

*Innovative Combustion Solutions Worldwide*

# METERING ORIFICE SYSTEMS

**Eclipse flanged metering orifices are designed to be installed in the supply piping of combustion systems to measure air or gas flow to burners.**

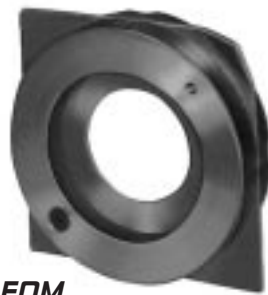
Metering orifice systems can be used to balance flows to burners and monitor air/gas ratios. Through careful use of orifice meters, combustion systems can be adjusted for maximum fuel economy.

3/4" through 2" metering orifice assemblies include an orifice plate, two pressure tap plates, gaskets, pipe flanges, and bolts. Larger sizes consist of a basic assembly containing an orifice plate, two pressure tap plates, and gaskets only; a flange kit must be ordered separately. Five standard orifice plate bores are available for each pipe size, and Eclipse can supply other bores on special order. Hose fitting and pressure gauge kits are available to complete the metering orifice system.

Although metering orifice bodies will withstand pressures to 125 psig, hose cocks and differential pressure gauges have maximum inlet pressure ratings of 15 psig. Ambient temperatures must not exceed 140° F. For higher pressures and temperatures, contact Eclipse. Standard differential pressure gauges are calibrated in inches water column with a maximum differential of 10" w.c. Other calibrations or higher differentials are available on special order.

*Easy installation  
Rugged construction  
Complete line of sizes  
Accurate and inexpensive  
Monitoring accessories available*

## **Series FOM**



**Basic FOM**



**FOM With  
Hose Cocks**



**FOM With  
Flanges**



**FOM With  
Pressure Gauge**

**Eclipse Combustion**



## Orifice Selection

For good readability of differential pressures, orifices should be sized to give a minimum of 2" w.c. ΔP at maximum flow rate. If sufficient pressure is available, size for the highest ΔP the system will tolerate (Do not exceed 20" w.c. ΔP. If higher ΔP's required, consult factory.)

To select an orifice, proceed as follows:

1. Determine maximum flow rate.
2. Determine specific gravity of gas.
3. Determine temperature of gas.
4. Determine pressure of gas at orifice location.
5. Determine maximum pressure loss your system can tolerate.
6. From the correction tables select a factor to obtain corrected maximum flow.
7. Divide maximum flow rate by each factor to obtain corrected maximum flow.
8. Using the corrected maximum flow, enter selection chart at maximum pressure loss selected (item 5). Read down to first flow rating which equals or exceeds the corrected flow and then left to the orifice size.
9. If maximum corrected flow rate using next larger orifice is less than 2" w.c. , a special size orifice is required. Consult factory.

EXAMPLE: (Note: Number 1 thru 9 in example will refer back to numbers 1 thru 9 in previous list.)

300,000 Btu burner using natural gas at 2 psig. From correction charts S.G. = .60 , SCFH Gas Flow = 300,000 ÷ 1000 (btu/C.F.) = 300 SCFH. Assume 60° F. temperature.

1. 300 SCFH
2. .60 S.G.
3. 60°F
4. 2 psig
5. Assume 6" w.c.
6. S.G. factor = 1.29, Temperature factor = 1.00, Pressure factor = 1.03.
7.  $300 \div 1.29 \div 1.00 \div 1.03 = 226$  CFH corrected maximum flow.
8. Locate 6" w.c. at the top of the chart and read down. The first flow which equals or exceeds 226 cfh is 281 cfh, which corresponds with the 3-4 FOM (3/4" pipe size). Actual high fire drop through this orifice will be about 4" w.c. (229 cfh). If you prefer a larger gas line size, say, 1" w.c. , read down further. The 4-2 FOM (276 cfh @ 6" w.c.) will also suffice.
9. Does not apply in this example.

### Temperature Correction Factors

| Temp °F | 50   | 60   | 70  | 80  | 90  | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 |
|---------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Factor  | 1.01 | 1.00 | .99 | .98 | .97 | .96 | .95 | .94 | .94 | .93 | .92 | .92 | .91 | .90 | .89 | .88 |

### Specific Gravity Correction Factors

| Specific Gravity | .40  | .50  | .60  | .65  | .70  | .80  | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 | 1.50 | 1.60 | 1.70 | 1.80 | 1.90 | 2.00 |
|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Factor           | 1.58 | 1.41 | 1.29 | 1.20 | 1.12 | 1.05 | 1.00 | .95  | .91  | .88  | .85  | .82  | .79  | .77  | .75  | .73  | .71  |

### Pressure Correction Factors (Sea Level)

| Press. PSIG | .5  | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   |
|-------------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Factor      | .98 | 1.00 | 1.03 | 1.06 | 1.09 | 1.12 | 1.15 | 1.18 | 1.20 | 1.23 | 1.25 | 1.28 | 1.30 | 1.33 | 1.35 | 1.37 |

### Specific Gravity and Btu Content Of Various Gases

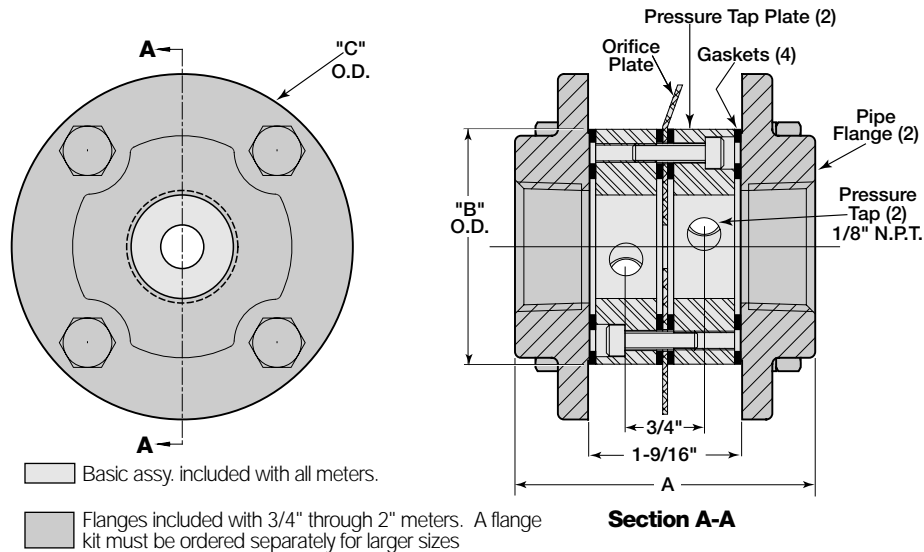
| Type of Gas | S.G. | BTU/CF | CF Air Req'd. Per CF Gas |
|-------------|------|--------|--------------------------|
| Natural     | .60  | 1000   | 10                       |
| Propane     | 1.56 | 2500   | 24                       |
| Butane      | 2.00 | 3300   | 30                       |
| Coke Oven   | .45  | 500    | 5                        |

## Selection Chart

| Pipe Size | Orifice Meter | Differential Pressure, "W.C. Across Orifice Taps For SCFH Air |        |        |         |         |         |         |         |         |         |         |         |         |         |         |
|-----------|---------------|---|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|           |               | 1   | 2      | 3      | 4       | 5       | 6       | 7       | 8       | 9       | 10      | 12      | 14      | 16      | 18      | 20      |
| 3/4"      | 3-1 FOM       | 39  | 56     | 68     | 79      | 88      | 97      | 104     | 111     | 118     | 125     | 137     | 147     | 158     | 167     | 176     |
|           | 3-2 FOM       | 56  | 79     | 97     | 112     | 125     | 137     | 148     | 158     | 168     | 177     | 194     | 210     | 224     | 238     | 251     |
|           | 3-3 FOM       | 80  | 113    | 138    | 160     | 179     | 196     | 211     | 226     | 240     | 253     | 277     | 299     | 320     | 339     | 357     |
|           | 3-4 FOM       | 115   | 162    | 198    | 229     | 256     | 281     | 303     | 324     | 344     | 362     | 397     | 429     | 458     | 486     | 512     |
|           | 3-5 FOM       | 170   | 240    | 290    | 330     | 370     | 410     | 440     | 470     | 500     | 530     | 580     | 620     | 670     | 710     | 740     |
| 1"        | 4-1 FOM       | 79  | 112    | 137    | 158     | 177     | 194     | 210     | 224     | 238     | 250     | 274     | 296     | 317     | 336     | 354     |
|           | 4-2 FOM       | 113   | 159    | 195    | 225     | 252     | 276     | 298     | 318     | 338     | 356     | 390     | 421     | 450     | 477     | 503     |
|           | 4-3 FOM       | 160   | 230    | 280    | 320     | 360     | 390     | 420     | 450     | 480     | 510     | 560     | 600     | 640     | 680     | 720     |
|           | 4-4 FOM       | 230   | 330    | 400    | 470     | 520     | 570     | 620     | 660     | 700     | 740     | 810     | 870     | 930     | 990     | 1,040   |
|           | 4-5 FOM       | 340   | 490    | 600    | 690     | 770     | 840     | 910     | 970     | 1,030   | 1,090   | 1,190   | 1,290   | 1,370   | 1,460   | 1,540   |
| 1-1/4"    | 5-1 FOM       | 160   | 220    | 270    | 320     | 350     | 390     | 420     | 450     | 470     | 500     | 550     | 590     | 630     | 670     | 710     |
|           | 5-2 FOM       | 230   | 320    | 390    | 450     | 500     | 550     | 600     | 640     | 680     | 710     | 780     | 840     | 900     | 960     | 1,010   |
|           | 5-3 FOM       | 320   | 460    | 560    | 650     | 720     | 790     | 860     | 920     | 970     | 1,020   | 1,120   | 1,210   | 1,290   | 1,370   | 1,450   |
|           | 5-4 FOM       | 470   | 670    | 820    | 940     | 1,050   | 1,150   | 1,250   | 1,330   | 1,410   | 1,490   | 1,630   | 1,760   | 1,880   | 2,000   | 2,110   |
|           | 5-5 FOM       | 710   | 1,000  | 1,230  | 1,420   | 1,580   | 1,740   | 1,870   | 2,000   | 2,130   | 2,240   | 2,450   | 2,650   | 2,830   | 3,010   | 3,170   |
| 1-1/2"    | 6-1 FOM       | 220   | 320    | 390    | 450     | 500     | 550     | 590     | 630     | 670     | 710     | 780     | 840     | 900     | 950     | 1,000   |
|           | 6-2 FOM       | 320   | 450    | 550    | 640     | 710     | 780     | 840     | 900     | 960     | 1,010   | 1,110   | 1,190   | 1,280   | 1,350   | 1,430   |
|           | 6-3 FOM       | 460   | 650    | 790    | 920     | 1,020   | 1,120   | 1,210   | 1,300   | 1,370   | 1,450   | 1,590   | 1,710   | 1,830   | 1,940   | 2,050   |
|           | 6-4 FOM       | 670   | 950    | 1,160  | 1,340   | 1,500   | 1,640   | 1,770   | 1,900   | 2,101   | 2,120   | 2,320   | 2,510   | 2,680   | 2,840   | 3,000   |
|           | 6-5 FOM       | 1,010   | 1,430  | 1,750  | 2,020   | 2,260   | 2,480   | 2,670   | 2,860   | 3,030   | 3,200   | 3,500   | 3,780   | 4,040   | 4,290   | 4,520   |
| 2"        | 8-1 FOM       | 320   | 450    | 550    | 630     | 710     | 770     | 840     | 890     | 950     | 1,000   | 1,090   | 1,180   | 1,260   | 1,340   | 1,410   |
|           | 8-2 FOM       | 450   | 640    | 780    | 900     | 1,000   | 1,100   | 1,190   | 1,270   | 1,350   | 1,420   | 1,560   | 1,680   | 1,800   | 1,910   | 2,010   |
|           | 8-3 FOM       | 640   | 910    | 1,110  | 1,290   | 1,440   | 1,580   | 1,700   | 1,820   | 1,930   | 2,030   | 2,230   | 2,410   | 2,570   | 2,730   | 2,880   |
|           | 8-4 FOM       | 930   | 1,320  | 1,610  | 1,860   | 2,080   | 2,280   | 2,460   | 2,630   | 2,790   | 2,940   | 3,230   | 3,480   | 3,720   | 3,950   | 4,160   |
|           | 8-5 FOM       | 1,380   | 1,950  | 2,390  | 2,760   | 3,090   | 3,380   | 3,660   | 3,910   | 4,150   | 4,370   | 4,790   | 5,170   | 5,530   | 5,860   | 6,180   |
| 3"        | 12-1 FOM      | 920   | 1,300  | 1,590  | 1,830   | 2,050   | 2,240   | 2,420   | 2,590   | 2,750   | 2,900   | 3,170   | 3,430   | 3,660   | 3,890   | 4,100   |
|           | 12-2 FOM      | 1,310   | 1,860  | 2,280  | 2,630   | 2,940   | 3,220   | 3,480   | 3,720   | 3,940   | 4,160   | 4,550   | 4,920   | 5,260   | 5,580   | 5,880   |
|           | 12-3 FOM      | 1,900   | 2,700  | 3,300  | 3,800   | 4,200   | 4,600   | 5,000   | 5,300   | 5,700   | 6,000   | 6,500   | 7,000   | 7,500   | 8,000   | 8,400   |
|           | 12-4 FOM      | 2,800   | 3,900  | 4,800  | 5,500   | 6,200   | 6,800   | 7,300   | 7,800   | 8,300   | 8,700   | 9,600   | 10,300  | 11,100  | 11,700  | 12,400  |
|           | 12-5 FOM      | 4,300   | 6,000  | 7,400  | 8,600   | 9,600   | 10,500  | 11,300  | 12,100  | 12,800  | 13,500  | 14,800  | 16,000  | 17,100  | 18,100  | 19,100  |
| 4"        | 16-1 FOM      | 1,800   | 2,600  | 3,200  | 3,700   | 4,100   | 4,500   | 4,900   | 5,200   | 5,500   | 5,800   | 6,400   | 6,900   | 7,300   | 7,800   | 8,200   |
|           | 16-2 FOM      | 2,600   | 3,700  | 4,500  | 5,200   | 5,900   | 6,400   | 6,900   | 7,400   | 7,900   | 8,300   | 9,100   | 9,800   | 10,500  | 11,100  | 11,700  |
|           | 16-3 FOM      | 3,800   | 5,400  | 6,600  | 7,700   | 8,600   | 9,400   | 10,100  | 10,800  | 11,500  | 12,100  | 13,300  | 14,400  | 15,300  | 16,300  | 17,200  |
|           | 16-4 FOM      | 5,800   | 8,100  | 10,000 | 11,500  | 12,900  | 14,100  | 15,200  | 16,300  | 17,300  | 18,200  | 19,900  | 21,500  | 23,000  | 24,400  | 25,700  |
|           | 16-5 FOM      | 9,000   | 12,700 | 15,600 | 18,000  | 20,100  | 22,000  | 23,800  | 25,500  | 27,000  | 28,500  | 31,200  | 33,700  | 36,000  | 38,200  | 40,300  |
| 6"        | 24-1 FOM      | 3,700   | 5,200  | 6,400  | 7,300   | 8,200   | 9,000   | 9,700   | 10,400  | 11,000  | 11,600  | 12,700  | 13,700  | 14,700  | 15,600  | 16,400  |
|           | 24-2 FOM      | 5,300   | 7,400  | 9,100  | 10,500  | 11,800  | 12,900  | 13,900  | 14,900  | 15,800  | 16,600  | 18,200  | 19,700  | 21,000  | 22,300  | 23,500  |
|           | 24-3 FOM      | 7,500   | 10,700 | 13,100 | 15,100  | 16,900  | 18,500  | 20,000  | 21,400  | 22,600  | 23,900  | 26,100  | 28,200  | 30,200  | 32,000  | 33,800  |
|           | 24-4 FOM      | 11,200  | 15,900 | 19,400 | 22,400  | 25,100  | 27,500  | 29,700  | 31,700  | 33,700  | 35,500  | 38,900  | 42,000  | 44,900  | 47,600  | 50,200  |
|           | 24-5 FOM      | 17,000  | 24,000 | 30,000 | 34,000  | 39,000  | 42,000  | 46,000  | 49,000  | 52,000  | 55,000  | 60,000  | 65,000  | 69,000  | 73,000  | 77,000  |
| 8"        | 32-1 FOM      | 7,300   | 10,400 | 12,700 | 14,700  | 16,400  | 18,000  | 19,400  | 20,800  | 22,000  | 23,200  | 25,400  | 27,500  | 29,400  | 31,100  | 32,800  |
|           | 32-2 FOM      | 10,600  | 15,000 | 18,300 | 21,200  | 23,700  | 25,900  | 28,000  | 30,000  | 31,800  | 33,500  | 36,700  | 39,600  | 42,400  | 44,900  | 47,400  |
|           | 32-3 FOM      | 15,000  | 22,000 | 27,000 | 31,000  | 34,000  | 38,000  | 41,000  | 43,000  | 46,000  | 49,000  | 53,000  | 58,000  | 61,000  | 65,000  | 69,000  |
|           | 32-4 FOM      | 23,000  | 33,000 | 40,000 | 46,000  | 52,000  | 57,000  | 61,000  | 65,000  | 69,000  | 73,000  | 80,000  | 87,000  | 92,000  | 98,000  | 103,000 |
|           | 32-5 FOM      | 36,000  | 51,000 | 63,000 | 73,000  | 81,000  | 89,000  | 96,000  | 103,000 | 109,000 | 115,000 | 126,000 | 136,000 | 145,000 | 154,000 | 162,000 |
| 10"       | 40-1 FOM      | 21,000  | 30,000 | 36,000 | 42,000  | 47,000  | 51,000  | 56,000  | 59,000  | 63,000  | 66,000  | 73,000  | 79,000  | 84,000  | 89,000  | 94,000  |
|           | 40-2 FOM      | 27,000  | 38,000 | 47,000 | 54,000  | 60,000  | 66,000  | 71,000  | 76,000  | 81,000  | 85,000  | 94,000  | 101,000 | 108,000 | 115,000 | 121,000 |
|           | 40-3 FOM      | 34,000  | 49,000 | 59,000 | 69,000  | 77,000  | 84,000  | 91,000  | 97,000  | 103,000 | 108,000 | 119,000 | 128,000 | 137,000 | 146,000 | 153,000 |
|           | 40-4 FOM      | 45,000  | 64,000 | 78,000 | 90,000  | 100,000 | 110,000 | 119,000 | 127,000 | 135,000 | 142,000 | 156,000 | 168,000 | 180,000 | 191,000 | 201,000 |
|           | 40-5 FOM      | 56,000  | 80,000 | 98,000 | 113,000 | 126,000 | 138,000 | 149,000 | 160,000 | 169,000 | 179,000 | 196,000 | 211,000 | 226,000 | 240,000 | 253,000 |

☐ =Piping velocity pressures exceed .5" w.c. at these flows. For good piping practices, Eclipse recommends velocity pressures below .5" w.c.

## Dimensions



| Pipe Size | Cat No.  | Orifice Dia. | Assy No. | Flange Kit | Hose Fitting Parts Kit* | Flow Meter Parts Kit** | Dimensions In Inches |         |        |
|-----------|----------|--------------|----------|------------|-------------------------|------------------------|----------------------|---------|--------|
|           |          |              |          |            |                         |                        | A                    | B       | C      |
| 3/4"      | 3-1 FOM  | 0.221        | 302072-1 | —          | 302053                  | 302057                 | 3-1/16               | 2-3/8   | 3-1/2  |
|           | 3-2 FOM  | 0.263        | 302072-2 | —          |                         |                        |                      |         |        |
|           | 3-3 FOM  | 0.313        | 302072-3 | —          |                         |                        |                      |         |        |
|           | 3-4 FOM  | 0.372        | 302072-4 | —          |                         |                        |                      |         |        |
|           | 3-5 FOM  | 0.442        | 302072-5 | —          |                         |                        |                      |         |        |
| 1"        | 4-1 FOM  | 0.313        | 302084-1 | —          | 302053                  | 302057                 | 3-1/16               | 2-3/8   | 3-1/2  |
|           | 4-2 FOM  | 0.372        | 302084-2 | —          |                         |                        |                      |         |        |
|           | 4-3 FOM  | 0.442        | 302084-3 | —          |                         |                        |                      |         |        |
|           | 4-4 FOM  | 0.526        | 302084-4 | —          |                         |                        |                      |         |        |
|           | 4-5 FOM  | 0.625        | 302084-5 | —          |                         |                        |                      |         |        |
| 1-1/4"    | 5-1 FOM  | 0.442        | 302085-1 | —          | 302053                  | 302057                 | 3-1/16               | 2-3/8   | 3-1/2  |
|           | 5-2 FOM  | 0.526        | 302085-2 | —          |                         |                        |                      |         |        |
|           | 5-3 FOM  | 0.625        | 302085-3 | —          |                         |                        |                      |         |        |
|           | 5-4 FOM  | 0.743        | 302085-4 | —          |                         |                        |                      |         |        |
|           | 5-5 FOM  | 0.884        | 302085-5 | —          |                         |                        |                      |         |        |
| 1-1/2"    | 6-1 FOM  | 0.526        | 302086-1 | —          | 302053                  | 302057                 | 3-1/2                | 3-11/16 | 5      |
|           | 6-2 FOM  | 0.625        | 302086-2 | —          |                         |                        |                      |         |        |
|           | 6-3 FOM  | 0.743        | 302086-3 | —          |                         |                        |                      |         |        |
|           | 6-4 FOM  | 0.884        | 302086-4 | —          |                         |                        |                      |         |        |
|           | 6-5 FOM  | 1.051        | 302086-5 | —          |                         |                        |                      |         |        |
| 2"        | 8-1 FOM  | 0.625        | 302087-1 | —          | 302053                  | 302057                 | 3-1/2                | 3-11/16 | 5      |
|           | 8-2 FOM  | 0.743        | 302087-2 | —          |                         |                        |                      |         |        |
|           | 8-3 FOM  | 0.884        | 302087-3 | —          |                         |                        |                      |         |        |
|           | 8-4 FOM  | 1.051        | 302087-4 | —          |                         |                        |                      |         |        |
|           | 8-5 FOM  | 1.250        | 302087-5 | —          |                         |                        |                      |         |        |
| 3"        | 12-1 FOM | 1.062        | 302050-1 | 302054     | 302053                  | 302057                 | 4-1/16               | 5-1/4   | 7-1/2  |
|           | 12-2 FOM | 1.266        | 302050-2 | 302054     |                         |                        |                      |         |        |
|           | 12-3 FOM | 1.500        | 302050-3 | 302054     |                         |                        |                      |         |        |
|           | 12-4 FOM | 1.781        | 302050-4 | 302054     |                         |                        |                      |         |        |
|           | 12-5 FOM | 2.125        | 302050-5 | 302054     |                         |                        |                      |         |        |
| 4"        | 16-1 FOM | 1.500        | 302051-1 | 302055     | 302067                  | 302066                 | 4-3/16               | 6-1/4   | 9      |
|           | 16-2 FOM | 1.781        | 302051-2 | 302055     |                         |                        |                      |         |        |
|           | 16-3 FOM | 2.125        | 302051-3 | 302055     |                         |                        |                      |         |        |
|           | 16-4 FOM | 2.531        | 302051-4 | 302055     |                         |                        |                      |         |        |
|           | 16-5 FOM | 3.000        | 302051-5 | 302055     |                         |                        |                      |         |        |
| 6"        | 24-1 FOM | 2.125        | 302052-1 | 302056     | 302067                  | 302066                 | 4-11/16              | 8       | 11     |
|           | 24-2 FOM | 2.531        | 302052-2 | 302056     |                         |                        |                      |         |        |
|           | 24-3 FOM | 3.000        | 302052-3 | 302056     |                         |                        |                      |         |        |
|           | 24-4 FOM | 3.578        | 302052-4 | 302056     |                         |                        |                      |         |        |
|           | 24-5 FOM | 4.250        | 302052-5 | 302056     |                         |                        |                      |         |        |
| 8"        | 32-1 FOM | 3.000        | 302064-1 | 302065     | 302067                  | 302066                 | 5-1/16               | 9-1/2   | 13-1/2 |
|           | 32-2 FOM | 3.578        | 302064-2 | 302065     |                         |                        |                      |         |        |
|           | 32-3 FOM | 4.250        | 302064-3 | 302065     |                         |                        |                      |         |        |
|           | 32-4 FOM | 5.062        | 302064-4 | 302065     |                         |                        |                      |         |        |
|           | 32-5 FOM | 6.000        | 302064-5 | 302065     |                         |                        |                      |         |        |
| 10"       | 40-1 FOM | 5.000        | 302068-1 | 302071     | 302069                  | 302070                 | 5-3/4                | 11-3/4  | 16     |
|           | 40-2 FOM | 5.600        | 302068-2 | 302071     |                         |                        |                      |         |        |
|           | 40-3 FOM | 6.200        | 302068-3 | 302071     |                         |                        |                      |         |        |
|           | 40-4 FOM | 6.900        | 302068-4 | 302071     |                         |                        |                      |         |        |
|           | 40-5 FOM | 7.500        | 302068-5 | 302071     |                         |                        |                      |         |        |

\* Hose Fitting Parts Kit includes: (2) 1/8" x 1/8" lever handle gas cocks, (2) 1/8" hose fittings and (2) 1/8" pipe nipples.

\*\* Flow Meter Parts Kit includes: differential gauge, (2) 1/8" x 1/8" lever handle gas cocks and necessary fittings, nipples, and tubing.



**Eclipse Combustion**



**Offered By:**

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