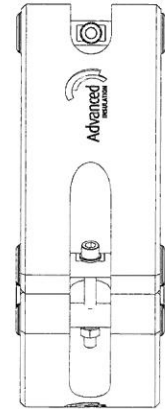
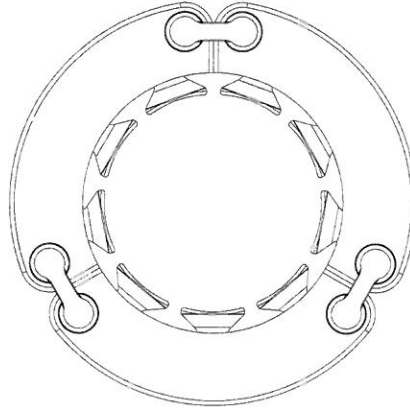
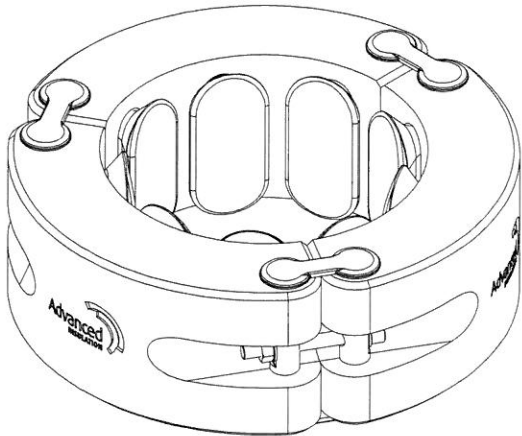


# Distributed Buoyancy Module

Reducing tension load on subsea risers and umbilicals

Advanced Insulation manufacture buoyancy and ballast modules complete with appropriate clamping systems engineered specifically to suit each riser scenario. These are known throughout the industry as Distributed Buoyancy Modules (DBMs)



- The Marine riser acts as an interface, connecting the static structures on the seabed with the dynamic floating structures on the surface. The riser itself can either be top tensioned, compliant or in some cases a hybrid of the two.
- In compliant riser systems, which utilise rigid or flexible lines, buoyancy and ballast modules are employed to create an optimised configuration (e.g. Lazy wave, Steep wave) to relieve damaging tensions loads, enabling a long design life despite the arduous offshore conditions.

## Clamping Technology (patent pending)

Each module must be located using an internal clamp at specific points along the riser length with no risk of slippage throughout its operational lifetime. On Steel Catenary Risers (SCRs) it is often possible to utilise large clamping loads without any detrimental effect to the riser itself, employing steel or other more exotic alloys. However this is not possible with insulated or multi-layered risers possessing a softer clamping surface. In such cases traditional clamps can be too stiff to cope with geometric contractions and the riser may be damaged by such attachment – AIS Compliant clamp technology mitigates this problem with an innovative interface.

## Construction

There are two main elements to a DBM as follows:

### 1. The internal clamp assembly

Designed to suit the specified loads and operating conditions and typically configured as 3-piece segments which are assembled and held together with a DBM Clamp Fastener assembly arrangement. There are three fastener assemblies on each complete clamp assembly, one between each clamp shell segment. Three rubber inserts are inserted into each clamp shell segment which brings a total of nine clamp rubber inserts in each assembly. The clamps are fitted with a fastener cover clip which prevents the constant flow of water over the fasteners assembly, therefore reducing the existence of marine growth around the fasteners. This will increase the life of the fastener. The DBM clamp makes it possible for the DBMs to be fitted at any point along the length of the flexible riser/umbilical.

### 2. The external buoyancy/ballast element

The buoyancy module is supplied as a two piece cylindrical product which fits around the internal clamp and is secured in place by means of Kevlar straps. Each piece comprises a Rotary Moulded Polyethylene shell filled with syntactic foam. Various densities of foam are utilised in order to achieve a specific buoyant upthrust, able to survive the hydrostatic forces at the specified operational water depth. Higher material densities are employed to service ballast applications.

## Features

### Internal clamp

- Rubber inserts form a friction grip against the flexible riser and increase surface contact between the rubber insert and flexible riser/umbilical.
- Vertical bar retainer rubbers ensure the vertical bars are retained in the body of the clamp which prevent the vertical bars from dropping off before the holding bolts are engaged. They also prevent shell segments from twisting around when the clamp is being installed around the flexible riser and take away peak shock between multiple clamp when assembled in tandem application.
- Single and double clamp fastener arrangement methods available.

### External buoyancy element

- The buoyancy unit core is designed to withstand the hydrostatic loads applicable at the specified water depth rating.
- Durable, long lasting polyethylene shell.
- Low maintenance design.
- Easy installation and release.
- Customised specifications to suit customer's unique application.

## Applications

The AI DBM Clamp can be used as follows, depending on individual customer requirements:

- Single clamping application: The clamp could be used as a single clamp assembly on a flexible riser/umbilical.
- Double Clamp Tandem application with extended vertical bars between the two clamps: The vertical bar retainer rubbers between the clamp segments are removed in order to enable the clamp segment faces to rest against each other. This application method is required in a situation where the clamping force to overcome is greater than that which a single clamp would withstand.
- Triple Clamping Application: Three complete assemblies of the DBM clamp could be fitted to the flexible riser/umbilical. The clamps are fitted with their individual vertical bars and are offset by 60 degrees to each other which enables the vertical bar retainer rubber to rest against the side of the clamp shell segment.

## Installation

For ease of installation, Advanced Insulation supply DBMs to site with all components of the clamp, rubber insert, vertical bars, holding bolts, nuts and washer, vertical bar retainer rubbers assembled, leaving the clamp in a hinge position with only one holding bolt remaining to completely fit the clamp unto the flexible riser. Once the clamp is fitted onto the required location around the flexible riser, the holding bolts can be firmly bolted in position to completely secure the clamp.