

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-186  
Relating to Exemptions under Section 27156  
of the Vehicle Code

HKS USA INC.  
AIR-TO-AIR INTERCOOLER SYSTEM SERIES 5010EC

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the air-to-air intercooler system series 5010EC manufactured by HKS USA, Inc. has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for vehicle applications indicated in the exemption application.

This exemption shall not apply to any device, apparatus, or mechanism advertised, offered for sale or sold with, or installed on, a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale, or advertise any component of a kit as an individual device.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF HKS USA, INC. AIR-TO-AIR INTERCOOLER SYSTEM.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 25<sup>th</sup> day of January, 1989.



K. D. Drachand, Chief  
Mobile Source Division

State of California  
AIR RESOURCES BOARD

Evaluation of HKS USA, Inc.'s Air-To-Air Intercooler System for  
Exemption from the Prohibitions of Vehicle Code Section 27156 in  
Accordance with Section 2222, Title 13, of the California  
Administrative Code.

January 19, 1989

Evaluation of HKS USA, Inc.'s Air-To-Air Intercooler System for Exemption from the Prohibitions of Vehicle Code Section 27156 in Accordance with Section 2222, Title 13, of the California Administrative Code.

by

Mobile Source Division

State of California  
Air Resources Board  
9528 TeiSTAR Avenue  
El Monte, CA 91731

(This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use).

## SUMMARY

HKS USA, Inc. (HKS) has requested an exemption from the prohibitions of Vehicle Code Section 27156 for their air-to-air intercooler system for use on the OEM turbocharged vehicles listed in the appendix.

Based on previous comparative tests evaluating the exhaust emission effects of several add-on intercooler kits and the staff's engineering evaluation of the intercooler's impact on exhaust emissions from turbocharged vehicles, the staff concludes that the HKS's air-to-air intercooler kit will not adversely affect exhaust emissions from vehicles for which exemption is requested.

The staff recommends that HKS USA, Inc. be granted an exemption for their air-to-air intercooler system as requested and that Executive Order D-186 be issued.

## CONTENTS

	<u>Page Number</u>
<u>SUMMARY</u>	i
<u>CONTENTS</u>	ii
I. <u>INTRODUCTION</u>	1
II. <u>CONCLUSIONS</u>	1
III. <u>RECOMMENDATIONS</u>	1
IV. <u>INTERCOOLER SYSTEM DESCRIPTION AND OPERATION</u>	2
V. <u>DISCUSSIONS</u>	2
VI. <u>APPENDIX - List of Vehicle Applications</u>	4

Evaluation of HKS USA, Inc.'s Air-To-Air Intercooler System for Exemption from the Prohibitions of Vehicle Code Section 27156 in Accordance with Section 2222, Title 13, of the California Administrative Code.

I. INTRODUCTION

HKS USA, Inc., of 20312 Gramercy Place, Torrance, California 90501, has requested an exemption from the prohibitions of Vehicle Code Section 27156 for their air-to-air intercooler system for use on the OEM turbocharged vehicle listed in the appendix.

II. CONCLUSIONS

Based on previous comparative tests evaluating the exhaust emission effects of different add-on intercooler kits and the staff's engineering evaluation of the intercooler's impact on exhaust emissions from turbocharged vehicles, the staff concludes that HKS's air-to-air intercooler system will not adversely affect exhaust emissions from vehicles for which exemption is requested.

III. RECOMMENDATIONS

The staff recommends that HKS USA, Inc. be granted an exemption for their air-to-air intercooler system as requested and that Executive Order D-186 be issued.

#### IV. INTERCOOLER SYSTEM DESCRIPTION AND OPERATION

The purpose of the intercooler is to reduce the temperature of the intake air/fuel charge going into the turbocharged engine. This reduction in the intake charge temperature allows a higher charge density (more amount of air per minute flowing through the engine) which means more fuel into the engine at a given intake manifold vacuum/pressure.

The major components of the HKS air-to-air intercooler system are: aluminum heat exchanger, pressure pipes, cadmium plated brackets, silicone connector hoses, hose clamps, compressor by-pass valve, silicone vacuum and blow-by hoses. They are packaged with installation hardware and instructions and sold as a kit. The system is designed using different design concepts, including tubing lengths, diameter and bends, to suit the requirements of the individual vehicle.

The HKS air-to-air intercooler system heat exchanger is mounted in the vehicles' frontal air stream. The intercooler is spliced into the original intake air plumbing between the turbocharger compressor and the intake manifold throttle body. During boost conditions, compressed air, normally 230 degrees F, is cooled to 130 degrees F by the HKS intercooler core being delivered to the engine. Some HKS intercooler systems incorporate a compressor by-pass valve which routes compressor discharge directly into the compressor intake under deceleration. This arrangement prevents impeller deceleration between gear shifts and reduces shock waves in intercooler plumbing and core.



V. DISCUSSION

HKS air-to-air intercooler system is similar in design concepts and principles as other manufacturers' systems that have been exempted by the Air Resources Board. Performance analyses that were previously submitted to the ARB by other manufacturers of similar system indicated that typical thermal efficiency of a turbocharger intercooler system ranges between 40% and 84%. Based on predicted efficiency of a heat exchanger on previous air temperature measurements of other exempted intercoolers installed and tested on vehicles and on a review of the device theory of operation, the staff has concluded that the use of an intercooler would not adversely affect vehicle emissions or result in the degrading of a vehicle's driveability.

In addition, it is the staff's opinion that the combustion temperature will be reduced as a result of cooler intake charge with the use of the air-to-air intercooler system. This reduction in combustion temperature will reduce the formation of NOx gases in the combustion chamber, resulting in less NOx emissions expelled through the exhaust system.

HKS air-to-air intercooler system has similar design with Spearco air-to-air intercooler system which is exempted by the ARB under E.O. D-140-3. Spearco's previous test results demonstrate no adverse effect on the vehicle's exhaust emissions of their kit.

APPENDIX

7. List vehicle makes, model years, engine displacements and systems that are compatible with the device, and for which exemption is requested. Specify the correct device model for each vehicle.

<u>HKS Part No.</u>	<u>Model-Years</u>	<u>Make</u>	<u>Model/Engine</u>	<u>Disp. (L,C.I.)</u>
5010EC-11026L	1987-1988	Toyota	Supra Turbo (7MG-TE)	3.0,183
5010EC-12721J	1985-1987	Toyota	4WD PU Turbo (22R-TE)	2.4,144
5010EC-12821J	1985-1987	Toyota	4 Runner Turbo (22R-TE)	2.4,144
5010EC-12221J	1985-1987	Toyota	2WD PU Turbo (22R-TE)	2.4,144
5010EC-24046H	1984-1986	Nissan	300ZX Turbo (V630ET)	3.0,181
5010EC-24046L	1987	Nissan	300ZX Turbo (V630ET)	3.0,181
5010EC-24447H	1984-1986	Nissan	200SX Turbo (CA18ET)	1.8,110
5010EC-24243E	1981-1983	Nissan	280ZX Turbo (L28ET)	2.8,168
5010EC-47070G	1983	Mitsub	Starion Turbo (654BT)	2.6,156
5010EC-47070H	1984-1987	Mitsub	Starion ES/LE (654BT)	2.6,156
5010EC-47070H	1984-1987	Dodge/ Plymth/ Chrysler	Conquest Turbo (654BT)	2.6,156
5010EC-47171J	1985-1986	Mitsub	Mirage Turbo (632BT)	1.6,98
5010EC-47171J	1985-1986	Dodge/ Plymth	Colt Turbo (632BT)	1.6,98
5010EC-47171L	1987-1988	Mitsub	Mirage Turbo (632BT)	1.6,98
5010EC-47171L	1987-1988	Dodge/ Plymth	Colt Turbo (632BT)	1.6,98
5010EC-58383K	1986-1987	Mazda	626 GT Turbo (FE Turbo)	2.0,122