Access to energy and fraud-preventing
Solutions to simplify and secure electrical distribution
The French Group Michaud, has been designing, qualifying, producing and selling electrical equipment and connection systems for over 60 years.

From R&D to after-sales service, Michaud Export, as a Michaud subsidiary, has full mastery of its value chain, ensuring high-level quality and service worldwide.

MIRELEC
Mirelec is a Michaud brand, dedicated to low voltage electrical distribution equipment.

The brand offers European quality products and solutions at a price matching emerging markets expectations.

According to the international standards, Michaud Export designs and develops energy distribution solutions. The product range is focused on two fields of expertise:

- **Low Voltage Network**: to connect and protect the overhead and underground electrical lines;

- **Energy Controlling**: to manage and offer easy access to electricity.

Michaud Export in a few words:
- **Reliability**
- **Support**
- **Adaptability**
- **Quality**
- **Innovation**
- **Expertise**
- **Reactivity**
- **Experience**
- **Listening**

**One-quarter of the world's population does not have access to energy, being a factor for economic development.**

In this environment, Michaud Export offers a true support approach to evaluate the situation and to propose optimal electrification systems.

In order to meet the challenges of sustainable development, Michaud Export offers a complete products range dedicated to Energy Controlling in rural and suburban environments, enabling everyone to have access to electricity.

as a technical expert in low-voltage networks, Michaud focuses R&D on innovative solutions.

Thanks to an engineering Department dedicated to international business, Michaud Export provides support to Power Utilities in their grid expansion projects.

From protection to connections, many innovative solutions are already used in major Power Utilities around the world.
The development of electrification in Africa is essential to support the economic growth of the continent countries and to reduce poverty in rural and peri-urban areas. African governments are aware of it and place regularly national power companies at the heart of development strategies. The major challenges for these companies will be to meet the continent’s economic and demographic challenge tomorrow, to make current and future investments profitable and thus achieve their electrification objectives.

Population - Sub-Saharan Africa

**Evolution of the population**

![Graph showing population and electrified population evolution from 1980 to 2050.]

- **Population**: 2,500,000,000
- **Electrified population**: 500,000,000

Data: World Bank and estimation trend until 2050.

In order to support population growth in matter of electrification, substantial investments will be needed for energy production, transmission and distribution. Thanks to the financial involvement of international organizations such as the World Bank, projects can be undertaken. Over the period 2014-2018, the World Bank has released **$5 billion** for projects in energy access.

However, the current funds will not be enough to cover all needs and follow the upward trend. It is therefore necessary to support utilities with complementary solutions to help them electrify rural areas and secure revenues over the long run.

Michaud Export offers solutions to significantly reduce the levels of non-technical losses through the cleaning of electrical distribution networks. As a result, network security, profitability and sustainability are improved. Working on network efficiency is a major challenge and requires the involvement of all stakeholders, especially installers. Michaud supports its customers with training sessions dedicated to fitters in order to ensure the proper installation of equipment and avoid early damage.

**Cost optimization**

**Adaptation to the local context**

**Sustainability of systems**

Michaud Export offers solutions which adapt to the specific context of rural electrification, from network protection to energy management. This range of products meets local expectations while ensuring the most accurate sizing of equipment. Utilities handle costs and resources and ensure a reliable electrification model.

Through its solutions, Michaud Export participates in a reliable, economical and sustainable electrification model.
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Fraud preventing

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With a growing consumption in electricity consumption in the coming years, the major challenge for utilities is to be able to meet the increase of the demand while maintaining an objective profitability. However, electrical networks suffer high losses, impacting the financial resources of companies. To compensate this lack of bailout resources, public bailouts and price increases are sometimes applied. These very unpopular decisions tend to encourage the development of fraud and thus fuel the vicious circle of non-technical losses. Securing facilities is a better strategy for achieving a positive financial impact.

### Evolution of electricity production

On this graph enlights that in 2018, about 260 TWh were generated by the various electricity companies in the region. Of this amount, more than 33 TWh were lost during the production, transmission and distribution of energy, or 12.7% of the loss. Following current trends, by 2050, no less than 160 TWh should be produced in pure financial loss. This is the equivalent of 23 nuclear reactors. By optimizing transmission and distribution networks, over a 30-year period, the annual gains could be close to 90 TWh, or 13 nuclear reactors.

### Case of the Sub-Saharan Africa

Any electrical network is subjected to a normal operating loss rate, due to the transformer efficiency rate or line losses on the cable. If reducing these phenomenon is difficult, work on the proper use of the equipment can help eliminate malfunctions:
- Material not adapted to the expected use
- Aging and deficient material

With better training of teams on the field, as well as a proper use of the product adapted to the environment, utilities could extend the service life of the facilities. Improving the quality of the network is the first step to realise savings.
In the case of new electrification projects, electricity companies must be able to anticipate the installations security in order to prevent non-technical losses. By integrating the fight against fraud as soon as the specifications are defined, utilities opt for reliable solutions which are difficult to bypass and facilitate installation and maintenance.

Working in collaboration with African and Asian national power companies, Michaud has identified several key points to protect on new installations, from the network to the meter. The use of innovative technologies, to make connections, paired with automatic control systems ensure a tamper-proof connection.

**Issues ?**

**Benefits ?**

- Meters shunt limited
- Pirate connections restricted
- Connectors theft for selling avoided
- Fraudulent manipulations of the circuit breaker reduced
Solution for network extension

To secure the network, an overhead service box limits the use of connectors. Thus, the network is cleaner, more readable and frauds become easily detectable.

To secure the connections, the use of a peripheral neutral cable from the service connection box to the meter box, prevents illegal connections. In case of attempted fraud on this cable, a short circuit is created.

The fuse located in the cutout sleeve ensures the safety of the installation.

Located at the top of the pole, the cutout sleeve also creates a cutoff point. In needed, the customer can be disconnected from the network without modification of the connection and without tools.

1. Service distribution box 8 outlets
The box allows to create a false cut and to tap up to 8 connections.
+ Connections protected from weather
+ Suppression the connectors and therefore less stress on the cable
+ Network readability

2. Cutout sleeve + fuse cartridge
The cutout sleeve makes it possible to secure the connection by creating a break point at the top of the pole in case of a short circuit due to illegal tap connections.
+ Cut-off spot and protection at the top of the pole

3. 6-points anchoring bracket
A 6-points bracket makes it possible to limit the fixing points on the pole.
+ Network readability
+ Mutualization of equipment

4. Peripheral neutral cable
Protects against illegal connections with an inaccessible phase, surrounded by a peripheral neutral.
+ Protection against illegal connections
+ Decrease of non-technical losses

5. Fraud preventing cable fulfilment kit
Restores the neutral and the phase to make the connection to the network and to the meter.
+ Ensured watertightness

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Fraud preventing service cable

**MIRELEC**

**Application**
The concentric insulated service cable is used for the connection between the low-voltage network and the premise. It is designed to limit fraud and thus to reduce non-technical losses thanks to a peripheral-neutral cable. Any unauthorised connection to this cable will create a short-circuit and will automatically cut off electricity supply. It is stretched overhead to a maximum range of 40m.

**Description**
- The single phase or three phases cable comprises:
  - One or three phase conductor(s) insulated in the central part
  - 1 peripheral insulated neutral conductor.
- Service voltage rate: is 600V.
- The conductor’s core is made of aluminium.
- The insulation is made of cross-linked polythene.

The cables meet the criteria of the IEC 60502 and NFC 33 209 standard.

<table>
<thead>
<tr>
<th>Code</th>
<th>Désignation</th>
<th>Match with</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U301</td>
<td>AERIAL SERVICE CONCENTRIC CABLE 13mm² SINGLE PHASE</td>
<td>U301 and U307</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>U307</td>
<td>AERIAL SERVICE CONCENTRIC CABLE 16mm² SINGLE PHASE</td>
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<td>1</td>
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<tr>
<td>U308</td>
<td>AERIAL SERVICE CONCENTRIC CABLE 16mm² THREE PHASES</td>
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<td>1</td>
<td></td>
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<tr>
<td>U308</td>
<td>AERIAL SERVICE CONCENTRIC CABLE 25mm² THREE PHASES</td>
<td>250</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Application**
These fulfilment kits enable to ensure the insulation and the sealing of the anti-fraud conductor, mainly for the neutral by reconstituting its insulation for the connection (the sheath is sheathed at its end).

**Tool for stripping**

This tool is used to strip the cable in order to reconstitute and isolate the neutral for connection.

**Code** | **Designation** | **Weight (kg)** | **Sales unit** |
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>K248</td>
<td>FRAUD-PREVENTING CABLE FULFILMENT KIT - 13mm² SINGLE PHASE</td>
<td>U301 and U307</td>
<td>0.040</td>
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<tr>
<td>K249</td>
<td>FRAUD-PREVENTING CABLE FULFILMENT KIT - 20mm² THREE PHASES</td>
<td>U302 and U308</td>
<td>0.040</td>
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<table>
<thead>
<tr>
<th>Code</th>
<th><strong>Designation</strong></th>
<th><strong>Sales unit</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>K311</td>
<td>CONCENTRIC STRIPPING PLIERS*</td>
<td>1</td>
</tr>
</tbody>
</table>

* The tool is available in several sizes to suit the cable section. Consult us.
Accessories for fraud preventing aerial cable

Cutout sleeve

**Application**

This cutout sleeve makes it possible to secure the connection of the phase conductor and to protect the installation against electrical faults that may occur during illegal connections on the concentric cable. This cutout sleeve can receive a 22×58 fuse up to 100A or a neutral tube.

**Description**

- This cutout sleeve is installed on the customer service conductor.
- This sleeve uses insulation piercing technology.
- This sleeve receives 6-35mm² Al/Cu insulated conductor on both sides.
- At the opening of the sleeve, the elastic tightening of the cartridge ensures that the fuse remains on the customer side, out of potential.
- The single tightening is ensured by two shear head screws sealable after breaking.
- The sleeve has a very good resistance to climatic conditions (humidity, temperature ...)
- The cutout function is sealable

This sleeves meets the criteria of EDF French specification 69 40 070.

**Code** | **Designation** | **Weight (kg)** | **Sales unit**
---|---|---|---
K221 | CUTOUT SLEEVE 63A (22×58) PIERCING 6-35 | 0.235 | 70

**Option :**

Stainless steel strap is available for the mechanical fixing on a pole.

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**Fusion preventing**

**Energy controlling**

**Mechanical fixing**

**Code** | **Designation** | **Weight (kg)** | **Sales unit**
---|---|---|---
K310 | ANCHORING CLAMP CONCENTRIC CABLE SINGLE PHASE | 0.100 | 25
U508 | ANCHORING CLAMP CONCENTRIC CABLE THREE PHASES | 0.180 | 1
L304 | FIXING CLAMP - FF25 | 0.010 | 100
F305 | MULTIPLE ANCHORING BRACKET - CAM 25 | 0.220 | 100

**Application**

This anchoring assembly is designed for fixing low voltage service A.B.C (Aerial Bundled Conductors) with capacity of 2×6 to 4×25mm². The anchoring clamp is also available in an adjustable hook version.

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**Extension**

**Accessories for fraud preventing aerial cable**

**Cutout sleeve**

**Fuse** 22×58

**Code** | **Designation** | **Weight (kg)** | **Sales unit**
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**Extension**

**Accessories for fraud preventing aerial cable**

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**Fuse** 22×58

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---|---|---|---
K221 | CUTOUT SLEEVE 63A (22×58) PIERCING 6-35 | 0.235 | 70

**Option :**

Stainless steel strap is available for the mechanical fixing on a pole.
Service distribution box 8 outlets

Application
The box 8 outlets is designed to establish the junction of 2 overhead networks and the tap contact of 8 single phase or 4 three phase connections maximum. The box can be installed on a facade or a pole. It can also be used at the end of the network.

The benefits:
+ Perform single phase or three phases connections
+ Better spread charges on the network, thanks to the connections visibility
+ Reduce the number of connectors (safer network organisation, strengthened fraud-prevention)
+ Improve the network readability (removal of the “spider’s web” effect)
+ Check the potential at the connection terminals (with a test probe)
+ Guarantee the network durability (better resistance to corrosion and humidity)
+ Make the operation easier (sliding cover with stop when used in open mode)
+ Guarantee a better fitters safety (electric shock risk limited)
+ Remove junctions between cables (making false regular cuts)

Description
- The 8 outlets box is equipped with 4 connection blocks. The network and connection terminals use insulation piercing technology.
- Each connection block is accessible at the touch of a voltage tester.
- The inlet and outlet of the conductors are realised by elastomer seals.
- The terminal separators in the box allow the connection of the conductors in any order.
- The degree of protection of the enclosure is IP33. The lid open, the degree of protection of the active parts is IP2X.
- The box can be delivered (optional) with a non-corrodible metal fixing plate. The rigidity of this plate allows laying on non-flat surfaces.
- The connection can be realised under voltage but without load.

This box meets the criteria of HN 62-S-33 and EN 50483-5 standards.

<table>
<thead>
<tr>
<th>INLET</th>
<th>OUTLET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network</td>
<td>Network</td>
</tr>
<tr>
<td>Capacities</td>
<td>16-95 mm² Al</td>
</tr>
<tr>
<td>Technology</td>
<td>Insulation piercing</td>
</tr>
</tbody>
</table>

Code Designation  Weight (kg)  Sales unit
P429 SERVICE DISTRIBUTION BOX 8 OUTLETS  2.000  1

Installation

Variant
The aerial connection box is also available with 3 outlets.

See sheet Fraud Preventing / Rehabilitation / Aerial connection box
Stabilize the existing network

Issues?

When a fraud preventing policy is launched for network improvement in order to reduce energy losses during transmission and distribution, the first step is to rehabilitate existing facilities.

With fraud preventing solutions installed on existing equipment, such as cable, investments are minimized and benefits observed quickly.

These solutions provide means to fight against some problems often encountered such as overconsumption not invoiced due to fraud upstream from meters and illegal connections on the lines.

Benefits?

+ Network cleaned at a lower cost
+ Invoicing conform to consumption
+ Increase of the power companies incomes
+ Significant decrease of non-technical losses
A cut-off and control point at the top of the pole for existing connections

Cutout sleeve + MINI-SWITCH
The sleeve associated to the mini-switch allows to control of the energy consumption of the customer while creating a cut-off point at the top of the pole.

+ Utility intervention facilitated
+ Limitation of the current that can flow in the connection
+ Cut-off point in case of over-consumption

A distribution point to connect new customers on an existing network

Aerial connection box
The box secures the network by limiting the use of service connectors. It also makes the network cleaner making frauds more easily detectable.

+ Reduce the number of connectors
+ Protection of connections against bad weather
+ Network readability
**Sleeve and mini-switch**

**Application**
This mini-switch limits to a certain intensity the current that can circulate permanently in the connection and control the energy consumption of the customer. Placed at the top of a pole or on an exterior facade in a cutout sleeve, it provides excellent protection against fraud mainly in case of bypass / shunt counter by limiting the consumption to the power subscribed. The massive over-consumption related to fraud is thus reduced significantly.

**Description**
This mini-switch possesses:
- Rating intensity limiting function on the principle of bimetal (thermal bimetallic strip):
  - Caliber: 5A, 10A, 15A, 20A
  - Size: 14x51mm, 22x58mm, T00
- Reversibility threshold: 45A or 60A depending on gauge.
- Circuit breaker fuse function (AD) : power of cut: 20kA.
- Endurance: from 5,000 to 15,000 cycles according the rating.

A three phases version is also available (Fuse Switch Disconnector + fuses).

**Principle of use**

**Example of a mini-switch 10A functionning.**

**Service intensity**

<table>
<thead>
<tr>
<th>Time</th>
<th>10A</th>
<th>Restoring original consumption</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Excess of subscribed power</td>
</tr>
<tr>
<td></td>
<td>5A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cutout</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normal consumption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overconsumption</td>
</tr>
</tbody>
</table>

**Code**

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
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<tbody>
<tr>
<td>P136</td>
<td>MINI-SWITCH 5A 14x51</td>
<td>0.030</td>
<td>10</td>
</tr>
<tr>
<td>P142</td>
<td>MINI-SWITCH 15A 14x51</td>
<td>0.030</td>
<td>10</td>
</tr>
<tr>
<td>P137</td>
<td>MINI-SWITCH 5A T00</td>
<td>0.110</td>
<td>10</td>
</tr>
<tr>
<td>P144</td>
<td>MINI-SWITCH 15A T00</td>
<td>0.120</td>
<td>10</td>
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</tbody>
</table>

**SEE SHEET**

**ACCESS TO ENERGY / Protection / Protection en tête de réseau BT**
Aerial connection box

Application
The box makes it possible to establish up to 6 single phase connections or up to 3 three phases connections at one point of the low voltage aerial bundled network. It can be installed on a façade or a pole. It can also be used at the network end.

Description
- The colour of the enclosure is ivory.
- The box is equipped with 4 connection blocks (1 neutral + 3 phases). The "neutral block" comprises one inlet and 6 outlets; each "phase block" comprises one inlet and 3 outlets.
- Network and Service terminals use either the insulation piercing technology or the stripping technology. The connection blocks are linked 2 by 2 by linking bars.
- Each connection block is accessible with the contact pin of a test probe.
- The inlet and outlet of the conductors in the lower part are performed through elastomer seal sockets.
- The box is delivered with an integrated anti corrosion metal fixing plate. The rigidity of this plate allows it to be installed on uneven surfaces.
- The cover is closed using 2 stainless steel screws.
- An integrated device enables the assembly to be sealed and possibly padlocked.
- The terminal separators inside the box enable the conductors to be connected in any order.
- The degree of protection of the enclosure is IP43 (according to NF EN 60529).
- When the cover is opened, the degree of protection of the live parts is IP2X.
- This box meet the acceptance criteria of the HN 62-S-33 standard.

The benefits:
+ Perform multiple single phase or three phases connections
+ Better spread charges on the network, thanks to the connections visibility
+ Guarantee the network durability (better resistance to corrosion and humidity)
+ Remove the connectors (safer network organized, fraud-preventing strengthened)
+ Disconnect subscribers easily (network cable unimpacted, possibility to re-use connectors)
+ Check the potential at the connection terminals (with a test probe)
+ Guarantee a better fitters safety (electric shock risk limited)

Implementation
Caution: the connection is not designed to withstand a mechanical strength on the conductors, which must be anchored. The maximum flow power is 110kVA.

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Network terminals</th>
<th>Service terminals</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>P431</td>
<td>INSULATION PIERCING AERIAL CONNECTION BOX 3 OUTLETS</td>
<td>Insulation piercing</td>
<td>Insulation piercing</td>
<td>2.880</td>
<td>1</td>
</tr>
<tr>
<td>P432</td>
<td>STRIPPING AERIAL CONNECTION BOX 3 OUTLETS</td>
<td>Stripping</td>
<td>Stripping</td>
<td>2.780</td>
<td>1</td>
</tr>
</tbody>
</table>

P 431 P 432

- "NETWORK" terminals: Insulation piercing
  Capacity: 35mm² - 150mm² Al or Cu
  - Insert the conductor fully through the corresponding seal socket up to the stop.
  - Tighten the screw until the shear head breaks.
  - Use a wrench with 17mm hexagonal socket only.

- "SERVICE" terminals: Insulation piercing
  Capacity: 10mm² - 35mm² Al or Cu
  16M - 50M Al
  - Insert the conductor fully through the seal socket up to the stop.
  - Tighten the screw until the shear head breaks.
  - Use a wrench with 10mm hexagonal socket only.

- "NETWORK" terminals: Stripping
  Capacity: 35mm² - 150mm² Al or Cu
  - Strip the conductor over a length of 90mm.
  - Brush the conductor with neutral grease.
  - Insert the conductor fully through the corresponding seal socket up to the stop.
  - Tighten the screw until the shear head breaks.
  - Use a wrench with 17mm hexagonal socket only.

- "SERVICE" terminals: Stripping
  Capacity: 6mm² - 35mm² Al or Cu
  16M - 50M Al
  - Strip the conductor to be connected over a length of 30mm.
  - Brush it with neutral grease.
  - Insert it fully through the seal socket up to the stop.
  - Tighten the screw until the shear head breaks.
  - Use a wrench with 10mm hexagonal socket only.
  - If reused, the conductor must be cut and stripped again. The recommended torque is 10Nm with an adapted spanner.

Video implementation available on the website www.michaud-export.fr (Documentation tab> Implementation videos)
Fraud preventing system: compose your solution

1. **Cable**
   - Single phase:
     - 1.3 mm² cable
     - 16 mm² cable
   - Three phases:
     - 20 mm² cable
     - 25 mm² cable

2. **Connectors**
   - Connection box
   - Connector
   - Fulfilment kit
   - Three phases fulfilment kit

3. **Protection**
   - Sleeve
   - Mini-switch
   - Fuse
   - Cutout sleeve + Fuse
   - Fuse switch disconnector + Fuses

4. **Anchoring**
   - Multiple anchoring
   - Simple anchoring
   - Anchoring clamp
   - Anchoring clamp
   - Multiple anchoring

Solution recommended by Michaud Export
Access to energy

Management
- Energy manager p.40
- Accessories for energy manager p.42
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- Meter cabinet RE for IGA's p.46
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Distribution
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- LV A.B.C cable p.54
- Aerial accessories p.56
- Stainless steel strap p.62

Protection
- LV network fuse protection p.66
- Fuses p.68
- Earth system p.70
In a context where maintenance costs are very high on electrical networks, materials protection is one of the main ways to guarantee the equipment’s sustainability. The network head-end is a key point of a LV infrastructure. Michaud Export proposes an economical alternative technology using fuses. Their high breaking capacity guarantees the installation security.

In addition, electrical networks must be protected with earth systems for people and goods safety.

Optimising cable cross-sections for actual consumption is an effective way to lower the costs of a project. With a 2x6mm² cable cross-section, 30A intensity and a reach of 40m, voltage drop is below 2%.

The 2x6mm² cable and corresponding accessories ensure implementation savings up to 30% for the operator.

In Kenya, 85% of household customers account for 25% of energy sales. In these conditions, an economical and autonomous management system can improve profitability and encourage access to energy.

The energy flat fee invoicing simplifies customers management by lowering operating and maintenance costs.

For Income Generating Activities (IGAs), a solution with simplified metering enables to reduce purchase costs for the operator.

The network head-end is a key point of a LV infrastructure. Michaud Export proposes an economical alternative technology using fuses. Their high breaking capacity guarantees the installation security.

In addition, electrical networks must be protected with earth systems for people and goods safety.
Simplified management of the consumption

**Issues ?**

In developing countries and more particularly in Sub-Saharan Africa the electrical network according to its infrastructure usually only reaches 20% of localities. This deficiency does not enable an economic, and social development of those territories.

Knowing about this context and being focused into electricity distribution toward the end customer, Michaud designed innovative solutions to optimize connection and business management.

Operating and selling difficulties of the electrical service in rural areas, sometimes isolated, have been integrated into a global thinking. That is why Michaud’s innovations take into account every components of the connection, from cable to customer interface, through solutions for consumption management.

**Benefits ?**

+ Support for economic development
+ Minimize implementation, maintenance operating costs
+ Simplify customers’ management
Flat fee invoicing

How does the flat fee invoicing system work?

Operator:
- Reliable and profitable business plan
- Planned and regular incomes
- Incomes collected before production
- Anticipation of energy production
- Automatic consumption management
- Canceled of meter reading costs
- Easy to recover

End customer:
- Monthly fixed cost
- Flexible payments in agreement with the operator
- Flat fee limited by time or energy quantity
- Daily consumption management
- Progressive awareness to energy management

How does the payment operate?

In the rural electrification context, end customer’s payment management is one of the major difficulties. The flat fee system brings some flexibility to the operator by offering various possibilities for payments. According to the economic and social environment of connected villages, customers can pay:
- Through mobile banking solutions
- Through money transfer solutions
- With fiduciary money

Depending on the end customers number, payments can be settled using a classic IT spreadsheet, easy to manage.

An adapted solution to rural electrification projects

With the energy manager, Michaud Export designed a solution which answers to this invoicing system. The energy manager can be set up according to the end customer contract and so frame the consumption.

The flat fee invoicing system remains the most suitable way for tiny consumptions.

Flat fee system: worthy advantages

The flat fee invoicing system allows the operator to collect incomes before engendering production costs.

Financial advantage: better cash flows management

Structural advantage: energy production anticipated

Thanks to an electricity consumption ceiling, the flat fee system enables to know the end customers’ maximum consumption. The operator anticipates production needs avoiding network failures and demand peaks.

The flat fee invoicing system tends to standardize inhabitants consumptions. It is a didactic system, perfectly suitable for end customers electrified for the first time.
Energy manager

**Application**

The energy manager is provided with an electronic regulator, controlling power and managing energy automatically without user/operator intervention.

It is perfectly suitable for flat fee energy invoicing. It replaces the meter and cancels the requirement of consumption reading. The cabinet can be installed outside thanks to the UV resistant IP34 property.

It is designed for a single phase connection.

**Description**

The energy manager is programmable according to the criteria chosen by the operator:

**MANAGEMENT MODE**

- **Time**
  - Allocated time quantity is adjustable down to the last hour

- **Energy**
  - Allocated energy quantity is adjustable down to the last watt

**SETTINGS**

- **Power**
  - Maximum instant power allowed (1500W)

- **Transfer**
  - Possibility to transfer the remaining time or energy quantity to the next period (1 period maximum)

- **Observation period**
  - Period when allocated time or energy quantity is defined. This gives a daily or weekly control of the used energy (1 day to 1 week)

- **Shut down time after overage**
  - Time during which energy is shutting down due to a power overage (up to 60 seconds)

- **Accepted overage time**
  - Time during which the maximum authorized instant power can be overcome (up to 60 seconds)

The settings can be modified according to flat fee contract set up by the operator, following households evolution.

**K497 PROGRAMMABLE ENERGY MANAGER CABINET 20 - 1 500W**

- 0.360 kg

**K498 PROGRAMMABLE ENERGY MANAGER MODULE 20 - 1 500W**

- 0.150 kg

To fit the environment, the module can be set in different holders, as the modular interface below. Please enquire.

Non contractual pictures and drawings. MICHAUD Export reserves the right to modify specifications without any prior notice.
Energy manager accessories

Configuration

The energy manager configuration is performed through a software available on PC or tablet.
The last ten settings are kept in memory for a better subscriber follow up.

Application

Connection

Description

The connectors allow a safe phase and neutral connection thanks to a cutout function, protecting in this way the energy manager.

Function

- Cable sections: 16-95 / 6-16mm².
- Insulation piercing technology.
- Simultaneous tightening.
- Potential free shear head screw.
- Very good resistance to harsh weather (humidity, heat...).
- IP2x during implementation
- IP33 after installation.
- Integrated and sealable cutout.
- Fuse: size 10.3x38mm gG.

- Cable sections: 16-95 / 2.5-35mm².
- Insulation piercing technology.
- Simultaneous tightening.
- Potential free shear head screw.
- Very good resistance to harsh weather (humidity, heat...).

Technical specifications

- Cable sections: 16-95 / 6-16mm².
- Insulation piercing technology.
- Simultaneous tightening.
- Potential free shear head screw.
- Very good resistance to harsh weather (humidity, heat...).

Option:
The EM (K487) bluetooth extension is available. Please enquire.

For the fuses, please enquire.

Tablet kit

The tablet kit includes a safe bluetooth system (dongle) and a digital tablet.

It allows an easy access to the energy manager on site.

Application

To afford the connection of a single customer as part of a new installation, the energy manager can be associated to connectors.

Code Designation Weight (kg) Sales unit

K223 FUSE CONNECTOR PIERCING 95/16 0.130 10

K232 CONNECTOR CBS / CT 95 0.130 30

Code Designation Weight (kg) Sales unit

K499 PC ENERGY MANAGER KIT 0.710 1

K488 PROGRAMMABLE ENERGY MANAGER BLUETOOTH DONGLE + TABLET 1.150 1

PC kit

The kit comprises an USB key containing the configuration software and an USB cable to connect energy manager to PC.

It is the best solution for the operator to set the energy manager at the office before the installation. Moreover, it allows to program the different flat fees levels offered by the operators.

Application

The EM (K487) bluetooth extension is available. Please enquire.

The fuses, please enquire.

Application

For the fuses, please enquire.
**Load limiter**

**Application**
The load limiter is provided with an electronic regulator which controls intensity and manages power automatically without user/operator intervention. It is perfectly suitable for flat fee invoicing. It replaces the meter and cancels the requirement of consumption reading. The cabinet can be installed at the top of the pole or on the outside facade with the help of screws and strap. The cabinet resists to UV and to water or insect penetration (IP34D). Its cover closing can be sealed providing an excellent fraud protection. This cabinet limiter can receive a single phase connection with 2.5-16mm² cable sections.

**Description**

- **Calibration** is factory set-up
- **Power**
  - Maximum power allowed, set in factory (1000VA)
- **Autonomous functioning**
  - Automatic power cut and reengagement
- **Cut off delay**
  - According to the calibration, it is between 1 up to 2 seconds
- **Cut time**
  - 30 seconds

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
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<tbody>
<tr>
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<td>ELECTRONIC LIMITER CABINET 50-75VA</td>
<td>0.380</td>
<td>1</td>
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<tr>
<td>K481</td>
<td>ELECTRONIC LIMITER CABINET 75-250VA</td>
<td>0.380</td>
<td>1</td>
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<tr>
<td>K482</td>
<td>ELECTRONIC LIMITER CABINET 250-1000VA</td>
<td>0.380</td>
<td>1</td>
</tr>
</tbody>
</table>

**Application**
The load limiter module can be placed into an interface. It comprises a cutout and a differential circuit-breaker to ensure goods and people protection. It is equipped with an input through a cable gland for power supply and 2 outputs:
- an electrical outlet for simple access to energy
- a second output through a cable gland and a insulating screw joint for home wiring.

The whole is pre wired and is suitable for a single-phase connection. Ideally, it can be installed inside the home or in an outdoor shelter.

**Option**
As an alternative to the electronic load limiter, another interface is available with a 1A thermal limiter (K832). Please enquire.

**Module**

- **Cut out**: Disconnection: Phase and Neutral
- **Differential circuit-breaker**
  - Nominal current: 1A
  - Nominal voltage application: 230V / 240V, 50Hz
  - Breaking capacity: 
  - Differential sensitivity: \( \Delta I = 300mA \)
  - Differential breaking: instantaneously
- **Power socket**
  - Bipolar plug + earthing (type NF C 61-314)
  - Female type

**Load limiter**

- **Calibration** is factory set-up
- **Power**
  - Maximum power allowed, set in factory (1000VA)
- **Autonomous functioning**
  - Automatic power cut and reengagement
- **Cut off delay**
  - According to the calibration, it is between 1 up to 2 seconds
- **Cut time**
  - 30 seconds

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- **Differential circuit-breaker**
  - Nominal current: 1A
  - Nominal voltage application: 230V / 240V, 50Hz
  - Breaking capacity: 
  - Differential sensitivity: \( \Delta I = 300mA \)
  - Differential breaking: instantaneously
- **Power socket**
  - Bipolar plug + earthing (type NF C 61-314)
  - Female type

**Integrated version into modular interface**

**Application**
The load limiter module can be placed into an interface. It comprises a cutout and a differential circuit-breaker to ensure goods and people protection. It is equipped with an input through a cable gland for power supply and 2 outputs:
- an electrical outlet for simple access to energy
- a second output through a cable gland and a insulating screw joint for home wiring.

The whole is pre wired and is suitable for a single-phase connection. Ideally, it can be installed inside the home or in an outdoor shelter.

**Option**
As an alternative to the electronic load limiter, another interface is available with a 1A thermal limiter (K832). Please enquire.

**Module**

- **Cut out**: Disconnection: Phase and Neutral
- **Differential circuit-breaker**
  - Nominal current: 1A
  - Nominal voltage application: 230V / 240V, 50Hz
  - Breaking capacity: 
  - Differential sensitivity: \( \Delta I = 300mA \)
  - Differential breaking: instantaneously
- **Power socket**
  - Bipolar plug + earthing (type NF C 61-314)
  - Female type

**Load limiter**

- **Calibration** is factory set-up
- **Power**
  - Maximum power allowed, set in factory (1000VA)
- **Autonomous functioning**
  - Automatic power cut and reengagement
- **Cut off delay**
  - According to the calibration, it is between 1 up to 2 seconds
- **Cut time**
  - 30 seconds

<table>
<thead>
<tr>
<th>Code</th>
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<th>Weight (kg)</th>
<th>Sales unit</th>
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<tr>
<td>K811</td>
<td>CUSTOMER BOARD 50-75VA</td>
<td>1.000</td>
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<tr>
<td>K812</td>
<td>CUSTOMER BOARD 75-250VA</td>
<td>1.000</td>
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<tr>
<td>K813</td>
<td>CUSTOMER BOARD 250-1000VA</td>
<td>1.000</td>
<td>1</td>
</tr>
</tbody>
</table>

**SEE SHEET**

Modular cabinets: make up your own solution
Meter cabinet RE for IGA’s

**Application**

This 2 outputs meter cabinet is a solution perfectly suitable for Rural Electrification (RE) and particularly Income Generating Activities (IGA’s).

It comprises an internal circuit breaker, a meter and a differential circuit breaker to ensure goods and people protection.

It is equipped with an input through a large cable gland for power supply and 2 outputs:  
- An electrical outlet for simple access to energy,
- Second outlet through a smaller cable gland and black domino terminal for home wiring.

The whole set is pre-wired. Ideally, it can be installed inside the home or below a shelter.

**Description**

- **Envelope:**  
  - Synthetic materials.
  - Dimensions (L x W x D): 220(260)x150x120mm.
  - Mounted / connected: cutout 10.3x38 (hidden) / meter / differential circuit-breaker / earthing terminal / power socket and terminal black domino terminal.
  - Cable gland at the bottom used to route power cables (2x6-16mm² - diameter 13 up to 18mm).
  - Movable window on the front side making the access to modular devices easier.
  - First outlet with power socket having closed protection cover IP54.
  - Second outlet with cable gland allowing leading-out cable (2x2.5mm² - diameter 5 up to 10mm).
  - IP43 Device with conductors.
  - Fitted with precuts at the bottom enabling the fixing of the envelope with screws, on every kind of material.
  - Anti-fraud: sealing possibility preventing the access to the live areas.

- **Cut-out:**  
  - Disconnection: Phase and Neutral.
  - Hidden cutout, inaccessible from the user.

- **Differential circuit-breaker:**  
  - Nominal current: 1A, 3A, 5A, 10A or 15A.
  - Nominal voltage application: 230V / 240V, 50Hz.
  - Breaking capacity: Icn = 3kA.
  - Differential sensitivity: IΔ = 300mA.
  - Breaking curve: type C.
  - Differential breaking: instantaneously.

- **Power socket:**  
  - Bipolar plug + earthing (type NF C 61-314).
  - Female type.

- **Meter:**  
  - Single phase type meter of 1 module size (18mm width).
  - Class of measure: 1.
  - Voltage rate: 230V ±10%.
  - Frequency: 50Hz.
  - Maximal current: 30A.

**Option:**

As an alternative, the meter cabinet is proposed with one output (1.0), access to energy being possible only through the power socket on the front side.

**Table:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
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</thead>
<tbody>
<tr>
<td>K851</td>
<td>METER CABINET 2.0 1A</td>
<td>1.000</td>
<td>1</td>
</tr>
<tr>
<td>K853</td>
<td>METER CABINET 2.0 3A</td>
<td>1.000</td>
<td>1</td>
</tr>
<tr>
<td>K855</td>
<td>METER CABINET 2.0 5A</td>
<td>1.000</td>
<td>1</td>
</tr>
<tr>
<td>K856</td>
<td>METER CABINET 2.0 10A</td>
<td>1.000</td>
<td>1</td>
</tr>
<tr>
<td>K857</td>
<td>METER CABINET 2.0 15A</td>
<td>1.000</td>
<td>1</td>
</tr>
</tbody>
</table>
Modular cabinets: make up your own solution

**Individual cabinet**

The transparent front door enables a clear readability of components like LED. Modules are fixed on DIN rail. It is implemented in a shelter or inside the premise.

- **Available space:** 5 modulars

**Collective cabinet**

The cabinet enables to gather equipment to optimize costs of several connections. Modules are fixed on DIN rail. It is implemented at the top of a pole.

- **Available space:** 10 modulars

**Benefits?**

- Customized solution
- Wide range of customers’ management
- Possibility to combine different management modules
- Several protection technologies
- Components implemented in serie and/or in parallel

**Management**

1. Choose your cabinet
2. Select your functions

**Protection**

- **People**
- **Installations**
- **Metering**

1 MODULAR
1 MODULAR
1 MODULAR
1 MODULAR
3 MODULARS
3 MODULARS
2 MODULARS
2 MODULARS

**Power**

- Flat fee
- Flat fee
- Flat fee
- Flat fee

**Time**

- Flat fee
- Flat fee
- Flat fee (time slot management)
Reliable and optimized electricity distribution

**Issues**
As a part of rural electrification programs, electricity distribution costs represent a significant budget and are often undervalued. In most cases, those additional charges are due to the transposition of traditional electrification models, without taking care of the economic, social and cultural context of developing countries.

Michaud proposes simplified solutions for low voltage connections, following international standards, from the HV/LV transformer aval post to the end customer. The result is **15% to 30% saving** enabling to connect more households and villages with the allocated budget!

**Benefits**
- Costs reduction
- Adaptation to local context
- Optimized access to energy
Aerial service cable

**MIRELEC**

**Application**
This single phase or three-phase aerial cable is used for the connection between the low voltage network and the home. It is perfectly suitable for electrification applications in rural and suburban areas thanks to its optimized 6mm² section. It is stretched to a maximum range of 40m.

**Description**
- This single phase or three-phase cable respectively consists of 2 or 4 twisted insulated conductors, phase(s) and neutral.
- Service voltage rate: 600V.
- Conductors core made of aluminium:
  - Conductors section: 6mm²
  - Diameter over core: 3.12mm
  - Number of strands: 7
  - Diameter of strands: 1.04mm
  - Mechanical strength of strands: 18.5daN/mm²
  - Minimum strain of strands: 1.2%
  - Step factor: 10 - 16
  - Step direction: right
- Conductors insulation made of polyethylene:
  - Nominal insulation thickness: 1.2mm
  - Minimum insulation thickness: 0.98mm
  - Diameter over insulation: 5.52mm
- Cable characteristics:
  - Phase identification: marking
  - Twist step factor: 25 - 60
  - Twist step direction: right
  - Twist weight: 75kg / km
  - Dielectric test / water: 2.5kVac / 1 min
  - Linear strength to 20°C: 4.5C/km
  - Maximum intensity in permanent capacity in the open air: 30A
  - Maximum temperature in service: 90°C
- This cable meets the acceptance criteria of the IEC 60502 standard.

Other cable sections available.

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Packaging</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U300</td>
<td>AERIAL SERVICE CABLE 2x6mm²</td>
<td>200m ring</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>U304</td>
<td>AERIAL SERVICE CABLE 4x6mm²</td>
<td>200m ring</td>
<td>30</td>
<td>1</td>
</tr>
</tbody>
</table>

**Accessories dedicated to the 6mm² cable**

- This insulation piercing connector is used to perform a tap connection from a network from 16 up to 95mm² with the 6mm² aerial service cable.

**Code** | **Designation** | **Weight (kg)** | **Sales unit** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L227</td>
<td>CONNECTOR CES/CT 95</td>
<td>0.060</td>
<td>200</td>
</tr>
</tbody>
</table>

- This anchoring clamp is used to fix 2x6mm² service cable between the pole and the home. It can be associated with the PF25 fixing clamp (L304) for implementation on a wall or a pole, thanks to a screw M10 (L306) or strap.

**Code** | **Designation** | **Weight (kg)** | **Sales unit** |
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U500</td>
<td>ANCHORING CLAMP 2x6mm² - PA6</td>
<td>0.100</td>
<td>60</td>
</tr>
<tr>
<td>U504</td>
<td>ANCHORING CLAMP 4x6mm² - PA4x6</td>
<td>0.120</td>
<td>60</td>
</tr>
<tr>
<td>L304</td>
<td>FIXING CLAMP - PF25</td>
<td>0.010</td>
<td>100</td>
</tr>
<tr>
<td>L306</td>
<td>SCREW M10</td>
<td>0.048</td>
<td>50</td>
</tr>
<tr>
<td>K265</td>
<td>BELT SUSPENSION WITH RING</td>
<td>0.020</td>
<td>25</td>
</tr>
</tbody>
</table>

**Other cable sections available.**

Please enquire.
Low voltage twisted insulated cable

**Network**

**MIRELEC**

**Application**

This cable is used for low voltage electrical distribution (0.6 / 1kV, 50Hz). The cable comprises a neutral messenger which is twisted with the rest of the conductors. One or several street light conductors are possible, consult us.

**Description**

- This cable has a working temperature of -60 °C to + 50 °C.
- The minimum installation temperature is -20 °C.
- The maximum allowed conductor temperature is + 90 °C.
- The bend radius of curvature corresponds to 10 x diameter of the conductor.

**Nominal section (mm²)** | **Nominal insulation thickness (mm)** | **External diameter of the maximal conductor (mm)** | **Approximate weight (kg/km)** | **Maximum resistance at 20 °C (Ω/km)**
--- | --- | --- | --- | ---
2 x 16 | 1.20 | 5.1 | 130 | 1.91
4 x 16 | 1.20 | 5.1 | 280 | 1.91
2 x 25 | 1.40 | 9.4 | 205 | 1.20
4 x 25 | 1.40 | 9.4 | 512 | 1.20

**Service**

- The cable is delivered on wooden drums.
- The cable is available in single-phase 2x16mm² and 2 x 25mm² or three-phase 4x16mm² and 4x25mm² bundles.
- Each conductor is composed of 7 strands.

This cable meets the criteria of the **NF C 33-209** standard.

**U305** METER OF TWISTED CABLE 2x16mm²

**U306** METER OF TWISTED CABLE 4x16mm²

**U312** METER OF TWISTED CABLE 2x25mm²

**U313** METER OF TWISTED CABLE 4x25mm²

The minimum sales unit is 1000m and then in 100m steps.

Others dimensions are available, consult us.
Aerial accessories

Connectors

**MIRELEC**

**Application**

These connectors are used to connect twisted aerial insulated conductors. Four items are available:

- **Street light connector** for powering street light lamp and performing tap connection of small section cables from a network (capacities: 16-95 / 1.5-10mm²)

- **Service connector** used to make a tap connection from the network to the customer (capacities: 16-95 / 2.5-35mm²)

- **Bare conductors version is available** [L259]

- **Service connector** used to make a tap connection from a network to customer (capacities: 35-150 / 6-35mm²)

- **Network connector** used to make a tap connection from the network to the customer (capacities: 16-95 / 16-95mm²)

- **Network connector** used to make a tap connection between aerial networks (capacities: 35-150 / 35-150mm²)

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
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<tbody>
<tr>
<td>L227</td>
<td>CONNECTOR CES / CT 95</td>
<td>0.060</td>
<td>200</td>
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<tr>
<td>K232</td>
<td>CONNECTOR CBS / CT 95</td>
<td>0.130</td>
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<tr>
<td>U533</td>
<td>CONNECTOR CBS / CT 35-150 / 6-35 A</td>
<td>0.100</td>
<td>100</td>
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<tr>
<td>L256</td>
<td>CONNECTOR CD / RS / CT 95</td>
<td>0.140</td>
<td>50</td>
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<tr>
<td>L356</td>
<td>CONNECTOR CD / RS / CT 150</td>
<td>0.400</td>
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<table>
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<tr>
<th>Code</th>
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<th>Weight (kg)</th>
<th>Sales unit</th>
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<tbody>
<tr>
<td>L259</td>
<td>CONNECTOR RDP / CM abc 6-35 / AI 7-95</td>
<td>0.130</td>
<td>20</td>
</tr>
</tbody>
</table>

**Fixing**

The anchoring assembly is used for up-holding A.B.C (aerial bundled conductors) with insulated neutral messenger. Two different sections of neutral messenger are available: 54.6mm² and 70mm².

- **Bare conductors version is available** +

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
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</thead>
<tbody>
<tr>
<td>U501</td>
<td>ANCHORING CLAMP 54.6mm² - PA 54.6</td>
<td>0.410</td>
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<tr>
<td>U501-70</td>
<td>ANCHORING CLAMP 70mm² - PA 70</td>
<td>0.530</td>
<td>25</td>
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<tr>
<td>U502</td>
<td>ANCHORING BRACKET 54.6mm² - CA 54.6</td>
<td>0.235</td>
<td>50</td>
</tr>
<tr>
<td>U502-70</td>
<td>ANCHORING BRACKET 70mm² - CA 70</td>
<td>0.300</td>
<td>60</td>
</tr>
<tr>
<td>U503</td>
<td>SUSPENSION ASSEMBLY 54.6mm² - ES 54.6</td>
<td>0.510</td>
<td>30</td>
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<tr>
<td>U503-70</td>
<td>SUSPENSION ASSEMBLY 70mm² - ES 70</td>
<td>0.650</td>
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</table>

**Code**

<table>
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<th>Code</th>
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<th>Weight (kg)</th>
<th>Sales unit</th>
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<tbody>
<tr>
<td>U500_4X25</td>
<td>SERVICE ANCHORING CLAMP - PA 25</td>
<td>0.105</td>
<td>100</td>
</tr>
<tr>
<td>F027</td>
<td>ANGULAR CLAMP RA25</td>
<td>0.080</td>
<td>100</td>
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</table>

**Note:** For pole hardware (BOC) supply, please enquire

**See Sheet**

Aerial service cable / Accessories / Stainless steel strap
### Aerial accessories

#### Network junction

<table>
<thead>
<tr>
<th>Code Designation</th>
<th>Leading-in cable (mm²)</th>
<th>Leading-out cable (mm²)</th>
<th>Dimensions (mm)</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
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<tbody>
<tr>
<td>U507_95N-95N MJPT SLEEVE 95-95</td>
<td>54.6 Black</td>
<td>54.6 Black</td>
<td>10.2 10.2</td>
<td>0.080</td>
<td>10</td>
</tr>
<tr>
<td>U507_95N-70N MJPT SLEEVE 95-70</td>
<td>54.6 Black</td>
<td>54.6 Black</td>
<td>13.5</td>
<td>0.090</td>
<td>10</td>
</tr>
<tr>
<td>U507_70N-70N MJPT SLEEVE 70-70</td>
<td>70 White</td>
<td>70 White</td>
<td>10.2 10.2</td>
<td>0.090</td>
<td>10</td>
</tr>
</tbody>
</table>

#### Leading-in
- **Elastomer seal gasket**
- Coloured en cap according to the section of the cable to connect

#### Leading-out
- **Elastomer seal gasket**
- Coloured en cap according to the section of the cable to connect

This preinsulated sleeve meets the requirements of the **NF C 33-021** and **EN 50-483** standards.

### Service junction

#### Description

This preinsulated lug meets the requirements of the **NF C 33-021** and **EN 50-483** standards.

<table>
<thead>
<tr>
<th>Code Designation</th>
<th>Leading-in cable (mm²)</th>
<th>Leading-out cable (mm²)</th>
<th>Dimensions (mm)</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>US09_10-10 MJPB SLEEVE 10-10</td>
<td>4 Ivory</td>
<td>4 Ivory</td>
<td>2.9</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_10-16 MJPB SLEEVE 10-16</td>
<td>4 Ivory</td>
<td>10 Green</td>
<td>4.3</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_10-25 MJPB SLEEVE 10-25</td>
<td>4 Ivory</td>
<td>25 Orange</td>
<td>6.5</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_10-35 MJPB SLEEVE 10-35</td>
<td>4 Ivory</td>
<td>35 Red</td>
<td>7.9</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_16-16 MJPB SLEEVE 16-16</td>
<td>6 Brown</td>
<td>6 Brown</td>
<td>3.3</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_16-25 MJPB SLEEVE 16-25</td>
<td>6 Brown</td>
<td>25 Orange</td>
<td>6.5</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_16-35 MJPB SLEEVE 16-35</td>
<td>6 Brown</td>
<td>35 Red</td>
<td>7.9</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_10-10 MJPB SLEEVE 10-10</td>
<td>10 Green</td>
<td>10 Green</td>
<td>4.3</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_10-16 MJPB SLEEVE 10-16</td>
<td>10 Green</td>
<td>16 Blue</td>
<td>5.3</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_10-25 MJPB SLEEVE 10-25</td>
<td>10 Green</td>
<td>25 Orange</td>
<td>6.5</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_10-35 MJPB SLEEVE 10-35</td>
<td>10 Green</td>
<td>35 Red</td>
<td>7.9</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_16-16 MJPB SLEEVE 16-16</td>
<td>16 Blue</td>
<td>16 Blue</td>
<td>5.3</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_16-25 MJPB SLEEVE 16-25</td>
<td>16 Blue</td>
<td>25 Orange</td>
<td>6.5</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_16-35 MJPB SLEEVE 16-35</td>
<td>16 Blue</td>
<td>35 Red</td>
<td>7.9</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_16-50 MJPB SLEEVE 16-50</td>
<td>16 Blue</td>
<td>50 Yellow</td>
<td>8.8</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_25-25 MJPB SLEEVE 25-25</td>
<td>25 Orange</td>
<td>25 Orange</td>
<td>6.5</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_25-35 MJPB SLEEVE 25-35</td>
<td>25 Orange</td>
<td>35 Red</td>
<td>7.9</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_25-50 MJPB SLEEVE 25-50</td>
<td>25 Orange</td>
<td>50 Yellow</td>
<td>8.8</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_35-35 MJPB SLEEVE 35-35</td>
<td>35 Red</td>
<td>35 Red</td>
<td>7.9</td>
<td>0.050</td>
<td>150</td>
</tr>
<tr>
<td>US09_35-50 MJPB SLEEVE 35-50</td>
<td>35 Red</td>
<td>50 Yellow</td>
<td>8.8</td>
<td>0.050</td>
<td>150</td>
</tr>
</tbody>
</table>

**SEE SHEET**

**ACCESS TO ENERGY** | **Distribution** | **Aerial accessories** | **Tooling**

---

Non contractual pictures and drawings. MICHAUD Export reserves the right to modify specifications without any prior notice.
Aerial accessories

Ending fitting

MIRELEC

Application
This spin-welded preinsulated lug is designed to connect low voltage overhead insulated conductors to copper equipment terminals. The cable sections range that the lug can receive goes from 16 to 150mm².

Description

This preinsulated lug meets the requirements of the NF C 33-021 and EN 50-483 standards.

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Insulated Al-Cu cable (mm²)</th>
<th>Dimensions (mm)</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 16mm² - DIAM 10</td>
<td>16</td>
<td>10.3</td>
<td>75</td>
<td>0.040</td>
</tr>
<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 25mm² - DIAM 10</td>
<td>25</td>
<td>10.3</td>
<td>100</td>
<td>0.040</td>
</tr>
<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 35mm² - DIAM 13</td>
<td>35</td>
<td>13</td>
<td>100</td>
<td>0.070</td>
</tr>
<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 50mm² - DIAM 13</td>
<td>50</td>
<td>13</td>
<td>100</td>
<td>0.070</td>
</tr>
<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 54.6mm² - DIAM 13</td>
<td>54.6</td>
<td>13</td>
<td>100</td>
<td>0.070</td>
</tr>
<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 70mm² - DIAM 13</td>
<td>70</td>
<td>13</td>
<td>100</td>
<td>0.070</td>
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<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 95mm² - DIAM 13</td>
<td>95</td>
<td>13</td>
<td>100</td>
<td>0.070</td>
</tr>
<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 120mm² - DIAM 13</td>
<td>120</td>
<td>13</td>
<td>118</td>
<td>0.220</td>
</tr>
<tr>
<td>U506</td>
<td>CPTAU SPIN-WELDED LUG 150mm² - DIAM 13</td>
<td>150</td>
<td>13</td>
<td>118</td>
<td>0.220</td>
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</table>

TOOLING FOR CONNECTORS INSTALLATION

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>F445</td>
<td>INSULATED RATCHET WRENCH HEXAGONAL 13/17mm</td>
<td>0.380</td>
<td>1</td>
</tr>
<tr>
<td>F460</td>
<td>INSULATED CROSS SPANNER 8-10-13-17mm</td>
<td>0.400</td>
<td>1</td>
</tr>
<tr>
<td>K005</td>
<td>INSULATED WEDGE SEPARATOR</td>
<td>0.360</td>
<td>5</td>
</tr>
<tr>
<td>K007</td>
<td>INSULATED WEDGE SEPARATOR 200x15x9mm</td>
<td>0.050</td>
<td>100</td>
</tr>
</tbody>
</table>

TOOLING FOR SPIN-WELDED AND SLEEVE

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>F400</td>
<td>50MN HYDRAULIC CRIMPING TOOL</td>
<td>2.350</td>
<td>1</td>
</tr>
<tr>
<td>F420</td>
<td>HEXAGONAL DIE TYPE E140</td>
<td>0.115</td>
<td>1</td>
</tr>
<tr>
<td>F421</td>
<td>HEXAGONAL DIE TYPE E173</td>
<td>0.115</td>
<td>1</td>
</tr>
<tr>
<td>F422</td>
<td>HEXAGONAL DIE TYPE E215</td>
<td>0.115</td>
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</table>

MEASURING DEVICE

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U813-2</td>
<td>CLAMP AMMETER</td>
<td>0.520</td>
<td>1</td>
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</table>
Stainless steel strap

**Description**

This stainless steel strap is mainly used to fix the suspension or anchoring clamp brackets on all types of poles (wooden, metal or concrete).

- This strap packaged in a 50m winder is available in four dimensions:
  - 10 x 0.4mm
  - 10 x 0.7mm
  - 20 x 0.4mm
  - 20 x 0.7mm
- The strap is made of stainless steel AISI 430. The strap edges are deburred.
- The strap delivered in a 50m roll inside a strengthened cardboard winder.

**Application**

This stainless steel strap is mainly used to fix the suspension or anchoring clamp brackets on all types of poles (wooden, metal or concrete).

**Implementation**

- Cut the required length of strap using the cutting tool.
- Fix the strap around the pole and bracket using a binding tool and attach a buckle.
- Keep the cutting tool and binding tool in the suitable carrying case.

**Tools**

- Cutting tool
- Binding tool ratchet type
- Buckles
- Carrying case for strap tools

**Anti-climbing buckles**

These stainless steel buckles are fixed onto the strap to prevent climbing on the pole and the fraud attempt.

**Option:**

Synthetic materials winder is also available.

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>K940</td>
<td>50m CARDBOARD WINDER STAINLESS STEEL STRAP EC 10x0.4mm</td>
<td>1.800</td>
<td>5</td>
</tr>
<tr>
<td>K941</td>
<td>50m CARDBOARD WINDER STAINLESS STEEL STRAP EC 10x0.7mm</td>
<td>2.800</td>
<td>5</td>
</tr>
<tr>
<td>K942</td>
<td>50m CARDBOARD WINDER STAINLESS STEEL STRAP EC 20x0.4mm</td>
<td>3.250</td>
<td>5</td>
</tr>
<tr>
<td>K943</td>
<td>50m CARDBOARD WINDER STAINLESS STEEL STRAP EC 20x0.7mm</td>
<td>5.690</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>K945</td>
<td>50m WINDER STAINLESS STEEL STRAP EC 10x0.4mm</td>
<td>1.850</td>
<td>5</td>
</tr>
<tr>
<td>K946</td>
<td>50m WINDER STAINLESS STEEL STRAP EC 10x0.7mm</td>
<td>2.950</td>
<td>5</td>
</tr>
<tr>
<td>K947</td>
<td>50m WINDER STAINLESS STEEL STRAP EC 20x0.4mm</td>
<td>3.450</td>
<td>5</td>
</tr>
<tr>
<td>K948</td>
<td>50m WINDER STAINLESS STEEL STRAP EC 20x0.7mm</td>
<td>5.800</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>K950</td>
<td>SET OF 100 BUCKLES EC FOR 10mm STRAP</td>
<td>0.320</td>
<td>1</td>
</tr>
<tr>
<td>K951</td>
<td>SET OF 100 BUCKLES EC FOR 20mm STRAP</td>
<td>0.610</td>
<td>1</td>
</tr>
<tr>
<td>K960</td>
<td>BINDING TOOL RATCHET TYPE FOR STRAP</td>
<td>1.950</td>
<td>1</td>
</tr>
<tr>
<td>K961</td>
<td>CUTTING TOOL FOR STRAP</td>
<td>0.550</td>
<td>1</td>
</tr>
<tr>
<td>K963</td>
<td>CARRYING CASE FOR STRAP TOOLS</td>
<td>0.550</td>
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</tr>
</tbody>
</table>

**Video implementation**

Available on the website www.michaud-export.fr (Documentation tab> Implementation videos)
Harsh climates of many developing countries create regularly disruptions on the lines. In order to protect people, the electrical production sources and networks, Michaud offers some economical and enduring alternatives to traditional solutions.

Mostly used in Europe, the thermal image circuit-breaker, installed at the top of the pole, causes inopportune power cuts in case of phases imbalance on the network. To avoid this inconvenience, Michaud has designed a very economical fuse switch disconnector equipped with fuses of high breaking capacity (HBC). This system has the advantage to add protection and breaking points, making easier the network operating and maintenance.

Michaud also proposes earth system solutions for people and installations protection.

**Issues ?**

**Benefits ?**

+ Safe and sustainable installations
+ Medium and long term profitability
+ Easier networks operating and maintenance
LV network fuse protection

Gang fuse switch disconnector

**MICHAUD**

**Application**

This multi-pole fuse switch disconnector device is installed below a transformer at the top of the pole. It provides protection up to 160A or cut-off up to 240A. It is attached to the pole and thus protects the transformer and the low-voltage network below it. It protects single phase and three phase transformers.

**Description**

- The switch disconnector is installed downstream:
  - Of the transformer 50kVA with fuses 80A,
  - Of the transformer 100kVA with fuses 160A,
  - Of the transformer 160kVA with neutral blade contacts, in order to create a breaking point on the network, each network outlet being possibly and independently protected with a disconnector.
- This protection system is designed to secure the opening with cable energised and loaded.
- The terminals authorise a connection up to 95mm². The connection is performed with insulation piercing technology, insuring a reliable and secured contact.

**The benefits:**

+ 50 to 80% more economical than a circuit breaker
+ Strong solution, very little sensitive to charge imbalances
+ Solution available in single phase and in three phases

**Option: Double Departure**

A double start can be achieved thanks to the two insulating perforation derivatives with a capacity of 6-35mm².

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>K298</td>
<td>DOUBLE POLE FUSE SWITCH DISCONNECTOR 160A (Size 00)</td>
<td>1.850</td>
<td>1</td>
</tr>
<tr>
<td>K293</td>
<td>TRIPLE POLE FUSE SWITCH DISCONNECTOR 160A (Size 00)</td>
<td>2.710</td>
<td>1</td>
</tr>
<tr>
<td>K294</td>
<td>QUADRUPLE POLE FUSE SWITCH DISCONNECTOR 160A (Size 00)</td>
<td>3.240</td>
<td>1</td>
</tr>
<tr>
<td>K098</td>
<td>DOUBLE TAP END CONNECTOR (6-35 mm²)</td>
<td>0.115</td>
<td>12</td>
</tr>
<tr>
<td>K098</td>
<td>DOUBLE TAP END CONNECTOR (6-35mm²)</td>
<td>1.850</td>
<td>1</td>
</tr>
</tbody>
</table>

Fixing with 2 galvanized steel screws of 10mm diameter is supplied with the disconnector console.

**Utilisation**

This stick when equipped with an end enables to manipulate the fuse carrier from the ground. Its length is 2.65 folded and 5m unfolded. Each model is equipped with a notched universal U-shaped terminal end.

**Operating stick**

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>F203</td>
<td>STICK 2E - 5M (TERMINAL U)</td>
<td>3.000</td>
<td>1</td>
</tr>
<tr>
<td>F209</td>
<td>BORED TERMINAL END DISCONNECTOR / STICK</td>
<td>0.105</td>
<td>10</td>
</tr>
</tbody>
</table>

**Installation video** available on the website www.michaud-export.fr
(Documentation tab> Implementation videos)
**Fuses**

**Fuse cartridge gG**

- **Application**: These gG fuses cartridges are designed to protect goods. They are implemented in a cutout sheltered from outside weather conditions.

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Available models</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U66X</td>
<td>FUSE CARTRIDGE 22×58 gG</td>
<td>1A to 32A</td>
<td>0.007</td>
<td>10</td>
</tr>
<tr>
<td>U66X</td>
<td>FUSE CARTRIDGE 14×51 gG</td>
<td>1A to 50A</td>
<td>0.021</td>
<td>10</td>
</tr>
<tr>
<td>U64X</td>
<td>FUSE CARTRIDGE 22×58 gG</td>
<td>2A to 32A</td>
<td>0.021</td>
<td>10</td>
</tr>
</tbody>
</table>

**Cylindrical fuse AD**

- **Application**: These AD fuse cartridges are used together with the circuit-breaker installed on the individual service tap connection. They perform the cutoff for high short-circuit currents and thereby extend the service life of the associated circuit-breaker, which is not overloaded up to the limit.

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Available models</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U61X</td>
<td>FUSE CARTRIDGE NH1 115mm</td>
<td>5A to 15A</td>
<td>0.009</td>
<td>10</td>
</tr>
<tr>
<td>U620</td>
<td>NEUTRAL TUBE 10.3×38</td>
<td>5A to 15A</td>
<td>0.012</td>
<td>10</td>
</tr>
<tr>
<td>U61X</td>
<td>FUSE CARTRIDGE NH2 160mm</td>
<td>15A to 45A</td>
<td>0.021</td>
<td>10</td>
</tr>
<tr>
<td>U621</td>
<td>NEUTRAL TUBE 14×51</td>
<td>15A to 45A</td>
<td>0.016</td>
<td>10</td>
</tr>
<tr>
<td>U61X</td>
<td>FUSE CARTRIDGE 22×58 AD</td>
<td>15A to 90A</td>
<td>0.056</td>
<td>10</td>
</tr>
<tr>
<td>U622</td>
<td>NEUTRAL TUBE 22×58</td>
<td>15A to 90A</td>
<td>0.028</td>
<td>10</td>
</tr>
</tbody>
</table>

**Fuse cartridge size 00 AD**

- **Description**: - The size of this blade fuse cartridge is 00 according to the IEC 60269-2-1 standard.
  - The fixing brackets are made of insulating synthetic materials.
  - The accessible metal parts (screws), with the exception of the blades, are potential free and also have the degree of protection IP2X according to the NF EN 60529 standard.
  - Low power loss limits heating of the device holding the fuse and extends its service life.
  - It is specified for a nominal voltage of 440V in alternating current with nominal frequency of 50Hz.
  - The nominal breaking capacity is 20kA.

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Available models</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U24X</td>
<td>FUSE CARTRIDGE SIZE 00 AD</td>
<td>30A to 90A</td>
<td>0.150</td>
<td>10</td>
</tr>
<tr>
<td>P240</td>
<td>NEUTRAL BLADE CONTACT SIZE 00</td>
<td>0.060</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

**Fuse cartridge NH1 and NH2**

- **Description**: - The size of this blade fuse cartridge is NH1 or NH2 according to the IEC 60269-2-1 standard.
  - It is specified for a nominal voltage of 440V in alternating current with nominal frequency of 50Hz.
  - The nominal breaking capacity is 50kA minimum.

<table>
<thead>
<tr>
<th>Code</th>
<th>Designation</th>
<th>Available models</th>
<th>Weight (kg)</th>
<th>Sales unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>U25X</td>
<td>FUSE CARTRIDGE NH1 115mm</td>
<td>63A to 250A</td>
<td>0.400</td>
<td>3</td>
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**Earth system**

Copper plated steel rod

**Energy controlling**

**Access to energy**

**Protection**

---

**Bare copper cable**

**Application**

These cables allow to conduct the electricity into the earth system and to guarantee the default current runoff.

**Non contractual pictures and drawings. MICHAUD Export reserves the right to modify specifications without any prior notice.**

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**Connectors**

These connectors establish a mechanical and electrical connection between two conductors to guarantee the equipotentiality of the system, to make a tap connection or to fix a severed conductor.

---

**Clamps**

This clamp enables to establish a connection between the earth rod and the conductor.

**Application**

**Other earth rod dimensions are available from 1m to 3m as well as other treatments and thicknesses**

Please enquire.
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Recommendations for products use

Implementation

These products must be installed and used with suitable tools. The screwheads should be driven in and tightened with the appropriate tool: allen key for hexagonal cap screws, flat screwdriver for slotted screwheads of the right size. Phillips screwdriver for cruciform screwheads, HSHC screwhead (avvis) for hollow hexagonal screw heads, etc. The screwheads with no torque-limiting device must be tightened to the recommended torque and must not be tightened again.

Requirements for use

The installation must be read carefully before using the equipment.

The product must be used and implemented in compliance with these recommendations for use and installation instructions; it must be used for the applications for which it was designed by the operator/manager of the network and on an electrical installation which is compliant and compatible with the product.

Never exceed the capacities indicated on the device and in the instructions sheet.

Unless explicitly indicated, products are designed for no-load connection.

Tools

The product should be installed and used with suitable tools.

Environment

Please group your waste together and follow the recycling and destruction instructions before leaving the worksite.
International expert in electrical distribution, Michaud Export designs, develops and implements reliable systems reducing maintenance operations on distribution networks.

As the architect of your solution, the company focuses on on-going innovation and leverages on the worldwide renowned expertise of the 250 employees at Michaud Group, leader in the industry for systems and connection fittings for electrical installations.

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