

Teledyne Benthos

# Flotation

Glass Instrument Housings

## Deep Sea Glass Spheres

GLASS SPHERES are a unique, reliable, cost effective method for flotation and the housing of electronic instruments in the marine environment. Teledyne Benthos is the world's leading manufacturer of deep sea glass spheres and instrument housings. Ongoing improvements continue to insure their high reliability in extreme environments. Advanced assembly techniques and the patented VacuSealed closure method consistently result in high quality, long-life spheres. Teledyne Benthos continues to pressure test every sphere prior to shipment, assuring their integrity in the field.

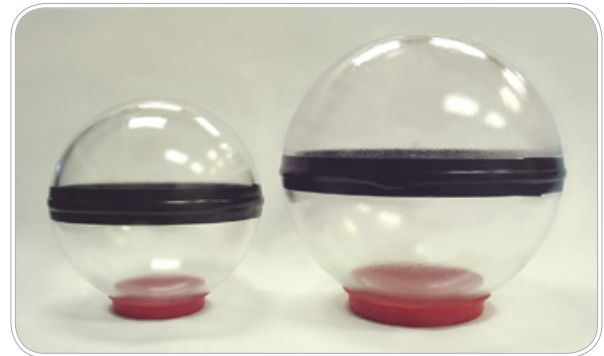
Deep sea glass spheres are superior to other types of flotation and instrument housing for several reasons: they are transparent, lightweight, inexpensive, corrosion resistant, easily handled, extremely strong, and non-polluting. As a result, they are preferred by oceanographers worldwide and are backed by over 50 years of experience in deep sea technology.



17 inch  
Instrument Housing



Glass spheres in protective hard hats



13 inch and 17 inch glass sphere.

### PRODUCT FEATURES

Teledyne Benthos patented VacuSealed glass floats and instrument housings are manufactured from precision-molded spheres to exact specifications. The edge of each hemisphere is ground flat to extreme tolerances. When used for flotation the hemispheres are mated, and then evacuated to an absolute internal air pressure of less than 0.3 atmospheres. After evacuation, a sealant and protective tape are applied around the equator. Spheres sealed in this method are nearly impossible to open due to the force exerted upon them by the atmospheric

pressure. In the case of the 43.2 cm (17 in) diameter float, this force is in excess of 880 kg (2,000 lbs).

#### VACUUM PORTS

A titanium vacuum port (Model 204-VPT) can be installed in a glass instrument housing to facilitate opening and closing the sphere. The vacuum port option is recommended for any housing that will be opened frequently.



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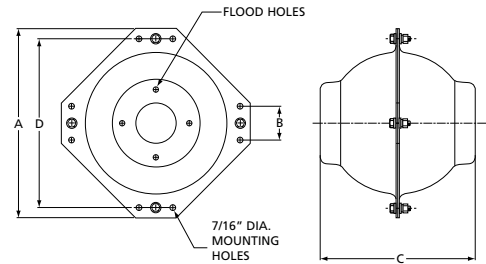
## Glass Instrument Housings

### TECHNICAL SPECIFICATIONS

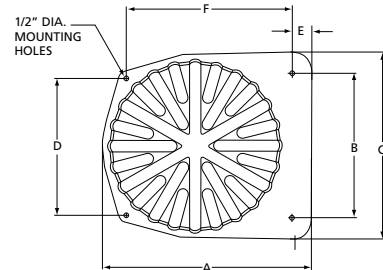
Type	Low expansion borosilicate
Thermal Coefficient of Expansion	$38 \times 10^{-7}/^{\circ}\text{C}$
Specific Gravity	2.22
Young's Modulus	62 GPa ( $9 \times 10^6$ p.s.i.)
Poisson's Ratio	0.20
Refractive Index	1.48
Thermal Conductivity	0.0023 calorie cm/cm <sup>2</sup> sec <sup>o</sup> C
Specific Heat	0.18 calorie/gm <sup>o</sup> C

### DIMENSIONS, WEIGHT, AND DEPTH DATA

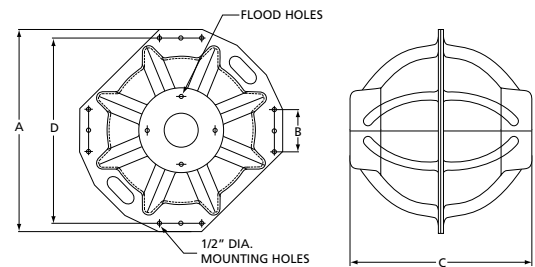
	Sphere Model 2040-13V	Sphere Model 2040-17V
Outside Diameter:	33cm (13 in)	43.2 cm (17 in)
Inside Diameter:	30.5 cm (12 in)	40.4 cm (15.9 in)
Weight in Air:	9.07 kg (20 lbs)	17.7 kg (39 lbs)
Net Buoyancy:	10.4 kg (23 lbs)	25.4 kg (56 lbs)
Depth Rating:	9,000 m (29,500 ft)	6,700 m (22,000 ft)



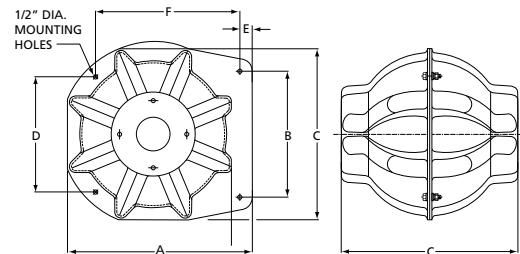
204H-17 Standard Hard Hat



204HR-17 Ribbed Hard Hat



204-SRO-13 and 17 Super Ribbed Octagonal Hard Hat



204-SRM-17 Super Ribbed Mooring Hard Hat



Standard  
204H

Ribbed  
204HR

Super Ribbed  
204-SRO/204-SRM

Bright yellow, neutrally buoyant, polyethylene hard hats are available for glass protection, storage, and ease of handling. Hard Hats consist of two flanged units bolted together with stainless steel hardware. Flanges can be bolted to a mounting framework, wire clamp, or chain section on a mooring line.

### Dimensions and Weight in Air (Dimensions in drawings, right)

Model	A		B		C		D		E		F		Weight in Air	
	cm	in	cm	in	cm	in	cm	in	cm	in	cm	in	kg	lbs
204H-17	55.9	22.0	12.7	5.0	48.3	19.0	49.5	19.5	-	-	-	-	2.95	6.50
204HR-17	54.6	21.5	38.1	15.0	49.5	19.5	35.8	14.1	5.1	2.0	43.2	17.0	3.29	7.25
204-SRO-13	48.3	19.0	12.7	5.0	40.6	16.0	43.2	17.0	-	-	-	-	2.50	5.50
204-SRO-17	61.0	24.0	12.7	5.0	53.3	21.0	55.9	22.0	-	-	-	-	3.63	8.00
204-SRM-17	55.9	22.0	38.1	15.0	51.8	20.4	35.0	13.7	3.8	1.5	43.7	17.2	3.74	8.25