鲲游光电

North Ocean Photonics

Product Brochure

以晶圆级光学奠定光子AI的基石

Building Photonic AI on Wafer Level Optics

About North Ocean Photonics

Based in Shanghai, China, North Ocean Photonics (NOP) is a leading high-tech company specializing in wafer-level optics (WLO) and optical integration.

Leveraging extensive technical expertise and advanced manufacturing capabilities, NOP is committed to exploring cutting-edge applications in the fields of photonics and optoelectronics.

Core Team

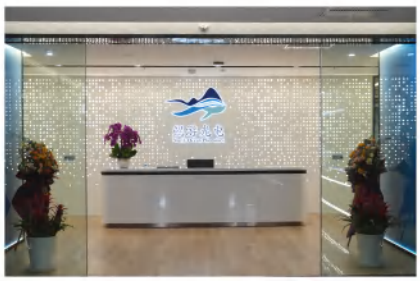
NOP’ s team brings together professors and PhDs from world-class universities, senior executives from globally and nationally renowned companies, as well as recipients of the prestigious National Science and Technology Progress Award.

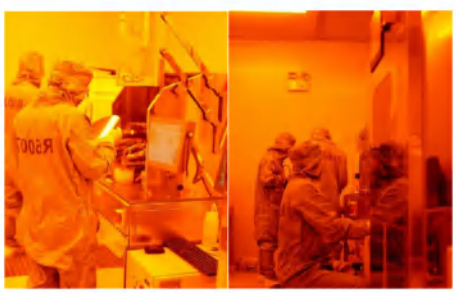
WLO Closed-loop R&D + Mass Production Platform

Since its establishment in 2017, NOP has built state-of-the-art facilities, including nearly 10,000 square meters of ultra-cleanrooms and cutting-edge hardware platforms. The NOP Shanghai R&D and Manufacturing Center, which is a key part of this development, features fully equipped office spaces, research labs, and in-house Class 100 and 1000 clean rooms.

NOP has also developed advanced quality control and software systems, along with comprehensive team training programs. This has enabled the realization of a fully integrated IDM system, covering the entire process from R&D, design, process development, mass production to quality testing.

Having undergone rigorous factory inspections and quality control certifications from top-tier multinational clients, the company has become one of the few globally to achieve shipments exceeding 10KK levels in the wafer-level optics field.





➢ Intellectual Property

NOP has formed a competitive and holistic IP system, with hundreds of patents in portfolio.

More than 300 patents totally, including 280 China patents, 11 US patents and 15 PCT patents.

已授权公告

案件名称	案件类别	案件阶段	官方状态	申请号	申请日	授权日	授权号
一种基于波导的增强现实显示装置	中国发明专利	维持阶段	专利权维持	2017100838845	2017-2-16	2020-6-16	CN106597672B
一种多层结构光学扩散片	中国实用新型专利	维持阶段	专利权维持	20182210599916	2018-12-15	2019-7-26	CN209167575U
一种基于二维光栅的平面光波导	中国实用新型专利	维持阶段	专利权维持	20182219539347	2018-12-26	2019-7-26	CN209167585U
一种基于衍射整合器的增强现实显示系统	中国实用新型专利	维持阶段	专利权维持	20182226414822	2018-12-31	2019-7-26	CN209167695U
一种线型光场投射器	中国实用新型专利	维持阶段	专利权维持	20192076827055	2019-5-7	2019-12-13	CN209784721U
基于Micro LED的AR投影组件	中国实用新型专利	维持阶段	专利权维持	20192186858800	2019-11-01	2020-06-23	CN210835436U
红外近光照明组件	中国实用新型专利	审查阶段	专利权维持	20192179474545	2019-10-23	2020-07-21	CN211061791U
增强信息获取装置	中国实用新型专利	维持阶段	专利权维持	20192179490365	2019-10-23	2020-06-23	CN210835462U
匀光片	中国外观设计专利	受理阶段	专利权维持	20193062027065	2019-11-12	2020-8-11	CN305982031S
匀光片	中国外观设计专利	受理阶段	专利权维持	20193062017755	2019-11-12	2020-08-11	CN305982030S

IPMS CERTIFICATE

Registration No: 11123IP0287R0S

This is to certify that the intellectual property management system of

Shanghai North Ocean Technologies Co., Ltd.

Unified Social Credit Code: 91310115MA1HAJQU1L

Registered address: No. 2699, Jiangshan Road, Building 4, West Zone, Lingang New Area, China (Shanghai) Pilot Free Trade Zone.

Auditing address: No. 2699, Jiangshan Road, Building 4, West Zone, Lingang New Area, China (Shanghai) Pilot Free Trade Zone; No. 2699, Jiangshan Road, 3F Building 1, Lingang New Area, China (Shanghai) Pilot Free Trade Zone.

Has been assessed and registered as meeting the requirements of GB/T 29490-2013

Scope of approval:

The management of intellectual property associated with the R&D, production, sales of optoelectronic products(wafer-level optics, optical fiber components), and related procurement activities.

(Note: The scope of certification does not include that didn't get effective regulations of the state, the relevant administrative licensing or qualification permission range of products/ services.)

First issuing date: Jul 26, 2023 Issuing date: Jul 26, 2023 Expiration date: Jul 25, 2026

The certificate should be only valid and used together with the notice of annual surveillance audit allowance by the certification organization.

Issued by: Zhong Gui Certification

Zhong Gui (Beijing) Certification Co., LTD.

ADD:Room 1105 Patent Plaza, No.11 Gaoliangqiaoxiejie Street, Haidian District,Beijing,China,100044

Tel:010-82102168; Web: www.zgrzbj.com

The certificate information may be found on the official website of the Certification and Accreditation Administration of the People's Republic of China (www.cnca.gov.cn).

➢ Qualifications

NOP holds the qualifications for mass production in the consumer electronics and automotive industries:

ISO9001、ISO14001、ISO45001; IATF16949.

HBC

Quality Management System Certificate

Shanghai North Ocean Photonics,Ltd

HBC

Environment Management System Certificate

Shanghai North Ocean Photonics,Ltd

HBC

Occupation Health And Safety Management System Certificate

Shanghai North Ocean Photonics,Ltd

Certificate of Registration

nqa

This is to certify that the Quality Management System of

Shanghai North Ocean Technologies Co., Ltd.

applicable to

The design and manufacture of optoelectronic products (fiber optic lens modules)

has been assessed and registered by NQA.

against the provisions of

IATF 16949:2016

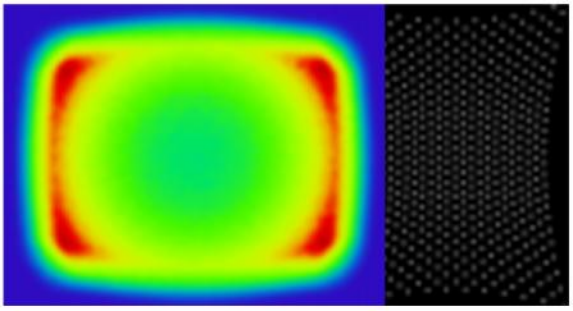
Three Key Product Lines

NOP has driven product innovation by launching three key product lines: sensing and machine vision, AR diffractive waveguide, and automotive LIDAR, all successfully adopted by leading clients around the globe.

Sensing and Machine Vision

Application：3D Depth Sensing & Automatic Driving

- The core DOE of 3D depth imaging module must be designed using wafer-level processing and manufactured accordingly;
- LiDAR for autonomous driving and depth cameras.



AR Diffractive Waveguide

Application：AR Diffractive Waveguide

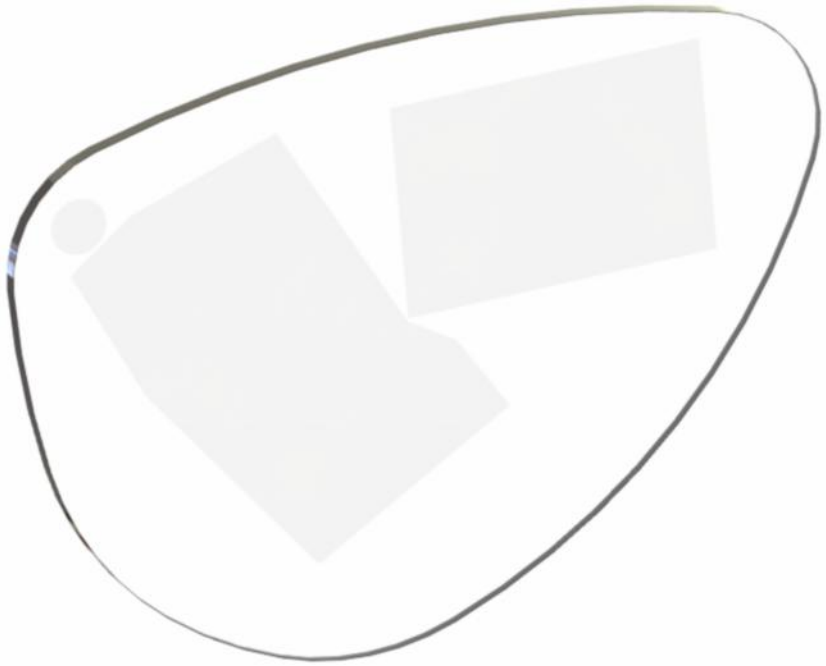
- The AR industry has tremendous potential, with the waveguide being the key display element in AR hardware, which comes with a high technical threshold.
- NOP can provide comprehensive solutions for AR waveguides that integrate multiple innovative approaches and enable cost-effective mass delivery.

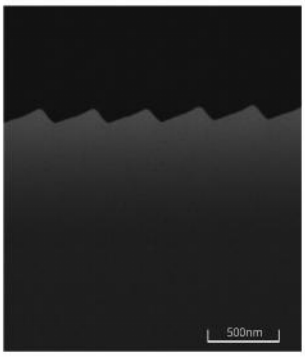
Automotive and LIDAR

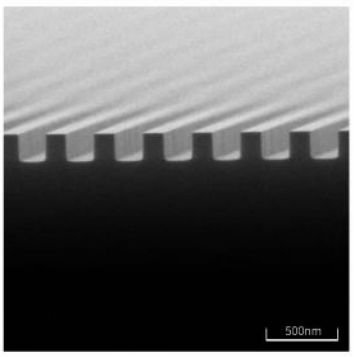
Application：Fiber Optics and LIDAR

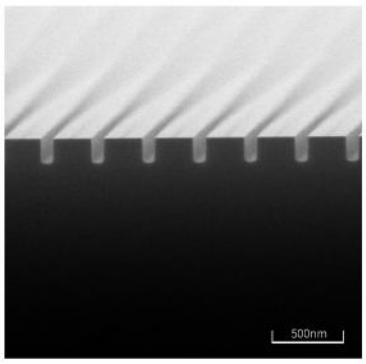
- Mainly used for high-speed (>100G) optical communication transceiver modules and high-precision coupling connections for silicon photonic chips;
- Optical transceiver module products for vehicle-mounted LiDAR，officially began to be integrated into mass production models of a well-known international brand at the beginning of 2022.

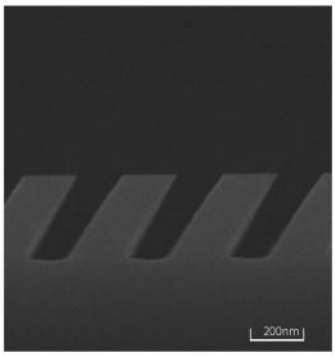
AR Diffractive Waveguide











- Different Grating Structures
- 1D/2D Pupil Expansion
- Angle/Depth Modulation

AR Waveguide Product Portfolio

To address diverse application scenarios and market demands, NOP is committed to delivering customized AR solutions by focusing on three key dimensions: form factor, optical performance and cost. Guided by these principles, NOP has developed six distinct AR product series – Qiushui, Xiaoyao, Mengdie, Fuyao, Yingning and Yuzhang – creating a comprehensive AR optical waveguide product portfolio.

Product Series	QiushuiII QS-C30	Xiaoyao XY-C25	Xiaoyao XY-Z25	Mengdie MD-C25	Fuyao FY-C30	Yingning YN-C25*LR	Yuzhang YZ-C20
Substrate Material	Polymer	Glass	Glass	Glass	Glass	Glass	Polymer
Manufacture Process	NIL	NIL	NIL	NIL	NIL	NIL+Etching	NIL
Field of view	30°	25°	25°	25°	30°	25°	20°
Color	Mono Green	Mono Green	Mono Green	Full color	Full color	Full color	Full color
Number of Plates	Single	Single	Single	Single	Dual	Single	Single
Efficiency	750nits/lm	900nits/lm	800nits/lm	1300nits/lm	800nits/lm	1500nits/lm	1600nits/lm
Brightness Uniformity	30%	30%	50%	30%	30%	50%	55%
Color Uniformity	NA	NA	NA	0.05	0.04	0.03	0.05
Thickness*	1.0mm	0.4mm	0.5mm	0.6mm	1.1mm	0.7mm	0.9mm
Weight*	2.2g	2.5g	5.9g	4.3g	7.5g	4.7g	2.2g

* Efficiency and brightness uniformity are designed and measured with non-polarized light engines.

** Thickness and weight values do not include cover glass.

*** YN-C25 is a variant featuring a low-reflection coating.

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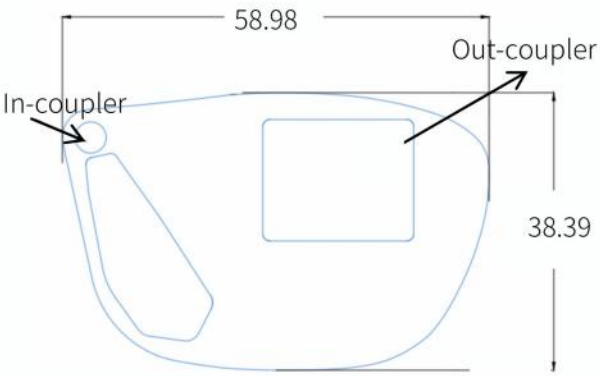
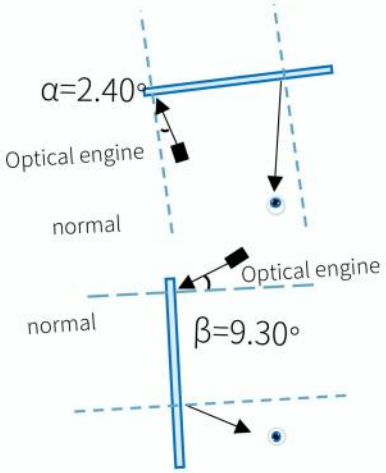
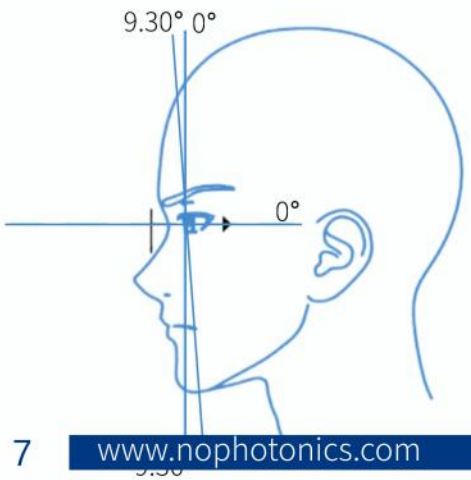
SRG AR Waveguide-QIUSHUI

QS-C30-B03

Parameters	Typical Value	Comment
Field of View	30°	
Aspect ratio	4:3	
Center wavelength	G: 528	
Angle α	2.40°	Angle between center of FOV and normal of waveguide in horizontal plane
Angle β	9.30°	Angle between center of FOV and normal of waveguide in vertical plane
In-coupler grating diameter	4.30mm	
Image focus distance	infinity	
Eye relief	20mm	
Eye box	12mm(H) x 10mm(V)	
Eyebox center position	33.30mm(X) 9.40mm(Y)	from input pupil
Efficiency	750 nits/lm	
MTF	60%@6.60lp/deg	
Contrast	60:1	ANSI 4 x 4 Checkerboard
Uniformity	35%	
Dimensions	58.98mm x 38.39mm	
Material	Polymer	
Number of Plates	Single	waveguide — cover
Thickness	1.90mm	waveguide: 1.00mm
Weight	3.87g	waveguide: 2.25g







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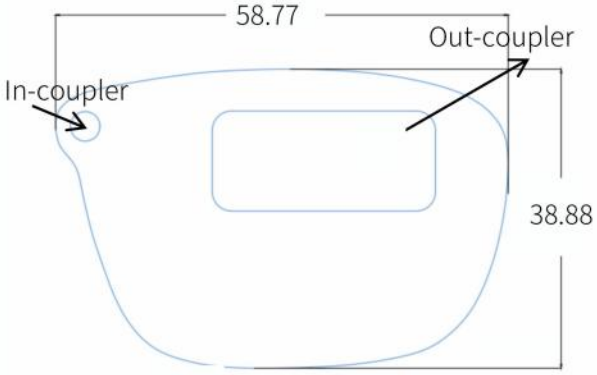
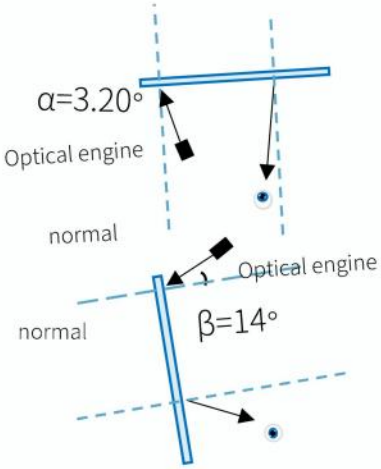
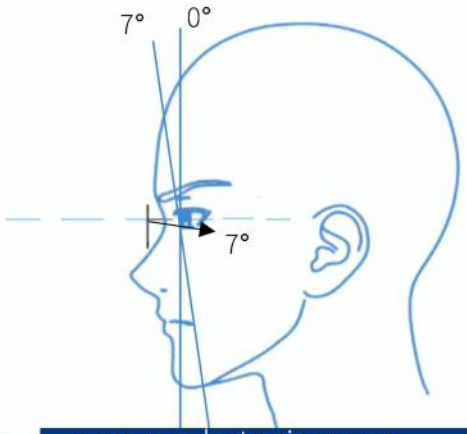
SRG AR Waveguide-XIAOYAO

XY-C25-B01

Parameters	Typical Value	Comment
Field of View	25°	
Aspect ratio	3:1	
Center wavelength	G: 527	
Angle α	3.20°	Angle between center of FOV and normal of waveguide in horizontal plane
Angle β	14°	Angle between center of FOV and normal of waveguide in vertical plane
In-coupler grating diameter	3.85mm	
Image focus distance	infinity	
Eye relief	20mm	
Eye box	15mm(H) x 10mm(V)	
Eyebox center position	34.50mm(X) 7.48mm(Y)	from input pupil
Efficiency	900 nits/lm	
MTF	50%@6.60lp/deg	
Contrast	60:1	ANSI 4 x 4 Checkerboard
Uniformity	30%	
Dimensions	58.77mm x 38.88mm	
Material	Glass	
Number of Plates	Single	waveguide  cover
Thickness	0.83 mm	waveguide: 0.40mm
Weight	4.00g	waveguide: 2.52g







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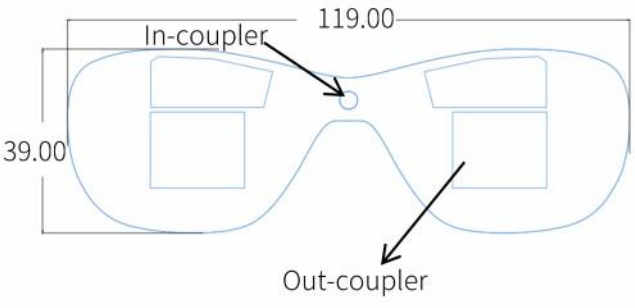
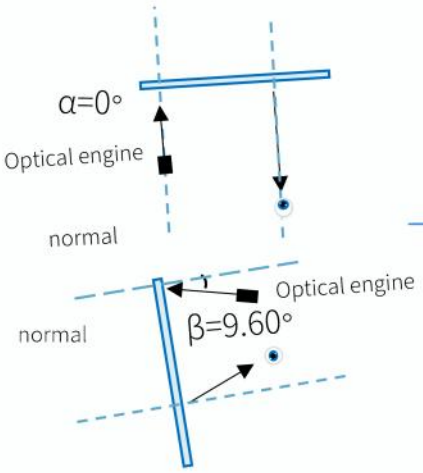
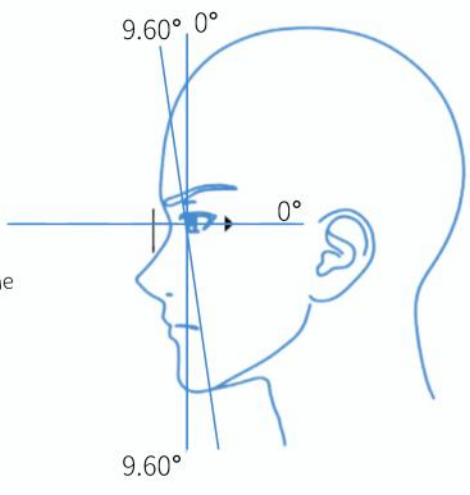
SRG AR Waveguide-XIAOYAO

XY-Z25-B01

Parameters	Typical Value	Comment
Field of View	25°	
Aspect ratio	1:1	
Center wavelength	G:530	
Angle α	0°	Angle between center of FOV and normal of waveguide in horizontal plane
Angle β	9.60°	Angle between center of FOV and normal of waveguide in vertical plane
In-coupler grating diameter	3.80mm	
Image focus distance	Infinity	
Eye relief	18mm	
Eye box	14mm(H) x 10mm(V)	
Eyebox center position	32mm(X) 7.37mm(Y)	from input pupil
Efficiency	800 nits/lm	
MTF	50% @6.60lp/deg	
Contrast	60:1	ANSI 4 x 4 Checkerboard
Uniformity	50%	
Dimensions	119mmX39mm	
Material	Glass	
Number of Plates	Single	
Thickness	1.36	waveguide: 0.50mm
Weight	11.60g	waveguide: 5.95g







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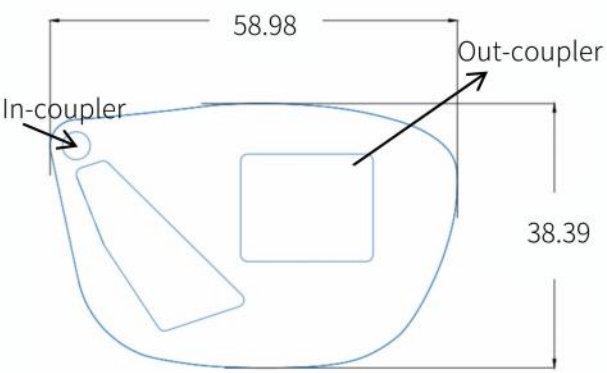
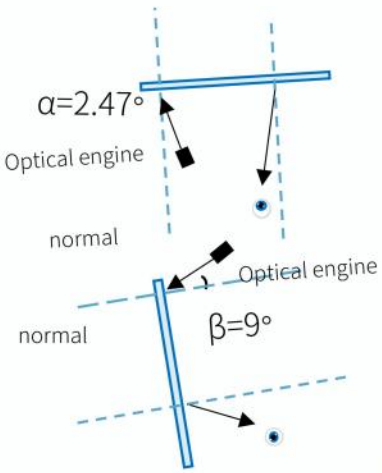
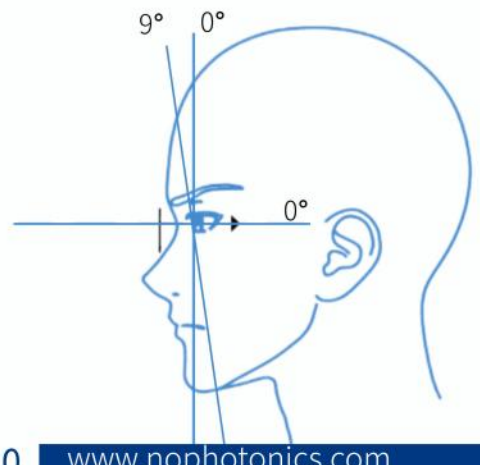
SRG AR Waveguide-MENGDIE

MD-C25-B01

Parameters	Typical Value	Comment
Field of View	25°	
Aspect ratio	4:3	
Center wavelength	R: 625 G: 525 B: 460	
Angle α	2.47°	Angle between center of FOV and normal of waveguide in horizontal plane
Angle β	9°	Angle between center of FOV and normal of waveguide in vertical plane
In-coupler grating diameter	4mm	
Image focus distance	infinity	
Eye relief	20mm	
Eye box	12mm(H) x 10mm(V)	
Eyebox center position	32.30mm(X)12.30mm(Y) from input pupil	
Efficiency	1300 nits/lm	
MTF	60%@6.60lp/deg	
Contrast	60:1	ANSI 4 x 4 Checkerboard
Color Uniformity	0.05	rms du'v'
Dimensions	58.98mm x 38.39mm	
Material	Glass	
Number of Plates	Single	waveguide — cover
Thickness	1.03 mm	waveguide: 0.60mm
Weight	5.84 g	waveguide: 4.32g







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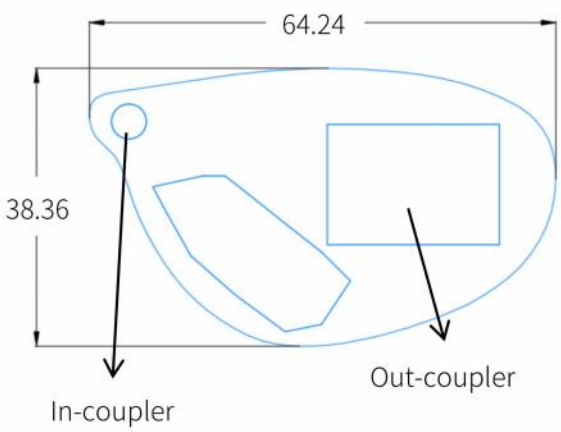
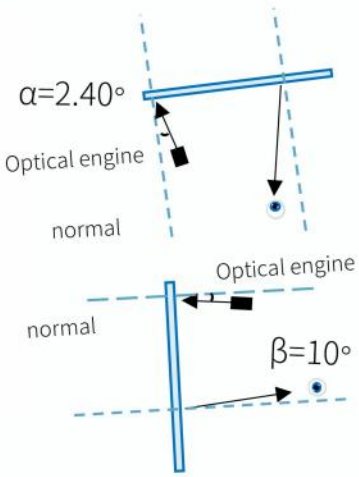
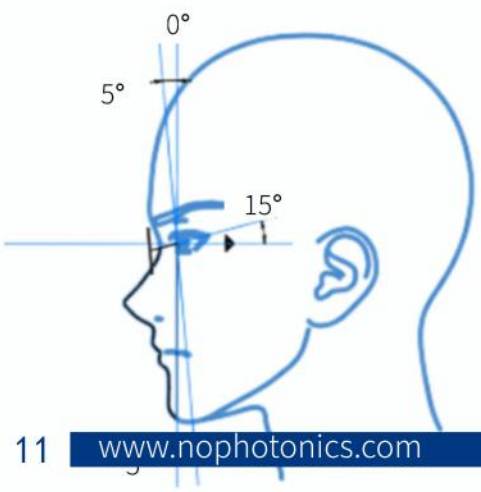
SRG AR Waveguide-FUYAO

FY-C30-B02

Parameters	Typical Value	Comment
Field of View	30°	
Aspect ratio	4:3	
Center wavelength	R: 635 G: 527 B: 460	
Angle α	2.40°	Angle between center of FOV and normal of waveguide in horizontal plane
Angle β	10°	Angle between center of FOV and normal of waveguide in vertical plane
In-coupler grating diameter	4.80mm	
Image focus distance	Infinity	
Eye relief	20mm	
Eye box	15mm(H) x 10mm(V)	
Eyebox center position	37.50mm(X) 6mm(Y)	from input pupil
Efficiency	800 nits/lm	
MTF	70% @6.60lp/deg	
Contrast	50:1	ANSI 4 x 4 Checkerboard
Brightness Uniformity	35%	
Dimensions	64.24mm x 38.36mm	
Material	Glass	
Number of Plates	Dual	
Thickness	2.16mm	waveguide: 1.13mm
Weight	10.50g	waveguide: 7.56g







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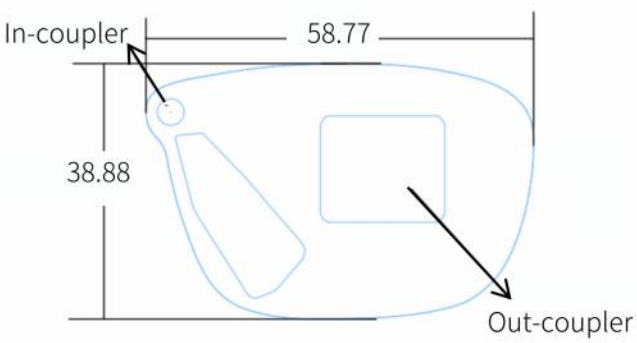
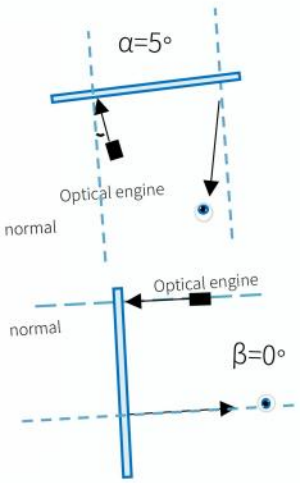
SRG AR Waveguide-YINGNING

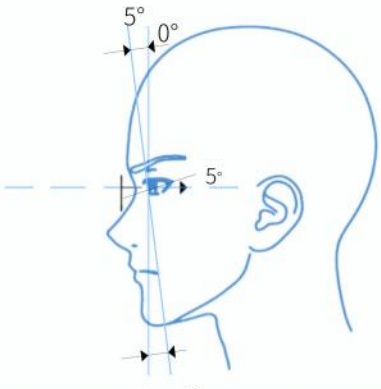
YN-C30-B02

Parameters	Typical Value	Comment
Field of View	30°	
Aspect ratio	1:1	
Center wavelength	R: 624 G: 520 B: 458	
Angle α	5°	Angle between center of FOV and normal of waveguide in horizontal plane
Angle β	0°	Angle between center of FOV and normal of waveguide in vertical plane
In-coupler grating diameter	4mm	
Image focus distance	Infinity	
Eye relief	16mm	
Eye box	12mm(H) x 10mm(V)	
Eyebox center position	30.60mm(X) 8.60mm(Y)	from input pupil
Efficiency	1300nits/lm	
MTF	60%@6.60lp/deg	
Contrast	60:1	ANSI 4 x 4 Checkerboard
Color Uniformity	0.03	rms du'v'
Dimensions	58.77mm x 38.88mm	
Material	Glass	
Number of Plates	Single	
Thickness	1.13mm	waveguide: 0.70mm
Weight	8.24g	waveguide: 6.70g

waveguide cover







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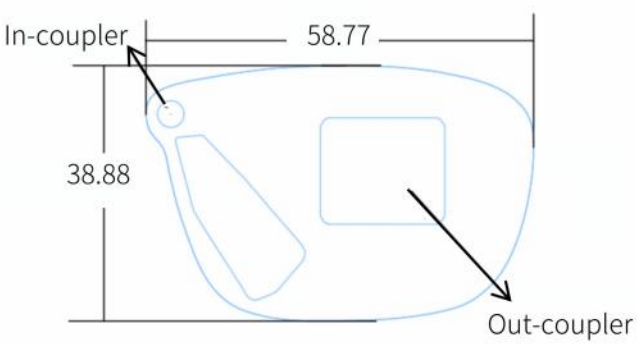
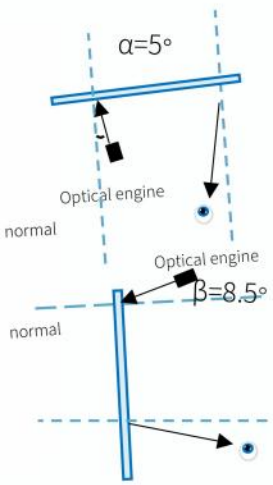
SRG AR Waveguide-YINGNING

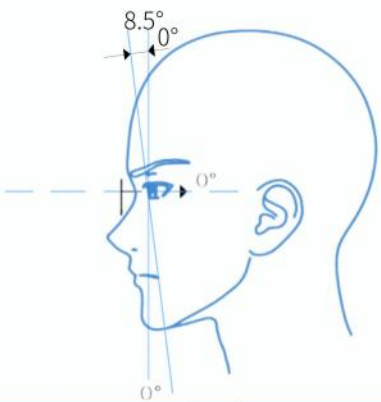
YN-C25-B01

Parameters	Typical Value	Comment
Field of View	25°	
Aspect ratio	4:3	
Center wavelength	R: 636 G: 528 B: 462	
Angle α	5°	Angle between center of FOV and normal of waveguide in horizontal plane
Angle β	8.5°	Angle between center of FOV and normal of waveguide in vertical plane
In-coupler grating diameter	4mm	
Image focus distance	Infinity	
Eye relief	16mm	
Eye box	12mm(H) x 10mm(V)	
Eyebox center position	33mm(X) 9mm(Y)	from input pupil
Efficiency	1500nits/lm	
MTF	63%@6.60lp/deg	
Contrast	95:1	ANSI 4 x 4 Checkerboard
Color Uniformity	0.03	rms du'v'
Dimensions	58.77mm x 38.88mm	
Material	Glass	
Number of Plates	Single	
Thickness	1.13mm	waveguide: 0.70mm
Weight	6.27g	waveguide: 4.75g

waveguide cover







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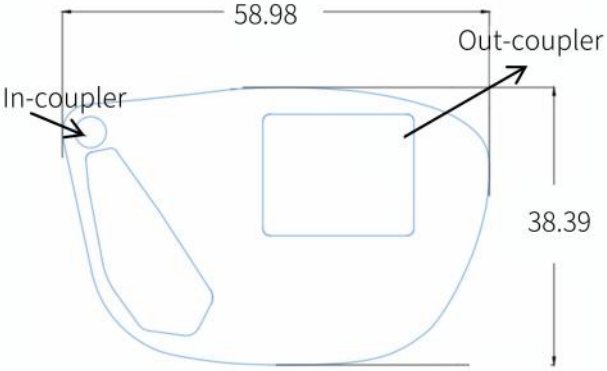
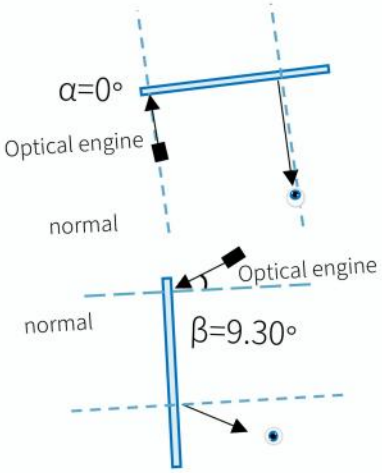
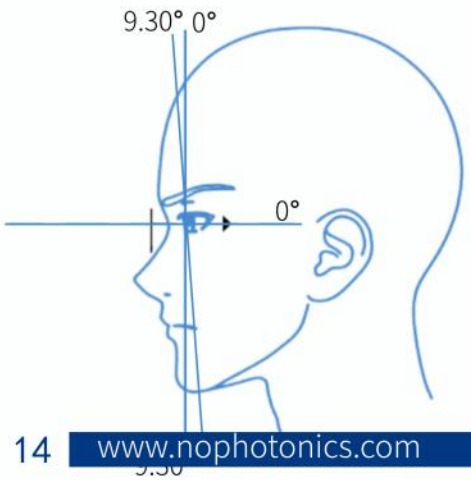
SRG AR Waveguide-YUZHANG

YZ-C20-B01

Parameters	Typical Value	Comment
Field of View	20°	
Aspect ratio	4:3	
Center wavelength	R: 635 G: 527 B: 460	
Angle α	0°	Angle between center of FOV and normal of waveguide in horizontal plane
Angle β	9.30°	Angle between center of FOV and normal of waveguide in vertical plane
In-coupler grating diameter	4.30mm	
Image focus distance	infinity	
Eye relief	20mm	
Eye box	12mm(H) x 10mm(V)	
Eyebox center position	34.20mm(X) 9.36mm(Y)	from input pupil
Efficiency	1600 nits/lm	
MTF	55%@6.60lp/deg	
Contrast	60:1	ANSI 4 x 4 Checkerboard
Color Uniformity	0.05	rms du'v'
Dimensions	58.98mm x 38.39mm	
Material	Polymer	
Number of Plates	Single	waveguide — cover
Thickness	1.78 mm	waveguide: 0.88mm
Weight	3.79 g	waveguide: 2.19g

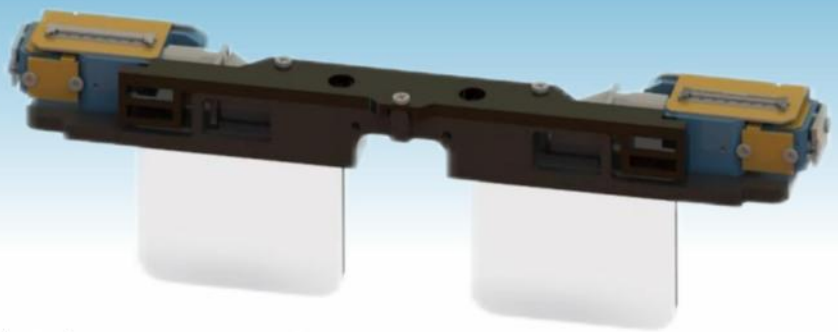






SRG AR Optical Module-FUYAO

FY-D40-M01



Parameters	Typical Value	Comment
Field of View	40°	
Aspect ratio	16:9	
Center wavelength	R: 617 G: 530 B: 465	
Efficiency	150 nits/lm	
Eye relief	20mm	
Eye box	18mm(H) x 15mm(V)	
Display	DLP	
Out-coupler grating diameter	4mm	
Display Size	11.65x 17.50 x 40.60mm	
Interface	LVDS	
Brightness	800nits	
Resolution	1280X720	
MTF	40%@6.6l0p/deg	module MTF
Contrast	40:1	ANSI 4 x 4 Checkerboard
Image focus distance	5m	
Distortion	< 1%	
Gray Level	24 Bits	
Power Consumption	0.50W*2	
Weight	21g	
Storage Temperature	-20~+80°C	
Operation Temperature	10~+70°C	

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