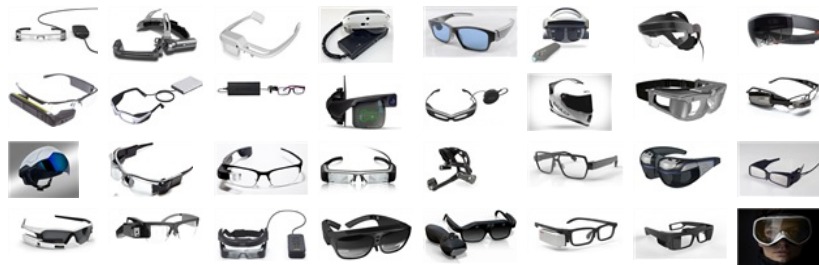


The Definitive Guide to Augmented Reality Smart Glasses

Cover	Introduction	Primary Differentiators	Optical Qualities	Sensors	Human Interfaces	Communications	Product Detail & Comparison	Resources
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The Definitive Guide to Augmented Reality Smart Glasses

*An Interactive Infobase of the Most Promising
Products Coming to Market*



Created by Ron Padzensky
published by AugmentedReality.org

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Introduction

Welcome to the Definitive Guide to Augmented Reality Smart Glasses

<small>Click item for details</small>
Why this Guide was Created
What is Augmented Reality?
About Augmented Reality Glasses
The Augmented Reality Market Forecast
The Scope of This Guide
Data Disclaimer
About the Author
About Tableau

The world is just now becoming familiar with the concept of augmented reality. Today our smart phones are capable of providing a glimpse of its future promise, but it is a foregone conclusion that this technology wants to be a hands-free mobile experience and smart glasses are the means to that end. There are a number of companies around the globe investing billions of dollars to bring smart glasses to market, each of them with their own vision for how this should work. It is not a matter of "if" ubiquity will be achieved -- only a question of "when". This free guide was created to advance the industry by helping people to learn about mobile AR technologies and how the most promising products are implementing them today.



Last Edit: 4/3/2017

Current number of glasses in database: 53

Click here to register to be notified of updates!



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Primary Differentiators

The primary differentiators are attributes that set AR glasses apart from one another in form and function. Learn about these attributes in the section below then filter the database to see which units fit the chosen criteria. You can view more details about the individual AR smart glasses elsewhere in the guide.

[Click term for explanation](#)

Form and Configuration

Market

Optical Class

Platform

An AR system needs to be hands free to enable AR experiences while the user performs tasks. Different makers take different approaches to best suit their intended uses. While many are working toward the socially familiar spectacles form, others are adapted for safety (helmets), active use (goggle, visor), or integration with other accoutrements (headset). While some makers integrate their non-optical components into the headset, others offload this work to a tethered controller, PC or smartphone.

Explore products by primary attributes

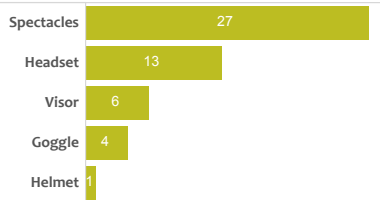
Available Now for Purchase

All

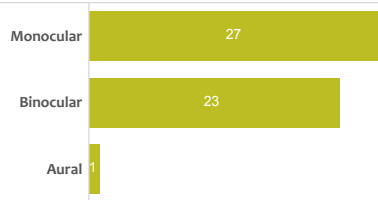
Click bars to filter the product list

Click product to view attributes & image

Form Factor



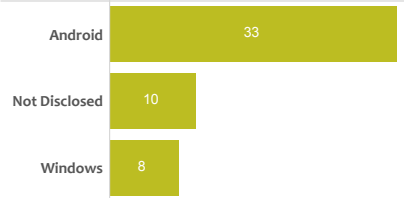
Class



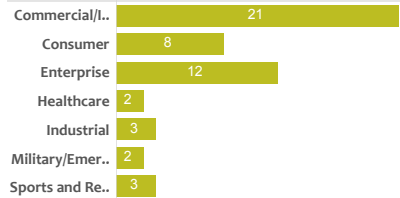
AiR Glasses by Atheer
AIRO by Cinoptics
AIRO II by Cinoptics
AiRScouter WD-200B by Brother
ARS30 by Trivisio
Blade 3000 Smart Glasses Business by Vuzix Corporati
Blade 3000 Smart Glasses Prosumer by Vuzix Corporat

Form Factor	Class	Platform	Market
Visor	Binocular	Windows	Consumer

Platform



Market



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Optical Qualities

The optical qualities of AR glasses are their most important attribute when it comes to rendering compelling experiences. The delivery of information to the eye also presents the hardest technological problems to solve. The holy grail of AR is to be able to place visual information almost anywhere in one's line of sight and we still have a long way to go until this is achieved. This section describes the optical qualities to look for and how the various products measure up.

[Click term for explanation](#)

Field of View

Optics

Resolution

The field of view (FOV) is the angle projecting out from the pupil to the horizontal ends of the rectangle through which computer generated information can be viewed through the AR system. A wider FOV is desirable in AR to provide a bigger canvas on which information can be displayed and to render a more immersive experience. It is thus one of the more important measures of the effectiveness of AR glasses. Human vision has an almost 180° FOV. The goal for makers should be to get as close as possible to this measure, but due to the physics of optical displays it has been one of the most challenging problems for them to solve.

Products by FOV

Available Now for Purchase
All

Product	Company	Optics	Resolution	Field of View							
				0°	20°	40°	60°	80°	100°	120°	
Sulon Q	Sulon	OLED Waveguide	2560x1440								120°
Totem	Vrvana Inc.	Video Pass Through	2650x1440								120°
Meta 2 Developer Kit	Meta	Optical see-through	1280x720							90°	
Mark I	IMMY	OLED Direct Retinal Projection	1024x768					60°			
AiR Glasses	Atheer	LCOS Waveguide	1800x720					50°			
nVisor ST50	NVIS	Optical see-through	1280x1024					50°			
Smartglasses 9	Osterhout Design Group (ODG)	Optical see-through	1920x1080					50°			
SXGA61-3D	Trivisio	Near-eye microdisplay	1280 x 1024					45°			
C Wear 20 Extended	Penny	OLED Direct Retinal See thro..	853x480					42°			
C Wear 30 Extended	Penny	OLED Direct Retinal See thro..	853x480					42°			
AIRO II	Cinoptics	Optical see-through	1280x720					40°			
DK-50	Lumus Ltd.	Optical see-through	1280x720					40°			
LinaTXT	Benny Labs LTD	e-ink	1x16					40°			
Revelio	MAXST	Optical see-through	1280x720					40°			

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Sensors

Humans have their eyes, ears and vestibular system (among other senses) to orient themselves in their surroundings and maintain situational awareness. AR glasses use an array of sensors to understand their environment as the means of reacting to it and with it. This section explains the most common sensor types found in AR units today and what their roles are. Below is an accounting of the usage of these sensors which you can click through to see which units have which sensors.

Click term for explanation	<p>Depth sensing time of flight systems consist of two or more camera sensors and one or more infrared laser or LED light projector. The cameras track infrared light, which is outside of the visible spectrum and work in stereo, to aid depth perception through parallax as human eyes do. AR glasses need only cast this light as far as arms reach to sense hand gestures. Readings are taken hundreds of times per second and streamed to software that converts the gestures to commands and actions in the apps.</p>
Depth Camera	
IMU	
Microphone	
RGB Camera	

Explore sensor integration in products

Click bar segments to filter list of products

Click product name to view sensor profile and image

Available Now for Purchase

All

Depth Camera

IMU

Microphone

RGB Camera

Count of Products

-
- opt
- Yes

- AIR Glasses by Atheer
- AIRO by Cinoptics
- AIRO II by Cinoptics
- AIRScouter WD-200B by Brother
- ARS30 by Trivisio
- Blade 3000 Smart Glasses Business by Vuzix Corp.
- Blade 3000 Smart Glasses Prosumer by Vuzix Corp.
- C Wear 20 Extended by Penny
- C Wear 30 Extended by Penny
- DK-40 by Lumus Ltd.
- DK-50 by Lumus Ltd.
- Eyes-On Glasses 3.0 by Evena
- Glass Enterprise Edition by Google
- Golden-I 3.8D by Kopin
- HMT-1 by RealWear Inc.
- Hololens Development Edition by Microsoft
- InfoLinker WUZ-01B by Westunitis

	Depth Camera	RGB Camera	IMU
Microphone	Yes	Yes	Yes

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Human Interfaces

Human interfaces are the means by which persons interact with AR systems to navigate and control them. There are two classes of controls to consider: The first is the navigation of menus and options; the second is manipulation of on-screen content through selecting, highlighting, scaling, rotating, dragging, etc. This sections explain the most commonly implemented systems for performing these and gives you the opportunity to interactively learn which AR glasses employ which systems. There are other exciting modes of human interface being developed such as eye tracking and brainwave control which have yet to find their way into products.

Click term for explanation

- Button Control**
- Hand Gesture Recognition
- Motion Controller
- TouchPad Control
- Voice Control

There's nothing space age about buttons, toggles and switches, but they still have their place on many of these AR glasses. They can be sized, shaped, textured and placed in configurations that make them intuitive to use. Of those units that have them, they may be found on the glasses temple or on the peripheral handheld controller. They are used to control such things as power, directional cursor movement, volume and preset commands.

Explore products by human interface

Click pie slices to filter list of products

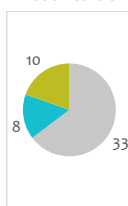
Click product name to view interface profile and image

Available Now for Purchase

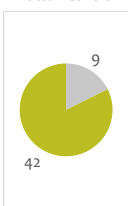
All



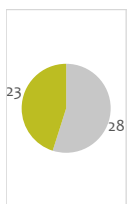
Motion Control



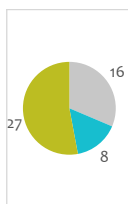
Button Control



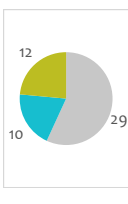
Touch Control



Voice Control

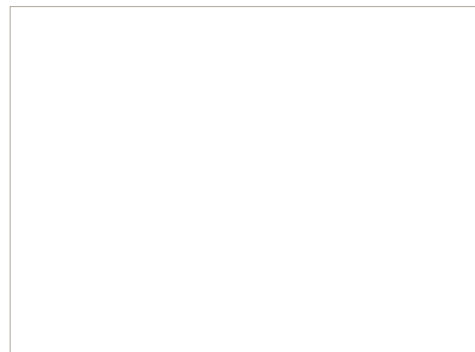


Gesture Control



- AIR Glasses by Atheer
- AIRO by Cinoptics
- AIRO II by Cinoptics
- AIRScouter WD-200B by Brother
- ARS30 by Trivisio
- Blade 3000 Smart Glasses Business by Vuzix Corp.
- Blade 3000 Smart Glasses Prosumer by Vuzix Corp.
- C Wear 20 Extended by Penny
- C Wear 30 Extended by Penny
- DK-40 by Lumus Ltd.
- DK-50 by Lumus Ltd.
- Eyes-On Glasses 3.0 by Evena
- Glass Enterprise Edition by Google
- Golden-I 3.8D by Kopin
- HMT-1 by RealWear Inc.
- Hololens Development Edition by Microsoft
- InfoLinker WUZ-01B by Westunitis
- Jet by Recon

Button Control	Gesture Control	Motion Controller	TouchPad Control	Voice Control
Yes	Yes	-	-	Yes



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Communications

Many experts predict that augmented reality glasses will replace smartphones for a significant portion of the mobile market in the near future. AR glasses need to be able to exchange information with other devices, peripherals, objects and networks while knowing its position on earth. Like our smartphones, smart glasses will do this with BlueTooth, cellular (LTE), WiFi and GPS and subsystems. This section describes this communication technology, how it will be used, and which units employ them.

[Click term for explanation](#)

BlueTooth
GPS
LTE
WiFi

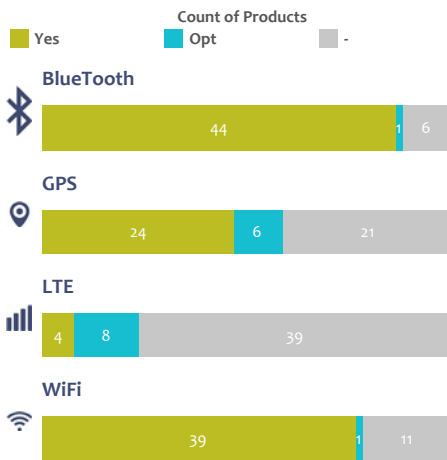
While Wi-Fi is intended as a replacement for high speed cabling for general local area network access, Bluetooth is intended for portable equipment and its applications. Its ubiquity makes it the ideal protocol for connecting AR glasses to peripheral devices such as phones, tablets, laptops, keyboards, mice, gesture control devices. It can do so securely, with low power, and with adequate range.

Explore products by communication capabilities

Available Now for Purchase
All

Click bar segments to filter list of products

Click product name to view communications capabilities and image



Products containing selected communication protocols

- AIR Glasses by Atheer
- AIRO by Cinoptics
- AIRO II by Cinoptics
- AIRScouter WD-200B by Brother
- ARS30 by Trivisio
- Blade 3000 Smart Glasses Business by Vuzix C
- Blade 3000 Smart Glasses Prosumer by Vuzix C
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- HMT-1 by RealWear Inc.
- Hololens Development Edition by Microsoft
- InfoLinker WUJ-01B by Westunitis
- Jet by Recon

Blue Tooth	GPS	LTE	WiFi
Yes	Yes	-	Yes

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Detailed Product Comparison

Compare	Product 1	Product 2	Product 3
	Hololens Development Edition by Mi..	R7 Smartglasses by Osterhout Desig..	Moverio BT-200 by Epson
Status	Dev Kits Shipping	Product Shipping	Product Shipping
Market	Consumer	Commercial/Industrial	Commercial/Industrial
Form Factor	Visor	Spectacles	Spectacles
Optical Class	Binocular	Binocular	Binocular
Design Form Factor	Self Contained	Self Contained	Tethered Controller
Cost	\$3,000	\$2,750	\$700
Weight headpiece (+peripheral)	579g	113g	88+124g
Battery Life	5.5 hrs	5.5 hrs	6 hrs
Platform	Windows	Android	Android
Processor	Intel Atom x5-Z8100	Qualcomm Snapdragon 805	TI OMAP 4460 1.2Ghz Dual Core
Audio	Stereo	Stereo	Stereo
Optics	Optical see-through	Optical see-through	Optical see-through
Resolution	1280x720	1280x720	960x540
Field of View	30°	30°	23°
Rx Lens Compatible	Yes	Opt	Opt
VR Convertible	Yes	-	Opt
Depth Camera	Yes	-	-
RGB Camera	Yes	Yes	Yes
Microphone	Yes	Yes	Yes
IMU	Yes	Yes	Yes
Button Control	Yes	Yes	Yes
Touchpad Control	-	Yes	Yes
Motion Controller	-	Yes	Yes
Voice Control	Yes	Yes	Opt
Gesture Control	Yes	Opt	Opt
Bluetooth	Yes	Yes	Yes
GPS	-	Yes	Yes
LTE	-	-	-
NFC	-	-	-
RFID	-	-	-
WiFi	Yes	Yes	Yes
SDK	Yes	Yes	Yes
3rd party toolkit support	-	Yes	Yes
	Microsoft HoloLens is the first fully untethered, holographic computer, enabling you to interact with high-definition holograms in your world.	R-7 is a totally new device incorporating ODG's next generation optics, electronics and industrial design. Targeted to Enterprise customers, the R-7 delivers a powerful and robust solution in a new lighter and tighter	The MOVERIO BT-200 smart glasses are designed to change how you experience the world around you. With the smallest, most comfortable and most affordable smart eyewear on the market, and a growing

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Resources



Link to Product Web Sites

Click name to open site in new browser tab

AiR Glasses by Atheer
AIRO by Cinoptics
AIRO II by Cinoptics
AiRScouter WD-200B by Brother
ARS30 by Trivisio
Blade 3000 Smart Glasses Business by Vuzix Corp
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C Wear 20 Extended by Penny
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DK-50 by Lumus Ltd.
Eyes-On Glasses 3.0 by Evena
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Golden-I 3.8D by Kopin
HMT-1 by RealWear Inc.
Hololens Development Edition by Microsoft
InfoLinker WUZ-01B by Westunitis
Jet by Recon
Jet Pro by Recon



New Products We're Tracking

Click name to open site in new browser tab

oglass Pro by Shenzhen Augmented Reality Techn
Air by Shadow Creator
Ares by Mad Gaze
Augmented Reality by Coretronic
Bridge + Structure Sensor by Occipital
Cloud-1 by Topsy
Cool Glass One by Alto Tech

Contact the Author



The Augmera Blog

Want to learn more about augmented reality? The author of this buyer's guide has distilled his years of research into a number of easy to understand blog posts that discuss all aspects of AR. Thousands of people from all over the world visit these articles every month to enrich their understanding of the technology and its impact on society.



AugmentedReality.org

AugmentedReality.org unites hundreds of companies, and thousands of entrepreneurs, engineers and designers – committed to advancing Augmented Reality. This site contains fantastic resources for those in the AR industry as well as those wanting to learn more about it. Watch videos from the annual Augmented World Expo conference, get news about current events, find scholarly articles, patents, publications, market research. The author of this buyer's guide is a contributor to the site's content.



Augmented World Expo

Augmented World Expo™ (AWE) is the world's largest conference and expo for professionals focused on making the world more interactive - featuring technologies such as Augmented Reality, Wearable Computing, Smart Glasses, Gesture and Sensors devices, and The Internet of Things. In 2017 it is being held in Santa Clara May 31 - June 2.



AWE has made available to the public their invaluable trove of videos of session speakers. Watch industry luminaries give compelling talks on fascinating AR topics.



Super Ventures

Super Ventures is the first early-stage fund and incubator dedicated to augmented reality. The fund invests in startups developing technologies that augment human performance. The incubator works hands-on with passionate entrepreneurs to help them successfully launch and fund their companies.

