Electrical Distribution

Earth system

Extract of Catalogue
Low Voltage Energy

MICHAUD Export

Michaud Export

The French Group Michaud, has been designing, qualifying, producing and selling electrical equipment and connection systems for over 60 years.

250 staff members

7 establishments Europe, North Africa, Asia

Certified since 1992 (ISO 9001), 2010 (ISO 14001), 1995 (cofrac)*

8 to 10% of turnover **invested in R&D**

1 Accredited Test Laboratory

3 Engineering departments

* Accréditation n° 1-0579 portée disponible sur www.cofrac.fr

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.

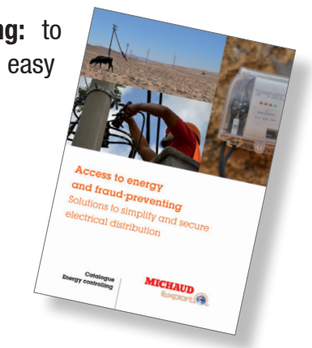
The brand offers **european quality** products and solutions at **a price matching emerging markets expectations.**

EN CE NF

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

Creator of innovative solutions

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.

Supplier of electrical equipment

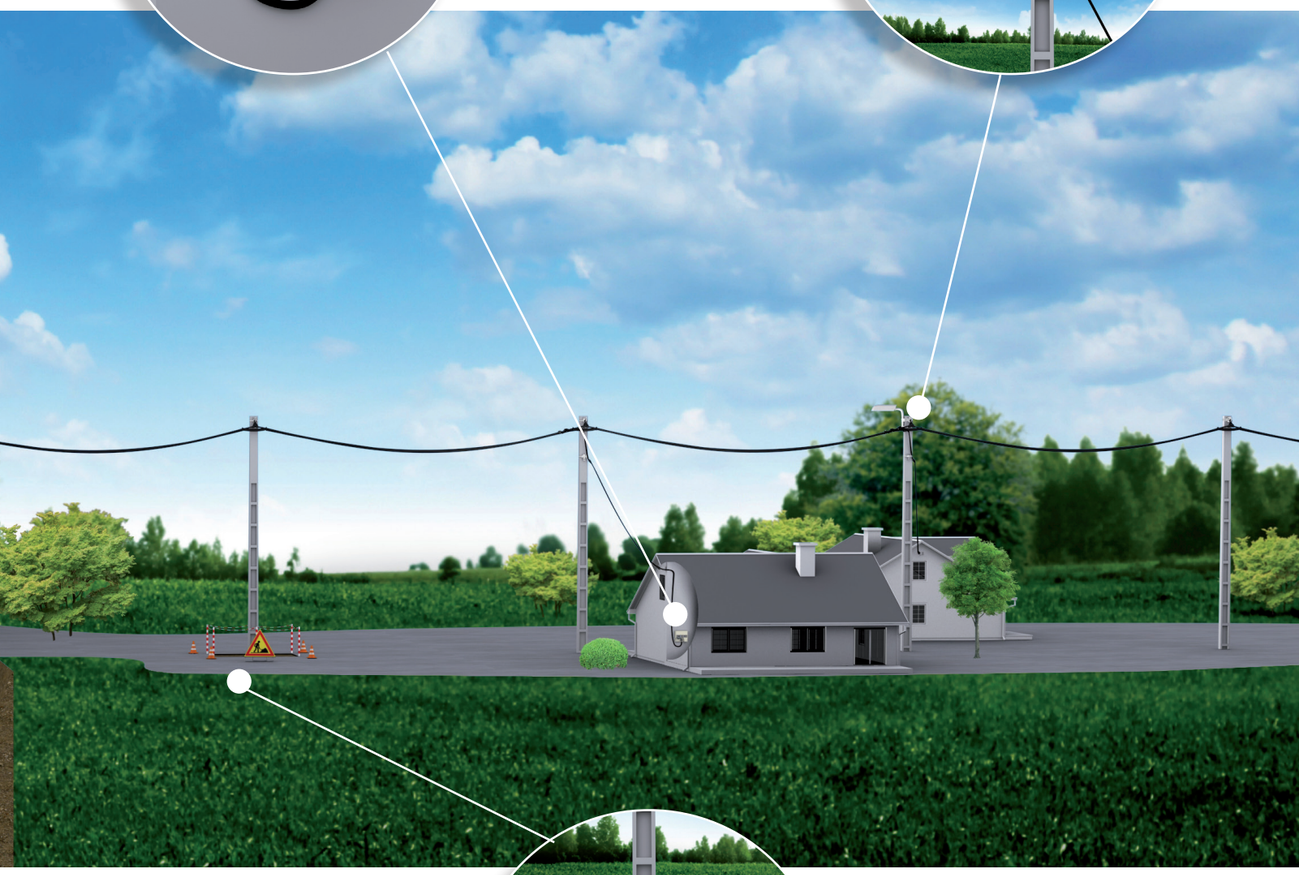
From MV/LV transformer substation to the end customer, Michaud Export offers all **electrical equipment for the construction & maintenance** of overhead and underground lines.

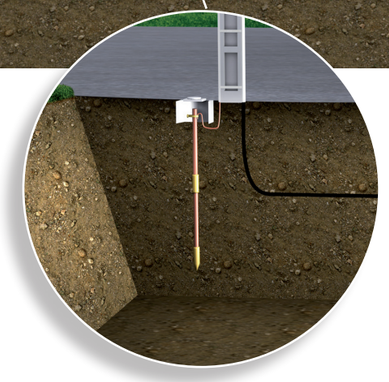
In addition to low-voltage networks, Michaud Export also offers **solutions for residential electrical distribution and smart metering.**

Protection

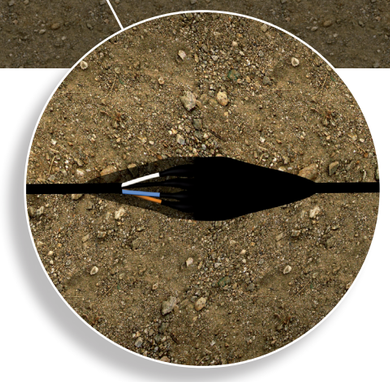
Housing

Overhead



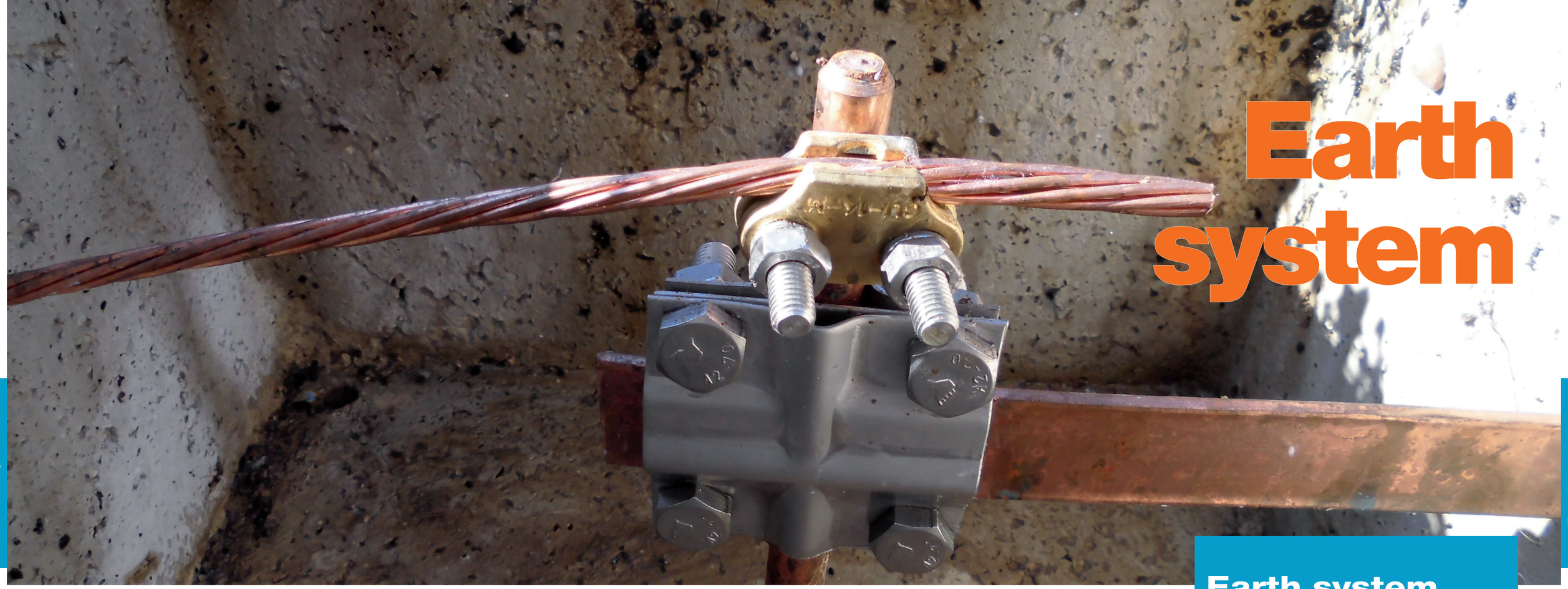


Earth system



Underground

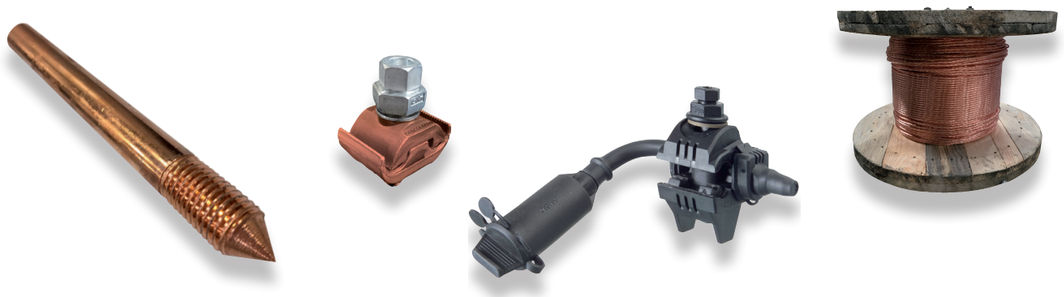
Installation



Earth system

Earth system

To meet electrical installations safety requirements, MICHAUD specialised in the earth system field.



The earth system

The role of an electrical installation earth system is to enable the fault current runoff into the soil.
When an installation is damaged owing to an insulation fault, the current cannot flow correctly anymore. An electric shock occurs, that is to say an element is charging in electricity. At this stage, the current is trying to come out thanks to a conductive environment. This is the aim of the earth system.

Earth system main functions

People protection and safety

The earth system enables to **protect from the electrocution risk**. It limits the potential difference in the close environment in order to avoid contact or step voltage.

High frequency currents dispersal

The earth system also has to **discharge direct or indirect currents** coming from lightning shocks.

Goods and equipment protection

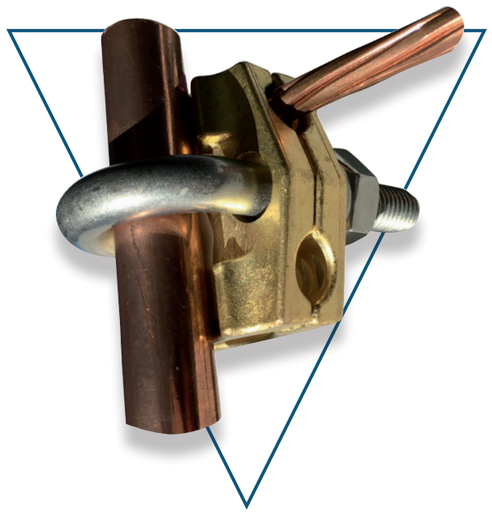
It **prevents goods and electrical installations from degradation**. The earth system ensures the electrical continuity and avoids too important voltage to installations terminals.

Components of an earth terminal

The electrical installation earth system is made by an earth terminal or earth circuit. The earth terminal connects the installation and the soil in which the fault current will be able to flow.

The earth terminal consists of three main components:

Connector
Enables connection



Conductor
Discharges current

Electrode
Establishes contact with the soil

The electrode establishes a contact with the soil. It is therefore essential to study the soil in order to better adapt the installation.

Soil study

Earth resistance

The current runoff into the soil will meet the earth terminal resistance. This one is partly the consequence of the soil's resistivity itself.

The soil's resistivity depends on several elements:
- Ground nature
- Water content (humidity)
- Soil heterogeneity
- Climatic variations

A stable and wet ground will enable a better electrical conductivity and earth system effectiveness.

Soil resistivity

The soil electrical resistivity (ρ) is its capacity to limit the electrical current passage, it is expressed in ohm meter (Ωm).

Ground nature	Resistivity ρ (Ωm).
Marshy ground	10
Clay	8 to 50
Clay, sand and gravel	40 to 250
Sand and gravel	60 to100
Slate, clay and sandstone	10 to 500
Rock	200 to 10 000

Earth electrode

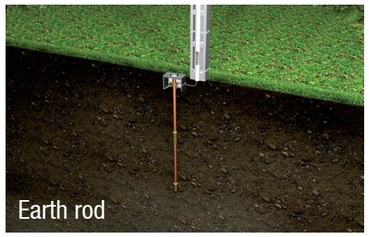
The earth electrode has to establish a connection with the soil to allow the current runoff. It must guarantee a good conductivity and be adapted to the ground nature.

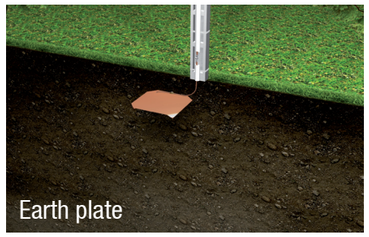
Deep earth terminal

It is recommended to go deep to find the weakest and the more stable earth resistance. Top layers are submitted to climatic variations so using an electrode able to go deep guarantees to meet stable and homogeneous soil.

Surface earth terminal

When it is not possible to go deep because of the soil nature or the risk of underground network degradation (gas, water, telecoms, etc...), an electrode on the surface turns out to be the best alternative.


Earth rod


Earth plate

The diversity of technics specifications used for earth systems gives the opportunity to find the best solution for every project.

Rod nature	Conductivity	Service life	Corrosion resistance	Competitiveness	Mechanical resistance
Copper bonded steel	+++	++	++	++	++
Stainless steel	+	+++	+++	+	++
Galvanised steel	++	+	+	+++	++

Earth conductor

The conductor is designed to disseminate the fault current from the equipment or the electrical installation up to the electrode. Two kind of conductors are available: round or cabled conductors and flat conductors or tapes.

Copper conductors

Cables remain the most common technology used in earth systems. For a specific installation or desired properties, tapes offer an alternative to cables (mechanical resistance).

Flat conductors

Copper conductors are generally recommended in earth circuits. Other metallic combinations can bring solutions to existing issues in the field.

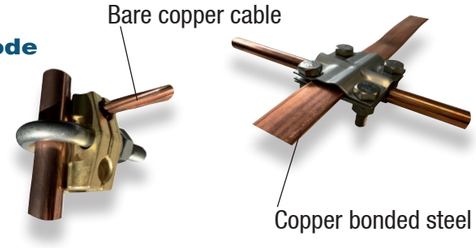
ECONOMIC SOLUTION
Copper bonded steel tape

THEFT PROTECTION
Tinned copper bonded steel tape

Connectors

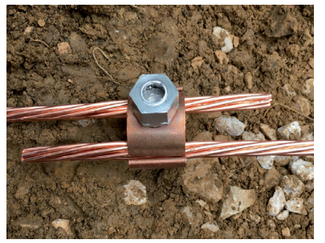
Connectors must ensure a mechanical bonding between the different elements constituting the earth system to guarantee a good electrical continuity.

Connection conductor/electrode



- ✔ Mechanical bonding
- ✔ Electrical continuity

Connection conductor/conductor



- ✔ Guarantee the system equipotentiality
- ✔ Perform a tap connection
- ✔ Fix the installation up if the conductor has been severed
- ✔ Enable bonding opening to measure earth resistance

Connection A.B.C. conductor/connector

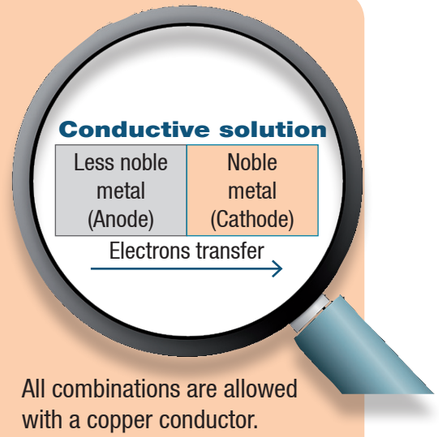
- ✔ Earth system on low voltage A.B.C. network.

Galvanic corrosion phenomenon

A galvanic phenomenon can happen when two metals with different potential are in contact within a conductive solution (such as water). Electron transfer is run from an anode to a cathode leading to a quick degradation of the less noble metal (the anode).

Electrode/connector combinations allowed

Connector (clamp) / Electrode	Brass	Galvanised steel	Stainless steel
Copper bonded steel	✔	✘	✔
Stainless steel	✔	✘	✔
Galvanised steel	✘	✔	✔



All combinations are allowed with a copper conductor.

- ✔ Allowed
- ✔ Tolerated
- ✘ Not allowed

Installation

Tools and accessories

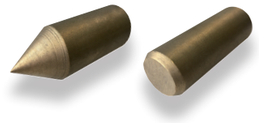
Some tools and accessories can be useful during the earth terminal installation.

Earth rod pushing

For a short rod installation into a wet soil, a hammer can enable pushing into ground.
For rods with more important dimensions, a drill hammer can be used.

Material protection

To protect the rod's copper coat during set up protection, accessories can be placed on both rod ends.
During the rod installation, abrasive elements in the soil can damage the copper coat. On the superior end, hammer blows can lead to copper and rod degradation. A driving spike and a driving head enable to prevent these aggressive effects.



Diverse recommendations

For an effective and reliable earth system:

- ✓ Insulate connections
- ✓ Watch connections locating them in a pit
- ✓ Control regularly the installation and the possible metal corrosion
- ✓ Perform the installation far from buried walls, deep foundations and rivers
- ✓ Do not use water distribution pipes
- ✓ Opt for a substantial depth to reach a stable resistance in a ground not submitted to climatic variations
- ✓ Ensure the system equipotentiality

Earth resistance measure

Preparation and material

The earth resistance measure is performed by an earth tester. In order to allow measurements, the earth circuit can be opened at the cutting blades or at the earth system disconnection kit.

Earth tester

The resistance value to get varies according to normative standards and installations types. The measure should be repeated over some time as the value might change due to a season, measure conditions or soils evolution.

Earth disconnection kit to unbolt

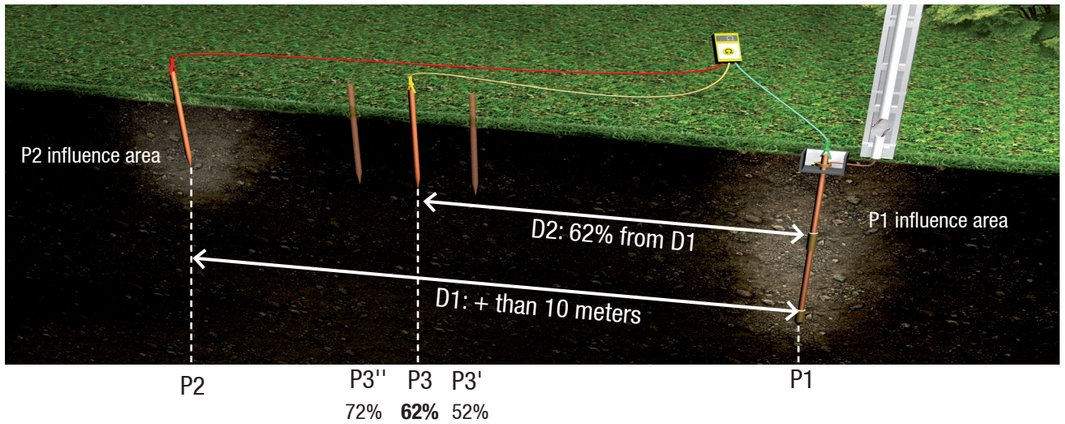
The resistance measurement through the 3 rods method

The measure

The 3 rods method also called 62% method is a way to measure the earth resistance. The measure consists of injecting a current between a first electrode and the earth rod to check. A third rod enables to measure voltage. Thanks to the ohm's law, it is possible to deduce the earth resistance.

Principle

This method implies to use 3 earth rods. One of them (P1) is that staying in the ground after the installation test. The rod (P2) must be placed in more than 10 meters from (P1) and third rod (P3) 62% of the separation distance of (P1) and (P2) in order to be out of the (P1) and (P2) influence area.



1st case:

The measure is not conclusive, the earth resistance value is too high. The rod must be extended or earth terminals must be multiplied taking care of the system equipotentiality in order to decrease value.

2nd case:

The measure is conclusive and it has to be confirmed. (P3) is going to be moved to 52% then to 72% from D1 respectively in P3' and P3". If the measure does not vary, the value got in the first place is confirmed otherwise please refer to first case.

Copper bonded steel rod

F249

MIRELEC

Application

This earth rod is used for the power networks earth system.
The copper coating made by electrolytic process gives a resistance to corrosion as well as a good conductivity.
The reference Standard is **EN 50 164-2**.

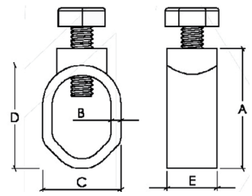
Code	Designation	Nominal diameter (mm)	Real diameter (mm)	Length (m)	Weight (kg)	Sales unit
50µm COPPER COATING						
U203	EARTH ROD COPPER 50µm L = 1m DIAM 12.7	14	12.7	1	1.025	10
U204	EARTH ROD COPPER 50µm L = 1.5m DIAM 12.7	14	12.7	1.5	1.537	10
U205	EARTH ROD COPPER 50µm L = 2m DIAM 12.7	14	12.7	2	2.050	10
F226	EARTH ROD COPPER 50µm L = 1m DIAM 14	16	14	1	1.250	10
F244	EARTH ROD COPPER 50µm L = 1.5m DIAM 14	16	14	1.5	1.900	10
F245	EARTH ROD COPPER 50µm L = 2m DIAM 14	16	14	2	2.500	10
254µm COPPER COATING						
U206	EARTH ROD COPPER 254µm L = 1m DIAM 14	16	14	1	1.250	10
F249	EARTH ROD COPPER 254µm L = 1.5m DIAM 14	16	14	1.5	1.900	10
F227	EARTH ROD COPPER 254µm L = 2m DIAM 14	16	14	2	2.500	10
U207	EARTH ROD COPPER 254µm L = 3m DIAM 14	16	14	3	3.700	10
U208	EARTH ROD COPPER 254µm L = 1m DIAM 17.2	19	17.2	1	2.000	10
U209	EARTH ROD COPPER 254µm L = 1.5m DIAM 17.2	19	17.2	1.5	3.000	10
U210	EARTH ROD COPPER 254µm L = 2m DIAM 17.2	19	17.2	2	4.000	10
U211	EARTH ROD COPPER 254µm L = 3m DIAM 17.2	19	17.2	3	6.000	10
350µm COPPER COATING						
U212	EARTH ROD COPPER 350µm L = 1m DIAM 17.2	19	17.2	1	2.000	10
U213	EARTH ROD COPPER 350µm L = 1.5m DIAM 17.2	19	17.2	1.5	3.000	10
U214	EARTH ROD COPPER 350µm L = 2m DIAM 17.2	19	17.2	2	4.000	10

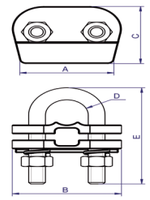
Nota: Other dimensions are available, please enquire.

Clamp

Connection clamp
F234

"U" bolt connection clamp
F224





MIRELEC

Application

This **brass clamp with stainless steel bolts** is designed to establish a connection between the earth rod and the conductor.
The cable can be fixed radially or axially through the "U" bolt clamp.

Code	Designation	Nominal rod diameter (mm)	Conductors sections (mm^2)	Dimensions (mm) A	B	C	D	E	Screw	Weight (kg)	Sales unit
F234	CONNECTION CLAMP ROD DIAM 12.7 + 14 UNTHREADED	14 - 16	35	35	3	21	30	17.5	M8	0.050	10
F246	CONNECTION CLAMP ROD DIAM 17.2 UNTHREADED	19	50	38	3	23	32	17.5	M8	0.050	10
F233	"U" BOLT CONNECTION CLAMP 50^2 ROD DIAM 12.7 + 14 UNTHREADED	14 - 16	16 - 50	25	41	26	8.7	-	-	0.095	20
F224	"U" BOLT CONNECTION CLAMP 150^2 ROD DIAM 12.7 TO 17.2 UNTHREADED	14 to 19	150	44	52	38	10.2	64	-	0.230	20

Accessories

F229

F238

Application

These **brass driving spikes and heads** are designed to protect the earth rod during the installation. They enable to preserve the copper coating and its technical features.

Code	Designation	Nominal rod diameter (mm)	Weight (kg)	Sales unit
F229	DRIVING SPIKE FOR ROD DIAM 12.7 + 14 UNTHREADED	14-16	0.115	10
F239	DRIVING SPIKE FOR ROD DIAM 17.2 UNTHREADED	19	0.145	10
F238	DRIVING HEAD FOR ROD DIAM 12.7 + 14 UNTHREADED	14-16	0.115	10
F237	DRIVING HEAD FOR ROD DIAM 17.2 UNTHREADED	19	0.145	10

Threaded copper bonded steel rod

F262

MIRELEC

Application

This earth rod is used for the power networks earth system.
The thread on both ends makes the earth rod lengthening possible.
The copper coating made by electrolytic process gives a resistance to corrosion as well as a good conductivity.
The reference Standard is **EN 50 164-2**.

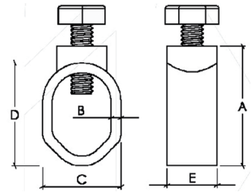
Code	Designation	Nominal diameter (mm)	Real diameter (mm)	Length (m)	Weight (kg)	Sales unit
50µm COPPER COATING						
U215	EARTH ROD COPPER 50µm L = 1m DIAM 12.7 - 2 THREADS 9/16"	14	12.7	1	1.025	10
F296	EARTH ROD COPPER 50µm L = 1.5m DIAM 12.7 - 2 THREADS 9/16"	14	12.7	1.5	1.537	10
U216	EARTH ROD COPPER 50µm L = 2m DIAM 12.7 - 2 THREADS 9/16"	14	12.7	2	2.050	10
U217	EARTH ROD COPPER 50µm L = 1m DIAM 14 - 2 THREADS 5/8"	16	14	1	1.250	10
F235	EARTH ROD COPPER 50µm L = 1.5m DIAM 14 - 2 THREADS 5/8"	16	14	1.5	1.900	10
F223	EARTH ROD COPPER 50µm L = 2m DIAM 14 - 2 THREADS 5/8"	16	14	2	2.500	10
254µm COPPER COATING						
U218	EARTH ROD COPPER 254µm L = 1m DIAM 14 - 2 THREADS 5/8"	16	14	1	1.250	10
F222	EARTH ROD COPPER 254µm L = 1.5m DIAM 14 - 2 THREADS 5/8"	16	14	1.5	1.900	10
F221	EARTH ROD COPPER 254µm L = 2m DIAM 14 - 2 THREADS 5/8"	16	14	2	2.500	10
U219	EARTH ROD COPPER 254µm L = 3m DIAM 14 - 2 THREADS 5/8"	16	14	3	3.700	10
U220	EARTH ROD COPPER 254µm L = 1m DIAM 17.2 - 2 THREADS 3/4"	19	17.2	1	2.000	10
F262	EARTH ROD COPPER 254µm L = 1.5m DIAM 17.2 - 2 THREADS 3/4"	19	17.2	1.5	3.000	10
U221	EARTH ROD COPPER 254µm L = 2m DIAM 17.2 - 2 THREADS 3/4"	19	17.2	2	4.000	10
U222	EARTH ROD COPPER 254µm L = 3m DIAM 17.2 - 2 THREADS 3/4"	19	17.2	3	6.000	10
350µm COPPER COATING						
U223	EARTH ROD COPPER 350µm L = 1m DIAM 17.2 - 2 THREADS 3/4"	19	17.2	1	2.000	10
U224	EARTH ROD COPPER 350µm L = 1.5m DIAM 17.2 - 2 THREADS 3/4"	19	17.2	1.5	3.000	10
U225	EARTH ROD COPPER 350µm L = 2m DIAM 17.2 - 2 THREADS 3/4"	19	17.2	2	4.000	10

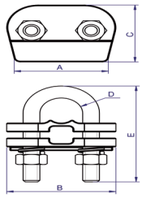
Nota: Other dimensions are available, please enquire.

Clamp

Connection clamp
F234

"U" bolt connection clamp
F224





MIRELEC

Application

This **brass clamp with stainless steel bolts** is designed to establish a connection between the earth rod and the conductor.
The cable can be fixed radially or axially through the "U" bolt clamp.

Code	Designation	Nominal rod diameter (mm)	Conductors sections (mm^2)	Dimensions (mm) A	B	C	D	E	Screw	Weight (kg)	Sales unit
F234	CONNECTION CLAMP ROD DIAM 12.7 THREADED	14	35	35	3	21	30	17.5	M8	0.050	10
F246	CONNECTION CLAMP ROD DIAM 14 + 17.2 THREADED	16 - 19	50	38	3	23	32	17.5	M8	0.050	10
F233	"U" BOLT CONNECTION CLAMP 50^2 ROD DIAM 12.7 + 14 THREADED	14 - 16	16 - 50	25	41	26	8.7	-	-	0.095	20
F224	"U" BOLT CONNECTION CLAMP 150^2 ROD DIAM 12.7 TO 17.2 THREADED	14 to 19	150	44	52	38	10.2	64	-	0.230	20

Accessories

F229

F238

F228

F298

Application

These **brass driving spikes and heads** are designed to protect the earth rod during the installation. They enable to preserve the copper coating and its technical features.
These **brass threaded couplings** enable to join two rods and get a deeper earth system.

Code	Designation	Nominal rod diameter (mm)	Weight (kg)	Sales unit
F229	DRIVING SPIKE FOR ROD DIAM 12.7 THREADED	14	0.115	10
F239	DRIVING SPIKE FOR ROD DIAM 14 THREADED	16	0.145	10
U226	DRIVING SPIKE FOR ROD DIAM 17.2 THREADED	19	0.155	10
F238	DRIVING HEAD FOR ROD DIAM 12.7 THREADED	14	0.115	10
F237	DRIVING HEAD FOR ROD DIAM 14 THREADED	16	0.145	10
U227	DRIVING HEAD FOR ROD DIAM 17.2 THREADED	19	0.155	10
F298	THREADED COUPLING FOR ROD DIAM 12.7 THREAD 9/16"	14	0.090	10
F236	THREADED COUPLING FOR ROD DIAM 14 THREAD 5/8"	16	0.115	10
F265	THREADED COUPLING FOR ROD DIAM 17.2 THREAD 3/4"	19	0.155	10
U228	SCREW FOR COUPLING FOR ROD DIAM 12.7 THREAD 9/16"	14	0.085	10
F228	SCREW FOR COUPLING FOR ROD DIAM 14 THREAD 5/8"	16	0.100	10
U229	SCREW FOR COUPLING FOR ROD DIAM 17.2 THREAD 3/4"	19	0.135	10

Other earth electrodes

Galvanised steel rod

MIRELEC

Solid profile U195

U199
Tubular profile

Application

This galvanised steel earth rod is used for the power networks earth system.
The corrosion protection is ensured thanks to a hot dip galvanisation surface treatment.
The reference Standard is **EN 50 164-2**.

Code	Designation	Diameter (mm)	Profile	Length (m)	Weight (kg)	Sales unit
U195	EARTH ROD GALVA L = 1m DIAM 16	16	Solid	1	1.70	10
U196	EARTH ROD GALVA L = 1.5m DIAM 16	16	Solid	1.5	2.55	10
U197	EARTH ROD GALVA L = 2m DIAM 16	16	Solid	2	3.40	10
U198	EARTH ROD GALVA L = 1.5m DIM 50x50x3	50x50x3	Cross-shaped	1.5	2.10	10
U199	EARTH ROD GALVA L = 1m DIAM 25	25	Tubular	1	1.60	10
U200	EARTH ROD GALVA L = 1.5m DIAM 25	25	Tubular	1.5	2.40	10
U201	EARTH ROD GALVA L = 2m DIAM 25	25	Tubular	2	3.20	10

Nota: Other dimensions are available, please enquire

Clamp

U192

Application

This clamp dedicated to galvanised earth rods is designed to establish a connection between the earth rod and the conductor.

Code	Designation	Rod diameter (mm)	Metal	Conductors section (mm^2)	Weight (kg)	Sales unit
U191	CONNECTION CLAMP GALVA ROD DIAM 16	16	Galvanised steel	50mm^2	0.054	20
U192	CONNECTION BOLT AND NUT ROD CROSS-SHAPED		Zamac / nickel	50mm^2	0.072	20
U193	CONNECTION CLAMP 25mm^2 ZINC BRASS ROD CROSS-SHAPED		Zinc brass	25mm^2	0.032	20
U194	CONNECTION CLAMP 50mm^2 ZINC BRASS ROD CROSS-SHAPED		Zinc brass	50mm^2	0.077	20

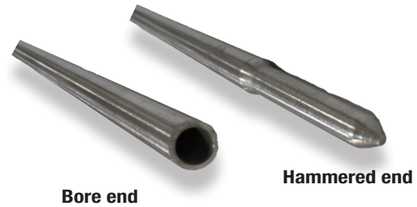
The connection between the conductor and the tubular earth rod is made by the actual ear on the top end of the rod. It receives a bolt and nut as well as a tubular lug.

Bolt and nut, please enquire.

SEE SHEET
OVERHEAD / LV ending fitting / Bare lug

Stainless steel earth rod

MIRELEC



Bore end
Hammered end
F230

Application

This stainless steel earth rod is used for the power networks earth system.
It gives a huge resistance to corrosion and can be implemented into hard grounds.
The rod has a hammered end and a boring respectively to lower and upper ends, giving it the possibility to be self-extendable.
The reference Standard is **EN 50 164-2**.

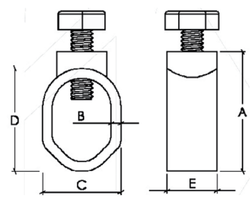
Code	Designation	Diameter (mm)	Length (m)	Weight (kg)	Sales unit
F230	EARTH ROD STAINLESS STEEL SELF-EXTENDABLE L = 1m DIAM 16	16	1	1.50	10
F231	EARTH ROD STAINLESS STEEL SELF-EXTENDABLE L = 1.5m DIAM 16	16	1.5	2.30	10
F232	EARTH ROD STAINLESS STEEL SELF-EXTENDABLE L = 2m DIAM 16	16	2	3.20	10

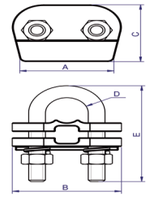
Nota: Other dimensions are available, please enquire.

Clamp

Connection clamp
F234

"U" bolt connection clamp
F224





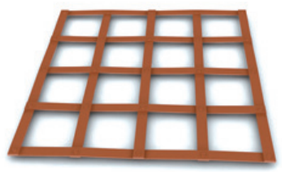
Application

This **brass clamp with stainless steel bolts** is designed to establish a connection between the stainless steel earth rod and the conductor. The cable can be fixed radialy or axialy through the "U" bolt clamp.

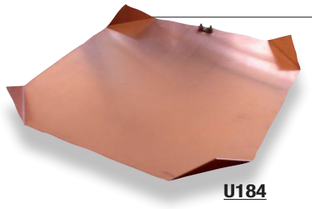
Code	Designation	Rod diameter (mm)	Conductors sections (mm^2)	Dimensions (mm)					Screw	Weight (kg)	Sales unit
				A	B	C	D	E			
F234	CONNECTION CLAMP ROD STAINLESS STEEL	16	16-35	35	3	21	30	17.5	M8	0.050	10
F233	"U" BOLT CONNECTION CLAMP 50² ROD STAINLESS STEEL	16	16-50	25	41	26	8.7	-	-	0.095	20
F224	"U" BOLT CONNECTION CLAMP 150² ROD STAINLESS STEEL	16	70-150	44	52	38	10.2	64	-	0.230	20

Copper earth plate and grid

MIRELEC



U188



U184

Application

This copper earth electrode is used for the power networks earth system.
When a deep installation is not possible, it gives an important contact area with the soil to discharge fault currents.
The reference Standard is **EN 50 164-2**.

Code	Designation	Length (mm)	Width (mm)	Thickness (mm)	Weight (kg)	Sales unit
U184	COPPER EARTH PLATE 500x500x2	500	500	2	4.5	1
U185	COPPER EARTH PLATE 500x500x3	500	500	3	6.8	1
U186	COPPER EARTH PLATE 500x1000x2	500	1000	2	9.0	1
U187	COPPER EARTH PLATE 500x1000x3	500	1000	3	13.6	1
U188	COPPER EARTH GRID 1000x1000x2	1000	1000	2	3.0	1
U189	COPPER EARTH GRID 2000x1000x2	2000	1000	2	4.0	1
U190	COPPER EARTH GRID 3000x1000x2	3000	1000	2	5.0	1

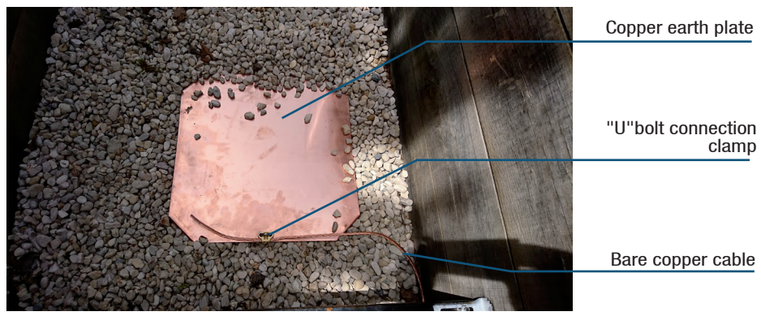
Clamp

Description

- Earth plates are delivered with a "U" bolt connection clamp enabling to perform the connection with the conductor.
- Earth grids can receive a "U" bolt connection clamp to perform the connection with the copper conductor.
- The earth grid connection can also be performed thanks to twin-saddle installed on the grid lateral tape.

Contact us.

SEE SHEET
EARTH SYSTEM / Earth electrodes / Clamp



Earth resistance measure - Earth tester

MIRELEC

F439

Application

This earth tester is used as part of the earth system installation. It enables to perform the earth resistance measurements to control the system effectiveness.

Description

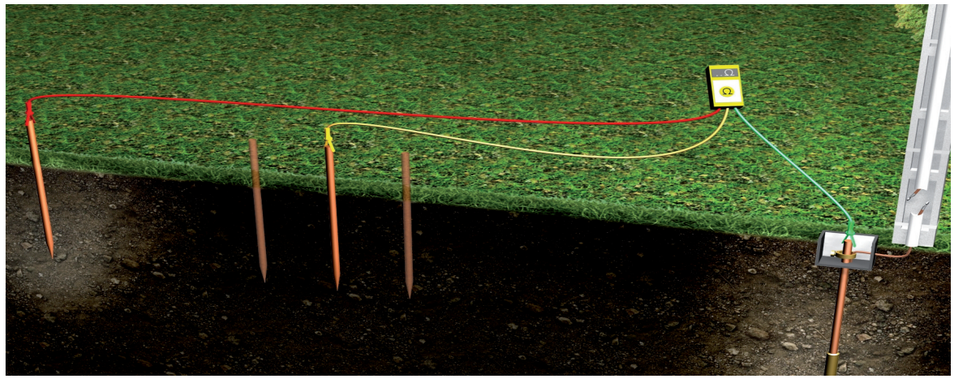
- This earth tester is installed in a anti-shock briefcase including three green, yellow and red cords respectively of 5m, 10m and 15m length.
- Cords are provided with a clamp to be placed on rod enabling the measure.
- The tester supply is possible thanks to batteries.
- The recommended surrounding temperature for use is between 0 and 40°C.
- The device is adapted to "2 rods" and "3 rods" measure methods. These methods require the use of backup rods. It is necessary to enable the current circulation between rods in order to perform an earth resistance measure thanks to the earth tester.
- The device keeps in memory the last measure.

The earth tester meets the criteria of **IEC 348** and **IEC 1010** standards.

Code	Designation	Measure range (Ω)	Measure current	Dimensions (mm)	Weight (kg)	Sales unit
F439	EARTH TESTER	0 to 2k	Constant 2mA @ 820Hz	205x90x55	0.550	1

Installation

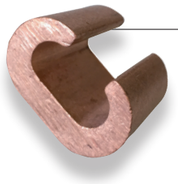
Measure with the 3 rods method.



Earth system

Earth connector

"C" shape connector



U009

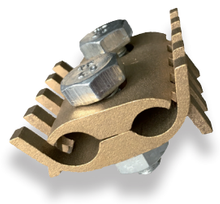
MIRELEC

Application

This **copper connector** is designed to join conductors. The mechanical and electrical connection is ensured thanks to crimping.

Code	Designation	Main conductor (mm²)	Tap conductor (mm²)	Weight (kg)	Sales unit
U001	C CONNECTOR 4-4	2.5-4	2.5-4	0.010	10
U002	C CONNECTOR 10-6	6-10	2.5-6	0.010	10
U003	C CONNECTOR 25-6	10-25	4-6	0.012	10
U004	C CONNECTOR 25-10	16-25	4-10	0.012	10
U005	C CONNECTOR 25-25	16-25	16-25	0.017	10
U006	C CONNECTOR 35-25	35	4-25	0.017	10
U007	C CONNECTOR 35-35	35	16-35	0.034	10
U008	C CONNECTOR 70-35	50-70	4-35	0.034	10
U009	C CONNECTOR 70-70	50-70	35-70	0.034	10
U010	C CONNECTOR 95-35	70-95	16-35	0.072	10
U011	C CONNECTOR 95-70	70-95	35-70	0.072	10
U012	C CONNECTOR 95-95	95	95	0.131	10
U013	C CONNECTOR 120-120	120	25-120	0.109	10
U014	C CONNECTOR 185-95	150-185	50-95	0.109	10
U015	C CONNECTOR 150-150	150	70-150	0.109	10
U016	C CONNECTOR 185-185	120-185	95-185	0.131	10

Jumper clamp



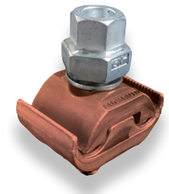
U020

Application

This **connector made of brass** is designed to join conductors. The mechanical and electrical connection is ensured thanks to a mechanical tightening that can be removed.

Code	Designation	Main conductor (mm²)	Tap conductor (mm²)	Weight (kg)	Sales unit
U020	JUMPER CLAMP 6-16mm²	6-16	6-16	0.028	10
U021	JUMPER CLAMP 10-50mm²	10-50	10-50	0.061	10
U022	JUMPER CLAMP 50-70mm²	50-70	50-70	0.112	10
U023	JUMPER CLAMP 70-95mm²	70-95	70-95	0.263	10
U024	JUMPER CLAMP 95-150mm²	95-150	95-150	0.443	10

Copper connector



L260

MIRELEC

Application

This **copper connector** is designed to fix up an installation in case the conductor has been severed.
The **stainless steel fastening** allows the product to be buried. The connector L260 is equipped with a shear head.

Code	Designation	Main conductor (mm²)	Tap conductor (mm²)	Weight (kg)	Sales unit
L260	CONNECTOR Cu 10-70 (SF + SH)	10-70	10-70	0.120	50
L261	CONNECTOR Cu 10-70 (SF)	10-70	10-70	0.110	50

Earth system disconnection kit

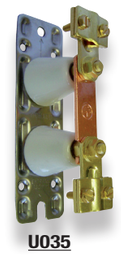
U031

Application

This **stainless steel kit** comprises two tubular lugs as well as a nut and a bolt. It is designed to disconnect the earth system in order to perform earth resistance measurements.

Code	Designation	Conductor section min (mm²)	Conductor section max (mm²)	Weight (kg)	Sales unit
U030	TUBULAR LUG 25-29	25	29	0.020	10
U031	EARTH SYSTEM DISCONNECTION KIT 25-29	25	29	0.060	10

Ground cutting blade



U035

U036

Application

This cutting blade is designed to open the earth system during earth resistance measurements. It is rather used inside for a residential installation.

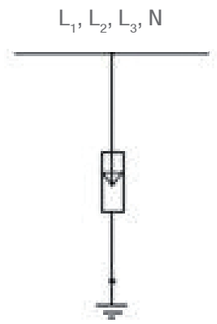
Code	Designation	Conductor section min (mm²)	Conductor section max (mm²)	Weight (kg)	Sales unit
U034	"T" SHAPE GROUND CUTTING BLADE	10	35	0.180	10
U035	HIGH GROUND CUTTING BLADE	16	35	0.3300	10
U036	LOW GROUND CUTTING BLADE	16	35	0.160	10

Surge protection device connector

MIRELEC

K241 -K 242

K243 - K244



Drawing of the connector

Application

The surge protection device connector (SPD IPC) is designed to protect low voltage overhead lines and electric equipment against over-voltages.
It enables the current from the lightning to be led to the ground.
The surge protection device connector includes the following elements:
- An insulation piercing connector,
- A terminal outlet inserted in the end cap of the connector,
- A surge protection device (metal oxide overmoulded with silicone) screwed into the terminal outlet,
- An earth system tail welded to the surge protection device.

The surge protection device reacts:
- After a certain number of over-voltages, when the current passing through the surge protection device increases by more than 1mA,
- In the case of atmospheric discharge (lightning strike), the current exceeding 65mA.

After the surge protection device has performed, the earth system tail physically separates from the connector. The surge protection device then should be replaced with an available spare part (comprising the surge protection device and the earth system tail).

Description

- The connector is used outside only.
- The maximum use altitude is 2000m.
- The connector can be used at a temperature going from -40°C to +70°C.
- The use frequency is 48-62Hz.
- The connector, the terminal outlet, the surge protection device and the tail are made of UV and flame resistant materials.
- The connector is equipped with a 0.5m long, 6mm² insulated black multi-stranded tail.
- The connector protection degree is IP67.
- The connector has a response time <25ns.

The surge protection devise is Class II as defined in the **IEC 61643-1** standard.

Installation

- The location of the surge protection device connection is decided according to the technical specifications and guidelines of the electrical regulatory authorities. These connectors must be installed on all overhead service and network line conductors, the phase(s) and neutral being linked by earth system tails.
- To protect long sections of overhead lines, it is recommended to use at least one surge protection device connector every 500 metres.
- Check that the terminal outlet is inserted into the connector fully and correctly.
- Position the connector on the conductor so that the surge protection device and its tail are directed towards the ground.
- Tighten the shear head until it breaks using a 13mm spanner. The 17mm head is only provided for an eventual dismantling. Do not use it to re-tighten.
- When the surge protection device connector has been used, protecting the power line against high voltages, the earth system tail is automatically disconnected from the base of the silicone cylinder. A new surge protection device, available as a spare part, must replace the old one. To do this, unscrew the old part of the silicone surge protection device from the terminal end and screw in a spare surge protection device, join all of the earth system tails together and link them to the earth.

Characteristics:

Code	Designation	I_{max} Maximal discharge current (kA)	U_c Continuous operating voltage V(AC)	I_n Nominal discharge current (kA)	U_p Protection level at In
K241	SPD IPC 15kA/275VAC 0.5m	40	275	15	< 1.86
K243	SPD SPARE PART 15kA/275VAC 0.5m	40	275	15	< 1.86
K242	SPD IPC 15kA/440VAC 0.5m	40	440	15	< 2.24
K244	SPD SPARE PART 15kA/440VAC 0.5m	40	440	15	< 2.24

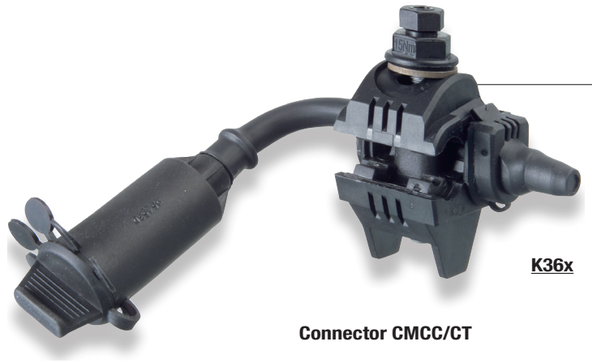
Code	Designation	Main line insulated Al-Cu (mm^2)	Weight (kg)	Sales unit
K241	SPD IPC 15KA/275VAC 0.5m	16-95	0.300	30
K243	SPD SPARE PART 15KA/275VAC 0.5m		0.170	30
K242	SPD IPC 15KA/440VAC 0.5m	16-95	0.300	30
K244	SPD SPARE PART 15KA/440VAC 0.5m		0.170	30

Upon request, the earth system tails can be delivered in different colours and lengths, and can be assembled with a terminal lug at their end. Please contact us.

SEE SHEET
INSTALLATION / LV insulated toolings

Earth system

Insulation piercing connector for measure and short-circuiting



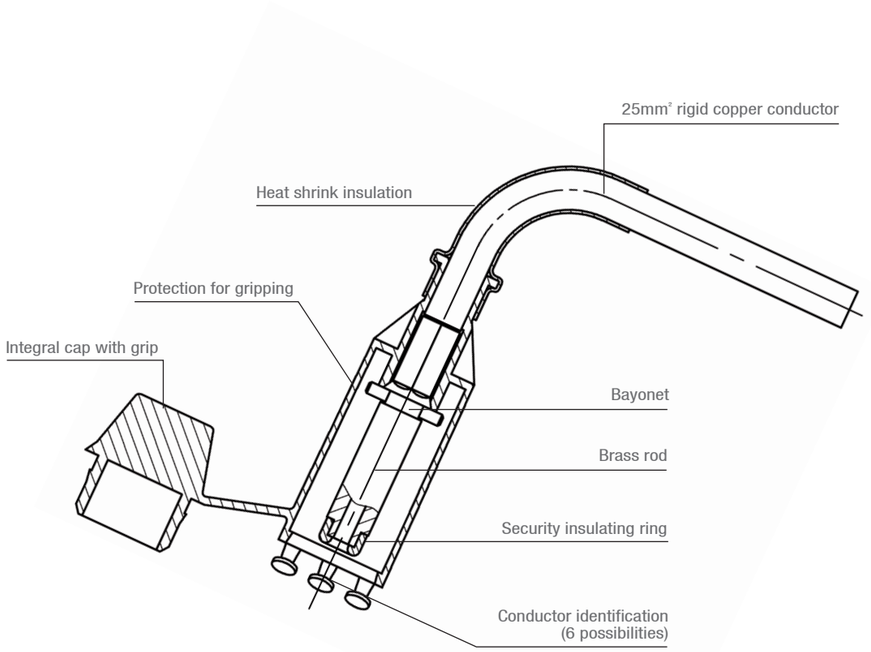
K36x

Connector CMCC/CT

MICHAUD

Application

This I.P.C. (Insulation Piercing Connector) is designed for short-circuiting or earthing the low voltage A.B.C. (Aerial Bundled Conductors). It is also used for taking voltage measures.
It comprises the connector and the socket.



Socket PMCC
K368

Description

- Connection is established through the insulation piercing technology.
- Dielectric strength in water is greater that 6kV.
- Tightening screw is the only accessible metal part and is potential free.
- Tightening efficiency is ensured by shear head screw.
- The end socket is protected by an integral cap preventing the water penetration and corrosion.

This connector meets the criteria of the **NF C 33-020** and **EN 50-483** standards.

ZINC-PLATED FASTENER (ZF)				
Code	**Designation**	Capacities Main insulated Al-Cu (mm²)	Weight (kg)	Sales unit
K362	**CONNECTOR CMCC/CT 25 ZF**	16-25	0.230	10
K363	**CONNECTOR CMCC/CT 70 ZF**	16-70	0.230	10
K361	**CONNECTOR CMCC/CT 95 ZF**	16-95	0.230	10
K364	**CONNECTOR CMCC/CT 150 ZF**	16-150	0.230	10

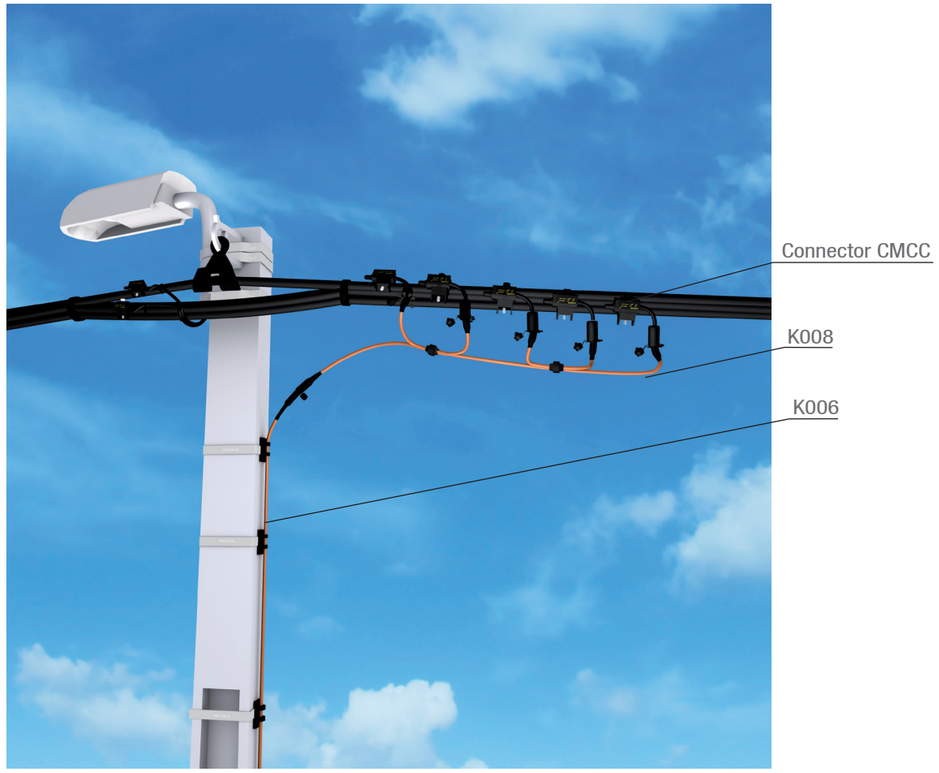
The connector K362 is adapted from a connector K322 (CBS/CT 25), the connector K363 from a connector K323 (CBS/CT 70) and the connector K364 from a connector K324 (CBS/CT 150).
It comprises the connector and the socket.

Variant:

The short-circuiting and earth system socket (PMCC) can be sold separately.
This tap socket can be used with the entire range of the 6kV CBS/CT and RDP/CN connectors of MICHAUD brand.

Code	Designation	Weight (kg)	Sales unit
K368	**SHORT-CIRCUITING AND EARTH SYSTEM SOCKET (PMCC)**	0.100	25

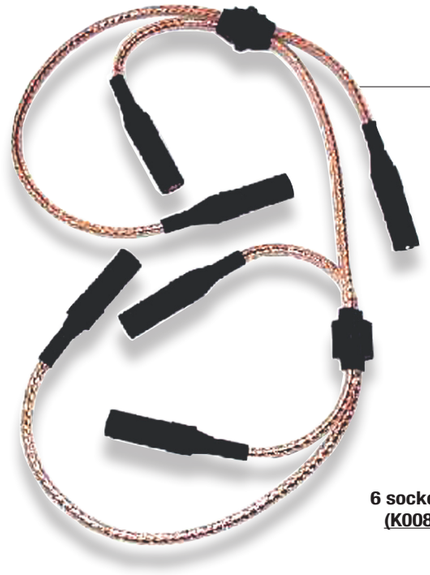
SEE SHEET
INSTALLATION / LV insulated toolings



Earth system

Earth system and short-circuiting device

Short-circuiting device



6 sockets
(K008)

MICHAUD

Application

This device is designed for short-circuiting and earthing the low voltage A.B.C. (Aerial Bundled Conductors). It is connected to a connector for measures and short-circuiting (type CMCC).

Description

- This device comprises 6 or 7 insulated sockets closing with a bayonet system on the CMCC connector tap socket.
- Connection between the sockets is established with a 25mm² flexible copper conductor.
- The electrical characteristics are:
  - Short-circuiting capacity: 4 000A/second,
  - Permanent current capacity: 200A.
- The device is packed in a carrying case.

Code	Designation	Weight (kg)	Sales unit
K008	SHORT-CIRCUITING EQUIPMENT 6 SOCKETS	2.490	1
K009	SHORT-CIRCUITING EQUIPMENT 7 SOCKETS	3.000	1

Nota: the K009 (7 sockets) is used for street light.

Earth system equipment

K006

MICHAUD

Application

This equipment is used for earth system a low voltage A.B.C. (Aerial Bundled Conductor). It is connected on short-circuiting device linked to CMCC connectors (for measures and short-circuiting).

Description

- This equipment comprises the following elements:
  - Earth clamp,
  - 10m long 25mm² copper insulated flexible conductor,
  - Insulated socket closing with a bayonet system on CMCC connector tap socket.
- The electrical characteristics are:
  - Short-circuiting capacity : 4 000A/second,
  - Permanent current capacity: 200A.
- The equipment is packed in a carrying case.

Code	Designation	Weight (kg)	Sales unit
K006	EARTH SYSTEM EQUIPMENT	4.000	1

Nota: the earth clamp has to be fixed on a rod. Contact us.

SEE SHEET
EARTH SYSTEM / Earth electrodes

Earth system

Switch earth system and short-circuiting device for Gang FSD

K010

MICHAUD

Application

This device is designed for short-circuiting and earthing the low voltage A.B.C. (Aerial Bundled Conductor). It is connected to the MICHAUD 3-poles type pole-mounted Gang Fuse Switch Disconnector (Gang FSD).

Description

- The short-circuiting of the Gang Fuse Switch Disconnector poles is carried out using a tinned metal comb bar. This bar can be seen from the bottom of the pole which constitutes a visual indicator of the short-circuiting of the poles.
- A safety hook made of synthetic material ensures correct closing of the bar holder on the body of the Gang fuse switch disconnector. The load related to the weight of the copper cable is offset towards the bar rotational axis via the presence of a metal bar. This assembly prevents the device from being opened when the operator pulls on the cable.
- A 2.5m long 35mm² copper cable with transparent insulation is fixed to the metal bar using a terminal lug. The other end of the cable is linked to the earth system clamp.
- The short-circuiting capacity is 9kA maximum over 500V.
- The device is delivered in a case ensuring safe transport and storage.

Installation

Fuse switch disconnector earthing

A - Installation of the earthing device :

1 - Open the fuse carrier with an operating stick.

2 - Put out the fuse carrier.

3 - Screw up the earthing clamp on an adapted equipment to link the cable to the earth.

Note : Check that length and section of earthing cable are adapted to the application.

4 - Put the device in the GANG FSD with an operating stick.

5 - Close the device in the same way that the fuse carrier.

6 - Check that the security hook is correctly locked.

OK

KO

B - Removal of the earthing device :

1 - Screw the stick on the device.

2 - Incline the stick on the earthing cable side to unlock the security hook. (see opposite drawing)

3 - Pull the stick to open the device.

4 - Put out the device from the GANG FSD.

5 - Disconnect the earthing cable from the earthing rod.

6 - Clean the device carefully and put it back in his box.

Replacement of the copper cable

The copper cable with transparent insulation and earth system clamp can be damaged during careless handling. Therefore, it should be replaced to ensure correct use of the device in complete safety. For this, dismount the existing cable and replace it with a new MICHAUD model by screwing the terminal lug on the metal bar of the device.

Code	Designation	Weight (kg)	Sales unit
K010	GANG FSD EARTH SYSTEM DEVICE 3 POLES	2.500	1
K012	GANG FSD EARTH SYSTEM DEVICE COPPER CABLE (2.5m / 35mm²)	1.400	1

SEE SHEET
PROTECTION / Network protection/ Fuse switch disconnector triple pole 160A

Cable

Bare copper

U051

MIRELEC

Application

This cable is designed for the earth systems. It is resistant to a temperature range of -15°C / +70°C and its flame behaviour meets the criteria of **IEC 60332-1**.

Description

- Nominal voltage: 600/1000V
- Short-circuit temperature: +250°C
- Minimum bending radius:
  - From 10mm² up to 25mm² (3x external Ø)
  - From 29mm² up to 300mm² (6x external Ø)
- This cable meets the criteria of the **EN 60228** standard.

Code	Designation	Section (mm²)	Number of strands	Strand diameter (mm)	External Ø (mm)	Weight (kg/km)	Sales unit
U050	BARE COPPER CABLE 10mm² - 500m drum	10	7	1.31	4	85	1
U051	BARE COPPER CABLE 16mm² - 500m drum	16	7	1.67	5.1	138	1
U052	BARE COPPER CABLE 25mm² - 500m drum	25	7	2.09	6.3	216	1
U053	BARE COPPER CABLE 29mm² - 500m drum	29	19	1.40	7	250	1
U054	BARE COPPER CABLE 35mm² - 500m drum	35	7	2.48	7.5	304	1
U055	BARE COPPER CABLE 50mm² - 500m drum	50	19	1.76	8.2	415	1
U056	BARE COPPER CABLE 70mm² - 500m drum	70	19	2.13	9.8	608	1
U057	BARE COPPER CABLE 95mm² - 500m drum	95	19	2.48	11.4	825	1
U058	BARE COPPER CABLE 120mm² - 500m drum	120	37	2.01	12.8	1055	1
U059	BARE COPPER CABLE 150mm² - 500m drum	150	37	2.21	14.4	1275	1
U060	BARE COPPER CABLE 185mm² - 500m drum	185	37	2.48	16.2	1606	1
U061	BARE COPPER CABLE 240mm² - 500m drum	240	37	2.84	18.8	2106	1
U062	BARE COPPER CABLE 300mm² - 500m drum	300	61	2.48	21	2661	1

Insulated copper

U069

Description

- Nominal voltage: 450/750V
- Test voltage: 2500V
- Short circuit temperature: +150°C
- Minimum bending radius: 5x external Ø
- This copper cable is covered by a PVC insulation.
- This cable meets the criteria of the **EN 50525-2-3** standard.

Code	Designation	Section (mm²) (Nb strands x strand Ø)	Insulation thickness (mm)	Conductor resistance at 20°C	External Ø (mm)	Weight (kg/km)	Sales unit
U063	INSULATED COPPER CABLE 6mm² - 500m drum	6 (30x0.5)	1	3.30	5.3	63	1
U064	INSULATED COPPER CABLE 10mm² - 500m drum	10 (7x1.34)	1	1.83	6,1	103	1
U065	INSULATED COPPER CABLE 16mm² - 500m drum	16 (7x1.67)	1	1.15	7.01	164	1
U066	INSULATED COPPER CABLE 25mm² - 500m drum	25 (7x2.09)	1.20	0.727	8.67	257	1
U068	INSULATED COPPER CABLE 35mm² - 500m drum	35 (7x2.46)	1.20	0.524	9.78	347	1
U069	INSULATED COPPER CABLE 50mm² - 500m drum	50 (19x1.80)	1.40	0.387	11.8	479	1
U070	INSULATED COPPER CABLE 70mm² - 500m drum	70 (19x2.12)	1.40	0.268	13.4	669	1
U071	INSULATED COPPER CABLE 95mm² - 500m drum	95 (19x2.49)	1.60	0.193	15.65	920	1
U072	INSULATED COPPER CABLE 120mm² - 500m drum	120 (37x2.00)	1.60	0.153	17.2	1130	1
U073	INSULATED COPPER CABLE 150mm² - 500m drum	150 (37x2.21)	1.80	0.124	19.07	1395	1
U074	INSULATED COPPER CABLE 185mm² - 500m drum	185 (37x2.46)	2.00	0.0991	21.22	1712	1
U075	INSULATED COPPER CABLE 240mm² - 500m drum	240 (37x2.82)	2.20	0.0754	24.14	2260	1
U076	INSULATED COPPER CABLE 300mm² - 500m drum	300 (37x3.20)	2.40	0.0601	27.2	2872	1

Non-contractual photos and drawings. MICHAUD Export reserves the right to modify characteristics without any prior notice.

Tape

MIRELEC

Application

This tape is designed to conduct the electricty into the earth system and to guarantee the default current runoff.

Copper

The copper gives an important electrical conductivity.

Code	Designation	Section (mm²)	Width (mm)	Thickness (mm)	Length (m)
U077	COPPER TAPE 20x3 L=100m	60	20	3	100
U078	COPPER TAPE 25x3 L=25m	75	25	3	25
U079	COPPER TAPE 25x3 L=50m	75	25	3	50

Copper bonded steel

The copper bonded steel offers a good economical alternative to copper.

Code	Designation	Section (mm²)	Width (mm)	Thickness (mm)	Length (m)
U080	COPPER BONDED STEEL TAPE 20x3 L=60m	60	20	3	60
U081	COPPER BONDED STEEL TAPE 25x3 L=40m	75	25	3	40
U082	COPPER BONDED STEEL TAPE 25x4 L=30m	100	25	4	30
U083	COPPER BONDED STEEL TAPE 30x3 L=40m	90	30	3	40
U084	COPPER BONDED STEEL TAPE 30x4 L=30m	120	30	4	30
U085	COPPER BONDED STEEL TAPE 40x4 L=20m	160	40	4	20

Tinned copper bonded steel

The tinned coating protects from theft thanks to the non visible copper coating.

Code	Designation	Section (mm²)	Width (mm)	Thickness (mm)	Length (m)
U086	TINNED COPPER BONDED STEEL TAPE 20x3 L=60m	60	20	3	60
U087	TINNED COPPER BONDED STEEL TAPE 25x3 L=40m	75	25	3	40
U088	TINNED COPPER BONDED STEEL TAPE 25x4 L=30m	100	25	4	30
U089	TINNED COPPER BONDED STEEL TAPE 30x3 L=40m	90	30	3	40
U090	TINNED COPPER BONDED STEEL TAPE 30x4 L=30m	120	30	4	30
U091	TINNED COPPER BONDED STEEL TAPE 40x4 L=30m	160	40	4	30

Stainless steel cruciform clamp

U092

Application

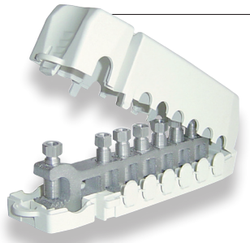
This cruciform clamp is designed to perform a connection between the earth rod and the conductor or between two conductors.

Code	Designation	Nominal rod diameter (mm)	Tape length (mm)	Cable section (mm²)	Screw	Weight (kg)	Sales unit
U092	STAINLESS STEEL CRUCIFORM CLAMP ROD DIAM 12.7 AND 14	14-16	≤ 40	28-78	M10	0.315	2
U093	STAINLESS STEEL CRUCIFORM CLAMP ROD DIAM 17.2	19	≤ 40	28-78	M10	0.400	2

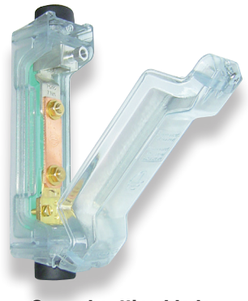
Non-contractual photos and drawings. MICHAUD Export reserves the right to modify characteristics without any prior notice.

Aluminium earth cable and accessories

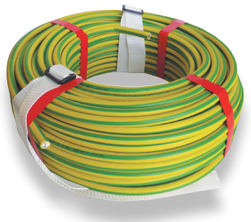
Exclusivity
ANTIFRAUD SOLUTION
Michaud Export



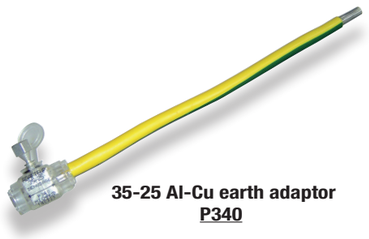
Earth distributor 6 taps
Q979



Ground cutting blade aluminium with box
N106



Aluminium earth cable
Q984 - Q985 - Q986



35-25 Al-Cu earth adaptor
P340

Application

The earth distributor is used to connect floor earths between themselves. It is installed in a building pillar according to applicable specifications.
The ground cutting blade is installed at the bottom of the earth pillar. It enables the earth system opening during an earth resistance measurement.

Benefits:

- **Aluminum terminals admitting copper or aluminium cable**
- **Reversible box cover protecting the ground cutting blade**
- **Earth distributor designed for an esthetic installation in 60x60mm conduit in case of renovation**

Description

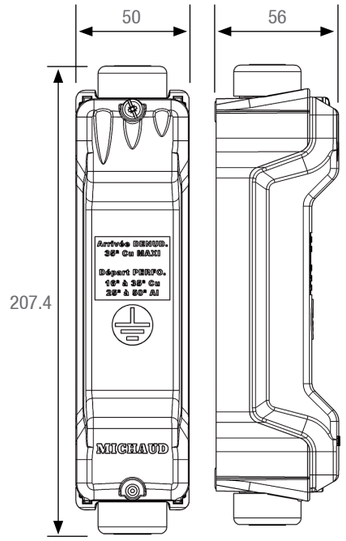
- The earth distributor can receive:
  - 1 cable **50mm²** maximum without cutting (main line)
  - 6 possible taps 35mm² maximum
- It comprises an aluminium profile with shear head screws and insulation piercing and a box in synthetic materials giving it a protection degree type IPXXB.
- It is equipped with a handle offering a possible sealing.

- The ground cutting blade with box is equipped with:
  - An insulation piercing superior terminal block in tinned aluminium with shear head screws (no need of stripping)
  - A copper blade
  - An inferior terminal block in brass
  - A synthetic materials box with reversible opening and closing way, giving it a protection degree type IP44D
- It can receive **aluminium cable section from 25 up to 50mm²** and **copper cable section from 16 up to 35mm²**.

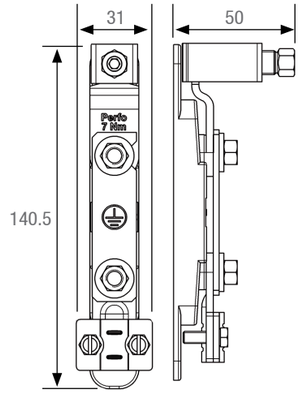
- The distribution board adaptor Al/Cu comprises:
  - A flexible tail 25mm², length 230mm
  - A shear head screw
- It can receive cable sections from 25 up to 35mm²
- Its use is requested for the connection of the individual protection connector and the earth terminal block of the distribution board, when this one cannot receive aluminium.

- The earth cable FR-N-07V-AR is made of aluminium. It is delivered in ring with 2 straps making transportation easier and a box of 25 identification labels marked “Alu”.
- It is available in 3 sections: 25, 35, 50mm².

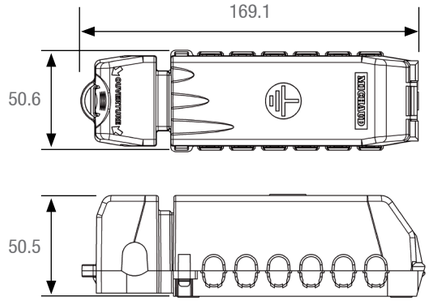
It meets the requirements of **NF C32-208**.



N106 - Earth box



N107 - Ground cutting blade



Q979 - Earth distributor

Code	Designation	Sales unit
N106	GROUND CUTTING BLADE ALUMINIUM WITH BOX	1
N107	GROUND CUTTING BLADE BARE AL	1
Q979	EARTH DISTRIBUTOR AL 6 TAPS	1
Q984	ALUMINIUM EARTH CABLE 25² 100M	1
Q985	ALUMINIUM EARTH CABLE 35² 100M	1
Q986	ALUMINIUM EARTH CABLE 50² 50M	1
P340	AL/CU EARTH ADAPTOR 35-25	10

Variants: Stripping technology

These products using the stripping technology require a brushing with neutral grease during installation.

ED001

ED002

Code	Designation	Sales unit
ED001	EARTH DISTRIBUTOR STRIP AL 5 TAPS	1
ED002	EARTH DISTRIBUTOR STRIP AL 8 TAPS	1
ED003	GROUND CUTTING BLADE AL STRIP	1

Accessories

N109

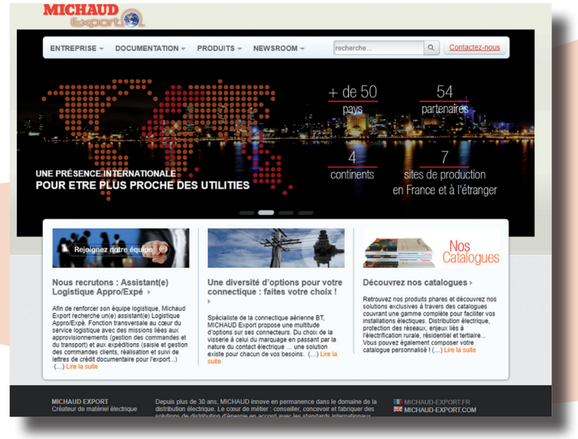
Code	Designation	Sales unit
BOX FOR CUTTING BLADE ALONE The box can be sold alone to receive for example a ground cutting blade for copper, Ref U036		
N108	BOX FOR GROUND CUTTING BLADE	1
LABELS AL CABLE These labels enable to identify aluminium cable		
N109	BOX OF 25 LABELS AL CABLE	1

Earth system

Web site

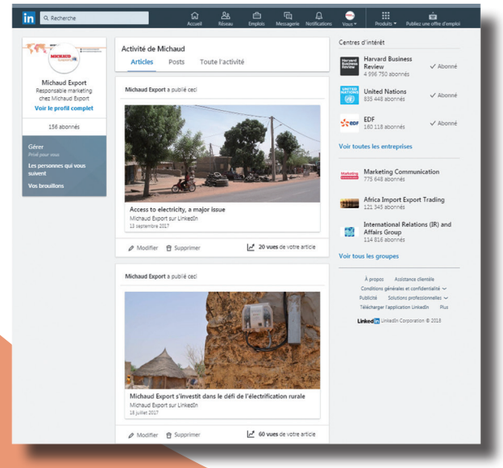
Discover our latest news, catalogues, products range as well as information mediums to assist you in the use of our products.

www.michaud-export.com



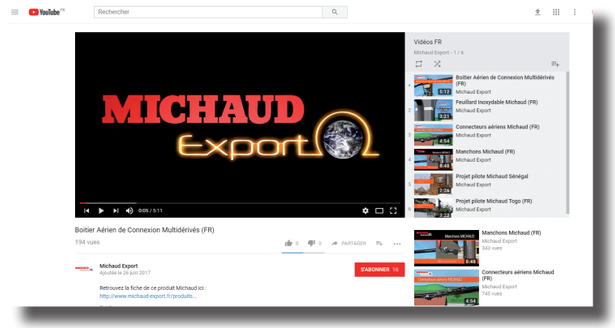
LinkedIn

Join us on Michaud Export's LinkedIn network to follow the company's development and to share with us.



YouTube

Follow our YouTube channel in order to discover products implementation videos and this way facilite your installations on the field.



Implementation

These products must be implemented and used in **compliance with the applicable regulations** with a skilled, qualified professional undertaking to do so following the generally accepted rules of the trade.

For **live-line** implementation or handling, the electrician must comply with the requirements for live-line work conditions and must be equipped with the necessary personal protection equipment. The implementation temperature limits are: -10°C to +40°C.

Live-line work is carried out under the responsibility of the ordering customer in compliance with the applicable rules.

Before powering up the equipment, all the required verifications must be carried out.

Tools

The product should be installed and used with **suitable tools**.

The screw heads should be tightened with the appropriate tool: **Spanner** for hexagonal cap screws, **flat screwdriver** for slotted screw heads of the right size, **Phillips screwdriver** for cruciform screw heads, **HSHC screw head (awls)** for hollow hexagonal screw heads, etc. The screw heads with no torque-limiting device must be tightened to the recommended torque and must not be tightened again.

Recommendations for use

The installation instructions must be read carefully before using the product.

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 defined by the operator/ manager of the network and on an electrical installation that 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.

Environment

Please group your waste together and follow the recycling and destruction instructions before leaving the worksite.

For further information:
www.michaud-export.com

1. APPLICATION OF CONDITIONS:

Purchaser make himself acquainted with these general selling conditions which shall lay down the Parties law, except purchaser's written denunciation ratified by MICHAUD EXPORT and despite opposite clauses that could be included in the purchaser's general conditions. Possible renunciation of one or few clauses herein does not interfere with the validity of the other clauses.
Except any formal and express derogation made by MICHAUD EXPORT, all purchaser's orders carry off his full and entire consent to the present General Selling Conditions which prevail over any Purchasing Conditions. All particular purchasing clauses or conditions aiming to modify the present conditions must not be contrary to the seller's ones.

2. ORDER:

Any order shall not constitute a contract unless accepted in writing by MICHAUD EXPORT.

3. PRICE LIST:

3.1 Unless otherwise stated by MICHAUD EXPORT, price lists and commercial offers are established in Euro €, excluding any other currency, even Euro indexed currencies, and is governed by Incoterms 2010 to be defined with the purchaser in the particular conditions.

3.2 The price list is established for standard items with specific given technical characteristics. Any technical changes on products to adapt them to other specifications or standards may lead to extra unit costs and price revision.

3.3 Unless otherwise stated by MICHAUD EXPORT,MICHAUD EXPORT reserves the right to gather purchaser's orders and to deal with according to a minimum invoice amount of 800 € excluding tax and freight charges (according to general price list in due force on the order date). Any order which amount is lower than 1 500 € shall result in the invoicing of a fixed sum of 150 € meant to cover administrative fees.

3.4 Unless otherwise stated and written by MICHAUD EXPORT, validity of the price list is one month starting when given to the purchaser.

3.5 The price list is subject to alteration without notice.

4. DELIVERY TIME:

4.1 The delivery time is defined as the case may be according to the commercial relationships established with the purchaser. MICHAUD EXPORT use their best endeavours to deliver the goods by the time fixed for delivery, however, in case of delay, they will not be responsible for any loss or damage thereby caused to the purchaser unless expressly accepted in writing by MICHAUD EXPORT.

4.2 Should partial or delayed deliveries occur, it does not justify any cancellation of purchaser's orders, and MICHAUD EXPORT shall not be liable and responsible for any actual or potential, direct or indirect, or consequential damages caused to the purchaser through delay or by failing on deliveries.

5. DISPATCH:

5.1 MICHAUD EXPORT use their best endeavours to select appropriate method of delivery with no responsibility on it. Choice shall be made freely unless purchaser's contrary notice who then support following additional cost that may follow.

5.2 Ex-works delivery is considered as an effective delivery, notably regarding modalities and payment terms.

5.3 Partial loss or damage during in transit must be reported to the carrier and to MICHAUD EXPORT in writing by registered letter with proof of delivery within three days after receipt of the goods by the purchaser. If these conditions are not complied with, the purchaser will be responsible for any loss or damage that may occur during transit.
The purchaser commits to return to MICHAUD EXPORT at his own costs and risks the products he rejected during his check-up for due investigation. The purchaser agrees that MICHAUD EXPORT shall return the products at the purchaser's cost and risks after examination or any possible repair or replacement.

6. USE OF THE PRODUCTS:

The purchaser has to follow imperatively the laws, current prescriptions in due force and custom rules regarding instruction procedures and use of the products. MICHAUD EXPORT shall not be responsible in case of wrong use of the products according to the specifications and prescriptions of use advised by MICHAUD EXPORT.

7. TESTING AND INSPECTION:

When testing and/or inspection is required by the purchaser, tests shall be carried out at MICHAUD SA's facilities, and relevant costs shall be covered by the purchaser, unless any exemption agreed and approved by MICHAUD EXPORT.

8. WARRANTY:

8.1 MICHAUD EXPORT guarantees the purchaser against latent defect of the goods according to the conditions driven by the law.
Once a guaranteed shortcoming is stated by the buyer, it is up to him to send his reclamation to MICHAUD EXPORT with a registered letter with proof of delivery within a time limit of three months starting from the fault's appearance.
This reclamation has to be accompanied by a detailed description of the fault's nature.
After this period of time the goods delivered shall be deemed as in good condition and the purchaser is no longer entitled to make a complaint about any defect on the products.

8.2 MICHAUD EXPORT guarantees its products for a period of one year after delivery or shifting from our facilities.
In case of fault, defect, non-conformity proved or admitted by MICHAUD EXPORT, MICHAUD EXPORT undertakes to replace the products admitted defective in reasonable time. In order to be replaced, rejected products shall be returned. No other prejudice of damage shall be required by the purchaser.

8.3 The guarantee is excluding the followings:
- If the product has been repaired or modified by the buyer or by third parties chosen by him ; or
- If it concerns items that have been made by sub-contractors or MICHAUD EXPORT suppliers to whom the normal producer or Subcontractor guaranty applies ; or
- If the defect is coming from the buyer's negligence, or recklessness ; or
- If the defect is the result of a force majeure or of an external event.

9. TAKING BACK OF THE PRODUCTS:

In case the purchaser renounces to the ordered and delivered products, no taking back will be considered unless expressly accepted in writing by MICHAUD EXPORT. Rejected goods shall be sent back to the French plant defined by MICHAUD EXPORT. Credit of the sent back goods will be registered after receipt in the warehouse. Taking back value will systematically take into consideration a reduction to be defined for administrative and check-up cost as well as a reduction for restoration of the product and packaging if necessary.

10. PAYMENT:

10.1 Payment terms are defined with the purchaser in the particular conditions. All goods shall be paid to the MICHAUD EXPORT head office located in Viriat France whatever the payment terms used. Invoice date shall be the starting point of the settlement period.

10.2 Legal property transfer of the goods shall be retained until full payment of the whole sold goods. MICHAUD EXPORT keep the property of the goods until full payment of their price, sending bank drafts or any other bond notes building payment obligation not constituting a payment.

10.3 Any unpaid draft or invoice being at maturity will produce due interest, without giving notice. Applicable penalties shall be equivalent to three times the legal interest rate at the payment date located on the invoice. Payment of any other sums owed by the failing debtor shall be immediately payable, even if they are accepted draft. Any full or partial non-execution by the Customer of the payment obligations or any delay in payment shall, without prejudice to any damages and interests, lead to the payment of fees of 40 € for collection charges set down by decreet made pursuant to the section 121 of this act. Moreover, MICHAUD EXPORT keep the right, in that case, to suspend or cancel fulfilment of the contracts and pending orders and demand cash in advance payment of any other delivery, whatsoever past conditions agreed for such delivery.

10.4 Any change in the purchaser situation regarding sale or other party's investment in the business, decease, incompetence, suspension of payment, official recovery, official receivership, temporary proceedings suspension, dissolution or form modification, even after partial fulfilment of the contracts or pending orders entails application of the same conditions as the ones described in case of unpaid invoice.

11. FORCE MAJEURE:

Neither MICHAUD EXPORT nor the buyer can be held responsible for a possible delay or lack in their obligations' execution, if this delay or lack is the result of a force majeure. A force majeure exists notably in the following situations, if they present certain characteristics of a force majeure, this means if the event was irresistible, unforeseeable, and externally provoked. This non-exhaustive list enumerates some situations which constitute a force majeure: explosions, fires, incidents, destruction of machinery, factories and equipment, natural disasters, acts by governmental authorities (refusing or cancellation of a license …), wars, or any acts of war, flooding, riots, or social conflicts.

The party that faces such a circumstance which responds to the above given definition must immediately inform in writing the other party of this intervention and when this circumstance possibly ends. In the case of absence of information, the concerned party can not prevail over, unless in the case of intervening circumstances, which also prevent any communication.

Where a force majeure case which responds to the above definition intervenes, the time for the contract's execution is prolonged for a period of time corresponding to the event's duration. This does not include any payment of damages and interest or a penalty for the delay.
However if the above mentioned circumstances do persist for a period of time of 6 months, each party can cancel the contract without any payment of damages and interest.

12. CANCELLATION:

The contract is cancelled by law, without the need of any judicial formality where there are serious shortcomings by one of the parties concerning essential obligations. Cancellation would become effective within one month after the mailing of a registered letter with proof of delivery of an earlier made formal notice which stayed unfruitful.

The essential obligations, which the parties have to fulfill, notably consist of the due payment by the buyer or the merchandise's non-delivery by MICHAUD EXPORT. In case of a serious shortcoming to the contract's essential obligations, the sale will be cancelled in good law without prejudice of damages and interest that can be claimed.

Any tolerance that one party allows the other not to prevail immediately over one of its rights, will not prejudice the party's rights to prevail over them later, except in case of a contrary convention or stipulation to the present conditions.

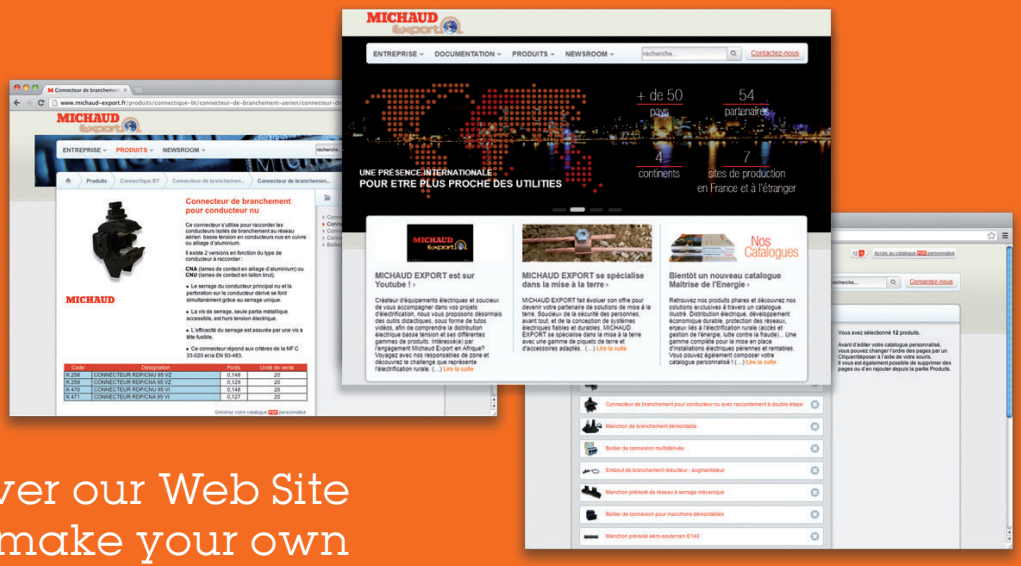
13. JURISDICTION ATTRIBUTION:

These General Selling Conditions shall be ruled and governed by the French Law as followed by the courts. Any dispute deriving from these General Selling Conditions, after failure of a previous conciliation procedure shall be of the exclusive French jurisdiction of the competent Commercial Court of Lyon located in France. Each party accepts to bear any costs and expenses it would have exposed.

14. OFFICIAL LANGUAGE:

The French version of these general selling conditions, available upon enquiry, is the only legally acceptable version.

Creator of electrical equipment



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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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