

# The Flame Ionization Detector

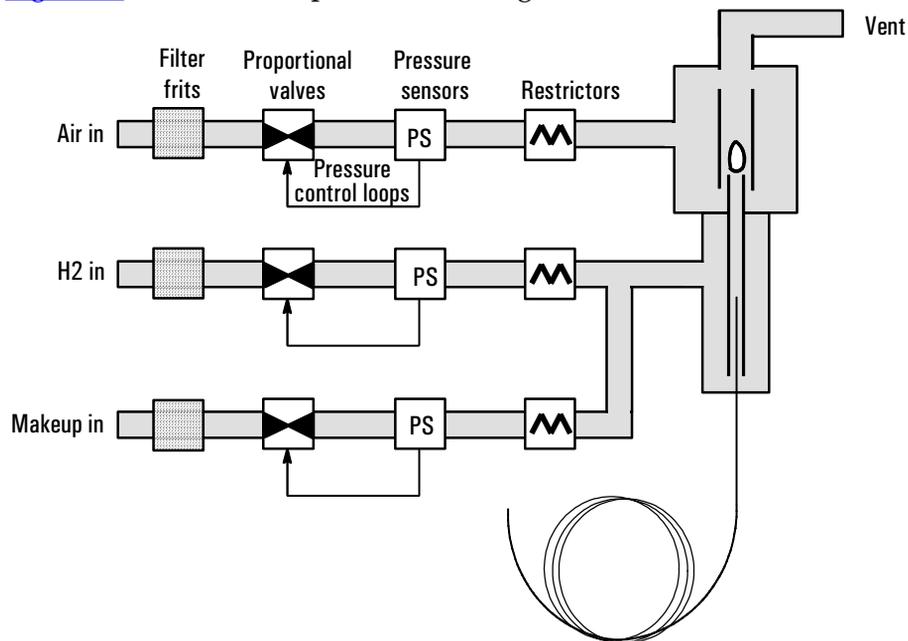
## General Information

The flame ionization detector passes sample and carrier gas from the column through a hydrogen-air flame. The hydrogen-air flame alone creates few ions, but when an organic compound is burned there is an increase in ions produced. A polarizing voltage attracts these ions to a collector located near the flame. The current produced is proportional to the amount of sample being burned. This current is sensed by an electrometer, converted to digital form, and sent to an output device.

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## FID pneumatics

[Figure 73](#) illustrates the pneumatics design for the FID.



**Figure 73** Schematic of a flame ionization detector

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## Special considerations

### Conditions that prevent the detector from operating

- Temperature set below 150°C
- Air or hydrogen flow set at Off or set at 0.0
- Ignition failure

### Detector shutdown

If a critical detector gas is shut down due to a pneumatics or ignition failure, your detector shuts down. This turns off everything except the detector temperature and makeup gas flow.

## Operating the FID

Use the information in [Table 61](#) when selecting temperatures and flows. Choose a minimum source pressure from [Figure 74](#).

**Table 61 Recommended Temperature and Flow Rates—FID**

Gas	Flow range (mL/min)	Suggested flow (mL/min)
<i>Carrier gas</i> (hydrogen, helium, nitrogen)		
Packed columns	10 to 60	
Capillary columns	1 to 5	
<b>Detector gases</b>		
Hydrogen	24 to 60*	40
Air	200 to 600*	450
Column plus capillary makeup	10 to 60	50
<i>Recommended: nitrogen</i> <i>Alternate: helium</i>		

### Detector temperature

< 150° C, flame will not light, prevents condensation damage

Detector temperature should be approximately 20° C greater than highest oven ramp temperature depending on the column type.

### Lit offset [Config][Front Det] or [Config][Back Det]

If the detector output (when the flame is on) minus the detector output (when the flame is off) falls below this value, the FID attempts to reignite twice. If output does not increase by at least this value, the detector shuts down.

2.0 pA is the recommended setting.

0.0 pA disables the autoreignite function.

\*The hydrogen-to-air ratio should be between 8% and 12% to keep the flame lit.

**Procedure: Using the FID**

Verify that all detector gases are connected, a column is installed, the correct jet is installed, and the system is free of leaks. Check the oven temperature, inlet temperature, and column flow. Use [Figure 75](#) as a guide when operating the FID.

**WARNING**

Verify that a column is installed or the FID column fitting is plugged before turning on the air or hydrogen. An explosion may occur if air and hydrogen are allowed to leak into the oven.

1. Press [Front Det] or [Back Det] to open the FID control table.
2. Set the detector temperature. The temperature must be greater than 150°C for the flame to light.
3. Change the hydrogen flow rate, if desired, and press [Off].
4. Change the air flow rate, if desired, and press [Off].
5. If you are using **packed columns**, turn off the makeup gas and proceed to Step 7.
6. If you are using **capillary columns**:
  - a. Verify that makeup gas type is the same as that plumbed to your instrument (next to Mkup line of control table). Change the gas type, if necessary.
  - b. If your capillary column is *defined* and connected to an EPC inlet, choose a new flow mode, if desired, and set the makeup gas flow or combined flow.
  - c. If your capillary column is *not defined* or connected to a nonEPC inlet, enter a makeup gas flow. Only constant flow is available in this case.
7. Scroll to F l a m e and press [On]. This turns on the air and hydrogen and initiates the ignition sequence. The signal typically increases to 5 to 20 pA after ignition. Verify that the flame is lit by holding a cold, shiny surface, such as a mirror or chrome-plated wrench, over the collector exit. Steady condensation indicates that the flame is lit.

**Short-cut procedure:**

(assumes correct setpoints are stored)

1. Open detector control table.
2. Turn temperature On.
3. Turn makeup gas On, if needed.
4. Press [Det Control].
5. Press [On].