C7035A
Compact Ultraviolet Flame Detector
User's Manual

Thank you for purchasing the C7035A. This manual contains information for ensuring correct use of the C7035A. It also provides necessary information for installation, maintenance, and troubleshooting.
This manual should be read by those who design and maintain devices that use the C7035A.
Be sure to keep this manual nearby for handy reference.

RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment.
Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use this product in applications where human safety may be put at risk.

NOTICE

Be sure that the user receives this manual before the product is used.

Copying or duplicating this user's manual in part or in whole is forbidden. The information and specifications in this manual are subject to change without notice.

Considerable effort has been made to ensure that this manual is free from inaccuracies and omissions. If you should find an error or omission, please contact Yamatake Corporation.

In no event is Yamatake Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

SAFETY PRECAUTIONS

Safety precautions are for ensuring safe and correct use of this product, and for preventing injury to the operator and other people or damage to property. You must observe these safety precautions. Also, be sure to read and understand the contents of this user's manual.

⚠ WARNING

Warnings are indicated when mishandling this product might result in death or serious injury to the user.

⚠ CAUTION

Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to this product.

⚠ WARNING

- Be sure to turn the power off before wiring this device. Failure to do so could result in electric shock.

⚠ CAUTION

- Use only to detect the flame of batch-operation combustion equipment (at least one start and stop in a 24-hour period).
- Use only with a Yamatake flame safeguard control (see section 6, Compatible Flame Safeguard Controls).
- Installation, wiring, inspection, adjustment of the C7035A should be carried out by a trained and experienced technician who has knowledge and technical skills related to combustion equipment and flame safeguard control equipment.
- Do not transport combustion equipment without first removing the UV tube. Otherwise vibration or shock may damage the tube. Put the tube in a secure packing box when transporting it.
- Always separate flame signal wires from the high-voltage ignition wires and other power wires. Be sure to run signal wires in a separate conduit.
- The effective life of the UV tube is 3 years or a total of 25,000 hours of use after the date of inspection by Yamatake Corporation. To be safe, be sure to replace the UV tube within this period. A sticker showing the operating life of the UV tube is included with the C7035A. Please use it for maintenance management.

UNPACKING

Check for the following items when removing the C7035A from its package. If there is some problem with your order, please contact your dealer promptly.

■ Included items (one each)

- C7035A
- Gasket
- UV tube
- Socket
- Protective cover
- User's manual (this document)
- UV tube operating life sticker

■ Labels and Sticker

● Wiring label

This label is affixed to the C7035A and shows how to wire it. Be sure to correctly.

小型ウルトラビジョンC7035A1064J

注意
プロテクトリレーへの配線は青色をF端子へ、白色をG端子へ接続します。逆接続の場合はUVチューブを損傷します。

Yamatake Corporation

● UV tube operating life label

This label is affixed to the UV tube.

使用周囲温度 -40～+120℃
129464NJ
Yamatake Corporation

UVチューブ
有効使用期限　xxxx年xx月
または使用期間　25000時間

● UV tube operating life sticker

This sticker is included with the C7035A. Please use it for maintenance management.

UVチューブ有効使用期限

バーナNo.	有効使用期限
	年　月
	年　月
	年　月

＊ウルトラビジョンは取扱い説明書をよく読み正しく御使用ください。

＊このシールを見やすい場所に貼り、UVチューブの管理に御役立て下さい。

● Thermolabel

This label is affixed to the UV tube. Keep the air cool enough (by air purge, etc.) so that the label does not change color from white to black. Use it as a guide to avoid use of the tube in an environment with excessive ambient temperature.

1. Overview

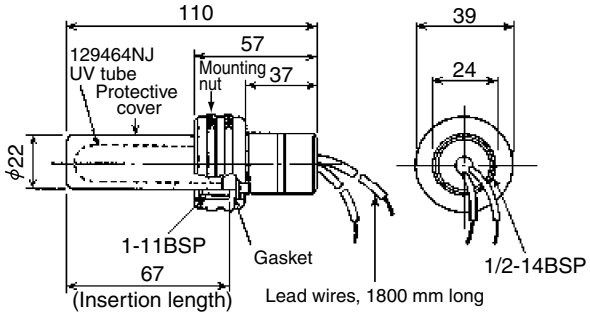
■ Features

- The C7035A is a flame detector that senses ultraviolet radiation from an oil or gas burner flame.
- The C7035A conforms to UL (Underwriters Laboratories), FM (Factory Mutual) and CSA (Canadian Standards Association) standards.
- The C7035A can be used in ambient temperatures up to 120 °C.

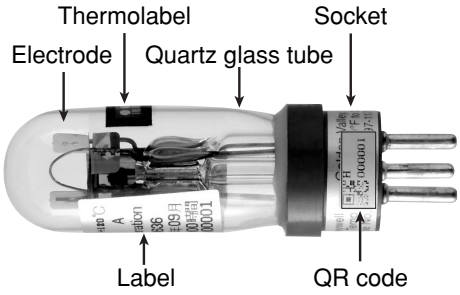
2. External Dimensions and Structure

■ External Dimensions

(Unit:mm)



■ 129464NJ UV Tube Structure



3. Installation Method

⚠ CAUTION

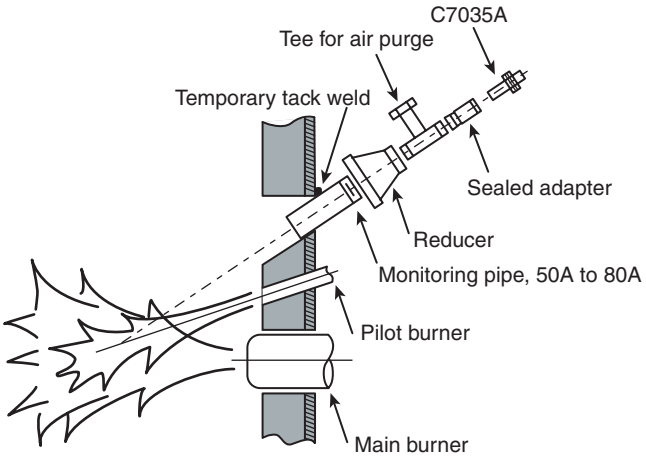
Be sure to take sufficient countermeasures if there is a possibility that the C7035A can detect a source of radiation other than the burner flame. Sources of radiation (most are not relevant under normal circumstances):

- UV rays:
  Red-hot furnace wall (1371 °C or more), ignition transformer and welding arc sparks, gas lasers, sunlamps, disinfecting lamps, strong flashlight, etc.
- Gamma rays and X-rays:
  Diffraction analyzers, electron microscopes, X-ray machines, high-voltage vacuum switches, high-voltage capacitors, radioactive isotopes, etc.
- Countermeasures are also required in atmospheres that obstruct the transmission of ultraviolet rays, due to steam, soot and smoke, oil spray, dust, etc.

■ Temporary mounting of monitoring pipe

● Before mounting this unit

To mount this unit correctly, thoroughly read the instruction manuals published by burner, boiler, and/or other equipment manufacturers. Make a proper mounting plan based on the instruction manuals. Appropriate mounting is the basis for good combustion safety control.



● Mounting angle

- Mount the C7035A so that it monitors the burner at an angle from above.

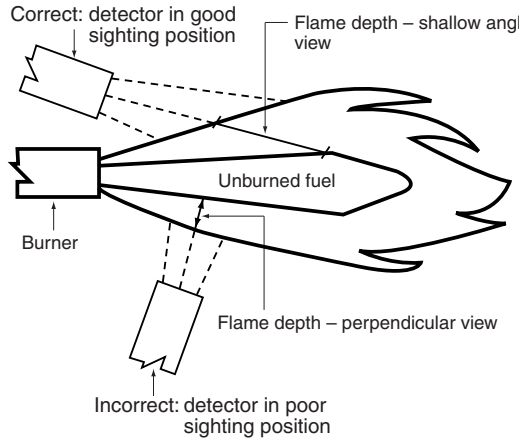
! Handling Precautions

- If the C7035A monitors from below or in the same horizontal plane, dust or soot may accumulate on the monitoring window or in the monitoring pipe, blocking the UV rays and preventing flame detection.

- Mount the C7035A so that its monitoring direction intersects the flame axis at the smallest possible angle.

Note

- The part of the flame that emits the most ultraviolet radiation is the first 30 %, near the burner nozzle.
- A small monitoring angle, relative to the flame axis, provides the maximum overlap between the C7035A's monitoring area and the flame. It therefore maximizes the amount of UV radiation reaching the detector.



● Materials of monitoring pipe

- Use a monitoring pipe with a black inside wall. Stainless steel and galvanized pipes are not good because they reflect UV rays internally, complicating aiming of the pipe.
- To avoid heat conductance to the C7035A, be sure to use a material with low heat conductivity.

● Size of monitoring pipe

For the detector to receive the optimal amount of UV radiation, its field of vision should be as wide as possible. To that end, do the following:

(1) Use the widest monitoring pipe possible, at least 50A to 80A, and connect the C7035A with a reducer.

(2) Make the monitoring pipe as short as possible. (However, do not allow the ambient operating temperature to rise above 120 °C.)

● Mounting space

Leave sufficient space to allow easy maintenance and inspection.

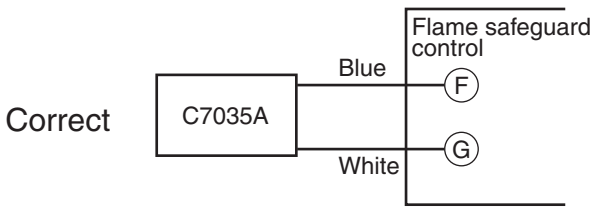
■ Wiring

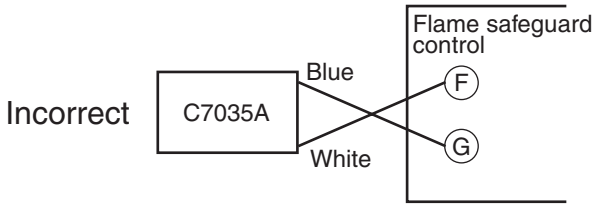
⚠ WARNING

- Be sure to turn the power OFF before wiring the C7035A. Failure to do so might cause electric shock.

⚠ CAUTION

- Carry out the wiring work in conformity with the specifications in this document.
- To avoid electric shock or damage, connect the power supply last.
- Connect the blue signal lead from the C7035A to terminal F and the white signal lead to terminal G of the flame safeguard control. Incorrect wiring might damage the UV tube.



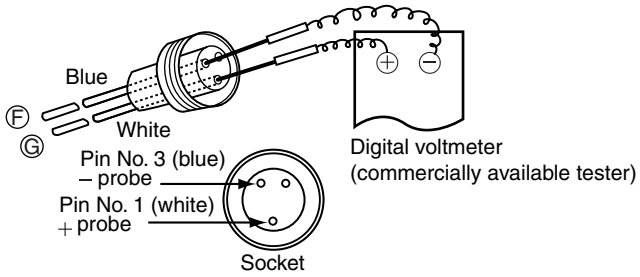


- Always keep the flame signal cables separate from the high-voltage ignition cables and power cables. Run the signal cables in a separate conduit.

● **Wiring check**

⚠ CAUTION

- Before turning the power supply ON, check that the wiring to terminals F and G is correct, using the steps below.



- Check procedure
  (1) Remove the UV tube from the socket.
  (2) Supply power to the flame safeguard control.
  (3) Measure the DC voltage in the socket with a digital voltmeter or tester.
    a. Connect the + probe to the No. 1 pin on the socket (white lead wire).
    b. Connect the – probe to the No. 3 pin on the socket (blue lead wire).
- Reference voltage (using an Advantest TR6841 voltmeter)

Power voltage	Measured DC voltage value
85 %	Positive (150 to 180 Vdc)
100 %	Positive (160 to 210 Vdc)
110 %	Positive (180 to 230 Vdc)

! Handling Precautions

- If the above measured value is negative, the wiring for terminals F and G is probably reversed.
- Mount the UV tube only after verifying by means of this wiring check that the wiring is correct.

■ Adjustment and inspection

After wiring, check the following:

(1) Insert the plug from the FSP136A100 analog flame meter into the flame current measurement jack on the amplifier of the flame safeguard control.

(2) Light a lighter or a match in front of the UV tube to check that the C7035A is operating properly.

! Handling Precautions

- Before using an open flame, check that there is no flammable gas in the vicinity.

(3) Mount the C7035A on the monitoring pipe temporarily.

(4) Start the combustion of the burner.

(5) To determine the optimal monitoring position, measure the flame current/voltage with the FSP136A100 analog flame meter while moving the monitoring pipe little by little in order to find a position where the highest stable current/voltage is shown, within flame current/voltage range specified for the flame safeguard control. Fluctuation within approximately the width of the flame meter needle is acceptable. For flame current/voltage ranges, refer to the user's manual for the flame safeguard control.

● **Pilot burner turndown test**

This test is intended to verify that the flame is correctly passed to the main burner when this device detects the pilot flame, even when the gas and air pressure are at their worst levels.

⚠ WARNING

- If the flame detector is set so that it detects a pilot flame that is too small to ignite the main flame, the C7035A will not be able to recognize (for example) a flame failure in the main burner. In this case fuel would continue to be supplied, causing a serious explosion hazard. To prevent this, be sure to do the pilot turndown test carefully.
- If it is necessary to do this test repeatedly, completely shut down all equipment each time the test is finished, and completely discharge unburned gas or oil that has accumulated in the ducts and combustion chamber. Failure to discharge unburned gas may result in an explosion.

⚠ CAUTION

- This test should be done only by a trained and experienced professional.

For details about how to carry out the pilot turndown test, refer to the user's manual of flame safeguard control used with this device, as well as the instrument manuals published by equipment manufacturers.

● **Ignition spark response test**

Make sure that the flame relay (normally relay 2K) is not affected by the spark generated by the ignition transformer. Make sure that the C7035A does not respond to the ultraviolet radiation from the ignition spark.

⚠ WARNING

- Make sure that this device does not detect ultraviolet rays other than those of the burner flame.

For details about how to carry out the ignition spark response test, refer to the user's manual for the flame safeguard control used with this device, as well as the instrument manuals published by equipment manufacturers.

■ Final mounting of the monitoring pipe

- When the equipment is operating properly with the specified flame voltage output after all adjustments have been completed, turn OFF the power to the equipment, remove the C7035A, and weld the monitoring pipe permanently.
- Securely mount the C7035A on the monitoring pipe and do the final wiring carefully.

■ Final inspection

To ensure proper burner control, do a trial run of at least one complete operation cycle of the combustion equipment to verify that all control operations function correctly.

4. Maintenance and Inspection

⚠ CAUTION

- The effective life of the UV tube is 3 years or a total of 25,000 hours of use after the date of inspection by Yamatake Corporation. To be safe, be sure to replace the UV tube within this period.
- To avoid damaging the UV tube during replacement, be sure to hold the socket rather than the glass tube.
- After a new UV tube is removed from its package, handle it carefully to prevent shock or impact that could cause damage.
- When transporting or storing the UV tube, pack it carefully in a secure packing box so that it is not damaged.

■ UV tube maintenance and inspection

● Flame failure test

Do this test periodically to check the function of the UV tube. During normal burner combustion, block the monitoring pipe window so that there is no flame signal, or else cut off the fuel at the source to extinguish the burner flame. Check that the flame failure is detected and that the main valve and pilot valve are closed.

● UV tube cleaning

Periodically clean the light-receiving glass surface of the UV tube using the following procedure:

(1) Remove the C7035A from the monitoring pipe.

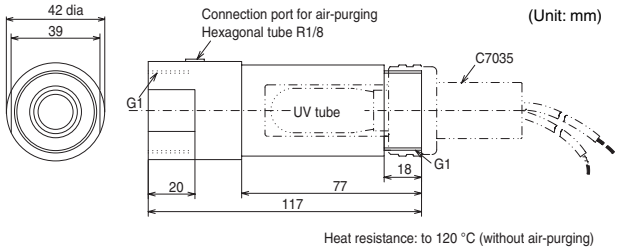
(2) Remove the protective cover, and clean the glass using a soft cloth.

(3) Reattach the protective cover.

(4) Put the C7035A back on the monitoring pipe.

● UV tube cooling

If the ambient temperature increases above 120 °C, the white points on the thermolabel will change color to black. In this case, make the air cooler by air-purging, or alternately use a sealed adapter (Part No. 81403159) to increase the distance from the heat source.

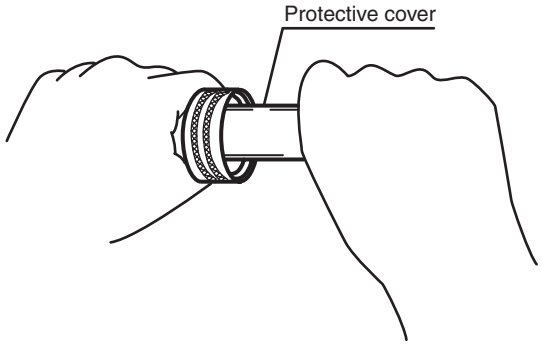


Heat resistance: to 120 °C (without air-purging)

● UV tube replacement method

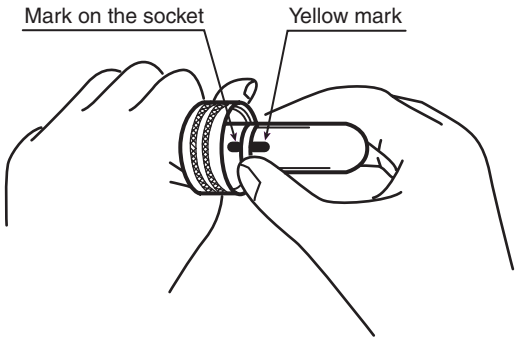
(1) Protective cover

Remove and replace the protective cover carefully so as not to damage the UV tube. When putting the cover on, be sure to push it fully to the end so that it does not fall off during use.



(2) UV tube

Hold the socket when inserting or removing the UV tube to avoid damaging the tube. To insert, first align the yellow mark on the UV tube with the mark on the socket, and then push the tube fully into the socket.



! Handling Precautions

- Do not touch the light-receiving glass face by hand.

5. Specifications

Item	Specifications
Model No.	C7035A1064J
Applicable types of flame	City gas, natural gas, propane gas, butane, kerosene, heavy oil, ethylene, etc.
Power supply	From the flame safeguard control device
Allowable current	10 mAdc max.
Power consumption	250 mW max.
Ambient temperature	-40 to +120 °C
Ambient humidity	40 °C 90 % RH max.
Mass	150 g
Insulation resistance	50 MΩ min. by 500 Vdc megger (between each lead wire and the metal part of socket when the UV tube is removed)
Allowable pressure	34.5 kPa
Vibration resistance	5 m/s^2 max. (10 to 60 Hz for 2 hours each in X, Y and Z directions)
Mounting nut	1-11BSP (G1 or equivalent)
Lead wires	AWG #18 (approx. 1.2 mm^2) stranded wire with heat-resistant silicone rubber insulation, 1800 mm long (blue and white)
Conduit	1/2-14BPS (G1/2 or equivalent)
Standards compliance	UL, FM and CSA
Flame signal wire	Standard: 2.0 mm^2, 600 Vac cable with PVC insulation ("IV cable") Max. length: approx. 200 m

6. Compatible Flame Safeguard Controls (sold separately)

Flame Safeguard Control	Model No.	Amplifier
Protectorelay	RA890G	built-in
	R4750C	
	R4780C	
	R4150	R7259B
Relay module	RM7800 Series	R7849A
Flame module	WN200A (discontinued)	R7259B
	WN210A (discontinued)	
Flame relay	FRS100C	built-in

7. Maintenance/Optional Parts (sold separately)

Name	Model No.
UV tube protective cover	191284
UV tube (ultraviolet photoelectric tube)	129464NJ
Sealed adapter	81403159
Analog flame meter	FSP136A100
Flange gasket	129808

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Specifications are subject to change without notice. (08)
Yamatake Corporation
Advanced Automation Company

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