Episode Book

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The Blue Plug That Out-Engineers Your House

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SYNOPSIS

The blue IEC 60309 plug — the 230V, 16-amp "Commando" connector you see on campsites and marinas — is a genuinely tougher piece of hardware than the BS 1363 plug on your kettle. Turned brass pins, IP44 weatherproofing even when disconnected, and mechanical retention all make it appealing for a home workshop. But rewiring appliances onto it isn't a plug swap: with no fuse in the plug, overcurrent protection has to move upstream to a dedicated radial circuit. And there's a regulatory paradox — BS 7671 requires shuttered domestic sockets, which IEC 60309 sockets aren't, so installing one is a formal departure, even though it's arguably safer than the compliant alternative. This episode walks through the standard's family tree, the contact design that makes it last, what it actually takes to build a bench PDU, and the odd-even rule for appliance inlets almost nobody knows.

TRANSCRIPT



Corn

Here's the thing about the blue plug on the campsite bollard — the one that's been quietly out-engineering everything in your house for decades. Every time this topic comes up, the conversation goes straight to regulations and paperwork, like the connector itself is the problem.



Herman

The connector is the one part that isn't a problem.



Corn

Right. Which is why Daniel sent us this. He wants to look at using IEC 60309 plugs in a home or home workshop context — specifically the 230 volt non-three-phase version, the blue one. The appeal, in his words, is that it's an extremely robust connector. He's noticed the plug heads and the sockets are sold separately, and the sockets come freestanding or wall-mounted. So as far as he can see, there's nothing standing in the way of somebody who's tired of brittle consumer connections rewiring a couple of appliances onto this standard and adding a PDU or a set of outlets with the sockets. He's heard of people doing exactly this on workbenches. So: what's required, and what's worth bearing in mind if you build a power strip or outlets out of this plug type.



Herman

And the answer to "what's required" is mostly: a screwdriver, and a serious conversation about what's behind the wall.



Corn

So let's start with what this thing actually is, because the blue 16 amp version is one specific animal in a much bigger family.



Herman

It's IEC 60309. The standard for industrial pin and sleeve plugs and sockets. Older names you'll see on datasheets and forum posts: IEC 309, CEE 17, and in the UK, Commando — that's MK's brand name that turned into the generic word for the whole family, which is its own sourcing headache. The CEE 17 standard was settled in the sixties,



Herman (continued)

adopted here as BS 4343 in 1968, superseded by IEC 309 in 1983, renamed IEC 60309, and the current UK adoption is BS EN 60309, which dates to 1999 for the base standard.



Corn

And the family is enormous. Give them the ceiling.



Herman

Across the whole standard, the maximum ratings are one thousand volts, eight hundred amps, five hundred hertz, and an ambient range of minus twenty-five to plus forty degrees Celsius. That's the envelope, not what's in your garage.



Corn

Very few people need eight hundred amps on a workbench. Although.



Herman

The 230 volt single-phase version is the blue, three-pin, 2P plus E, six-hour-keyed connector. Line, neutral, earth, earth pin sitting at the six o'clock position. Rated 16 amps, also made in 32. The three-phase versions are red, 380 to 480 volts, either 3P plus N plus E or straight 3P plus E, six-hour keyed as well, and they are physically larger and won't mate with the blue type. That non-intermatability is the point.



Corn

And the colours do the work before anyone reads a label. Yellow is 100 to 130 volts, blue is 200 to 250, red is 300 to 480, black is 500 to 1000. Then the keying — where the earth pin sits on the clock face, one hour through twelve — stops you mating incompatible voltages that happen to share a colour.



Herman

The Museum of Plugs and Sockets — which is exactly as good as it sounds — describes the 16 amp type as "rarely used for domestic purposes but common in workshops," and then lists where you actually find them: campings, marinas, farms. Which is precisely the niche Daniel's asking about. It's not a fringe idea, it's an established one that just never crossed over into the house.



Corn

So that's the family portrait. Now, why does anyone care? Why is this thing so much tougher than what's already on your wall?



Herman

Three separate arguments, and they stack. The first is the housing. Every connector in this standard has a minimum IP44 weatherproofing rating — that applies whether it's mated or detached, which is not how consumer gear works. Then you get IP67 and IP66 slash IP67 variants that add a gasket and a twist-lock ring. The housings themselves are thick impact-resistant thermoplastic — PBT, or rubber on some ranges. MK's own Commando literature claims remarkable impact strength, outstanding temperature performance, good chemical resistance. Solid brass pins, stainless steel contacts.



Corn

The housing is the part people picture. It's not the interesting part.



Herman

It isn't. The interesting part is the contact design, and this is where it stops being a durability story and becomes an electrical one. The pins are cylindrical and turned — machined — and they mate into contact tubes. Keir Stitt over on the IET's EngX forum put it well: turned pins into a metal hole with a transition fit gives a very reliable contact. Then he makes the argument that actually matters. A spring brass contact onto a flat pin, when it overheats, tends to anneal. Annealing is permanent. Performance drops and never comes back.



Corn

Whereas a turned pin in a metal hole has enough copper in it to draw heat away from the hot spot in the first place.



Herman

And the pins aren't thin brass shim. gkenyon in the same thread — not all plug pins are solid brass, but most industrial plugs and appliance inlets to the BS EN IEC 60309 series tend to be solid brass. That's a lot of metal to soak up a fault current before anything softens.



Corn

Compare that to the thirteen amp plug on your kettle. Flat pins, spring contact, fuse in the plug, and every single one of its failure modes is thermal.



Herman

Third argument is retention and water. The socket's spring-loaded hinged cap hooks over a lug on the plug, so the plug is mechanically retained — not just friction. Fixed connectors are normally installed angled downward so water sheds off. And this is a connector family where the weatherproofing is spec'd while disconnected, which is the condition when it's most vulnerable.



Corn

So mechanically, we've established the blue plug wins. Now the part that changes everything. Say the sentence.



Herman

The plug contains no fuse.



Corn

And a BS 1363 plug does. That's the whole reason the thirteen amp plug exists in the form it does — the fuse lives in the plug so the ring final can be protected at 32 amps at the board with each appliance limiting itself locally. Pull the fuse out of that arrangement and the calculus changes completely.



Herman

It does. With no fuse in the plug, overcurrent protection has to come from somewhere else. Either the fixed wiring — an MCB or RCBO — or a fused or RCD-protected socket outlet. That is the single most important thing to understand before you rewire anything onto this standard.



Corn

Which means you can't just swap a plug head and be done. That's the misconception to break right now.



Herman

Correct. A Commando plug belongs on a dedicated radial circuit with appropriate overcurrent protection — commonly a 16 amp MCB or RCBO. It does not go on a ring final circuit. You can't take your existing ring, cut into it, and hang a Commando socket off it, because there's nothing to stop the appliance pulling more than the cable or the socket can take. The IET On-Site Guide reportedly permits protective devices up to 20 amps for 16 amp sockets — I'm going on a practitioner's reading there, not a verified quote — but the principle is that the protection moves upstream.



Corn

Where the overcurrent protection lives is a design decision. So which means the circuit behind the socket is now part of the project.



Herman

Which is the second misconception, and it's the one Daniel's prompt actually brushes against — the idea that a tougher connector is automatically the more compliant one. It isn't. And this is where the episode gets interesting.



Corn

This is the regulatory paradox, and it's the strongest thing in the whole topic.



Herman

BS 7671 regulation 553.1.201 requires socket outlets in domestic installations to be shuttered — the little internal shutters that stop you poking a screwdriver into a live hole. IEC 60309 sockets are not shuttered. They are keyed and they're interlocked in some versions, but they're not shuttered. So installing a Commando socket in a dwelling is a formal departure from BS 7671, which requires a risk assessment.



Corn

Here's what makes that so absurd. A European Schuko socket is shuttered, so it ticks the box. But Schuko is not polarised — you can plug it in either way round — and it's not remotely as robust as a Commando. So on a 16 amp radial in a UK house, a shuttered but fragile, non-polarised Schuko is code-compliant, while a polarised, interlocked, weatherproof, far more robust Commando is a formal departure. The regulation is doing the opposite of what it's meant to do.



Herman

And this isn't a hypothetical. Keir Stitt's own example is that he wants to run a small CNC at home. It needs a 16 amp single-phase supply, and he'd like to connect it via an interlocked EN 60309 Commando socket — and that would be a departure from 553.1.201, precisely because Commando sockets aren't shuttered.



Corn

I want to sit on that for a second. The socket is interlocked. It cuts the power when nothing's plugged in, and it locks the plug in place until the power is off. That's a stronger safety property than a shutter. And the regulation doesn't recognise it.



Herman

It's worth being honest about how solid that regulation reading is. It rests on a practitioner's discussion on the IET EngX forum, not on a verified quote of the current text. But the view expressed there — that 553.1.201 may be an outdated provision with unintended consequences — has a lot of force when you lay the two connectors side by side.



Corn

And then the part that makes me laugh. Stitt notes that many electricians just put commandos in people's garages without even considering that they're departing from BS 7671 at all. So in practice, the departure is happening constantly, unpoliced, because nobody involved thinks of it as a departure.



Herman

Which is the friction point. Not the connector. The paperwork.



Corn

So the connector itself is sorted. But here's where it gets interesting — the no-fuse design and the regulatory departure both push complexity somewhere else. The circuit. So what does this actually look like when someone builds it?



Herman

Let's do the PDU first, because that part is easy and it's what Daniel's asking about. The socket side of this standard comes in every form factor you'd want for a bench. Freestanding or portable socket outlets. Wall-mounted surface sockets. Angled or sloping built-in sockets for a panel. Appliance inlets, which are the male side you'd mount on a chassis — Herman's odd-even rule applies here, odd numbers are cord connectors, even numbers are appliance inlets, and almost nobody knows that mnemonic. So if you want a bank of four sockets on the underside of a bench, you buy four freestanding or surface sockets and mount them however you like.



Corn

So the form factor problem is solved off the shelf.



Herman

Entirely solved. And then you can go up a tier on safety. IEC 60309 part four covers interlocked switched sockets. These cut the power when nothing is plugged in and lock the plug in place until the power's off — so you can't unplug something that's live, and you can't have a live exposed socket. That's beyond a shutter. And they exist off the shelf, not as custom builds. Lewden does a 16 amp three-pin 240 volt RCD socket, IP44, around one hundred and eighty-seven pounds excluding VAT, with an IP66 version at about one hundred and seventy-six. Deligo does a 16 amp three-pin 230 volt IP44 interlocked



Herman (continued)

socket with a DIN-rail window for four modules at around fifty-four pounds excluding VAT.



Corn

So a big spread. One hundred and eighty-seven versus fifty-four. What buys the difference?



Herman

The Lewden one has the RCD built into the socket. So you get the residual current protection at the point of use — which matters because, remember, with no fuse in the plug, any protection you want has to come from somewhere. The Deligo one is interlocked but gives you the DIN-rail window so you can fit your own protection module inside it — MCB, RCBO, RCD, whatever the circuit calls for. Both are legitimate answers. They just put the protection in different places.



Corn

Then the third option is no protection in the socket at all, and it lives entirely at the board. Which is the cheapest, and which is also where people get into trouble, because it requires the circuit to be right.



Herman

Which brings us to the circuit topology. This is where the DIY calculus actually lives. Commando plugs are unfused, so they must be on a dedicated radial with appropriate overcurrent protection. Not a ring final. And a 30 milliamp RCD is recommended wherever mobile equipment or extension leads might get damaged — that's from IET Wiring Matters, issue 91, July 2022 — which in a workshop is basically always.



Corn

Because a bench grinder's cable is going to get rolled over by something eventually.



Herman

It's going to get rolled over. There's a forum post on the MIG Welding Forum where someone plans a workshop feed and it's a good illustration of the topology people actually build. Thirteen amp plug into the wall, 2.5 square millimetre cable out to a Commando socket, then 4 square millimetre cable from there to a second Commando socket, then a four or five way thirteen amp distributor. The whole point of stepping up the cable gauge is to minimise voltage drop over the run.



Corn

The Commando connector is being used as a midpoint in a longer chain — you start at a thirteen amp wall plug, and the Commando connector lets you carry a healthy supply out to where the work is. That's a real pattern, and it's a sensible one.



Herman

It is. And one more safety note the sources flag — reverse-wired sockets are not uncommon, so double-pole-breaking RCDs and main switches are recommended. That's about the awful case where somebody's wired a socket backwards and the neutral is live when it shouldn't be. Double-pole breaking means you kill both.



Corn

Let's take stock of what the research couldn't give us. There's no single authoritative how-to-build-a-Commando-PDU guide anywhere. The knowledge is scattered across forum threads and vendor product pages. If you want to do this, you're assembling the picture yourself from a dozen sources.



Herman

Which is part of why the question is worth asking. And there's one more angle that reframes the whole thing, which is the camping and caravan precedent.



Corn

Right. The blue 16 amp connector is the de-facto pan-European caravan and marina mains connector.



Herman

Which means the largest existing deployment of this connector in a domestic-adjacent setting is already at 230 volts single-phase. Millions of caravans, boats, campsite bollards — all running on the blue 16 amp connector. That's the proof that the standard works fine outside an industrial setting. It's not a connector that only behaves itself in a factory. It's a connector that's already doing domestic duty across a continent, we just don't call it domestic.



Corn

The honest summary: the connector is easy, the circuit is the hard part, and the regulation is the friction point. And that's before we talk about what actually happens in a real garage.



Hilbert

In practice it's about a tenner.



Hilbert

The socket. About a tenner. I was doing maintenance at a small joinery works the year before I moved over here, and we had four of them on the bandsaw and the extractor. Solid brass pins, screw terminals, you could take one apart with a flathead and a cup of tea. Bits of the trade it was — we didn't wire them back to a ring, we ran a dedicated sixteen amp off the board and left it.



Herman

That's the part the research completely misses. Everything I found was forum threads and product pages. Nobody writes about the circuit behind the wall.



Hilbert

The circuit's not the interesting bit. The interesting bit's the sockets. You buy one of those, the brass pins are turned out of one piece, and you can see it. Sheffield cutlery used to be done like that, before they worked out you could stamp it for a tenth of the price and throw it away when it went. These didn't go. The pair on the extractor came off a job in the seventies and they were still going when I left. I kept one. I've got four now.



Corn

Four.



Hilbert

Four. Two on the bench, one in the van, one on the shelf. I don't need four. I've got four.



Herman

Did anything ever fail on them? Anything you had to go back to?



Hilbert

One. The lid spring on the oldest one — the cap that hooks over the lug. Forty years of being opened and shut and the spring went soft, so it wouldn't stay shut on its own. I bent it back with pliers, it's still fine. The pin side, never. Never once. What used to fail was the thirteen amp plugs on the machines, and it was always the same failure — the pin got hot and the plastic around it went soft and shiny, and you knew it was done. Spring brass anneals, that's what it is. And once it anneals, it's done. The brass ones never did that. It's just more copper in the same gap, is what it is.



Corn

That's a very good point.



Hilbert

It's not a point. It's just what happened.



Herman

This is exactly it. The thing the sources can't tell you is what the failure actually looks like on the bench — the shiny plastic around the pin, the moment you know a plug is finished. That's the detail that doesn't make it into a datasheet.



Corn

The retired plug that came off the bandsaw and went to the bench, because it wasn't broke. That's the whole case for this standard in one object.



Herman

The research gives us the theory. The forum threads give us the arguments. And what we get from the bench is that someone replaced a plug only when it failed, and it failed once in four decades, and it cost a few pounds to fix with a pair of pliers.



Corn

Here's the thing I keep coming back to, though, and it's not the plug. It's the regulation. We have a situation where an electrician can hang a Commando socket in somebody's garage, do a good job of it, use a better connector than the one that's nominally compliant, and be in formal departure from BS 7671 — with a risk assessment needed to paper over the gap. And that view comes from a practitioner's reading on the EngX forum, not a settled legal position, so we should flag that we're working from a forum thread rather than the text of the regulation itself.



Herman

I'd add that the paradox is unresolved. Nobody in the sources settles whether 553.1.201 is fit for purpose in an age where interlocked sockets exist. It was written for a world where the only alternative to a shuttered socket was no protection at all.



Corn

The practical takeaway for anyone thinking about this: the connector is easy, the circuit is the hard part, and the regulation is the friction point. But the caravan precedent proves the standard behaves fine at 230 volts single-phase in domestic-adjacent settings. It's already doing the job across a continent.



Herman

As home workshops adopt more serious equipment — CNC machines, welders, 3D printer farms — the case for a tougher connector standard probably gets stronger, even if the regulations lag behind it. We might be years away from that being a settled thing.



Corn

If you've done this in your own workshop, or you've got a story about Commando connectors in a domestic setting, we want to hear it. Full episode notes are at my weird prompts dot com. Email us at show at my weird prompts dot com. Thanks as always to producer Hilbert Flumingtop, who has four of them now. This has been My Weird Prompts.



Herman

The human-AI collaboration podcast.



Corn

We'll be back soon.