

# Short Guide for the Use of Marine Moisture Meters on GRP

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## Introduction:

This document provides a short guide for the use of electronic moisture meters on conventional glass reinforced polyester (GRP) boat hulls. For a more detailed explanation please refer to the authors *Short Guide to Osmosis and its Treatment*, or *The Osmosis Manual*.

The information contained in this document applies only to the **Skipper** and **Skipper Plus** instruments manufactured by Tramex in Ireland, and the **Sovereign Marine Moisture Meter** manufactured by Sovereign Chemicals in England.

Like many parameters in the marine industry, the readings suggested in this guide are based upon practical experience in the field. While there is no direct correlation between moisture meter readings and laminate condition, industry experience shows that the incidence of 'Osmotic' failures is much reduced if the figures suggested in this guide are followed. Nevertheless, these figures are a 'rule of thumb' and some circumstances may indicate the need for higher or lower readings.

## Why Use a Moisture Meter?

The object of taking moisture meter readings is to determine whether moisture is being absorbed and retained by the GRP laminate. Persistently high moisture readings (i.e. over a period of several weeks) may indicate the presence of *hygroscopic solutes* such as *propylene glycol* within the laminate; and accordingly may indicate an 'Osmotic' condition. The application of epoxy or polyurethane coatings is **not** recommended where moisture readings are high because of the greater risk of failure by blistering.

Electronic moisture meters provide a quick, accurate and non-destructive check for retained moisture. Nevertheless, these meters are not foolproof, and they cannot discriminate between different types of water, so it will be seen that extraneous moisture **must** be eliminated if readings are to be valid.

## Preparation:

Salt, marine fouling and slime will retain moisture, so the hull must be thoroughly pressure washed with plenty of fresh water, and allowed to become completely dry before any readings are taken. Ensure that the yacht is safely propped before working underneath her. The yachts bilges must be completely dry and well ventilated, as moisture meters will read through the hull.

Avoid taking readings in damp, misty or humid conditions. Do not take readings at sub-zero temperatures as the conductivity of water drops rapidly as it freezes.

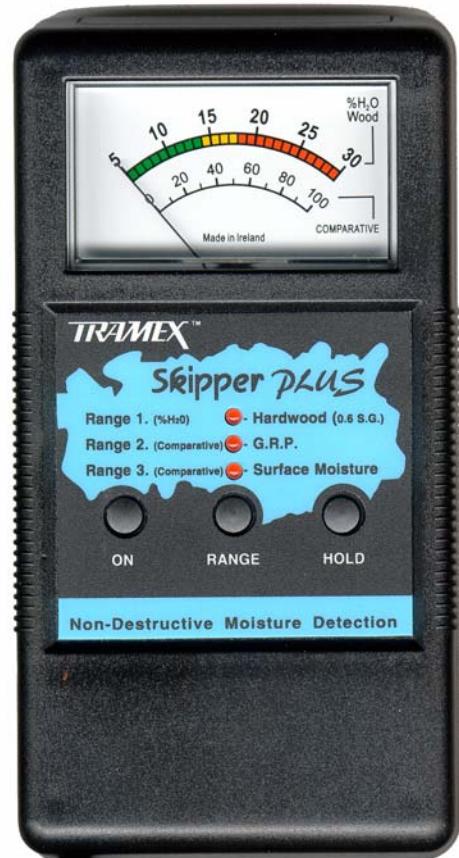
Most boats built since the early 1990's have *Isophthalic* gel-coats and/or lay-up resins. These often show low readings after just a few hours out of water; but this cannot be guaranteed. Older boats built with *Orthophthalic* resins can take several weeks to dry. Likewise, epoxy coatings such as International Gelshield and Blakes Gelprotect can retain moisture for several weeks after lifting, and may result in high moisture readings during this time.

Contrary to popular belief, antifouling paints **do not** usually need to be removed before taking moisture readings. The only exceptions are electrically conductive coatings such Copperbott, and boats with very heavy accumulations of antifouling. However, a surveyor will usually want to remove a few small 'coupons' of antifouling to examine the gel coat closely for signs of wicking, blistering or fibre swelling.

## Tramex Skipper and Skipper Plus meters.

The electrodes on the Tramex meters are spaced 22 millimetres apart. This gives the instrument a 'depth of field' of 12 millimetres or so, providing a useful indication of overall moisture content. However, internal condensation can also result in high readings!

The Skipper and Skipper Plus meters should be set to **Range 2** for GRP, regardless of whether the vessel is kept in salt or fresh water.



If an osmosis prevention or treatment is to be carried out, readings must be lower than 14% H<sub>2</sub>O (i.e. 'in the green') before any epoxy materials are applied. The same readings are required when applying polyurethane finishes to topsides and superstructures, or when carrying out laminate repairs.

For pre purchase surveys, (i.e. boats currently in service), readings up to 18% H<sub>2</sub>O (i.e. 'in the green or the yellow') are usually acceptable. Higher readings may indicate an increased risk of blistering, but these should be investigated to see whether they are caused by bilge water or internal fittings before reporting an osmotic condition. **If in doubt, fresh readings should be taken after a period ashore.**

#### Sovereign Marine Moisture Meter:

The Sovereign has two concentric electrodes, separated by an annular gap of 3 millimetres. This narrow gap restricts the Sovereign's depth of field to approximately 1.5 millimetres, although secondary coupling increases this somewhat.



The Sovereign should be set to '**Scale A**' regardless of whether the vessel is kept in salt or fresh water. If possible, switch the instrument on a few minutes before it is required to allow stabilization.

If an osmosis prevention or treatment is to be carried out, readings must be lower than 5% H<sub>2</sub>O on the **top** scale before any epoxy materials are applied. The same readings are required when applying polyurethane finishes to topsides and superstructures, or when carrying out laminate repairs.

For pre purchase surveys, (i.e. boats currently in service), readings up to 10% H<sub>2</sub>O on the top scale are usually acceptable. Higher readings indicate an increased risk of blistering, but these should be investigated to see whether they are caused by bilge water or internal fittings before reporting an osmotic condition. **If in doubt, additional readings should be taken after a period ashore.**

However, please note that the Sovereign is highly sensitive to surface moisture, and may be misled by condensation or moisture in coatings. Similarly, excessively thick gel coat layers may mislead the instrument to give inaccurately low readings.

#### General Notes:

Moisture meter readings should always be taken from the relevant '% H<sub>2</sub>O' scale, and not the 'Relative Scale'. The Relative Scale is for use with conversion tables supplied by the moisture meter manufacturer; therefore readings from this scale are meaningless and misleading without these tables.

By convention, electronic moisture meters are calibrated for timber (usually Douglas Fir), so readings are not directly applicable to GRP. The true moisture content of GRP is approximately 10% of the value shown on both Tramex and Sovereign instruments.

Ribs, stringers, and bulkheads will often show locally high moisture readings on either instrument, as water vapour is slow to disperse from these structures. Moisture meters cannot be used on metals, encapsulated metal keels or on carbon fibre as these materials are electrically conductive.

**As a general rule, if readings are unexpectedly high, fresh readings should be taken after a period ashore. Unusually low readings must be checked against a recently calibrated instrument.**

Finally, Osmosis is a very slow process, and high moisture readings do not always mean that blistering will occur within the next few months: indeed, many boats show high readings for ten years or more before the first blisters are seen.

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