

**Wilson Walton
International**



IMPRESSED CURRENT CATHODIC PROTECTION ICCP

Cathodic Protection Specialist

Manufacturing complying with International Standards

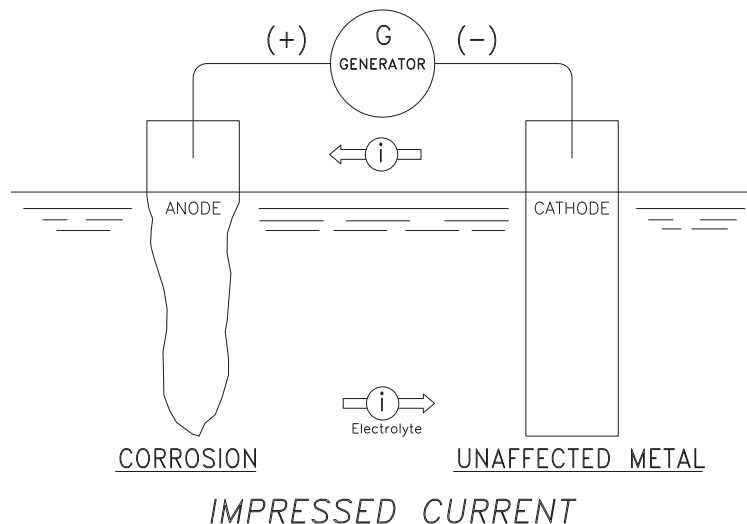
Introduction

WWS AQUAMATIC® is Wilson Walton International Spain system of Cathodic Protection using the impressed current method (ICCP). Developed over many years of practical experience at sea, the latest version of the **WWS AQUAMATIC® v5 System** employs some of the best electrical equipment and hull units available, designed to withstand the rigorous of shipboard use with minimal maintenance.

Corrosion

Microprocessors and the availability at low cost of mass memory capability have provided Wilson Walton International Spain means of monitoring and controlling the performance of the **WWS AQUAMATIC® v5 System**.

Anodic and Cathodic areas exist in ships' hulls due to several factors: metal of differing potentials (electro-chemical characteristics) may be joined together, there may be deterioration or non-uniformity of paintworks, there may be spontaneous formation of inseparable anodes and cathodes on an otherwise uniform metal surface. Corrosion currents can also be produced by inconsistencies in the composition of the surrounding seawater. Elimination of anodic areas on metallic components is essential. Corrosion causes roughness on the hull surface and deterioration of components such as propellers leading to inefficient performance.



The **WWS AQUAMATIC® v5 System** employs automatic control of the output current by means of a reference electrode enabling the current level, and thus the level of protection, to be maintained at the optimum. (It should be noted that an excess of protective current can lead to damage to protective coatings and this is avoided when the **WWS AQUAMATIC® v5 System** employed).

The WWS AQUAMATIC® v5 System

The **WWS AQUAMATIC® v5 System** comprises several anodes, reference electrodes and controller power unit. A drawing of a typical installation which applies to both small and large vessels is shown below, Fig.2. The types and sizes of these components and their positions on the hull are specified according to design parameters which allow for the size of the vessel and fluctuations in the protections current to be likely to be encountered during sea-going service.

Whilst foregoing protects the hull structure, it is also important to protect the propeller, exposed shafting and the rudder. The propeller and shafting are grounded to the hull structure with a shaft slip ring making them electrically common with the hull and the rudder is also grounded with a flexible cable; with electrical continuity established these components are protected by the **WWS AQUAMATIC® v5 System**.

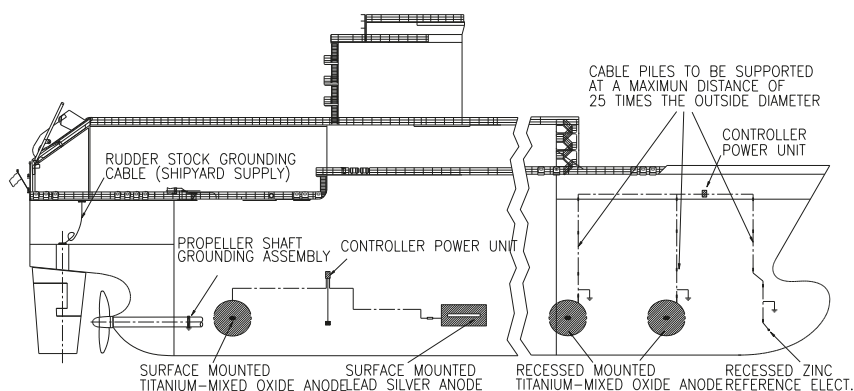


Fig.2. Typical locations of WWS AQUAMATIC® v5 system.

Anodes

The anodes used in a **WWS AQUAMATIC® v5 System** can be Lead/Silver alloys, Ti-MMO or Ti-Platinised and all are relatively inert.

The Lead/Silver anodes are encapsulated in resin supports reinforced with fiberglass and are recommended for vessels carrying out normal maritime operations, since they provide an ideal distribution of the current.

We have different current and length capacities.

The anodes are attached to the hull through a support plate which is welded to the hull. Around the anodes is placed a dielectric protection shield composed of a bi-component putty.

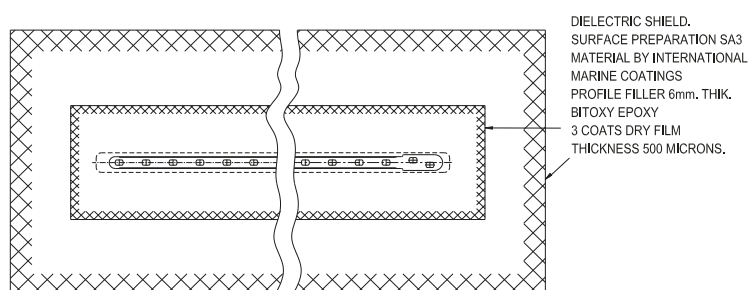


Fig.3. Surface mounted anode. Linear Lead/Silver.

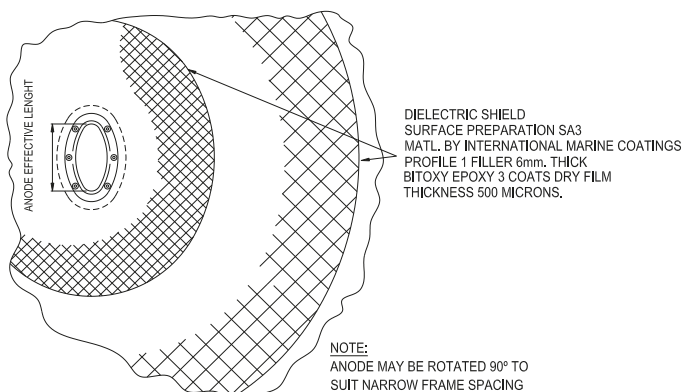


Fig.4. Recessed anodes. Ti-MMO or Platinum anode. Elliptical or Circular.

Platinized anodes comprise a coating of platinum on a carrier metal plate such as titanium or niobium encapsulated in and mounted on a reinforced resin holder. They may be surface mounted or recessed when protection is required.

An areas surrounding platinized anodes is protected by a dielectric shield of an epoxy mastic material applied to a shot blasted area of the hull.

All types of anode are provided with a cofferdam incorporating a double gland assembly approved by the Classification Societies to ensure the water tightness.

Reference Electrode

Finally, the reference electrodes are installed, which are responsible for measuring the potential of the hull, sending this measurement to the CPU to automatically control the current output to the anodes.

There are two ways to install said reference electrodes, one is on the surface and another is recessed. Both types incorporate a block of zinc of high purity that, due to its robust construction and stable electrochemical characteristics, are ideal for purposes of potential measurements.



Surface reference electrode.



Recessed reference electrode.

The surface reference electrodes are contained in a glass-reinforced resin support that is screwed to a double plate welded to the hull.

The built-in electrodes are mounted similarly in a hole and are flush with the hull.

As with the anodes, each reference electrode has a cofferdam disposition approved by the Classification Societies, to ensure the water tightness.

Controller Power Unit

Our CPU are powered directly at 220Vac – 3pH - 50/60Hz so they do not need to have power transformer, achieving a very considerable savings in weight and volume. CPUs are designed with the best existing electronic components and complying with international regulations.

The CPUs are designed preserving a principle of maximum robustness and maintaining appropriate dimensions and weights for each application, which means that they can be installed directly on bulkheads, saving a lot of space in the place of their location and facilitating their maintenance.

WWI Spain has made a major advance in ICCP technology with the development of CPU **WWS AQUAMATIC® v5 System**, the intelligent system for naval vessels. Warships require specialized ICCP systems which prevent hull corrosion, but do not interfere with the electrical war-fighting capability of the ship.

With the power modules the network voltage is rectified and a continuous voltage of 300Vdc is obtained at the input of the module. Through an internal high frequency transformer the input voltage of 300Vdc is converted to an output voltage of 12Vdc or 24Vdc as required.

The CPU *AQUAMATIC® v5 System* is specifically designed to meet the stringent requirements of EMC/EFI, shock, vibration, low maintenance and flexibility of operation in the military environment.

WWI can manufacture CPUs from 25A to 500A, depending on the application required. Other powers, consult.

Input power 220Vac/50-60Hz and Current output is 50 or 200 Amps at 12/24 Vdc with a Ripple Content of less than 0.1% into 6 nominal OR333 loads.

Can be configured as two at four Zone System with every anode assembly having its own controller and each controller capable of using up to four reference electrodes.

The use of different electrodes provides optimum control and flexibility. It also ensures maximum corrosion protection throughout the complete range of operational characteristics of the warship.



Silentblocks installed on ICCP 200A/12V.

220VAC/3Ph/50-60Hz

Output Power (DC)	Power (W)	Anodes (qty. x A)	Anodes (qty. x A) Cabinet Size (WxHxD)	Installation	Weight (≈ Kg)
50A/12V	600	2x25	400x400x210	Bulkead or Pedestal	16
100A/12V	1200	2x50 or 4x25	600x600x210	Bulkead or Pedestal	28
200A/12V	2400	2x100 or 4x50	600x800x210	Bulkead or Pedestal	50
300A/12V	3600	2x150	1000x800x260	Bulkead or Pedestal	80

Output Power (DC)	Power (W)	Anodes (qty. x A)	Anodes (qty. x A) Cabinet Size (WxHxD)	Installation	Weight (≈ Kg)
50A/24V	1200	2x25	600x600x210	Bulkead or Pedestal	26
100A/24V	2400	2x50 or 4x25	600x800x210	Bulkead or Pedestal	36
200A/24V	4800	2x100 or 4x50	600x800x210	Bulkead or Pedestal	50
300A/24V	7200	2x150	1000x800x260	Bulkead or Pedestal	80



Input 220Vac3Ph & Output 100A/12V and 2 anodes.



Input 220Vac3Ph & Output 200A/12V and 2 anodes.

Shaft Earthing System

The current generated by the current dispersing anodes returns to the hull through the noblest metal that in this case is the ship's propeller, therefore it is necessary that this current flows with the least possible resistance and for them a system of laying to mass on the tail shaft.

This system consists of friction brushes that are highly conductive of the current mounted on support brush holders. These brushes make direct contact on a slip ring that is mounted on the tail shaft itself. With this system the bearings of the tail shaft are also protected.

The brushes are usually silver/graphite due to high conductivity and the slip rings are copper with a central silver band.

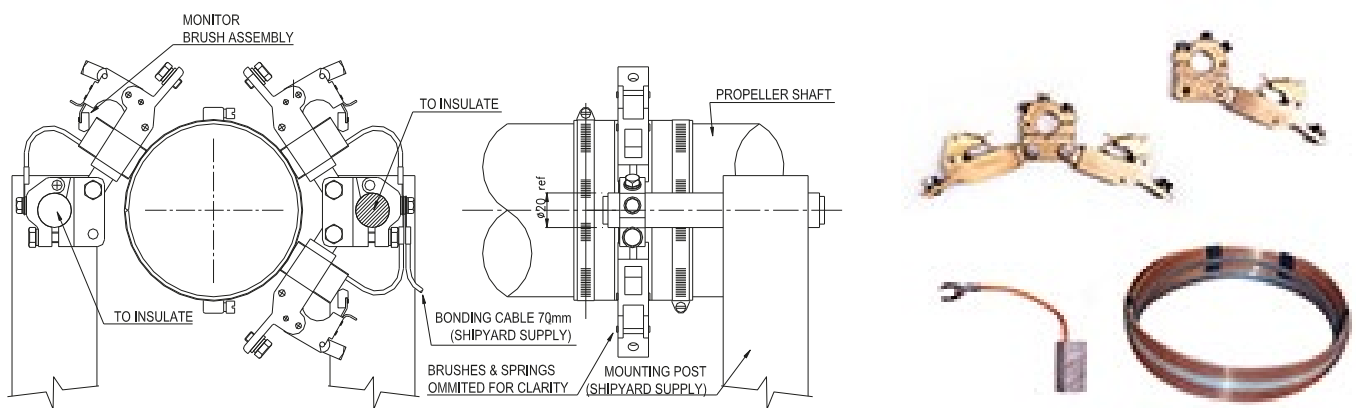


Fig.5. Shaft Earthing System. Brush, Brush Holder, Slip ring.

The bearings of the rudder stock do not give adequate electrical continuity between the rudder stock and the hull, therefore, to provide a union that guarantees the cathodic protection of the rudder stock, it is secured by a flexible cable of appropriate section between the rudder stock and the deck head.

In addition, flexible cables of appropriate section must be installed between other types of hull appendages such as fins, etc. for the good return of the current to the hull.

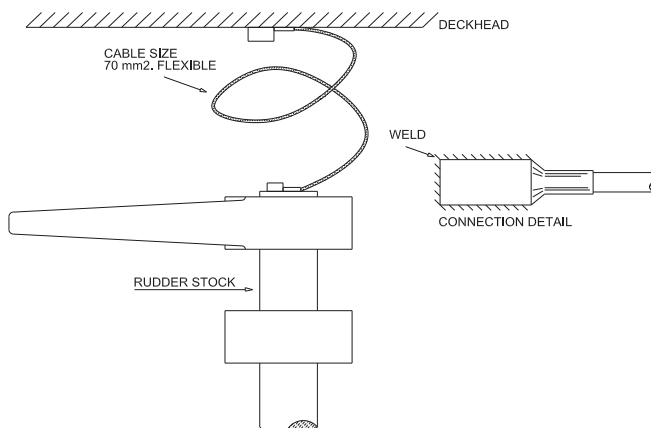


Fig.6. Rudder stock bond.

Installations, Commissioning and Service

In Fig. 2 a drawing of the typical installations of the **WWS AQUAMATIC® v5 System** is shown. That for "aft" systems is applicable for both small and large vessels, while the "forward" system applies only to large vessels where the length of the vessel must be protected requires the use of a complementary system near the section forward.

This is where it is necessary to lower the anodes to protect them from mechanical damage and to reduce the vessel's hydrodynamic resistance.

On ships equipped with bow thrusters, an additional **WWS AQUAMATIC® v5 System** can be installed to protect the bow tunnel from the carcass and the components.

The **WWS AQUAMATIC® v5 System** is supplied complete, except interconnecting cables, cable tray, etc., which are normally shipyard supplies. With each system there is a complete set of drawings. Manuals and specifications are included to facilitate installations and maintenance. The installation is normally carried out by the shipyard under the supervision of an engineer from WWI Spain. When necessary, WWI Spain will obtain the approval of the Classification Society for the installation before the start of the work.

Hull component installations can take place during a few days during ship construction or during a period of routine dry dock. Electrical and auxiliary equipment can be installed simultaneously or when the ship is once again afloat.

Once in service, the operation of a **WWS AQUAMATIC® v5 System** is completely automatic and does not require any adjustment. However, to confirm that the system is working correctly, record sheets are provided in which the daily recordings of the operational readings of the control unit are made. The record sheets provide a continuous record of the level of protection and data from which any malfunction of the system and the condition of the underwater coating can be evaluated. In addition, our CPUs can be equipped with an automatic read-taking system and can be sent remotely.

Completed log sheets returned to WWI Spain offices are used to evaluate system performance. Possible malfunctions requiring the attention of a service engineer are identified at an early stage.



Cathodic Protection for small, medium and specialized vessels

Although the reliability of the *WWS AQUAMATIC® v5 System* is well proven, WWI Spain recommends that installations are serviced on a routine basis during dry-docking by their trained personnel.

Stocks of *WWS AQUAMATIC® v5 System* components are maintained in all WWI Spain offices to ensure delivery at short notice trained when required

WWI Spain has technicians that can perform technical assistance anywhere in the world.

WWS AQUAMATIC® v5 System are of particular value in small, specialized craft such small, medium and specialized as tugs, fishing boats, supply boats, ice breakers, FPSO, others. On these vessels the cathodic protection requirements can be more demanding and require specialized system. In icebreakers, for example, exposed sacrificial anodes on the surface of the hull would be extremely vulnerable to damage or loss, particularly in the bow section. Also the coating on an icebreaker is quickly damage to expose large areas of bare metal requiring high current densities for adequate protection which only an ICCP system can supply.

Of particular concern is the amount of exposed non-ferrous metal relative to the hull of the vessel where specialized propellers, positioning equipment and operating devices are installed below water level. If sacrificial anodes are installed it is difficult to predict the current requirements of non-ferrous materials, so that sacrificial anode system are frequently either over or under designed.

The advantage of the *WWS AQUAMATIC® v5 System* is that it is completely controllable so that, irrespective of the operating circumstances of the smaller specialized vessel, ship owners can have confidence that the system is providing the correct level of protection at all times.

The *WWS AQUAMATIC® v5 System* has been designed for smaller craft and can be supplied with anodes and power units to match capacities of 10 to 50A.

To keep the size of the anodes as small and compact as possible, platinized anodes to the same specification as the larger system are used having capacities of 10 to 15A each. The systems are controlled in a similar manner with zinc reference cells and power units manufactured to meet the same criteria so that complete cathodic protection systems can be fitted.

Also, as with larger vessels, it is important to bond the propeller shaft to the hull to ensure protection for the propeller, the shaft and bearings.

Principal Customers

Shipyards, National and International Ship-Owners, Spanish, Norway, Australia Venezuela, Turkish Navy, Offshore and Oil & Gas companies, Port facilities suppliers, etc...

Area reserved for your Local Wilson Walton International Agent/Office is:

WILSON WALTON INTERNATIONAL, S.A. and its collaborators incorporate companies established in the main shipping centers of the world. This structure facilitates the range of international products and the availability of local experience and system design. The company WILSON WALTON INTERNATIONAL, S.A. It is service oriented and oriented mainly to the Maritime, Military, Offshore, Onshore and Port Facilities with the support of a consolidated. Engineering and Consulting department.

SYSTEMS & PRODUCTS (Marine, Military, Port Facility, Onshore & Offshore Applications)

Sacrificial Anode Systems. **WWI ALONINE®** & **WWI ZINCOLINE®**.

Impressed Current Cathodic Protection Systems, **WWS AQUAMATIC® System**.

Marine Growth Prevention System, **WWS PRAICOMATIC® System**.

WWS ALUMINASA®, WWS ALOLINE®, WWS FERROLINE® & WWS CUPROLINE®.

This publication is one of a series of Technical Product Information brochures on aspects of cathodic protection for Offshore, Onshore, Marine and Port Facilities applications. Further information about the series is available on request through sales@wilsonwaltoninternational.com

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