

SmartPlug Product Review – SmartPlug vs. 1938

About the author:

Rodd C Collins is the owner of Compass Marine, Inc. located in Cumberland, Maine. Rodd is an ABYC certified marine electrician located in Maine. Rodd writes articles for his Marine “How To” website for DIY boaters. His site has over 350,000 readers worldwide. Rodd has become a trusted source for boaters around the world. Here is a link to the website review: http://www.pbase.com/mainecruising/installing_a_smart_plug

About the review: Rod contacted SmartPlug Systems to request sample products to conduct his review. He has not received any compensation from SmartPlug Systems for his time and effort to provide the most comprehensive review ever conducted for the twist-type products.

A Smart Plug Kit



In today's day and age it is far and few between that I come across products that:

- #1 Do as they say.
- #2 Are built to an exceptional standard.
- #3 Redefine what GREAT is.

The SmartPlug is one of these products.

I got a call from this owner one day saying his shore power cord looked "charred" and no surprise it certainly was. I knew exactly how to fix and remedy his problem, a new SmartPlug inlet and cord set..

Unfortunately this call was in FEBRUARY, in MAINE and the boat is stored in the water because this hearty owner sails year round!

Due to the fact that he sails year round he keeps his boat heated with electricity to prevent it from freezing up. I had previously warned him that we would want to beef up his shore connection and cord to which he shrugged and put it off.

A few months later my suggestion became an emergency...

Pictured here, in the snow, is a 50' X 30A SmartPlug cord set and a 30A X 125V AC inlet.

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No Mincing Of Words Here

This is an ordinary day for me and it brings to mind that saying, *a picture tells a thousand words...*

OK more ranting from me, that you've come to expect. Here it goes.

AS A MARINE ELECTRICIAN I TRULY DESPISE THIS ANTIQUATED & ARGUABLY UNSAFE STANDARD FOR SHORE POWER PLUGS/SOCKETS ON BOATS!!!!!!

The regulatory boards that over see this such as the NEC, NFPA & ABYC should all be ashamed that they continue to allow this standard to continue in the marine environment.

There I said it.. Whew..... Why do I dislike it so much? Let's examine this further.

-When this plug standard began life it was back in 1938! I can't imagine that Harvey Hubbell III ever intended this to be used on boats near the ocean back when it was conceived..

- In 1938 houses had cloth covered wire and no safety ground for 120V outlets
- In 1938 we did not even have seat belts
- In 1938 GFCI outlets were not even a thought in an inventors mind
- In 1938 lead paint was the rage and asbestos was in everyday use.
- In 1938 there were no STANDARDS for electrical safety on docks or boats.
- In 1938 safety testing for marine use never even existed.
- How many other electrical items do you use in your house or boat that have remained virtually unchanged since 1938..????

Suffice it to say we have been GRANDFATHERED into a substandard and marginally adequate plug & socket combination for marine shore power cord/plug/receptacle use. This *twist-lock* standard would likely never gain approvals under today's electrical safety standards.



High Resistance Is Your Enemy



"But I have a circuit breaker aren't I protected?"

NO.....!!!!!!!!!!!!

With this old antiquated left over 1938 NEMA L5-30 standard there is approximately 20 times LESS SURFACE CONTACT AREA than there is in a modern SmartPlug, 20X less contact area!!!!

On boats we are in a corrosive environment that also MOVES! Add just a little corrosion, some torqueing & pulling on the plug and stack all that onto the MINIMAL contact area and we have HEAT.

Heat is generated at points of high resistance in an electrical circuit when pushing current.

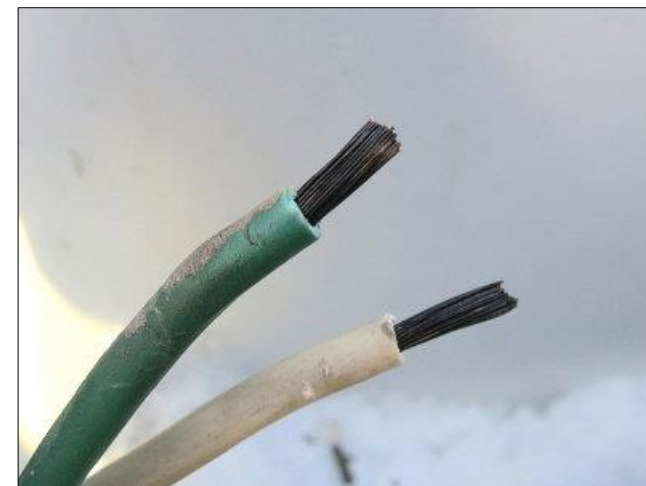
PLEASE understand that you can EASILY start a fire with high resistance and NEVER trip a circuit breaker. As we can see in this

photo the wire was not only corroded, due to marine environment and the age, but it also suffered due to the high resistance. The wire jacket itself was melted and then the jacket fractured.

Untinned Wire

Here is a prime example of where tinned marine wire *may* have bought this owner more time. A new run of 10/3 triplex wire was in order. The black oxidation on this wire can also create high resistance. When in doubt it is best to also replace the feed wire from the new AC inlet to the AC panel..

If your wire run between the AC shore inlet to the AC main breaker, at the AC panel, is more than 10' wire feet, not as the crow flies, then you will want to install a second 30A or 50A double pole breaker. This breaker needs to be interrupting WHITE/NEUTRAL & BLACK/HOT, and be located quite closely to the AC shore inlet.



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Why Do I Want A Smart Plug?



Over the years I have seen far too many examples of situations like this. I suspect a large number of the 55% of boat fires that are electrical in nature (source ABYC & USCG data) are the result of this antiquated and unsafe twist-lock standard we currently use.

Of those 55% of boat fires nearly 54% of that number is caused by "shore power". That means that nearly 25% of all boat fires start in the shore cord/power system. Wow!!!!

Read on and I will dig much deeper into the why's & how's...

Need More Convincing???

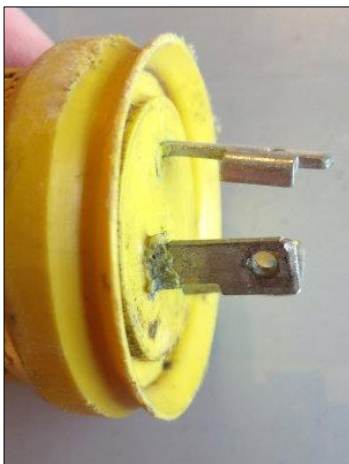
When word got out, in my Hall of Fail article that I was a huge fan and proponent of the Smart Plug images came flying in from all over of burned twist-lock plugs. I am certainly not alone in my dislike for this antiquated UNSAFE standard..

I have far too many images of burned twist-lock plugs to show them all so I chose this one to be a good representation.. A surveyor on the west coast was kind enough to photograph a great collection of them!!

Photo courtesy: A. Mazon



Early Signs of A Potential Fire



If you know what you are looking for the early signs of high resistance can be pretty obvious. Look at the pin closest to you and you can easily see the melted plastic migrating up from the base. There are also signs of arcing and burning on the pin itself.

If your cord looks like this it is TIME FOR A REPLACEMENT...

It is important to understand that I am not alone in my feelings about shore power safety. The quote below comes straight from ACE Insurance one of the nation's largest underwriters of marine insurance. They understand these problems because they PAY THE CLAIMS...

Quote: Ace Insurance Group - SUGGESTED ELECTRICAL INSPECTION STANDARD FOR MARINAS AND YACHT CLUBS:

"Each vessel's connection devices shall be inspected annually. Annual inspections shall be carried out between the end of the cruising season and the beginning of cold weather, when most boats have returned to their moorings, but before they have begun to present winter heating loads to the Marina. Any boat that enters the marina under a new Moorage Agreement during the winter heating season shall be inspected within 15 days of its entry into the Marina.

*A major reason for this inspection routine is to document the condition of each boat's Inlet Receptacle, the device on the boat's exterior to which the shore power cord is connected, and the condition of the mating end of the cord itself. **This cord-to-boat connection is subject to wear-and-tear damage from the activity of connecting and disconnecting the cord, and it is also subject to damage from wet winter weather, and it is a major source of fire in marinas.** If the connection between the cord and the boat is even slightly damaged, it will create heat that can eventually result in fire."*

A NEMA L5-30 Socket

In order to dig deeper than we've ever seen before, into this antiquated standard, I bought a NEMA L5-30 socket. This is the standard used for 30A shore power on boats here in the USA and elsewhere.



In order to drive this home I chose to destroy this socket by cutting it open to give a full look into why they are so dangerous.

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NEMA L5-30



Other than a yellow color and some tinning of the socket contacts a NEMA L5-30 is a NEMA L5-30.. They are built to the NEMA L5-30 standard whether you buy marine or RV sockets they must all work together..

Many have said to me that the problem is not the design, but rather how boat owners improperly use these cords and don't use the locking rings. Do you see any locking rings on this dock pedestal? Why is there no locking ring at the dock end?

While many boats owners do improperly uses these cord sets, and this can lead to high resistance, many of them still fail and burn up even when being properly used with the locking rings properly used and installed.

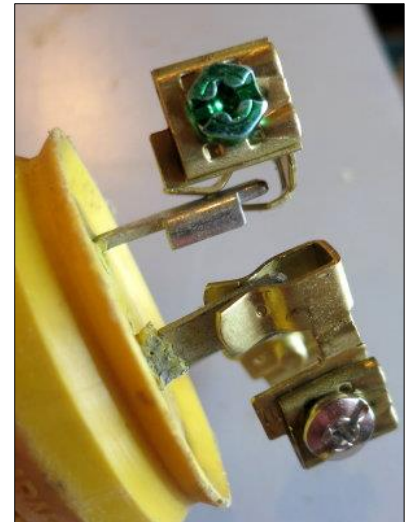
Many of these locking rings fail within a few months use or just fall off and disappear entirely. Others simply cross thread them and ruin them. Should the ring falling off or cross threading even be possible if this is so critical to the performance of the cord set?

It is a combination of a poor design that is not well suited to the application and sometimes no option to use the cord-set properly even if an owner wanted to.

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I Cut The Plug Open And Exposed The Actual Sockets

My goal here was to show exactly why or how this standard can result in SO MANY fires. In this picture we can see the contact area between pin and socket. NOT MUCH.... The green headed screw is the GROUND terminal but they all have about the same contact surface area.



The Locking Dimple



If you click this image you will be able to see the locking dimple on the female socket that locks into the hole on the pins of the male plug. Why is this important? Read on...

Socket Riding On Spot Dimple For Contact Area

Please do yourself a favor and blow this image up. This is the result of just 1-2mm's of movement and the dimple riding up and out of the hole in the pin..

Let's go over some of the major issues with this standard that lead to safety issues.

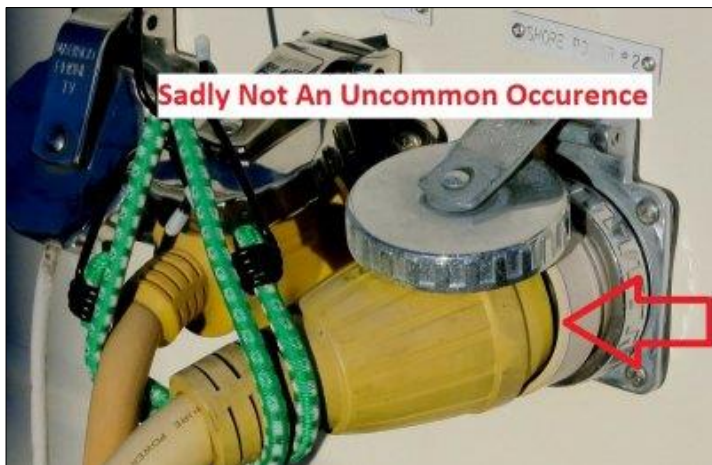
- #1 Round plugs need to twist in order to lock into place. To facilitate this locking dimples are used to create the *detent* so you know the socket is in place.
- #2 Due to the fact that this standard relies on twisting to lock the plug into the socket the fit of the round plug into the female socket is more sloppy than it should be and allows movement between socket and plug. Shore cords weigh a LOT and the cord alone can cause strain to the plug & socket, forget waves, boat movement or people stepping on the shore cord etc.... It is very rare that a shore cord is properly supported to strain relieve the plug & socket.



Socket Riding On Spot Dimple For Contact Area (cont.)

- #3 We are trying to use this on boats and boats MOVE!!!
- #4 Even just 1-2 millimeters of movement between the plug & socket can cause the dimple to ride up out of the hole and create even LESS contact area than this already unsafe standard has.
- #5 There are no seals on this standard thus it is very easy for corrosion to set in on the pins & sockets and create even more resistance.
- #6 The socket clamping mechanism/spring clamping feature is made from material just 1mm thick.. It does not take much pressure to loosen a 1mm spring clamp and provide less pressure for good contact.
- #7 There are no thermal breakers in these plugs or sockets to open the circuit in the event of overheating, due to high resistance. Instead this can lead to a fire or darn near..

We All Know Boats Don't Move.....Right..?



I sure wish I could say I never see this, but I see it with regular frequency.. SCARY!!!!

Ask yourself how a boat-owner "locks" this shore cord into place to prevent this occurrence....?

Actual Contact Area NEMA L5-30 Socket

I needed a good way to show the actual contact surface area of the clamping socket on a NEMA L5-30. I grabbed some sheet metal the same thickness as the plug pin and inserted the socket over it. I then slid it back and forth thus creating a corresponding mark on the sheet metal showing the actual contact area. The results were, well, SHOCKING!

It should be noted that this was not the dimple side but the non-dimpled side!!



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I Was Being Kind Here



In the shop shooting these pics I realized my glasses were in the house. When I blew up the picture I realized I had been very kind to the width of the contact surface area. Still 1.31 mm is pretty weak for 30A of current on a moving boat where corrosion is a huge player.

My Computer Seems To Be Taking Over

Really, I am not uploading these, my computer is just so full of them it keeps puking them out... (grin)



McCotter's Marina Fire



During the course of my research I came across the McCotter's Marina fire that happened in January of 2011 in North Carolina. Results on google were inconclusive other than to say the cause of the fire was "electrical". Frustrated with the investigation follow up I could find on-line I reached out to the Bunyan, NC fire department to see if they had any more information, they did.

What I was told was that the "exact" cause can't be 100% pin pointed and they rarely are. Their best guess and best information came directly from an eye witness who had stepped off his boat and saw the fire engulfed on the OUTSIDE of another boat at the SHORE POWER INLET.. D'oh....!

The individual I spoke with at Bunyan Fire Department asked not to be identified because they were unsure if the damage numbers on boats, \$\$\$ etc. were accurate. This individual was directly involved in the investigation and quite confident about the eye witness and the *perceived or assumed* cause of this massive fire and where it originated..

This fire at McCotter's Marina was estimated at approximately 23 million dollars in damage and included a Bertram 68, with a single boat value into the millions. This fire also turned McCotter's into a SUPERFUND SITE for cleanup. Over 20 boats and the marina were destroyed all on what is believed to be a shore power cord/inlet!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

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Okay, Back On Track....

The contact area that was scored into the sheet metal was just about the same width as a US dime as seen here..



But Wait There's More.....



Never being satisfied with what should be enough to show my readers what I am trying to say, I pushed on.

This time I aligned the socket with a straight edge and moved it in and out to score another line onto the sheet metal. I wanted to see if this motion created any more contact area or width. It would only be fair to show both..

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HOLY COW !!!!!

I am beginning to see the reason why so many of these plugs and sockets lead to melt downs, boat fires or entire marina's burning down. The entire contact area here is but a 1.3mm X 2.7mm and 1.3mm X 2.4mm area often trying to handle 25A - 30A of current.

Smart Plug 30A

Back of Pin Contact = 16.4mm X 8.5mm = 139.4 sq mm

Front of Pin Contact = 6mm X 8.5mm = 51 sq mm

Total Contact Area = 190.4 sq mm

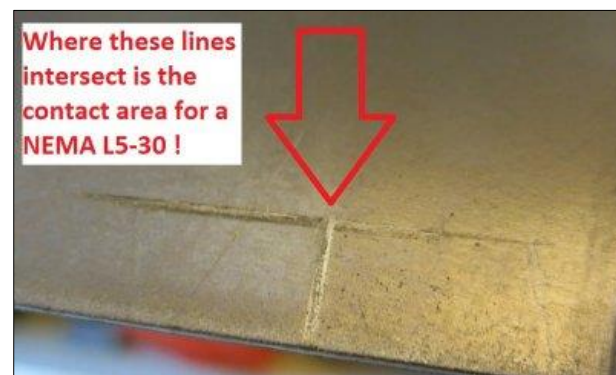
30A Twist Lock

Back of Pin Contact = 1.3mm X 2.7mm = 3.51 sq mm

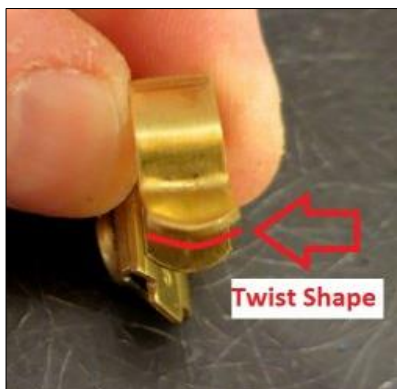
Front of Pin Contact = 1.3mm X 2.4mm = 3.12 sq mm

Total Contact area with dimple locked in place = 6.63 sq mm

Disclaimer: Due to the curved shape of the twist-lock measurements are as near as can be made, with a caliper, without going to impressions on transfer paper. The Smart Plug pins are flat thus measurements are far easier. Still the difference is HUGE!!!!



Why Is There So Little Contact Area..???

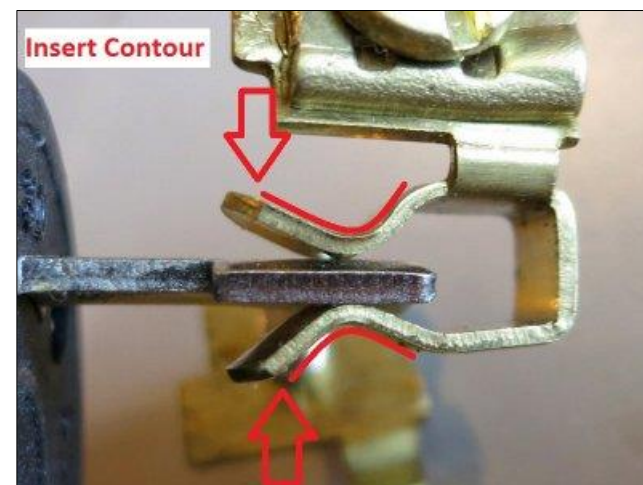


Remember this is called the "twist-lock" or "HUBBELLOCK®" standard. It requires both INSERTING & TWISTING.

Because of this dual stage insertion method the socket receptacle has to be shaped to accept both forms of engagement. INSERT and then the TWIST.. The two contours needed to allow INSERT & TWIST create a very small point of final engagement!

Insert Contour

With the last two images you can easily see why the two actions required for connecting this plug, insert & twist, leaves us with very, very, very little contact surface area..



The Spring Mechanism



I very often come across sockets where the detent or dimple & hole really don't feel as if they have meshed up and locked into one another. I have learned over the years that this is due to the clamping mechanism in the female socket weakening over time and getting loose.

This weakening is likely exacerbated by movement in the cord and plug as the boat moves. It may also be due to the rather thin metal used in the clamping mechanism of the socket?

As you can see here the metal used to create the clamping force on the male pin is a mere 1mm thick in the NEMA L5-30 socket...

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The Male Pins Are Thicker

Here I am measuring the pin thickness of a NEMA L5-30 "marine" plug made by Marinco. It measures about 1.77mm thick.



An RV/Home Depot L5-30



Here is a different brand of NEMA L5-30, a non "marine" version, and we can see that the thickness of the male pin is virtually the exact same. Why is this? Because marine or not these are all built to the same standard. The only differences, when it comes to contact area & clamping force, are usually in the tinning of the terminals on "marine" plugs & receptacles.

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Let's Examine The SmartPlug

This is the back of a SmartPlug 30A inlet. This is the original style plug which has now been updated, and further enhanced for ease of installation, but the basics are the same.

In order to wire the AC shore inlet you will need to first remove the rear cover plate. This is a simple one screw deal. Once the plate is removed the inlet can be wired.

This new SmartPlug 30A inlet is purposely designed to use the same mounting & hole pattern as the twist-lock standard 30A marine inlet. It will fit the old location regardless of whether the original inlet was plastic or metal. This makes installation SIMPLE!



Smart Plug Inlet



Here we are looking at the back of the 120V SmartPlug inlet with the cover plate removed. You can easily see that GREEN/GROUND is the bottom hole, BLACK/HOT is the right hole and NEUTRAL/WHITE is the left hole. Everything is clearly coded for a US wire color standard installation.

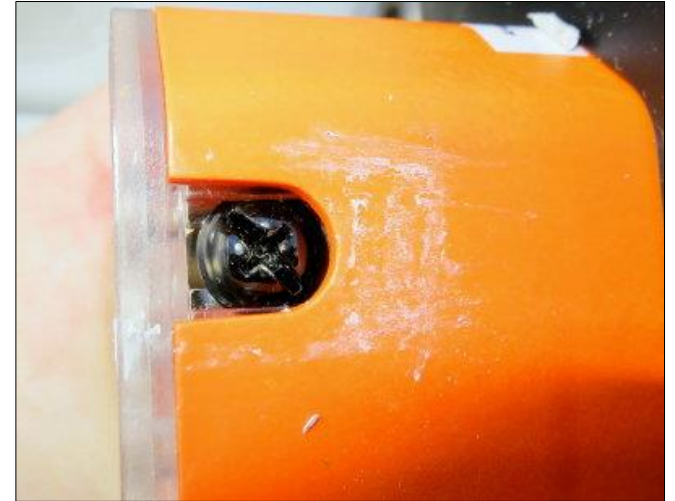
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BLACK = 120V HOT

The SmartPlug makes installations EASY. Even the clamping screws are color coded to the corresponding wire colors. This is the clamping screw for the BLACK/HOT wire.

In this photo we are looking at the side of the 30A shore power inlet.

DISCLAIMER: If you are at all uncomfortable with AC wiring, and do not understand the differences between HOT, NEUTRAL and GROUND, please hire a competent marine electrician to do this install. AC wiring and wiring mistakes can KILL YOU!!!!!!



GREEN = GROUND



All the clamping screws on the Smart Plug inlet are color coded to make it nearly fool proof. Please notice that I said *nearly*.

NOTE: New versions of the 30A SmartPlug inlet will begin shipping with the new set screw design you will see below. There is no problem with this design but the new design makes installation even easier. These guys are constantly looking to make this product the absolute best it can be and they DO listen to the trade and DIY customers, when it comes to feedback!!

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SILVER = 120V WHITE/NEUTRAL

The silver screw is your AC 120V WHITE/NEUTRAL wire.

I apologize for the tape residue but some of these pics were taken in 11F weather and the tape did not want to come off cleanly...



Flat Straight Blades



One of the reasons the SmartPlug can have so much more metal to metal contact surface area between the male pins and the female socket is because this is a single-action device. This means it only has to INSERT but does not have to TWIST as well. The shaping of the female socket to accept the TWISTING results in considerably less surface area contact.

The other reason there can be more contact area, is because the pins are FLAT not curved. This makes it much easier for spring tension to create a longer & wider mating area, as you'll see below.

NOTE: At this point in time SmartPlugs are for the boat end only. This is the end that sees the most abuse and a 50% fix is better than no fix at all. SmartPlug is awaiting approvals for the dock pedestal end, a long and arduous process, and once they do they will have dock pedestal products available.

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Oh My, Another One

Apparently my computer has a mind of its own today and these images just keep seeping from my image database... Sorry I will try not to let it happen again.. (wink)



A Very Sung Fit



The SmartPlug only inserts one way, STRAIGHT IN, and the male and female are unidirectional in shape thus NO MISTAKES.

I have literally seen NEMA L5-30's forced in and inserted incorrectly. This can create a very dangerous situation. This physically cannot happen with the SmartPlug.

The positive locking mechanism is also a lot more robust. Because it does not involve threads, twisting and the plug can't physically wiggle once inserted, the locking mechanism actually lasts for more than a few weeks before self-destructing.

A feature I really do like is the LED indicator light found on the pre-made cord sets. The field install plugs DO NOT have the LED indicator. They tried but to make them waterproof was proving too expensive on a field install plug. Factory made cord sets have a blue LED in the boat end of the cord. Nice feature... Overload the main breaker and trip it? One look in the cockpit, or at the boat end of the cord, saves you a trip to the dock pedestal.

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Robust

In my experience nearly everything about the SmartPlug is extremely well thought out, and built specifically for the marine environment. This inlet is highly polished cast, not stamped, 316L stainless steel. If you break the cover off a Smart Plug inlet you're also going to have a nice hole in your boat... (wink). The gasketing for keeping it water tight is also very well designed and engineered.



Inside Construction



This is what it looks like inside the female SmartPlug. The receptacle is ROBUST and offers massive contact area when compared to the circa 1938 twist-lock standard.

Note how beefy the spring clamping mechanism is and the up turned guide points which make entry of the male pins seamless and easy..

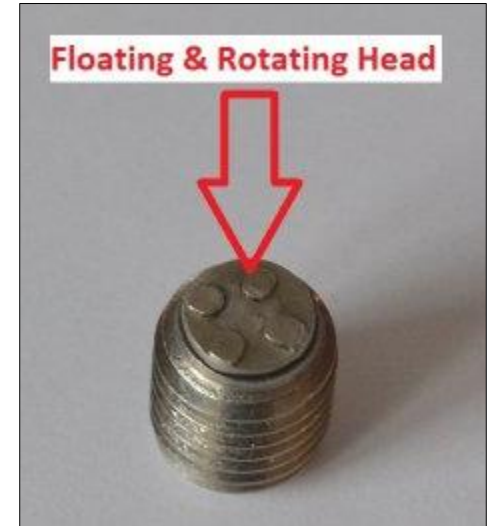
Note: This is a 50A female SmartPlug inlet not the 30A version.

Innovative Designs

These guys like to think outside the box and come up with very well designed equipment. This is their new set screw design for clamping the inlet wire.

One of the big issues with many inlet designs is the "pinching" of the wire is not always uniform or robust. You also can't drive a standard set screw directly into finely stranded wire without fracturing it. This is also against ABYC safety standards. To combat these issues the guys at SmartPlug came up with a floating & rotating head for their set screw design. This prevents fracturing the wire strands and creates incredible clamping force on the wire to create a good electrical connection.

I experimented with these set screws in my shop to see how they performed.. I clamped a 10GA UL1426 wire under one of the clamp screws 35 times. After 35 inserts and removals only two very small wire strands broke. This is pretty incredible when you consider you will only ever do it once or perhaps twice at the most..



Side View Of Set Screw Head



Here you can see the design and floating nature of the set screw head. Even under quite a bit of torque the head continued to spin in the set screw and not destroy the wire.

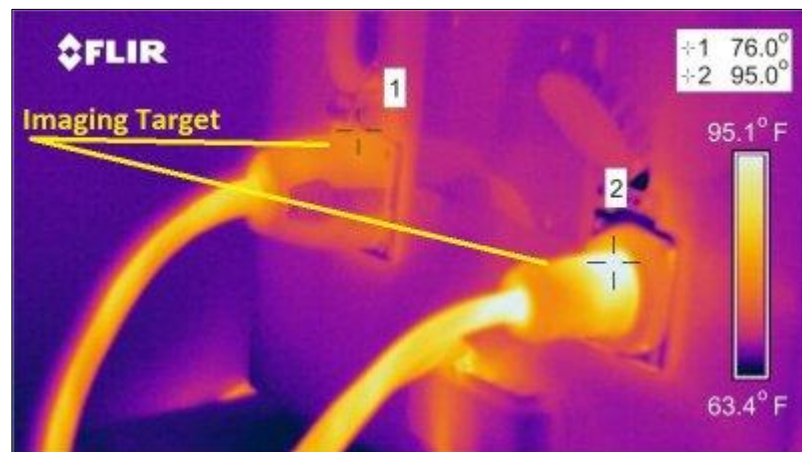
These Were Brand New Plugs

When I called SmartPlug, during the research phase of this article, I spend many hours or sometimes weeks researching before I delve into a detailed article, I asked about independent testing and temp scanning.

They told me that Cascade Thermal Imaging, Inc. of Redmond Washington had in fact conducted some independent, third part thermal imaging tests on the Smart Plug.

I was then able to convince them to send me this thermal image of two BRAND NEW plugs & inlets, both 30A. One is the circa 1938 NEMA L5-30 twist-lock standard, most boaters are using today, and the other is a Smart Plug.

These plugs and inlets were both 30A versions run at 28A or 93% of the face value rating. They were loaded to 28A for 1.5 hours at an ambient room temp of 72F..



I think the image speaks for itself and represents pretty much what I see in the real world. When you look at the temp spread you can see a 23F rise in temperature, from the ambient air temp, on the circa 1938 NEMA L5-30 plug standard. Loaded identically, the SmartPlug yields just a 4F rise from ambient room temp.

I am playing devil's advocate here, but there may be differences in the plug casings and how they transmit heat? My gut instinct is that I suspect 1.5 hours should be sufficient to get any heating at the plug/socket juncture to the surface of the plug.

Keep in mind that a 30A NEMA L5-30 circuit should never be loaded to this level for long durations. This was 28A in a controlled testing environment with BRAND NEW specimens. Even at this 93% of *rating* level the Smart Plug handles the current in a far better manner. I suspect if the NEMA L5-30 standard were tested today, to today's standards, it would have never gained approvals.

I regularly measure plug temps with my infrared thermometer, wish I had a Flir, and also see this in the real world. Here in Maine we do have a fair number of boats that winter over many of which use electric heat.

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These Were Brand New Plugs (cont.)

I will say it again, portable electric heaters can be VERY, VERY dangerous even on well-maintained cord sets and inlets because they draw immense current. Please be CAREFUL!

The max level at which you want to load these circuits is 80%. Keep in mind this is *when NEW* with CLEAN tight connections. As the connections age corrosion can set in and this can create high resistance, especially with the 1938 twist-lock standard.

I generally don't recommend loading a NEMA L5-30 30A circuit to more than 70% of its face value rating, especially in the MARINE environment. This means approx 21A on a 30A circuit. If you want to push it to 80%, and feel safe about that, the number is 24A. As a marine electrician I DO NOT feel safe about that with the 1938 NEMA L5-30 plug standard..

Let's Be Fair



I examined rather closely the NEMA L5-30 socket and pin design and now want to show the SmartPlug 30A pin and socket. It's only fair right...?

What jumps out to me is the sheer contact area made by the SmartPlug pin and socket. Not only can the clamping spring be longer but because the pin and socket are FLAT there is a *ship load* more contact area.

Once plugged in and *locked* a SmartPlug 30A or 50A male/female socket combo CAN NOT MOVE side to side or up and down. This was a major part of the design criteria for this system..

This essentially means that no torqueing or unintended loading of the spring clamping mechanism, beyond the design criteria, can occur with the SmartPlug. It does not take an engineer to see that the spring clamp can remain tighter, and in design spec for FAR LONGER, with the SmartPlug than it can with a twist-lock. It can remain in spec far longer than a twist-lock because the twist-lock allows for odd angles, twisting, unintended odd angle loading and torqueing and expansion/stretching of the clamp mechanism all due to its poor design.

Sure in 1938 perhaps the twist-lock plug was the cat's meow for industry and factories. Today, in 2014 we CAN do better and Smart Plug has done better..

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Field Install Plug & Inlet

Here we are looking at the 30A field install/retrofit plug and a 30A inlet. There are FOUR points of positive locking between the inlet and the plug:

#1 Right & left push lock connectors which are similar to the locking mechanisms found in cordless drill batteries. They are SS and lock into very thick and robust notches in the sides of the inlet.

#2 The front portion of the lid, nearest the hinge, positively locks into the plug body.

#3 The back portion of the lid locks positively into the plug body.

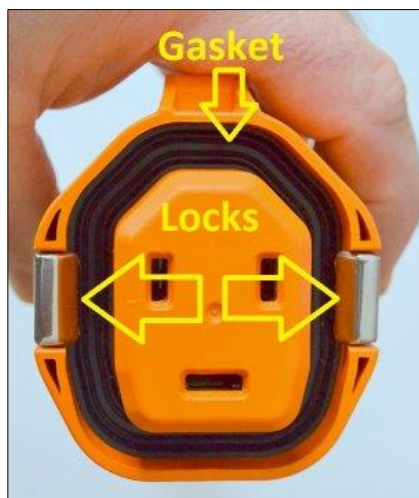
Rather than do my own video SmartPlug has already done this:

<https://youtu.be/xL-JzGtFygY>



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Keep It Dry



One of the biggest pit falls of the circa 1938 twist-lock design is that it is nearly impossible to gasket and keep dry. This can be an **IMPORTANT** consideration when installed just feet from a salt water environment. Corrosion is a direct contributor to **HIGH RESISTANCE**. High resistance is a **DIRECT CONTRIBUTOR TO BOAT FIRES!!!!**

Due to the design this system can be very well gasketed in order to keep it as dry and corrosion free as is possible.

The Lid Also Has Gasket

Here we can see the lid gasket. When not in use this gasket keeps the pins drier..

This image also show just how thick and robust the plastic of the plug body is. This is not an accident. The robust nature of the inlet is part of the design. It needs to be robust to handle the marine environment and loads imposed by a moving boat. It also creates a nice wide gasket mating surface and a very solid area for the positive locking devices to lock into.



Holy Flaming Tamales



Darn, another one got by me...

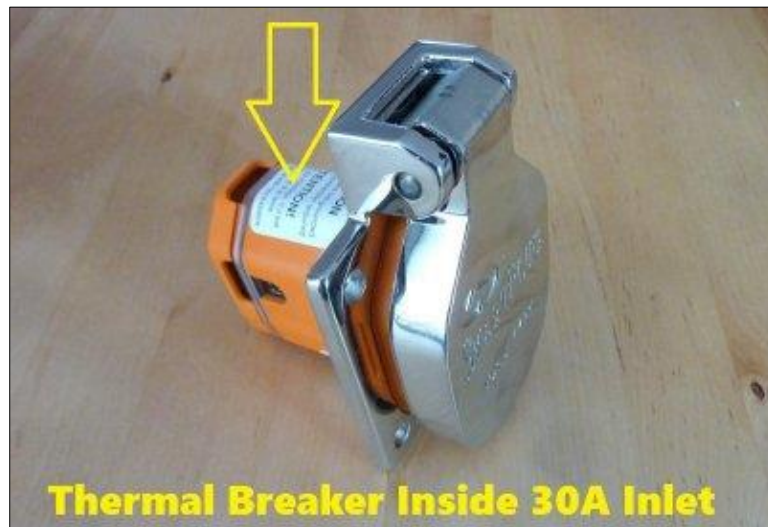
The Grand Slam Safety Feature

So just what is this "grand slam safety feature"? When Ken, the owner of SmartPlug, set out to design this product he wanted to incorporate a thermal breaker into the inlet body to prevent melt downs due to high resistance. It was not good enough for Ken to just design a better plug & inlet, he wanted to design a truly *safe* product. Should be simple right?

WRONG.....

It seems that no thermal breaker existed that could work in this type of application.

Problem number one, design and build a thermal protection system for the SmartPlug 30A inlet.





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The Grand Slam Safety Feature (cont.)

Problem number two find a company that can make it to SmartPlug's stringent specifications and quality standards. They finally settled on a design for the thermal protection system and then found a company to manufacture it. This company is not Chinese, as one may assume, but rather a German company where labor costs are quite high.

It should be noted that the vast majority of this system is made right here in AMERICA! I like that!!

#1 The TINNED wire used in the cord sets is made here in AMERICA!!

#2 The thermoplastics used in the SmartPlug are all made in AMERICA!!

#3 Assembly is all done here in AMERICA with US LABOR!!

#4 The thermal breaker is made in Germany using comparable wages to US workers.

#5 The stainless used in the SmartPlug does come from China but only out of necessity. If US Made the product would sit in US shelves because it could not be built affordable and could not be competitive. Ken tried his hardest to manufacture it all here in the US which is more than most companies will even attempt these days.

GRAND SLAM SAFETY FEATURE:

Inside the body of the 30A inlet is an epoxy potted thermal breaker that will trip at 200F. This is below the melting point of the wire jacket. Once the inlet has cooled it will automatically re-set at 110F so you don't lose bilge pumps etc..

No other shore cord system, in the world, incorporates this IMPORTANT SAFETY FEATURE. It will prevent the high resistance melt down images you have already seen so many of here.

Note: There are *some* in the industry who feel an auto-resetting breaker, of any kind, is not safe. This mind set stems from breakers re-setting into a dead short, and I agree 100% with this. However resetting into a dead short is not the same as a high resistance thermal shut down.

REMEMBER HIGH RESISTANCE CAN CAUSE A FIRE AND NEVER TRIP A STANDARD CIRCUIT BREAKER!



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The Grand Slam Safety Feature (cont.)

Up until now we have had no shore power thermal breakers that trip on high resistance / temperature just on overload of the circuit or an imbalance such as an ELCI..

The argument the *opponents* (most likely the manufacturers who don't care about safety) propose is this:

Boat owner's Darrell & his other brother Darrell get to the boat. Darrell & Darrell find no electricity. Darrell #1 opens the AC panel at the same exact moment the thermal breaker *re-sets* and gets zapped..

While, in theory, this *could* possibly happen, but about as likely as Rosie O'Donnell beating Lance Armstrong in a bike race, at least that owner had a chance to get onto his boat before it burned or burned the entire marina.

Think about this; the same *few* folks/competitors arguing against the thermal breaker in the SmartPlug 30A inlet have ZERO issue with auto-transfer inverters which can create the SAME EXACT Darrell & Darrell scenario they paint above and use to argue against the SmartPlug.. Once such competitor actually argues out one side of their mouth against the thermal switch then out the other sell piles of auto-transfer inverters.... Hypocrisy? You bet...

Follow me here... Darrell goes to the pedestal and UNPLUGS the shore cord. He steps back on-board opens the AC panel and ZAP!!!! Oooops the inverter transferred AUTOMATICALLY..... D'oh..... It is hard to argue against the thermal breaker in the Smart Plug 30A without also arguing against auto-transfer inverters, if they want to use the Darrell & Darrell argument....

Like anything common sense must rule the day. We now have a safer mouse trap & a better mouse trap but it will always get hung up with second guessers & competitors proposing supposition like I just mentioned. You will have to decide what is safer.

So How Do I Get A Smart Plug?

SmartPlug sales have taken off dramatically and demand is high, and for good reason. That said the product is out there and is available.

I will be honest here and say that I MUCH PREFER a new cord set and inlet as compared to the "retrofit" kit shown to the right. If your old yellow cord is in good condition then replacing the boat end is a suitable option. If however your cord set is older, do yourself a favor and buy a new cord set and inlet.



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Where do you buy a SmartPlug?

The crew at Sailboatowners.com ([LINK](#)) are really great. They have good prices, great customer service, are in close proximity to the SmartPlug facilities which means they have great access to inventory.

Lots of places have the SmartPlug but for on-line purchases I really do like these guys. I have included some links to the various parts to make ordering easier if you choose to do so.

[Purchase SmartPlug Retrofit Power Cord Plugs \(LINK\)](#)

[Purchase SmartPlug Shore Power Inlets \(LINK\)](#)

[Purchase SmartPlug Cord Sets \(LINK\)](#)

EDIT: PLEASE be patient. This article and some others have generated a large demand and supplies may be limited. They are working to fill orders as fast as they can..

A Shill....? RANT ON!!

It recently came to my attention that some, within an organization I support fully, namely the ABYC, have told people that this article is a direct marketing piece for Smart Plug and that I am a shill for Smart Plug?? This is flat out bovine dung and a 150% LIE!

Let's stop the BS here and now. I find this level of immaturity, by people who should know better, utterly disgusting and the lowest form of low. GROW UP, YOU KNOW WHO YOU ARE.

Fact: I make no direct compensation from Smart Plug and I have specifically & purposely NOT become a direct dealer so as to not impede or negatively impact the IMPORTANCE of this article. I believe in the dire seriousness of these issues 150%.

Fact: This article was written by me and of my own volition. I did NOT need any prompting and am only doing what 2000+ other good marine electricians should have done long ago. By that I mean calling out the sheer safety concerns of a left over, grandfathered & arguably dangerous standard from 1938 vs. today's technology designed from the ground up to minimize the exact issues the twist lock standard is fraught with..

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Smart Plug had NOTHING to do with this article other than to offer heat sensing images and answer about 1000 questions from me. I wrote this from my own physical experiences and from what I BELIEVE is safer, as a marine electrician.

Fact: I receive NOTHING from Smart Plug, zero, zilch, NADA. I buy my Smart Plug products through regular wholesale or retail organizations such as Hamilton Marine, Sailboatowners.com, Defender etc.. I don't even buy direct from Smart Plug. I do this purposely and by design to eliminate any potential for being called a shill.

Fact: The only compensation I've made from this article has been from the "DONATE" button in this article. This is 100% reader support, not industry in any form shape or matter.. To date I have made less than it cost me to write this article due to the cost of buying the supplies etc. then destroying them. (EDIT: 1/27/15 I have now made a \$65 in net reader donations on this article after paying off all the parts and pieces used or destroyed in the article.)

Fact: I personally believe in this product and Smart Plug had nothing to do with my writing of this article. Twist-Lock FAILURES and marina fires are what drive my motivation.

Fact: If this level of immaturity keeps up I will begin naming names and I will call you out..! Enough with the lies already. Please GROW UP!!

Fact: What have I received from Smart Plug? Exactly one warranty replacement 30A 50' shore cord for a customer who had one "fade" to a paler shade of orange. This was a very early cord and they subsequently added more UV inhibitors in later production runs. The customer benefited, not me.

Here is a link to Rodd's review: http://www.pbase.com/mainecruising/installing_a_smart_plug

