

BC-R35 Series Burner Controllers

Summary

BC-R35 Series burner controllers are combustion safety controllers specifically designed for batch operation (systems which start and stop at least once within 24 hours). They ensure safety by automatically controlling the ignition, combustion monitoring, and fuel shutoff of oil and gas burners with proportional control. They are also equipped with a 7-segment display that can be used in maintenance, a trial operation mode that is convenient for trial-run operation and adjustment, and other features.

Additionally, the BC-R35 is equipped with host communications (RS-485) and Smart Loader Package functions, allowing troubleshooting and more detailed observation of status.

Features

Compliant with JIS standards

- Safe construction of combustion systems and equipment
 - Pre-purge and ignition timing in compliance with JIS B 8407:2012 (forced-air burners) and JIS B 8415:2008 (combustion equipment in compliance with the safety principles for industrial incinerators).
 - POC (proof of closure), based on shutoff valve closure confirmation switch input
- JIS-compliant burner controller safety design
 - Safety design in compliance with JIS C 9730 (automatic electrical controls for household and similar use)
 - EN 298 compliance (certification pending)

Easy mounting and replacement

- DIN rail mounting
 - Easily mountable in the same way as other control devices and control relays
- Uses sub-base structure
 - Structure separates the sub-base from the main unit
It is possible to change only the main unit, leaving the wired-in sub-base in place

■ Precautions on equipment instrumentation

- (1) The equipment used in the combustion safety system was designed with careful consideration of laws, standards, safety guidelines, and the like. If the system is designed to a foreign specification, refer to laws and standards in the relevant country.

Main Safety Policies in Japan

- Technical policy on Safety Standards for Combustion Equipment in Industrial Furnaces: Ministry of Health, Labour 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
 - The index of safety technology of industrial gas combustion equipment: Japan Gas Association
 - Index of safety technology of gas boiler combustion facilities: Japan Gas Association
- (2) This device monitors for failures in the relay contacts used for combustion load (IG, PV, MV) output. An E09 error is output if a voltage occurs at a load terminal, due to a ground fault or wiring error, when this device is not outputting a load. If an E09 error occurs when this device is installed, recheck the wiring and eliminate the factors causing the error.
 - (3) 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 casing through a conduit, keeping a distance between power lines and input lines, and other measures. Check the operation of the system on installation.
 - (4) A reset signal must always be input near the equipment (burner, etc.), not remotely.
If a reset is input while it is not possible to confirm safety, there is the risk of explosion.



Extensive communications with external devices

- Equipped with a 7-segment display
 - 7-segment display for sequence codes and warning codes
 - Press the DISP switch to display the flame voltage.
- External status output
 - States such as ignition failure, flame failure, and combustion detected are output digitally (and used as panel displays)
- Warning reset by contact input
- Equipped with a trial-run operation mode
 - The control motor can be forced to full open and full closed outputs to adjust the high and low fire positions and check the airflow volume
- Equipped with host communications (RS-485), allowing remote observation of status
- Status checking by the Smart Loader Package

Specifications

Item		Description							
Application		Batch-operated combustion systems burning gas, oil, or gas/oil mixture							
Compatible flame detector		AUD100/ 100/ 120 series UV sensor, flame rod AFD100/110 series visible light flame detector , contact input							
Sequence	Sequence timing	Pre-purge	Ignition standby	Pilot ignition (main ignition) ^{*1}	Pilot only (Hi solenoid valve ignition standby) ^{*1}	Main ignition (Hi solenoid valve ignition) ^{*1}	Main burner stabilization	Low fire shutdown	Postpurge
		35 s, 45 s, 60 s, 3 min (select by model number) ^{*2}	7.5±1 s	4.5±0.5 s	8.5±1 s	4.5±0.5 s	8.5±1 s	45 s max.	20±2 s
	Flame response	AUD100/110/120 series UV sensor	Flame rod		AFD series visible light flame detector		Contact input		
		2 s max (nominally 1.5 s) (when flame voltage is 3 V)	2 s max (nominally 1.5 s) (when flame voltage is 2 V)		2 s max (nominally 1.5 s) (20 lx -> 0 lx)		1 s max (nominally 0.8 s) 3 s max. when combined with AUR300 series controller (with flame response 2s max.) for continuous operation		
	Reset timing	1 s or longer (main unit reset switch or contact reset input) ^{*4}							
	Warning detection timing	False flame	Airflow switch error 1	Airflow switch error 2	Interlock error	Low fire interlock error 1	Low fire interlock error 2	High fire interlock error	POC (shutoff valve closure check) error
		5 s	1 s max.	180 s	1 s	1 s max.	180 s	180 s	3 s
	Airflow switch monitoring	Yes (checks for switch error #1, error #2)							
	Ignition failure	Lockout							
	Flameout	Lockout							
	Low fire shutdown ^{*3}	After confirming low combustion position when stopped, moves to postpurge (selected according to model).							
Electrical specifications	Rated power supply voltage	AUD100/110/120 series UV sensor	Flame rod		AFD series visible light flame detector		Contact input		
		100 Vac, 200 Vac, or 220 Vac, 50/60 Hz				100 to 230 Vac, 50/60 Hz			
	Allowable power supply voltage	85 to 110 % of rated power supply							
	Power consumption	10 W or less							
	Voltage resistance	1,500 Vac for 1 min, or 1,800 Vac for 1s Between each terminal and ground, except for combustion sensor connection terminals (terminals 14, 15)							
	Insulation resistance	At least 50 MΩ, 500 Vdc megger Between each terminal and ground, except for combustion sensor connection terminals (terminals 13, 14)							
	Contact rating	Blower motor (electromagnetic breaker)	Ignition transformer	Pilot valve (main valve Lo solenoid valve) ^{*1}	Main valve (main valve Hi solenoid valve) ^{*1}	Warning		Control motor open output, close output, proportional output	
		100 VA	300 VA	200 VA	200 VA	75 VA		200 VA	
	Monitor outputs	4, maximum 30mA each							
	Combustion detection level	AUD100/110/120 series UV sensor	Flame rod		AFD100/110 series visible light flame detector		Contact input		
		When ignition is detected: 1.5 to 4.5 Vdc When extinction is detected: 0.2 to 0.6 Vdc	When ignition is detected: 1.5 to 4.5 Vdc When extinction is detected: 0.0 to 0.2 Vdc		When ignition is detected: 1.3 Vdc or less When extinction is detected: 0.5 Vdc or more		When ignition is detected: Short between F and G When flame is not detected: Open between F and G		
	Flame voltage output	Recommended flame voltage: must be stable at 2 Vdc or above Flame voltage output range: 0.2 to 4.5 Vdc	Recommended flame voltage: must be stable at 2 Vdc or above Flame voltage output range: 0.0 to 4.5 Vdc		Flame voltage output range: 0.2 to 4.8 Vdc		When ignition is detected: 4.0 Vdc or more When flame is not detected: 0.5 Vdc or less		
	Input	Start input, lockout interlock input, contact reset input, airflow switch input, POC (shutoff valve closure check) input, high fire interlock, low fire interlock * Each input is a non-voltage contact input, with allowable contact resistance up to 500 Ω							
	Lifespan	10 years when used for eight hours per day, or 100,000 start/stop cycles (at 25 °C, room temperature, rated voltage)							
Host communication specifications	Communications standard	RS-485							
	Transmission route	3-wire system							
	Transmission speed	4800, 9600, 19200 bps							
	Transmission distance	Max. 500 m							
	Communication method	Semi-duplex							
	Synchronization method	Asynchronous							
	Data format	8 data bits, 1 stop bit, even parity, odd parity 8 data bits, 2 stop bits, even parity, odd parity							
	Device address	1 to 32							
	Connection method	1: N (max. 15 units)							
	Miscellaneous	Based on RS-485							

Transportation and storage conditions	Ambient temperature	-20 to +70°C
	Ambient humidity	5 to 95 % RH (no condensation)
	Vibration	0 to 9.8 m/s ² (10 to 150 Hz, 1 octave/minute, 10 cycles, in each of XYZ directions)
	Shock	0 to 300 m/s ²
	Packaged drop test	60 cm drop height (free drop onto 1 corner, 3 edges, 6 sides)
Operating conditions	Ambient temperature	-20 to +60 °C
	Ambient humidity	10 to 90 % RH (no condensation)
	Vibration	0 to 3.2 m/s ² (10~150Hz, 1 octave/minute, 10 cycles, in each of XYZ directions)
	Shock	0 to 9.8 m/s ²
	Mounting angle	Reference plane +/-10 °
	Dust	0.3 mg/m ² or less
General specifications	Protective structure	IP40 (with a sideboard (81447515-001) attached to the sub-base (BC-R05)) IP10 (sub-base (BC-R05) only)
	Excess voltage category	II
	Pollution degree	PD2
	Case color	Black
	Case material	Denatured PPE resin (UL94-V0 PTI materials group IIIa)
	Structure	Sub-base and main unit
	Mounted orientation	Vertical or horizontal However, in horizontal mounting the 7-segment display must face directly upward (DIN rail mounting or direct mounting through base screw holes)
	Standards compliance	JIS C 9730-2-5: 2010 <u>Certifications</u> CE Marking <ul style="list-style-type: none"> • Gas Appliances Regulation (2016/426/EU) based on EN 298: 2012 • Low Voltage Directive (2014/35/EU) based on EN 60730-2-5: 2015 • Electromagnetic Compatibility Directive (2014/30/EU) based on EN 61000-6-2: 2005, EN 61000-6-4: 2007+A1: 2011 • RoHS Directive (2011/65/EU) based on EN IEC63000: 2018
	Dimensions	W95 × H105 × D110 mm
	Weight	Approximately 600 g (incl. sub-base)
Wiring types and max. wiring length	<p>- Start, airflow switch, lockout interlock, POC (shutoff valve proof of closure), low fire interlock, high fire interlock Copper IV wire with 600 V vinyl insulation, 1.25 mm², recommended condition: 20 m or less, maximum wiring length: 100 m</p> <p>- Contact reset Copper IV wire with 600 V vinyl insulation, 1.25 mm², maximum wiring length: 10 m - AUD100/110/120 (F, G)</p> <p>Copper IV wire with 600 V vinyl insulation, 1.25 mm², maximum wiring length: 100 m - Flame rod (F, G)</p> <p>RG-11U (JAN standard: US DoD compliant specification) or equivalent, 5C2V, 7C2V (JIS standard) Recommended condition: 20 m or less, maximum wiring length: 30 m - AUD100/110 (F, G)</p> <p>Copper IV wire with 600 V vinyl insulation, 1.25 mm², maximum wiring length: 10 m - RS-485 communications (3-wire system) 0.2 to 1.5 mm² shielded, twisted pair cable (recommended) Maximum wiring length: 500 m - Signal line for flame voltage output IV wire, 0.75 mm² or larger, max. wiring length 10 m</p>	

*1 Item in () is for the case of direct ignition.

*2 Visible light flame detector and contact input are 35s only.

*3 Visible light flame detector and contact input model do not have the low fire shutdown function.

*4 During postpurge after a warning, no reset input is accepted until postpurge is complete.

Also, reset input is not accepted if no warning has occurred.

Model number composition

(Note: The dedicated sub-base and sideboard are not provided with the BC-R35 controller. Order them separately.)

● Flame detector: Flame rod / UV sensor (AUD100/110)

I II III IV V VI VII Example: BC-R35B1G0500

I	II	III	IV	V	VI	VII	Description
Base model number	Communications function	Flame detector	Power supply	Function code	Timing code	Additional functions	
BC-R							Burner Controller
	35						RS-485, with Smart Loader Package function
		B					Flame rod (Ionization)
		C					UV sensor (AUD100/110/120)
			1				100 Vac
			2				200 Vac
			6				220 Vac
				G			Interrupted pilot type, No low fire stop
				J			Interrupted pilot type, Low fire stop available
				L			Direct ignition type, No low fire stop
				N			Direct ignition type, Low fire stop available
					050		Pre-purge time 35 s
					086		Pre-purge time 45 s
					122		Pre-purge time 60 s
					158		Pre-purge time 3 min
						0	None
						D	With inspection record (with data)

● Flame detector: Visible light flame detector AFD100/110 series

I II III IV V VI VII Example: BC-R35A7G0500

I	II	III	IV	V	VI	VII	Description
Base model number	Communications function	Flame detector	Power supply	Function code	Timing code	Additional functions	
BC-R							Burner Controller
	35						RS-485, with Smart Loader Package function
		A					Visible light flame detector
			7				100-230 Vac
				G			Interrupted pilot type, No low fire stop)
				L			Direct ignition type, No low fire stop
					050		Pre-purge time 35 s
						0	None
						D	With inspection record (with data)

● Flame detector: Contact input

I II III IV V VI VII Example: BC-R35F7G0490

I	II	III	IV	V	VI	VII	Description
Base model number	Communications function	Flame detector	Power supply	Function code	Timing code	Additional functions	
BC-R							Burner Controller
	35						RS-485, with Smart Loader Package function
		F					Contact input
			7				100-230 Vac
				G			Interrupted pilot type, No low fire stop
				L			Direct ignition type, No low fire stop
					049		Pre-purge time 35 s Flame failure response timing 1 s max
					121		Pre-purge time 60 s Flame failure response timing 1 s max
						0	None
						D	With inspection record (with data)

Compatible flame detector (sold separately)

● UV sensor

Model number	Name	Notes
AUD15C1000	Advanced UV sensor tube unit	Use a dedicated socket for the AUD100C/110C/120C
AUD100C100_	Dedicated socket for the AUD15 Lead wire type	AUD15C1000, sold separately
AUD100C1000-A15		AUD15C1000 in package
AUD110C100_	Dedicated socket for the AUD15 Terminal board type	AUD15C1000, sold separately
AUD110C1000-A15		AUD15C1000 in package
AUD120C120_	Dedicated socket for the AUD15 1/2-inch mounting type	Without G1/2 adapter, AUD15C1000, sold separately
AUD120C121_		With G1/2 adapter, AUD15C1000, sold separately

_ : 0: standard product, D with inspection record (with data), T tropicalization treatment (AUD110C only), B with inspection record (with data) + tropicalization treatment (AUD110C only)

● Flame rod

Model number	Name	Notes
C7007A	Flame rod holder	Discontinued
C7008A	Flame rod assembly	Discontinued

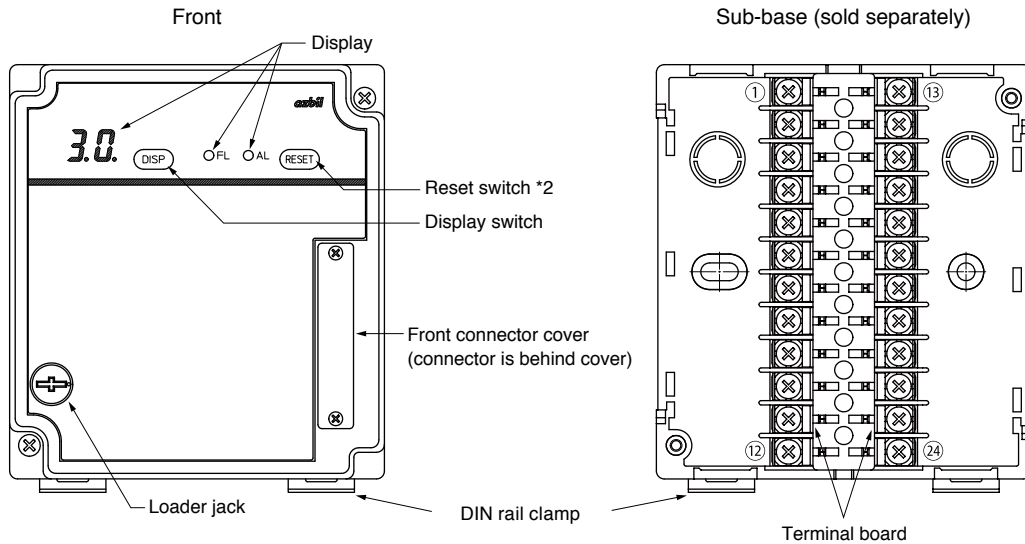
● Visible light flame detector

Model number	Name	Notes
AFD100A0700	Visible light flame detector	Light reception direction: front, top-view type
AFD100B0700		Light reception direction: side, side-view type
AFD110A0000		G3/4-inch flange mounting type

Options (sold separately)

Model number	Product name	Notes
BC-R05A100	Dedicated sub-base for BC-R	Required for all products in the BC-R35 series
81447514-001	Connector for front wiring	Weidmueller model number : BL3.5/11F, compatible wire: 0.2-1.5mm ² (AWG28-14)
81447514-002	Connector for front wiring (For right-side wiring)	Weidmueller model number : BL3.5/11/270F, compatible wire: 0.2-1.5mm ² (AWG28-14)
81447515-001	Sideboards	Contains two. Not included in the sub-base.
SLP-BCRJ71	Smart Loader Package (No cable)	
81441177-001	USB loader cable	
FSP136A100	Analog flame meter	
81447519-001	Jack cover	(Included with the controller.)
81447531-001	Front connector cover	Packaged with mounting screws (Included with the controller.)
81447596-001	R4780/R4715-compatible mounting plate	For use when replacing R4715, R4780, R440H, R4751, or R4781

Terminal numbers, front panel item names



Terminal numbers

Front terminals

No.	Function	No.	Function
25	Flame voltage output (+)	31	Power supply for monitor output
26	Flame voltage output (-)	32	Monitor output, combustion
27	Host communications (RS-485) DA	33	Monitor output, ignition failure
28	Host communications (RS-485) DB	34	Monitor output, flame failure
29	Host communications (RS-485) SG	35	Monitor output, lockout interlock input
30	NC		

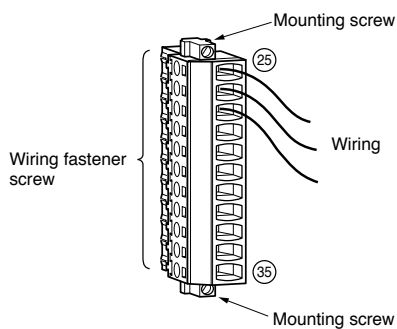
Sub-base terminals

No.	Function	No.	Function
1	Output for the blower motor (electromagnetic breaker)	13	Warning output
2	AC power supply (L1)	14	Flame detector (F)
3	AC power supply (L2 (N))	15	Flame detector (G)
4	Output common 1	16	Input common 1
5	Output common 2	17	Input common 2
6	Ignition transformer output	18	Low fire interlock input
7	Pilot valve output	19	High fire interlock input
8	Main valve output	20	Start input ^{*1}
9	Control motor output common	21	Airflow switch input
10	Control motor proportional output	22	Lockout interlock input
11	Control motor open output	23	POC (shutoff valve closure check) input
12	Control motor closed output	24	Contact reset input ^{*2}

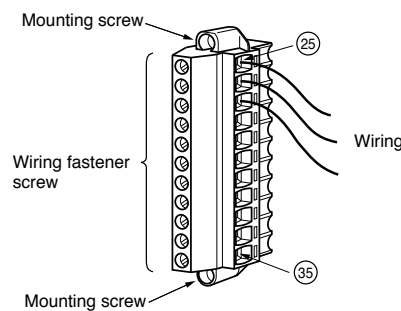
*1 After lockout is released, even if the start input is ON, the unit will not start for 5 seconds to ensure operation stability.

*2 During postpurge, reset is disabled for 20 seconds.

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



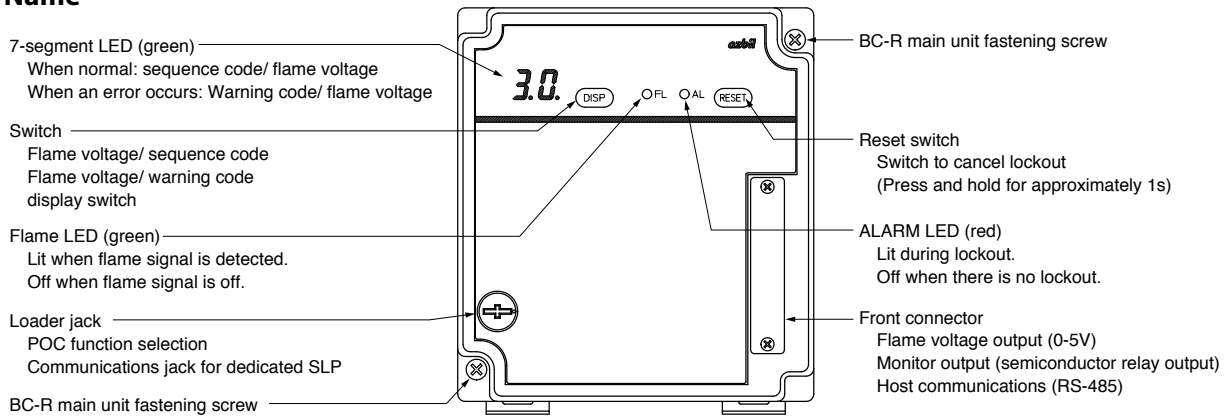
● Connector for front wiring (for right side wiring) (81447514-002) terminal layout



7-segment display, LED display, switches

If this device detects a flame failure etc., it isolates the load and applies a lockout. During lockout, the relevant diagnostic function code is displayed on the 7-segment display.

Part Name



Warning codes

Display	Name	Content
E0	Interlock error	Lockout interlock
E1	False flame	Combustion signal was detected for 5s during start check and pre-purge
E2	Airflow switch error 1	The airflow switch turned Off during combustion
E3	Airflow switch error 2	The airflow switch stayed On for 3 minutes during start check The airflow switch stayed off for 3 minutes during pre-purge
E4	High fire interlock error	During pre-purge, no high fire interlock input was detected for three minutes after high fire position output.
E5	Low fire interlock error 1	The low fire interlock turned off between pilot ignition and main stabilization
	Low fire interlock error 2	The low fire interlock remained Off for three minutes during ignition standby
E6	Ignition failure	Ignition could not be detected with pilot ignition (interrupted pilot type) Ignition could not be detected with main trial (direct ignition type)
E7	Flame failure	The flame signal disappeared in the sequence after pilot ignition (interrupted pilot type) The flame signal disappeared in the sequence after main trial (direct ignition type)
E8	POC (shutoff valve proof of closure) error*	The shutoff valve closure check switch was detected to be Off (open) when the main valve was closed The shutoff valve closure check switch was detected to be On (closed) when the main valve was open
E9 + Sub-code (2 digits)	Device error	Voltage error detected in output from the ignition transformer, pilot valve, or main valve, etc.

* Replace the burner controller, and if there is a warning code E8, POC may have been set by the equipment manufacturer as disabled.

Sequence codes

• Interrupted pilot type

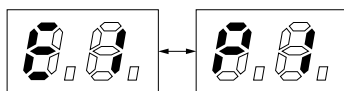
Display	Status content
P1	Start check
P2	Pre-purge
P3	Ignition standby
P4	Pilot ignition
P5	Pilot only
P6	Main ignition
P7	Main stabilization
P8	Steady combustion
PL	Low fire shutdown
P9	Postpurge
--	Stop

• Direct ignition type

Display	Status content
P1	Start check
P2	Pre-purge
P3	Ignition standby
P4	Main ignition
P5	Hi solenoid valve ignition standby
P6	Hi solenoid valve ignition
P7	Main stabilization
P8	Steady combustion
PL	Low fire shutdown
P9	Postpurge
--	Stop

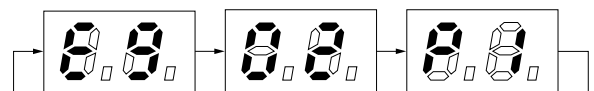
Examples of sequence codes and warning codes

• Warning code: E0 to E8



Switches every 0.8s

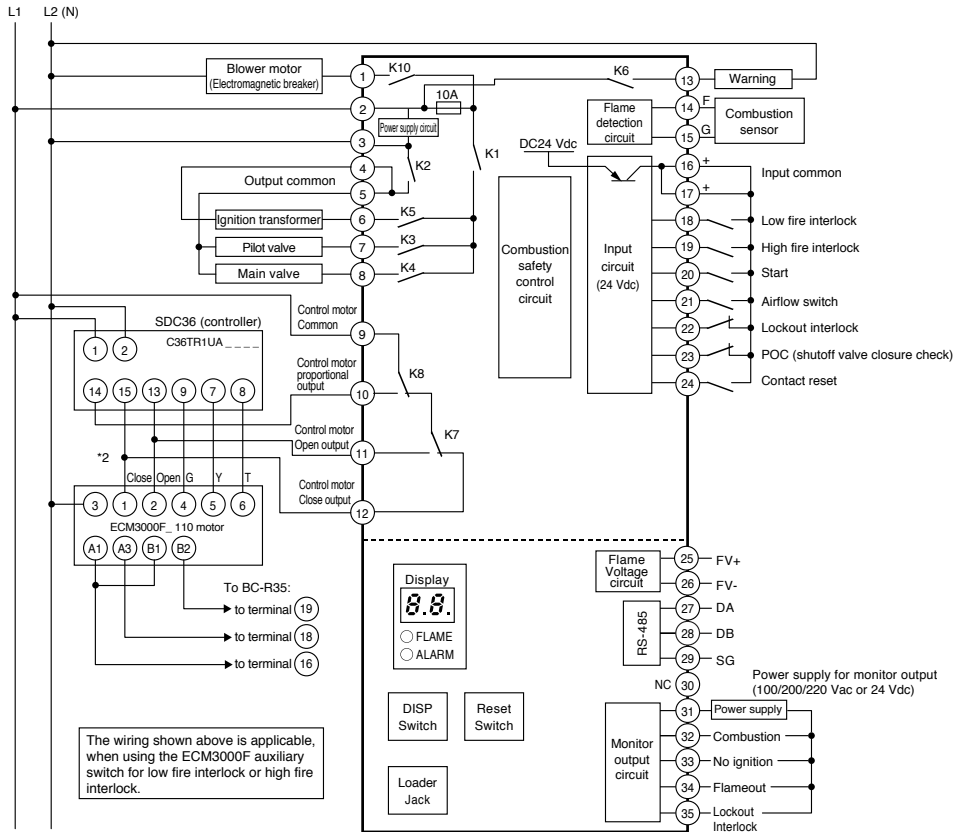
• Alarm code: E9 + sub-code (2 digits)



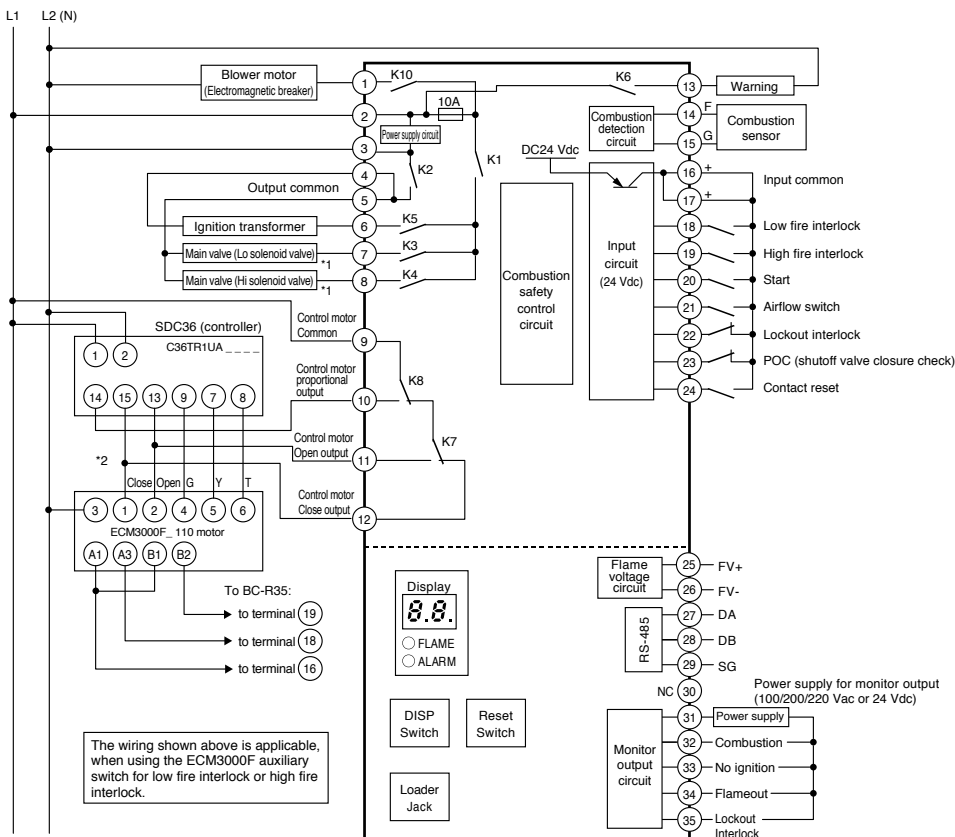
Switches every 0.8s

Internal block circuit, external connection terminals (1-24 on sub-base, 25-35 on front connector)

● Interrupted pilot type (excluding the BC-R35F)



● Direct ignition type



Note: - Use contact reset (terminal 24) input in isolation. It cannot be used in conjunction with other BC-R contact reset inputs.

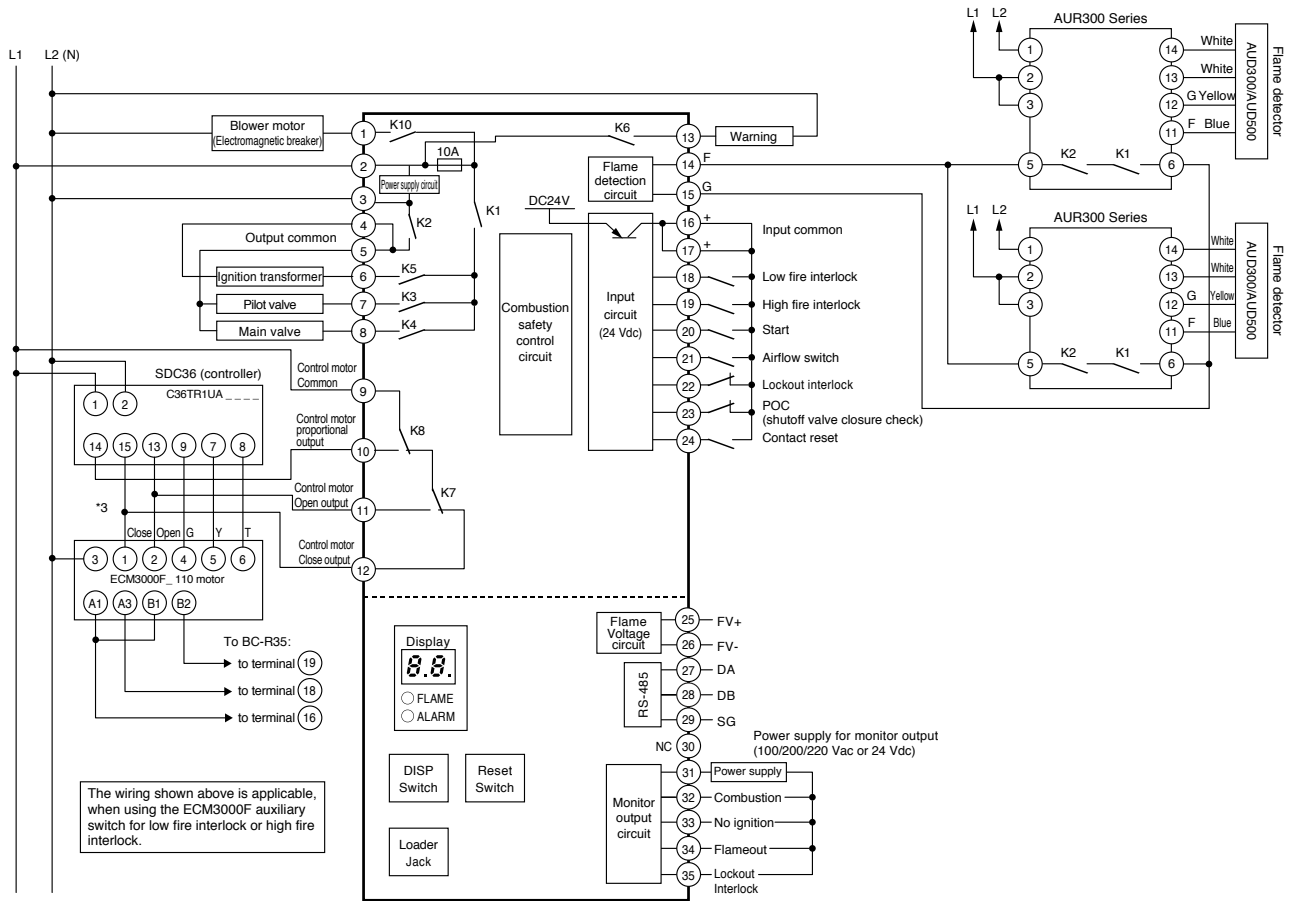
- Output common (terminals 4, 5) and input common (terminal 16, 17) cannot be used in conjunction with other BC-R contact reset inputs.

- Host communications (RS-485) and Smart Loader Package compatibility are only available on the BC-R35.

*1 Content in () describes the situation when three-position (Off-Lo-Hi) control is used. If other than three-position control is used, connect to main valve (terminal 7).

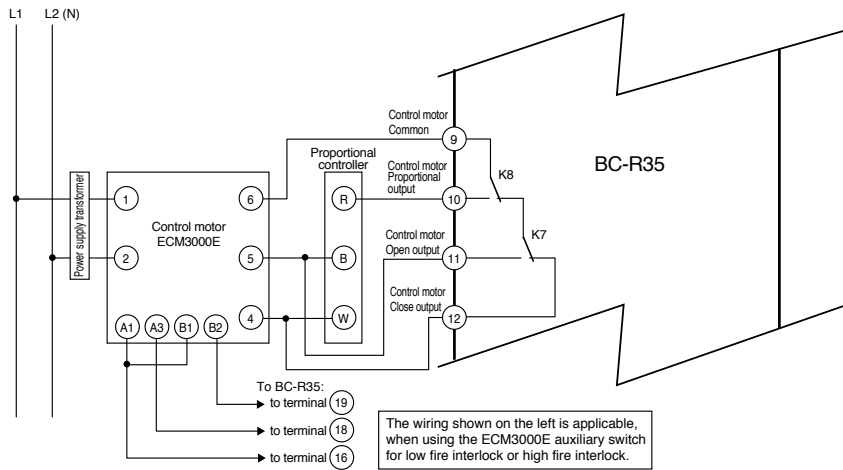
*2 See Page 9 for the wiring for using a proportional controller and ECM3000E.

● For compliance with the standard on remote control of boilers (Standards circular No. 0331001) when using the BC-R35F

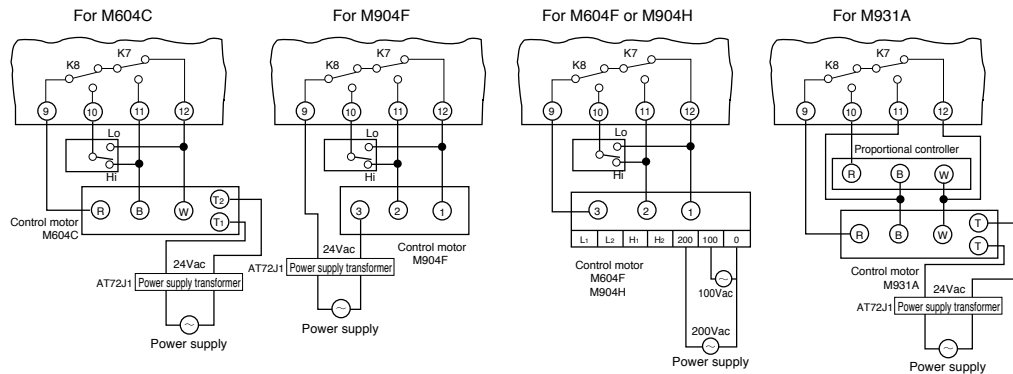


Note: This is not suitable for continuous operation, even if a flame detector for continuous operation is used.

*3 • The following wiring is applicable, when using a proportional controller/ECM3000E, instead of the SDC36 controller/ECM3000F.



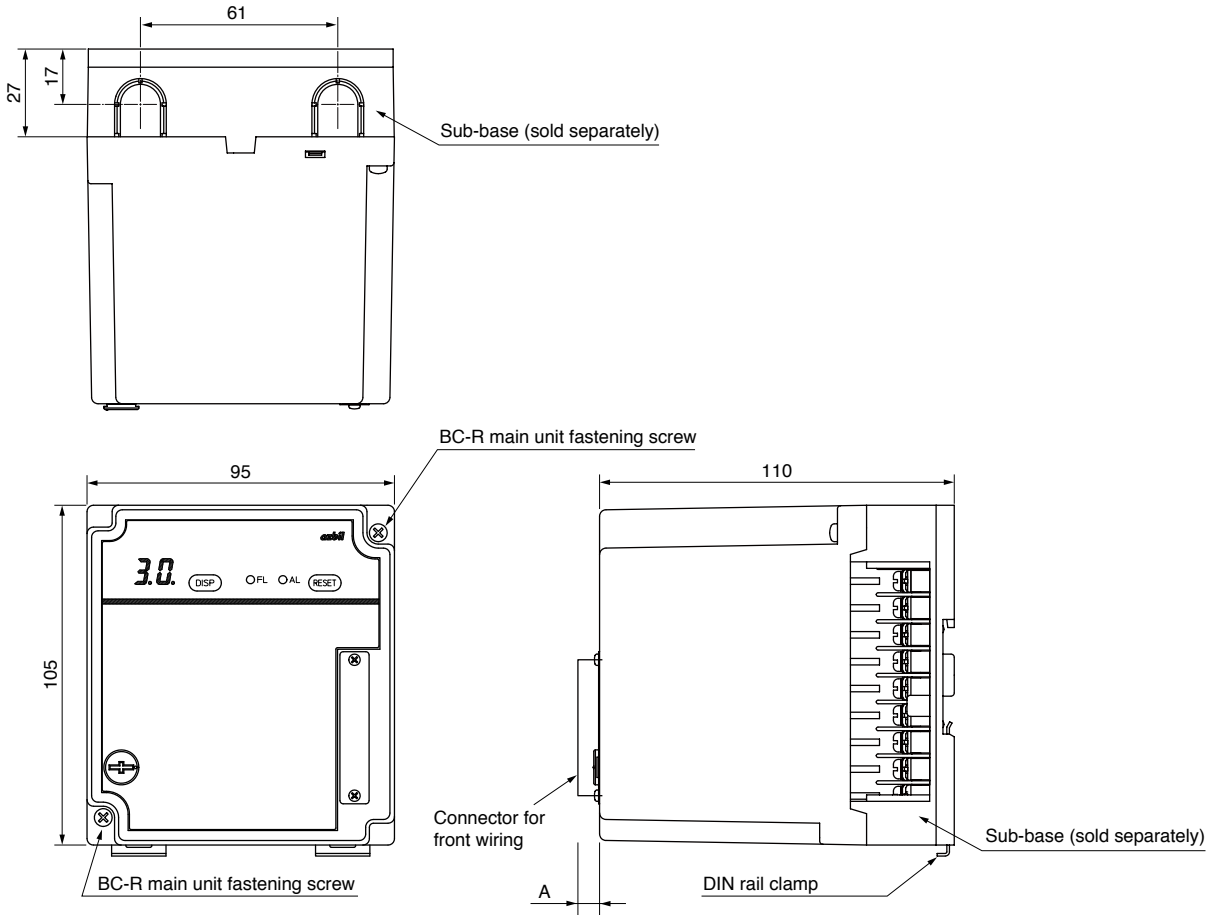
• Wiring with other control motors



External Dimensions

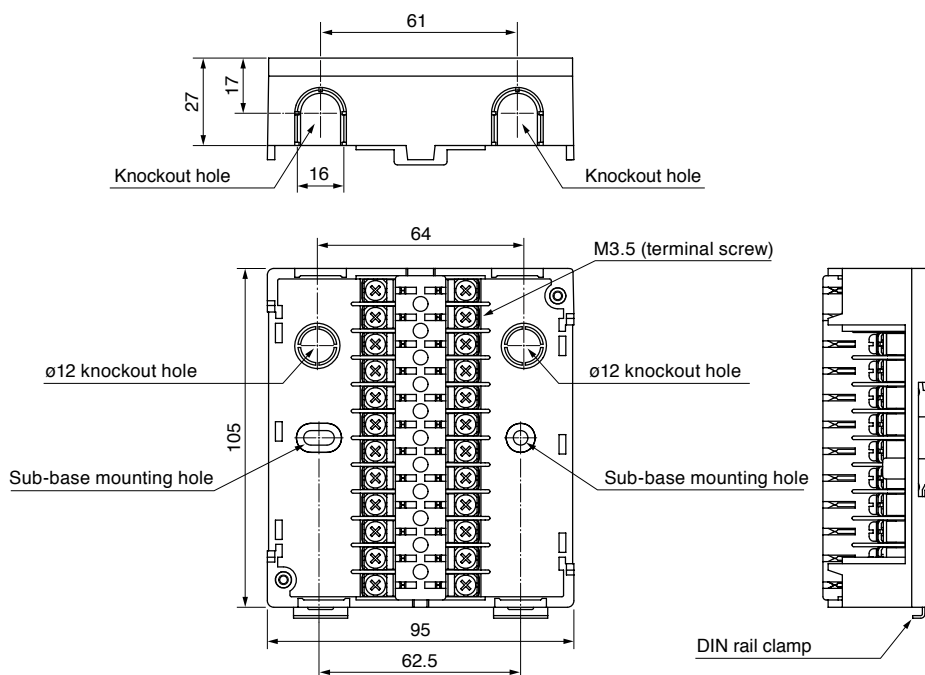
(Unit: mm)

- BC-R35 Burner Controller



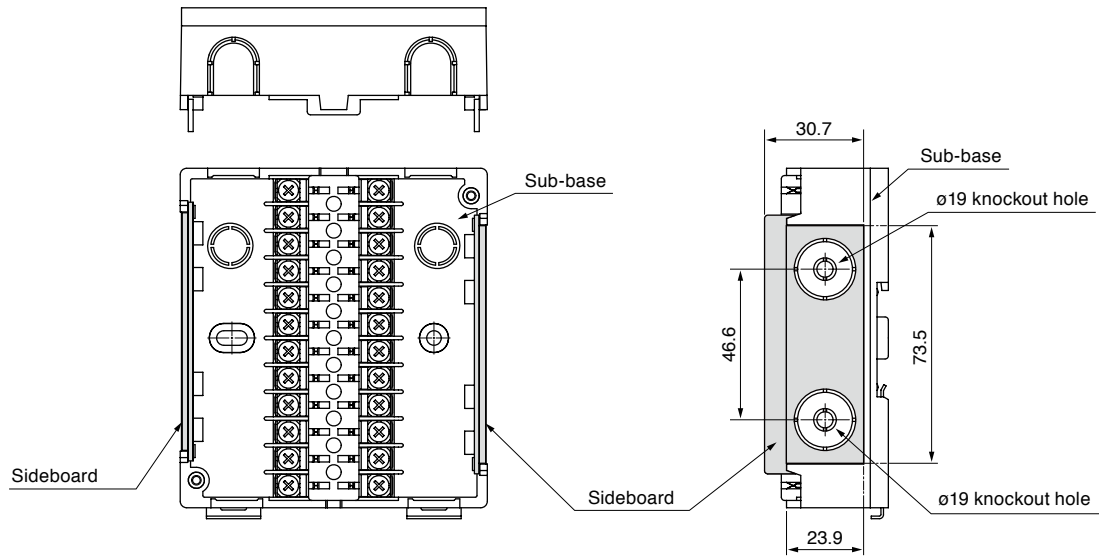
Model number	A
81447514-001	10.6
81447514-002	14.6

- Sub-base BC-R05A100 (sold separately)



- Sideboard 81447515-001 (sold separately)

(Unit: mm)

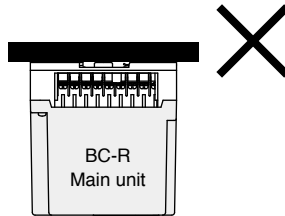


Installation orientation

Install the device in the orientation shown below.



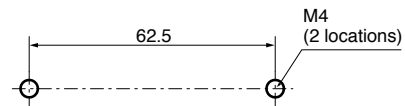
Do not install it in the orientations illustrated below.



Mounting in a Panel

- [1] Screw two M4 screws into the panel.
- [2] Use the screws to mount the sub-base on the panel.
(Maximum tightening torque: 1.2 N·m)

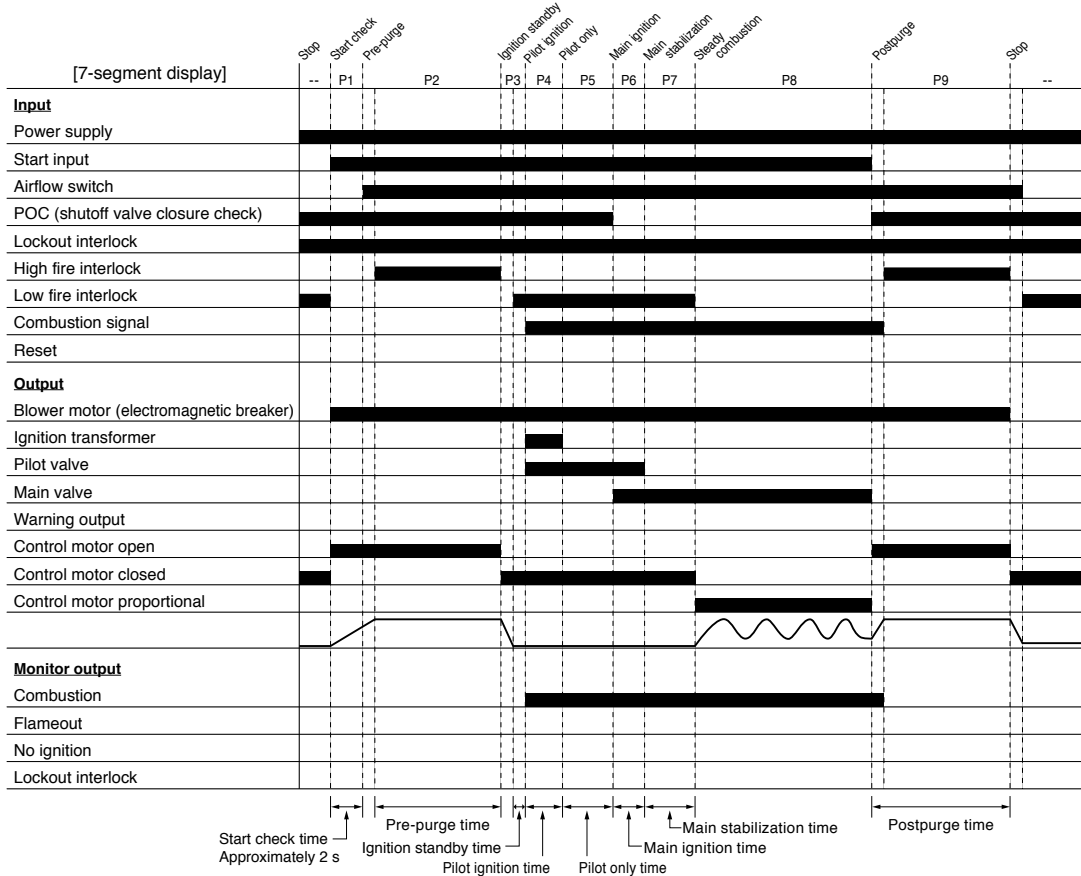
(Unit: mm)



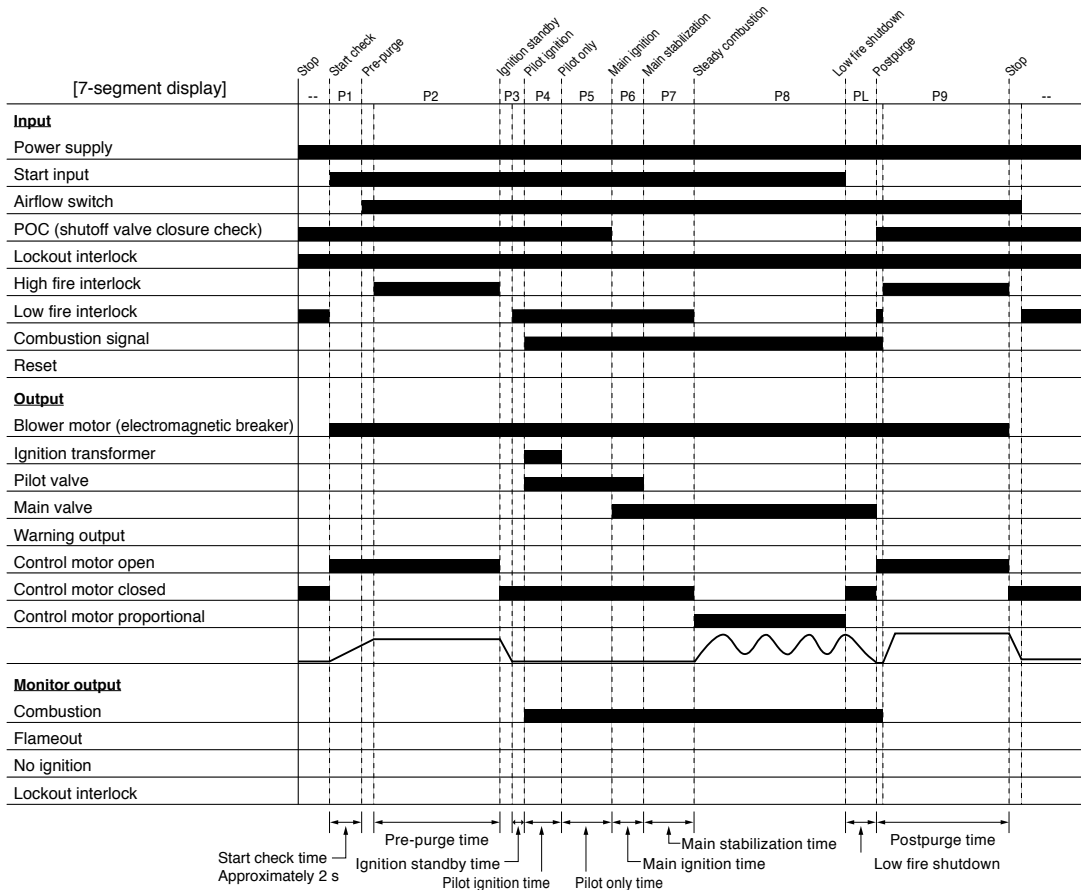
Operation Sequence

About the sequence except Normal Operation, please watch "BC-R35 User's manual No. CP-SP-1389E".

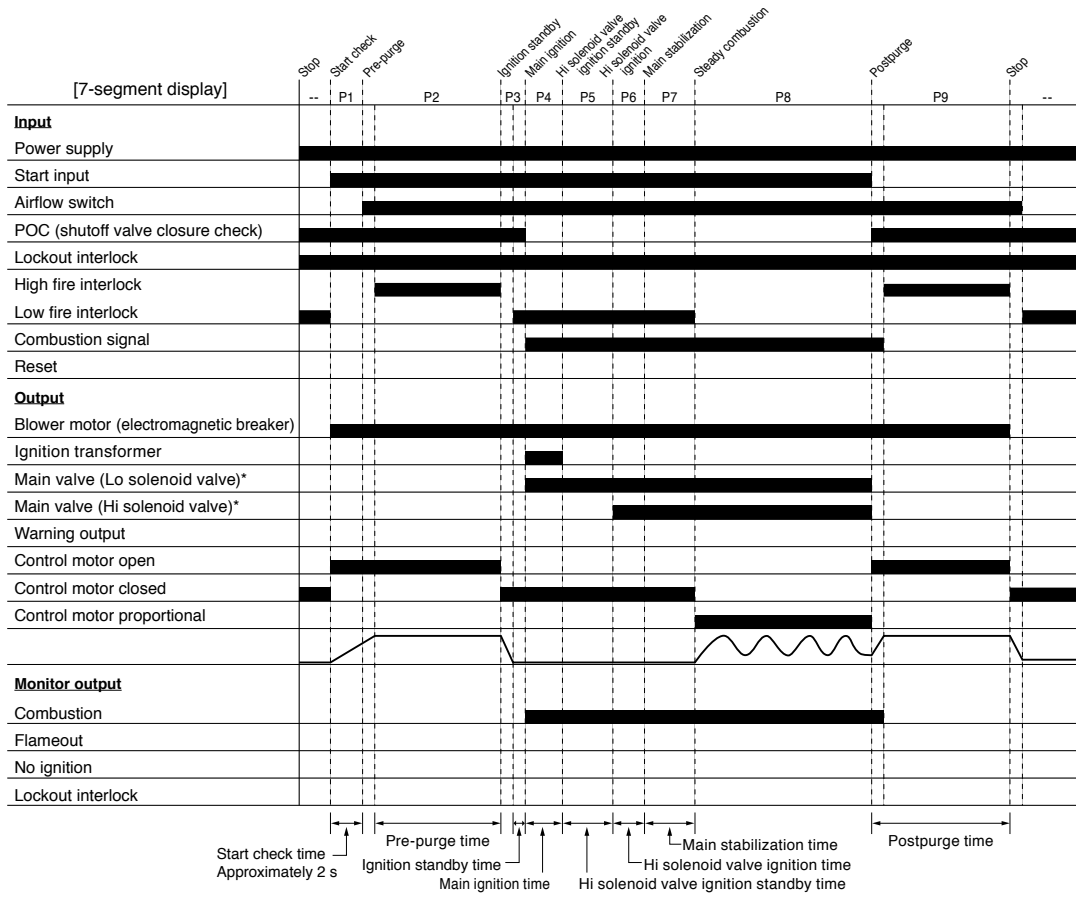
1-1. Normal operation (interrupted pilot type, without low fire shutdown)



1-2. Normal operation (interrupted pilot type with low fire shutdown)

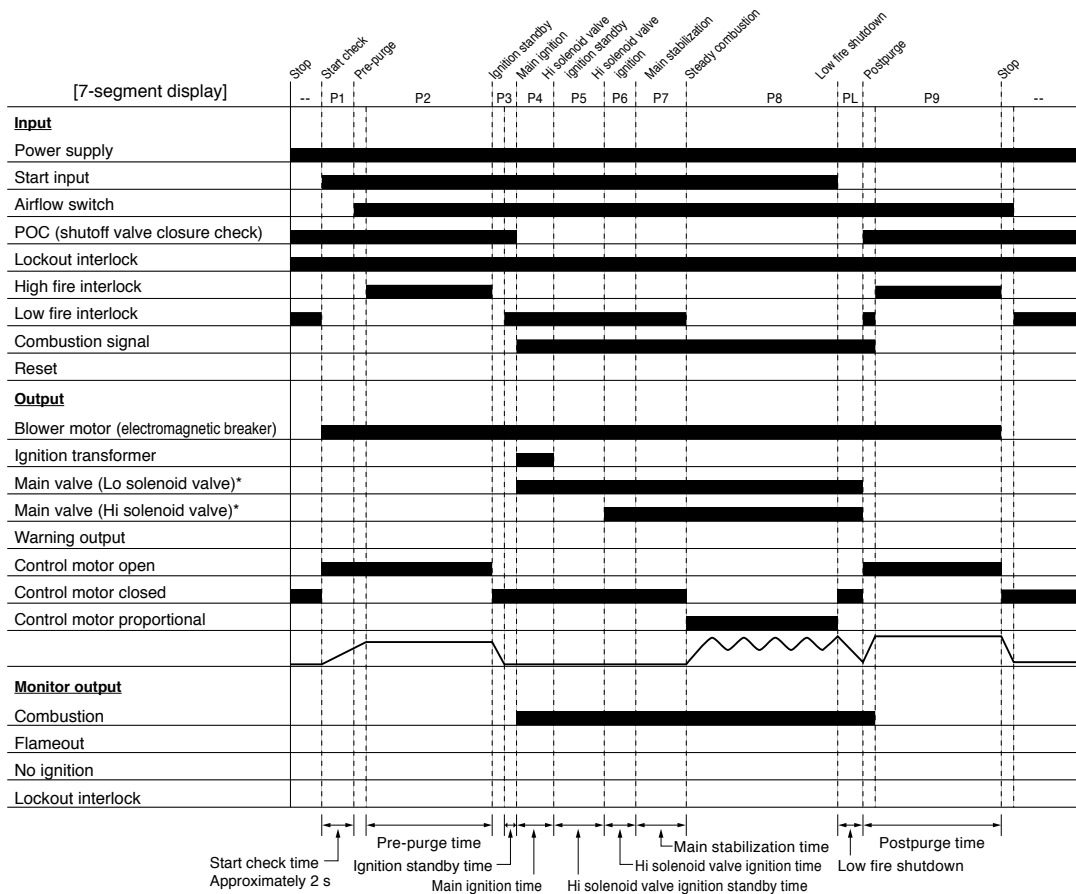


1-3. Normal operation (direct ignition type without low fire shutdown)



* Content in () describes the situation when three-position (Off-Lo-Hi) control is used.
If other than three-position control is used, only look at the main valve (Lo solenoid valve)

1-4. Normal operation (direct ignition type with low fire shutdown)



* Content in () describes the situation when three-position (Off-Lo-Hi) control is used.
If other than three-position control is used, only look at the main valve (Lo solenoid valve)

Customer Specification Check Sheet, BC-R35 Series

This sheet is for selecting the optimum BC-R35 Series product to suit the customer's specification.
Use it to facilitate communications with our sales staff.

Equipment name		
Equipment summary		
Flame detector used (draw a circle around the applicable product)		Flame rod / UV sensor (AUD100 series) / Visible light flame detector (AFD100 series) / contact input
(For a UV sensor: Write the model No.)		
(With a visible light flame detector: Write the model No.)		
Ignition method (circle the applicable product)		Direct ignition type / time-limited pilot ignition type
Low fire shutdown		Yes/No
Power supply voltage (circle the applicable voltage)		100 Vac / 200 Vac / 220 Vac
Sequence	Pre-purge	Seconds or minutes
	Ignition standby	s
	Pilot only	s
	Main ignition	s
	Main stabilization	s
	Postpurge	s
Input (Write whether or not there is input, the specification, etc.)	Lockout interlock input	
	Start input	
	Contact reset input	
	Airflow switch input	
	High fire interlock input	
	Low fire interlock input	
	POC (shutoff valve closure check) input	
MEMO		

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.

azbil

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