azbil

No. CP-SP-1454E

Flame Monitor

Model AUR355

User's Manual

Thank you for purchasing your Azbil Corporation product.

This manual contains information for ensuring the safe and correct use of the product.

Those designing or maintaining equipment that uses this product should first read and understand this manual. This manual contains information not only for installation, but also for maintenance, troubleshooting, etc. Be sure to keep it nearby for handy reference.

Azbil Corporation

NOTICE

Please make sure that this manual is available to the user of the product.

Unauthorized duplication of 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 complete and accurate, but if you should find an omission or error, please contact us.

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

Conventions Used in This Manual

■ The safety precautions explained below aim to prevent injury to you and others, and to prevent property damage.

⚠WARNING	**Warnings are indicated when mishandling this product may result in death or serious injury.**
⚠CAUTION	**Cautions are indicated when mishandling this product may result in minor injury or property damage only.**

■ In describing the product, this manual uses the icons and conventions listed below.


: Indicates that caution is required in handling.


: The indicated action is prohibited.


: Be sure to follow the indicated instructions.

Handling Precautions : Information to be aware of when handling.

Note: : Indicates information that may be useful.

☞ : Indicates an item or page to which the user may refer.

(1) (2) (3): : Steps in a sequence or parts of a figure, etc.

Safety Precautions

WARNING

 **Before mounting, removing, or wiring, be sure to turn off the power to this device and all connected devices. Failure to do so may result in an electric shock.**
 **This device has functions that are extremely important for the safe operation of combustion equipment. Use it correctly in accordance with the user's manual.**
 **This device does not have a prepurge and sequence function. Use this device as part of a system whose design gives careful consideration to the function established safety guidelines. If the combustion chamber and gas flue are not ventilated to remove any unburned gas, the ignition process may cause an explosion.**
 **Make sure that the AUD flame sensor does not detect UV rays from a source other than the burner.**
 **Do not touch terminal 14 (F) after turning the power off. An electric charge may remain on terminal 14 (F) and may cause an electric shock.**
 **Carry out the pilot turn-down test carefully. If the flame detector is set so that it detects a pilot flame that is too small to ignite the main burner, this device will not be able to detect a flame failure in the main burner. In that case, fuel will continue to be supplied, causing a serious explosion hazard.**
 **Do not use the event output or alarm output as safety output.**
 **This device has a limited product life. Replace this device within its product life. Beyond the product life, the risk of device failure becomes higher.**
 **Do not disassemble this device. Doing so may cause malfunction, device failure, or electric shock.**
 **Do not operate this device without first completing its adjustment and testing, and also the testing specified by the combustion equipment manufacturer.**
 **Never short-circuit the start contact in order to start and stop this device by switching the power on and off. This is very important for reliable activation of the self-check circuit at device startup. Failure to observe this warning could lead to an explosion.**
 **Before doing the pilot turn-down test or ignition spark response test, make sure that all manual fuel valves are closed.**
 **If the pilot turn-down test must be carried out repeatedly, completely stop all combustion equipment each time the test is finished, and completely discharge unburned gas or fuel oil that has accumulated in the combustion chamber, ducts, and flues. Otherwise, an explosion may result.**
 **After completing the pilot turn-down test, turn off the power switch. Restore the original state of all test jumpers and limit switches and reset the controller settings. If operation begins without the above steps, damage to the equipment, gas leak, or explosion may result.**
 **Close the fuel valve before using the flame simulator for a check while this device is attached. If you use the flame simulator during normal operation, since a flame will seem to be present, fuel will continue to be supplied even if the pilot burner or main burner is off, possibly causing an explosion.**
 **For the combustion equipment to be connected to this device, select reliable devices in accordance with the regulations and laws on combustion equipment, and take care to design the circuit correctly.**

⚠ CAUTION

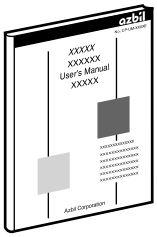
Installation, wiring, maintenance, inspection, and adjustment must be carried out by a professional with technical training in combustion equipment and combustion safety.
Use this unit correctly within the range of the rated specifications stated in the user's manual. Not doing so may cause device failure or malfunction.
Do not install this product in a place with any of the following characteristics. • **Certain chemicals or corrosive gases (ammonia, sulfur, chlorine, ethylene compounds, acid, etc.)** • **Splashing water or excessive humidity** • **High temperatures** • **Prolonged vibration**
Wire this device correctly by using the wiring method, power, and installation method specified in this user's manual. Not doing so may cause device failure or malfunction.
Provide appropriate maintenance and inspection for the product, following the methods, procedures, replacement cycle, etc., specified by this user's manual.
When disposing of this device, dispose of it as industrial waste, following local regulations.
If timers and auxiliary relays are needed for additional functions, select ones with being listed or component recognized by authorities, and be sure to design the circuit correctly.
Use this device within the operating ranges given in the specifications for temperature, humidity, voltage, vibration, shock, mounting position, atmosphere, etc.
Make sure that the flame detector does not detect the ignition spark. If the ignition spark is detected, change the position of the flame detector or ignition electrode.
For mounting and wiring, follow the instructions in this user's manual or in manuals provided by the combustion equipment manufacturer.
The ignition transformer ground must be directly connected to the burner itself or to metal that is electrically connected to the burner.
Keep power wires and the ignition transformer high voltage cable separate from the flame detector wiring.
Make sure that ignition transformer high-voltage cables are properly connected to prevent faulty contact. Faulty contact can generate high-frequency radio waves, causing malfunction.
Connect the power supply last to prevent electric shock or damage. Otherwise touching terminals by mistake may cause electric shock or may damage the device.
Always supply electricity at the voltage and frequency stated on the model label of this device.
Make sure the burner frame is properly grounded complying with applicable local electrical codes, ordinances and regulations.

⚠CAUTION

The pilot turn-down test should be carried out only by specialists who have knowledge and skills concerning combustion equipment and combustion safety.
If the combustion equipment is restarted after a safety shutoff, do all of the inspection steps described in ☞ Chapter 5. Trial Operation and Adjustment.
When doing a maintenance inspection of the burner, be sure to do the pilot turn-down test. Inspection must be done at least once a year.
Inspect the combustion equipment periodically in accordance with the instructions given in the manual provided by the equipment manufacturer.
When cleaning the burner, clean the flame detector also.
When transporting or storing this device, temporarily remove it from the sub-base and pack it in the box it was originally shipped in. Transportation while attached to a panel, etc., may cause damage.
Do not connect a load that exceeds the rating stated in the specifications to the flame output (terminals 11–12). The non-replaceable fuse between these terminals will burn out. If the fuse burns out, replace this device.
Flame output (terminals 11–12) is the safe output of this device. However, this device does not detect the short circuit of the flame output (terminals 11–12). Check that the flame output (terminals 11–12) is opened before carrying out flame detection with the flame output (terminals 11–12).
Flame output (with start check)(terminals 6–7), and flame relay N.C. output (terminals 6–5) are the compatible outputs of AUR300/350. No fuse is built in these outputs. Be sure to install a fuse or circuit breaker externally to guard against a short circuit of the load. If a short circuit of the load occur, this product should be replaced because there is an increased probability of contact failure.
Flame output (with start check)(terminals 6–7), and flame relay N.C. output (terminals 6–5) are outputs for replacing the equipment which was performing manual ignition by previous product AUR300/350. These outputs do not conform to any safety standard. Use flame output (terminals 11–12), when this device performs the flame detecting of a burner.
Flame signal that are detected while this device is in the standby state should not use to equipment as an important interlock or malfunction alarm. In rare cases, flames may be detected momentarily due to ultraviolet radiation from a source other than flames.
If inductive loads, such as relay coils, are used for the Non-voltage contact outputs (terminal 5-6, terminal 6-7, terminal 9-10 or terminal 11-12) of this device, surge voltage generates between the contacts. If it causes unevenness on the contacts surface, the contacts may lock before the lifetime is reached. When implementing surge voltage countermeasures, connect a surge protector on the load side. However, if it is connected, the recovery time of the inductive loads will be delayed, so check the operation with the actual load before use.

The Role of This Manual

There are four different manuals related to model AUR355. Read them as necessary for your specific requirements. If you do not have a manual you require, please contact us or one of our dealers.

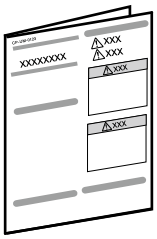


Flame Monitor Model AUR355 User's Manual

Document No. CP-SP-1454E

This manual.

Personnel who are using model AUR355 for the first time, or are designing combustion equipment that uses the AUR355, or are designing hardware used to incorporate it into a control panel, etc., or are maintaining the AUR355, should read this manual thoroughly. This manual gives an overview of the product, tells how to install and wire it for incorporation into equipment, and gives an overview of operation, trial operation and adjustment methods, communication, maintenance and inspection, and specifications.

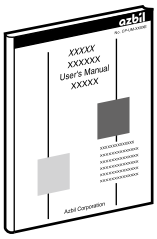


Flame Monitor Model AUR355 User's Manual for Installation

Document No. CP-UM-5965JE

This manual is supplied with the AUR355.

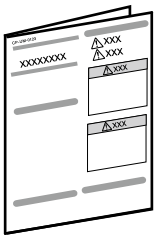
Personnel who design or maintain equipment that uses the AUR355 should read this manual thoroughly. This manual describes installation of this device.



Flame Monitor Model AUR355 User's Manual for Communication Functions

Document No. CP-SP-1453E

Personnel who use the communication functions of the AUR355 should read this manual. Refer to this document when creating communication programs for equipment that uses this device. It describes the items displayed on this device, communication procedure, communication data list, troubleshooting, and communication specifications.



Installation and Usage Guide for Smart Loader Package Model SLP-A55 for Burner Controller Model AUR_55

Document No. CP-UM-5956JE

This manual is supplied with Smart Loader Package model SLP-A55.

Personnel who design equipment that uses the AUR355 or who configure and maintain the AUR355 using the SLP-A55 should read this manual thoroughly. It describes the PC software used to configure various settings for the AUR355 and to read out internal data from the AUR355. The manual describes installation of the software on a PC, its operation on the PC, and setup procedures.

Contents

-MEMO-

Chapter 1. Overview

The AUR355 flame monitor (hereafter “this device”) is a combustion safety device that performs self-checking of its built-in flame detection circuit continuously to ensure safety. This device can be used in combination with the AUD300C advanced ultraviolet flame detector, the AUD500C explosion-proof advanced ultraviolet flame detector, or a flame rod.

The AUR355 drives the shutter that is built into the AUD300C/500C to continuously check both its own flame detection circuit and the ultraviolet detector in order to provide flame detection for continuous burner operation. Also, when used with a flame rod, the AUR355 continuously checks its own built-in flame detection circuit to provide flame detection for continuous burner operation. Also, it is equipped with a 7-segment display that can be used in maintenance. Additionally, the device is equipped with host communications (RS-485) and a smart loader package function, allowing more detailed observation of status and troubleshooting.

- The operating status codes, event codes and flame voltage are shown on the 7-segment display.
- LED indicators show whether there is a flame signal and indicate a fault stop.
- Self-diagnosis of the internal control relay circuit
- Equipped with host communications (RS-485) to enable remote monitoring.
- DIN rail mounting and a sub-base structure are provided for easy installation and replacement.

■ Handling Precautions

- This device is equipped with functions that are extremely important for the safe operation of combustion equipment. Be sure to follow the instructions stated in this user’s manual.
- Installation, wiring, maintenance, inspection, and adjustment of this device must be carried out by a professional with technical training in combustion equipment and combustion safety.

■ Cautions for combustion equipment design

Facilities that use a flame safeguard system must be designed in compliance with relevant laws, standards, safety guidelines, and the like.

If the system is designed to foreign specifications, please observe the local laws and standards.

- Main safety policies in Japan
  Technical Policy on Safety Standards for Combustion Equipment in Industrial Furnaces, by Ministry of Health, Labor and Welfare
- Combustion Equipment in Compliance with the Safety Principles for Industrial Incinerators - JIS B 8415
- Forced Draught Burners — Part 1: Gas Burners (JIS B 8407-1)
- Forced Draught Burners — Part 2: Oil Burners (JIS B 8407-2)
- Index of Safety Technology of Industrial Gas Combustion Equipment, by Japan Gas Association
- Index of Safety Technology of Gas Boiler Combustion Facilities, by Japan Gas Association

■ Most important points for ensuring safety

Design the equipment observing the following points to ensure safety.

- If loads are driven by this device, connect the loads directly to this device.
- Make sure that the start check runs correctly at startup.
- Do not add a bypass circuit that allows manual operation of any load.
- Both the main valve and pilot valve must have redundant shutoffs.

■ Precautions for system design

Provide a purge function with external instrumentation, taking into account factors such as the conditions for purge and the time settings.

■ Model No.

The dedicated sub-base, sideboard, and front connector are not included with this device. Please order them separately.

Basic model No.	Flame sensor	Flame sensitivity	Flame response	Power voltage	(Reserved)	(Reserved)	Other	Description
AUR355								–
	B							Flame rod
	C							UV flame detector
		1						Standard
			3					4 s max. (nominal: 3 s)
		*	2					2 s max. (nominal: 1.5 s)
				1				100 V AC
				2				200 V AC
				3				220 V AC
					0			–
						0		–
							0	Without inspection data
							D	With inspection data

*AUR355C only

■ Related devices

● Compatible ultraviolet flame detector (sold separately)

Model No.	Name
AUD500C11000	Explosion-proof Advanced Ultraviolet Flame Detector
AUD300C100_	Advanced Ultraviolet Flame Detector
AUD300C110_	

_ : 0 : standard product
D : with inspection certificate (with data)
T : with tropicalization
Y : with traceability certificate
DT : with tropicalization and inspection certificate
YT : with traceability certificate and tropicalization

● Optional parts (sold separately)

Model No.	Name
BC-R05A100	Dedicated sub-base (a requirement for the AUR355)
81447514-001	Connector for front wiring Weidmüller model number BL3.5/11F Compatible wire: 0.2–1.5 mm^2 (28–14 AWG)
81447514-002	Connector for front wiring (for right-side wiring) Weidmüller model number BL3.5/11/270F Compatible wire: 0.2–1.5 mm^2 (28–14 AWG)
81447515-001	Sideboards (2)
SLP-A55J91	Smart Loader Package (without cable)
81441177-001	USB loader cable
FSP136A100	Analog flame meter
81447519-001	Jack cover (1)
83968019-001	Surge absorber

Chapter 2. Installation and Wiring

WARNING
This device is equipped with functions that are extremely important for the safe operation of combustion equipment. Be sure to follow the instructions stated in this user's manual.
Before mounting, removing, or wiring, be sure to turn off the power to this device and all connected devices. Failure to do so may result in electric shock.

CAUTION
For mounting and wiring, follow the instructions in this user's manual or in manuals provided by the combustion equipment manufacturer.
Follow all applicable regulations when doing the wiring work.
Connect the power supply last to prevent electric shock or damage. Otherwise touching terminals by mistake may cause electric shock or may damage the device.
Do not use unused terminals on the device as relay terminals.
Make sure that loads connected to the terminals do not exceed the rating indicated in the specifications.
Always supply electricity at the voltage and frequency stated on the model label of this device.
Make sure the burner frame is properly grounded complying with applicable local electrical codes, ordinances and regulations.
Run the high-voltage ignition transformer cable separately and keep it at least 30 cm away from this device.
Keep power wires and the ignition transformer high voltage cable separate from the flame detector wiring.
Make sure that ignition transformer high-voltage cables are properly connected to prevent faulty contact. Faulty contact can generate high-frequency radio waves, causing malfunction.
The ignition transformer ground must be directly connected to the burner itself or to metal that is electrically connected to the burner.
Check that the wiring is correct before use. Incorrect wiring may cause damage or faulty operation.
If the wiring from this device exceeds the recommended length, prevent malfunction due to the effects of external noise by running wires from the control panel to the case through a conduit, keeping power lines and input lines apart from each other, and other measures. Check the operation of the system after installation.
After turning on the power, allow sufficient time before checking the output of this device. This device does not start operation until about 8 seconds after power-on.

CAUTION
When disposing of this device, dispose of it as industrial waste, following local regulations.
Use a surge protector or similar device if there is a risk of power surges caused by lightning. Failure to do so may cause fire or device failure.
Use the contact reset input (terminal 24) for one AUR only. Do not use the terminal for contact reset input to other AUR355 devices.
Do not share the output common (terminal 6) and the input common (terminals 19, 20) with other AUR355 devices.
Do not provide instrumentation to stop the power to the device as soon as the alarm operates. When the power to this device is turned on again, an alarm may be activated (E908).
To prevent malfunction caused by the effect of external noise, in operations other than trial operation, maintenance, or troubleshooting, do not keep the loader cable connected during the operation.
Take countermeasures based on the instruction manual for that device if there is a device such as an inverter nearby that generates strong electrical noise.
Firmly tighten the terminal screws to the torque listed in the specifications.

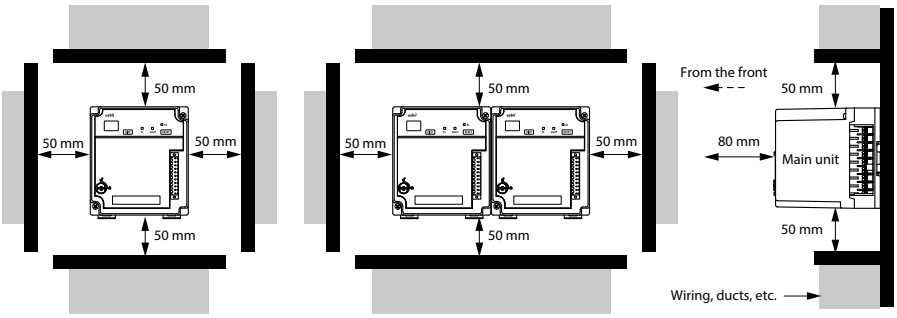
■ Installation method

WARNING
Before mounting, removing, or wiring, be sure to turn off the power to this device and all connected devices. Failure to do so may result in an electric shock.

CAUTION
Installation, wiring, inspection, adjustment, and maintenance must be carried out by experienced specialists who have knowledge and skills concerning combustion equipment and this device.
Do not install this product in a place with any of the following characteristics. • **Certain chemicals or corrosive gases (ammonia, sulfur, chlorine, ethylene compounds, acid, etc.)** • **Splashing water or excessive humidity.** • **High temperatures** • **Prolonged vibration**
When using this device in a burner control system, install it in a control panel that is rated IP40 or more. To achieve IP40 protection without installing in a control panel, mount this device on separately-sold sideboards. The protection rating of this device is equivalent to IP10.

■ Cautions regarding installation

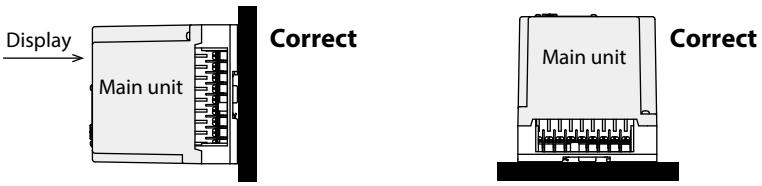
- Leave space 50 mm above and below, 50 mm on the left and right, and 80 mm in the front as space for removal, wiring, and maintenance. Also, do not install this device close to electrical power devices or other sources of heat.



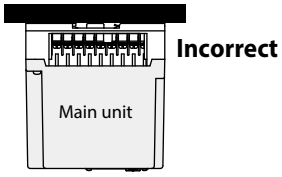
- This device must be installed in a grounded and conductive control panel to ensure safety.
- Do not pull on the wiring while it is attached to the device. Doing so can cause failure of the connectors or this device itself.
- If there is room, leave as much space as possible between them for heat dissipation.
- If the ambient temperature is close to the allowable upper limit, install a panel air conditioner or a fan to lower the temperature inside the panel.
  Upper limit of allowable ambient temperature, for installation of single unit: 60 °C, for gang mounting: 45 °C
- Firmly tighten the terminal screws with a torque of 0.5 N·m or less.

■ Installation orientation

Attach the device in the orientation shown below.



Do not install it in the orientation illustrated below.

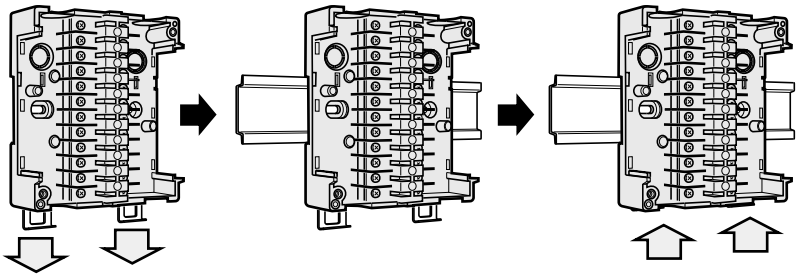


■ Mounting on a DIN Rail

(1) Pull down the sub-base's DIN rail clamps.

(2) Attach the sub-base to the DIN rail, making sure that the sub-base is not upside-down.

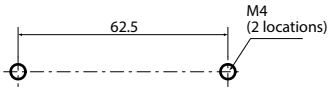
(3) Push up the DIN rail clamps to fasten the sub-base to the DIN rail.



■ Mounting in a panel

(1) Cut two M4 threaded holes in the panel.

Unit:mm



(2) Use screws to mount the sub-base in the panel.
(Maximum tightening torque: 1.2 N·m)

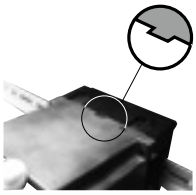
CAUTION

Turn the power off before mounting the device on the sub-base. Otherwise, device failure may result.

■ Mounting the main unit on the sub-base (sold separately) and removing it

● Mounting

(1) Align the indentation in the center of the top of the device with the projection on the sub-base.



(2) Once aligned as in (1), slowly push the device toward the sub-base.

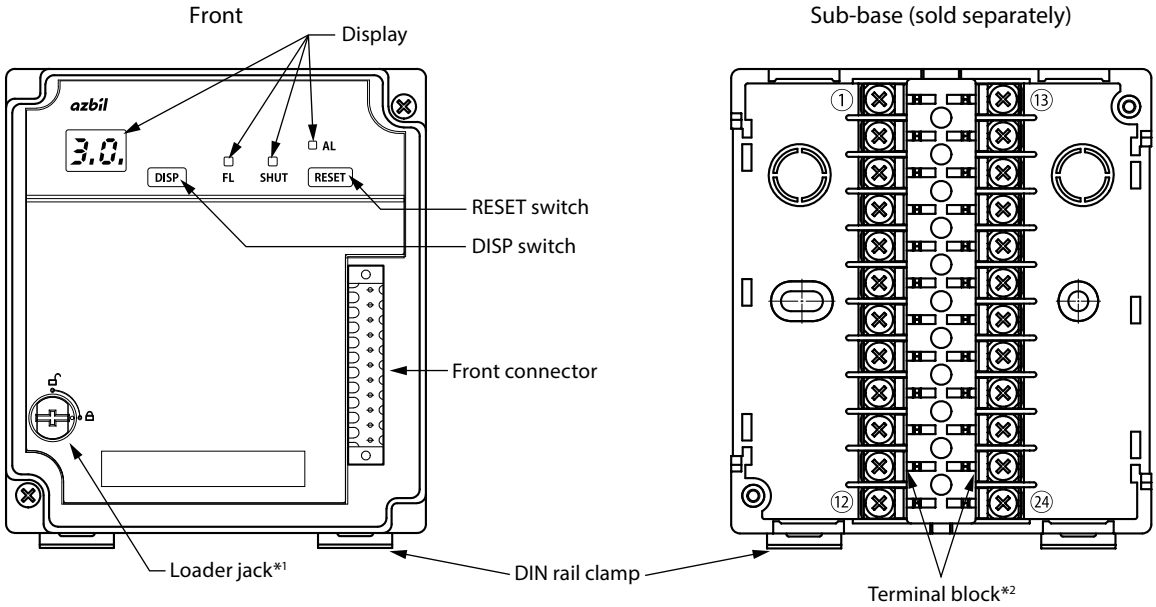
(3) Tighten the device's retaining screws to secure it in the sub-base. (Maximum tightening torque: 0.5 N·m).

● Removing

(1) Remove the mounting screws.

(2) Pull the device out toward you while holding down the sub-base.

■ Terminal numbers, front panel item names



*1 Also used as a Smart Loader Package jack

*2 Firmly tighten the terminal screws with a torque of 0.5 N·m or less.

■ Terminal numbers

● Sub-base terminals

No.	Code	Function	No.	Code	Function
1	–	Not used	13	–	Not used
2	AC-H	Power supply (H)	14	F	Flame detector (F)
3	AC-G	Power supply (G)	15	G	Flame detector (G)
4	–	Not used	16	S1	Shutter output 1 (for AUR355C)
5	NC	Flame relay N.C. output	17	S2	Shutter output 2 (for AUR355C)
6	COM	Contact output common	18	–	Not used
7	FC	Flame output (with start check)	19	COM1	Input common 1
8	–	Not used	20	COM2	Input common 2
9	EV-NO	Event output	21	START	Start input
10	EV-COM	Event output	22	–	Not used
11	FL-NO	Flame output	23	–	Not used
12	FL-COM	Flame output	24	RESET	Contact reset input

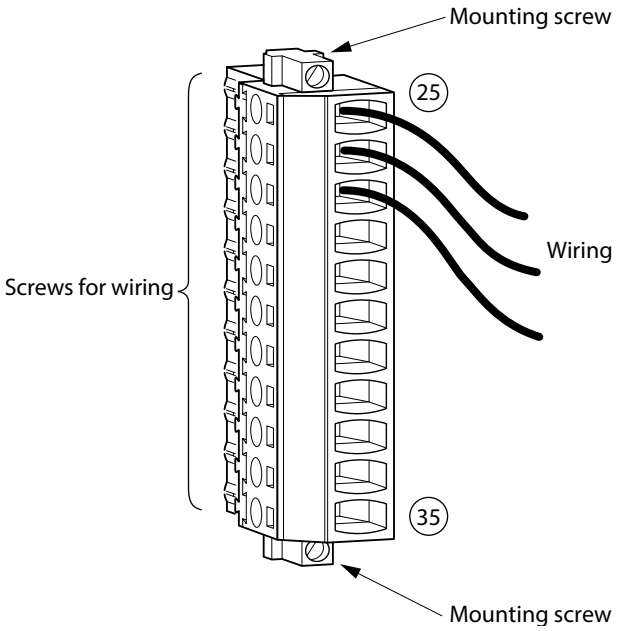
● **Front connector terminals**

No.	Function	
25	FV+	Flame voltage output (+)
26	FV–	Flame voltage output (–)
27	DA	RS-485 (DA)
28	DB	RS-485 (DB)
29	SG	RS-485 (SG)
30	–	Not used
31	–	Not used
32	–	Not used
33	–	Not used
34	–	Not used
35	–	Not used

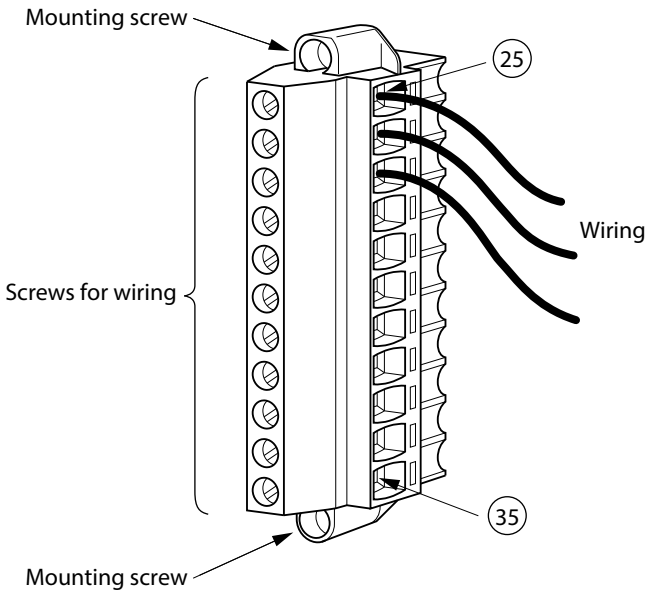
● **LED indication**

Name	Code	Color	Function
7-segment LED	–	Green	When normal: operating status code / flame voltage / event code When an error occurs: alarm code / flame voltage
FLAME	FL	Green	Lit when flame signal is detected, OFF when flame signal is off.
SHUTTER	SHUT	Green	LED is ON when the flame detection circuit is being checked.
ALARM	AL	Red	ON when fault stop occurs, OFF when there is no fault stop. While contact reset input is not accepted, the alarm LED blinks.

● **Connector for front wiring (model 81447514-001) terminal layout**

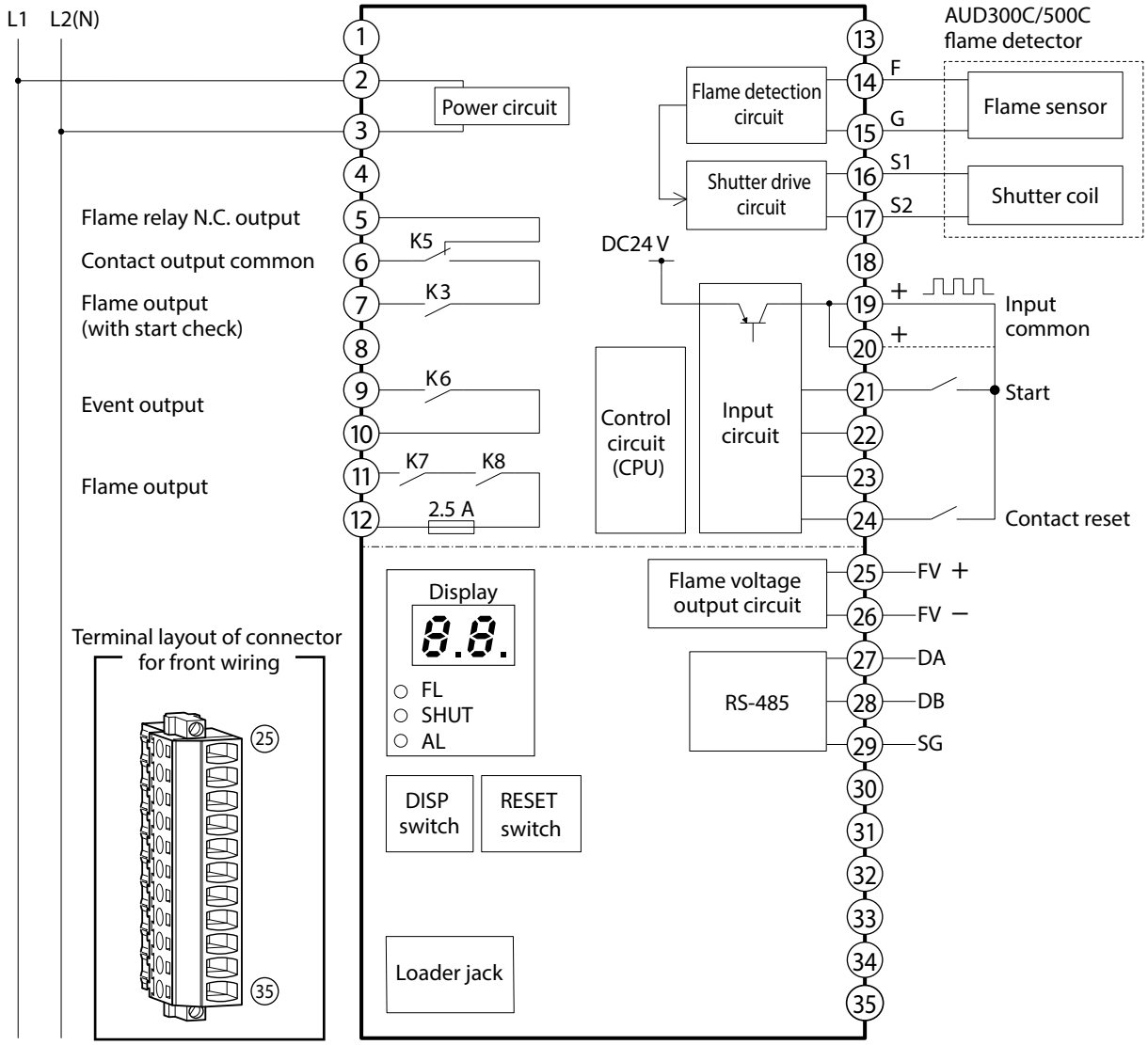


● **Connector for front wiring (for right side wiring) (model 81447514-002) terminal layout**



■ Example of wiring with external devices (terminals 1–24: sub-base; terminals 25–35: front connector)

● **Flame sensor: UV sensor**

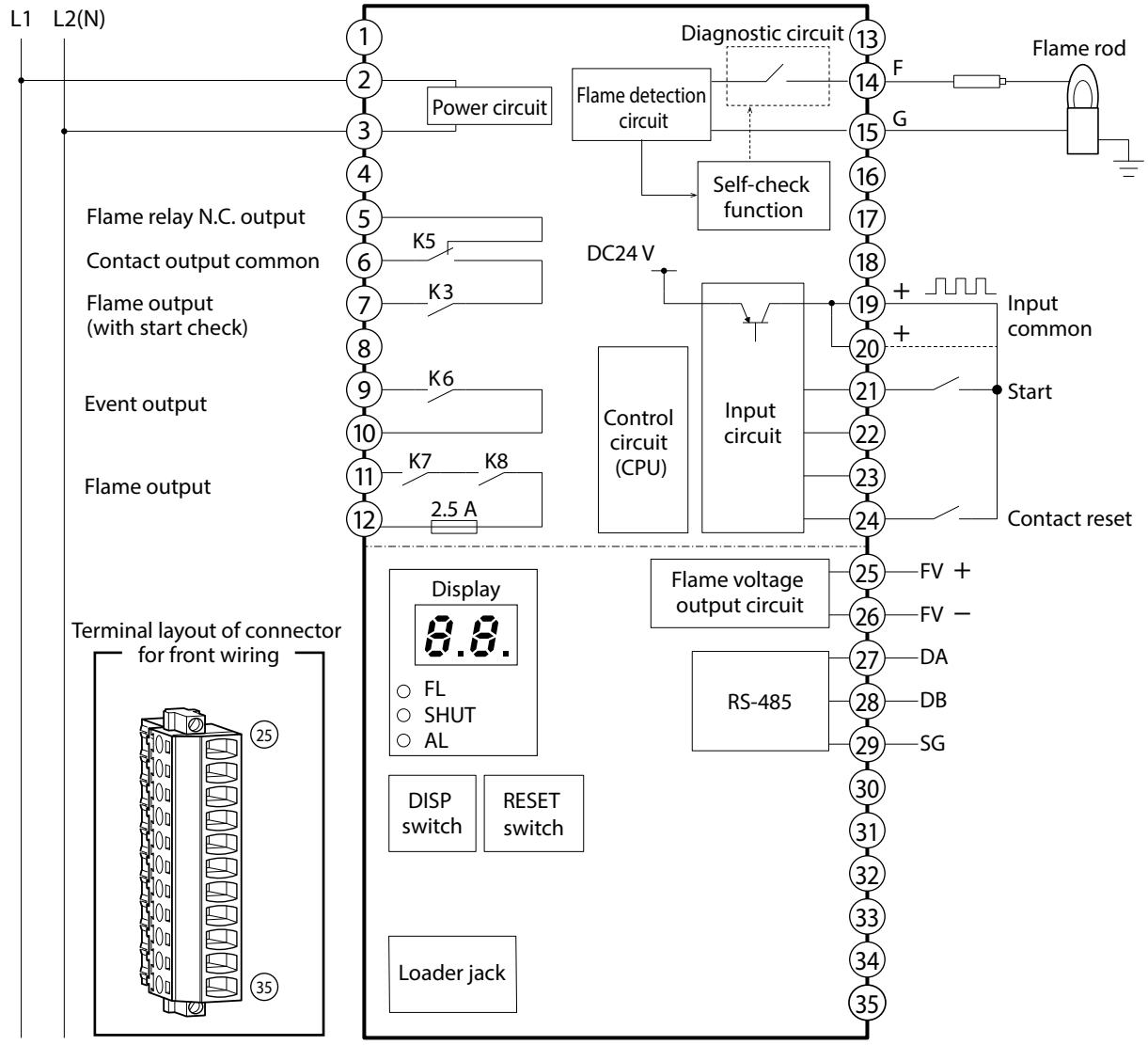


K3: Start check relay
K5, K7, K8: Flame relay
K6: Event relay

! Handling Precautions

- After mounting the connector for front wiring, secure it in place with the mounting screw on the side of the connector.
- Use the contact reset input (terminal 24) for one AUR only. Do not use the terminal for contact reset input to other AUR355 devices.

● **Flame sensor: flame rod**



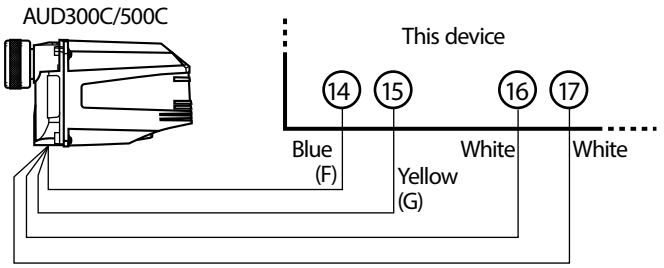
K3: Start check relay
K5, K7, K8: Flame relay
K6: Event relay

! Handling Precautions

- After mounting the connector for front wiring, secure it in place with the mounting screw on the side of the connector.
- Use the contact reset input (terminal 24) for one AUR only. Do not use the terminal for contact reset input to other AUR355 devices.

■ Connection with model AUD300C/500C

Connect to the AUD300C or AUD500C as shown.



! Handling Precautions

- AUD300C and 500C signal wires (blue and yellow) have polarity. Connect the blue wire to terminal 14 (F), and the yellow wire to terminal 15 (G). A reversed connection will damage the tube unit and cause a malfunction.
- To extend the wiring, use 1.25 mm^2 600 V PVC-insulated cable (IEC 60227-3), and keep the wiring no longer than 200 m.

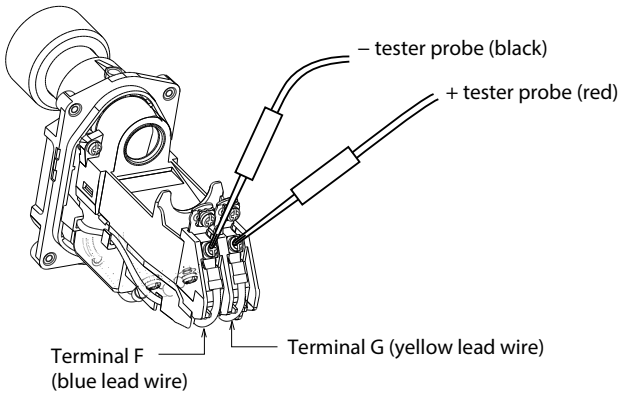
■ Check of wiring between this device and model AUD300C or AUD500C

Necessary tools: tester
Input impedance of 100 kΩ or more

To check that wiring to this device is correct, remove the tube unit from the AUD300C or AUD500C and measure the DC voltage between terminals F and G with the tester as shown below.

Connect the + tester probe (red) to terminal G (yellow lead wire) and the – tester probe (black) to terminal F (blue lead wire).

≫ If the reading is between 160 and 220 V DC, the leads are connected correctly. If a negative voltage is measured, terminals F and G are reversed.

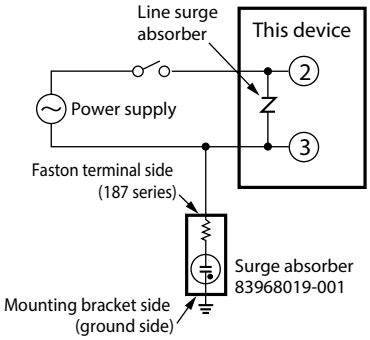


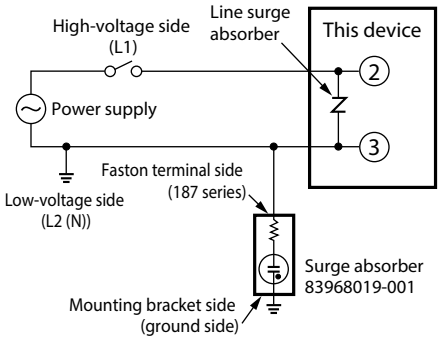
Terminal	Tester probe	Voltage
F	– (black)	160 to 220 V DC
G	+ (red)	

● Sample countermeasure for power surges caused by lightning

When using a surge absorber as a countermeasure for power surges caused by lightning, connect it between terminal 3 and ground, as shown below.

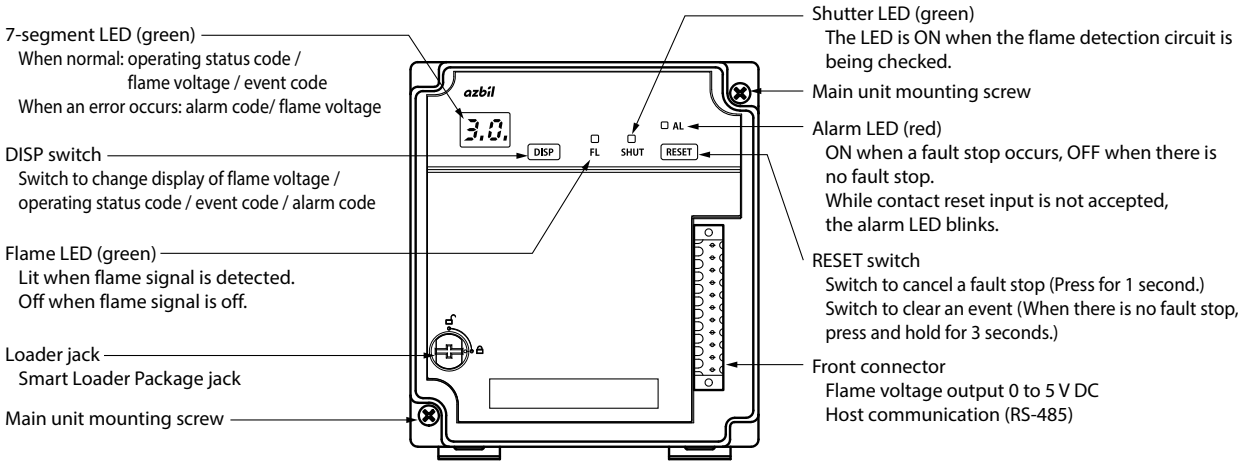
The mounting brackets of the surge absorber are electrically connected internally by crimping to the ground side of the absorber. Therefore, the absorber can be grounded simply by attaching the brackets to a grounded metal part such as the combustion equipment housing. For wiring to the power supply, use 0.75 mm^2 or larger wires (diameter: 0.18, strand count: 30), in compliance with JIS C 3306. Attach a #187 Faston receptacle at one end and keep the wire length as short as possible.





Chapter 3. Operating This Device

■ Part names



All the LEDs are lit for 4 seconds after the power is turned on, and then they turn off, and the display of the operating status code begins. If a fault stop occurs, the alarm code and the code for the operating status where the fault stop occurred are displayed alternately.

- Identifying information

Item		Notation
Product number		AUR355 _ _ _ _ _ _ _
Voltage		AC _ _ _ V
Timing	Flame failure response time	FFRT _ s

● 7-segment display lower-right LED dot

If the dot at the bottom right of the 7-segment LED is blinking, initialize the settings. For the method of initialization, see ☞ Operation when the dot at the lower right of the 7-segment LED is blinking (p. 21).

■ Operation

● DISP switch

● During normal operation

The 7-segment display shows the operating status code. Every time the DISP switch is pressed, the display cycles through the operating status code, the flame voltage, and (only if an event occurs) the event code.

- Operating status codes

Code	Status
PF	Flame is being monitored.
PE	False flame is detected.
- -	Controlled shutdown

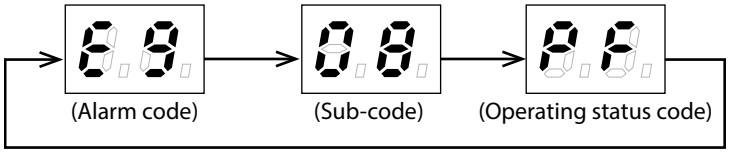
● When an error occurs

The 7-segment display alternately displays an alarm code and the code for the operating status where the fault stop occurred. Every time the DISP switch is pressed, the display changes between the flame voltage and alternate display of the alarm code and the operating status code when fault stop occurred.

• Alarm codes

Alarm codes	Sub-code	Description
E9	08	Alarm at power-on
E9	50–	Device error

Display example when an error occurs

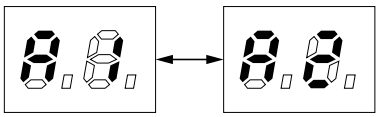


The item displayed changes every 0.8 s.

● If an event occurs

If an event specified in advance occurs, the 7-segment display displays the event code. If multiple events have occurred, all the corresponding event codes are sequentially displayed starting from the smallest one.

Display example (if events A1 and A2 have occurred)



The item displayed changes every 0.8 s.

Press the RESET switch for 3 s or longer or short the contact reset input for 3 s or longer to clear all active events at the same time. However, note that the RESET switch and contact reset input cannot be used to clear events during a fault stop.

Event name	Event No.	Operation
UV flame detector check (combustion time)	A1*1 *2	Turns ON if the combustion time exceeds the value set for the UV flame detector (combustion time) checking time. Utilize this event for maintenance of the equipment, in order to know when to replace the flame detector, etc.
Product service life check (total operating time)	A2*2	Turns ON if the total operating time exceeds the value set for the product service life (total operating time) checking time. Utilize this event for maintenance of the equipment, in order to know when to replace this device or all connected devices.
Product service life check (total combustion count)	A3*2	Turns ON if the total combustion count exceeds the value set for the product service life (total combustion count) checking time. Utilize this event for maintenance of the equipment, in order to know when to replace this device or all connected devices.
False flame	A4	Turns ON if the flame relay is ON before startup and the start check relay does not turn ON after startup. Possible cause: false flame, or welding of flame relay contacts
Flame relay OFF	A5	Turns ON if the flame relay turns OFF (indicating a flame failure) when the start input is ON during flame monitoring (PF). Use this event to check the flame detection status.
Flame relay OFF (shutter closed)	A6	AUR355C: Turns ON if the start input is ON and if the shutter is closed for 5 s or more. Use this event to diagnose a failure of the flame detector or this device. AUR355B: This event does not occur.

*1 This can also be used as a maintenance event for the flame detector or flame rod.

*2 Events A1 to A3 occur regardless of whether the start input is ON or OFF.

Handling Precautions

- When the product is shipped, only A1 (UV flame detector check) is configured as an event.
- It is necessary to configure event settings in order to have an event code displayed when an event occurs. Configure event settings using Smart Loader Package model SLP-A55 (SLP-A55J91).

● RESET switch

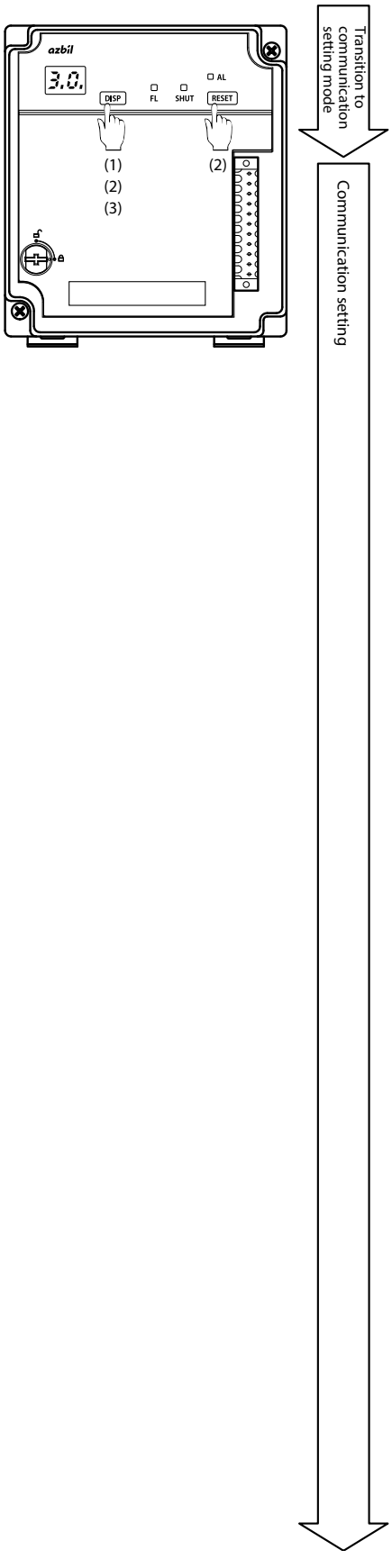
A fault stop can be canceled by pressing the RESET switch for 1 second. After a fault stop is canceled, start input is not accepted for about 5 seconds.

● Contact reset input (terminal 24)

A fault stop can be canceled by shorting the contact reset input for 1 second.

After a fault stop is canceled, start input is not accepted for about 5 seconds.

■ Communication setting mode



(1) Press and hold the DISP switch for approximately 5 s or more during the stop status (when the start switch is OFF). The 7-segment display changes to C 1 and the system goes into communication setting mode. The central dot of the 7-segment display starts blinking. (a 1 s cycle)

(2) When the DISP switch is pressed, the display changes in the following order: ↵ H1 → H2 → H3 → CL ↵
Select a communication setting type using the DISP switch.

Display	Description
H1	Communication address setting
H2	Baud rate setting
H3	Communications format setting
CL	Initialization of settings

Note

- For the 200 or 220 V AC model, you can set H1, H2, and H3 even if the power is 100 V AC.

● Selection of communication setting mode

● When a selection from H1 to CL is made

• Communication address setting (H1)

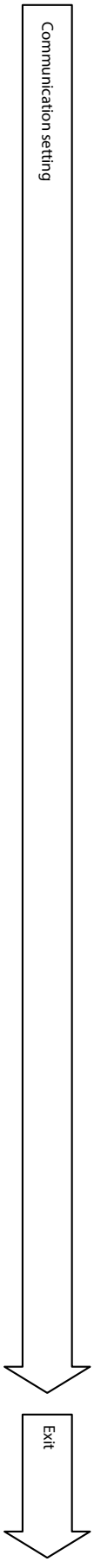
Use the DISP switch to select H1 on the 7-segment display.

1. Press the RESET switch. The 7-segment display shows H1/_. _ is the address value. (Default setting: 1)
2. When the DISP switch is pressed in this situation, the display cycles through ↵ H1/1 → H1/2 → H1/3……H1/32. ↵
   Select the address.
3. After making a selection, press the RESET switch.
   "H1" blinks, and when the blinking ends, configuration is complete.
   At this time, H1 is displayed.

• Baud rate setting (H2)

Use the DISP switch to select H2 on the 7-segment display.

1. Press the RESET switch. The 7-segment display shows H2/_. _ represents 1, 2, or 3. (Default setting: 3)
   1 : 4800 bps
   2 : 9600 bps
   3 : 19200 bps
2. When the DISP switch is pressed in this situation, the display cycles through ↵ H2/1 → H2/2 → H2/3. ↵
   Select the baud rate.



3. After making a selection, press the RESET switch. "H2" blinks, and when the blinking stops, configuration is complete.
   At this time, "H2" is displayed.

- Communications format setting (H3)

  Use the DISP switch to select H3 on the 7-segment display.

  1. Press the RESET switch. The 7-segment display shows H3/_. _ represents 1, 2, or 4. (Default setting: 1)

     1 : Even parity, 1 stop bit
     2 : Even parity, 2 stop bits
     3 : Odd parity, 1 stop bit
     4 : Odd parity, 2 stop bits

  2. When the DISP switch is pressed in this situation, the display cycles through → H3/1 → H3/2 → H3/3. →
     Select the communications format.

  3. After making a selection, press the RESET switch. "H3" blinks, and when the blinking stops, configuration is complete.
     At this time, "H3" is displayed.

- Initialization of settings (CL)

  Use the DISP switch to select CL on the 7-segment display.

  1. Press the RESET switch. The 7-segment display shows CL/no.
  2. When the DISP switch is pressed in this situation, the display toggles between CL/no (no) and CL/Y (yes). Select whether to initialize all the communication settings.

CL/Y	Execute initialization
CL/no	Cancel initialization

  3. After making a selection, press the RESET switch. "CL" blinks, and when the blinking stops, initialization of settings is complete.

     Settings after initialization

Display	Description	Initial value
H1	Communication address setting	1
H2	Baud rate setting	3 : 19200 bps
H3	Communications format setting	1Even parity, stop bit1

  4. After initialization, check the settings and change them as needed.

(3) Press and hold the DISP switch for 5 s or more to end communication setting mode. Communication setting mode also ends in the following cases:

- When the power is turned OFF.
- If an alarm occurs during communication setting mode.

● Operation when the dot at the lower right of the 7-segment LED is blinking

If the communication settings are not correctly configured during communication setup due to a power shutdown or other cause, this device stops abnormally due to communication settings error E971 and the 7-segment display alternately shows E9 and 71. If a fault stop occurs due to E971, correctly rewrite the communication settings with the following procedure.

(1) Reset the E971 error. The reset operation returns the communication settings to the following initial values.

Communications address setting : 1
Baud rate setting : 3 (19200 bps)
Communications format setting : 1 (even parity, 1 stop bit)

(2) Enter communication setting mode and rewrite the communication settings with the correct values.

■ Host communication setting using the Smart Loader Package (model SLP-A55)

! Handling Precautions

- Until configuration is complete, do not turn off the power or remove the loader cable. If the power is turned off during configuration, an error may result.

RS-485 host communication settings H1 to H3 incommunication setting mode can also be set using the Smart Loader Package.

(1) Turn off the power to the product.

(2) Remove the RS-485 wires. Insert one end of the USB loader cable into the loader jack on the product, and insert the other end into a USB port on the PC.

(3) Turn on the power to the product.

(4) Start the SLP-A55 and set up host communication.

(5) Turn off the power to the product.

(6) Remove the USB loader cable.

(7) Connect the wiring for RS-485.

(8) Turn on the power to the product.

(9) Start communications with the host device.

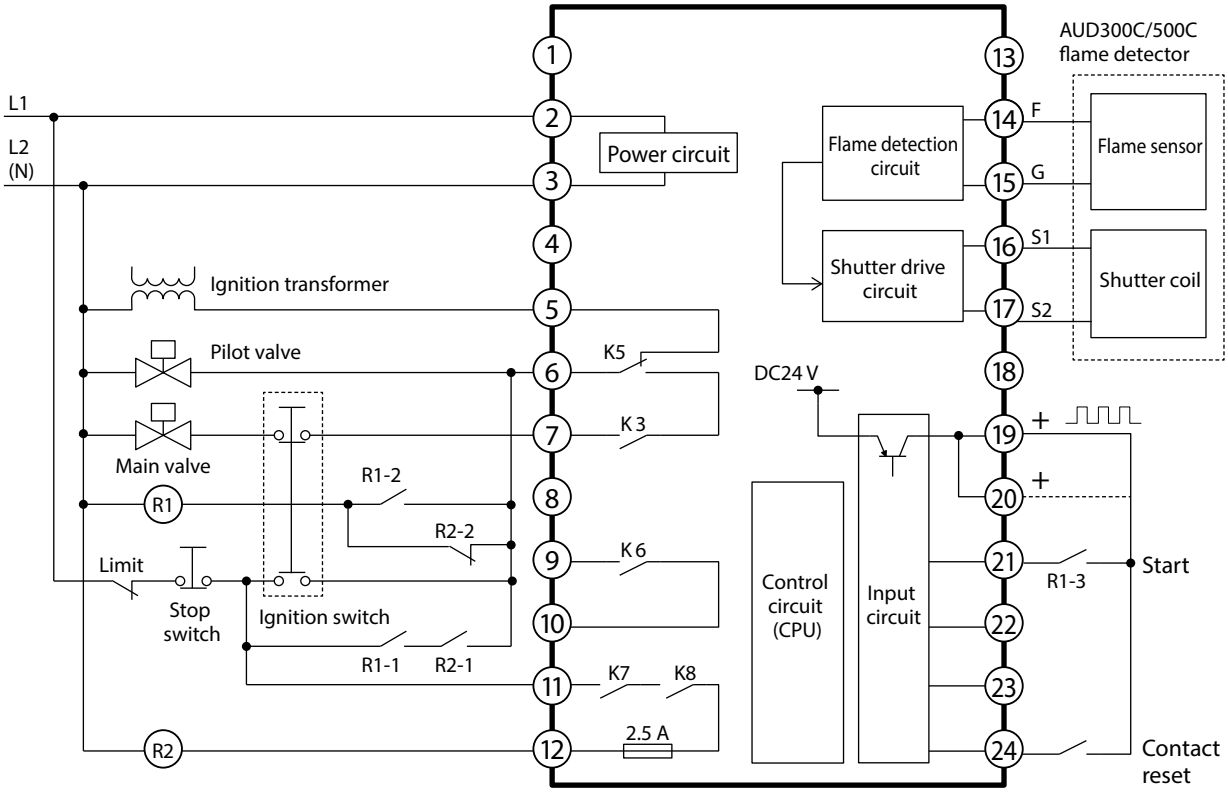
Chapter 4. How This Device Operates

CAUTION

After turning on the power, allow sufficient time before checking the output of this device. This device does not start operation until about 8 seconds after power-on.

After a fault stop is canceled, start input is not accepted for about 5 seconds.

■ Sample instrumentation for manual ignition (intermittent pilot)



Operation	Operation of this device	SHUT LED	FL LED	7-seg.
Power ON Limit ON	Voltage is applied to terminals 2 and 3 (to the AUR355C and AUD300C/500C)	○	○	- -
Ignition switch ON	Relay R1 turns on when R2-2 turns off. When R1-3 turns ON, relay K3 (start check relay) turns ON.	○	○	PF
	When a pilot flame is detected, relays K7, K8 and K5 turn ON. When contacts R1-2 turn ON, relay R1 remains ON and, at the same time, contacts R1-1 and R2-1 turn ON and pilot valve output continues.	◎	●	PF
	When K5 and K3 turn ON, the main valve enters standby mode.	◎	●	PF
Ignition switch OFF	Terminals 6 and 7 are powered and the main valve starts operating.	◎	●	PF
Stop operation Stop switch OFF	Power to all loads is shut off and relays R1 and R2 turn OFF.	○	○	- -
Flame failure during operation	All relays turn OFF.	○	○	- -

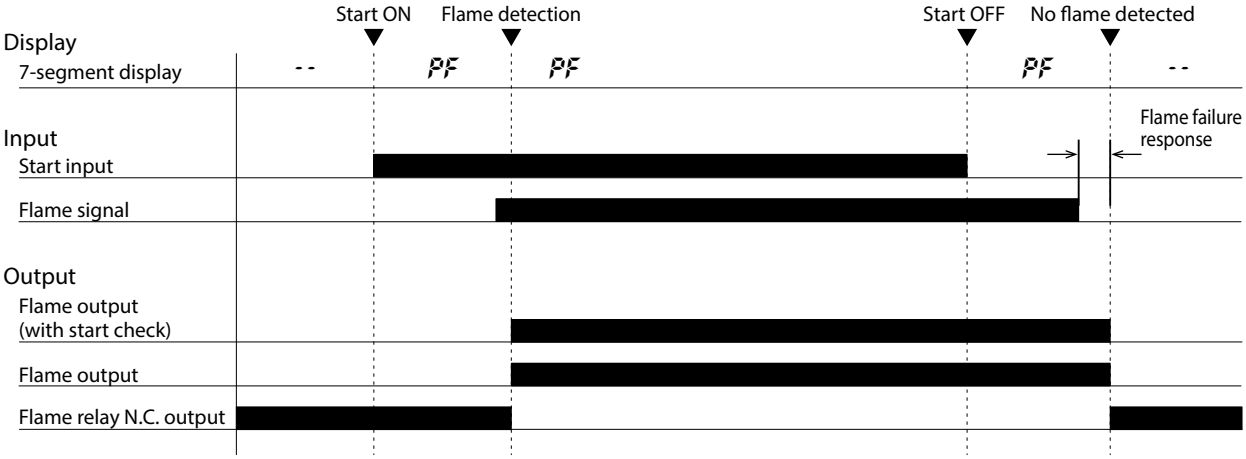
●: Lit, ○: Off, ◎: Blinks

■ Sequence chart

The operation sequence of this device is shown below.

● Normal operation

If the start input is turned ON when there is no flame signal, the device transitions to flame monitoring status (PF). If a flame signal is detected while the start input is ON, the two flame outputs (with and without start check) turn ON. Even if the start input is turned OFF while the flame signal is detected, both flame outputs continue to be ON. After that, if the flame signal turns OFF, both flame outputs turn OFF and the device transitions to controlled shut down status (- -). In this case, flame signal turnoff does not trigger recording of playback monitor data.



Operation	Operation of this device	SHUT LED	FL LED	7-seg.
Start input OFF	All relays are OFF.	○	○	- -
Start input ON	Flame monitoring starts and relay K3 turns ON.	○	○	PF
Flame signal input	If a flame signal is detected, relays K5, K7 and K8 turn ON.	◎	●	PF
Start input OFF	Relays K3, K5, K7, and K8 are ON while the flame signal is detected.	◎	●	PF
Flame signal OFF	All relays turn OFF and the device transitions to controlled shut down status.	○	○	- -

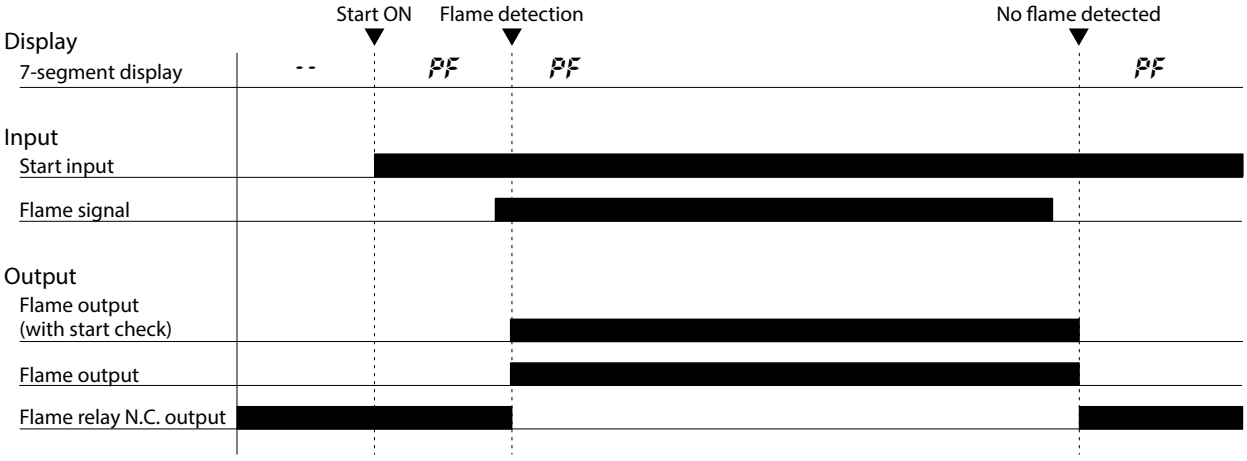
●: Lit, ○: Off, ◎: Blinks

● Normal operation (when start input ON continues)

When the start input continues to be ON, the two flame outputs (with and without start check) operate in the same manner as in the case above. The difference from the normal operation described above (☞ p. 23) is that even if the flame signal turns OFF, the device remains in flame monitoring status (PF). In this case, flame signal turnoff triggers recording of playback monitor data.

! Handling Precautions

- Since the number of playback monitor recordings is limited, if the device is used in combustion equipment where the flame signal turns off frequently, the start input should be turned OFF before the burner is stopped.

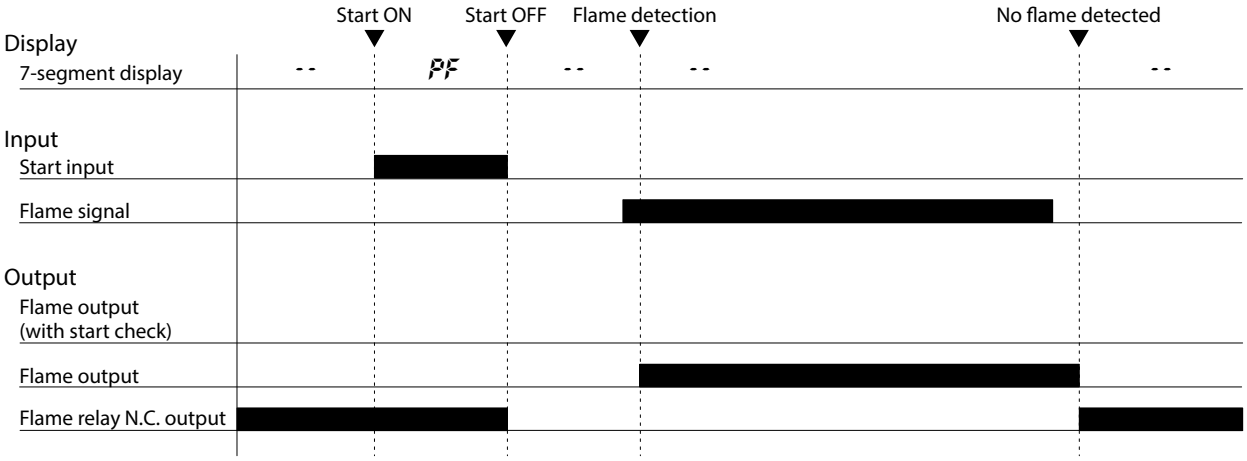


Operation	Operation of this device	SHUT LED	FL LED	7-seg.
Start input OFF	All relays are OFF.	○	○	- -
Start input ON	Flame monitoring starts and relay K3 turns ON.	○	○	PF
Flame signal input	If a flame signal is detected, relays K5, K7 and K8 turn ON.	◎	●	PF
Flame signal OFF	Relays other than K3 turn OFF and the device continues monitoring the flame.	○	○	PF

●: Lit, ○: Off, ◎: Blinks

● If the start input is turned OFF before the flame signal is detected

If a flame signal is detected when the start input is OFF, only the flame output without start check turns ON. Also in a case where a flame signal is detected after the start input had been ON but has turned OFF, only the flame output without start check turns ON. Flame signal turnoff does not trigger recording of playback monitor data.

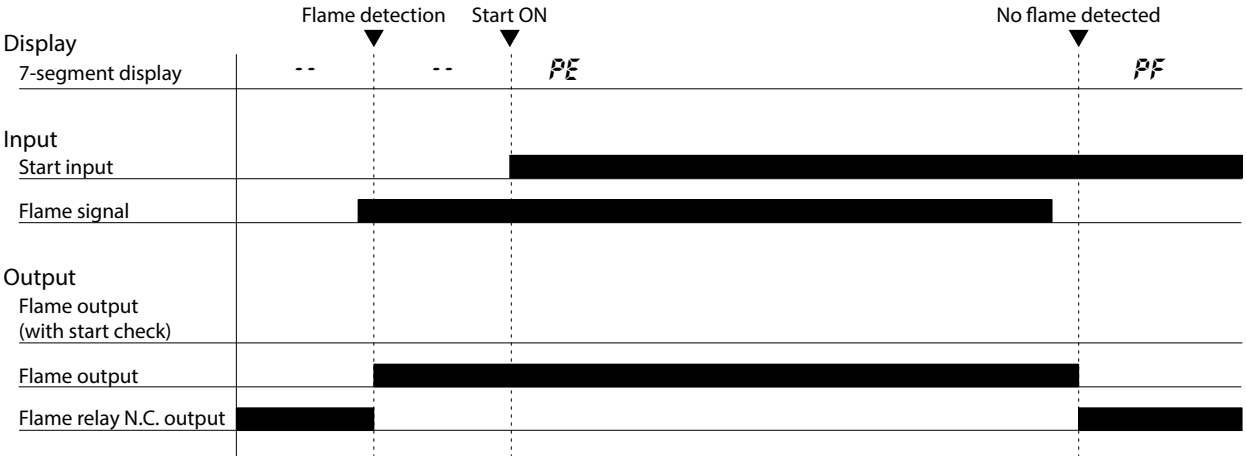


Operation	Operation of this device	SHUT LED	FL LED	7-seg.
Start input OFF	All relays are OFF.	○	○	- -
Start input ON	Flame monitoring starts.	○	○	PF
Start input OFF	The device transitions to controlled shut down status.	○	○	- -
Flame signal input	If a flame signal is detected, relays K7 and K8 turn ON.	◎	●	- -
Flame signal OFF	Relays K7 and K8 turn OFF and the device transitions to controlled shut down status.	○	○	- -

●: Lit, ○: Off, ◎: Blinks

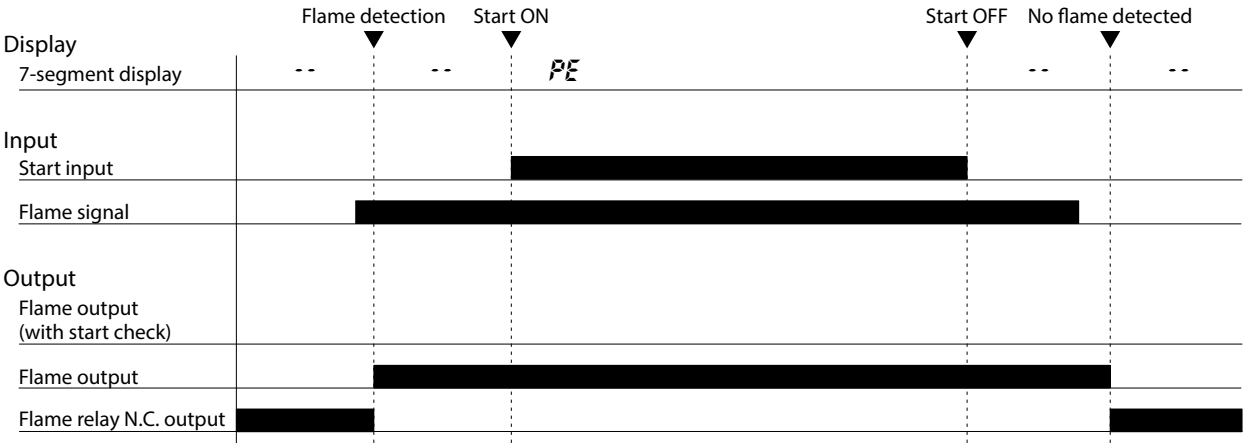
● False flame

If the start input turns ON while the flame signal is detected, the device transitions to false flame detection status (PE). The device shifts out of false flame detection status (PE) if the flame signal or the start input turns OFF.



Operation	Operation of this device	SHUT LED	FL LED	7-seg.
Start input OFF	All relays are OFF.	○	○	- -
Flame signal input	If a flame signal is detected, relays K7 and K8 turn ON.	◎	●	- -
Start input ON	Flame monitoring starts (false flame detected).	◎	●	PE
Flame signal OFF	Relays K7 and K8 turn OFF and the device continues monitoring the flame.	○	○	PF

●: Lit, ○: Off, ◎: Blinks

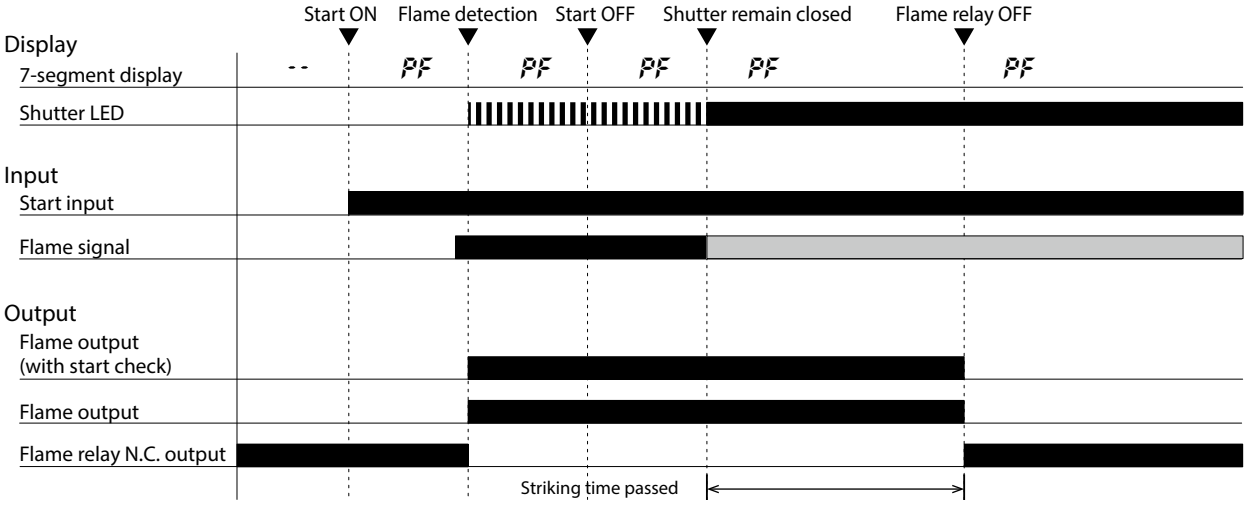


Operation	Operation of this device	SHUT LED	FL LED	7-seg.
Start input OFF	All relays are OFF.	○	○	- -
Flame signal input	If a flame signal is detected, relays K7 and K8 turn ON.	◎	●	- -
Start input ON	Flame monitoring starts (false flame detected).	◎	●	PE
Start input OFF	The device transitions to controlled shut down status, and only relays K7 and K8 are ON.	◎	●	- -
Flame signal OFF	Relays K7 and K8 turn OFF.	○	○	- -

●: Lit, ○: Off, ◎: Blinks

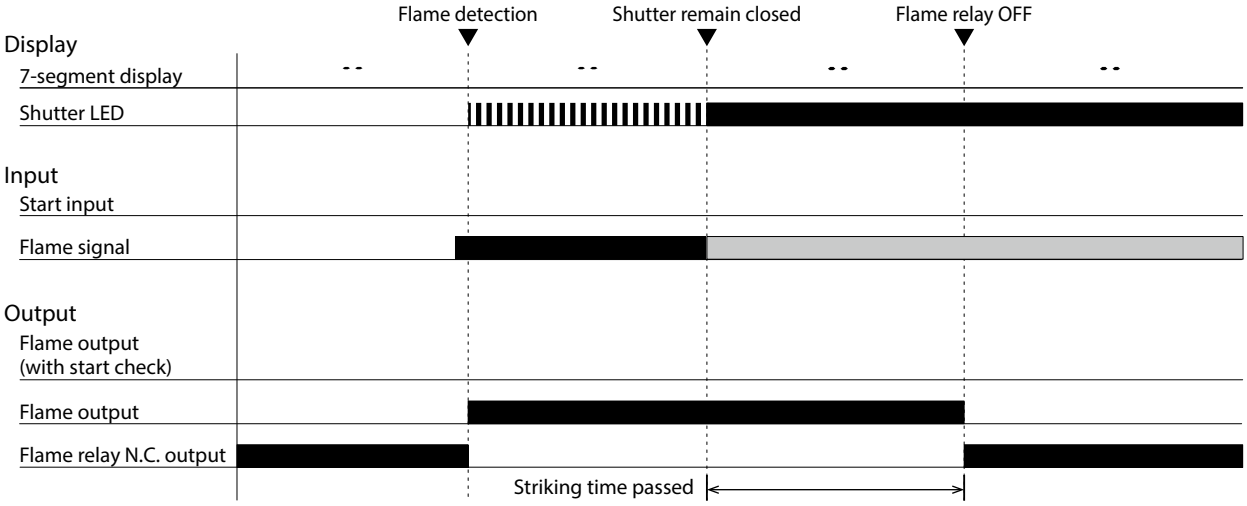
● When shutter remains closed (AUR355C only)

Regardless of whether the start input is ON or OFF, if the shutter is closed for 5 seconds or longer, the flame relay will turn OFF. While the shutter is closed, this device cannot detect the presence or absence of a flame (the period indicated by ▒▒).



Operation	Operation of this device	SHUT LED	FL LED	7-seg.
Start input OFF	All relays are OFF.	○	○	- -
Start input ON	Flame monitoring starts and relay K3 turns ON.	○	○	PF
Flame signal input	If a flame signal is detected, relays K5, K7 and K8 turn ON.	◎	●	PF
Shutter closed	After the shutter remains closed for 5 seconds, all relays turn OFF.	◎→●	○	PF

In the case above, playback monitor data is recorded after the shutter remains closed for 5 seconds. ●: Lit, ○: Off, ◎: Blinks



Operation	Operation of this device	SHUT LED	FL LED	7-seg.
Start input OF	All relays are OFF.	○	○	- -
Flame signal input	If a flame signal is detected, relays K7 and K8 turn ON.	◎	●	- -
Shutter closed	After the shutter remains closed for 5 seconds, relays K7 and K8 turn OFF.	◎→●	○	- -

In the case above, playback monitor data is recorded after the shutter remains closed for 5 seconds. ●: Lit, ○: Off, ◎: Blinks

■ Instantaneous power outage / voltage drop during operation

If an instantaneous power outage or voltage drop occurs while this device is operating, the subsequent operation is as follows.

Instantaneous power outage	Shorter than 90 ms	Operation continues.
	90 ms or longer	Operation continues or restarts from stop, or restarts after power-OFF
Instantaneous voltage drop (drop in power of 50 %)	Shorter than 100 ms	Operation continues.
	100 ms or longer	Operation continues or flame failure occurs due to voltage drop in the flame detector*

* Because the voltage to the fuel valve also drops, the fuel supply may decrease, causing flame failure.

■ Playback monitor / flame logger

The playback monitor and flame logger functions facilitate maintenance of equipment. For details, refer to ☞ Flame Monitor Model AUR355 User's Manual for Communication Functions, No. CP-SP-1453E.

Chapter 5. Trial Operation and Adjustment

WARNING
The ignition time for the pilot and main burners should not exceed the time defined by the burner or device manufacturer. If it does, fuel will accumulate in the combustion chamber and form an explosive mixture, resulting in a very dangerous situation in which an explosion could occur.
Do not touch terminal 14 (F) after turning the power off. An electric charge may remain on terminal 14 (F) and may cause an electric shock.
Do not operate this device without first completing its adjustment and testing, and also the testing specified by the combustion equipment manufacturer.

CAUTION
Installation, wiring, inspection, adjustment, and maintenance must be carried out by experienced specialists who have knowledge and skills concerning combustion equipment and this device.
The pilot turn-down test should be carried out only by specialists who have knowledge and skills concerning combustion equipment and combustion safety.
After turning on the power, allow sufficient time before checking the output of this device. This device does not start operation until about 8 seconds after power-on.

■ Preliminary inspection

- The temperature and humidity are within the ranges specified for operating conditions.
- There are no errors in wiring, and terminal screws are not loose.
- The flame detector is installed correctly. (For the installation location, orientation, and other details, see the user's manual for the flame detector.)
- The burner is adjusted correctly.
- There are no obstructions, covers, or other items blocking the combustion air intake or exhaust outlet.
- The power supply voltage and frequency are the same as those shown on the device.

■ Inspection procedure

For safe operation of the combustion equipment, inspect the following items carefully and make appropriate adjustments.

● **Ignition spark response**

⚠WARNING

Make sure that the AUD flame detector does not detect ultraviolet rays from a source other than the burner. If the AUD detects other ultraviolet rays, it will continue to send flame detection signals even if the burner flame goes out. Consequently, fuel will continue to be supplied, potentially resulting in an explosion.

Before doing the spark response test, make sure that all manual fuel valves are closed.

(1) Close the manual valves in the piping for the pilot and main burners.

(2) Begin equipment operation and measure the flame voltage during the pilot ignition sequence to check for any effect from the ignition spark.

(3) If the spark has an effect, such as causing the flame LED of this device to light up, refer to the user's manual for the combustion equipment and make adjustments in the following way.

- Move the AUD flame detector or the flame rod so that the spark does not affect the flame voltage.
- Attach a shield that prevents the spark's ultraviolet radiation from entering the optical path of the AUD flame detector. Adjust so that the spark's effect on the flame signal is no more than 0.4 V DC.
- If an S7200A_ _ _GH_ or S720A_ _ _GH_ igniter is used, swap the polarity of the power to the igniter. When this device is used in combination with an igniter, changing the polarity of the power can prevent the AUD flame detector from detecting the spark.

Handling Precautions

- Ensure that the ultraviolet detector does not detect ultraviolet rays other than those from the burner flame.

Sources of ultraviolet radiation (other than the burner flame) that can activate the AUD flame detector include the following.

Examples:

Ultraviolet ray sources	1371 °C or hotter red-hot furnace wall (within 50 cm from wall)
	Spark of an ignition transformer or welding arc
	Gas laser
	Sunlamp
	Germicidal lamp, ultraviolet lamp, fluorescent lamp
	Strong flashlight (toward ultraviolet sensor)
Gamma ray and X-ray sources	X-ray diffractometer, gamma-ray analyzer
	Electron microscope
	X-ray machine
	High-voltage vacuum switch
	High-voltage capacitor
	Radioactive isotope
	Any other ultraviolet, gamma, or X-ray source

● Measurement of flame voltage

This device shows the flame voltage on the 7-segment display. The voltage can be checked by changing the display using the DISP switch on the front of the unit. Checking the flame voltage is the best way to determine whether or not the location of the flame detector is appropriate.

The flame voltage should be checked during installation and servicing. Checking it once per month or more can prevent shutdowns due to insufficient flame voltage.

Start the device and measure the voltage under various conditions, such as at startup and during normal operation. Check to make sure that the flame voltage remains stable at 2.0 V DC or more. (The recommended flame voltage is 2.0 V DC or more and it must be stable.)

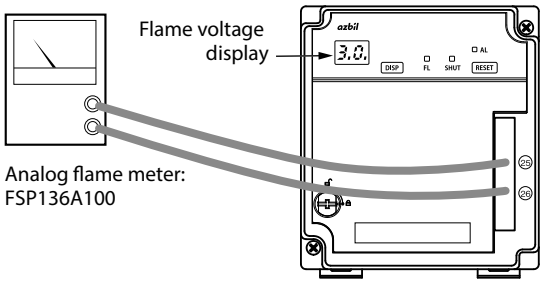
If this stable voltage cannot be achieved, the problem may be caused by one or more of the following. In such a case, do a thorough inspection.

- The power supply voltage or frequency is not correct.
- The air supply pressure or air-fuel ratio is not correct.
- The flame detector is not correctly wired.
  - Open circuit
  - Short circuit
  - High-resistance short circuit of the lead wires due to humidity or dirt

- Incorrect flame detector mounting angle (AUR355C)
- Dirty flame detector sensing surface (AUR355C)
- Tube unit deterioration (AUR355C)
- Incorrect flame rod installation (AUR355B)
  - Area in contact with flame is insufficient.
  - Position of flame rod in flame is incorrect.
  - The flame rod insulator is at a high temperature (315 °C).
  - Flame rod is affected by the ignition transformer.

    If the ignition transformer is close to terminal F of the flame rod, electrons in the flame will be absorbed into the ignition transformer, and as a result, sufficient flame voltage will not be achieved.

The voltage can be checked on the 7-segment display or by connecting a flame meter to terminals 25 & 26 on the front connector. It is necessary to obtain a monitor/communication connector (81447514-001) to connect the FSP136A100 and the AUR355.



Handling Precautions

- For the flame voltage output signal wires, use 600 V PVC-insulated cable (IEC 60227-3), 0.75 mm^2 or more in cross-sectional area. The wiring should be no longer than 10 m.
- The input impedance of a measuring instrument used with this device must be 100 kΩ or more.

● **Pilot turn-down test**

⚠WARNING

For equipment that uses the AUR355 to detect both the pilot and the main burner flame, carry out the pilot turn-down test carefully. If the flame detector is set so that it detects a pilot flame that is too small to ignite the main burner, this device will not be able to detect a flame failure in the main burner. In that case, fuel will continue to be supplied, causing a serious explosion hazard.

Before doing the pilot turn-down test or ignition spark response test, make sure that all manual fuel valves are closed.

If the pilot turn-down test must be carried out repeatedly, completely stop all combustion equipment each time the test is finished, and completely discharge unburned gas or fuel oil that has accumulated in the combustion chamber, ducts, and flues. Otherwise, an explosion may result.

After completing the pilot turn-down test, turn off the power switch. Restore the original state of all test jumpers and limit switches and reset the controller settings. If operation begins without the above steps, damage to the equipment, gas leak, or explosion may result.

⚠CAUTION

The pilot turn-down test should be carried out only by specialists who have knowledge and skills concerning combustion equipment and combustion safety.

The purpose of this test is to determine the smallest possible pilot flame that will reliably ignite the main burner. Before and after this test, make sure to measure the flame voltage and confirm that it is 2.0 V or more.

(1) Turn off the power to the equipment to stop all devices.

(2) Close the main valve (by removing one side of the wiring to the main valve or by closing the manual cock) to shut off the gas to the main burner. Open the pilot valve to its normal position.

(3) Turn on the power switch of the equipment. If the start input is on, the ignition sequence begins after prepurge, as soon as the pilot valve is opened.

(4) After the pilot burner ignites, turn the pilot valve (manual cock) down until this device extinguishes the flame. Mark the position of the manual cock at the time when the flame is extinguished. Then, press the RESET switch to reset the error and restart the equipment. Turn the manual cock back until just before the previously marked position (so that more gas is output), and check that combustion continues.

(5) Turn off the power switch, return the main valve to its normal state (open the manual cock) and then turn on the power switch again. After prepurge, pilot burner combustion begins, followed by main burner combustion. If the main burner does not ignite, turn off the power switch of the equipment immediately. The main burner does not ignite because the pilot flame is too small, so it must be increased. After increasing the pilot flame, change the position of the flame detector so that its monitoring angle is slightly away from the pilot flame monitoring axis.

(6) Changing the gas pressure between minimum and maximum, repeat steps (1) to (5) to check if the main burner ignites without fail.

Handling Precautions

- If it is necessary to repeat this test, in order to prevent an explosion, stop all combustion equipment devices each time the test is finished, and completely discharge unburned gas or fuel that has accumulated in the chamber, ducts, and flues.

● Safety shutoff check

- Pilot ignition failure check

  Close the manual gas cock. Turn on the start input of the equipment to begin operation. After prepurge, pilot burner ignition is attempted. Since the manual cock is closed, however, the pilot burner does not ignite and the equipment is locked out. After confirming the above behavior, open the manual cock. Cancel the lockout, restart the equipment, and check that the burner ignites properly.

- Flame failure check

  Close the manual gas cock while the burners are operating. After the flame failure response time elapses, the pilot valve and main valve close and the equipment is locked out. After confirming the above behavior, open the manual cock. Cancel the lockout, restart the equipment, and check that the burners ignite properly.

- Power loss (power failure) check

  Turn off the power switch of the equipment during burner operation in order to stop combustion. After waiting for a while, turn the power back on. Then, turn on the start input, restart the equipment, and check that the burners ignite properly.

Chapter 6. Maintenance and Inspection

⚠WARNING

Before mounting, removing, or wiring, be sure to turn off the power to this device and all connected devices. Failure to do so may result in an electric shock.

Do not touch terminal 14 (F) after turning the power off. An electric charge may remain on terminal 14 (F) and cause an electric shock.

⚠CAUTION

Installation, wiring, inspection, adjustment, and maintenance must be carried out by experienced specialists who have knowledge and skills concerning combustion equipment and this device.

If the combustion equipment is restarted after a safety shutoff, do all of the inspection steps described in ☞ Chapter 5. Trial Operation and Adjustment.

When doing a maintenance inspection of the burner, be sure to do the pilot turn-down test. Inspection must be done at least once a year.

Inspect the combustion equipment periodically in accordance with the instructions given in the manual provided by the equipment manufacturer.

When cleaning the burner, clean the flame detector also.

■ General maintenance and inspection

- When replacing this device, observe the cautions (☞ p. 1) and carry out all the inspections and adjustments of this device and the combustion equipment that are described in chapter 5.
- Do not lubricate any part of this device.
- Remove any products of combustion that have accumulated on the burner, etc.

■ Maintenance and inspection cycle

The maintenance and inspection cycle should be determined by taking into consideration the device type, ambient conditions at the installation location, the frequency of use, etc. The following are rough guidelines.

- Cleaning of the burner: once or more per year
  After cleaning, make sure to do the pilot turn-down test.
- Burner shutdown check: once or more per month
- Flame voltage check: once or more per month

■ Alarm codes and details

If a fault stop occurs, the alarm code and the code for the operating status where the fault stop occurred are displayed alternately.

Alarm code	Sub-code	Description	Status	Cancellation method
E9	00	Alarm at power-on	When the cause of the fault stop cannot be identified • Device power was turned off before the cause of the error was saved. • The internal latch relay was set due to transportation vibration, etc. This does not indicate a problem with the device. Reset the device to restore normal operation.	Reset
E9	50	Internal error ROM checksum	ROM check code error	Reset
E9	51	Internal error EEPROM read	Error in reading from the EEPROM • Data was not correctly saved to the EEPROM with the Smart Loader Package (SLP-A55) because the power was turned OFF or the loader cable was removed while settings were being written, etc. • Due to some other failure of the EEPROM, data was not correctly saved.	☞ What to do if E951 occurs (p. 36)
E9	52	Internal error EEPROM write	Error while writing to the EEPROM	Reset
E9	53	Internal error process data value	Internal memory error	Reset
E9	54	System error (1)	CPU communication error	Reset
E9	55	Internal error (input-circuit)	Detection of part failure (voltage applied to the input terminals by wrong wiring) or strong inductive electrical noise to the signal wire	Reset
E9	56	Internal error (input-circuit)	Internal clock error	Reset
E9	57	Internal error (EEPROM data value)	An error was found in CPU mutual check. There are discrepancies in EEPROM data.	Reset
E9	58	Internal error (CPU mutual check)	An error was found in the CPU internal status mutual check.	Reset
E9	60	Internal error (CPU mutual check)	An error was found in the CPU process status mutual check.	Reset
E9	61	Internal error (CPU mutual check)	CPU process synchronization error	Reset
E9	63	Internal error (CPU mutual check)	Internal memory data error • While settings were being written with the Smart Loader Package (SLP-A55), the power was turned OFF or the loader cable was removed.	Write settings using the Smart Loader Package (SLP-A55), and then do a reset.
E9	64	Internal error (flame circuit)	Error in the circuit for diagnosing the flame detection circuit	Reset
E9	65	Internal error (flame circuit)	Error in the interactive diagnosis of the flame detection circuit	Reset

Alarm code	Sub-code	Description	Status	Cancellation method
E9	71	Internal error (Communication setting)	Internal memory error in host communication setting • In communication setting mode, the power was turned off during configuration (when the 7-segment display was blinking), and data was not saved correctly to the EEPROM. • Data was not correctly saved to the EEPROM with the Smart Loader Package (SLP-A55) because the power was turned OFF or the loader cable was removed while settings were being written, etc. • Due to some other failure of the EEPROM, data was not correctly saved.	Reset the error. The reset operation initializes the communication settings. Please rewrite them with the correct values. ☞ Communication setting mode (p. 19)

Note

- If the operating status cannot be identified, the code for the status where the fault stop occurred may be "- -" (controlled shut down).
- If a fault stop occurs even if the alarm is reset several times, there is a problem with the product.

■ What to do if E951 occurs

E951 occurs when the data read from this device's EEPROM is abnormal. In order to write data correctly into the EEPROM, the following operations are required before and after resetting E951.

(1) If E951 occurs, do not reset the error immediately.

(2) Write correct data to event settings, AUR tag, and AUR memo using the Smart Loader Package (SLP-A55).

(3) When writing is complete, reset the E951 error.

(4) If any other error occurs, reset it.

(5) Wait for 5 seconds after the reset. If there is no error message, turn off the power of this device.

(6) Turn the power back on. Wait for 5 seconds after "- -" is displayed on the 7-segment LED. If there is no error message, the settings have been properly stored in the EEPROM. If E951 occurs again, repeat the operation from step 1.

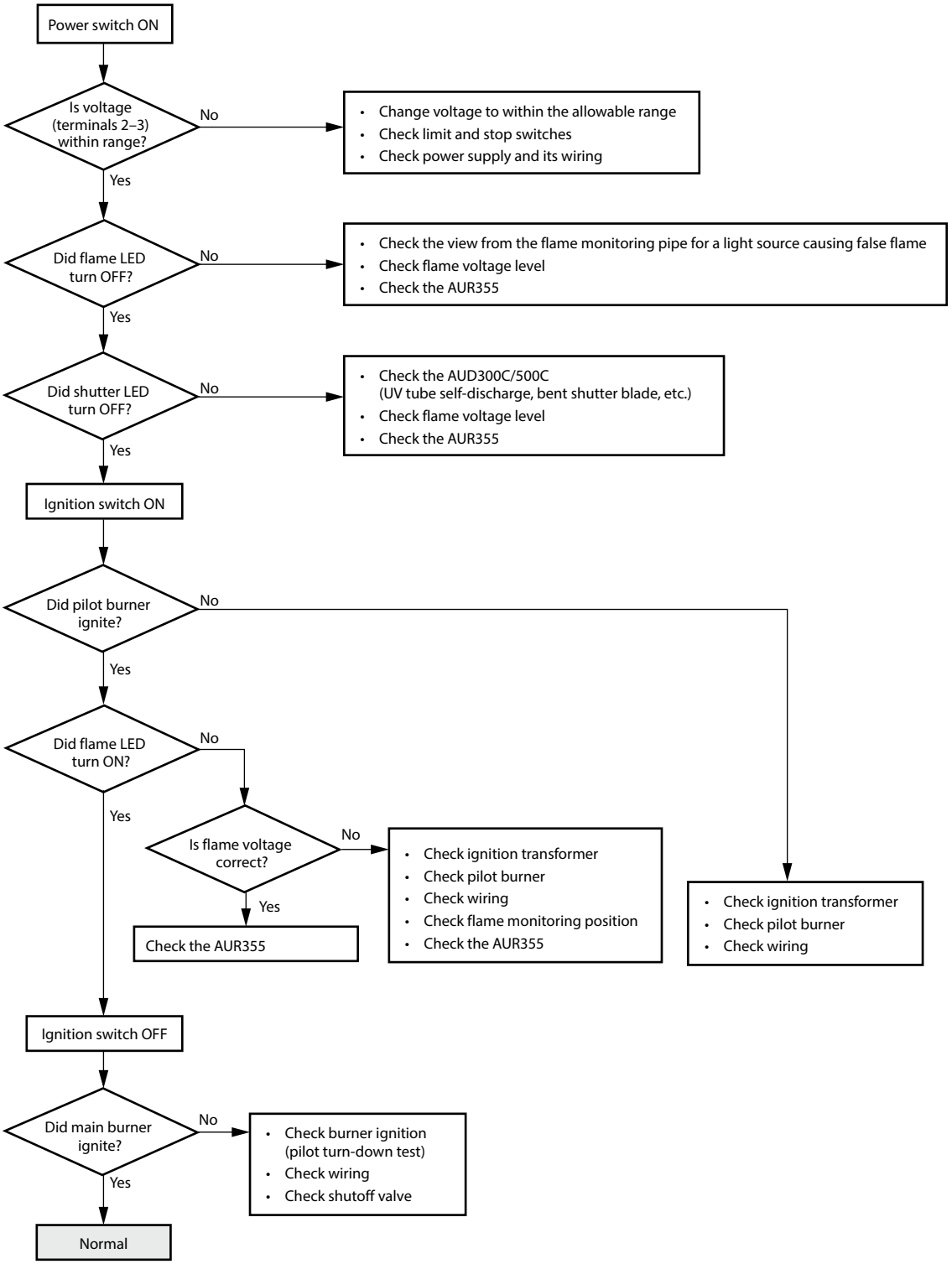
E951 occurs when data was not properly saved to this device due to power shutoff or cable removal during data writing, due to an EEPROM error, etc. After giving a command to write the settings to this device, do not turn off this device until the writing completion message is displayed in the Smart Loader Package (SLP-A55).

■ Failure inspection flowchart

WARNING

Before removing, mounting, or wiring this device, be sure to turn off the power to this device and all connected devices. Failure to do so may result in electric shock.

If there is a problem with the combustion equipment, follow the inspection procedure below.



Chapter 7. Specifications

<table>
<tr><th colspan="2">Item</th><th colspan="4">Description</th></tr>
<tr><td colspan="2">Application</td><td colspan="4">Gas- or oil-burning combustion equipment</td></tr>
<tr><td colspan="2">Compatible flame detector</td><td colspan="4">Model AUD300C/500C UV flame detector or flame rod</td></tr>
<tr><td colspan="2" rowspan="2">Flame failure response time</td><td colspan="2">Model AUD300C/500C UV flame detector</td><td colspan="2">Flame rod</td></tr>
<tr><td colspan="2">2 s max. or 4 s max.
(when flame voltage is 3 V)</td><td colspan="2">4 s max.
(when flame voltage is 2 V)</td></tr>
<tr><td colspan="2">Reset timing</td><td colspan="4">1 s or longer (reset switch or contact reset input*1)</td></tr>
<tr><td colspan="2">Fault stop</td><td colspan="4">Fault stop requiring manual reset</td></tr>
<tr><td rowspan="11">Electrical specifications</td><td>Supply power rating</td><td colspan="4">100/200/220 V AC, 50/60 Hz</td></tr>
<tr><td>Allowable supply voltage</td><td colspan="4">85 to 110 % of rated voltage</td></tr>
<tr><td>Power consumption</td><td colspan="4">15 W max. (AUR355C), 10 W max. (AUR355B)</td></tr>
<tr><td>Dielectric strength</td><td colspan="4">1500 V AC for 1 min or 1800 V AC for 1 s
Between each terminal and ground (the DIN rail clamp), except for flame detector connection terminals (terminals 14–15 and 16–17)</td></tr>
<tr><td>Insulation resistance</td><td colspan="4">50 MΩ min. with a 500 V DC megger
Between each terminal and ground (the DIN rail clamp), except for flame detector connection terminals (terminals 14–15 and 16–17)</td></tr>
<tr><td rowspan="2">Contact rating</td><td>Flame relay N.C. output</td><td>Flame output (with start check)</td><td>Event output</td><td>Flame output*2</td></tr>
<tr><td>5 A, 250 V (cosφ = 1)</td><td>5 A, 250 V (cosφ = 1)</td><td>3 A, 250 V (cosφ = 1)</td><td>0.2 A, 30 V DC (cosφ = 1) or 0.3 A, 250 V AC (cosφ = 1)</td></tr>
<tr><td>Flame detection level</td><td colspan="2">Model AUD300C/500C UV flame detector</td><td colspan="2">Flame rod (Ionization)</td></tr>
<tr><td rowspan="2"></td><td>Flame establishment</td><td colspan="2">1.5–4.5 V DC</td><td colspan="2">1.5–4.5 V DC</td></tr>
<tr><td>Flame out detection</td><td colspan="2">0.0–0.6 V DC</td><td colspan="2">0.0–0.2 V DC</td></tr>
<tr><td>Flame voltage output</td><td colspan="2">Recommended flame voltage:
Stable 2.0 V DC min.
Flame voltage output range: 0.0–5.0 V DC</td><td colspan="2">Recommended flame voltage:
Stable 2.0 V DC min.
Flame voltage output range: 0.0–4.5 V DC</td></tr>
<tr><td>Input</td><td colspan="4">Start, contact reset
Each input is a non-voltage contact input, with allowable contact resistance of 500 Ω max.</td></tr>
<tr><td>Service life</td><td colspan="4">7 years or 100,000 relay operations (at 25 °C, normal temperature, and rated voltage)</td></tr>
<tr><td rowspan="5">Operating conditions</td><td>Ambient temperature</td><td colspan="4">Separately mounted unit: −20 to +60 °C
Gang mounted units: −20 to +45 °C</td></tr>
<tr><td>Ambient humidity</td><td colspan="4">10–90 % RH (without condensation)</td></tr>
<tr><td>Vibration resistance</td><td colspan="4">0–3.2 m/s^2 (10–150 Hz, 1 octave/minute, 10 cycles, in each of XYZ directions)</td></tr>
<tr><td>Shock</td><td colspan="4">0–9.8 m/s^2</td></tr>
<tr><td>Mounting angle</td><td colspan="4">Reference plane ±10°</td></tr>
<tr><td></td><td>Dust</td><td colspan="4">0.3 mg/m^3 max.</td></tr>
</table>

Item		Description
General specifications	Protective structure	IP40: if sideboards (81447515-001) are attached to the sub-base (model BC-R05) IP10: (sub-base (model BC-R05) only)
	Overvoltage category	II
	Pollution degree	PD2
	Automatic action	Type 2.A.V
	Software	Class C
	Case color	Black
	Case material	Denatured PPE resin (UL 94-V0 PTI materials group IIIa)
General specifications	Structure	Sub-base and main unit
	Mounting orientation	Vertical or horizontal For horizontal mounting, the 7-segment display must face upward (DIN rail mounting or direct mounting through screw holes in base)
	Dimensions	W95 × H105 × D110 mm (incl. sub-base)
	Weight	Approximately 600 g (incl. sub-base)
Wiring types and max. wiring length		• Start Copper 600 V PVC-insulated cable (IEC 60227-3), 1.25 mm^2, recommended length: 20 m or less, max. wiring length: 100 m • Contact reset*1 Copper 600 V PVC-insulated cable (IEC 60227-3), 1.25 mm^2, recommended length: 20 m or less, max. wiring length: 100 m • AUD300C/500C (F, G, S1, S2) Copper 600 V PVC-insulated cable (IEC 60227-3), 1.25 mm^2, max. wiring length: 200 m • Flame rod (F, G) RG-11U (JAN standard: US DoD compliant specification) or the equivalent, 5C2V, 7C2V (JIS standard) Recommended length: 20 m or less, max. wiring length: 30 m • RS-485 communications (3-wire system) 0.2–1.5 mm^2 shielded, twisted pair cable (recommended), max. wiring length: 500 m • Flame voltage output signal Copper 600 V PVC-insulated cable (IEC 60227-3), 0.75 mm^2 min., max. wiring length: 10 m • Event output JIS C 3306: 0.75 mm^2 min. • Flame relay N.C. output Copper 600 V PVC-insulated cable (IEC 60227-3), 1.25 mm^2 • Flame output (with start check)*2 Copper 600 V PVC-insulated cable (IEC 60227-3), 1.25 mm^2 • Flame output Copper 600 V PVC-insulated cable (IEC 60227-3), 1.25 mm^2

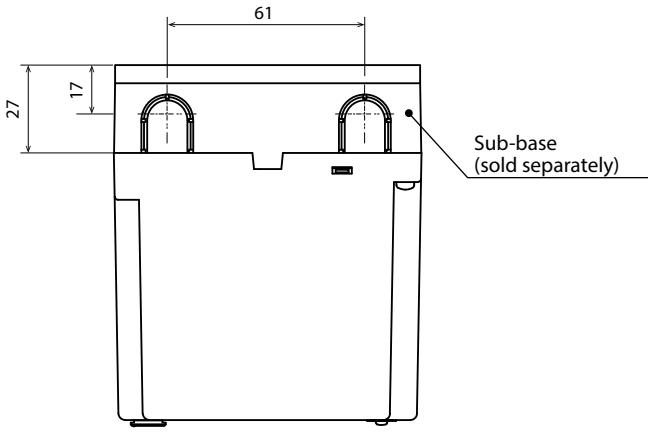
*1 ☞ Contact reset input (terminal 24) (p. 18) (for details on the contact reset input specifications)

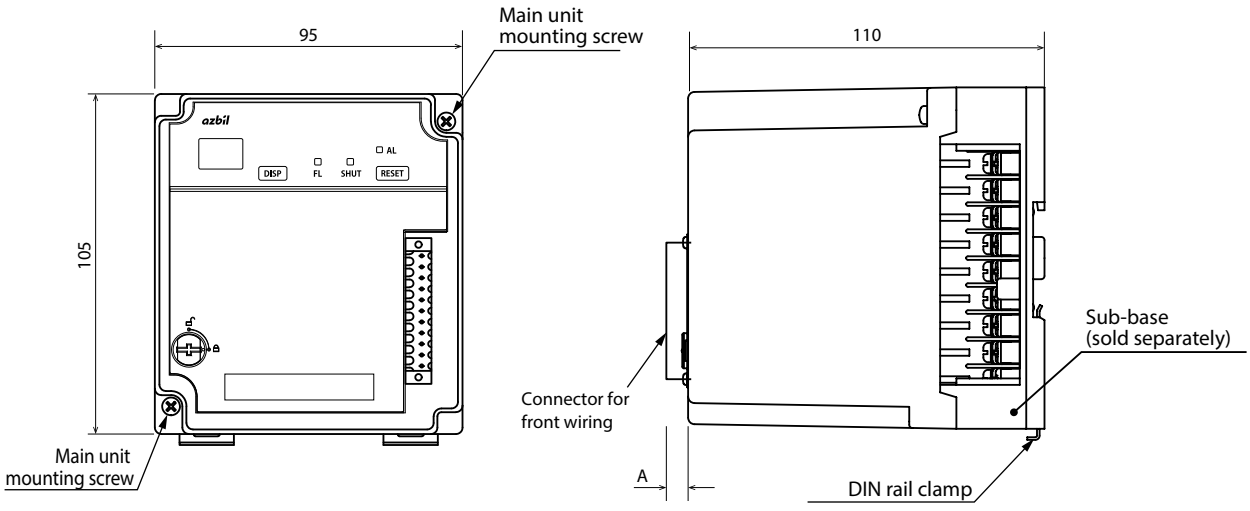
*2 SIL3 In Process

■ Dimensions

● Main unit

Unit:mm

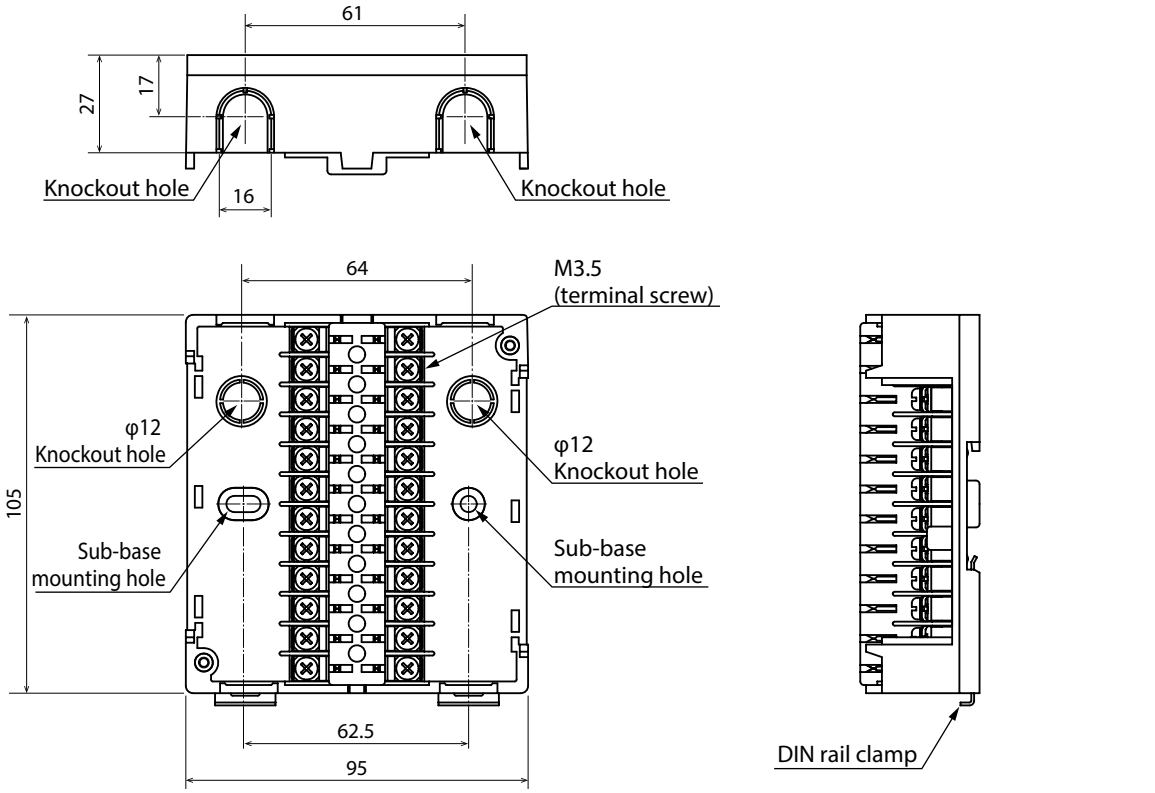




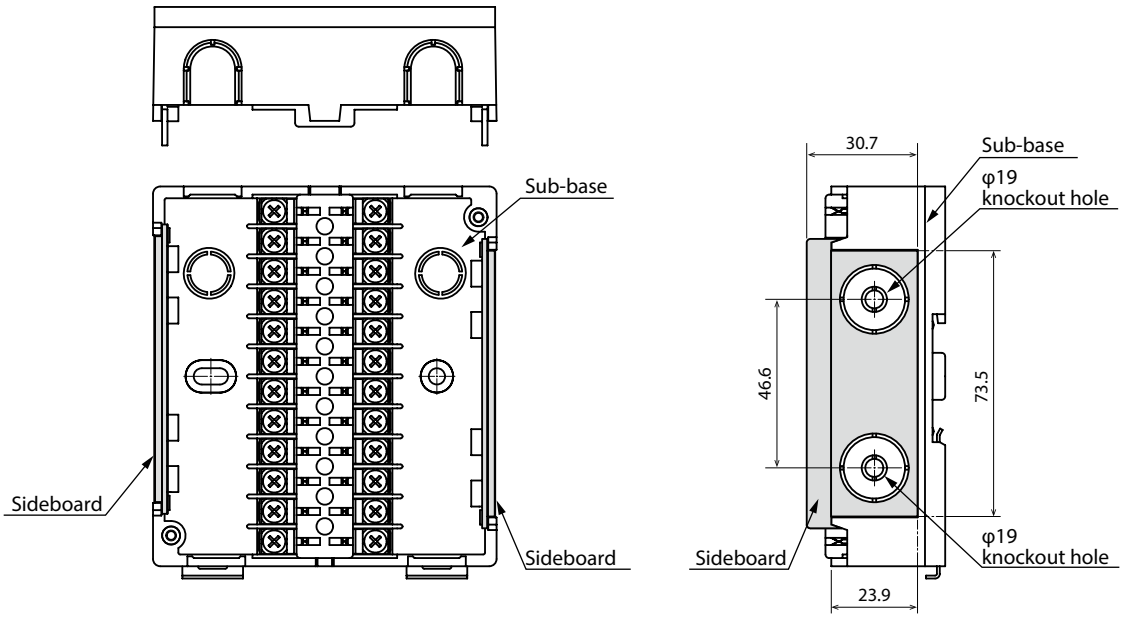
Model No. of connector for front wiring	A
81447514-001	10.6
81447514-002	14.6

● Sub-base model BC-R05A100 (sold separately)

Unit:mm



● Sideboard model 81447515-001 (sold separately)



-MEMO-

Revision History (CP-SP-1454E)

Date	Edn.	(New) Page No.	Description
June 2021	**1**		
Feb. 2022	**2**	ii iv 1 38-39	WARNING: Added the descriptions. CAUTION: Added the descriptions. Chapter 1. Overview: Deleted the descriptions. Chapter 7. Specifications: Deleted the descriptions in the table. Added a note to the table.

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

   1.1 Warranty period

   Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

   1.2 Warranty scope

   In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

   (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
   (2) Failure caused for other reasons than Azbil Corporation's product;
   (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
   (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
   (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
   (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

   Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

   You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

   (1) Regulations and standards or laws that your Equipment is to comply with.
   (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
   (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
   Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,*1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

   *1. A design that is safe even if the user makes an error.
   *2. A design that is safe even if the device fails.
   *3. Avoidance of device failure by using highly reliable components, etc.
   *4. The use of redundancy.

3. Precautions and restrictions on application

   3.1 Restrictions on application

   Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality*5 required	Nuclear power quality*5 not required
Within a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Cannot be used (except for limit switches for nuclear power*7)
Outside a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Can be used

   *5. Nuclear power quality: compliance with JEAG 4121 required
   *6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes,"etc.
   *7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

   Any Azbil Corporation's products shall not be used for/with medical equipment.

   The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

   3.2 Precautions on application

   you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
(2) For use of specific purposes, such as:
    * Nuclear energy/radiation related facilities
      [When used outside a radiation controlled area and where nuclear power quality is not required]
      [When the limit switch for nuclear power is used]
    * Machinery or equipment for space/sea bottom
    * Transportation equipment
      [Railway, aircraft, vessels, vehicle equipment, etc.]
    * Antidisaster/crime-prevention equipment
    * Burning appliances
    * Electrothermal equipment
    * Amusement facilities
    * Facilities/applications associated directly with billing
(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

azbil

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