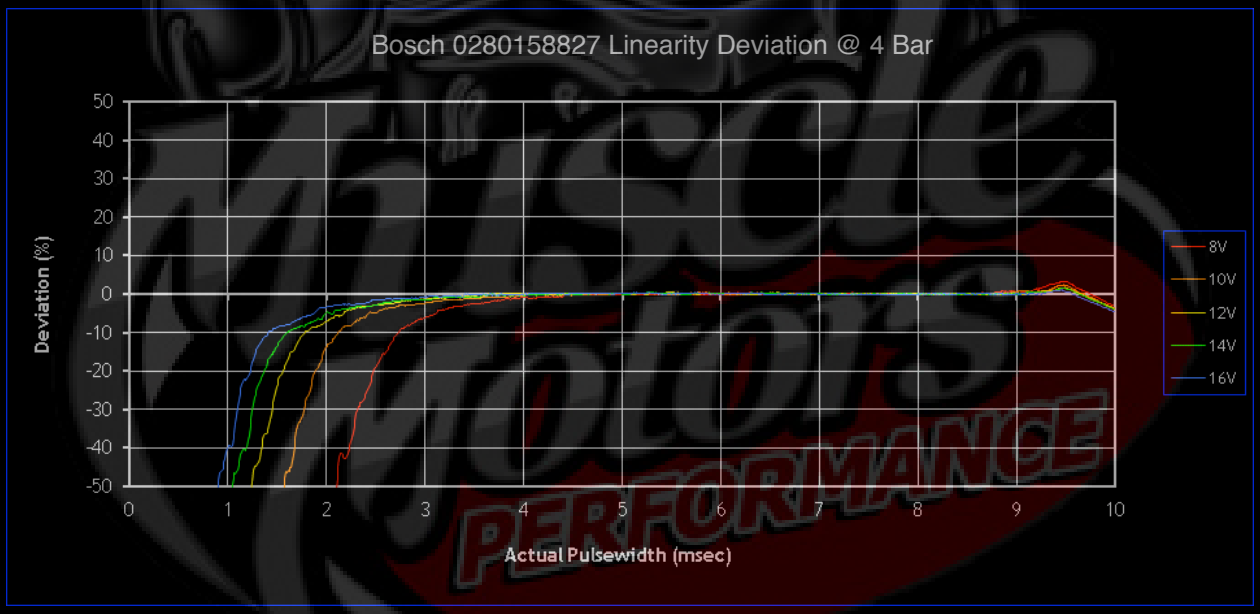




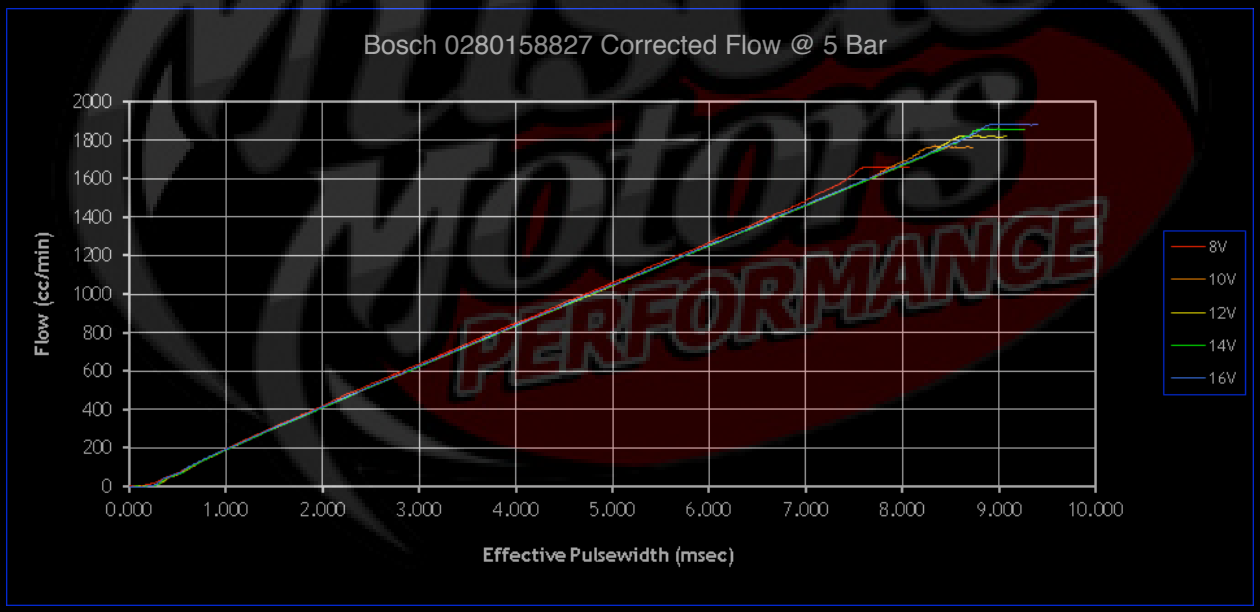
Dynamic Flow Characteristics - 4 Bar (58.0 psi)

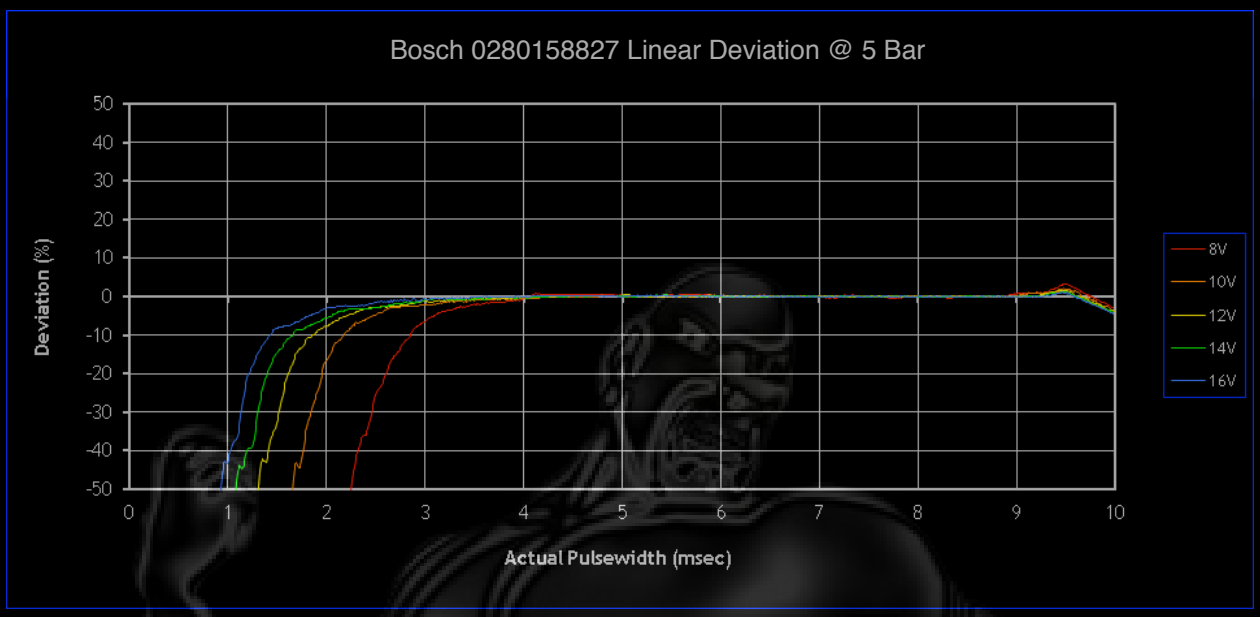



Bosch 0280158827 Corrected Flow @ 4 Bar
Flow (cc/min)
1800
1600
1400
1200
1000
800
600
400
200
0
0.000
1.000
2.000
3.000
4.000
5.000
6.000
7.000
8.000
9.000
10.000
Effective Pulsewidth (msec)
8V
10V
12V
14V
16V

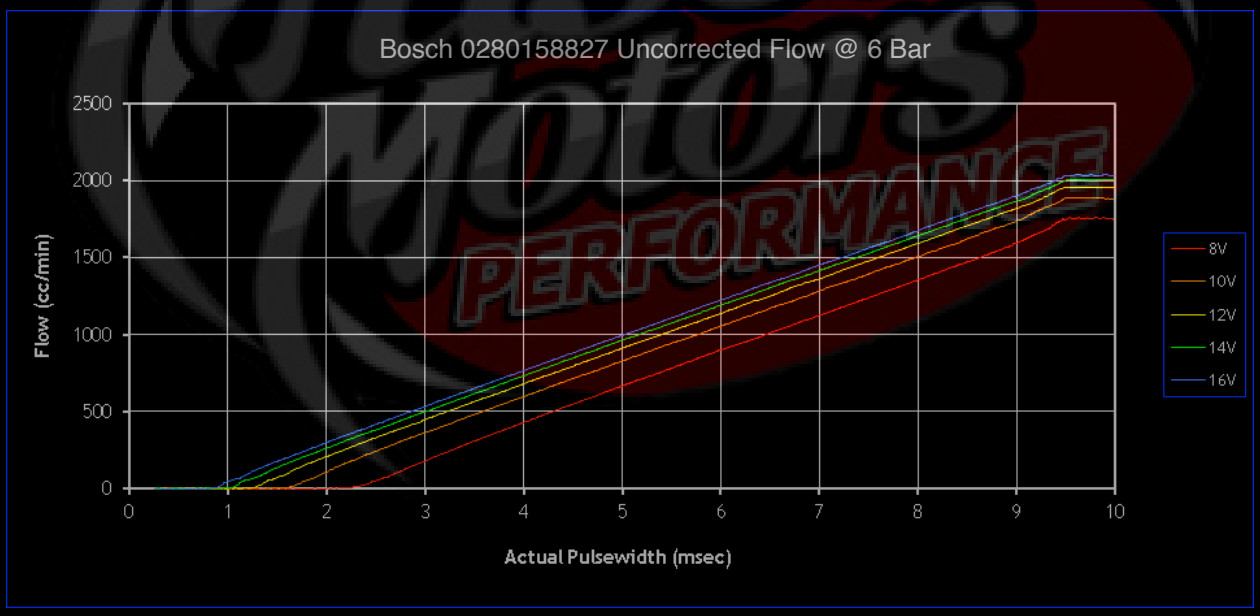

Bosch 0280158827 Linearity Deviation @ 4 Bar
Deviation (%)
50
40
30
20
10
0
-10
-20
-30
-40
-50
0
1
2
3
4
5
6
7
8
9
10
Actual Pulsewidth (msec)
8V
10V
12V
14V
16V

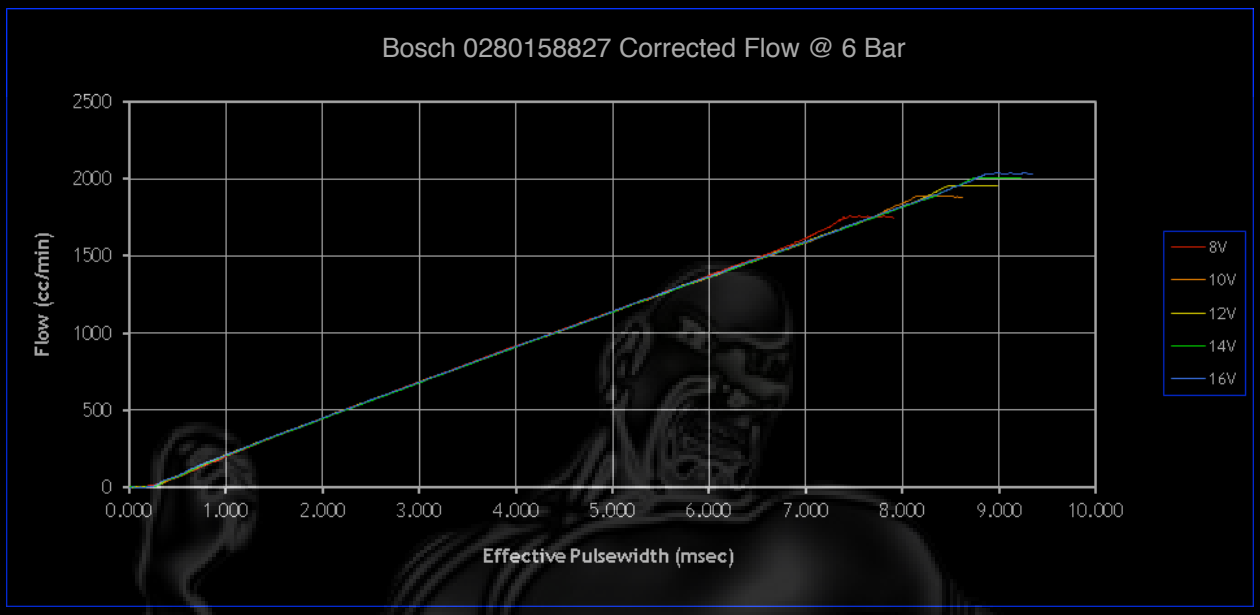
Dynamic Flow Characteristics - 5 Bar (72.5 psi)

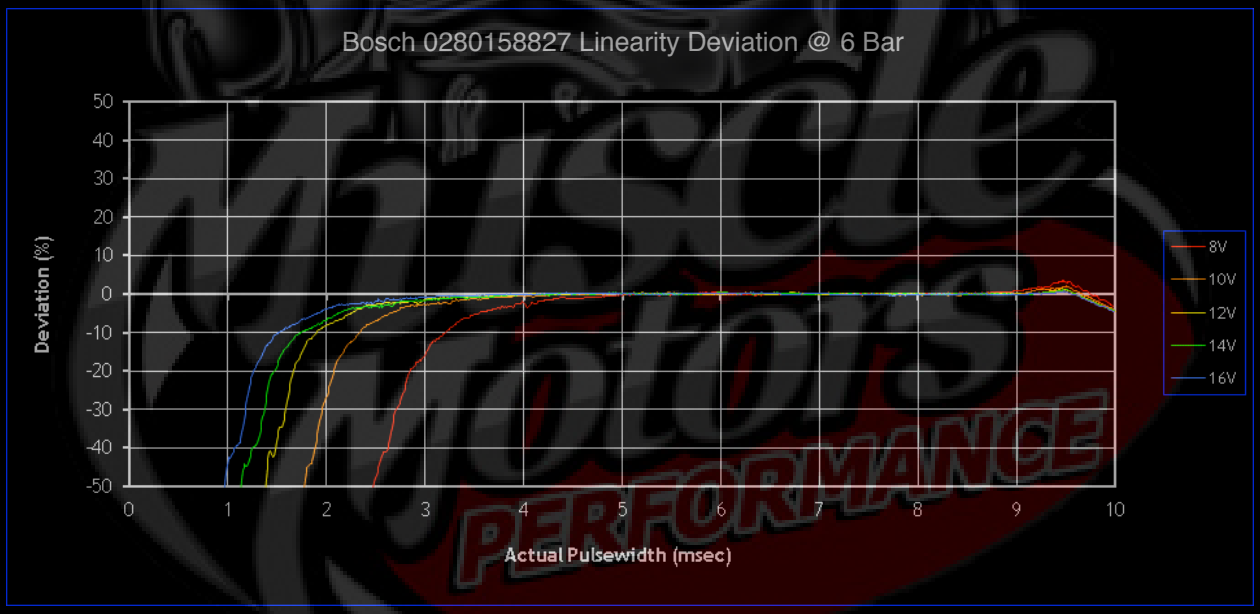




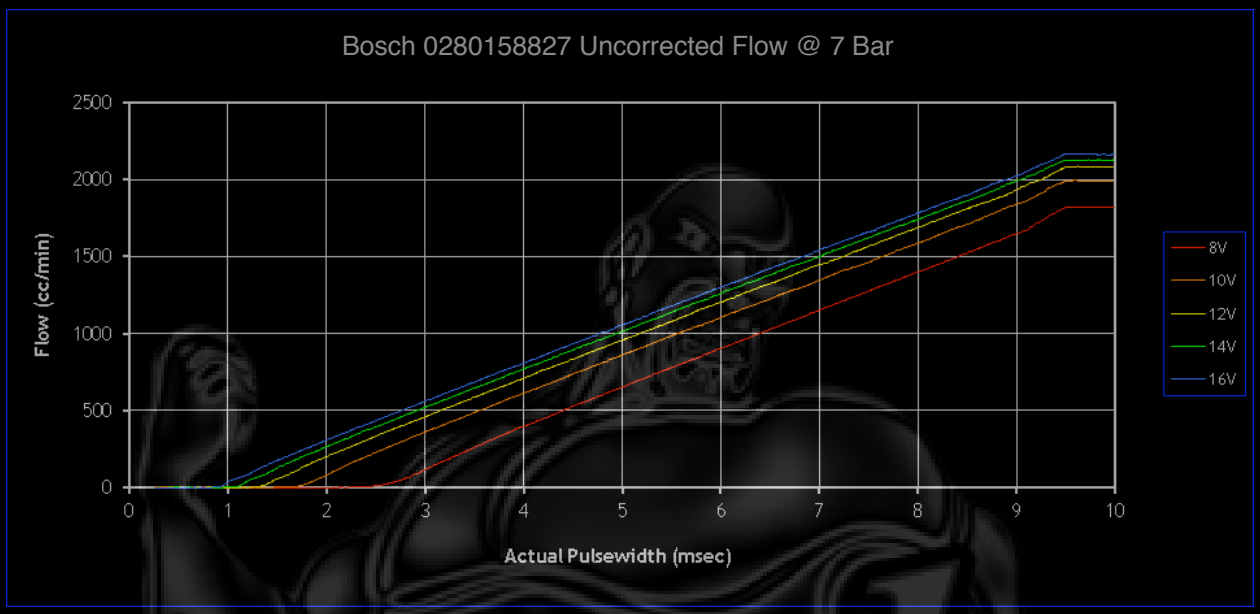
Dynamic Flow Characteristics - 6 Bar (87.0 psi)

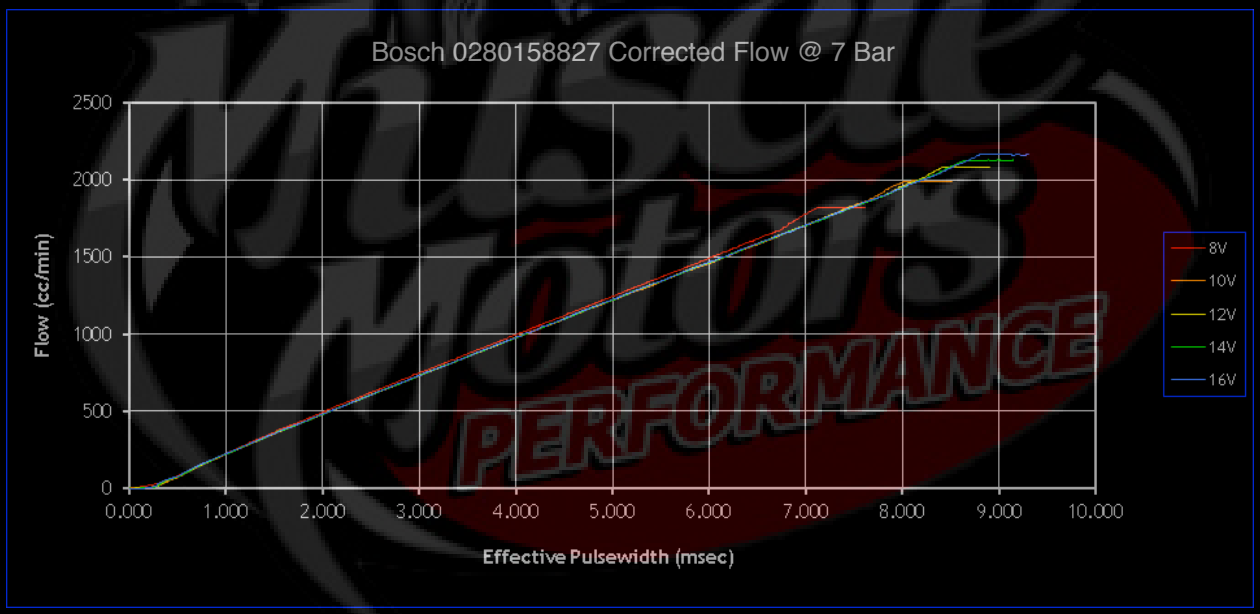


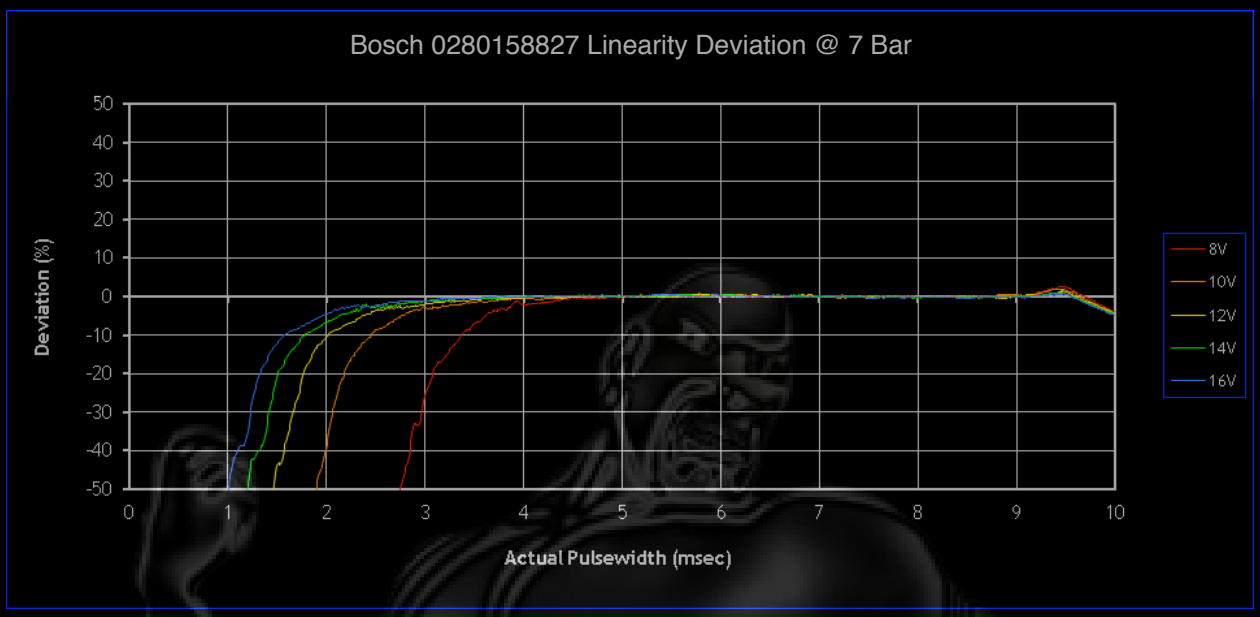

Bosch 0280158827 Corrected Flow @ 6 Bar
Flow (cc/min)
2500
2000
1500
1000
500
0
0.000
1.000
2.000
3.000
4.000
5.000
6.000
7.000
8.000
9.000
10.000
Effective Pulsewidth (msec)
8V
10V
12V
14V
16V


Bosch 0280158827 Linearity Deviation @ 6 Bar
Deviation (%)
50
40
30
20
10
0
-10
-20
-30
-40
-50
0
1
2
3
4
5
6
7
8
9
10
Actual Pulsewidth (msec)
8V
10V
12V
14V
16V

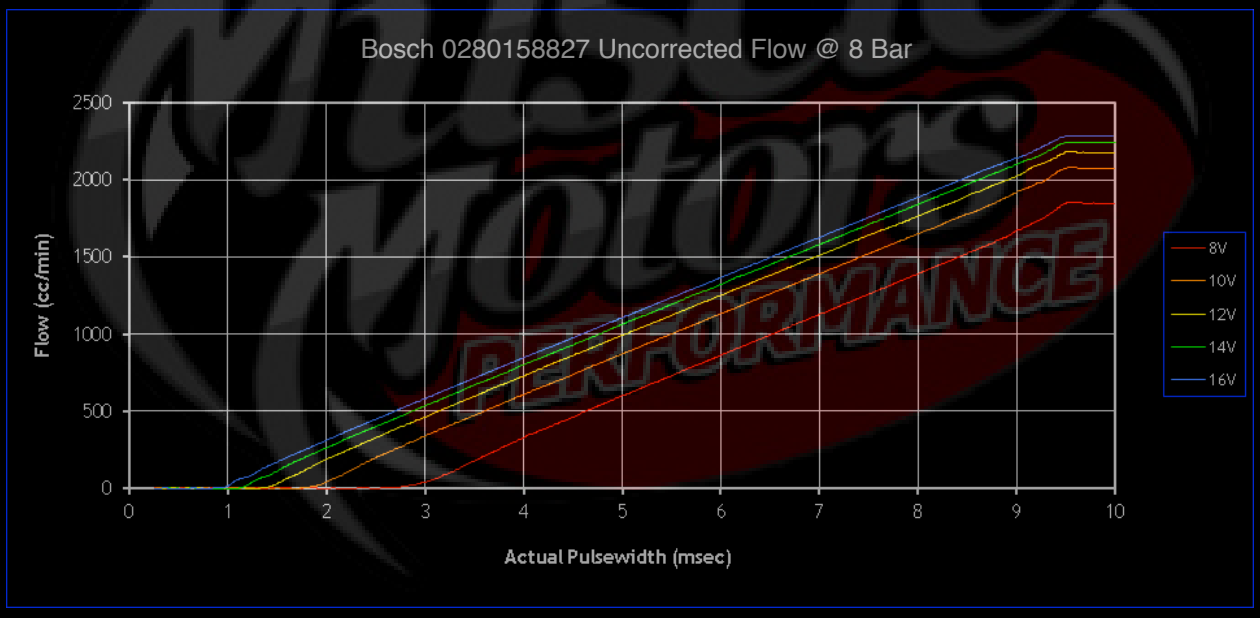
Dynamic Flow Characteristics - 7 Bar (101.5 psi)

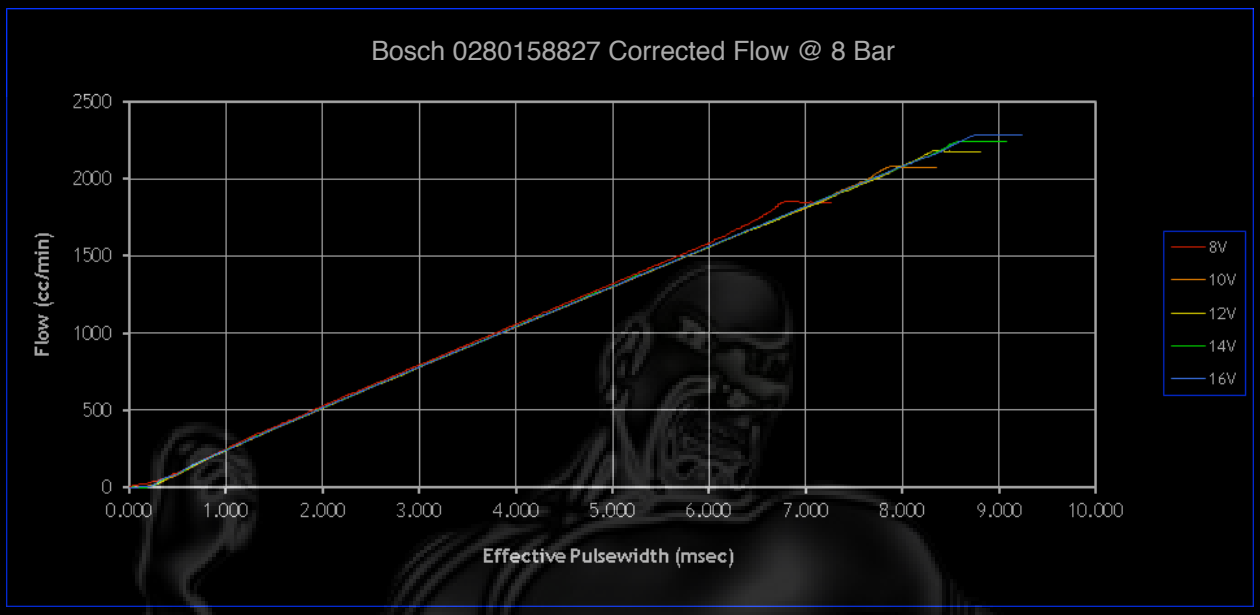


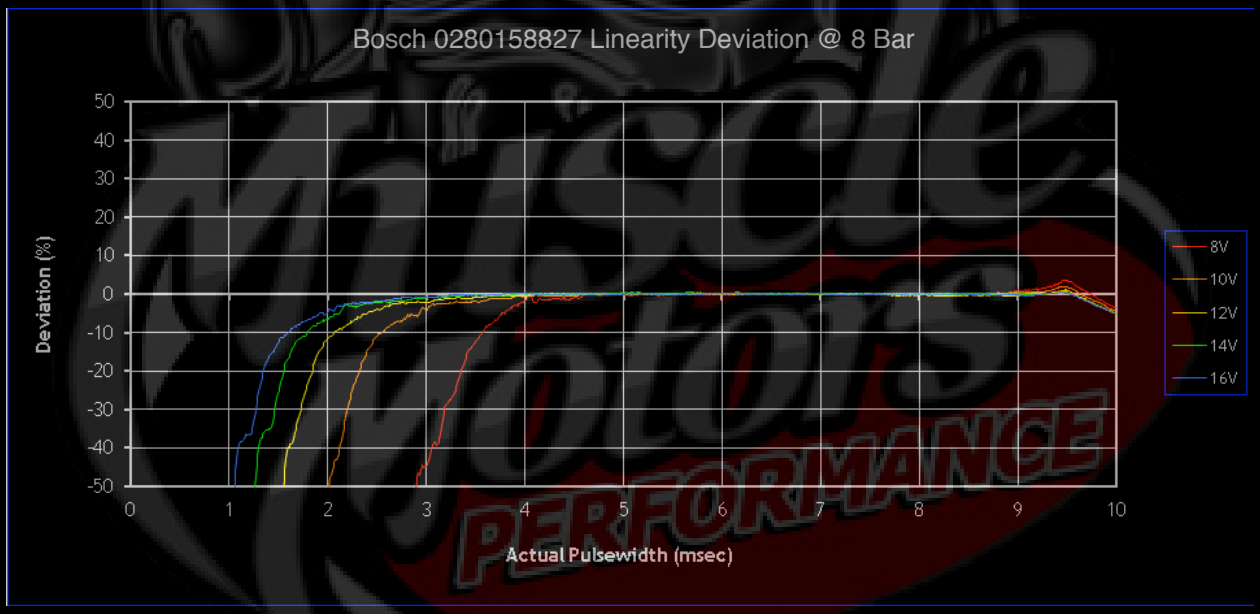




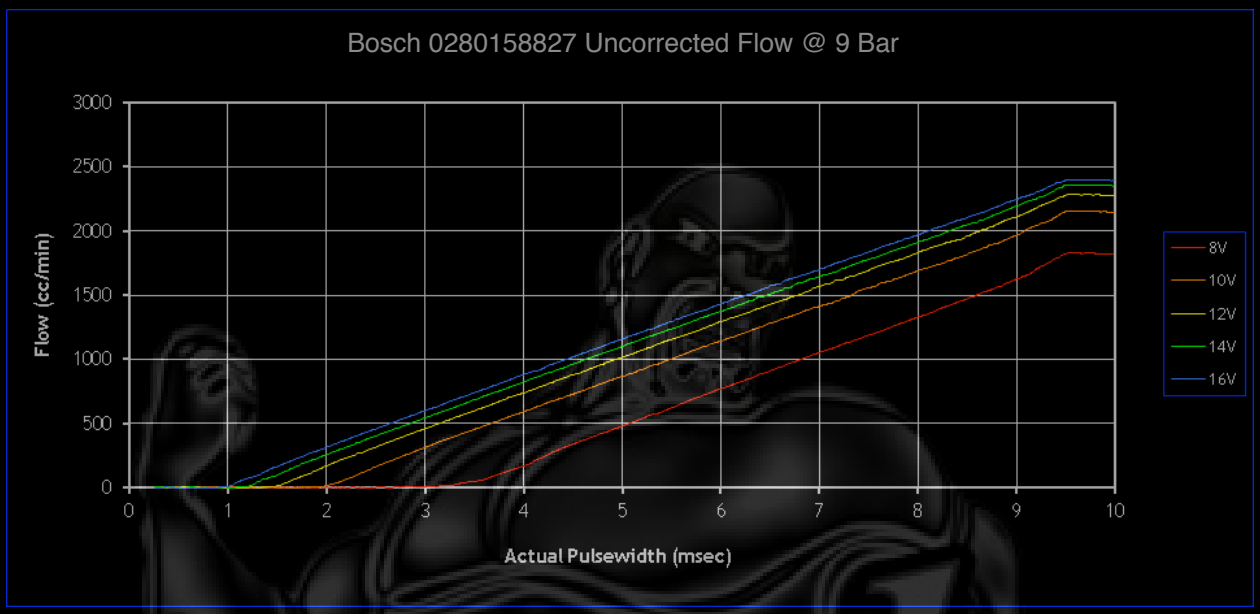
Dynamic Flow Characteristics - 8 Bar (116.0 psi)

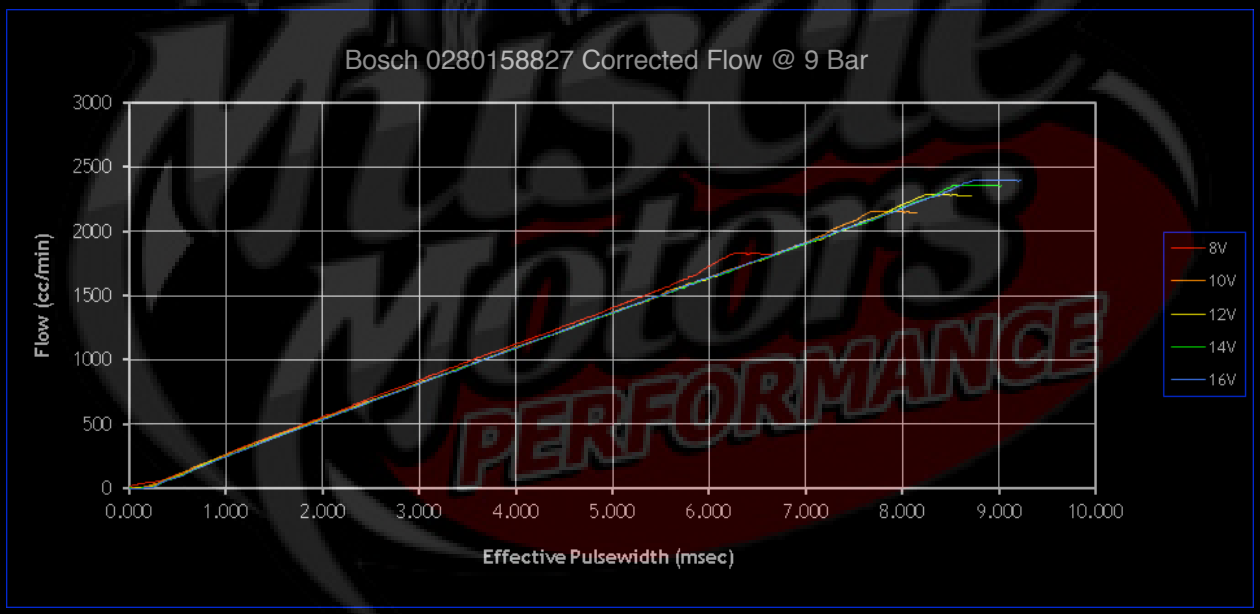


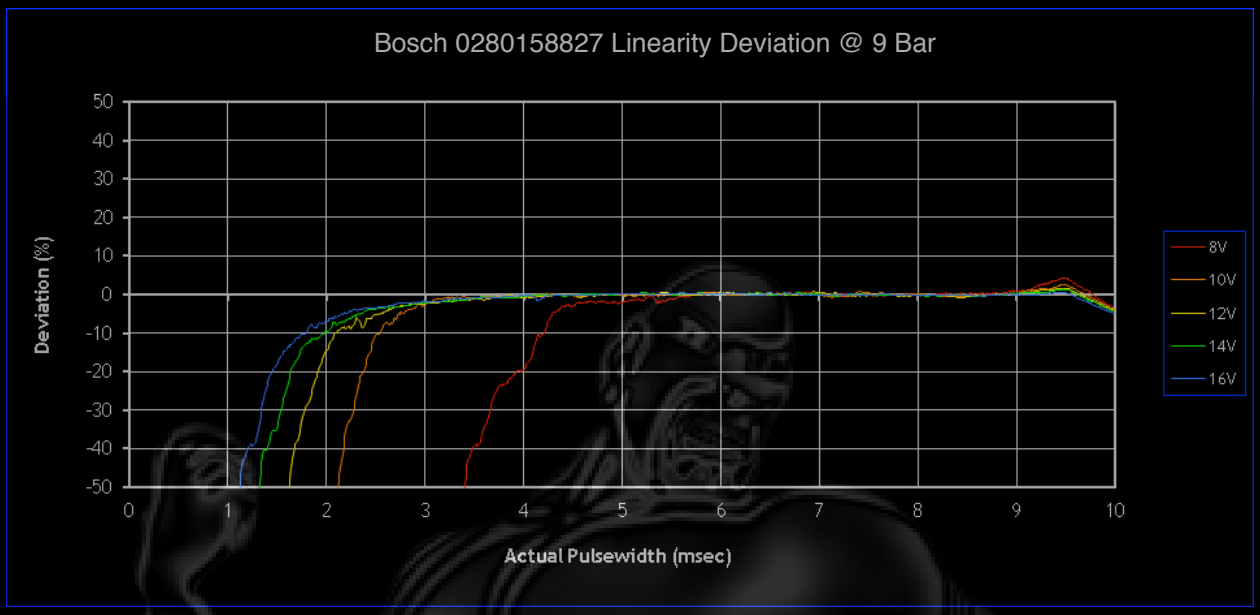

Bosch 0280158827 Corrected Flow @ 8 Bar
Flow (cc/min)
2500
2000
1500
1000
500
0
0.000
1.000
2.000
3.000
4.000
5.000
6.000
7.000
8.000
9.000
10.000
Effective Pulsewidth (msec)
8V
10V
12V
14V
16V


Bosch 0280158827 Linearity Deviation @ 8 Bar
Deviation (%)
50
40
30
20
10
0
-10
-20
-30
-40
-50
0
1
2
3
4
5
6
7
8
9
10
Actual Pulsewidth (msec)
8V
10V
12V
14V
16V

Dynamic Flow Characteristics - 9 Bar (130.5 psi)

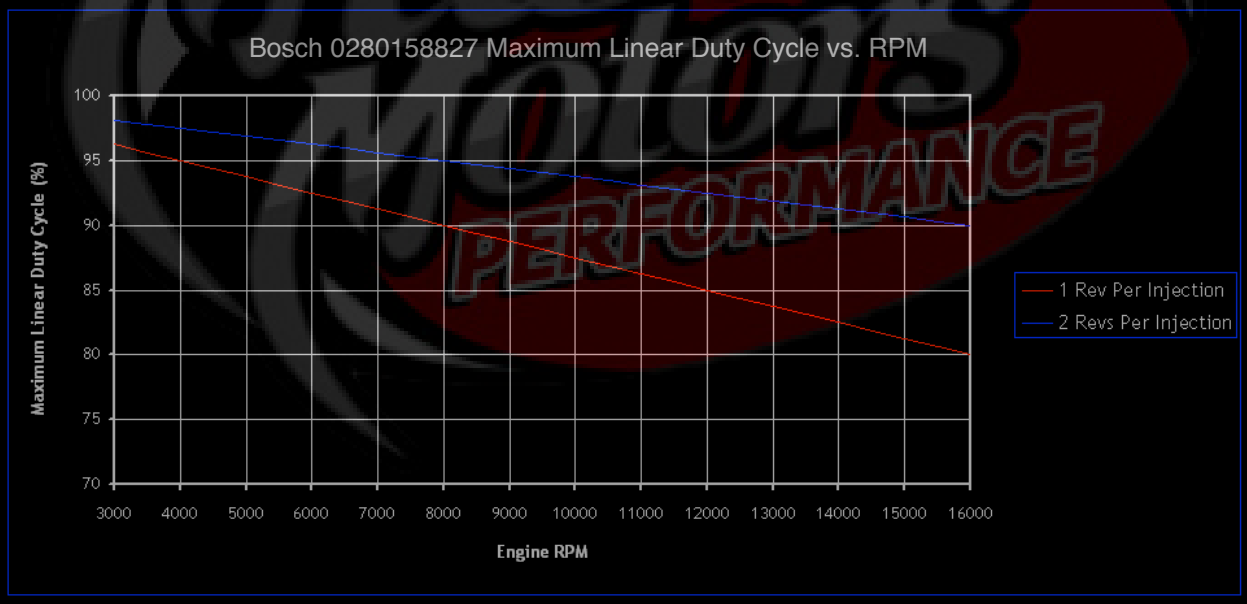






Maximum Linear Duty Cycle

The Maximum Linear Duty Cycle Graph shows the maximum duty cycle that can be achieved while still maintaining linear output. Note that this value is both RPM and firing arrangement dependent.



Dynamic Flow Rate and Dead Time Summary

Dynamic flow rate and dead time values across the voltage and pressure range.

Bosch 0280158827 Dynamic Flow Data						
Fuel Pressure (psid)	Dead Time (usec)					Flow Rate (cc/min)
	8 Volts	10 Volts	12 Volts	14 Volts	16 Volts	
43.5	1545	1065	795	615	505	1640
45.0	1565	1070	800	615	505	1665
50.0	1620	1100	815	625	515	1750
55.0	1680	1130	830	635	520	1825
60.0	1740	1160	855	650	535	1905
65.0	1800	1200	880	675	555	1980
70.0	1860	1235	905	700	580	2050
75.0	1920	1275	935	720	600	2120
80.0	1980	1310	965	740	615	2185
85.0	2045	1345	1000	760	630	2245
90.0	2130	1380	1025	780	645	2305
95.0	2230	1420	1045	805	660	2365
100.0	2340	1460	1070	830	680	2420
105.0	2455	1510	1105	860	700	2480
110.0	2570	1570	1140	890	725	2535
115.0	2700	1630	1175	920	745	2590
120.0	2860	1695	1210	940	760	2640
125.0	3040	1760	1245	955	765	2680
130.0	3240	1825	1275	965	770	2720