

■ **Features**

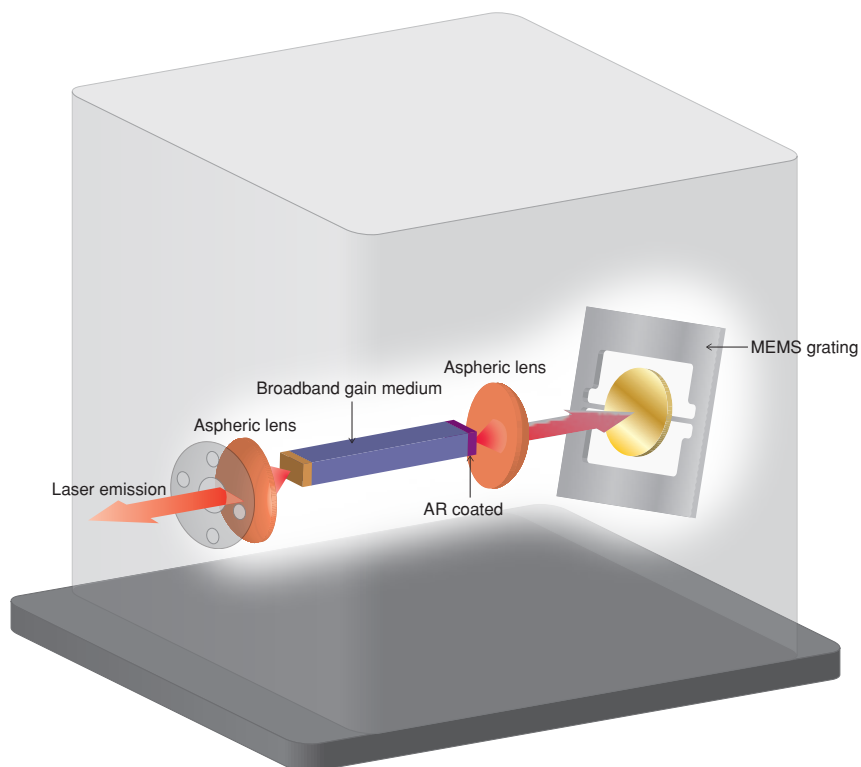
- Installed MEMS grating
- Realize high speed and broad wavelength sweeping
- Built-in collimation lens
- Broadband QCL based on DAU structure



■ **Outline**

It is a pulse quantum cascade laser that realized broadly wavelength sweeping by external cavity configuration. It can carry out the measurement of mid-infrared spectrum remotely, contactless and with high throughput. This product offers new value to the mid-infrared spectroscopy, which was traditionally carried out with FT-IR, by utilizing features of laser; high output and high wavelength resolution.

■ **External cavity**



# Wavelength swept pulsed quantum cascade laser L14890-09

## ■ Characteristics

Unless otherwise specified, the repetition rate of the MEMS operation signals  $F(\text{mems})=1.8$  kHz, The repetition frequency  $F(\text{qcl})$  of the QCL operation signal is 180 kHz, and the QCL operation temperature  $T_{\text{op}(\text{qcl})}$  is 20 °C.

| Characteristic                     | Condition                                   | Min. | Typ.   | Max. | Unit             |
|------------------------------------|---------------------------------------------|------|--------|------|------------------|
| Wavenumber sweep frequency         | External control *1 (MEMS operation signal) | —    | 1.8 *2 | —    | kHz              |
| Pulsed output power                | MEMS stop                                   | 200  | 600    | 900  | mW               |
| Optical pulse width                | Fixed before shipment from the factory      | 80   | 100    | 120  | ns               |
| Optical pulse repetition frequency | External control *1 (QCL operation signal)  | —    | 180 *3 | —    | kHz              |
| Spectrum linewidth *4              | MEMS stop                                   | —    | 2.0    | 3.0  | cm <sup>-1</sup> |
| Beam diameter *5                   | Distance *6 800 mm ± 20 mm<br>MEMS stop     | 3    | 5      | 7    | mm               |
| Beam divergency *7                 | Distance *6 800 mm ± 20 mm<br>MEMS stop     | —    | —      | 5    | mrاد             |
| Beam steering stability            | Distance *6 800 mm ± 20 mm                  | —    | —      | 2    | mrاد             |
| Polarization                       | Vertical to the bottom                      |      |        |      |                  |
| Center wavenumber                  | Calculated from wavenumber sweep width      | 1020 | 1075   | 1140 | cm <sup>-1</sup> |
| Wavenumber sweep width             | Pulsed output power > 10 mW                 | 180  | 200    | —    | cm <sup>-1</sup> |

\*1: Controlled by a signal source such as a separate function generator. \*2:  $F(\text{mems})$ : Repetition frequency of the MEMS operation signal.  
 \*3:  $F(\text{qcl})$ : Repetition frequency and rise edge of the QCL operation signal. \*4: Full width at half maximum of the spectrum. \*5:  $1/e^2$   
 \*6: Distance from the outgoing window \*7: Half angle

## ■ Recommended operating conditions

| Characteristic               | Symbol               | Value                         | Unit               |
|------------------------------|----------------------|-------------------------------|--------------------|
| Power input                  | Voltage              | DC24                          | V                  |
|                              | Current              | 0.05                          | A                  |
| QCL operation signal *1      | Waveform             | Positive pulse square wave *2 | —                  |
|                              | Repetition frequency | 180                           | kHz                |
|                              | Signalling voltage   | 4.0 *3                        | V <sub>pk</sub> *3 |
|                              | Duty ratio           | 1.8                           | %                  |
| MEMS operation signals *4    | Waveform             | Sine wave                     | —                  |
|                              | Repetition frequency | 1.8                           | kHz                |
|                              | Signalling voltage   | 4.0                           | V <sub>pp</sub>    |
| Peltier current *5           | I <sub>c</sub>       | ±1.6                          | A                  |
| Peltier voltage *5           | V <sub>c</sub>       | ±2.2                          | V                  |
| QCL operation temperature *5 | T <sub>op(qcl)</sub> | +20                           | °C                 |

\*1: External control. A signal source such as a separate function generator is needed. \*2: Positive pulse with a pulse base voltage of 0 V.  
 \*3: V<sub>pk</sub>: Pulse stop voltage value when the pulse base voltage is set to 0 V.  
 \*4: External control. A signal source such as a separate function generator that is different from \*1 is needed.  
 \*5: External control. Operation temperature of the laser element (QCL) controlled by a separate peltier controller.

## ■ General specifications

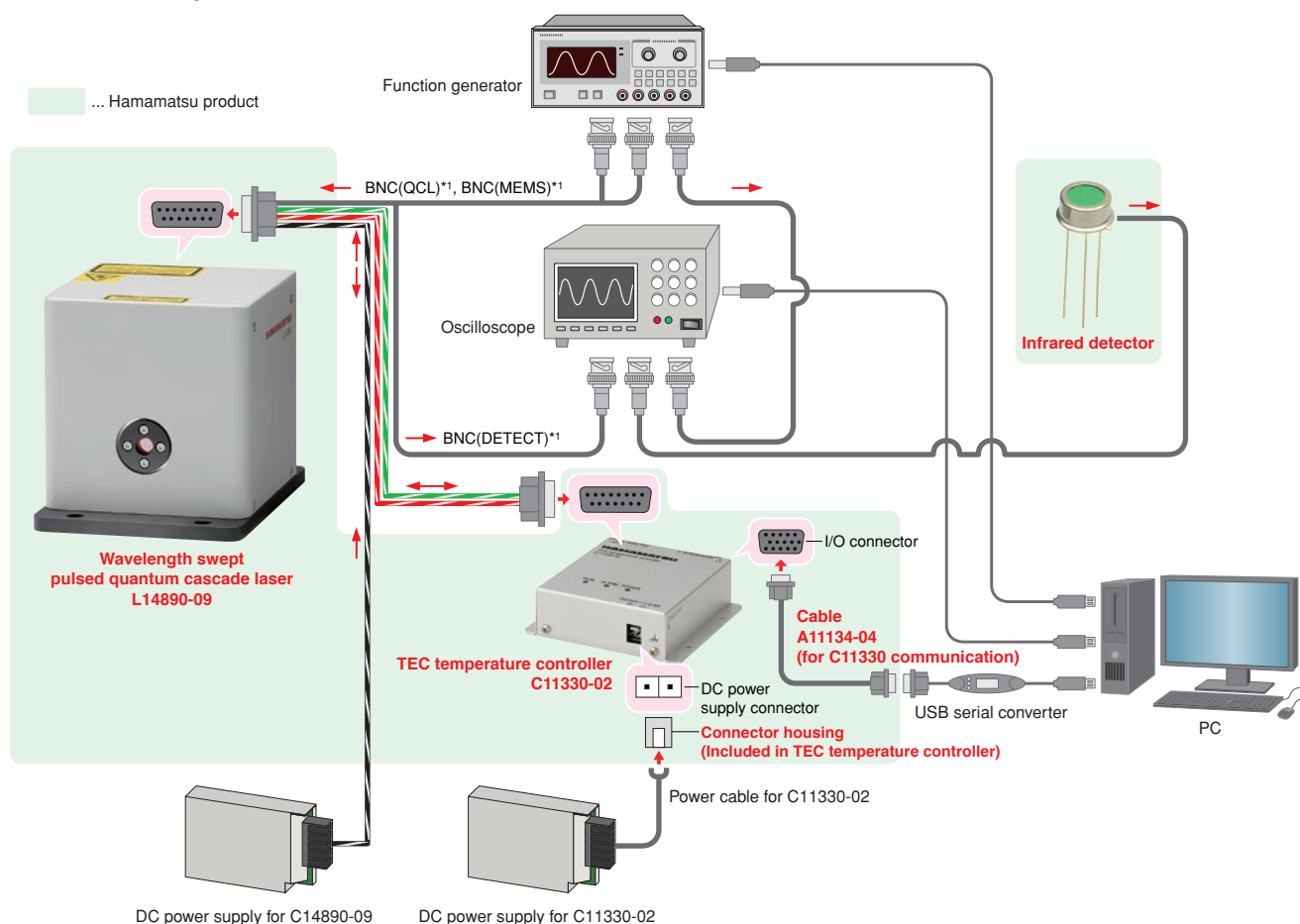
| Characteristic                        | Value         | Unit   |
|---------------------------------------|---------------|--------|
| Operation temperature (ambient)       | +10 to +40    | °C     |
| Storage temperature (ambient)         | +5 to +55     | °C     |
| Relative operation humidity (ambient) | 30 to +60 *1  | %      |
| Relative storage humidity (ambient)   | 20 to +60 *1  | %      |
| Startup time                          | 5 or less     | Second |
| Place of use                          | Indoor place  | —      |
| Operation altitude                    | 2000 or less  | m      |
| Dimensions (W × H × D) *2             | 82 × 88 × 112 | mm     |
| Weight                                | 1.2           | kg     |

\*1: No condensation \*2: Excluding projections

# Wavelength swept pulsed quantum cascade laser L14890-09

## ■ Configuration

### ● Connection example



\*1: The name printed on the power cable attached to the product. Refer to "Power connector specifications" on page 4 for the functions.

\* The cable connected to the power connector is attached with the product. The cables connected to the DC power supply and the TEC temperature controller have to be manipulated by the user.

\* This configuration is recommended for working the sample software properly. Refer to the table of the required equipment for the model number of the recommended equipment.

### ● Accessories included product

| Content                | Quantity |
|------------------------|----------|
| Power cable (2 m)      | 1        |
| Sample software (CD-R) | 1        |
| Instruction manual     | 1        |

### ● Necessary items for normal operation excluded product

| Equipment                  | Manufacturer             | Type No.                    |
|----------------------------|--------------------------|-----------------------------|
| 2-ch function generator    | NF Corporation           | WF1974                      |
| Oscilloscope               | Keysight Technologies    | DSOX2024A                   |
| DC Power supply            | TDK lambda               | HWS30A-24/A                 |
| TEC temperature controller | Hamamatsu Photonics K.K. | C11330-02 *1*2              |
| PC                         | —                        | Windows 10 (64-bit) USB 2.0 |

\*1: A PC and an external DC power supply (24 V) are needed to control.

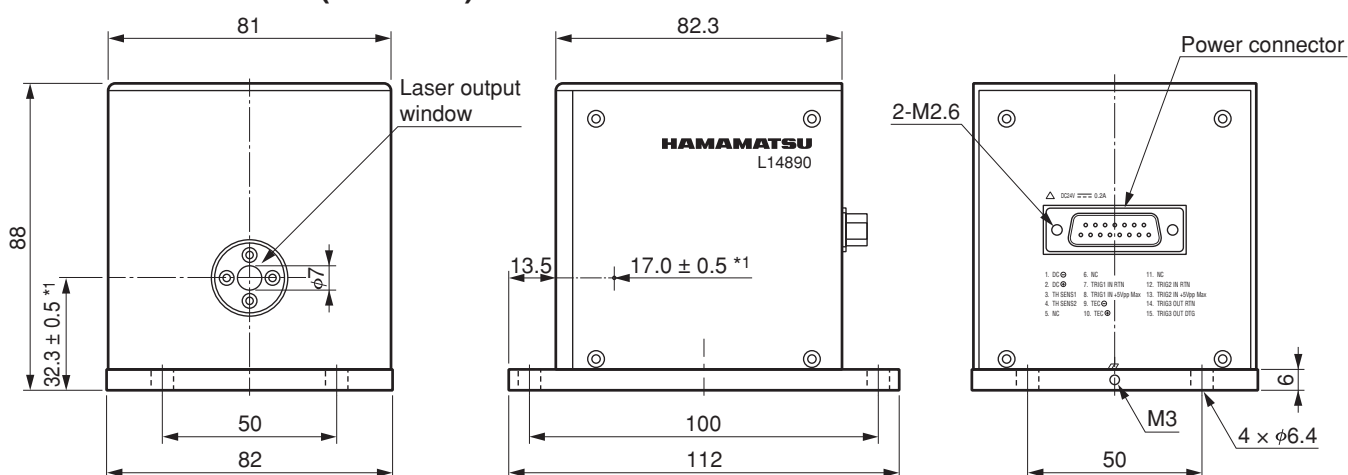
\*2: Recommended DC Power Supply: TDK lambda HWS50A-24/A

## ■ Thermistor

| Characteristic | Symbol | Condition     | Value      | Unit |
|----------------|--------|---------------|------------|------|
| R25 resistance | R25    | 25 °C         | 10 ± 2.5 % | kΩ   |
| Beta value     | B      | 0 °C / 100 °C | 3450       | K    |

# Wavelength swept pulsed quantum cascade laser L14890-09

## Dimensional outline (unit: mm)



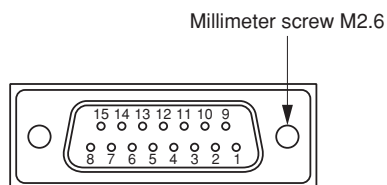
\*1: Emitter

\* Tolerance: ±0.3 mm unless specified

LHJ3F0043-27\_A

## Power connector specifications

### 15-pin D-sub connector (male)



| Power connector |              |                                   | Power cable     |
|-----------------|--------------|-----------------------------------|-----------------|
| Pin No.         | Symbol       | Function                          | Wire color/name |
| 1               | 24 V (-)     | External power input              | Black           |
| 2               | 24 V (+)     | External power input              | Black/White     |
| 3               | Thermistor A | Temperature sensor output         | Red             |
| 4               | Thermistor B | Temperature sensor output         | Red/White       |
| 5               | N.C.         | —                                 | —               |
| 6               | N.C.         | —                                 | —               |
| 7               | QCL trig (-) | QCL operation signal input (Rtn)  | BNC (QCL)       |
| 8               | QCL trig (+) | QCL operation signal input (Sig)  | BNC (QCL)       |
| 9               | Peltier (-)  | Peltier power input *1            | Green           |
| 10              | Peltier (+)  | Peltier power input *1            | Green/White     |
| 11              | N.C.         | —                                 | —               |
| 12              | MEMS (-)     | MEMS operation signal input(Rtn)  | BNC (MEMS)      |
| 13              | MEMS (+)     | MEMS operation signal input (Sig) | BNC (MEMS)      |
| 14              | DETECT (-)   | MEMS detection signal input (Rtn) | BNC (DETECT)    |
| 15              | DETECT (+)   | MEMS detection signal input (Sig) | BNC (DETECT)    |

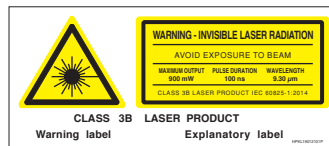
\*1: The forward direction shows the cooling mode.

\* The cable connected to the power connector is attached with the product. The cables connected to the DC power supply and the TEC temperature controller have to be manipulated by the user.

### CLASS 3B LASER

Invisible Laser Radiation: Avoid Exposure to Beam

• The Laser emits invisible laser radiation. The instrument which used the LASER, operated under ordinary conditions, is classified as Class 3B according to the laser product classification code IEC 60825-1. See IEC 60825-1, -14 for more details and safety operation concerning the above countermeasures.



Information described in this material current as of October 2023. Specifications are subject to change without notice.

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