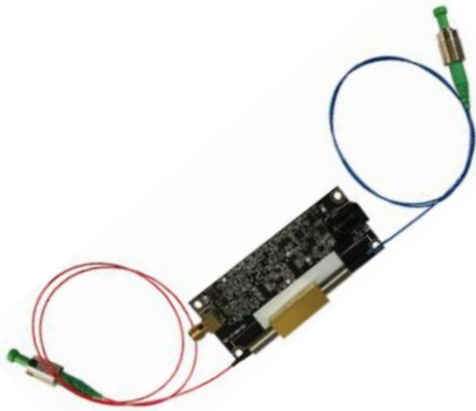


# Variable Fiber Optical Splitter/Coupler (1x2, 2x2, SM, PM)



DATASHEET

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The Variable Fiber Optical Splitter/Coupler splits an incoming optical signal among the two output optical fibers (1x2) with a continuously variable ratio controlled by an input voltage signal from 0 to 5V, either DC or AC. Two inputs/outputs (Full 2x2) configuration is also available. The device does not create extra loss during the transition and is bidirectional. When the electrical control signal is removed, or at 0 V, the splitter returns to the original ratio of 100:0. The all-solid-state crystal design meets the most demanding requirements of ultra-high reliability, fast response time, and continuous operation over 25 years. The Variable Fiber Optic Splitter has passed Telcordia and space reliability qualification tests.

The unit is mounted on a driving board with a control signal input SMA connector and a wall plug-in power supply. Several frequency versions of drivers are available. As an Electro-optical crystal-based device, the variable splitter output has a certain degree of variation due to environmental changes. A driver with output power stabilization via feedback control is available as a Precision Variable Fiber Optical Splitter.

For 2x2 splitters, the splitting for the two inputs is related but functions simultaneously. One can set the ratio of the first input and then measure the splitting ratio of the second input while turning off the first one.

## Features

- High Speed
- High Reliability
- Low Insertion Loss
- Compact

## Applications

- Instrumentation
- Power balance
- Sensor

## Specifications

Parameter		Min	Typical	Max	Unit
Central Wavelength		450		2000	nm
Wavelength Bandwidth			± 50		nm
Insertion Loss <sup>[1]</sup>	1900~2100nm		0.9	1.5	dB
	1260~1650nm		0.6	1.1	dB
	960~1260nm		0.8	1.4	dB
	760~960nm		1	1.6	dB
	650 -760nm		1.5	1.9	dB
	450-640nm		2	2.5	dB
Cross Talk On/Off Ratio at 100% Split in Single Stage <sup>[2]</sup>		18	25	35	dB
Cross Talk On/Off Ratio at 100% Split in Dual Stage <sup>[3]</sup>		35	40	50	dB
Splitting Variation	Output 1		100 ~ 0		%
	Output 2		0 ~ 100		%
	Type	Continuous			
Electrical Power Consumption				1	W
Repetition Rate		DC	20	1000 <sup>[4]</sup>	kHz
Response Time				1	us
Polarization Dependent Loss			0.1	0.35	dB
IL Temperature Dependency			0.25	0.5	dB
Polarization Mode Dispersion			0.1	0.2	ps
Return Loss		45	50	60	dB
Operating Temperature		-5		70	°C
Optical Power Handling <sup>[5]</sup>	Regular		300	500	mW
	High power		2	10	W
Storage Temperature		-40		85	°C

### Notes:

- [1] Single stage 1x2 and excluding connectors. Wavelength < 960nm will be implemented in NP version.
- [2] Cross talk is measured in 1x2 at 5kHz, which may be degraded at the higher repeat rate.
- [3] Dual stage version is special only for high CT at 0:100%, please contact us for any question.
- [4] 100kHz version is available with the high splitting variation, while 1MHz version may be available at either a fixed splitting ratio or a small splitting variation such as ~25%.
- [5] Defined at 1310/1550nm. For the shorter wavelength, the handling power may be reduced.

**Note:** The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link](#):

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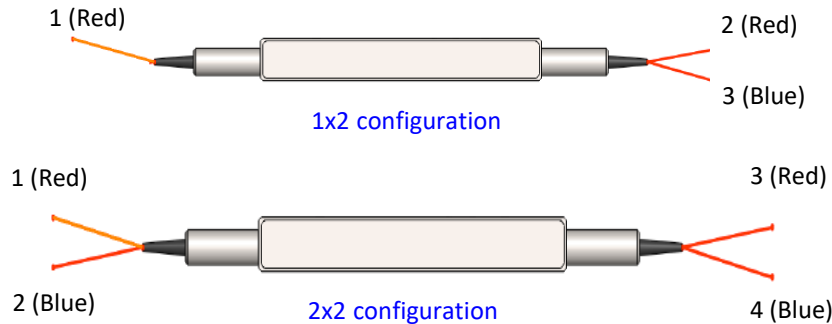
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# Variable Fiber Optical Splitter/Coupler (1x2, 2x2, SM, PM)



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### Port Diagram and Function



For 2x2 configuration, Port 1 -> port 3 and port 2 -> port 4 respectively without voltage. When a voltage is applied, the light from port 1 splits between port 3 and 4 and the light from port 2 splits between port 4 and 3, respectively with the same ratio. Portions of lights from port 1 and 2 add at output port 3 and 4 proportionally.

### Driving Board Configuration

The NSVS/NHVS module comprises a NanoSpeed (NS) switch mounted either on a VOA control circuit board or a feedback control board. The module generally uses the standard version of NVOA of a single stage or dual stage.

Driver's repeat Rate	Part Number (P/N)
20 kHz	NVDR-113235112
100 kHz	NVDR-112221112
1000 kHz <sup>[1]</sup>	NVDR-1PH210121
Power regulation driver <sup>[2]</sup>	NRDR-33001111

[1]: This 1MHz driver is limited to the fixed split ratio < 80% at the repeat rate > 500kHz, or to the lower splitting variation such as <30%.

[2]: The power in one output port #2 is regulated at the fixed level while the power in another output may vary as the input power is changing. This fixed level is preset, and unchangeable in the OEM version. This device can also be used as laser power stabilizer. The average response for the feedback control loop is micron-seconds.

### Frequently Asked Questions

**Q:** The spec states "repetition". Does it mean that the unit only works for a periodic signal?

**A:** It works for any signal with a bandwidth of less than 100 kHz generally. For NP type of NSVS can reach up to 1MHz with some degradation of split ratio (not 100/0). The optical response follows the input electrical signal shape to some extent with distortion. The repetition rate is a way to indicate how fast the system can respond.

**Q:** What is the difference between NS splitter and NS switch?

**A:** The device is the same; however, NS splitter is driven by an analogy circuit, while NS switch by a digital circuit that is much faster.

**Q:** Does the splitter maintain the splitting ratio once set by the control signal?

**A:** The electro-optical device maintains the splitting ratio to a certain range over a certain time period.

Please order the precision splitter version for applications that require maintaining a precise ratio.

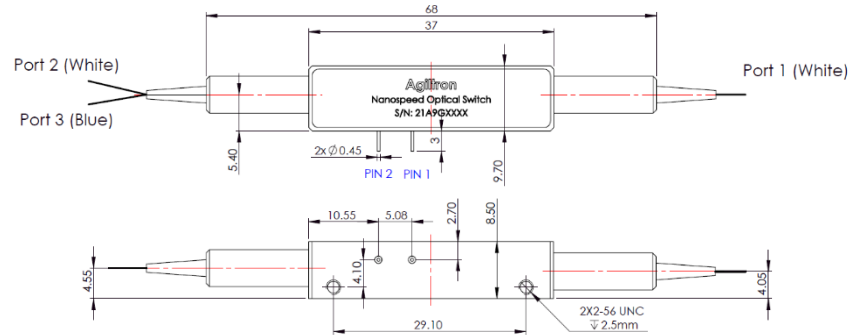
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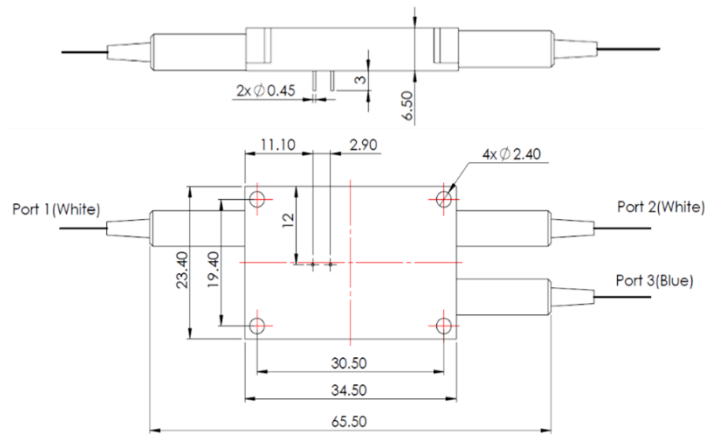
## DATASHEET

### Mechanical Dimensions (mm) of NSVS w/o Driver

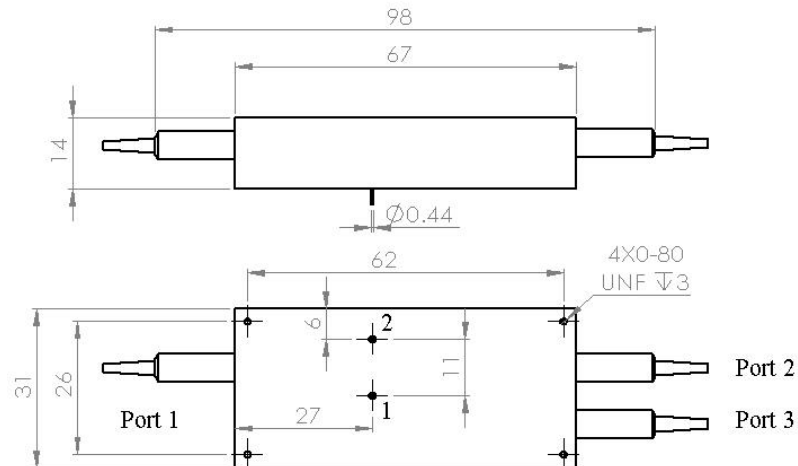
#### Single Stage & Power $\leq 1W$



#### Single Stage & High power 2~5W



#### Single Stage & $\lambda \Rightarrow 1.9\mu m$



\*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

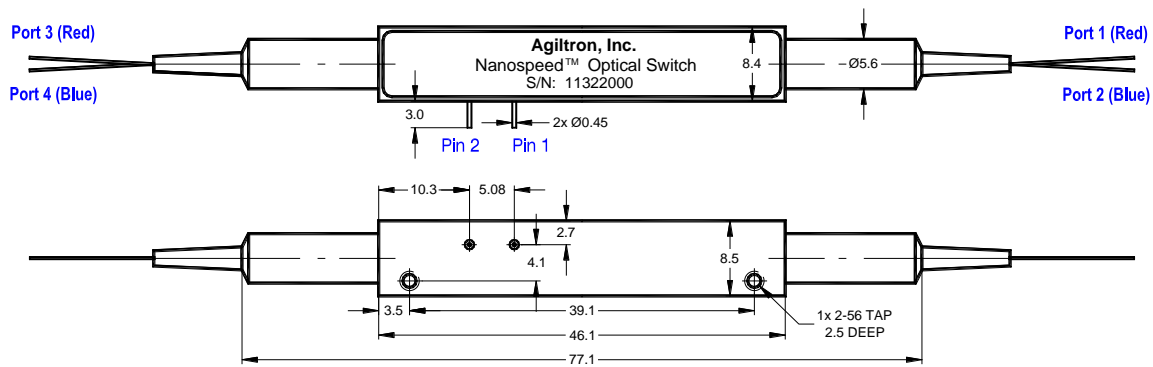
# Variable Fiber Optical Splitter/Coupler (1x2, 2x2, SM, PM)



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## Mechanical Dimensions (mm) of NSVS w/o Driver

### Single Stage 2x2 & Power $\leq 1W$



TBD for Dual-Stage 1x2 Package

## Operation Instruction

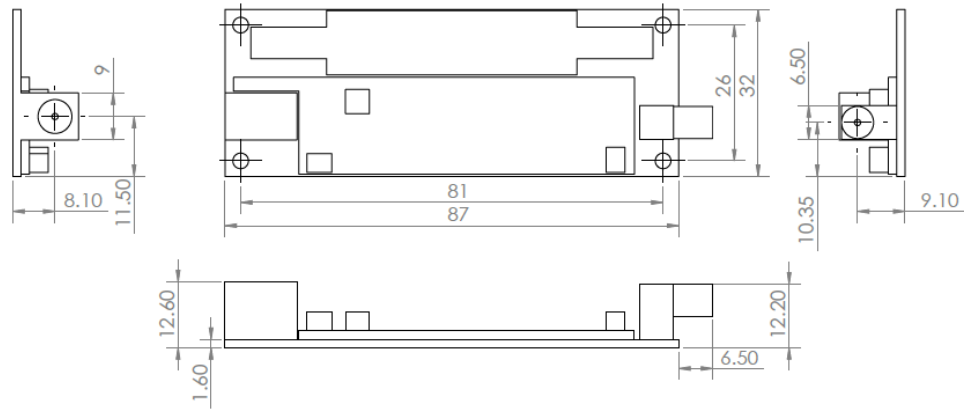
1. Plug in the accompanied power supply
2. Plug in a 0-5V control signal to the input SMA connector (golden color). One can use a DC power supply first, and then a function generator. The optical output will change from maximum to minimum or from minimum to maximum depending on which port is measured.
3. Do not adjust settings on the board

# Variable Fiber Optical Splitter/Coupler (1x2, 2x2, SM, PM)

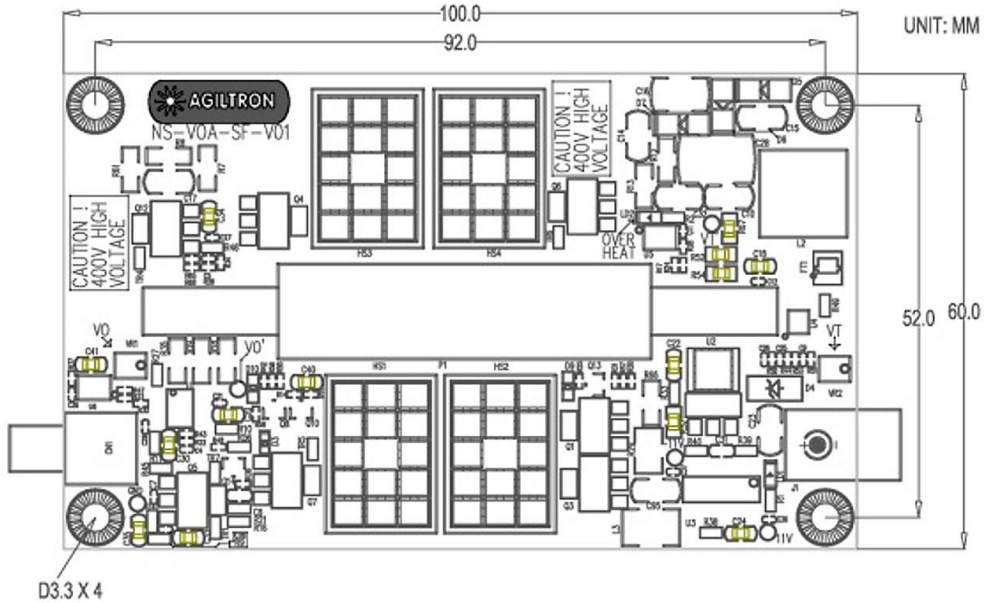


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### Module Dimensions (mm) with Driver PCB and Regular Power NSVS



20kHz Driver (87mm x 32mm)



100kHz Driver (100mm x 60mm)

### Module Dimensions (mm) with Other Driver PCB & NSVS and NHVS

TBD

\*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

# Variable Fiber Optical Splitter/Coupler (1x2, 2x2, SM, PM)



## DATASHEET

### Ordering Information

Prefix	Type	Wavelength <sup>[4]</sup>	Driver	Configuration	Fiber Type	Fiber Cover	Fiber Length	Connector <sup>[6]</sup>
<b>NSVS</b> - <sup>[1]</sup>	1x2 = 12	1060nm = 1	20kHz = 2	Single-stage & ≤ 0.5W = 1	SMF-28 = 1	Bare fiber = 1	0.25m = 1	None = 1
<b>NHVS</b> - <sup>[2]</sup>	2x2 = 22 <sup>[3]</sup>	2000nm = 2	100kHz = 3	Single-Stage & 1W = A	HI1060 = 2	900um tube = 3	0.5m = 2	FC/PC = 2
		1310nm = 3	No Drift <sup>[5]</sup> = 6	Single-Stage & 5W = C	HI780 = 3	Special = 0	1.0m = 3	FC/APC = 3
		1550nm = 5	Special = 0	Single-Stage & 10W = D	PM980 = 9		Special = 0	SC/PC = 4
		1625nm = 6		<b>Dual-Stage &amp; ≤ 0.5W = 2</b>	Special = 0			SC/APC = 5
		850nm = 8		Special = 0				ST/PC = 6
		780 = 7						LC/PC = 7
		650 = E						LC/APC = A
		550 = F						LC/UPC = U
		400 = G						Special = 0
		Special = 0						

[1]. **NSVS** – Regular power and 1W variable splitter

[2]. **NHVS** – High power (≥ 2W) variable splitter

[3]. 2x2 is available only in single stage at regular power, please contact us for new development.

[4]: All red-lighten versions will be implemented in the special version with a long lead-time.

[5]: One tap version stabilizes optical outpower in one output. If the input power is kept a constant, the splitter ratio is also stabilized. If the input power varies, only the power level in one output is stabilized. This device can also be used as laser power stabilizer. The average response for the feedback control loop is micron-second.

[6]: For optical power >1W, the high-power connector is recommended. Please contact us.

### Fiber Core Alignment

Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

### Fiber Cleanliness

Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

### Maximum Optical Input Power

Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the handling by expanding the core side at the fiber ends.