

**M9011/M9012  
Temperature Control & Power Supply Units  
For H7421/H7422 Series**

**INSTRUCTION MANUAL**

- 
- **Before using this product, be sure to read the "Safety Precautions".**
  - **The M9011/M9012 undergoes complete In-house testing before shipment. However, if any damage caused by transportation is found or operational failure is suspected, immediately contact your Hamamatsu sales office.**
  - **This product is warranted for a period of one year from the date of delivery. If any failure is found in the workmanship or materials within this warranty period, Hamamatsu will repair or replace the defective parts without charge.**

**HAMAMATSU**

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# 1. Before Using This Product

When you receive this product, unpack it carefully and check that there is no damage on the exterior and that all components and accessories are included. If any components are missing, contact your Hamamatsu sales office.

## 1.1 Safety precautions (Always ensure safety!)

This product was designed with sufficient consideration of safety and reliability. However, like most electrical products, improper handling or misoperation may cause fire or electrical shock, resulting in accidents that may include serious injury or death. Be sure to observe the following precautions to prevent accidents.

### Observe caution items for safety



Read the caution items described in this manual carefully and follow the instructions.

These caution items include general precautions relating to this product.




### If any abnormality occurs ...

For example, if smoke or an unusual sound or odor is sensed, immediately turn off the power supply.

- Warning information in this manual is shown classified into the following items by the extent of danger or damage that may result if the product is improperly used not by following these instructions.

	<b>WARNING</b>	Failure to follow WARNING instructions could result in serious injury or death to the operator or person servicing the product
	<b>CAUTION</b>	Failure to follow CAUTION instructions may result in injury to the operator or person servicing product, or damage to the product or peripheral equipment.

- Warning symbols used in this manual are classified as explained below. Make sure that you thoroughly understand the meaning of each symbol and follow the instruction. (These symbols are just examples.)

 <b>CAUTION</b>	Symbols showing a caution or warning you must pay attention to
 <b>Prohibited</b>	Symbols showing what you must NOT do
 <b>Must Do Item</b>	Symbols showing what you must DO



## WARNING

**Do not allow water or foreign matter to enter the product.**



Fire



Electrical  
Shock



Prohibited

Avoid placing any containers holding water near the M9011/M9012.

If water spills and enters the interior of the case, immediately turn off the power, then contact your Hamamatsu sales office for correct servicing.

**Do not disassemble or modify any part of this product.**



Fire



Electrical  
Shock



Do NOT  
disassemble

A high voltage is applied to some internal parts of this product. Touching them may cause fire, electrical shocks or injury.

**If smoke, excessive heat or an unusual odor is sensed, immediately turn off the power.**



Fire



Electrical  
Shock



Must DO  
Item

Continuous operation may generate heat due to electrical shorts or insulation failure, resulting in fire or electrical shocks. Immediately turn off the power.

**Stop using the power cable if damaged and turn off the power.**



Fire



Electrical  
Shock



Must DO  
Item

Continuous operation may generate heat due to electrical shorts or insulation failure, resulting in fire or electrical shocks. Immediately turn off the power and disconnect the power cable plug.

**Remove dust deposits on the power cable plug.**



Fire



Electrical  
Shock



Must DO  
Item

Dust deposits or metallic chips adhering to the power cable plug may cause electrical shorts or insulation failure by moisture, resulting in fire or electrical shocks. If they are deposited, disconnect the power cable and wipe off with dry cloth. Check to see if dust and foreign matter adhere to the plug periodically.

**Do not touch the power cable plug with moist hands.**



Electrical  
Shock



Must NOT do

Electricity conducts through water so touching the power cable plug with moist hands may result in electrical shocks.



## CAUTION

**Do not install in locations with oily smoke, steam, humidity, large quantities of dust or strong vibrations.**



Fire



Prohibited

Oily smoke, steam, vapor corrosive gases and inflammable gases will adversely affect the M9011/M9012.

**Don't remove by pulling on cable**



Fire



Electrical Shock



Prohibited

Pulling on the cable will damage it. Using the cable while damaged will generate heat due to electrical shorts and insulation defects, possibly causing fire or electrical shock.

**Read the instruction manual carefully and install correctly.**



Fire



Electrical Shock



Must Do Item

Operating in ways other than listed in this instruction manual may lead to serious accidents.

**Do not use in a vacuum.**



Fire



Electrical Shock



Prohibited

The M9011/M9012 were designed and manufactured for use in a normal atmosphere. Using them in a vacuum may cause fire or electrical shock.

**Do not place any item inside.**



Fire



Electrical Shock



Prohibited

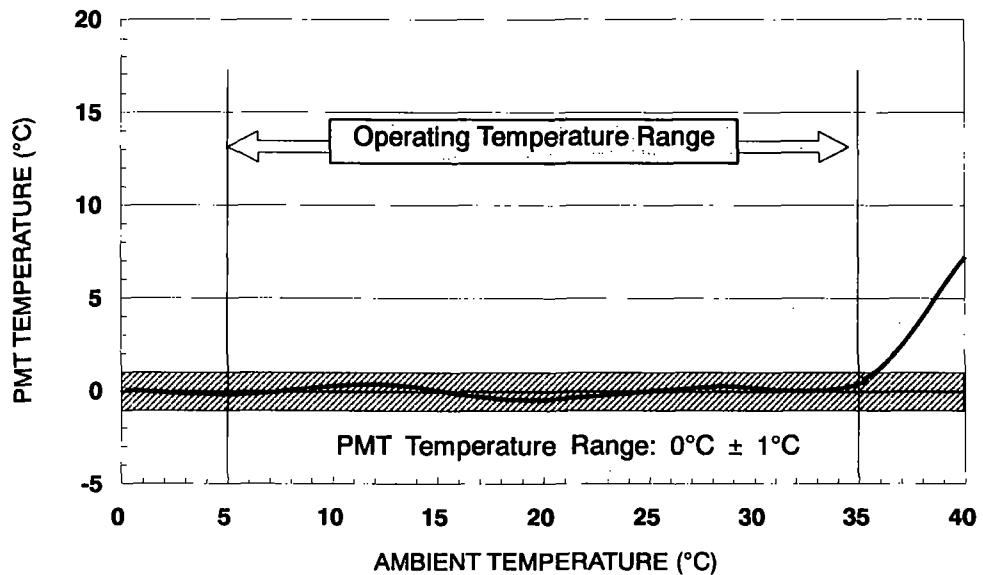
Do not place items such as metal, fluids or combustible materials inside the unit. Doing so may cause damage from electrical shorts or cause electrical shocks and fire from sparks or heat emissions.

## 1.2 Features

The M9011/M9012 are power supplies specifically designed for the H7421/H7422 series.

### Stable H7421/H7422 series operation by temperature control

The H7421/H7422 series photomultiplier tubes (PMTs) have a built-in Peltier (cooling) element that lowers the thermal noise in the PMT and delivers a good signal-to-noise ratio. The M9011/M9012 are able to maintain a stable output and noise level in the H7421/H7422 series by controlling the Peltier element in response to changes in ambient temperature.



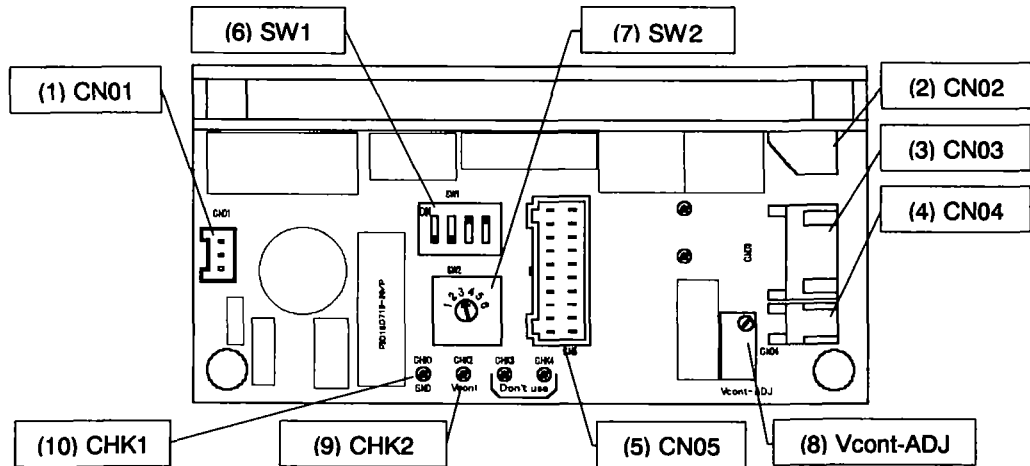
### PMT Temperature vs. Ambient Temperature

#### Simple operation

The M9011/M9012 turn the PMT and cooling operation on and off with a simple circuit using external control signals. The gain of the PMT housed inside the H7422 series can also easily be adjusted by the M9012 or external I/O.

## 1.3 Major parts & accessory items

### 1.3.1 Part names



#### Part name

#### (1) Power connector "CN01"

Supplies power to the M9011/M9012.

Adaptable housing model: PAP-03V-S (made by JST)

Pin No.	Name	I/O		Cable color	Description
1	Vin	IN	+12 V dc	Orange	Connector for supplying power.
2			NC	-	
3			GND	Violet	

#### (2) Peltier element power connector "CN02"

Outputs power to the H7421/H7422 series Peltier element.

Adaptable housing model: PAP-04V-S (made by JST)

Pin No.	Name	I/O		Description
1	Pel	OUT	+2.5 V dc Max	Output pins for Peltier element (Pin No. 1 and 3, and Pin No. 3 and 4 are the same voltage potential.)
2				
3			RTN	
4				

### (3) Module connector "CN03"

Temperature monitor, high voltage circuit and control voltage connector for H7421/H7422 series.

Adaptable housing model: PAP-06V-S (made by JST)

Pin No.	Name	I/O		Description
1	Vcc	OUT	+5 V dc / +12 V dc	Main unit output pins. Setting depends on the equipment. M9011 : 5 V / M9012 : 12 V
2			GND	
3	Vcont	OUT	+1.26 V Max *1	Used for adjusting the gain of the H7422 series PMT.
4			GND	
5	Th	OUT	+5 V dc	Temperature monitor output.
6			GND	

\*1)No load



*The "Vcc" supply voltage setting depends on the equipment that is connected. Making the wrong setting might damage the equipment so always check the setting before turning on the power.*



*The H7421 control voltages are already set to an optimal level at the factory so no customer adjustment is needed..*

### (4) Fan power output connector "CN04"

Connector for supplying power to the A7423 fan for the H7421/H7422 series. See "3.3 Connections" for more information.

Adaptable housing model: PAP-02V-S (made by JST)

Pin No.	Name	I/O		Description
1	Fan	OUT	+12 V dc	Power output connector for the A7423 fan with heat sink.
2			GND	



### (5) External I/O connector "CN05"

Controls the PMT and cooling on the H7421/H7422 series with external ON and OFF signals. See "4. How to use" for more information.

Adaptable housing model: PADP-20V-1-S (made by JST)

Pin No.	Name	I/O		Description
1	ASS-POW	OUT	+5 V	Outputs an auxiliary +5 V.
2			GND	
3	PeI-POW-TTL	IN	+5 V	Turns the cooler ON/OFF with TTL level voltage inputs. Allows inverted logic. See "3.2 Settings" for more information.
4			GND	
5	PeI-ERR-TTL	OUT	+5 V	Sets to "H" level when a cooler error occurs.
6			GND	
7	PMT-POW-TTL	IN	+5 V	Turns the PMT high voltage on and off with TTL level inputs. Allows inverted logic. See "3.2 Settings" for more information.
8			GND	
9	PMT-ERR-TTL	OUT	+5 V	Sets to "H" level when the overload protective function of the H7422 series (except for H7422-01 and H7422-02) has been triggered.
10			GND	
11	PMT-LED	OUT	+5 V	LED for showing status of high voltage applied to PMT and cooling conditions.
12			GND	
13	ABN-LED	OUT	+5 V	LED for showing error has occurred. Flashes during cooler error and lights up when H7422 series protective circuit is triggered.
14			GND	
15	Vcont-MON	OUT	+1.26 V Max *1	Control voltage monitor output for adjusting the gain of the H7422 series.
16			GND	
17	Vcont-EXT	IN	+0.9 V Max	Pin used for inputting external signal to set the gain of H7422 series. Use with SW1-4 set to ON when using external power supply for Vcont.
18			GND	
19	Fan-POW-TTL	IN	+5 V	Turns the A7423 cooling fan for the H7421/H7422 series on and off with TTL level voltage inputs. Negative logic operation.
20			GND	

\*1) No load

### (6) DIP switch "SW1"

Switch for equipment settings, external I/O logic settings and H7422 series control voltage supply method. See "3.2 Settings" for more information.



**Making the wrong DIP switch setting may damage the equipment. Always recheck the settings before turning on the power.**

**(7) Temperature switch "SW2"**

Switch for setting the PMT temperature. See "3.2 Settings" for more information.



*When changing temperature settings make sure they do not exceed the maximum applicable environmental temperature.*

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**(8) H7422series control voltage trimmer "Vcont-ADJ"**

Trimmer for adjusting the gain on the H7422 series. Adjustable from 0 V to 0.9 V. Setting Pin 4 of "SW1" to ON disables this trimmer.

**(9) GND terminal "CHK1"**

Use as the ground when monitoring the control voltage while adjusting the gain of the H7422 series.

**(10)PMTcontrol voltage monitor terminal"CHK2"**

Use for monitoring the control voltage when adjusting the gain of the H7422 series.

### 1.3.2 Accessories

• **Power cable** x1

Cable for supplying DC power to the power supply unit.

• **Module cable** x1

Cable for supplying power to the H7421/H7422 series from the power supply unit.

• **Fan cable** x1

Cable for supplying power to the A7423 cooling fan for the H7421/H7422 series series.

• **External I/O cable** x10

Cables for controlling the H7421/H7422 series operation. Use this along with the external I/O connector housing. See "4. How to use" for more information.

• **External I/O connector housing** x1

Connector housing for external I/O connector "CN05" that controls the H7421/H7422 series operation.

• **Instruction manual** x1

This manual.

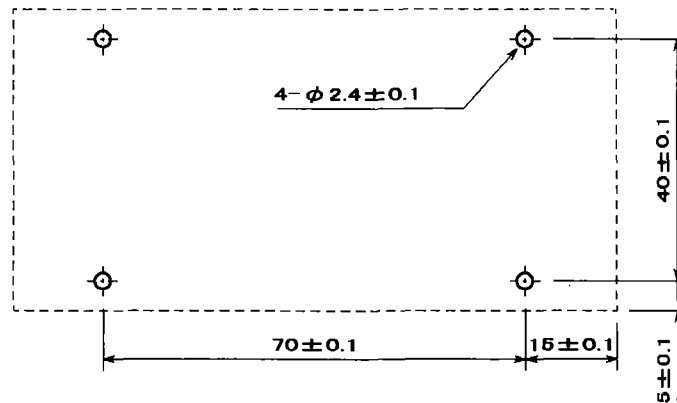
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## 2. Installation

### CAUTION

- Do not install in hot, highly humid locations.
- Use M2 screws for the installation. If the screw length is too long it will contact the board so use caution.(Use less than 5 mm screw length.)

Unit: mm



Installation drawing

### 3. Settings and connections

The M9011/9012 are designed to easily connect to the H7421 series photon counting head and H7422 series photosensor module. This section describes how to make those connections.

#### 3.1 Before making settings and connections

Check that H7421/H7422 series optical system connections are complete. Make sure that excessive light is not being input to the input window of the H7421/H7422 series. Also check that the M9011/M9012 are not in operation.

#### 3.2 Settings

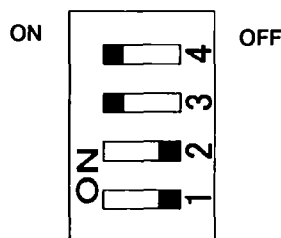
##### 3.2.1 DIP switch "SW1"

Settings on the DIP switch "SW1" have the following functions. Make the settings after checking the device and operating method to be used.

SW No.	Function	I/O	
		ON	OFF
1	Sets the Peltier element operation when the M9011/M9012 are turned on.	Inputting a TTL voltage to "PEL-POW-TTL" turns on the Peltier element.	Inputting a TTL voltage to "PEL-POW-TTL" turns off the Peltier element.
2	Sets the PMT operation when the M9011/M9012 are turned on.	Inputting a TTL voltage to "PMT-POW-TTL" turns on the PMT.	Inputting a TTL voltage to "PMT-POW-TTL" turns off the PMT.
3	Sets the voltage supplied to the main unit for the H7421/H7422 series.	Supplies 5 V to the main unit for the H7421 series.	Supplies +12 V to the main unit for the H7422 series.
4	Sets how to supply control voltages for adjusting the PMT gain when using the H7422. Maximum input is 0.9 V. This setting does not affect the H7421.	External input mode Inputs a control voltage from "Vcont-EXT".	Internal input mode Inputs a control voltage from "Vcont-ADJ".



**CAUTION** Making the wrong DIP switch setting may damage the equipment. Always recheck the settings before turning on the power.



**SW1**  
M9011  
Factory setting



**SW1**  
M9012  
Factory setting

### 3.2.2 Temperature switch "SW2"

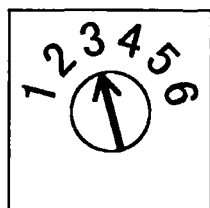
This switch sets PMT cooling temperature. A low temperature setting will lower the signal noise but an ambient temperature higher than the maximum environmental temperature may damage the equipment. Make changes to this switch only when the H7421/H7422 ambient temperature has to be controlled within the maximum environmental temperature.



**When changing temperature settings make sure they do not exceed the maximum applicable environmental temperature.**

No.	Temp. setting [°C]	Environmental temperature [°C]	
		When A7423 fan is on	When A7423 fan is off
1	-10	+5 to +25	-
2	-5	+5 to +30	+5 to +10
3	0	+5 to +35	+5 to +15
4	+5	+5 to +35	+5 to +20
5	+10	+10 to +35	+10 to +25
6	+15	+15 to +35	+15 to +30

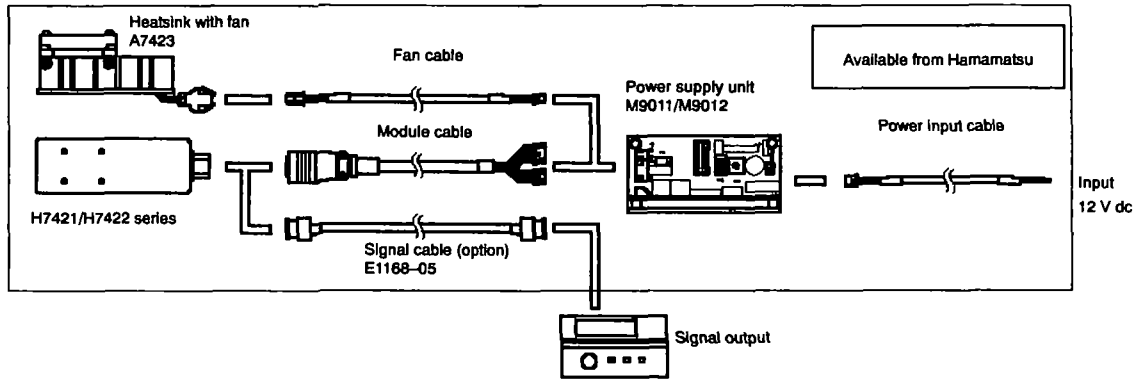
\* Environmental temperature ..... This refers to the H7421/H7422 series ambient temperature.



**SW2**

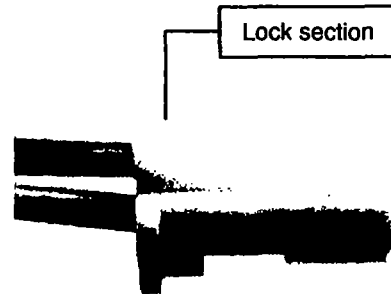
Factory setting

### 3.3 Connections



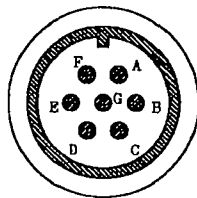
#### 3.3.1 Connecting accessory cables to the M9011/M9012

Connect the M9011/M9012 input/output connectors and cables. Connect and disconnect the cables by gripping the lock section on the connector.

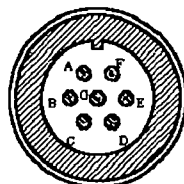


#### 3.3.2 Connecting to the H7421/H7422series

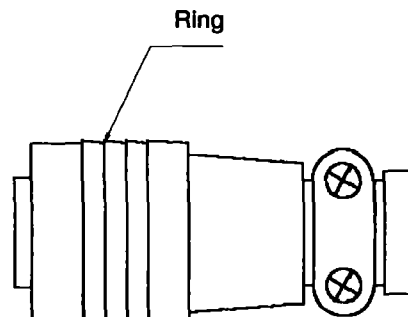
Connect the H7421/H7422 "POWER IN" connector and module cable plugs by using the accessory module cables. When attaching the module cable plug to the main unit, align the guide mark on the ring, with the "MODULE" letters printed on the main unit rear surface, and insert while gripping the end of the plug. To remove, grip the ring part of the plug and pull outwards.



H7421/H7422 series power input connector



Module cable plug



**Pin No. and description**

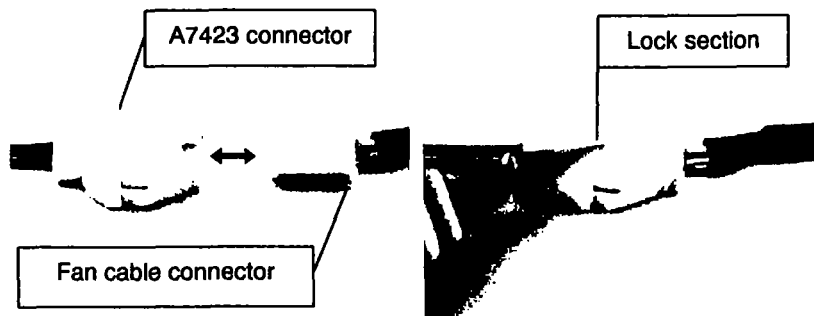
Pin No.	Name	Description
A	Thermistor 1	Connects the thermistor. M9011/M9012 controls the Peltier element using the output from the thermistor for stable cooling performance.
B	Thermistor 2	
C	Peltier element +pin	Current output pin for operating the Peltier element.
D	Peltier element -pin	
E	DC +5 V / +12 V	Output pin for main unit supplies +5 / +12 V dc.
F	Control voltage	Outputs a control voltage for adjusting the gain of the H7422 series. Has no effect on the H7421 series.
G	GND	Ground potential



***An optimal H7421 control voltage is set at the factory prior to shipment. To use with the H7421 series, set switch No. 4 on "SW1" to "ON.***

### 3.3.3 Connecting the cable to the A7423 heatsink fan

To connect the fan cable connector to the A7423, align the guide as shown in the photo and press in. To detach, pull outwards on the connector while holding down the lock section with tweezers or a similar item.



### 3.3.4 External I/O cable connection

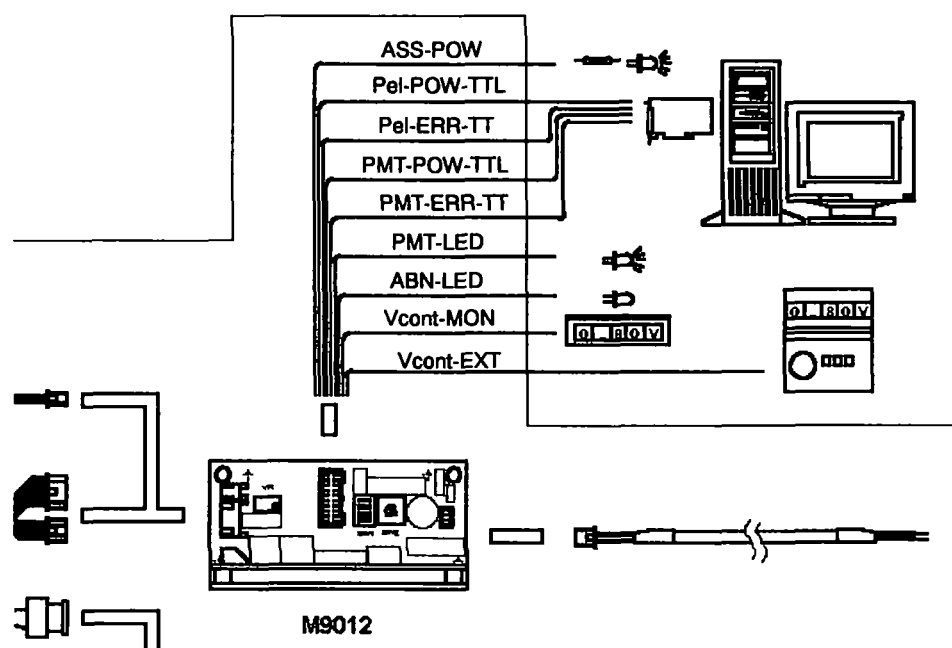
The M9011/M9012 turn the PMT and cooling on and off in a simple operation using external I/O signals.

External I/O signals are sent through the "CN05" connector. See "1.3.1 Part names" for pin numbers and functions.

#### Typical external I/O connections

Typical external I/O connections are listed below.

- Use "ASS-POW" to show the power is on. (Connect a protective resistor.)
- Connect the TTL input/outputs ("PeI-POW-TTL", "PeI-ERR-TTL", "PMT-POW-TTL", "PMT-ERR-TTL" to the computer. (Control panel is required.)
- Make the "PMT-LED" and "ABN-LED" connections.
- Input the PMT gain adjust voltage from "Vcont-EXT" and use "Vcont-MON" to monitor that voltage. (When using the M9012)

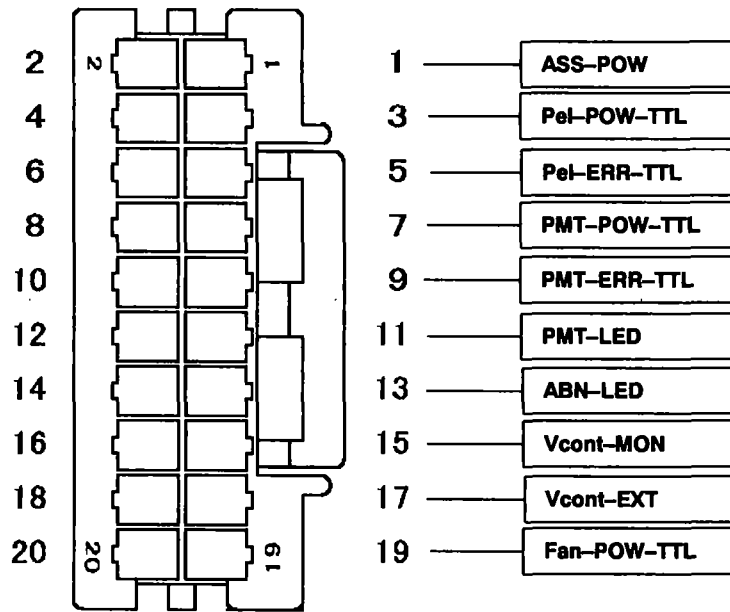
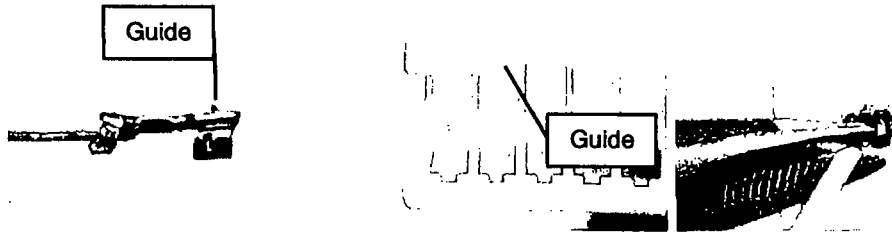


External I/O connection diagram



### Typical external I/O connection

Decide the function you need and then make the connection as follows. Attach the external I/O cable to the connector housing. Align the connector pin guide on the end of the external I/O cable with the guide on the external I/O connector housing and push inwards using tweezers or a similar tool.



**Connector pin connection diagram**



***Making the wrong connection may damage the equipment. Always check the connections before using.***

## 4. How to use

This section describes procedures when using or when not using the external I/O.

### Before using...

Check the following items before turning on the power.

- Check the optical system connections on the H7421/H7422 series. If optical system connections are incomplete, not only will light leaks cause incorrect measurements but the equipment may sustain damage.
- Check the SW1 DIP switch and temperature settings.
- Check the electrical connections.



*External I/O connections are needed to detect errors/abnormalities.*

### 4.1 M9011 (For H7421 series)

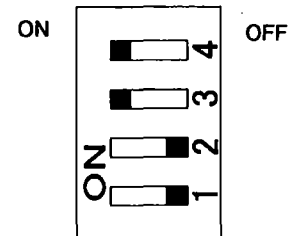
If using the M9012 there is no need to read this section.

#### 4.1.1 When not using the external I/O

This section briefly describes how to set and use the M9011 when you wish to use the H7421 series.

##### 1. Check SW1 settings.

Check that SW1 is set as shown at right and change the settings if necessary.



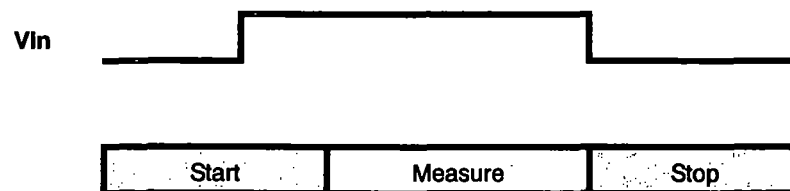
##### 2. Turn on the power.

1. Supply 12 V dc to "Vin".
2. Cooling is complete after about 3 minutes and measurements can then be made.

##### 3. Turn off the power.

Cut off the voltage supply to "Vin".

**SW1**  
M9011  
Factory Setting



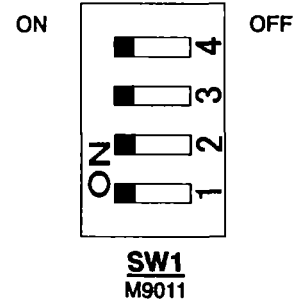
Timing chart

## 4.1.2 When using the external I/O

This section shows examples using the external I/O "Pel-POW-TTL" (positive logic), "Pel-ERR-TTL", "PMT-POW-TTL" (positive logic), "PMT-ERR-TTL", "PMT-LED", "ABN-LED", "Vcont-MON" and "Vcont-EXT".

### 1. Check SW1 settings.

Set SW1 as shown in the figure at right.

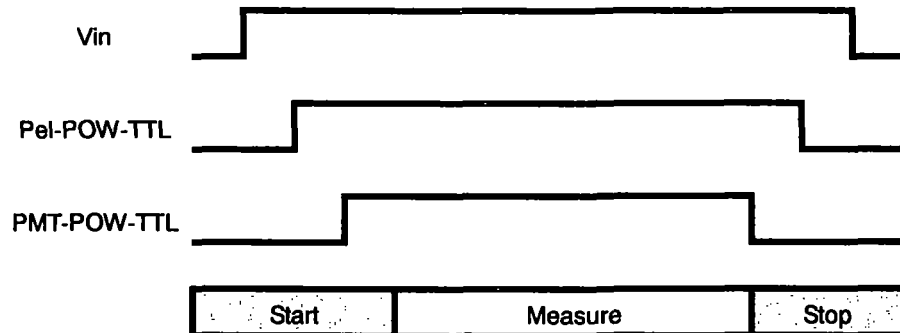


### 2. Turn on the power.

1. Supply 12 V dc to "Vin". The A7423 heatsink fan operates.
2. Input a TTL voltage to "Pel-POW-TTL" to turn on the Peltier element. The "PMT-LED" flashes at about 2 second intervals. When cooling is complete, the "PMT-LED" flashes at about 0.5 second intervals.
3. Input a TTL voltage to "PMT-POW-TTL" to turn on the PMT. The "PMT-LED" changes from a flashing to lit state and measurement can begin.

### 3. Turn off the power.

1. Cut off the voltage to "PMT-POW-TTL" to turn off the supply voltage Vcc.
2. Cut off the "Pel-POW-TTL" supply voltage to turn off the Peltier element.
3. Turn off the voltage supply to "Vin".



Timing chart

### Stopping the fan

The M9011 can turn off the cooling fan for the H7421 series by using external I/O signals. The maximum fan stop time is 5 minutes. Input a TTL level voltage to "PMT-POW-TTL" to turn off the A7423 fan for the H7421/H7422 series (negative logic). However operation will resume if the M9011 detects a cooling error.

## 4.2 M9012 (For H7422series)

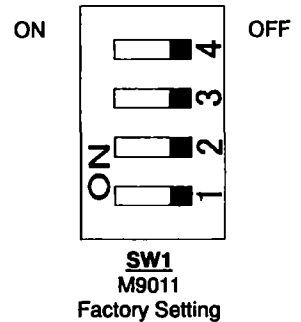
If using the M9011 there is no need to read the following.

### 4.2.1 When not using external I/O

This section briefly describes how to set and use the M9012 when you wish to use the H7422 series.

#### 1. Check SW1 settings.

Set SW1 as shown in the figure on the right.

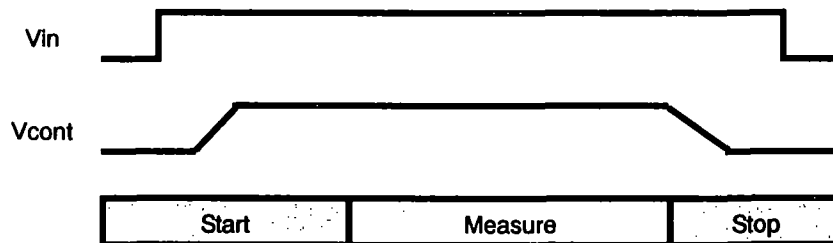


#### 2. Turn on the power.

1. Supply 12 V dc to "Vin".
2. Adjust the PMT gain by turning the "Vcont-ADJ" trimmer clockwise while monitoring the control voltage from the "PMT control voltage monitor terminal". Maximum control voltage input is 0.9 V.
3. Cooling is complete after about 3 minutes and measurement can begin.

#### 3. Turn off the power.

1. Lower the PMT gain by turning the "V-cont-ADJ" trimmer counterclockwise.
2. Turn off the voltage supply to "Vin".



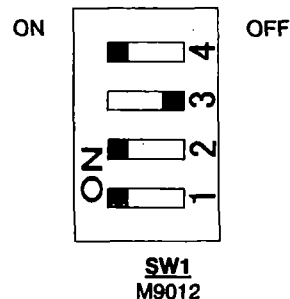
Timing chart

## 4.2.2 When using external I/O

This section shows examples using the external I/O "Pel-POW-TTL" (positive logic), "Pel-ERR-TTL", "PMT-POW-TTL" (positive logic), "PMT-ERR-TTL", "PMT-LED", "ABN-LED", "Vcont-MON", and "Vcont-EXT".

### 1. Check SW1 settings.

Set SW1 as shown in the figure on the right.

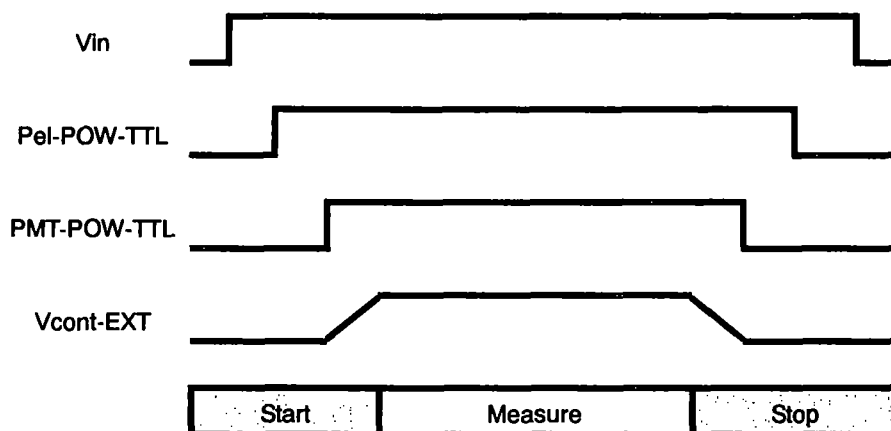


### 2. Turn on the power.

1. Supply 12 V dc to "Vin". The A7423 heatsink fan operates.
2. Input a TTL voltage to "Pel-POW-TTL" to turn on the Peltier element. The "PMT-LED" flashes at about 2 second intervals. When cooling is complete, the "PMT-LED" flashes at about 0.5 second intervals.
3. Input a TTL voltage to "PMT-POW-TTL" to turn on the PMT. The "PMT-LED" changes from a flashing to lit state and measurement can begin.
4. Adjust the PMT gain by inputting a control voltage from "Vcont-EXT" while monitoring the control voltage using "Vcont-MON". Maximum control voltage input is 0.9 V.

### 3. Turn off the power.

1. Lower the PMT gain by decreasing the "V-cont-EXT" input voltage.
2. Turn off the PMT by cutting off the power to "PMT-POW-TTL".
3. Turn off the Peltier element by cutting off the power to "Pel-POW-TTL".
4. Turn off the voltage supply to "Vin".



**Timing chart**

### Stopping the fan

The M9012 can turn off the cooling fan for the H7422 series using external I/O signals. The maximum fan stop time is 5 minutes. Input a TTL level voltage to "PMT-POW-TTL" to turn off the A7423 fan for the H7421/H7422 series (negative logic). However operation will resume if the M9012 detects a cooling error.

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## 4.3 Errors

This section describes errors or abnormalities that can be detected by the M9011/M9012 and how to reset them.



*External I/O connections are needed to detect errors or abnormalities.*

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### 4.3.1 Cooling errors

The M9011/M9012 can detect cooling errors in the H7421/H7422 series. Temperature control is disabled if the H7421/H7422 series environmental (ambient) temperature rises higher than the maximum environmental temperature. If this happens, the M9011/M9012 shuts down the cooling, the "ABN-LED" flashes and "Pel-ERR-TTL" sets to "Hi" level.

To reset, first eliminate the cause of the error/abnormality and then turn on the power again by using "Pel-POW-TTL".

### 4.3.2 PMT overload errors

The H7422-40/H7422-50/H7422P-40/H7422P-50 have overload protective functions. (There is no overload protective function on the H7421 series and the H7422-01/H7422-02/H7422-20.) If the overload protective function is triggered due to excessive light falling on the light sensitive area, operation will automatically turn off to protect the PMT. The "ABN-LED" lights up at this time and "PMT-ERR-TTL" sets to "Hi".

To reset, first eliminate the cause of the error and then turn on the power again by using "PMT-POW-TTL".



*The H7421 series and H7422-01/H7422-02/H7422-20 have no overload protective function.*

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## 5. Caution

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### 5.1 Always observe this precaution!

Remove the power cable if not using the M9011/M9012 for long periods of time.

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### 5.2 Fault diagnosis

Before requesting a repair, check the following items and also refer to "Fault diagnosis" in the H7421/H7422 series manual.

Symptom	Probable cause	Corrective action
No signal output from H7421/H7422 series.	Bad connection <ul style="list-style-type: none"><li>• Connector is not securely connected.</li></ul>	Check for a wrong or poor connection.
	Wrong PMT initial setting <ul style="list-style-type: none"><li>• PMT initial setting on switch is faulty.</li></ul>	Check the usage method.
	Electrical circuit malfunction <ul style="list-style-type: none"><li>• Excessive voltage is applied to power supply unit.</li><li>• Wrong device is connected.</li></ul>	Request a repair.
No signal output from H7422series.	PMT overload protective function has been triggered. <ul style="list-style-type: none"><li>• PMT overload protective function was triggered due to excessive light on H7422 series light sensitive area.</li></ul>	Eliminate the cause of the error and turn the power on again.
	PMT gain is not adjusted. (M9012) <ul style="list-style-type: none"><li>• PMT gain is not correctly adjusted.</li></ul>	Check the usage method.

When the problem or symptom still occurs even after checking the above items, ship the product back to our sales office with a clear description of the problem.



***When shipping this unit, take full precautions with the packing to prevent any damage from occurring. (Use the box this product was shipped in or a slightly oversize box filled with plenty of cushioning material.)***

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## **5.3 Warranty**

This product is warranted for a period of one year from the date of delivery. If any failure is found in the workmanship or materials within this warranty period, Hamamatsu will repair or replace the defective parts without charge. However, the repair and replacement costs will be charged to the user in the following cases even if within the warranty period.

- (1) Failure or trouble was caused by misoperation, mishandling, or not following the instructions and precautions described in this manual.
- (2) The product has been modified electrically or mechanically by the customer.
- (3) Failure was caused by accidents such as natural or man-made disasters.

The warranty is limited to repair or replacement.

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## **5.4 After sales service**

If trouble or failure occurs after a long period of operation due to the components reaching the end of their service life in this product, send the product back to us for repair, replacement and/or adjustment.



# 6. Specifications

## 6.1 Ratings

Parameter		Rated Value		Unit
		M9011	M9012	
Input power voltage (Vin)		+10.8 to +13.2		V
Maximum input power current(Vin)		1.2		A
Maximum power consumption(Vin)		15.8		VA
Output voltage for main unit <sup>*1</sup> (Vcc)		4.75 to 5.25	11.4 to 12.6	V
Maximum output current for Peltier element <sup>*2</sup> (Pel)		2.2		A
Output voltage for fan(Fan)		10.8 to 13.2		V
Maximum control voltage output <sup>*3</sup> (Vcont)		-	1.26	V
Maximum control voltage input(Vcont-EXT)		-	0.9	V
Control signal input voltage <sup>*4</sup>	Peltier element(Pel-POW-TTL)	Non-insulated TTL level input		V
	PMT(PMT-POW-TTL)	Non-insulated TTL level input		
	Fan(Fan-POW-TTL)	Non-insulated TTL level input		
Error signal output voltage	Peltier element(Pel-ERR-TTL)	Non-insulated TTL level output		V
	PMT(PMT-ERR-TTL)	Non-insulated TTL level output		
Output voltage for LED <sup>*5</sup>	Normal(PMT-LED)	4.5 to 5.5		V
	Error(ABN-LED)	4.5 to 5.5		V
Output voltage for auxiliary(ASS-POW)		4.5 to 5.5		V
Cooling temperature <sup>*6</sup> (SW2)		-10 / -5 / 0 / +5 / +10 / +15		°C
Ambient operating temperature <sup>*7</sup>		0 to +40		°C
Ambient operating humidity <sup>*7</sup>		30 to 80		% Rh
Performance-guaranteed temperature <sup>*7*8</sup>		+5 to +35		°C
Performance-guaranteed humidity <sup>*7</sup>		30 to 80		% Rh
Storage temperature <sup>*7</sup>		-20 to +50		°C
Storage humidity <sup>*7</sup>		10 to 85		% Rh
Maximum ripple noise (at maximum load)	Main unit(Vcc)	100		mV p-p
	Peltier element(Pel)	50		
	Fan(Fan)	100		
	Control voltage <sup>*3</sup> (Vcont)	-	20	
Protective circuit		Excess current protection		-
Dimensions (excluding projecting parts)		100(W) × 50(D) × 28 (H)		mm
Weight (excluding cables)		120		g

\*1: Output voltage for main unit can be selected with the switch.

\*2: Peltier element is controlled with constant current. Supply voltage is less than 2.6 V when operated within the rated current.

\*3: When "Vcont-ADJ" is used & No load.

\*4: Inverted logic can be used.

\*5: Maximum output current is 10 mA.

\*6: Factory setting temperature is 0 °C.

\*7: Non-condensation

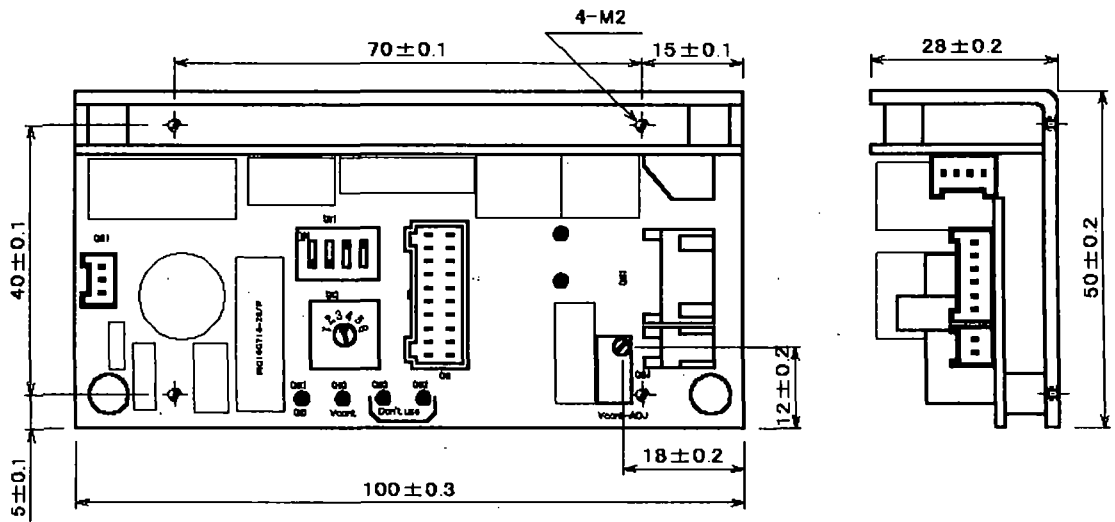
\*8: When setting temperature is 0 °C.

## 6.2 Accessories

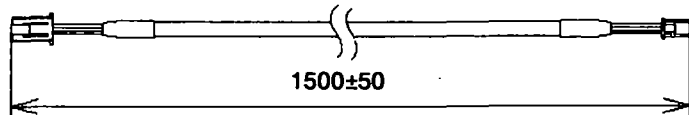
Fan cable (1.5 m).....	1
Module cable (1.5 m).....	1
DC input cable (1.0 m).....	1
External I/O cable (1.0 m).....	10
External I/O housing.....	1
Instruction manual.....	1

## 6.3 Dimensional outlines

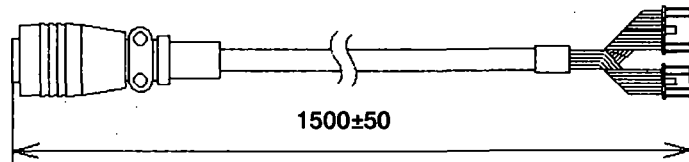
Unit: mm



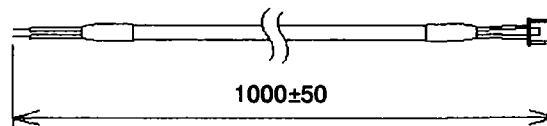
Fan cable



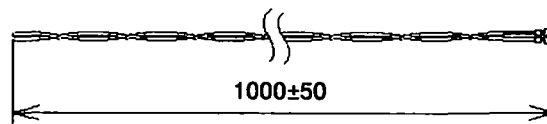
Module cable



DC input cable



External I/O cables



External I/O housing



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For further information, contact our sales office in your country.

# **HAMAMATSU**

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*Characteristics and specifications are subject to change without prior notice  
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