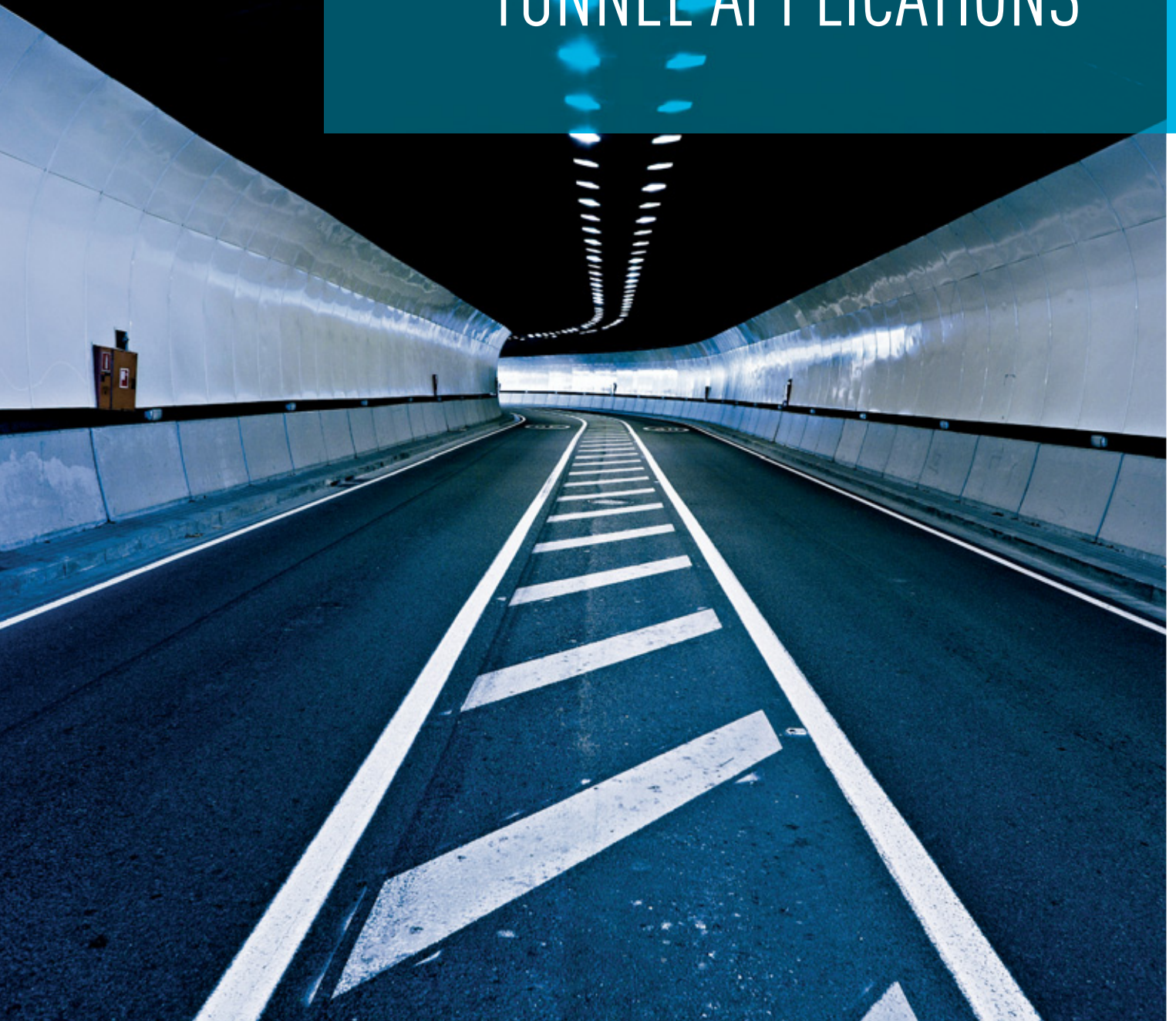


# TUNNEL APPLICATIONS



ELECTRICAL INDUSTRIAL CONNECTORS  
& BOXES



# SAFE AND RELIABLE ELECTRICAL CONNECTIONS IDEALLY SUITED TO TUNNEL APPLICATIONS.

**MARECHAL ELECTRIC offers a range of products suited to your applications.**

Tunnels are confined environments where safety must be paramount, even though the electrical equipment is in an extremely corrosive atmosphere: pollution, cleaning, thrown-up road debris, smoke and heat in the event of a fire. This equipment must therefore meet substantial requirements.

Conceived to cope with such restrictions, MARECHAL® boxes, available with connectors and DECONTACTOR™ plugs, offer sound solutions to tunnel operators.

- Conformity
- Reliability
- Speed
- Quality

...and as always with the same goals: to guarantee drivers' safety, to optimize maintenance and facilitate rescue teams when responding on site.





# CONTENTS

## MARECHAL ELECTRIC TECHNOLOGY P. 4



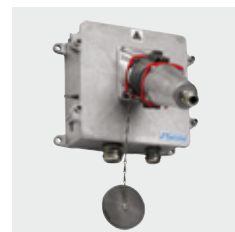
## BOXES FOR STANDARD LIGHTING P. 6



## BOXES FOR EMERGENCY LIGHTING P. 7



## F400 PLUG & SOCKET-OUTLET FOR JET FANS P. 8



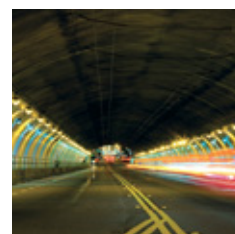
## BF FIRE SERVICE BOX P. 8



## PNC CONNECTORS FOR LIGHTING DEVICES P. 9



## MAIN ACHIEVEMENTS P. 10



# MARECHAL ELECTRIC TECHNOLOGY

MARECHAL ELECTRIC is now a market leader in the field of electrical connections for tunnels. Thanks to unique technology and materials specifically developed to suit these harsh environments and to offer quick disconnection of electrical installations, MARECHAL<sup>®</sup> equipment complies with the industry current standards and is certified by the quality accreditation bodies, thus guaranteeing optimum safety.

MARECHAL ELECTRIC is constantly innovating in order to meet the needs of the various operators and facilitate maintenance work. MARECHAL<sup>®</sup> boxes are C.S.T.B and IMQ certified. The connectors and DECONTACTOR<sup>™</sup> plugs comply with the European standard EN 60309-1, the French ministerial order issued on 20/12/2011 pertaining to the rules governing removable electrical equipment and to its connection and usage standards as well as to the Low Voltage Directive.

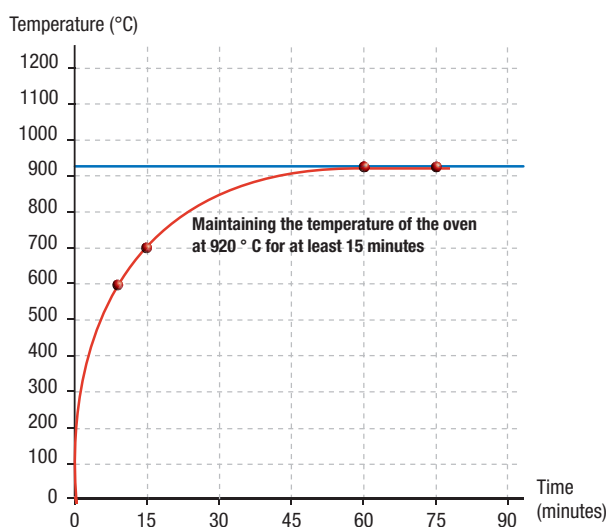
## STANDARDS & CERTIFICATIONS

Supply circuits for emergency lighting installed in tunnels must meet the following requirements:

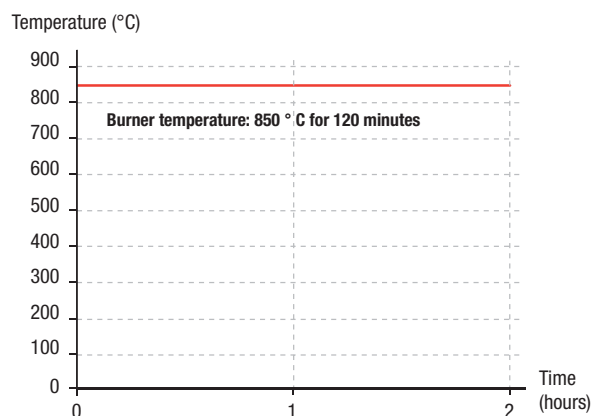
- ▶ EN 50362 European standard,
- ▶ French government Directive No. 2000-63 of 25 August 2000 on safety in tunnels and national road network,
- ▶ NF C 32-070 French standard,
- ▶ Guides CETU defining the fire behaviour of road tunnels.

To meet these requirements, MARECHAL<sup>®</sup> equipment is among the only on the market to have been tested and certified by:

- C.S.T.B France - Centre Scientifique et Technique du Bâtiment.
- IMQ laboratory in Italy.



Oven temperature curve - standardized time  
NF C 32-070 standard



Flame temperature curve - Time  
NF EN 50362 standard



# FASTER, SAFER, EASIER.

## DECONTACTOR™ technology: tested safety

- ▶ A socket with built-in switch in a compact unit
- ▶ Simply pressing the latch once cuts off the current and eliminates all risk of electrical arcing.
- ▶ The plug then ejects automatically and the appliance is off-load.
- ▶ The safety of users is guaranteed at all times.

## Watertightness

All boxes and connectors are watertight and withstand the use of high-pressure washing during tunnel maintenance.

## Connection quality and life expectancy

MARECHAL® products are fitted with spring-loaded contacts providing a permanent and durable contact.

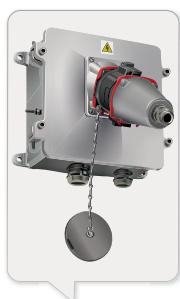
The silver-nickel tips at the end of the contacts provide exceptional connection quality and excellent resistance in wet and corrosive environments, even after years of use.

## Suited materials

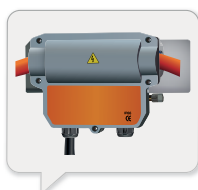
In order to guarantee maximum safety, the materials used in the making of MARECHAL®'s boxes and connectors are corrosion- and shockproof (IK09). In the event of a fire, these materials do not produce any halogen gases or smoke.



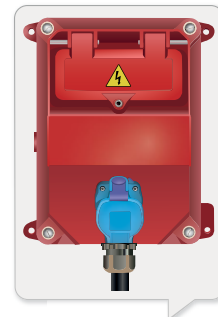
## APPLICATION EXAMPLES



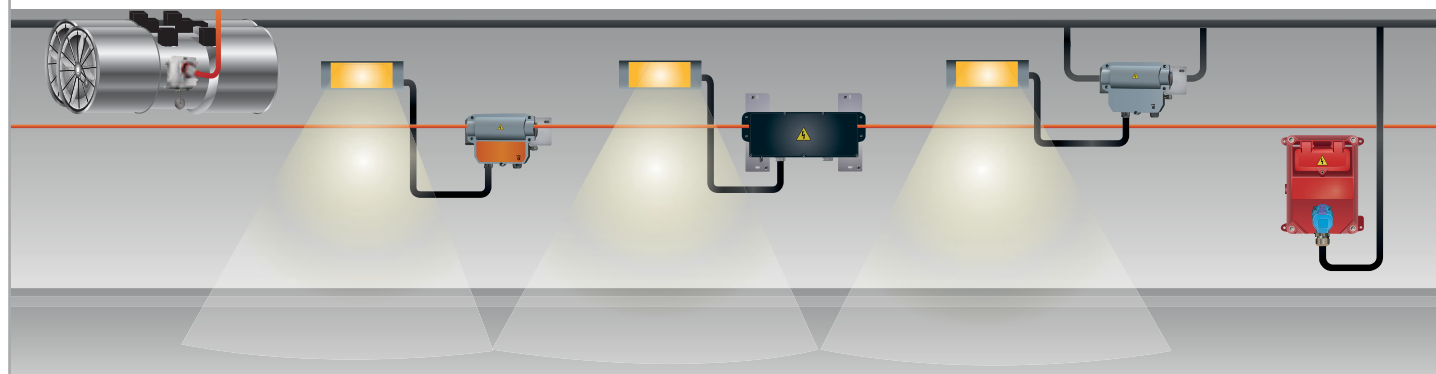
**F400**  
**PLUG & SOCKET-OUTLET**  
**FOR JET FANS**



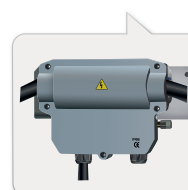
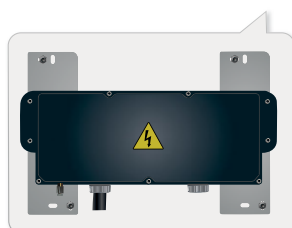
**EXPRESS® FIRE BOX**  
**BOXES FOR EMERGENCY**  
**LIGHTING**



**BF**  
**FIRE SERVICE BOX**



**EXPRESS® FIRE BOX**  
**BOXES FOR EMERGENCY**  
**LIGHTING**



**EXPRESS® BOX**  
**BOXES FOR**  
**STANDARD**  
**LIGHTING**

# BOXES FOR STANDARD LIGHTING

## WITHOUT CUTTING MAIN CABLE

- ▶ Service tap-off from the main through cable without the need to strip or cut the main cable.
- ▶ "Snail" type gasket allow the immediate positioning of cables creating an IP67 seal.
- ▶ Box lid fitted with a retaining cord, fixed to the box by means of captive stainless steel screws.

### MAIN FEATURES

#### POLY BOXES

#### ALUMINIUM BOXES

Service terminals	2 to 5 insulation-piercing.	
Service protection	By circuit breaker fitted to DIN rail	
Cables accepted	Armoured and unarmoured cables, stranded or flexible, from 2,5 mm <sup>2</sup> to 35 mm <sup>2</sup> (For conductors above 25 mm <sup>2</sup> , the main cable must be cut.)	Armoured and unarmoured cables, stranded or flexible, from 4 mm <sup>2</sup> to 35 mm <sup>2</sup>
Internal and external Earth point	Inside and outside the enclosure	
Ingress Protection	IP66 according to NF EN 60529	
Shock resistance	IK09 according to NF EN 50102	
Fire smoke class	M1F0	
Self extinguishing material	UL94-V0	
Modularity box - Options - Other equipment	<ul style="list-style-type: none"> <li>• Supply of service leads fitted with MARECHAL® coupler sockets</li> <li>• Accessories for fixing box to cable tray or ladder.</li> <li>• "Power On" signal light</li> <li>• Alternative non-piercing terminals</li> <li>• Alternative Protection: single phase circuit breaker</li> <li>• Plate for external fixing</li> </ul>	<ul style="list-style-type: none"> <li>• Supply of service leads fitted with MARECHAL® coupler sockets</li> <li>• Alternative Protection: single phase circuit breaker</li> </ul>



#### EXPRESS® BOX MADE FROM HALOGEN FREE FIBREGLASS REINFORCED POLYESTER COMPOUND

Type	H x L x P in mm	Distribution
91150	268 x 272 x 111	Maximum 2 tap-offs using 2 sockets Maximum 4 tap-offs using glands



#### EXPRESS® BOX MADE FROM HALOGEN FREE THERMOPLASTIC

Type	H x L x P in mm	Distribution
93036	190 x 522 x 121	Maximum 4 tap-offs using 2 sockets Maximum 4 tap-offs using glands



#### EXPRESS® BOX 1 LINE

Type	H x L x P in mm	Distribution
01N4015010E0	183 x 205 x 100	Maximum 2 tap-offs using 2 sockets Maximum 2 tap-offs using glands



#### EXPRESS® BOX 2 LINES

Type	H x L x P in mm	Distribution
01N4017020E0	268 x 272 x 111	Maximum 2 tap-offs using 2 sockets Maximum 2 tap-offs using glands

# BOXES FOR EMERGENCY LIGHTING

**FIRE RESISTANT - UP TO 920 °C\***

- Poly boxes:**
- ▶ Service tap-off from the main through cable without the need to strip or cut the main cable.
  - ▶ "Snail" type gasket allow the immediate positioning of cables creating an IP67 seal.
- Cast iron boxes:**
- ▶ service tap-off from the main through cable.
  - ▶ Box lid fixed to the box by means of captive stainless steel screws.

## MAIN FEATURES

	POLY BOXES	CAST IRON BOXES
Fire resistance	<p>* Electrical continuity of the main cable guaranteed:</p> <ul style="list-style-type: none"> <li>• <b>NF C 32-070</b> : oven temp. 920°C - temperature increases.</li> <li>• <b>NF EN 50362</b> : oven temp. 850°C - temperature increases.*</li> </ul>	Electrical continuity of the main cable guaranteed to oven temp. 920°C - temperature increases according to <b>NFC 32-070</b> standard.
Service terminals	<ul style="list-style-type: none"> <li>• 2 to 5 insulation-piercing, stainless steel connectors, fitted into a ceramic base. The whole arrangement is fitted to the wall by means of a stainless steel plate.</li> <li>• 2 to 5 insulation-piercing only under EN 50362</li> </ul>	2 to 5 insulation-piercing, stainless steel connectors, fitted into a ceramic base.
Service protection	By fuse or circuit breaker fitted to DIN rail	By fuse or circuit breaker mounted on ceramic base.
Cables accepted	Armoured and unarmoured cables, stranded or flexible, from 4 mm <sup>2</sup> to 35 mm <sup>2</sup> . (For conductors above 25 mm <sup>2</sup> , the main cable must be cut.)	Cables up to 35 mm <sup>2</sup> (Part Nr 91178) and up to 185 mm <sup>2</sup> (Part Nr 92768).
Internal and external Earth point	Inside and outside the enclosure	
Ingress Protection	IP66 according to NF EN 60529	
Shock resistance	IK09 according to NF EN 50102	
Fire smoke class	M1F0	
Self extinguishing material	UL94-V0	
Modularity box - Options - Other equipment	<ul style="list-style-type: none"> <li>• Supply of service leads fitted with MARECHAL® coupler sockets</li> <li>• Accessories for fixing box to cable tray or ladder.</li> <li>• "Power On" signal light</li> <li>• Alternative non-piercing terminals</li> <li>• Alternative Protection: single phase circuit breaker</li> <li>• Plate for external fixing</li> </ul>	<ul style="list-style-type: none"> <li>• Supply of service leads fitted with MARECHAL® coupler sockets</li> <li>• Alternative Protection: single phase circuit breaker</li> </ul>

\* Only for EXPRESS® BOX Part no. 91151



### EXPRESS® BOX MADE FROM HALOGEN FREE FIBREGLASS REINFORCED POLYESTER COMPOUND

Type	CSTB Certificate	IMQ Certificate	H x L x P in mm	Distribution
91151	RS10-083	AC.00646	268 x 272 x 111	Maximum 2 tap-offs using 2 sockets Maximum 4 tap-offs using glands



### EXPRESS® BOX MADE FROM HALOGEN FREE THERMOPLASTIC

Type	CSTB Certificate	H x L x P in mm	Distribution
92946	RS05-172	190 x 522 x 121	Maximum 4 tap-offs using 2 sockets Maximum 4 tap-offs using glands



### CAST IRON BOXES

Type	CSTB Certificate	H x L x P in mm	Distribution
91178	RS06-023A	262 x 262 x 111,5	Maximum 3 tap-offs using 2 sockets Maximum 3 tap-offs using glands



### CAST IRON BOXES

Type	CSTB Certificate	H x L x P in mm
92768	RS99-133	533 x 410 x 188

# F400 WALL MOUNTING SOCKET-OUTLET

## JET FANS

- ▶ Jet fan local disconnectors for quick visible isolation.
- ▶ Mounted on aluminium boxes.
- ▶ 3P+E 63 A / 690 V connector withstands 400 °C for 2 hours.
- ▶ Box lid fixed to the box by means of captive stainless steel screws.

### MAIN FEATURES

Fire resistance	Electrical continuity of the main cable guaranteed to 400°C for 2 hours as the test programme 5 of <b>NF EN 12101-3</b> standard
Breaking capacity	AC-22 according to NF EN 60947-3
Service terminals	3 terminals usually mounted on a steel base fire
Cables accepted	Armoured and unarmoured flexible cables, from 10 mm <sup>2</sup> up to 95 mm <sup>2</sup> box side via terminals and from 6 mm <sup>2</sup> up to 35 mm <sup>2</sup> plug side (contact us for higher sizes).
Internal and external Earth point	Inside and outside the enclosure
Ingress Protection	IP66 according to NF EN 60529
Shock resistance	IK09 according to NF EN 50102
Modularity box - Options - Other equipment	• Auxiliary contacts



### F400 WALL MOUNTING SOCKET-OUTLET

Type	CSTB Certificate	H x L x P in mm
3934013Z + 3938013Z	RS05-026	264 x 260 x 345

# FIRE SERVICE BOX

## SECURITY RECESS

- ▶ Especially developed in collaboration with emergency services who specialise in tunnel rescue.
- ▶ Completely made of aluminium, this box is composed of a back box, an inclined cover with an inspection window.
- ▶ Box lid fixed to the box by means of captive stainless steel screws.

### MAIN FEATURES

Service protection	Differential circuit breaker 30 mA.
Internal and external Earth point	Inside and outside the enclosure
Ingress Protection	IP55 according to NF EN 60529
Shock resistance	IK09 according to NF EN 50102

### ALUMINIUM BOX

Type	H x L x P in mm	Distribution
91277	345 x 280 x 125	One or two MARECHAL® deconnector (DS or DN) can be fit on the inclined cover







# PNC

## CONNECTORS FOR LIGHTING DEVICES

- ▶ Compact and rugged connector designed for all types of aggressive environments (humidity, corrosion, pollution) found in many industrial sectors including transport infrastructure.
- ▶ Perfect for connecting light fittings as well as ventilation equipment in tunnels.
- ▶ Both quickly assembled and put into service. Its locking ring resists vibration thus preventing accidental disconnection of the plug on load.

### ELECTRICAL FEATURES

Voltage	480 V
Impulse withstand voltage	5 kV / Pollution degree 3
Contact resistance	< 2mΩ
Permitted current range	4-20 mA / 16 A
Polarity	3P+N+E
Conductors accepted	From 0,75 mm <sup>2</sup> to 2,5 mm <sup>2</sup> - Mechanical terminals
Cable diameter	From 11 to 15 mm (smaller ø available according to specification)

### CLIMATIC FEATURES

Ambient temperature	-40 °C to +100 °C
IP protection	IP66/IP67 (IP68 on specification)
Salt, Fog performance	200 h minimum not connected - More than 1000 h connected
Resistance to fluids	Motor oils, petrol, fats, detergents...

### MECHANICAL FEATURES

Casing & insulator	Glassfibre reinforced thermoplastic UL94 V-0
Butt contacts	Copper alloy with silver-nickel tips
Contact protection	Tinning
Load cycles	More than 2000 cycles
Shock resistance	IK08
Vibration	Frequency 5-1000 Hz, 1g (90 minutes on each critical frequency) according to IEC 6068-2-6

### STANDARDS ASPECTS

PNC connectors comply with:

- The requirements of IEC 61984, IEC 60529, IEC 62262, IEC 68-2-6 International standards,
- The European Low Voltage Directive 2006/95/CE,
- The French NF C 15-100 standard,
- The decrees relating to workers' protection in Belgium, Spain and Italy.

Also certified by GOST (Russian inspection laboratory).

**SOCKET-OUTLET**  
female **PNC (16 A)**



**INLET** male  
**PNC (16 A)**



Umax	Polarity	Part no.	Part no.
480 V	5P	01E4007	01E8007

**COUPLER SOCKET**  
female **PNC (16 A)**



**PLUG** male  
**PNC (16 A)**



Umax	Polarity	Part no.	Part no.
480 V	5P	01E3007	01E1007

**SOCKET-OUTLET**  
**CAP PNC (16 A)**



**PLUG CAP**  
**PNC (16 A)**



Part no.	Part no.
01EA125	01EA126

# MAIN ACHIEVEMENTS

After designing products to meet the relevant standards, MARECHAL ELECTRIC now supplies many subterranean building works with electrically-fed lighting equipment, jet fans or even safety pods reserved for rescue teams' operations. Listed as follows as some of our projects and the reasons for product specification by the customer:



## A6B PARIS FRANCE

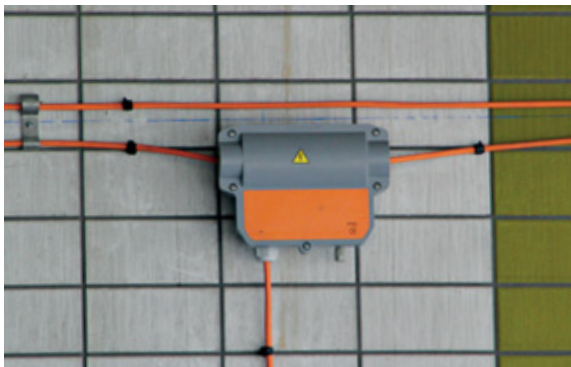
### Tunnel

- ▶ Lighting devices connection.
- ▶ Emergency lighting (CR1-C1 cables) and standard lighting.

**EXPRESS® BOX** for emergency and standard lighting,

**BF** fire department box.

- Personal safety and security equipment.
- Ease of installation.
- Robustness: strength of materials in aggressive environments.



## A89 EST BALBIGNY – SALVIGNY TOWER FRANCE

**Tunnels : Bussière (1000m) , Violay (3900m) and Chalosset (700m)**

- ▶ Supply of standard and emergency lighting.

**EXPRESS® FIRE BOX**

- Reliability of equipment over time.
- On site advice about customer's needs and specifications.
- Certification and fire resistance warranty.



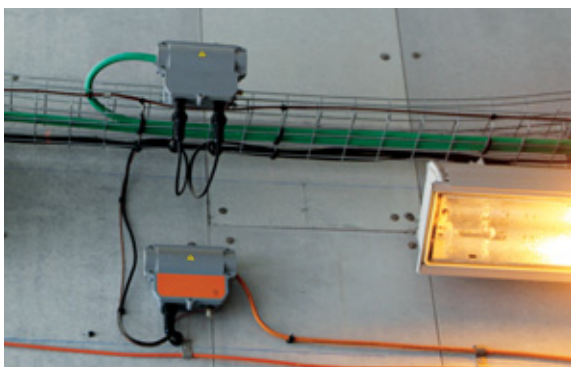
## BRESSANONNE ITALY

### Tunnel

- ▶ Lighting fittings connection.
- ▶ Supply of jet fan connectors.

**EXPRESS® FIRE BOX** for emergency lighting, **F400** wall mounting socket-outlet for jet fans.

- Safety: integrated switching device for use by all staff without electrical qualifications.
- Robustness: strength of materials.
- Technical assistance and after-sales service.



## FORLÌ ITALY

### Tunnel

- ▶ Supply of standard and emergency lighting.

**EXPRESS® BOX** and **EXPRESS® FIRE BOX** with **PNC** connectors.

- Compact, lightweight, easy to assemble product.
- Ideal When it is planned to use multipole cables for power distribution to lighting.
- Save time and money on installation.



## INDRA SPAIN

### Dos Valires Tunnel, Andorra

- ▶ Supply emergency lighting and ventilation systems.

**EXPRESS® FIRE BOX** for emergency lighting, **F400** wall mounting socket-outlet for jet fans

- Safety of persons and security equipment.
- Saves time: ease of installation.
- Compact design and equipment.



## CALLE M30 ESPAGNE

### M30 Tunnel - A3

- ▶ Supply emergency lighting.

**EXPRESS® FIRE BOX** for emergency lighting

- Safety of persons and security equipment.
- Ease of installation.
- Robustness: strength of materials in aggressive environments.



## PARIS SUBWAY FRANCE

### Tunnel – Extension of lines

- ▶ Lighting devices connection.

**EXPRESS® FIRE BOX** for emergency lighting, **SOCKET-OUTLET BOXES**

- Technical assistance and after-sales service.
- Technical expertise and MARECHAL ELECTRIC references on multiple sites.
- Reliability of equipment over time.



## HINDHEAD TUNNEL UNITED-KINGDOM

### Tunnel

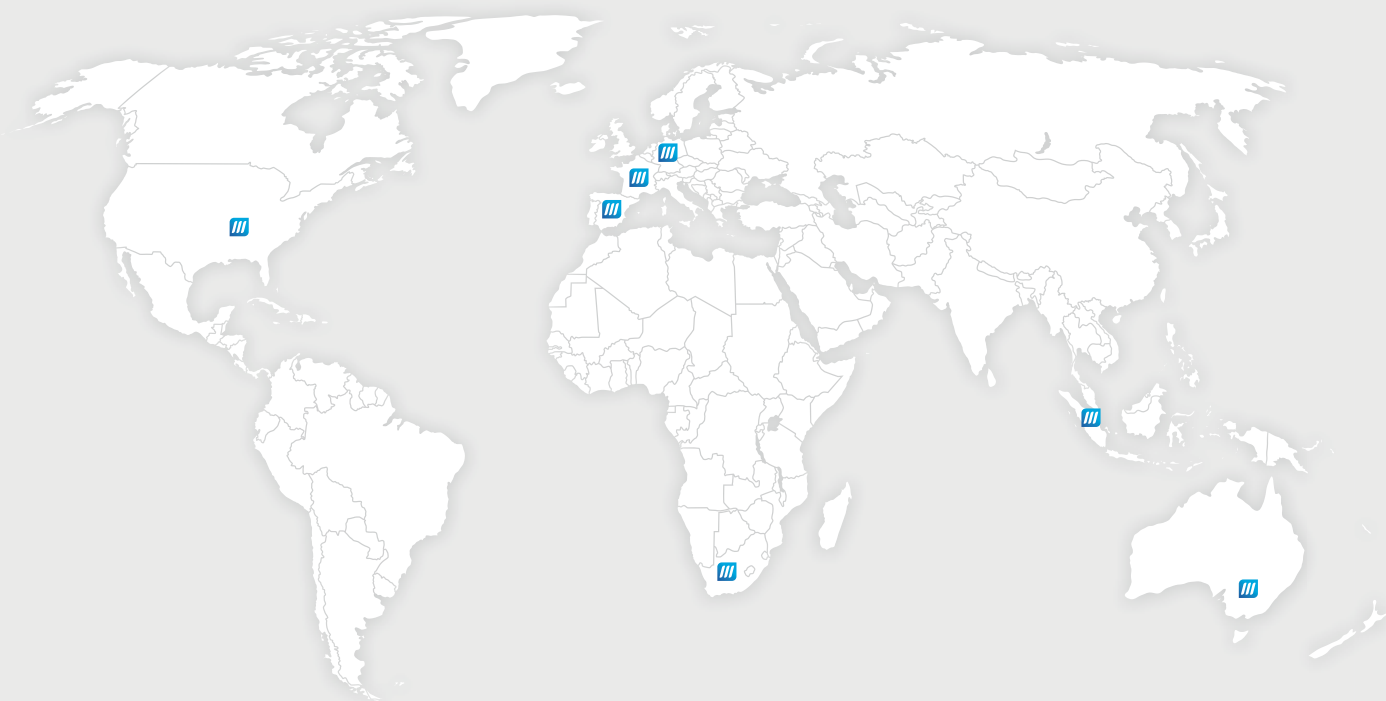
- ▶ Supply emergency lighting and jet fan connectors.

**F400** wall mounting socket-outlet for jet fans

- Saves time during maintenance.
- Resistance to high temperature and maintain of the installations in operation.
- Ingress Protection IP55 against moisture and dust.



**MARECHAL** ELECTRIC GROUP



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