MGDUFF

Shaft Bonding

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When steel is immersed in sea water (e.g. a ships hull) small galvanic currents are initiated at anodic areas of the metal surface, causing corrosion.

Such corrosion predominates at the stern of a ship, where the combined effects of increased turbulence and differential metals results in accelerated corrosion rates.

The application of Cathodic Protection effectively suppresses these corrosion cells by applying an opposing current from external anodes and if the propeller is to receive the benefits of cathodic protection then there must be a continuous electrical circuit between the propeller and the ships structure.

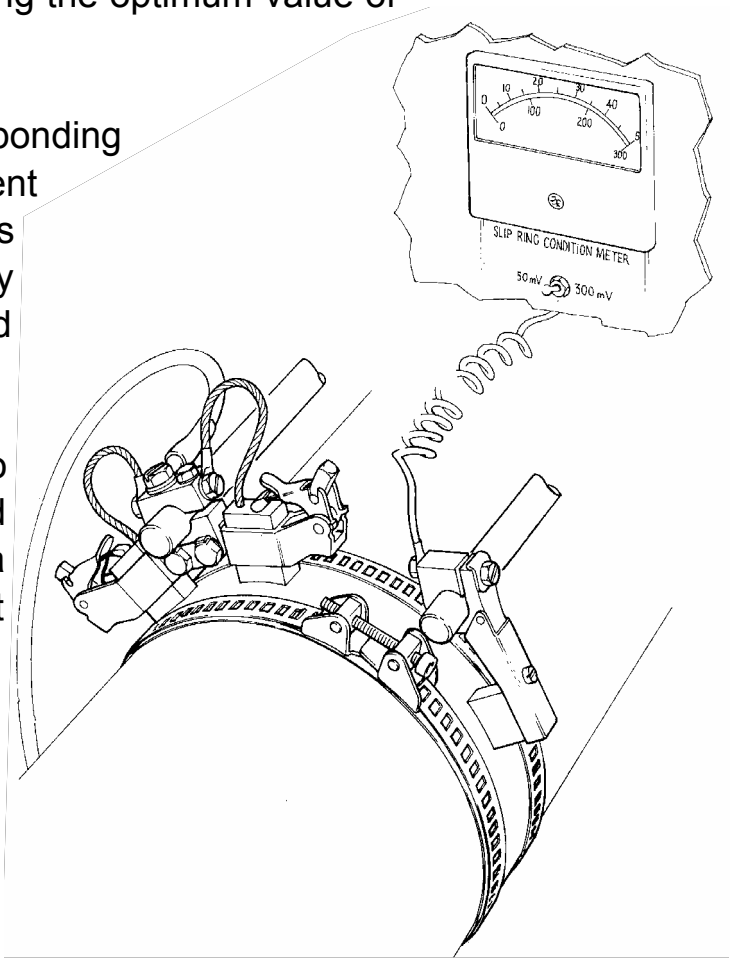
This circuit usually exists when the propeller is at rest, where a metal to metal contact is made between the shaft and the stern tube liners, or main engine bearings and journals.

However, whilst the shaft is turning the bearing lubrication creates an intermittent high resistance which effectively insulates the propeller from the hull structure and since the propeller presents a relatively large surface area of bare metal, it attracts cathodic protection currents, which tend to discharge by arcing across the lubrication film and in so doing, results in spark erosion which eventually leads to pitting and ‘striping’ of white metal bearing surfaces.

It is generally accepted, that the effects of arcing are minimised when the potential across the shaft/hull interface is less than 50 mV.

Therefore, to overcome this undesirable condition of arcing, whilst at the same time ensuring that cathodic protection is extended to the propeller, it is general practice to install Shaft Bonding equipment as an integral component of a ships Cathodic Protection system and is applicable in conjunction with both sacrificial anode schemes as well as the Impressed Current technique. Furthermore, where such bonding is installed it is recommended that the capacity of the cathodic protection system should include an allowance for the propeller.
Various combinations of slipring and carbon brush materials are available but experience has determined that only high silver composition brushes running on a silver track, can provide the effective and sustained low conductivity necessary to ensure that the shaft bonding and its connections maintains a contact resistance no greater than 0.001 Ohms.

However, it is accepted that in practice, such a low value is outside the range of most commercial multimeters and is therefore difficult to determine. It is for this reason that many ship operators prefer a permanent visual indication in the form of a shaft condition monitor, which provides a constant display of shaft potential and confirmation that the bonding equipment is successfully maintaining this at a level not exceeding the optimum value of 50 mV.



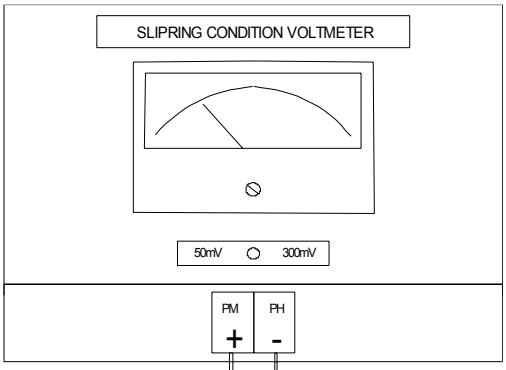
The M G DUFF system of shaft bonding comprises a split slipring arrangement and ancillary brush gear, which is designed to facilitate ease of assembly by proficient technical personnel and without the need for specialist tools.

The slipring is supplied as two identical halves rolled to the specified shaft diameter. However, to allow a tolerance for variations in shaft diameter the slipring is manufactured slightly oversize and should be dressed to fit on site. This involves removing small amounts of metal at the slipring mating joints until an exact fit is achieved and the slipring conforms to the shaft diameter without unevenness. Failure to remove excess slipring material before securing with the band tensioning, or to finish with badly fitted joints will result in distortion or an uneven track surface with consequent rapid brush wear.

Under normal circumstances, a correctly fitted slipring and associated brushgear can be expected to perform for many years and with a minimum maintenance requirement. Under these conditions and subject to the vessels trading/operational pattern, the anticipated brush life is one year, although smaller diameter shafts turning at higher brush contact speeds will inevitably result in increased brush wear rates.

To ensure effective bonding, the slipring should be installed on the intermediate shaft, astern of any insulating couplings or flanges and preferably clear of water spray or oil and grease contamination from stern gland lubrication.

SHAFT BONDING CONDITION MONITORING

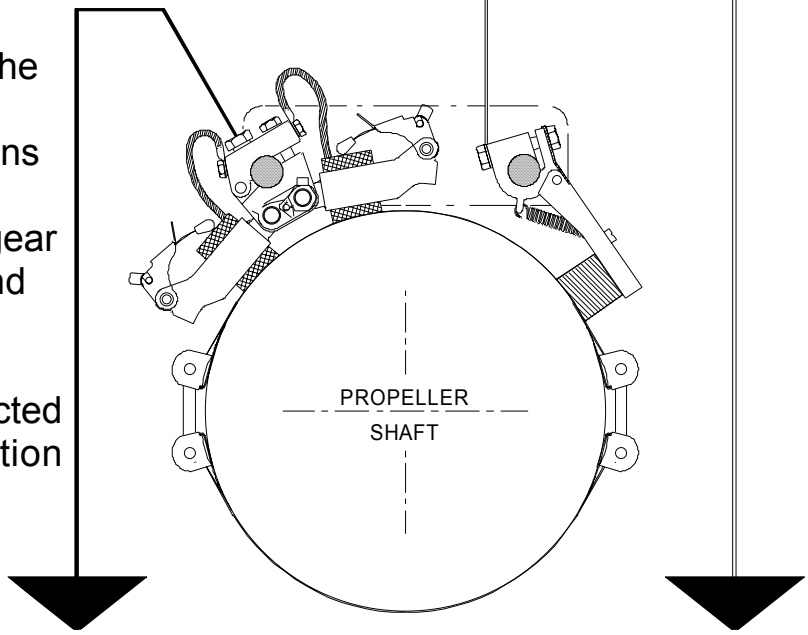


The condition monitoring system provides a permanent and readily available indication on the condition and therefore, effectiveness of the shaft bonding system.

To ensure a continuous cathode bond and freedom from shaft bearing damage the Condition Monitor should display shaft potential not exceeding 50 mV. Readings in excess of this value are indicative of worn bonding brushes or poorly maintained brushgear and/or sliprings.

Measurement of the shaft potentials is achieved by the installation of a single Monitoring Brush which runs on the main shaft bonding slipring, but has its brushgear mounted on a separate and INSULATED spindle.

This brushgear is connected direct to the Condition Monitor Unit.



EQUIPMENT SUPPLIED

	SHAFT BONDING		SHAFT MONITORING (Optional)
1	SLIPRING - Copper/Silver Track TENSION BANDS & CLAMPS - S.S.	4	SINGLE BRUSH HOLDER BRUSH - 1 X 80% AG. INSULATED SPINDLE
2	DOUBLE BRUSH HOLDER BRUSHES - 2 X 80% AG. MOUNTING SPINDLE - S.S.	5	CONDITION METER
3	BONDING CABLE - 2M X 35mm^2	6	FULLY DESCRIPTIVE HANDBOOK

When ordering please specify: **Shaft Diameter**
Number of Shafts