

## TLK-BM - February 22, 2019

Item # TLK-BM was discontinued on February 22, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

### TUNABLE LASER KIT COMPONENTS

- ▶ Components for ECL Kits Offer Highly Customizable Solutions
- ▶ Alter Cavity to Support Various Wavelengths



**TLK-G1800R**  
 Grating Module,  
 980 nm Operation



**Z812**  
 Motorized Actuator



**SAF1550P2**  
 SAF Gain Chip,  
 CWL = 1550 nm,  
 PM Fiber

[Hide Overview](#)

#### OVERVIEW

This page includes products that are direct replacements of standard components in the Tunable Laser Kit and can be used to customize a tunable laser kit's performance. By using these components, customers can replace standard components and alter the laser's performance. The images and tables immediately below label the components in our standard Tunable Laser Kits.

#### Littman Tunable Laser Kits

Label	Description	Label	Description
A	Tuning Motor Mount	F	Collimating Lens
B	Gain Chip Mounting Plate	G	Littman Grating Platform
C	Half Butterfly Gain Chip	H	Littman Grating Module
D	Collimation Adjuster	I	Littman Mirror Module
E	Mode Hop Adjuster	J	Tuning Motor



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#### Littrow Tunable Laser Kits

Label	Description	Label	Description
A	Tuning Motor Mount	E	Mode Hop Adjuster
B	Gain Chip Mounting Plate	F	Collimating Lens
C	Half Butterfly Gain Chip	G	Littrow Grating Module
D	Collimation Adjuster	H	Tuning Motor



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[Hide Gain Chip Specs](#)

#### GAIN CHIP SPECS

All quoted values are typical, unless otherwise indicated. Please see the gain chip's Spec Sheet (linked below) for the most detailed information on performance.

[This link opens a document that contains a comprehensive list of performance specifications and performance plots.](#)

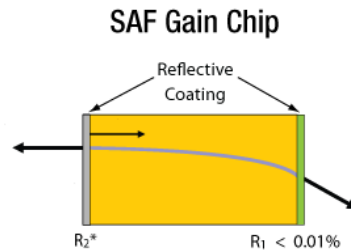
#### General Specifications

Item #	Spec Sheet	Reference Cavity	CWL <sup>a</sup>	Tuning Range <sup>a, b</sup>	Peak Power <sup>a</sup>	Chip Gain <sup>c</sup>	Gain Ripple	R <sub>1</sub>	R <sub>2</sub>	Chip Length
SAF1171S		TLK-L780M <sup>d</sup>	1050 nm	60 nm	8 mW	30 dB	2.5 dB (Max)	0.005%	10% <sup>e</sup>	1 mm
SAF1175S		Littmann Cavity (Offered as OEM)	1220 nm	90 nm	40 mW	17 dB	0.5 dB	0.005%	10% <sup>e</sup>	1 mm
SAF1174S		TLK-L1300R <sup>d</sup>	1310 nm	100 nm	50 mW	35 dB	0.35 dB	0.005%	10% <sup>e</sup>	2 mm
SAF1450S2		TLK-L1450R <sup>d</sup>	1450 nm	120 nm	40 mW	20 dB	0.4 dB (Max)	0.005%	10% <sup>e</sup>	1.5 mm
SAF1550S2		TLK-L1550R <sup>d</sup>	1550 nm	120 nm	40 mW	17 dB	0.6 dB (Max)	0.005%	10% <sup>e</sup>	1 mm
SAF1550P2		TLK-L1550R <sup>d</sup>	1550 nm	120 nm	40 mW	17 dB	0.6 dB (Max)	0.005%	10% <sup>e</sup>	1 mm
SAF1900S		TLK-L1900M <sup>d</sup>	1900 nm	120 nm	7 mW	18 dB	1.5 dB	0.005%	20% <sup>e</sup>	2 mm

- The values given in the highlighted columns were measured in the specified reference cavity. Different external cavities will produce different performance specifications.
- 10 dB point.
- Single-pass optical gain at center of gain curve.
- This item is no longer available for individual purchase.
- Refer to the SAF chip reflectivity diagram below.

ASE Specifications					
Item #	Center Wavelength (Typ.)	3 dB Bandwidth (Typ.)	ASE Current	Operating Current (Typ.)	Operating Current (Max)
SAF1171S	1050 nm	60 nm	150 mA (Max)	-	150 mA
SAF1175S	1220 nm	80 nm	200 mA (Typ.)	200 mA	-
SAF1174S	1320 nm	80 nm	600 mA (Typ.)	500 mA	800 mA
SAF1450S2	1450 nm	100 nm	500 mA (Max)	-	500 mA
SAF1550S2	1550 nm	80 nm	300 mA (Typ.)	300 mA	600 mA
SAF1550P2	1550 nm	80 nm	300 mA (Typ.)	300 mA	600 mA
SAF1900S	1930 nm	150 nm	400 mA (Typ.)	500 mA	800 mA

**Note:** The light polarization is vertical inside the Fabry-Perot Gain Chip, while the light polarization is horizontal inside the SAF Gain Chips.



\*R<sub>2</sub> = 10% for all models in the SAF series except the SAF1900S, for which R<sub>2</sub> = 20%.

## SAF Gain Chip Lasing Performance Using Littrow Tunable Laser Kit

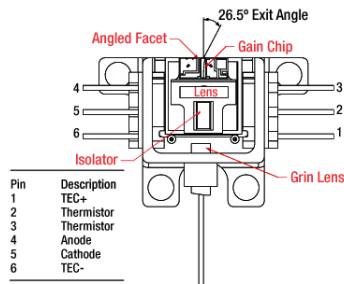
The innovative design of an SAF gain chip is ideal for use in external cavity lasers because it virtually eliminates unwanted feedback from the intracavity facet of the gain chip. These devices offer superior performance in a wide variety of external cavity configurations. Given below are typical spectra and details on the packaged devices.

Item #	Center Wavelength	Power vs. Current	Power Spectrum
SAF1171S	1050 nm		
SAF1175S	1220 nm		
SAF1174S <sup>a</sup>	1320 nm		
SAF1450S2	1450 nm		
SAF1550S2	1550 nm		
SAF1550P2	1550 nm		

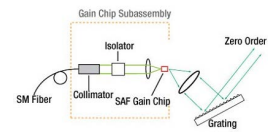
SAF1900S	1900 nm		

- Please note that the fluctuations in the power spectrum between 1350 and 1380 nm are associated with water vapor absorption.

### Fiber-Coupled SAF Gain Chip Drawing



### Basic Littrow Configuration



### Hide Cavity Configuration

## CAVITY CONFIGURATION



Lasers consist of an active gain element and optical feedback to this gain element. The most common diode lasers are based on a Fabry-Perot design with a linear waveguide and reflective surfaces at both ends of the gain chip to provide feedback. Some Fabry-Perot lasers

are constructed for external feedback, but this is rare. Single angle facet (SAF) gain chips, on the other hand, have a curved waveguide with only one internally reflective endface and rely on external optical feedback to produce lasing.

Cavity Design	Littrow	Littman-Metcalf
High Output Power	x	
Wide Tuning Range	x	
Narrow Linewidth		x
Stationary 0 <sup>th</sup> Order Beam		x



Through the use of an external feedback mechanism, a user is able to tune a laser cavity to sustain a desired wavelength with minimal linewidth. This is highly desirable for many applications, particularly in metrology where precision is essential. Littrow and Littman-Metcalf configurations are the two most common ways to build an External Cavity Laser (ECL). Many other ECL configurations are based on these designs, but typically modify the cavity with additional optical components. Littrow cavities have minimal losses and thus intrinsically offer higher power, while Littman-Metcalf cavities produce a narrower linewidth.

A Littrow cavity provides feedback to the gain element through the use of a grating. One end of the gain element must allow light to exit, such as the design of an SAF. Light emitted from this end is first collimated. A grating then diffracts this collimated beam with the 1<sup>st</sup> order diffraction coupled back into the gain element, which allows it to support lasing. Wavelength tuning of the laser is possible by altering the angle of the grating relative to the cavity. 0<sup>th</sup> order diffraction from the grating will exit the laser's cavity at an angle dependent on the grating angle.

Littman-Metcalf configured ECLs use both a grating and a mirror for tuning. Similar to the Littrow configuration, light emitted from the uncoated end of the gain element must first be collimated. This beam is then diffracted by a grating. The 0<sup>th</sup> order diffraction reflects off of a mirror back on to the grating, where it is diffracted a second time before being coupled back into the gain element. Since light is diffracted twice, losses are higher (power loss), but the side mode suppression ratio (SMSR) is increased to produce a narrower linewidth laser. In this configuration the grating remains stationary, while the mirror is turned to tune the laser cavity's supported wavelength. Unlike with Littrow lasers, the direction of the 0<sup>th</sup> order free space beam remains stationary, which can be beneficial in some applications.

Many modifications to these cavities can be made to produce a higher polarization extinction ratio (PER) or to improve the SMSR. We always seek to tailor our products to our customers' applications. Please contact Tech Support and let us know what accessories would benefit your application.

### Hide Tunable Laser Gain Chips with TEC

## Tunable Laser Gain Chips with TEC

- Gain Chips Mounted for Easy Integration into External Cavity Lasers
- Half-Butterfly Assembly with Thermoelectric Cooler
- AR Coating Eliminates Unwanted Reflections, Increasing Laser Stability,


The SAF1171S, SAF1175S, SAF1450S2, and SAF1900S will be retired without replacement








when stock is depleted. If you require this part for line production, please contact our OEM Team.

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Output Power, and Spectral Quality

- ▶ 1.0 m Long (Min), SM or PM Tight Jacket Pigtail with FC/APC Connector

Click the  icon below for more detailed performance specifications. SAF gain chips can also be coupled to PM fiber. Please contact Tech Support for more information on customization and quotes.

Item #	Info	ASE Center Wavelength	ASE 3 dB Bandwidth	Peak Gain	Gain Ripple	Compatible Laser Kits	Typical Center Wavelength <sup>a</sup>
SAF1171S		1060 nm	60 nm	30 dB	2.5 dB (Max)	TLK-L1050M	1050 nm
SAF1175S		1220 nm	80 nm	17 dB	0.5 dB	TLK-L1220R	1220 nm
SAF1174S		1320 nm	80 nm	35 dB	0.35 dB	TLK-L1300M TLK-L1300R	1320 nm
SAF1450S2		1450 nm	100 nm	20 dB	0.4 dB (Max)	TLK-L1450R	1450 nm
SAF1550S2		1550 nm	80 nm	17 dB	0.6 dB (Max)	TLK-L1550M TLK-L1550R	1550 nm
SAF1550P2		1550 nm	80 nm	17 dB	0.6 dB (Max)	TLK-L1550M TLK-L1550R	1550 nm
SAF1900S		1900 nm	150 nm	18 dB	1.5 dB	TLK-L1900M TLK-L1950R	1900 nm

All values typical unless otherwise noted. See the *Gain Chip Specs* tab for more information.

- Center wavelength of the specified reference cavity.

Part Number	Description	Price	Availability
SAF1171S	Mounted SAF Gain Chip, Half Butterfly Pkg, CWL = 1050 nm, SM Fiber	\$3,330.40	Lead Time
SAF1175S	Mounted SAF Gain Chip, Half Butterfly Pkg, CWL = 1220 nm, SM Fiber	\$2,783.04	Today
SAF1174S	Mounted SAF Gain Chip, Half Butterfly Pkg, CWL = 1320 nm, SM Fiber	\$2,783.04	Today
SAF1450S2	Mounted SAF Gain Chip, Half Butterfly Pkg, CWL = 1450 nm, SM Fiber	\$2,783.04	5-8 Days
SAF1550S2	Mounted SAF Gain Chip, Half Butterfly Pkg, CWL = 1550 nm, SM Fiber	\$2,783.04	Today
SAF1550P2	Mounted SAF Gain Chip, Half Butterfly Pkg, CWL = 1550 nm, PM Fiber	\$2,943.78	Today
SAF1900S	Mounted SAF Gain Chip, Half Butterfly Pkg, CWL = 1900 nm, SM Fiber	\$2,783.04	Today

[Hide Mounting Plates for AR-Coated Laser Diodes in TO Cans](#)

### Mounting Plates for AR-Coated Laser Diodes in TO Cans

- ▶ Mounts Ø5.6 mm or Ø9 mm Diodes
- ▶ Integrated TEC and Thermistor
- ▶ Four-Pin Socket Accepts A, B, C, D, or E Pin Configurations (See Right)

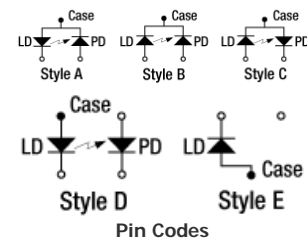
These mounting plates integrate TO-packaged laser diodes into Thorlabs' Tunable Laser Kits. They are drop-in replacements for the standard Half-Butterfly Mounting Plates. As TO-packaged diodes are readily available with various center wavelengths, this represents an economical solution for building a customized tunable laser that operates at wavelengths for which a half-butterfly gain chip is not available.

The mounting plates incorporate a 10 kΩ thermistor into the diode bracket for accurate temperature readings, and a 1.5 A TEC element is placed in contact with this bracket via thermal grease, providing excellent heat transfer. If greater thermal control is required, the TEC element may be replaced with a larger TEC by the user.

These mounting plates ship ready to accommodate either a Ø5.6 mm or a Ø9 mm diode. Regardless of which model is ordered, a supplementary bracket is included to accept the other diode package size. When changing between brackets, ensure that the thermistor is disconnected from the wiring harness and re-apply thermal grease to the TEC element before re-attaching a laser diode bracket.

#### Installation Notes

To insert a laser diode in to the mounting plate, first remove the retaining ring from the bracket with an SPW301 spanner wrench. Next, insert a laser diode. Now thread the retaining ring behind the diode to secure it in the mount. Attach the laser diode socket to the diode and route the wires to the proper connection on the mounting plate.



These items will be retired without replacement when stock is depleted. If you require this part for line production, please contact our OEM Team.

Limited  
STOCK

Part Number	Description	Price	Availability
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TLK-PM5	Customer Inspired!&nbsp;Tunable Laser Kit Mounting Plate for Ø5.6 mm TO-Packaged Laser Diodes	\$729.12	Today
TLK-PM9	Customer Inspired!&nbsp;Tunable Laser Kit Mounting Plate for Ø9 mm TO-Packaged Laser Diodes	\$729.12	Today

[Hide Tunable Laser Kit Base Module](#)

### Tunable Laser Kit Base Module

- ▶ Base Plate of Tunable Laser Kit
- ▶ Includes Controller Interface with Laser Polarity Switches

The TLK-BM base module is the common mounting plate on which all other tunable laser components are mounted, and can be purchased here as a replacement for the base included in the Tunable Laser Kits. The TLK-BM includes a controller interface with polarity switches to support different AR-coated and laser diodes.

The TLK-BM will be retired without replacement when stock is depleted. If

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STOCK**

you require this part for line production, please contact our OEM Team.

Part Number	Description	Price	Availability
TLK-BM	Customer Inspired!&nbsp;Tunable Laser Kit Base Module, Includes LD/TEC Controller Interface	\$1,289.09	5-8 Days

[Hide Littrow Grating Module](#)

### Littrow Grating Module

- ▶ Grating Module for Operation at 980 nm
- ▶ Includes Pivot Bracket, Arm, and Grating

Thorlabs offers the TLK-G1800R holographic reflection grating with 1800 grooves/mm for use with TLK Series Littrow Tunable Laser Kits. The gratings are premounted on a pivot arm for easy installation into existing Tunable Laser Kits.

Littrow Grating Item #	Compatible Littrow Kit	Optimal Center Wavelength
TLK-G1800R	N/A	980 nm

The TLK-G1800R will be retired without replacement when stock is depleted. If you require this part for line production, please contact our OEM Team.

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Part Number	Description	Price	Availability
TLK-G1800R	Littrow Grating Module for Littrow Tunable Laser Kits, 1800 g/mm, 980 nm Operation	\$1,816.49	Lead Time

[Hide Littman Grating Module](#)

### Littman Grating Module

- ▶ Grating Module for Operation Centered at 1050 nm
- ▶ Includes Grating and Mount

Thorlabs offers a holographic reflection grating featuring 1150 grooves/mm for use at 1050 nm. The grating, 17.0 mm x 7.3 mm, is premounted for easy installation into existing Tunable Laser Kits.

Littman Grating Item #	Compatible Littman Kit	Optimal Center Wavelength
TLK-G1150M	TLK-L1050M	1050 nm

This item will be retired without replacement when stock is depleted. If you require this part for line production, please contact our OEM Team.

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Part Number	Description	Price	Availability
TLK-G1150M	Customer Inspired!&nbsp;Littman Grating Module for Littman Tunable Laser Kits, 1150 g/mm	\$520.05	Lead Time

[Hide Tuning Actuator Mounts](#)

### Tuning Actuator Mounts

- ▶ Mirror / Grating Actuator Motor Mount
- ▶ Radial Arm Retainer Spring
- ▶ TLK-MM2: Designed for Ø9.5 mm (Ø3/8") Barrel Actuators

The TLK-MM2 Tuning Motor Mount has a clamp for Ø9.5 mm (Ø3/8") barrel actuators. This allows the integration of actuators such as our PE4 manual and piezo drive or the Mitutoyo 148-142 high-

The TLK-MM2 will be retired without replacement when stock is depleted. If

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STOCK**

you require this part for line production, please contact our OEM Team.

resolution micrometer.

Part Number	Description	Price	Availability
TLK-MM2	Ø9.5 mm (3/8") Barrel Tuning Motor Mount for Tunable Laser Kits	\$241.64	5-8 Days

[Hide DC Motor Tuning Actuator](#)

### DC Motor Tuning Actuator

- ▶ Direct Replacement for TLK Tuning DC Servo Motor
- ▶ 12 mm Travel
- ▶ 29 nm Theoretical Resolution
- ▶ 3 mm/s Max Velocity

The Z812 is the standard DC servo motor used in Thorlabs' Tunable Laser Kits. Its 1/4"-80 threaded barrel mounts to the former TLK-MM1 Tuning Motor Mount. We recommend using the KDC101 Kinesis® Controller for this actuator.

Part Number	Description	Price	Availability
Z812	12 mm Motorized Actuator, 1/4"-80 Thread (0.5 m Cable)	\$647.17	Today