

Eccospheres®

High performance hollow glass microspheres

Eccospheres® are thin-walled, hollow glass microspheres (HGMS) developed to meet the demanding strength, weight and electrical specifications of our clients in the aerospace, defense and industrial markets. Magnification reveals the near perfect spherical shape of HGMS, which to the naked eye, resemble a fine, white, free-flowing powder. The unique properties of Eccospheres® can help reduce costs, enhance specific properties and improve material processing. Eccospheres® can be incorporated into a wide range of polymer and resin systems and can replace or combine with other materials to create composites.

Features & Benefits:

- Industry leading chemical stability
- High temperature resistance
- Good density/strength ratios
- Clean surface chemistry
- Low thermal conductivity
- Low dielectric constant
- Low dissipation factor
- Diverse array of particle size/strength/density combinations
- Inert internal gas
- Industry leading particle packing

Applications:

- Extreme processing conditions (extrusion, roller milling, injection)
- Chemically sensitive systems (silicones, vinyl esters, long pot life epoxies)
- High viscosity systems
- High temperature systems
- Low dielectric/loss tangent materials



Storage

Eccospheres® should be stored in original containers at a temperature between 15 and 25 °C. If stored in the specified conditions, they will have a shelf life of 12 months from date of production.

Health & Safety

Eye protection and gloves should be worn when working with Trelleborg Eccospheres®.

Please refer to the Trelleborg MSDS.

Eccospheres® Series

Trelleborg Applied Technologies manufactures four standard grades of Eccospheres® that exhibit unique properties to meet your needs. The four grades include the IG series, the FTD series, the SI series and the SID series. The typical properties are shown in the table.

Customization

Trelleborg Applied Technologies has the capability of tailoring the properties of high grade Eccospheres® to meet your precise material needs. From reducing weight to modulating light, Eccospheres® can drive your material innovation in varied and diverse directions.

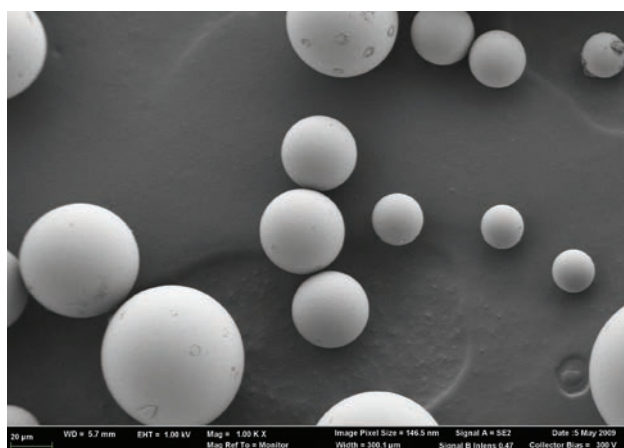
Customized silane treatments are available for resin/microsphere coupling. Available treatments include:

- S1 - N-Phenyl Amino
- Epoxy Functional
- Alkyl Chloro Functional
- Alkyl Amino Functional

TYPICAL PROPERTIES							
Series Description	Grade	Mean Particle Size (Microns)	Collapse Pressure (psi*)	Average Density Range +/- 0.02 (g/cc)	Theoretical Thermal Conductivity (K/mK)	Drum Size (lbs/kg)	Repack Size (kg)
The IGD series exhibits a clean surface chemistry and offers customers a lower cost, industrial grade option.	IG-101	55	1500	0.35	n/a	50 lbs (22.7 kg)	-
	IG-201	65	1500	0.35	n/a	50 lbs (22.7 kg)	-
	IGD-101	55	1500	0.305	n/a	50 lbs (22.7 kg)	3.10
The FTD series exhibits a clean ion-exchanges surface that ensures compatibility with almost any resin system.	FTD-200	65	750	0.20	0.08	40 lbs (18.2 kg)	1.00
	FTD-250	55	1200	0.25	0.09	50 lbs (22.7 kg)	1.00
The SI series exhibits a clean surface chemistry with a reduced alkali content ensuring compatibility with most resin and surface coating systems.	SI-100	65	250	0.10	0.05	25 lbs (11.4 kg)	-
	SI-130	65	300	0.13	0.06	25 lbs (11.4 kg)	-
	SI-160	62	400	0.16	0.07	40 lbs (18.2 kg)	-
	SI-200	60	800	0.20	0.08	40 lbs (18.2 kg)	1.00
	SI-250	60	1800	0.25	0.09	50 lbs (22.7 kg)	1.00
	SID-160Z	60	600	0.16	0.07	40 lbs (18.2 kg)	-
The SID series exhibits a clean surface chemistry with improved strength. High strength ensures survival of the sphere when subjected to aggressive processing. This series has the highest strength to weight ratio.	SID-200Z	53	1000	0.20	0.08	40 lbs (18.2 kg)	-
	SID-230Z	52	2100	0.23	0.09	50 lbs (22.7 kg)	-
	SID-270Z	50	5000	0.27	0.10	50 lbs (22.7 kg)	-
	SID311Z	45	6000	0.31	0.11	50 lbs (22.7 kg)	-
	SID-350Z	45	6500	0.35	0.12	50 lbs (22.7 kg)	-

*Isostatic Collapse Pressure (80% Survival) - ASTM D3102-78

Table 1: Typical properties only



Contact Us

Trelleborg's Applied Technologies division is an industry expert in delivering innovative and reliable solutions that maximize performance for our customers. Our vast range of specialized, customizable materials ensure peace of mind at every stage of your project. With reliable and efficient project management and manufacturing we endeavor to take performance to new levels by achieving your goals safely, on time and within scope.

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Firestop™

Protecting people and assets

Reducing the risk of fire hazard is a vital but challenging part of designing and engineering an offshore oil and gas installation. Protecting people, structures and equipment from all types of fire in this extreme environment is paramount to ensuring onboard safety.

Trelleborg's certified rubber based passive fire protection technology, protects structures from exceeding critical temperature limits. The dampening, noise reducing flexible nature of Firestop™ protects equipment from vibrations, collisions, explosions and even earthquakes. Firestop™ is tested to withstand a blast up to 2.1 bars and jet fire resistant for more than 2 hours.

The main purpose of Firestop™ as a passive fire protection material is to protect personnel and equipment by minimizing fire escalation. It provides time to evacuate people, close down critical equipment and for responders to gain control of the fire.

The Firestop™ system can be supplied in various material combinations to meet your project specific requirements which may include:

- Fire protection
- Corrosion and HISC protection
- Mechanical protection
- Thermal insulation
- Antifouling

**Applications:**

- Riser protection, both rigid and flexible
- HPT - Pipe penetration seals
- Drain gully
- Tailor made flexible seals
- Vikodeck™ - deck protection
- Enclosures for actuators, hang-offs and valves
- Bolt and flange protection

Benefits:

- Abrasion resistant
- Blast resistant
- Design life of 40 years
- Flexible
- Hydrocarbon fire resistant (up to 2 hours)
- Impact resistant
- Jet fire resistant (up to 2 hours)
- Maintenance free
- Noise reducing
- Ozone resistant
- Service temperature range
-50°C/-58°F to 155°C/311°F
- UV resistant
- Water resistant

Contact Us

Trelleborg Offshore delivers innovative and reliable offshore solutions that maximize business performance to meet your needs. Our dedicated and highly skilled staff are always on hand to provide seamless process support from initial idea, through to delivery and beyond.

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FireNut™

Fire protection for bolts and nuts

In refineries, offshore oil installations or wherever hydrocarbons are transported, the pipes are flanged and held together with nuts and bolts. In case of fire, the flanges and pipes should maintain the same level of integrity to avoid escalation. Traditional protection is to capsule the whole valve and flanges in a fire-insulated metal box – a bulky, heavy and expensive solution. The box also creates challenges during inspection and maintenance. Trelleborg Offshore has developed a jet fire protection for bolted connections to extend service life in the event of a fire. It helps the bolts and flanges to maintain their level of integrity and avoid escalation.

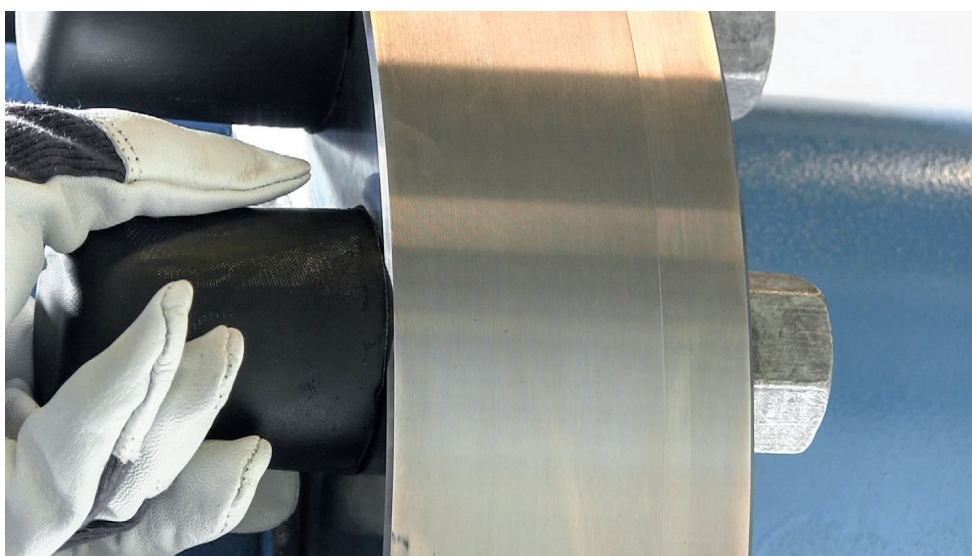
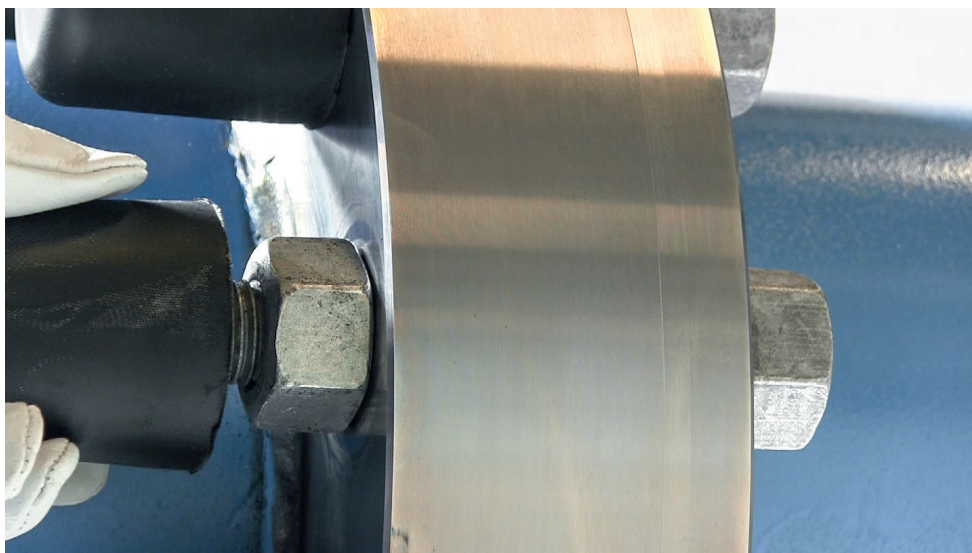
The easy to install FireNut™ resists both jet fire and pool fire and is tailor made to accommodate almost any bolt size. The rigid and tough design means that FireNut™ has extremely good resistance to mechanical damage when installed.

FireNut™ is hand mounted by screwing it on to the bolt. It protects each bolt separately, allowing for easy inspection as well as lowering weight and occupying less space. The FireNut™ system simplifies installation, inspection and maintenance of flanges, increases efficiency and reduces costs. It can be re-used after disassembly and does not require certified personnel for installation.

FireNut™ is based on Trelleborg Offshore's Firestop™ material, which combines extreme fire protection with other unique rubber capabilities. Trelleborg Offshore has delivered Firestop™ based products to the offshore industry for more than 30 years.

**Benefits:**

- High resistance to blast, impact, ozone, UV, most solvents and seawater
- Jet- and hydrocarbon fire resistant up to 2 hours
- Excellent protection from HISC, corrosion, and mechanical damage and wear
- Easy installation, no maintenance and easy to inspect
- Long service life
- No hot work
- Weight and space savings
- Tailor-made to accommodate almost any bolt size
- FireNut™ comes in a number of sizes and variations, to ensure they are easy to install in all environments

**Applications:**

- FireNut™ has been installed on a number of offshore constructions worldwide
- FireNut™ can be applied to both new and old bolts and flanges
- FireNut™ is a product that is not just restricted to offshore high pressure flanges, but can be used in any other context where bolt and nut protection is required.

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Eccofloat®

Syntactic foams

Trelleborg Applied Technologies manufactures a range of high performance, low density syntactic foam for deep sea buoyancy applications.

These composite foams provide ultra low densities by selecting only the highest specification hollow glass microspheres, called Eccospheres®, and combining them within a rigid, high strength resin system. The syntactic foam is typically cast into blocks and then is used to prepare large buoyancy modules that can be readily shaped to conform to hull contours and outfitted for installation in the forward and aft free-flood areas of submarines.

Oceanographers also depend on syntactic foams to suspend instrumentation in deep ocean studies. For these applications, the syntactic foam is used in either block form or custom molded shapes for installation in manned and unmanned submersibles such as the legendary Alvin and Jason vehicles that were used to discover and explore the Titanic.

Trelleborg Applied Technologies produces various grades of syntactic foams, called Eccofloat®, to meet our customers broad range of requirements.

TG Grade syntactic foams are lightweight and economical for building manned and remote operating vehicles. The foams are also used to manufacture mine neutralization systems because of their zero magnetic and sea-water comparable acoustic signatures.



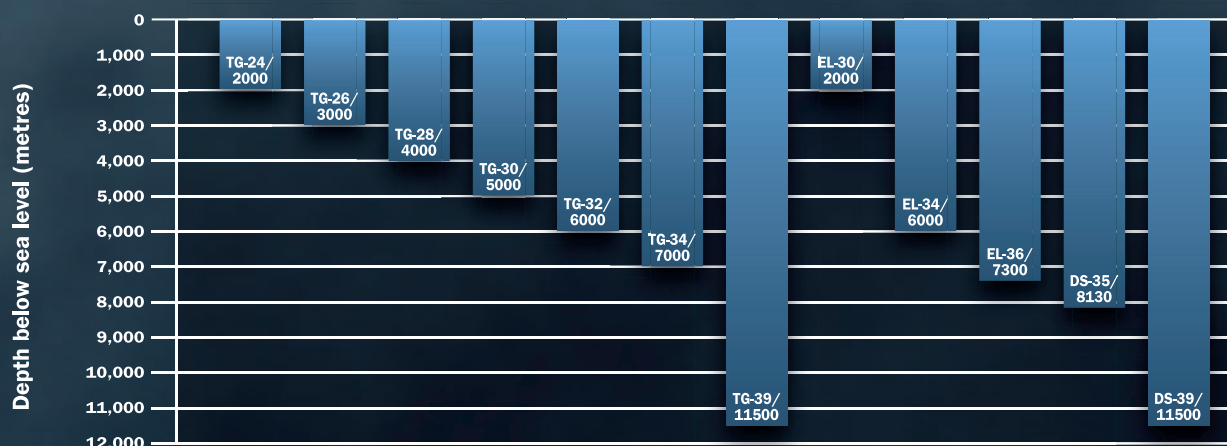
Applications include hydroplanes, rudders, trim adjustment modules for submarines and specialized applications such as acoustic windows due to the material profile and ability to significantly improve sonar functions.

EL Grade epoxy syntactic foams are the material of choice for manufacturing manned and unmanned submersibles because of their density range and ability to withstand exposure to diesel fuels and hydraulic fluids.

DS Grade syntactic foams combine lightweight glass Eccospheres® with multifunctional epoxy resin to produce ultra-high strength-to-weight materials for high-performance, deep sea applications including manned and unmanned submersibles.

Eccofloat® Syntactic Foam

ROV/AUV/HOV and Oceanic Applications



ECCOFLOAT® PRODUCT	SERVICE DEPTH		DENSITY		SERVICE PRESSURE
	FSW	MSW	lbs/ft³	kg/m³	psi
TG-24/2000	6,560	2,000	24	385	3,000
TG-26/3000	9,843	3,000	26	416	4,444
TG-28/4000	13,124	4,000	28	448	5,287
TG-30/5000	16,430	5,000	30	481	7,307
TG-32/6000	19,716	6,000	32	513	8,768
TG-34/7000	22,900	7,000	34	544	10,164
TG-39/11500	38,000	11,500	39	639	16,872
EL-30/2000	6,750	2,000	30	480	3,000
EL-34/6000	20,000	6,000	34	544	9,000
EL-36/7300	24,000	7,300	36	576	11,000
DS-35/8130	26,700	8,130	35	560	11,888
DS-39/11500	38,000	11,500	39	624	16,872

Eccofloat® Product Sizes

Eccofloat® TG and EL Grades are available in the following dimensions:

6 x 12 x 12 in (152.4 x 304.8 x 304.8 mm)

6 x 12 x 24 in (152.4 x 304.8 x 609.6 mm)

6 x 19.5 x 29.5 in (150 x 500 x 750 mm)

Eccofloat® DS Grade is available in the following dimensions:

4 x 12 x 18 in (101.6 x 304.8 x 457.2 mm)

Certifications

Trelleborg Applied Technologies is ISO 9001 certified.

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Vikodeck™

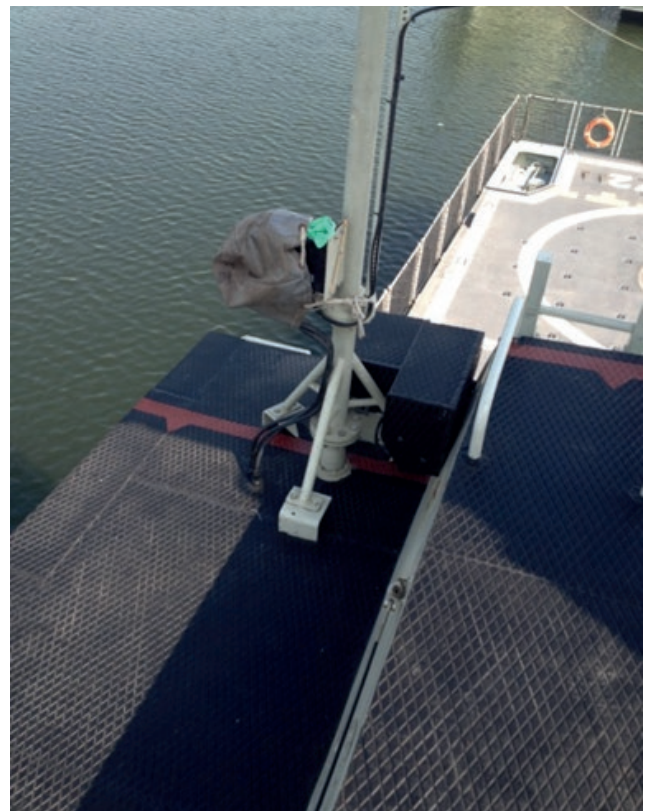
Ensuring onboard safety

Safety on offshore oil and gas installations is of paramount importance, and having effective and reliable surface protection is vital to ensuring onboard safety. In the harsh offshore and onshore oil and gas industry, operators need the assurance that their surface protection delivers proven performance for their installations, without fail.

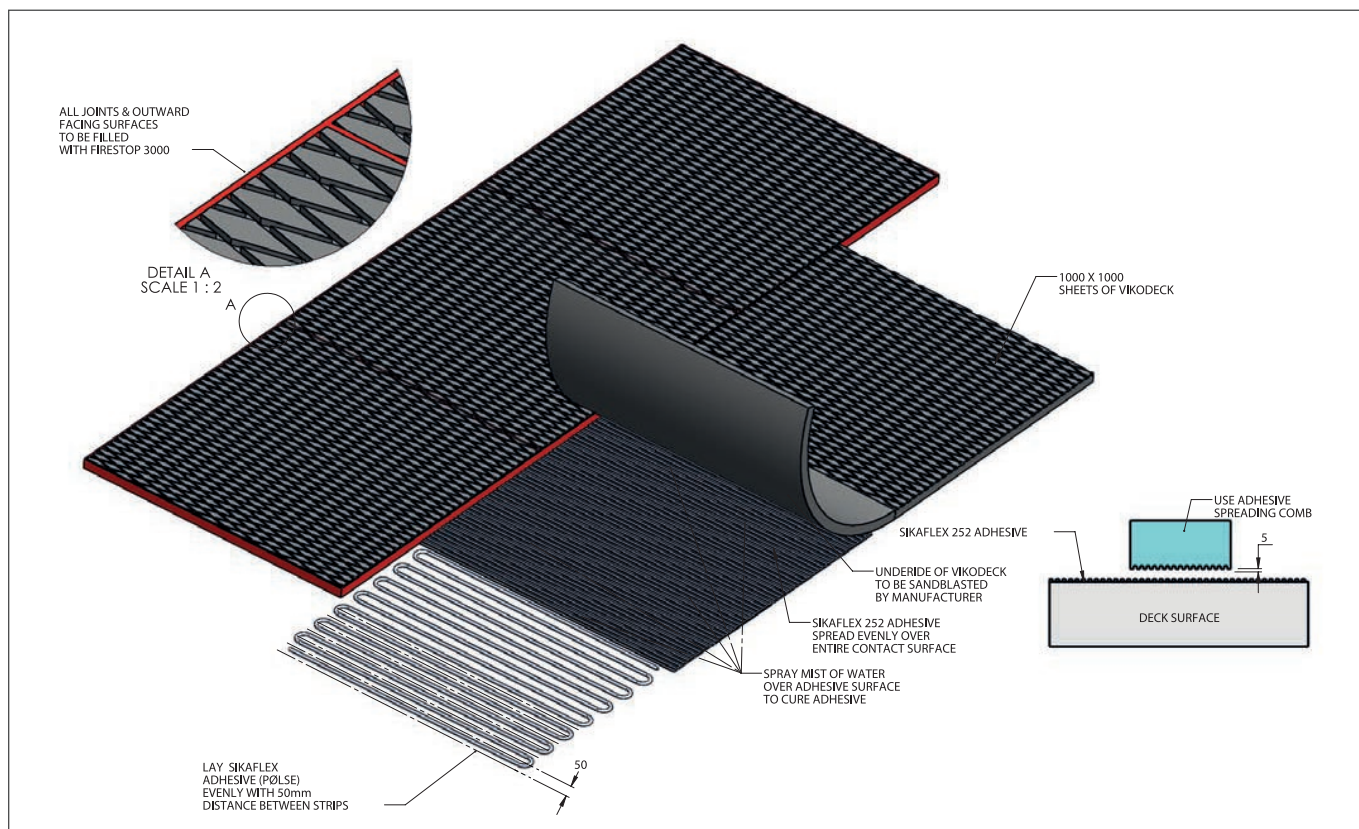
Vikodeck™ is designed to offer surface protection against blast, jet and pool fire in harsh offshore oil and gas environments. It can be tailored to withstand various chemical and mechanical conditions to provide you with performance at every level. In addition it is an excellent corrosion protection and provides anti-fatigue dampening support for the comfort and safety of your employees.

Benefits:

- Abrasion resistant
- Blast resistant
- Can be painted
- Flexible
- Maintenance free
- No hot work required
- Quick and easy to install
- Resistant to Ozone and UV light
- Seawater resistant
- Sound dampening



Vikodeck™ has been tested and can withstand cryogenic spills of cold liquids such as LNG and will regain its flexible properties following cryogenic exposure. It is normally delivered in one square meter sheets, but can be drilled, cut or shaped to fit the area of installation to suite any surface to provide you with performance at every level.



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