EK-QuantumX Delta TEC

CPU WATER BLOCK
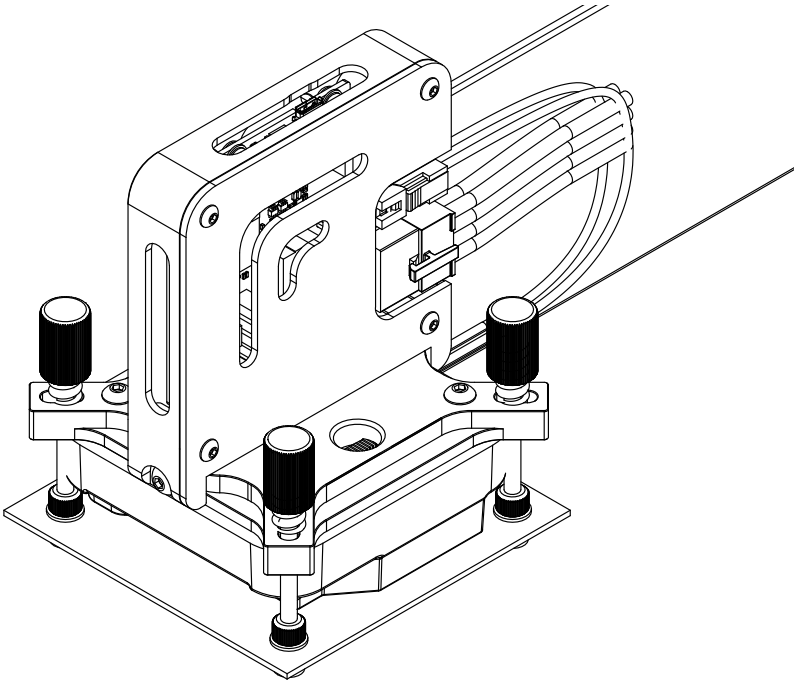
TABLE OF CONTENTS

SHORT DESCRIPTION

The EK® QuantumX Delta TEC is a CPU water block combined with a Peltier element - TEC plate. It's designed and engineered for high-performance cooling and advanced overclocking to achieve sustained peak CPU performance. It is used within a regular custom liquid cooling loop (containing a radiator, pump, and fans) while the TEC plate boosts the cooling performance.

LONG DESCRIPTION

The EK-QuantumX Delta TEC is a rugged, all-metal, CPU water block, incorporating a TEC plate cooler and the necessary electronics into one assembly.

TEC plates are solid-state thermoelectric heat pumps that utilize the Peltier effect to move heat from one side to another. When current is applied, one side of the TEC gets cold, and the other hot. This is how sub-ambient temperatures are achieved.

The TEC plate is integrated into the CPU block so that it's cooling the cold plate, while the water block is cooling the hot side of the TEC. The integrated TEC is custom-made and has a maximum cooling power of 338W, while its maximum power draw is limited to 200W.

EK-QuantumX Delta TEC water block is controlled by electronics located on top of the water block. It's powered through the 8-Pin PCIe power plug. The electronics on top of the block are additionally equipped with two temperature sensors - one is located inside the CPU block, and the other on the controller's PCB. The TEC plate is connected to the controller with a 2-pin power connector.

For this controller unit to operate, it has to be connected to the motherboard. The connection is achieved with a micro USB plug located on the PCB and connected to the internal 9-pin motherboard USB header or a regular external USB connector. The connection to the motherboard is necessary because of the software that will help control the TEC plate.

The software is supporting three operation modes:
1. Standby - The TEC plate is off,
2. Cryo - The TEC plate is operating with a no-dew setting – it is cooling but preventing overcooling and condensation,
3. Unregulated – This is the manual mode that allows the exploitation of the TEC cooler's full power and even reaching sub-zero temperatures.

This CPU block is also equipped with a polyurethane foam guard, which slows down the condensation around the CPU socket when the TEC place is running at full power.

WHAT IS NOT THE PURPOSE OF THIS PRODUCT?

This product is not meant for extreme all-core maximum load scenarios like Cinebench or Prime95. If you put the EK-QuantumX Delta TEC up against conventional liquid cooling solutions, they will outperform it if the goal is to achieve as low temperatures as possible. This product is not meant to be tested head-to-head as a cooling solution.

WHAT IS THE PURPOSE OF THIS PRODUCT?

The benefits of Intel Cryo Cooling Technology and the EK-QuantumX Delta TEC, compared to standard liquid cooling, comes from the CPU being able to operate at sub-ambient temperatures.

When conditions are right, OC Turbo Velocity Boost unleashes the highest possible in-game frequencies for maximum performance. Cryo Cooling and OC TVB can reach frequencies that are not stable or achievable with traditional liquid cooling solutions.

Overclocking Turbo Velocity Boost is designed to take advantage of the fact that higher OC frequencies are possible as long as the processor is cold (below a certain temperature point). OC TVB also ensures that frequencies are reduced when the processor warms up beyond a specific temperature threshold to avoid instabilities and system crashes.

For example: If a processor can be cooled to 40°C, it can reach 100MHz higher OC frequency, but if the temperature rises to 70°C quickly, it will no longer be stable. In this scenario, the OC TVB will ensure the frequency is lowered until the CPU again gets cold enough.

SUPPORTED CPUs

The Cryo Cooler is supported by all 10th gen unlocked CPUs (K-series). The Cryo cooling software monitors CPU status (including temperature and utilization) and Cryo cooler data (device temperature, voltage, power consumption, and local environmental conditions) and uses sophisticated algorithms to maintain a safe temperature and avoid condensation while maximizing performance and power efficiency of the Thermoelectric Module (TEC).

SYSTEM REQUIREMENTS

- Using EK-QuantumX Delta TEC requires water-cooled loop installed in PC
- 200W of available power supplied with 1x 8pin PCIe power connectors
- Internal USB connection with Cryo Cooler controller unit
- Compatible Intel CPU
- System with Windows 10 64-bit OS
- The solution is designed to fit into an ATX chassis. Make sure the chassis that you use has space for the entire liquid cooling solution (pump + radiator), not just the heatsink block
- Compatible motherboard and latest BIOS update

  - Vendor Model:
  Gigabyte Z490 Aorus Master
  Gigabyte Z490 Aorus Ultra
  Gigabyte Z490 Aorus Pro AX
  Gigabyte Z490-i Aorus Ultra
  Gigabyte Z490 Aorus Extreme
  MSI MPG Z490 Gaming Carbon
  MSI MEG Z490 ACE
  ASRock Z490 Velocita
  ASRock Z490 Steel Legend
  ASRock Z490 Taichi
  Asus Maximus XII Apex
  Asus Maximus XII Extreme
  Asus Maximus XII Formula
  Asus Maximus XII Hero (Wi-Fi)
  Asus Strix Z490-e gaming

> ⚠ **WARNING!**
> Given that the CPU is cooled by the EK-QuantumX Delta TEC directly to achieve low temperatures, the rest of your liquid cooling loop will be under stress from the TEC plate. Do not use your CPU temperatures as a baseline for your Fan or Pump speeds! It is best to monitor the coolant temperature or set the fans and pump at a fixed speed level!

CABLING AND ELECTRICAL CONNECTIONS

The liquid cooling solution includes a condensation controller that requires the following connections:

- 12V ATX power (using a 2x4 PCI power cable directly to the power supply)
- 2 pin connector between the heatsink and condensation controller (pre-connected from the factory)
- 2 pin sensor connector – pre-connected from factory
- USB connection (the cooler has a micro USb port that should be connected to the motherboard front panel headers or to an available USB port. Cables are included

INSTALLING THE CRYO COOLER USB DRIVER

Check all cooler and controller connections (12V 8-pin PCIe and USB) and boot the system. You should see a solid red LED light coming from inside the EK-QuantumX Delta TEC cooler controller.

After booting the system, you will see that Windows recognizes a new USB device. Please check the device manager to make sure that you have the following device installed:


 If the device has a yellow warning sign showing the driver is not installed, please click on Update Driver, and Windows 10 will try to retrieve the USB driver and install it.

If that doesn't work, please install the driver from the following link: https://www.silabs.com/documents/public/software/CP210x_Universal_Windows_Driver.zip

INSTALLING THE CRYO COOLER SOFTWARE

Obtain the Cryo Cooler software installer from Intel.

Accept the Terms and continue with the installation.
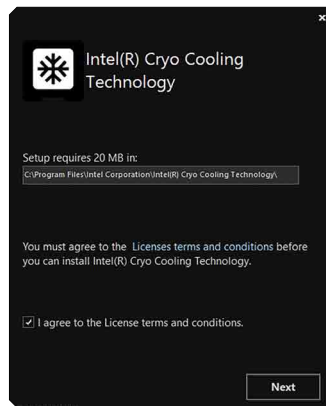
Make sure you have installed the driver as described in the previous step before installing the software.

Software can be downloaded from https://downloadmirror.intel.com/29979/eng/Intel(R)%20Cryo%20Cooling%20Technology.exe

After installation, you will see a tray icon that will control and report the cooler status:
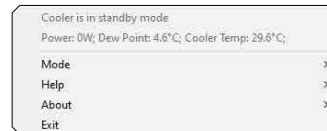
WHAT IS OC TVB AND HOW DO I USE IT?

Overclocking Thermal Velocity Boost (OC TVB) is a new feature introduced in the 10th gen unlocked CPU (K-series) family. Make sure you have the latest version of the BIOS from your motherboard vendor. Users can confirm BIOS support for OC TVB by clicking on the "About" menu of the tray icon for the Cryo Cooling software. NOTE: OC TVB is not a BIOS menu option explicitly. OC TVB merely needs the installed BIOS to contain the latest CPU microcode update from Intel. See section below for more details on OC TVB.

In order to use OC TVB you will need to install Intel Extreme Tuning Utility (XTU) version 7.0.1.4 or later.

• The primary benefit is to increase Overclocking (OC) Fmax when the CPU is at colder temperatures
• OC TVB is designed to take advantage of the fact that colder CPU silicon is capable of operating at higher OC frequencies than are possible at the typical operating temperatures achieved by traditional coolers
• If excessive workloads momentarily increase the CPU temperature beyond a User-defined setpoint, OC TVB reduces OC frequencies by a User-specified amount in order to maintain system stability. As soon as CPU temperatures drop below the threshold target again, the higher OC frequencies are restored. This process is dynamic and automatic with no interruption of the User's compute experience.
• Sub-ambient cooling strategies, including Intel® Cryo Cooling, particularly benefit from OC TVB because they are capable of reaching lower CPU temperatures than traditional coolers, but often cannot sustain those under the most severe OC workloads (some sub-ambient strategies, such as dry ice baths, also are not capable of sustaining the lowest temperatures indefinitely).

Example: If a processor can be held at 40 °C it may be able reach a 100 MHz higher OC frequency than it could at 70 °C. Attempting to OC at a fixed higher frequency corresponding to the 40 °C temperature may lead to instability or system failure if a momentary workload spike causes the CPU temperature to rise to 70 °C, even briefly. OC TVB enables the system to operate more stably, providing the maximum frequency performance whenever the CPU temperature meets the 40 °C threshold target without concern for workload spikes.

OPERATION MODES

The system has three modes of operation that can be selected via the Windows tray menu

Operating Mode	Status Description	Controller LED Indicator
Standby	In this mode there is no power applied to the TEC module on the cooler. Radiator fans and water pump continue to operate, offering cooling capability sufficient to support TDP operation at stock CPU frequencies (sub ambient capabilities are disabled).	Blue - slow blinking
Cryo	This is the RECOMMENDED mode for both performance and day-to-day use. The cooler dynamically controls TEC power to provide maximum cooling under heavy workloads while minimizing power consumption and protecting your system from condensation during light workloads.	Green - slow blinking
Unregulated	Allows user to force cooler into maximum power state (within device safety limits). In this mode there will be condensation risk on the heatsink surfaces and surround areas due to the low temperatures. **This can cause permanent system damage.**	Purple - fast blinking

Operating Mode	Status Description	Controller LED Indicator
Offline	Occurs during system boot or resumes from low power states. Also occurs if controller is uninstalled, improperly installed, or damaged. If the red LED remains on after booting it signals a subsystem failure (see troubleshooting)	Red - solid

⚠️ **NOTE:**
Unregulated Mode may cause condensation, which could result in an electrical short circuit that can cause damage to your computer or create a safety hazard. To minimize this risk, be sure the CPU shroud provided with your Cryo Cooler is securely installed and forms an airtight seal between the motherboard and the cooler water block. Users should implement their own condensation prevention measures and should closely monitor operation for signs of condensation. Users acknowledge and accept all the risks associated with operating in this mode.
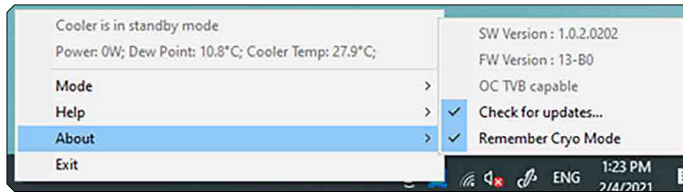
FEATURES

CHECK FOR UPDATES

When this option is checked, Intel(R) Cryo Cooling software will check for latest version of the software and notify user to download and update.

REMEMBER CRYO MODE

When this option is checked, Intel(R) Cryo Cooling software will remember the "Cryo" mode selection upon system power on, reboot and resume from sleep.

RUN DIAGNOSTIC TEST

During the self-diagnostic test, Intel(R) Cryo Cooling software will first reset the Cryo cooler and then perform cooler health checks. Cooler will switch the runtime mode between Cryo and Unregulated modes. Cooler temperature and power consumption data will be collected and validated to ensure it is running properly.

Diagnostic test data will be saved to C:\temp\logs\sac.diagnose. YYYY-MM-DD.log. Here the YYYY-MM-DD is the combination of four-digit year, two-digit month and two-digit day based on the date when the test is performed. This information is required when you request for technical support.
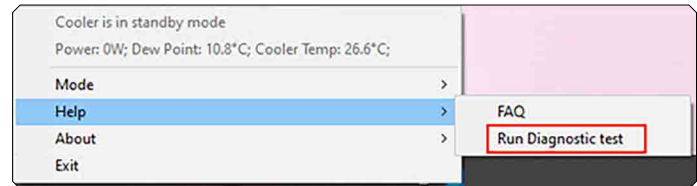
VERIFICATION OF OC TVB FUNCTIONALITY

1. Open XTU (Advanced Tuning → Core) and enable Thermal Velocity Boost. It needs to be enabled for OCTVB to work.

2. Set Ratio Tuning Mode to Package. This is the easiest way to define active core buckets and set the appropriate limits.
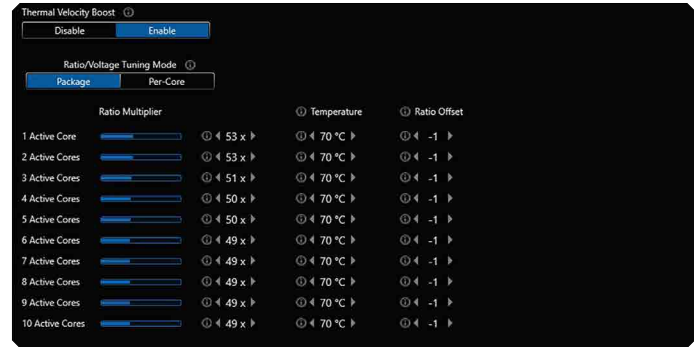

3. Before overclocking, make sure all current and power limits are set to maximum.

4. For testing functionality of the OCTVB:

  a. Set your OCTVB Ratio Multipliers to your desired overclock ratios.

    – OCTVB Ratio Multiplier determines the active core frequency when below OCTVB temperature.

  b. Set your OCTVB Temperatures and Ratio Offset down bins to your desired values.

    – Ratio Offset is the number of bins lower for the active core frequency when above OCTVB Temperature.

    – Ratio Offset frequency reductions provide system stability during workload peaks.

  c. Click Apply when done.

Example only, not to be applied:

TROUBLESHOOTING AND ERROR MESSAGES

Problem	Possible Cause	Corrective Action
Cryo Cooler switches itself from **Unregulated** mode to **Cryo** mode	Not an error. This is a protective cooler response to prevent excessive condensation from Unregulated mode operation without any workload or User interaction for 10 minutes	None
Red LED doesn't go away when booting the computer	Software not installed or working properly	Please make sure you have installed the latest version of the software - install/reinstall and reboot system. The red LED should be on while the system boots and then transition to standby (slow blinking blue)
	Power supply not connected properly	Make sure that the power supply is plugged in properly (8-pin connector PCIe from ATX PSU).
	Thermoelectric cooling module not connected properly	Make sure that the 2-pin black connector of the cooling module is connected properly (factory preinstalled)
	Temperature sensor malfunction	Please contact support, all devices are factory tested prior to shipping
	Cooler controller USB port not connected	Please check that the USB port of the cooler is connected according to the installation instructions
Red LED turns ON while using the system after a while	An overheating condition has been detected. Potentially because of an installation issue, pump failure, or radiator fans not running. The cooling system will enter standby mode in order to protect itself.	Check your installation, check that the pump and fans are connected to always-on power sources - not controlled by the motherboard dynamic fan/pump control system. Reboot the system and check functionality after correcting the condition
Red LED turns ON and system hibernates	An extreme overheating condition has been detected on the cooling subsystem, potentially because of an installation issue, pump failure, or radiator fans not running. The PC will hibernate to protect itself.	Check your installation, check that the pump and fans are connected to always-on power sources - not controlled by the motherboard dynamic fan/pump control system. Reboot the after correcting the condition

Problem	Possible Cause	Corrective Action
Error message during diagnostic test procedure: An error occurred while running the test: Please Contact Support	Running diagnostics test with an active workload or after the system is in Cryo or Unregulated mode for too long	Make sure the system is idle and a demanding workload is not in progress. Please wait at least two minutes until the temperature stabilizes and try again
Error message: This cooling solution is not supported on this processor. Please uninstall the application	Using the Cryo cooler with a non-supported configuration Only Intel® 10th generation CPUs are supported	Please install a supported processor
Error message: Unable to establish connection with cooler or cooler is offline	Cooler USB port is disconnected, or driver is not installed	Please verify that the USB driver is installed properly and that the cooler is connected to the USB port as described in the manual. Check that the cooler has a valid connection to the USB port on the motherboard or any other active USB port
Error message: Unable to establish connection with service or Cryo Cooling service is not running. Please start the service	Stopped Cryo cooling service by accident or other reason	Please go to Windows services and restart the Intel® Cryo Cooling service, or reboot your system
Error message: Power supply disconnected from cooler	ATX 12V power supply cable not connected properly to the cooler	Please make sure to use a 2x4 PCIe power connector to the cooler and that your power supply has enough capacity (approx. 180 W peak power requirement for Cryo Cooler)
Error message: TEC not connected to the cooler	The TEC cable is disconnected	This two-wire power connector is factory installed but may have become loose during shipping and handling or installation, check any loose connections from the TEC module to the cooler (red/black cable)
Error message: Hybrid sensor Failure	Cooler sensor failure	Reboot system. If issue persists, power off the system, disconnect power, and contact support

Problem	Possible Cause	Corrective Action
Error message: Temperature sensor failure	Internal temperature sensor failure	Check that the installation is correct and thermal grease has been applied properly. Check that temperature sensor wire (factory installed) is securely connected to Cryo Cooler controller. Contact support if error persists.
Error message: Overheating condition or thermal sensor failure – Error OT2 – please shut down system and check the cooling system integrity	The measured cooling block temperature exceeds 80 °C (should not happen in normal operation). This could be caused by fan failure, pump failure, coolant leak, or other serious failure of the water-cooling loop, or it could be because of thermistor failure or detachment. This error also drops the Cryo controller into "Standby" mode	System should be powered down and all elements of the water-cooling loop should be inspected for proper operation. The mounting integrity of the cooler should also be checked (the physical connection between the water block and the TEC and the copper spreading block).
Error message: Overheating condition detected, Error OT3, system will be shutting down in 5 seconds.	Estimated cooling block temperature exceeds 90 °C (should never happen). Temperatures at this level could indicate imminent failure of the water-cooling loop and potential permanent damage to the system. This should not be possible unless multiple simultaneous failures of the cooling system have occurred (e.g., pump failure, coolant leak, thermistor failure, CPU or OS failure, etc.). This error initiates a system shutdown.	System should be powered down and all elements of the water-cooling loop should be inspected for proper operation. The mounting of the cooler to the motherboard should also be checked (the physical connection between the water block, the TEC, the copper spreading block, and the CPU).
Error message: Cooler controller error detected, Error CB1, system will hibernate in 10 seconds.	Hardware failure of the TEC controller power regulation.	Reboot system. If problem persists, contact support to replace damaged controller card.
Error message: Sensor health issue detected, Error DT1, please shut down and verify that cooling system is installed properly.	Measured (thermistor) and estimated temperatures for copper spreading block are out of spec. This could be caused by a failed or improperly installed thermistor, or by an improper installation of the cooler on the motherboard.	System should be powered down and installation of cooler and thermistor should be checked.

Problem	Possible Cause	Corrective Action
Error message: Cryo Cooler Notification UI is not running.	Intel Cryo Cooling software failure	Restart Intel Cryo Cooling Notification UI or reboot system
Error message: Temperature sensor is not working, Error TD1, please shutdown the system and check all connections.	Thermistor failure	System should be powered down. Check thermal sensor wiring connection. If problem persists, replace thermistor.
Error message: Your TEC is malfunctioning – please contact support.	TEC resistance is too high. This could be caused by loose wiring connections, or internal failure of the TEC module.	System should be powered down. Check TEC wiring connections. If problem persists, TEC must be replaced.
Error message: Unregulated mode suspended after extended period of inactivity due to risk of condensation damage. Board is set to Cryo mode.	CPU idle (power <25 W) for more than 10 minutes with cooler in Unregulated mode	None.
Error message: Poor thermal resistance to ambient – e.g., bad fan or bad pump – check installation	Insufficient cooling by water loop detected. Could be partially blocked or failed fan(s), low flow rate (pump issue), coolant leakage, or other installation issue.	System should be powered down and all elements of the water-cooling loop should be inspected for proper operation. The mounting of the cooler to the motherboard should also be checked.

OTHERS
System kicked out of unregulated to cryo after 15 minutes

The system monitors the CPU workload. When the system is in idle state and in unregulated more for 15 minutes or more. The system will move back to Cryo mode in order to minimize risk of condensation that can occur in unregulated mode

SUPPORT AND SERVICE

In case you need assistance, please contact:
http://support.ekwb.com/

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