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Interchiller System



Technical Guide

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Problem: High Intake Air Temperature (IAT)

In turbocharged or supercharged engines, compressed air heats up significantly. When this hot air enters the engine, performance drops and the risk of detonation increases.

Normally, this heat is reduced using an intercooler (air-to-air or water-to-air). However, in hot climates or during extended track use, conventional intercoolers may not be sufficient.

Solution: Interchiller System

The Interchiller uses the vehicle's A/C (R134a / R1234yf refrigerant) system to cool the water circulating in the intercooler loop.

This allows the intercooler coolant temperature to drop even below ambient temperature (as low as +5 °C or near 0 °C).

How It Works

1. The A/C compressor pressurizes the refrigerant and sends it into the cooling cycle.
2. The interchiller is integrated into this cycle – refrigerant now passes through the interchiller as well as the cabin evaporator.
3. Inside the interchiller, a heat exchanger transfers energy between the refrigerant and the intercooler water circuit.
4. The intercooler water is significantly cooled.
5. This cold water circulates into the water-to-air intercooler.
6. The intake air is cooled → denser air → more oxygen → more power.

Key Benefits

- Intake air temperature below ambient (critical for drag racing & launches).
- Stable IAT → ECU does not reduce ignition timing.
- Enables higher boost safely.
- Increases power output with greater reliability.

Race Valve Explained

- A valve that directs all A/C cooling power to the interchiller.
- When activated: cabin A/C is disabled, only the interchiller operates.
- Best for short performance bursts (drag racing, dyno runs).
- Provides maximum cooling and lowest IAT.
- For daily use: race valve can remain closed, and the cabin A/C functions normally.

Technical Specifications:

- Length: 311 mm
- Length Between Connections: 250mm
- Width Between Connections: 50 mm
- Overall Width: 111 mm
- Tightening Torque: $(9 + 2.40 * N)$ mm
- Number of Plates: 20
- Weight: 3.6 kg
- Design Pressure: 30 Bar
- Test Pressure: 45 Bar
- Flow Plates: AISI 316
- Cover Plates: AISI 304
- Connection Port: AISI 304
- Solder: 99.9% Copper
- Operating Temperature: -196°C / +225°C
- Heat Transfer Area: 0.52 m²
- Volume [L]:
 - 1 → 2 → 0.50 L
 - 3 → 4 → 0.45 L

- Flow Direction:

- 1 → 2
- 3 → 4

- **Kit Contents**

1. Interchiller unit
2. Brass elbow fittings
3. TXV (thermal expansion valve)
4. M2 Orifice
5. High-pressure resistant hoses & fittings
6. Race valve (cabin A/C control)
7. Additional brass fittings
8. Wiring harness
9. ON/OFF switch
10. Stainless steel temperature sensor clamp
11. Solenoid valve mounting bracket
12. Protective caps
13. Fuse
14. Fuse holder
15. 10 × zip ties
16. Insulated ground connector
17. Solenoid mounting bolts
18. Temperature sensor clamp bolts/nuts
19. Product stickers
20. Installation manual

Installation Guide

- Connect the aftercooler water line to Interchiller port #1 (hot water in).
- From Interchiller port #2, connect cooled water back to the aftercooler.
- From A/C compressor outlet, connect a T-fitting into Interchiller port #3.
- Install the TXV on port #4 line.
- TXV outlet connects via T-fitting into condenser → cabin line (before race valve).
- The race valve should be placed after the cabin pressure sensor (if equipped).
- Mount the temperature sensor on a metal surface of the compressor → port #3 line using the stainless clamp. Sensor must be parallel to the ground (angled sensors give false readings).
- Install the ON/OFF switch inside the cabin, within easy reach of the driver.

Electrical Wiring

Color	Function	Section (mm ²)	Length
Yellow	+12V Ignition	0.75	1 m
Black	Ground (0V)	0.75	1 m
Orange	Solenoid (+)	0.35	4.5 m
Black	Solenoid (-)	0.35	4.5 m
Yellow	Switch Input	0.25	1 m
Red	Switch Output	0.25	1 m
Black	Switch Ground	0.25	1 m

Operating Notes

- Frost on the interchiller is normal, ice build-up is not.
- If icing occurs → increase superheat setting.

Superheat Adjustment

- Defined as the difference between sensor temp and refrigerant evaporation temp.
- Factory set to 5 °C.
- Each full turn clockwise = +4 °C superheat.

Refrigerant Charging Reference

Ambient Temp (°C)	Low Pressure (psi)	High Pressure (psi)	Superheat Target (°C)	Subcooling Target (°C)	Refrigerant (g)
20	20	150	5	7	1110
25	25	175	5	8	1200
30	30	200	6	9	1275
35	35	225	6	10	1300
40	40	250	7	11	1325

Testing Parameters

Measurement	Target Value
Evaporator water outlet temp	Should reach -10 °C faster
Superheat	4-6 °C (slightly lower possible)
Low Pressure (LP)	20-30 psi
High Pressure (HP)	120-150 psi
Compressor cycle frequency	Stable, fewer load variations

Orifice Sizing Analysis

- Cooling too slow, low superheat → Larger orifice (M3).
- Difficult to control superheat, icing present → Smaller orifice (M1).
- Compressor cycling too frequently → Smaller orifice (M1).
- Targeting extreme cooling → Larger orifice (M3).

Application Notes

- Compatible only with turbocharged and supercharged vehicles with aftercoolers.
-  Not usable if the A/C system has been deleted.

Warranty

All Bosphorus Innovations products are covered by a 2-year warranty against manufacturing defects from the delivery date.

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