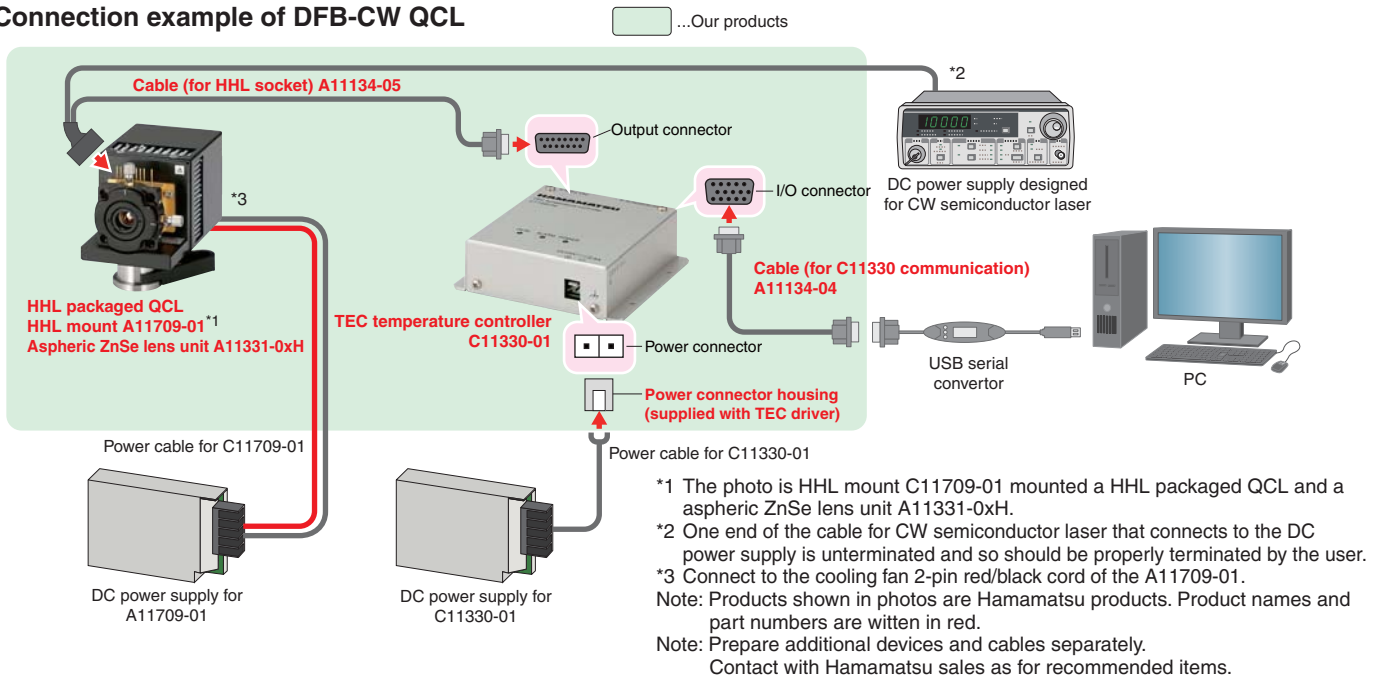


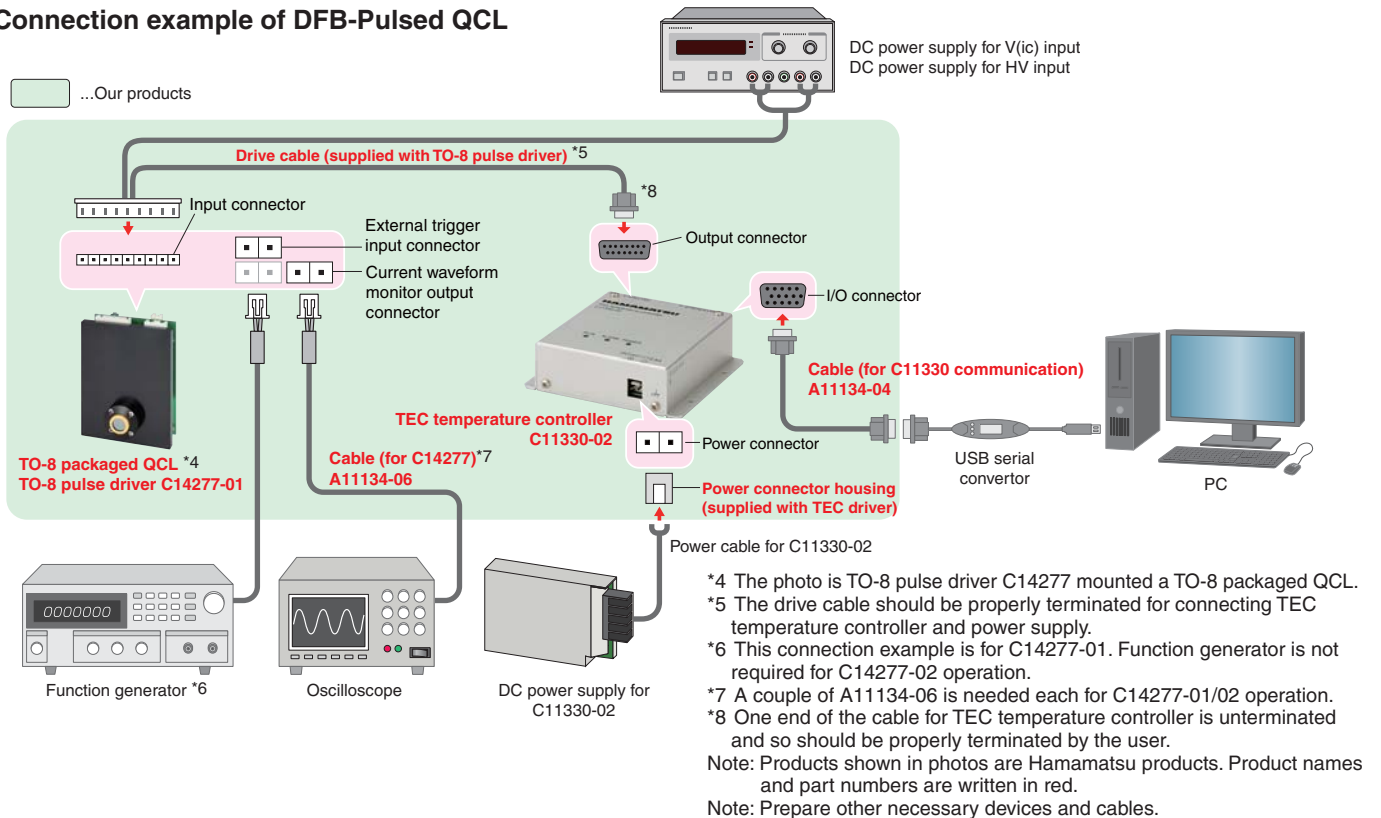
List of accessories

●TEC temperature controller	2	●Cable	9
●HHL mount	4	●Lens / Lens unit	12
●TO-8 pulse driver	5	●Heatseeker	14

Connection example of DFB-CW QCL



Connection example of DFB-Pulsed QCL



Accessories for Quantum Cascade Lasers

TEC temperature controller C11330 series



Peltier (TEC: thermoelectric cooler) driver is used to control QCL temperature with high accuracy and high stability. Designed to be built into an instrument.

Specifications

Parameter		C11330-01	C11330-02
Applicable product		CW QCL (HHL package)	Pulsed QCL (TO-8 package)
TEC output *1	TEC control current	-8 A to +8 A	-1.9 A to +1.9 A
	Compliance voltage	24 V	
DC power supply (DC)	Input voltage	24 V	
	Input current (Max.)	8 A *2	2.6 A *2
Temperature sensor *3	Thermistor	NTC, 2 lines	
	RTD sensor	3-line platinum temperature measurement resistance (Pt100)	
Temperature control	Temperature control range (Thermistor/RTD)	-50 °C to +125 °C / -50 °C to +150 °C	
	Temperature stability (Typ.)	0.01 °C	
	Control algorithm	Digital PID loop *4	
General	Host interface	RS-232C, RS-424	
	Operating ambient temperature *5	0 °C to +40 °C *6	
	Storage ambient temperature	-5 °C to +60 °C *6	
	Dimensions (W × H × D)	100 mm × 110 mm × 33 mm	
	Weight	0.3 kg	

*1 Actual output depends on characteristics of the connected load (TEC module), and input power supply voltage and current.

*2 Required input current depends on the capacity of the connected load (TEC module). When using C11330-01, required output current of power supply (DC 24 V) is more than 4.0 A, and using C11330-02, more than 2.0 A is needed.

*3 Thermistor and Pt100 cannot be used simultaneously; select one of them.

*4 Auto-tuning function can be set by the host controller (PC).

*5 A Heatshink may be required for this TEC temperature controller during high output operation.

*6 No condensation.

Note: External DC power supply (DC 24V), power cable, communication cable(A11134-04) and host controller (PC) are separately needed.

Note: This product can only be controlled via serial communication.

Note: When controlling through a PC which does not have any ports or terminal emulators for serial communication, use an USB serial convertor of Hamamatsu's recommendation (Windows 7 or later).

Note: Supplied with sample software. (Windows XP, 7 or later).

Accessories for Quantum Cascade Lasers

■Connector

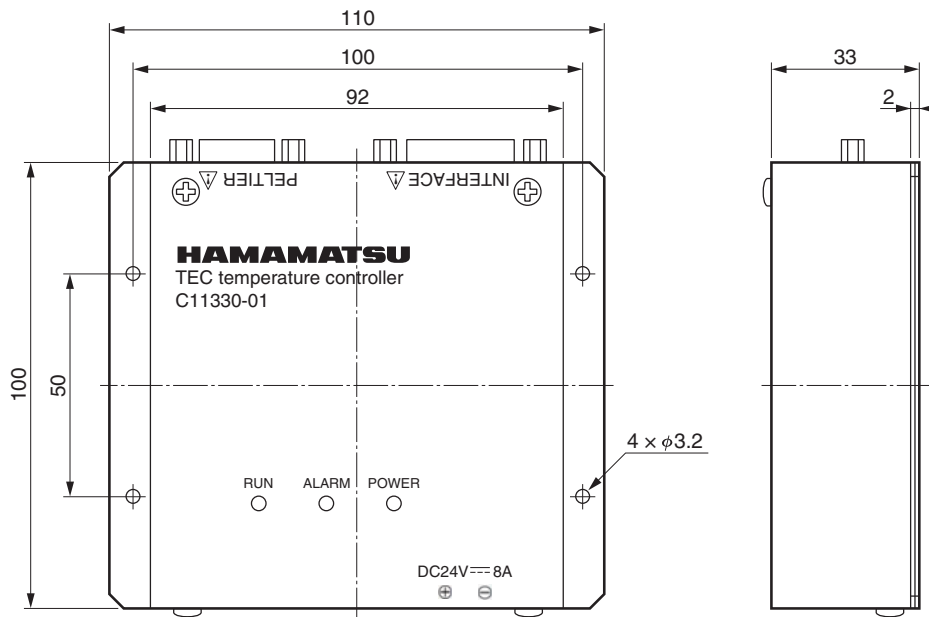
Connector	Type of connector	Description
Power connector *1	VHR-2R / JST	Connecting to DC power supply
Output connector (PELTIER)	D-sub 15pin (female)	Connecting to Peltier (TEC) and/or Thermistor
I/O connector (INTERFACE)	High density D-sub 15 pin (female)	Connecting to host controller like a PC

*1 Housing matched to connector, and contact are supplied with C11330 series.

Connect shield of power cable to frame terminal.

Note: Contact with hamamatsu sales as for pin assignment.

■Dimensional outline (Unit: mm)



Accessories for Quantum Cascade Lasers

HHL Mount A11709 series



A11709-01 Forced air cooling

A11709-02 Water cooling

Note: Mounts shown in photos have HHL packaged QCL

Cooling unit for HHL packaged QCL. Two types of cooling, forced air and water, are available. An aspheric ZnSe lens unit A11331-0xH can be mounted.

Specifications

Parameter	A11709-01	A11709-02
Applicable product	CW QCL (HHL package)	
Cooling method	Forced air cooling	Water cooling
Maximum heat discharge power	Approx. 30 W *1	Approx. 50 W *2
Thermal resistance	Approx. 0.5 °C/W *1	Approx. 0.3 °C/W *2
Operating temperature	0 °C to +40 °C	
Dimensions (W × H × D)	68 mm × 82 mm × 117 mm	60 mm × 103 mm × 50 mm
Weight	0.5 kg	0.52 kg

*1 DC fan speed should be 7600 min⁻¹ at ambient temperature 25 °C. *2 Necessary flow and water temperature: 2000 cc/min at 20 °C.

●A11709-01

Absolute maximum current	Operating voltage	Rotation speed	Maximum air generation	Maximum static pressure	Sound pressure level
0.47 A	10.8 V to 12.0 V	7600 min ⁻¹	1.05 m ³ /min	155.0 Pa	44 dB[A]

Note: Power supply for DC fan of forced air cooling mount is user-supplied.

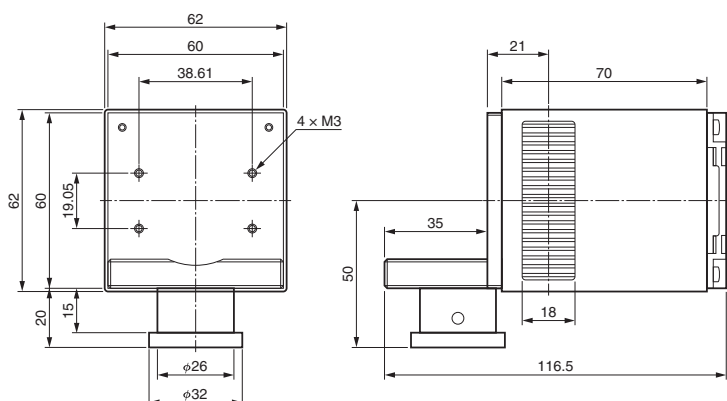
●A11709-02

Refrigerant	Maximum flow rate	Recommended flow rate	Dimensions of I/O pipes	Material
Water	5000 cc/min	2000 cc/min	φ6.35 mm	Copper

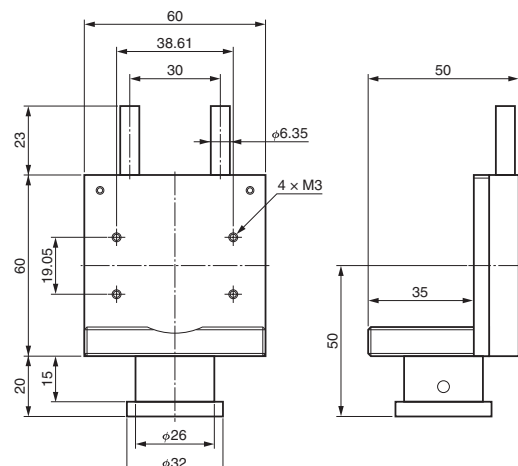
Note: Do not use corrosive refrigerant. Note: It is recommended to use chiller which has water cooling function in water circulation.

Dimensional outline (Unit: mm)

●A11709-01



●A11709-02



Accessories for Quantum Cascade Lasers

TO-8 Pulse Driver

●C11635



Note: The photo is TO-8 pulse driver C14277 mounted a TO-8 packaged QCL.

Pulsed QCL driver for TO-8 packaged pulsed QCL. It outputs low noise pulsed current, and TO-8 packaged pulsed QCL can be mounted directly. Also, aspheric ZnSe lens unit A11331-0xH can be mounted. Designed to be built into an instrument.

■Absolute maximum ratings

Parameter		Symbol	Value
Output current *1	Pulsed current	I_{pulse}	3.5 A *2
	Duty ratio	DR	5.0 % *3
External bias (DC) *4	Bias voltage	V_{bias}	4.5 V
	Bias current	I_{bias}	80 mA
Power supply voltage (DC)	$V_{(\text{ic})}$ input	$V_{(\text{ic})}$	15 V
	HV input	HV	36 V
Operating ambient temperature (body) *5		T_{op}	0 °C to +40 °C
Storage ambient temperature (body) *5		T_{stg}	-5 °C to +60 °C

*1 The pulsed output current must be controlled within a range where the absolute maximum rating of the QCL is not exceeded even momentarily.

*2 The maximum amplitude of the pulsed output current depends on the electrical characteristics of pulsed QCL.

*3 Sufficient heat dissipation from the driver circuit is required.

*4 Bias voltage should be floating from any other circuit, including other peripherals.

*5 No condensation.

■Specifications

Parameter		Symbol	Value
Applicable product		—	Pulsed QCL (TO-8 package)
Output current *1	Pulsed current	I_{pulse}	0 A to +3.5 A *2
	Pulsed width	P_w	10 ns
	Trigger mode	—	Internal trigger
	Repetition frequency	f_r	Approx. 150 kHz to 1 MHz
	Duty ratio (Max.)	DR	5.0 % *3
Power supply voltage (DC)	$V_{(\text{ic})}$ input	$V_{(\text{ic})}$	12 V *4
	HV input	HV	0 V to 35 V *5
Dimensions (W × H × D)		—	90 mm × 68 mm × 43 mm
Weight		—	0.3 kg

*1 The pulsed output current must be controlled within a range where the absolute maximum rating of the QCL is not exceeded even momentarily.

*2 The maximum amplitude of the pulsed output current depends on the electrical characteristics of pulsed QCL.

*3 Sufficient heat dissipation from the driver circuit is required.

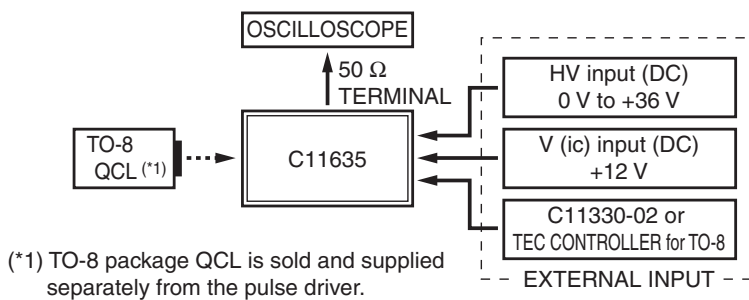
*4 Operating voltage of driver circuit.

*5 Amplitude of the pulsed output current is controlled by HV input. The HV input must be set within a range where the absolute maximum rating for the pulse forward current of the QCL is not exceeded even momentarily.

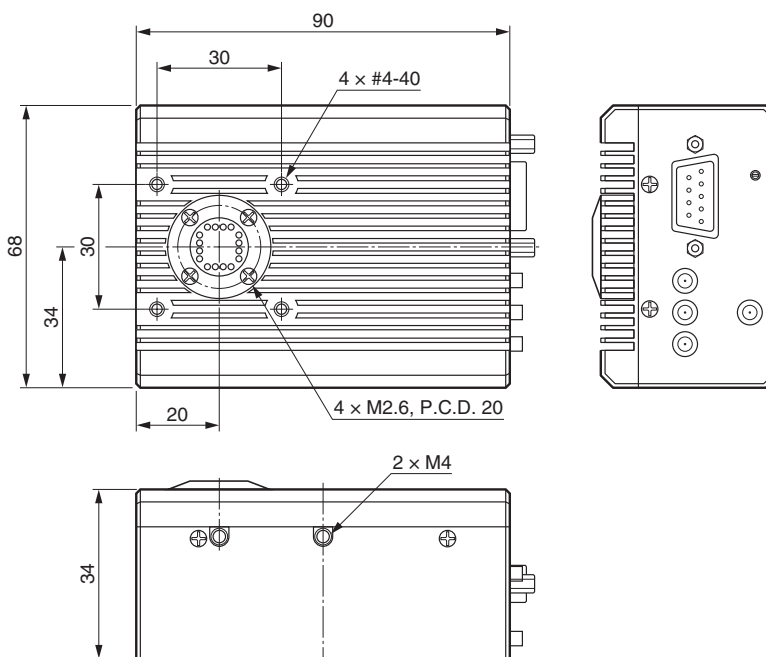
Note: External DC power supplies and a TEC temperature controller are user-supplied.

Accessories for Quantum Cascade Lasers

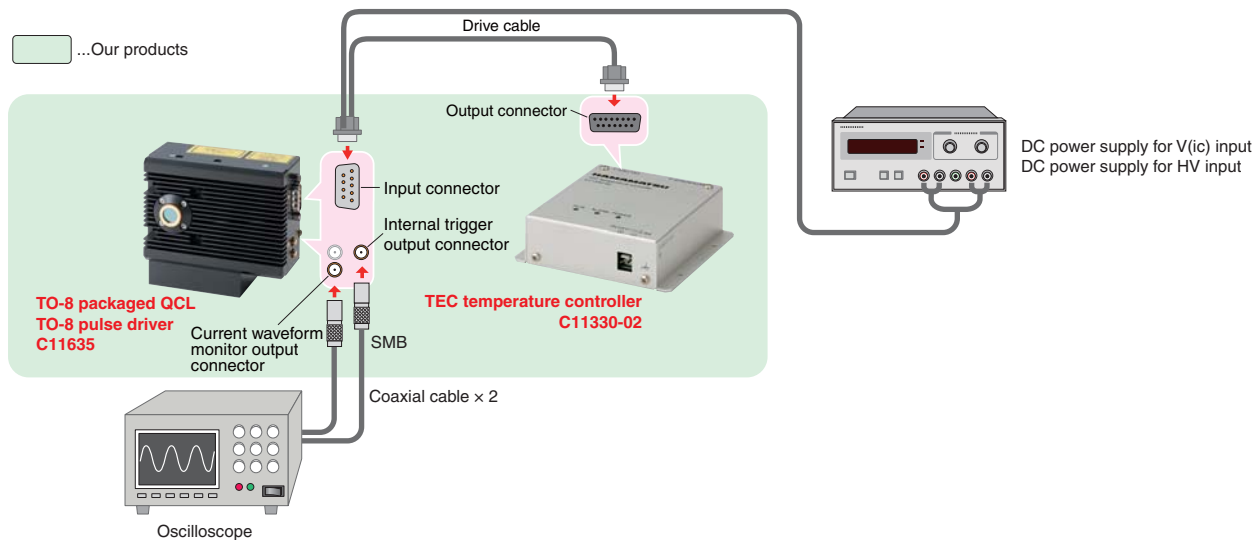
Setup example



Dimensional outline (Unit: mm)



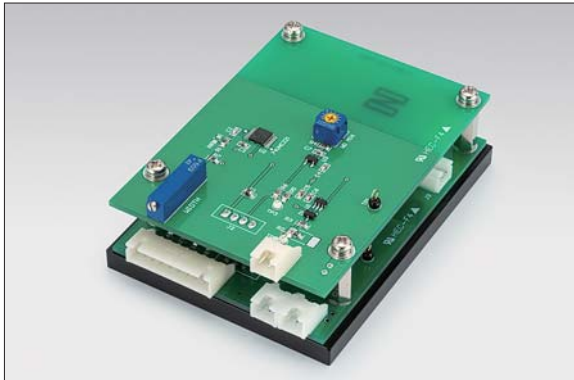
Connection example



Accessories for Quantum Cascade Lasers

TO-8 Pulse Driver

●C14277 series



C14277-01



C14277-02



Note: The photo is TO-8 pulse driver C14277 mounted a TO-8 packaged QCL.

TO-8 pulsed driver is exclusive use for pulsed QCL (TO-8 package). This product is designed to be built into equipment and does not work solely. Two types of trigger, external and internal, are available.

■Absolute maximum ratings

Parameter		Symbol	C14277-01	C14277-02
Output *1	Pulsed current	I_{out}	2.5 A *2	
	Pulsed width	t_w	2000 ns	
	Repetition frequency	f_r	1000 kHz	500 kHz
	Duty ratio	DR	5 % *3	
External bias (DC) *4	Bias voltage	V_{bias}	25 V	
	Bias current	I_{bias}	150 mA	
External trigger	Repetition frequency	f_r	1000	— *5
	Input voltage	—	TTL	— *5
Current voltage (DC)	$V_{(ic)}$ input	$V_{(ic)}$	12 V	
	HV input	HV	20 V	
Operating ambient temperature (body) *6		T_{op}	+5 °C to +60 °C	
Storage ambient temperature (body) *6		T_{stg}	-10 °C to +70 °C	

*1 The pulsed output current must be controlled within a range where the absolute maximum rating of the QCL is not exceeded even momentarily.

*2 The maximum amplitude of the pulsed output current depends on the electrical characteristics of pulsed QCL.

*3 Sufficient heat dissipation from the driver circuit is required.

*4 Bias voltage should be floating from any other circuit, including other peripherals.

*5 C14277-02, which is internal trigger type, can not be complied external trigger.

*6 No condensation.

Accessories for Quantum Cascade Lasers

Specifications

Parameter		Symbol	C14277-01	C14277-02
Applicable product		—	Pulsed QCL (TO-8 package)	
Output current *1	Pulsed current	I_{pulse}	0 A to +2.5 A *2	
	Pulsed width	P_w	20 ns to 2000 ns	
	Trigger mode	—	External trigger *3	Internal trigger
	Repetition frequency	f_r	150 kHz to 1000 kHz	50 kHz to 500 kHz
	Duty ratio (Max.)	DR	< 5 % *4	
Power supply voltage (DC)	V(ic) input	$V_{(ic)}$	12 V *5	
	HV input	HV	0 V to 20 V *6	
Dimensions (W × H × D)		—	88 mm × 31.6 mm × 66 mm	
Weight		—	0.13 kg	

*1 The pulsed output current must be controlled within a range where the absolute maximum rating of the QCL is not exceeded even momentarily.

*2 The maximum amplitude of the pulsed output current depends on the electrical characteristics of pulsed QCL.

*3 Rise edge. External trigger source is required.

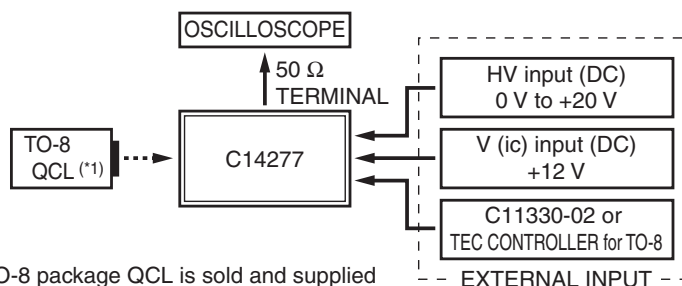
*4 Sufficient heat dissipation from the driver circuit is required.

*5 Operating voltage of driver circuit.

*6 Amplitude of the pulsed output current is controlled by HV input. The HV input must be set within a range where the absolute maximum rating for the pulse forward current of the QCL is not exceeded even momentarily.

Note: External DC power supplies and a TEC temperature controller are user-supplied.

Setup example



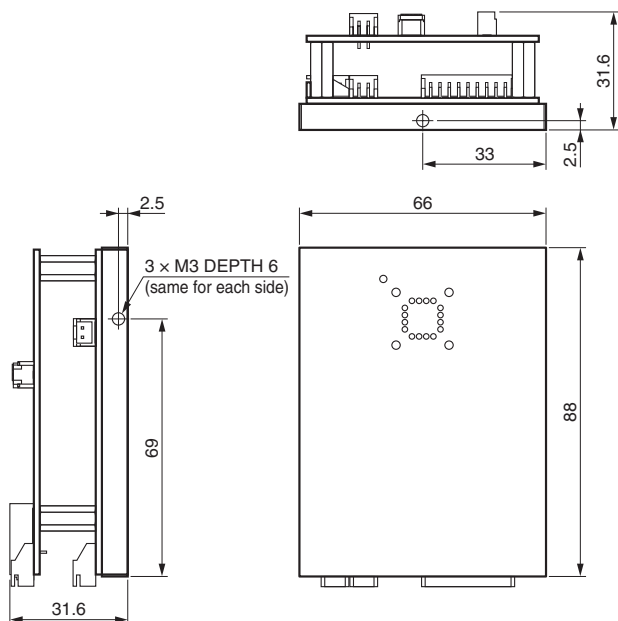
(*1) TO-8 package QCL is sold and supplied separately from the pulse driver.

Note: C14277-01 requires an external trigger.

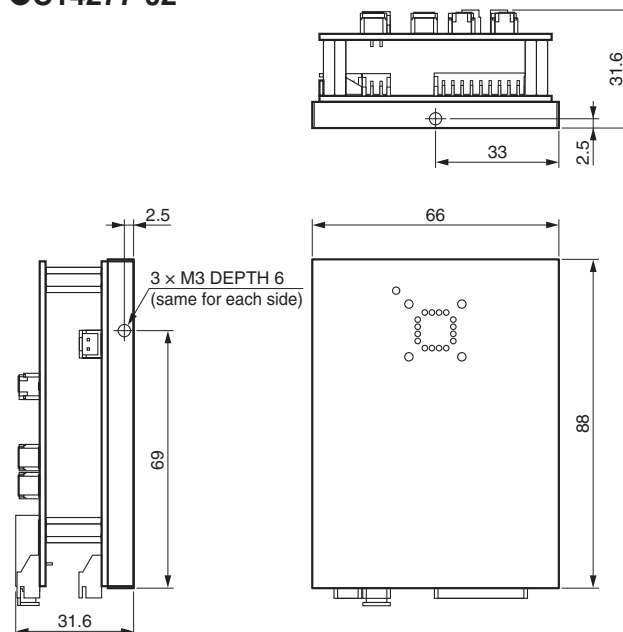
Note: Aspheric ZnSe lens unit A11331-0xH is not adaptable to C14277 series.

Dimensional outline (Unit: mm)

●C14277-01



●C14277-02



Accessories for Quantum Cascade Lasers

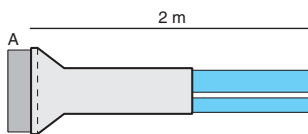
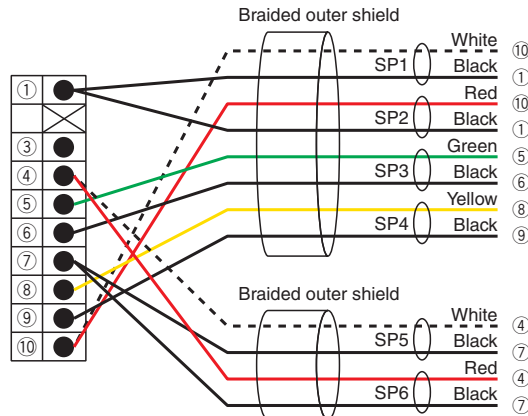
■ Cable

● A11134-01 (for HHL socket)



This Cable exclusive use for HHL packaged QCL operation. HHL connector is connectable to HHL package.

■ Pin layout



No.	A	B	C
Name	HHL connector	TEC drive cable	QCL drive cable
Terminal	9 pin socket	Cut-off 4PS (8 wires)	Cut-off 2PS (4 wires)
Connected to	HHL packaged QCL	C11330-01 (TEC driver)	DC power supply for CW semiconductor laser

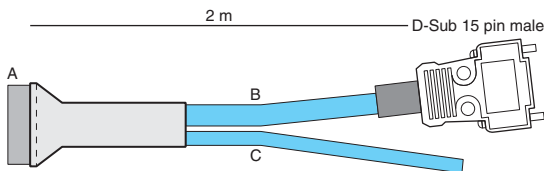
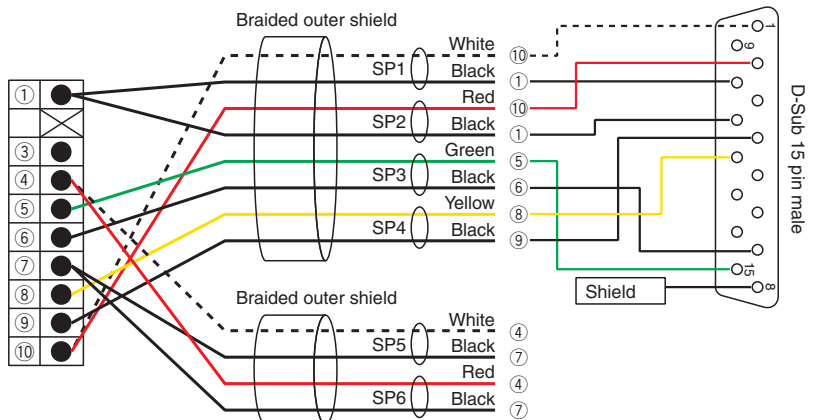
Note: Terminals B and C are to be modified in accordance with the type of TEC controller and power supply.

● A11134-05 (for HHL socket)



This Cable exclusive use for HHL packaged QCL operation. One end of the cable terminated D-sub 15pin (male); connectable to TEC temperature controller C11330-01.

■ Pin layout



No.	A	B	C
Name	HHL connector	TEC drive cable	QCL drive cable
Terminal	9 pin socket	D-sub 15 pin (male)	Cut-off 2PS (4 wires)
Connected to	HHL packaged QCL	C11330-01 (TEC driver)	DC power supply for CW semiconductor laser

Note: Terminal C is to be modified in accordance with the type of power supply.
Note: Securing screw of D-sub 15pin (male) is milli screw M2.6.

Reference: Pin assignment of standard HHL packaged QCL

Pin No. *1	Function	Pin No. *1	Function
①	TEC cathode (-)	⑦	QCL cathode (-)
③	N.C.	⑧	Thermistor (Top(c))
④	QCL anode (+)	⑨	Thermistor (Top(c))
⑤	Thermistor (Top(qcl))	⑩	TEC anode (+)
⑥	Thermistor (Top(qcl))	—	—

*1 Pin of ③ is electrically connected to the case; package body. All of other pins are floating to the case.

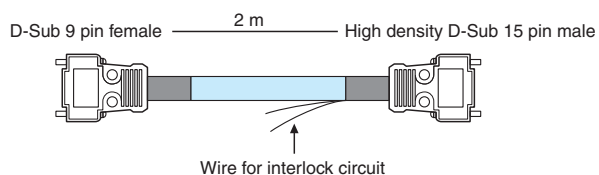
Note: This table indicates standard pin configuration of HHL packaged QCL. Confirm pin assignment of laser product firmly.

Accessories for Quantum Cascade Lasers

●A11134-04 (for C11330 communication)



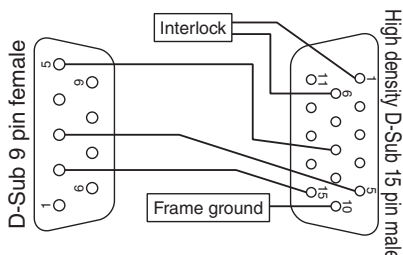
This cable exclusive use for serial communication (RS-232C) with C11330 series.



■Pin layout

PC side
D-Sub 9 pin layout

Pin No.	Signal
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI



C11330 side
High density D-Sub 15 pin layout

Pin No.	Signal	Pin No.	Signal
1	INTERLOCK	9	GND
2	ALARM	10	Frame ground
3	RS-422 Rx+	11	START
4	RS-422 Tx+	12	STABLE
5	RS-232C Rx	13	RS-422 Rx-
6	GND	14	RS-422 Tx-
7	GND	15	RS-232C Tx
8	GND		

Note: When controlling through a PC which does not have any ports or terminal emulators for serial communication, use an USB serial converter of Hamamatsu's recommendation (Windows 7 or later).

Note: Securing screw of D-sub 9pin (female) is Inch screw #4-40, and D-sub 15 pin (male) is milli screw M2.6.

●A11134-06 (for C14277)



Coaxial cable exclusive use for C14277 series operation and communication. Use by connecting JST XH connector of C14277 series.

■Pin layout

BNC connector ————— 2 m ————— XH connector

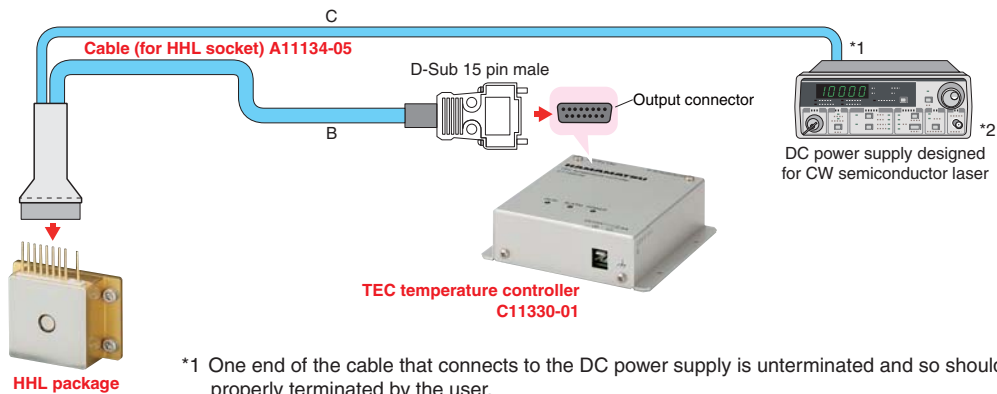


Pin No.	Function	Type
1	Signal wire	XHP-2 (JST)
2	GND	—

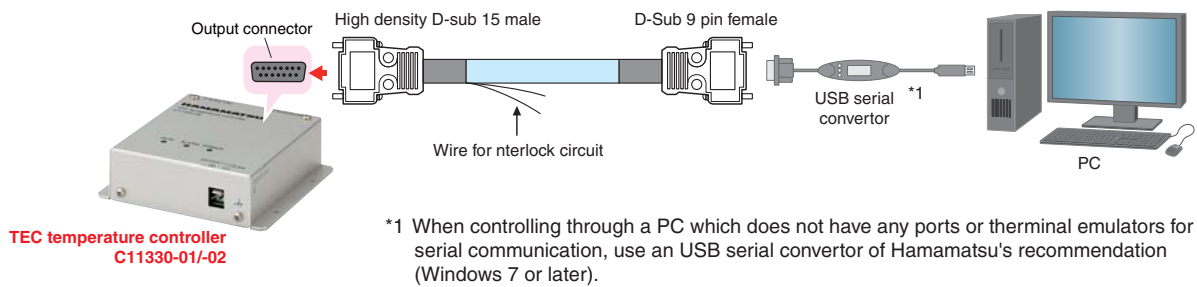
Accessories for Quantum Cascade Lasers

■Cable connection example

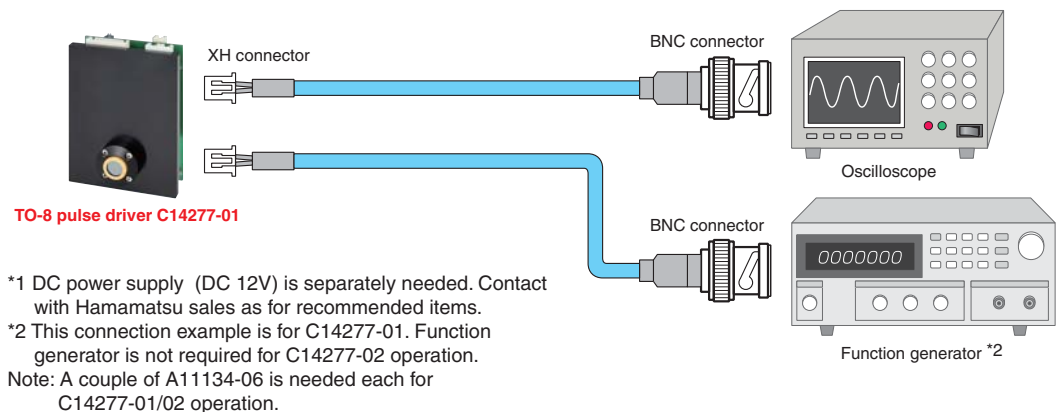
●A11134-01 / -05



●A11134-04



●A11134-06



Accessories for Quantum Cascade Lasers

■ Lens / Lens unit

● Aspheric ZnSe Lens A11331-0x



● Aspheric ZnSe Lens Unit A11331-0xH



Aspheric ZnSe lens designed for QCLs can be installed into lens unit A11331-0xH. The A11331-0xH series can be mounted onto HHL mount A11709 series and/or TO-8 pulsed driver C11635. The A11331-0x series can also be used solely.

Lens unit A11331-0xH supplied with an lens.

■ Specifications

Parameter	Symbol	A11331-01	A11331-02
Primary designed wavelength *1	λ	8 μm	5 μm
Numerical aperture (NA)	NA	0.78	
Actual focal distance	EFL	4.8 mm	
Material	—	ZnSe	
Refractive index	n	2.417 at 8 μm	2.429 at 5 μm
AR coating	—	BBAR, T (ave)>97 % *2	BBAR, T (ave)>96 % *3
Weight	—	5 g	

*1 Choose either A11331-01 or -02 in accordance with wavelength of QCL.

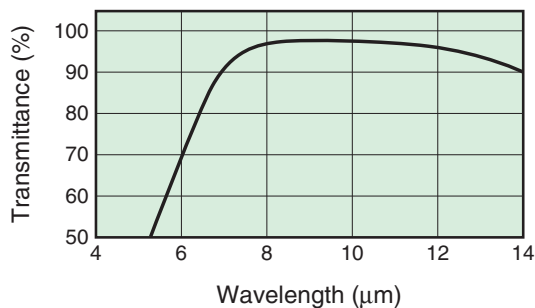
*2 T_(ave): Average transmittance in wavelength between 8 μm and 12 μm .

*3 T_(ave): Average transmittance in wavelength between 4 μm and 8 μm .

■ Wavelength transmissivity properties

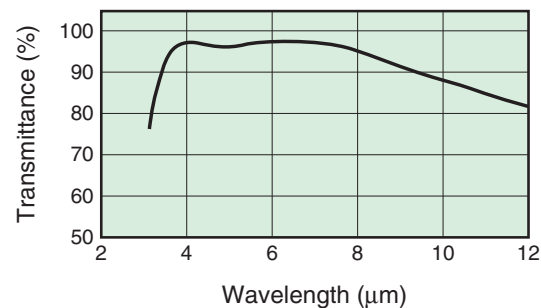
● A11331-01 / A11331-01H

BBAR / 8 μm to 12 μm



● A11331-02 / A11331-02H

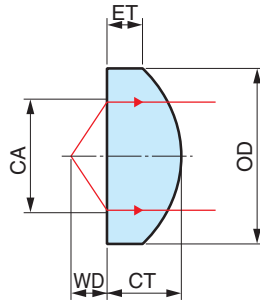
BBAR / 4 μm to 8 μm



Accessories for Quantum Cascade Lasers

■ Dimensional outline (Unit: mm)

● A11331-0x

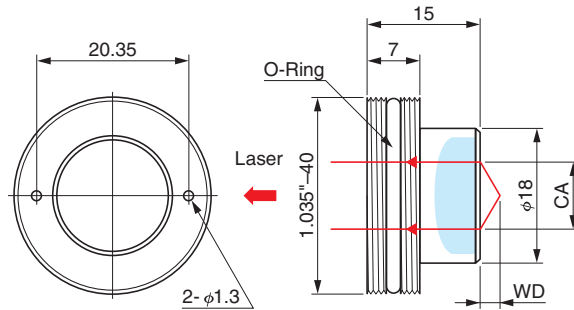


Parameter	Symbol	A11331-01	A11331-02
Effective diameter	CA	10 mm	
Working distance	WD	3.0 mm	
Periphery	OD	14.9 mm to 15.0 mm	
Center thickness	CT	6.4 mm ± 0.2 mm	6.3 mm ± 0.2 mm
Edge thickness	ET	3 mm	

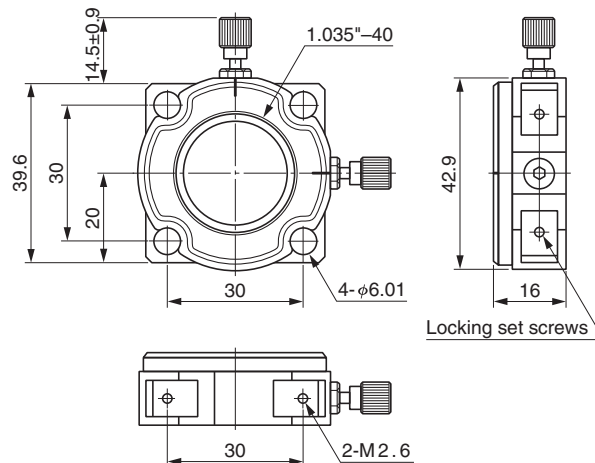
● A11331-0xH

Note: Aspheric ZnSe lens unit is consisted of two parts; Lens mounting unit and XYZ translator.
 Note: Attached lens specifications follow A11331-0x.

· Lens mounting unit



· XYZ translator



Accessories for Quantum Cascade Lasers

Heatseeker A10767



Heatseeker A10767 consists of 2 types of thermal viewing cards and an alignment target. It can be used for visualization and alignment of the QCL laser beam.

Thermal viewing card

Thermal material provides visibility of the invisible IR laser beam and facilitates tracing of the beam. Two cards with different sensitivity ranges are provided.

Alignment target

The light axis of the invisible IR laser beam can be easily aligned. Includes a cross target for checking the light axis. Thermal viewing cards can be inserted.

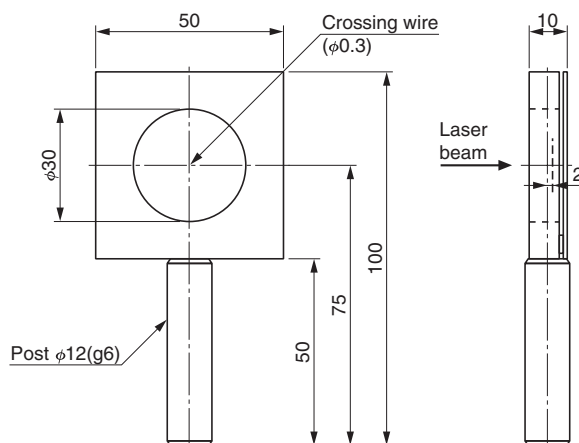
Specifications

Parameter		Value / Description
Detectable temperature range	Thermal viewing card #01	18 °C to 32 °C
	Thermal viewing card #02	30 °C to 35 °C
Usage wavelength range		1.0 μm to 20 μm
Power required for visibility *1		>3 mW/mm ²
Damage threshold (Max. power density)		20 mW/mm ²
Maximum aperture		φ30 mm
Storage temperature		-5 °C to +60 °C *2
Dimensions (W × H × D)		50 mm × 100 mm × φ12 mm

*1 Average power density

*2 No condensation

Dimensional outline (Unit: mm)



Accessories for Quantum Cascade Lasers

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