BRITAIN'S BEST-SELLING BOATING MAGAZINE

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Practical Boat Owner®

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HULL & KEEL
ANTIFOUL & RUST REMOVAL
FROM
PBO PROJECT BOAT

SEACOCKS EXPLAINED
- Are yours up to the job?
- Maintenance
- Installation
- Metal vs composite

Which kit boat?
BUILD YOUR OWN BOAT ON A BUDGET

Bouncing back
The rise of boat shows, boat clubs and staycations

CRUISING
Welsh valleys
Winter in Sicily
Learning to sail on holiday

USED BOAT TEST
Viking Seamaster 27

INTO THE WILDERNESS
'Skye to Orkney with our dog'

18 PAGES OF DIY INSIDE

HOW TO...
- Reeve a halyard
- Make guardrail pads
- Polish old diesel
- Service dinghy valves
- Restore a kicker

'We chased a drifting yacht with our tender!'

Peter Draper applies Sikaflex sealant to the seacock

PBO PROJECT BOAT

ABOVE Ali Wood with Peter Draper and James Turner

PROJECT BOAT RESTORATION

Installing new seacocks

Ali Wood swaps the corroded and unsuitable metal seacocks for smart new composite ones on the Maxi 84 PBO Project Boat

Seacocks can be a daunting topic for a new boat owner. The small valves on the boat's hull which allow water to flow through are arguably among the most important fittings on the whole boat.

They're used for a range of purposes, such as letting water in to cool the engine or letting water in and out to flush the heads or drain a sink. If a pipe fails, the seacock is your first line of defence, able to close off the hole in the hull.

Depending on the situation, they may be left open or closed. For example, seacocks in an engine cooling system are almost always left open, but should the engine overheat it's likely the seacock will need to be closed if you have to remove and clean the strainer.

On the other hand, those connected to a sink drain might be opened in port but closed at sea.

Either way, if seacocks fail, you could end up with a hole in your boat, and we all know what that means. The water pressure from a 1in hole a couple of feet underwater is enough to sink your boat very quickly.

So when the survey of *Maximus*, our 43-year-old Maxi 84, flagged the seacocks to be in a poor condition, replacing them went straight to the top of our to-do list.

"These are going to have to go," said marine surveyor Ben Sutcliffe-Davies as he tried to free the seized handles. "They're clearly over five years old and

LEFT How the composite TruDesign skin fitting and seacock attach to the hull
BELOW RIGHT SeaSeal cone valve seacocks in 1½in and ¾in sizes

corroded. Plus, the clamps aren't actually on the end of the hosetail."

Before choosing seacocks, I found it useful to revisit the topic of through-hull fittings and which materials these come in.

Through-hull fittings

A through-hull fitting consists of the skin fitting, the valve (seacock) and the hosetail, which attaches to the hose and leads to whichever appliance it's connected to. Additionally, with the TruDesign seacock (pictured top), there may also be a load-bearing collar between the valve and the skin fitting.

Skin fitting This is the assembly that maintains the hole going through the hull (note: unlike seacocks, you can get skin fittings above and below the waterline).

Mostly, skin fittings take the form of metal or composite threaded pipes with flanges, and backing nuts or plates that are made watertight with a generous amount of sealant.

An inlet fitting might also have a strainer to keep out particles of seaweed.

It's important that any bolts or other fastenings are made of a material that won't corrode in seawater or be incompatible with the material of the fitting itself.

Seacock Seacocks (valves) are an essential part of the underwater skin fitting. Occasionally the terms 'skin fittings' and 'seacocks' are used interchangeably, but the seacock is specifically the valve that lets the water in or out.

Which skin fitting material?

Skin fitting materials vary depending on the type of hull they're installed in. They should have markings revealing the manufacturer's name, which helps you deduce what material they're made of.

Brass Brass fittings were used on many production boats up until the turn of the century, but are dangerous and should be replaced regardless of age as they corrode from the inside out, without any obvious sign of damage.

Although brass doesn't rust in the same way as steel, it loses its zinc content and can degrade and become brittle. Leakage of electric current from the boat, or even its neighbours, earths through the water and dissolves the metal parts in a process known as electrolytic corrosion.

The situation gets worse when a number of different metals are used in a fitting; for example, if a steel ball is used in a ball valve-type brass seacock.

In truth, it's not the seacock that usually fails, but the skin fittings, most often the hosetail.

Maximus's seacocks were zinc-plated brass, which is totally unsuitable for use under the waterline.

DZR Dezincification-resistant brass (DZR – sometimes marked as CR) is another common material used in skin fittings. According to the Recreational Craft Directive, these need to be replaced every five years, a lifespan that many people in the industry believe is far too short.

"Historically all seacocks were made of bronze, and they were fantastic," explains James Turner from marine distributor Meridian Zero. "However, bronze is really expensive these days and to save money boatbuilders started to use brass, which has a high zinc content. When zinc comes away you're left with copper, which is very, very soft."

DZR contains 32% zinc and was developed for the domestic plumbing market, but when the RCD came in and boatbuilders realised skin fittings need only last five years, they used it on boats too.

"Whoever thought of that directive was barking mad," said James. "Skin fittings should last 30 years, not five. What's more, if you put a boat in a marina with DZR fittings, where there's a lot of stray currents from other boats, you can end up with one that lasts three years and crumbles in your hands."

Other alloys In response to the problems with DZR seacocks, English brand SeaSeal have produced a seacock assembly with traceable, high-grade DZR brass alloy, which reduces the risk of corrosion, especially when the seacock has been forged – a far stronger method than casting, and less prone to invisible internal faults.

Blakes is another brand of metal seacocks recommended by our surveyor. They're made of a blend of non-corrosive metals and, according to the manufacturers, undergo intensive testing before they're dispatched.

'Brass doesn't rust but loses zinc content and can degrade and become brittle'

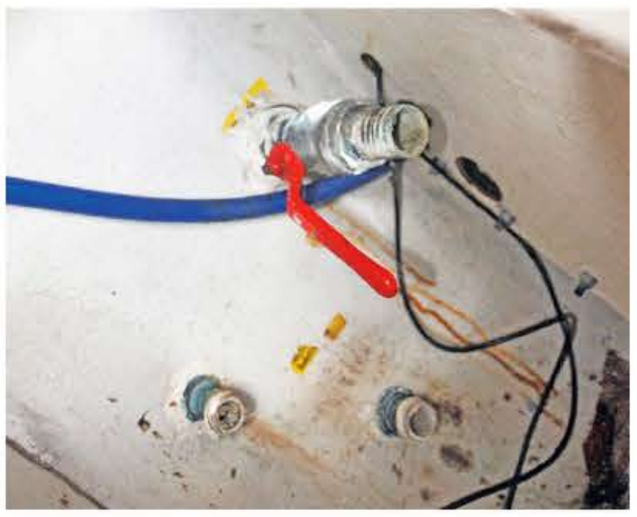
Bronze Bronze skin fittings are the most reliable – you'll get much more life out of them than DZR. However, ball valves are rarely made entirely of this material. They mostly have chrome-plated brass balls offering up to three different metals all in one place.

Composite Composite fittings – such as those made by TruDesign and Forespar Marelon – are considered fit for the life of the vessel. Materials range from carbon fibre to injection-moulded polymers. As there's no metal, there's no risk of electrolytic or galvanic corrosion and they don't need to be electrically bonded together.

Composite or metal?

There's nothing new about composite skin fittings, but take-up in the industry and among boatowners has been slow, partly due to cost and also to misinformation, says James Turner, who does technical PR and marketing work for Meridian Zero, a distributor of TruDesign seacocks.

Indeed, at the yard where we keep *Maximus*, the shipwrights had only ever installed metal skin fittings.



James Turner

ABOVE Peter Draper adds sealant to the TruDesign skin fitting. Note the application tool is inside it. On the hull you can see he's done one already. **TOP RIGHT** Cutting out the old fittings. **ABOVE RIGHT** The old seacocks on *Maximus* were cut away

Types of seacock

Gate valve

A gate valve has a tap-like handle and is designed for higher flow-rates. A gate valve moves a solid disc up and down to open/close the orifice. Typically these are cheaper and easier to install in smaller spaces, although these days most gate valves on boats have been replaced with ball valves. On *Maximus*, the original gate valve (which had seized) is under the galley sink.

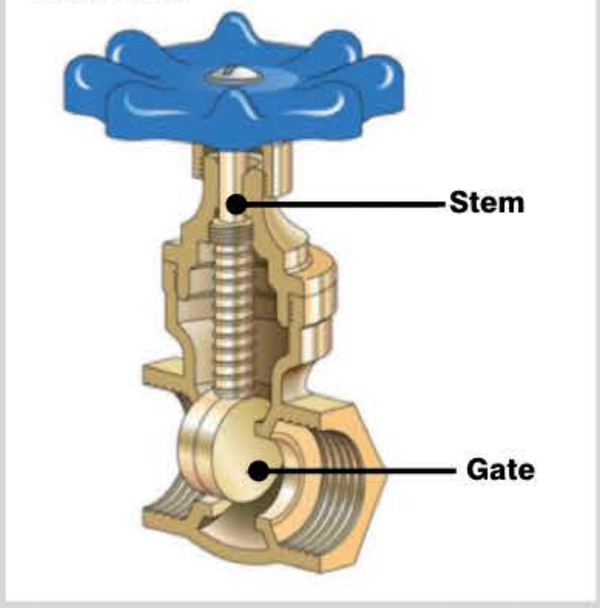
Ball valve

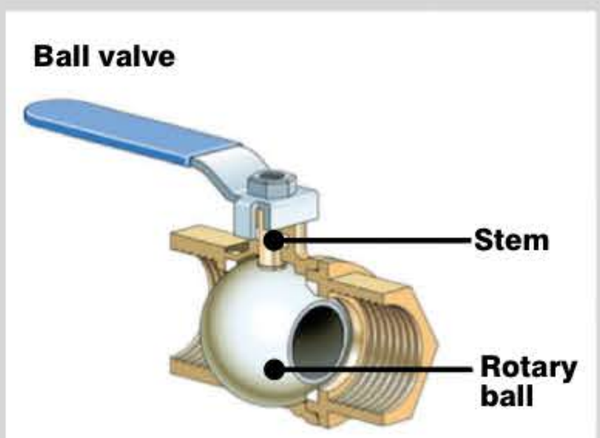
A ball valve has a lever handle and is designed for smaller flow-rates. On *Maximus* we have three ball valves controlling the heads discharge, intake and the sink. The ball valve works by rotating a ball (the orifice) with a bore in it, 90° to open/close the valve.

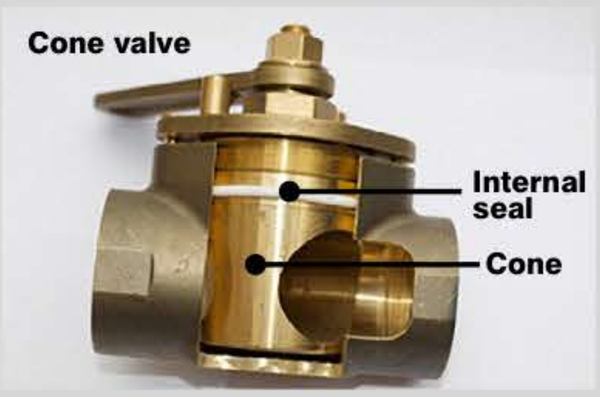
We also have a ball valve on the engine, a MD2020 Volvo Penta Saildrive, though it's in a very difficult place to access (only I'm small enough to squeeze over and turn it on. My husband is far too bulky!). We'll need to add an inspection hatch from the pilot berth to make this a bit easier to get to.

Cone valve

Cone valves like those from SeaSeal or Blakes can be stripped and regreased during routine maintenance to keep them working properly. A unique feature of SeaSeal in particular is that, if necessary, they can even be partially stripped and unseized without leakage while the boat is still in the water – saving the cost of a lift-out.







James replaced all the metal skin fittings on his Bruce Roberts 36 back in 1986. "One thing's for sure, boats have loads more electrical equipment on them these days," says James. "There's a lot more potential for electrolytic and galvanic action than in the past.

"The issue isn't having a metal underwater, it's having different metals under water where one is bolder than the other and the less bold one is eaten up by the bolder one. To counter this we fit zinc or aluminium anodes which are not very bold at all and consequently they get eaten away first."

According to marine surveyor Roger Pinder, who – together with John Lomer – developed SeaSeal seacocks, whether you go for metal or composite really comes down to personal choice. A lot of classic boats, in particular, prefer metal.

"The downside with composites is they're kind of bendy. Not everybody likes them, and you don't want them in your engine room," he advises.

An advantage of the SeaSeal seacock is that it can be easily stripped down for winter maintenance and be regreased.

"If you have a ball valve on the engine

A TruDesign composite ball valve assembly

RIGHT Up and down on the ladder!
BELOW Multi-tool was used to cut away the old skin fittings
BOTTOM Pink thread inside the old gate valve shows where the zinc has leached away
BELOW RIGHT Holes in the newly scraped hull where the skin fittings used to be

and it goes, you're stuck with whatever position it's in," says Roger.

"If it sticks shut – which tends to be the case – you have no propulsion. When you open a ball valve from open to shut, the ball turns and it exposes the bit behind the ball.

"When it starts to seize, the only way you can do anything with it is to work the handle, and if the action goes light and the handle breaks, that's when you're stuck and you have to take the boat out.

"When all's said and done, you can do without the heads but you can't do without the engine!"

Roger agrees that the Recreational Craft Directive regarding skin fittings is poor.

"We expect our seacocks to last decades and certainly would not want them replaced after five years," he says.

Maximus's seacocks

Maximus had four seacock fittings that need changing – three ball valves in the forepeak (1 x 1½in and 2 x ¾in) and one gate valve under the galley sink. All three valves (the sink discharge, head intake and discharge), skin fittings and hosetails were in poor condition.

Surveyor Ben Stucliffe-Davies recommended replacing the whole assemblies.

Though not original to the 43-year-old boat, the problem was that the replacement zinc-plated brass seacocks had used the original skin fittings, which had bronze tapered tails, carrying the risk of thread incompatibility.

RIGHT **Components of a composite TruDesign skin fitting and seacock**

In the galley, the gate or 'sluice' valve looked to be bronze, which is much better, but it was completely seized. None of us could turn the handle and there was corrosion on the castings.

Gate valves aren't serviceable, and you can't tell whether they're open or closed just by looking. Even when the handle turns on an old one, there's a chance that the thread may have stripped and the handle is not actually closing the valve

Decision time

I was definitely tempted by SeaSeal's smart new seacocks – which are designed to last the life of the vessel. Indeed, the engine saildrive seacock is a little stiff, so this might be an option if I decide to replace it at a later date.

However, budget was a constraint, and TruDesign's composite seacocks are less than a third of the price of SeaSeal's forged DZR ones (£40 for ¾in compared to £158).

The composite seacocks looked really smart and felt very solid (though more bulky than metal ones) and durable, while easy to lever back and forth. I also liked the idea of not having to do any maintenance other than exercising them from time to time.

TruDesign seacocks come with an optional load-bearing collar, designed to go between the skin fitting and the valve, which is ideal for use in areas such as a locker, where it might get a thump from an unsecured object in a rough sea.

On *Maximus*, where the seacocks

Safety standards

The RYA urges boaters to only buy replacement seacocks and through-hull fittings that comply with international standards and in particular ISO 9093:2020.

This ISO specifies requirements for through-hull fittings, seacocks, hose connections, their fittings and their installation in small craft.

There are lots of cheaper seacocks in chandleries and available online which aren't built to this standard.

ISO 9093:2020 requires seacock and through-hull fitting components formed of a metallic material to show no degradation to the point that their operation is impaired.

ISO 9093:2020 now replaces ISO 9093: 1994, Part1 which required seacocks and through-hull fittings not to suffer any defect that impaired tightness, strength or function within a service time of five years.

BELOW The sink gate valve was inconveniently hidden under the bottom drawer in the galley

The seacocks with their load bearing collars

‘Skin fittings need to be installed a day before the seacocks to allow the sealant time to dry’

were tucked out of the way, this wasn’t absolutely necessary, as they weren’t exposed, but I opted for the collars anyway so we could demonstrate how they’re fitted.

Where possible, I was advised to go for straight hosetails, as it’s much easier to free a blockage from one of these than a 90° one. However, it also depends on the space available. A shipwright should be able to measure up for you if you’re not sure. We chose the list of fittings shown on the panel below, but actually got one of the skin-fittings wrong initially – a 1in hosetail was required instead of a 1½in, but TruDesign kindly sent that out next-day delivery.

Installation

I got in touch with Peter Draper of Navigators Marine in Chichester, a certified TruDesign installer. He kindly agreed to come down to *Maximus* to show how to fit the seacocks.

We were all set to go – James Turner from TruDesign was making an overnight trip from Devon – when, the day before, Peter asked me if I’d removed the outlet and inlet pipes from the heads and galley.

No, I hadn’t! I’d assumed he’d be doing that as part of the installation, but he told me that health and safety legislation meant removal of contaminated grey and black water discharge pipes was not something he could carry out.

“Old heads pipework is contaminated with human waste, often very old rotting stinking waste and anything else that has been flushed down the toilet for years.”

Removal and disposal should ideally be done by a specialist, certified company, but even for a small boat the size of *Maximus* that could cost up to £2,000, Peter told me.

So in reality most owners remove the old pipework themselves or see if their boatyard is prepared to do it, he said.

Unable to get to the boat myself – it being a three-hour-plus round trip between school-runs – I called Dell Quay boatyard and begged them (not for the first time) to step in last-minute, which they did. Thank you, Dell Quay!

Lesson No1 – always ask a contractor, ‘is there anything else you need me to do?’ before booking in a job. I hadn’t considered the complications of removing the hoses.

It’s a two-day job

Skin fitting and seacock installation is a two-day job as the skin fittings needed to be installed a day before the seacocks to allow the sealant time to dry. For the sealant TruDesign recommends using Sikaflex 291i or 3M 5200.

Peter started by cutting out the old fittings, using a multitool for the awkward corners. Once the nut was removed the skin fitting could be pushed out from the inside. It was interesting to see just how corroded the assemblies were.

Peter showed me the gate valve,

Seacock shopping list

- 1½in heads outlet with straight hose tail
- ¾in heads inlet with right angle hose tail
- 1in basin outlet with straight hose tail
- ¾in galley sink outlet with straight hose tail
- Load bearing collars for all of the above

Maintenance is key

Don’t neglect your seacocks urges Simon Jinks, RYA instructor and examiner:
Hidden deep in the murky depths of the bilge, often covered by floorboards, seacocks go unnoticed. Often they’re seized up and unable to do their ‘turn’, when required.

When inspecting boats or running some own-boat tuition, I’m finding more and more seized seacocks. Quite often the boats are under five years old and have so-called ‘maintenance free’ seacocks. Worryingly, when trying to move the seacock handle either the handle starts bending or the valve itself is in danger of breaking or moving the skin-fitting within the hull.

Whatever the type of seacock, including those that are maintenance free, they all need to be exercised regularly so they don’t corrode or foul up in the open or closed position.

Hoses attached to seacocks and skin fittings should be double clipped so they’re secure. Double clipping increases the surface area of the clipped pipe so there is less chance of the pipe coming off.

Ideally the handle should operate through 90°, so it’s easy to identify when a seacock is open or shut.

Should a seacock fail, a softwood bung can be placed in the hole. Bungs should be taped or tied to the seacock or pipe so they’re readily available in an emergency.

If you have different crew sailing on your boat, construct a plan identifying where the holes are in the boat. Then, in the event of water suddenly coming in, it’ll be easier for anyone to check the seacocks.

Skin fitting installation

1 Remove the old fitting. A multitool comes in handy for cutting in those awkward corners.

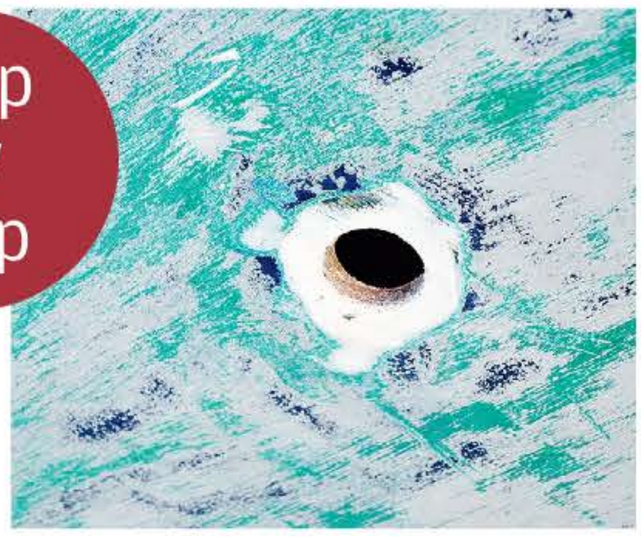
2 Once the nut is removed from the inside, push the skin fitting out through the hull.

3 Abrade and clean up around the holes to give the sealant the best chance of sticking.

Photos: James Turner

Step by step

4 On the outside, make sure you remove all the old sealant.



5 Abrade and clean up, same as for the inside of the boat.

6 Apply a good helping of sealant to the skin fitting flange...

7 ... and push the fitting into the hole. Installation tool helps avoid mess.

8 Inside, ensure there is sealant between the hull and washer, and between washer and nut.

9 Do up the nut finger-tight only, then wipe away excess sealant. Leave overnight for the sealant to cure.

Fitting the seacock

1 Carefully cut away excess cured sealant on the outside of the hull with a sharp knife.

2 Inside, cut off any excess length of the skin fitting and fit the load-bearing collar and valve. Use sealant on the joints but keep the ball valve clean.

3 Screw in the hose tail. Leave everything to cure overnight before attaching and double clamping the hose.

Peter Draper of Navigators Marine came to Dell Quay to fit the seacocks

TOP LEFT Here you can see the seacock is closed and the 'ball' in the ball valve is blocking the hole LEFT Ali getting accidentally locked in Peter's van was the only hiccup to the day's events

which would have been the 43-year-old original fitting. He explained that the pink colouring was evidence that the zinc had disappeared from the alloy, suggesting the old gate valve wasn't bronze as first thought, but brass and – now that the zinc had leached away – largely copper! It's a good job it was replaced as it could have disintegrated at any time.

Peter cleaned the holes thoroughly to give the sealant the best chance of adhering to the laminate. He then abraded the area inside, outside and across the laminate and applied a good helping of sealant.

Using the installation tool, Peter placed the fittings in the hole and then removed the tool. Rather than wiping away the excess sealant, he left it to cure, ready to be cut away in the morning.

It's important there's sealant between the hull and washer and between the washer and nut, so to ensure this the nut need only be finger-tight so it doesn't squeeze all the sealant out, allowing the sealant to do its job.

Fitting the seacocks

The following morning the sealant had cured nicely and Peter cut the excess away with a sharp knife.

Again he used the multitool, this time to cut away the excess length of the skin fitting; as you never really know when dry-fitting how much thread will be left inside the hull it's best to leave this job until after the sealant has cured.

Next came the load-bearing collar and seacock. Although the TruDesign seacocks are much chunkier than the metal ones that had gone in before, the skin fitting is the same size, as it's a BSP standard. They were either ¾in, 1in or 1½in diameter.

The valves in the heads went in easily enough, but it was certainly a fiddle for Peter trying to replace the old gate valve in the galley, which was positioned underneath a tiny drawer with barely inches to move around.

"Everyone knows that boatbuilders make boats to be difficult for future owners," said James. "This has never been more true than for the valve in this locker!"

Still, he managed. He used sealant for all the joints, but was careful not to get sealant into the centre of the valve where it could clog up the smooth operation.

Finally he fitted the hose tails and we were done. What an informative day it had been. I was glad to have been there to witness the seacocks coming out and going in, and to fully understand why they needed to be replaced.

There was one small hitch, however… the 10 minutes I spent accidentally locked in Peter's van!

Feeling rather helpless with the installation itself, I tried to be helpful by finding him a wrench. I was looking for the tool when the wind blew the van door shut, and with no access to the driver's seat, I fumbled around in the pitch black for several minutes, sweating buckets and trying to think what fictional hero Jack Reacher would do.

Just as I found the door-release, Peter and James came looking for me, realising the banging wasn't just 'ordinary boatyard noise'. Lesson No2: don't climb into vans on a windy day!

We then needed to wait 24 hours – again for the sealant to fully cure – before replacing the hoses.

Before we launch we'll be sure to attach some tapered wooden bungs with lanyards to plug the hole in case the skin-fitting ever fails.

With no hoses attached, it was quite good fun to open and close the ball valves, and see first-hand how they work. When you see daylight streaming in from under the boat, you realise just how important these little fittings are, and why it's important to keep them in good nick!

Thanks to
James Turner, Dell Quay Marine, TruDesign, the RYA and Navigators Marine, info@navigatorsmarine.co.uk