

## 51nanoFI-S-808-16-G15-P-5-2-28-0-150

Fiber-coupled low coherence laser source with integrated Faraday isolator and polarization-maintaining fiber cable



### **FEATURES**

The Laser Diode Beam Source of type 51nanoFl-S-808-16-G15-P-5-2-28-0-150 has a <u>reduced</u> <u>power noise</u>, <u>a reduced coherence length and a low speckle contrast</u>.

- Reduced power noise: typ. < 0.1 % of P<sub>0</sub> (RMS, Bandwidth < 1 MHz)</li>
- Reduced coherence length: coherence length ≈ 300 µm
- Reduced speckle contrast
- Wavelength: 808 nm
- Laser output power: 16 mW
- Integrated Faraday isolator > 30 dB
- Polarization-maintaining fiber cable
- FC APC connector (8°-polish)
- Modulation analog and TTL
- With interlock and key switch (conform to EN 60825-1)

Alternative: Laser Diode Beam Source <u>51nanoFi-N</u> (OEM version w/o key switch and w/o interlock)

With integrated Faraday isolator





## **DESCRIPTION**



The fiber-coupled Laser Diode Beam Source of type 51nanoFI-S-808-16-G15-P-5-2-28-0-150 has a reduced power noise (typ. < 0.1 % of P<sub>o</sub> (RMS, Bandwidth < 1 MHz)), reduced coherence length ( $\approx$  300  $\mu$ m) and a lowered speckle contrast.

### **Electrical features**

The output power is adjustable using a potentiometer or using the two modulation inputs for analog and TTL.

### Faraday isolator

The source has an integrated Faraday isolator in order to protect the laser from back reflections.

### Fiber cable

The source is fiber-coupled to a polarization-maintaining fiber cable (standard, polarization extinction ratio ≥ 23 dB). As a result the beam profile is rotationally symmetric with Gaussian intensity distribution. The fiber cable is equipped with an FC APC type connector (8°-polish). The fiber cable has a strain-relief and a protective sleeving (Ø 3 mm). Standard cable length is 150 cm.

### Options:

- Single-mode fiber
- Core-centered (single-mode only)
- Other connector types including FC PC, DIN or AVIO, or E2000
- Other fiber cable lengths
- Incorporated vacuum feed-through

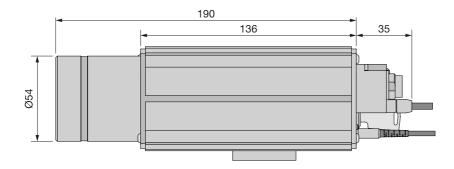
### Laser safety

The laser safety is conform to IEC 825 / EN 60825-1.

- Interlock chain for the remote deactivation of the laser
- Laser power-up is only possible using the key switch
- LED status indicator for "Laser ON"
- For a quick start the laser is shipped with a interlock connector type <u>BC0106F-iLCK</u>

An OEM version is available as type <u>51nanoFi-N</u> without key switch or interlock which is not conform to EN 60825-1.

A version without Faraday isolator is available here.





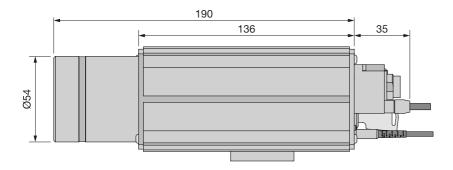
# **TECHNICAL DATA**

51nanoFI-S-808-16-G15-P-5-2-28-0-150

Modulation input connector6 pin (male, Lumberg SV60)Modulation inputsAnalogTTLMax. input voltage5 V5 VVoltage for Pmin / Po0 V / 2.5 V< 0.8 V / > 2.4 VInput impedance22 kOhm22 kOhm	Order Code	51nanoFI-S-808-16-G15	51nanoFI-S-808-16-G15-P-5-2-28-0-150		
Center Wavelength         808 ± 10 nm           Bandwidth         0.7 - 4 nm           Output power         typ. 16 mW           Power adjustment         < 1 - 100 %           Power noise         typ. < 0.1 % of P₀ (RMS, BW < 1 MHz)           Coherence length         ≈ 300 μm           Isolation         > 30 dB           Fiber cable         polarization-maintaining           Fiber type         PMC-780           Nominal fiber NA         0.12           Effective fiber NAe²         0.077 ± 10 % (1/e²)           Mode field diameter MFD         6.7 μm ± 10 % (1/e²)           PER         ≥ 23 dB           Fiber cable length         1.5 ± 0.05 m (standard)           Fiber cable type         Ø 3 mm with Kevlar strain-relief           Fiber connector type         FC APC (standard)           Power stability         max. 12 % power variation between 15°C and 35°C           Electronics type         H           Electr. cable length         1.5 ± 0.1 m (standard)           Connector type         3 pin (male, Lumberg SV30)           Supply voltage         5.0 ± 0.2 V           Max. current consumption*         260 mA           Modulation input connector         6 pin (male, Lumberg SV60)           Modulation inp	Series	5	51nanoFI-S (PM)		
Bandwidth         0.7 - 4 nm           Output power         typ. 16 mW           Power adjustment         < 1 - 100 %           Power noise         typ. < 0.1 % of P₀ (RMS, BW < 1 MHz)           Coherence length         ≈ 300 μm           Isolation         > 30 dB           Fiber cable         polarization-maintaining           Fiber type         PMC-780           Nominal fiber NA         0.12           Effective fiber NAe²         0.077 ± 10 % (1/e²)           Mode field diameter MFD         6.7 μm ± 10 % (1/e²)           PER         ≥ 23 dB           Fiber cable length         1.5 ± 0.05 m (standard)           Fiber cable type         Ø 3 mm with Kevlar strain-relief           Fiber connector type         FC APC (standard)           Power stability         max. 12 % power variation between 15°C and 35°C           Electronics type         H           Electr. cable length         1.5 ± 0.1 m (standard)           Connector type         3 pin (male, Lumberg SV30)           Supply voltage         5.0 ± 0.2 V           Max. current consumption*         260 mA           Modulation input connector         6 pin (male, Lumberg SV60)           Modulation inputs         Analog         TTL <t< th=""><th>Laser class</th><th></th><th>3B</th></t<>	Laser class		3B		
Output power         typ. 16 mW           Power adjustment         < 1 - 100 %	Center Wavelength	808 ± 10 nm			
Power adjustment       < 1 · 100 %         Power noise       typ. < 0.1 % of P₀ (RMS, BW < 1 MHz)         Coherence length       ≈ 300 μm         Isolation       > 30 dB         Fiber cable       polarization-maintaining         Fiber type       PMC-780         Nominal fiber NA       0.12         Effective fiber NAe²       0.077 ± 10 % (1/e²)         Mode field diameter MFD       6.7 μm ± 10 % (1/e²)         PER       ≥ 23 dB         Fiber cable length       1.5 ± 0.05 m (standard)         Fiber cable type       Ø 3 mm with Kevlar strain-relief         Fiber connector type       FC APC (standard)         Power stability       max. 12 % power variation between 15°C and 35°C         Electronics type       H         Electr. cable length       1.5 ± 0.1 m (standard)         Connector type       3 pin (male, Lumberg SV30)         Supply voltage       5.0 ± 0.2 V         Max. current consumption*       260 mA         Modulation input connector       6 pin (male, Lumberg SV60)         Modulation inputs       Analog       TTL         Max. input voltage       5 V       5 V         Voltage for $P_{min}$ / $P_O$ 0 V / 2.5 V       < 0.8 V / > 2.4 V         Lumberg SV6	Bandwidth	0.7 - 4 nm			
Power noise       typ. < 0.1 % of P₀ (RMS, BW < 1 MHz)	Output power	typ. 16 mW			
Coherence length       ≈ 300 μm         Isolation       > 30 dB         Fiber cable       polarization-maintaining         Fiber type       PMC-780         Nominal fiber NA       0.12         Effective fiber NAe²       0.077 ± 10 % (1/e²)         Mode field diameter MFD       6.7 μm ± 10 % (1/e²)         PER       ≥ 23 dB         Fiber cable length       1.5 ± 0.05 m (standard)         Fiber cable type       Ø 3 mm with Kevlar strain-relief         Fiber connector type       FC APC (standard)         Power stability       max. 12 % power variation between 15°C and 35°C         Electronics type       H         Electr. cable length       1.5 ± 0.1 m (standard)         Connector type       3 pin (male, Lumberg SV30)         Supply voltage       5.0 ± 0.2 V         Max. current consumption*       260 mA         Modulation input connector       6 pin (male, Lumberg SV60)         Modulation inputs       Analog       TTL         Max. input voltage       5 V       5 V         Voltage for P <sub>min</sub> / P <sub>O</sub> 0 V / 2.5 V       < 0.8 V / > 2.4 V         Input impedance       22 kOhm       22 kOhm	Power adjustment	< 1 - 100 %			
Isolation   $> 30  dB$   Fiber cable   polarization-maintaining   Fiber type   PMC-780   Nominal fiber NA   0.12	Power noise	typ. $< 0.1 \%$ of P <sub>0</sub> (RMS, BW $< 1 \text{ MHz}$ )			
Fiber cable polarization-maintaining Fiber type PMC-780 Nominal fiber NA 0.12 Effective fiber NA $_{e}^2$ 0.077 ± 10 % (1/ $e^2$ ) Mode field diameter MFD 6.7 $\mu$ m ± 10 % (1/ $e^2$ ) PER $\geq$ 23 dB Fiber cable length 1.5 ± 0.05 m (standard) Fiber cable type Ø 3 mm with Kevlar strain-relief Fiber connector type FC APC (standard) Power stability max. 12 % power variation between 15°C and 35°C Electronics type H Electr. cable length 1.5 ± 0.1 m (standard) Connector type 3 pin (male, Lumberg SV30) Supply voltage 5.0 ± 0.2 V Max. current consumption* 260 mA Modulation input connector 6 pin (male, Lumberg SV60) Modulation inputs Analog TTL Max. input voltage 5 V 5 V 5 V Voltage for $P_{min}$ / $P_{O}$ 0 V / 2.5 V $\langle$ 0.8 V / $\rangle$ 2.4 V Input impedance 22 kOhm 22 kOhm	Coherence length		≈ 300 µm		
Fiber type PMC-780  Nominal fiber NA 0.12  Effective fiber NA $_{e}^2$ 0.077 ± 10 % (1/ $e^2$ )  Mode field diameter MFD 6.7 $\mu$ m ± 10 % (1/ $e^2$ )  PER $\geq$ 23 dB  Fiber cable length 1.5 ± 0.05 m (standard)  Fiber cable type Ø 3 mm with Kevlar strain-relief  Fiber connector type FC APC (standard)  Power stability max. 12 % power variation between 15°C and 35°C  Electronics type H  Electr. cable length 1.5 ± 0.1 m (standard)  Connector type 3 pin (male, Lumberg SV30)  Supply voltage 5.0 ± 0.2 V  Max. current consumption* 260 mA  Modulation input connector 6 pin (male, Lumberg SV60)  Modulation inputs Analog TTL  Max. input voltage 5 V 5 V  Voltage for $P_{min}$ / $P_{O}$ 0 V / 2.5 V $\langle$ 0.8 V / $\rangle$ 2.4 V  Input impedance 22 kOhm 22 kOhm	Isolation	> 30 dB			
Nominal fiber NA $0.12$ Effective fiber NA <sub>e</sub> <sup>2</sup> $0.077 \pm 10 \% (1/e^2)$ Mode field diameter MFD $6.7 \mu m \pm 10 \% (1/e^2)$ PER $\geq 23 \text{ dB}$ Fiber cable length $1.5 \pm 0.05 \text{ m}$ (standard)  Fiber cable type Ø 3 mm with Kevlar strain-relief  Fiber connector type FC APC (standard)  Power stability max. 12 % power variation between 15°C and 35°C  Electronics type H  Electr. cable length $1.5 \pm 0.1 \text{ m}$ (standard)  Connector type $3 \text{ pin}$ (male, Lumberg SV30)  Supply voltage $5.0 \pm 0.2 \text{ V}$ Max. current consumption* $260 \text{ mA}$ Modulation input connector $6 \text{ pin}$ (male, Lumberg SV60)  Modulation inputs Analog TTL  Max. input voltage $5 \text{ V}$ $5 \text{ V}$ Voltage for $P_{\text{min}} / P_{\text{O}}$ $0 \text{ V} / 2.5 \text{ V}$ $< 0.8 \text{ V} / > 2.4 \text{ V}$ Input impedance $22 \text{ kOhm}$ $22 \text{ kOhm}$	Fiber cable	polarization-maintaining			
Effective fiber NAe² $0.077 \pm 10 \% (1/e²)$ Mode field diameter MFD $6.7 \mu m \pm 10 \% (1/e²)$ PER≥ 23 dBFiber cable length $1.5 \pm 0.05 \text{ m}$ (standard)Fiber cable typeØ 3 mm with Kevlar strain-reliefFiber connector typeFC APC (standard)Power stabilitymax. 12 % power variation between 15°C and 35°CElectronics typeHElectr. cable length $1.5 \pm 0.1 \text{ m}$ (standard)Connector type3 pin (male, Lumberg SV30)Supply voltage $5.0 \pm 0.2 \text{ V}$ Max. current consumption* $260 \text{ mA}$ Modulation input connector $6 \text{ pin (male, Lumberg SV60)}$ Modulation inputsAnalogModulation inputs $5 \text{ V}$ Max. input voltage $5 \text{ V}$ Voltage for Pmin / Po $0 \text{ V}/2.5 \text{ V}$ Input impedance $22 \text{ kOhm}$	Fiber type	PMC-780			
Mode field diameter MFD $6.7  \mu m \pm 10  \%  (1/e^2)$ PER≥ 23 dBFiber cable length $1.5 \pm 0.05  m$ (standard)Fiber cable typeØ 3 mm with Kevlar strain-reliefFiber connector typeFC APC (standard)Power stabilitymax. 12 % power variation between 15°C and 35°CElectronics typeHElectr. cable length $1.5 \pm 0.1  m$ (standard)Connector type3 pin (male, Lumberg SV30)Supply voltage $5.0 \pm 0.2  V$ Max. current consumption* $260  mA$ Modulation input connector6 pin (male, Lumberg SV60)Modulation inputsAnalogModulation inputs $5  V$ Max. input voltage $5  V$ Voltage for $P_{min} / P_O$ $0  V / 2.5  V$ Voltage for $P_{min} / P_O$ $0  V / 2.5  V$ Input impedance $22  kOhm$	Nominal fiber NA	0.12			
PER  ≥ 23 dB  Fiber cable length  1.5 ± 0.05 m (standard)  Fiber cable type  Ø 3 mm with Kevlar strain-relief  Fiber connector type  FC APC (standard)  Power stability  max. 12 % power variation between 15°C and 35°C  Electronics type  H  Electr. cable length  1.5 ± 0.1 m (standard)  Connector type  3 pin (male, Lumberg SV30)  Supply voltage  5.0 ± 0.2 V  Max. current consumption*  260 mA  Modulation input connector  6 pin (male, Lumberg SV60)  Modulation inputs  Analog  TTL  Max. input voltage  5 V  Voltage for P <sub>min</sub> / P <sub>O</sub> 0 V / 2.5 V	Effective fiber NA <sub>e</sub> <sup>2</sup>	0.077 ± 10 % (1/e <sup>2</sup> )			
Fiber cable length  Fiber cable type  Ø 3 mm with Kevlar strain-relief  Fiber connector type  FC APC (standard)  Power stability  max. 12 % power variation between 15°C and 35°C  Electronics type  H  Electr. cable length  1.5 ± 0.1 m (standard)  Connector type  3 pin (male, Lumberg SV30)  Supply voltage  5.0 ± 0.2 V  Max. current consumption*  260 mA  Modulation input connector  6 pin (male, Lumberg SV60)  Modulation inputs  Analog  TTL  Max. input voltage  5 V  5 V  Voltage for P <sub>min</sub> / P <sub>O</sub> 0 V / 2.5 V  1.5 ± 0.1 m (standard)  1.5 ± 0.1 m (standard)	Mode field diameter MFD	6.7 $\mu$ m ± 10 % (1/e <sup>2</sup> )			
Fiber cable type  Fiber connector type  FC APC (standard)  Power stability  max. 12 % power variation between 15°C and 35°C  Electronics type  H  Electr. cable length  1.5 ± 0.1 m (standard)  Connector type  3 pin (male, Lumberg SV30)  Supply voltage  5.0 ± 0.2 V  Max. current consumption*  260 mA  Modulation input connector  6 pin (male, Lumberg SV60)  Modulation inputs  Analog  TTL  Max. input voltage  5 V  5 V  Voltage for P <sub>min</sub> / P <sub>O</sub> 0 V / 2.5 V  Input impedance  22 kOhm  22 kOhm	PER	≥ 23 dB			
Fiber connector type  Power stability  max. 12 % power variation between 15°C and 35°C  Electronics type  H  Electr. cable length  1.5 ± 0.1 m (standard)  Connector type  3 pin (male, Lumberg SV30)  Supply voltage  5.0 ± 0.2 V  Max. current consumption*  260 mA  Modulation input connector  6 pin (male, Lumberg SV60)  Modulation inputs  Analog  TTL  Max. input voltage  5 V  5 V  Voltage for P <sub>min</sub> / P <sub>O</sub> 0 V / 2.5 V  Input impedance  22 kOhm  22 kOhm	Fiber cable length	1.5 ± 0.05 m (standard)			
Power stabilitymax. 12 % power variation between 15°C and 35°CElectronics typeHElectr. cable length $1.5 \pm 0.1 \text{ m}$ (standard)Connector type3 pin (male, Lumberg SV30)Supply voltage $5.0 \pm 0.2 \text{ V}$ Max. current consumption* $260 \text{ mA}$ Modulation input connector6 pin (male, Lumberg SV60)Modulation inputsAnalogTTLMax. input voltage $5 \text{ V}$ $5 \text{ V}$ Voltage for $P_{min} / P_O$ $0 \text{ V} / 2.5 \text{ V}$ $< 0.8 \text{ V} / > 2.4 \text{ V}$ Input impedance $22 \text{ kOhm}$ $22 \text{ kOhm}$	Fiber cable type	Ø 3 mm with Kevlar strain-relief			
Electronics typeHElectr. cable length $1.5 \pm 0.1 \text{ m}$ (standard)Connector type3 pin (male, Lumberg SV30)Supply voltage $5.0 \pm 0.2 \text{ V}$ Max. current consumption* $260 \text{ mA}$ Modulation input connector6 pin (male, Lumberg SV60)Modulation inputsAnalogTTLMax. input voltage $5 \text{ V}$ $5 \text{ V}$ Voltage for $P_{min} / P_0$ $0 \text{ V} / 2.5 \text{ V}$ $< 0.8 \text{ V} / > 2.4 \text{ V}$ Input impedance $22 \text{ kOhm}$ $22 \text{ kOhm}$	Fiber connector type	FC APC (standard)			
Electr. cable length  Connector type  3 pin (male, Lumberg SV30)  Supply voltage  5.0 ± 0.2 V  Max. current consumption*  260 mA  Modulation input connector  6 pin (male, Lumberg SV60)  Modulation inputs  Analog  TTL  Max. input voltage  5 V  Voltage for P <sub>min</sub> / P <sub>O</sub> 0 V / 2.5 V  Input impedance  22 kOhm	Power stability	max. 12 % power variation between 15°C and 35°C			
Connector type3 pin (male, Lumberg SV30)Supply voltage $5.0 \pm 0.2 \text{ V}$ Max. current consumption* $260 \text{ mA}$ Modulation input connector $6 \text{ pin (male, Lumberg SV60)}$ Modulation inputsAnalogMax. input voltage $5 \text{ V}$ Voltage for $P_{\text{min}} / P_{\text{O}}$ $0 \text{ V} / 2.5 \text{ V}$ Voltage for Pmin / Po $0 \text{ V} / 2.5 \text{ V}$ Input impedance $22 \text{ kOhm}$	Electronics type		Н		
Supply voltage $5.0 \pm 0.2 \text{ V}$ Max. current consumption* $260 \text{ mA}$ Modulation input connector $6 \text{ pin (male, Lumberg SV60)}$ Modulation inputsAnalogTTLMax. input voltage $5 \text{ V}$ $5 \text{ V}$ Voltage for $P_{\text{min}} / P_{\text{O}}$ $0 \text{ V} / 2.5 \text{ V}$ $< 0.8 \text{ V} / > 2.4 \text{ V}$ Input impedance $22 \text{ kOhm}$ $22 \text{ kOhm}$	Electr. cable length	$1.5 \pm 0.1 \text{ m (standard)}$			
Max. current consumption*260 mAModulation input connector6 pin (male, Lumberg SV60)Modulation inputsAnalogTTLMax. input voltage5 V5 VVoltage for Pmin / Po0 V / 2.5 V< 0.8 V / > 2.4 VInput impedance22 kOhm22 kOhm	Connector type	3 pin (male, Lumberg SV30)			
Modulation input connector6 pin (male, Lumberg SV60)Modulation inputsAnalogTTLMax. input voltage $5 \text{ V}$ $5 \text{ V}$ Voltage for $P_{min} / P_0$ $0 \text{ V} / 2.5 \text{ V}$ $< 0.8 \text{ V} / > 2.4 \text{ V}$ Input impedance $22 \text{ kOhm}$ $22 \text{ kOhm}$	Supply voltage	5.0 ± 0.2 V			
Modulation inputs         Analog         TTL           Max. input voltage         5 V         5 V           Voltage for P <sub>min</sub> / P <sub>O</sub> 0 V / 2.5 V         < 0.8 V / > 2.4 V           Input impedance         22 kOhm         22 kOhm	Max. current consumption*	260 mA			
	Modulation input connector	6 pin (male, Lumberg SV60)			
Voltage for $P_{min} / P_{O}$ $0 \vee / 2.5 \vee$ $< 0.8 \vee / >$ $2.4 \vee$ Input impedance $22 \text{ kOhm}$ $22 \text{ kOhm}$	Modulation inputs	Analog	TTL		
Input impedance         22 kOhm         22 kOhm	Max. input voltage	5 V	5 V		
	Voltage for P <sub>min</sub> / P <sub>O</sub>	0 V / 2.5 V			
Max. modulation frequency 100 kHz 100 kHz	Input impedance	22 kOhm	22 kOhm		
	Max. modulation frequency	100 kHz	100 kHz		



Time delay ON/OFF*	2/0.3 μs	1.5/0.1 μs	
Rise / fall time*	1.0/1.0 μs	1.0/1.0 µs	
* Typical value. Depends on laser diode.			
Operating temperature	1	15 - 35°C ± 0.5°C	
Warm-up time		approx. 10 min	
Air humidity	max. 90 %	max. 90 % non-condensing	
Casing Type		S1	
Weight		g	
Dimensions (w/o base)	66 x 66 x 225 mm		
Protection Class		IP30	
Dimensions (for a complete dimensional drawing please refer to the downloads section)			



## **TECHNOTES**

- Fiber-coupled low noise beam source
   Comparison of a low noise laser source to a conventional laser source
- 51nano: Electronics Type H
   Electronic features for electronics type H



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## **DOWNLOADS**



090410090100.pdf (Dimensional drawing)



(PM/OEM)

(SM)

Conformity 51nano 2023 E web.PDF (CE certificate)

## **ACCESSORIES**

PS051003E Power Supply 5 V

BC0106F-ILCK Interlock connector

**FIBER COLLIMATORS** Fiber Collimators for collimating light exiting a single-

SINGLE-MODE/PM mode or polarization-maintaining fiber cable

## RELATED PRODUCTS

51NANO-S Fiber-coupled low coherence laser source with

(POLARIZATIONpolarization-maintaining fiber cable **MAINTAINING)** 

**51NANOFI-N WITH** Fiber-coupled low coherence laser source with **FARADAY ISOLATOR** polarization-maintaining fiber cable (OEM version)

51NANOFI-S WITH Fiber-coupled low coherence laser source with

**FARADAY ISOLATOR** single-mode fiber cable



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