Vent hole calculator

Altimeter Cloud

Mercury V1 manual · v1.0

https://d21c22pth15itr.cloudfront.net/support/mercuryv1/vent-hole-calculator/

Most altimeters rely on atmospheric pressure to determine altitude. For the sensor to work accurately, the air pressure inside your rocket needs to match the air pressure outside. This means you need to create vent holes in your body tube to allow the pressure to equalise.

How many holes?

A single hole will cause noise and incorrect readings, as the pressure at a single point can be affected by wind or the angle of the airflow as your rocket flies. Multiple holes, evenly spaced around the circumference of your tube, average out these effects and give the sensor a much cleaner pressure reading.

The minimum workable number of holes is generally considered to be 3, although 4 or more is recommended. Place the holes at least 3 body tube diameters away from the nose cone base, joints, or transitions to avoid turbulence.

Calculator

This calculator uses the standard Vern Knowles vent hole formula to determine the diameter of each hole based on your tube dimensions and the number of holes. The formula ensures the air inside your airframe can equalise fast enough to track atmospheric pressure changes during ascent and descent.

Tube diameter

75.0 mm

Tube length

1000 mm

Number of holes

4

Each hole diameter

Total vent area

The formula

FORMULA

$$\text{hole\_diameter} = 0.004396 \times \text{tube\_diameter} \times \sqrt{(\text{tube\_length} / \text{number\_of\_holes})}$$

Where all measurements are in millimetres. The constant 0.004396 is derived from the aerodynamic relationship between airflow through an orifice and the rate of pressure change needed to track altitude during flight.

Tips

Placement

Position your vent holes at least 3 body tube diameters away from the nose cone base. Holes too close to the nose, joints, or transitions will be affected by turbulence and give less accurate readings.

Finishing

Drilling cardboard tubes can cause fraying around the holes. Consider reinforcing each hole with a drop of CA (super glue) and sanding smooth afterwards for a cleaner finish.

Light protection

Pressure sensors are light sensitive. Keep vent holes as small as the calculator recommends and consider painting the inside of your payload section black, or using open-cell black foam over the sensor to minimise light reaching it.

Reference: vernk.com — Altimeter Port Sizing