ENGINEERING REPORT

2023+ Nissan Z Heat Exchanger | SKU: MMHE-Z-23

By: Ye Liu, *Mishimoto Product Engineer*

REPORT AT A GLANCE

- **Goal:** Create a direct-fit heat exchanger for the water-to-air intercooler system that outperforms the stock heat exchanger.
- **Results:** Compared to the stock heat exchanger, the Mishimoto heat exchanger increased core volume by 172% and reduced outlet temperature by 10°F during heat soak testing.
- **Conclusion:** The Mishimoto heat exchanger is a well-rounded upgrade for Z owners seeking to maximize performance while preserving a clean, OEM-like fitment.

CONTENTS

DESIGN OBJECTIVES

- Create a heat exchanger that outperforms the stock counterpart in cooling capacity
- A direct-fit design with no permanent modification required for installation
- Maximize the heat exchanger's core volume
- Optimize inlet and outlet port locations to ensure proper air bleeding
- Full aluminum construction with TIG-welded end tanks

DESIGN AND FITMENT

The Nissan Z platform employs a water-cooled charge air cooler (CAC). The CAC charging system has an independent cooling water circuit and circulates coolant from the charge air cooler to the CAC heat exchanger, powered by electric water pumps.

The stock heat exchanger core measures 429mm x 220mm x 16.4mm. After evaluation of the available design space, we chose an oversized core dimension of 430mm x 306mm x 32mm. At 172% core volume gain, the Mishimoto heat exchanger increases coolant capacity over the stock cooler by approximately 0.3 qt.

The Mishimoto heat exchanger reuses stock rock guard and provides a bleeder screw on top of the driver-side end tank which can be accessed without removing the front bumper.

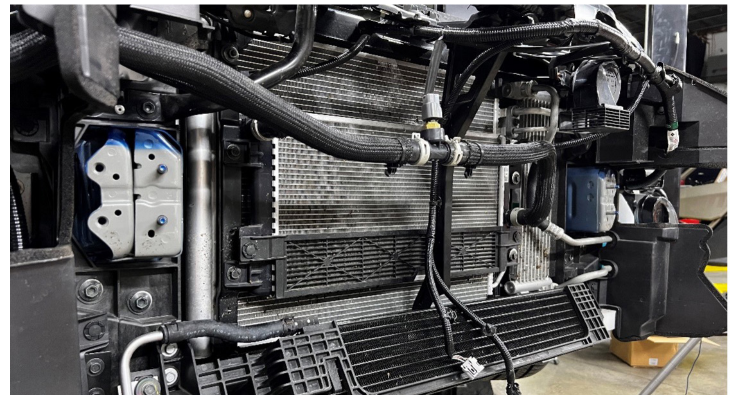

Figure 1: *Stock CAC heat exchanger*

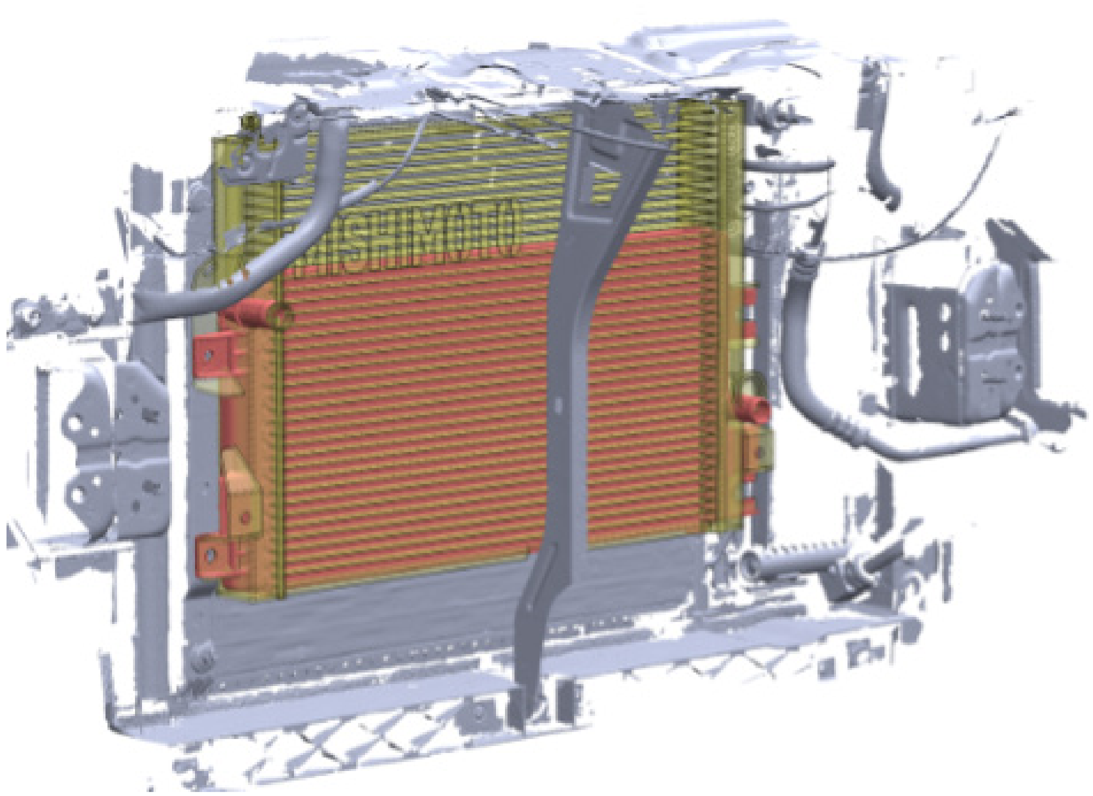

Figure 2: *Mishimoto heat exchanger overlaid by a 3D scan image of the stock heat exchanger (shaded red)*

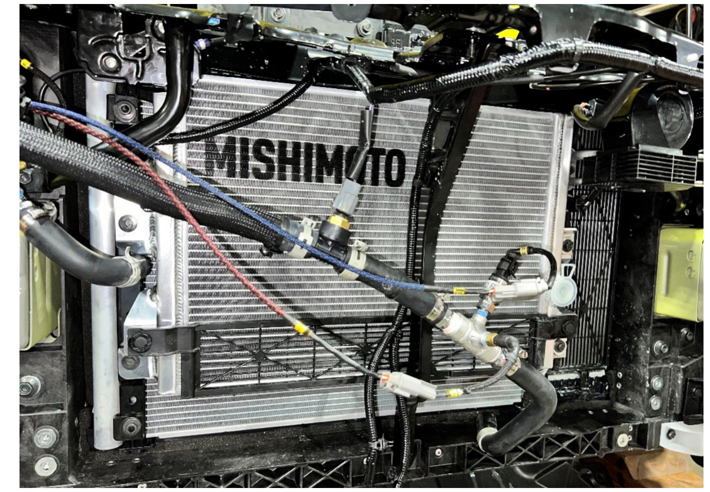

Figure 3: *Mishimoto heat exchanger (prototype) installed for dyno testing*

PERFORMANCE TESTING

All dyno tests were performed in-house on our DynaPack chassis dynamometer. The AEM AQ-1 data acquisition system is used to gather data from two temperature and pressure sensors installed near the inlet and outlet ports on both the stock and Mishimoto heat exchangers. Critical OBD-II channels, such as engine coolant temperature and ambient air temperature, were monitored for safety and to ensure realistic and consistent results.

Heat soak performances of both heat exchangers were evaluated in a test where four dyno runs were conducted back-to-back with the intent to significantly raise charged air temperatures over a short amount of time and mimic real-world track racing situations. The starting inlet temperature was controlled at 105-108°F after all systems were fully warmed up. Under these conditions, the stock heat exchanger outlet temperature rose to 135°F at the fourth run, whereas the Mishimoto heat exchanger saw a maximum outlet temperature of 125°F after the fourth run, 10°F lower than the stock setup thanks to the core volume gain and external fin area increase.

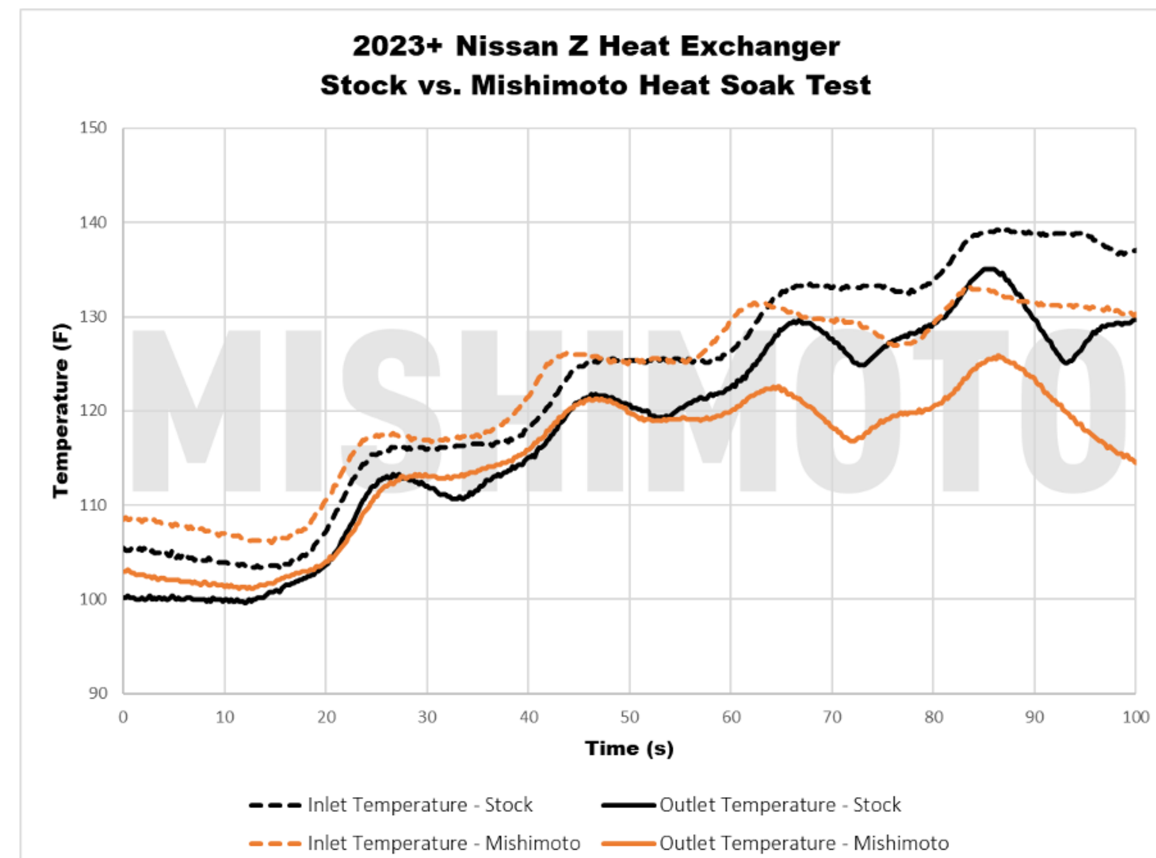

Figure 4: *Heat soak test results*

At the same time, the Mishimoto heat exchanger recorded 4 psi of pressure drop, 2 psi less compared to the stock exchanger. The significantly increased internal tube area of the Mishimoto heat exchanger reduces restriction across the cooler. A more free-flowing cooler translates to a higher flow rate, better heat extraction capabilities, and less mechanical stress on the CAC electric pumps.

INSTALLATION NOTES

Please note that Mishimoto recommends following the OEM procedure and using an air-lift tool to refill the CAC cooling system. Improper refill and bleeding can cause cavitation damage to the electric pumps.

TESTING DONE BY:

Ye Liu, Mishimoto Product Engineer

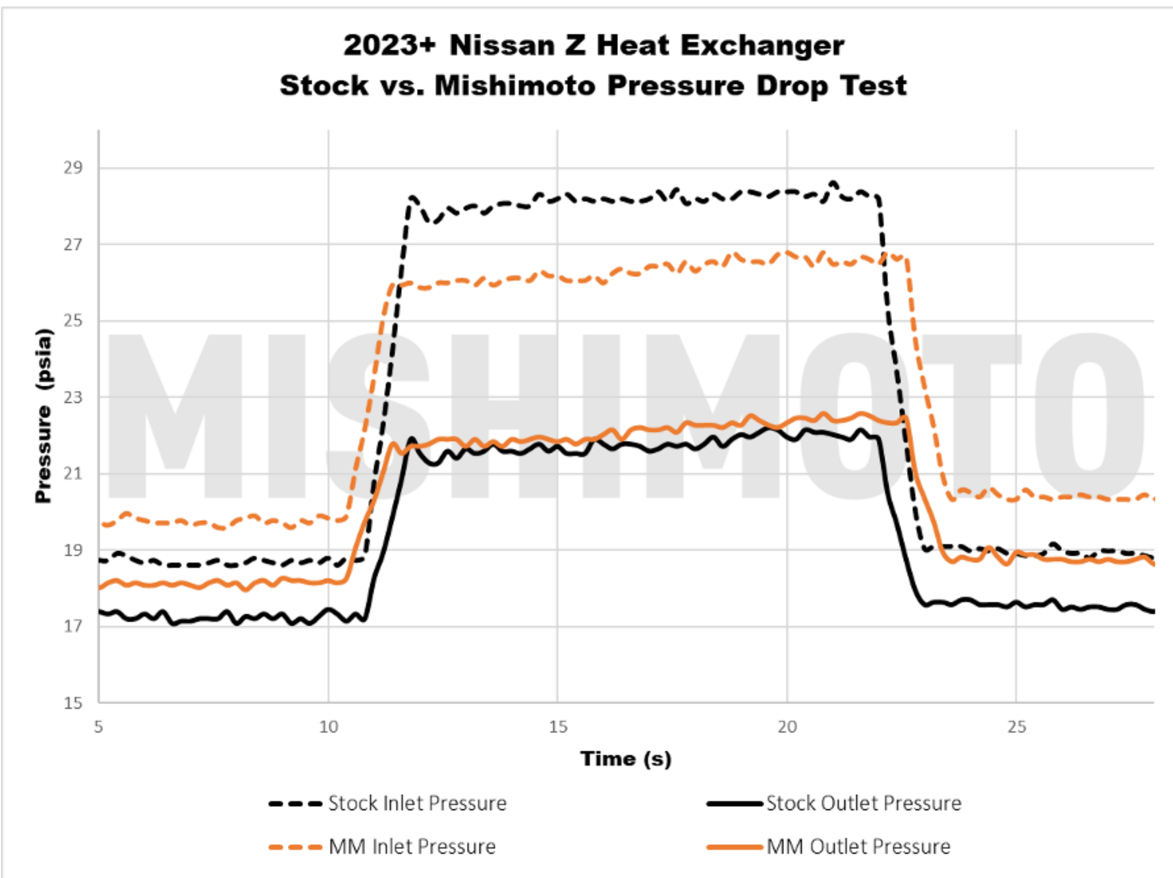

Figure 5: *Load test results (heat exchanger inlet and outlet pressures)*

FOLLOW US

Mishimoto is very active on social media so we can be in constant contact with our customers. Our Social Media Team is available via Facebook, Instagram, Youtube, our Engineering Blog, and forums. We sponsor contests and promotional events, so be sure to follow us.

GOMISHIMOTO

MISHIMOTO.COM/ ENGINEERING

MISHIMOTO

#MISHIMOTO

CONTACT US

Email
For sales and technical questions please contact
support@mishimoto.com

By Phone
USA: 877.466.4744
International: +1.302.762.4501

Mail
Mishimoto
7 Boulden Circle,
New Castle, DE 19720

Visit
Mishimoto.com
Mishimoto.co.uk
Mishimoto.eu

MISHIMOTO