

#### NRF TECHNICAL ARTICLE

## NOT ALL RADIATORS ARE THE SAME

### THE DIFFERENCE BETWEEN BRAZED AND MECHANICALLY ASSEMBLED RADIATORS



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#### THE (AFTERMARKET) OFFER

> There are two types of radiators. A mechanically assembled (usually cheap) radiator and a brazed radiator. Both of these radiators are used by car manufacturers. When replacing a radiator, the new radiator specifications (material, technology and dimensions) have to be equal or better than the original part. Only in case when the replacement radiator is brazed and the original one was mechanically assembled it is acceptable that the core thickness is slightly smaller. This is because a brazed radiator has up to 60% more cooling performance.

> In case of a retrofit trailer hitch installation and/or engine performance tuning it is recommended to check the radiator for possible replacement for a high performance brazed version.

#### ENGINE COOLING BASICS

When an engine is in use, it produces a lot of friction and heat. Temperatures may increase to more than 1500 °C. The engine (parts) that are subjected to such temperatures must be effectively cooled to prevent overheating. If the engine temperature should be too low, fuel economy will suffer and emissions will rise. The engine cooling system keeps the engine at a constant temperature. An essential part is the radiator.

#### THE RADIATOR

> The radiator is connected to the engine with channels through which a liquid (engine coolant) is pumped. The circulating coolant receives the combustion heat and has to cool down by the radiator. The radiator has a series of thin tubes where the coolant flows through. By a continuous air flow the coolant is cooled down. This results in a constant engine temperature and prevents the engine from overheating. The radiator is placed in the front of the vehicle, often attached to other heat exchangers, such as the intercooler or condenser.

#### THE DIFFERENCE BETWEEN BRAZED AND MECHANICALLY ASSEMBLED RADIATORS

A radiator consists of tubes with fins in between. The (hot) coolant passes through the tubes. The fins provide the heat transfer from the tubes into the air stream. There are two ways in which radiators are produced:

> In a brazed radiator the fins and tubes are brazed in an oven. This creates a metal connection. Due to this brazed connection an optimal heat transfer is being created. The tubes of this type of radiator are often flattened. This creates a larger cooling surface. NRF radiators are soldered according to the Nocolok® brazing technology.

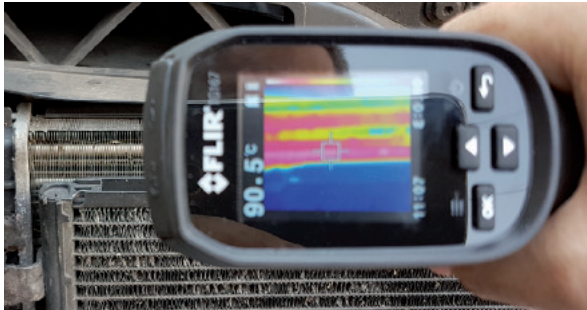
Mechanically assembled radiator > Round tubes, no fixed connection between tubes and fins. Lower cooling performance.



Brazed radiator > Flattened tubes, brazed connection between tubes and fins. High cooling performance



Temperature test > Minimum heat transfer visible in the mechanically assembled radiator test.



> The other type of radiator is the mechanically assembled radiator. The difference with a brazed one is the cost and energy saving production method, because these radiators are not soldered. The tubes are always round. These round tubes are inserted throughout the fins pack. There always will be a tiny gap between the tubes and fins. This automatically results in a much lower (up to 60%!) heat transfer compared with a brazed radiator

#### **FINAL CONCLUSION**

If a vehicle engine originally has been equipped with a mechanically assembled radiator, then the same type can be used for repair. If the original radiator was a brazed radiator, then the assembly of a brazed radiator is highly recommended! It is likely that the engine can operate in such a thermal stress condition where the mechanically assembled radiator is unable to provide an optimal cooling.

A brazed radiator is usually a bit more expensive than a mechanically assembled radiator, but is a safer, stress-free and long-term solution. NRF has a product range of more than 3,000 brazed radiators.

