

# Aktiv gekühlter Diodenlaser-Barren, 1200 W cw bei 808 nm Actively Cooled Diode Laser Bar, 1200 W cw at 808 nm

**SPL E20N81G2**



## Vorläufiges Datenblatt / Preliminary Data Sheet

### Besondere Merkmale

- Laserstack mit 20 Laserbarren auf Mikrokanalkühler
- Für Dauerstrich- (CW) und quasi-kontinuierlichen Betrieb (QCW)
- Zuverlässiges Halbleiter-Material mit Mindest-Lebensdauer von 10.000 h, typischerweise >50.000 h
- Geringer thermischer Widerstand
- Geringer smile ( $< 3 \mu\text{m}$ ), geringe mechanische Toleranzen
- Ein-/Auslass für Kühlwasser an Unterseite
- Geringer Abstand der Laserbarren (1,6 mm)
- Einfacher Anschluss durch optionalen Wasserverteiler

### Anwendungen

- Pumpen von Festkörperlasern
- Direkte industrielle Anwendungen (Löten, Oberflächenbehandlung,...)
- Medizinische Anwendungen
- Druckanwendungen

### Sicherheitshinweise

Je nach Betriebsart emittieren diese Bauteile hochkonzentrierte, nicht sichtbare Infrarot-Strahlung, die gefährlich für das menschliche Auge sein kann. Produkte, die diese Bauteile enthalten, müssen gemäß den Sicherheitsrichtlinien der IEC-Norm 60825-1 behandelt werden

### Features

- Micro channel cooled laser stack with 20 bars
- For continuous wave (cw) and quasi continuous wave (qcw) operation
- Highly reliable semiconductor material with minimal life time of 10,000 h, typically >50,000 h
- Low thermal resistance
- Low smile ( $< 3 \mu\text{m}$ ) and low mechanical tolerances
- Coolant inlet/outlet at bottom.
- Low bar-to-bar distance of 1.6 mm
- Optional manifold for easy usage

### Applications

- Pumping of solid state lasers
- Direct industrial applications (soldering, surface treatment,...)
- Medical applications
- Printing applications

### Safety Advices

Depending on the mode of operation, these devices emit highly concentrated non visible infrared light which can be hazardous to the human eye. Products which incorporate these devices have to follow the safety precautions given in IEC 60825-1 "Safety of laser products".

| Typ<br>Type  | Anzahl Barren<br>Bar count | Wellenlänge<br>Wavelength | Bestellnummer<br>Ordering Code |
|--------------|----------------------------|---------------------------|--------------------------------|
| SPL E20N81G2 | 20                         | 808 nm                    | Q65110A6232                    |

#### Grenzwerte Maximum Ratings

| Parameter<br>Parameter                                                  | Symbol<br>Symbol | Werte<br>Values |      | Einheit<br>Unit |
|-------------------------------------------------------------------------|------------------|-----------------|------|-----------------|
|                                                                         |                  | min.            | max. |                 |
| Ausgangsleistung<br>Optical output power                                | $P_{\max}$       | —               | 1200 | W               |
| Tastverhältnis<br>Duty cycle                                            | $dc$             | —               | 100  | %               |
| Kühlwassertemperatur <sup>1)</sup><br>Coolant temperature <sup>1)</sup> | $T_{\text{op}}$  | 5               | 40   | °C              |
| Kühlwasserdruck<br>Coolant pressure                                     | $p_{\max}$       | —               | 4    | bar             |

<sup>1)</sup> Betauung des Moduls muss ausgeschlossen werden  
Prevent moisture on the module.

**Dioden-Kennwerte** (25 °C Kühlwassertemperatur)  
**Diode Characteristics** (25 °C coolant temperature)

| Parameter<br>Parameter                                                                                                    | Symbol<br>Symbol         | Werte<br>Values |      |      | Einheit<br>Unit |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------|------|------|-----------------|
|                                                                                                                           |                          | min.            | typ. | max. |                 |
| Optische Ausgangsleistung <sup>1)</sup><br>Optical output power <sup>1)</sup>                                             | $P_{\text{opt}}$         | –               | 1200 | –    | W               |
| Optische Ausgangsleistung pro Laserbarren <sup>1)</sup><br>Optical Output power per bar <sup>1)</sup>                     | $P_{\text{bar}}$         | –               | 60   | –    |                 |
| Emissionswellenlänge <sup>1) 2)</sup><br>Emission wavelength <sup>1) 2)</sup>                                             | $\lambda$                | 805             | 808  | 811  | nm              |
| Spektrale Breite (Halbwertsbreite)<br>Spectral width (FWHM) <sup>1)</sup>                                                 | $\Delta\lambda$          | –               | 3    | 5    | nm              |
| Schwellstrom<br>Threshold current                                                                                         | $I_{\text{th}}$          | –               | 12   | 15   | A               |
| Kennliniensteigung<br>Slope efficiency                                                                                    | $\Delta P/\Delta I$      | 20.0            | 23.0 | 25.0 | W/A             |
| Kennliniensteigung pro Laserbarren<br>Slope efficiency per bar                                                            | $\Delta P/\Delta I$      | 1.00            | 1.15 | 1.25 |                 |
| Betriebsstrom <sup>1)</sup><br>Operating current <sup>1)</sup>                                                            | $I_{\text{op}}$          | 60              | 65   | 70   | A               |
| Betriebsspannung<br>Operating voltage <sup>1) 3)</sup>                                                                    | $V_{\text{op}}$          | 34              | 36   | 40   | V               |
| Konversionseffizienz (elektrisch zu optisch) <sup>1)</sup><br>Conversion efficiency (electrical to optical) <sup>1)</sup> | $\eta_{\text{con}}$      | 48              | 52   | –    | %               |
| Temperaturkoeffizient der Wellenlänge <sup>1) 2)</sup><br>Temperature coefficient of wavelength <sup>1) 2)</sup>          | $\Delta\lambda/\Delta T$ | –               | 0.25 | 0.31 | nm/K            |
| Strahldivergenz senkrecht (Vollwinkel, 1/e <sup>2</sup> )<br>Beam divergence fast axis (full angle, 1/e <sup>2</sup> )    | $\theta_{\perp}$         | –               | 65   | 70   | deg             |
| Strahldivergenz parallel (Vollwinkel, 1/e <sup>2</sup> )<br>Beam divergence slow axis (full angle, 1/e <sup>2</sup> )     | $\theta_{\parallel}$     | –               | 8    | 10   | deg             |
| TE Polarisation<br>TE Polarization                                                                                        | $P_{\text{TE}}$          | 90              | –    | –    | %               |
| Thermischer Widerstand<br>(pn-Übergang - Kühlwasser)<br>Thermal resistance (junction to coolant)                          | $R_{\text{th}}$          | –               | 0.3  | –    | K/W             |
| Abstand der Laserbarren<br>Bar-to-bar distance                                                                            |                          | –               | 1.6  | –    |                 |

**Dioden-Kennwerte (25 °C Kühlwassertemperatur) (cont'd)**  
**Diode Characteristics (25 °C coolant temperature) (cont'd)**

| Parameter<br>Parameter                                                        | Symbol<br>Symbol      | Werte<br>Values |           |      | Einheit<br>Unit |
|-------------------------------------------------------------------------------|-----------------------|-----------------|-----------|------|-----------------|
|                                                                               |                       | min.            | typ.      | max. |                 |
| Strahlabmessungen am optischen Austritt<br>Beam dimensions at optical output  | $h \times w$          | –               | 30.5 x 10 | –    | mm <sup>2</sup> |
| Spezifischer Widerstand (Kühlwasser)<br>Coolant electrical resistivity        | $\rho$                | 125             | 250       | 333  | kΩcm            |
| Partikelfilter<br>Particle filter                                             |                       |                 | 10        | 30   | μm              |
| Durchflussmenge (Kühlwasser) <sup>4)</sup><br>Coolant flow rate <sup>4)</sup> | $\Delta v / \Delta t$ | 6               | 7         | 8    | l/min           |
| Druckabfall (Kühlwasser) <sup>4)</sup><br>Coolant pressure drop <sup>4)</sup> | $\Delta p$            | –               | 1.5       | 2.0  | bar             |

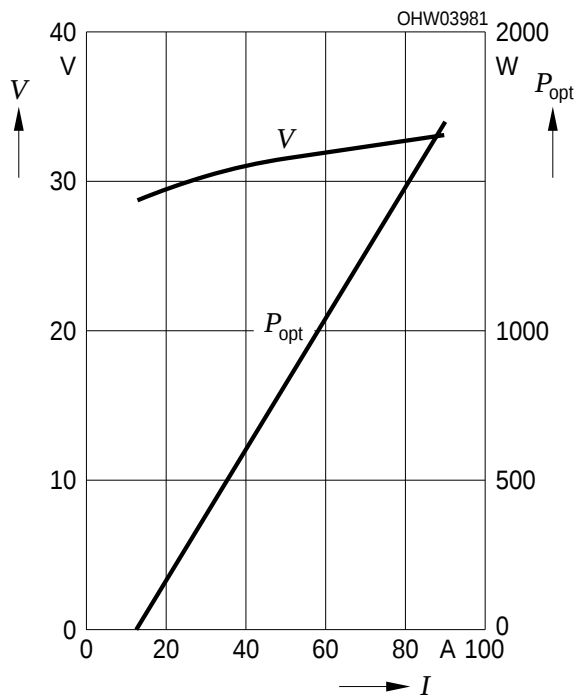
<sup>1)</sup> Werte beziehen sich auf die Standardbetriebsbedingung 1200 W cw Ausgangsleistung, 25°C Kühlwassertemperatur und 7 l/min Kühlwasser-Durchflussmenge.  
 Values refer to standard operating conditions of 1200 W cw output power, 25°C coolant temperature and 7 l/min coolant flow rate.

<sup>2)</sup> Die zentrale Emissionswellenlänge muss beim spezifizierten Strom kontrolliert werden. Liegt die Wellenlänge höher als im Testprotokoll spezifiziert, so weist dies auf einen schlechten thermischen Kontakt und eine thermische Überlastung der Laserdiode hin. Bevor der Laserbetrieb weitergeführt wird, muss der thermische Kontakt verbessert werden. Die zentrale Emissionswellenlänge schiebt mit 0,3 nm/K.  
 Check the emission wavelength at the specified current. A much longer wavelength than specified in the test protocol indicates inefficient or inadequate cooling and thermal overload of the diode laser. Then the cooling has to be improved before continuing laser operation. The emission wavelength shifts with 0.25 nm/K.

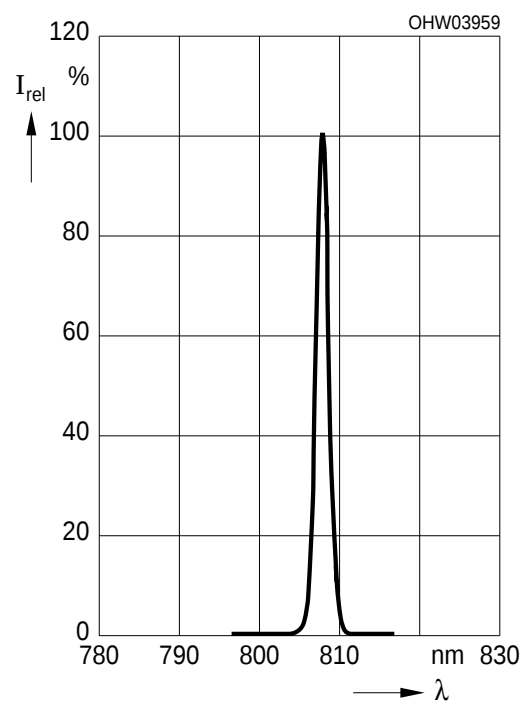
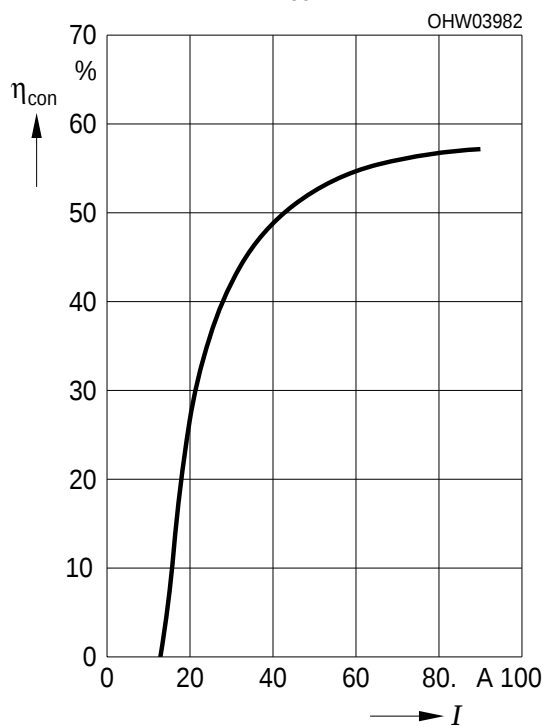
<sup>3)</sup> Das Anlegen einer Spannung in Sperrrichtung der Laserdiode muss ausgeschlossen werden.  
 Reverse voltage has to be excluded.

<sup>4)</sup> Die Lebensdauer der wassergekühlten Hochleistungs-Diodenlaser wird maßgeblich von der Qualität des Kühlwassers beeinflusst. Durchfluss, Druck, Leitwert (Reinheit) und Temperatur des Kühlwassers müssen angemessen definiert sein. Es darf nur entionisiertes Wasser verwendet werden.  
 An essential criterion for the lifetime of actively cooled high-power diode lasers is defined in using the right cooling water. Water flow, dynamic pressure, conductivity (purity), temperature and water particle filter must be defined properly. As coolant de-ionized (DI-) water has to be used.

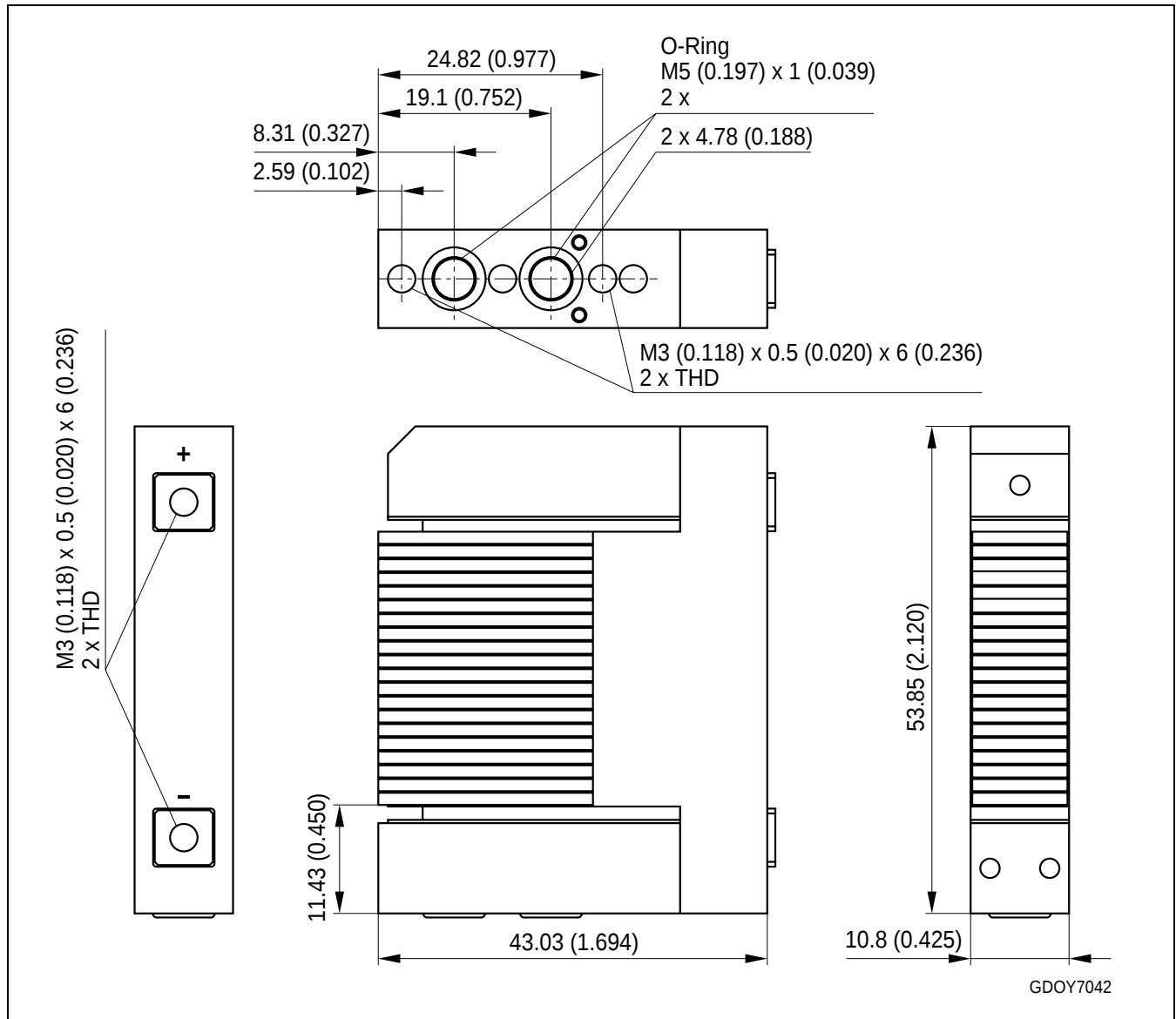
Optische Kennwerte (cw, 25°C Kühlwassertemperatur)  
Optical Characteristics (cw, 25°C coolant temperature)

Optical power  $P_{opt}$  and voltage  $V$  vs. current  $I$ 

Optical Spectrum @ 1200 W

Wallplug efficiency  $\eta_{con}$  vs. current  $I$ 

# Maßzeichnung Package Outlines



Maße in mm (Zoll) / Dimensions in mm (inch).

Allgemeintoleranz / General Tolerance: +/- 0.14 mm (0.005 inch)

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"This product contains lead (Pb) in the chip solder connection"

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