



newmacey
The way we connect



**introducing the new macey range of
waterproof connectors for the rail industry**



new macey manufactures high voltage electrical connectors for exposed environments such as railways and shipping ports. They are one of the few guaranteed waterproof connectors available in Australia.



Introduction

New Macey originally made connectors for underground coal mines. However, it was realised that mining technology could effectively translate to the demanding conditions of railways, which need connectors that tolerate high humidity, water, corrosive washing solutions, dirt, vibration and heat.

A key feature of our connectors is they are completely waterproof. Conventional connectors fail when dirt and moisture penetrate the electrical contacts, causing arcing, signal interference and phase asymmetry. By eliminating water, the plugs and receptacles give reliable long term performance.

A second benefit is our ability to tailor plugs to exact rail authority requirements. We can combine AC, DC and control circuits in the one unit, giving more protection to smaller cables and reducing the risk of shunting carriages that are still connected.

Products

We locally manufacture a range of waterproof electrical connectors, from multi-pin low voltage communications and lighting plugs to 22 kV 800 amp high voltage connectors. These are all corrosion free, robust and fully waterproof.

Our objective is to supply a complete solution to a customer's problem, not just a box of components. We will therefore not only design and supply electrical connections, but will install them at any location and offer training and maintenance programs for ongoing operations.



Advanced Features

Developed over the last ten years, the current generation of New Macey plugs have advanced features found on no other high voltage electrical plug. Some of these benefits are listed below.

Waterproof

Moisture penetration into plugs accounts for a high percentage of electrical cable failures. By eliminating moisture, New Macey plugs are more reliable than any comparable product available to the Australian transport community. Our Camlock connectors are designed to operate under more than 10 metres of water (I.P.68) and plate connectors have been tested under full electrical load and simultaneous total water immersion.

Statutory Approvals

Many of our high voltage plugs have been intensively tested to relevant Australian Standards and have been approved by SIMTARS and Testsafe in flameproof, encapsulated and increased safety categories. To the best of our knowledge, no other plug has ever achieved all three of these categories.

Compact Construction

The plugs have fewer components, so they are more compact than conventional designs. This makes them easier to handle, causing fewer occupational injuries.

Positive Anchorage

A continuous resin seal on the cable sheath and conductors means there are no cones or grommets to slip or leak.

Permanently Colour Coded

Plugs are pigment coloured to denote different voltages. There is no need to paint plugs to correctly identify them.

Easy to Assemble

Each plug can be fitted with a knife and two Allen keys. It takes about one third the time to fit a New Macey plug.

Readily Maintained

Plug maintenance is more efficient, saving time in workshops and repair facilities. Connecting bolts are marine grade stainless steel. The Camlock design is robust and is well accepted whenever simple and safe non-permanent connections are required.

Quality Materials

Plugs are made from marine grade stainless steel, bronze, aluminium and reinforced resin, so there are no corrosion problems.

Heavy Duty Sockets

Sockets are silver or gold plated and built for maximum heat dissipation. They give positive electrical contact along the full length of terminal pins.



Railway plugs and receptacles

Electrical connections between railway carriages

Power and communications circuits between rail carriages are either hard wired to permanent terminals or joined with some form of plug. If cables are hard wired, specialist tradespeople are needed to uncouple carriages and there is a high potential for error during re-connection. Traditional plugs overcame these problems, but gave unsatisfactory performance for the following reasons:

- Plugs and receptacles can be too fragile, so they distort in use;
- Alternatively, plugs can be too heavy, giving OH&S concerns;
- They are usually not waterproof, allowing moisture and dirt to cause electrical arcing;
- Power and communication circuits usually cannot be included in the same plug, so costs increase;
- End contact pins heavily pit, causing terminals to burn; and
- Excessive force may be needed to separate and re-connect plugs and receptacles.

New Macey plugs

Plugs are securely connected to receptacles using the well tested Camlock coupling system. The two parts are separated by a rubber gasket which is compressed with coupling levers. This gives a secure and waterproof connection. Multiple terminal plugs are produced to suit your requirements. Apart from earth and power conductors, these can include data and communications circuits.

Receptacles

New Macey receptacles use high quality silver plated multiple wire or beryllium copper lamella sockets. These significantly reduce the force required to connect to plugs and give positive contact along the full length of terminal pins. Allowable current densities are higher than normal solid sockets, reducing heat generation.

Blank receptacles

Terminal plugs and cables can be damaged when they are unrestrained on the last wagon of a train. Blank receptacles secure unused cables and keep dirt and moisture out of plugs.



XPT Power Plug and Receptacle



Xplorer/Endeavour Receptacle and 72 Pin Communication Receptacle



Coupled Plug and Receptacle

Typical rail experience

Xplorer/Endeavour Class trains

Existing European power cable plugs and receptacles were difficult to disengage and they leaked, causing extensive pitting of terminals. A light aluminium body distorted during service, so that electrical failures were frequent and replacements were quite expensive. New Macey designed an alternative connector with additional terminals so the battery charger from one carriage could flexibly feed other carriages to enhance reliability.

The new plugs and receptacles were made from high tensile manganese bronze and used a Camlock coupling to seal against water penetration and vibration damage. Service trials commenced in mid-2002. Following the success of those trials, the company was awarded a contract to replace all jumpers, plugs and receptacles on Xplorer and Endeavour carriages and locomotives.



Old Style English Receptacle

XPT power jumpers and receptacles

Power cables from RailCorp's XPT fleet were joined by older English plugs and receptacles. These were unacceptably heavy, causing OH&S concerns for shunting and maintenance staff. They were also difficult to engage and disassemble, encouraging staff to use hammers and crowbars inappropriately. New Macey redesigned the connectors to reduce weight and more readily couple together. Additional trip circuits were included so that cables could not be damaged by powering up train sets that were uncoupled but still connected electrically. New Macey subsequently refurbished all XPT carriages and locomotives in RailCorp's fleet.



Explorer and XPT Breakaway Plugs

New Macey have developed a unique safety release system that will simply disconnect should the vehicle attempt to leave with the shore supply still connected. The breakaway unit will simply pull apart and the trip circuit will de-energise the system without any electrical or mechanical damage to the equipment and vehicle. Re-coupling the breakaway is effected by simply pushing the plug and receptacle together. The breakaway unit has a rating of IP68 when coupled. This unit is electrically rated at 1100Volt 200Amp. The unit has a total of four trip wires that can be used for other purposes. E.G; It will stop the power car from moving off while the shore supply is still connected.

Communications plugs, Malaysia

KTMB, the state rail authority for Peninsula Malaysia, had a problem connecting public address systems between rail carriages. Monsoonal rain caused existing plugs to leak, leading to signal interference and static in loudspeakers. The Authority requested New Macey to supply a combined power and communications plug and receptacle, with future capacity for video, data transmission and electronic display facilities. These were placed in service in early 2004.

Other applications

Our plugs have been used for a variety of applications that are suitable for railways. These include:

- Power supplies to pumps, especially emergency pumps or units liable to flooding;
- Temporary power supplies such as generators and transformers;
- Outdoor lighting;
- Shore supplies to railway workshops, both single car and full trains;
- Continuity of supplies to refrigerated containers whilst they are in shunting yards; and
- High voltage supplies and communications in tunnels and access shafts.



Design flexibility

Our ability to tailor each design means that we can develop a connection that meets your exact needs.

Pins and sockets

The heart of our receptacles are the multi-contact sockets. Each is carefully selected to meet the needs of the particular connection. Power sockets and trip circuits are all silver plated, while communications sockets are gold plated. They allow very high surface current densities and whether Lamella or multi spring wire, accommodate vibration and misalignment.

A major benefit of pins and sockets is they are self cleaning. End contacts can be held apart by dirt, which promotes arcing and pitting of the terminal ends.



Kevlar Braided Sheath and Plug

Jumper cables

Bare jumper cables are often damaged by abrasion from ballast, which can strip off conductor insulation. Bare wires are a safety hazard and are unreliable. We offer Kevlar braided sheath, rail conduits for groups of separate conductors or vulcanised rubber multi-strand cables, either conventional cable or customised to a customer's requirements.



XPT Power Jumper

Receptacle connections

Our objective is to make conversions as simple as possible. Receptacles are normally connected by conventional crimped lugs or by screwed terminals. If the receptacles connect directly to bus bars, we can fabricate special brass lugs that attach directly to the existing bus bars without modification or expensive alterations.



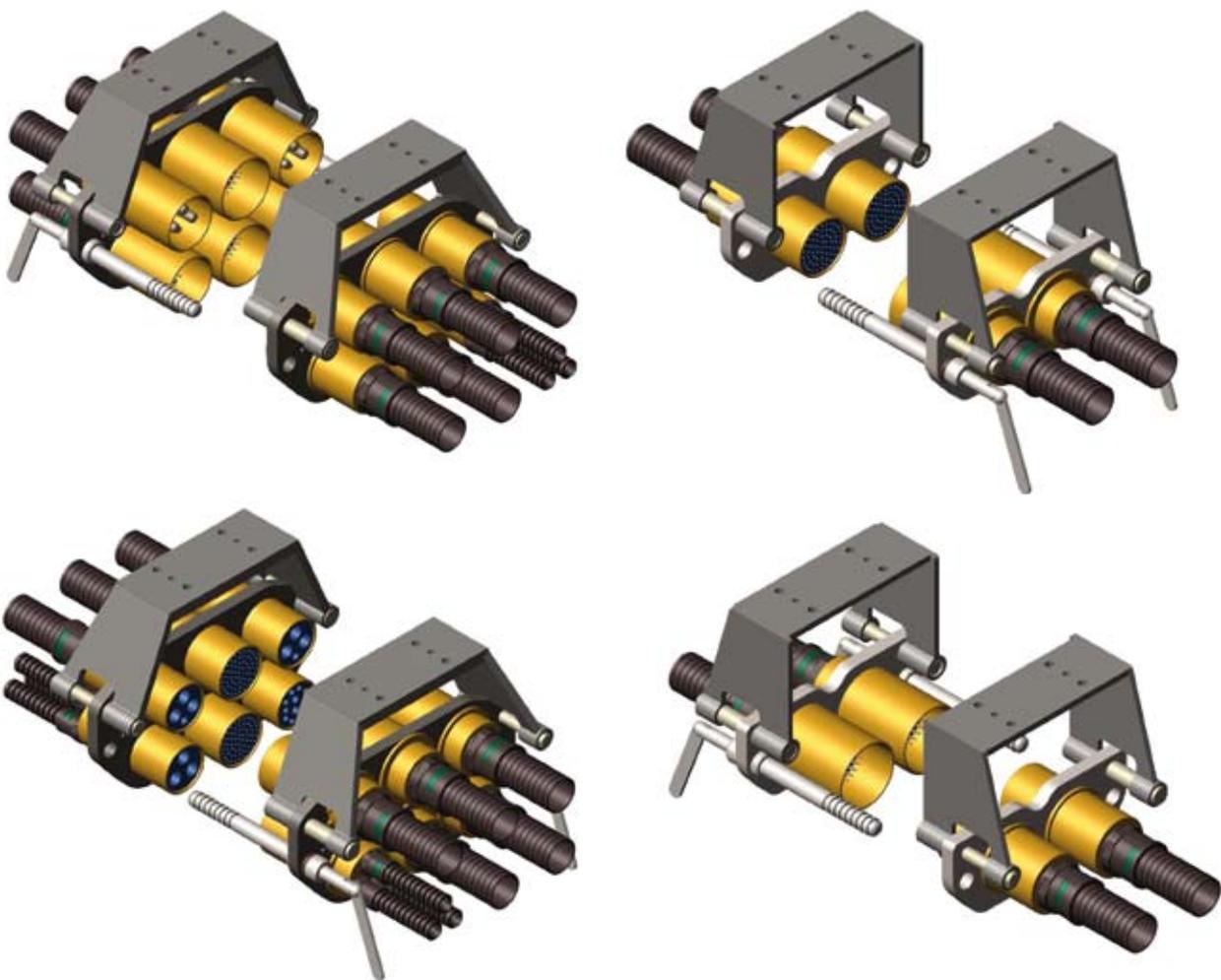
Receptacle Terminations Manufactured to Suit Existing Conditions



Plate couplers

The most recent addition to our inter-car connectors is the patented range of plate couplers. These allow all power, data, communications and safety circuits to be incorporated into the one connector. Each is a separate plug or receptacle module that can be individually replaced without removing the plate coupler from a carriage. The couplers are mounted under carriage draw bars and allow sets to be separated and rejoined in a matter of moments. They can operate under their design electrical loads while being fully submerged in water.

New Macey plate couplers were used in the Outer Suburban Carriages built for RailCorp by United Group Rail. These proved to be reliable and met the customer's requirements for quick and safe inter-car coupling.



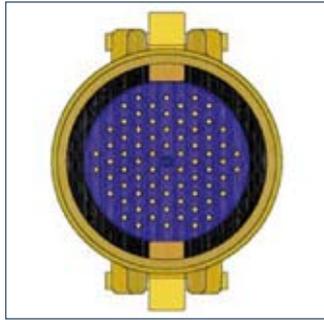
Variations of Outer Suburban Plate Couplers





Communications plugs

The Camlock technology can be used to connect communications circuits between carriages. The number of pins and sockets can be varied to between two and seventy, depending on the needs of the rail customer. Receptacles can be provided with hinged or loose covers and parking receptacles are supplied for hard wired jumpers.



Various Multi Pin Communication Connectors

Shore supplies

The company manufactures normal shore supply leads and motorised retractable shore supply units for use in railway workshops and maintenance facilities. The latter ensure that trip hazards are reduced by automatically retracting power leads when they are not being used.

The units have warning lights for in-service operation, overload protection, electronic monitoring equipment to measure voltages, currents, power factors, power consumption, etc.

A further innovation was the development of a poly-urethane plug and socket that disconnects if a train drives out still connected to a shore supply lead. Just like in a petrol station, such things should never occur – but they do!



Retractable Shore Supply Installation

Refurbished jumper cables

We provide all types of new and refurbished jumpers, including 27 pin MU jumpers for locomotives, starter jumpers, fully sealed 44 pin communications jumpers, inter-car designs based on old British mining plugs, etc. Whatever your needs, we will design a customised solution.



XPT and MU Locomotive Jumper Cables



Old and New Style 44 Pin Communication Jumper Cables





Industry experience

Moulded New Macey plugs have now been in continuous service for more than seven years. Electrical engineers have been impressed with their robust and reliable performance.

Companies that have used our plugs include:

- Ampcontrol
- BP
- BHP Billiton
- Bombardier
- Downer EDI
- ITT Flygt
- KTMB Malaysia
- Lithgow Cable Repairs
- MainTrain
- Minera Alumbraera
- NSW State Rail Authority
- Pacific National
- RailCorp
- Rio Tinto
- Shell
- Thiess
- United Group Rail

One of the reasons for the developing popularity of New Macey plugs is their streamlined and lightweight design. This, coupled with their patented use of reinforced resin to fully seal components, gives superior performance under harsh operating conditions.



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