

COMPUTER HARD DRIVES

A hard drive is the hardware component of your computer that stores all of your digital content. Your operating system, programs, documents, pictures, music, videos.



Desktop 3.5" SATA Hard Drive (HDD)



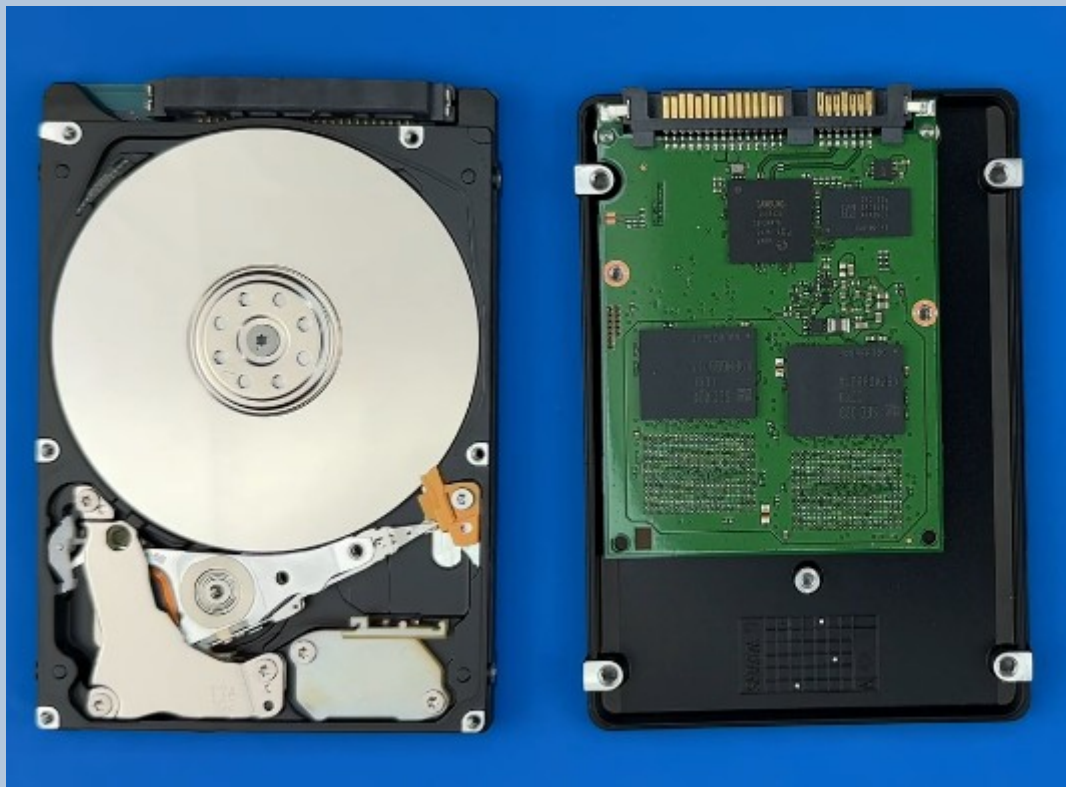
3.5" Hard drive with cover removed. Mechanical Hard Drive with spinning disk.

LAPTOP 2.5"

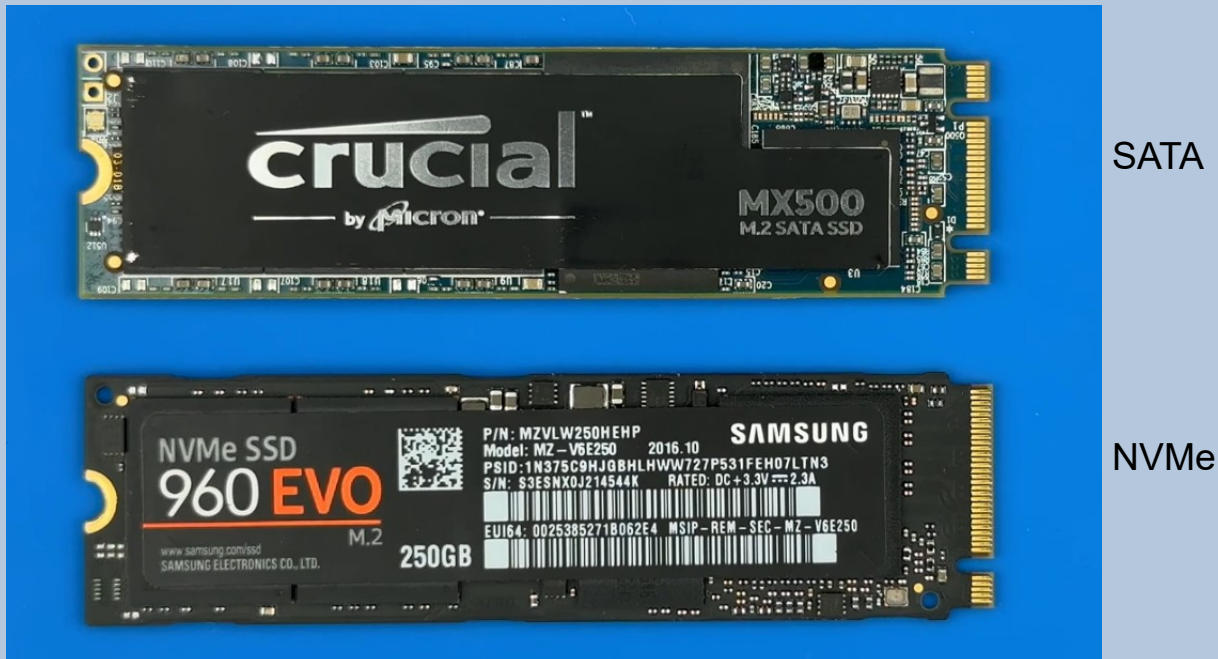


Mechanical Hard Drive (HDD)

Solid State Hard Drive (SSD)



M.2 Solid State Hard Drive. Used in Desktops and Laptops



Hard Drive FORM FACTOR

Form Factor refers to its shape and size. Hard drives come in several different Form Factors: 3.5 inch, 2.5 inch and M.2 as shown above. It is important to pick the correct form factor that applies to your computer.

Laptops use the 2.5 inch hard drive or the M.2 – Desk tops use the 3.5 inch drive and the M.2. It is possible to fit a 2.5 inch hard drive into a desktop computer with a special mounting bracket.

Hard drives can be either mechanical or solid state. Mechanical Hard Drives have a spinning platter while solid state hard drives have no moving parts.

The designation HDD refers to a Mechanical Hard Drive and SSD refers to a Solid State Hard Drive.

Everything stored on a hard drive is measured in terms of its file size. Your Operating System & Programs take up the most space.

Hard Drive capacity is measured in Bytes.

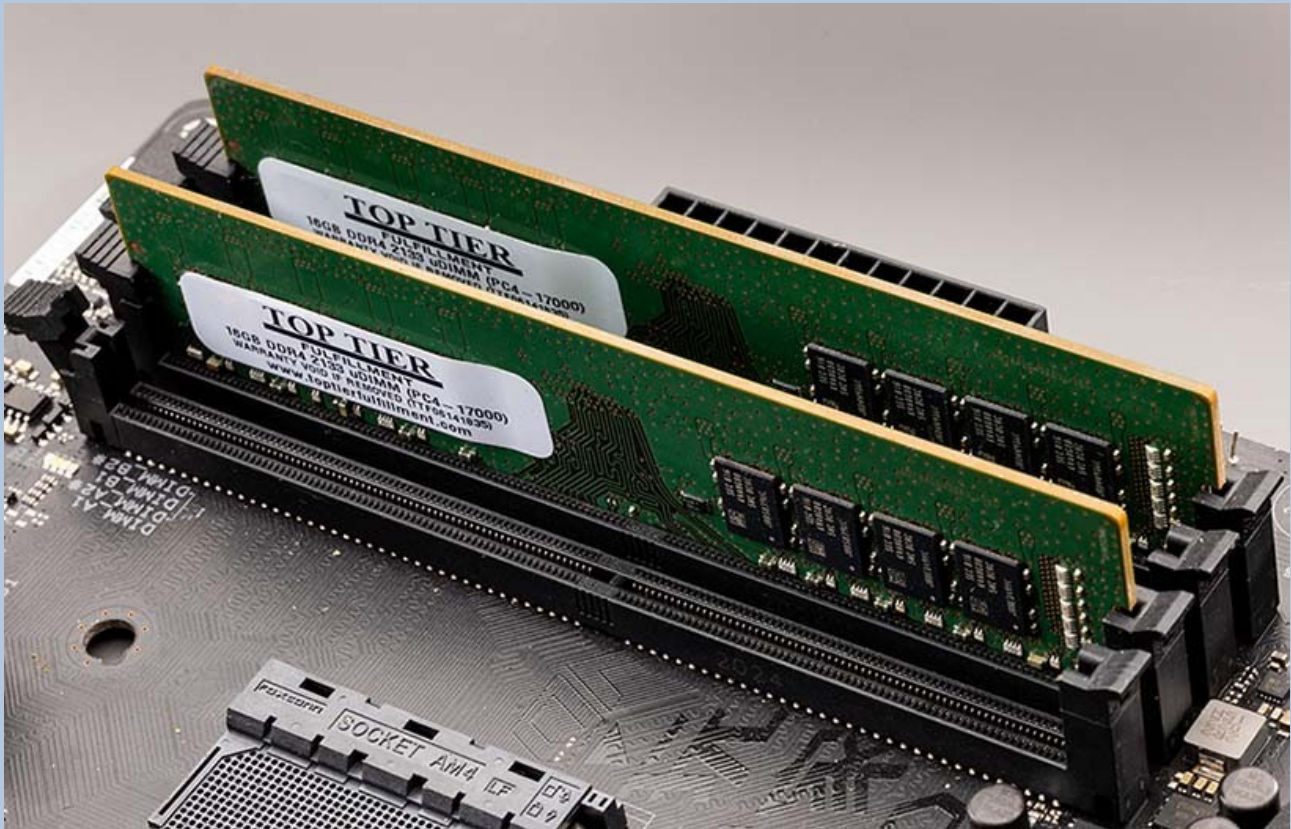
KB = 1 Kilobyte = 2^{10} = 1024 bytes

MB = 1 Megabyte = 1,048,576 bytes

GB = 1 Gigabyte = 1,073,741,824 bytes

TB = 1 Terabyte = 1,099,511,627,776 bytes.

Do not confuse your Hard Drive with RAM (Random Access Memory). RAM is Working Memory used by the Processor and is not used for storing files. Both RAM and Hard Drives use the same unit of measurement which leads to the confusion.



Two RAM chips mounted on the Mother Board. Not to be confused with the Hard Drive. RAM Form Factor - Two sizes -



HARD DRIVE CONNECTORS

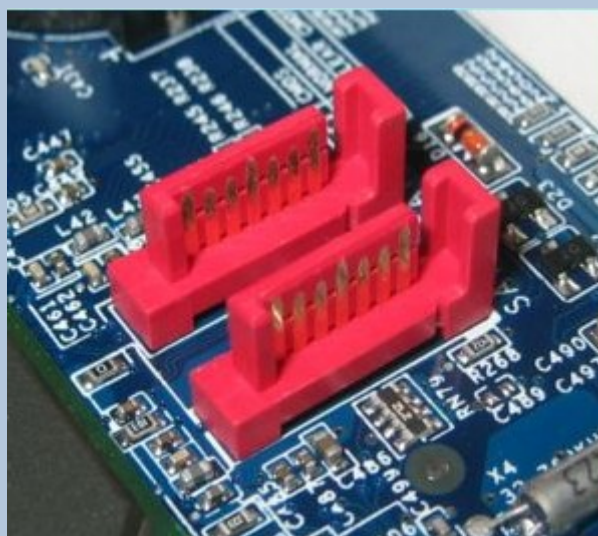
Older computers used the IDE connector which you will not find anymore unless you have a very very old desktop.

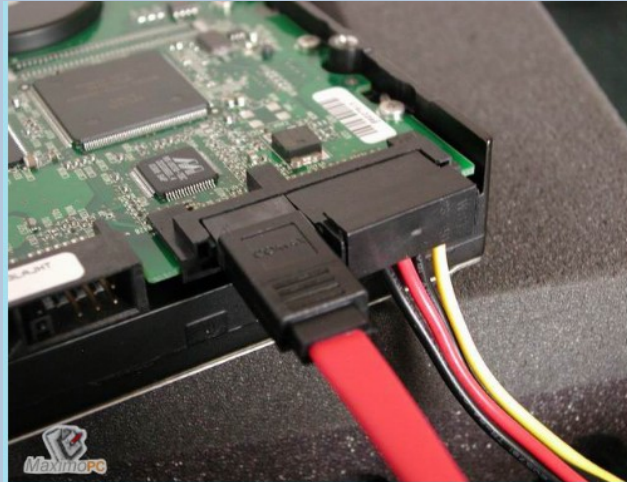
All modern computers, both desktop and laptops use the SATA or the M.2 connector.



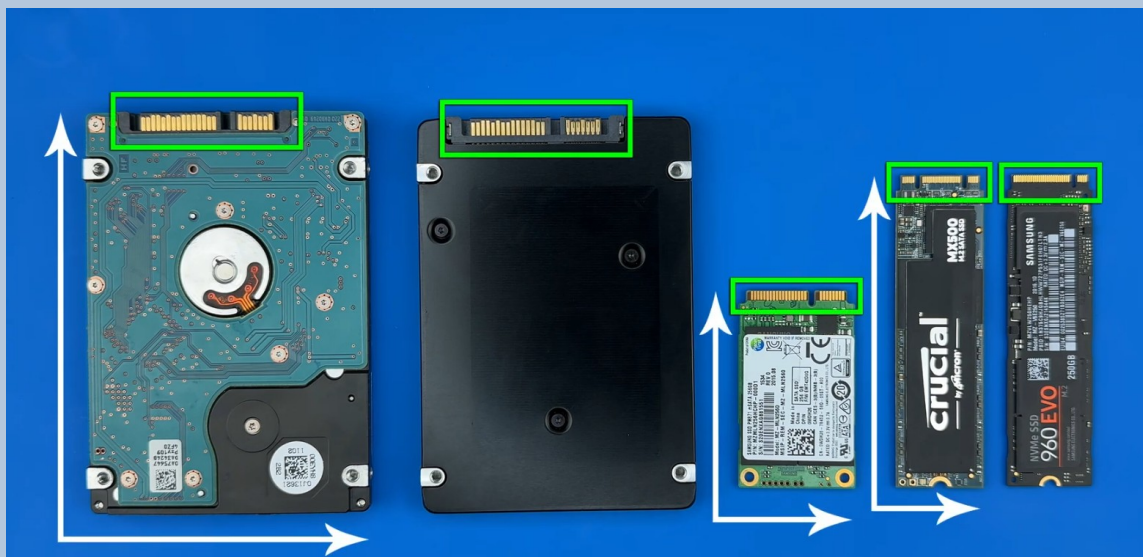
This is a close up view of a 3.5 inch drive SATA connector. The smaller connector of the left is for the Data Cable and the one on the right is for the Power connector.

SATA Motherboard connectors





SATA data and power cables attached.



2.5 inch Drive and M.2 connectors.

Show above are the 2.5 inch HDD, 2.5 inch SSD, mSATA, M.2 SATA & M.2 NVMe

The mSATA is used in smaller laptops and embedded systems.

M.2 connected
directly to the
Mother Board



HARD DRIVE DOCKING STATION

Wide Support for Multiple Types of HDD and SSD



3.5" SATA HDD



2.5" SATA HDD



2.5" SATA SSD



NVMe
M.2 SSD



SATA
M.2 SSD*



mSATA
SSD*



*M.2 slot is for NVMe M.2 SSD only, SATA M.2 and mSATA SSDs can be supported with an optional SATA to M.2 and mSATA adapter (sold separately)

This is a Hard Drive Docking Station which allows a hard drive to be used externally.

Plugs into USB-C port on your computer.
Requires external power adaptor 12vdc

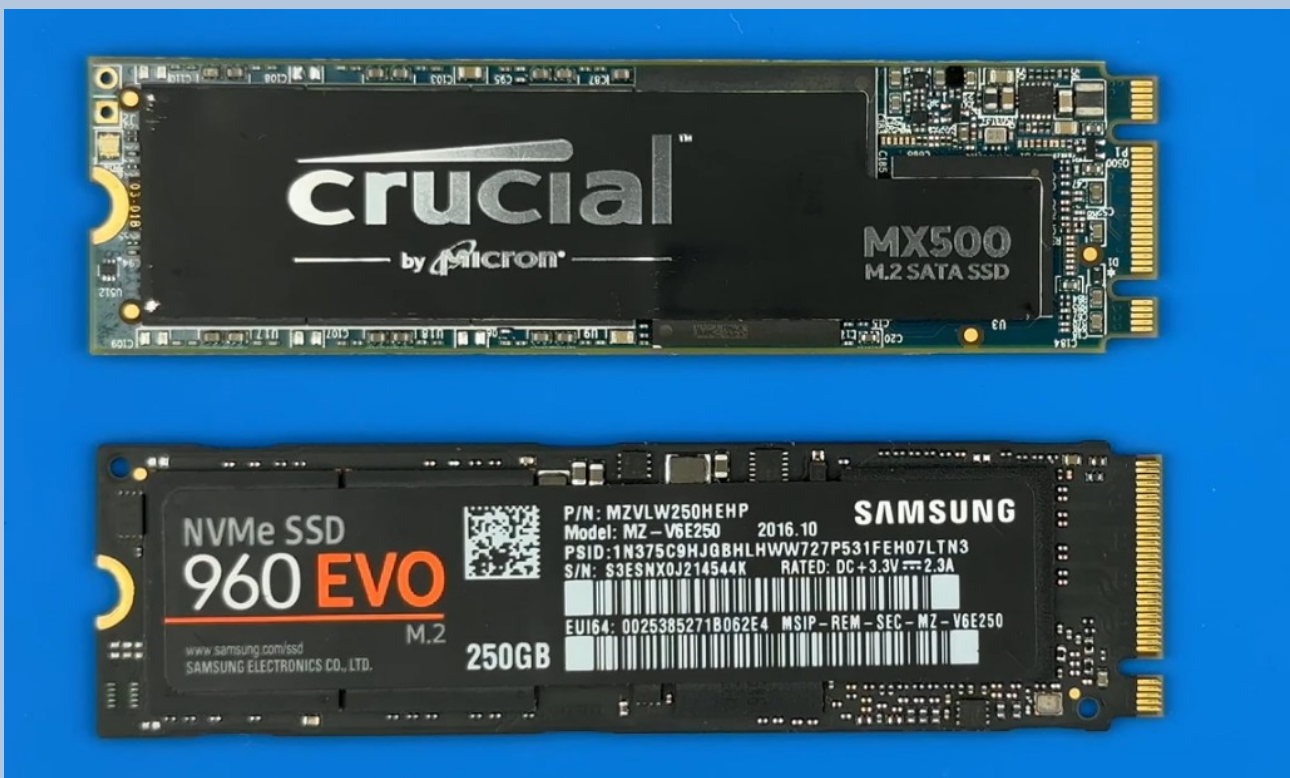
Hard Drive Interface

There are two main types of storage interfaces; SATA and NVMe

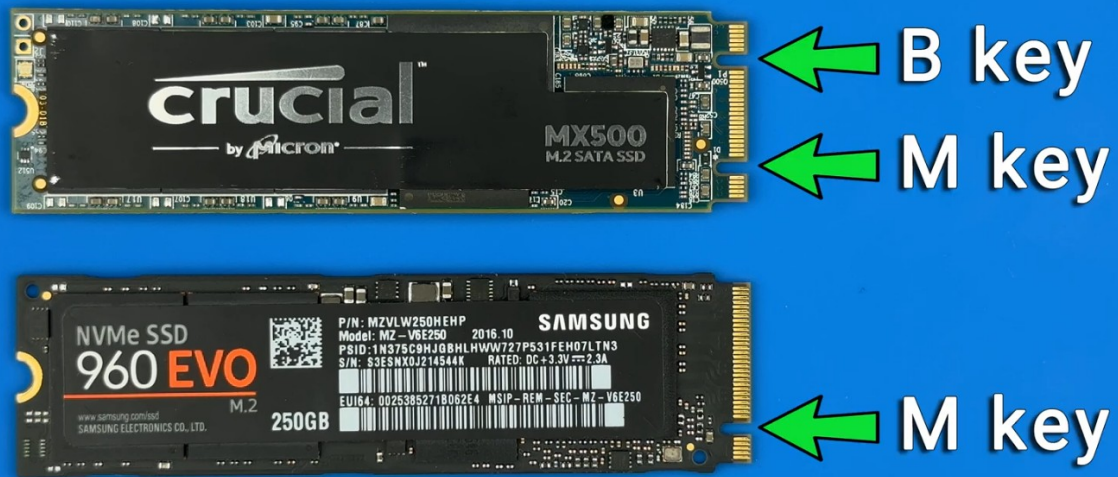
The storage interface determines how data is transferred between the storage device and the system, impacting speed and compatibility.

SATA is used on HDDs, SSDs, mSATA and M.2 SATA with a max speed up to 550 MB/s. The SATA interface is being replaced by NVMe which has a max speed up to 14,000 MB/s (PCI-Express Gen 5)

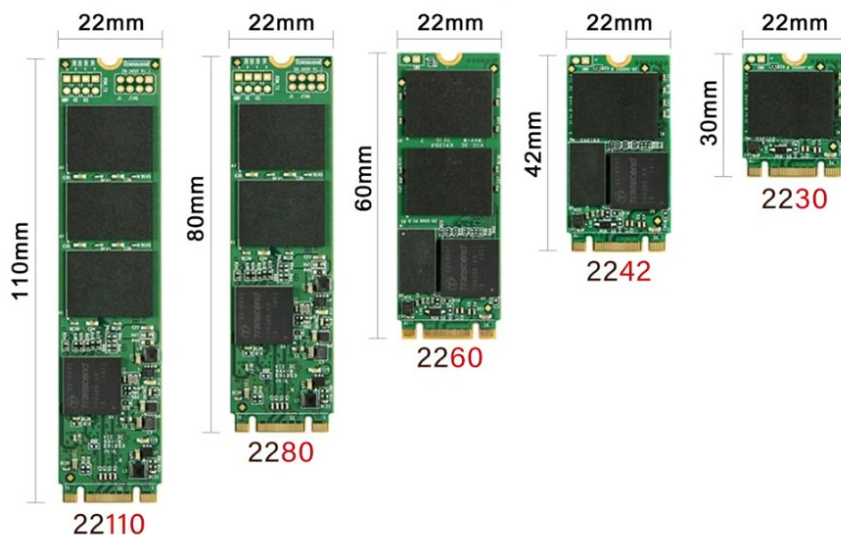
M.2 SATA and M.2 NVMe are not interchangeable unless the computer is designed to take both.



The connector is slightly different. Notice the Notch.
They differ in performance, interface, speed and how they connect to the motherboard.

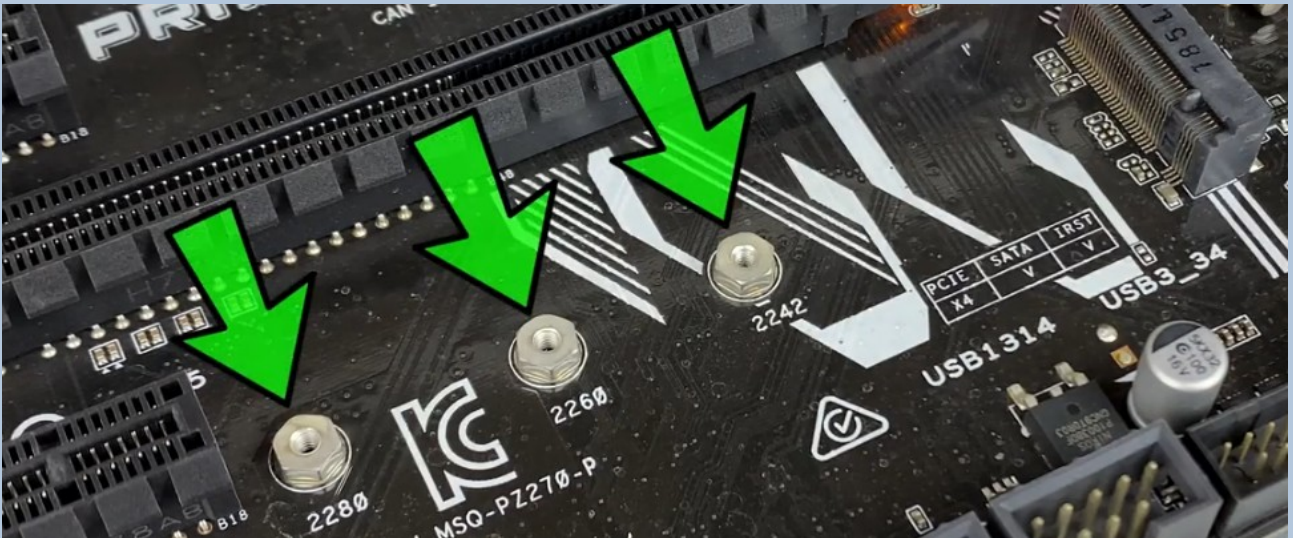


M.2 SSD Form factor: 22110, 2280, 2260, 2242, 2230



M.2 is available in different sizes. The numbers represent the length and width of the chip.

The M.2 2280 is 22mm wide and 80mm in length. It is important to determine which size your computer will accept.



This motherboard will support three sizes.

SATA



Max Speed
up to 550 MB/s

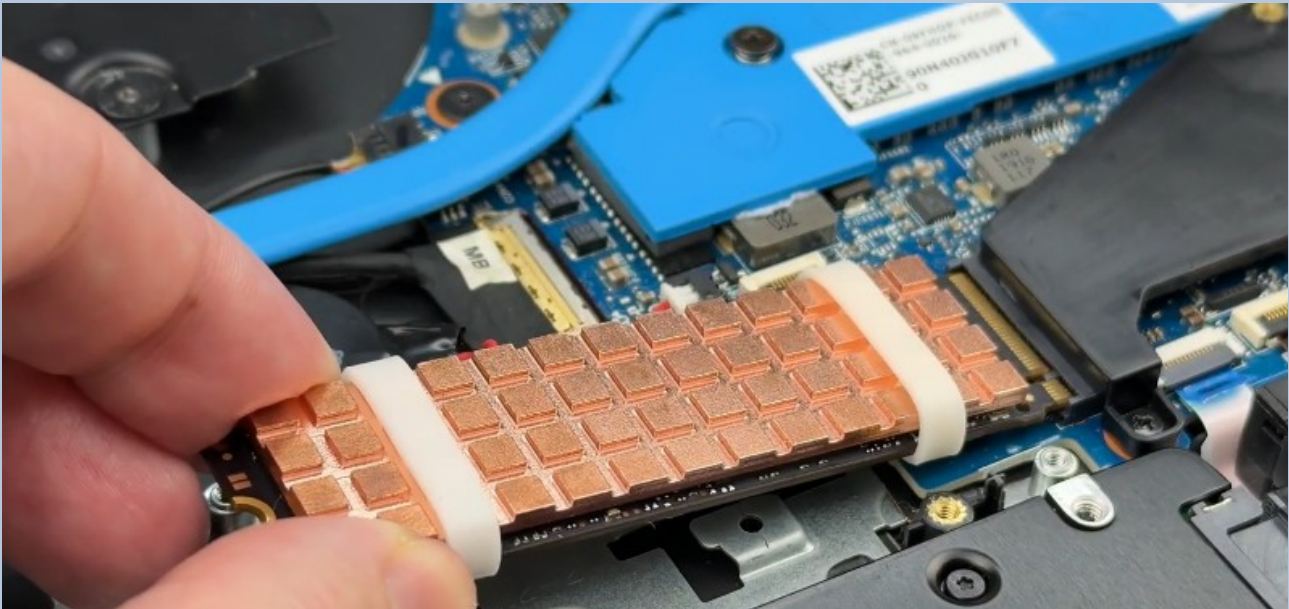


PCIe Gen 3: ~3,500 MB/s
PCIe Gen 4: ~7,000 MB/s
PCIe Gen 5: ~14,000 MB/s

PCI-Express ^{NVMe}

REMEMBER THIS:
The SATA and NVMe M.2 are NOT interchangeable unless the computer is designed to take both.

The M.2 SSD can generate a lot of heat and it is strongly recommended that you use a HEAT SINK. Some brands of M.2 comes with a preinstalled Heat Sink.

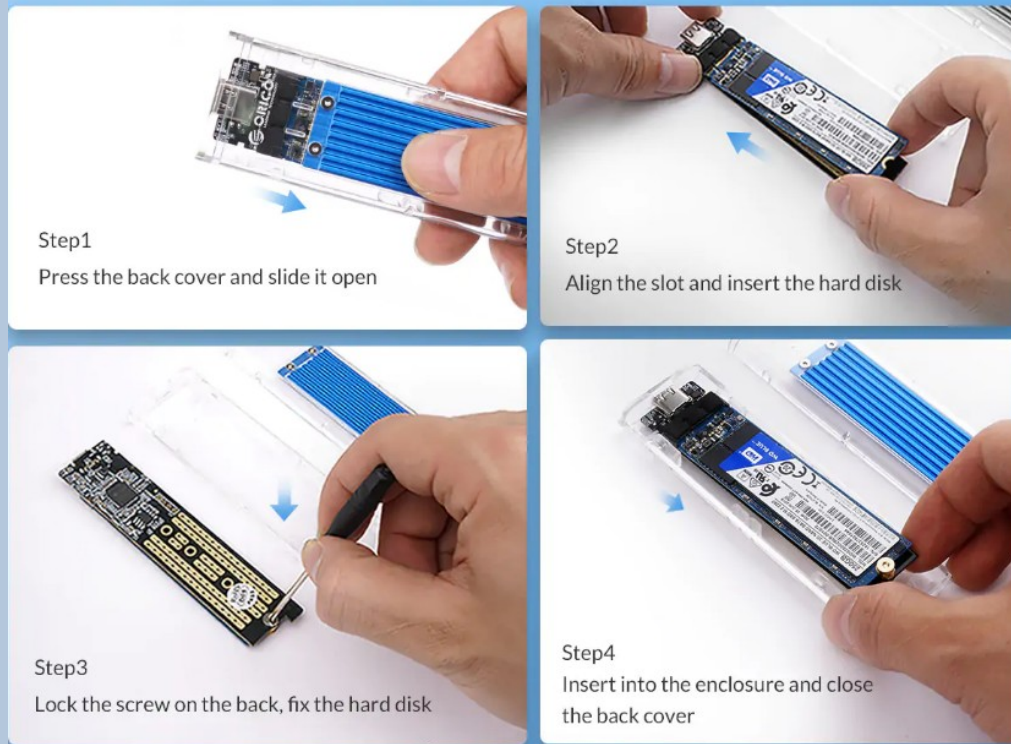


If you are purchasing an M.2 enclosure to use it externally make sure you purchase the correct one.

This is a picture of a NVMe M.2 enclosure that would plug into a USB-C port on your PC using a USB-C cable.



4 Steps Slide-cover Installation



If your desktop motherboard does not have an M.2 slot you can install this adaptor card.



This is an example of a different adaptor card that fits inside a 2.5" drive case.



Free Space Management

Leave **10–20% free space** to run M2 SSD at maximum speed and prevent performance degradation.

Choosing the right brand is important.



Samsung:

- NAND, Controllers & Firmware
- Very low failure & Return rates
- Warranty up to 5 years



Western Digital (WD):

- NAND & Controllers Manufacturer
- Reliability



Crucial (Micron):

- NAND manufacturer
- Cost-Effective
- Reliability