ENGINEERING REPORT

2024 Honda Civic Type-R Intercooler and Piping Kit | SKU: MMINT-CTR-23K

By: Michael Smith, Mishimoto Product Engineer

REPORT AT A GLANCE

- **Goal:** Create a direct fit front mount intercooler and piping kit that outperforms stock.
- **Results:** The Mishimoto intercooler and piping kit reduced outlet air temperatures by 57°F (30°C) compared to the stock intercooler and piping. This reduction in temperature led to a max power gain of 10 hp and 9 lb-ft of torque.
- **Conclusion:** The Mishimoto intercooler and piping kit is a great upgrade for anyone looking to get the most performance out of their Civic Type-R and provides room for future vehicle performance upgrades and tuning.

CONTENTS

DESIGN OBJECTIVES

1. Create an intercooler and piping kit that performs better than stock
2. Piping should be larger than stock
3. Pressure loss should be kept to a minimum

DESIGN AND FITMENT

The project began by evaluating the stock intercooler core design and dimensions to find potential room for improvement. We performed theoretical calculations on various potential core configurations and compared them to the stock intercooler.

Once the initial calculations were out of the way we 3D-scanned the stock intercooler and piping assembly as well as any relevant areas of the vehicle. These scans provided constraints when designing the intercooler and piping. After the prototypes were designed utilizing CAD software, they were 3D printed, test-fitted and adjusted to ensure the best fit. From there, functional prototypes were created and tested utilizing our in-house Mustang dyno.

APPARATUS

Testing was performed utilizing a Mustang dynamometer with data being collected through the dynamometer software and an AEM AQ-1 Data Acquisition System.

Various data points were measured utilizing the AEM AQ-1, including air temperature and pressure at the inlet and outlet of the intercooler. This was done to capture the pressure, and temperature differences across the stock and Mishimoto intercooler and allowed us to see how well each intercooler performed.

PERFORMANCE TESTING

A 2024 Honda Civic Type-R was used to test all the intercooler setups. Testing took place over two days with an average ambient air temperature of 76˚F (24˚C) each day. The Mustang dyno used for this testing is also set up to automatically compensate for differences in temperature and humidity between runs. Due to layout constraints with our dyno room, we must test all FWD vehicles in AWD mode. This will result in slightly lower horsepower and torque numbers as it adds additional resistance to the dynamometer, however, both stock and Mishimoto intercoolers were tested in this same manner. When comparing intercooler kits, it's important to look at the percentage increase and not merely the horsepower and torque numbers alone as no two dynos are the same.

The vehicle was warmed up by idling it on the dyno until the coolant temperature reached 183˚F (84˚C). Once the car was warmed up, multiple dyno runs were conducted until the horsepower and torque numbers were consistent. The car was left running between runs and the coolant temperature was allowed to cool back down to the 183˚F (84˚C) starting temperature. As a final test for each configuration, six

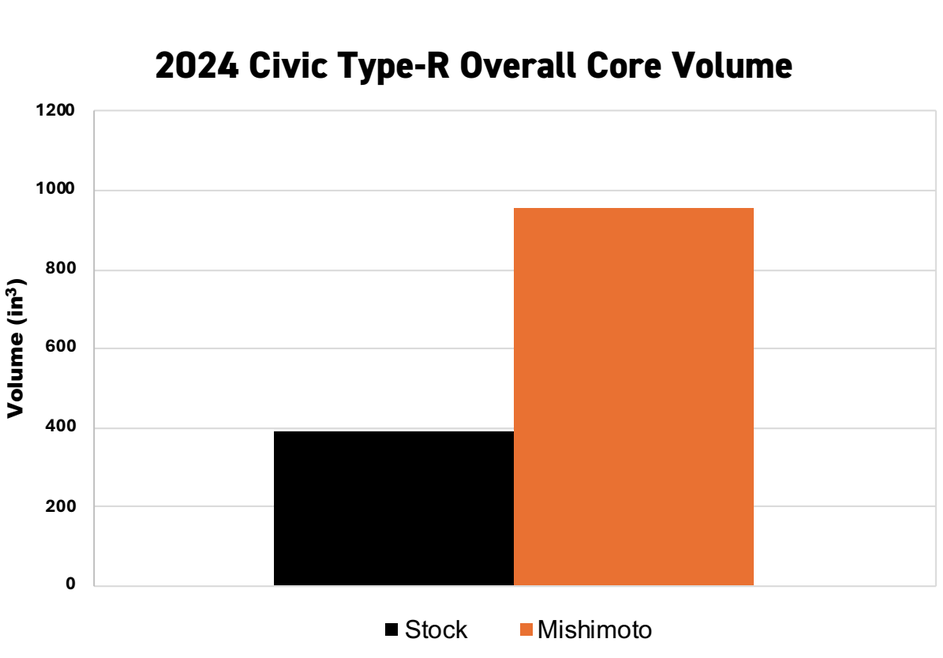

Figure 1: *The Mishimoto intercooler has a 146% increase in overall core volume compared to the stock intercooler.*

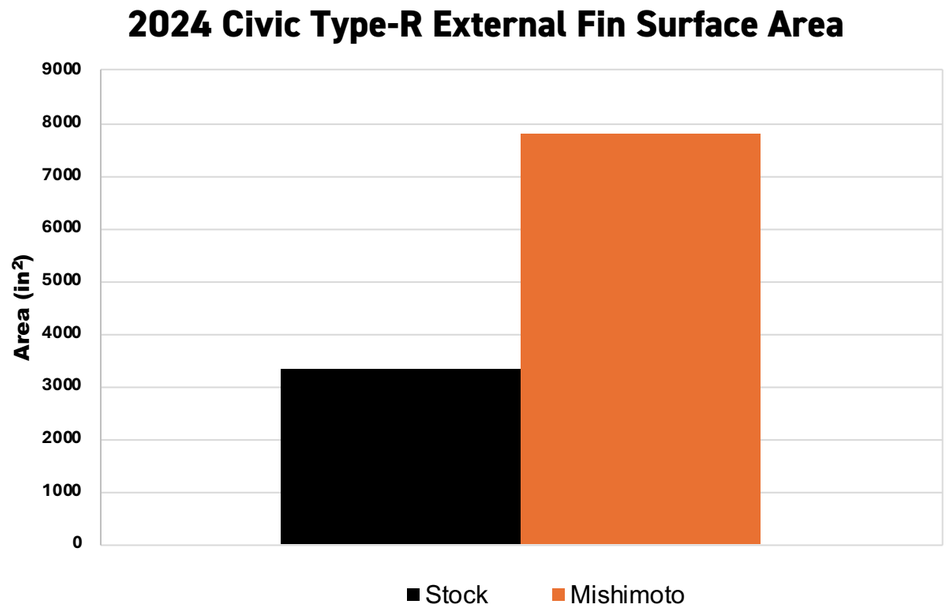

Figure 2: *The Mishimoto intercooler has a 135% increase in fin surface area over the stock intercooler.*

consecutive dyno runs were made back to-back to simulate a heat-soak condition. As seen in figures 8 and 9, the Mishimoto intercooler kit really starts to shine when it comes to back-to-back power runs. After six back-to-back runs the ECU had pulled back the peak horsepower by 21 hp compared to only 10 hp with the Mishimoto intercooler.

The Mishimoto intercooler saw an additional 1 PSI of pressure drop compared to the stock setup. This will not have any adverse effects on the intercooler system and with the Mishimoto intercooler and piping kit the vehicle yielded a max gain of 10 hp, all while running up to 2 PSI less than the stock system. This shows the cooling benefits of the Mishimoto intercooler and highlights the torque targeting nature of the ECU.

CONCLUSION

The intercooler's primary function is to reduce the heat generated while compressing air. Since colder air is denser than hot air, it contains more oxygen. This additional oxygen allows the engine to burn more fuel and create more power. This could be seen in our testing as the car was running slightly less boost pressure than the stock setup but was making more power. Some modern ECUs use a torque or power targeting model which makes it difficult to see massive gains in horsepower and torque from basic bolt-ons without additional tuning. Most modern ECUs will also reduce the power output of the engine if the air temperature gets too hot to prevent damage to the engine. A performance intercooler can help prolong this ECU "detuning" as it's better equipped to keep air temperatures down. An experienced tuner can easily tune for this and take full advantage of the reduction in intake air temperature to tune for more horsepower.

TESTING DONE BY: MICHAEL SMITH

Product Engineer, Mishimoto Automotive

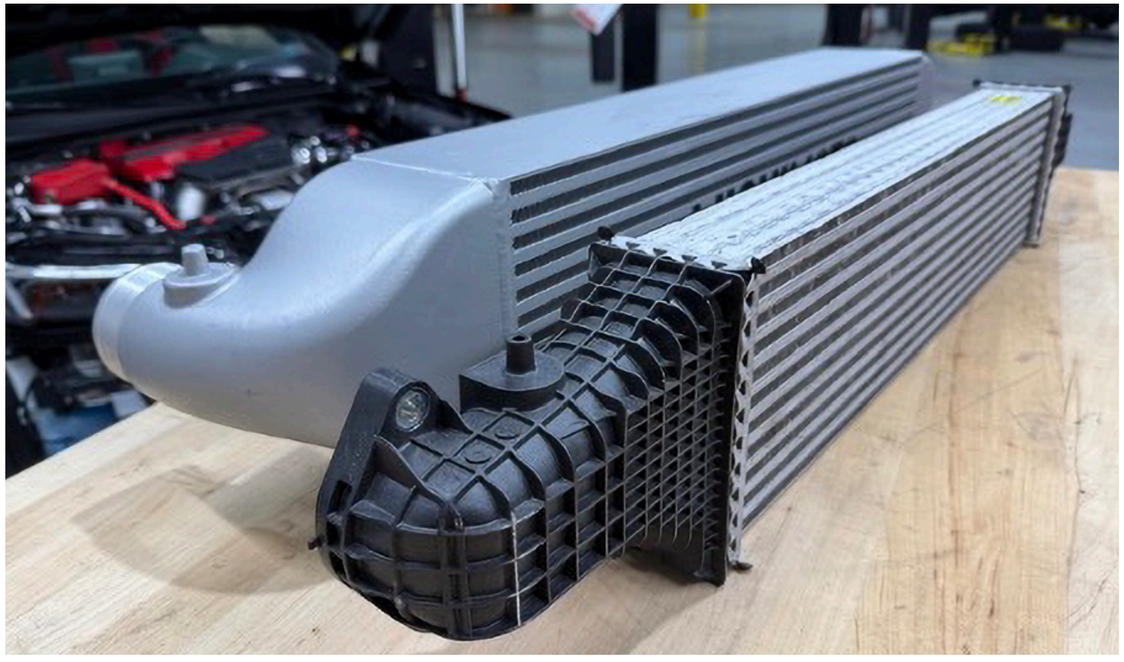

Figure 3: *Side-by-side comparison of the stock intercooler and Mishimoto intercooler.*

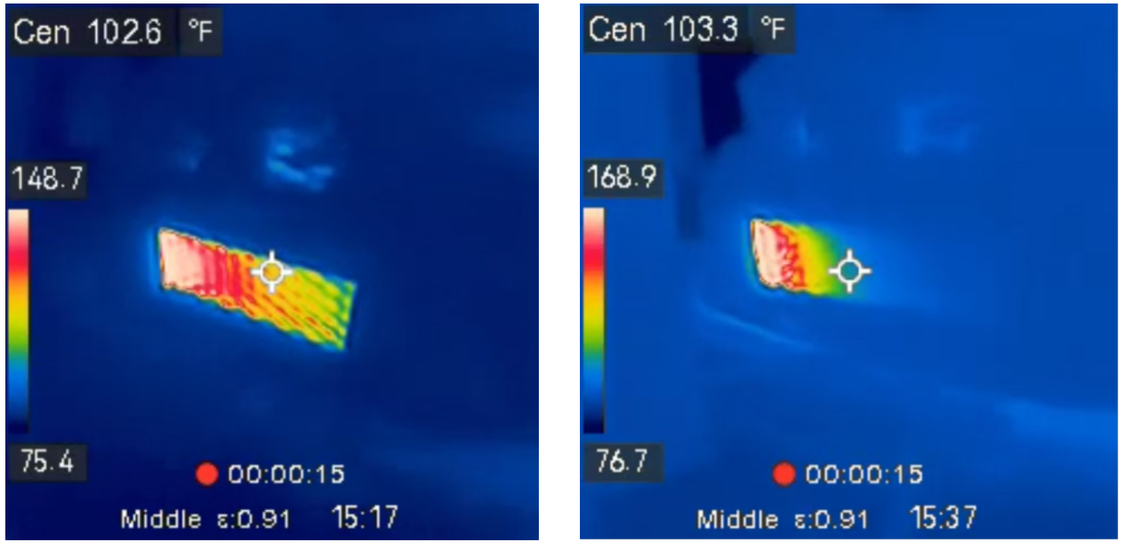

Figure 4: *Thermal images of stock intercooler (left) and Mishimoto intercooler (right) after a 15-second long dyno pull.*

Figure 5: *AEM AQ-1 datalogging system.*

Figure 6: *Vehicle on our in-house Mustang dynamometer.*

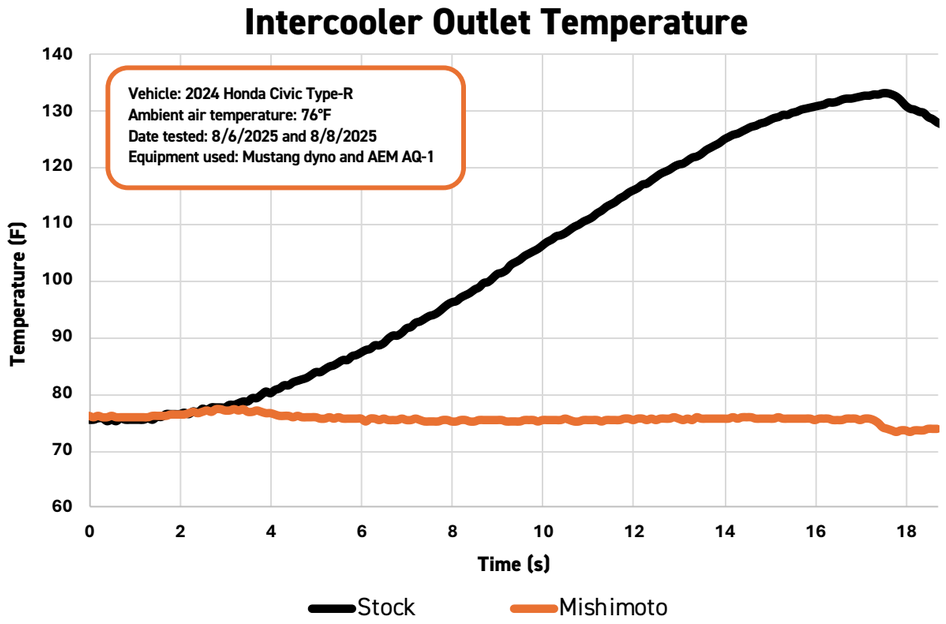

Figure 7: *The Mishimoto intercooler kit reduced the outlet temperature by 57 °F (30°C) compared to the stock intercooler and piping.*

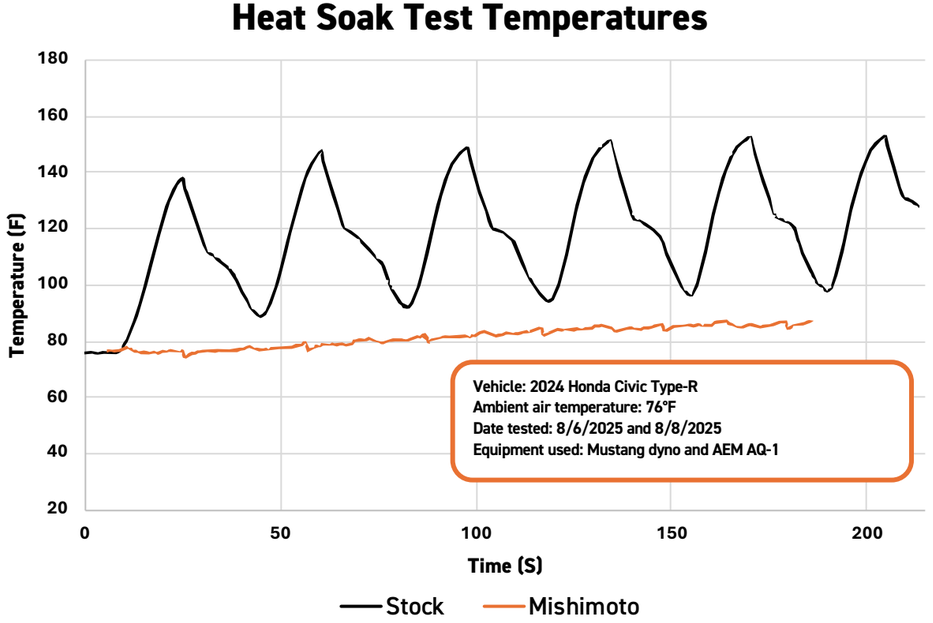

Figure 8: *The Mishimoto intercooler kept air temperatures significantly lower during our heat soak test runs when compared to the stock setup.*

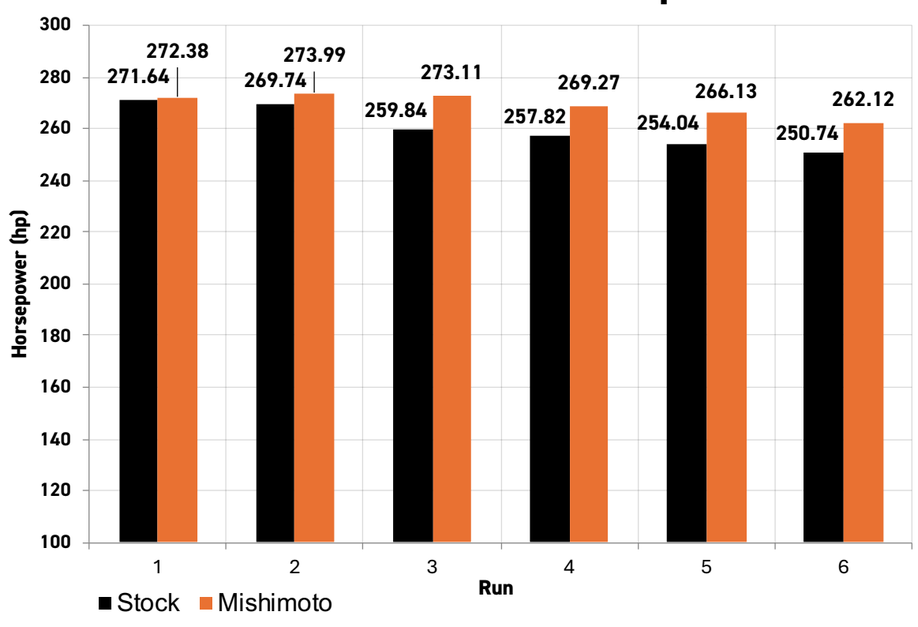

Figure 9: *The Mishimoto intercooler took longer to see the effects of heat soak when compared to the stock setup. The Mishimoto intercooler produced almost 12 hp more than the stock intercooler after 6 heat soak runs.*

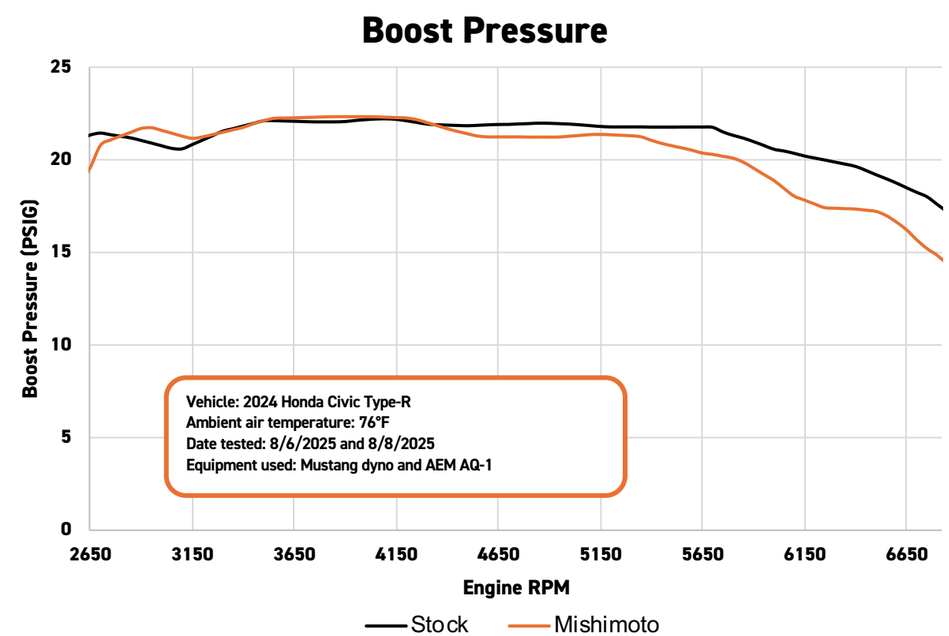

Figure 10: *The boost pressure was as much as 2 PSI less in the higher RPM range with the Mishimoto intercooler when compared to the stock setup.*

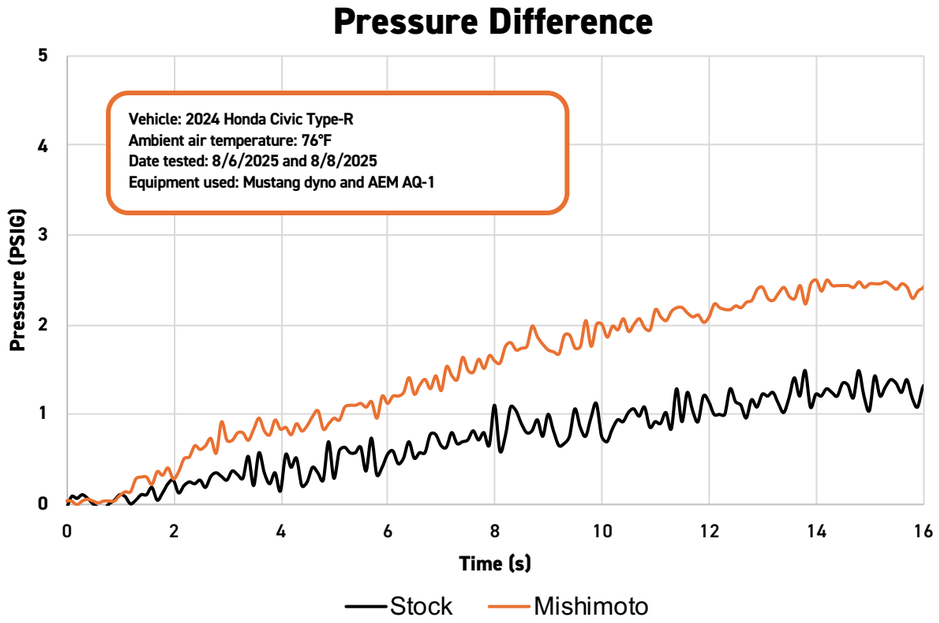

Figure 11: *The Mishimoto intercooler saw an additional 1 PSI of pressure drop compared to the stock setup.*

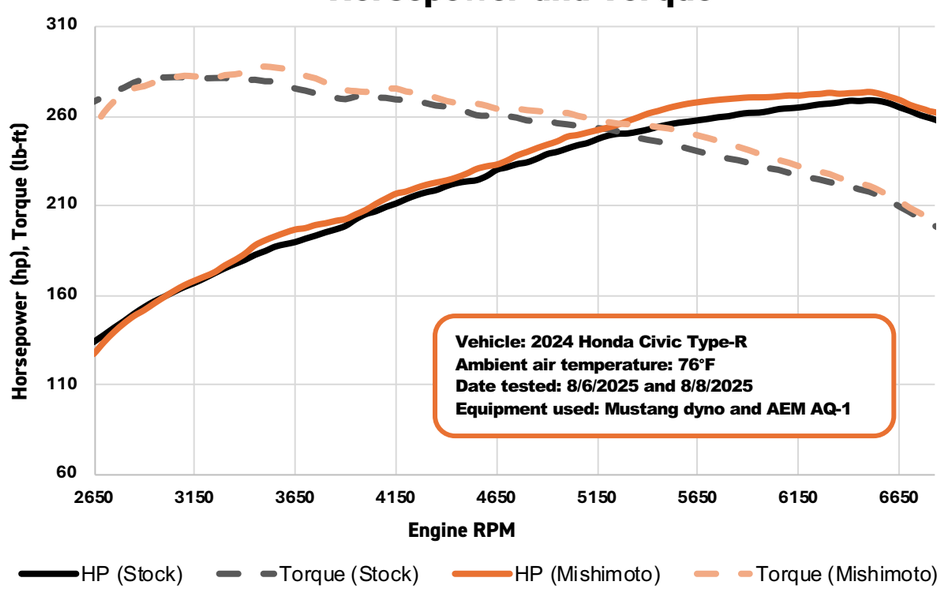

Figure 12 *The Mishimoto intercooler yielded a peak gain of 5 hp and 6 lb-ft and a max gain of 10 hp and 9 lb-ft.*

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CONTACT US

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

By Phone
USA: 877.466.4744
International:
+1.302.762.4501
Fax: 302.762.4503

Mail
Mishimoto
1515 Garnet Mine Road,
Garnet Valley, PA 19060

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

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