



## PRODUCT CATALOG 2012

# Deep Sea Glass Spheres

Deep sea 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 ensure their high reliability in extreme environments. Advanced assembly techniques and the VacuSealed closure method result in high quality, long-life spheres. Teledyne Benthos pressure tests 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 40 years of experience in deep sea technology.



INNOVATIVE UNDERSEA SYSTEMS TECHNOLOGY



**TELEDYNE  
BENTHOS**

A Teledyne Technologies Company

**50** Years of  
Innovation  
1962-2012

## Glass Spheres & Instrument Housings



13 inch (left) and 17 inch (right) glass floats.

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 matched, 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 (2000 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.

### 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/ $\text{cm}^2 \text{ sec}^{\circ}\text{C}$
Specific Heat	0.18 calorie/g $^{\circ}\text{C}$

### Dimensions, Weight, and Depth Data

	Sphere Model 2040-13V*	Sphere Model 2040-17V
Outside Diameter	33 m (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 Bouyancy	10.4 kg (23 lbs)	25.4 kg (56 lbs)
Depth Rating	9000 m (29,500 ft)	6700 m (22,000 ft)

\*13" spheres available with improved optical transmission profiles, low potassium and low photonic radiation.

Note: All prices listed in U.S. dollars

### Flotation Spheres

Part Number	Description
C-204-41 .....	2040-13V; Glass Flotation Sphere - 13" (33 cm) 10.4 kg (23 lbs) Approximate Net Buoyancy.
C-204-42 .....	2040-17V; Glass Flotation Sphere - 17" (43.2 cm), 25.4 kg (56 lbs) Approximate Net Buoyancy.

### Instrument Housing

C-204-44 .....	2040-13H; Glass Instrument Housing-13" (33 cm)
C-204-45 .....	2040-17H; Glass Instrument Housing-17" (43.2 cm)

## Glass Spheres & Instrument housings

### Hard Hats

Part Number	Description
C-204-99 .....	204-SRO-13; Super Ribbed Hard Hat Housing for 13" Sphere
C-204-49-1 .....	204H-17; Standard Hard Hat Housing for 17" Spheres
C-204-49-2 .....	204HR-17; Ribbed Hard Hat Housing for 17" Sphere
C-204-49-3 .....	204-SRO-17; Super Ribbed Octagonal Flange Hard Hat Housing for 17" Sphere
C-204-49-4 .....	204-SRM-17; Super Ribbed Mooring Flange Hard Hat Housing for 17" Sphere

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.



Standard  
204H



Ribbed  
204HR



Super Ribbed  
204-SRO/204-SRM

### Spares & Accessories

Part Number	Description
C-189-18-5 .....	204N-17; Nylon Net Bag for 17" Spheres
0900-024 .....	204-SS; Sealant Strip for Glass Spheres. 9.1 M (25 Ft. Roll)
0903-013 .....	204-T; Tape; Black for Glass Spheres. 30.5 M (100 Ft Roll) Wide Version

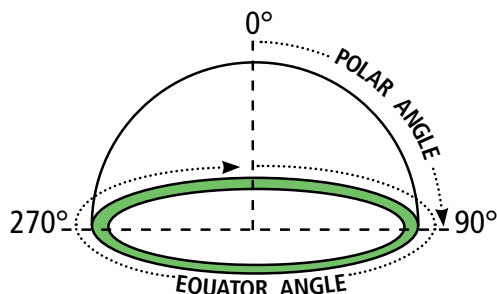
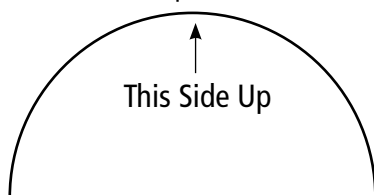
### Instrument Housing Options

Part Number	Description
B-204-123-1 .....	2045-78-N; Single Penetrator, Uninstalled
B-204-78 .....	Single Neoprene Penetrator, Installed
B-204-86 .....	204-VPT; Titanium Vacuum Port, Installed.
B-204-48-1 .....	204-DHO; Glass Hole Drilling to 1/2" Width Ground Flat
B-204-48-2 .....	204-DHO; Glass Hole Drilling Greater Than 1/2" Width Ground Flat

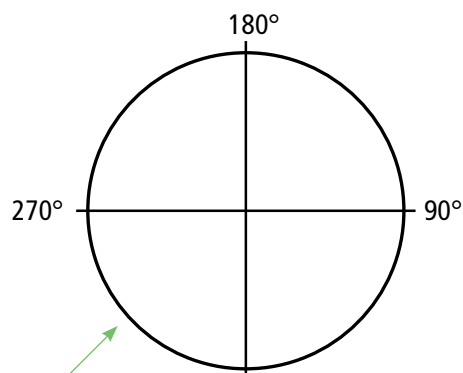


# Drill Hole Instruction Sheet

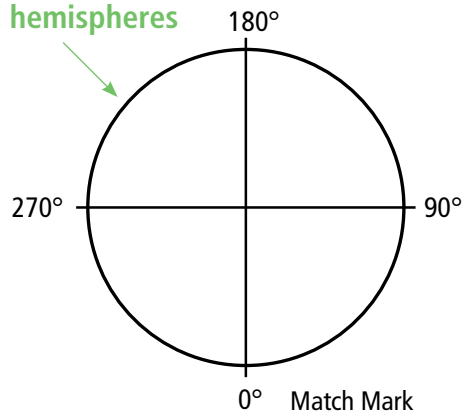
When measuring for holes, orient hemispheres as shown.



Measure along the Polar and Equator angles to determine the exact location of all holes to be drilled in each glass sphere. Record all necessary information in the grids below.



Top view of hemispheres



## TOP HEMISPHERE

Hole Number	A	B	C	D	E	F	G	H
Equator Angle								
Polar Angle								
Hole Type								

## BOTTOM HEMISPHERE

Hole Number	1	2	3	4	5	6	7	8
Equator Angle								
Polar Angle								
Hole Type								

Customer: \_\_\_\_\_ Date: \_\_\_\_\_

Revision: \_\_\_\_\_

Sales Order: \_\_\_\_\_ Ship Date: \_\_\_\_\_ Quantity: \_\_\_\_\_ Size: \_\_\_\_\_

Recommended Polar Angle for Penetrators for Hard Hat Clearance				
10" H 25	13" SRO 30	17" H 30	17" HR N.A.	17" SR 25

Typical Vacuum Port Positions	
XT-6000-10	E=180 P=45, top hemi, per B-500-3
XT-6000-17	E=0 P=25, top hemi, per B-500-7
TR-6000	E=135 P=25, per B-210-428

Hole Type	Standard Applications	Drill Diameter
1	Vacuum Port, 3/16"	.203"
2	XT/TR Transducer	.281"
3	Bulkhead, 7/16", Brass	.453"
4	Bulkhead, 7/16", Titanium	.438"
5	Single Pin Penetrator	.156"

Special Applications		
6		
7		
8		

**NOTE:** — All customer supplied penetrators must have 1" stems and be furnished with dummy plugs and hardware.

— When shipping penetrators to Teledyne Benthos, please reference purchase order number and/or sales order number.

**Maximum polar angle is 50°**

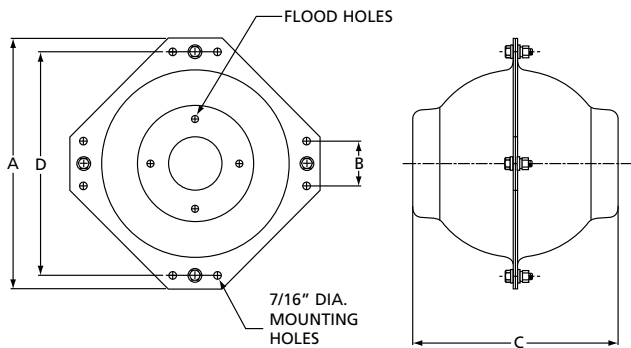
# Glass Spheres & Instrument Housings

## Dimensions and Weight in Air

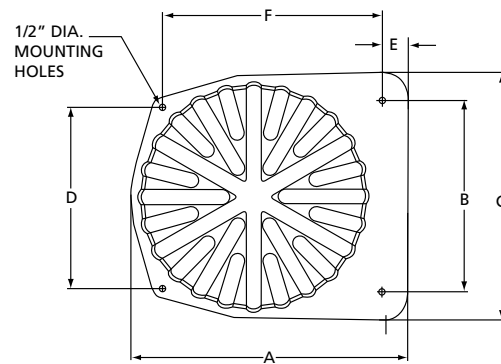
Dimensions shown below	A		B		C		D		E		F		Air Weight	
Model	cm	in	cm	in	cm	in	cm	in	cm	in	cm	in	kg	lbs
204H-17	55.9	22.0	12.7	5.0	48.3	19.0	49.5	19.5					2.95	6.50
204HR-17	54.6	21.5	38.1	15.0	49.5	19.5	35.8	14.1	5.1	2.0	43.2	17.0	3.29	7.25
204-SRO-13	48.3	19.0	12.7	5.0	40.6	16.0	43.2	17.0					2.50	5.50
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

(neutrally buoyant in water)

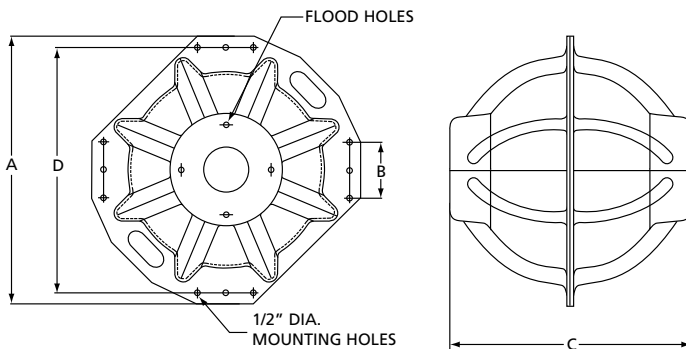
**204H-17  
Standard Hard Hat**



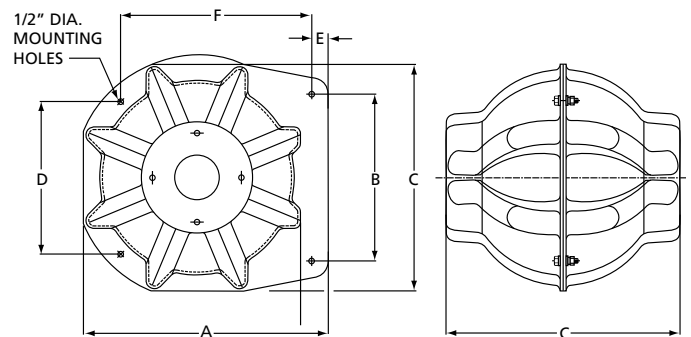
**204HR-17  
Ribbed Hard Hat**



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



**204-SRM-17  
Super Ribbed Mooring Hard Hat**





FLOTATION

## Terms & Conditions

Seller's Offer, and any order issued by Buyer to Seller  
for the goods and/or services specified herein, is strictly limited to  
Seller's Terms and Conditions of Sale, which can be found at [www.benthos.com](http://www.benthos.com)



49 Edgerton Drive, North Falmouth, MA 02556 USA  
Tel +1 508.563.1000 • Fax +1 508.563.6444 • E-mail: benthos@teledyne.com

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