

General Specifications

Selecting the Pipe Size

Determine pipe size based on the maximum GPM. Table 1 shows the ASHRAE recommendations. ASHRAE's criterion is, "a maximum friction loss of 4 feet head per 100 feet of pipe". Some designers prefer to use 80% of the ASHRAE maximum.

Table 1: Maximum GPM (Schedule 40 Pipe)

PIPE SIZE	GPM	PIPE SIZE	GPM	PIPE SIZE	GPM
2"	42	5"	475	12"	4600
2 1/2"	72	6"	775	14"	6000
3"	130	8"	1550	16"	8500
4"	275	10"	2900		

Selecting the Venturi Model

Using Table 2, select the size and venturi model where the design GPM falls between the low and high ΔP limits. The Selection Chart, shows the GPM ranges for all models. When this chart is used the maximum permanent head loss will usually be less than .9 feet and the minimum reading on the gauge will be 24" or 2 feet. If the design GPM falls within the recommended range of both the (L) and the (H) models, the (H) model is generally preferred because it will have the lowest permanent head loss.

To calculate an exact ΔP or GPM, use the Venturi Flow Factor from Table 2 in the following equations.

$$\Delta P \text{ (inches)} = \left[\frac{\text{GPM} \times 17.3}{\text{FF}} \right]^2$$

$$\text{GPM} = \frac{\text{FF}}{17.3} \times \sqrt{\Delta P \text{ (inches W.C.)}}$$

Selection Examples

1. Select a venturi for a 4" line with a design flow of 225 GPM.

In the Selection Chart, 225 GPM falls in the recommended range for both the 400L and 400H models. Choose the 400H because it will have the lowest permanent pressure loss.

The following example shows how to calculate the ΔP and permanent pressure loss.

2. What are the exact ΔP and permanent loss at 225 GPM for Models 400H and 400L?

Model 400H

$$\Delta P \text{ (inches)} = \left[\frac{225 \times 17.3}{709} \right]^2 = (5.49)^2 = 30" \text{ W.C.}$$

Permanent Loss = 10% ΔP = 3" W.C. or .25 feet

Model 400L

$$\Delta P \text{ (inches)} = \left[\frac{225 \times 17.3}{519} \right]^2 = (7.50)^2 = 56" \text{ W.C.}$$

Permanent Loss = 10% ΔP = 6.9" W.C. or .6 feet

3. What are the exact ΔP and permanent pressure loss for Model 1400L at 6000 GPM?

This flow is above the normal recommended range of 100" W.C., but will work fine as long as the permanent pressure loss is not too high for designed pump head.

$$\Delta P \text{ (inches)} = \left[\frac{6000 \times 17.3}{9117} \right]^2 = (16.13)^2 = 260"$$

Permanent Loss = 10% ΔP = 22.4" W.C. or 1.9 feet

Table 2: Steel Venturi Selection Chart

Pipe Size	Venturi Model	GPM Range		Venturi Flow Factor
		Low 24" ΔP	High 100" ΔP	
2"	200L	25	50	86.5
	200H	42	85	143.6
2 1/2"	250L	39	85*	138.4
	250H	85	180	311.4
3"	300L	80	165	282.0
	300H	165	335	580.0
4"	400L	145	300	519.0
	400H	200	410	709.0
5"	500L	200	400	692.0
	500H	400	825	1427.0
6"	600L	375	750	1304.0
	600H	725	1500	2560.0
8"	800L	625	1300	2259.0
	800H	1300	2800	4758.0
10"	1000L	950	1900	3322.0
	1000H	1900	4000	6920.0
12"	1200L	1600	3100	5709.0
	1200H	2400	5000	8460.0
14"	1400L	2200	4400	7733.0
	1400H	2800	6000**	9930.
16"	1600L	2600	8500***	9117.0

Notes:

- ΔP = Flow Signal = Gauge Reading
- Permanent Loss = 10% x ΔP
- If the required flow is lower than that shown for a model (L) venturi, the low limit ΔP can be reduced from 24" to 12". The low GPM limit will go down by 29% (multiply the flow at 24" by .71). If the flow is lower than this, select the next smaller size venturi.

- * Model 250L based on 117" ΔP
- Model 500L based on 147" ΔP
- Model 600L based on 194" ΔP
- Model 1400L based on 224" ΔP

Common Questions and Answers

Q How is the venturi installed if three inlet and two outlet straight pipe runs are not available?

A There would be additional error in the readings. The standard accuracy of $\pm 1\%$ could become $\pm 15\%$ without the proper straight run. If the venturi must be installed anyway, the available straight run should be used on the inlet (upstream) side. The amount of error without proper straight run cannot be predicted.

Q Can a venturi be mounted vertically?

A Yes, and the flow can be either up or down.

Q What benefit do flanges provide on venturis?

A Flanges allow for easy removal for servicing, but since there is nothing to service on venturis the preferred connection is weld ends.

Q Can any D.P. meter be used to read FDI venturis?

A Yes, as long as it has the proper full scale calibration. 0 to 300" (0-20') is the most popular combination instrument for measurement and balancing.

Q Does the precision of the gauge kit affect the overall metering accuracy?

A Yes. One-half or more of the overall accuracy depends on the readout kit. Whatever meter error is present, adds algebraically to the 1% venturi error. The FDI Meter Kit 300.4 has a full scale accuracy of $\pm 1.75\%$. In normal use, the error increases to 4% or 6% when metering at 3P 's below full scale.

Q Are flow curves available?

A Yes, individual venturi curves are shipped with each unit.

Q Can we get better than $\pm 1\%$ F.S. venturi accuracy.

A Yes, individual venturis can be flow tested by the FDI engineering department at a specified flow and certified to $\pm 1/2\%$ accuracy. The cost for this testing ranges between \$300 and \$600 per venturi.

Q Can venturis measure fluids other than water?

A Yes, FDI's engineering department can give formulae for converting other liquids and gases to standard GPM of water so the flow equations for water can be used.