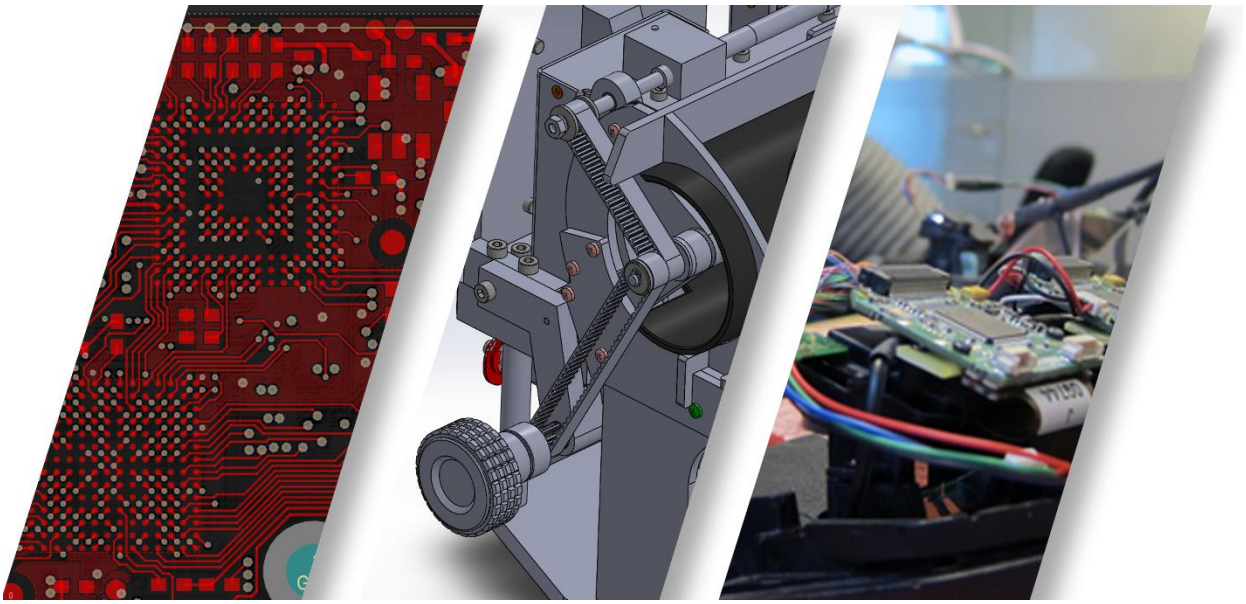
CINOPTICS™

LET'S CREATE REALITY

"Technology breakthrough: Cinoptics introduces 4th generation cable"



HMD as sensor HUB

The modern application of HMD[1] technology in training and research is more demanding than ever, both in virtual as well as augmented reality environments. In this field where monitoring the user as well as the environment is key to the application, the HMD at the center has evolved to a sensor hub hosting several sensor systems. More and more different systems are integrated in the HMD and used for tracking the user or mapping the environment.

Cinoptics specializes in custom solutions tailored to the customer needs. This often requires specific sensors / systems to be integrated in the HMD, and is possible as Cinoptics designs and produces its HMD products in house. Cinoptics' Reseach and Development department is constantly working on the forefront of technology to make sure the lastest features are available.

> *"Cinoptics specializes in custom solutions … as Cinoptics designs and produces its HMD products in house."*

The increase In data gathering from sensor systems, in addition to ever higher resolution displays, leads to an increase in communication bandwidth required and emphasizes the critical role of the interconnect between host and HMD. This interconnect is what has constantly been under development and improved over the years.

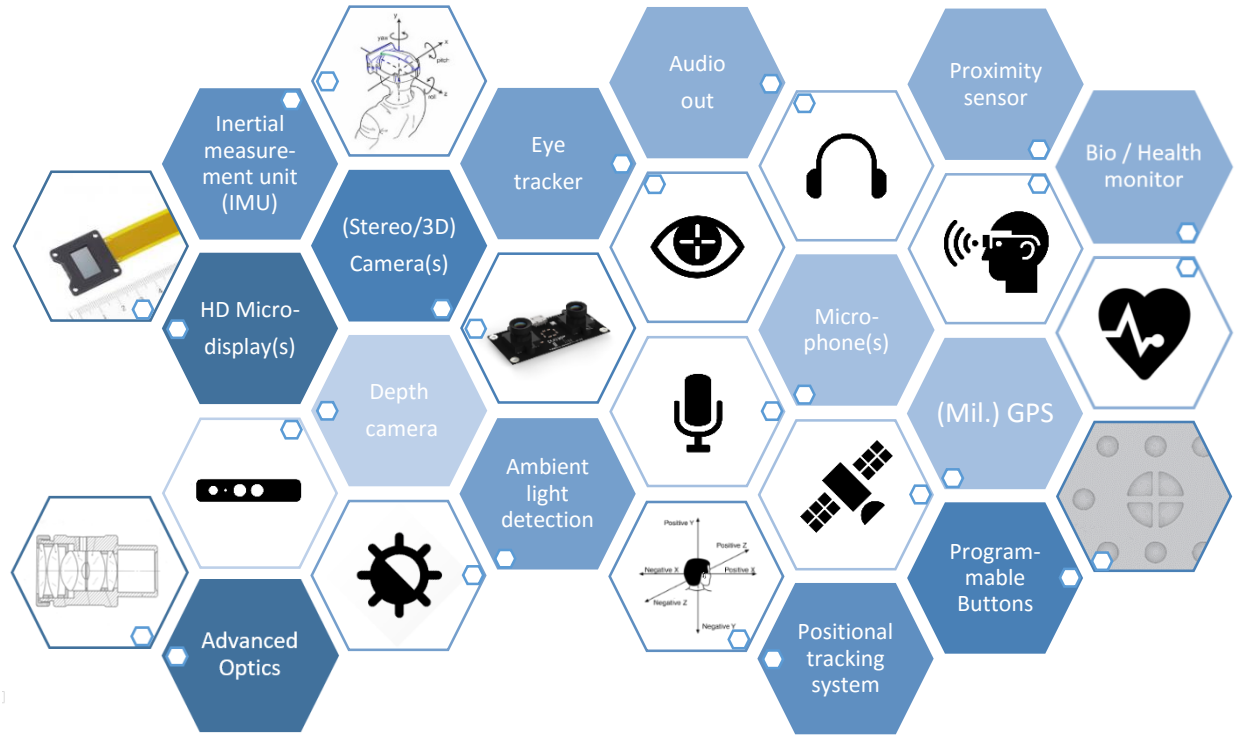


Figure 1: Variety of components that are often integrated in a modern HMD

[1] HMD – Head mounted display

Connecting the HMD

The complete Cinoptics product portfolio is independent of platform and application, as all devices are detected by the host just like any other monitor. The HMD connects directly to a host using a generic Displayport video and USB data interface. This philosophy allows for easy integration in any situation and a quick setup.

To achieve this all devices utilize microdisplay technology that yields the best image quality while no specific post-processing is required. This in turn significantly lowers user system requirements and benefits wearable battery powered systems where performance is often limited.

> *"To achieve maximum display quality and the best overall experience a wired connection is still essential"*

A wired connection between the host and the HMD is still the preferred way of connecting any HMD as opposed to Wireless connections methods. Any wireless connection will introduce additional latency and/or compression, as well as have a limited bandwidth for exchanging sensor data. Also it limits the amount of systems that can operate in one location. To achieve maximum display quality and the best overall experience a wired connection is still essential.

Currently the best solution for a wireless system is the use of a battery powered wearable system. Performance of these systems has increased dramatically in recent years thanks to the developments in the smartphone and tablet industry.

Figure 2: OLED Microdisplay as used in Cinoptics AIRO II

Evolution of technology

All HMD applications benefit from a simple cable system where the user can move freely and maximum performance is guaranteed. As the cable is still an essential part of any HMD, there has been a lot of development making sure it is as unobtrusive as possible while allowing maximum capability.

Figure 3a (2005):
Double custom made SCSI cable, used for legacy dual display (stereoscopic) Cybermind (c) devices. All devices connect to a seperate Cybermind (c) control box that drives and powers the device using this cable. Sensor systems requiring additional cables.

Cable specification:

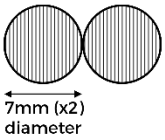


Figure 3b (2013):
Double custom displayport connection, used for current generation dual display Cinoptics devices. It uses a fixed end-of-cable cablecombiner to transfer power and USB over a Displayport connection. Requires seperate video signals for left and right displays.

Cable specification:

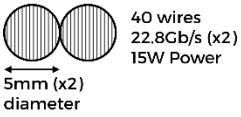


Figure 3c (2015):
Single custom displayport connection, able to support single and dual display devices using a single cable. Used for current generation Cinoptics devices. Uses a fixed end-of-cable cablecombiner to transfer power and USB over a Displayport connection.

Cable specification:

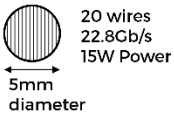
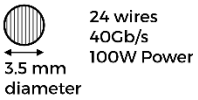


Figure 3d:
A single USB 3.1 type-C cable connection that will support single & dual display devices as well as data and power for multiple sensor systems. The HMD can connect directly to the host (e.g. PC, tablet, smartphone) using a using a single user replacable OTS cable.

Cable specification:



In-house Development of HMD technology started in 2005 with the introduction of the Cybermind Visette 45. Due to the complexity of the driving electronics then, a complex custom cable was required to connect to the HMD.

In 2014 a new electronics platform was introduced under the new Cinoptics name where for the first time all electronics are integrated inside the HMD. The new cable design based on Displayport technology with an end-of-cable cable combiner also features an USB data channel. The USB data channel connects to a USB hub inside the HMD allowing multiple sensors to connect internally.

> *"Cinoptics aims on continuing the single cable HMD setup with the new USB 3.1 type C technology on its 4th generation cable system"*

In 2015 Cinoptics introduced the first single cable system capable of supporting a dual display stereoscopic HMD, also based on Displayport.

The key focus on development of the HMD cable has always been:

- Smaller diameter
- More flexibility
- Higher bandwidth
- Robustness
- Variable cable length possibilities
- Lowering cost

Cinoptics aims on continuing the single cable HMD setup with the new USB 3.1 type C technology on its 4th generation cable system.

Introducing USB 3.1 type-C

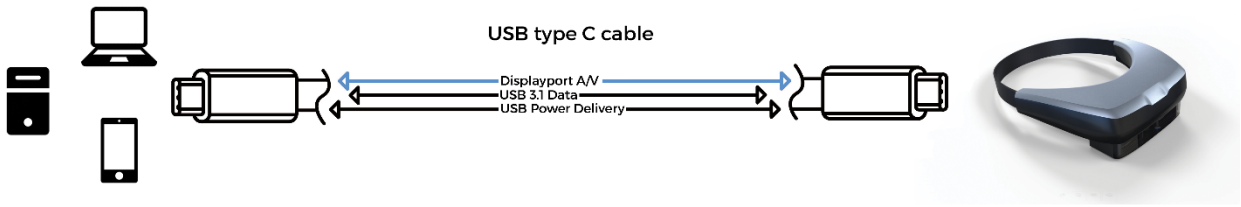


Figure 4: USB 3.1 type C cable connecting the HMD

In august 2014 the USB Implementers Forum introduced the USB 3.1 type-C specification that aims to replace various USB Type-B and Type-A connectors and cables with a standard meant to be future-proof. Aside from the advanced power and USB data capabilities it features Displayport video capability using the alternate mode for use alongside the USB data connection.

The USB 3.1 type-C cable is ideal for connecting high performance HMDs as it combines all the interfaces required over a single small cable that is both future proof and versatile. It allows connecting and powering the HMD from most USB type-C capable host PC / laptop / phone etc. using a single OTS[2] user replaceable cable.

"The USB 3.1 type-C cable is ideal for connecting high performance HMDs … over a single small cable that is both future proof and versatile"

A single USB type-C cable can provide video for two microdisplays as well as a super speed USB connection capable of supporting several camera systems. In addition power for all components can be provided using the USB power delivery providing up to 100W of power.

Cinoptics has shown an example of this technology at the ITEC 2016 and will announce its first USB 3.1 type C enabled products in Q3 2016.

Cinoptics

Cinoptics is a leading Designer and Manufacturer of Augmented Reality and Virtual Reality solutions and have been serving the industry for more than 17 years. We specialize in producing high-end Head/Helmet Mounted Displays, Handheld, Virtual Binoculars & Virtual Microscopes with the most flexible electronics platform and highest quality optics in the industry. In addition to our off the shelf (OTS) products, Cinoptics' OEM Service enables you to cost effectively create your own Near to Eye applications.

Learn more about Cinoptics products and capabilities at www.cinoptics.com

[2] Off The Shelf