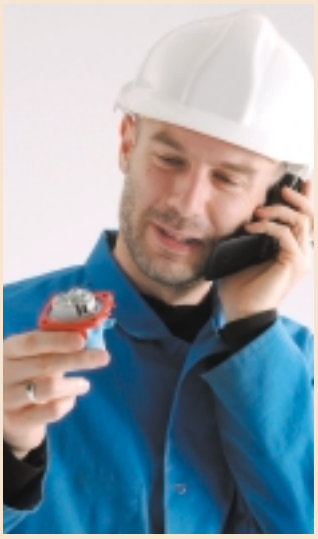
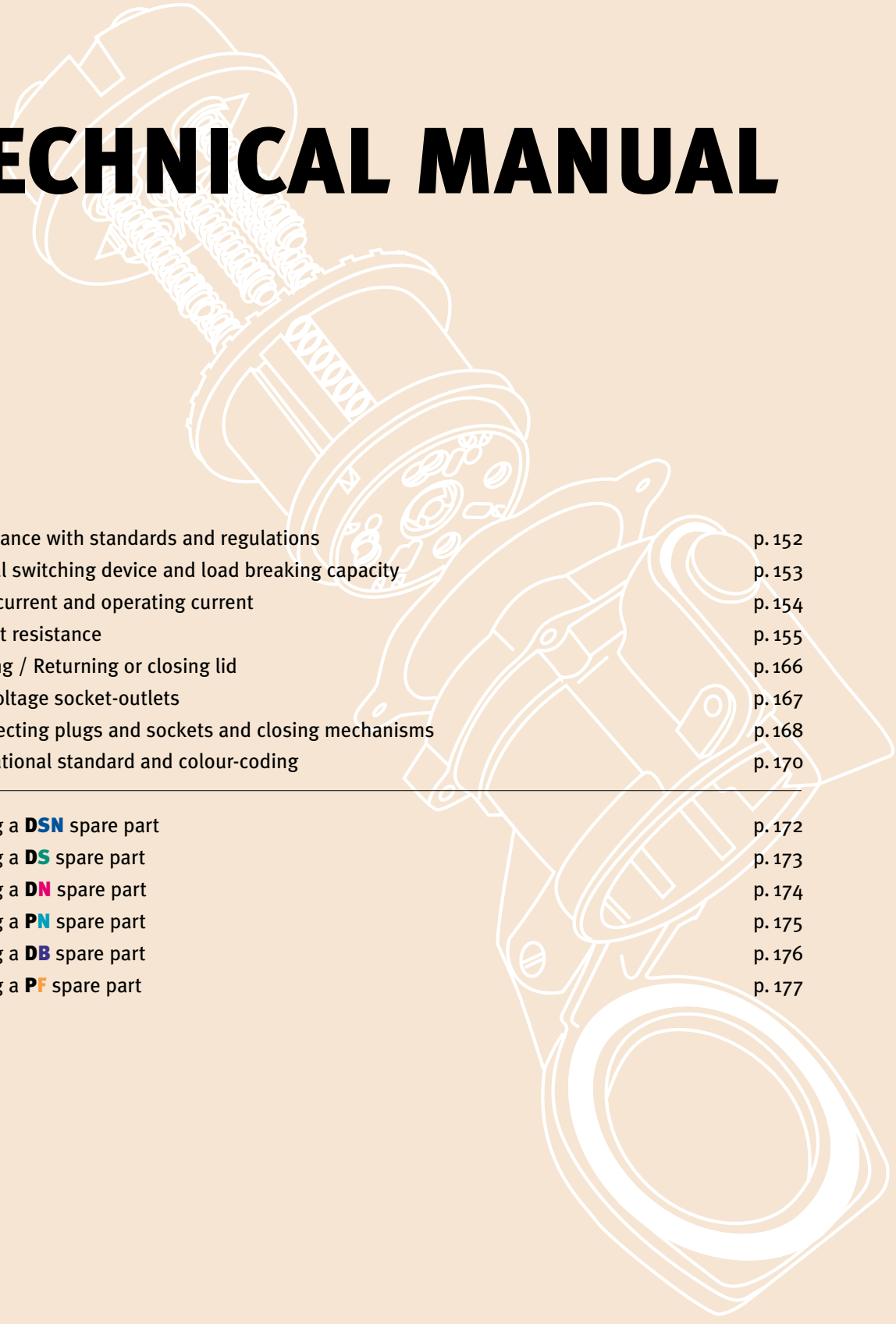
Welcome to the MARECHAL ELECTRIC Technical Manual!



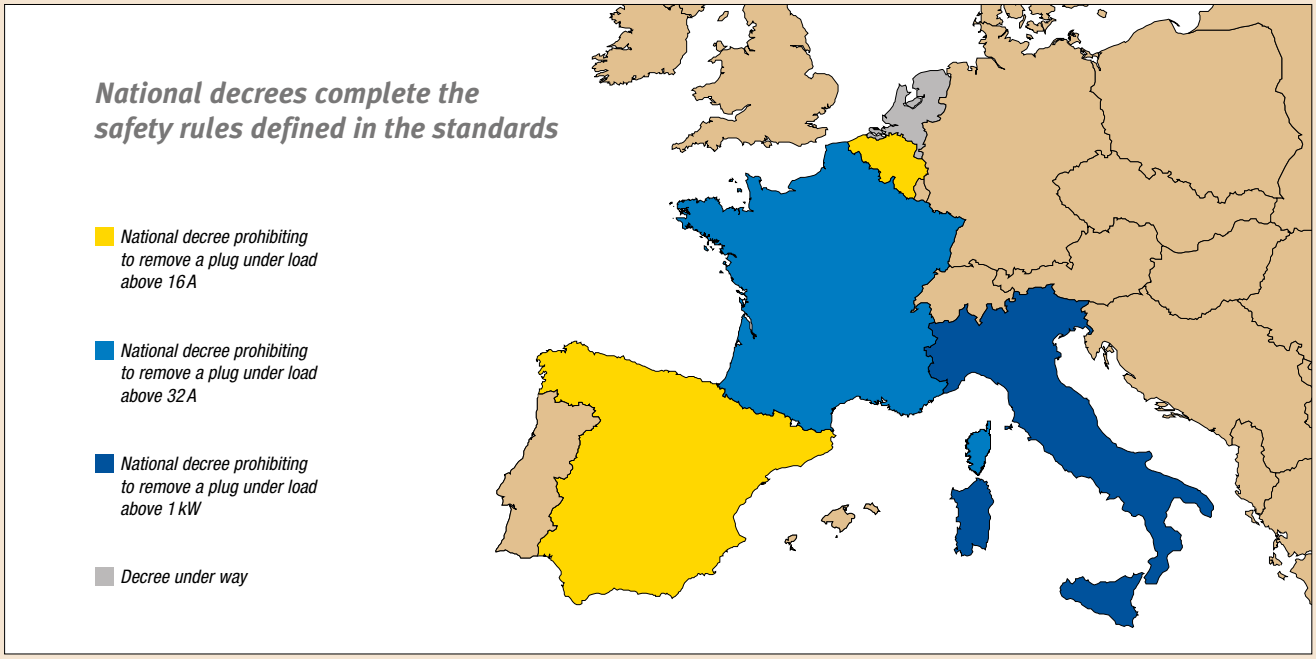
Do you need a spare part?

You will find from pages 172 to 177 all the forms you need to order Marechal spare parts.

TECHNICAL MANUAL



Compliance with the European standards and decrees



Maréchal decontactors are industrial plugs and socket-outlets using the silver-nickel butt-contacts instead of the brass sliding pins and sleeves. Thanks to this butt-contact used for the switches, Maréchal decontactors are used not only to carry currents, but also to make and break currents.

Decontactors are defined in clause 2.8 of the standard IEC / EN 60309-1 as plugs and socket-outlets with an integral switching device.

MARECHAL ELECTRIC's products are not concerned by the standard IEC / EN 60309-2. That standard comes from EEC publication 17 issued in 1953, and defines for manufacturers of industrial plugs and socket-outlets using cylindric pin and sleeves the dimensional requirements to sell interchangeable products.

Maréchal decontactors are compliant with all international standards and national decrees: in France, the applicable Standard is the NF EN 60309-1 and the decree N° 88-1056 dated November 14, 1988.

In Europe and many other countries the applicable standard to plugs and socket-outlets for industrial purposes is the IEC / EN 60309-1standard. That standard sets general requirements whose purpose is to ensure the safety of the users. In order to adjust to brass pin and sleeves products, the IEC / EN 60309-1 standard was amended several times since it was issued.
For instance in 1979:

- Load breaking capacity: the tests are reduced from 50 to 20 operations for currents 63 and 125 A.
- Test currents: the test currents are reduced from 82 to 63 A and from 162 to 125 A.
- Maximum temperature rise after testing for all terminals units are increased from 45°K to 50°K.

And in 1988:

- Temperature rise tests are no longer conducted with the full product that was tested, they are done with the tested socket-outlet and a new plug.

Being aware that the IEC / EN 60309-1 standard was no longer sufficient to garantee the safety of the users in all circumstances, the Labour Department enforced additional safety rules. By law, it is stipulated in clause IV ot the French decree about Worker's protection dated November 14, 1988: "Plugs and socket-outlets, connectors and inlets with a rated current above 32 amperes, may not be separated under load".

The only requirement in Europe for industrial plugs and socket-outlets is the compliance with the European Low Voltage Directive.

For many years, most European countries have passed worker protection laws: royal Belgian decree dated May 7, 2000 requiring the use of plugs and socket-outlets with a load breaking capacity (rated current ≥ 32 A), Italian decree DPR 547 dated 1955 requiring the presence of a breaking device for any load exceeding 1 kW. The general trend in Europe is to consider that a plug and socket-outlet exceeding 16 A – 400 V should not be connected/disconnected under load.

Also see: "Marechal quality label and international standard" (Pages 6 and 7)

Integral switching device and load breaking capacity

Ranges concerned:
DSN, DS, DN and DB.

A plug and socket-outlet is an electric device composed of two elements: a socket-outlet and a plug. Connecting a plug into a socket-outlet closes the circuit; withdrawing the plug from the socket-outlet opens the circuit.

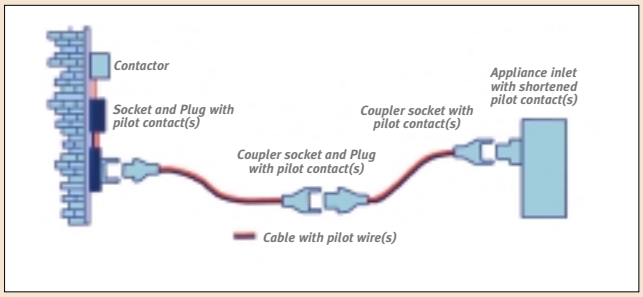
European and international standards have defined a minimal level of load breaking capacity. By the law, above 32 A in France or 1 Kw in Italy (5 A – 230 V) plugs and socket-outlets using pin and sleeves which have by construction no load breaking capacity, must be mechanically or electrically combined with a switch or a contactor.

As industrial plugs and socket-outlets have the particularity of carrying currents and voltages generally well above those used in domestic plugs and socket-outlets; i. e. to create an electric arc dangerous for the user when the plug is withdrawn from the socket-outlet, MARECHAL ELECTRIC has designed the DECONTACTOR™ which is a plug and socket-outlet with an integral switching device defined in IEC 60309-1 (international standard for industrial plugs and socket-outlets purposes) clause 2.8. A simple press on the button located on the socket-outlet ejects the plug to its parked position.

This integral switching device is possible because of the use of butt-style pressure contacts with silver-nickel tips already used in all other breaking devices (switches, contactors...). Decontactors have a load beaking capacity of AC 22, AC 23 and AC 3 according to the IEC 60947-3 standard (international standard for Air-break switches).

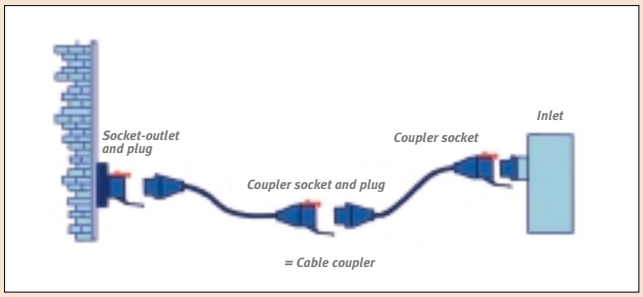
The user is consequently always guaranteed to withdraw the mobile part (plug or coupler socket) in complete safety, as the circuit is already dead.

Compliance with regulations for plugs and socket-outlets using pin and sleeves



Plugs and socket-outlets using pin and sleeves are mere isolators as, by design, they have no load breaking capacity. They are dangerous because of their possibility of opening an electric circuit whereas they are not designed for that. By law, they must be mechanically or electrically combined with a switch or a contactor.

Compliance with regulations for Maréchal decontactors



Thanks to an integral switching device, Maréchal wall socket-outlets and cable couplers are compliant with the decrees without any need to wire pilot cable all along the installation.

Maréchal cable couplers are compact and light, due to the absence of pilot wires.

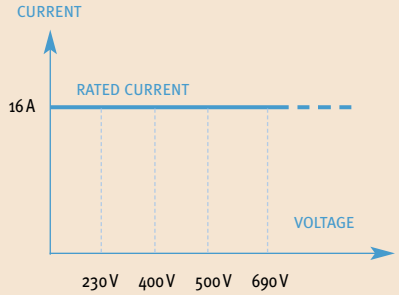
Also see: "Contact technology" (Page 155)

Rated current and operating current

Rated current

According to the IEC / EN 60309-1 standard, after a serie of tests, a plug and socket-outlet must have one single operating current, whatever its operating voltage. That current is called the rated current and corresponds to a fixed current.

Rated current is the current that plugs and socket-outlets can carry on a permanent basis, after testing, without their terminals having a temperature rise beyond 50°C.



The IEC / EN 60309-1 standard offers 6 currents: 16 / 20, 32, 63, 125 and 250 A and lets manufacturers free to use other rated currents.

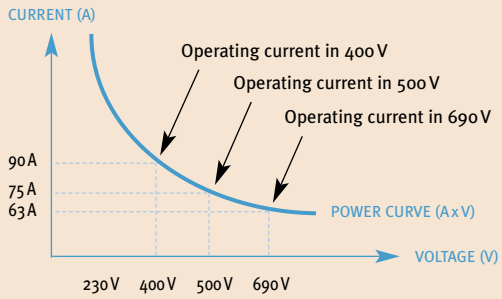
Because of the significant differences between such currents and users applications, Maréchal decontactors offer four intermediate rated currents: 30, 50, 90 and 150 A.

Rated currents	Maréchal decontactors			
16/20 A	DSN1	-	DN8	DXN1
30 A	-	DS1	DN1	-
32 A	DSN3	-	-	DXN3
50 A	-	DS3	DN3	-
60 A	-	-	-	DXN6
63 A	DSN6	-	-	DXN6
90 A	-	DS6	DN6	-
125 A	-	-	-	DX100
150 A	-	DS9	DN9	-
250 A	-	DS2	-	-

Operating currents

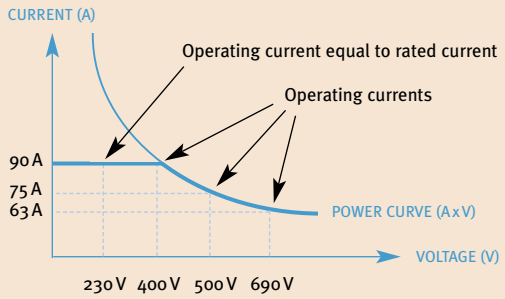
Thanks to an integral switching device, decontactors can make and break under load according to the IEC / EN 60309-1 standard *(for industrial plugs and socket-outlets purposes)* and to the IEC / EN 60947-3 *(for air-break switches)*.

According to the latter standard, a device should have different operating currents depending on its operating voltage.



As they are used as switches, decontactors have operating currents depending on its operating voltage, but, in order to be compliant with the plugs and socket-outlets, such operating currents must not exceed the rated current.

Thus, as a switch, a DECONTACTOR™ with a 90 A rated current, has a 90 A operating current up to 400 V, and operating currents gradually reducing to reach a 63 A value at 690 V: its maximum operating voltage.



Product resistance: temperature rise

Ranges concerned:
decontactors and plugs and socket-outlets

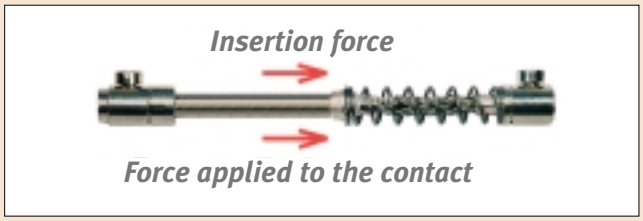
Temperature rise is linked to the overall resistance of the points of contacts in series in a plug and socket-outlet:

- The emitting part terminal *(socket-outlet)*,
- The receiving part terminal *(plug)*,
- The socket-outlet / plug contact interface *(contact technology)*.

Contact technology

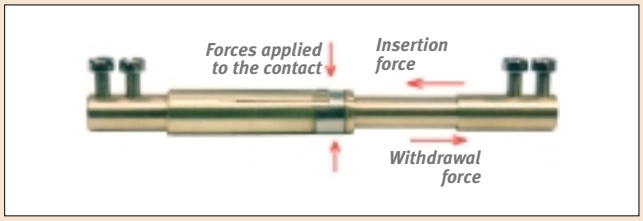
Butt-style pressure contacts and metallic braid

Maréchal contacts are identical to those used for switches and contactors. They use butt-style pressure contacts and metallic braid technology and a defined spring. Force applied to this contact which is generated by compression of this spring is consequently known and remains constant over time even after tens of thousands of operations.



Furthermore, this contact technology combined with ejection springs located in the socket-outlet helps to a quick load break between socket-outlet and plug contact and to separate contacts in individual arc chambers by the required distance to perform isolation.

Butt-style pressure contacts and metallic braid guarantee a perfect quality of contact over time and gives the opportunity to have an integral switching device.



In the case of sliding pin and sleeves contacts, the applied force is generally generated by the resilience of the split sleeve, possibly completed by a spring around the sleeve, which works by flexion (expansion). Given the tolerances, such a spring cannot be accurately rated with precision, and consequently to have a precise control of the minimum value of the applied force is only theorical. Finally the applied force to the contact changing with the number of operation, it is impossible to guarantee a constant contact quality over time.

Silver-nickel contacts tips

MARECHAL ELECTRIC has chosen this material because it combines the outstanding contact performances of silver with the excellent mechanical properties of nickel.

These main performances are:

- low contact resistance when new or aged *(oxidised)* *(see chart)*,
- a mechanical endurance allowing tens of thousands of operations,
- resistance to welding *(static and dynamic)* allowing to withstand perfectly electric arcs,
- closing or opening of a circuit,
- strong post-arc dielectric strength which reduces the average duration of arcs,
- resistance to transfer of metal particles in the arc chambers and the build up of a conductive layer that would deteriorate the dielectric strength.

Silver-nickel contacts tips guarantee a perfect quality of contact over time and gives the opportunity to have an integral switching device.

Material	Contact resistance	
	New	Oxidised
Silver	6 µΩ	25 µΩ
Gold	31 µΩ	31 µΩ
Copper	29 µΩ	400 µΩ
Brass	370 µΩ	1400 µΩ
Silver-Nickel 85/15	**23 µΩ**	**60 µΩ**

Plugs and socket-outlets with pins and sleeves use brass or copper as contact material. Brass has already a significant contact resistance when brand-new, because zinc is a poor conductive material, but when the copper it contains has oxidised, it becomes totally useless. Moreover, brass is not arc resistant, and wears rapidly under friction. Copper has a low contact resistance when brand-new which allows a good contact quality. But, like brass it oxidises at ambient temperature, which increases its contact resistance a lot and decreases consequently its contact quality. Moreover, copper is not arc resistant and does not help a quick extinction of the arc.

Ctd on next page

Product resistance: temperature rise (ctd)

follows the text of previous page

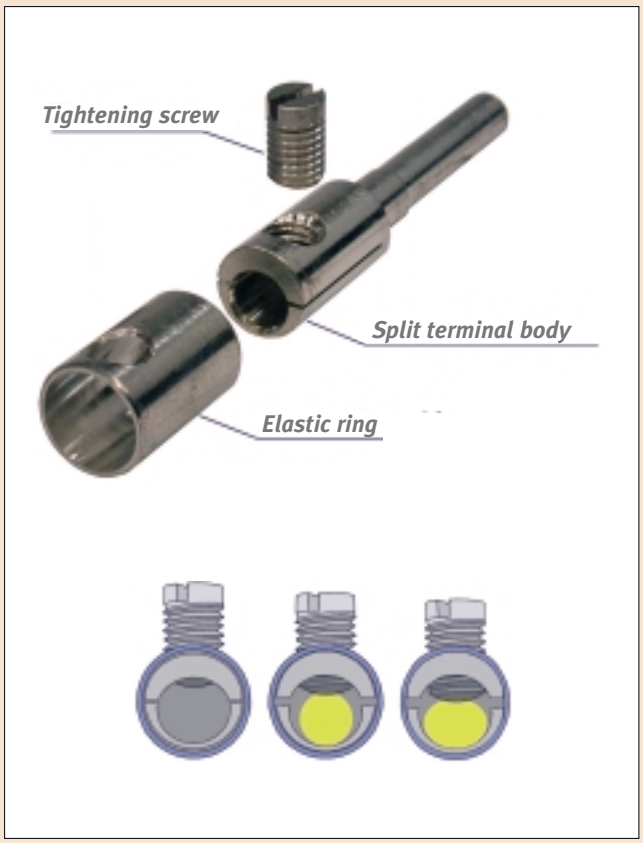
Unloosening of terminal screws

One of the main causes for failure of plugs and socket-outlets is the loosening of their terminal screws.

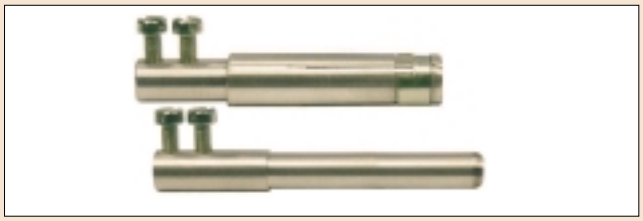
Many factors contribute to this loosening:

- daily rough manipulation,
- vibrations due to machines on which plugs and socket-outlets have been mounted,
- thermal cycles generated by intermittent passage of current,
- settling and moving of multiple thin strands of flexible conductors,
- low resilience of material used for conductors (copper) which yields by a simple thigtening of the connection screw.

MARECHAL ELECTRIC plugs and socket-outlets have a terminal designed to compensate for strand settlement and copper yield. A constant force is applied to the conductor by means of an elliptical deforming ring, around a split terminal body. To prevent damage to the strands, the tightening screw has a smooth head with the largest possible diameter.



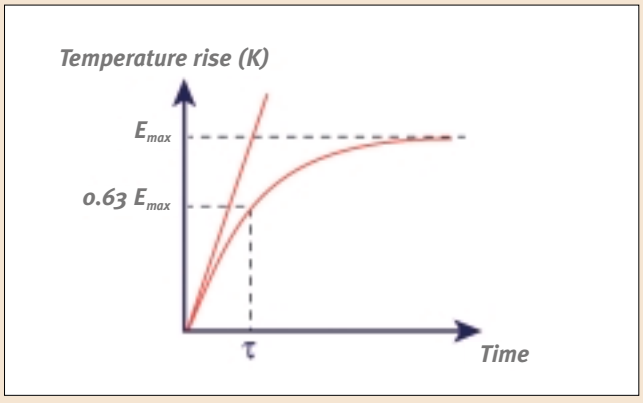
This elastic blocking system also eliminates the risk of loosening under vibrations. In brief, it definitively eliminates checking of the good tightening for connection screws.



Plugs and socket-outlets with pins and sleeves use simple screws for tighten conductors without any unloosening mean. If a regular control of the good tightening for connection screws is not made, it inevitably ends up with a high temperature rise of contacts and consequently the failure of the plug and socket-outlet.

Temperature rise is proportional to the square of the current ($E_{max} = K \times I^2$). Pin and sleeve may function satisfactorily in the domestic environment, where they are oversized anyway, for mechanical reasons. As the current increases, their performance becomes more and more critical.

When a socket supplies a current "I" to an appliance, as its internal resistance is constant, terminals and contacts heat up to reach, after a certain time, a thermal equilibrium. **Thermal equilibrium** depends, of course, on the resistance, and also on the typical construction of the product, its mass and volume, and how the heat generated is dissipated along the conductors and the bodies.



Thermal equilibrium is reached gradually. The slope of the temperature rise curve, function of time (t), determines the time constant (τ) of the product. The **time constant** corresponds to 63% of the thermal equilibrium. Two sockets of the same rating but of different designs do not heat up the same way. Those with a higher contact resistance will reach their thermal equilibrium more rapidly and the slope of their temperature rise

curve will be steeper. **The larger the time constant, the longer the socket takes to reach its thermal equilibrium.**

DECONTACTOR™	Time constant (τ)
DS1 DSN1 DSN3	17 mn
DS3 DSN6	29 mn
DS6 DSN9	35 mn
DS9	53 mn
DS2	60 mn

The major consequence of this rule is that a product with a long time constant can carry significant overloads for a period of time, without overheating.

Thanks to their design and low contact resistance, Maréchal products have long time constants.
Conversely, pin and sleeve, even when brand-new, have short time constants and are totally unable to withstand temporary overloads without excessive temperature rises, well above what their contact material (brass) can withstand.

International standard for plugs and sockets (IEC/EN 60309-1) sets to 50K the maximum temperature rise for the contacts. The reason is that above this limit, brass oxidises in depth and becomes useless.

In other International standards covering products usually fitted with silver alloy contacts (e.g. IEC/EN 60947-3, that deals with air-break switches), the temperature rise is only limited by the need to not to cause damage to adjacent parts, as silver and its alloys retain their electrical properties well above 300°C/570°F.
As Maréchal decontactors and disbreakers refer to the IEC 60309-1 plug and socket standard, this limit of 50K anyhow applies to them but this limit is far less critical.

DECONTACTOR™	Rated current	Temperature rise
DS1	30 A	30 K
DS3	50 A	35 K
DS6	90 A	35 K
DS9	150 A	38 K
DS2	250 A	47 K

Product resistance: mechanical and electrical endurance

Ranges concerned: decontactors

Applicable standard to industrial plugs and socket-outlets is the IEC / EN 60309-1 standard. It defines in clauses 20 and 21, minimum load breaking capacity for products having an integral switching device defined in clause 2.8.

These tests are followed by a temperature rise test (clause 22) in which terminals and contacts must be below 50K and a dielectric strenght test.

Maréchal **products out-performs all these minimum requirements.** In terms of endurance and overload currents, decontactors guarantee 2 to 8 times depending on nominal current what the IEC / EN 60309-1 standard *(plugs and socket-outlets for industrial purposes)* requires. They can withstand without any damage 5 to 8 times their nominal current during 1 minute and also temporary overloads due to starting of motors, pums, fans or priming of spotlights. They also guarantee at least one making and breaking operation at 10 times their nominal current.

In many applications, users need products that out-perform the requirements defined by the standard. For instance a 125 A plug and socket-outlet is required to make and break under load only for 250 operations.

Decontactors performances with 3000 operations are much closer of the real using conditions.

Maréchal *decontactors performances according to standard requirements*

Rated current	Test voltage	Power factor Cos φ	Test current		Number of operations	
			Standard	Maréchal	Standard	Maréchal
10 to 20 A	1.1 Un	0.6	1.25 In	**4 In**	50	50
	Un	0.6	In	In	5000	**10000**
	Un	0.6	/	**10 In**	/	**1**
21 to 29 A	1.1 Un	0.6	1.25 In	**3 In**	50	50
	Un	0.6	In	In	5000	**8000**
	Un	0.6	/	**10 In**	/	**1**
30 to 40 A	1.1 Un	0.6	1.25 In	**3 In**	50	50
	Un	0.6	In	In	1000	**8000**
	Un	0.6	/	**10 In**	/	**1**
41 to 59 A	1.1 Un	0.6	1.25 In	**2 In**	50	50
	Un	0.6	In	In	1000	**5000**
	Un	0.6	/	**10 In**	/	**1**
60 to 70 A	1.1 Un	0.6	1.25 In	**2 In**	20	**50**
	Un	0.6	In	In	1000	**5000**
	Un	0.6	/	**10 In**	/	**1**
71 to 99 A	1.1 Un	0.6	1.25 In	1.5 In	20	**50**
	Un	0.6	In	In	1000	**3000**
	Un	0.6	/	**10 In**	/	**1**
100 to 125 A	1.1 Un	0.7	1.25 In	**1.5 In**	20	**50**
	Un	0.7	In	In	250	**3000**
	Un	0.7	/	**10 In**	/	**1**
126 to 199 A	1.1 Un	0.7	1.25 In	1.25 In	20	**50**
	Un	0.7	In	In	250	**500**
	Un	0.7	/	**10 In**	/	**1**
200 to 250 A	1.1 Un	0.8	1.25 In	1.25 In	10	**50**
	Un	0.8	In	In	125	**500**
	Un	0.8	/	**10 In**	/	**1**
Temperature rise < 50 K						

Product resistance: overload conditions

Ranges concerned:
decontactors for starting motors

A typical cause for temporary overload is when a motor starts up, or restarts, when, for a short time, the current is several times higher than its rated full load current *(In)*.

Type of starter	Current coefficient
Direct	5 to 7 In
Star-delta	2.5 In
Statoric	3 to 4 In
Rotoric	1 to 2 In

As we know, for each accessory:

- the temperature rise corresponding to its permanent load,
- its time constant,

it is easy to calculate the temperature it will reach for a given current after a given time. As the **time constant** of decontactors is long, we may either use the exact formula *(example 1)*, or the formula of the initial tangent to the curve instead of the curve itself *(example 2)* to calculate the **temperature rise**.

EXAMPLE 1

For instance, a DS6 heats by 35 K after 35 minutes under a load of 90 A, so what will the temperature rise be with an overload of 450 A for 1 minute?

The thermal equilibrium for 450 A will be:

$$35 \times \frac{450^2}{90^2} = 875\ K$$

After 1 minute the temperature rise will be:

$$875 \times 1 - \frac{1}{e^{1/35}} = 25\ K$$

Which is negligible. For a load of 630 A for 1 minute, the temperature rise would be 49.1 K.

EXAMPLE 2

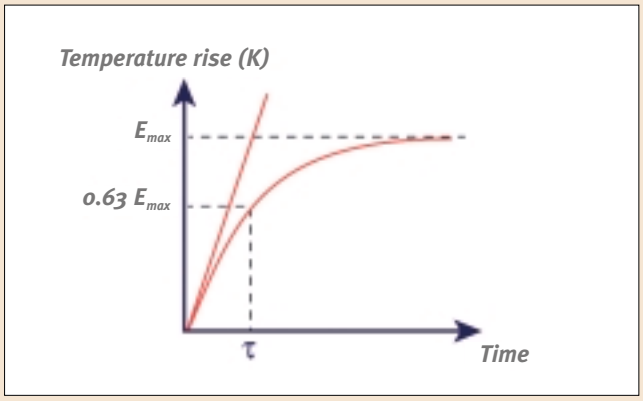
With a permanent load of 16 A, a DS1 heats up by 8.5°. With an overload of 160 A, the temperature rise at thermal equilibrium would be:

$$8.5 \times (160/16)^2 = 850\ K$$

As its time constant is 17 minutes, its temperature rise after 1 minute will be:

$$850 / 17 = 50\ K$$

All Maréchal products can withstand temporary overloads due to starting or frequent restarting of motors, pumps or fans *(that generate among the longest overload times)*, without any damage. It is obvious that conventional brass pin and sleeve with short time constants, reach their thermal equilibrium very quickly and are unable to withstand these over-loads without heavily oxidising the contacts, welding and becoming completely useless.



Short-circuits: withstand and close-on tests

Ranges concerned: decontactors

Although electrical installation are now designed to minimise potential short-circuit currents, they may, anyhow, reach 10 to 100 times the nominal current of a socket.

When we mention short-circuits, we must consider two cases:

- The one which occurs when the contacts are closed
- And the other when a plug is introduced into a socket, when there is a faulty cable or defective appliance

The latter is likely to have disastrous consequences because of the arc that occurs when the plug is about to mate with the socket. The mating is gradual and under the arc, the brass sleeve, made of a thin wall of soft metal, disintegrates, producing gases loaded with conductive metallic oxides. As the sleeve disintegrates, the contact never completely closes and the metallic oxides merge and create a phase-to-phase or phase-to-ground short-circuit inside the socket which may explode. As the connection is never completely made, arc resistance and flowing currents may not be large enough to trip in time the upward protection.

Tests have been carried out according to North American standards to check the behaviour of our accessories under short-circuit conditions. These tests have been carried out in conditions of unfavourable circuit protection, using time fuses rated at 21/2 to 4 times the rating of the socket. Depending on the product range, all the accessories passed both the withstand, and closing (make) tests for short-circuits with currents of 10,000 to 200,000 A.

The butt contact closes immediately when the two solid metal parts touch - the current flows and the protection trips. Circuit-breakers are the best illustration of the suitability of this design.

To our knowledge, the DECONTACTOR™ is the only product in the world capable of offering total security when closing on a fault.

10 kA withstand and close-on tests:

DECONTACTOR™	Fuse type	Power factor and voltage
DS1	TSR80R 80 A delayed fuse	Cos φ 0.49 - 600 V AC
DS3	TRS125R 125 A delayed fuse	Cos φ 0.49 - 600 V AC
DS6	TRS250R 250 A delayed fuse	Cos φ 0.49 - 600 V AC
DS9	TRS400R 400 A delayed fuse	Cos φ 0.49 - 600 V AC
DS2	TRS600R 600 A delayed fuse	Cos φ 0.49 - 600 V AC
DB3	90 A fuse	Cos φ 0.50 - 600 V AC
DB6	ESCA175 175 A fuse	Cos φ 0.50 - 600 V AC
DB9	ESCA350 350 A fuse	Cos φ 0.40 - 250 V AC
DSN1	TRS80R 80 A delayed fuse	Cos φ 0.49 - 480 V AC
DSN3	TRS125R 125 A delayed fuse	Cos φ 0.49 - 600 V AC
DSN6	TRS250R 250 A delayed fuse	Cos φ 0.49 - 600 V AC

100 kA withstand and close-on tests:

DECONTACTOR™	Current	Power factor and voltage
DS6	100 kA avec fusible URL60	Cos φ 0.20 - 600 V AC

200 kA withstand and close-on tests:

DECONTACTOR™	Current	Power factor and voltage
DB3	212 kA avec fusible ESCA 60 A	Cos φ 0.20 - 600 V AC
DB6	212 kA avec fusible ESCA 125 A	Cos φ 0.20 - 600 V AC
DB9	212 kA avec fusible ESCA 125 A	Cos φ 0.20 - 600 V AC

Resistance to the climatic conditions and harsh environments

Ranges concerned: see below

Sold throughout the world, Maréchal products end up in many different climatic conditions, from Antarctic pole bases, to equatorial environment, and from high altitude sky observatories down to below 1000 m diamond mines.

All parts susceptible to rusting have been eliminated: all products resist saline environment. Materials used have generally an exceptional resistance to the most common chemical agents. Anyhow, given the very large number of chemical in use in various industries, we suggest, in case of doubt, to leave samples of our product in the considered environment for the necessary length of time, to control their resistance.

Polymeric materials

Casings

Ranges concerned: DS1-DS3-DS6
DS9-DS7C3-DS24C
DSN24C-DS37C-DSN37C
DXN-DSN-DN8

Made of a special compound of thermoplastic polyester, fibreglass and elastomere, specially developed for Marechal. It provides an outstanding resistance to most chemical agents and environmental conditions, including UV and Gamma rays. This material also offers a great resistance to impacts (shock resistance IK08) in a broad spectrum of temperatures. The basic material our blend is made of is known as PBT or PBTP (Poly Buthylene Tere Phthalate).

Installation accessories

Wall boxes, inclined sleeves and handles are in polyamide and are supplied with self-drilling screws in brass.

Interiors

Breaking chambers are made of Melamine or of a special compound of thermoplastic polyester, fibre glass and elastomere. Other materials are used such as Polyamide, Bakelite, etc.

Metal materials

Casings

Ranges concerned: PN HT, PF in aluminium and PN, DN, DS and DB in zamak. The materials used are treated anti-corrosive and provides an outstanding resistance to most chemicals agents and environmental conditions. These materials also offer a great resistance to impacts over a broad spectrum of temperatures *(shock resistance IK 09)*.

Products	Material	Socket-outlet	Inlet
DS1 DS9 DS2 DS7C3			
DS7C9 DB			
DN8 DN1 DN3 DN6	Zamak	Epoxy	Anti-corrosive
DN9 DN9C DN20C		paint	treatment
PN PN7C PN12C			
PN (HT)	Aluminium		
PX DX PF_Q PF_C	alloy		

Installation accessories

Wall boxes, inclined sleeves and handles are in zamak or in aluminium alloy. Boxes are made of cast iron or in aluminium alloy. All zamak accessories can be supplied with an epoxy paint protection.

In standard, all the accessories in zamak may be protected by an epoxy paint.

Contacts

All our contacts are made of silver-nickel or of solid pure silver (PF, CS and CCH), both resist to all climatic conditions, as well as to all known chemical agents found in the industry with one exception: Sulphuric acid. Products installed in sulphuric acid environment with significant concentration should then have an IP rating of at least 66, and have their contacts coated with a 5µ layer of gold. To obtain this layer of gold just add suffix 08 to your part number (socket-outlet and inlet).

The tremendous advantage of silver and silver alloy contacts over any other material is that they retain exceptional performances over time, even in very harsh and corrosive environments. Their properties are maintained well above 300°C.

Ctd on next page ···⁘

Resistance to the climatic conditions and harsh environments (ctd)

follows the text of previous page

Resistance of polymeric casings to various chemical agents

		Polyester reinforced glass fibre			Polyamide		
Agent		**23°C**	**60°C**	**80°C**	**23°C**	**60°C**	**80°C**
Butyl acetate		++	++		++		
Ethyl acetate		+			++		
Acetone		+			++		
Acetic acid	5%	++	++	+	+	+	-
	10%	++	+	+	+	-	-
Hydrochloric acid	10%	++	++	++	+	-	-
Chromic acid	40%	++	++	++	-	-	
Citric acid	10%	++	++	++	+		
Formic acid	5%	++	+	+	+	+	
Nitric acid	10%	++	+	+	+	-	
Oleic acid	100%	++	++	++	+		
Phosphoric acid	3%	++	++	++	+		
	30%	++	++	++	-	-	
	85% (conc)	++	++	++	-	-	
Sulphuric acid	3%	++	++	++	-	-	
	30%	++	++	++	-	-	
Ethyl alcohol		++			++		
Methyl alcohol		++			++		
Aniline		++			-		
Benzene		+	+		++		
Soda bicarbonate	10%	++	+	-	++	++	+
Potassium bichromate	10%	++			++		
Sodium bisulphate	10%	++	+	-	++	+	
Butane		++			++		
Butanol		+	+		+		
Soda carbonate	10%	++	-	-	++	++	+
	20%	++	-	-	++	+	+
Disulphuric carbonate		++			++		
Calcium chloride	10%	++	++		++		
Potassium chloride	10%	++	+	-	++		
Sodium chloride	10%	++	+	-	++		
Detergents	1%	++	+	-	++	+	
	25%	++	+	-	++	+	
Dibutylphtalate		++	++		++		
Dichlorethane		-			++		
Dioxane		++	-		++		
Water		++	+	-	++	++	+
Bleach		++	+		++		
Gas		++			++		
Turpentine		++			++		
White spirit		++			++		
Ether		++			++		

		Polyester reinforced glass fibre			Polyamide		
Agent		**23°C**	**60°C**	**80°C**	**23°C**	**60°C**	**80°C**
Freon 11		++			++		
Glycerine		+	+		++	+	-
Glycol		+	+		++	+	-
Grease		++	++	++	++	++	++
Heptane		++			++		
Hexane		++			++		
Cotton seed oil		++	++	++	++	++	++
Silicon oil		++	++	++	++	++	++
Processing oil		++	++	++	++	++	++
Diesel oil		++			++		
Olive oil		++	++	++	++	++	++
Mineral oil		++	++	++	++	++	++
Engine oil		++	++	++	++	++	++
Plant oil		++	++	++	++	++	++
Ammonium hydroxide	10%	+			++		
	conc	-			++		
Potassium hydroxide	1%	-	-	-	++		
	10%	-	-	-	++		
Sodium hydroxide	1%	-	-	-	++		
	10%	-	-	-	++		
Calcium hypochlorite		++	++		++		
Sodium hypochlorite	10%	++	+	-	-		
Isopropanol		+	+		+		
Braking liquid		++	++	++	++		
Methylethycetone		++	+		++		
Perchlorethylene		++	++		++	+	-
Potassium permanganate	10%	++			-		
Oil		++			++		
Hydrogen peroxide	3%	++			-		
	30%	++			-		
Soap solution	1%	++	-	-	++		
Carbon tetrachloride		++			++		
Tetrahydrofurane		+			+		
Toluene		++			++		
Trichlorethylene		+			++	+	+
Vaseline		++	++	++	++	++	++
Xylene		++			++		

Legend : ++ = Excellent + = Good - = Poor

Resistance of metal casings to corrosive agents

Agent	Bare Zamak	Protected Zamak or aluminium
Dry lighting gas	++	++
Water steam	-	+
Hot water	-	+
Artificial sea water	-	+
Soluble oil 3%	+	+
Soluble oil 5%	++	++
Cleansing soap	++	++
Potash solution 1%	+	+
Potash solution 5%	+	+
Ammonia 1%	+	+
Ammonia 5%	+	+
Sodium chloride 1%	+	+
Sodium chloride 5%	+	+
Acetic acid 1%	+	+
Acetic acid 5%	-	-
Gas	++	++
Engine oil	++	++
Printing ink	+	+
Ethyl or methyl alcohol	++	++
Trichloethylene	+	+
Dry insecticides	+	+

Legend : ++ = Excellent + = Good - = Poor

Temperatures

Ranges concerned:
plugs and socket-outlets and decontactors

All Maréchal plugs and sockets, Decontactors can be used with no particular precaution from -25°C to +40°C / -13°F to +104°F.

Between +40°C/104°F and +60°C/140°F, we recommend to de-rate their nominal current by 1.5 % per degree C° of ambient temperature above 40°C or 0.84% per °F of ambient temperature above 104°F. A product with a nominal current of 63 A used in an ambient temperature of 50°C/122°F must be de-rated to:

50 - 40 = 10°C 122 - 104 = 18°F

10 x 1.5% = 15% 18 x 0.84% = 15%

63 - 15% = 63 x (1 - 0.15) = 53 A

Some products that do not contain any polyamide can operate up to 80°C/175°F, but precise conditions and duty cycles must be submitted to the technical department for approval.

Below -25°C/-13°F, materials become more brittle, and polyamide must be excluded. Metal and polyester casings can be used as low as -40°C/-40°F.

With all due precautions, some of our products are even in service at -60°C/-76°F, in drying tunnels.

A limited range of products is available for ambient temperatures up to +240°C/465°F.

Range	I_n	Maximum number of contacts	Material	Maximum ambiant temperature	U_{max}
DN9C HT	25 A	8P+T/9P	Zamak / Teflon	135°C	415 V
PN7C HT	25 A	6P+T	Aluminium / Teflon	185°C	50 V
PN HT	30 A	3P+N+T	Aluminium / Teflon	185°C *	500 V
DN7C3 HT	50 A	6P+T	Zamak / Teflon	135°C	415 V
DN7C6 HT	90 A	6P+T	Zamak / Teflon	135°C	415 V

** 240°C version available on request*

Mechanical resistance *(IK ratings)*

Ranges concerned:
all

Maréchal product resistance to shocks conditions is specified in accordance with the IK ratings.

IEC/EN 50102 "IK ratings"

	Protection against mechanical shocks
00	No protection
01	= 0.,15 Joule
02	= 0.20 Joule
03	= 0.35 Joule
04	= 0.50 Joule
05	= 0.70 Joule
06	= 1 Joule
07	= 2 Joules
08	= 5 Joules
09	= 10 Joules
10	= 20 Joules

Polymeric products

PN, DS, DN and DSN series *(IK08)* are made of a special compound of thermoplastic polyester, fibreglass and elastomere, specially developed for Marechal. It provides an outstanding resistance to most chemical agents and environmental conditions, including UV and Gamma rays. This material also offers a great resistance to impacts in a broad spectrum of temperatures. The basic material our blend is made of is known as PBT or PBTP *(Poly Buthylene Tere Phthalate)*.

Metal products

Metal products are made of the following materials:

Product	Part	IK	Materialè
PF	Socket-outlet	10	Aluminium AS13
	Plug	10	Aluminium AS13
DN PN DS DB	Socket-outlet	09	Zamak 5 + blue epoxy coat
	Plug	09	Zamak 5 + protection

Watertightness levels *(IP ratings)*

Ranges concerned: all

Maréchal product resistance to dusty and wet conditions is specified in accordance with the IP ratings.

DSN are resistant to high pressure washing: 80°C, 80 bars.

DSN, DXN, PF and PN have an IP66+67 rating in standard. They can withstand both to powerful jetting water from any direction and temporary submersion without any harmful water ingress. DB has an IP67 in standard. Note that an IP67 product has not necessarily an IP65 or IP66 rating due to the difference in the tests involved.

Other products have a standard IP54 or IP55. Anyhow, when sockets face upwards in normal operation, such as in assemblies like inclined appliance inlets with trailing sockets, rain water may well then run down alongside the inlet body, right into the socket. It is then advised to select an optional IP rating of at least IP66, or assemble the unit in such a way that the socket always faces down *(inlet facing up)* as shown.

The IP seal of the watertight sockets does not allow the proper, complete automatic closing of the cover. Sockets with IP66 or 67 are all supplied with a lid sprung opened, unless otherwise specified.

IEC/EN 60529 "IP ratings"

First digit			Second digit	
Protection against the ingress of solid foreign objects and access to hazardous parts			Protection against the ingress of water with harmful effects	
0	No protection		**0**	No protection
1	≥ 50 mm	Back of hand	**1**	Vertically dripping water (condensation)
2	≥ 12.5 mm	Finger	**2**	Dripping water at 15°
3	≥ 2.5 mm	Tool	**3**	Spraying water at 60° (rain)
4	≥ 1 mm	Wire	**4**	Splashing water from any direction
5	Against dust	Wire	**5**	Jetting water from any direction
6	Dust-tight	Wire	**6**	Powerful jetting water from any direction
-			**7**	Temporary submersion
			8	Long-term submersion

IP standard for Maréchal products

Product	IP (Socket-outlet alone)	IP (Socket-outlet +plug)
DSN DXN PN PF	66 + 67	66 + 67
DB	67	67
DN	55	54
DS	55	54
DX	65	65
PX	65	65
CS	-	45
CCH	-	45

Opening / Returning or closing lid

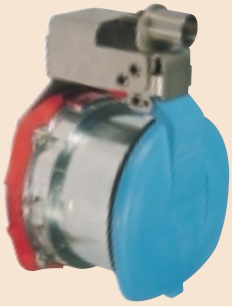
Ranges concerned:
decontactors and plugs and socket-outlets

Self-opening lid, self-closing lid, self-returning lid ...
Each device offers both advantages and disadvantages.
The following chart provides keys for choosing the optional feature you need.

1- Lid closed on DSN socket-outlet (IP66/67)

2- Self-returning lid on PN socket-outlet (IP66/67 with a manual closing of the lid)

3- Self- closing lid on PN socket-outlet (IP54)



4- Self-closing lid on DS inlet (IP55)

	Advantages / Disadvantages
1- Socket-outlet with self-opening lid (standard on: **DSN DS DN DB PN DXN**)	
The lid remains open (up to 180° optional) when the plug is inserted in the socket-outlet.	**Plug insertion is easier.**
The lid remains open after the removal of the plug from the socket-outlet. Manual closing of the lid …	**… allows to achieve a maximum IP.**
2- Socket-outlet with self-returning lid (optional on: **DSN DS DN PN DXN**)	
When the plug is inserted in the socket-outlet …	… the lid prevents the plug insertion.
When the plug is connected in the socket-outlet, the lid remains stuck to the plug.	**The plug and socket protrusion is reduced.**
The lid self-returns after the removal of the plug from the socket-outlet.	The lid must be pressed manually.
Manual closing of the lid…	**… allows to achieve a maximum IP.**
3- Socket-outlet with self-closing lid (standard on: **DSN1 PN**)	
When the plug is inserted in the socket-outlet …	… the lids prevents the plug insertion.
When the plug is connected in the socket-outlet, the lid remains stuck to the plug.	**The plug and socket protrusion is reduced.**
The lid self closes after the removal of the plug from the socket-outlet.	**The lid does not need to be pressed.**
The self-closing lid …	… does not provide a maximum IP.
4- Inlet with self-closing lid (optional on: **DSN DS***)	
When the coupler socket is inserted in the inlet…	… the lid prevents the coupler socket insertion.
When the coupler socket is connected in the inlet, the lid remains stuck to the coupler socket.	**The plug and socket protusion is reduced.**
The lid self-closes after the removal of the coupler socket from the inlet.	**The lid does not need to be pressed.**
The self-closing lid…	… does not provide a maximum IP.

* for **DSN1** and **DS2**, please consult us.

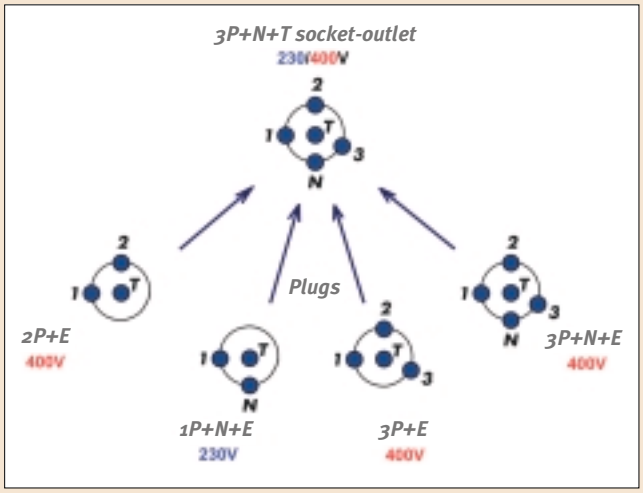
Dual voltage socket-outlet

Ranges concerned:
PN plug and socket-outlet and decontactors

In a three-phase + neutral + earth 400 V distribution system, a 230 V line voltage is available between any of the phases and the neutral.

Thanks to its particular design, a three-phase + neutral 230 / 400 V socket-outlet can receive 4 different plugs, that are electrically compatible:

- a 2P+E 400 V plug
- a 1P+N+E 230 V plug
- a 3P+E 400 V plug
- a 3P+N+E 400 V plug

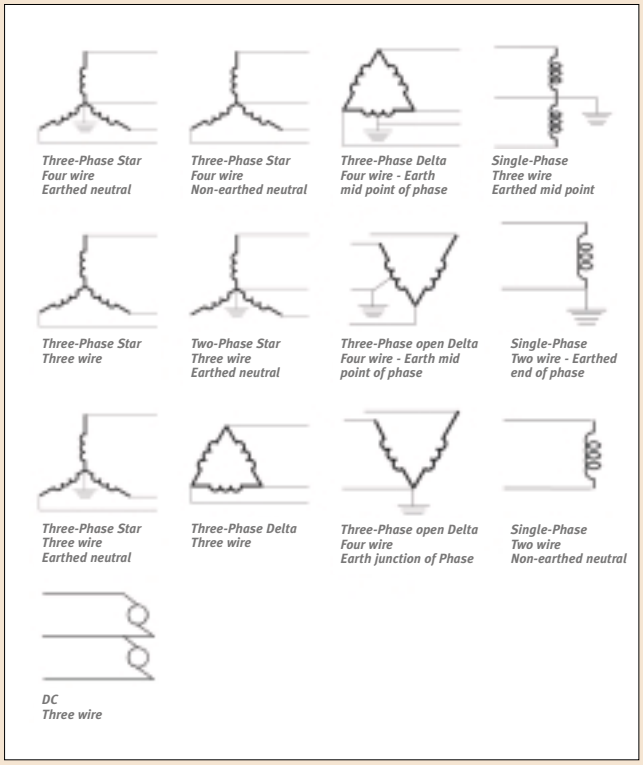


Moreover, the 1P+N+E 230 V plug will also connect to a dedicated 230 V, 1P+N+E socket-outlet as well as to a 230 V, 3P+E socket-outlet.

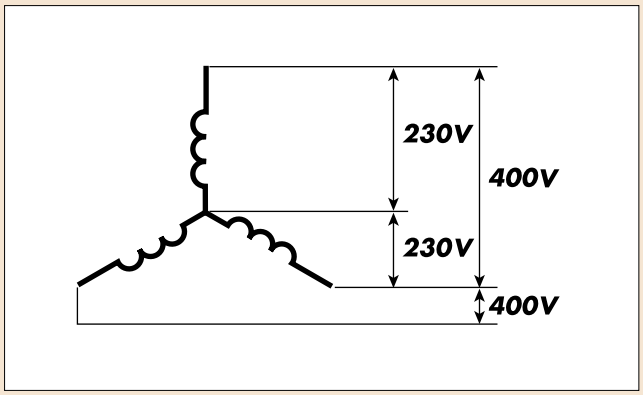
For this particular reason 3P+N+E socket-outlets are fitted with dual colour coding rings and voltage stickers:

- Yellow / Blue for 127 / 230 V
- Blue / Red for 230 / 400 V
- Red / Black for 400 / 690 V

Having two voltages delivered by a single socket-outlet allows to reduce significantly the number of sockets that need to be installed.



Power supplies



Various voltages in a three-phase + neutral + earth 400 V power supply

3P+N+E coupler-socket having a dual voltage 230 V / 400 V socket-outlet

See also: "International standard and colour-coding" (Pages 170 and 171)

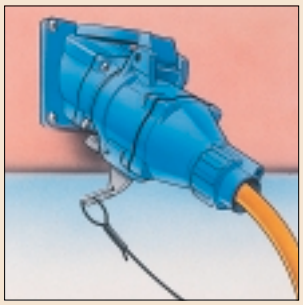
Self-ejecting plugs and sockets and closing mechanisms

Ranges concerned: decontactors

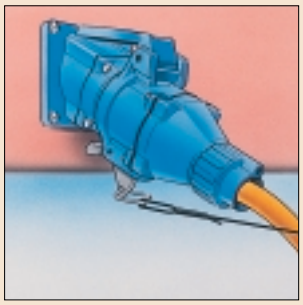
Self-ejecting decontactors protect the electrical installation when a mobile appliance is moved without having first separated the inlet (male) from the socket-outlet (female). Application: general use for vehicles or mobile appliances.

For high current plugs and socket-outlets, a closing mechanism with a draw lever is available to facilitate the rating of the plug into socket-outlet.

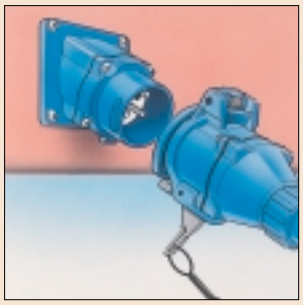
Principle of operation



Power supply by a coupler socket which is inserted in an inclined inlet.

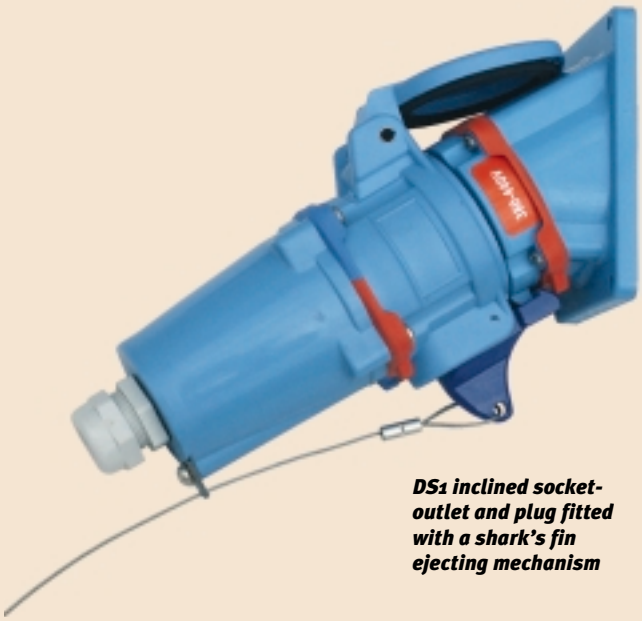


The coupler socket is maintained into the inlet thanks to the latch. This shark's fin latch is mechanically clamped to the flexible cable by a stainless steel tension cord.



When the mobile appliance is moved without having first disconnected the coupler socket, a tension on the flexible cable thanks to the tension cord automatically lifts the retaining latch of the socket-outlet and releases the coupler socket.

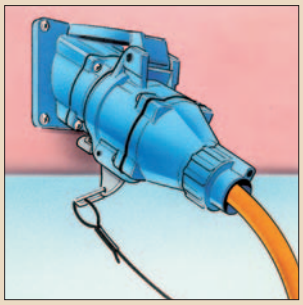
DS2 inclined socket-outlet and plug fitted with an ejecting plug release cam and a draw lever



DS1 inclined socket-outlet and plug fitted with a shark's fin ejecting mechanism

Available devices

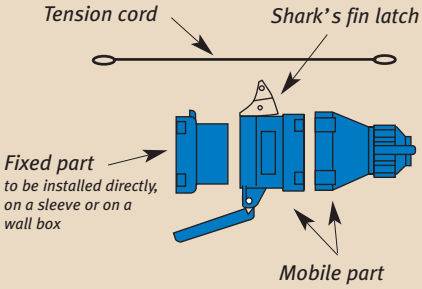
Self-ejecting coupler socket



Principle of operation:
A shark's fin latch located on the socket-outlet is linked to the flexible cable by a tension cord. A tension on this tension cord lifts the latch and releases the coupler socket.

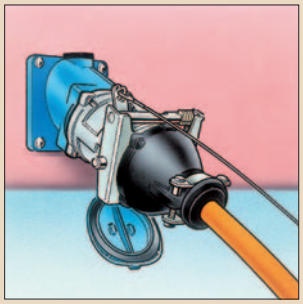
Available on all the range for DS, DN, DSN.

The complete device includes a tension cord and a shark's fin latch.



Self-ejecting plug

Shark's fin or cam mechanism

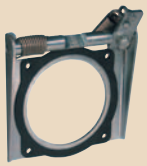


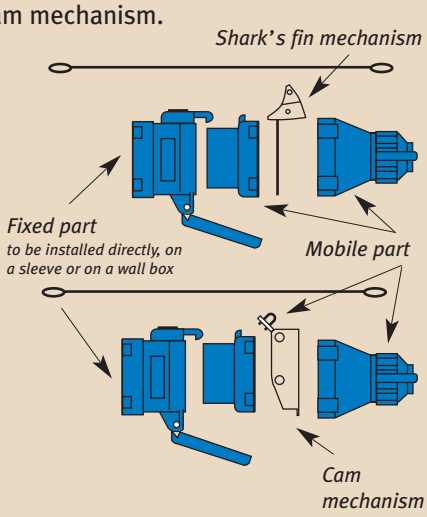
Principle of operation:
A cam or shark's fin mechanism is used to lift the latch located on the socket-outlet and to release the plug when a tension is applied on the flexible cable.

Shark's fin mechanism available up to 90 A on: DS1, DS3, DS6, DS7C3, DN1, DSN1, DSN3, DSN6 and up to 25 A multicontacts on: DS24C, DS37C, DSN24C, DSN37C, DN9C.

Cam mechanism available from 90 to 250 A on: DS9, DS2, DN6, DN9 and 25 A multicontacts on DN20C.

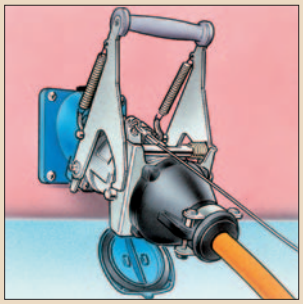
The complete device includes a tension cord and a shark's fin or a cam mechanism.





Self-ejecting plug

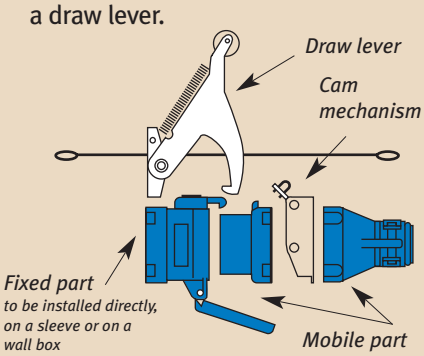
Cam mechanism with closing mechanism



Principle of operation:
This device includes a cam mechanism and a closing mechanism to facilitate the mating of the plug into the socket-outlet.

Available from 90 to 250 A on: DS9, DS2, DN6, DN9 and up to 25 A multicontacts on: DN20C.

The complete device includes a tension cord, a cam mechanism and a draw lever.

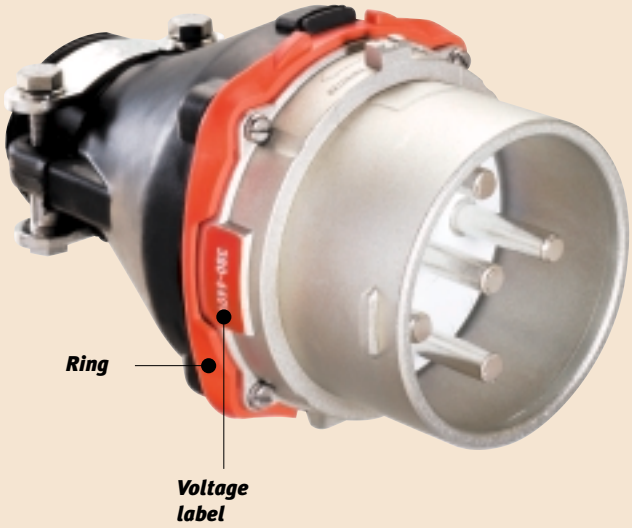


International standard and colour-coding

Ranges concerned:
decontactors and plugs and socket-outlets

MARECHAL ELECTRIC products complies with the common electric butt-contact and socket-outlet keying position chart which defines angular position of the device voltage / frequency combination.

A colour ring and a voltage sticker allow for easy identification of the device voltage/frequency. The standard was designed to allow the compatibility of several plugs with just one single socket-outlet *(the socket-outlet voltage sticker and rings have two-colours)*. For instance, 3P+N+E 230 / 400 V socket-outlet *(blue/red)* accepts 1P+N+E 230 V plug *(blue)*, 3P+E 400 V plug *(red)* or 3P+N+E 400 V *(red) (see table below)*.
Then this design allows to divide by 2 or 3 the number of socket-outlets, but also to reduce installation costs.
In order to guarantee total safety for users, this modular design is combined with a device which prevents the mating of a socket-outlet and a plug using incompatible voltage or polarities.



Dual-colour ring = dual voltage socket-outlet *(see chart on Page 171)*

In most of the cases, the colour of the voltage label is the same than the ring. The differences of colours are indicated at the bottom of the tables.

Alternative current

Socket-outlet				Inlet
Voltage / freq. 5th & 6th character	**Polarity** 7th character	**Part #** 5th to 7th char.	**Ring colour**	**Ring colour**
20 - 24 V 50 Hz	2P (P1,P2)	08**A**	Purple	Purple
20 - 24 V 50 Hz	3P	08**B**	Purple	Purple
20 - 24 V 50 Hz	3P+N	08**C**	Purple	Purple
20 - 24 V 50 Hz	1P (P1)+N	08**D**	Purple	Purple
20 - 24 V 50 Hz	2P (P1,P3)	08**E**	Purple	Purple
20 - 24 V 50 Hz	2P (P1,P2)+N	08**G**	Purple	Purple
20 - 24 V 50 Hz	2P (P1,P2)+E	08**2**	Purple	Purple
20 - 24 V 50 Hz	3P+E	08**3**	Purple	Purple
20 - 24 V 50 Hz	1P (P1)+N+E	08**5**	Purple	Purple
20 - 24 V 50 Hz	2P (P1,P2)+N+E	08**6**	Purple	Purple
20 - 24 V 50 Hz	3P+N+E	08**7**	Purple	Purple
20 - 24 V 60 Hz	2P (P1,P2)	02**A**	Purple	Purple
20 - 24 V 60 Hz	3P	02**B**	Purple	Purple
20 - 24 V 60 Hz	3P+N	02**C**	Purple	Purple
20 - 24 V 60 Hz	1P (P1)+N	02**D**	Purple	Purple
20 - 24 V 60 Hz	2P (P1,P3)	02**E**	Purple	Purple
20 - 24 V 60 Hz	2P (P1,P2)+N	02**G**	Purple	Purple
20 - 24 V 60 Hz	2P (P1,P2)+E	02**2**	Purple	Purple
20 - 24 V 60 Hz	3P+E	02**3**	Purple	Purple
20 - 24 V 60 Hz	1P (P1)+N+E	02**5**	Purple	Purple
20 - 24 V 60 Hz	2P (P1,P2)+N+E	02**6**	Purple	Purple
20 - 24 V 60 Hz	3P+N+E	02**7**	Purple	Purple

Socket-outlet				Inlet
Voltage / freq. 5th & 6th character	**Polarity** 7th character	**Part #** 5th to 7th char.	**Ring colour**	**Ring colour**
25 - 28 V 50 Hz	2P (P1,P2)	06**A**	Blue	Blue
25 - 28 V 50 Hz	3P	06**B**	Blue	Blue
25 - 28 V 50 Hz	3P+N	06**C**	Blue	Blue
25 - 28 V 50 Hz	1P (P1)+N	06**D**	Blue	Blue
25 - 28 V 50 Hz	2P (P1,P3)	06**E**	Blue	Blue
25 - 28 V 50 Hz	2P (P1,P2)+N	06**G**	Blue	Blue
25 - 28 V 50 Hz	2P (P1,P2)+E	06**2**	Blue	Blue
25 - 28 V 50 Hz	3P+E	06**3**	Blue	Blue
25 - 28 V 50 Hz	1P (P1)+N+E	06**5**	Blue	Blue
25 - 28 V 50 Hz	2P (P1,P2)+N+E	06**6**	Blue	Blue
25 - 28 V 50 Hz	3P+N+E	06**7**	Blue	Blue
40 - 48 V 50 Hz	2P (P1,P2)	13**A**	White	White
40 - 48 V 50 Hz	3P	13**B**	White	White
40 - 48 V 50 Hz	3P+N	13**C**	White	White
40 - 48 V 50 Hz	1P (P1)+N	13**D**	White	White
40 - 48 V 50 Hz	2P (P1,P3)	13**E**	White	White
40 - 48 V 50 Hz	2P (P1,P2)+N	13**G**	White	White
40 - 48 V 50 Hz	2P (P1,P2)+E	13**2**	White	White
40 - 48 V 50 Hz	3P+E	13**3**	White	White
40 - 48 V 50 Hz	1P (P1)+N+E	13**5**	White	White
40 - 48 V 50 Hz	2P (P1,P2)+N+E	13**6**	White	White
40 - 48 V 50 Hz	3P+N+E	13**7**	White	White

Socket-outlet				Inlet
Voltage / freq. 5th & 6th character	Polarity 7th character	Part # 5th to 7th char.	Ring colour	Ring colour
110 - 125 V 60 Hz	1P (P1)+N+E	075	Orange	Orange
110 - 125 V 60 Hz	2P (P1,P2)+N+E	076	Orange	Orange
110 - 125 V 60 Hz	3P+N+E	077	Orange	Orange
110 - 130 V 50 Hz	1P (P1)+N+E	035	Yellow	Yellow
115 - 127 V 200 Hz	1P (P1)+N+E	125	Green(1)	Green(1)
115 - 127 V 400 Hz	1P (P1)+N+E	115	Green(1)	Green(1)
120 - 127 V 60 Hz	1P (P1)+N+E	165	Yellow	Yellow
190 - 230 V 50 Hz	2P (P1,P2)+E	032	Blue	Blue
190 - 230 V 50 Hz	3P+E	033	Blue	Blue
200 - 220 V 200 Hz	2P (P1,P2)+E	122	Green(2)	Green(2)
200 - 220 V 200 Hz	3P+E	123	Green(2)	Green(2)
200 - 220 V 400 Hz	2P (P1,P2)+E	112	Green(2)	Green(2)
200 - 220 V 400 Hz	3P+E	113	Green(2)	Green(2)
208 - 220 V 60 Hz	2P (P1,P2)+E	162	Blue	Blue
208 - 220 V 60 Hz	3P+E	163	Blu	Blu
220 - 250 V 50 Hz	1P (P1)+N+E	015	Blu	Blu
220 - 250 V 60 Hz	2P (P1,P2)+E	072	Orange	Orange
220 - 250 V 60 Hz	3P+E	073	Orange	Orange
225 - 277 V 60 Hz	1P (P1)+N+E	045	Grey	Grey
347 V 60 Hz	1P (P1)+N+E	145	Red	Red
380 - 440 V 50 Hz	2P (P1,P2)+E	012	Red	Red
380 - 440 V 50 Hz	3P+E	013	Red	Red
380 - 440 V 50 Hz	1P (P1)+N+E	195	Red	Red
440 - 480 V 60 Hz	2P (P1,P2)+E	042	Red	Red
440 - 480 V 60 Hz	3P+E	043	Red	Red
480 - 500 V 50 Hz	2P (P1,P2)+E	092	Black	Black
480 - 500 V 50 Hz	3P+E	093	Black	Black
600 V 60 Hz	2P (P1,P2)+E	142	Black	Black
600 V 60 Hz	3P+E	143	Black	Black

Socket-outlet				Inlet
Voltage / freq. 5th & 6th character	Polarity 7th character	Part # 5th to 7th char.	Ring colour	Ring colour
660 - 690 V 50 Hz	2P (P1,P2)+E	192	Black	Black
660 - 690 V 50 Hz	3P+E	193	Black	Black
1000 V 50 Hz	2P (P1,P2)+E	222	Black	Black
1000 V 50 Hz	3P+E	223	Black	Black
1000 V 50 Hz	1P (P1)+N+E	225	Black	Black
1000 V 50 Hz	2P (P1,P2)+N+E	226	Black	Black
1000 V 50 Hz	3P+N+E	227	Black	Black

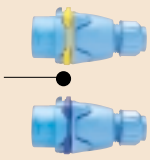
(1) Green ring, yellow label (2) Green ring, blue label

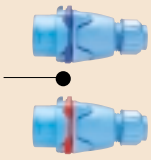
Direct current

Socket-outlet				Inlet
Voltage / freq. 5th & 6th character	Polarity 7th character	Part # 5th to 7th char.	Ring colour	Ring colour
20 - 24 V DC	2P (P2,P3)+E	089	Purple	Purple
20 - 24 V DC	3P	08F	Purple	Purple
20 - 24 V DC	2P (P2,P3)	08Z	Purple	Purple
25 - 28 V DC	2P (P2,P3)+E	069	Blue	Blue
25 - 28 V DC	3P	06F	Blue	Blue
25 - 28 V DC	2P (P2,P3)	06Z	Blue	Blue
40 - 48 V DC	2P (P2,P3)+E	139	White	White
40 - 48 V DC	3P	13F	White	White
40 - 48 V DC	2P (P2,P3)	13Z	White	White
110 - 130 V DC	2P (P2,P3)+E	109	Yellow	Yellow
220 - 250 V DC	2P (P2,P3)+E	209	Blue	Blue
660 - 690 V DC	2P (P2,P3)+E	199	Black	Black

Dual-voltage

Socket-outlet				Inlet
Voltage / freqency	Polarity	Part #	Ring colour	Ring colour
110 - 125 V / 220 - 250 V 60 Hz	2P (P1,P2)+N+E	076	Orange	Orange part # 076 or 075
110 - 125 V / 220 - 250 V 60 Hz	3P+N+E	077	Orange	Orange part # 077 or 075
110 - 130 V / 190 - 230 V 50 Hz	2P (P1,P2)+N+E	036	Yellow & Blue	Blue part # 036 or Yellow part # 035
110 - 130 V / 190 - 230 V 50 Hz	3P+N+E	037	Yellow & Blue	Blue part # 037 or Yellow part # 035
115 - 127 V / 200 - 220 V 200 Hz	2P (P1,P2)+N+E	126	Green(3)	Green(4) part # 126 or 125
115 - 127 V / 200 - 220 V 200 Hz	3P+N+E	127	Green(3)	Green(4) part # 127 or 125
115 - 127 V / 200 - 220 V 400 Hz	2P (P1,P2)+N+E	116	Green(3)	Green(4) part # 116 or 115
115 - 127 V / 200 - 220 V 400 Hz	3P+N+E	117	Green(3)	Green(4) part # 117 or 115
120 - 127 V / 208 - 220 V 60 Hz	2P (P1,P2)+N+E	166	Yellow & Blue	Blue part # 166 or Yellow part # 165
120 - 127 V / 208 - 220 V 60 Hz	3P+N+E	167	Yellow & Blue	Blue part # 167 or Yellow part # 165
220 - 250 V / 380 - 440 V 50Hz	2P (P1,P2)+N+E	016	Blue & Red	Red part # 016 or Blue part # 015
220 - 250 V / 380 - 440 V 50Hz	3P+N+E	017	Blue & Red	Red part # 017 or Blue part # 015
255 - 277 V / 440 - 480 V 60Hz	2P (P1,P2)+N+E	046	Red	Red part # 046 or Grey part # 045
255 - 277 V / 440 - 480 V 60Hz	2P (P1,P2)+N+E	047	Red	Red part # 047 or Grey part # 045
347 V / 600 V 60 Hz	2P (P1,P2)+N+E	146	Red & Black	Black part # 146 or Red part # 145
347 V / 600 V 60 Hz	3P+N+E	147	Red & Black	Black part # 147 or Red part # 145
380 - 440 V / 660 - 690 V 50 Hz	2P (P1,P2)+N+E	196	Red & Black	Black part # 196 or Red part # 195
380 - 440 V / 660 - 690 V 50 Hz	3P+N+E	197	Red & Black	Black part # 197 or Red part # 195





(3) Green ring, yellow & blue label (4) Green ring, blue label