



N O S T R U M

H I G H P E R F O R M A N C E

BMW N55 HIGH PRESSURE FUEL PUMP DEALER TUNING GUIDE

BMW N55 3.0L BB PART #: H086-0715

734-548-8677
support@nostrumshop.com



1145 Oak Valley Drive, Suite B, Ann Arbor, MI 48108 | 734-548-8677 | support@nostrumshop.com

WWW.NOSTRUMSHOP.COM

BMW N55 3.0L

HIGH FLOW HIGH PRESSURE FUEL PUMP KIT

INSTALLATION INSTRUCTIONS

BMW N55 3.L KIT PART #: H086-0715

BMW N55 DIT FUEL SYSTEM OVERVIEW & DEALER TUNING GUIDE

The N55 engine found on BMW 435 vehicles utilizes direct injection which injects fuel at up to 20MPa (200Bar, or ~2900 psi) directly into the combustion chamber of the engine. In order to achieve these pressures, the powertrain utilizes a low-pressure and high-pressure fuel system.

The low-pressure system consists of one 12-volt in-tank pump which maintains approximately 5 bar fuel pressure at the inlet of the high-pressure fuel pump (HPFP). The HPFP then increases that pressure to up to 20 MPa at the fuel rail. This is done via a piston that follows a specialized lobe on the camshaft. The piston in the HPFP moves a fixed volume of fuel per stroke, determined by its displacement and when fuel demand is low, excess fuel is returned back to the inlet of the HPFP via a control solenoid. This solenoid returning fuel to the low pressure side of the pump is how the ECU controls the rail pressure, and if unplugged or failed in any way, it will default to open and the pressure on the outlet side of the pump will be the same as the inlet side (~.5MPa) . Additionally, the fuel pump contains an internal bypass valve: This bypass valve is a mechanical device built into the body of the HPFP and, on the Nostrum HPFP, it is set to open at pressures above ~27 MPa. This means that no matter what, fuel pressure cannot increase past the point where the bypass valve opens. The bypass valve is a safety device intended to prevent over-pressure of the high-pressure fuel system, and as such should not be relied upon for pressure control: doing that will cause its internal spring to weaken, making the valve open at increasingly lower pressures.

WHAT IS THE NOSTRUM HIGH PERFORMANCE FUEL PUMP?

The Nostrum HPFP is a complete fuel pump upgrade that replaces the OEM pump for a larger unit, flowing approximately 64% more fuel per stroke. The upgraded pump is 100% Ethanol compatible to ensure longevity when running E85. It is a direct bolt-on component that installs in the factory location (always refer to the installation guide) but it does require calibration changes in order to work.

LIMITATIONS OF THE STOCK FUEL SYSTEM

The HPFP is directly driven by the camshaft meaning that pump speed and its ability to move fuel increases and decreases with engine speed. Therefore, the capacity of the HPFP is lowest at low engine speeds and highest at high engine speeds. If a loss of fuel rail pressure is observed at low RPMs it is likely that the maximum capacity of the HPFP has been exceeded at that engine speed. Conversely, the low-pressure fuel pump operates independently of engine speed and has a constant maximum flow rate. If fuel rail pressure drops at high RPMs, when horsepower and thus fuel demand are at their highest, the maximum capacity of the low-pressure pump has been exceeded. In order to take full advantage of the Nostrum HPFP it is recommended that you upgrade your in-tank fuel pump.

Nostrum does not currently offer an in-tank pump upgrade however we recommend replacing the in-tank pump for a larger unit and are currently running a Walbro 485 pump in our development engine.

.....
THIS DOCUMENT IS CONFIDENTIAL AND ONLY INTENDED FOR NOSTRUM HIGH PERFORMANCE DEALERS.
.....

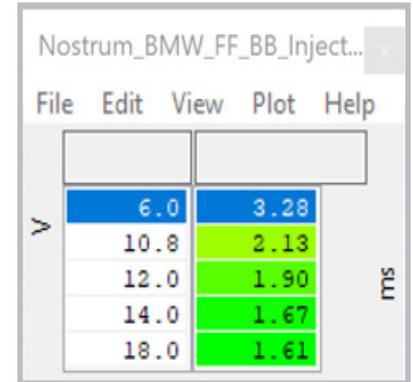
CONFIDENTIAL



TUNING OF THE HIGH PERFORMANCE FUEL PUMP

The following changes are ***required*** before the vehicle can be started and run: Under “Fuel System”, “High Pressure”, “Mass Flow Valve”:

MFV Delay Time: This accounts for the larger pump’s control solenoid’s 15% greater latency.

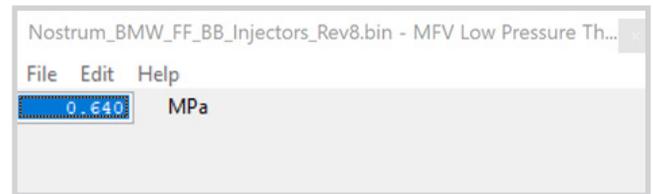


V		
6.0	3.28	ms
10.8	2.13	
12.0	1.90	
14.0	1.67	
18.0	1.61	

MFV Hold Current Minimum: The pump requires over 3A hold current. We use 3.2A in our calibration:



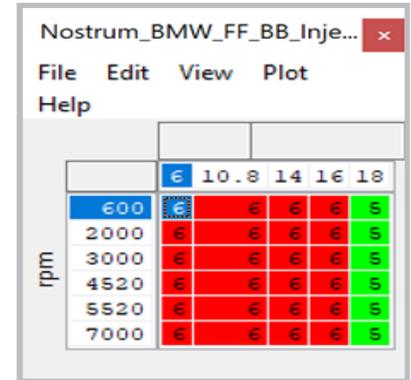
MFV Low Pressure Threshold: This is lowered to 0.640MPa so the valve is actuated at lower pressures than stock.



MFV Low Pressure Threshold: This is lowered to 0.640MPa so the valve is actuated at lower pressures than stock.



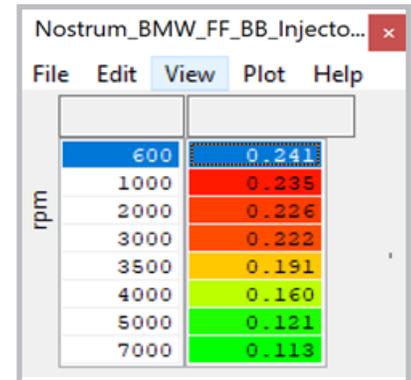
MFV Pullin Current Minimum: The nostrum HPFP requires a minimum of 6A pull-in current in order to open.



	6	10.8	14	16	18
600	6	6	6	6	6
2000	6	6	6	6	6
3000	6	6	6	6	6
4520	6	6	6	6	6
5520	6	6	6	6	6
7000	6	6	6	6	6

Under: "Fuel System", High Pressure", "Fuel Rail Pressure Control":

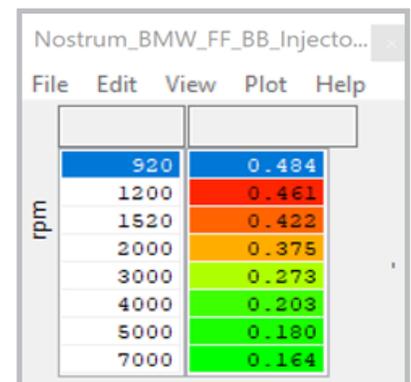
HPP Feedforward Angle Slope: This accounts for the larger fuel volume moved by the Nostrum HPFP:



600	0.241
1000	0.235
2000	0.226
3000	0.222
3500	0.191
4000	0.160
5000	0.121
7000	0.113

Note that this table is calibratable depending on how good your fuel pressure control is. We found the values above to work well in our development vehicle. Lowering these numbers will decrease the amount of fuel delivered; it is possible to determine if the numbers being run are on the high side or low side by looking at what the fuel pump Proportional and Integral gains are doing.

HPP Proportional Gain: This is also reduced since the pump flows more fuel, and needs smaller angle changes to do so.



920	0.484
1200	0.461
1520	0.422
2000	0.375
3000	0.273
4000	0.203
5000	0.160
7000	0.164

THIS DOCUMENT IS CONFIDENTIAL AND ONLY INTENDED FOR NOSTRUM HIGH PERFORMANCE DEALERS.

CONFIDENTIAL



Fuel Rail Pressure

It is recommended that the fuel pressure target not be increased much beyond stock values. The HPFP's built-in mechanical bypass will relieve pressures above approximately 27 MPa. This bypass valve ensures that the fuel rail does not reach pressures higher than what the fuel injectors can open at, or even pressures high enough fail fuel system components.

At Nostrum we recommend treading carefully when attempting to command fuel pressures in excess of the factory's 20 MPa and watching for signs that you may be hitting the fuel pump bypass, such as an inability to reach target pressure or maintain stable pressure under load. Furthermore, constant stress on the internal bypass can fatigue the spring ultimately causing it to open at lower pressure and further lowering the maximum pressure of the pump

.....
THIS DOCUMENT IS CONFIDENTIAL AND ONLY INTENDED FOR NOSTRUM HIGH PERFORMANCE DEALERS.
.....

CONFIDENTIAL

