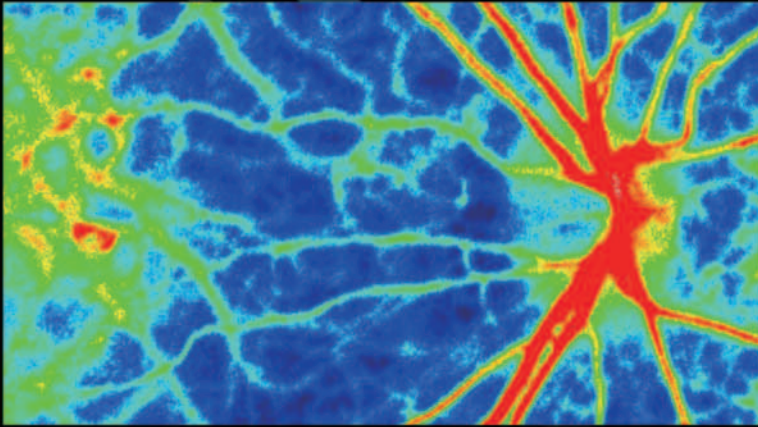




Laser Speckle Flowgraphy  
**LSFG-RetFlow**



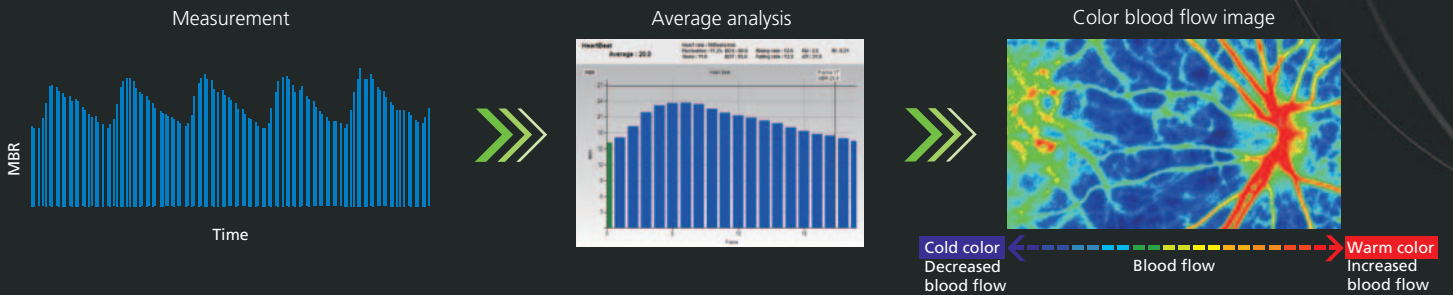
**THE ART OF EYE CARE**

# Non-invasive, Real-time Imaging and Quantitative Assessment of Retinochoroidal Blood Flow

Color coded display of blood flow allows easy clinical evaluation and analysis. Quantitative assessment makes follow-up measurements easy because any changes in indices are clearly recognized. Rapid, user-friendly measurement ensures patient comfort.

## MBR (Mean Blur Rate)

MBR (Mean Blur Rate) measures relative blood flow velocity which correlates to the actual rate of blood flow.\* A color map of the MBR data allows intuitive interpretation of onset, progression, and follow-up of disease.



## Multifunctional Analysis

- Selectable image display (Color scale or gray scale)
- Selectable area with multiple shapes and sizes for analysis (Maximum 6)
- 16 different indices to evaluate retinochoroidal circulation

### <Optic nerve head analysis>

MV: Blood flow of vascular area  
MT: Blood flow of tissue area  
MA: Blood flow of all areas



### <Retina blood vessel analysis>

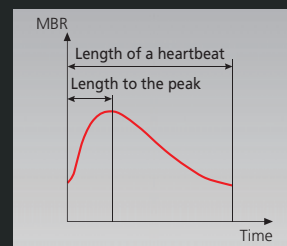
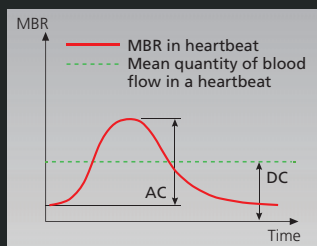
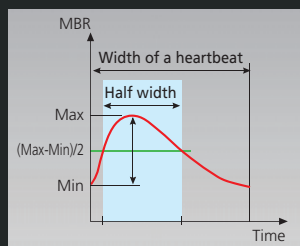
RFV: Relative retinal blood vessel flow volume

### <Waveform parameter analysis>

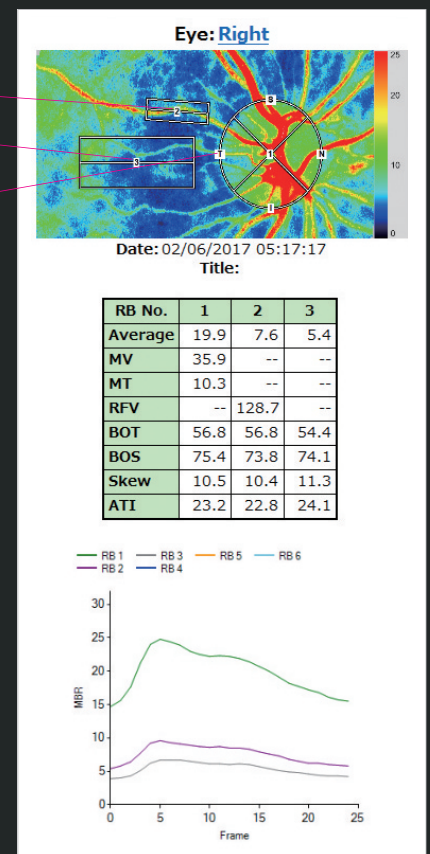
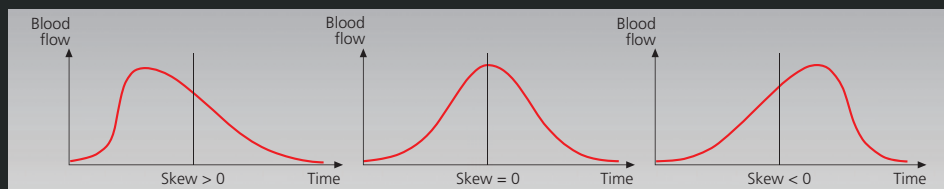
BOT: Duration of high volume blood flow

BOS: Index of the maintenance of blood flow volume

ATI: Maximum blood flow index in one heartbeat



Skew: Skewness waveform of blood flow

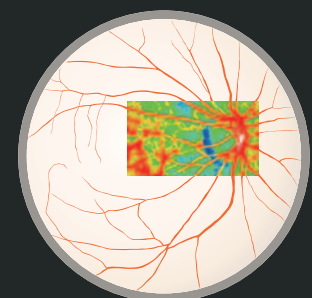


## Easy Operation

- Selectable measurement area of 22 degrees using a fixation target
- One click operation of quick measurements

## Follow-up Assessment with Auto Tracking Function

Follow-up measurements can be performed in the same area.



22 degrees viewing angle

\* Measurements of Retinal Perfusion Using Laser Speckle Flowgraphy and Doppler Optical Coherence Tomograph. Luft N, Wozniak PA, Schmetterer L, et al. *Invest Ophthalmol Vis Sci.* October 2016, Vol.57, 5417-5425. doi:10.1167/iovs.16-19896

## Laser Speckle Flowgraphy Bibliography

### Glaucoma

1. Laser speckle flowgraphy derived characteristics of optic nerve head perfusion in normal tension glaucoma and healthy individuals: a pilot study.  
Mursch-Edlmayr AS, Luft N, Bolz M, et al. *Scientific Reports*. 2018;8:5343.
2. The effect of systemic hyperoxia on optic nerve head blood flow in primary open-angle glaucoma patients.  
Kiyota N, Shiga Y, Nakazawa T, et al. *Invest Ophthalmol Vis Sci*. 2017 Jun 1;58(7):3181-3188.
3. Association between optic nerve head microcirculation and macular ganglion cell complex thickness in eyes with untreated normal tension glaucoma and a hemifield defect.  
Anraku A, Ishida K, Tomita G, et al. *Journal of Ophthalmology*. 2017;2017:3608396.
4. Waveform analysis of ocular blood flow and the early detection of normal tension glaucoma.  
Shiga Y, Omodaka K, Nakazawa T, et al. *Invest Ophthalmol Vis Sci*. 2013 Nov 21;54(12):7699-7706.
5. Preperimetric glaucoma prospective observational study (PPGPS): Design, baseline characteristics, and therapeutic effect of tafluprost in preperimetric glaucoma eye.  
Aizawa N, Kunikata H, Nakazawa T, et al. *PLoS ONE*. 2017;12(12):e0188692.
6. Association between optic nerve blood flow and objective examinations in glaucoma patients with generalized enlargement disc type.  
Chiba N, Omodaka K, Nakazawa T, et al. *Clinical Ophthalmology (Auckland, NZ)*. 2011;5:1549-1556.

### Retinochoroidal disease

#### Diabetic retinopathy (DR)

7. Effects of photocoagulation on ocular blood flow in patients with severe non-proliferative diabetic retinopathy.  
Iwase T, Kobayashi M, Terasaki H, et al. *PLoS ONE*. 2017;12(3):e0174427.
8. The effect of intravitreal bevacizumab on ocular blood flow in diabetic retinopathy and branch retinal vein occlusion as measured by laser speckle flowgraphy.  
Nitta F, Kunikata H, Nakazawa T, et al. *Clinical Ophthalmology (Auckland, NZ)*. 2014;8:1119-1127.

#### Central retinal vein occlusion (CRVO)

9. Ocular blood flow levels and visual prognosis in a patient with nonischemic type central retinal vein occlusion.  
Maeda K, Ishikawa F, Ohguro H. *Clinical Ophthalmology (Auckland, NZ)*. 2009;3:489-491.

#### Branch retinal vein occlusion (BRVO)

10. Changes in retinal microcirculation after intravitreal ranibizumab injection in eyes with macular edema secondary to branch retinal vein occlusion.  
Fukami M, Iwase T, Terasaki H, et al. *Invest Ophthalmol Vis Sci*. 2017 Feb 1;58(2):1246-1255.

#### Central serous chorioretinopathy (CSC)

11. Pulse waveform changes in macular choroidal hemodynamics with regression of acute central serous chorioretinopathy.  
Saito M, Saito W, Ishida S, et al. *Invest Ophthalmol Vis Sci*. 2015 Oct;56(11):6515-6522.

### Healthy subjects

12. Ocular blood flow measurements in healthy white subjects using laser speckle flowgraphy.  
Luft N, Wozniak PA, Schmetterer L, et al. *PLoS ONE*. 2016;11(12):e0168190.
13. Optic nerve head and retinal blood flow regulation during isometric exercise as assessed with laser speckle flowgraphy.  
Witkowska KJ, Bata AM, Schmetterer L, et al. *PLoS ONE*. 2017;12(9):e0184772.

## LSFG-RetFlow Specifications

Light source	Type	Laser diode
	Wavelength	830 nm
Output image	Viewing angle	22°
	Resolution	750 (W) x 360 (H) pixels
Minimum pupil diameter	ø4 mm	
Focus adjustment range	-14 to +5 D	
Internal fixation lamp	Organic EL	
External fixation lamp	LED	
Power supply	AC 100 to 240 V, 50/60 Hz	
Power consumption	40 VA	
Dimensions/Mass	359 (W) x 390 (D) x 490 (H) mm / 13 kg 14.1 (W) x 15.4 (D) x 19.3 (H) " / 29 lbs.	
Optional accessories	Isolation transformer, motorized optical table, PC rack	

It is difficult for this system to measure absolute velocity such as mm/s.  
This system is suitable for measuring any increase or decrease of blood flow within the same retinal or choroidal vessels and for observing the wave profiles of the flow velocity that change with the heartbeat.



Product/Model name: LASER SPECKLE FLOWGRAPHY LSFGRetFlow  
Brochure and listed features of the device are intended for non-US practitioners.  
Specifications may vary depending on circumstances in each country.  
Specifications and design are subject to change without notice.



**HEAD OFFICE**  
(International Div.)  
34-14 Maehama,  
Hiroishi-cho, Gamagori,  
Aichi 443-0038, JAPAN  
TEL: +81-533-67-8895  
URL: [www.nidek.com](http://www.nidek.com)

**TOKYO OFFICE**  
(International Div.)  
3F Sumitomo Fudosan Hongo  
Bldg., 3-22-5 Hongo, Bunkyo-ku,  
Tokyo 113-0033, JAPAN  
TEL: +81-3-5844-2641  
URL: [www.nidek.com](http://www.nidek.com)

**NIDEK INC.**  
2040 Corporate Court,  
San Jose, CA 95131, U.S.A.  
TEL: +1-408-468-6400  
+1-800-223-9044  
(US Only)  
URL: [usa.nidek.com](http://usa.nidek.com)

**NIDEK S.A.**  
Europarc,  
13 rue Auguste Perret,  
94042 Créteil, FRANCE  
TEL: +33-1-49 80 97 97  
URL: [www.nidek.fr](http://www.nidek.fr)

**NIDEK TECHNOLOGIES S.R.L.**  
Via dell'Artigianato,  
6/A, 35020 Albignasego (Padova),  
ITALY  
TEL: +39 049 8629200/8626399  
URL: [www.nidektechnologies.it](http://www.nidektechnologies.it)

**NIDEK (SHANGHAI) CO., LTD.**  
Rm3205, Shanghai Multi  
Media Park, No.1027 Chang  
Ning Rd, Chang Ning District,  
Shanghai, CHINA 200050  
TEL: +86 021-5212-7942  
URL: [www.nidek-china.cn](http://www.nidek-china.cn)

**NIDEK SINGAPORE PTE. LTD.**  
51 Changi Business Park  
Central 2, #06-14,  
The Signature 486066,  
SINGAPORE  
TEL: +65 6588 0389  
URL: [www.nidek.sg](http://www.nidek.sg)

[Manufacturer]