

Selas Adjustable Oil Lance (SAOL) Burner

SAFETY

These instructions pertain only to the Selas Adjustable Oil Lance Burner and should only be used for its intended purpose. Only qualified personnel should work on the SAOL to ensure proper installation, especially when installing fuel oil piping or electrical wiring. All installations MUST follow/meet region requirements. If unsure about this information, contact your local fuel oil or electric company. This product can cause serious injury/harm if misused; any person working with the SAOL should be equipped with proper protective equipment, such as safety glasses, close-toed shoes, and adequate clothing attire. Contact the factory if you have any questions or concerns regarding the Selas Adjustable Oil Lance Burner.

Warning: This guide **does not** provide every eventuality; the information provided should be considered when working with the SAOL Burner.

Description: How It Works

The Selas Adjustable Oil Lance (SAOL) Burner is designed for regenerative glass furnaces, with an adjustable mechanism for adjusting the position of the oil nozzle in relation to the atomizing air nozzle, thus affecting the atomizing of the oil and affecting flame length. Two sizes with four tips are available to provide flexibility for under port firing both in end port and cross-fired furnaces.



	SAOL 2.5		SAOL 2.5		SAOL 2.5		SAOL 3.0	
			SAOL 3.0		SAOL 3.0		SAOL 3.0	
	Tip 1		Tip 2		Tip 3		Tip 4	
	Min	Max	Min	Max	Min	Max	Min	Max
mm BTU	1.8	9.0	2.4	12.0	3.0	15.0	3.5	18.0
MW	0.53	2.64	0.70	3.52	0.88	4.40	1.03	5.27
GPH	13	65	17	87	22	109	25	130
LPH	49.4	246.8	65.8	329.1	82.3	411.4	96.0	493.7

NOTES:

1. Assume 138,000 BTU/Gal.
2. Burner sizes can overlap, consult Selas for details.

Cold Installation

Provided with the burner is a burner and bracket layout drawing. This drawing shows the overall setup of the burner, bracket, and seal plate. Use the drawing to set the burner and all accessories in the correct position.

- Normally, the burner, bracket, and seal plate are installed cold before start-up to ensure a good fit. After the installation is made, the burner is removed during the heat up and the block is sealed with appropriate high-temperature fiber wool.
- The burner bracket is installed on appropriate support steel. The channel support supplied with the bracket should be welded in place per the drawing.
- Included with the burner bracket are the nuts and bolts needed to hold the bracket to the channel. Slots are set in the bracket to allow the bracket to be moved forward or back to set the correct position of the bracket as needed for the proper burner position.
- For under-port firing, use the included jack bolts on the bracket to hold the seal plate in position against the burner block.
- Set the burner in the bracket and push it against the seal plate to ensure a tight fit. Lock the burner in position.
- Set the wind cooling airline, as shown on the drawing, in position to provide cooling to the seal plate.
- Attach the oil and atomizing air hoses to the burner. Ensure the hoses do not pull on the burner. In many cases, the field piping is not set close enough to the burner, causing the hoses to pull on the burner. If this happens, the field piping must be adjusted for a proper fit from the hoses to the burner.
- After all equipment is set in position and the setup is confirmed, remove the burner and seal the block for the heat up.

Installation and Start Up

Once the furnace is above auto-ignition temperature, 1400°F (760 °C), the SAOL burner can be installed and started.

- Follow plant safety protocols throughout the start up. Ensure all personnel in the area are ready and aware that the main burner lights are off.
- Install the burners on the port and lock in position.
- Verify the burner and seal plate have a good firm seal.
- Install the air and oil lines to the burner.
- Open the off-side cooling air valves to the burner set to the required operating pressure: 275 +/- 75 mbar (4 +/- 1 psig).
 - Note: Excessive cooling air can cause furnace gases to recirculate in the block, causing fouling and build-up of condensates in the block.
 - Too low pressure can allow the furnace gases to heat the burner parts or the seal plate.



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Installation and Start Up Cont.

- After the reversal, verify the combustion air is flowing to the port and that the oil and atomizing air reversal valve to the port are open.
- Adjust the atomizing air pressure to about 40 PSIG (2.75 Barg).
- Slightly (15-25%) open the oil flow control valve to the port.
- Then, for each burner, open the oil valves individually.
- Verify ignition for the burners.
- Adjust oil flow as needed.
- Repeat for all ports.

Normally, the flame is unstable at the initial light off, even after removing the heat-up burners. This is because the furnace is empty, with no glass under the flame. Also, combustion air temperatures are still cold as the regenerators have not heated up. Cold air takes up less volume, so the air velocity is much lower than normal operating temperatures. Once the furnace is at full operating temperatures, the regenerators will still take a few days to heat up to normal temperature.

Initial Burner Set Up

Once the burners are firing and the heat up burner is removed, the burners can be balanced.

- For under port firing, it is best to set all equally at first. On cross-fired furnaces, the burners typically are all set with equal flow. On end port furnaces, typically the outer burner is set with more flow and the inner burner less flow.
- Initially, the oil nozzle adjustment screw is set to position 1 or 2.
 - Fully closed is position 0.
 - Fully open is position 4.
 - For higher atomizing rates and shorter flames, use a higher position. This allows more atomizing air to flow, increasing the mixing of the atomizing air and oil.
 - Normally, lighter oils, #2 (diesel oil), will use lower atomizing rates and lower atomizing air pressure.
 - Heavier oils, #5 and #6, will use higher atomizing air rates and higher atomizing air pressure.
- See operation table below for typical settings.
- Initial burner firing angles can be set by adjusting the bracket angles up or down or rotating left or right. Fine-tuning the firing angles is best done after the tank is full of glass and at normal operating temperatures.



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Oil Nozzle Adjustment Screw



Oil Nozzle
Adjustment
Screw

Operating Table Data

	Burner Capacity		Oil Flow		Atom Air Flow		Atom Air Press		Off-side Cooling	
	mm	BTU MW	GPH LPH		SCFM Nm3/hr		PSIG Barg		PSIG Barg	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Tip 1	1.8	9.0	13	65	7.8	52.2	20.0	45.0	2.0	6.0
	0.53	2.64	49.4	246.8	12.6	83.9	1.4	3.1	0.1	0.4
Tip 2	2.4	12.0	17	87	10.4	69.6	20.0	45.0	2.0	6.0
	0.70	3.52	65.8	329.1	16.8	111.9	1.4	3.1	0.1	0.4
Tip 3	3.0	15.0	22	109	13.0	87.0	20.0	45.0	2.0	6.0
	0.88	4.40	82.3	411.4	21.0	139.9	1.4	3.1	0.1	0.4
Tip 4	3.5	18.0	25	130	15.2	104.3	20.0	45.0	2.0	6.0
	1.03	5.27	96.0	493.7	24.5	167.9	1.4	3.1	0.1	0.4



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Burner Operation

There are basically three tools to work with to change the flame length flame characteristics, atomizing pressure, oil nozzle position, and changing the pressure plate.

Shown above in photo and below is the oil nozzle adjustment screw. By rotating the adjustment knob clockwise, the position of the oil nozzle moves back inside the atomizing air nozzle. This creates more area for the atomizing air to mix with the oil stream, enhancing the atomization and shortening the flame.

By rotating the adjustment knob counterclockwise, the oil tip moves forward, and the mixing of the atomizing air and oil is reduced, and the flame will be slightly longer.

On the adjustment mechanism, there is a scale with engraved lines, the nozzle position is noted as 0 – 4 rings. Position 0 being fully CCW, position 4 being fully CW, and position 2 being the typical starting position.

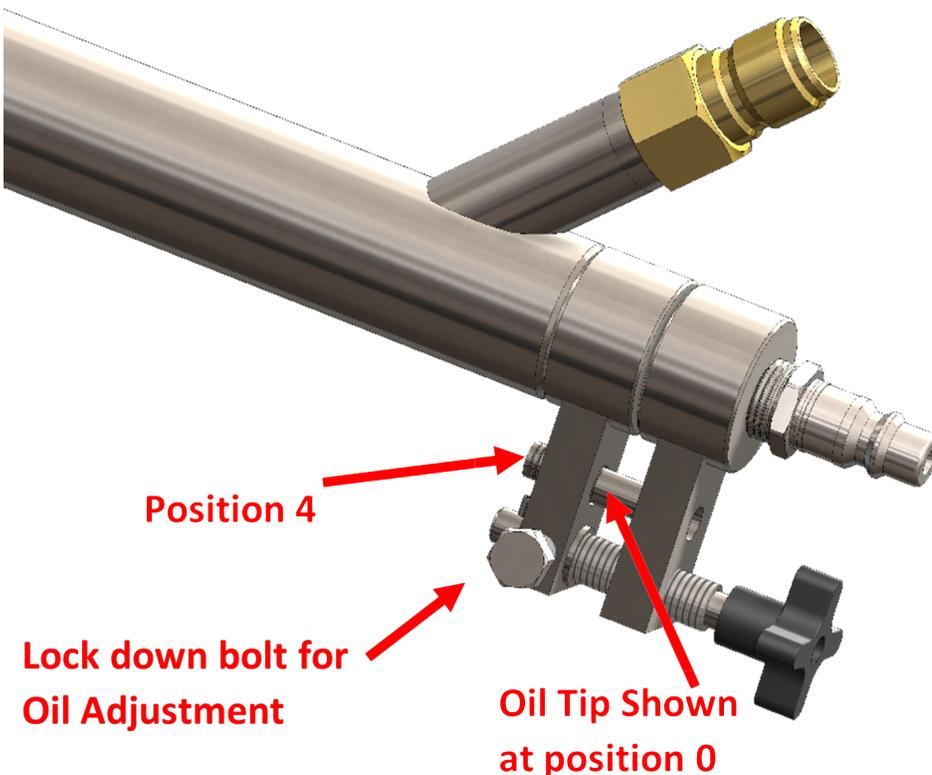
Adjusting the atomizing air pressure from low to higher pressure increases the atomizing effect and shortens the flame.

Different hole angles in the pressure plates are available to change the flame length and shape; 15, 25, and 45 deg angles. The lower angle makes a longer, narrower flame and the higher angle make a shorter, wider flame.

Below, atomizing and oil nozzle detail shows the oil (Item 5) and atomizing tip (Item 4) with pressure plate (Item 6) and O-ring (Item 11). Your specific burner will have tips and plates designed for the normal oil flows and oil type. Changing the pressure plate angle and hole size can affect the flame appearance as noted above. Consult Selas for details of changes are desired.

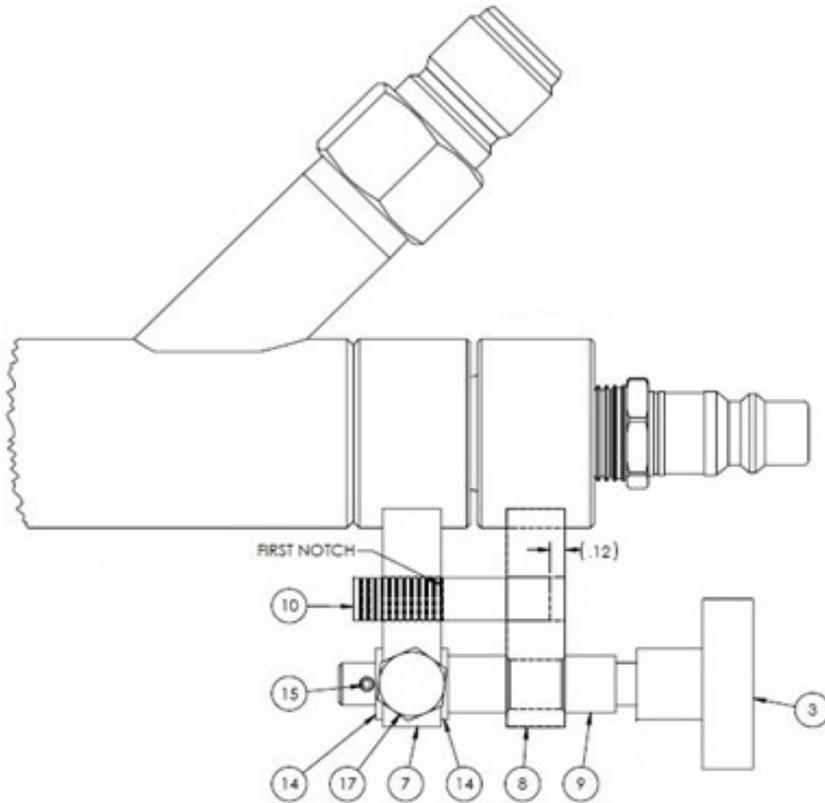
Typically, heavy oils will require higher levels of atomization to break up the oil stream. Light oils will need less atomization to break up the oil stream.

Oil Nozzle Adjustment Operation



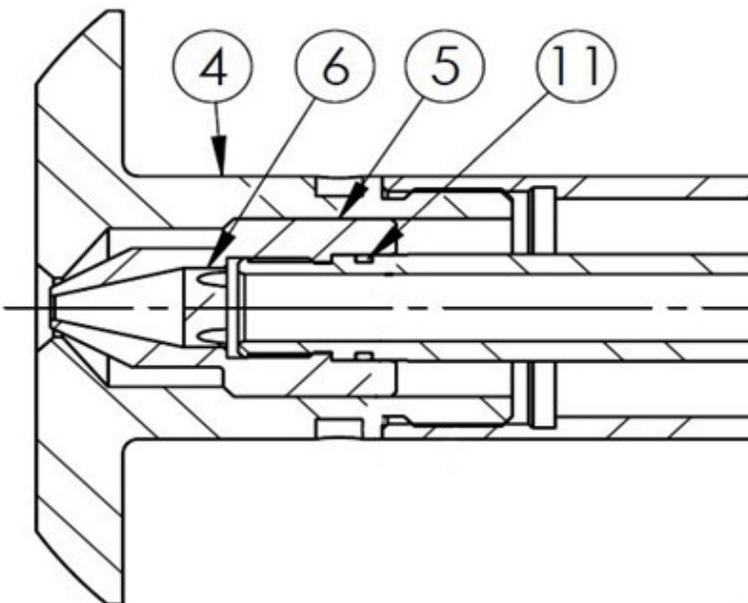
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Oil Nozzle Adjustment Operation Cont.



- First notch is shown in position 0.
- Note each change in the notch position moves the oil nozzle 0.12”.
- To pull the oil tip back and increase atomization:
 - Loosen hex nut (Item 17).
 - Rotate the adjusting handle (Item 3) CW.
 - You will see the notch move back, going to positions 1, 2, 3, then 4.
- To push the oil tip forward, reverse the process by rotating the adjusting handle CCW.
 - Always lock the hex screw (Item 17) when complete.

Oil and Atomizing Air Nozzle Details



- Item 4 is the atomizing tip
- Item 5 is the oil tip
- Item 6 is the pressure plate
- Item 11 is the oil tip O-ring



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End Port Firing

Traditionally on an end port, the flame must be long to reach the throat end wall, and the heat release is extended to move the heat away from the port. To achieve this desired firing set up normally:

- The burner close to the outside wall is set with more flow, and the burner close to the opposite port is set with less flow. This setup tends to extend the outside flame down the furnace length and minimizes short circuits on the inside burners.
- Adjust oil tip position and atomizing air pressure to achieve the desired flame requirements.

Crossfire Furnace Under Port Firing

For under port firing on a cross-fired furnace, the flame should be at least halfway across the furnace. In many cases, operators have used shorter flames, which can be achieved, but realistically, the shorter flames are less efficient. To achieve this desired firing set up normally:

- The burners are typically set up with equal flow on a port.
- Adjust oil tip position and atomizing air pressure to achieve the desired flame requirements.

Burner Firing Angles Under Port Firing

If the firing angle is set too high, the flame will be unstable and erratic. If the firing angle is set too flat, the mixing with the combustion air is delayed, which may cause incomplete combustion. Normally, with under port, there is little left/right adjustment to the flames. Though, in some cases on an end port, the outside burner could be set slightly away from the port centerline and the inside burner slightly toward the port centerline.

Maintenance and Routine Operation

Normal operation of the burner should require little maintenance. A good routine for checking the burners and operation will ensure a good long life and operation. Checks should include normal furnace operating data, which are not listed and may influence burner performance. The discussion here is specific to the burner.



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Shift Observations and Checks

- Oil flow
- Oil pressure
- Off-side cooling air pressure
- Atomizing air pressure
- Flame shape and appearance
- Changes in oil/atomizing flow or pressure could indicate dirty nozzles
- Changes to flame shape or angles could indicate burner block blockage

Periodic Checks (Weekly/As Needed)

1. Physically check burner, seal plate, and bracket for any obvious issues, oil leaks, air leaks, proper wind cooling, good burner setting to seal plate, and nothing loose or moved.
2. Remove and clean burners blocks as needed based upon changes in the flame appearance or unusual changes to flows/pressures.

Burner Removal and Installation

1. A spare burner should be available before any burner removal.
 - a. Selas can provide a recommended spare part package to allow for routine cleaning of the oil burners.
2. Remove/replace burners on the offside only, following plant safety protocol.
3. At the burner, shut off oil and air.
4. Remove oil and air hoses.
 - a. Be mindful of oil leaking from the end of the burner or the oil hose.
5. Unlatch the burner from the bracket and remove it.
6. Inspect the burner block for debris or any blockage. Clean if necessary.
7. Install the spare burner and ensure it is positioned properly to the seal plate. Lock down the bracket and hold down the arm.
8. Connect hoses to the burner.
9. Open oil and air valves.
10. Check firing after reversal.



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Cleaning

1. Normally, the oil tip, atomizing tip, and pressure plate are removed for cleaning. These parts can be washed with clean diesel oil. The surfaces can be cleaned with a steel brush. The orifice in the plate and tips can be cleared with an appropriately sized wire.
2. There are three O-rings on the burner, one for the oil nozzle and two for the air tube. These should be checked for cracking and wear. Change out as needed.
3. On the burner oil adjustment, due to the heat, the adjustment screws may freeze up. A fresh coat with high-temperature grease on these surfaces will help keep the parts free.

Other Burner Maintenance

1. The burner part drawing included in the documentation package provided with the burner shows all the various burner parts and general assembly. Follow this diagram for any burner part replacement.
2. Typical spare parts that could need changing include:
 - a. Oil tip
 - b. Atomizing tip
 - c. Pressure plate
 - d. O-ring oil nozzle
 - e. O-ring air tube
 - f. Seal plates

Note: Changing these parts would be based on general wear and tear.

3. At a campaign end, we recommend changing all gaskets and O-rings. Depending upon the length of operation, changing some/most of the burner tips may be appropriate. Changing all seal plates at the start of a new campaign would be recommended. Burner buckets should be cleaned, and all moving parts checked for proper operation.

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