



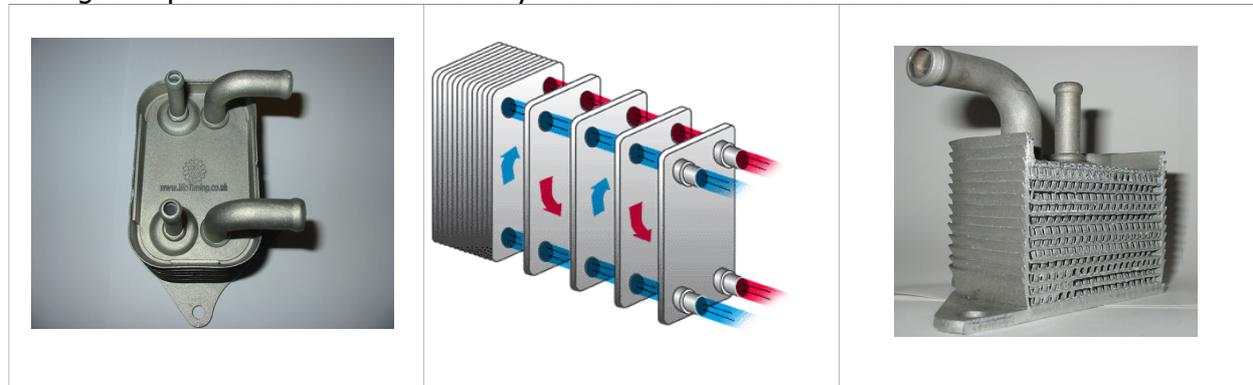
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## **Heat Exchanger Fitting Instructions** (HE3 v1.1)

### **About the BioTuning Heat Exchanger**

BioTuning heat exchangers are designed especially for use in vegetable oil conversions. They are constructed of aluminium for the best chemical compatibility with vegetable oil, coolant, biodiesel and diesel. They are sized for maximum heat output from a very compact size and have hose ports arranged for the greatest flexibility making them great for retro-fit in diesel cars where space is limited. They are built to very high specification for automotive applications. The maximum fuel and coolant pressure exceeds 50bar (725 psi).

Being brazed plate heat exchangers, they internally have many alternating narrow plates. There are six plates for the vegoil which are sandwiched between neighbouring plates of hot coolant. To increase the heat transfer surface further and to give better internal strength there is a continuous array of baffles between each plate. As well as increasing the surface area they induce mixing of the fluids to ensure thorough heating within each layer to give the greatest heat transfer. One other advantage of this type of heat exchanger is that the plates are arranged in parallel so that there is very little resistance to the flow of fuel and coolant.



As shown in the figure above, it is best to have the coolant and the vegoil flowing in opposite directions to get the greatest heat transfer.

### **Installing the BioTuning Heat Exchanger**

Installing the heat exchanger is a matter of mounting it in a suitable location, preferable below the coolant header tank<sup>1</sup> and routing the coolant and the fuel through it. The heat exchanger should not be mounted in a location where it, or the hoses connected to it, will be vibrating when the engine is running. Nor should it be mounted with the hoses under tension.

The heat exchanger should be installed in the fuel line after the fuel filter and as close to the injector pump as possible to attain the maximum heat where it is needed most. If running a twin-tank system, the heat exchanger should be installed between the heated fuel filter and the fuel select valve to ensure the vegoil is heated and not the diesel (although it is possible to run on heated diesel it is better not to). It is also possible to install the heat exchanger before the filter if a heated filter is not being used. If doing this, it should be noted that it can take some time for the heat to get through to the injector pump due to the capacity of the filter needing to be heated first. Also note that the oil must be filtered well to prevent any particles becoming clogged between the plate baffles of the heat exchanger. The fuel fittings on the heat exchanger are for 8mm (5/16") ID for hose. The hose can be clamped onto the hose tails using jubilee type hose clips.

1. If mounted above the header tank it is possible to flush through any airlocks by momentarily parking on a slope and revving the engine

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BioTuning accept no liability for any personal injury or problems encountered as a consequence of following this fitting guide. Persons fitting a BioTuning heat exchanger do so at their own risk.

The coolant should be supplied to the heat exchanger from the hoses that run to the internal heater matrix. These can be identified as the pair of hoses that run through the bulkhead towards the interior of the vehicle. They are typically either 16mm or 19mm internal diameter and should both be cut and teed to create a parallel circuit of coolant that runs to the heat exchanger. The coolant fittings on the heat exchanger are for 12mm (1/2") ID hose so it is likely to need reducing hose fittings in order to run new coolant lines to the heat exchanger.



Locate the hoses that run through the bulkhead to the internal heater matrix.



Cut into both hoses, collect any coolant that escapes in a container.



Fit tees into the hoses and run two new coolant lines to the heat exchanger.

With a cold engine, locate the coolant hoses running through the bulkhead into the comfort heater matrix inside the vehicle. Start the engine and turn the heat up to maximum and the fan speed to maximum. Feel the two hoses near the bulkhead. As soon as the hoses start to become slightly warm, determine which hose is the warmest. Turn off the engine. Make a note of this warmer hose; this is the one leading to the heater matrix, the other is the return from the matrix.

Do not progress with the next step unless the engine coolant is cold – feel the hoses to make sure you will not get scalded. Using hose clamps, clamp off the coolant lines to the heater matrix or alternatively use a suitable container to drain the coolant water to below the level of the heater hoses just before they enter the bulkhead, keep the coolant that is drained to top up the expansion tank later.

Once the coolant has been drained, cut the heater hoses in a straight section close to the bulkhead using a hose cutter or sharp knife. Slip over the hose clips and insert the male branch tee or reducing tee as required to connect the hose run to the new components. If using a branch tee, screw on the swivel nut hose tail. Insert the new coolant hose and tighten down the hose clips. Run the new heater line from the hose supplying the heater matrix to the heat exchanger, then to the heated filter and back to the tee in the heater matrix return line. Secure all connections with hose clips. Top up the coolant and start the vehicle. Check for leaks and tighten clips if required.

The fuel should flow in the opposite direction to the coolant within the heat exchanger to obtain the greatest heat possible from the heat exchanger.

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