Meteorological Balloons

The **Model 400 Series Meteorological Balloons** are produced by rotational molding of natural rubber. Their uniform wall thickness prevents premature blowouts, and they are ozone resistant. Reinforced necks allow use in strong winds without tearing. These balloons are not recommended for tethering.

Each balloon is inflated, inspected, and tested before being dusted and sealed in a moistureproof polyethylene bag. They may be stored up to seven years if kept in a cool, dark room. No preflight conditioning is required.

Two basic types of balloons are available. The smaller **pilot (or ceiling) balloons** are usually tracked with a theodolite. These balloons are not designed to carry a payload. Three different colors provide easier sighting under varying weather conditions. The natural color has the greatest visibility on clear days; red is easiest to see in scattered clouds; and black is best for overcast conditions. Small lights can be used to illuminate pilot balloons for easier sighting during nighttime observations. Balloon weight is chosen based on the altitude and ascent rate required. The larger **sounding balloons** are designed to carry a radiosonde aloft, and these balloons are usually used in conjunction with a rawinsonde tracking station. They can also carry other types of payload, such as radar targets. The burst altitude required should be used to determine the balloon weight needed.

Specifications are based on performance tests conducted at the factory. They are taken from hydrogen-inflated balloons. Helium inflation may provide different results.

Specifications and Ordering Information

Model	Nominal Weight gm	Color	Neck Dia in (mm)	Uninflated Dia in (cm)	Std Inflated Dia ft (cm)	Burst Dia ft (cm)
Pilot Balloons:						
400-8210	10	red	0.9 (23)	3.2 (8)	1.5 (46)	2.0 (60)
400-8230	30	red	0.6 (14)	7.1 (18)	2.1 (64)	3.3 (102)
400-8231	30	black	0.6 (14)	7.1 (18)	2.1 (64)	3.3 (102)
400-8232	30	natural	0.6 (14)	7.1 (18)	2.1 (64)	3.3 (102)
400-8233	100	red	0.6 (14)	13.8 (35)	2.4 (74)	4.4 (133)
400-8234	100	black	0.6 (14)	13.8 (35)	2.4 (74)	4.4 (133)
400-8235	100	natural	0.6 (14)	13.8 (35)	2.4 (74)	4.4 (133)
400-8236	200	natural	1.3 (32)	18.9 (48)	3.9 (118)	8.9 (270)
Sounding Balloons:						
400-8237	300	natural	1.3 (32)	23.6 (60)	5.0 (154)	12.8 (390)
400-8239	500	natural	1.3 (32)	32.7 (83)	5.7 (175)	17.7 (540)
400-8242	800	natural	1.3 (32)	42.5 (108)	6.1 (185)	22.3 (680)

Options:

400-8260-10	10G Balloon Filling System, includes pressure hose, valve, and 10gm weighted nozzle
400-8266	Helium Tank Regulator
400-8318	Pilot Balloon Light, 2.5 volt, 0.3 amp bulb, water-activated battery, weight 0.34 oz

Performance Test Specifications — Results

Weight gm	Free Lift gm	Payload gm	Gross Lift gm	Inflation Vol cu ft (cu M)	Inflation Dia ft (M)	Ascent Rate M/Min	Altitude at Burst Mi (Km)
Pilot Balloons:							
10	50	—	60	1.9 (0.05)	1.5 (0.5)	150	4.3 (7)
30	140	—	170	5.5 (0.16)	2.2 (0.7)	200	7.8 (12.5)
100	160	—	260	8.4 (0.24)	2.5 (0.8)	200	9.3 (15)
200	850	—	1050	33.9 (0.96)	4.0 (1.2)	350	11.8 (19)
Sounding Balloons:							
300	1400	630	2330	75.2 (2.1)	5.2 (1.6)	400	13.0 (21)
500	1700	1150	3350	108.1 (3.1)	5.9 (1.8)	400	15.2 (24.5)
800	2000	1150	3950	127.4 (3.6)	6.2 (1.9)	400	17.4 (28)

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Sounding balloons can carry payloads greater than those listed in the chart if the gross lift of the balloon is increased. This is done by increasing the inflation volume. (Note the burst diameter of the balloon to avoid overfilling.) The ascent rate and burst altitude will vary from the values given. The following formulas can be used to calculate approximate values. Experimentation will probably be required.

$$Gross\ lift\ (gm) = Free\ lift\ (gm) + Balloon\ weight\ (gm) + Payload\ (gm)$$

$$Inflated\ volume\ (ft^3) = \frac{Gross\ lift\ (gm)}{31\ gm/ft^3}$$

where $31\ gm/ft^3$ is the lifting force of hydrogen at $1013\,mb,\ 25^\circ C$.

$$Inflated\ diameter\ (ft) = 2\sqrt[3]{\frac{Inflated\ volume\ (ft^3)}{4.189}}$$

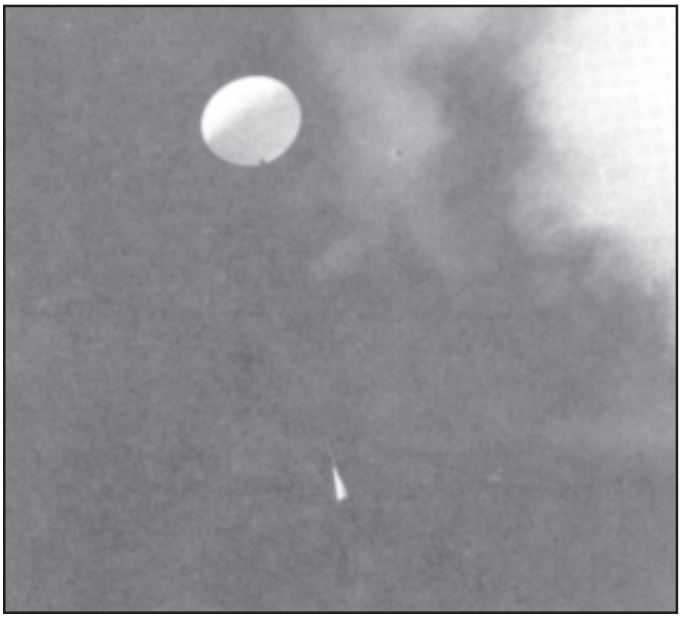
$$Ascent\ rate\ (m/min) = K\frac{\sqrt{Free\ lift\ (gm)}}{\sqrt[3]{Gross\ lift\ (gm)}}$$

where K is a factor dependent on the drag coefficient of the balloon.

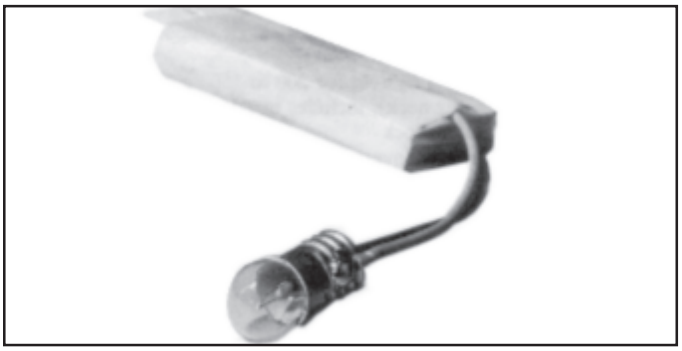
$K = 142$ for 300–1500 gm balloons

$K = 151$ for 2000 gm balloons

$K = 158$ for 3000 gm balloons



Meteorological Balloon



400-8318 Pilot Balloon Light