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VITROVEX®

DEEP SEA FLOATATION and INSTRUMENT HOUSINGS

THE MATERIAL

Glass has properties which make it perfectly destined for deepsea use. It's corrosion resistance, it's lightness, it's chemical, electrical and magnetic inertness and it's optical qualities add up to a valuable combination.

VITROVEX is a 3.3 borosilicate glass with standardised physical, chemical and optical properties. It is formed into spheres and thick wall tubes by means of intricate processing and thermal post-treatments.

Country of origin and manufacture is Germany. VITROVEX is made by the well experienced SCHOTT company (formerly JENAer Glaswerk, Jena).

Optical properties:

refractive index n_d	: 1,472
dispersion $n_f - n_c$	: 72.6 x 10^{-4}
stressoptical coefficient	: 4.0 x 10^{-6} mm^2/N
transmission (8 mm at 500 nm)	: 89 %
attenuation (8 mm at 500 nm)	: % 1 dB

Physical properties:

Young's modulus	: 63 GPa
thermal coefficient of expansion	: 3.3 x 10^{-6} / °K
specific gravity at 25 °C	: 2.23 g / cm^3
Poisson's ratio	: 0.20
thermal conductivity at 90° C	: 1.2 W / m x °K
specific heat	: 0,8 J / g x °K

Chemical properties:

base resistivity DIN ISO 695	: % 146 mg / dm^2
acid resistivity DIN 12116	: % 0.3 mg / dm^2
water resistivity DIN ISO 719	: % 31 µg Na_20 per g glass
(base emittance)	0,03 ml / l (HCL c=0,01 ml / l)

THE TUBES and SPHERES

The VITROVEX tube is a well proven design for deep ocean instrument housings. The cylindrical shape is more convenient compared to a sphere. The properties surpass those of any other conventional material, e.g. a cylindrical VITROVEX instrument housing floats in seawater. VITROVEX tubes represent the development of a manufacturing process to make thick wall tubes. It is now possible to make them to a wall thickness of more than 16mm. Maximum length (1100 -1500 mm) depends on manufacturing method and tolerances required. Longer lengths can be achieved by cascades of single tubes.

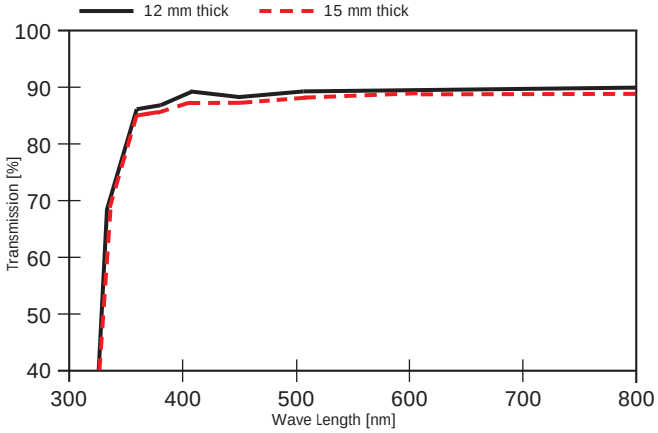
OD [mm]	ID [mm]	Length [mm]	Depth [m]
192	160	1500	6000
187	159	1000	4500
141	113	1000	6700
120	100	1500	6700
143	125	1100	3000
130	115	1100	3000

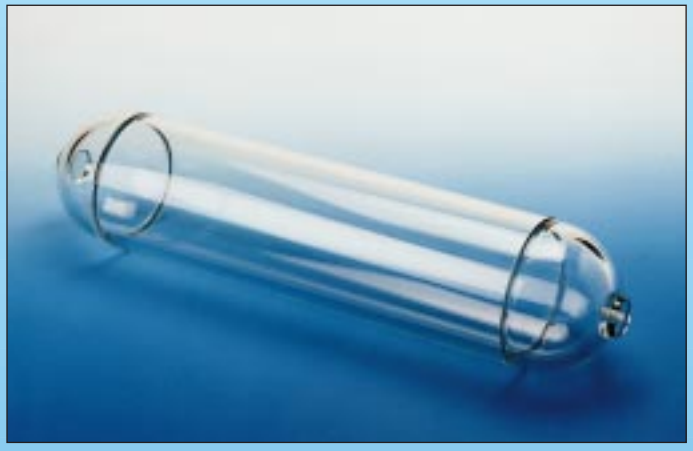
Other dimensions and operational depths upon request

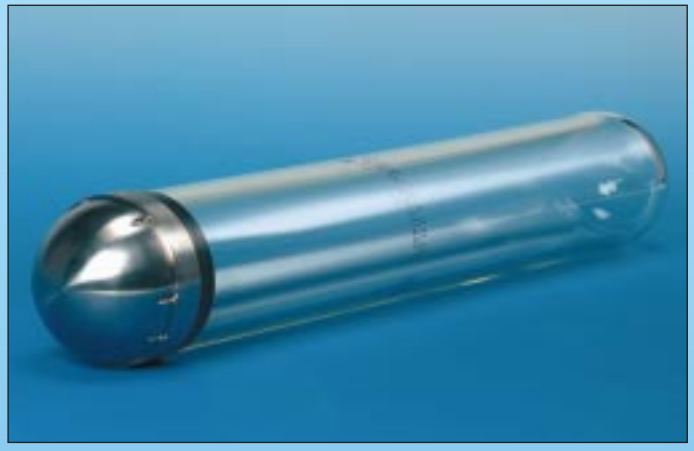
VITROVEX spheres can be used as floats or as instrument housings with feed-throughs and vacuum ports according to users requirements. Two standard sizes are available.

Quality assurance and pressure testing is conducted to ISO 9001

VITROVEX Optical Transmission







THE ENDCAPS

The VITROVEX endcap design and manufacturing process ensures an even distribution of pressure over the sealing surface, avoiding the likelihood of fracturing.

Endcaps can be delivered in different materials and to custom designs:

- glass
- titanium
- hybrid (titanium / glass)

OEM solutions are possible

The endcaps can be equipped with feed-throughs to user request. However, owing to the unique properties of glass, the need for feed-throughs is in some cases reduced or even eliminated, via optical, magnetic or inductive coupling possibilities. This prevents potential weakening of the housing, saves on the cost of connectors or feed-throughs and reduces the risk of associated failures.

THE ACCESSORIES

There is a wide range of accessories available:

- Vacuum ports (titanium and stainless steel)
- Adapters to match vacuum ports and hoses
- Pressure feed-throughs (titanium)
- Sealant bands (2 types) and protective tape
- Sleeves (sealing and protection)
- Mounting brackets (Delrin)
- Electrical penetrators and connectors
- Protective shells in different design and size
- EDDYGRIP swivelling sphere attachments
- Mooring components
- Mooring ropes and wires

The accessories are carefully designed and manufactured to meet the high demands of oceanography and offshore technology.

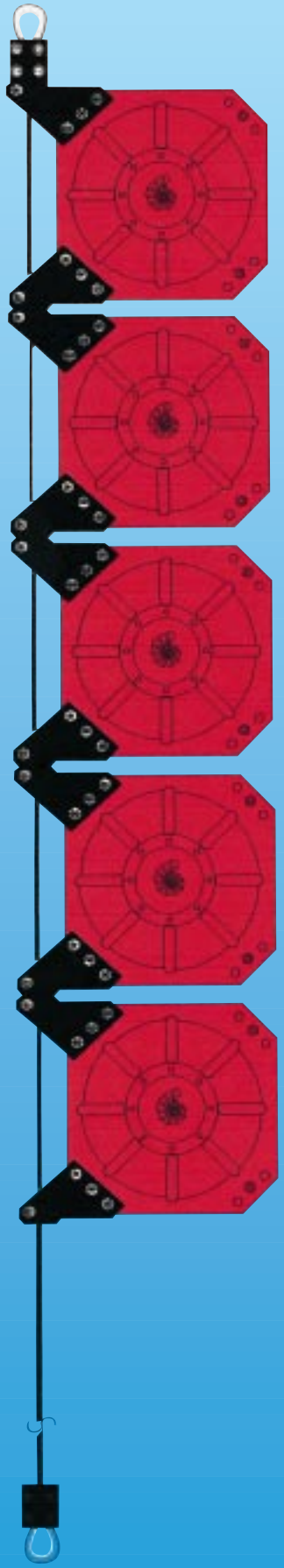
DEEP SEA INSTRUMENT MOORINGS
featuring components

VITROVEX® - EDDYGRIP® - KING ROPE®

EDDYGRIP® – swivelling sphere attachments. Made of seawater-resistant, neutrally buoyant material. Developed, tested and patented to Alfred-Wegener-Institute for Polar and Marine Research, Germany.

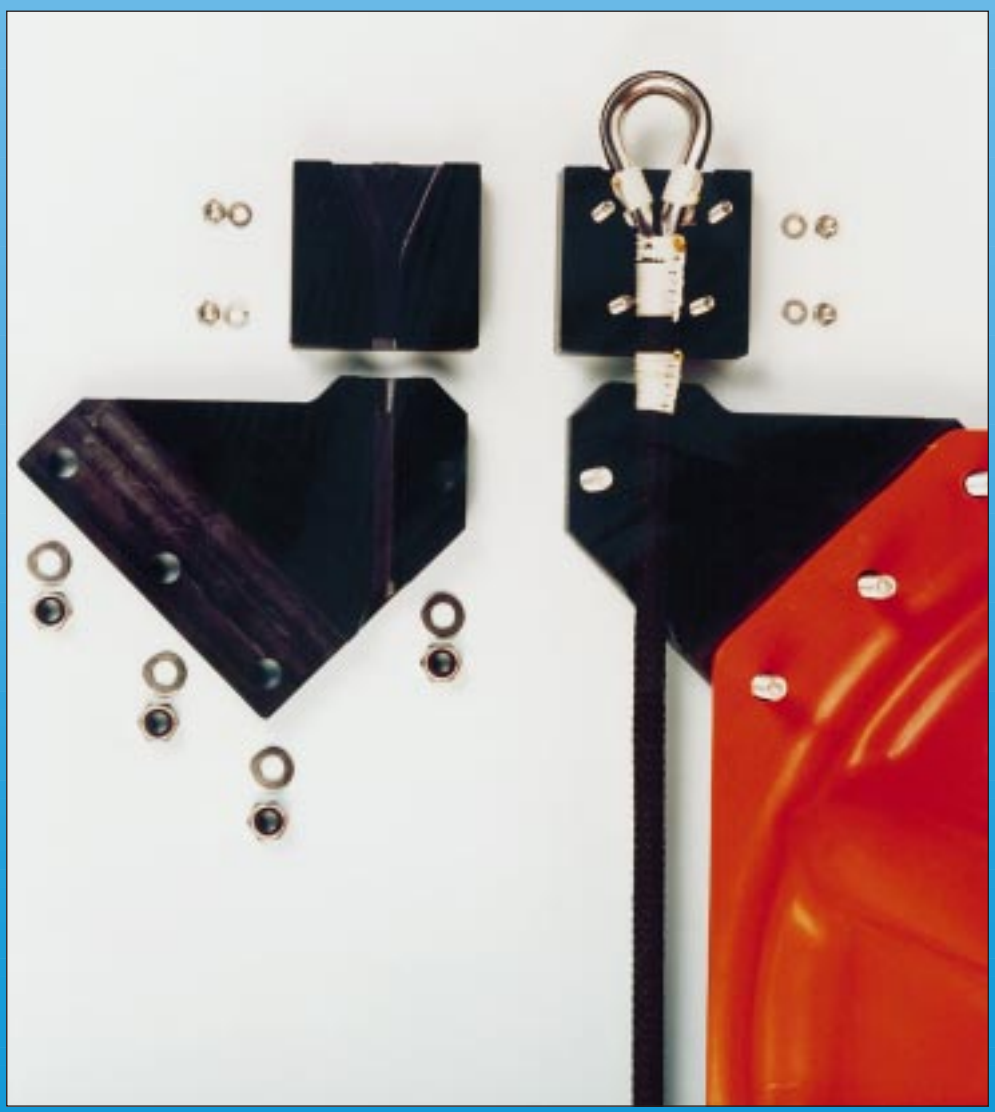
VITROVEX® – glass spheres for buoyancy in 6,700 meters depth. Average buoyancy 260 N each sphere.

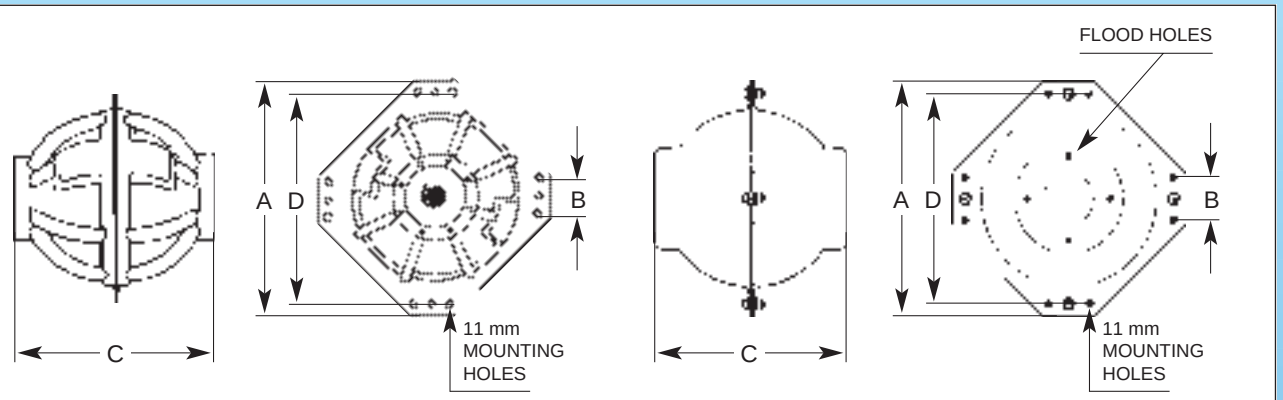
KING ROPE® – a specially braided Superaram fibre rope with polyester cover. Breakforce up to 160 kN.



DESCRIPTION:

Each module consists of five VITROVEX glass spheres housed in protective PE-shells and attached to the KING ROPE with EDDYGRIP. The rope is 5 meters long and is terminated with splice, thimble and stopper at each end. The stoppers absorb weight and uplift.





SR-MODELS | H-MODELS

GLASS SPHERES

The spheres are manufactured from borosilicate glass 3.3 (SCHOTT DURAN®). Floatation spheres are evacuated and sealed after careful triple grinding of each equatorial sealing face. The equator is sealed with a butyl-rubber sealant band and protective tape. The precision moulded hemispheres do not require matching. Hemispheres of instrument housings can be mated without being orientated.

Models and Dimensions

OD [mm / inch]	ID [mm]	Weight [kg / air]	Buoyancy [N]	Depth [m]
432 / 17	404	17,2	260	6700
432 / 17	396	21,7	215	9000
330 / 13	306	8,5	107	9000

Other sizes upon request

Protective Shells

Bright orange, polyethylene, neutrally buoyant protective shells are available for impact protection, stowing and ease of handling. The shells consist of two flanged halves, bolted together with stainless steel screws, washers and self-locking nuts. Synthetic hair pads absorb shock and retain the sphere concentrically. The flanges can be bolted to mounting hardware, such as EDDYGRIP swivelling sphere attachments.

Models and Dimensions

Model	A [mm / inch]	B [mm / inch]	C [mm / inch]	D [mm / inch]	Weight (air) [kg]
SR432	610 / 24,0	127 / 5,0	526 / 20,7	558 / 22,0	5,55
H432	559 / 22,0	127 / 5,0	483 / 19,0	495 / 19,5	4,95
SR330	483 / 19,0	127 / 5,0	406 / 16,0	432 / 17,0	2,6
SR330-EG	500 / 19,7	127 / 5,0	406 / 16,0	432 / 17,0	2,8

VITROVEX Production and Quality Control


annealing oven


grind


measure


leaktest and evacuation


pressure test


assembly

VITROVEX® Applications

Satellite Transmitter
OHB Bremen

Neutrino Telescope
DESY Zeuthen

DOP - Deep Ocean Profiler
(MARUM - University Bremen)

EDDYGRIP Floating Module
(BSH Hamburg)

Cover photo:
Subsurface Platform (MARUM - University Bremen)

Distributor