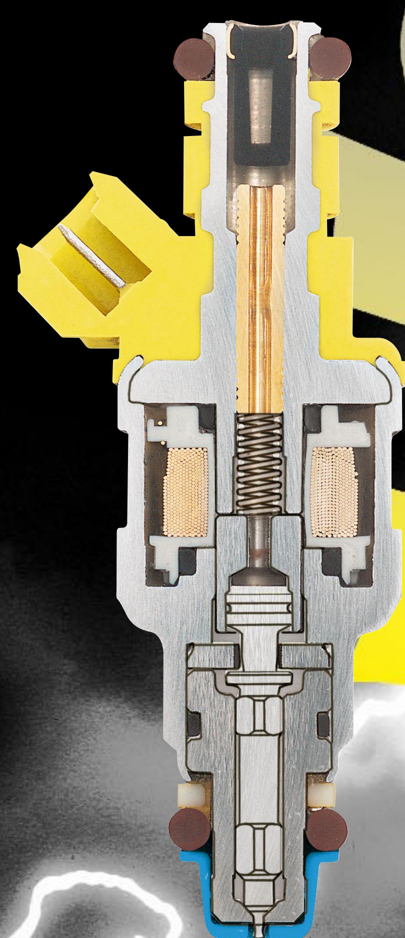
ACCEL®

PERFORMANCE FUEL INJECTOR PROGRAM

ACCEL Performance Fuel Injectors provide precise control of fuel delivery and atomization for increased power, improved throttle response and better fuel economy.



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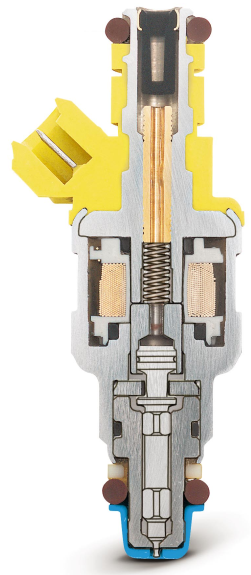
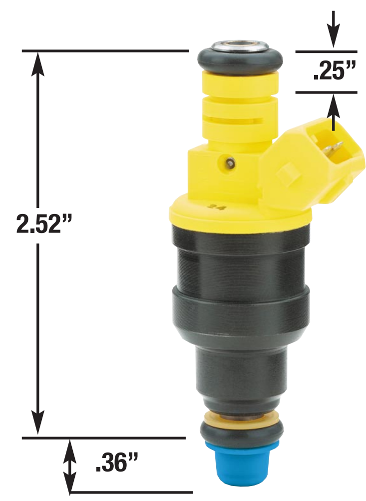


Featuring a high-impedance design to function properly with the specified vehicle's ECUs, ACCEL's Performance Fuel Injectors are all-new units, not remanufactured from used cores. They utilize a precision-ground Bosch-style pintle design, which produces a wide-angle conical spray pattern of 150 micron diameter droplets, providing an ultra-fine fuel atomization and maximum emulsification for improved burn efficiency. This pintle design also produces a more accurate and consistently more repeatable fuel flow control than either the ball valve seat/deflector plate or disk injector designs. ACCEL Performance Fuel Injectors are 100% flow tested, balanced and matched to within +/- 1.5% of their nominal pound/flow rating.

ACCEL Performance fuel injectors also feature an anti-plugging vapor cap that virtually eliminates carbon build-up. ACCEL's low-mass internal needle valve and high-pressure spring assembly ensure faster response time and greater dramatic response range. These Injectors also feature their noted flow rating permanently laser etched into the ACCEL-yellow molded top for the unmatched combination of great looks and instant recognition. They come complete and ready for installation with precision-molded O-rings and fine mesh fuel strainers.

ACCEL Performance Fuel Injectors are available in the 13 different pound flow ratings from 14 lbs./hr to 48 lbs./hr. They come packaged in sets of 4, 6 and 8 packs to cover the most popular car, truck and SUV applications.



ACCEL Performance Fuel Injector Program Technical data and specifications.

ACCEL Indivigual Injector Catalog p/n	Catalog lbs/hr Flow Rating or 39.7 PSI	Static lbs/hr Flow Rating @ 2.7 BAR or 44.1 PSI	Static lbs/hr Flow Rating @ 3.0 BAR or 44.1 PSI	Static cc/min Flow Rating @ 3.0 BAR or 44.1 PSI	High Impedance Resistance Ohms
150114	14	13.4	14.1	137	14.4
150115	15	14.6	15.4	149	14.4
150117	17	16.4	17.3	168	14.4
150119	19	18.2	19.2	186	14.4
150121	21	20.0	21.1	205	14.4
150123	23	21.8	23.0	224	14.4
150124	24	23.1	24.3	236	14.4
150126	26	24.3	25.6	249	14.4
150130	30	27.9	29.4	286	14.4
150132	32	30.3	32.0	312	14.4
150136	36	35.2	37.1	360	14.4
150140	40	37.6	39.7	385	12.0
150148	48	45.3	47.8	464	12.0

Applications

Cyl	Years	Application	Stock Replacement 4, 6 or 8 Pack	Plus Level 1	Plus Level 2	Plus Level 3	Plus Level 4	Plus Level 5	Plus Level 6	Plus Level 7	Plus Level 8	Plus Level 9
	Ford Cars											
4	1988-94	Tempo, Topaz 2.3L	150414	150415	150417							
	1991	Escort, Tracer 1.9L	150414	150415	150417							
	1987-90	Mustang 2.3L	150414	150415	150417							
6	1986-98	Taurus, Sable 3.0L exc. SHO & FFV	150614	150615	150617							
	1988-90	Taurus, Sable 3.8L	150614	150615	150617							
	1990-92	Probe 3.0L	150614	150615	150617							
	1992-94	Tempo, Topaz 3.0L	150614	150615	150617							
	1988-90	Thunderbird, Cougar 3.8L	150614	150615	150617							
8	1986-89	Thunderbird, Cougar 5.0L	150814	150815	150817	150819						
	1986-91	Crown Vic, Grand Marquis 5.0L	150814	150815	150817	150819						
4	1991-93	Mustang 2.3L	150415	150417								
	1992-96	Escort, Tracer 1.9L	150415	150417								
6	1994-98	Mustang 3.8L	150615	150617	150619	150621						
	1989-95	Taurus, Sable 3.8L	150615	150617	150619	150621						
	1991-95	Thunderbird 3.8L	150615	150617	150619	150621						
	1991	Cougar 3.8L	150615	150617	150619	150621						
	1996-97	Thunderbird 3.8L	150615	150617	150619	150621						
8	1986-95	Mustang 5.0L	150819	150821	150823	150824	150826	150830	150832	150836	150840	150848
	1991-93	Thunderbird 5.0L	150819	150821	150823	150824	150826	150830	150832	150836	150840	150848
	1991	Cougar 5.0L	150819	150821	150825	150824	150826	150830	150832	150836	150840	150848
6	1994-95	Taurus 3.8L Police	150621	150623	150624							

Applications

(continued)

Cyl	Years	Application	Stock Replacement 4, 6 or 8 Pack	Plus Level 1	Plus Level 2	Plus Level 3	Plus Level 4	Plus Level 5	Plus Level 6	Plus Level 7	Plus Level 8	Plus Level 9
Ford Cars *(continued)*												
8	1996-98	Mustang 4.6L SOHC	150821	150823	150824	150826	150830	150832	150836	150840	150848	
	1992-97	Crown Vic 4.6L SOHC	150821	150823	150824	150826	150830	150832	150836	150840	150848	
	1992-97	Grand Marquis 4.6L SOHC	150821	150823	150824	150826	150830	150832	150836	150840	150848	
	1991-94	Lincoln Town Car 4.6L SOHC	150821	150823	150824	150826	150830	150832	150836	150840	150848	
8	1993-95	Mustang Cobra 5.0L, Cobra R 5.8L	150826	150830	150832	150836	150840	150848				
	1993-98	Lincoln Mark VIII 4.6L DOHC	150826	150830	150832	150836	150840	150848				
	1993-98	Lincoln Continental 4.6L DOHC	150826	150830	150832	150836	150840	150848				
	1996-98	Mustang 4.6L DOHC Cobra	150826	150830	150832	150836	150840	150848				
6	1989-90	Thunderbird 3.8L SuperCoupe	150630	150632	150636	150640	150648					
	1989-90	Cougar 3.8L XR-7 Supercharged	150630	150632	150636	150640	150648					
6	1991-93	Thunderbird 3.8L SuperCoupe	150632	150636	150640	150648						
	1991	Cougar 3.8L XR-7 Supercharged	150632	150636	150640	150648						
6	1994-95	Thunderbird 3.8L SuperCoupe	150636	150640	150648							
Ford / Mazda Trucks												
4	1998	Ranger 2.5L	150414	150415	150417							
	1998	B2500	150414	150415	150417							
	1985-94	Ranger 2.3L	150414	150415	150417							
	1994	B2300	150414	150415	150417							
	1986-87	Aerostar 2.3L	150414	150415	150417							
6	1986	Bronco II 2.3L	150614	150615	150617	150619	150621					
	1986-92	Ford Ranger / Bronco II 2.9L exc. 1990 Calib. 58F, T, H, S	150614	150615	150617	150619	150621					
	1991-97	Ranger 3.0L	150614	150615	150617	150619	150621					
	1994-97	B3000	150614	150615	150617	150619	150621					
	1986-97	Aerostar 3.0L exc. 1990 Calib. 9-56J-R11	150614	150615	150617	150619	150621					
	1987-89	Ford E-250 Truck 4.9L	150614	150615	150617	150619	150621					
	1987-91	Ford E-, F- Series Trucks 4.9L	150614	150615	150617	150619	150621					
	1995-98	Windstar 3.0L	150614	150615	150617	150619	150621					
4	1995-97	Ranger 2.3L	150415	150417								
	1995-97	B2300	150415	150417								
6	1990-96	Ford E-, F- Series Trucks 4.9L	150615	150617	150619	150621						
	1995	Windstar 3.8L	150615	150617	150619	150621						
6	1990-92	Ranger 4.0L	150621	150623	150624	150626						
	1991-92	Explorer 4.0L	150621	150623	150624	150626						
	1991-92	Navajo	150621	150623	150624	150626						
	1990-95	Aerostar 4.0L	150621	150623	150624	150626						
	1996-98	Windstar 3.8L	150621	150623	150624	150626						
8	1985-96	Ford E-, F- Series Trucks 5.0L	150821	150823	150824	150836						
	1988-96	Ford E-, F- Series Trucks 5.8L	150821	150823	150824	150836						
	1996-99	Ford E-, F- Series Trucks 4.6L	150821	150823	150824	150836						
	1996-99	Expedition 4.6L	150821	150823	150824	150836						
	1996-99	Ford E-, F- Series Trucks 5.4L	150821	150823	150824	150836						
	1998	Expedition, Navigator 5.4L SOHC	150821	150823	150824	150836						
8	1988-91	Ford E-, F- Series Trucks 7.5L	150824	150826	150830	150832						
8	1992-97	Ford E-, F- Series Trucks 7.5L	150826	150830	150832	150836						
GM Cars												
6	1985-90	Celebrity 2.8L	150615	150617	150619	150621						
	1985-92	Camaro / Firebird 2.8L / 3.1L	150615	150617	150619	150621						
	1985-86	Cavalier, Citation 2.8L	150615	150617	150619	150621						
	1990-94	Lumina 3.1L	150615	150617	150619	150621						
	1990-93	Corsica / Beretta 3.1L	150615	150617	150619	150621						
	1991-94	Cavalier 3.1L	150615	150617	150619	150621						
	1985	Skylark 2.8L	150615	150617	150619	150621						
	1989-93	Century, Skylark 3.3L	150615	150617	150619	150621						
	1987-89	Century, Regal 2.8L	150615	150617	150619	150621						
	1989	Regal 3.1L	150615	150617	150619	150621						
	1990-93	Regal 3.8L	150615	150617	150619	150621						
	1985-86	Cimarron 2.8L	150615	150617	150619	150621						
	1989-93	Achiva, Calais, Ciera 3.3L	150615	150617	150619	150621						
	1985-87	Firenza 2.8L	150615	150617	150619	150621						
	1988-93	Cutlass Supreme 2.8L / 3.1L	150615	150617	150619	150621						
	1986-89	Ciera 2.8L	150615	150617	150619	150621						
	1991-94	Sunbird 3.1L	150615	150617	150619	150621						
	1992-93	Grand Am 3.3L	150615	150617	150619	150621						
	1987-93	Grand Prix 2.8L / 3.1L	150615	150617	150619	150621						
	1986-91	6000 2.8L / 3.1L	150615	150617	150619	150621						
	1985-86	Fiero 2.8L	150615	150617	150619	150621						
6	1993-95	Camaro / Firebird 3.4L	150617	150619	150621	150623						
	1994-96	Corsica / Beretta 3.1L	150617	150619	150621	150623						
	1995-99	Lumina / Monte Carlo 3.1L	150617	150619	150621	150623						
	1997-99	Malibu 3.1L	150617	150619	150621	150623						
	1994-98	Century, Regal, Skylark 3.1L	150617	150619	150621	150623						
	1994-98	Achiva, Ciera 3.1L	150617	150619	150621	150623						
	1993-97	Cutlass Supreme 3.1L	150617	150619	150621	150623						
	1997-98	Cutlass 3.1L	150617	150619	150621	150623						
	1994-99	Grand Prix, Grand Am 3.1L	150617	150619	150621	150623						
6	1995-99	Camaro / Firebird 3.8L	150619	150621	150623	150624	150626					
8	1985-92	Camaro / Firdbird 5.0L TPI	150819	150821	150823	150824	150826					
6	1991-95	GM 3.8L Series I Supercharged (1991-93 205hp, 94-95 225hp)	150621	150623	150624	150626	150630					
	1991-93	GM 3.4L DOHC (X) 215hp	150621	150623	150624	150626	150630					
8	1986	Corvette 5.7L iron head	150821	150823	150824	150826	150830					
	1989-91	Corvette 5.7L exc. ZR-1	150821	150823	150824	150826	150830					
	1989-91	Camaro / Firebird 5.7L TPI	150821	150823	150824	150826	150830					
8	1985	Corvette 5.7L TPI	150824	150826	150830	150832	150836					
	1986	Corvette 5.7L Aluminum head TPI	150824	150826	150830	150832	150836					
	1987-88	Corvette 5.7L TPI	150824	150826	150830	150832	150836					
	1987-88	Camaro / Firebird 5.7L TPI	150824	150826	150830	150832	150836					
	1992-93	Corvette 5.7L LT-1	150824	150826	150830	150832	150836					
	1993	Camaro / Firebird 5.7L LT-1	150824	150826	150830	150832	150836					
8	1994-96	Corvette 5.7L LT-1	150826	150830	150832	150836	150840					
	1994-97	Camaro / Firebird 5.7L LT-1	150826	150830	150832	150836	150840					
	1995-96	Impala SS & Full size 5.7L LT-1	150826	150830	150832	150836	150840					
	1996	Corvette 5.7L LT-4	150826	150830	150832	150836	150840					
	1996-97	Camaro / Firebird 5.7L LT-4	150826	150830	150832	150836	150840					
6	1984-85	Buick 3.8L Turbo (9)	150630	150632	150636	150640	150648					
	1986-87	Regal, GN 3.8L Turbo (7)	150630	150632	150636	150640	150648					
	1989	Trans Am Turbo (7)	150630	150632	150636	150640	150648					
GM Trucks												
6	1991-93	GMC Syclone/Typhoon 4.3L Turbo	150630	150632	150636	150640	150648					
European Cars												
6	1992-94	VW Corrado 2.8L VR-6	150621	150623	150624	150626						
	1993-96	VW Jetta 2.8L VR-6	150621	150623	150624	150626						
	1993-97	VW Passat 2.8L VR-6	150621	150623	150624	150626						
	1994-96	VW Golf 2.8L VR-6	150621	150623	150624	150626						
6	1994-97	Porsche 993 Carrera 3.6L (1994-95 270 hp, 1996-97 282 hp)	150624	150626	150630	150632						
6	1995-97	Porsche 993 Carrera 3.6L Twin-Turbo	150640	150648								

Note: The last two digits of the injector p/n's denote the flow rate.

Choosing The Correct Fuel Injector For Your Application

Fuel requirement in lbs./hr = (Max HP x BSFC) / (number of injectors x duty cycle)
Note: to convert from lbs./hr to the Metric measurement of cc/min, use this equation: [(lbs./hr) x 60] / 6.177 = cc/min

Max HP is a realistic horsepower estimate at the crankshaft or known value from engine dyno testing. Chassis dyno horsepower figures can only be used once you factor in the drive train losses, which can vary from vehicle to vehicle. Ask your chassis dyno operator to calculate the drive train horse power loss for your vehicle. Add the drive train horse power loss to the drive wheel horsepower to closely estimate crankshaft horsepower.

BSFC or brake-specific fuel consumption is the amount of fuel consumed per unit of power produced. It is an indication of the efficiency of the engine configuration and calibration. Actual BSFC is a function of compression, camshaft timing, cylinder head design, tune, ambient conditions, etc. The lower the BSFC number, the more efficiently the engine is making power. Engine dyno testing can provide exact BSFC data. To estimate the fuel requirements of your engine, use the examples below that best match your engine type. The reason we use a higher BSFC value to calculate fueling requirements for a supercharged engine is because of the parasitic losses or the power required to driving the supercharger that is never seen at the crank. In other words, a supercharged engine that dyno tests 450 hp at the crank, may actually be making 490 hp, but the supercharger and drive assembly is absorbing 40 hp, so you net out 450 hp. Also, the heating effect of pressurizing the intake charge in a non-intercooled system also increases the fueling requirement of a super/turbocharged engine. Always remember that too lean of a mixture can result in spark knock, high combustion temperatures and engine damage. It's smart to be slightly on the rich or safe side.

Engine type	Gasoline	Alcohol
High compression	0.45 to 0.55	0.90 to 1.10
Low compression	0.50 to 0.60	1.00 to 1.20
Super/Turbocharged	0.55 to 0.65	1.10 to 1.30

There is one other parameter involved in properly sizing fuel injectors: duty cycle. This is the percent of time that the injector is actually open (which is also referred to as pulse width) vs. total time between firing events. When an injector is open 100% of that time, the injector is in what is called a static condition. For road-racing engines that are at maximum power for extended periods of time, the desired maximum safe duty cycle is 0.85. This ensures that the injector is closed a sufficient time to keep it from overheating. For a typical street engine that spends less than 1% of its time at maximum power, you could argue that a higher duty cycle could be used to calculate fueling needs. Typically we would not do this because again we want to error on the safe side. Some may ask why not just install the biggest injector you can find. Well it's the same analogy of putting an 850cfm carburetor on a Chevette motor, overkill at best, more like a controlled leak. One other thing to remember is that an injector can only open and close so fast, this is called minimum dynamic flow range. If the ECU, in an attempt to lean out a rich mixture, selects a pulse width that is shorter than the injector's minimum dynamic flow range, the injector becomes inconsistent in its ability to supply the required fuel. This results in poor engine performance, surging and stumbling. In other words bigger isn't always better.

Let's calculate the fueling requirements of a few engines to illustrate what we have been talking about.

For the first example let's take a stock Ford 5.0L Mustang motor that makes an advertised 215 hp and look a the very conservative approach Ford used to calculate the injector size for the factory engine by using the O.E. typically safe 0.80 duty cycle limit.

Fuel injector size = (215 hp x 0.55) / (8 x 0.80) = 18.5 lbs./hr or the ACCEL p/n 150119 injector

Now let's upgraded the engine with more efficient GT-40 type components that will lower the BSFC and use a more realistic 0.85 duty cycle limit. Ford says this combination of GT-40 parts will produce about 275 hp. What injector size is required to support this?

Fuel injector size = (275 hp x.50) / (8 x 0.85) = 20.1 lbs./hr or the ACCEL p/n 150121 injector

Until now your only choice would have been to go with a 24 lbs./hr unit, which would be fine if the engine was making about 325 hp, but not ideal for 275 hp. Remember the comment about realistic horsepower; don't kid yourself! Now let's factor in an adjustable fuel pressure regulator as a tuning tool for this setup. By adjusting fuel pressure you can change the flow rating of a given injector. The calculation is simple, as long as you know the static flow rating of an injector at a specific pressure. For example ACCEL p/n 150121 flows 20.0 lbs./hr at 2.7 BAR or 39.6 PSI, which just happens to be where the stock Ford non-adjustable fuel pressure regulators are preset. As a point of reference, most GM factory fuel pressure regulators are preset at 3.0 BAR or 44.1 PSI. If we were to increase the fuel pressure from 39.6 PSI to 45 PSI, what will be the new flow rating of the ACCEL p/n 150121 injector?

New flow rating = [square root of (new pressure /old pressure)] x old flow rating
New flow rating = [square root of (45 PSI / 39.6 PSI)] x 20.0 lbs./hr = 21.3 lbs./hr

This increase in flow rating would support about 15 additional horsepower on our GT-40 engine. An adjustable fuel pressure regulator is an excellent tuning tool as long as the fuel pressure does not exceed 55 PSI, which is the limit that the stock fuel line fittings are designed to handle. So let's say we increase the fuel pressure up to 55 PSI, then the ACCEL p/n 150121 injector would be flowing 23.6 lbs./hr. But because ACCEL offers p/n 150123 that flows 23.1 lbs./hr at 39.6 PSI and 150124 that flows 24.3 lbs./hr at 39.6 PSI, radical increases in fuel pressure are not required to find the perfect match for your engine. The key is to make power efficiently, choosing the correct injector for your intended needs and using the adjustable pressure regulator as a fine tuning tool.

For the third example let's use Ford's new 392 crate motor p/n M-6007-A392. Out of the crate, using a 750cfm carburetor, this engine dyno tested at 453 hp with a .454 BSFC. Let's calculate the injector size you would need if the 392 were to be fuel injected.

Fuel injector size = (453 hp x 0.454) / (8 x 0.85) = 30.2 lbs./hr units or the ACCEL p/n 150130 injector.

As a point of reference, this same 392 crate engine has made over 530 hp on a dyno with Air Flow Research 185cc heads vs. stock GT-40X heads. To support this new-found power, using the same equation, larger 35.2 lbs./hr units or the ACCEL p/n 150136 would be needed. So when calculating injector size, if you are planning on large power adders in the future, keep in mind that you may have to upgrade your injector size. Just like if you might have had to put a bigger carburetor on a modified motor in the past.

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