



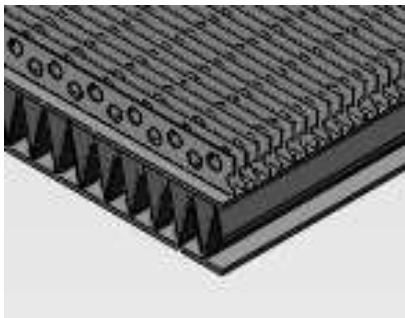
## Core Selection

At the heart of every intercooler resides the air-to-air core. The air-to-air core is the component of the system that exchanges hot charged air from the turbocharger for cooler air which enters your engine, the cooler the air entering your engine the more horsepower that can be extracted. With three different intercooler cores to choose from; Perforated cores, MDC (medium-density core) and HDC (High-Density Core), Treadstone has the core to suit your intercooling and turbocharging needs.

Each of the three cores has a verity of advantages when it comes to cooling efficiency, pressure drop and Airflow. To achieve this each core incorporates different technologies to maximize performance. To aid in the selection of the core Treadstone Performance Engineering has made a comparison to the three cores we offer. This article shows the difference between each of the cores and a brief summary of the different technologies incorporated within. Also included is the TRE Performance Scale which is for comparison purposes only it measures performance of the core when compared to the other cores Treadstone Performance Engineering offers, not the actual performance of the cores themselves, this helps distinguish each core. When choosing a core it is imperative to choose depending on your goal, when all components are working with each other in perfect automotive harmony producing a mechanical symphony in the form of unparalleled performance from your turbo system. ☺

<sup>2</sup> TRE Performance Scale(this scale is for comparison purposes only it measures performance of the core when compared to the other cores Treadstone Performance Engineering offers, not the actual performance of the cores themselves)

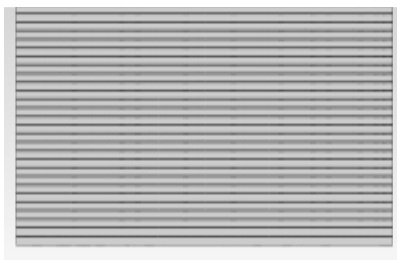
### Perforated Core:



The Perforated Fin is the entry level core that offers very little pressure drop and an unobstructed straight through design. These perforation offer increased surface area without airflow obstructions, which help maintain high air velocity and decreased pressure drops. The straight through design offers increased airflow, but have less fpa (fins per area), fins which aid in the cooling process.

#### Benefits:

- Low pressure drops, small airflow obstruction
- Low surface area, low cooling efficiency
- High airflow (straight through design)



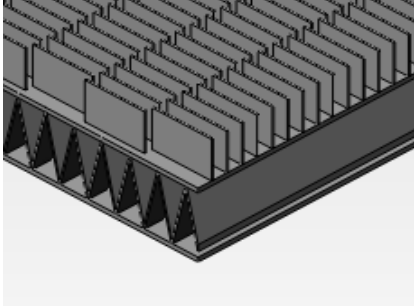
High Air Velocity→High Flow

TRE Performance Scale (1: low to 3: high)<sup>2</sup>:

Efficiency:	1
Pressure Drop:	1
Airflow:	3

Without these perforations, air would have a straight passage way through the core, and will do little to scrub the heat out of the high temp boosted air. The TR8L utilizes a perforated design and is used in our 350Z turbo kit where were only running 8-10psi, and do not need the extra cooling efficiency of the MDC structure. With this core design we have optimized the turbo system creating a very low pressure drop through the intercooler

### MDC (Medium-Density Core):



The Medium Density Cores or MDCs are the intermediate cores that Treadstone offers, they given the name due to their staggered set of 10mm long fins compared to the high density's 3.5" long fins. This core offers very moderate pressure drop with an increased cooling capacity (compared to perforated cores)

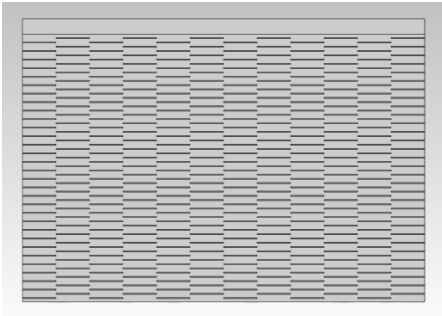
MDC is the name given to medium density fin intercoolers. They are known as medium density fin intercoolers because of the 10mm long alternating fins and a 10 fins per inch which offer a larger increase in surface area, which add to the cooling capacity with a minor pressure drop.

#### Benefits:

- Little pressure drops (less airflow obstruction)
- Larger Increased surface area (compared perforated fins)
- Increased cooling capacity (increased contact area)

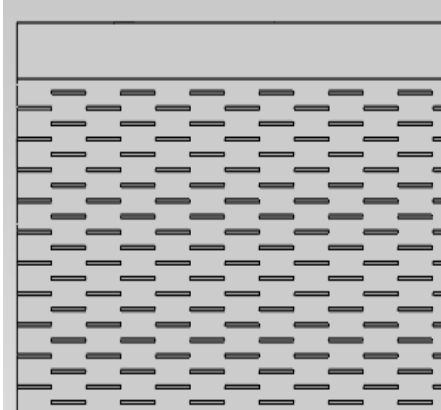
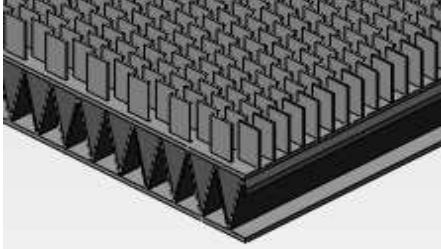
TRE Performance Scale (1: low to 3: high)<sup>2</sup>:

Efficiency:	2
Pressure Drop:	2
Airflow:	1



MDCs offer a well balanced FPA and are optimized between pressure drop and flow when using a horizontal flow intercooler. This style core is most common among our intercooler line, and is used in all of our universal horizontal flow intercoolers with a few exceptions when we opt for a perforated design like in the TR8L. Due to the increase in FPA, this core has a reduced average air velocity and lower flow rate (compared to perforated cores) which translates into a minor pressure drop. With proper turbo and component matching this slight pressure drop can be compensated for when running boost pressures in excess of 20-30psi. A 22" long core length is standard among our line up, and boost pressures are easily cooled to 95% of ambient air temp when using a MDC intercooler when running 20-30psi.

### HDC (High-Density Core):



The HDCs or High Density Cores are cores provide maximum cooling efficiency. The HDCs are given the name High density due to the increased FPA which is accomplished through the use of staggered fins 3.5mm long. This core offers superior cooling capacity with moderate pressure to drops.

HDC is the name given to the high density fin cores. The fins much like the MDC mentioned above which offer alternating fins every 3.5mm and 10 fins per inch for increased surface/contact area at this allows the core to be the most efficient core Treadstone offers.

#### Benefits:

- Increased cooling capacity (compared to the MDCs)
- Most efficient at reducing heat
- High FPA (fins per area)

TRE Performance Scale (1: low to 3: high)<sup>2</sup>:

Efficiency:	3
Pressure Drop:	3
Airflow:	1

HDCs are an ideal solution for those customers who need a maximum cooling rate in a small given area. These are mainly used on short runner intercoolers 6-12" runner length, which are considered our vertical flow intercoolers. Vertical flow intercoolers have very low pressure drop because of the short runner length, and are commonly used on Supercharger applications, or turbo systems with low to moderate boost 8-18psi, widely used on many V8 engines.

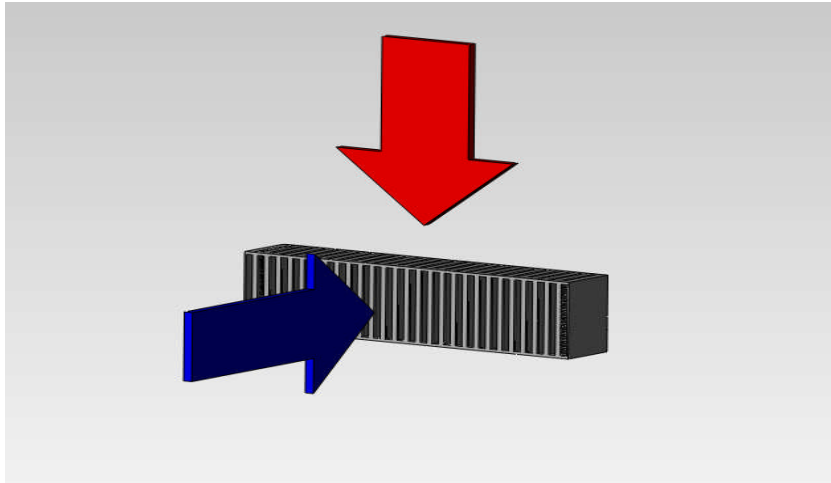
The HDC's FPA is the largest of all the three cores available, the larger the FPA the larger the cooling the core is able to achieve. Due to the increase in FPA and contact area the HDC does exhibit an increased pressure drop and lower flow rate when compared to perforated or MDC (medium density core) style intercoolers.

## Horizontal Design Vs. Vertical Design

Vertical and horizontal flow cores that are manufactured exhibit different internal fin design characteristics. Horizontal flow coolers have long runner lengths which translate higher pressure drop through the core, while the vertical cores have short runner lengths and lower pressure drops. Inversely, vertical flow intercoolers have lower cooling efficiency compared to a longer runner horizontal flow. This balance between efficiency and flow is where intercooler selection becomes not so easy. By understand this, a prober intercooler can designed and constructed to match the performance criteria. Also, by changing the density of our internal fin structure for any given intercooler the efficiency of the intercooler changes accordingly. By manipulation the parameters (such as fin density, length, height and core depth) of the inter coolers Treadstone Performance Engineering can design a intercooler that suit your needs.

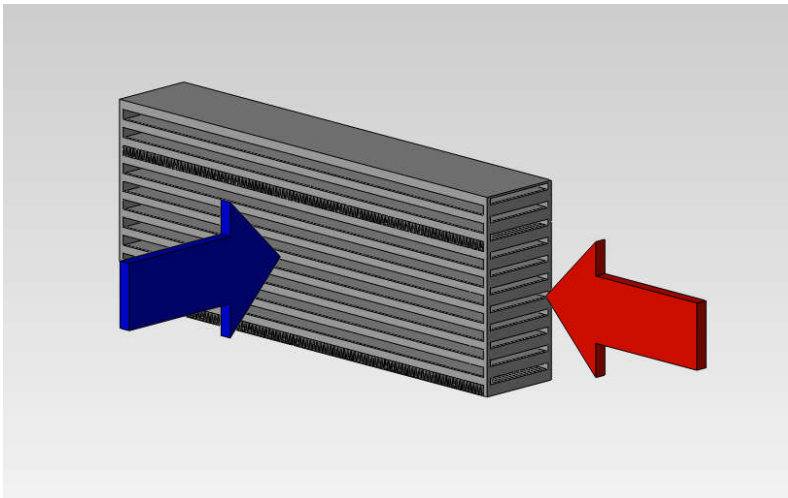
### Vertical Core

Many vertical cores that we manufacture are designed for larger displacement motors that do not require high boost pressures, therefore we need a dense internal fin design to extract all the heat we can, as the air passes through 6-10" of core length.



### Horizontal Core

Many smaller displacement motors 1.6L to 3.0L will require higher boost pressures 15psi and above, to achieve the power levels one is looking for. With this higher boost pressure means higher compressor outlet temp, and we need to cool this air over a longer runner length of intercooler. Making the runner length longer means higher pressure drop through core, and this is something that robs us of power. Manufacturing a slightly less dense core than our vertical flow cores, we can still have low pressure drop through core, while still extracting as much heat as possible



### Pressure drop

With all Turbocharged Systems pressure drops are to be expected, the difference in pressure on either sides of the intercooler is what's called pressure drop. The more air you try to force through an intercooler the more pressure drop it will have. With a well designed system matched to the specific application, we can optimize the performance gain from your intercooler. Basically the rating on our intercoolers for pressure drop is 1.5cfm is to 1Hp, and this rating is at less than 1.5 psi pressure drop through the core. So if you car is making 300hp, your flowing 450 cfm through the core. If this flow # is less than the rating on our core, then you have a pressure drop through the core less than 1.5psi, and your operating efficiently. Exceeding this figure is not detrimental, and it is done all the time, we just try to give the most efficient rating figure for our intercoolers.