azbil Specification

AUR450C

Dynamic Self-Checking Burner Controller

Overview

The AUR450C Dynamic Self-Checking Burner Controller is a flame safeguard controller for batch or continuous operation. In combination with the AUD300C Advanced Ultraviolet Flame Detector or the AUD500C Explosion-Proof Advanced Ultraviolet Flame Detector, it safely and automatically ignites and monitors a gas or oil burner using the correct sequence of steps. This device monitors combustion while continuously checking the AUD300C/500C tube unit and the flame detection circuits by driving the shutter of the AUD300C/500C.
For routine maintenance, or if a problem occurs, the front of the AUR450C has a helpful 7-segment display, and the device is equipped with a communications function.
The 7-segment display shows flame voltage, sequence codes, and alarm codes.
Using the Smart Loader Package for the AUR450C, the system status before an alarm occurred can be checked, including data such as flame voltage, past alarm history, operation time, and number of combustion starts.

Features

- **Compliance with global safety standards**
  This device has received the following certifications.
  - Gas Appliance Directive (CE) : 0063BS1427
  - Underwriters Laboratories Inc. : File No. MH27717
  - Canadian Standards Association : Master Report LR 078402
- **Selectable ignition sequence**
  Either a 4-second or 8-second pilot ignition trial time is selectable by model number.
  Equipped for both intermittent and interrupted pilot, selectable by output terminal.

- **Easy instrumentation and handling**
  Compact design requires less mounting space than conventional models. Wiring attaches to the subbase, so mounting and dismounting the controller is easy. Flame monitor output and alarm output contacts can be used as independent non-voltage contacts.
  There is an input terminal for remote reset, or reset can be done from the operating panel.
- **Includes a variety of display functions**
  The LED indicators, which are especially useful for maintenance and troubleshooting, can be used to check the progress of the ignition sequence, as well as the status of flame detection, alarms, and events. The flame LED changes color (green/orange/red) depending on the flame voltage level. On the 7-segment display, sequence codes, alarm codes, and event codes can be checked.

Note

The use of this device is tightly restricted according to the safety guidelines.
To ensure safety, this device must not be used with incompatible equipment.

■ Precautions for equipment instrumentation

When designing facilities that include combustion safety equipment, take the safety directives listed below into careful consideration.
- Safety Engineering Directives for Industrial Heating Furnace Combustion Equipment (Health, Labor and Welfare Ministry)
- General Safety Code for Industrial Combustion Furnaces (= JIS B 8415)
- Safety Engineering Directives for Industrial Gas Combustion Equipment (The Japan Gas Association)
- Safety Guidelines for Gas Boiler Combustion Equipment (The Japan Gas Association)
- In the U.S.: Standard for Ovens and Furnaces (National Fire Protection Association, NFPA 86)
- In Europe: Industrial thermoprocessing equipment. (= EN 746). (Directive 93/68/EEC on Appliances Burning Gaseous Fuels)

For overseas use, be sure to refer to the laws and standards of the relevant country when designing equipment.

- **Important safety points**
  1. Directly connect the load to this device.
  2. Structure the interlock so that power to the load is directly turned off.
  3. Use the start check circuit during startup (do not short out the start contact input).
  4. Do not make a manual operation circuit or other bypass circuit for any load.
  5. Use redundant shutoff for both the main valve and pilot valve.
- **Precautions for system design**
  Use an external circuit for the purge function (this device does not have a purge function).

Specifications

Item	Description				
Compatible flame detector	**AUD300, AUD500**				
Sequence timing (at room temperature and humidity, and rated voltage)	Sequence if a flame failure occurs.	Ignition trial	Pilot only	Main trial	Flame response time
	Non-recycle operation	4 ± 1 s, 8 ± 2 s (selectable by model number)	7.5 ± 2.5 s	7 ± 3 s	1.5 s nominal (2 s max.) 3 s nominal (4 s max.) (selectable by model number)
Range of flame voltage output	0 to 5 V (normal flame)				
Flame voltage range (at rated voltage, room temperature and humidity)	Flame established: 1.5 to 4.0 V DC Flame-out: 0.0 to 0.6 V DC				
Recommended flame voltage	Stable 2.0 V DC or more				
Rated supply voltage	100/120/200/230 V AC, 50/60 Hz (selectable by model number)				
Allowable voltage range	85 to 110 % of power supply voltage				
Power consumption	15 W max. (including both AUR450C and AUD300C/500C)				
Dielectric strength	1500 V AC, 50/60 Hz for 1 min between ground and primary terminals 11 to 24*, or 1800 V AC, 50/60 Hz for 1 s. * Note that terminals 1 to 10 are not included.				
Insulation resistance	50 MΩ min. with a 500 V DC megger between ground and primary terminals (11 to 24) * Note that terminals 1 to 10 are not included.				
Lightning-induced surge	10 kV, 1.2/50 μs (JEC-187, surge impedance 75 Ω min.) when the surge absorber shown below is connected between the power terminal (terminal 1) and ground. Recommended surge absorber: No. **83968019-001**				
Service life	7 years or 100,000 on-off cycles				
Communication	Signal level	RS-485 compliant			
	Transmission line connection	Multipoint connection (up to 15 slave stations for 1 host station)			
	Communications system	Half duplex			
	Synchronization method	Start-stop			
	Transmission control	Polling-selecting method			
	Wiring length	500 m max.			
	Communication wiring	3-wire system			
	Transmission speed error	0.16 %			
	Terminating resistor	Built in (use of another resistor is prohibited)			
	Transmission speed	19200 bps			
	Data length	8 bits			
	Stop bits	1 bit			
	Parity bit	Even parity			
Allowable ambient temperature	Stand-alone mounting: -20 to +55 °C, Side-by-side mounting: -20 to +45 °C				
Storage temperature	-20 to +70 °C				
Allowable humidity	90 % RH at 40 °C (without condensation)				
Vibration resistance	During operation: amplitude 0.5 mm p-p, frequency 10 to 55 Hz During transportation/storage: amplitude 0.75 mm p-p, frequency 10 to 55 Hz				
Pollution degree	Pollution degree 2				
IP rating	IP20				
Certificates *	Gas Appliance Directive (CE): 0063BS1427				
	Underwriters Laboratories Inc.: File No. MH27717				
	Canadian Standards Association: Master Report LR 078402				
Mounting method	Dedicated subbase, model **Q241A104** (sold separately)				
Mounting orientation	Mount the controller on a vertical surface so that the flame voltage terminals are located at the bottom.				
Color	Black				
Mass	Approx. 830 g including subbase				

* Certificates are valid only for a combination of AUR450C, AUD300C, and Q241A104.

Model selection table

Basic model no.	Ignition safety time	Standards compliant	Flame response time	Power supply	Additional feature 1	Additional feature 2	Description
AUR450C							Dynamic Self-Checking Burner Controller
	4						4 ± 1 s
	8						8 ± 2 s
		2					Yes
			2				Nominal 1.5 s (maximum 2 s)
			3				Nominal 3 s (maximum 4 s)
				1			100 V AC, meets CE, UL, CSA standards
				2			200 V AC, meets CE, CSA standards
				3			120 V AC, meets CE, UL, CSA standards
				5			230 V AC, meets CE, CSA standards
					0		None
						00	Standard
						D0	Inspection records
						T0	Tropicalization treatment
						DT	Tropicalization treatment and inspection records

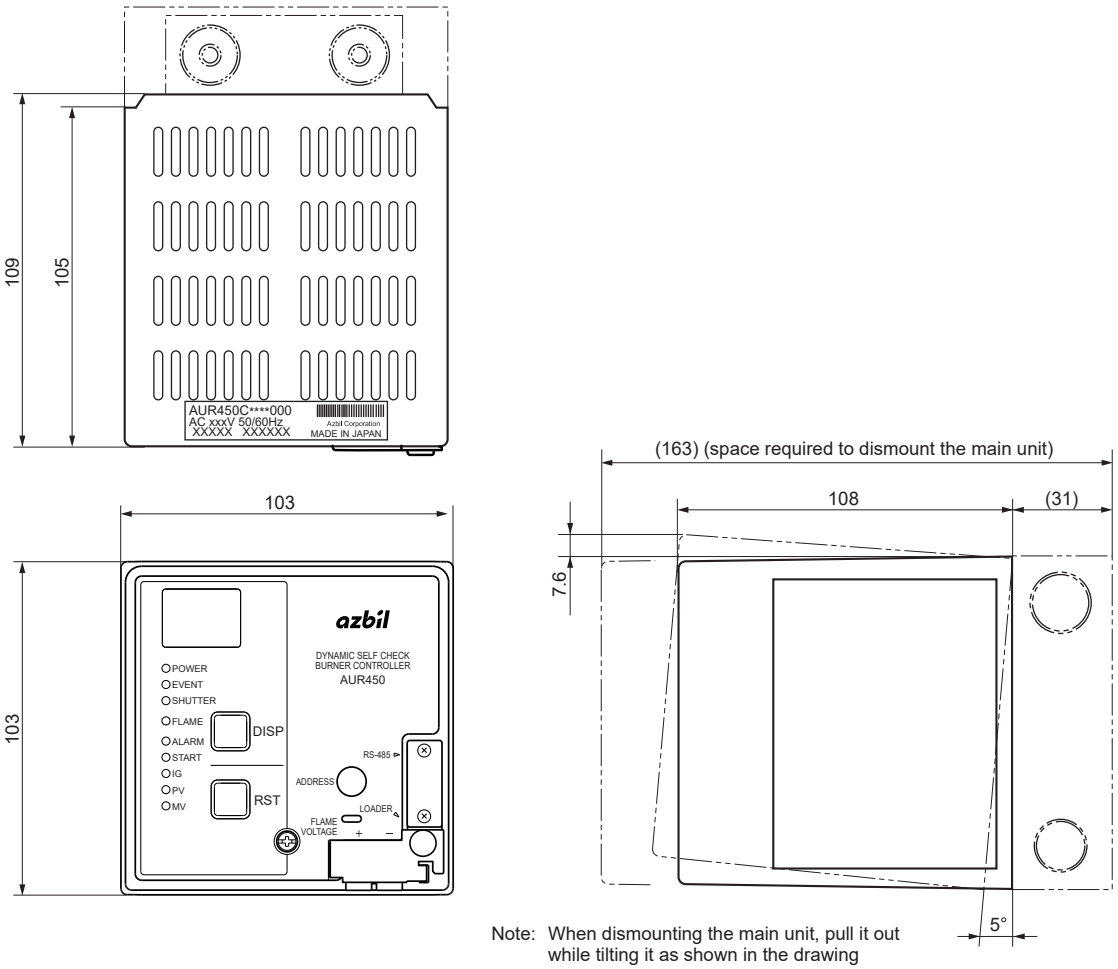
Optional devices (sold separately)

Item	Model No.
Subbase	**Q241A104**
Surge absorber	**83968019-001**
Communication connector	**81446848-001**

Item	Model No.
Smart Loader Package with cable	**SLP-A00J50**
Smart Loader Package without cable	**SLP-A00J51**
Analog flame meter	**FSP136A100**

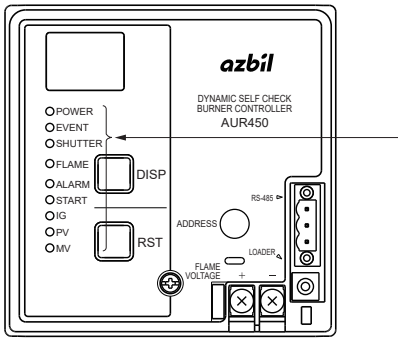
External dimensions

(Unit: mm)



Note: When dismounting the main unit, pull it out while tilting it as shown in the drawing

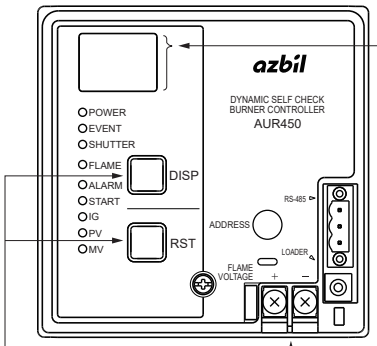
LED display



LED name	Color	Remarks
POWER	Green	Lights up when the power is turned on
EVENT	Orange	Lights up when an event occurs
SHUTTER	Green	Lights up when the shutter is closed
FLAME	Green *	Lights up when a flame is detected
ALARM	Red	Lights up when there is an alarm
START	Green	Lights up when the start contact circuit is closed, and turns off when an alarm is detected
IG	Green	Lights up when the ignition transformer output is on
PV	Green	Lights up when the interrupted pilot valve opening output is on
MV	Green	Lights up when the main valve opening output is on

* On the AUR450C, the color changes to green, orange or red as determined during setup. The factory settings are green for a flame voltage of more than 2.5 V, orange for 1.6 to 2.4 V, and red for less than 1.5 V. The LED turns off if no flame is detected (K6 is off).

7-segment display



DISP switch:
Changes the contents of the 7-segment display.

RST switch:
Resets the alarm (/lockout).

● Sequence code display

Normally, a code is displayed corresponding to the present stage of the operation sequence. The table below shows the displayed code and the concurrent stage in the sequence.

Display	Sequence	Description
– –	Standby	Standby when the start contact input is off.
P1	Start check	Start check of this device and of the AUD300C.
P2	Safety Time	gnition of the pilot burner.
P3	Pilot Stabilization	Check to confirm reliable pilot burner ignition.
P4	Main Trial	Ignition of main burner.
P5	RUN	Flame monitoring after main burner ignition.
PL	Lockout	Lockout

● Alarm code display

When lockout occurs, the display automatically changes to alarm code display, and the lockout sequence code and alarm code are alternately displayed.

Display	Alarm name	Description
E0	Start check alarm	The start check was not completed for some reason such as momentary power failure or part malfunction.
E1	Interlock alarm	Interlock occurred.
E2	False flame	A false flame such as a remaining flame was detected.
E3	UV alarm	A flame was detected even though the shutter output was off.
E4	Ignition failure	No flame was detected at the completion of the ignition trial.
E5	Flame failure	A flame failure occurred in the following sequence: • Pilot Stabilization • Main Trial • RUN
EE	Other	When the cause of lockout cannot be identified: • In cases where power was turned off before CPU error determination • In cases where vibration during transportation, etc., cause latch relay to switch to lockout

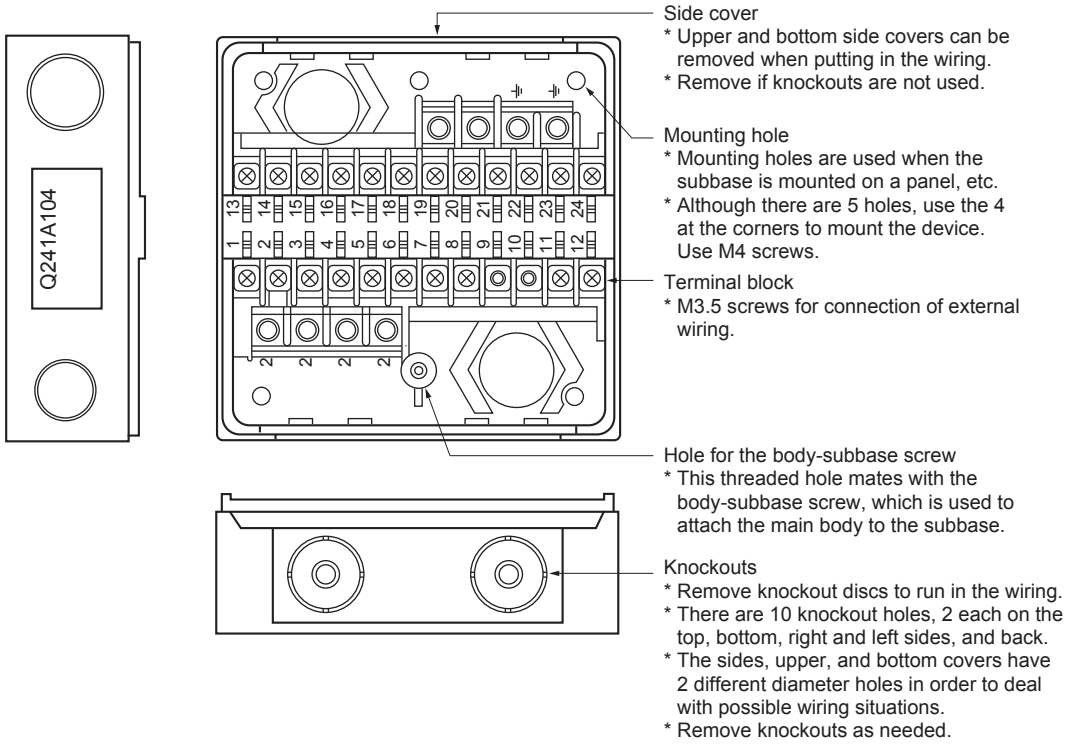
● Flame voltage terminals

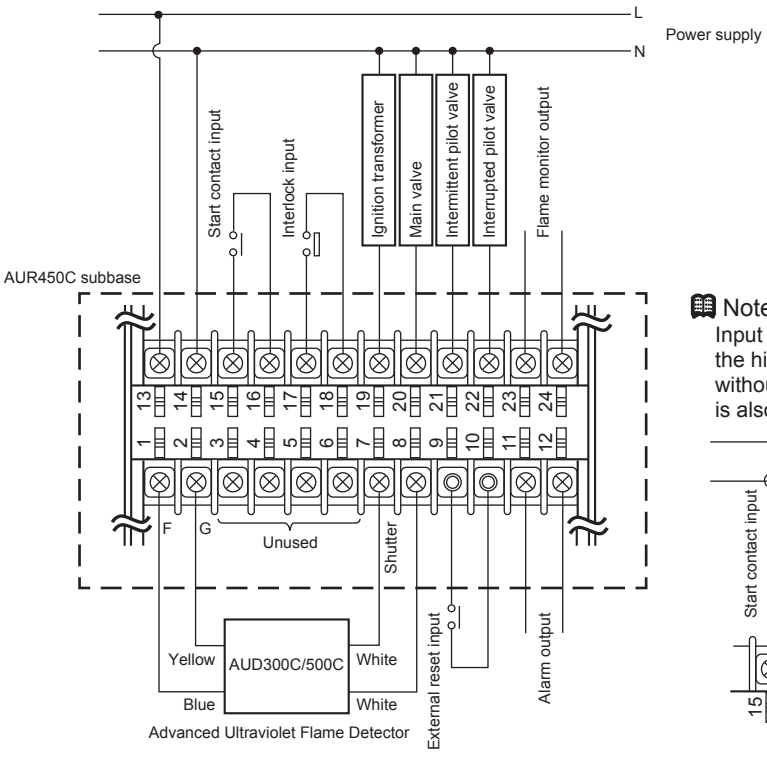
The table below describes the flame voltage terminals on the front panel.

Terminal No.	Description	Rated
+	Flame voltage output (+)	0 to 5 V DC
–	Flame voltage output (–)	

Terminal connection diagram

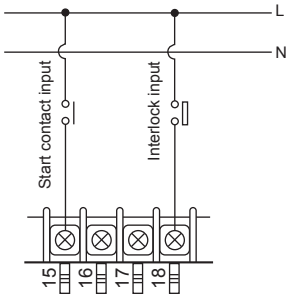
- **Subbase (Q241A104), sold separately**





Note

Input to terminals 15 and 18 through the high potential side L contacts, without using terminals 16 and 17, is also possible.



! Handling Precautions

- If the power supply differentiates between high potential side L and ground side N, connect the high potential side L to terminal 13 and the ground N side to terminal 14.
- Do not use unused terminals as relay terminals.
- Use an overload prevention device for the power supply as needed.
- For wiring to the power supply, use 0.75 mm^2 wire (30 cores, 0.18 mm dia.), in keeping with JIS C3306.
- Terminal screws for the external reset input (terminal numbers 9 and 10) are not attached. When using the external reset input, wire to the subbase using the included terminal screws.
- For the external reset input signal and flame voltage output signal, use wire with indoor PVC insulation (“IV wire,” JIS C3307), 0.75 mm^2 in cross-sectional area. Wire length should be 10 m max.
- Although terminals with a ground mark are provided on the subbase, this device is not grounded.

Terminal assignments

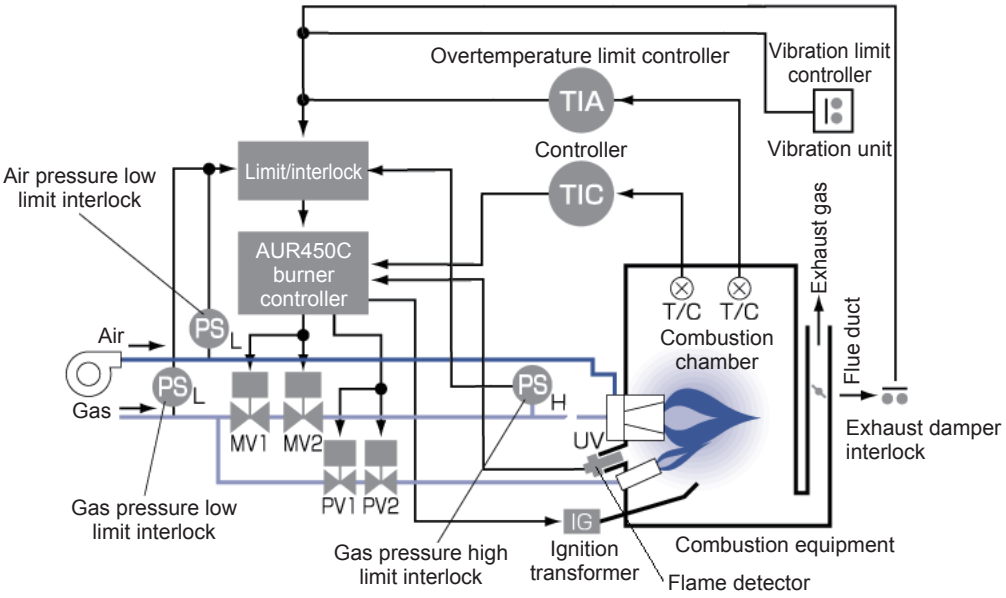
● Subbase terminal block

The table below describes the terminals on the subbase.

Terminal No.	Description	Rating
1	AUD300C/500C terminal F (blue)	
2	AUD300C/500C terminal G (yellow)	
3	Do not use.	
4	Do not use.	
5	Do not use.	
6	Do not use.	
7	AUD300C/500C shutter (white)	24 V DC 150 mA
8	AUD300C/500C shutter (white)	
9	External reset input	
10		
11	Alarm output contacts	75 VA max.
12		
13	Power supply L	100/120/200/230 V AC 50/60 Hz
14	Power supply N	
15	Start contact input	Varies with model no. Contact resistance 100 Ω max.
16	Start contact input	
17	Interlock	100/120/200/230 V AC 50/60 Hz Contact resistance 100 Ω max.
18	Interlock	
19	Ignition transformer	300 VA max. (cos φ = 0.5)
20	Main valve	200 VA max. (cos φ = 0.5)
21	Intermittent pilot	200 VA max. (cos φ = 0.5)
22	Interrupted pilot	200 VA max. (cos φ = 0.5)
23	Flame monitor output	75 VA max. (cos φ = 0.5)
24	Flame monitor output	

Instrumentation example with interrupted pilot

[Air pressure low limit interlock]

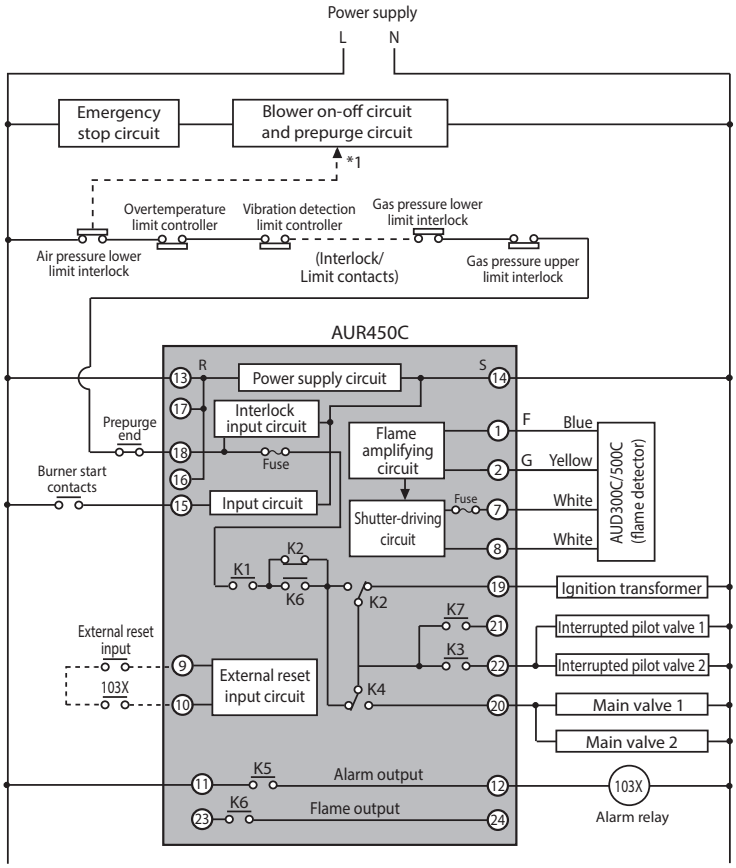


- **Precautions for instrumentation and circuit configuration with an interrupted pilot**

For safety control and operation circuits, devise a safety plan based on risk assessment.

- Configure the interlock (including limit) contacts so that the load (ignition transformer, pilot safety shutoff valve, main safety shutoff valve, etc.) can be directly disconnected.
- Design a circuit that shuts down all the burners when an ignition failure or flame failure of the pilot or main burner occurs.
- Install all the interrupt contacts on the high potential (non-ground) side of the power supply.
- As needed, take preventive measures against electrical leakage, such as using a ground fault circuit interrupter or a double pole contact system.
- Do not configure a circuit that turns off the interlock input (terminals 17-18) using the alarm output contacts (terminals 11-12). With such a circuit, if a false flame (E2), UV alarm (E3), ignition failure (E4), or flame failure (E5) occurs, the interlock alarm (E1) may be displayed.

- **Internal block diagram**



*1 Air pressure switch
Configure a check circuit that does the following:
- When the blower starts, if there is no air flow, the circuit should verify that no pressure is detected. If there is no air flow and pressure is detected, the circuit should not activate the startup switch.

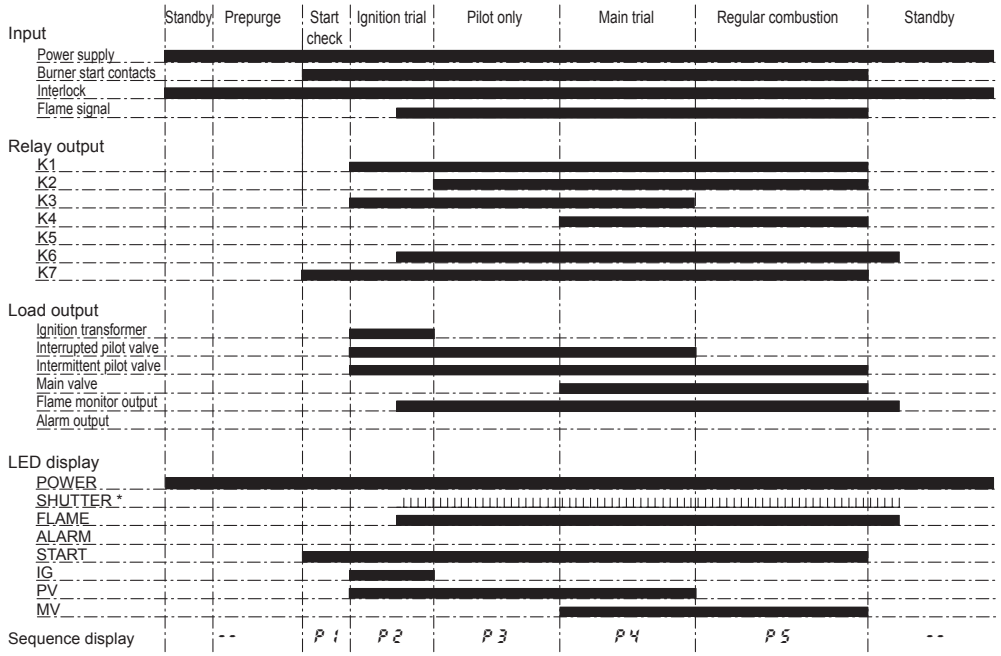
Note

- JISB8415 defines ignition times as follows.
  Pilot burner ignition time: within 10 s.
  Main burner ignition time: within 5 s.

● Sequence charts

• Normal operation

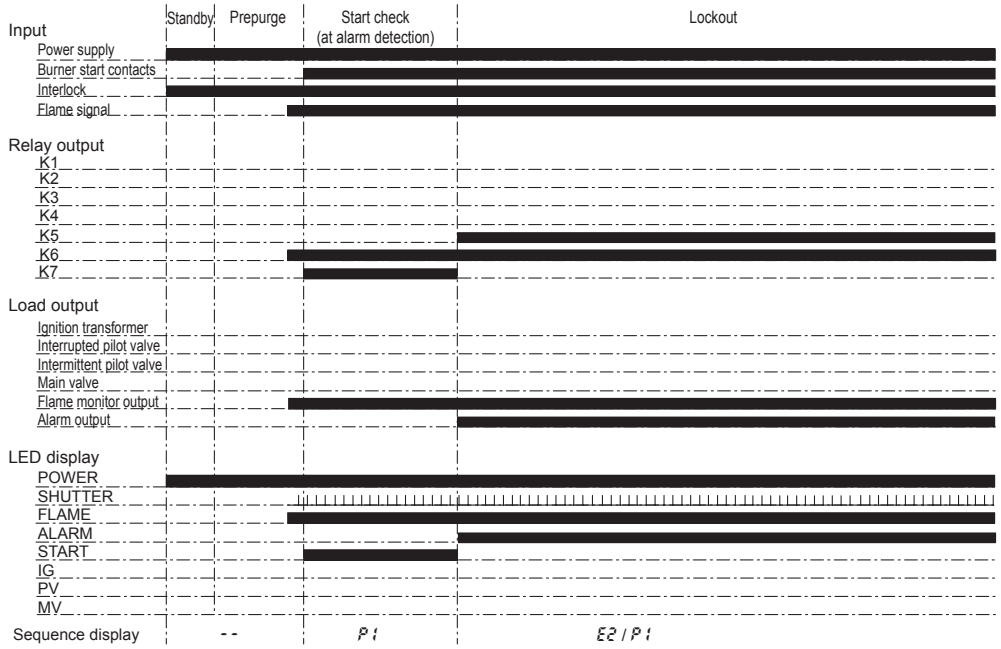
When the power supply, interlock, and prepurge end contacts are ON, and the start contacts are turned ON, the operation progresses to regular combustion following the sequence shown below. If the start contacts turn OFF, the sequence goes to standby.



* When the voltage output to the shutter is ON (opening), the shutter LED goes off.
When the voltage output to the shutter is OFF (closing), the shutter LED lights up.

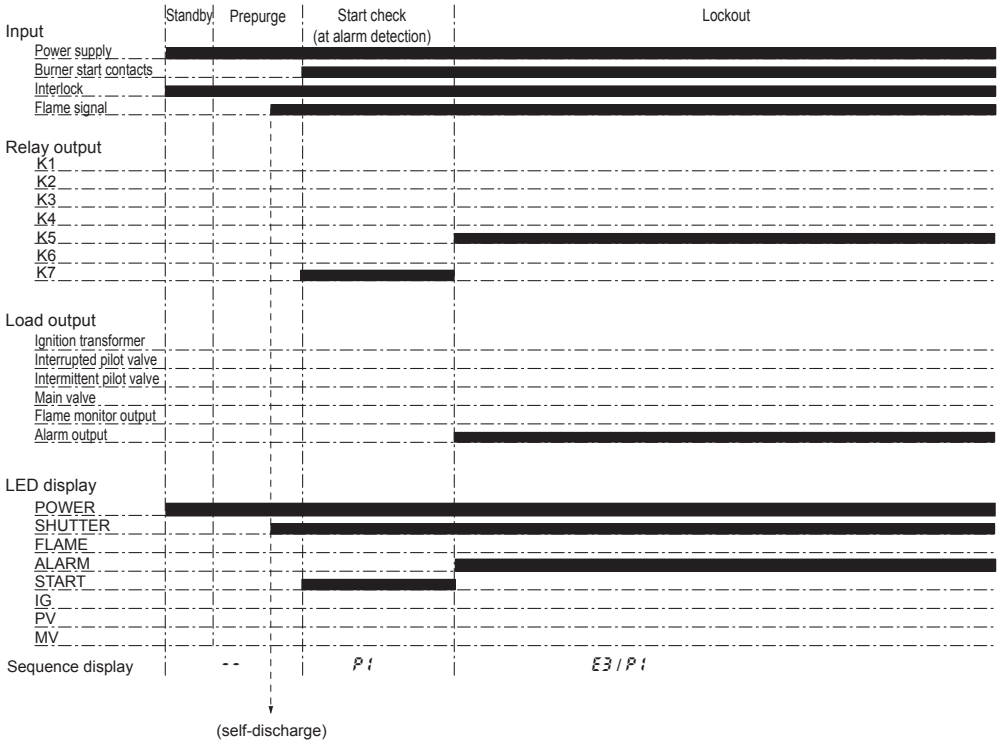
• Start check error due to false flame

If an error (false flame) is detected during the start check and normal operation does not resume within 10 seconds, lockout occurs. While a false flame is detected, the K6 flame monitor output is ON. On the AUR450C, “E2” (false flame) and “P1” are displayed alternately.



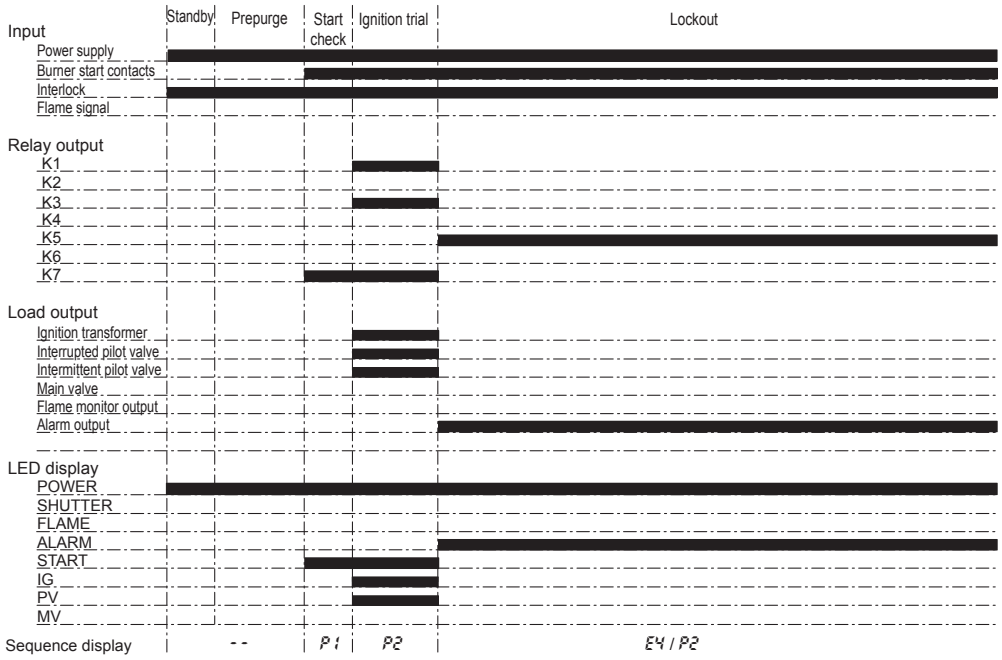
- **Start check error due to self-discharge**

  If an error (self-discharge) is detected during the start check and normal operation does not resume within 10 seconds, lockout occurs. In this case, there is no flame monitor output and the FLAME LED does not light up. On the AUR450C, “E3” (UV error) and “P1” are displayed alternately.



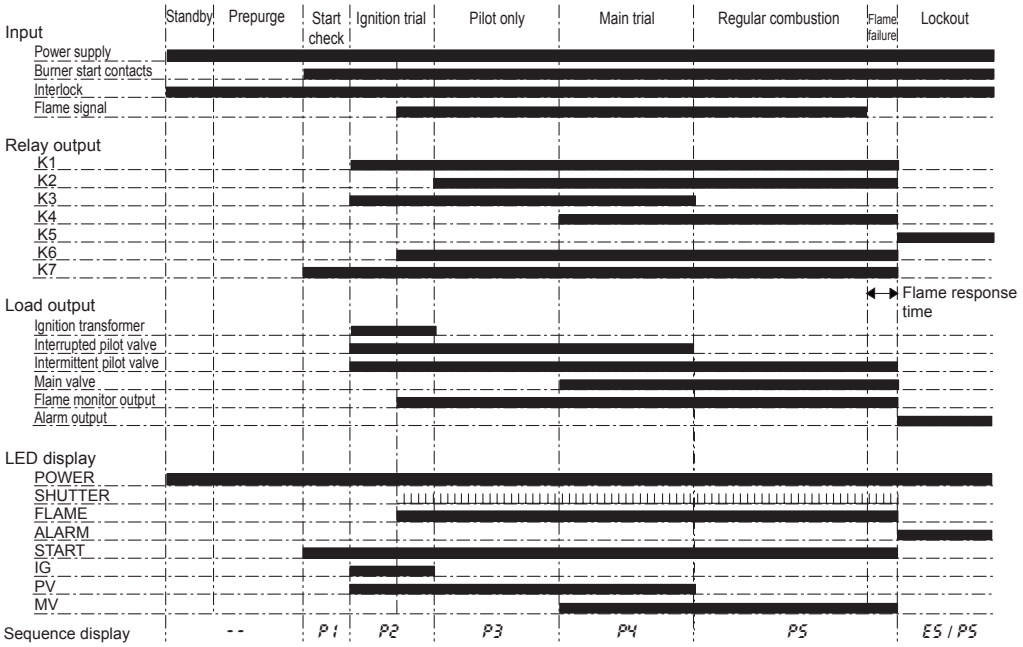
- **Ignition failure**

  If ignition is not detected within the ignition trial time period, lockout occurs and an alarm is output. On the AUR450C, “E4” (ignition failure) and “P2” are displayed alternately.



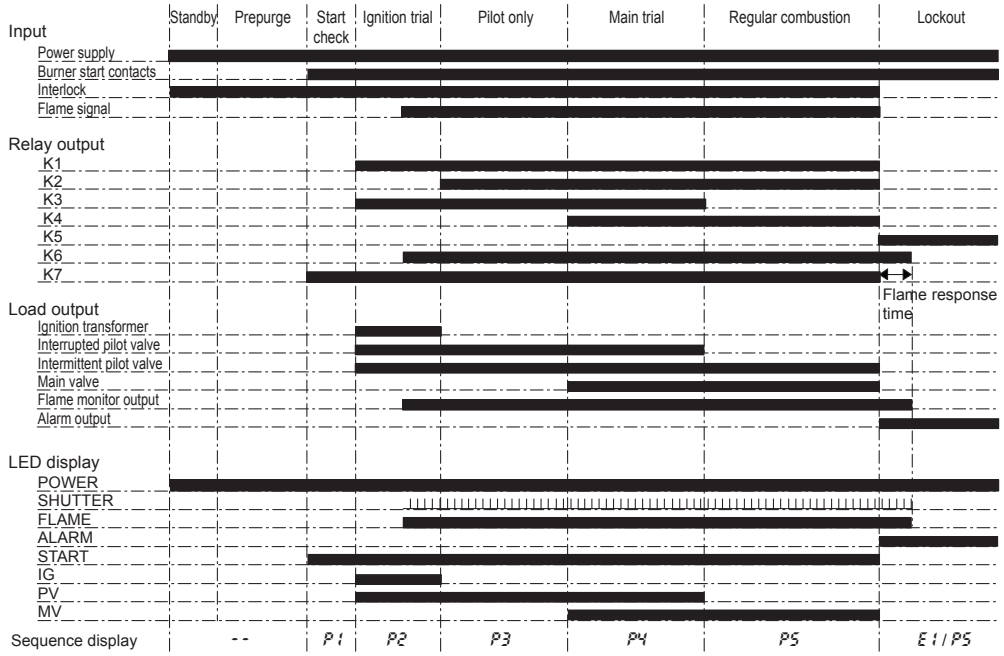
- **Flame-out**

  If a flame-out is detected during regular combustion, the lockout occurs and an alarm is output.
  On the AUR450C, “E5” (flame failure) and “P5” are displayed alternately.



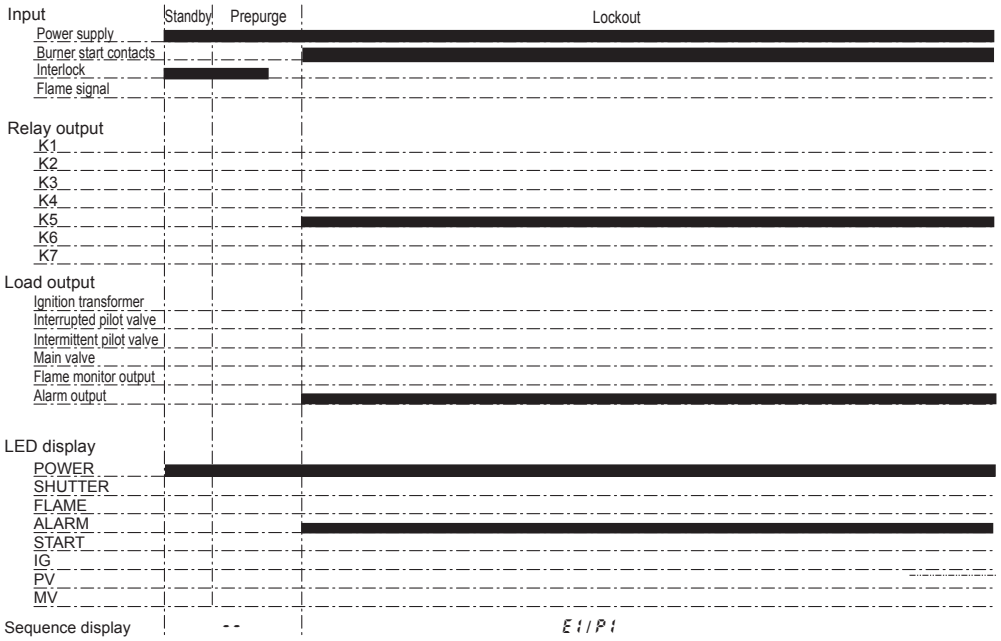
- **Behavior during interlock (occurring during regular combustion)**

  If the lockout interlock contacts have been disconnected and are OFF, lockout occurs and an alarm is output.
  On the AUR450C, “E1” (interlock) and “P5” are displayed alternately.

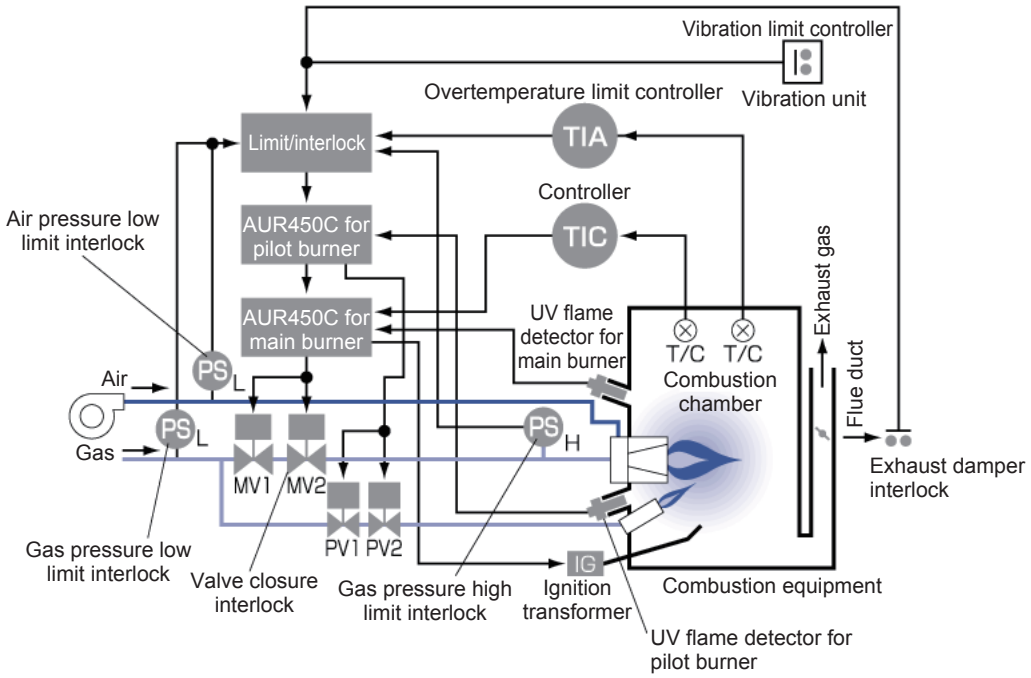


- **Behavior during interlock (during standby, until start signal)**

  Lockout does not occur even though the lockout interlock contacts have been disconnected and are OFF.
  If a start signal is input in that situation, lockout occurs and an alarm is output.
  On the AUR450C, “E1” (interlock) and “P1” are displayed alternately.



[Instrumentation example with intermittent pilot]



● Precautions for instrumentation and circuit configuration with an intermittent pilot

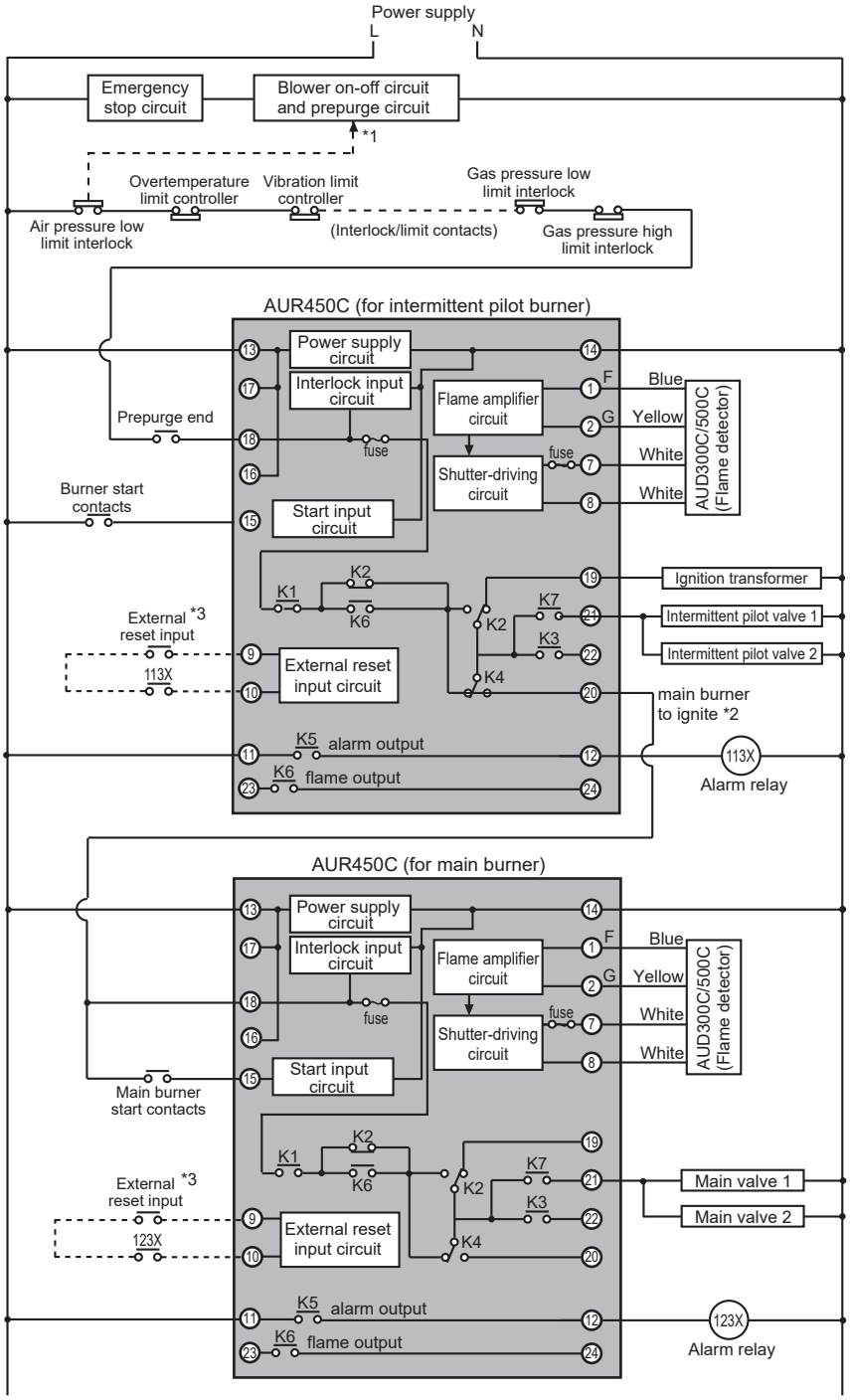
A fundamental rule for intermittent pilots is that a separate monitoring system is required for the pilot and main burners.

Also, for the instrumentation and circuit configuration of an intermittent pilot system, note the following:

- For safety control and operation circuits, devise a safety plan based on risk assessment.
- Install separate combustion monitoring equipment (flame detector and burner controller) for the main burner and pilot burner.
- Install the flame detector for the main burner in a location where it does not detect the pilot burner flame.
- Configure the interlock (including limit) contacts so as to directly disconnect loads (ignition transformer, pilot safety shutoff valve, main safety shutoff valve, etc.).
- When configuring the start circuit, be sure to connect the output that allows the main burner to ignite (the pilot ignition signal output) from the burner controller for the pilot burner to the interlock input terminals and start input terminals on the burner controller for the main burner.
- Design a circuit that shuts down all the burners when an ignition failure or a flame failure of the pilot or main burner occurs.
- Install all the interrupt contacts on the high potential (non-ground) side of the power supply. As needed, take preventive measures against electrical leakage, such as using a ground fault circuit interrupter or a double pole contact system.
- Do not configure a circuit that turns off the interlock input (terminals 17-18) using the alarm output contacts (terminals 11-12). With such a circuit, if a false flame, UV alarm, ignition failure, or flame failure occurs, the interlock alarm (E1) may be displayed.

● Internal block diagram

The internal block diagram below shows an example of wiring with external devices.



*1 Air pressure switch
Configure a check circuit that does the following:
- When the blower starts, if there is no air flow, the circuit should verify that no pressure is detected.
If there is no air flow and pressure is detected, the circuit should not activate the startup switch.

*2 When configuring the circuit, use the pilot ignition signal output as the condition for starting the burner controller for the main burner or for activating the interlock.

*3 Be sure to set up a separate external reset input for each AUR450C. The external reset input of another AUR450C cannot be shared.

Note:

- JIS B 8415 defines ignition times as follows.
Pilot burner ignition time: 10 s max.
Main burner ignition time: 5 s max.

⚠ CAUTION

(1) Do not install where exposed to any of the following:
- Certain chemicals or corrosive gases (ammonia, sulfur, chlorine, ethylene compounds, acid, etc.)
- Water drops or excessive humidity
- High temperatures
- Prolonged vibration

(2) This device has a protective structure equivalent to IP20. Take measures to protect it from dust.
Note that if the equipment is designed to comply with CE/CSA/UL standards, this device should be mounted in an instrument panel with IP54 or equivalent protection.

(3) Installation, wiring, maintenance, inspection, adjustment, etc. should be carried out by a trained and experienced technician who has knowledge and technical skills related to combustion equipment and flame safeguard control devices.

(4) Make sure the load connected to each terminal does not exceed the rating indicated in the specifications.

(5) If timers and auxiliary relays are needed for additional functions, select ones with high reliability, and be sure to design the circuit correctly.

(6) When installing and wiring, be sure to follow the instructions in this manual and in the user's manual for the combustion equipment.

(7) The ignition transformer ground lead should be connected directly to the burner body or to a metallic part electrically connected to the burner body.

(8) Run the high-voltage ignition transformer cable separately and keep it at least 10 cm away from this device.

(9) Keep power wiring and ignition transformer high-voltage cables separate from wires for the AUD300C/500C and for the external reset input.

(10) Make sure that ignition transformer high-voltage cables are properly connected to prevent faulty contact. Faulty contact might generate high-frequency radio waves which can cause malfunction.

(11) Always connect the power supply last.
Otherwise, touching a terminal accidentally could result in electric shock or damage.

(12) Always supply electric power at the voltage and frequency stated on the model label of this device.

(13) In keeping with technical standards for electrical equipment, the burner must have an earth ground connection with a resistance of less than 100 Ω.

(14) After the wiring is complete, be sure to check that it is correct. Incorrect wiring may cause damage or faulty operation.

(15) Make sure that the flame detector does not detect the ignition spark. If it detects the spark, change the position of the flame detector or ignition electrode.

(16) Only an experienced technician who has knowledge and technical skills related to combustion equipment and combustion safety should carry out the pilot turndown test.

(17) This product is equipped with functions that are extremely important for the safe operation of combustion equipment. Carefully follow the instructions for use given in this user's manual.

(18) If the safety shutoff has been activated, check all of the items on the checklists in the TRIAL-RUN ADJUSTMENT section of the user's manual before resuming equipment operation.

(19) When doing a maintenance inspection of the burner, be sure to do the pilot turndown test. Inspection must be done at least once a year.

(20) Conduct periodic inspections in accordance with the user's manual of the equipment manufacturer.

(21) When cleaning the burner, clean the flame detector as well.

(22) For transportation or storage of this device, remove it from the subbase and pack it in its original box.
It might be damaged if transported while mounted on a panel or the like.

Please read “Terms and Conditions” from the following URL before ordering and use.

https://www.azbil.com/products/factory/order.html

Specifications are subject to change without notice.

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